ATTACHMENT A

Transfer Plan Review
Part 2

Final Report

Prepared in accordance with Council Motion 14145

King County
Department of
Natural Resources and Parks
Solid Waste Division

Waste **Prevention** • *Resource* **Recovery** • *Waste* **Disposal**

www.kingcounty.gov/solidwaste

June 2015

Table of Contents

ACRONYMS, ABBREVIATIONS, AND COMMON TERMS **1**

BACKGROUND **7**

- Purpose of Review 7
- Process 8
- Key Assumptions 8
- Transfer Plan Review Part 1 9
- South County Service Area 9

TRANSFER PLAN REVIEW PART 2 ..... **10**

- Guiding principles 10
- Stakeholder Engagement 10
- Consultant Roles and Expertise 11
- Data Collection 11
- Process Used to Forecast and Analyze Data 12
- Benchmarks 16

STUDY ELEMENTS **18**

- Capacity 19
- Concept Descriptions 19
- Overview of Strategies 20
- Resource Recovery and Recycling Goals and Assumptions 24
- Costs 24
- Environmental Impacts 25

METHODOLOGY FOR EVALUATING CONCEPT AND STRATEGY PACKAGES **25**

- Summary of Constraints 26
- Tier 1/Tier 2 Screening 27
- Shoreline 28
- Factoria 32
- Bow Lake 37

CONCEPT 3 ..... **40**

RENTON **41**

CONCLUSION **43**

- Recommendations 44

APPENDICES **46**

Acronyms, Abbreviations, and Common Terms

Cedar Hills	Cedar Hills Regional Landfill
division	King County Solid Waste Division
HHW	Household Hazardous Waste
ILA	Interlocal Agreement
LOS	Level of service; a grade that can be used to assess capacity and operational performance
MSWMAC	Metropolitan Solid Waste Management Advisory Committee
NERTS	Northeast Recycling and Transfer Station
self-haul or self-hauler	Anyone who brings garbage, recyclables, and/or yard waste to a transfer facility except a commercial collection company
SEPA	State Environmental Policy Act
service performance indicators	Indicate potential service issues and need for further evaluation: • Service times for commercial customers of 16 minutes or less • Service times for self-haul customers of 30 minutes or less • Inbound queuing and potential impacts to off-station roadways and/or driveways
service time	Time customers spend on-site measured from the inbound scale to the outbound scale
SWAC	Solid Waste Advisory Committee
Transfer Plan	The adopted 2006 Solid Waste Transfer and Waste Management Plan
TSO	Transfer Station Operator

Introduction

Purpose Statement

This report has been prepared in response to Council Motion 14145, which directs the King County Solid Waste Division to determine how to manage transactional demand at transfer stations in the northeast service area of King County. This report identifies demand management strategies and compares them to the adopted plan with the goal of minimizing customer wait times and managing the effective utilization of transfer stations.

Summary of findings

There are several options for managing transactional demand in the northeast portion of the county. These options will require certain policy and procedure changes. If they are implemented, a Northeast Transfer Station is not needed at this time but should remain an option as a potential future facility.

Other key findings:

- Implementation of demand management strategies enables the planned closure of the Houghton Transfer Station and not building a new Northeast.
- The Renton, Algona, and Enumclaw transfer stations do not share a customer base with the northeast and are not directly affected by demand management strategies.
- Bow Lake was designed for increased capacity and will expand regardless of any options selected to serve the northeast.
- Any selected demand management strategy applied in our peak year of 2023 should continue to be effective in 2028 should Bellevue and the four Point Cities elect to stay in the system.
- Renton has some effect on other stations but not enough to change the demand management options.
- Some demand management strategies, such as mandatory collection and material bans, require legislative action by the King County Council and participating cities.

A complete explanation of findings can be found in the “Conclusion” section of this report.

Concepts Analyzed

The division analyzed four concepts to determine how to meet the goals of this report. Since the adopted plan calls for the construction of a new Northeast, that concept was included for comparative purposes and remains an available option.

- Do Not Build Northeast (Concept 0)
    - No Northeast
    - Does not direct commercial haulers
    - Does not restrict self-haulers

- Redirect Commercial (Concept 1)
    - No Northeast
    - Redirects commercial haulers, primarily to Shoreline

- Restrict Self-Haul (Concept 2)
    - No Northeast
    - Restricts self-haulers from using Factoria at certain times and extends operating hours at Factoria

- Build Northeast (Concept 3)
    - Build Northeast

No-Build Actions that Meet Desired Service Times and Queue Lengths

The following no-build concepts, combined with mitigation strategies, meet desired wait times and queue lengths.

A full list of demand management strategies and mitigation strategies can be found in the "Study Elements" section of this report. An explanation of how these actions were analyzed and packaged can be found in the "Methodology for Evaluating Concept and Strategy Packages" section of this report.

No-Build Options That Meet Desired Service Times and Queue Lengths

CONCEPTS	FACTORIA	SHORELINE
Do Not Build Northeast (Concept 0)	• Extend operating hours (6 a.m. to 10 p.m. weekdays, 8 a.m. to 8 p.m. weekends) • Implement incentive pricing on minimum load fees of $22 or $41.25 depending on peak hour times and day of the week	• Add staff • Add an outbound scale
Do Not Build Northeast and Redirect Commercial (Concept 1)	• Ban yard and wood waste from transfer stations and redirect to existing private site or new public site • Implement mandatory curbside collection • Lower-cost bulky item collection to reduce self-haul transactions	• Add staff • Add an outbound scale
Do Not Build Northeast and Restrict Self-Haul (Concept 2)	• Ban yard and wood waste from transfer stations and redirect to existing private site or new public site • Implement mandatory curbside collection • Lower-cost bulky item collection to reduce self-haul transactions	• Add staff • Add an outbound scale

Costs

Though the division can analyze and forecast future costs associated with operational and capital improvements, some costs customers could incur are more difficult to measure. For example, commercial haulers have indicated that not building a Northeast would result in more trucks on the road and more miles driven, which could cause collection rates paid by the customer to increase. A Hauler Survey that explains what could happen if a Northeast is not built can be found in Appendix C.

Strategies with an operational emphasis tend to have lower recurring costs but are subject to inflation over time. Though the analysis shows that operational costs do escalate over time, those costs never reach the upfront amount the division would need to pay to build a new Northeast. Strategies with an emphasis on capital tend to have higher one-time costs and are not subject to inflation. To compare the costs of the different build/no-build strategies, a Net Present Value calculation was used to account for the different cost and revenue streams over time.

Building a new Northeast Transfer Station is the most expensive of the modeled strategies for managing transactional demand in the northeast service area. The upfront capital costs of building a new station exceeds the operational and policy costs associated with strategies like adding an outbound scale at Shoreline or extending hours at Factoria.

A complete cost analysis and comparison of the different concepts and strategies can be found in Appendix I.

Environmental Impacts

Both build and no-build actions can result in environmental impacts and would require a State Environmental Policy Act review.

Regionally, not building a Northeast would lead to more cars on the road driving farther and burning more fuel to reach transfer stations, increasing greenhouse gas emissions. Building a new transfer station also creates greenhouse gas emission impacts during its construction.

At Factoria, the environmental impacts most likely to occur are additional vehicle traffic during evening peak commuting hours.

At Shoreline, although the addition of staff and an outbound scale could result in reduced queuing and reduced negative air quality impacts, as well as a decrease in self-haul traffic, an increase in commercial traffic would occur.

A more extensive explanation of potential environmental impacts projected under the various packages can be found in the “Methodology for Evaluating Concept and Strategy Packages” section of this report.

70 Percent Recycling Rate: Tonnage vs. Transactions

King County has set a goal of reaching a 70 percent recycling rate by 2020. The region stands to benefit substantially through economic and environmental impacts. The single largest influence on landfill capacity is the fact that 78 percent of what is being brought into the transfer system to be landfilled could be recycled instead. When the landfill reaches capacity, the region will face more expensive disposal options. While the recycling goal is an important one to achieve for extending the life of the landfill, it has only a small effect on the number of customers using the transfer system. Though an increase in recycling leads to a decrease in garbage tonnage, self-haulers, the primary drivers of transfer station capacity needs, would continue to use stations at the same rate and create the same transactional demand.

Responsiveness to Comments

On March 31, 2015, the Solid Waste Division submitted the *Draft Transfer and Waste Management Plan* to the King County Council and opened the draft for review by cities, stakeholders, and the public, who were encouraged to submit their comments. The public comment period was scheduled to close on April 29, but to give its customers and stakeholders enough time to respond to the draft plan, the public comment period was extended by seven days. On May 6, the public comment period ended and the division began reviewing the comments in preparation for submitting the final report to council on June 30.

The division received 20 letters, containing various comments, from cities, the general public, and a Solid Waste Advisory Committee member. Those comments, as well as responses, can be found in Appendix J. Some comments received, including retaining building a Northeast as an option, cost analysis and comparisons of concepts, and equitable distribution of transfer service and fees, among others, influenced the final report. Changes made to the body of the report in response to comments are also noted in Appendix J.

Recommendations

Though the results show a Northeast is not needed at this time, the modeled demand management strategies are untested and would benefit from real-life analysis in order to determine how the strategies can be distributed as equitably as possible. Additionally, regional discussion with cities and stakeholders is needed to inform policies to be included in an updated *Comprehensive Solid Waste Management Plan* (Comp Plan). Such policy discussions include maximizing the lifespan of the Cedar Hills Regional Landfill, increasing recycling and diversion efforts to reach a 70 percent recycling rate, providing system-wide customer service excellence, and ensuring a sustainable rate model is in place to cover system expenses.

The division recommends the following:

- Do not build a new Northeast Transfer Station at this time, but keep it as an option for a future potential facility.
- Develop and test the following demand management strategies:
    a. Conduct a pilot program to test the effectiveness and potential impacts of using demand management strategies, including web cameras to inform customers of station activity in real time.
    b. Work with private industry customers and stakeholders to develop a low-cost bulky item collection pilot in target regions of the county by May 2016.
    c. Research point of sale (IT system) needs to support differential pricing for transactions at the transfer stations and identify implementation needs by May 2016. Implement necessary technology changes by September 2017.
    d. In 2017, begin a 12-month pilot to test the effectiveness and potential impacts of extended hours and incentive pricing. Following the pilot, transmit a report and recommendation to Council in March 2019.
- Identify the steps needed to achieve 70 percent recycling rates.
- Continue the *Comprehensive Solid Waste Management Plan* process with city partners and other stakeholders to address key policy issues and produce a draft *Comprehensive Solid Waste Management Plan* for review in early 2017.
- Upon adoption of the *Comprehensive Solid Waste Management Plan*, the system's infrastructure should be reassessed to ensure it fully supports the adopted strategies and goals of the system.

Background

In King County, the transfer system serves a population of about 1.4 million residents and numerous businesses ranging across 2,000 square miles from rural and remote to densely urban and suburban.

This review is focused on the urban transfer system and one central question in particular: *How do we serve the northeast area?* Impacts of closing the Renton Transfer Station are also addressed.

There are options for providing service – from capital investments to policy changes to operational strategies. This report provides information so that these options can be compared. Then, with feedback from stakeholders, a final report will be prepared with a recommended course of action.

Purpose of Review

In 2013, in collaboration with its stakeholders, the King County Solid Waste Division (division) conducted a comprehensive review of the Solid Waste Transfer and Waste Management Plan (Transfer Plan). One of the recommendations of that report was to continue to evaluate the best capital and operational approaches to provide service to the northeast county. This report addresses that recommendation, along with other analysis specified in Council Motion 14145:

> By March 31, 2015, the division shall transmit a draft report to the Council, followed by a final report by June 30, 2015, prepared in collaboration with stakeholders, on strategies to manage transactions at transfer stations, as well as other operational and capital strategies such as increased use of underutilized transfer stations.
>
> - The report shall address the management of transfer station transactions through the use of strategies intended to avoid excessive user wait times resulting from overutilization of individual stations.
> - The report shall analyze options E1 and E2 in the Transfer Plan Review Report.
> - The report shall also analyze the effect of the potential closure of the Renton Transfer Station on the self-haul service needs of residents currently served by the Renton Transfer Station, with particular attention to the accessibility and convenience provided to current transfer station clients by the Renton station, compared with drive time and potential waits associated with alternative transfer station options.
> - The report shall analyze options for self-haul service for residents currently served by the Renton Transfer Station in the event of a closure of the station.

The report also addresses recommendations of the Transfer Plan Review Final Report (Revised and Amended June 2014):

> In collaboration with stakeholders, continue to evaluate a mix of capital facilities and operational approaches to address system needs over time, including implementation of operational approaches such as transaction demand management strategies that would provide service for the northeast county without building an additional transfer station; compare trade-offs and benefits with the Transfer Plan.

Questions and concerns expressed by cities and other stakeholders during the review process are also addressed in the report.

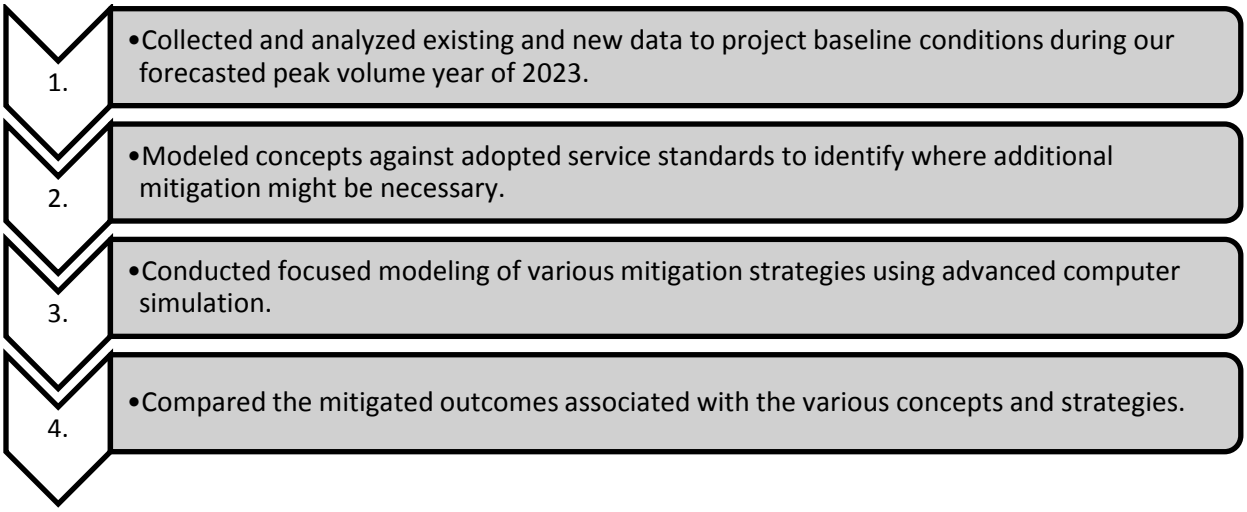
This second review of the Transfer Plan will inform the revision of the comprehensive solid waste management plan update.

Process

A team of consultants collected and analyzed the data that led to the findings presented in this report. An advisory committee composed of members of the Metropolitan Solid Waste Management Advisory Committee and the Solid Waste Advisory Committee provided feedback and advice to the Solid Waste Division throughout the review. Workshops provided a larger group of stakeholders with updates and helped to identify outstanding questions and concerns. Surveys of transfer station self-haulers and commercial haulers were also conducted.

The data collection and analysis process was composed of four key steps to ensure a thorough review of regional solutions.

Data Collection and Analysis Process



Key Assumptions

Key assumptions informed by Council Motion 14145, as well as previous review in 2013, include:

1. The review focused on the northeast service area and the Renton Transfer Station.
2. All concepts assumed that the Houghton Transfer Station would close sometime before 2023.
3. Each concept was analyzed both with the Renton Transfer Station open and with it closed.
4. Factoria was modeled based on the design of the station currently under construction.
5. Analysis focused on 2023 because that year represents the forecasted peak for system tonnage, so any potential service problems could be identified and mitigation applied under a worst case scenario.
6. A 70 percent recycling rate would be achieved in 2020.
7. The City of Bellevue, along with four of the five Point Cities – Clyde Hill, Hunts Point, Medina, and Yarrow Point – will leave the system in July 2028.
8. Concept 3, Build a Northeast Recycling and Transfer Station, was included because it is in the adopted Transfer Plan and provides a useful comparison to the other concepts.

Transfer Plan Review Part 1

As a follow-up to the 2006 Transfer and Waste Management Plan that was developed in collaboration with advisory committees and reviewed by an independent consultant, the King County Council requested a review of that plan in 2013. The report for that review was provided to Council on March 3, 2014. Council amended the report in May 2014 and directed that additional review be done. The report recommended the following:

- Proceed with a new Factoria Recycling and Transfer Station in 2014.
- Continue the siting process for a South County Recycling and Transfer Station.
- Continue to evaluate a mix of capital facilities and operational approaches to address system needs over time, including implementation of operational approaches such as transaction demand management strategies that would provide service for the northeast county without building an additional transfer station; compare trade-offs and benefits with the Transfer Plan.
- Revise the 2006 Solid Waste Transfer and Waste Management Plan and the pending Comprehensive Solid Waste Management Plan to address the transfer station network to include among the new or upgraded urban Recycling and Transfer Stations: Bow Lake, Factoria, Shoreline, and a new South King County Recycling and Transfer Station.
- Revise the 2006 Solid Waste Transfer and Waste Management Plan and the pending Solid Waste Comprehensive Plan to acknowledge continuing system attention to potential capital needs over time that may include capital projects such as recycling facilities, CDL facilities, a new northeast recycling and transfer station, or other capital projects as potential future facilities to retain flexibility in the system.

As of June 2015, the division has completed construction of the Bow Lake Recycling and Transfer Station, begun construction of a new Factoria Recycling and Transfer Station, and is in the process of siting a new South County Recycling and Transfer Station to replace the Algona Transfer Station.

South County Service Area

Although it is an integral part of our urban transfer system, the south county service area, currently served by the Algona Transfer Station, is not significantly impacted by decisions regarding the north part of the county. The Transfer Plan Review Part 1 concluded that a new South County Recycling and Transfer Station would be necessary to replace the aging Algona Transfer Station. The Bow Lake Recycling and Transfer Station is not sufficient to serve the south county service area, even if the Renton Transfer Station were to remain open. For more information see the Transfer Plan Review Final Report.

Council Motion 14145 specifically directed additional review of the northeast and Renton service area needs. Decisions made for the northeast service area, currently served by the Houghton Transfer Station, will have little or no impact on the south county service area as there is virtually no overlap in the customer base. There is minimal overlap between the Renton and south county service areas. Tables showing what percentage of the loads delivered to each urban transfer station come from which city, for both self-haul and commercial-haul can be found in Appendix H. Additionally, in a recent survey of transfer station customers (see Appendix B), less than four percent of Renton Transfer Station self-haulers said that they would use the Algona Transfer Station if the Renton station were to close. That represents about a two percent increase in transactions in the south county service area or about 6 to 7 customers per day.

Transfer Plan Review Part 2

In July 2014, following council adoption of Motion 14145, the division began the process to undertake further review of the Transfer Plan. Through the advisory committees – MSWMAC and SWAC – and a special Transfer Plan Review committee, the division benefited from diverse participation and views to ensure the effectiveness of this study. In addition to the committee meetings, the division held two workshops to reach out to a broader audience. To foster awareness of the study as it progressed, information was distributed and posted on the division's website. As with the previous review, the process began with outreach to stakeholders and adoption of guiding principles.

Guiding principles

In collaboration with its stakeholders, the division adopted the following principles to guide the transfer plan review process:

- Participants in the King County solid waste system will have access to efficient and reliable regional transfer services at rates as low as reasonably possible, consistent with sound financial and environmental stewardship.
- Future system facilities will be designed to provide flexibility to accommodate changes in growth, anticipated future customer needs, and future waste disposal, conversion, and recycling options and technologies.
- The system will comply with all applicable local, state, and federal regulations.
- The system will support the following long-term goals:
  1. Extend the life of the Cedar Hills Regional Landfill through 2040
  2. Achieve Zero Waste of Resources by 2030
  3. Achieve 70 percent recycling by 2020
  4. Provide stable, competitive rates
  5. Environmental excellence
- This review will be conducted in a transparent and collaborative manner between King County and its stakeholders.

Stakeholder Engagement

To assist with the Transfer Plan review, an advisory committee composed of MSWMAC and SWAC members met in August, September, and October to review demand management strategies, the effect of Renton closure, and other topics responsive to the Council motion. Workshops in November and February provided a larger group of stakeholders with updates and helped to identify outstanding questions and concerns. Transfer Plan Review advisory committee members, links to the meeting and workshop information, and stakeholder comments can be found in Appendix F.

In addition, the division conducted an online survey focused on Houghton, Factoria, and Renton Transfer Station self-haulers from mid-November to early January. The purpose of the survey was to provide the division with additional data related to customer origin and type, types of waste disposed, reasons for using the stations, and curbside garbage subscription levels in order to better understand how and why self-haulers use the stations. Questions included how frequently self-haulers take loads to the stations, what materials they bring, how transfer system use would change if Houghton or Renton closed, and

what the most important transfer station features or elements are and customer willingness to pay for a new Northeast Recycling and Transfer System. For more detailed information see Appendix B.

Information was also requested from the commercial haulers to assess how potential changes to the transfer system might affect the haulers and their customers. Division staff sent a list of questions to each of the commercial haulers and also met with representatives from Waste Management, Republic and Recology Cleanscapes to discuss the information. Questions that were discussed include: potential routing and cost impacts if Houghton and Renton closed; potential routing and cost impacts if haulers were directed to use specific transfer stations; facility operating hours; potential use of private transfer stations to haul directly to Cedar Hills (regional direct); and bulky waste collection. For more detailed information see Appendix C.

Consultant Roles and Expertise

The division contracted with a team of consultants to provide data collection and analysis. AECOM (formerly URS) provided project management oversight of the team which included Transpo Group, and The Greenbusch Group.

All three firms have expertise in environmental and impact analysis on commercial and industrial facilities, including transfer stations, as a core portion of their business. Some of their specific project experience includes: design and construction management of the Seattle South Transfer Station; SWD Intermodal Facility Siting Study; Snohomish County Transfer Station Master Planning; Bow Lake Transfer Station Master Plan, Advanced Traffic Management System, and Noise Analysis and Compliance; First Avenue Transfer Station traffic impact analysis; and Waterfront Streetcar Maintenance Facility Siting Study and Design. All of these projects involved environmental review, permitting strategies, cost analysis and scheduling. The team was supported by IDAX, using video technology to monitor and calculate service times and vehicle queuing at key locations at the stations.

The division was further supported by Cascadia Consulting Group, which developed an online customer survey to provide more information about self-haul use of transfer stations. Specific projects that Cascadia has completed include on-site customer surveys at Seattle and King County solid and hazardous waste collection facilities; a web-based survey of participants in King County's Business Hazardous Waste pilot project; an industry-wide "recycling best management practices" survey for the federal Airport Cooperative Research Program; and various targeted research efforts for the cities of Seattle, Olympia, and Bellingham.

Data Collection

The consultant team collected data on weekdays and Saturdays at the Shoreline, Houghton, Factoria, Renton, and Bow Lake stations to understand the existing conditions and operations of each facility (Appendix A). Appendix L contains more detailed information about the collected data and the roles and responsibilities for collection and analysis.
Data collected included:

<u>Traffic counts</u> – First, consultants placed traffic counters at each station for a number of days in September 2014 to determine the weekday and Saturday three-hour peak period for each station. 24-hour tube counts were conducted over a two-week period at the approaches to each station.

<u>Service time counts</u> – Next, consultants returned to the site during the station's 3-hour peak period. Each vehicle entering the site was tracked through license plate identification to measure delay and service times for various activities on-site. The processing times at the entry scale, exit scale, self-haul tipping floor area, and commercial tipping floor area were collected at each site. In addition, the

processing time for the recycling area, household waste, and yard waste areas were measured at the transfer stations where that service is provided.

Video – Simultaneous with the service time counts, video was taken to document the traffic volumes at key locations as well as the vehicle type.

Customer origin/destination surveys – At the same time the service time counts were taken, customers were asked the origin of their trip to understand the distribution of customers using the station. This is useful information to consider when looking at the potential future closure of stations (i.e., Houghton, Renton) or analyzing a potential shift in station operations (i.e., redirecting commercial haulers or restricting self-haul).

Off-site traffic analysis – Traffic counts were collected at key intersections surrounding each station during each station's respective weekday and Saturday station peak-hour period. This information was used to assess the impacts to the off-site intersections based on the site traffic anticipated under each of the concepts. The off-site analysis was conducted using Synchro[i] software, a program used to evaluate the capacity of intersections. Synchro is used by all the cities in which the stations are located. Synchro provides a level of service (LOS) grade that can be used to assess overall intersection capacity and operational performance. (Attachment B to Appendix A, LOS Definitions, provides a more detailed explanation of intersection LOS criteria.)

Noise monitoring – Concurrent with the traffic and service time counts, noise measurements were taken to understand noise levels at the boundary of the station properties and to identify noise levels of vehicle types using the station. Noise measurements were taken at Bow Lake, Renton, and Shoreline; for Factoria, 2012 noise measurements were used.

Process Used to Forecast and Analyze Data

Using data from several sources, the consultant team developed a model to analyze site conditions at the selected transfer stations. Tonnage data is a necessary input to the model, but the number of transactions at the stations determines how well traffic flows at a given site. Data from the cashiering system that collects daily transaction and tonnage information, and data that was collected on-site on both weekdays and weekends were all used to develop the model.

Tonnage forecast and assumptions

Population and other demographic data from the Puget Sound Regional Council and local economic forecasting firm of Dick Conway and Associates provide a basis for the tonnage forecast. Key demographic data used includes population growth, employment, household size, and per capita income. Other assumptions in the forecast include:

- A 70 percent recycling rate is achieved in 2020
- The City of Bellevue, along with four of the five Point Cities – Clyde Hill, Hunts Point, Medina, and Yarrow Point – will leave the system in July 2028

These assumptions are discussed in more detail below.

By 2031, based on current recycling goals being considered by the cities and the county for the update of the Comprehensive Solid Waste Management Plan, the division is forecasting that 70 percent of all waste generated will be recycled. This is expected to have little or no effect on transactions since the material will still be received and handled at the recycling and transfer stations. The division projects

[i] Synchro, Trafficware, version 8.0

that the gains in recycling will be gradual – about one percent a year. The increased curbside collection of recyclable materials – single, multi-family, and non-residential – will somewhat reduce commercial tons and transactions at transfer stations. The forecast also projects that self-haulers will recycle about 35 percent of the waste brought to the transfer stations – reducing total disposed, but with minimal effects to transactions.

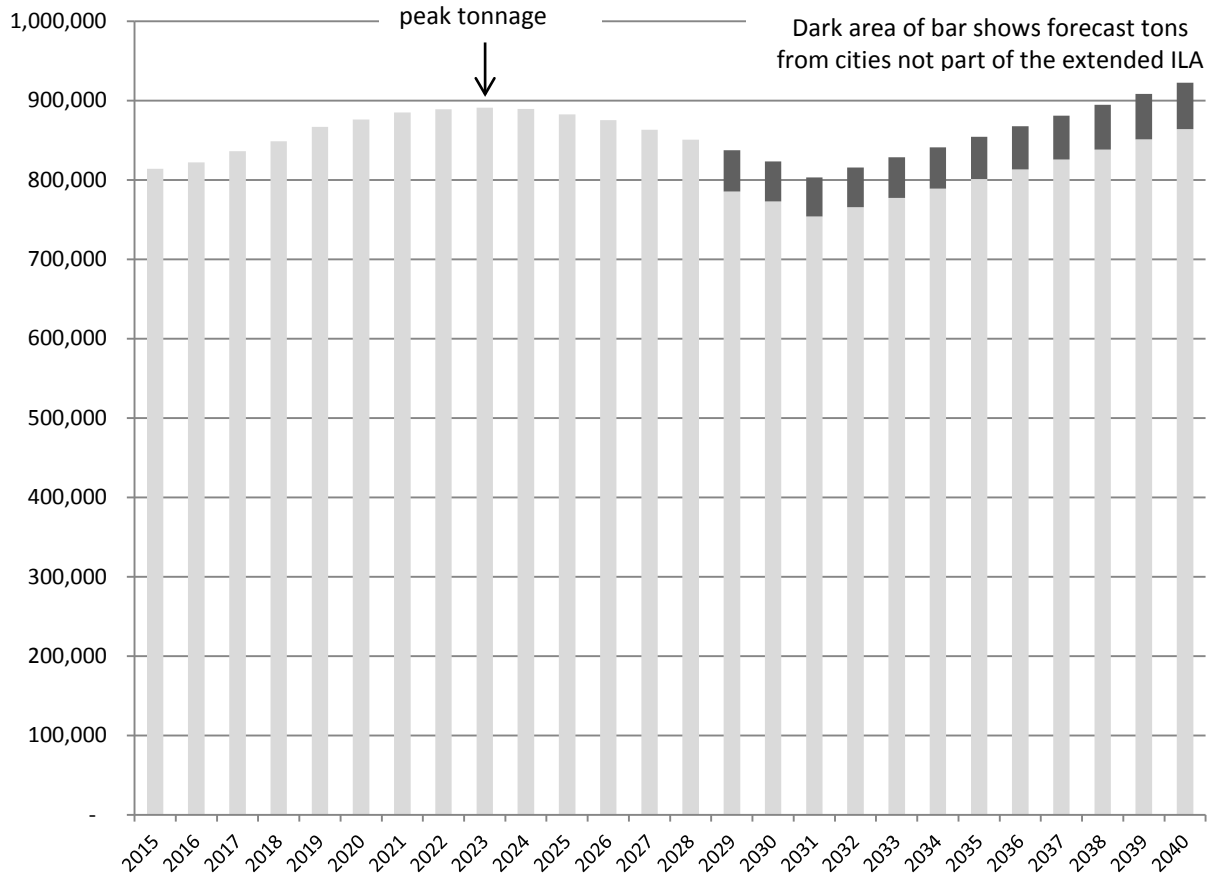
Population growth, higher per capita income, and increased employment are directly correlated with an increase in consumption and waste generation. In King County, population is expected to grow at a steady rate of about one percent per year and employment is expected to increase at an annual rate of about 1.8 percent over the forecast period. Per capita income is also expected to grow by about two percent a year (adjusted for inflation). Household size is expected to decrease from an average of about 2.6 persons per household to 2.4 persons per household; a decrease in household size tends to increase waste generation per capita.

King County currently has Solid Waste Interlocal Agreements with thirty-seven cities in King County. These agreements establish the respective responsibilities of the parties in the solid waste management system including guaranteeing that waste produced in the cities will be directed to the King County solid waste system. Thirty-two cities have signed ILAs which are in effect through 2040 and five cities – Bellevue and four Point Cities – have ILAs which are in effect through June 2028.

The tonnage forecast projects that the peak year for garbage disposed (about 900,000 tons) will be 2023. At that time, Bellevue and the four Point Cities will still be part of the County's solid waste system. After July 2028, if Bellevue and the four Point Cities have not signed the Amended and Restated Interlocal Agreement and are not a part of the system, the cities' contracted haulers will need to take the garbage collected from these cities to their own transfer stations and will not use the County transfer system. Since Bellevue and the four Point Cities generate approximately eight percent of the commercial tonnage, the system would see a commensurate drop in tonnage, as shown in Figure 1.

If Bellevue self-haulers did not use the Factoria Recycling and Transfer Station there would be an approximate 35 percent reduction in transactions; however, this would not occur until July 2028.

Figure 1: Forecast of Garbage Disposed 2015-2040



Garbage Forecast Sensitivity

Any forecast is sensitive to changes in the factors that were used to develop the forecast. Three important factors that influence the garbage forecast add degrees of uncertainty – the proposed vs. actual recycling rate, the number of cities that are participating in the system, and the economy. The recycling rate is the most sensitive in terms of deviation from the forecasted tonnage numbers, followed by the numbers of cities participating in the regional system, and economic conditions.

Recycling rate: The current forecast assumes that the recycling rate will increase by one percent per year. A total of approximately 1.7 million tons of waste is generated (recycled and disposed) by households and business each year. A one percentage point deviation in the recycling rate has an almost three times larger effect than the one percent deviation in job growth. If a 60 percent recycling rate is reached, rather than 70 percent, by 2031 it would increase disposal by about 250,000 tons in that year (+33 percent). The recycling rate has remained relatively flat for the past several years, but the county and the cities are working together to plan how to achieve the 70 percent recycling rate.

Cities participating in the County's solid waste system: Currently, Bellevue and the four Point Cities have not signed the Amended and Restated ILA, so they will not be a part of the system after 2028. The planning assumptions for the forecast were based on this scenario for the long term planning

horizon. If those cities reconsider and sign the ILA, the division would expect to receive an additional 50,000 tons more per year.

Economic factors: If growth in employment exceeds the forecast then additional garbage would be created. An estimated 2,300 tons of garbage could be expected for every 5,000 jobs exceeding the forecast. In the short run, the margin of error is rather small. A one percent increase in employment causes garbage disposed to go up by about 3,200 tons (which equals about one percent of all the garbage generated by the non-residential sector). From 2012 to 2013 the region experienced a 3.6 percent growth rate in employment, which amounted to an additional 11,500 tons of garbage.

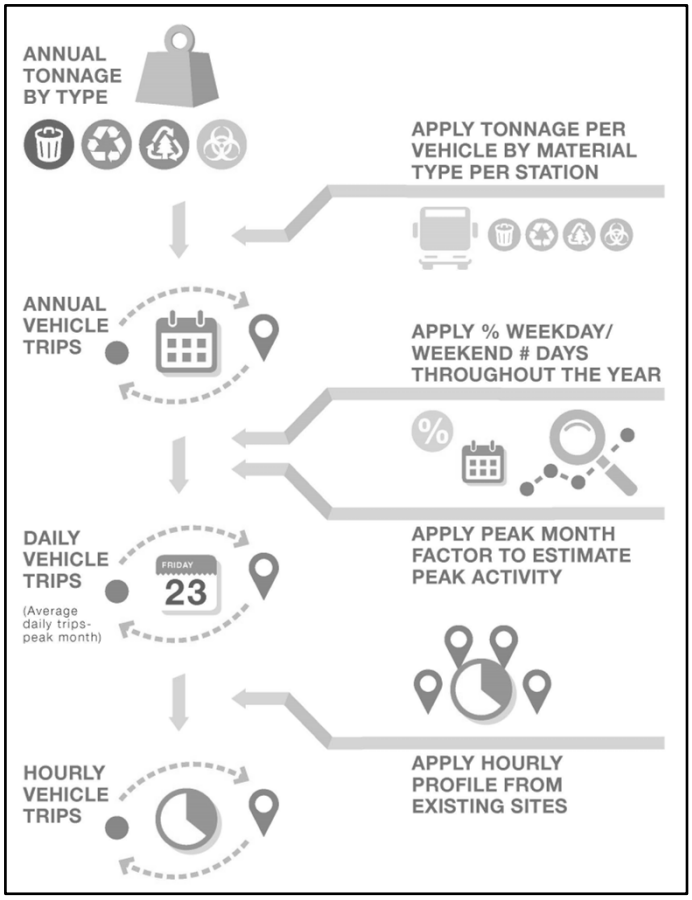
Site Traffic – Trip Generation Methodology

A multi-step process was utilized to estimate the peak hour trip generation for each site based on annual tonnage forecasts (see Figure 2). The process used to develop the peak hour trip generation forecasts is illustrated below.

In general, the forecasts consider the following:

- Annual tonnage by type (i.e., garbage, recycle, yard waste, HHW)
- Average load (in tons) per vehicle for all material
- Weekday/weekend allocation
- Peak month and seasonal variations
- Weekday and weekend hourly distribution of traffic by customer type (commercial haul, self-haul, transfer trailers, and recycling)

Figure 2: Trip Generation Methodology



Analysis period

The traffic analysis focuses primarily on 2023 because that year represents the forecasted peak for system tonnage and therefore the year that capacity issues might arise. Given the range of customers that utilize the transfer stations, from the commercial-haulers to the general public, both the weekday and Saturday peak periods were analyzed. The specific peak hours vary at each station and as such were identified through comprehensive hourly counts taken over a multiple-week period. Details for each station are presented in the individual station assessment sections in Appendix A.

This analysis used a 90th percentile peak hour demand factor. This factor means that 10 percent of the time the demand is greater, but the demand can be considerably less. The 90th percentile is used to help to account for the seasonal variations of the facilities. It also helps to ensure that traffic volumes do not exceed the station capacity and impact adjacent city streets on a regular basis. Furthermore, the division designs the facilities for the 90th percentile demand, so it is appropriate that the traffic analysis apply a similar standard. Peak demand factors are typically used in the industry as it provides a

reasonable worst-case of peak conditions. For more detailed information about how the 90th percentile was calculated, see Appendix A, page 6.

Trip generation estimates prepared for each station and each concept considered the local factors such as tonnage per vehicle and hourly distribution patterns to estimate peak-hour activity. The detailed description of the calculation factors are provided for each station in the station assessment section in Appendix A.

On-Site Traffic Analysis

The internal traffic flow at the transfer stations is a complex transportation network with multiple service points and circulation needs. This includes the inbound process at the scale house, the primary tipping floor, additional material recycling and disposal stations, and the outbound operations at the scale house. This interconnected system is further complicated by the presence of commercial and self-haul traffic that utilize different areas of the tipping floor and, depending on the station, potentially separate scales.

The on-site evaluation of each station used VISSIM, a microscopic traffic simulation model. Using this model, a transfer station can be analyzed as one connected network including all circulation roadways, scale house operations, tipping floor access and capacity, and activity for other materials such as yard waste, recycling, or household hazardous waste. In addition, the VISSIM model includes the multiple vehicle types observed at each station.

> **PTV Vissim** is a microscopic multi-modal traffic flow simulation software package developed by PTV Planung Transport Verkehr AG in Karlsruhe, Germany. The name is derived from "**V**erkehr **I**n **S**tädten - **SIM**ulationsmodell" (German for "Traffic in cities - simulation model"). VISSIM was first developed in 1992 and is today a global market leader. (Wikipedia)

Before the VISSIM model was used for any analysis of existing and forecast conditions, a comprehensive calibration process was completed for each weekday and Saturday peak period model. The existing conditions in the model were calibrated to match conditions as they were observed in the field at each station. Existing operational information was collected during the weekday and Saturday peak 3-hour periods. Each vehicle entering the stations during this time was tracked by license plate to measure delay and service times for various activities on-site. The processing times at the entry scale, exit scale, self-haul tipping floor area, and commercial tipping floor area were recorded. This data was used to understand the timing and movement of customers using the station so constraints could be identified.

In addition, the processing time for the recycling area, household hazardous waste, and yard waste areas were measured at the transfer stations where that service is provided. Default values in the VISSIM model such as vehicle travel speeds and dwell times at the various areas at the stations were modified from the default values in the model to match the observed data. The scope of the extensive data collection at each station is reviewed in more detail in the station assessment section in Appendix A.

Benchmarks

As part of the Transfer Plan review process, the division looked at how other nearby transfer systems compare to the King County system. Primarily, information was gathered from four other nearby systems – the City of Seattle, Snohomish County, Pierce County, and Kitsap County.

The King County transfer system (comprised of six urban and two rural transfer stations and two rural drop boxes) serves a population of about 1.4 million, about half a million more than Snohomish County and about double the population of the City of Seattle. It serves an area of about 2,000 square miles, which is about the same as Snohomish County. In 2013, the King County system handled about 786,000

tons of garbage, which is almost 90 percent of what was handled by all of the other systems combined. In contrast, the King County system handles far less separated organics than the City of Seattle or Pierce County, largely because, unlike King County, those systems transfer organics collected at the curb through their facilities. The King County system handles almost as many transactions as the City of Seattle, Snohomish County, and Kitsap County systems combined. Most of those transactions are generated by self-haul customers; the City of Seattle and Snohomish County report similar percentages of self-haul. Table 1 includes the details of the transfer systems in King, Snohomish, Kitsap, and Pierce counties and the City of Seattle.

Table 1: Regional Benchmarks

	King Co	City of Seattle	Snohomish Co	Pierce Co	Kitsap Co
Population	1,385,000	659,000 (2014)	746,000	820,000	230,000
Area Served	2,050 sq. mi.	82 sq. mi.	2,087 sq. mi.	1,669 sq. mi.	395 sq. mi.
Transfer Station Garbage Tons	786,072	247,271	412,445	56,913	178,081
Organics Tons	7,577	72,946	9,324	36,711	349
Transactions	707,255	264,857	335,047	not available	122,722
Percentage Self-Haul Transactions	85 percent	85 percent	80 percent	not available	not available
Transfer Facilities	8 transfer stations and 2 drop boxes	2 transfer stations	3 transfer stations and 3 drop boxes	3 transfer stations and 2 drop boxes	1 transfer station and 3 drop boxes
Garbage Per Ton Fee[ii]	$129.40	$145	$108.78	$144.97	$70.45
Recycling Rate	53%	56%	45%	not available	42%

All data is for 2013 unless otherwise noted.

The other jurisdictions were also asked about the average time that customers spend at their facilities – inbound scale to outbound scale. The City of Seattle reported an average time on-site at the South Transfer Station of about 7 and a half minutes for commercial haulers and about 13 minutes for self-haulers. Pierce County estimated an average of about 18 minutes on-site during the week and a weekend peak average closer to 30 minutes. At Kitsap County's Olympic View Transfer Station the average is about 16 minutes. In the King County system, the average time on-site varies between transfer stations. Table 2 shows the 2014 average minutes on-site at King County's transfer stations.

[ii] 2015 per ton fee; includes state refuse tax, and for King County and the City of Seattle includes a moderate risk waste surcharge.

Table 2: 2014 Average Minutes On-site
(Inbound Scale to Outbound Scale)

	Weekday		Weekend	
	Commercial	**Self-Haul**	**Commercial**	**Self-Haul**
Algona	13	13	12	11
Bow Lake	8	14	9	13
Enumclaw	9	12	6	12
Factoria	14	14	12	12
Houghton	11	13	11	11
Renton	10	11	12	10
Shoreline	9	14	15	13
Vashon	8	10	4	10

Jurisdictions were also asked about how long customers wait before entering the site. Snohomish County had information from a 2012 customer survey – according to customers, the average wait was just over 1 minute, with about 62 percent reporting no wait, and only 3 percent reporting a wait of 10 minutes or longer; 15 minutes was the longest reported wait time. Pierce County estimated that the longest wait time at the largest transfer station is usually less than 2 minutes, although it can be up to 10 minutes during the busiest times, and wait times for smaller sites and yard waste tend to be longer. Information about wait time was not available from the City of Seattle or Kitsap County. The division does not collect data on how long customers wait before they enter the station. Customer complaints about wait times are rare. Queue lengths at King County stations are discussed in more detail later in this report.

Another aspect that was explored was the use of tare weights or radio-frequency identification (RFID) for commercial haulers and other customers with charge accounts. Tare weights are not widely used. Both the City of Seattle and Snohomish County use RFID for commercial haulers and the City of Seattle uses RFID for some other large account customers as well. Use of RFID could be implemented at facilities to help to improve efficiency and service to commercial haulers; however there would be little or no effect on transfer station capacity because this improvement would not address the projected constraints at the stations.

For more detailed benchmark information, see Appendix E.

Study Elements

To address the Council motion, the division looked at data in several different ways, testing combinations of concepts and demand management strategies for their effect on capacity and other aspects of the transfer system. Three different concepts that would not build a Northeast Recycling and Transfer Station were created and compared to one concept that did build a new Northeast Recycling and Transfer Station.

Using the developed model, the consultants identified constraints for each concept at each transfer station. Next, the team identified potential strategies to mitigate the constraints. Of the strategies

identified, those most likely to be effective were modeled. The strategies and solutions selected varied by site, depending on the issue that needed to be solved.

Capacity

This review focused on the transactional capacity at the transfer stations. Transactional capacity (also called trip, customer, or vehicle capacity) refers to the ability of a particular transfer station to process the number of customers using the station, without causing excessive service times or off-site queues that block driveways or roadways. Factors that might affect capacity include:

- Property size and layout, e.g., distance from gate to scale house and from scale house to tipping building
- Station size and layout, e.g., number of stalls and flexibility to reconfigure
- Operating method, e.g., direct dump vs. pit or flat floor
- Peak demand times, e.g., Saturday in July vs. Wednesday in February
- Hours of operation
- Time it takes customers to use the site, e.g., time spent on the scale, time spent unloading waste or recycling, and time spent moving from one point to another

Concept Descriptions

Four concepts were developed to address the Council motion.

- Concept 0 – No Northeast, does not direct commercial haulers, no self-haul restrictions
- Concept 1 – Direct commercial haulers, no Northeast (E1*)
- Concept 2 – Restrict self-haul, no Northeast (E2*)
- Concept 3 – Build Northeast

**Reflect E1 and E2 as referenced in Council Motion 14145*

All of the concepts assume that the Houghton Transfer Station will close by 2023. In addition, each concept was analyzed both with the Renton Transfer Station open and with it closed. The division included Concept 3, Build Northeast, because it is called for in the adopted Transfer Plan and is useful as a comparison to the other concepts. These concepts represented a starting point for addressing transactional constraints. Analysis was completed to determine the extent to which these concepts would avoid extensive customer wait times, or to what degree additional mitigations strategies would be needed.

Concept 0: This concept assumes that a new Northeast Recycling and Transfer Station would not be built. It is used as the baseline concept to identify issues in the system. It assumes current customer use patterns. It does not direct commercial haulers to use any particular stations nor are there any self-haul restrictions. Operating hours remain similar to the current hours and HHW and recycling are available at Factoria.

Concept 1: Concept 1 directs commercial haulers to specific stations to more evenly balance use across the system (see Table 3). This concept is adapted from Alternative E1 from the *Transfer Plan Review Report*. Concept 1 differs from E1 in that it does not assume extended hours, additional scales, or a queuing lane except as potential mitigation strategies. E1 also assumed that Renton would remain open, while Concept 1 was analyzed with Renton open and closed. Concept 1 would require a council ordinance to restrict commercial hauler use of Factoria and to direct them to alternate stations. This concept assumes that operating hours would be similar to current operating hours and that HHW and recycling would be available at Factoria.

Table 3: Concept 1: Direct commercial haulers

	cities/surrounding areas directed to Factoria	cities/surrounding areas directed to Shoreline	cities/surrounding areas directed to Renton	cities/surrounding areas directed to Bow Lake
a)	***Without Renton***			
	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Issaquah, Medina, Newcastle, North Bend, Redmond, Sammamish, Snoqualmie, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	n/a – Renton closed or not accepting commercial	Mercer Island, Renton
b)	***With Renton***			
	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Medina, Mercer Island, Redmond, Sammamish, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	Issaquah, Newcastle, North Bend, Renton, Snoqualmie	

Note: Cities/surrounding areas not shown in the table would not be directed to a specific transfer station.

Concept 2: This concept would restrict self-haul use at Factoria during peak commercial hours – 6 a.m. to 3 p.m. It is adapted from Alternative E2 from the *Transfer Plan Review Report*. Concept 2 differs from E2 in that it restricts self-haul use until 3 p.m. instead of 4 p.m., it assumes that recycling would be available, and it assumes HHW service, additional scales, or a queueing lane except as potential mitigation strategies. E2 also assumed that Renton would remain open, while Concept 2 was analyzed with Renton open and closed. To make this possible, the King County council would need to approve an ordinance that restricts self-haul use. Like E2, Concept 2 assumes extended Factoria hours of 6 a.m. to 10 p.m. weekdays and 8 a.m. to 8 p.m. on weekends.

Concept 3: This is the only concept that assumes a new Northeast Recycling and Transfer Station would be built to serve the area currently served by the Houghton Transfer Station. For analysis purposes, the division considered locations near the end of State Route 520 and in the Totem Lake area. It assumes that a new Northeast station would be of a similar size, design, and operation as the new Factoria station and that the operating hours would be similar to the operating hours of the existing Houghton Transfer Station.

Overview of Strategies

This review analyzed a variety of mitigation strategies that manage transfer station transactions – individually and in concert with each other – to determine what impact they might have on use of the transfer system. Goals included more evenly balancing use of transfer stations across the system and avoidance of excessive user wait times and queue lengths.

Concepts 1 and 2 both have demand management strategies built into the concept.

- Concept 1 directs commercial haulers to use certain transfer stations so that transfer system use is more evenly balanced and in particular so that use of Shoreline is increased.

- Concept 2 restricts the hours that self-haulers can use Factoria and also extends the hours so that self-haulers are encouraged to use the extended hours or to use alternative transfer stations during the restricted hours.

Additional mitigation strategies analyzed fall into two general categories: those that reduce the number of customers using a particular transfer station or the transfer system in general and those that increase the number of customers that can be served at a station. Operational, policy, and capital strategies were considered. All demand management strategies identified during the Transfer Plan Review Part 1 are included in the current review.

The key demand management strategies that reduce the number of customers using the transfer system or a particular transfer station that were analyzed include:

- Extend operating hours
- Incentive/peak pricing
- Provide wait time information (video feed using existing cameras)
- Mandatory curbside garbage collection
- Lower cost curbside bulky waste collection
- Higher minimum fee
- Lower regional direct fee to encourage haulers to use their own transfer stations
- Do not provide HHW service at Factoria, provide at separate location elsewhere in service area
- Ban materials from disposal and recycling

Strategies that improve site capacity that were considered include:

- Add scales and/or queueing lanes
- Add stalls/ increase the tip floor capacity
- Provide unloading assistance

The effectiveness of each strategy, or a combination of strategies, varies from station to station. A more thorough description of the strategies follows:

Extend operating hours: The intended effect of extending hours is to encourage self-haulers to use the station at times other than the peak operating hours. The current operating hours for Factoria are 6:30 a.m. to 4 p.m., Monday-Friday, and 8:30 a.m. to 5:30 p.m., Saturday and Sunday. Concept 2 includes the extended hours of 6 a.m. to 10 p.m. on weekdays and 8 a.m. to 8 p.m. on Saturdays and Sundays at Factoria. These same extended hours were considered for Factoria under other concepts as well.

Impacts of this strategy include more vehicle traffic during peak afternoon commute hours and potential impacts to neighboring businesses. Changing the hours would require approval of an ordinance by the King County council. In addition, a new environmental review would be needed to analyze the effects of the increased traffic during the afternoon commute hours.

Incentive/peak pricing: The division looked at implementing incentive/peak pricing via a variable minimum fee of $22 or $41.25 depending on peak hour times and day of the week. This strategy, in conjunction with extended operating hours, would encourage self-haulers to use the transfer station during hours when the station is not as busy. Price elasticity research indicates that a fifty percent price increase during peak hours would cause about a fifteen percent drop in transactions during those hours,

thus moving transactions to other transfer stations or to off-peak hours. Depending on the concept, the division could expect to realize a revenue increase of about $700,000 to $2.2 million (in 2023) from this strategy. Potential issues with this strategy include fee equity, potential adverse impacts on low income customers and small business owners, and customer dissatisfaction.

Provide wait time information: Cameras located at the scale house could provide information to customers that are going to make a trip to the transfer station. The cameras could provide views of the entrance to the station and at points within the station so that the customer could decide whether to delay their trip to a time when that station is not as busy. The division could make use of cameras that may already be in place to show a photo that is frequently refreshed on the Solid Waste Division website. Costs associated with this option would be minimal. Some other transfer facilities and other high-traffic services provide this type of information via their websites; however, none could provide any information about how it had affected traffic volumes.

Mandatory curbside garbage collection: This strategy would require that all residents subscribe to curbside garbage collection. Estimates of the impact this strategy would have on reducing trips to the transfer station vary by station and are based on information provided by self-haul customers.

Table 4: Estimated percentage reduction in self-haul transactions if mandatory garbage collection

Algona	Bow Lake	Factoria	Houghton	Renton	Shoreline
10.6%	14.9%	6.5%	1.4%	11.6%	16.6%

For this strategy to be effective, it would require the County and all of the cities that do not currently have mandatory collection to pass ordinances. At this time, residents in 24 of the 37 cities in the solid waste system and the unincorporated area are not required to have curbside garbage collection. Issues with this strategy include possible dissatisfaction due to reduction in choice, difficulty with serving some properties with curbside collection, and potential impacts on low income residents.

Lower cost bulky item collection: Because a high percentage of what self-haulers are bringing to the transfer station are bulky wastes that do not fit into a curbside garbage can, a strategy that was analyzed is lower cost curbside bulky item collection. Many cities currently have a rate in their contracts for bulky waste pick-up, but the rate is high enough that it is not widely used. Costs range from a low of just over $20 up to about $100 with a median cost of about $50 to $65 per item. In an online survey of self-haulers, a majority of respondents said that they would be willing to pay for curbside bulky waste pick-up if it was priced at $25 per item ($35 for refrigerators/freezers). The reduction in trips varies by station, but overall it is estimated that this strategy would have only a small impact because the number of customers who only bring bulky items to the stations and indicate a lower cost curbside service is relatively small as a percentage of total transactions. The cities and haulers would be primarily responsible for changing their contracts to institute a lower bulky waste item collection rate.

Higher minimum fee: This strategy considers what the effect raising the minimum fee would have on self-hauler use of the transfer stations. Since garbage disposal is necessary, the price elasticity tends to be lower in comparison to other goods and services. The minimum fee was increased 100 percent (doubled) to model the effect. Model results indicate that if the fee is doubled system wide, there would be an estimated 7.5 percent decrease in overall transactions. If the fee were doubled at the Factoria Recycling and Transfer Station only, there would be an estimated 20 percent reduction in transactions at Factoria. Depending on whether the fee was doubled system-wide or just at Factoria, there would be a revenue increase of about $10 to 15 million (assuming a minimum fee of $55 in 2023). Issues with this strategy include fee equity, potential adverse impacts on low income customers and small business owners, and customer dissatisfaction.

Lower regional direct fee: The Regional Direct Fee (RDF) is a discounted fee charged to commercial collection companies that bring solid waste to Cedar Hills in large transfer trailers via their own transfer stations and processing facilities. The current RDF is $103.50, which is about 14 percent less than the Basic Fee. Prior to 2003, the RDF was about 28 percent lower than the Basic Fee. When the RDF was lower, about 25 percent of solid waste was brought directly to Cedar Hills. Currently, only about 1 percent comes directly to Cedar Hills. However, lowering the RDF would have little to no effect in the northeast or Factoria service areas because, according the commercial haulers, any waste diverted from the transfer stations would be from the Bow Lake, Algona, and Renton transfer stations. Additionally, at this time there is not sufficient private transfer capacity available.

No HHW service at Factoria: This strategy would remove transactions from Factoria and allow the space to be used for vehicle queuing. If HHW service is not provided at the station, however, it will need to be provided elsewhere. Building a new, fixed facility, would entail a siting process, SEPA process for the new facility, and permits including land use and building permits. The estimated cost for a separate HHW facility is about $9 million. Issues with this strategy include finding a suitable site in the urban service area, potential increases in improper disposal, and a decrease in services available at the transfer station. HHW collection service could be provided by the Wastemobile instead, but finding adequate sites may be challenging.

Ban materials: This strategy would ban the disposal or recycling of yard waste and clean wood waste at Factoria (for both self-haul and commercial customers). Banning these materials would remove an estimated one-third of materials from the transfer station. If not accepted at Factoria, these materials would need to be taken to other King County transfer stations or to private sector facilities. Another solution would be to site a drop box to accept yard waste and wood waste. The estimated cost to site and build a drop box facility is about $18.5 million. To support recycling goals, if this strategy is selected, it is recommended that a disposal ban on these materials be implemented system-wide. This effort would also require monitoring and enforcement to be effective. Issues with banning yard waste and wood waste include a decrease in service at the transfer stations, potential revenue loss, and siting a new drop box facility.

Additional scales/lanes: Adding scales and/or queuing lanes addresses specific site constraints. For instance, where the model indicates that there is a queue waiting to exit the site then an additional outbound scale was considered. Additional queueing space does not shorten wait time, but could help mitigate off-site impacts. Capital costs for scales and queuing lanes range from about $1 to 2 million. New permits would be needed including a possible SEPA process.

Increase tip floor capacity: Tip floor capacity could be increased by making operational changes or by banning materials. Operational changes were considered under all of the concepts including reconfiguring the tipping floor to maximize the number of vehicles and assuming that there would be no resource recovery from mixed loads. Material bans were considered as a mitigation strategy for Factoria – if there were no disposal or recycling of yard and wood waste, it would free up space on the tipping floor.

Unloading assistance: Adding staff on the tipping floor to assist customers with unloading would reduce self-haul time on the tipping floor by an estimated 25 percent, reducing overall time on-site and allowing more customers to be served each hour. For this strategy to be effective, it would require a large increase in staffing resulting in high additional operational costs – about $4 million in 2023 (equal to about $4.50 per ton). Some additional staff facilities to accommodate the larger staff would also be needed with a cost of about $1 million.

Resource Recovery and Recycling Goals and Assumptions

The division periodically conducts waste characterization studies at the transfer stations to assess the material make-up of the waste stream. These studies show that up to 78 percent of the waste that is landfilled could be recycled. Many loads arrive with large amounts of recyclable cardboard, metals, and clean wood which all have readily available markets. To help increase our overall recycling rate and put these valuable materials back into the economy, the division launched a pilot resource recovery program in 2014. This entails dumping material-rich loads on the tipping floor and picking through to reclaim the recyclable materials. In addition to the goal of increasing recycling, recovering recyclable materials from the waste stream reduces greenhouse gas emissions, conserves resources, and extends the life of the landfill.

In order to recover recyclable materials from the waste stream at the transfer stations, space on the tipping floor must be used. All concepts, except Concept 3, assumed that all floor space at the Factoria Recycling and Transfer Station would be needed for customer unloading and processing of garbage, resulting in limited space for resource recovery. Resource recovery would continue at the Shoreline and Bow Lake facilities. Under Concepts 1 and 2, resource recovery at Shoreline would experience some constraints during peak hours. These limitations would result in an overall reduction in the recycling rate potential of about one and one-half percent.

Costs

Though the division can analyze and forecast future costs associated with operational and capital improvements, some costs customers could incur are more difficult to measure. For example, commercial haulers have indicated that not building a Northeast would result in more trucks on the road and more miles driven, which could cause collection rates paid by the customer to increase. A Hauler Survey that explains what could happen if a Northeast is not built can be found in Appendix C.

Strategies with an operational emphasis tend to have lower recurring costs but are subject to inflation over time. Though the analysis shows that operational costs do escalate over time, those costs never reach the upfront amount the division would need to pay to build a new Northeast. Strategies with an emphasis on capital tend to have higher one-time costs and are not subject to inflation. To compare the costs of the different build/no-build strategies, a Net Present Value (NPV) calculation was used to account for the different cost and revenue streams over time (see below table for NPV calculations).

Building a new Northeast Transfer Station is the most expensive of the modeled strategies for managing transactional demand in the northeast service area. The upfront capital costs of building a new station exceeds the operational and policy costs associated with strategies like adding an outbound scale at Shoreline or extending hours at Factoria.

The division applied NPV to all four concepts, with Renton both opened and closed, over three different time periods – 17 years, 30 years, and 50 years – to create a comprehensive cost analysis throughout the useful life of a transfer station. Based on the analysis, a no-build approach is the least expensive option in all three of the different time periods. Building NERTS has a substantially higher cost, in both the short- and long-term, because that concept includes upfront capital costs, as well as operating and maintenance costs. Under all concepts, keeping Renton open is more expensive than closing it.

Net Present Value Calculation for 2023-2053

Do Not Build a Northeast (Concept 0) with Renton Closed	$236,499,661

Do Not Build a Northeast (Concept 0) with Renton Open	$271,987,544
Redirect Commercial (Concept 1) with Renton Closed	$284,561,024
Redirect Commercial (Concept 1) with Renton Open	$313,077,615
Restrict Self-Haul (Concept 2) with Renton Closed	$307,348,969
Restrict Self-Haul (Concept 2) with Renton Open	$342,393,235
Build Northeast (Concept 3) with Renton Closed	$351,519,043
Build Northeast (Concept 3) with Renton Open	$387,006,927

A complete cost analysis and comparison of the different concepts and strategies can be found in Appendix I.

Environmental Impacts

Actions implemented instead of building a new Northeast can result in environmental impacts and would require a State Environmental Policy Act review.

Regionally, not building a Northeast would lead to more cars on the road driving farther and burning more fuel to reach transfer stations, increasing greenhouse gas emissions.

At Factoria, the environmental impacts most likely to occur are additional vehicle traffic during evening peak commuting hours.

At Shoreline, although the addition of staff and an outbound scale could result in reduced queuing and reduced negative air quality impacts, as well as a decrease in self-haul traffic, an increase in commercial traffic would occur.

A complete explanation of potential environmental impacts projected under the various packages can be found in the "Methodology for Evaluating Concept and Strategy Packages" section of this report.

Methodology for Evaluating Concept and Strategy Packages

The following section provides a summary of the methodology used to evaluate the concepts and demand management strategies. For more detailed information, see Appendix A.

Analytical work began by determining how each of the concepts would perform relative to customer service times. These measures focus on the individual operations of the station as well as the experience of the station users, and define the station constraints and inform the identification of potential station improvements. The service performance indicators used for preliminary analysis were selected from the adopted Transfer Plan. The primary performance indicators are:

- Service times for commercial customers of 16 minutes or less[iii]
- Service times for self-haul customers of 30 minutes or less[iv]
- Inbound queuing and potential impacts to off-station roadways and/or driveways

[iii] Measured scale-to-scale consistent with service time indicators identified in the 2006 Solid Waste Transfer and Waste Management Plan
[iv] Measured scale-to-scale consistent with service time indicators identified in the 2006 Solid Waste Transfer and Waste Management Plan

In addition to these primary performance measures, the internal queuing at either the tipping floor or outbound scale was considered due to its potential impact to overall station operations.

Figure 3 was used as a preliminary screening tool only to identify potential areas of concern. If one or more of the indicators was exceeded, the concept and site received a “minus” illustrating that additional evaluation was needed (as reflected in the Tier 2 Screening). The degree to which any given concept exceeded an expectation varies and thus this information was only used to identify where more mitigation may be appropriate. More detailed information is provided for each site and concept.

Figure 3: Preliminary Screening to Determine Concepts/Sites That May Require Additional Mitigation Strategies (2023 Conditions)

SITE WITH RENTON

WEEKDAY					SATURDAY			
CONCEPT 0	CONCEPT 1	CONCEPT 2	CONCEPT 3	SITE	CONCEPT 0	CONCEPT 1	CONCEPT 2	CONCEPT 3
⊕	⊕	⊕	⊕	RENTON	⊕	⊕	⊕	⊕
⊕	⊕	⊖	⊕	SHORELINE	⊖	⊖	⊖	⊕
⊖	⊖	⊖	⊕	FACTORIA	⊖	⊖	⊖	⊕
⊖	⊖	⊖	⊖	BOWLAKE	⊖	⊖	⊖	⊖

SITE WITHOUT RENTON

WEEKDAY					SATURDAY			
CONCEPT 0	CONCEPT 1	CONCEPT 2	CONCEPT 3	SITE	CONCEPT 0	CONCEPT 1	CONCEPT 2	CONCEPT 3
—	—	—	—	RENTON	—	—	—	—
⊕	⊖	⊖	⊕	SHORELINE	⊖	⊖	⊖	⊕
⊖	⊖	⊖	⊖	FACTORIA	⊖	⊖	⊖	⊕
⊖	⊖	⊖	⊖	BOWLAKE	⊖	⊖	⊖	⊖

⊕ Station is forecast to operate as defined based on KC service time standards and queue lengths (2006 Solid Waste Transfer and Waste Management Plan).

⊖ Station is forecast to exceed KC service time standards and queue lengths.

Summary of Constraints

VISSIM modeling identified operating constraints at the Shoreline, Factoria, and Bow Lake stations. No constraints were identified at the Renton Transfer Station under any of the concepts. Keeping Renton open did not significantly change constraints identified at Shoreline, Factoria, or Bow Lake.

Shoreline

Commercial tipping floor: The primary constraint identified at Shoreline is the commercial-haul tipping floor which is constrained by the number of stalls and the dwell time of vehicles on the tipping floor itself.

Outbound scale: Another constraint is the outbound scale. The model shows queues at the outbound scale extending back to the commercial tipping floor during the Saturday peak-hour resulting in longer

commercial-haul service times. If capacity of the commercial tipping floor were increased by decreasing on-floor dwell times or increasing stalls, the outbound scale would become a more notable constraint.

Factoria

Self-haul tipping floor: The primary constraint at Factoria is the self-haul tipping floor. The self-haul tipping floor is constrained by the number of stalls and the dwell time of vehicles on the tipping floor itself. The self-haul tipping floor cannot accommodate all of the self-haul vehicles within the peak-hour.

Outbound scale: Another constraint of the station is the outbound scale. Although not an issue at the rate vehicles are processed on the tipping floor; if the tipping floor capacity is increased (by decreasing on-floor dwell times or increasing stalls) the outbound scale would become a constraint.

On-station queue storage: Based on the long queues that the model predicts, there is not enough room to accommodate the high volumes of vehicles anticipated during the peak hours. This results in queues that extend off-station, blocking adjacent businesses along SE 32nd Street and extending onto Richards Road.

Bow Lake

Inbound scale capacity: Capacity constraints exist at the inbound scale resulting in vehicle queues that extend back to and onto Orillia Road. The service time results are affected by the capacity of the inbound scale. Despite the variance in weekday and Saturday vehicle demands, the on-station service times are approximately the same. This indicates that the inbound scale is operating at its maximum capacity and lacks the capacity to accommodate the forecasted demand. The Bow Lake Recycling and Transfer Station is designed to accommodate additional scales as they become necessary.

Outbound scale capacity: Due to the capacity restriction on the inbound scale, the analysis of the unmitigated concepts does not identify capacity constraints on the outbound scale. However, if the inbound scale capacity is increased, the capacity of the existing outbound scale was identified as a constraint, because on-site queuing would extend from the outbound scale house into the self-haul tipping floor area, as well as self-haul and commercial-haul service times increase.

Tier 1/Tier 2 Screening

In order to efficiently evaluate a wide range of strategies for all concepts and stations, a screening process was employed. The consultants and the division used a two-tiered (Tier 1/Tier 2) process to identify the potentially most effective strategies for concepts that did not meet the station capacity indicators shown in Figure 3 above.

The Tier 1 screening analyzed the reduction in transactions (inbound vehicle trips) that would result from implementing the various demand management strategies. This screening also considered environmental and other factors such as noise and air quality, cost implications, economic and social justice, and regulatory requirements. Each strategy was analyzed individually, at each station, under each concept (see Attachment F of Appendix A for more detail). The resulting peak-hour station traffic volumes were compared to the estimated station capacity to identify the potential benefits of the strategy.

For second, or Tier 2 screening, the most promising strategies from Tier 1 were combined with the detailed VISSIM model developed for each station. Those strategies that had the most positive effect in reducing the number of inbound vehicle trips and also made sense from an operational or regulatory point of view were combined. Based on a review of the individual strategies and the assessments

prepared for the Tier 1 screening, the following combinations were identified for detailed Tier 2 evaluation and modeling.

Shoreline

Strategy combinations were identified based on the results of the Tier 1 screening process. The Tier 2 screening process included the testing of the strategy combinations using VISSIM. The effectiveness of the strategies was tested for the without-Renton scenario as that time period represents the period with the highest peak-hour demand for the stations. Various strategy combinations were applied for Concepts 0 to 2. See Appendix A for detailed tables for all concepts.

The following combinations were identified for detailed evaluation:

Concept 0:

- Combination A1 (Saturday only) – add one Transfer Station Operator(TSO) on commercial floor
- Combination A2 (Saturday only) – add one TSO on commercial floor with added outbound scale
- Combination B (Saturday only) – add one TSO on commercial floor + mandatory curbside collection

Concept 1:

- Combination A1 (weekday & Saturday) – add one TSO on commercial floor
- Combination A2 (weekday & Saturday) – add one TSO on commercial floor with added outbound scale
- Combination B (weekday & Saturday) – add one TSO on commercial floor + mandatory curbside collection

Concept 2:

- Combination A1 (weekday & Saturday) – add one TSO on commercial floor
- Combination A2 (weekday & Saturday) – add one TSO on commercial floor with added outbound scale
- Combination B (weekday & Saturday) – add one TSO on commercial floor + mandatory curbside collection

Concept 3:

- No modeling necessary

Results

The results of the combinations tested on the concepts and demand management strategies are shown and discussed below.

Concept 0

Combinations A and B were tested on Concept 0 without-Renton traffic volumes as the without-Renton traffic volumes are higher, modeling the worst-case scenarios. Only the Saturday peak hours were evaluated under Concept 0 as the weekday peak hours under Concept 0 already met the adopted service time and queue values.

Concept 0 with the addition of Combinations A2 or B, meet both the adopted service time and queue values. Concept 0, with Combination A1, exceeds the adopted indicator commercial-haul service time value by approximately 4 minutes.

Concept 1

Concept 1 with Combinations A and B were evaluated for the without-Renton conditions. Results show that Concept 1 along with any strategy combination meets the weekday service time and threshold queues, but only Concept 1 with Combination A2 meet the Saturday adopted service time value.

Concept 2

The modeled results show that only Concept 2 along with Combination A2 meets the adopted service time and queue values for both weekday and Saturday. Concept 2 with Combination B meets the adopted service time and queue values during the Saturday peak conditions. Concept 2 with Combination A1 does not meet the adopted service time value for either the weekday or Saturday peak periods.

Concept 3

Concept 3 is within the adopted travel time and threshold inbound queue values, and as such, no additional demand management strategies were modeled.

Table 5: Summary of Demand Management Strategies Applied to Shoreline

Shoreline	Cost Estimate	Environment	Service (service time and queue[i])	Other
Concept 0 Combination A **A1 – Add 1 TSO on commercial floor (weekend only)** **A2 – Add 1 TSO on commercial floor (weekend only) + outbound scale**	• ~$70,000 increase in SWD operating cost (A1 and A2) • ~$1.7 million capital cost (A2) • ~$0.24 increase in per ton tip fee (A2)	• Reduced queuing and associated air quality impacts (A2)	• Weekend self-haul service time 29 min., commercial service time 20 min. (A1) • Weekend self-haul service time 17 min., commercial service time 12 min. (A2) • Weekend inbound queue 4 vehicles (A1 and A2) *Note that weekday for Concept 0 does not require mitigation so weekday times were not modeled.*	• Permit needed (A2)
Concept 0 Combination B **Add 1 TSO on commercial floor (weekend only) + mandatory curbside collection**	• ~$70,000 increase in SWD operating cost	• Minor increase in commercial haul traffic and decrease in self-haul traffic	• Weekend self-haul service time 22 min., commercial service time 15 min. • Weekend inbound queue 4 vehicles *Note that weekday for Concept 0 does not require mitigation so weekday times were not modeled.*	• Mandatory collection requires Cities and County to pass ordinances • Mandatory collection issues include reduction in citizen choice, some properties not easily served by curbside, and potential adverse impact on low income residents

Shoreline	Cost Estimate	Environment	Service (service time and queue[i])	Other
Concept 1 Combination A A1 – Add 1 TSO on commercial floor (weekdays and weekend) A2 – Add 1 TSO on commercial floor (weekdays and weekend) + outbound scale	• ~$340,000 increase in SWD operating cost (A1 and A2) • ~$1.7 million capital cost (A2) • ~$0.54 increase in per ton tip fee (A2)	• Reduced queuing and associated air quality impacts (A2)	• Weekday self-haul service time 20 min., commercial service time 15 min. (A1) • Weekday self-haul service time 17 min., commercial service time 13 min. (A2) • Weekend self-haul service time 37 min., commercial service time 22 min. (A1) • Weekend self-haul service time 17 min., commercial service time 12 min. (A2) • Weekday inbound queue 3 vehicles (A1 and A2) • Weekend inbound queue 6 to 7 vehicles (A1 and A2)	• Permit needed for additional scale (A2)
Concept 1 Combination B Add 1 TSO on commercial floor (weekdays and weekend) + mandatory curbside collection	• ~$340,000 increase in SWD operating cost • ~$0.38 increase in per ton tip fee	• Reduced queuing and associated air quality impacts • Minor increase in commercial haul traffic and decrease in self-haul traffic	• Weekday self-haul service time 19 min., commercial service time 15 min. • Weekend self-haul service time 27 min., commercial service time 20 min. • Weekday inbound queue 3 vehicles • Weekend inbound queue 5 vehicles	• Mandatory collection requires Cities and County to pass ordinances • Mandatory collection issues include reduction in citizen choice, some properties not easily served by curbside, and potential adverse impact on low income residents
Concept 2 Combination A A1 – Add 1 TSO on commercial floor (weekdays and weekend) A2 – Add 1 TSO on commercial floor (weekdays and weekend)	• ~$340,000 increase in SWD operating cost (A1 and A2) • ~$1.7 million capital cost (A2) • ~$0.54 increase in per ton tip fee (A2)	• Reduced queuing and associated air quality impacts (A2)	• Weekday self-haul service time 38 min., commercial service time 23 min. (A1) • Weekday self-haul service time 19 min., commercial service time 13 min. (A2) • Weekend self-haul service time 29 min., commercial service time 20 min. (A1) • Weekend self-haul service time 17 min.,	• Permit needed for additional scale (A2)

Shoreline	Cost Estimate	Environment	Service (service time and queue[i])	Other
+ outbound scale			commercial service time 12 min. (A2) • Weekday inbound queue 8 to 11 vehicles (A1 and A2) • Weekend inbound queue 4 vehicles (A1 and A2)	
Concept 2 Combination B Add 1 TSO on commercial floor (weekdays and weekend) + mandatory curbside collection	• ~$340,000 increase in SWD operating cost • ~$0.38 increase in per ton tip fee	• Reduced queuing and associated air quality impacts • Minor increase in commercial haul traffic and decrease in self-haul traffic	• Weekday self-haul service time 28 min., commercial service time 21 min. • Weekend self-haul service time 22 min., commercial service time 15 min. • Weekday inbound queue 5 vehicles • Weekend inbound queue 4 vehicles	• Mandatory collection requires Cities and County to pass ordinances • Mandatory collection issues include reduction in citizen choice, some properties not easily served by curbside, and potential adverse impact on low income residents
Concept 3 not modeled – no mitigation required				

[i] Shoreline queue length information: intersection of Meridian Ave N / N 165th St located approximately 15 vehicles from the scale

Summary

Increases in station traffic range from 44 to 76 vehicles per hour between the different concepts during the weekday peak period under with-Renton conditions and range from 44 to 96 vehicles per hour during the weekday peak period under the without-Renton conditions. During the Saturday peak period, peak demand volumes range from 67 to 86 vehicles per hour under with-Renton conditions and range from 67 to 92 vehicles per hour under without-Renton conditions.

- Analysis of on-site operations showed operational issues at the commercial-haul tipping floor and the outbound scale resulting in commercial-haul service times exceeding the adopted service time value primarily during the Saturday peak periods.
  - Three demand management strategy combinations were analyzed to improve on-site operations under Concepts 0 to 2 without-Renton conditions, both during the weekday and Saturday peak periods. Combination A2 (add a TSO on the commercial tipping floor and additional outbound scale) under Concepts 0 to 2 meets both the adopted weekday and Saturday service time and queue threshold values. The other combinations under the without-Renton conditions exceed either the adopted service time or the queue threshold values.
- The mitigated time on-site for commercial haulers, depending on the concept and time of week, would range from about 12 to 22 minutes. For self-haulers, the mitigated wait times on-site would range from about 17 to 38 minutes. The existing time on-site for commercial haulers is between 12 and 13 minutes and for self-haulers it is about 17 to 18 minutes.
- The mitigated queue length for customers waiting to get into the station ranges from about 3 vehicles up to about 46 vehicles. The existing queue ranges from 1 to 2 vehicles.

- Evaluation of off-station intersections showed minimal increases in traffic for Concept 2. Concept 2 represented the highest peak demand thus represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

Factoria

Strategy combinations were identified based on the results of the Tier 1 screening process. Reductions in peak hour demand from applying the strategies range up to about 34 percent. Specific strategies examined at the Factoria station and the estimated reductions include:

- Extend operating hours, 4 percent reduction
- Lower cost curbside bulky waste collection, 3.4 percent reduction
- Mandatory curbside garbage collection, 4 percent reduction
- Incentive/peak pricing, 15 percent reduction
- Higher minimum fee at Factoria only, 20 percent reduction
- No HHW service, 3 percent reduction
- Ban yard waste and wood waste from disposal and recycling, 34 percent reduction

In addition to the demand strategies noted above, potential physical station improvements were identified to address the operational constraints. These improvements considered the addition of increased staffing, the addition of an outbound scale, and added internal vehicle queueing.

The Tier 2 screening process included the testing of the strategy combinations using VISSIM. The effectiveness of the strategies was tested for the without-Renton scenario as that represents the period with the highest peak-hour demand. Various strategy combinations were applied for Concept 0 and Concept 2. Modeling was not conducted for Concept 1 as the demand is similar to Concept 0. No VISSIM modeling was conducted for Concept 3 because analysis showed it met most of the adopted service time and queue threshold values. See Appendix A for detailed tables for all concepts.

The following combinations were identified for detailed evaluation:

Concept 0:

- Combination A (weekday & Saturday) – extended hours + incentive/peak pricing
- Combination B (weekday & Saturday) – increase staffing (decrease dwell time) + higher minimum fee
- Combination C (weekday & Saturday) – banned materials + mandatory curbside collection + lower cost curbside bulky waste collection

Concept 1:

- No modeling necessary (Concept 1 is similar to Concept 0, results of Concept 0 analysis will apply)

Concept 2:

- Combination C (weekday & Saturday) – banned materials + mandatory curbside collection + lower cost curbside bulky waste collection
- Combination D (weekday & Saturday) – added internal queuing (expanded entry lane and repurpose of HHW area) + HHW banned

Concept 3:

- No modeling was necessary because analysis showed that the concept met most of the adopted service time and queue threshold values.

Results

The results of the combinations tested on the concepts and demand management strategies are shown and discussed below.

Concept 0

Concept 0 with combination C2 is the only package that meets the adopted service time values, and falls within the threshold of vehicle queues for both the weekdays and Saturday peak periods. While the improvements identified in Combination B reflect improvements in service times and queues relative to Concept 0, the resulting values do not meet the adopted service time and queue threshold values.

Concept 1

No strategy combinations were tested for Concept 1 as peak-hour demand is similar to forecasts for Concept 0. Future operations for Concept 1 under the scenarios tested would be similar.

Concept 2

Concept 2 with Combination C meets the adopted travel time and queue threshold values for both weekdays and Saturday. Concept 2 with Combination D exceeds the adopted self-haul service time value. Due to the additional on-site queue storage, the queues that were previously off-site are now mostly accommodated on-site, greatly increasing the service times.

Concept 3

No combinations were modeled for Concept 3 as the service times and queues meet the adopted values under all scenarios with the exception of the self-haul service times exceeding the adopted value under the weekday peak period. During this period, on-site service times are anticipated to exceed the adopted values by approximately 8 minutes. Based on the results from the Concept 0 evaluation, the application of the strategy combinations tested would likely result in a decrease in service times, improving these conditions.

Table 6: Summary of Demand Management Strategies Applied to Factoria

Factoria	Cost Estimate	Environment	Service (service time and queue[ii])	Other
Concept 0 Combination A Extend hours, peak pricing	• ~$1.5 million increase in SWD operating cost • ~$2.3 million revenue increase • Net per ton tip fee decrease ~$0.50	• Additional vehicle traffic during p.m. peak commute hours • Noise code limits lower in evening • New SEPA needed for extended hours	• Weekday self-haul service time 38 min., commercial service time 12 min. • Weekend self-haul service time 41 min., commercial service time 20 min. • Weekday and weekend inbound queue 3 to 6 vehicles	• KC rate ordinance to implement peak price • KC process to change hours • Impact from noise and traffic on neighboring residents and businesses during extended hours • Issues include fee equity (transfer station fees would be higher in northeast area than other areas of the county), potential adverse impacts on low income customers and small business owners, and customer dissatisfaction due to higher cost

Factoria	Cost Estimate	Environment	Service (service time and queue[ii])	Other
				• More issues may be identified during SEPA process
Concept 0 Combination B **B1 – Unloading assistance, higher minimum fee** **B2 – Unloading assistance, higher minimum fee, additional outbound scale**	• ~$4 million increase in SWD operating cost • ~$1 to 2 million capital cost • ~$15.4 million revenue increase • Net per ton tip fee decrease ~$7.50	• Shifts vehicle traffic in the region resulting in increased vehicle miles travelled	• Weekday self-haul service time 51 to 52 min., commercial service time 12 to 16 min. (B1 and B2) • Weekend self-haul service time 50 min., commercial service time 29 min. (B1) • Weekend self-haul service time 29 min., commercial service time 16 min. (B2) • Weekday inbound queue 35 to 39 vehicles, blocks driveways of neighboring businesses (B1 and B2) • Weekend inbound queue 48 vehicles, blocks driveways of neighboring businesses (B1) • Weekend inbound queue 11 vehicles (B2)	• King County rate ordinance to double minimum fee at Factoria • Issues include fee equity (transfer station fees would be higher in northeast area than other areas of the county), potential adverse impacts on low income customers and small business owners, and customer dissatisfaction due to higher cost
Concept 0 Combination C **C1 – Ban yard/wood waste, mandatory collection, curbside bulky waste collection** **C2 – Ban yard/wood waste, mandatory collection, curbside bulky waste**	Site and build yard/wood waste drop box • ~$600,000 increase in SWD operating cost • ~$18.5 million capital cost • ~$2.30 increase in per ton tip fee Yard/wood waste goes elsewhere • No added cost	• Siting process needed if build a drop box to handle yard/wood waste • Shifting vehicle traffic in the region resulting in increased vehicle miles travelled • Minor increase in commercial haul traffic and decrease in	• Weekday self-haul service time 23 to 25 min., commercial service time 11 to 13 min. (C1 and C2) • Weekend self-haul service time 32 min., commercial service time 20 min. (C1) • Weekend self-haul service time 23 min., commercial service time 15 min. (C2) • Weekday inbound queue 2 to 3	• King County process to implement material ban; band would require monitoring and enforcement (not included in costs) • Potential customer dissatisfaction and adverse impacts to small businesses • Permits needed if siting/building new drop box • Mandatory collection would require Cities and County to pass ordinances • Mandatory collection issues include reduction in citizen choice, some properties not

Factoria	Cost Estimate	Environment	Service (service time and queue[ii])	Other
collection, additional outbound scale	to SWD • ~$1.40 increase in per ton tip fee due to revenue loss Additional outbound scale • ~$1 million capital cost	self-haul traffic	vehicles (C1 and C2) • Weekend inbound queue 4 to 5 vehicles (C1 and C2)	easily served by curbside, and adverse impact on low income residents • Cities and haulers would be primarily responsible for determining a system that would lower bulky waste collection cost; lower cost would make service more accessible • Additional outbound scale would require permit • More issues may be identified during SEPA/permitting process
Concept 1 not modeled due to similarity of peak hour demand with Concept 0 – same strategies could be applied with similar results				
Concept 2 Combination C **Ban yard/wood waste, mandatory collection, curbside bulky waste collection**	Extended operating hours • ~$1.5 million increase in SWD operating cost • ~$2.00 increase in per ton tip fee Site and build yard/wood waste drop box • ~$600,000 increase in SWD operating cost • ~$18.5 million capital cost • ~$2.30 increase in per ton tip fee Yard/wood waste goes elsewhere • No added cost to SWD • ~$1.40 increase in per ton tip fee due to	• Additional vehicle traffic during p.m. peak commute hours • Noise code limits lower in evening • New SEPA needed for extended hours • SEPA needed if site/build new drop box • Shift of vehicle traffic in the region and increased vehicle miles travelled • Minor increase in commercial haul traffic and decrease in self-haul traffic	• Weekday self-haul service time 23 min., commercial service time 12 min. • Weekend self-haul service time 22 min., commercial service time 15 min. • Weekday and weekend inbound queue 2 to 3 vehicles	• KC process to change hours • Impact from noise and traffic on neighboring residents and businesses during extended hours • King County process to implement material ban; band would require monitoring and enforcement (not included in costs) • Issues include customer dissatisfaction and adverse impacts to small businesses • Permits needed if site/build new drop box • Mandatory collection would require Cities and County to pass ordinances • Mandatory collection issues include reduction in citizen choice, some properties not easily served by curbside, and adverse impact on low income residents • Cities and haulers would be primarily responsible for determining a system that would lower bulky waste collection cost; lower cost would make service more accessible

Factoria	Cost Estimate	Environment	Service (service time and queue[ii])	Other
	revenue loss			• More issues may be identified during SEPA/permitting process
Concept 2* Combination D **Added internal queuing (expanded entry lane and repurpose of HHW area), second inbound lane along SE 32nd St, and no HHW service** **Concept 2 includes extended hours at Factoria: 6 a.m. to 10 p.m. on weekdays and 8 a.m. to 8 p.m. on weekends*	Extended operating hours • ~$1.5 million increase in SWD operating cost • ~$2.00 increase in per ton tip fee Queuing improvements • ~$2.4 million capital cost • ~$0.20 increase in per ton tip fee Site/build separate HHW facility • ~$9.1 million capital cost • ~$0.80 increase in per ton tip fee	• Additional vehicle traffic during p.m. peak commute hours • Noise code limits lower in evening • New SEPA needed for extended hours • Permits and SEPA for expanded entry and queueing • Permits and SEPA for inbound lane on SE 32nd – proximity to stream • Reduced impact on local streets and neighbors • Some reduction in traffic at Factoria • Some shift of vehicle traffic in the region and increase in vehicle miles travelled • Siting for new HHW facility	• Weekday self-haul service time 30 min., commercial service time 13 min. • Weekend self-haul service time 1 hour, 6 min., commercial service time 22 min. • Weekday and weekend inbound queue 3 to 7 vehicles *Note that service time (scale-to-scale) increases for this combination is because the queue is moved on site.*	• KC process to change hours • Impact from noise and traffic on neighboring residents and businesses during extended hours • Siting process and permits needed for new HHW facility • Issues include customer dissatisfaction and potential increase in improper disposal • More issues may be identified during SEPA/permitting process
Concept 3 not modeled because analysis showed that the concept met most of the adopted service time and queue threshold values.				

[ii] Factoria queue length information: first driveway located approximately 10 vehicles from the scale; Richards Road intersection located approximately 60 vehicles from scale

Summary

- Between the different concepts, increases in station traffic range from 55 to 113 vehicles per hour during the weekday peak period under with-Renton conditions, and range from 69 to 127 vehicles per hour during the weekday peak period under the without-Renton conditions. During the Saturday peak period, peak demand volumes range from 74 to 152 vehicles per hour under with-Renton conditions, and range from 91 to 168 vehicles per hour under without-Renton conditions.
- Analysis of on-site operations showed that moving vehicles through the self-haul tipping floor was the constraint at Factoria, so that vehicles would wait to enter the tipping, resulting in queues extending off-site, beyond the queue thresholds, as well as service times exceeding the adopted values under Concepts 0 to 2 for the weekday and/or Saturday peak conditions.
  - Seven combinations were analyzed to improve on-site operations under Concepts 0 and 2 without-Renton conditions, both during the weekday and Saturday peak periods. Combinations C1 and C2 (banned materials, mandatory curbside collection, lower cost curbside bulky waste collection, and as part of Combination C2 only, an additional outbound scale) under Concepts 0 and 2, respectively, meet both the weekday and Saturday adopted service time and queue threshold values. The other combinations under the without-Renton conditions exceed either the adopted service time or the queue threshold values.
- The mitigated time on-site for commercial haulers, depending on the concept and time of week, would range from about 11 to 29 minutes. For self-haulers, the mitigated wait times on-site would range from about 22 to 52 minutes. The existing time on-site for commercial haulers is between 11 and15 minutes and for self-haulers it is about 22 to 23 minutes.
- The mitigated queue length for customers waiting to get into the station ranges from about 2 vehicles up to about 48 vehicles. The existing queue is about 1 vehicle.
- Evaluation of off-station intersections showed minimal traffic increases for Concept 0. Concept 0 represented the highest peak demand and represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

Bow Lake

Strategy combinations were identified based on the results of the Tier 1 screening process. The Tier 2 screening process included the testing of the strategy combinations using VISSIM. The effectiveness of the strategies was tested for the without-Renton scenario as that time period representing the period with the highest peak-hour demand for the stations. See Appendix A for detailed tables for all concepts.

The following combinations were identified for detailed evaluation:

Concept 0:

- Combination A – additional inbound scale
- Combination B1 – additional inbound scale and additional outbound scale
- Combination B2 – additional inbound scale, additional outbound scale, and outbound queue pocket (on-station)

Due to similar peak-hour demands for the concepts, the Tier 2 evaluation utilizing VISSIM applied the following strategy combinations to Concept 0 (weekday and Saturday) only.

Results

The results of the combinations tested on the concepts and demand management strategies are shown and discussed below.

Concept 0

Concept 0 with the addition of Combination B2 meets the adopted service times for the Saturday peak demand, but exceeds the adopted service time targets for the weekday period. The commercial-haul times exceed the adopted service time value by 1-minute and the self-haul times exceed the adopted service time value by 5 minutes. Relative to the existing service times, Combination B2 results in the most similar performance levels.

Although the self-haul service times with Combination B2 appear to be worse on the weekday compared with Concept 0 by itself, the queues are reduced by 95 vehicles. As noted previously, the unmitigated service times for Concept 0 are skewed due to the forecasted queueing and the metering effect of the inbound scale house. The inbound vehicle queues for the weekday and Saturday conditions are well under the threshold, with a maximum queue length of six vehicles.

Concepts 1, 2, and 3

Peak-hour demands for all scenarios are similar between Concept 0 and Concepts 1, 2, and 3. As such, no VISSIM modeling was conducted for Concepts 1, 2, and 3.

Table 7: Summary of Demand Management Strategies Applied to Bow Lake

Bow Lake	Cost Estimate[iii]	Environment	Service (service time[iv] and queue[v])	Other
Concept 0 Combination A **Additional inbound scale**	• ~$270,000 increase in SWD operating cost • ~$1.2 million capital cost • ~$0.40 increase in per ton tip fee	• Reduced queuing and associated air quality impacts • Reduced impact on local streets	• Weekday self-haul service time 57 min., commercial service time 45 min. • Weekend self-haul service time 1 hour 10 min., commercial service time 52 min. • Weekday inbound queue 4 vehicles • Weekend inbound queue 52 vehicles	• More issues may be identified during SEPA/permitting process
Concept 0 Combination B **B1 – Additional inbound scale, additional outbound**	• ~$270,000 increase in SWD operating cost • ~$2.1 million capital cost (B1) • ~$2.9 million capital cost (B2) • ~$0.55 increase in per ton tip fee	• Reduced queuing and associated air quality impacts • Reduced impact on local streets	• Weekday self-haul service time 45 min., commercial service time 31 min. (B1) • Weekday self-haul service time 35 min., commercial service time 17 min. (B2) • Weekend self-haul	• More issues may be identified during SEPA/permitting process

Bow Lake	Cost Estimate[iii]	Environment	Service (service time[iv] and queue[v])	Other
scale **B2 – Additional inbound scale, additional outbound scale, outbound queue pocket**	(B2)		service time 36 min., commercial service time 26 min. (B1) • Weekend self-haul service time 28 min., commercial service time 13 min. (B2) • Weekday inbound queue 3 vehicles (B1 and B2) • Weekend inbound queue 6 to 7 vehicles (B1 and B2)	
Concepts 1, 2, and 3 not modeled due to similarity of peak hour demand with Concept 0 – same strategies could be applied with similar results				

[iii] Cost estimates for operating cost and per ton tip fee are for 2023; capital costs are total project cost inflated
[iv] Service time is defined as time on site (scale-to-scale) and does not include time spent in queue offsite
[v] Bow Lake queue length information: intersection of S 188th St / Orillia Rd S located approximately 32 vehicles from the scale

Summary

- Increases in station traffic range from 85 to 88 vehicles per hour between the different concepts during the weekday peak period under with-Renton conditions and range from 110 to 118 vehicles per hour during the weekday peak period under the without-Renton conditions. During the Saturday peak period, peak demand volumes range from 110 to 111 vehicles per hour under with-Renton conditions and range from 140 to 152 vehicles per hour under without-Renton conditions.
- Analysis of on-site operations showed operational issues at the inbound scales, resulting in queues extending beyond the adopted inbound queue thresholds.
  - Three combinations were analyzed to improve on-site operations under Concept 0 without-Renton conditions, both during the weekday and Saturday peak periods. Combination B2 (an additional inbound and outbound scale and outbound queue storage pocket) meets the Saturday adopted service time and queue threshold values as well as being near the adopted service time values and meeting the queue threshold values on the weekdays. The other combinations under the without-Renton conditions exceed either the adopted service times or the queue threshold values.
- The mitigated time on-site for commercial haulers, depending on the concept and time of week, would range from about 13 to 52 minutes. For self-haulers, the mitigated wait times on-site would range from about 28 minutes up to about an hour and ten minutes. The existing time on-site for commercial haulers is about 13 minutes and for self-haulers it is between 26 and 27 minutes.
- The mitigated queue length for customers waiting to get into the station ranges from about 3 up to about 52 vehicles. The existing queue is about 2 to 3 vehicles.
- Evaluation of off-station intersections showed minimal increases in traffic for Concept 0 relative to without-project conditions. Concept 0 represented the highest peak demand, and thus represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

Concept 3

Concept 3 is the only concept which would build a new Northeast Recycling and Transfer Station (NERTS) to replace the Houghton Transfer Station.

Service

At Factoria, during peak weekday hours, self-haul service times would exceed the adopted service time value of 30 minutes or less, but would be within the standard for commercial. Saturday service times would be within standard for self-haul and commercial. Off-site queues would not impact local businesses or streets (see Tables 9 and 10 for more information).

Table 8: Factoria Without Renton Weekday

	Peak Hour Demand (inbound trips)	Service Times[2] in minutes		Inbound Queue[3]
		Self-Haul	Commercial	
Existing[1]	36	23:00	11:00	1
Concept 3 (2023)	71	38:00	12:00	2

Table 9: Factoria Without Renton Saturday

	Peak Hour Demand (inbound trips)	Service Times[2] in minutes		Inbound Queue[3]
		Self-Haul	Commercial	
Existing[1]	46	22:00	15:00	1
Concept 3 (2023)	93	25:00	15:00	3

1. Existing conditions reflects the configuration of the planned station and 2014 volumes observed.
2. Measured scale-to-scale.
3. First driveway located approximately 10 vehicles from the scale. Richards Road intersection located approximately 60 vehicles from scale.

Cost

The cost of a new Northeast Recycling and Transfer Station is estimated at about $97 million in 2015 dollars.

- The average cost (2015-2040) per ton to build NERTS would be about $7 per ton
- Would add about $5 per year to the average single-family household curbside collection cost (median 2015-2040)

In the online customer survey conducted from mid-November 2014 to early January 2015, Houghton users were asked about their willingness to pay higher fees to replace the Houghton Transfer Station with a new nearby facility. Randomly, survey participants were asked if they would be willing to pay $8 or $15 more per ton. While more would be willing to pay the lower increase, overall about 75 percent said they would be willing to pay the higher fee, 10 percent said they weren't sure, and about 15 percent said they would not be willing. While only Houghton users, who would be the primary

beneficiaries of a new station, were asked, capital costs are spread across all system users. See Appendix B for more detailed customer survey information.

Environment

Building a Northeast Recycling and Transfer Station may not substantially change the number of vehicle trips in the region, but would reduce the driving distance of customers and haulers and would reduce overall fuel consumption and greenhouse gas emissions. In addition, extended wait times and therefore idling vehicles at stations can result in localized effects to air quality. Providing an additional station would reduce wait times and the potential for localized air quality effects at Factoria and Shoreline.

Renton

The current Transfer Plan calls for the Renton Transfer Station to close when replacement capacity is available. The 2013 Draft Comprehensive Solid Waste Management Plan recommends reserving the option to retain the Renton station until new urban transfer facilities have been sited and impact of the closure has been fully evaluated. The City of Renton has affirmed that it wants the station closed in 2018. The review process considered how closing the Renton Transfer Station would affect the transfer system under each concept. And as specified in Council Motion 14145 the division evaluated the following:

- The effect of the potential closure of the Renton Transfer Station on the self-haul service needs of residents currently served by the Renton Transfer Station, with particular attention to the accessibility and convenience provided to current transfer station clients by the Renton station, compared with drive time and potential waits associated with alternative transfer station options.
- Options for self-haul service for residents currently served by the Renton Transfer Station in the event of a closure of the station.

Service

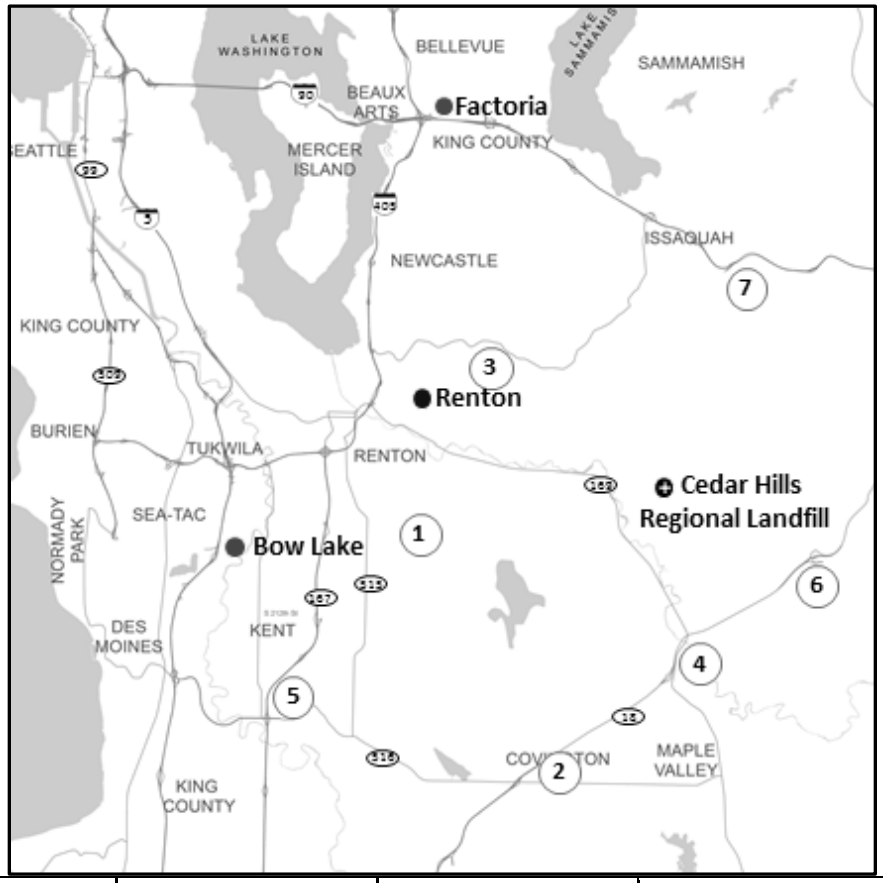
Under all concepts, if the Renton Transfer Station were to remain open, the station would not experience any service time or queueing issues. Renton would continue to provide garbage service and recycling service as space allows. Under the current configuration, space is not available to provide separate yard waste collection.

Alternatives to the Renton Transfer Station

Over 97 percent of Renton Transfer Station self-haul customers who participated in the recent online customer survey said that they were satisfied with the current transfer station – 80 percent were very satisfied.

The vast majority of survey respondents, over 90 percent, said that geographic location was the most important factor in choosing a transfer station. While many self-haulers that use the Renton transfer Station are geographically located at a nearly equal distance to Factoria or Bow Lake there may be differences in travel time or experience that make Renton more desirable for the customers that use the station. Figure 4 shows the travel times to the Renton, Bow Lake, and Factoria stations. The locations were chosen based on trip origin information from Renton Transfer Station self-haulers. Travel times could be longer in traffic.

Figure 4: Drive Distances and Times



Location	Renton		Bow Lake		Factoria	
	miles	minutes	miles	minutes	miles	minutes
1	6.42	10	8.58	16	13.73	18
2	13.12	22	13.39	22	22.41	32
3	2.41	6	10.18	16	8.36	18
4	12.61	19	18.23	25	19.92	27
5	8.77	12	5.5	10	15.82	18
6	14.02	22	23.37	31	17.01	24
7	9.47	17	17.23	27	8.90	13

If Renton were to close, about 47 percent of survey respondents said they would use Factoria instead, 17 percent would use Bow Lake, 7 percent would use Enumclaw, and about 4 percent said they would use Algona. However, less than 5 percent said they would be satisfied with these options and over 70 percent said they would be very dissatisfied. Were Renton to close, customers making use of other stations would experience queues and service times associated with whichever Concept and mitigation strategies are chosen.

Cost

The cost to repair and retain the Renton Transfer Station would be about $2 million. The added cost, capital and operating, to retain Renton would be about $1.60 per ton in 2023. The advantage Renton has from a cost perspective is its close proximity to Cedar Hills thus relatively low hauling cost despite lacking a compactor.

Environment

Keeping Renton open would not have any significant impacts from a traffic or noise perspective. Shorter driving distances for customers and for division trucks traveling to the Cedar Hills landfill would reduce overall fuel consumption and greenhouse gas emissions.

Summary

- Under all modeled concepts, Renton does not experience any constraints
- It has some effect on how other stations function, but the impact is not enough to be a deciding factor in whether or not to keep it open
- If the station were to close, current users would primarily use Factoria and Bow Lake

Conclusion

This review determined that there are multiple options available to the region for shifting transactional demand at the transfer stations. The impacts varied by station, therefore the solutions are also different at each station.

This review revealed that the Shoreline Recycling and Transfer Station would experience some constraints if a Northeast Recycling and Transfer Station were not built. These constraints could be mitigated by a combination of adding some staff, mandatory curbside collection, and adding an outbound scale:

- The capital cost of adding an outbound scale would be about $1.7 million; the operational cost of adding staff would range from about $70,000 to $340,000 annually depending on the concept
- Permits would be needed for the capital improvements

This review also determined that closing the Houghton Transfer Station and not building a Northeast Recycling and Transfer Station would, if unmitigated, result in on-site service times at Factoria for commercial haulers of up to 22 minutes and for self-haul customers of over an hour. In addition, substantial off-site queueing with weekday queues of up to about 130 vehicles and Saturday queues over 180 could occur; queues of this length would extend well beyond the intersection of SE 32nd Street and Richards Road. However, mitigation strategies could reduce both service times and queue lengths to acceptable levels. Potential strategies analyzed for Factoria include extending hours, adding peak pricing, adding staff to help with unloading vehicles, banning yard and wood waste from both disposal and recycling, not providing HHW service at this site (service would be provided at a yet to be determined location somewhere in the area), adding internal queuing space, improving curbside bulky collection service, and mandatory curbside collection. The mitigation strategies for Factoria with the most impact would require combinations of strategies including the following:

- Extending operating hours and implement peak pricing
- Extending hours would increase operating costs, but the cost may be offset by pricing incentives. Eliminating yard and wood waste from both disposal and recycling services along with mandatory curbside collection and less-expensive curbside bulky collection service; this combination could be implemented with or without extended operating hours and could be further enhanced by adding a second outbound scale
    - Provide yard and wood waste disposal and recycling services at other locations
        - Options range from providing a drop box somewhere in the service area at a capital cost of approximately $18.5 million and an operating cost of about $600,000 annually, to allowing the material to flow to other transfer facilities and private

service providers which would have minimal direct costs, but could result in revenue loss

- Implementing mandatory garbage collection and less-expensive options for curbside collection of bulky items, in combination with other mitigation strategies; independently these actions would likely have a relatively small effect on demand at the station
    - Cities and the County would need to pass ordinances requiring that everybody pay for the service; potential issues include reduction in citizen choice and dissatisfaction, some properties are not easily served by curbside, and potential adverse impact on low-income residents
    - Establishing a system that would lower bulky waste collection cost; lower cost would make service more accessible to low- and middle-income households; cities and haulers would be primary parties responsible for implementation

At Bow Lake, the review identified that constraints related to the inbound and outbound scale capacity will exist in the future under all scenarios. These constraints were anticipated during station design, so the scale complex was designed to accommodate additional scales when they become necessary:

- Adding inbound and outbound scale capacity along with outbound queue improvements would address constraints under all concepts
    - The capital cost of the improvements would be about $2.9 million; the operational cost would be about $270,000 annually

In general, whether or not the Renton Transfer Station closes is not a significant factor in capacity constraints at other sites, although keeping it open would ease demand on the transfer system. However, customers of that station have expressed clearly that they value both the geographic location of the station and the service that it provides.

Recommendations

Though the results show a Northeast is not needed at this time, the modeled demand management strategies are untested and would benefit from real-life analysis. More importantly, it is critical we continue the regional discussion with cities and stakeholders to inform policies to be included in an updated *Comprehensive Solid Waste Management Plan* (Comp Plan). Such policy discussions include maximizing the lifespan of the Cedar Hills Regional Landfill, increasing recycling and diversion efforts to reach a 70 percent recycling rate, providing system-wide customer service excellence, and ensuring a sustainable rate model is in place to cover system expenses.

The division recommends the following:

- Do not build a new Northeast Transfer Station at this time, but keep it as an option for a future potential facility.

- Develop and test the following demand management strategies:

    a. Conduct a pilot program to test the effectiveness and potential impacts of using demand management strategies, including web cameras to inform customers of station activity in real time.

b. Work with private industry customers and stakeholders to develop a low-cost bulky item collection pilot in target regions of the county by May 2016.

c. Research point of sale (IT system) needs to support differential pricing for transactions at the transfer stations and identify implementation needs by May 2016. Implement necessary technology changes by September 2017.

d. In 2017, begin a 12-month pilot to test the effectiveness and potential impacts of extended hours and incentive pricing. Following the pilot, transmit a report and recommendation to Council in March 2019.

- Identify the steps needed to achieve 70 percent recycling rates
- Continue Comp Plan process with city partners and other stakeholders to address key policy issues and produce a draft Comp Plan for review in early 2017.
- Upon adoption of the Comp Plan, the system's infrastructure should be reassessed to ensure it fully supports the adopted strategies and goals of the system.

Appendices

A. URS/Transpo Report

B. Online Customer Survey

C. Hauler Survey

D. Maps

E. Benchmark Information

F. Stakeholder Engagement

G. Supporting Documents

H. Load Origin – Urban Transfer Stations

I. Cost Summary/Comparison

J. Responsiveness Summary

K. Comment Letters

L. Data Collection Roles and Responsibilities

Appendix A: Environmental Report

ENVIRONMENTAL REPORT

King County
Solid Waste Transfer and Waste Management Plan Update

March 17, 2015
Draft

Prepared for:

King County
Department of
Natural Resources and Parks
Solid Waste Division

Prepared by:

URS Corporation

1501 4th Avenue, Suite 1400
Seattle, WA 98101

Table of Contents

Introduction viii

Transportation 1

Study Approach 1

Report Terminology 1

Analysis Period 2

Traffic Analysis 2

Station Traffic – Trip Generation Methodology 5

Station Assessments 8

Bow Lake 8

Renton 27

Factoria 41

Shoreline 65

References 89

Noise N-1

Report Terminology N-1

General Principles N-1

Metrics N-2

Methodology N-3

Data Collection N-4

Existing Environmental Noise Levels N-4

Sounds Levels for Individual Sources N-7

Modeling Input Parameters N-8

On-Site Equipment, Vehicles, and Activities N-8

Traffic Volumes N-8

Issue Identification N-10

Regulatory Compliance **N-10**
Bow Lake N-10
Renton N-11
Factoria N-11
Shoreline N-12
Increases to Existing Noise Condition **N-12**
Analysis **N-13**
Bow Lake N-13
Renton N-14
Factoria N-15
Shoreline N-15
References **N-17**
Air Quality **A-1**
Existing Air Quality **A-1**
Methodology **A-3**
Environmental Consequences **A-4**
References **A-7**

Attachments

Attachment A **Project Scope**
Attachment B **LOS Definitions**
Attachment C **On-Site Data Collection Summary**
Attachment D **Customer Origin/Destination Data**
Attachment E **Trip Generation Forecasts**
Attachment F **Tier 1 Tables**
Attachment G **Off-Site Traffic Counts**
Attachment H **LOS Worksheets**
Attachment I **Noise Model Figures**

Figures

Figure 1 Example VISSIM MODEL (Shoreline) 3
Figure 2 Trip Generation Process 6
Figure 3 Concept 0 - Saturday ADT for each Station 7
Figure 4 Bow Lake Site Vicinity 8
Figure 5 Bow Lake On-Site Future Building Configuration and Circulation Patterns 8
Figure 6 Bow Lake Existing Typical Weekday and Saturday Traffic Volume Patterns 10
Figure 7 Bow Lake Existing and Concept Peak-Hour Volumes 11
Figure 8 Bow Lake Study Intersections 17
Figure 9 Bow Lake Existing Weekday and Saturday Station Peak-Hour Traffic Volumes 18
Figure 10 Bow Lake 2023 Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes 19
Figure 11 Bow Lake Weekday Trip Distribution (With and Without-Renton) 23
Figure 12 Bow Lake Saturday Trip Distribution (With and Without-Renton) 24
Figure 13 Bow Lake Concept 0 With and Without-Renton Net-New Trip Assignment 25
Figure 14 Bow Lake Concept 0 Weekday and Saturday Station Peak-Hour Traffic Volumes 25
Figure 15 Renton Site Vicinity 27
Figure 16 Renton On-Site Future Building Configuration and Circulation Patterns 28
Figure 17 Renton Existing Typical Weekday and Saturday Traffic Volume Patterns 30
Figure 18 Renton Existing and Concepts 0-3 Peak-Hour Volumes 31
Figure 19 Renton Study Intersections 33
Figure 20 Renton Existing Weekday and Saturday Station Peak-Hour Traffic Volumes 34
Figure 21 Renton Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes 35
Figure 22 Renton Weekday and Saturday Trip Distribution 38
Figure 23 Renton Weekday and Saturday Net-New Trip Assignment 38
Figure 24 Renton Concept 2 Weekday and Saturday Station Peak-Hour Traffic Volumes 39
Figure 25 Factoria Site Vicinity 41
Figure 26 Factoria On-Site Future Building Configuration and Circulation Patterns 42
Figure 27 Factoria Existing Typical Weekday and Saturday Traffic Volume Patterns 44
Figure 28 Factoria Existing and Concepts 0-3 Peak-Hour Volumes 45
Figure 29 Total Factoria Weekday 2023 Transactions for Concepts 0 and 2 46
Figure 30 Factoria Study Intersections 54
Figure 31 Factoria Existing Weekday and Saturday Station Peak-Hour Traffic Volumes 55
Figure 32 Factoria 2023 Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes 56
Figure 33 Factoria Weekday Trip Distribution (With and Without-Renton) 60
Figure 34 Factoria Saturday Trip Distribution (With and Without-Renton) 61
Figure 35 Factoria Concept 0 With and Without-Renton Net-New Trip Assignment 62
Figure 36 Factoria Concept 0 Weekday and Saturday Station Peak-Hour Traffic Volumes 63
Figure 37 Shoreline Station Vicinity 66
Figure 38 Shoreline On-Site Future Building Configuration and Circulation Patterns 67
Figure 39 Shoreline Existing Typical Weekday and Saturday Traffic Volume Patterns 68
Figure 40 Shoreline Existing and Concepts 0-3 Peak-Hour Volumes 69

Figure 41 Shoreline Study Intersections 77
Figure 42 Shoreline Existing Weekday and Saturday Station Peak-Hour Traffic Volumes 78
Figure 43 Shoreline 2023 Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes 80
Figure 44 Shoreline Weekday and Saturday Trip Distribution (With and Without-Renton) 84
Figure 45 Shoreline Concept 2 With and Without-Renton Net-New Trip Assignment 85
Figure 46 Shoreline Concept 2 Weekday and Saturday Station Peak-Hour Traffic Volumes 86
Figure N-1 Bow Lake Recycling and Transfer Station –Noise Monitoring Locations N-6
Figure N-2 Renton Recycling and Transfer Station –Noise Monitoring Locations N-6
Figure N-3 Shoreline Recycling and Transfer Station –Noise Monitoring Locations N-7
Figure A-4 Bow Lake Noise Model N-18
Figure A-5 Renton Noise Model N-18
Figure A-6 Shoreline Noise Model N-19
Figure A-1 Current Central Puget Sound Region Designated Maintenance and Nonattainment Areas A-3

Tables

Table 1 Bow Lake Customer Trip Origin Summary 9
Table 2 Bow Lake Existing and Concept Service Times Summary 12
Table 3 Bow Lake Existing and Concept Inbound Queuing Summary 13
Table 4 Bow Lake Combinations Service Times and Queues (Concept 0 – 2023 Without-Renton) 15
Table 5 Bow Lake Existing Weekday and Saturday Station Peak Hours LOS Summary 18
Table 6 Bow Lake 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary 20
Table 7 Bow Lake Concept 0 With-Renton Trip Generation Summary 21
Table 8 Bow Lake Concept 0 Without-Renton Trip Generation Summary 22
Table 9 Bow Lake Concept 0 Weekday and Saturday Station Peak Hours LOS Summary 26
Table 10 Renton Customer Trip Origin Summary 29
Table 11 Renton Existing and Concepts 0-3 Peak-Hour Service Times and Queuing Summary 32
Table 12 Renton Existing Weekday and Saturday Station Peak Hours LOS Summary 34
Table 13 Renton 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary 36
Table 14 Renton Concept 2 Trip Generation Summary 37
Table 15 Renton Concept 2 Weekday and Saturday Station Peak Hours LOS Summary 40
Table 16 Factoria Customer Trip Origin Summary 43
Table 17 Factoria Existing and Concepts 0-3 Peak-Hour Service Times Summary 46
Table 18 Factoria Existing and Concepts 0-3 Inbound Queues Summary 48
Table 19 Factoria Combinations Peak-Hour Service Times and Queues (Concept 0 – 2023 Without-Renton) 51

Table 20 Factoria Combinations Service Times and Queues (Concept 2 – 2023 Without-Renton) 52
Table 21 Factoria Existing Weekday and Saturday Station Peak Hours LOS Summary....55
Table 22 Factoria 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary 57
Table 23 Factoria Concept 0 With-Renton Trip Generation Summary 58
Table 24 Factoria Concept 0 Without-Renton Trip Generation Summary 58
Table 25 Factoria Concept 0 Weekday and Saturday Station Peak Hours LOS Summary 64
Table 26 Shoreline Customer Trip Origin Summary 68
Table 27 Shoreline Existing and Concepts 0-3 Service Times Summary 70
Table 28 Shoreline Existing and Concepts 0-3 Inbound Queues Summary....71
Table 29 Shoreline Combinations Service Times and Queues (Concept 0 – 2023 Without-Renton) 74
Table 30 Shoreline Combinations Service Times and Queues (Concept 1 – 2023 Without-Renton) 75
Table 31 Shoreline Combinations Service Times and Queues (Concept 2 – 2023 Without-Renton) 76
Table 32 Shoreline Existing Weekday and Saturday Station Peak Hours LOS Summary 79
Table 33 Shoreline 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary 81
Table 34 Shoreline Concept 2 With-Renton Trip Generation Summary....82
Table 35 Shoreline Concept 2 Without-Renton Trip Generation Summary....83
Table 36 Shoreline Concept 2 Weekday and Saturday Station Peak Hours LOS Summary....87
Table N-1 Common Sound Levels, dBA....N-3
Table N-2 Existing Sound Levels, Median of Hourly L_{eq} values, dBA N-5
Table N-3 Measured Individual Noise Sources....N-8
Table N-4 Modeled Noise Sources for Existing Conditions, L_{eq}, dBA N-8
Table N-5 Modeled Peak-Hour Traffic Volumes, Existing Peak-Hour N-9
Table N-6 Modeled Peak-Hour Traffic Volumes, Peak-Hour Maximum Traffic – 2023....N-10
Table N-7 Bow Lake Hourly Sound Level Limits, dBA N-11
Table N-8 Renton Hourly Sound Level Limits, dBA N-11
Table N-9 Factoria Hourly Sound Level Limits, dBA....N-11
Table N-10 Shoreline Hourly Sound Level Limits, dBA....N-12
Table N-11 Noise Impact Criteria based on Increases to Existing Conditions N-12
Table N-12 Bow Lake Regulatory Compliance, Peak-Hour Maximum Traffic – 2023 ....N-13
Table N-13 Bow Lake Increase to Existing, Peak-Hour Maximum Traffic – 2023 ....N-14
Table N-14 Renton Regulatory Compliance, Peak-Hour Maximum Traffic – 2023 ....N-14
Table N-15 Renton Increase to Existing, Peak-Hour Maximum Traffic – 2023 ....N-14
Table N-16 Shoreline Regulatory Compliance, Peak-Hour Maximum Traffic – 2023....N-15
Table N-17 Shoreline Increase to Existing, Peak-Hour Maximum Traffic – 2023....N-16
Table A-1 Ambient Air Quality Standards....A-2
Table A-2 Intersection Data....A-6

Abbreviations and Acronyms

ADT	Average Daily Traffic
BCC	Bellevue City Code
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CADNA	Control of Accuracy and Debugging for Numerical Applications
CAD	computer aided design
CH	Commercial-haul
CO	carbon monoxide
dB	decibel levels
dBA	A-weighted decibel levels
division	Solid Waste Division
Ecology	Washington State Department of Ecology
EDNA	Environmental Designation for Noise Abatement
EPA	Environmental Protection Agency
FR	Federal Register
GHG	greenhouse gases
GIS	graphical information system
HC	hydrocarbons
HCM	Highway Capacity Manual
HHW	Household Hazardous Waste
ISO	International Organization for Standardization
ITE	Institute of Transportation Engineers
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
L_n	Percent Sound Level
L_p	Sound Pressure Level
L_w	Sound Power Level
LOS	Level of Service
mg/m^3	milligrams per cubic meter
MPO	Metropolitan Planning Organization
MSAT	Mobile Source Area Toxics
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
ppbv	parts per billion by volume

ppmv	parts per million by volume
PSCAA	Puget Sound Clean Air Agency
PSRC	Puget Sound Regional Council
PWL	Sound Power Level
pW	1 pico-watt
RMC	Renton Municipal Code
SH	Self-haul
SLM	sound level meter
SMC	Shoreline Municipal Code
SPL	Sound Pressure Level
Scalehouse	Entry and exit point for each station
SIP	State Implementation Plan
SR	State Route
SO_x	sulfur oxides
Tipping floor	Main building where material is removed from vehicles
TMC	Tukwila Municipal Code
transactions	inbound trips
$\mu g/m^3$	micrograms per cubic meter
µPa	micro-pascals
v/c	volume-to-capacity
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

Introduction

Based on the extensive analysis developed in the Transfer Plan review by the King County Department of Natural Resources and Parks, Solid Waste Division (division), and following cooperative work with Council staff and the County auditor, a preliminary County report recommended revising the 2006 Solid Waste Transfer and Waste Management Plan and the pending Solid Waste Comprehensive Plan. These plans are intended to acknowledge continuing system attention to potential capital needs over time that may include capital projects such as recycling facilities, CDL facilities, a new northeast recycling and transfer station, or other capital projects to retain flexibility in the system.

This environmental report supports this plan revision effort by providing analysis of the transportation, noise and air quality implications of multiple concepts for operating the existing recycling and transfer stations with and without a new northeast recycling and transfer station.

Report Preparers

The division contracted with the URS Team to provide data collection and analysis. The primary consultants working on the project and providing project management oversight are AECOM (formerly URS) with team members Transpo Group and The Greenbusch Group, Inc. URS has extensive experience with the planning, design, construction oversight and operational aspects of recycling and solid waste transfer stations. All three firms conduct environmental and impact analysis on commercial and industrial facilities, including transfer stations, as a core portion of their business. Some of our specific project experience includes: design and construction management of the Seattle South Transfer Station; SWD Intermodal Facility Siting Study; Snohomish County Transfer Station Master Planning; Bow Lake Transfer Station Master Plan, Advanced Traffic Management System, and Noise Analysis and Compliance; First Avenue Transfer Station traffic impact analysis; and Waterfront Streetcar Maintenance Facility Siting Study and Design. All of these projects involved environmental review, permitting strategies, cost analysis and scheduling.

Greenbusch collected noise measurements and sound levels and provided noise modeling analysis. Transpo Group collected traffic counts and video, and provided traffic modeling and impact analysis. URS and Transpo Group jointly collected service time counts and origin/destination surveys.

Data Collection

To accomplish the goals of this review, extensive data was collected at the Shoreline, Houghton, Factoria, Renton and Bow Lake stations to understand the existing conditions and operations of each facility. Data was collected during weekdays and Saturdays. Data collected included:

- Traffic counts – the first step was to place tube counters at each station for a number of days (in Sept 2014) to determine the weekday and Saturday 3-hour peak period for the station. 24-hour tube counts were conducted over a two-week period at the approaches to each station.
- Service time counts – the second step was to return to the site during the station's 3-hour peak period. Each vehicle entering the site was tracked through license plate identification to measure delay and service times for various activities on-site. The processing times at the entry scale, exit scale, self-haul tipping floor area, and commercial tipping floor area were collected at each site. In addition, the processing time for the recycling area, household waste, and yard waste areas were measured at the transfer stations where that service is provided.
- Video – simultaneously to the service time counts, video was taken to document the traffic volumes at key locations as well as the vehicle type such as automobile, personal trucks, trailers and commercial hauler trucks.
- Customer origin/destination surveys – also simultaneously to the service time counts, customers were asked the origin of their trip to understand the distribution of customers using the station. This is useful information to consider with the potential future closure of stations (i.e. Houghton, Renton) or analyzing a potential shift in station operations (i.e. redirecting commercial haulers or restricting self-haul).
- Off-site traffic – traffic counts were collected at key intersections surrounding each station. This information was used to assess the impacts to the off-site intersections based on the site traffic anticipated under each of the concepts.
- Noise monitoring – at the same time as the tube counts and service time counts, noise measurements were taken to understand noise levels at the boundary of the station properties and to identify noise levels of vehicle types using the station. Noise measurements were taken at Bow Lake, Renton and Shoreline (Factoria 2012 noise measurements were used).

Concept Descriptions

Four concepts were developed by the division to address the Council request for optional operation scenarios. The general concept descriptions are:

- Concept 0 – No Northeast station, does not direct commercial haulers, no self-haul restrictions
- Concept 1 – Direct commercial haulers, no Northeast station
- Concept 2 – Restrict self-haul, no Northeast station
- Concept 3 – Build Northeast station

Tier 1/Tier 2 Screening

In order to evaluate a wide range of strategies and improvements for all stations under several concepts and scenarios, a screening process was necessary to use modeling and analysis effort wisely and efficiently. A two-tiered process was utilized to identify the most effective strategies for concepts and scenarios that did not meet the station capacity criteria.

The Tier 1 screening analyzed the reduction in transactions (inbound vehicle trips) that would result from strategy implementation. It is also considered factors of the environment such as noise and air quality, cost implications, economic and social justice, and regulatory requirements. Each strategy was analyzed individually, at each station, under each concept. The resulting peak-hour station traffic volumes were compared to the estimated station capacity to identify the potential benefits of the strategy.

For the Tier 2 screening, the full impact of information from Tier 1 was combined with detailed modeling using the VISSIM models developed for each station. Those strategies that had the most positive effect in reducing the number of inbound vehicle trips and also made sense from an operational or regulatory point of view were combined. Based on a review of the individual strategies and the assessments prepared for the Tier 1 screening, combinations were identified for detailed evaluation and modeling. See the division Strategy and Concept Combinations summary and the Traffic section of this report.

Transportation

This section of the report provides a comprehensive summary of the traffic analysis conducted for this study. This summary includes a review of the technical approach and key findings; including anticipated station constraints and the potential impacts of individual demand management or improvement strategies, as well as combinations of strategies identified for each station.

The methodology and scope of the traffic analysis focused on the following two objectives:

- **Evaluate on-site circulation** and capacity of existing and planned stations (given the forecasted tonnage) and identify anticipated constraints impacting station performance. Improvement strategies will be identified, and overall effectiveness tested and summarized.
- **Identify potential impacts to off-site intersections** related to the implementation of multiple operational concepts.

Subsequent sections of the report are organized in the following manner:

- Study Approach
- Trip Generation Methodology and Forecasts
- Station Assessments (Bow Lake, Renton, Factoria, Shoreline)

The first two sections provide a general overview of the study approach and trip generation methodology developed to forecast station-related traffic volumes for the future conditions. The station assessments conducted for each station provide a comprehensive review of the data collection conducted to support the analysis, forecast traffic volumes for the station and off-site intersections and anticipated station constraints, and potential improvement strategies.

Study Approach

This section provides an overview of the study approach (including common terminology used in the report), analysis periods, traffic analysis software and study parameters, as well as the process used to evaluate the effectiveness of the individual and combinations of strategies.

Report Terminology

Different terminology is used throughout this section of the report when describing the operations of the station:

- **Commercial-haul (CH)** – This is traffic that is associated with the commercial-haulers such as Waste Management, Republic, and Rabanco.
- **Self-Haul (SH)** – This includes all other traffic not related to the commercial-haulers. Users in this category may or may not have commercial accounts with King County. This traffic includes multiple vehicle types such as sedans, pick-up trucks, truck/trailer combinations, and commercial users such as landscape companies.
- **Scalehouse** – This is the entry and exit point for each station where vehicles are weighed and the transactions completed.

- **Tipping floor** – This is the main building where the material is removed from the vehicles. These are generally divided in to a commercial side and a self-haul side. Each station is configured differently and individual operations plans identified for each. These operations plans dictate how the commercial side of the tipping floor is managed as well as the procedures for clean-out of the self-haul area. Additional information on the operations of the individual stations are presented in the subsequent sections.
- **Recycling/yard waste/Household Hazardous Waste (HHW) areas** – In addition to the garbage, the transfer stations have areas to receive additional material such as yard waste, recycling, and/or HHW. The locations and configurations of these areas are unique to each station and are described further in the individual station assessment sections.

Analysis Period

The traffic analysis focuses primarily on the 2023 horizon year. As indicated by Solid Waste Division (division) staff, the 2023 horizon year represents the currently anticipated peak of the system tonnage for the next 15 years. Given the range of customers and the needs of the different population groups that utilize the transfer stations, from the commercial-haulers to the general public, both the weekday and Saturday peak periods were analyzed. The specific peak hours vary at each station and as such were identified through comprehensive hourly counts taken over a multiple-week period. Details for each station are presented in the individual station assessment sections.

The following analysis scenarios were identified for each analysis period at each station (weekday and Saturday):

1. Evaluate existing conditions
2. Evaluate future conditions (Concept 0, Concept 1 , Concept 2, Concept 3)
3. Evaluate improvement strategies (Concept 0, Concept 1 , Concept 2, Concept 3)

All cases were considered with and without the Renton station being open. All forecasts assume the closure of Houghton station by the 2023 analysis horizon year.

Traffic Analysis

This section describes performance measures and the analysis methodology used in the evaluation of the station operations.

Performance Measures. Several key performance measures were identified for each station. These performance measures focus on the individual operations of the station as well as the overall experience of the station users. The performance measures are used to define the station constraints and inform the identification of potential station improvements. The primary performance measures include:

- Service times[1] for commercial users – 16 minutes or less

[1] Measured scale to scale consistent with adopted service times identified in the Solid Waste Transfer and Management Plan, December 2007

- Service times[1] for self-haul customers – 30 minutes or less
- Inbound queuing and potential impacts to off-station roadways and/or driveways

In addition to these primary performance measures, the internal queuing at either the tipping floor or outbound scale was considered due to its potential impact to overall station operations.

On-Site Traffic Analysis. The transfer stations are a complex transportation network with multiple service points and circulation needs. This includes the inbound process at the scalehouse, the primary tipping floor, additional material stations, and the outbound operations at the scalehouse. This interconnected system is further complicated by the presence of commercial and self-haul traffic that utilizes different areas of the tipping floor and depending on the station, potentially separate scale.

The on-site evaluation of each station was conducted using VISSIM. VISSIM is a microscopic traffic simulation model that was used to model the transfer station as one connected network including all circulation roadways, scalehouse operations, tipping floor access and capacity, and activity for other material such as yard waste, recycling, or HHW. In addition, the VISSIM model includes the multiple vehicle types observed for each station. **Figure 1** provides an image of the Shoreline area that highlights the areas that were included in the VISSIM model.

Figure 1
Example VISSIM MODEL (Shoreline)

Before the VISSIM model was used for any analysis of existing and forecast conditions, a comprehensive calibration process was completed for each weekday and Saturday peak period model. The existing conditions in the model were calibrated to match conditions as they were observed in the field at each station. Existing operational information was collected during the weekday and Saturday peak 3-hour periods. Each vehicle entering the stations during this time was tracked through license plate identification to measure delay and service times for various activities on-site. The processing times at the entry scale, exit scale, self-haul tipping floor area, and commercial tipping floor area were recorded. In addition, the processing time for the recycling area, household waste, and yard waste areas were measured at the transfer stations where that service is provided. Default values in the VISSIM model such as vehicle travel speeds and dwell times at the various areas at the stations were modified from

the default values in the model to match the observed data. The scope of the extensive data collection at each station is reviewed in more detail in the station assessment section. A summary of the scope is included in **Attachment A (Project Scope)**.

Off-Site Traffic Analysis. The off-site analysis was conducted using Synchro[2] software. This program is used to evaluate the capacity of intersections based on the geometry, number of lanes, signal timing (if signalized), relative to current Highway Capacity Manual standards[3]. Synchro is used by all agencies in which the stations are located. Synchro provides a level of service (LOS) grade that can be used to assess overall intersection capacity and opperational performance. The operational characteristics of an intersection are determined by calculating the intersection's LOS. The intersection as a whole and its individual turning movements can be described alphabetically with a range of LOS (A through F), with LOS A indicating free-flow traffic, and LOS F indicating extreme congestion and long vehicle delays. LOS is measured in average control delay per vehicle and is typically reported for the intersection as a whole at signalized intersections and for the approach or turning movement that experiences the most delay at two-way stop-controlled intersections. Control delay is defined as the combination of initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. **Attachment B (LOS Definitions)** provides a more detailed explanation of intersection LOS criteria.

The specific study areas identified for the off-site analyses are dicussed in more detail in the indivudal station assessment sections.The off-site study intersections were evaluated for each station during each station's respective weekday and Saturday station peak-hour period.

Tier 1/Tier 2 Screening Methodology

In order to evaluate a wide range of strategies and improvements for all stations under several concepts and scenarios, a screening process was necessary to use modeling and analysis effort wisely and efficiently. A two-tiered process was utilized to identify the most impactful strategies for which further VISSIM modeling was conducted. This modeling focused on stations and scenarios that did not meet the capacity criteria[4] defined for each station.

The Tier 1 screening analyzed the reduction in transactions (inbound trips) that would result from implementation of the potential demand management strategies which included the following:

---

[2] Synchro, Trafficware, version 8.0

[3] LOS, delays, and volume-to-capacity (v/c) ratios were calculated using the *Highway Capacity Manual* (*HCM*) *2010* methodology. 2000 HCM methodology used where signal phasing was not compatible with 2010 methodology.

[4] Criteria defined based on on-site service times and vehicle queuing thresholds (see Traffic Analysis – Performance Measures section)

- Extend Operating Hours
- Provide wait time information
- Lower cost curbside bulky waste collection
- Mandatory curbside garbage collection
- Lower regional direct fee to encourage haulers to use their own transfer stations
- Ban materials:
    - Ban yard/wood waste from both disposal and recycling
    - Ban HHW only transactions
- Incentive/peak pricing
- Adjust minimum fee
    - Factoria Only – double the minimum fee
    - System-wide minimum fee increase
- Drop Box
    - Provide a drop box in the northeast
    - Provide a drop box in the southeast
- Ban non-system Self-Haul (effective 2029)

Although summarized in other sections of the report, the Tier 1 screening process also considered factors of the environment such as noise and air quality, cost implications, economic and social justice, and regulatory requirements. Each strategy was analyzed individually, at each station. The resulting peak-hour station volumes were compared to the estimated station capacity[5] figure to identify the potential benefits of the specific strategy.

For the Tier 2 screening, the information from the Tier 1 evaluation was combined with detailed modeling using the VISSIM models developed for each station. The individual strategies that had the most effect on the inbound trips and also aligned with operational or regulatory requirements at each station were combined.

Station Traffic – Trip Generation Methodology

A multi-step process was utilized to estimate the peak-hour demand trip generation for each station. The forecasting process relied on annual tonnage forecasts provided by division staff for each of the stations. The process used to develop the peak-hour trip generation forecasts are shown in **Figure 2** and generally considers the following:

- Annual tonnage by type (i.e., garbage, recycle, yard waste, HHW)
- Average load (in tons) per vehicle for all material
- Weekday/Saturday allocation
- Consideration of peak month and seasonal variations, the division targets the 90th percentile demand for purposes of evaluating station capacity
- Weekday and Saturday hourly distribution of traffic for commercial-haul, self-haul, transfer trailers, and recyclables haul vehicles

[5] Estimated peak-hour station capacity was developed for the Concept 0 assumptions considering the adopted service times and queueing criteria defined previously.

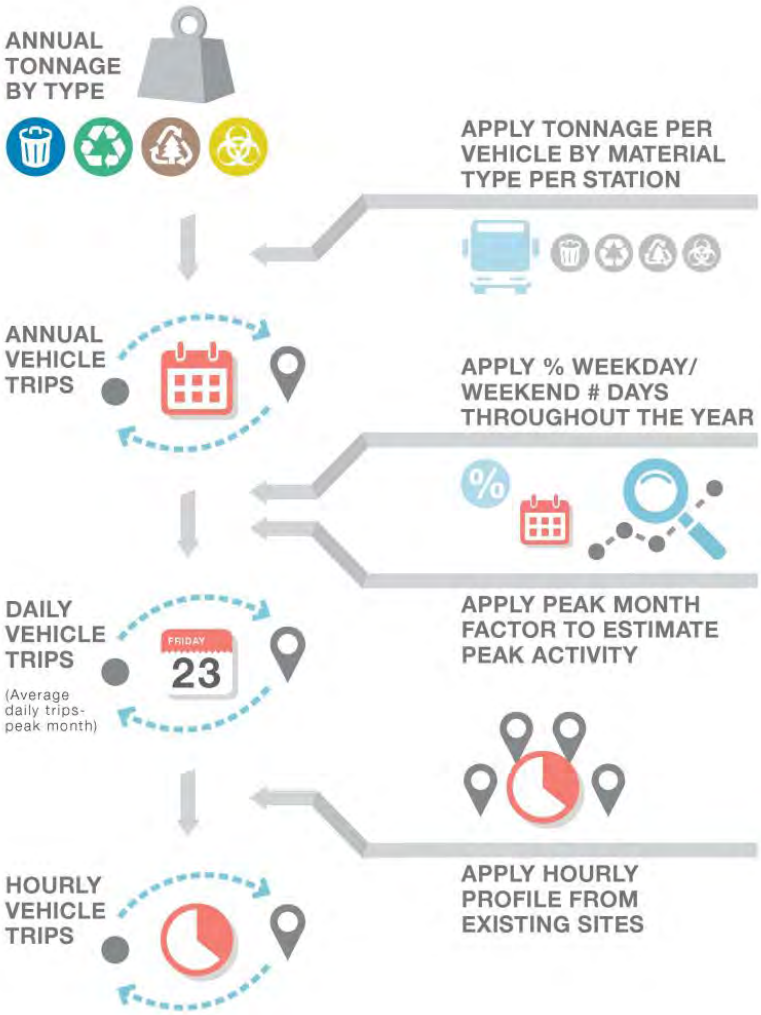


Figure 2
Trip Generation Process

Figure 2 summarizes the (Saturday) Average Daily Traffic (ADT) for each station, with and without the Renton station over multiple horizon years. As shown in the figure the peak demands for the system are anticipated to occur in 2023. Future decreases in overall trip generation for each station is expected to occur at a fairly nominal annual percentage.

As noted in the list above, the "average" daily vehicle demands at each station were adjusted to represent the 90th percentile volumes. The 90th percentile factor was calculated from data provided from King County. In order to get a large sample set to more accurately determine the 90th percentile, the hourly transactions were provided for each station by King County for the period that included January to December 2013. This information included customer type (i.e., if the customer was a self-haul or commercial vehicle). The hourly transactions were summarized by daily totals as well as weekday and Saturday transaction totals. From this data set, the 90th percentile and 50th percentile (i.e., median) transactions per day were calculated for commercial and self-haul separately, as well as combined, as the total daily transactions. The 90th percentile daily transactions were then divided by the 50th

percentile daily transactions to determine the 90th percentile percent increase relative the 50th percentile daily transaction for each station.

Peak demands factors are typically used in the industry as it provides a reasonable worst-case of peak conditions. The use of the 90th percentile factor accounts for the seasonal nature of the facilities and helps ensure that traffic volumes do not exceed the station capacity and impact adjacent city streets on a regular basis. Furthermore, the division designs the facilities for the 90th percentile demand, so it is appropriate that the traffic analysis applies a similar standard.

Trip generation estimates prepared for each station and each concept considered the local factors such as tonnage per vehicle and hourly distribution patterns to estimate peak-hour activity. Detailed forecasts and description of the calculation factors are provided for each station in the station assessment section.

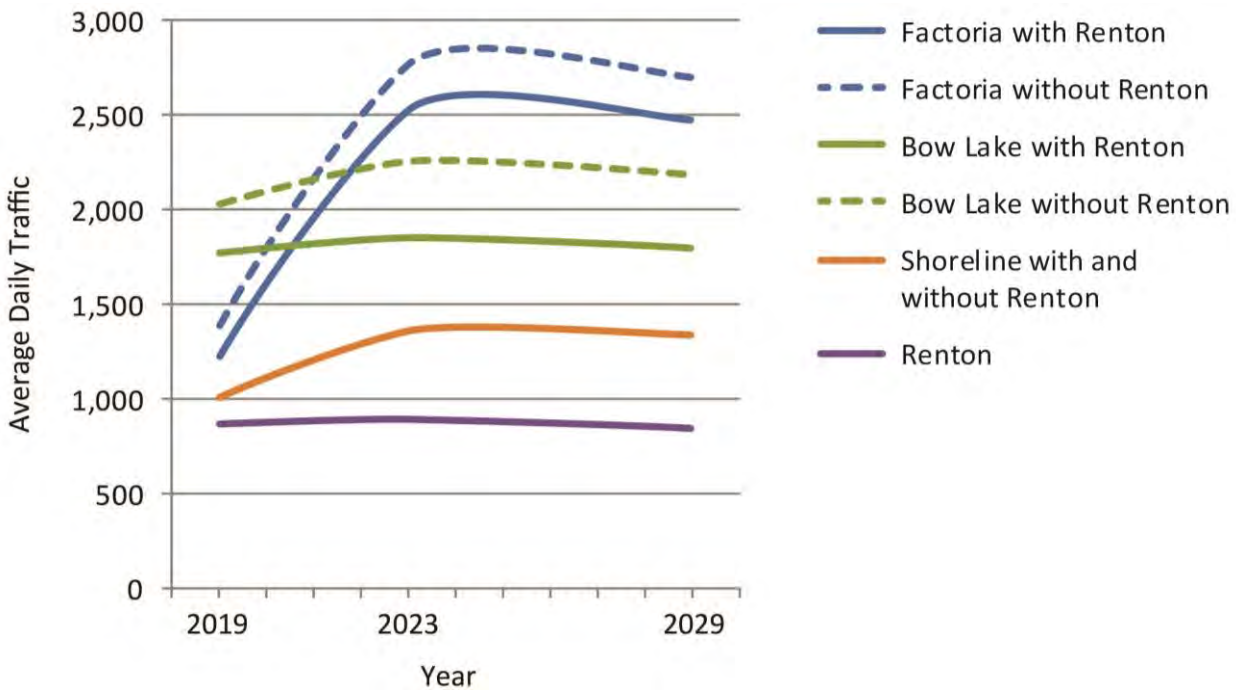


Figure 3
Concept 0 - Saturday ADT for each Station

Station Assessments

Bow Lake

Station Description – Access and Circulation

Primary vehicle access to the Bow Lake station is provided along the north leg of the S 188th St / Orillia Rd S intersection. Both the general public and division trucks utilize the S 188th St / Orillia Rd S intersection to access the station. The transfer station site vicinity is shown in **Figure 4**.

The tipping floor is divided into two main sections, commercial and self-haul areas. The self-haul area is located in the western portion of the building and is accessed via the southwest corner and the exit of the building is located via the northwest corner. Commercial vehicles access the building from the southeast corner and exit the building through the northeast corner of the building.

In the self-haul area there is a total of 15 stalls used for garbage. There are four stalls on the commercial side of the floor. This station also includes a separate recycling area which is located south of the tipping floor building. **Figure 5** shows the building configuration and vehicle circulation and access.

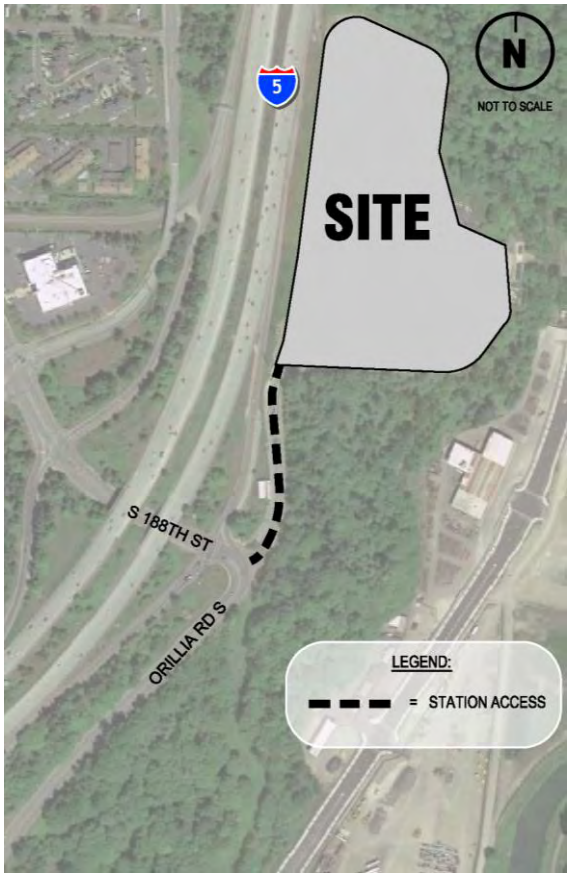


Figure 4
Bow Lake Site Vicinity

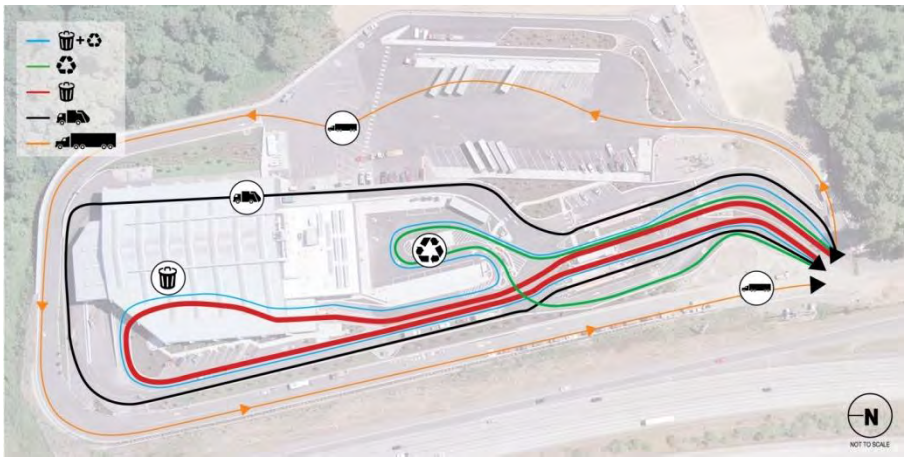


Figure 5
Bow Lake On-Site Future Building Configuration and Circulation Patterns

Station Data

Data Collection. Extensive data collection was conducted to support the development of the VISSIM model and establish the existing conditions on the station. While this information was largely used to calibrate the VISSIM model, it also assists in providing the existing context against which the future conditions can be compared. A general outline of the data collected as well as a map of the specific locations for video collection, traffic counts, and service time studies is included in **Attachment C (On-Site Data Collection Summary).**

Customer Origin/Destination Surveys

In addition to the traffic volume, queuing, and service time data, customer origin/destination data was collected to identify the general distribution of customer traffic utilizing this station during the days the surveys were conducted. The survey was conducted during the 3-hour period. The following questions were asked of customers as they exited the facility:

- Where are you coming from (zip code and closest intersection)?
- Are you coming from a home or business?

Not all customers participated in the survey so the information shown in **Table 1** represents all answered surveys of the customers that utilized the station during the observation period. The response rate on the weekday was approximately 65 percent, whereas the response rate on Saturday was approximately 80 percent. It is important to note that the lower response rate on the weekday is primarily due to commercial vehicles not being asked to participate in the survey.

Reponses from customers were mapped to the nearest major intersection using a graphical information system (GIS). This information is shown in **Attachment D (Customer Origin/Destination Data)**. The responses from the surveys indicated the following distribution of customers utilizing the Bow Lake station. Information is presented for the weekday and Saturday time periods show a similar general distribution of customers.

Table 1
Bow Lake Customer Trip Origin Summary

	Survey Respondents - Weekday		Survey Respondents - Saturday	
Trip Origin	**Number**	**Percentage**	**Survey Origin**	**Percentage**
Kent	25	27%	34	23%
Tukwila	6	6%	6	4%
Seattle	8	9%	14	10%
King County (excluding Seattle/Tukwila/Kent)	51	55%	91	61%
Snohomish County	3	3%	2	1%
Pierce County	0	0%	2	1%
Total	93	100%	149	100%

Existing Traffic Volumes. Based on the data collected for the station, the weekday peak period (3 hours) was defined to be 11:30 a.m. to 2:30 p.m. and the Saturday period was 10:45 a.m. to 1:45 p.m. **Figure 6** shows the weekday and Saturday daily station traffic volumes.

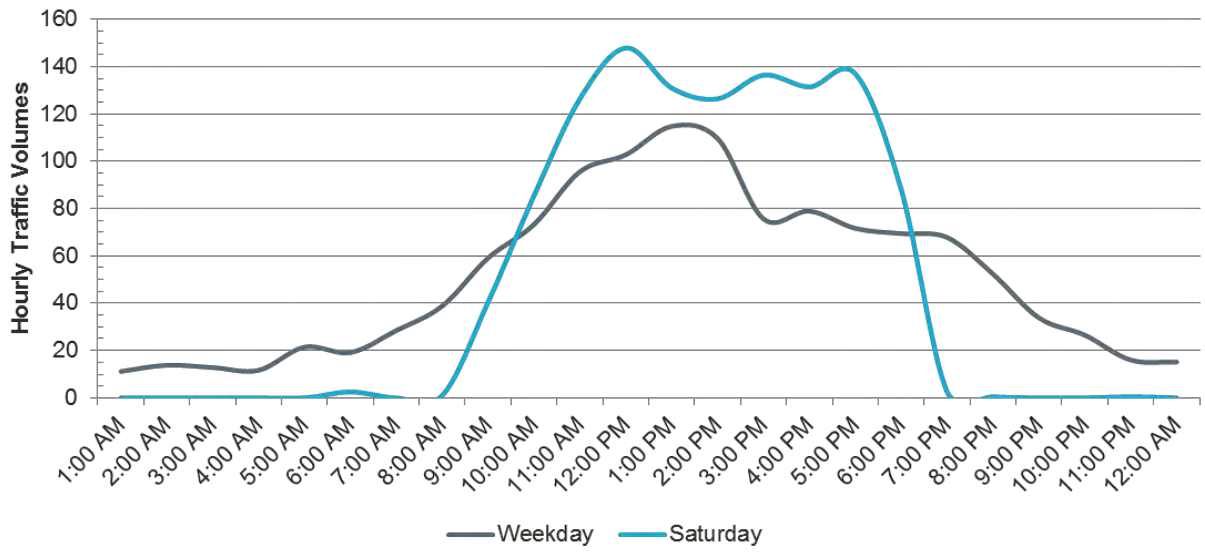


Figure 6
Bow Lake Existing Typical Weekday and Saturday Traffic Volume Patterns

Future (2023) Traffic Volumes. As noted previously, 2023 represents the peak demand within the system and thus correlates to the highest traffic volumes at the transfer stations included in this study. Future traffic volumes at the stations were forecast based on the methodologies described previously. Three (3)-hour peak volumes were developed based on annual tonnage forecasts developed for the station, distribution of weekday and Saturday activity, tonnage per vehicle, seasonal factors, and hourly trip generation patterns for the station. The detailed calculations showing all the key assumptions are included in **Attachment E (Trip Generation Forecasts)**.

Traffic volume forecasts were developed for Concept 0, Concept 1, Concept 2, Concept 3, both with and without the Renton station operational. All concepts assumed that the Houghton station was closed. **Figure 7** summarizes the peak-hour demand volumes for each of the concepts (self-haul and commercial-haul) traffic for weekday and Saturday conditions, with- and without-Renton. Although only the peak-hour demand is shown in this figure, the peak-hour volumes are generally anticipated to occur for multiple hours as shown in the **Figure 6** hourly profile.

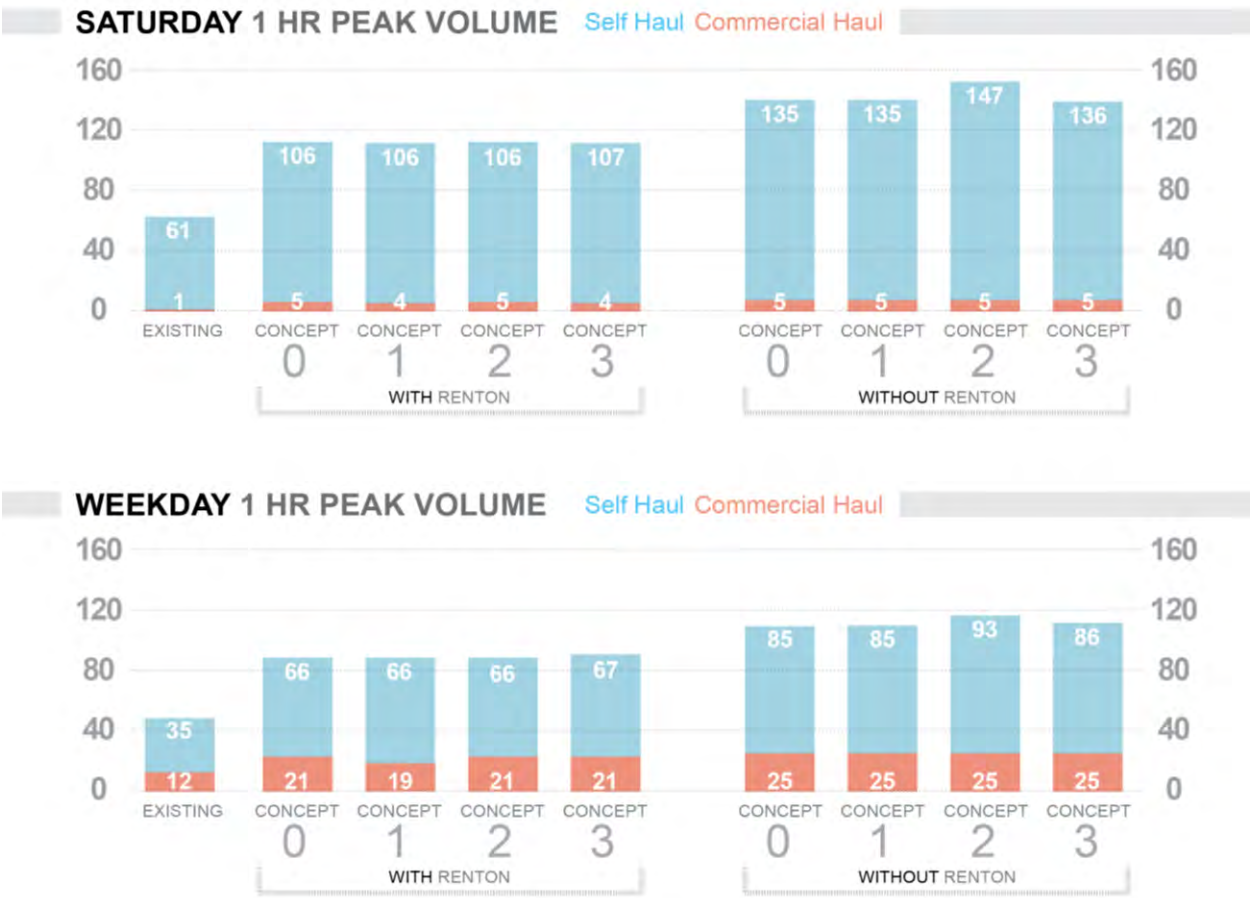


Figure 7
Bow Lake Existing and Concept Peak-Hour Volumes

As shown in **Figure 7**, the forecast peak-hour traffic volumes for all concepts are similar under all scenarios, weekday and Saturday as well as with- and without-Renton. The largest variance in volumes occurs under the Saturday without-Renton conditions where Concept 2 shows 12 additional vehicles in the peak-hour, as compared to Concepts 0, 1, and 3.

On-Site Analysis Results

The on-site service times and inbound vehicle queues were calculated using the methodology described previously. The results of the service time analysis for all concepts, with and without the Renton station are shown in **Table 2**. The existing conditions and adopted service times are included for comparison purposes.

Table 2
Bow Lake Existing and Concept Service Times Summary

	With-Renton Station					Without-Renton Station			
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday Peak-Hour		Saturday Peak-Hour	
Scenario	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)		CH (h:mm)	SH (h:mm)	CH (h:mm)	SH (h:mm)
Standard[3]	*00:16*	*00:30*	*00:16*	*00:30*		*00:16*	*00:30*	*00:16*	*00:30*
Existing[4]	00:13	00:26	00:13	00:27					
Concept 0 (2023)	00:20	00:28	00:17	00:26		00:22	00:29	00:18	00:27
Concept 1 (2023)	00:19	00:27	00:17	00:26		00:21	00:29	00:18	00:27
Concept 2 (2023)	00:20	00:28	00:17	00:26		00:20	00:28	00:19	00:26
Concept 3 (2023)	00:18	00:28	00:17	00:27		00:22	00:29	00:18	00:27

1. CH = Commercial-Haul
2. SH = Self-Haul
3. Adopted standards as defined in King County Transfer Plan (December 2007)
4. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 2**, all concepts exceed the adopted service times for the commercial-haul vehicles for all scenarios evaluated. Service time standards for self-haul vehicles are met. However, queueing at the inbound scalehouse is impacting these service time results by effectively metering traffic. The service times for all concepts are generally similar. Service times on the weekday and Saturday and both with- and without-Renton range between 17 to 22 minutes for commercial-haul, and between 26 to 29 minutes for self-haul vehicles. The commercial-haul service times exceed the adopted standard of 16 minutes under all scenarios whereas the self-haul service times are below the adopted standard of 30 minutes under all scenarios. Relative to existing conditions, the weekday with-Renton commercial-haul service times increase by 5 to 7 seconds, and the self-haul service times increase by 1 to 2 seconds. The Saturday with-Renton conditions commercial-haul service times increase by approximately 4 seconds relative to existing, and the self-haul service times remain the same or improve by approximately 1-minute relative to the existing service times.

The results of the queuing analysis for all concepts, with and without the Renton station are shown in **Table 3**. The existing conditions and queue thresholds are included for comparison purposes.

Table 3
Bow Lake Existing and Concept Inbound Queuing Summary

Scenario	With-Renton Station			Without-Renton Station	
	Weekday (Vehicles)[1]	Saturday (Vehicles)		Weekday (Vehicles)	Saturday (Vehicles)
Threshold[2]	***32***	***32***		***32***	***32***
Existing[3]	2	3			
Concept 0 (2023)	17	99		98	205
Concept 1 (2023)	18	98		95	202
Concept 2 (2023)	17	99		128	235
Concept 3 (2023)	20	102		98	205

1. Vehicle length assumed to be 32 feet.
2. Threshold of 32 vehicle queue is approximate distance to adjacent intersection from station access (Orillia Rd S / S 188th St)
3. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 3**, under the with-Renton scenario, inbound queues forecasted for the weekday peak-hour do not exceed the defined threshold (32 vehicles). However, during the Saturday peak-hour for this same scenario (with-Renton), all queues are forecast to exceed the threshold. For the without-Renton scenarios, the queues generally exceed the adopted service time by approximately 300 percent in the case of Concepts 0 to 3 during weekday conditions and exceed the threshold by approximately 600 percent for Concepts 0 to 3 during Saturday conditions. Relative to existing conditions, future conditions under all Concepts result in longer queues, forecasting increases of 15 to 233 vehicles with the Concepts compared to existing conditions.

Summary of Constraints

The main constraints at the Bow Lake station were found to be the capacity of the inbound scales and the outbound scales as it relates to the ability to process the forecast peak-hour demands for the station.

Inbound Scale Capacity – Capacity constraints exist at the inbound scale resulting in vehicle queues that extend back to and onto Orillia Road. The service time results are affected by the capacity of the inbound scale. As evidenced by the fact that despite the variance in weekday and Saturday vehicle demands, the on-station service times are approximately the same. This indicates that the inbound scale is operating at its maximum capacity and lacks the capacity to accommodate the forecasted demand.

Outbound Scale Capacity – Due to the capacity restriction on the inbound scale, the analysis of the unmitigated concepts does not identify capacity constraints on the outbound scale. At the current rate vehicles are processed at the inbound scale, the outbound scale is not identified as a constraint. However, if the inbound scale capacity is increased the capacity of the existing outbound scale were

identified as a constraint, as evidence by on-site queuing that would extend from the scalehouse into the self-haul tipping floor area, as well as self-haul and commercial-haul service times.

Analysis of Improvement Strategies

The Tier 1 screening primarily focused on the overall reduction in station traffic anticipated under the particular strategy. The strategies analyzed are listed in **Tier 1/Tier 2 Screening Methodology**. The anticipated peak-hour demand reduction in station traffic under both the with- and without-Renton scenarios during the weekday and Saturday peak hours for each of the individual strategies is summarized in **Attachment F (Demand Management Strategy Trip Reductions)**. The percent reductions applied to the unadjusted peak-hour demands are based on data provided by the division. Reductions range from 0 to 34 percent of the peak-hour demand.

It is important to note that not all improvement strategies are as effective if combined. Thus, the identification of the improvement combinations accounts for the relationship to one another. In addition to the transportation demand strategies noted above, potential physical station improvements were identified to address the operational constraints. These improvements considered the addition of a third inbound and a third outbound scale.

Strategy combinations were identified based on the results of the Tier 1 screening process. The Tier 2 screening process included the testing of the strategy combinations using VISSIM. The effectiveness of the strategies were tested for the without-Renton scenario as that time period representing the period with the highest peak-hour demand for the stations. The following combinations were identified for detailed evaluation:

Combination A – Additional inbound scale

Combination B –

B1. Additional inbound scale and additional outbound scale

B2. Additional inbound scale, additional outbound scale, and outbound queue pocket (on-station)

Due to similar peak-hour demands for the concepts, the Tier 2 evaluation utilizing VISSIM applied the following strategy combinations to Concept 0 (weekday and Saturday) only. The results of the strategy combinations tested for the specific concepts are shown and discussed below.

<u>Concept 0</u>

Strategy combinations A and B were tested on Concept 0. The queue and service times of the combinations are shown in **Table 4**.

Table 4
Bow Lake Combinations Service Times and Queues (Concept 0 – 2023 Without-Renton)

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	***00:16***	***00:30***	***00:16***	***00:30***		***32***	***32***
Existing[6]	00:13	00:26	00:13	00:27		2	3
Concept 0	00:22	00:29	00:18	00:27		98	205
Concept 0 + Combination A	00:45	00:57	00:52	1:10		4	52
Concept 0 + Combination B1	00:31	00:45	00:26	00:36		3	7
Concept 0 + Combination B2	00:17	00:35	00:13	00:28		3	6

1. CH = Commercial-haul
2. SH = Self-haul
3. Vehicle length assumed to be 32 feet.
4. Adopted standards as defined in King County Transfer Plan (December 2007)
5. Threshold - Threshold of 32 vehicle queue is approximate distance to adjacent intersection from station access (Orillia Rd S / S 188th St)
6. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 4**, Concept 0 with the addition of Combination B2 meets the adopted service times for the Saturday peak demand, but exceeds the adopted service times for the weekday period. The commercial-haul service times exceed the standard by 1-minute and the self-haul times exceed the standard by 5 minutes. Relative to the existing service times, Combination B2 results in the most similar performance levels.

Although the self-haul service times with Combination B2 appear to be worse on station on the weekday compared with Concept 0 by itself, the queues have been reduced by 95 vehicles. As noted previously, the unmitigated service times for Concept 0 are skewed due to the forecasted queueing and the metering effect of the inbound scalehouse. The inbound vehicle queues for the weekday and Saturday conditions are well under the threshold, with a maximum queue length of six vehicles.

Concept 1 – 3

Peak-hour demands for all scenarios are similar between Concept 0 and Concepts 1, 2, and 3. As such, no VISSIM modeling was conducted for Concepts 1, 2, and 3.

Off-Site Traffic Analysis Results

The analysis includes an evaluation of intersection operations at four intersections. The study intersections (see **Figure 8**) and the jurisdictions include:

1. I-5 Southbound Ramps / S 188th St (WSDOT)
2. I-5 Northbound Ramps / S 188th St (WSDOT)
3. Orillia Rd S / S 188th St (Tukwila)
4. Orillia Rd S / S 200th St (Tukwila)

These study intersections were evaluated during the weekday and Saturday peak hours at Bow Lake identified during the station observations in September 2014. The peak hours identified were 12:00 to 1:00 p.m. for both weekday and Saturday conditions.

Intersection LOS was calculated at the study intersections based on Highway Capacity Methodology as described previously. As noted, the study intersections are within two jurisdictions, the cities of SeaTac and Tukwila. Based on the City of Tukwila's Comprehensive Plan, Orillia Rd S is a principal arterial and the LOS standard for principal intersections is not to exceed LOS E. LOS D thresholds are applied to the WSDOT facilities, including the I-5 ramps.

Figure 8
Bow Lake Study Intersections

Existing Conditions

Existing intersection turning movements were collected at the off-station intersections in October 2014 for both weekday and Saturday periods. Detailed intersection turning movement traffic volumes are provided in **Attachment G (Off-Station Intersection Traffic Counts)**. The weekday and Saturday existing intersection traffic volumes are shown in **Figure 9**.

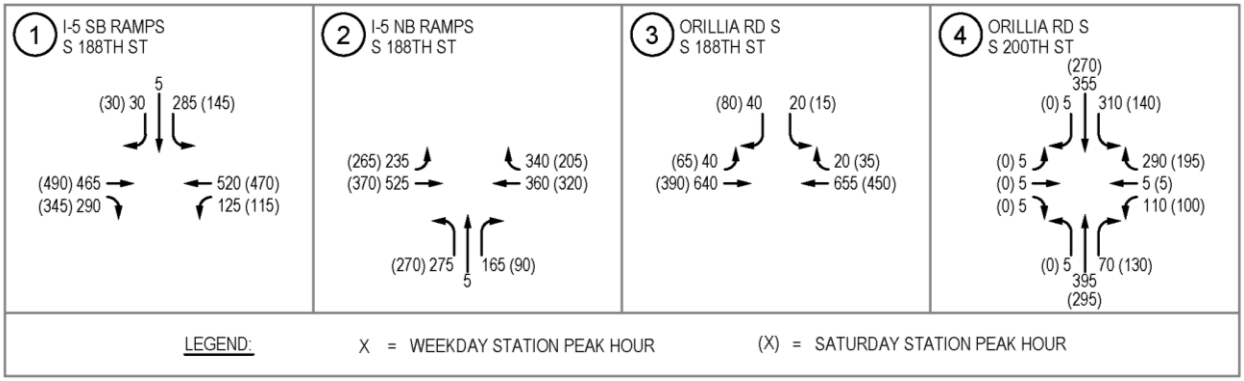


Figure 9
Bow Lake Existing Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 5 summarizes the existing weekday and Saturday station peak-hour LOS. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

Table 5
Bow Lake Existing Weekday and Saturday Station Peak Hours LOS Summary

Intersection	Jurisdiction	Traffic Control	Weekday Station Peak-Hour (12 – 1 p.m.)				Saturday Station Peak-Hour (12 – 1 p.m.)		
			LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
1. I-5 Southbound Ramps / S 188th St	SeaTac	Signalized	B	13			A	8	
2. I-5 Northbound Ramps / S 188th St	SeaTac	Signalized	B	17			B	11	
3. Orillia Rd S / S 188th St	Tukwila	Two-Way Stop Controlled	D	35	SBL		C	20	SBL
4. Orillia Rd S / S 200th St	Tukwila	Signalized	B	16			A	9	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology.
2. Average delay in seconds per vehicle.
3. WM= Worst movement reported for unsignalized intersections where SBL = southbound left.

As shown in **Table 5**, under existing conditions all study intersections operate at LOS D or better during both weekday and Saturday study periods, meeting both WSDOT and Tukwila's LOS standards.

Future 2023 Without-Project Conditions

As the study intersections are located within two jurisdictions, both the City of SeaTac and the City of Tukwila's planned improvements were reviewed. Based on a review of the City of SeaTac's *(2015-2024) Transportation Improvement Program*, no planned improvements were identified that would impact the

operations of the study intersections. Similarly, based on a review of the City of Tukwila's *(2015-2020) Capital Improvement Program*, no planned improvements were identified that would impact the operations of the study intersections.

The 2023 without-project traffic volumes were forecast by applying an annual growth rate to the existing 2014 traffic counts and adding traffic from approved, but not yet constructed (pipeline) development in the study area. Based on discussions with Tukwila staff, the pipeline project includes traffic volumes associated with the Tukwila South development and an annual growth rate of 1.5 percent. Without-project conditions represent a condition that assumes that the station continues to operate as-is. No changes in station volumes outside of normal background growth were assumed. This scenario is not consistent with Concept 0.

The 2023 without-project weekday and Saturday station peak-hour traffic volumes are shown in **Figure 10**. Comparing the existing traffic volumes to the without-project conditions, weekday peak-hour traffic volumes would increase by approximately 95 to 180 percent, and Saturday peak-hour traffic volumes would increase by 50 to 120 percent.

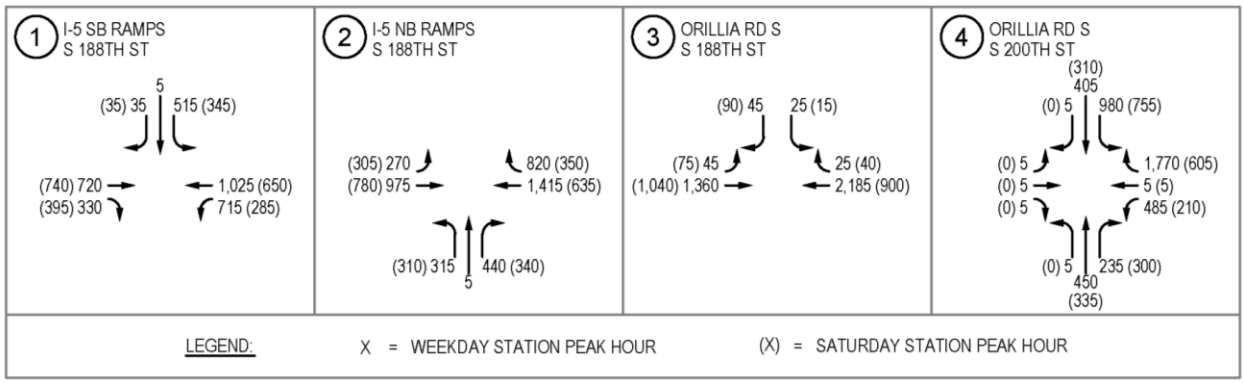


Figure 10
Bow Lake 2023 Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes

Signal timing was optimized for the 2023 analysis; optimizing the traffic signal timing takes into consideration the actuated nature of the signals and changes that would occur with growth in traffic volumes. **Table 6** summarizes the LOS results for the without-project weekday and Saturday peak hours.

Table 6
Bow Lake 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary

Intersection	Traffic Control	Existing				2023 Without-Project		
		LOS[1]	Delay[2]	WM[3]		LOS	Delay	WM
Weekday Station Peak-Hour (12 – 1 p.m.)								
1. I-5 Southbound Ramps / S 188th St	Signalized	B	13			D	45	
2. I-5 Northbound Ramps / S 188th St	Signalized	B	17			E	66	
3. Orillia Rd S / S 188th St	Two-Way Stop Controlled	D	35	SBL		F	>180	SBL
4. Orillia Rd S / S 200th St	Signalized	B	16			F	93	
Saturday Station Peak-Hour (12 – 1 p.m.)								
1. I-5 Southbound Ramps / S 188th St	Signalized	A	8			B	12	
2. I-5 Northbound Ramps / S 188th St	Signalized	B	11			B	16	
3. Orillia Rd S / S 188th St	Two-Way Stop Controlled	C	20	SBL		F	79	SBL
4. Orillia Rd S / S 200th St	Signalized	A	9			B	17	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology.
2. Average delay in seconds per vehicle.
3. WM= Worst movement reported for unsignalized intersections where SBL = southbound left.

Table 6 shows that with the addition of background growth and pipeline projects, many study intersections LOS would degrade under without-project conditions compared to existing conditions. During the weekday peak-hour, the I-5 ramp / S 188th Street intersections would degrade from LOS B to LOS D and E for the southbound and northbound ramps, respectively, the northbound ramp falling below WSDOT's LOS D standard. Similarly, the Orillia Rd intersections both degrade to LOS F under without-project conditions compared to LOS C and LOS D under existing conditions, exceeding the LOS E standard for the City of Tukwila. During the Saturday peak-hour, the study intersections would operate at LOS C or better, with the exception of the Orillia Road S / S 188th Street intersection, which degrades to LOS F for the southbound left movement under without-project conditions compared to LOS under existing conditions. This is the station access intersection, which is an unsignalized three-leg intersection, where S 188th Street changes to Orillia Road S as it transitions from east/west to north/south.

2023 Concept 0 Conditions

As discussed above, the station peak-hour traffic volumes are similar for each concept (see **Figure 7**) and as such the Concept 0 forecasts were utilized for the off-station intersection analysis. As this is an existing station, the net new trips were calculated and assigned to the off-station study intersections. To calculate the net new trips the station transactions (the inbound trips) were provided by King County for the same day the off-station traffic volumes were collected in order to ensure the data was consistent. The net-new trips under 2023 Concept 0 conditions were then calculated by subtracting the existing transactions, which were doubled to account for in and outbound trips from the station, from the 2023 Concept 0 forecast number of trips. This is shown in the Trip Generation **Tables 7** and **8** for with- and without-Renton conditions, respectively.

Table 7
Bow Lake Concept 0 With-Renton Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*39*	*39*	78		78	78	156
Concept 0							
Commercial-haul	21	21	42		5	5	10
Self Haul	66	66	132		106	106	212
Total	87	87	174		111	111	222
Net New Project Trips (2023 Concept 0 – Existing)	48	48	96		33	33	66

1. Existing total based on station transactions during the peak hours on the day the off-station intersection traffic volumes were collected, October 4 and 7, 2014

As shown in **Table 7**, during the weekday peak-hour 96 net new trips are estimated, and during the Saturday peak-hour 66 net new trips are estimated relative to the existing traffic counts.

Table 8
Bow Lake Concept 0 Without-Renton Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*39*	*39*	78		78	78	156
Concept 0							
Commercial-haul	25	25	50		5	5	10
Self-haul	85	85	170		135	135	270
Total	110	110	220		140	140	280
Net New Project Trips (2023 Concept 0 – Existing)	71	71	142		62	62	124

1. Existing total based on station transactions during the peak hours on the day the off-station intersection traffic volumes were collected October 4 and 7, 2014.

The weekday and Saturday peak-hour trips are 1.5 to 2 times greater under without-Renton conditions compared to with-Renton conditions. As shown in **Table 8**, during the weekday peak-hour 142 net new trips are estimated, and during the Saturday peak-hour 124 net new trips are estimated relative to the existing traffic counts.

The trip distribution pattern for the self-haul vehicles was developed based on the data received from the weekday and Saturday customer origin/destination surveys. As noted above, the survey respondents were asked the closest intersection and zip code they were coming from. Each respondents answer was plotted so the trip distribution could be estimated. Under with-Renton conditions the Bow Lake respondents were used to calculate the trip distribution. Under Bow Lake without-Renton conditions, approximately 2/3 of the Renton users are anticipated to use Bow Lake and as such, the Bow Lake without-Renton trip distribution was adjusted by adding 2/3 of the Renton respondents. The trip distributions for Bow Lake on the weekday and Saturday under both with- and without-Renton conditions are shown in **Figures 11** and **12**.

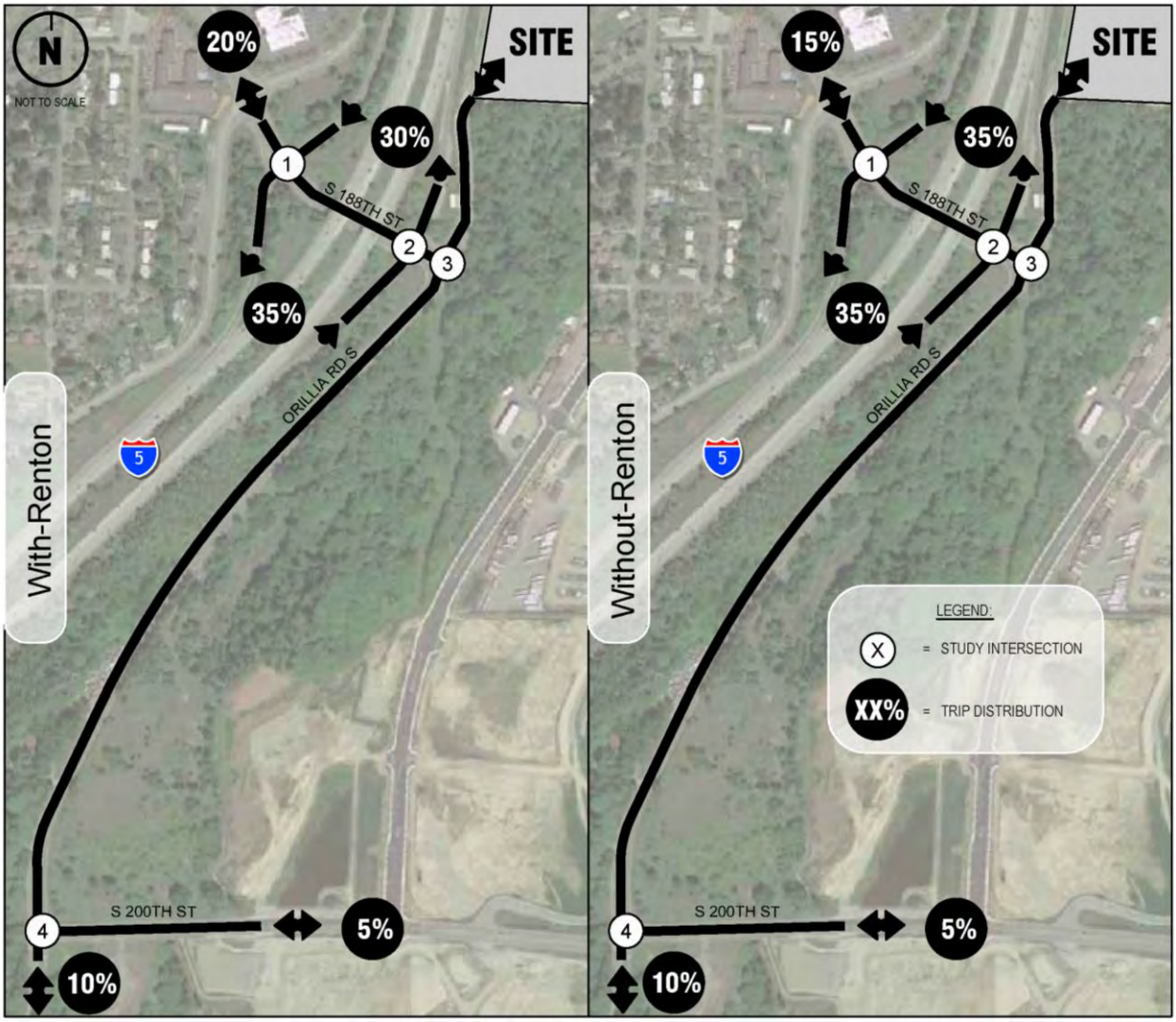


Figure 11
Bow Lake Weekday Trip Distribution (With and Without-Renton)

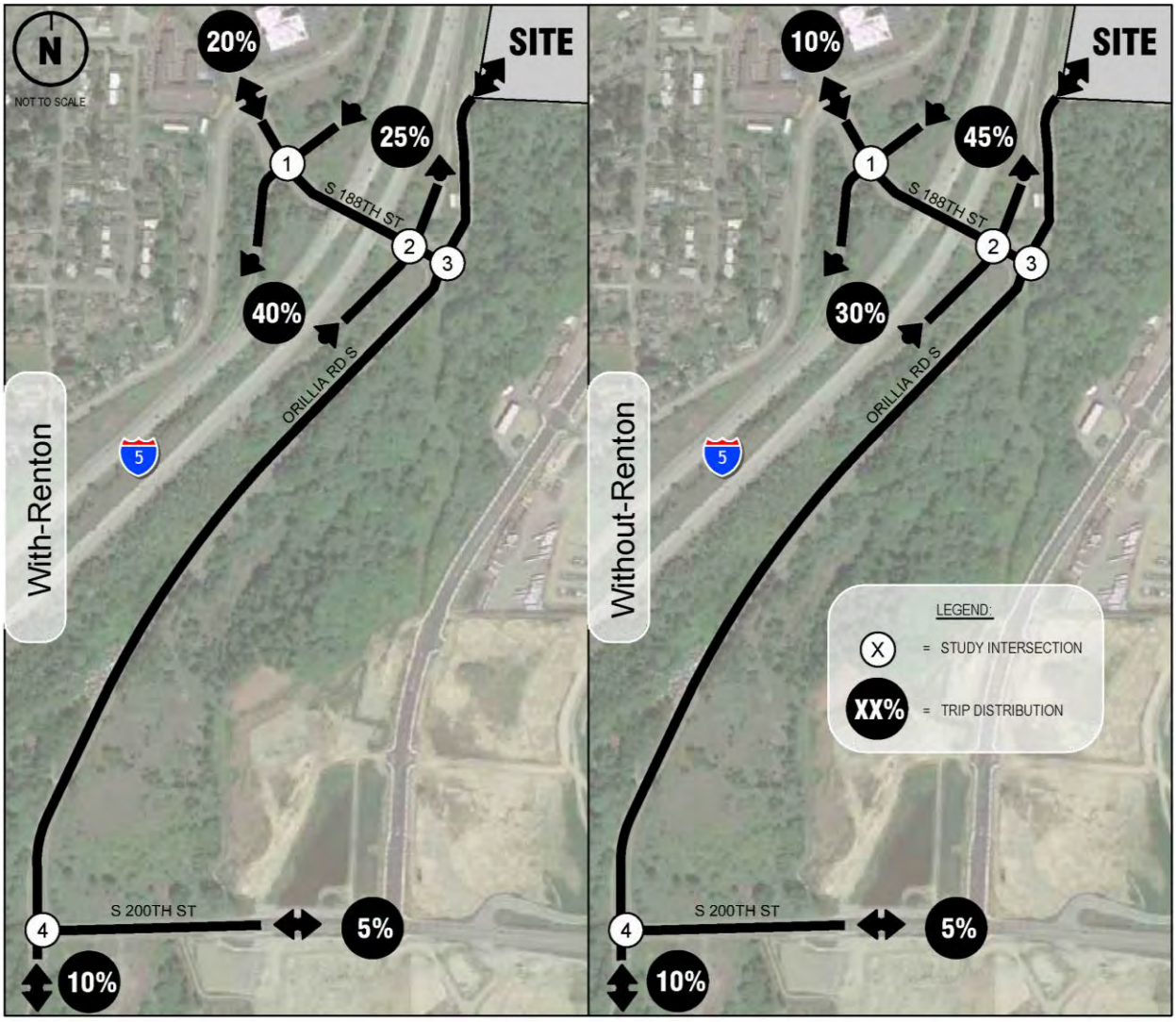


Figure 12
Bow Lake Saturday Trip Distribution (With and Without-Renton)

The net-new trips associated with each scenario was assigned to the study intersections based on the trip distributions. The net new project trip assignment for weekday and Saturday under both with- and without-Renton conditions are shown in **Figure 13**.

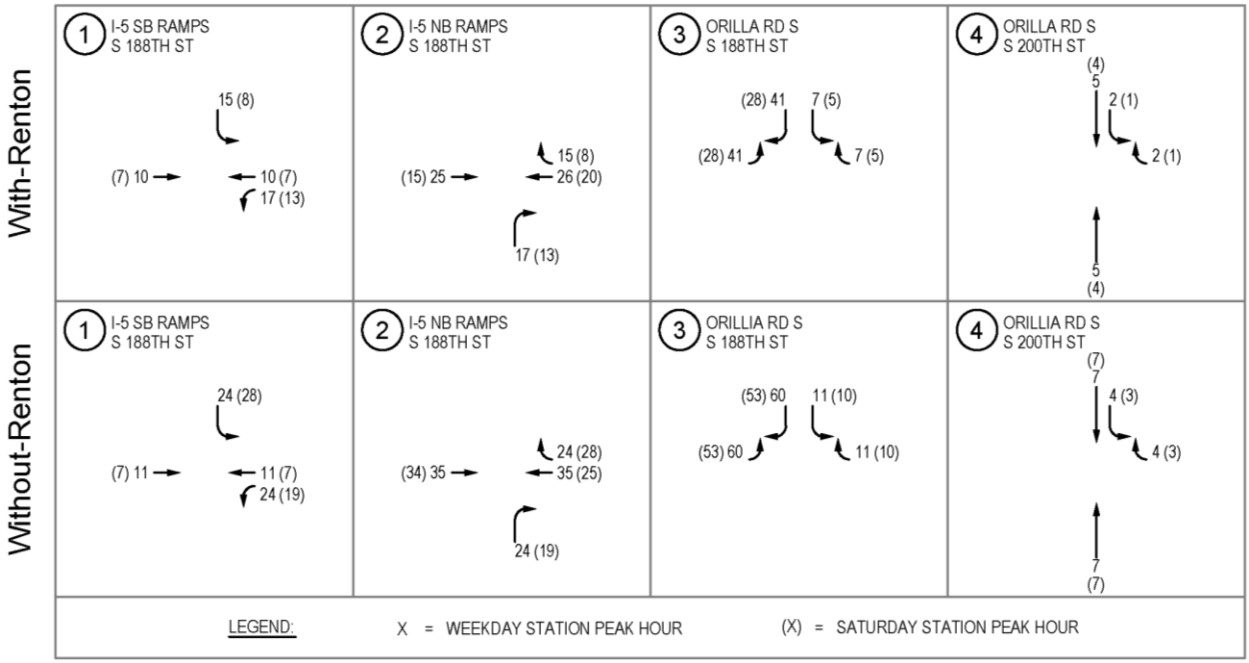


Figure 13
Bow Lake Concept 0 With and Without-Renton Net-New Trip Assignment

The with-project 2023 Concept 0 weekday and Saturday peak-hour traffic volumes both with- and without-Renton are shown in **Figure 14**.

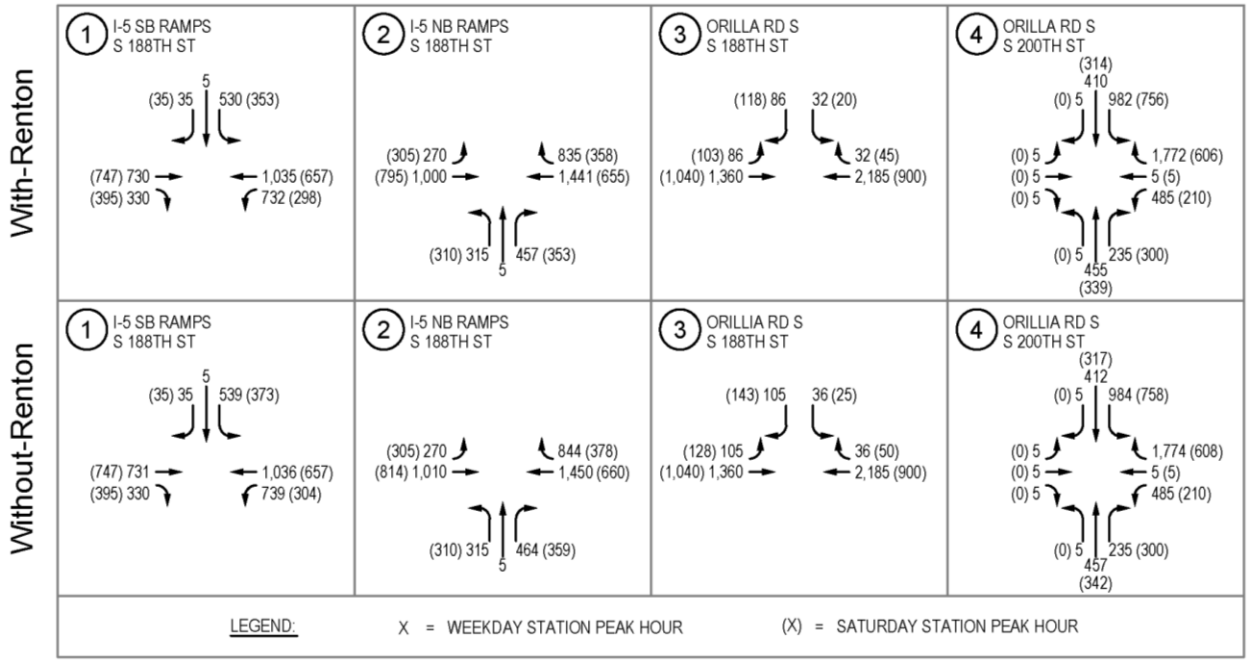


Figure 14
Bow Lake Concept 0 Weekday and Saturday Station Peak-Hour Traffic Volumes

The largest percent impact of the Concept 0 traffic volumes relative to the without-project conditions was at the station access intersection, the S 188th Street / Orillia Road S intersection, under all Concept 0 scenarios. During the weekday station peak-hour percent increases under Concept 0 compared to without-project conditions range from 3 percent to 4 percent under with- and without-Renton conditions, respectively. Similarly, during the Saturday station peak-hour percent increases under Concept 0 compared to without-project conditions range from 3 percent to 6 percent during with- and without-Renton conditions, respectively.

Table 9 provides a comparison between the 2023 Concept 0 and without-project conditions both with- and without-Renton conditions. The detailed LOS worksheets are included **in Attachment H (LOS Worksheets)**.

Table 9
Bow Lake Concept 0 Weekday and Saturday Station Peak Hours LOS Summary

	2023 Without-Project				Concept 0 – With-Renton				Concept 0 – Without-Renton		
Intersection	LOS[1]	Delay [2]	WM [3]		LOS	Delay	WM		LOS	Delay	WM
Weekday Station Peak-Hour (12 – 1 p.m.)											
1. I-5 Southbound Ramps / S 188th St	D	45			D	49			D	50	
2. I-5 Northbound Ramps / S 188th St	E	66			E	71			E	73	
3. Orillia Rd S / S 188th St	F	>180	SBL		F	>180	SBL		F	>180	SBL
4. Orillia Rd S / S 200th St	F	93			F	94			F	95	
Saturday Station Peak-Hour (12 – 1 p.m.)											
1. I-5 Southbound Ramps / S 188th St	B	12			B	12			B	12	
2. I-5 Northbound Ramps / S 188th St	B	16			B	17			B	17	
3. Orillia Rd S / S 188th St	F	79	SBL		F	108	SBL		F	156	SBL
4. Orillia Rd S / S 200th St	B	17			B	17			B	17	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology.
2. Average delay in seconds per vehicle.
3. WM= Worst movement reported for unsignalized intersections where SBL = southbound left.

As shown in **Table 9,** all study intersections continue to operate at the same LOS under Concept 0, both with- and without-Renton, compared to the without-project conditions.

Bow Lake Station Summary

- Increases in station traffic range from 85 to 88 between the different concepts during the weekday peak period under with-Renton conditions and range from 110 to 118 during the weekday peak period under the without-Renton conditions. During the Saturday peak period, peak demand volumes range from 110 to 111 under with-Renton conditions and range from 140 to 152 under without-Renton conditions.
- Analysis of on-site operations showed operational issues at the inbound scales, resulting in queues extending beyond the defined inbound queue thresholds.
    - Three combinations were analyzed to improve on-site operations under Concept 0 without-Renton conditions, both during the weekday and Saturday peak periods. Combination B2 (an additional inbound and outbound scale and outbound queue storage pocket) meets the Saturday adopted service times and queue thresholds as well as being near the adopted service times and meeting the queue thresholds on the weekdays. The other combinations under the without-Renton conditions exceed either the adopted service times or the queue thresholds.
- Evaluation of off-station intersections showed minimal increases in off-station intersections for Concept 0 relative to without-project conditions. Concept 0 represented the highest peak demand, and thus represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

Renton

Station Description – Access and Circulation

Primary vehicle access to the Renton station is provided via Jefferson Avenue NE. Both the general public and County trucks utilize Jefferson Avenue NE. The transfer station site vicinity is shown in **Figure 15**.

Figure 15
Renton Site Vicinity

The tipping floor is laid out such that the commercial-haulers and self-haulers dump their garbage directly into the County trailers. The County vehicles are in the center of the floor set below the level of the haulers, dividing the floor into two sides, an east and west side. Both the east and west tipping floors are set up for entry on the north side and exit on the south side of the building (see **Figure 16** for vehicle circulation). The east tipping floor is set up consistently on the weekdays and Saturdays, serving the commercial-haul and self-haul vehicles with tipping trailers as well as some self-haul vehicles without tipping trailers. The east tipping floor has two stalls available to the commercial vehicles and self-haul vehicles with tipping trailers, and four stalls available to the general self-haul vehicles. The west tipping floor is for the general self-haul vehicles with four stalls on the weekdays, and eight stalls on Saturdays. This station also includes areas a recycling area which is located outside of the scales, northwest of the station.

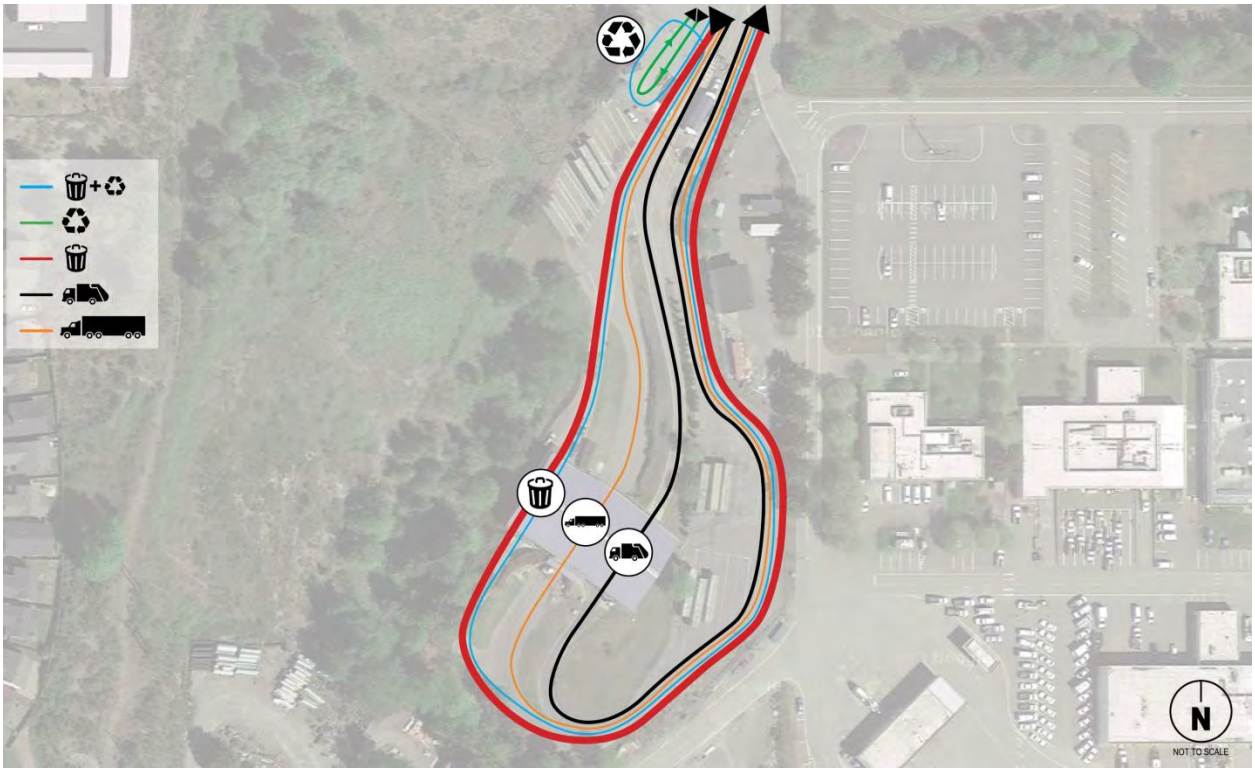


Figure 16
Renton On-Site Future Building Configuration and Circulation Patterns

Station Traffic Volumes

Data Collection. As noted previously, extensive data collection was conducted to support the development of the VISSIM model and establish the existing conditions on the station. While this information was largely used to calibrate the VISSIM model, it also assists in providing the existing context against which the future conditions can be compared. A general outline of the data collected as well as a map of the specific locations for video collection, traffic counts, and service time studies is included in **Attachment C (Data Collection Summary)**.

Customer Origin/Destination Surveys. In addition to the traffic volume, queuing, and service time data, customer origin/destination data was collected to identify the general distribution of customer traffic utilizing this station during the days the surveys were conducted. The survey was conducted during the 3-hour period. The following questions were asked of customers as they exited the facility:

- Where are you coming from (zip code and closest intersection)?
- Are you coming from a home or business?

Not all customers participated in the survey so the information shown in **Table 10** represents a sample of the customers that utilized the station during the observation period. The response rate on the weekday was approximately 70 percent, whereas the response rate on Saturday was approximately 100 percent, missing less than 5 customers. It is important to note that the lower response rate on the weekday is primarily due to not asking commercial vehicles to participate in the survey.

Reponses from customers were mapped to the nearest major intersection using GIS. This information is shown in **Attachment D (Customer Origin/Destination Data)**. The responses from the surveys indicated the following distribution of customers are utilizing the Renton station. Information is presented for the weekday and Saturday time periods, although (as shown) the general distribution of customers is not that different.

Table 10
Renton Customer Trip Origin Summary

	Survey Respondents - Weekday		Survey Respondents - Saturday	
Trip Origin	**Number**	**Percentage**	**Survey Origin**	**Percentage**
Renton	17	30%	72	45%
Seattle	0	0%	5	3%
King County (excluding Seattle/Renton)	38	68%	83	52%
Pierce County	1	2%	0	0%
Total	56	100%	160	100%

Existing Traffic Volumes. Based on the data collected for the station, the weekday peak period (3 hours) was defined to be 11:15 a.m. to 2:15 p.m. and the Saturday period was 10:45 a.m. to 1:45 p.m. **Figure 17** shows the weekday and Saturday daily station traffic volumes.

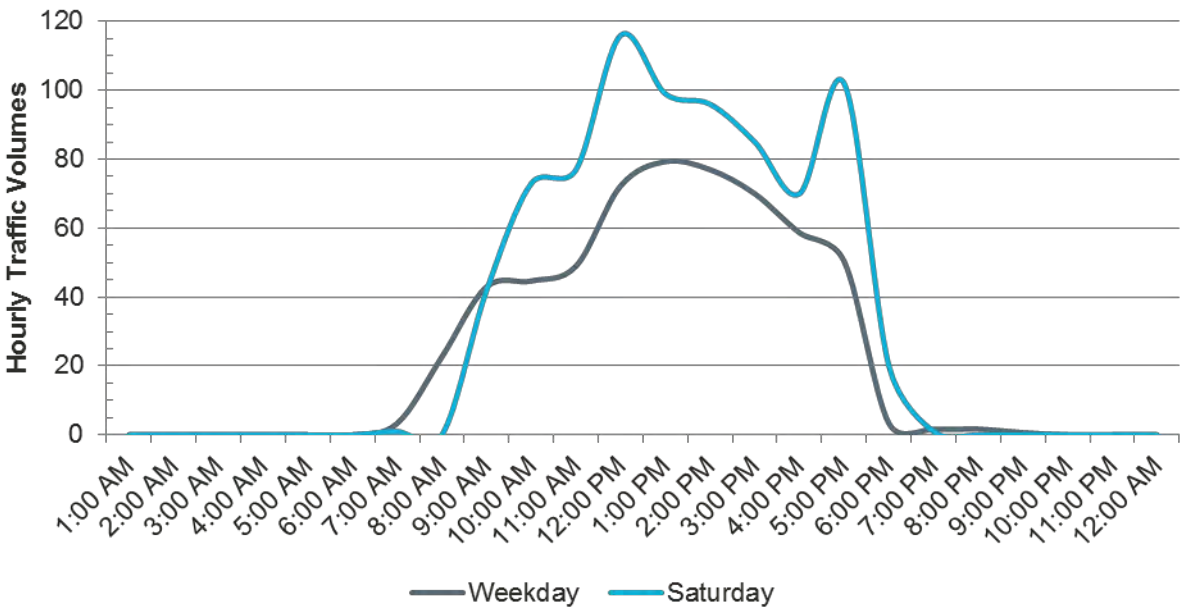


Figure 17
Renton Existing Typical Weekday and Saturday Traffic Volume Patterns

Future Traffic Volumes. Similar to previous station assessments, future conditions for 2023 were evaluated. Future traffic volumes at the station were forecast based on the methodologies described previously. Three (3)-hour peak volumes were developed based on annual tonnage forecasts developed for the station, distribution of weekday and Saturday activity, tonnage per vehicle, seasonal factors, and hourly trip generation patterns for the station. The detailed calculations showing all the key assumptions are included in **Attachment E (Trip Generation Forecasts)**.

Station forecasts were developed for Concept 0, Concept 1, Concept 2, and Concept 3. All concepts assumed that the Houghton station was closed. **Figure 18** summarizes the peak-hour volumes for each of the concepts (self-haul and commercial-haul) traffic for weekday and Saturday conditions. This comparison helps to understand the station traffic forecasts for the different concepts. Although only the peak-hour is shown in this Figure, the peak-hour volumes are generally anticipated to occur for multiple hours as shown in the **Figure 17** hourly profile.

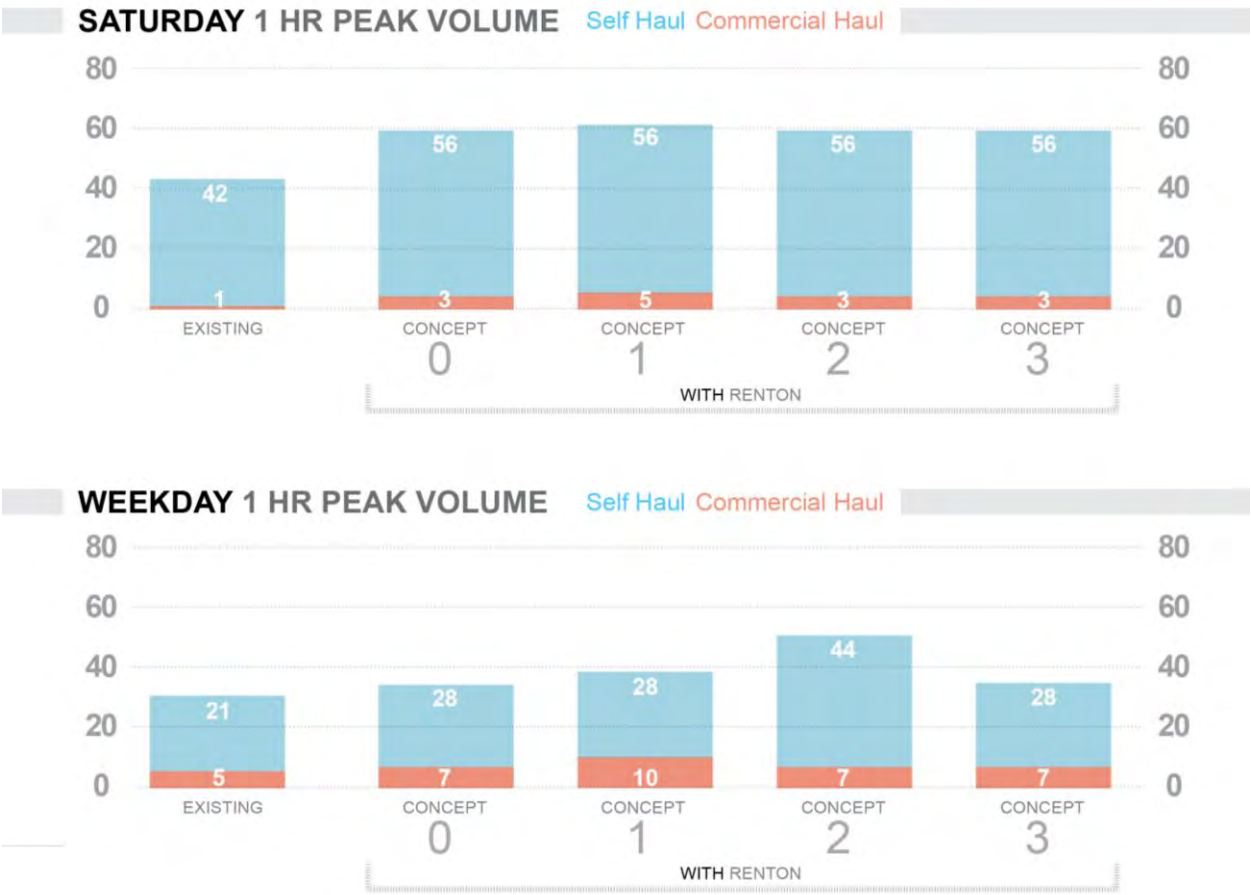


Figure 18
Renton Existing and Concepts 0-3 Peak-Hour Volumes

As shown in **Figure 18**, relative to the existing volumes, the Concept 0 peak-hour traffic volumes are anticipated to increase by approximately 35 percent during both the weekday and Saturday peak hours. During the Saturday peak-hour, the traffic volumes between the concepts are anticipated to be similar with up to two vehicle differences between Concepts 0 to 3. During the weekday peak-hour, traffic volumes for Concepts 0, 1, and 3 are similar, only Concept 2 has a notable change in traffic volumes. An increase in the peak-hour volumes is anticipated with Concept 2 during the weekday due to the restriction of self-haul vehicles at Factoria.

On-Site Analysis Results

The on-site service times and inbound vehicle queues were calculated using the methodology described previously. The service time and queue results are shown in **Table 11** for existing, and Concepts 0, 1, 2, and 3 conditions.

Table 11
Renton Existing and Concepts 0-3 Peak-Hour Service Times and Queuing Summary

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	***00:16***	***00:30***	***00:16***	***00:30***		***40***	***40***
Existing[6]	00:10	00:17	00:11	00:19		0	0
Concept 0	00:10	00:18	00:11	00:21		0	1
Concept 1	00:10	00:18	00:11	00:21		0	1
Concept 2	00:10	00:28	00:11	00:21		4	1
Concept 3	00:10	00:18	00:11	00:21		0	1

1. CH = Commercial-haul
2. SH = Self-haul
3. Vehicle length assumed to be 32 feet.
4. Adopted standards as defined in King County Transfer plan (December 2007)
5. Threshold - Threshold of 40 vehicle queue is approximate distance to adjacent intersection along Jefferson Ave NE (NE 3rd St / Jefferson Ave NE)
6. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 11**, service times for all concepts meet the adopted service times. Inbound queues for the commercial and self-haul vehicles is minimal and within the defined threshold. The longest service time and queues are under Concept 2 weekday conditions, with an anticipated 28-minute self-haul service time and an inbound queue of 4 vehicles.

Summary of Constraints

As noted above, all service travel times and queues are below the adopted standards or thresholds; therefore, no constraints were identified.

Analysis of Improvements Strategies

All service times and inbound queues are below the adopted standards or thresholds; therefore, no improvement strategies were identified and evaluated.

Off-Site Traffic Analysis Results

The analysis includes an evaluation of intersection operations at five intersections. The study intersections identified for this analysis include (see **Figure 19**):

1. I-405 Northbound Ramps / Maple Valley Hwy / SR 169
2. I-405 Southbound Ramps / SR 900 / Maple Valley Hwy / SR 169
3. SR 900 / NE 3rd St
4. Jefferson Ave NE / NE 3rd St
5. Duvall Ave NE / NE 4th St

These study intersections were evaluated during the weekday and Saturday station peak hours. Based on the station observations conducted in September 2014, the peak hours identified were 1:00 to 2:00 p.m. and 12:00 to 1:00 p.m. for the weekday and Saturday, respectively.

Figure 19
Renton Study Intersections

Intersection LOS was calculated at the study intersections using the LOS methodology described previously.

Existing Conditions

Existing intersection turning movements were collected at the off-station intersections in October 2014 during the weekday and Saturday peak hours defined for the station. Detailed intersection turning movement traffic volumes are provided in **Attachment G (Off-Station Intersection Traffic Counts)**. The weekday and Saturday existing intersection traffic volumes are shown in **Figure 20**. **Table 12** summarizes the existing weekday and Saturday station peak-hour LOS. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

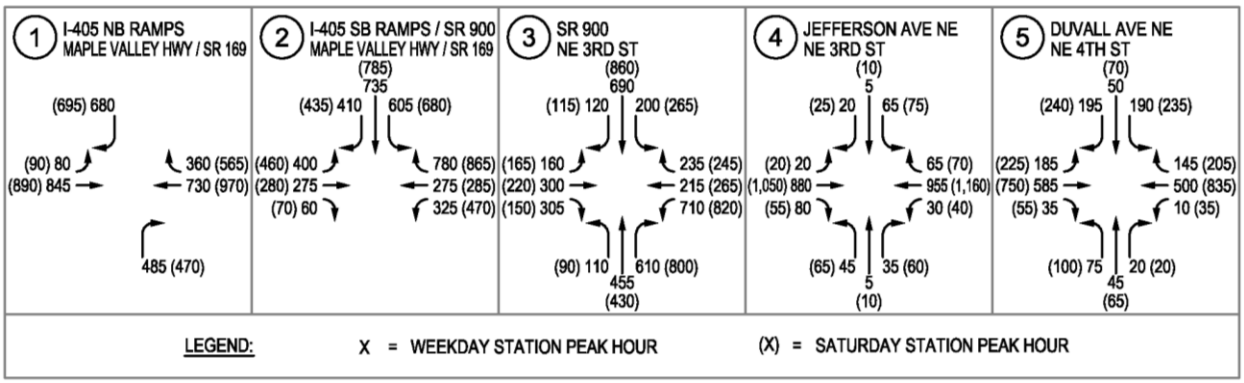


Figure 20
Renton Existing Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 12
Renton Existing Weekday and Saturday Station Peak Hours LOS Summary

	Weekday Station Peak-Hour (1 – 2 p.m.)				Saturday Station Peak-Hour (12 – 1 p.m.)		
Intersection	LOS[1]	Delay[2]	V/C[3]		LOS	Delay	V/C
1. I-405 Northbound Ramps / Maple Valley Hwy / SR 169	B	16	0.4		B	15	0.39
2. I-405 Southbound Ramps / SR 900 / Maple Valley Hwy / SR 169	C	35	0.78		D	42	0.85
3. SR 900 / NE 3rd St	D	47	0.74		D	44	0.81
4. Jefferson Ave NE / NE 3rd St	A	9	0.45		B	11	0.51
5. Duvall Ave NE / NE 4th St	C	26	0.55		C	30	0.71

1. Level of service (LOS), based on 2000 Highway Capacity Manual methodology. The Renton study intersections were unable to be modeled using the HCM 2010 methodology.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections.

As shown in **Table 12**, under existing conditions all study intersections operate at LOS D or better during both weekday and Saturday station peak hours.

Future 2023 Without-Project Conditions

Based on a review of the City of Renton's *Six-Year (2015-2020) Transportation Improvement Program*, the NE 3rd / NE 4th Street corridor is planned to provide improved traffic operations including re-channelization and improved signal timing, transit priority at signalized intersections, queue jumps, and non-motorized improvements for pedestrians, bicyclists, and transit users. This improvement is planned to begin in 2017; however, no specific improvements that would affect the operations at the study intersections have been identified at this time.

The 2023 without-project weekday and Saturday peak-hour traffic volumes were estimated by growing existing traffic volumes by 2 percent per year to 2023 conditions. This growth rate was determined in coordination with the City of Renton. No pipeline projects were identified within the study area. The 2023 without-project weekday and Saturday peak-hour traffic volumes are shown in **Figure 21**. Without-project conditions represents a scenario that assumes the station continues to operate as-is. No changes in volumes outside of normal background growth was assumed. This scenario is not consistent with Concept 0.

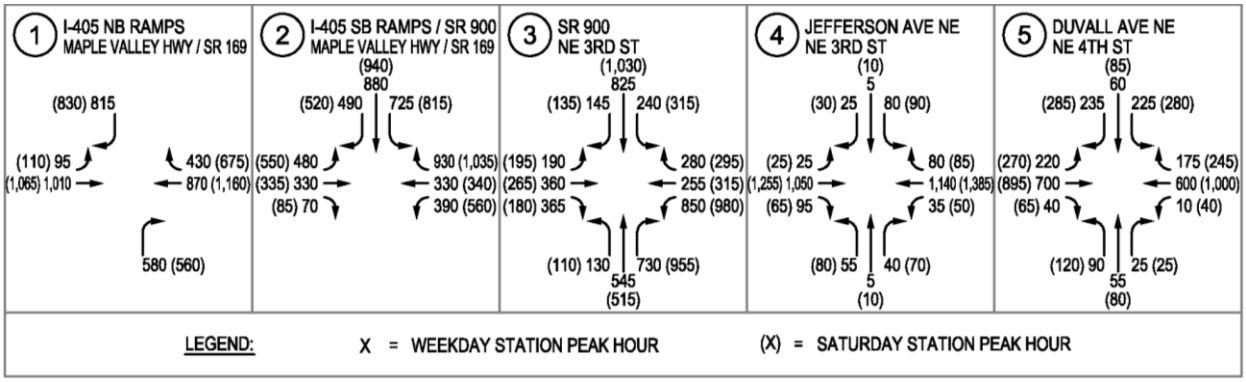


Figure 21
Renton Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes

Signal timing was optimized for the 2023 analysis; optimizing the traffic signal timing takes into consideration the actuated nature of the signals and changes that would occur with growth in traffic volumes. **Table 13** summarizes the LOS results for the without-project weekday and Saturday peak hours.

Table 13
Renton 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary

Intersection	Existing				2023 Without-Project		
	LOS[1]	Delay[2]	V/C[3]		LOS	Delay	V/C
Weekday Station Peak-Hour (1 – 2 p.m.)							
1. I-405 Northbound Ramps / Maple Valley Hwy / SR 169	B	16	0.4		C	31	0.85
2. I-405 Southbound Ramps / SR 900 / Maple Valley Hwy / SR 169	C	35	0.78		D	42	0.95
3. SR 900 / NE 3rd St	D	47	0.74		D	45	0.9
4. Jefferson Ave NE / NE 3rd St	A	9	0.45		B	12	0.54
5. Duvall Ave NE / NE 4th St	C	26	0.55		C	31	0.66
Saturday Station Peak-Hour (12 – 1 p.m.)							
1. I-405 Northbound Ramps / Maple Valley Hwy / SR 169	B	15	0.39		C	29	0.77
2. I-405 Southbound Ramps / SR 900 / Maple Valley Hwy / SR 169	D	42	0.85		D	53	1.01
3. SR 900 / NE 3rd St	D	44	0.81		D	39	0.89
4. Jefferson Ave NE / NE 3rd St	B	11	0.51		B	14	0.61
5. Duvall Ave NE / NE 4th St	C	30	0.71		D	50	0.86

1. Level of service (LOS), based on 2000 Highway Capacity Manual methodology. The Renton study intersections were unable to be modeled using the HCM 2010 methodology.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections.

As shown in **Table 13,** all study intersections operate at LOS D or better under both weekday and Saturday peak-hour conditions.

2023 Concept 2 Conditions

As discussed above, the station peak-hour traffic volumes are similar for each concept with the exception of the higher peak-hour traffic volumes under Concept 2 weekday conditions (see **Figure 18**) and as such the Concept 2 forecasts were utilized for the off-station intersection analysis. As this is an existing station, the net new trips were calculated and assigned to the off-station study intersections. To calculate the net new trips, the station transactions (inbound trips) were provided by King County for the same day the off-station traffic volumes were collected in order to ensure the data was consistent. The net-new trips under 2023 Concept 2 conditions were then calculated by subtracting the existing transactions, which were doubled to account for in- and outbound trips from the station from the 2023 Concept 2 forecast number of trips. This is shown in the Trip Generation **Table 14**.

Table 14
Renton Concept 2 Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*35*	*35*	70		51	51	102
Concept 2							
Commercial-haul[2]	11	11	22		3	3	6
Self-haul	44	44	88		56	56	112
Total	55	55	110		59	59	118
Net New Project Trips (2023 Concept 0 – Existing)	20	20	40		8	8	16

1. Existing total based on station transactions during the peak hours on the day the off-station intersection traffic volumes were collected.
2. Actual weekday forecast inbound and outbound commercial vehicles is 7 vehicles. For a conservative analysis, no decrease in commercial vehicles taken into account.

As shown in **Table 14**, during the weekday peak-hour 40 net new trips are estimated, and during the Saturday peak-hour 16 net new trips are estimated, relative to the existing traffic counts.

The trip distribution pattern for the self-haul vehicles was developed based on the survey respondents at Renton on the weekday and Saturday. As noted above, the survey respondents reported the closest intersection and zip code they were coming from. Each respondents answer was plotted so the trip distribution could be estimated. The trip distributions for Renton on the weekday and Saturday are shown in **Figure 22**.

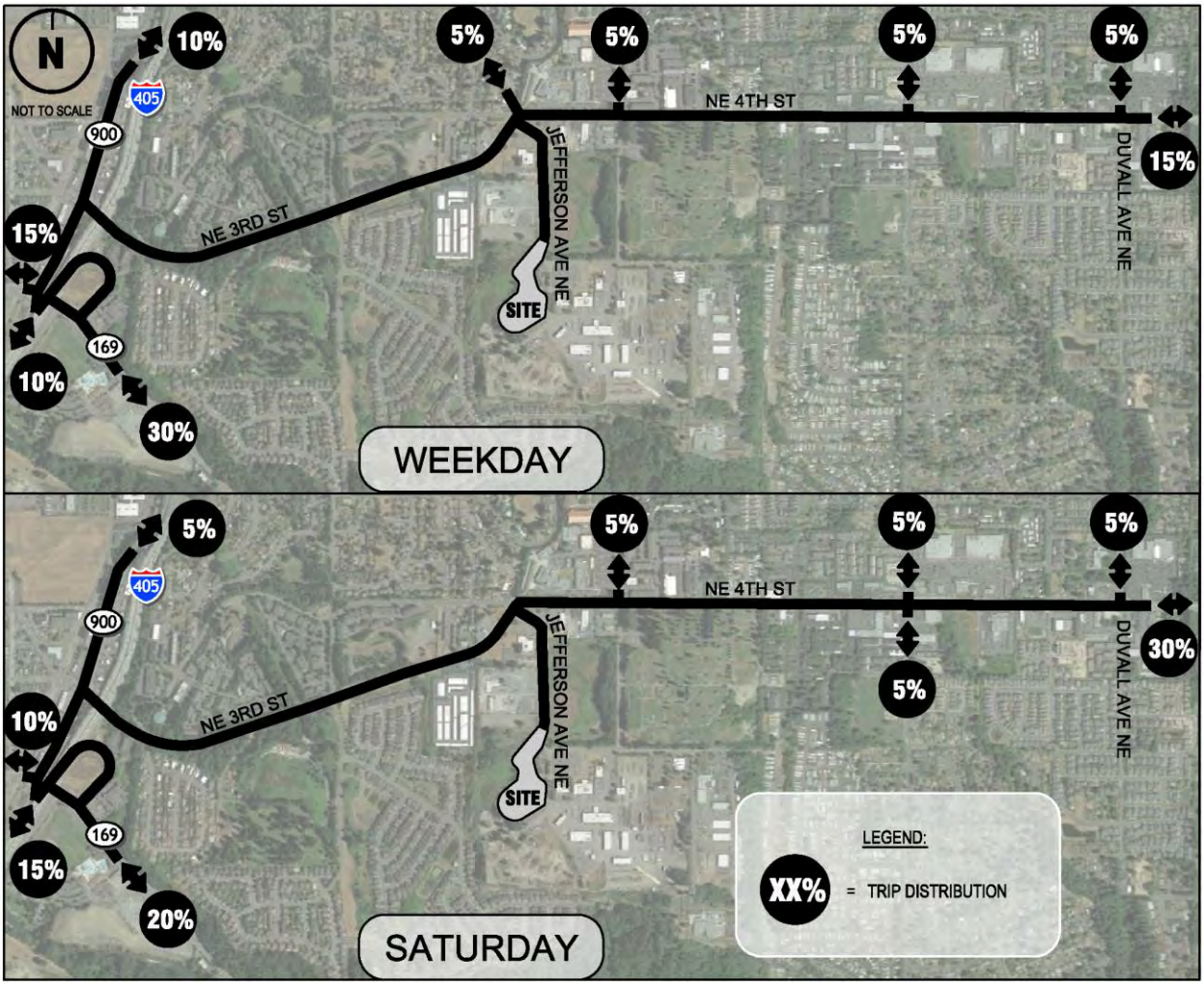


Figure 22
Renton Weekday and Saturday Trip Distribution

The net new project trip assignment for weekday and Saturday are shown in **Figure 23**.

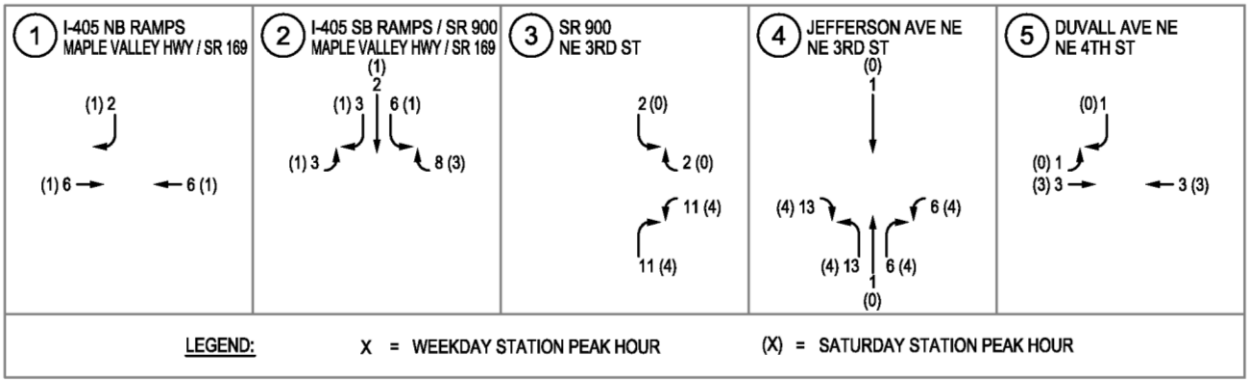


Figure 23
Renton Weekday and Saturday Net-New Trip Assignment

The with-project 2023 Concept 2 weekday and Saturday peak-hour traffic volumes are shown in **Figure 24**. Based on the anticipated increase in station trip generation, the largest percent impact of the Concept 2 traffic volumes relative to the without-project conditions was at the station access intersection, and the Jefferson Avenue NE / NE 3rd Street intersection, during both the weekday and Saturday station peak hours. The percent increase at this intersection is less than 2 percent during both the weekday and Saturday station peak hours under Concept 2, compared with without-project conditions, showing that Concept 2 has little impact on the off-station study intersections.

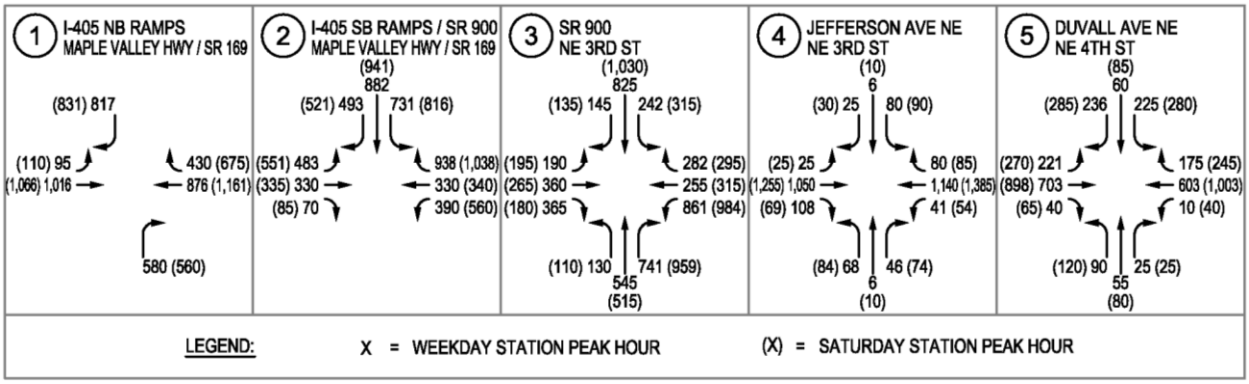


Figure 24
Renton Concept 2 Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 15 provides a comparison between the 2023 Concept 2 and without-project conditions. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

Table 15
Renton Concept 2 Weekday and Saturday Station Peak Hours LOS Summary

Intersection	2023 Without-Project				Concept 2		
	LOS[1]	Delay[2]	V/C[3]		LOS	Delay	V/C
Weekday Station Peak-Hour (1 – 2 p.m.)							
6. I-405 Northbound Ramps / Maple Valley Hwy / SR 169	C	31	0.85		C	32	0.86
7. I-405 Southbound Ramps / SR 900 / Maple Valley Hwy / SR 169	D	42	0.95		D	43	0.96
8. SR 900 / NE 3rd St	D	45	0.9		D	45	0.9
9. Jefferson Ave NE / NE 3rd St	B	12	0.54		B	13	0.55
10. Duvall Ave NE / NE 4th St	C	31	0.66		C	31	0.66
Saturday Station Peak-Hour (12 – 1 p.m.)							
6. I-405 Northbound Ramps / Maple Valley Hwy / SR 169	C	29	0.77		C	29	0.77
7. I-405 Southbound Ramps / SR 900 / Maple Valley Hwy / SR 169	D	53	1.01		D	53	1.01
8. SR 900 / NE 3rd St	D	39	0.89		D	39	0.9
9. Jefferson Ave NE / NE 3rd St	B	14	0.61		B	14	0.61
10. Duvall Ave NE / NE 4th St	D	50	0.86		D	50	0.87

1. Level of service (LOS), based on 2000 Highway Capacity Manual methodology. The Renton study intersections were unable to be modeled using the HCM 2010 methodology.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections.

As shown in **Table 15**, all study intersections would continue to operate at the same LOS under Concept 2 compared to 2023 without-project conditions. All intersections are projected to operate at LOS D or better under all conditions during the station peak hours.

Renton Station Summary

- Increases in station traffic ranges from 35 to 51 between the different concepts during the weekday peak period. During the Saturday peak period, peak demand volumes range from 59 to 61 vehicles per hour, with the highest traffic volumes occurring under Concept 2.
- Analysis of on-site operations showed no operational issues with respect to on-site service times or vehicle queueing.
- Evaluation of off-station intersections showed minimal increases in delay under volumes for Concept 2. Concept 2 represented the highest peak demand, and thus represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

Factoria

Station Description – Access and Circulation

Primary vehicle access to the Factoria station is currently provided via SE 32nd Street. The transfer station site vicinity is shown in **Figure 25**.

Figure 25
Factoria Site Vicinity

Currently County trucks and the general public utilize SE 32nd Street. In the future (anticipated by late 2016), with the new transfer station building, County truck access the station via SE 30th Street. Access for the self-haul and commercial-haul vehicles will continue to be provided via SE 32nd Street. The station assessment for Factoria was conducted based on the future building configuration that is currently under construction. **Figure 26** shows the future building configuration.

Like the other facilities previously described, the tipping floor is divided into two main sections, commercial and self-haul areas. The self-haul area is located in the eastern portion of the building and is accessed via the north side during weekday and Saturday periods. During the weekday period, self-haul vehicles will exit the building at the southeast corner. Commercial vehicles will access the building from the south, circulate internally, and exit to the south. During the Saturday periods, when commercial traffic is less, self-haul traffic will also utilize the commercial tipping floor, exiting from the southwest corner of the building consistent with the commercial traffic.

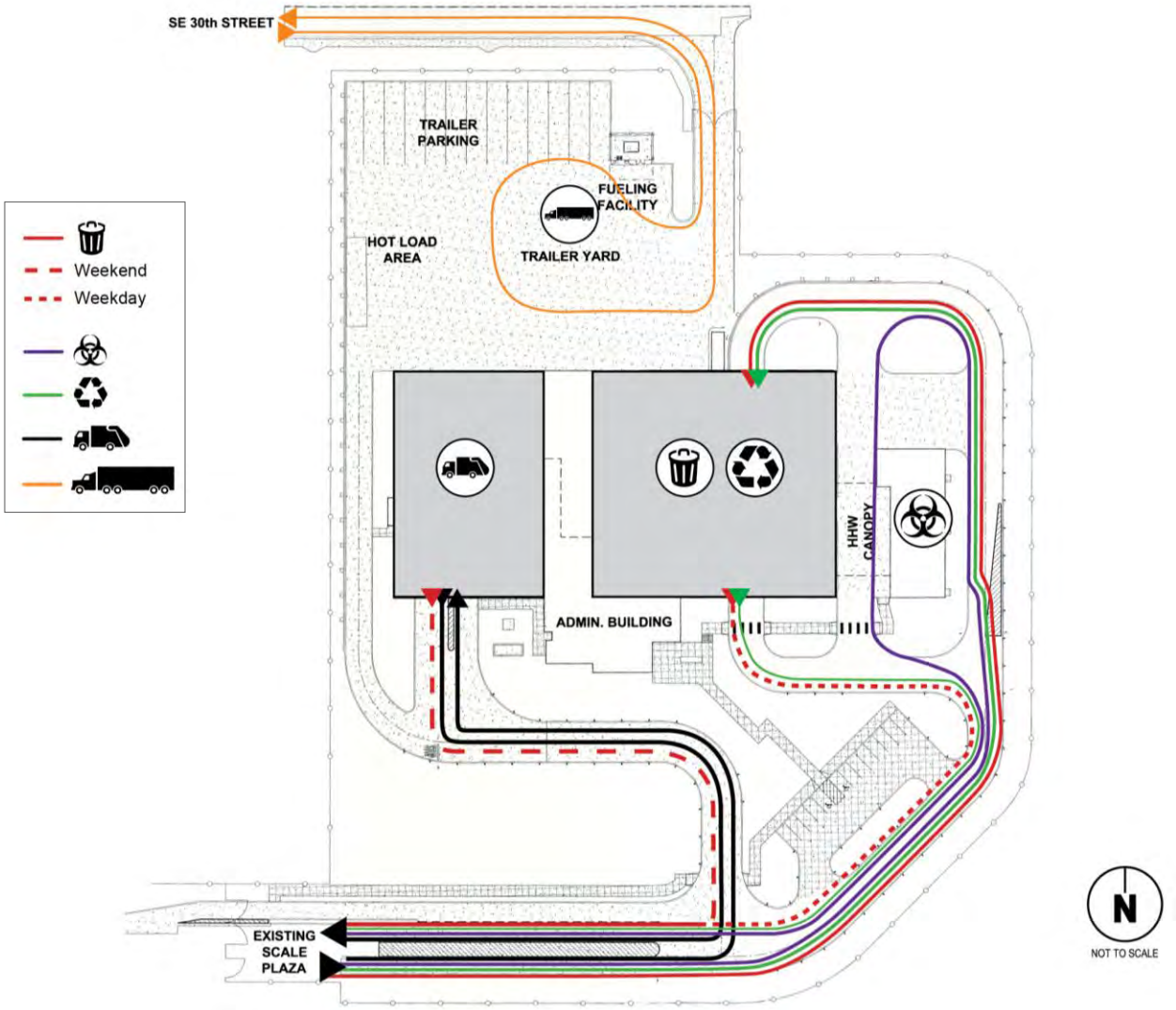


Figure 26
Factoria On-Site Future Building Configuration and Circulation Patterns

The tipping floor is an open floor concept with general areas identified for self-haul and commercial-haul activity. In the self-haul area there is anticipated to be a total of 10 and 14 stalls used for garbage on the weekday and Saturdays, respectively. There is also a total of six stalls on the commercial side of the floor. Because of the flat floor configuration, a total of 30 percent of all stalls were assumed to be closed at any one time in order to clear the area of garbage.

This station includes areas for yard waste and recycling, both of which are accommodated in the main tipping floor building. The HHW area is accessed via a separate vehicle loop. Vehicles utilizing the HHW and the tipping floor areas have to circulate an extra time through the station to deposit both types of material.

Station Traffic Volumes

Data Collection. As noted previously, extensive data collection was conducted to support the development of the VISSIM model and establish the existing conditions on the station. While this information was largely used to calibrate the VISSIM model, it also assists in providing the existing context against which the future conditions can be compared. A general outline of the data collected as well as a map of the specific locations for video collection, traffic counts, and service time studies is included in **Attachment C (Data Collection Summary)**.

Customer Origin/Destination Surveys. In addition to the traffic volume, queuing, and service time data, customer origin/destination data was collected to identify the general distribution of customer traffic utilizing this station during the days the surveys were conducted. The survey was conducted during the 3-hour period. The following questions were asked of customers as they exited the facility:

- Where are you coming from (zip code and closest intersection)?
- Are you coming from a home or business?

Not all customers participated in the survey so the information shown in **Table 16** represents a sample of the customers that utilized the station during the observation period. The response rate on the weekday was approximately 90 percent, whereas the response rate on Saturday was approximately 95 percent.

Reponses from customers were mapped to the nearest major intersection using GIS. This information is shown in **Attachment D (Customer Origin/Destination Data)**. The survey responses indicated the following distribution of customers are utilizing the Factoria station. Information is presented for the weekday and Saturday time periods, although (as shown) the general distribution of customers is not that different.

Table 16
Factoria Customer Trip Origin Summary

	Survey Respondents - Weekday		Survey Respondents - Saturday	
Trip Origin	**Number**	**Percentage**	**Survey Origin**	**Percentage**
Bellevue	41	40%	65	45%
Seattle	2	2%	4	3%
King County (excluding Seattle/Bellevue)	57	55%	75	51%
Snohomish County	3	3%	1	1%
Total	103	100%	145	100%

Existing Traffic Volumes. During the weekday period, traffic on the adjacent arterials adjacent to the station have two primary peaking periods, both corresponding to the a.m. and p.m. commute periods. This is unlike the station traffic during the weekday and Saturday periods which has a more sustained and consistent level of activity without the elevated peak periods. Based on the data collected for the

station, the weekday peak period (3 hours) was defined to be 11:45 a.m. to 2:45 p.m., and the Saturday period was 1:15 to 4:15 p.m. **Figure 27** shows the weekday and Saturday daily station traffic volumes.

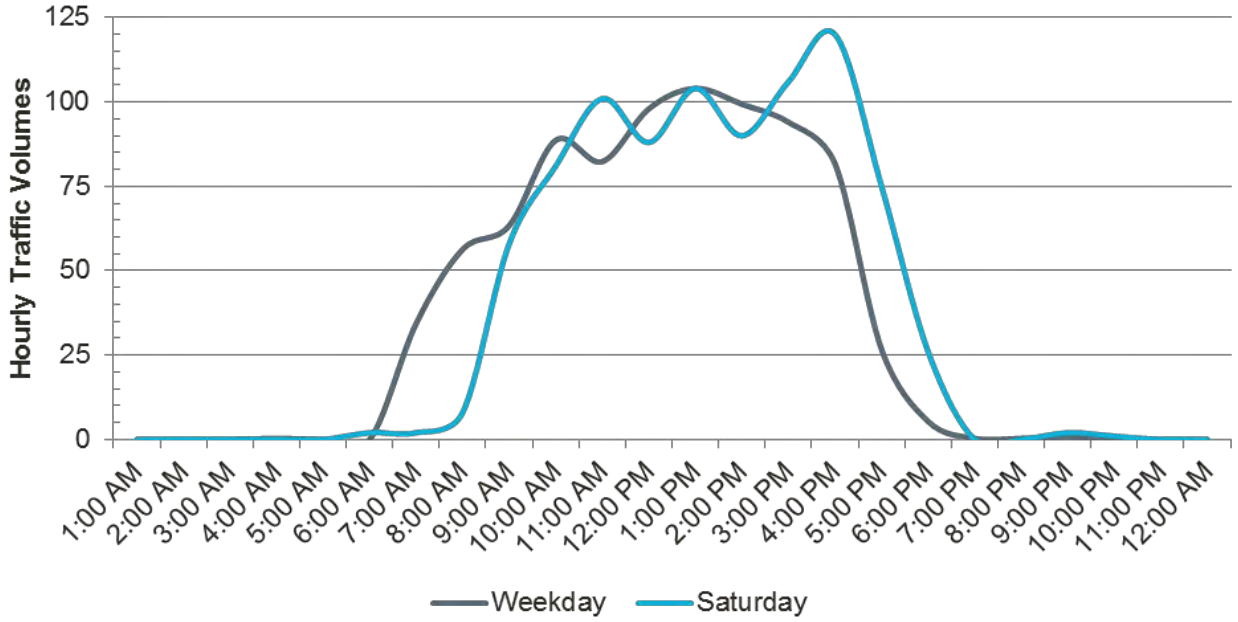


Figure 27
Factoria Existing Typical Weekday and Saturday Traffic Volume Patterns

Future Traffic Volumes. Future traffic volumes at the station were forecast based on the methodologies described previously. Three (3)-hour peak volumes were developed based on annual tonnage forecasts developed for the station, distribution of weekday and Saturday activity, tonnage per vehicle, seasonal factors, and hourly trip generation patterns for the station. The detailed calculations showing all the key assumptions are included in **Attachment E (Trip Generation Forecasts).**

Station forecasts were developed for Concept 0, Concept 1, Concept 2, and Concept 3; both with and without the Renton station operational. All concepts assumed that the Houghton station was closed. **Figure 28** summarizes the peak-hour volumes for each of the concepts (self-haul and commercial-haul) traffic for weekday and Saturday conditions, and with- and without-Renton. This comparison helps to understand the relationship and potential impacts of the different concepts at the station level. Although only the peak-hour is shown in this figure, the peak-hour volumes are generally anticipated to occur for multiple hours as shown in the **Figure 27** hourly profile.

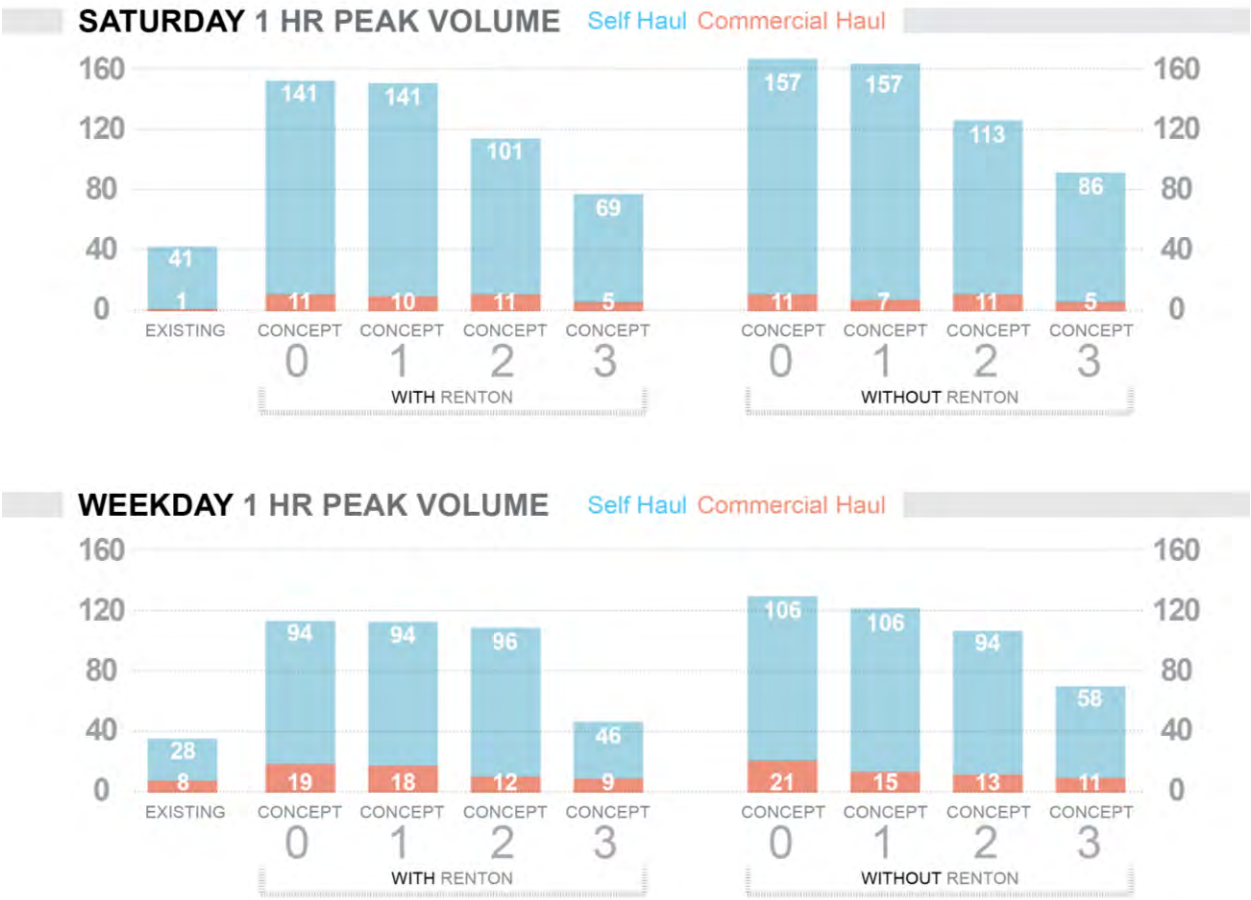


Figure 28
Factoria Existing and Concepts 0-3 Peak-Hour Volumes

As shown in **Figure 28**, during the Saturday period with-Renton, the peak-hour volumes forecast for Concept 0 and Concept 1 are similar. In both scenarios, with Concept 2, the peak-hour volumes are anticipated to decrease due to the extended hours assumed for Saturday. The hourly patterns anticipated under Concept 2, with extended hours, are based on information received from King County and generally follows the observed patterns at the Bow Lake station. The biggest decrease in peak-hour activity is anticipated under Concept 3, due to the construction of the Northeast Recycling and Transfer Station (NERTS). During this same period, without-Renton, the peak-hour volumes are slightly higher due to the closure of Renton, but the general relationships between the concepts stay the same.

The assumed hourly distribution is one characteristic that is different on the weekday versus Saturday for Concept 2. Since Concept 2 includes restriction of self-haul activity until 3:00 p.m., the peak-hour demand is anticipated to occur later in the day. This revised hourly distribution was based on discussions with King County staff. **Figure 29** shows the relationship between the Concept 0 hourly assumptions and Concept 2 hourly assumptions for the weekday period. With the extended hours assumed for the Saturday period, the magnitude of the peak-hour traffic is anticipated to decrease slightly as well, but not have the change as forecasted for the weekday period.

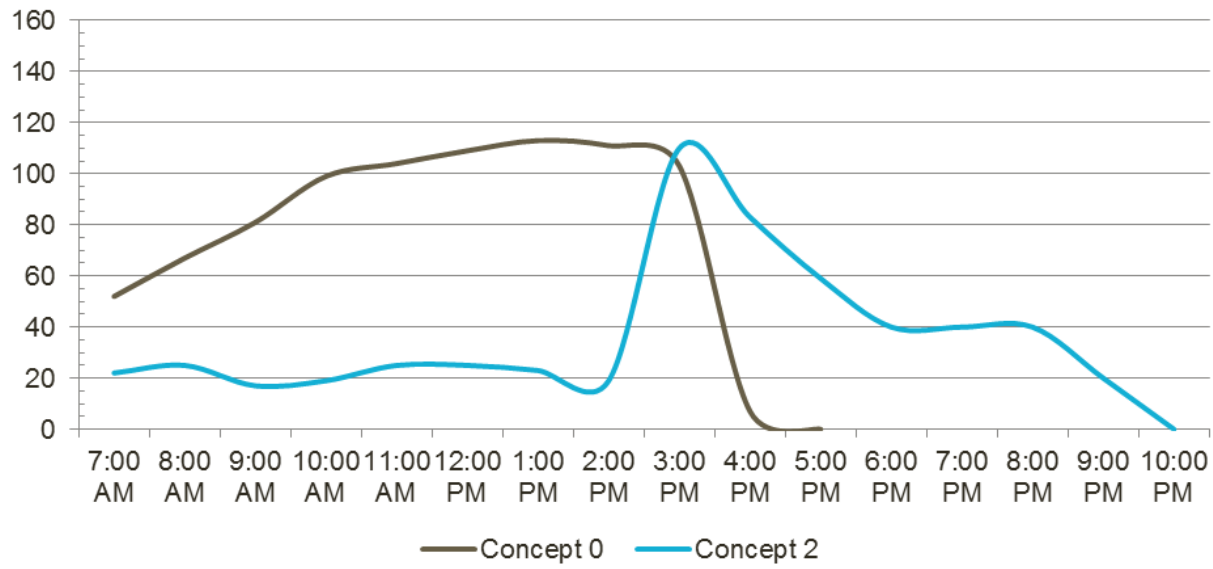


Figure 29
Total Factoria Weekday 2023 Transactions for Concepts 0 and 2

On-Site Analysis Results

The on-site service times and inbound vehicle queues were calculated using the methodology described previously. The service time and queue results are shown in **Tables 17** and **18**, respectively, for existing and Concepts 0 to 3.

Table 17
Factoria Existing and Concepts 0-3 Peak-Hour Service Times Summary

	With-Renton Station					Without-Renton Station			
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday Peak-Hour		Saturday Peak-Hour	
Scenario	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)		CH (h:mm)	SH (h:mm)	CH (h:mm)	SH (h:mm)
Standard[3]	*16:00*	*30:00*	*16:00*	*30:00*		*16:00*	*30:00*	*16:00*	*30:00*
Existing[4]	11:00	23:00	15:00	22:00					
Concept 0 (2023)	22:00	1:06:00	24:00	52:00		22:00	1:06:00	23:00	54:00
Concept 1 (2023)	22:00	1:07:00	24:00	52:00		21:00	1:09:00	23:00	54:00
Concept 2 (2023)	13:00	30:00	20:00	45:00		13:00	28:00	23:00	49:00
Concept 3 (2023)	12:00	24:00	15:00	22:00		12:00	38:00	15:00	25:00

1. CH = Commercial-haul
2. SH = Self-haul
3. Adopted standards as defined in King County Transfer plan (December 2007)
4. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 17**, all concepts exceed the adopted service times for both commercial and self-haul vehicles with the following exceptions:

- Concept 2 weekday with- and without-Renton
- Concept 3 weekday with-Renton
- Concept 3 Saturday with- and without-Renton

The service time results are discussed by concept, below.

Concept 0 - The Concept 0 service times under with-Renton condition have increased compared to the exiting service times. The weekday service time increase from existing to Concept 0 on Saturday showed increases of 11 minutes for commercial-haul service times and 43 minutes for self-haul service times. As shown in **Figure 28**, the Concept 0 peak-hour on-site volumes have more than tripled relative to the existing peak-hour volumes.

The Concept 0 service times under the without-Renton condition are the same during the weekday and have 1- to 2-minute changes during Saturday compared to the without-Renton condition. This is likely due to the station operating at capacity and no additional vehicles able accommodated on-site.

Concept 1 - Concept 1 has similar service times to Concept 0, with the largest change being 3 minutes. Concept 1 redirects commercial haulers, reducing the number of commercial vehicles at the Factoria station. This reduction in commercial-haul volume is greater under the without-Renton condition and a reduction of 1-minute of service time for the commercial haulers is anticipated under Concept 1 compared with Concept 0. The self-haul service times actually increase under Concept 1 compared to Concept 0, an increase of 1-minute and 3 minutes under the with- and without-Renton conditions, respectively. This increase in service time for the self-haul vehicles is likely due to more self-haul vehicles accommodated on-site due to the reduction in the number of commercial vehicles.

Concept 2 - As stated above, Concept 2 meets the adopted service times for the weekdays under both with- and without-Renton conditions. Concept 2 restricts the self-haul vehicles at Factoria on the weekdays, changing the self-haul operating hours to 3:00 p.m. to 10:00 p.m. and the commercial-haul operating hours to 6:00 a.m. to 10:00 p.m. The Factoria station opens to self-haul customers once the majority of commercial-haul volumes have completed the activity for the day. This allows for the Factoria station to be operated as it is on Saturday, increasing the number of stalls on the tipping floor from 10 to 14 for the self-haul customers. This increase in stalls on the tipping floor on the weekday and the variation in volumes with the shift in the peak volumes at the station resulted in at- or below-adopted service times for the weekday both with- and without-Renton conditions for Concept 2.

The Saturday service times for Concept 2 are reduced compared to Concept 0. Although the daily on-site volumes are the same on the Saturday for both Concepts 0 and 2, Concept 2 operates with extended hours on Saturday. The station operates from 8:00 a.m. to 8:00 p.m. for Concept 2, an extension of 2 hours from Concept 0. This allows for lower volumes per hour, resulting in the lower service times for Concept 2 compared to Concept 0.

Concept 3 - All service times are below the adopted standards with the exception of the self-haul weekday service time under without-Renton conditions which exceeds the standard by approximately 8 minutes. Concept 3 constructs the NERTS resulting in a decrease in peak-hour demand when compared to the other concepts. Despite the increase in volume due to the different analysis years, Concept 3 under with-Renton conditions increases in service time by only 1-minute during the weekday and is the same on Saturday.

Table 18
Factoria Existing and Concepts 0-3 Inbound Queues Summary

Scenario	With-Renton Station			Without-Renton Station	
	Weekday (Vehicles)[1]	Saturday (Vehicles)		Weekday (Vehicles)	Saturday (Vehicles)
Threshold[2]	***10***	***10***		***10***	***10***
Existing[3]	1	1			
Concept 0 (2023)	99	121		131	184
Concept 1 (2023)	93	119		126	177
Concept 2 (2023)	3	22		4	58
Concept 3 (2023)	1	2		2	3

1. Vehicle length assumed to be 32 feet
2. Threshold - Threshold of 10 vehicle queue is approximate distance to adjacent driveway along SE 32nd Street (station access)
3. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 18**, Concepts 0, 1, and Concept 2 exceed the threshold queue lengths during the peak period on Saturday. Concept 3 and Concept 2 on weekdays are within the queue threshold. The results of the queueing analysis are discussed by concept, below.

Concept 0 - The anticipated queues under the with-Renton condition are projected to increase compared to the existing queues. The increase from existing to Concept 0 is forecast to be 98 and 120 vehicles for weekday and Saturday, respectively. As shown in **Figure 28**, the Concept 0 peak-hour on-station volumes have more than tripled relative to the existing peak-hour volumes. Due to the increase in peak-hour demand anticipated with the closure of Renton, vehicle queueing is anticipated to increase as shown in the table.

Concept 1 - Concept 1 has similar queues compared to Concept 0, with minor reductions in the inbound queue length, with the largest reduction of seven vehicles occurring under without-Renton conditions during the Saturday peak period.

Concept 2 – Forecasted queue lengths are within the defined thresholds for the weekdays under both with- and without-Renton conditions. Thresholds are exceeded during the Saturday peak period.

Concept 3 – With the construction of the NERTS, peak-hour demands are reduced. Queues under Concept 3 are within 1 to 2 vehicle lengths of existing conditions. As such forecast queue lengths are anticipated to operate within the defined threshold.

Summary of Constraints

As shown by the high service times and long queues for all concepts with the exception of Concept 3, the Factoria station has several constraints. The main constraints at the Factoria station were found to be the self-haul tipping floor capacity, the outbound scale capacity, and the available on-station queue storage. These constraints were identified with the modeling of the station in VISSIM and are discussed below.

Self-Haul Tipping Floor - The primary constraint at the Factoria station was found to be the self-haul tipping floor. The self-haul tipping floor is constrained by the number of stalls and the service time of vehicles on the tipping floor itself. The self-haul tipping floor cannot accommodate all of the self-haul vehicles within the peak-hour.

Outbound Scale - Another constraint of the station is the outbound scale. Although not an issue at the current rate vehicles are processed on the commercial and self-haul tipping floors; if the tipping floor were to increase their capacity (decreasing on-floor dwell times or increasing stalls) the outbound scale would become a constraint.

On-station Queue Storage - As shown by the long queues under Concepts 0 and 1 relative to the adopted service times, the on-station storage length is unable to accommodate the high volumes anticipated during the peak hours. This results in queues that extend off-station, blocking adjacent businesses along SE 32nd Street.

The Tier 1 screening primarily focused on the overall reduction in station traffic anticipated under the particular strategy. The strategies analyzed are listed above in **Tier 1/Tier 2 Screening Methodology**. The anticipated peak-hour demand reduction in station traffic under both the with- and without-Renton scenarios during the weekday and Saturday peak hours are summarized in **Attachment F (Demand Management Strategy Trip Reductions)**. The percent reductions shown in the table are based on modeling conducted by the division. Reductions from strategies range from 0 to 34 percent of the peak-hour demand. Specific strategies examined at the Factoria station and the reductions assumed include:

- Extend Operating Hours (4%)
- Lower Cost Curbside Bulky Waste Collection (3.4%)
- Mandatory Curbside Garbage Collection (4%)
- Incentive / Peak Pricing (15%)
- Higher Minimum Fee at Factoria Only (20%)
- Banned Materials
    - HHW (3%)
    - Yard/Wood Waste (34%)

The percentage reductions were provided to Transpo from the division for use in the traffic volume forecasts and modeling. It is important to note that not all improvement strategies are as effective if combined. Thus, the identification of the improvement combinations accounts for the relationship to one another. In addition to the transportation demand strategies noted above, potential physical station improvements were identified to address the operational constraints. These improvements considered the addition of increased staffing, the addition of an outbound scale, and added internal vehicle queueing.

Strategy combinations were identified based on the results of the Tier 1 screening process. The Tier 2 screening process included the testing of the strategy combinations using VISSIM. The effectiveness of the strategies were tested for the without-Renton scenario as that time period represents the period with the highest peak-hour demand for the stations. Various strategy combinations were applied for Concept 0 and Concept 2. Modeling was not conducted for Concept 1 as the demand is similar to Concept 0. No modeling was necessary for Concept 3 based on the results of the modeling. The following combinations were identified for detailed evaluation:

Combination A – extended hours and incentive/peak pricing

Combination B –

B1. Increase staffing (decrease dwell time) and higher minimum fee

B2. Increase staffing (decrease dwell time), higher minimum fee, and additional outbound scale

Combination C –

C1. Banned Materials, mandatory curbside collection, and lower cost curbside bulky waste collection

C2. Banned Materials, mandatory curbside collection, lower cost curbside bulky waste collection, and additional outbound scale

Combination D – Added internal queuing (expanded entry lane and repurpose of HHW area), added external queue lane, and HHW banned

The results of the combinations tested on the Concepts are shown and discussed below.

<u>Concept 0</u>

Combinations A, B, and C were tested on Concept 0. The queue and service times of the combinations are shown in **Table 19**. Results are compared to the existing and Concept 0 conditions, with no additional mitigation.

Table 19
Factoria Combinations Peak-Hour Service Times and Queues (Concept 0 – 2023 Without-Renton)

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	***16:00***	***30:00***	***16:00***	***30:00***		***10***	***10***
Existing[6]	11:00	23:00	15:00	22:00		1	1
Concept 0	22:00	1:06:00	23:00	54:00		131	184
Concept 0 + Combination A	12:00	38:00	20:00	41:00		3	6
Concept 0 + Combination B1	17:00	51:00	29:00	50:00		39	48
Concept 0 + Combination B2	16:00	52:00	16:00	29:00		35	11
Concept 0 + Combination C1	13:00	25:00	20:00	32:00		3	5
Concept 0 + Combination C2	11:00	23:00	15:00	23:00		2	4

1. CH = Commercial-haul
2. SH = Self-haul
3. 3. Vehicle length assumed to be 32 feet
4. Adopted standards as defined in King County Transfer Plan (December 2007)
5. Threshold – Threshold of 10 vehicle queue is approximate distance to adjacent driveway along SE 32nd Street (station access)
6. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 19**, Concept 0 with combination C2 is the only package that meets the adopted service times, and falls within the threshold of vehicle queues for both the weekdays and Saturday peak periods. While the improvements identified in Combination B reflect improvements in service times and queues relative to Concept 0, the resulting values do not meet the adopted standards or thresholds.

Concept 1

No strategy combinations were tested for Concept 1 as peak-hour demand are similar to forecasts for Concept 0. Future operations for Concept 1 under the scenarios tested would be similar to the operations shown in **Table 19**.

Concept 2

Strategy Combinations C and D were applied to the Concept 2 without-Renton traffic volumes. The resulting queue and service times of the strategy combinations are shown in **Table 20**.

Table 20
Factoria Combinations Service Times and Queues (Concept 2 – 2023 Without-Renton)

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	*00:16*	*00:30*	*00:16*	*00:30*		*10*[2]	*10*
Existing[6]	00:11	00:23	00:15	00:22		1	1
Concept 0	00:22	1:06	00:23	00:54		131	184
Concept 2	00:13	00:28	00:23	00:49		4	58
Concept 2 + Combination C	00:12	00:23	00:15	00:22		2	3
Concept 2 + Combination D	00:12	00:34	00:18	1:17		3	11

1. CH = Commercial-haul
2. SH = Self-haul
3. Vehicle length assumed to be 32 feet
4. Adopted standards as defined in King County Transfer Plan (December 2007)
5. Threshold – Threshold of 10 vehicle queue is approximate distance to adjacent driveway along SE 32nd Street (station access)
6. Existing conditions based on calibrated VISSIM model – September 2014

As shown in **Table 20**, Concept 2 with Combination C meets the adopted standards for travel time and thresholds for queues for both the weekdays and Saturday. Combination D exceeds the adopted self-haul service time, greatly increasing the service times compared to Concept 2. This is due to the additional on-site queue storage. As shown by the greatly reduced queues under Combination D compared with Concept 2, the queues that were previously off-site are now mostly accommodated on-site.

Concept 3

No combinations were modeled for Concept 3 as the service times and queues shown in **Tables 17** and **18** meet the queue thresholds and adopted service times under all scenarios with the exception of the self-haul service times exceeding the adopted service times under the weekday peak period. During this period, on-site service times are anticipated to exceed the standard by approximately 8 minutes. Based on the results from the Concept 0 evaluation, the application of the strategy combinations tested would likely result in decrease in service times, improving these conditions.

Off-Site Traffic Analysis Results

The analysis includes an evaluation of intersection operations at seven intersections. The study intersections include and are shown in **Figure 30**:

1. Richards Rd / Lake Hills Connector
2. Richards Rd / SE 26th St
3. Richards Rd / SE 32nd St
4. Richards Rd / SE Eastgate Way
5. Factoria Blvd SE / I-90 EB Ramp
6. Factoria Blvd SE / Coal Creek Pkwy SE
7. 148th Ave SE / Eastgate Way

These study intersections were evaluated during the weekday and Saturday peak hours at Factoria as identified during the station observations in September 2014. The peak hours identified were 1:00 to 2:00 p.m., and 2:00 to 3:00 p.m. for weekday and Saturday conditions, respectively. Intersection LOS was calculated at the study intersections using the LOS method described previously.

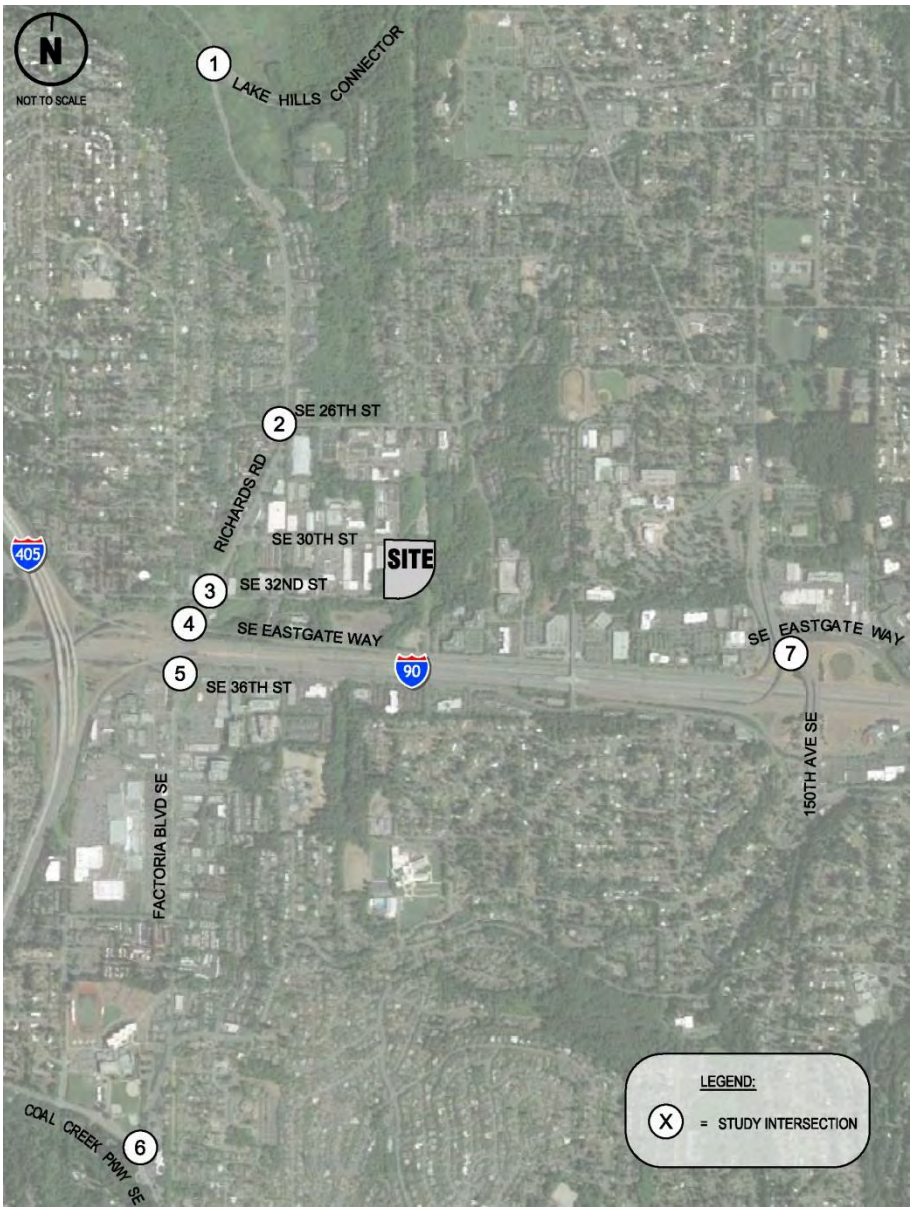


Figure 30
Factoria Study Intersections

Existing Conditions

Existing peak-hour intersection turning movements were collected at the off-site intersections in October 2014 for both weekday and Saturday periods. Detailed intersection turning movement traffic volumes are provided in **Attachment G (Off-Station Intersection Traffic Counts)**. The weekday and Saturday existing intersection traffic volumes are shown in **Figure 31**. **Table 21** summarizes the existing weekday and Saturday peak-hour LOS. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

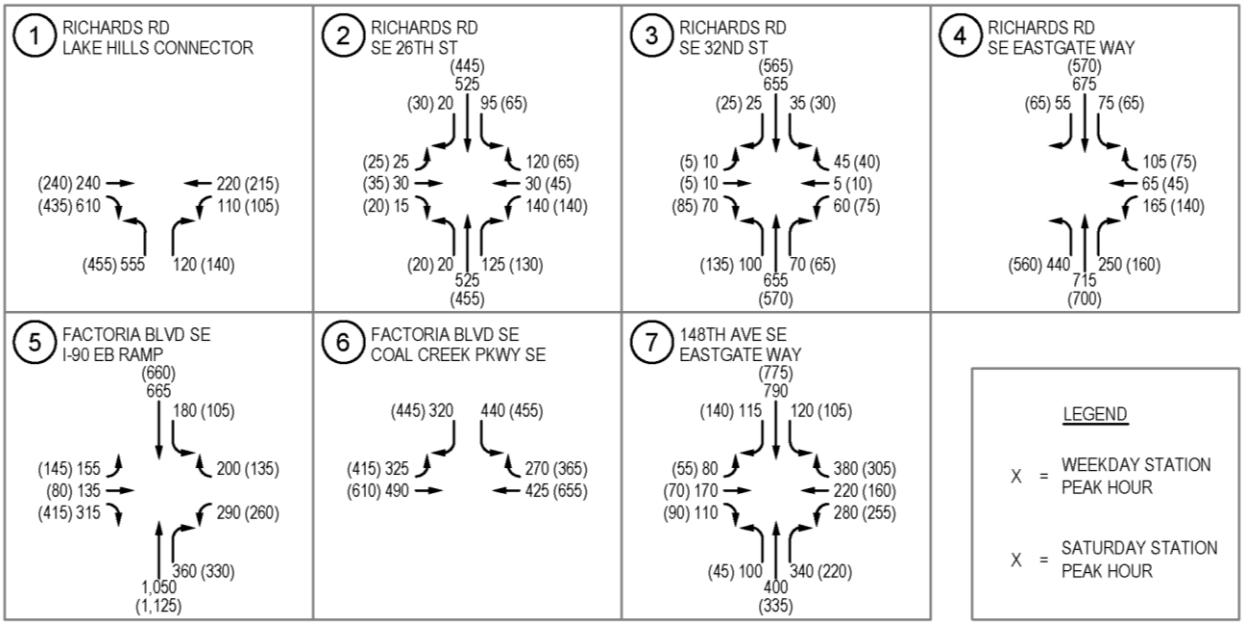


Figure 31
Factoria Existing Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 21
Factoria Existing Weekday and Saturday Station Peak Hours LOS Summary

	Weekday Station Peak-Hour (1 – 2 p.m.)				Saturday Station Peak-Hour (2 – 3 p.m.)		
Intersection	LOS[1]	Delay[2]	V/C[3]		LOS	Delay	V/C
1. Richards Rd / Lake Hills Connector[4]	B	16	0.52		B	15	0.41
2. Richards Rd / SE 26th St	B	11			B	13	
3. Richards Rd / SE 32nd St	A	4			A	4	
4. Richards Rd / SE Eastgate Way	B	14			B	18	
5. Factoria Blvd SE / I-90 EB Ramp	B	13			B	20	
6. Factoria Blvd SE / Coal Creek Pkwy SE	B	12			D	37	
7. 148th Ave SE / Eastgate Way	C	27			C	26	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology, 2000 methodology utilized where 2010 could not be applied.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections. Only reported for HCM 2000 methodology.
4. Evaluated using 2000 HCM methodology.

As shown in **Table 21**, under existing conditions all study intersections operate at LOS C or better during both weekday and Saturday.

Future 2023 Without-Project Conditions

Based on a review of the City of Bellevue's *(2015-2020) Transportation Improvement Program*, no planned improvements were identified that would impact the operations of the study intersections.

The 2023 without-project weekday and Saturday peak-hour traffic volumes were estimated by growing existing traffic volumes by 2 percent per year to 2023 conditions. This growth rate was determined in coordination with the City of Bellevue. No pipeline projects were identified within the study area. The 2023 without-project weekday and Saturday peak-hour traffic volumes are shown in **Figure 32**. Without-project conditions represent a condition that assumes that the station continues to operate as-is. No changes in volumes outside of normal background growth was assumed. This scenario is not consistent with Concept 0.

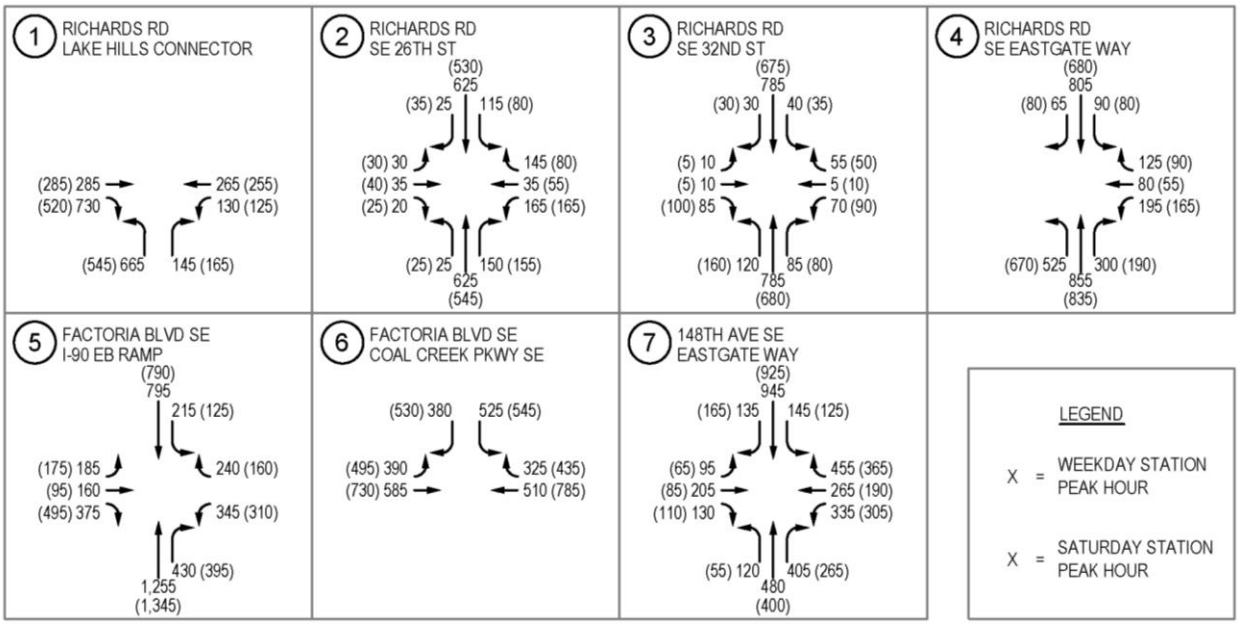


Figure 32
Factoria 2023 Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes

Signal timing was optimized for the 2023 analysis; optimizing the traffic signal timing takes into consideration the actuated nature of the signals and changes that would occur with growth in traffic volumes. **Table 22** summarizes the LOS results for the without-project weekday and Saturday peak hours.

Table 22
Factoria 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary

Intersection	Existing				2023 Without-Project		
	LOS[1]	Delay[2]	V/C[3]		LOS	Delay	V/C
Weekday Station Peak-Hour (1 – 2 p.m.)							
1. Richards Rd / Lake Hills Connector[4]	B	16	0.52		B	18	0.61
2. Richards Rd / SE 26th St	B	11			B	12	
3. Richards Rd / SE 32nd St	A	4			A	4	
4. Richards Rd / SE Eastgate Way	B	14			B	16	
5. Factoria Blvd SE / I-90 EB Ramp	B	13			B	17	
6. Factoria Blvd SE / Coal Creek Pkwy SE	B	12			B	14	
7. 148th Ave SE / Eastgate Way	C	27			C	33	
Saturday Station Peak-Hour (2 – 3 p.m.)							
1. Richards Rd / Lake Hills Connector	B	15	0.41		B	16	0.48
2. Richards Rd / SE 26th St	B	13			B	13	
3. Richards Rd / SE 32nd St	A	4			A	4	
4. Richards Rd / SE Eastgate Way	B	18			B	18	
5. Factoria Blvd SE / I-90 EB Ramp	B	20			B	20	
6. Factoria Blvd SE / Coal Creek Pkwy SE	D	37			D	37	
7. 148th Ave SE / Eastgate Way	C	26			C	26	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology, 2000 methodology utilized where 2010 could not be applied.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections. Only reported for HCM 2000 methodology.
4. Evaluated using 2000 HCM methodology.

As shown in **Table 22**, all study intersections continue to operate at LOS D or better under without-project conditions.

2023 Concept 0 Conditions

As previously discussed, the Concept 0 peak-hour traffic volumes are largest relative to the other concepts (see **Figure 28**) and as such the Concept 0 forecasts were utilized for the off-site intersection analysis. As this is an existing station, the net new trips were calculated and assigned to the off-site study intersections. To calculate the net new trips the station transactions (the inbound trips) were

provided by King County for the same day the off-station traffic volumes were collected in order to ensure the data was consistent. The net-new trips under 2023 Concept 0 conditions were then calculated by subtracting the existing transactions, which were doubled to account for in- and outbound trips from the station, from the 2023 Concept 0 forecast number of trips. This is shown in the Trip Generation **Tables 23** and **24** for with- and without-Renton conditions, respectively.

Table 23
Factoria Concept 0 With-Renton Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*38*	*38*	76		43	43	86
Concept 0							
Commercial-haul	19	19	38		141	141	282
Self-haul	94	94	188		11	11	22
Total	113	113	226		152	152	304
Net New Project Trips (2023 Concept 0 – Existing)	75	75	150		109	109	218

1. Existing total based on on-site transactions during the peak hours on the day the off-site intersection traffic volumes were collected.

As shown in **Table 23**, during the weekday peak-hour 150 net new trips are estimated, and during the Saturday peak-hour 218 net new trips are estimated.

Table 24
Factoria Concept 0 Without-Renton Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*38*	*38*	76		43	43	86
Concept 0							
Commercial-haul	21	21	42		157	157	314
Self-haul	106	106	212		11	11	22
Total	127	127	254		168	168	336
Net New Project Trips (2023 Concept 0 – Existing)	89	89	178		125	125	250

1. Existing total based on on-site transactions during the peak hours on the day the off-site intersection traffic volumes were collected.

As shown in **Table 24**, during the weekday peak-hour 178 net new trips are estimated, and during the Saturday peak-hour 250 net new trips are estimated. The net new trips under the without-Renton conditions are larger than the with-Renton net new trips, an increase of approximately 15 to 20 percent during the weekday and Saturday peak hours, respectively.

The trip distribution pattern for the self-haul vehicles was developed based on the survey respondents on the weekday and Saturday. As noted above, the survey respondents told the closest intersection and zip code they were coming from. Each respondent's answer was plotted so the trip distribution could be estimated. Due to the closure of Houghton, the users that go to Houghton under existing conditions that would shift to Factoria were included. Under with-Renton conditions the Factoria and Houghton respondents were used to calculate the trip distribution. Under Factoria without-Renton conditions, approximately 1/3 of the Renton users are anticipated to use Factoria and as such, the Factoria without-Renton trip distribution was adjusted by adding 1/3 of the Renton respondents to the Factoria with-Renton conditions. The trip distributions for Bow Lake on the weekday and Saturday under both with- and without-Renton conditions are shown in **Figures 33** and **34**.

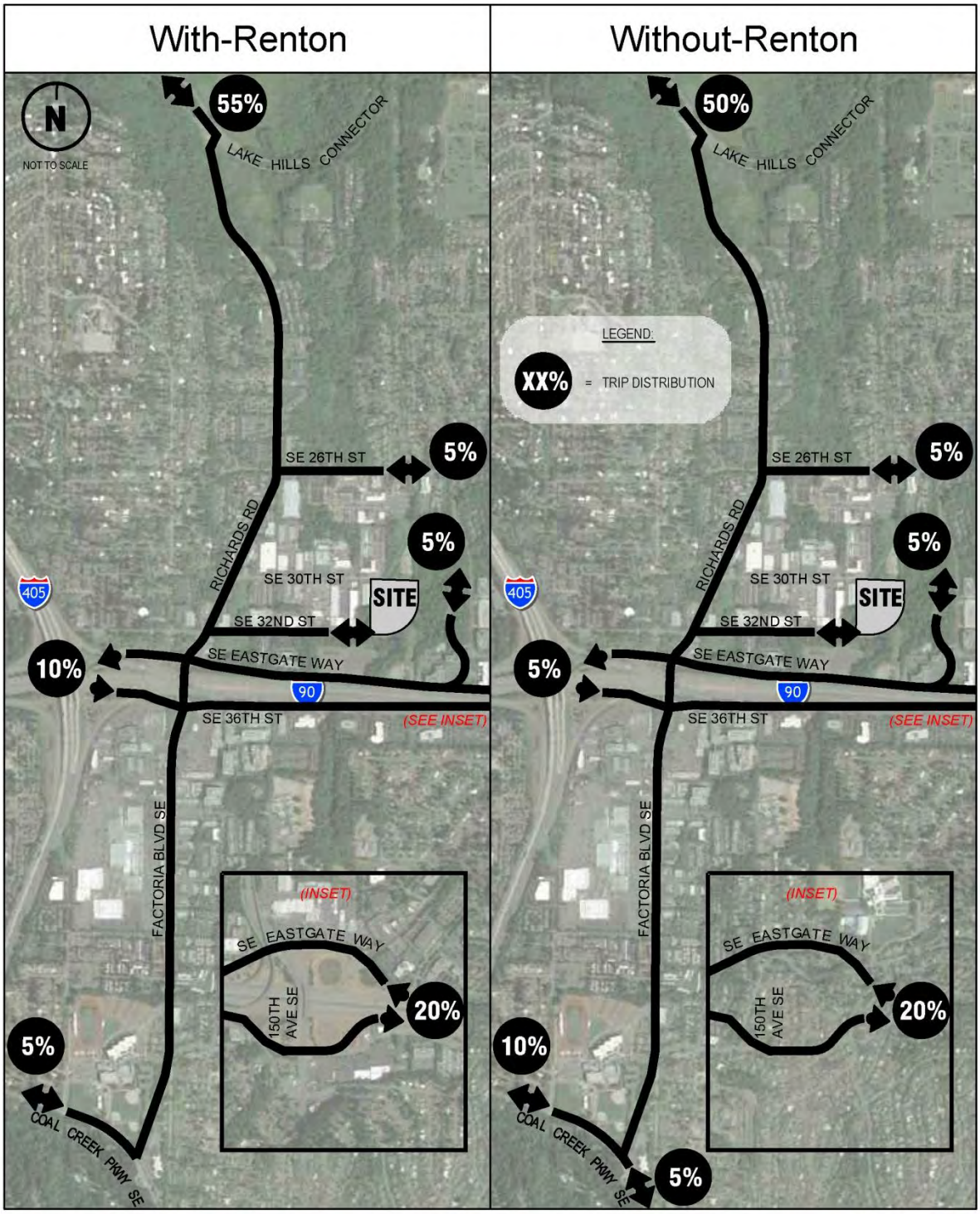


Figure 33
Factoria Weekday Trip Distribution (With and Without-Renton)

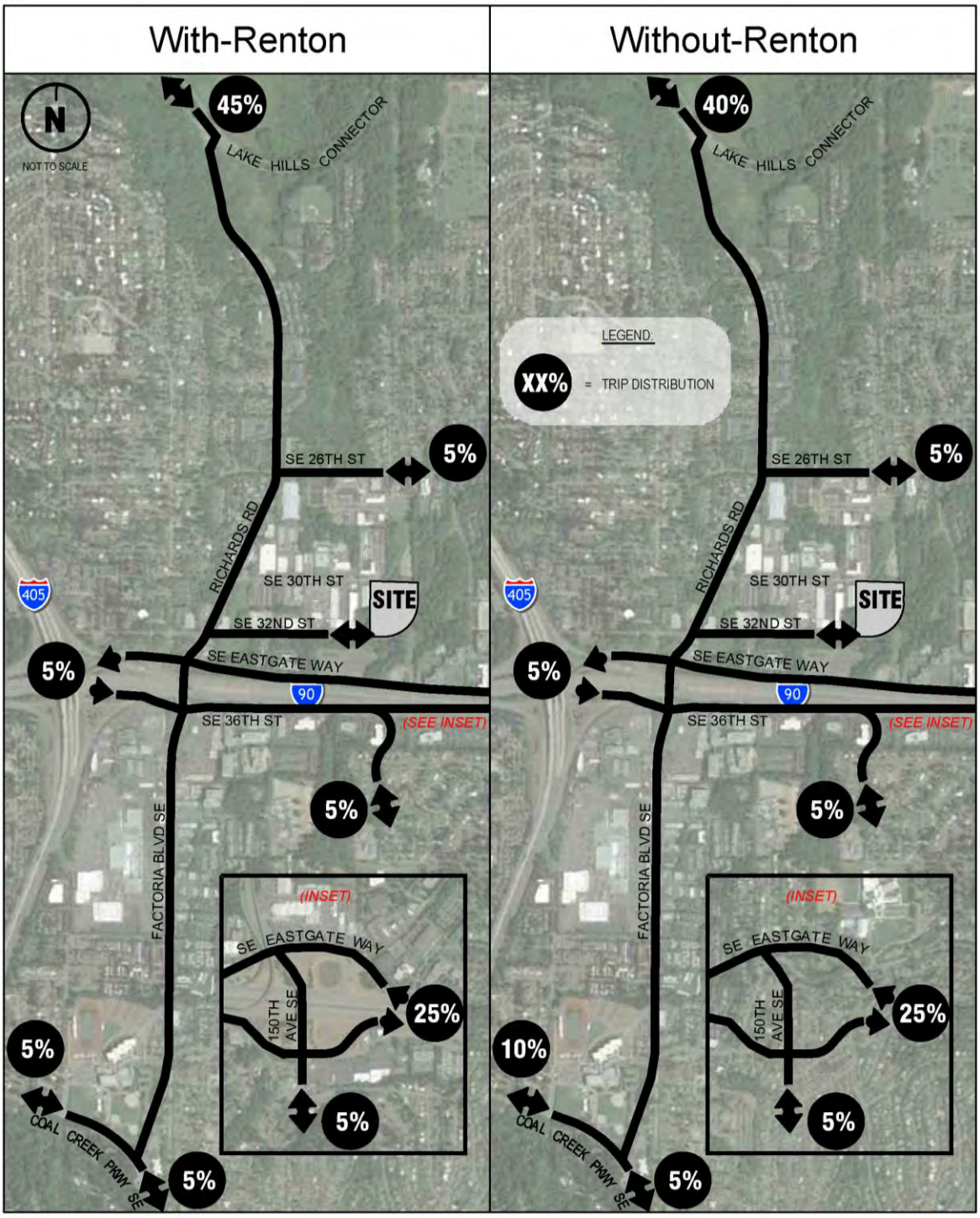


Figure 34
Factoria Saturday Trip Distribution (With and Without-Renton)

The net-new trips associated with each scenario assigned to the study intersections was based on the trip distributions. The net new project trip assignment for weekday and Saturday under both with- and without-Renton conditions are shown in **Figure 35**.

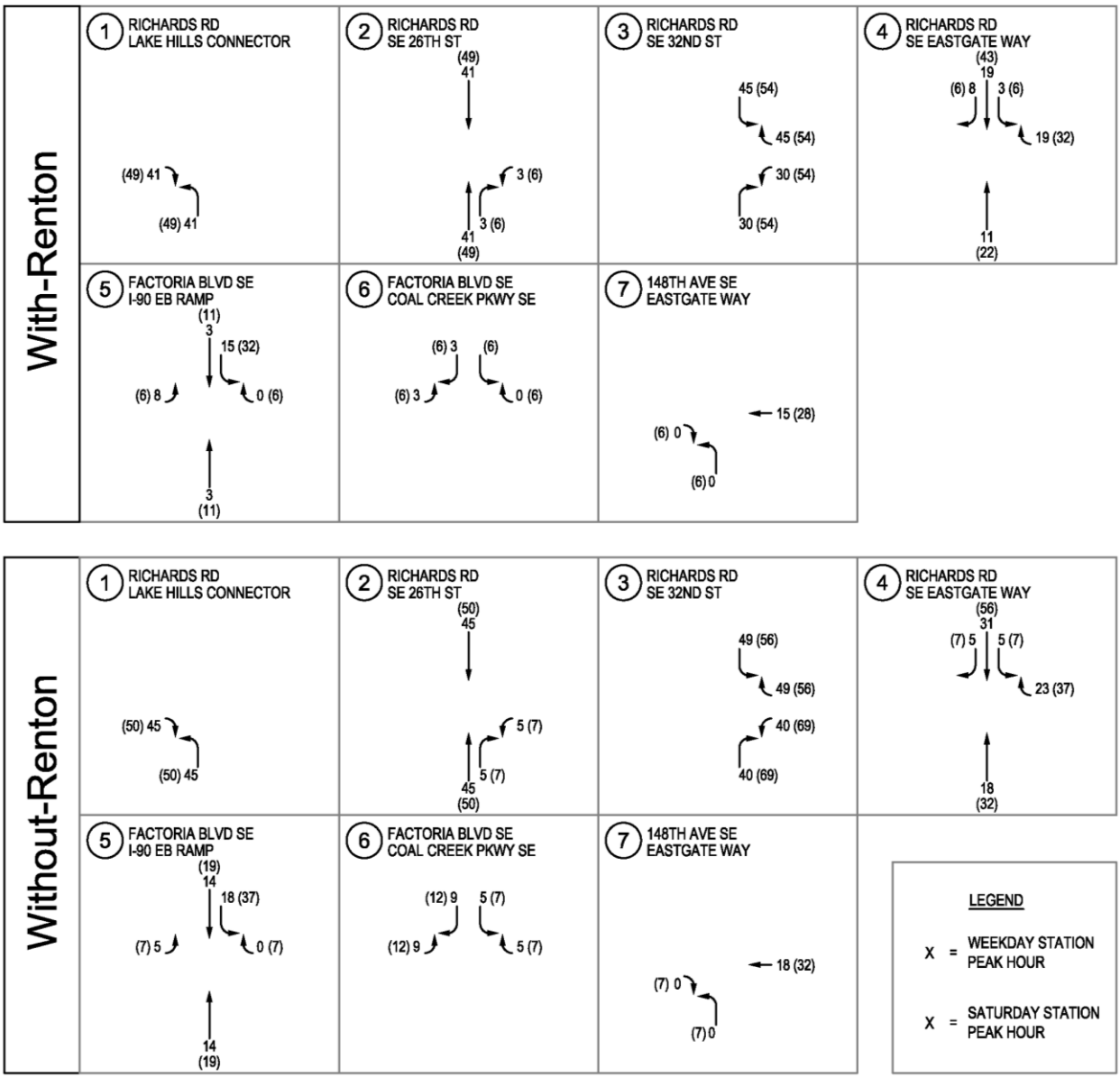


Figure 35
Factoria Concept 0 With and Without-Renton Net-New Trip Assignment

The with-project 2023 Concept 0 weekday and Saturday peak-hour traffic volumes both with- and without-Renton are shown in **Figure 36**. The largest percent impact of the Concept 0 traffic volumes relative to the without-project conditions was at the station access intersection, the Richards Road / SE 32nd Street intersection, under all Concept 0 scenarios. During the weekday station peak-hour percent increases under Concept 0 compared to without-project conditions range from 7 to 9 percent under with- and without-Renton conditions, respectively. Similarly, during the Saturday station peak-hour percent increases under Concept 0 compared to without-project conditions range from 11 to 13 percent during with- and without-Renton conditions, respectively.

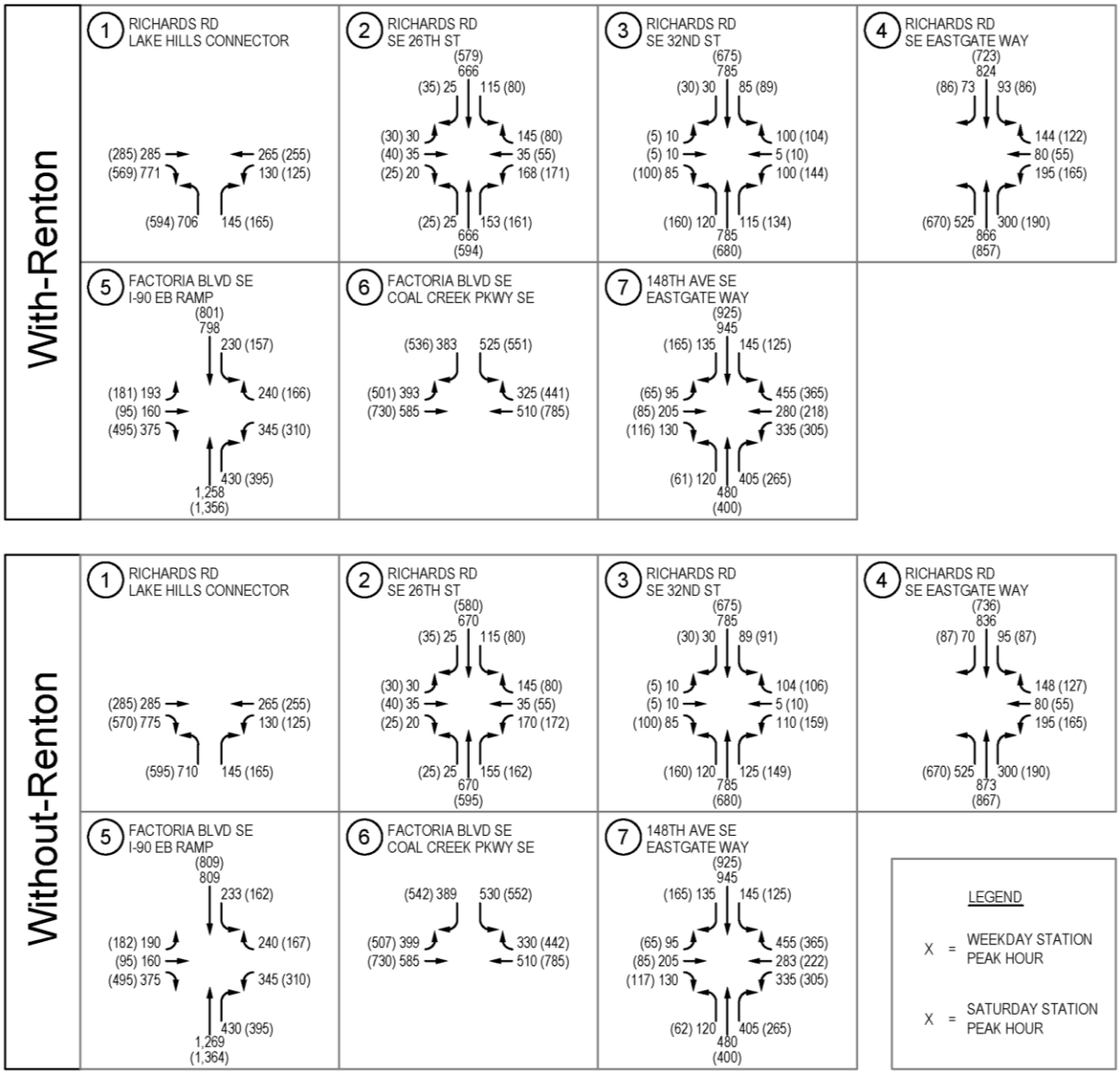


Figure 36

Factoria Concept 0 Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 25 provides a comparison between the 2023 Concept 0, both with- and without-Renton conditions and without-project conditions. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

Table 25
Factoria Concept 0 Weekday and Saturday Station Peak Hours LOS Summary

Intersection	2023 Without-Project				Concept 0 – With-Renton				Concept 0 – Without-Renton		
	LOS[1]	Delay[2]	V/C[3]		LOS	Delay	V/C		LOS	Delay	V/C
Weekday Station Peak-Hour (1 – 2 p.m.)											
1. Richards Rd / Lake Hills Connector[4]	B	18	0.61		B	19	0.63		B	19	0.64
2. Richards Rd / SE 26th St	B	12			B	12			B	12	
3. Richards Rd / SE 32nd St	A	4			A	5			A	5	
4. Richards Rd / SE Eastgate Way	B	16			B	16			B	16	
5. Factoria Blvd SE / I-90 EB Ramp	B	17			B	17			B	17	
6. Factoria Blvd SE / Coal Creek Pkwy SE	B	14			B	14			B	14	
7. 148th Ave SE / Eastgate Way	C	33			C	33			C	33	
Saturday Station Peak-Hour (2 – 3 p.m.)											
1. Richards Rd / Lake Hills Connector	B	16	0.48		B	17	0.51		B	17	0.51
2. Richards Rd / SE 26th St	B	13			B	13			B	13	
3. Richards Rd / SE 32nd St	A	4			A	5			A	6	
4. Richards Rd / SE Eastgate Way	B	18			B	19			B	19	
5. Factoria Blvd SE / I-90 EB Ramp	B	20			C	20			C	20	
6. Factoria Blvd SE / Coal Creek Pkwy SE	D	37			D	39			D	41	
7. 148th Ave SE / Eastgate Way	C	26			C	26			C	26	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology, 2000 methodology utilized where 2010 could not be applied.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections. Only reported for HCM 2000 methodology.
4. Evaluated using 2000 HCM methodology.

Table 25 shows that all study intersections would continue to operate at LOS D or better with the addition of the Concept 0 net new traffic during the weekday and Saturday peak hours under both with- and without-Renton conditions.

Factoria Station Summary

- Increases in station traffic range from 55 to 113 between the different concepts during the weekday peak period under with-Renton conditions, and range from 69 to 127 during the

weekday peak period under the without-Renton conditions. During the Saturday peak period, peak demand volumes range from 74 to 152 under with-Renton conditions, and range from 91 to 168 under without-Renton conditions.

- Analysis of on-site operations showed operational issues at the self-haul tipping floor, resulting in queues extending off-site, beyond the queue thresholds, as well as service times exceeding the adopted standards under Concepts 0 to 2 for the weekday and/or Saturday peak conditions.
    - Seven combinations were analyzed to improve on-site operations under Concepts 0 and 2 without-Renton conditions, both during the weekday and Saturday peak periods. Combinations C1 and C2 (banned materials, mandatory curbside collection, lower cost curbside bulky waste collection, and as part of Combination C2 only, an additional outbound scale) under Concepts 0 and 2, respectively, meet both the weekday and Saturday adopted service time and queue thresholds. The other combinations under the without-Renton conditions exceed either the adopted service times or the queue thresholds.
- Evaluation of off-station intersections showed minimal increases in off-station intersections for Concept 0. Concept 0 represented the highest peak demand and represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

Shoreline

Station Description – Access and Circulation

Primary vehicle access to the Shoreline station is provided via N 165th Street. The general public utilize N 165th Street to access the station, whereas the County truck access is provided to the south via a shared transit access to I-5. The transfer station site vicinity is shown in **Figure 37**.

The tipping floor is divided into two main sections, commercial and self-haul areas. The self-haul area is located in the eastern portion of the building and is accessed via the southeast side, and exits the building via the northeast corner. Commercial vehicles access the building from the southwest corner and exit the building through the west side of the building.

In the self-haul area there is a total of 10 stalls used for garbage. There are also two stalls on the commercial side of the floor. This station also includes areas a recycling area which is located north of the tipping floor. **Figure 38** shows the building configuration and vehicle access.

Figure 37
Shoreline Station Vicinity

Station Traffic Volumes

Data Collection. As noted previously, extensive data collection was conducted to support the development of the VISSIM model and establish the existing conditions on the station. While this information was largely used to calibrate the VISSIM model it also assists in providing the existing context against which the future conditions can be compared. A general outline of the data collected as well as a map of the specific locations for video collection, traffic counts, and service time studies is included in **Attachment C (Data Collection Summary)**.

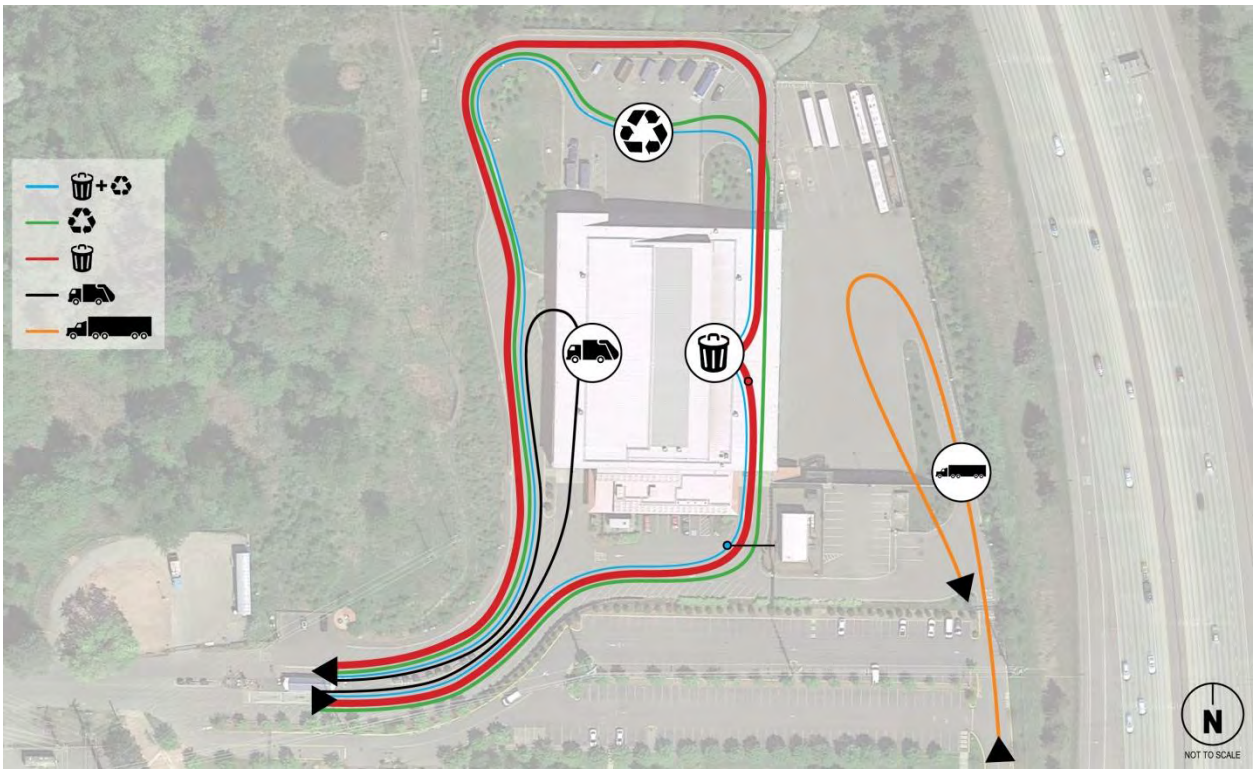


Figure 38
Shoreline On-Site Future Building Configuration and Circulation Patterns

Customer Origin/Destination Surveys. In addition to the traffic volume, queuing, and service time data, customer origin/destination data was collected to identify the general distribution of customer traffic utilizing this station during the days the surveys were conducted. The survey was conducted during the 3-hour period. The following questions were asked of customers as they exited the facility:

- Where are you coming from (zip code and closest intersection)?
- Are you coming from a home or business?

Not all customers participated in the survey so the information shown in **Table 26** represents a sample of the customers that utilized the station during the observation period. The response rate on the weekday was approximately 90 percent whereas the response rate on Saturday was approximately 95 percent.

Reponses from customers were mapped to the nearest major intersection using GIS. This information is shown in **Attachment D (Customer Origin/Destination Data)**. The responses from the surveys indicated the following distribution of customers are utilizing the Factoria station. Information is presented for the weekday and Saturday time periods; although as shown, the general distribution of customers is not that different.

Table 26
Shoreline Customer Trip Origin Summary

Trip Origin	Survey Respondents - Weekday		Survey Respondents - Saturday	
	Number	Percentage	Survey Origin	Percentage
Shoreline	32	22%	65	34%
Seattle[1]	89	61%	94	50%
King County (excluding Seattle/Shoreline)	11	8%	19	10%
Snohomish County	13	9%	12	6%
Total	145	100%	190	100%

1. The North Transfer Station in Seattle was closed at the time of observation increasing the percentage of Seattle customers.

Existing Traffic Volumes. Based on the data collected for the station, the weekday peak period (3 hours) was defined to be 11:45 a.m. to 2:45 p.m., and the Saturday period was 1:15 to 4:15 p.m. **Figure 39** shows the weekday and Saturday daily station traffic volumes.

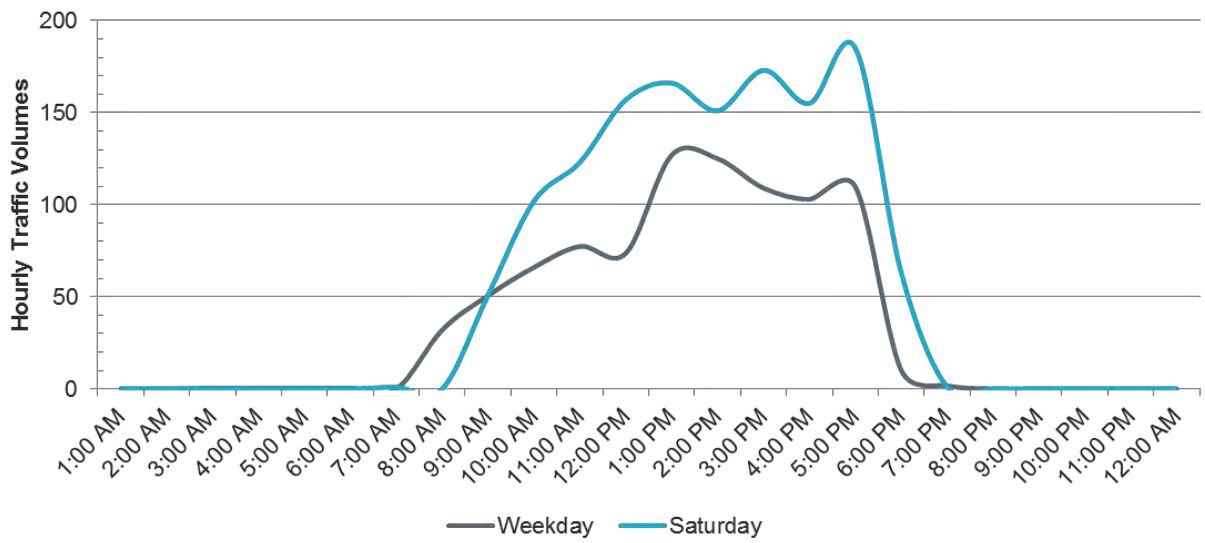


Figure 39
Shoreline Existing Typical Weekday and Saturday Traffic Volume Patterns

Future Traffic Volumes. Future traffic volumes at the station were forecast based on the methodologies described previously. Three (3)-hour peak volumes were developed based on annual tonnage forecasts developed for the station, distribution of weekday and Saturday activity, tonnage per vehicle, seasonal factors, and hourly trip generation patterns for the station. The detailed calculations showing all the key assumptions are included in **Attachment E (Trip Generation Forecasts)**.

Station forecasts were developed for Concepts 0, 1, 2, and 3, both with and without the Renton station operational. All concepts assumed that the Houghton station was closed. **Figure 40** summarizes the peak-hour volumes for each of the concepts (self-haul and commercial-haul) traffic for weekday and

Saturday conditions, with- and without-Renton to help understand the comparison of the station traffic forecasts for the different concepts. Although only the peak-hour is shown in this Figure, the peak-hour volumes are generally anticipated to occur for multiple hours as shown in the **Figure 39** hourly profile.

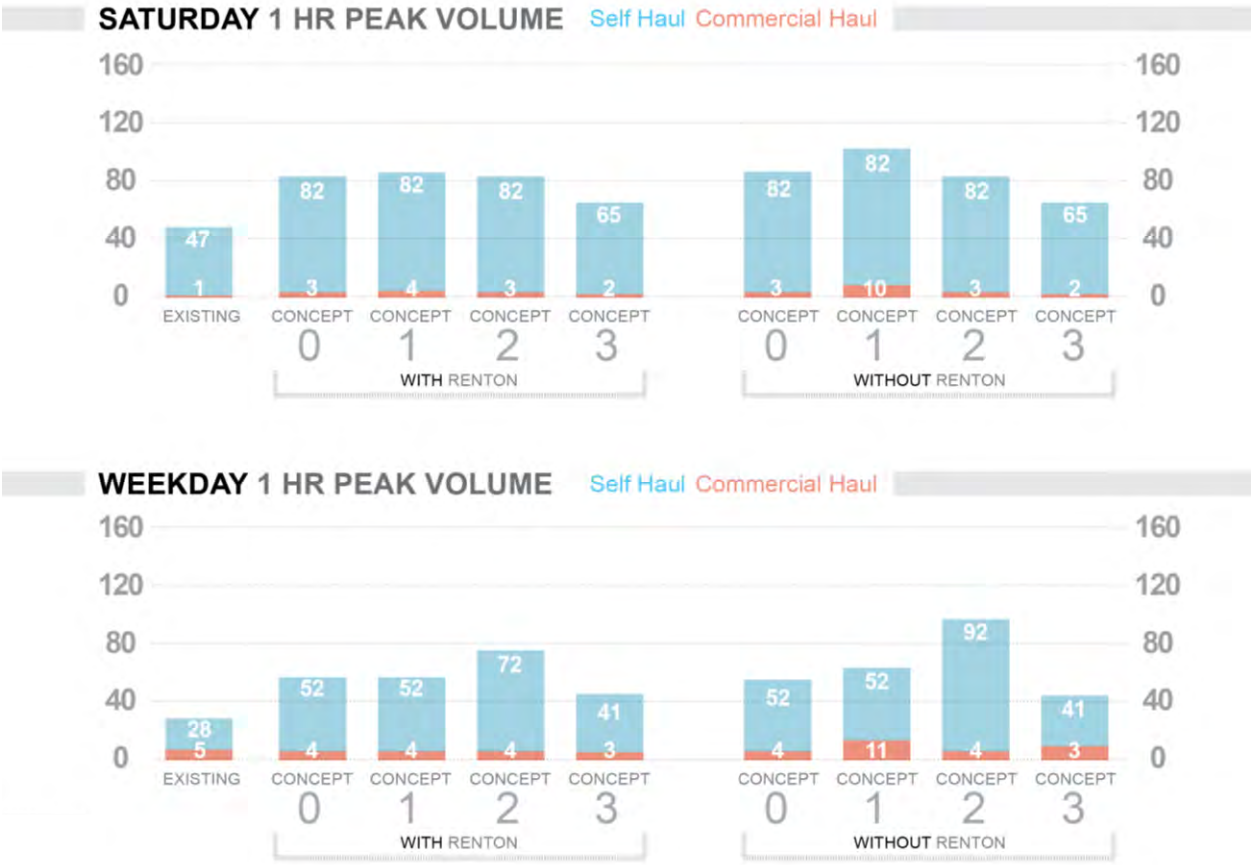


Figure 40
Shoreline Existing and Concepts 0-3 Peak-Hour Volumes

As shown in **Figure 40**, Concepts 0 and 1 are generally similar with commercial-haul volumes increasing up to seven vehicles under Concept 1, compared with Concept 0 under without-Renton conditions due to the redistribution of commercial vehicles. During the weekday peak hours, Concept 2 is consistently largest due to the restriction of self-haul vehicles at the Factoria station on the weekdays. In all scenarios, Concept 3 has the smallest peak-hour volumes due to the construction of NERTS.

On-Site Analysis Results

The on-site service times and inbound vehicle queues were calculated using the methodology described previously. The service time and queue results are shown in **Tables 27** and **28**, respectively, for existing and Concepts 0 to 3.

Table 27
Shoreline Existing and Concepts 0-3 Service Times Summary

Scenario	With-Renton Station					Without-Renton Station			
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday Peak-Hour		Saturday Peak-Hour	
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)		CH (h:mm)	SH (h:mm)	CH (h:mm)	SH (h:mm)
Standard[3]	*00:16*	*00:30*	*00:16*	*00:30*		*00:16*	*00:30*	*00:16*	*00:30*
Existing[4]	00:13	00:17	00:12	00:18					
Concept 0 (2023)	00:13	00:18	00:23	00:29		00:13	00:18	00:23	00:29
Concept 1 (2023)	00:13	00:18	00:24	00:29		00:18	00:20	00:26	00:35
Concept 2 (2023)	00:19	00:22	00:23	00:29		00:25	00:38	00:23	00:29
Concept 3 (2023)	00:13	00:18	00:14	00:19		00:13	00:18	00:14	00:19

1. CH = Commercial-haul
2. SH = Self-haul
3. Adopted standards as defined in King County Transfer plan (December 2007)
4. "Existing" is based on reduced volumes than observed due to the additional vehicles from North Transfer Station in Seattle.

As shown in **Table 27**, with Renton station, self-haul travel times for the weekday and Saturday conditions are anticipated to meet adopted service times. Commercial-haul service times are anticipated to exceed adopted standards with Concept 2 on weekdays and Concepts 0, 1, and 2 on Saturday.

Results without Renton station show overall increases in service times for several scenarios. When compared to the with-Renton scenario, the same concepts exceed the adopted service times during the same time periods with the exception of two additional cases of Concept 1 on the weekday (commercial-haul) and Concept 2 on the weekday (self-haul).

The travel time results are discussed by concept, below:

Concept 0 – The Concept 0 service times are the same under Concept 0 with- and without-Renton. The Concept 0 travel times are similar during the weekday peak-hour but have increased by 11 minutes for both commercial and self-haul travel times during the Saturday peak-hour, exceeding the commercial-haul adopted service time standards.

Concept 1 – The Concept 1 service times under with-Renton conditions, during both weekday and Saturday peak periods, are the same as the Concept 0 service times with only the commercial-haul during the Saturday peak period exceeding the adopted service times. Under without-Renton

conditions, all service times exceed the standards with the exception of the self-haul service time during the weekday peak period.

Concept 2 - Self-haul service times are within adopted standards for all scenarios with the exception of the weekday peak-hour under without-Renton conditions; however, the commercial-haul service times exceed the standard under all scenarios. Concept 2 restricts the self-haul vehicles at Factoria on the weekdays, which is why the weekday peak hours are effected and the Saturday peak hours under Concept 2 are the same as Concept 0.

Concept 3 - All travel times are below the adopted standards. Concept 3 constructs the NERTS making conditions similar to existing.

Table 28
Shoreline Existing and Concepts 0-3 Inbound Queues Summary

Scenario	With-Renton Station			Without-Renton Station	
	Weekday (Vehicles)[1]	Saturday (Vehicles)		Weekday (Vehicles)	Saturday (Vehicles)
Threshold[2]	***15***	***15***		***15***	***15***
Existing[3]	1	2			
Concept 0 (2023)	3	6		3	6
Concept 1 (2023)	3	6		3	46
Concept 2 (2023)	4	6		11	6
Concept 3 (2023)	2	3		2	3

1. Vehicle length assumed to be 32 feet.
2. Threshold - Threshold of 15 vehicle queue is approximate distance to adjacent intersection along N 165th Street (Meridian Avenue N / N 165th Street)
3. "Existing" is based on reduced volumes than observed due to the additional vehicles from North Transfer Station in Seattle.

As shown in **Table 28**, queues are within the queue length threshold under all scenarios with the exception of Concept 1 during the Saturday peak-hour under without-Renton conditions. The queue results are discussed by concept, below:

Concept 0 – The with- and without-Renton queues are the same under Concept 0. The queues have tripled under Concept 0 compared to existing conditions but the queues are well within the threshold of 15 vehicles.

Concept 1 - Concept 1 has similar queues to Concept 0 under all scenarios with the exception of during the Saturday peak-hour under without-Renton conditions. The Concept 1 during the Saturday peak-hour under without-Renton conditions exceeds the threshold queues. Concept 1 redirects commercial-haulers, increasing the number of commercial vehicles at Shoreline. Although both weekday and

Saturday peak hours increase the commercial-haul vehicles by seven vehicles under the without-Renton conditions, the Shoreline station is less able to accommodate the additional vehicles on Saturday. On Saturday, there are a greater number of self-haul vehicles and the number of self-haul vehicles that have lift trailers proportionally increase compared with the weekday. The lift-trailers are allowed on the commercial-haul tipping floor, and as they are the general public, they generally take longer on the tipping floor than the commercial vehicles. As stated above, the commercial-haul tipping floor is assumed to have two stalls on Saturday, and a greater percentage of the time if taken up by the self-haul vehicles. The greater volumes through the commercial-haul tipping floor cannot be accommodated which creates a queue from the commercial-haul tipping floor which blocks the internal circulation of the station, resulting in the long inbound queue.

Concept 2 - Concept 2 is within the queue thresholds under all scenarios.

Concept 3 - All queues are within the threshold queue lengths. Concept 3 constructs the NERTS making conditions similar to existing.

Summary of Constraints

The primary constraints at the Shoreline station were found to be the commercial-haul tipping floor and the outbound scale. These constraints were identified with the modeling of the station in VISSIM.

Commercial-Haul Tipping Floor - The primary constraint identified at the Shoreline station was found to be the commercial-haul tipping floor. The commercial-haul tipping floor is constrained by the number of stalls and the dwell time of vehicles on the tipping floor itself.

Outbound Scale - Another constraint at the station is the outbound scale. Queues at the outbound scale extend back to the commercial tipping floor during the Saturday peak-hour resulting in larger commercial-haul service times. If the capacity of the commercial tipping floor were to increase their capacity by decreasing on-floor dwell times or increasing stalls the outbound scale would become a more notable constraint.

The Tier 1 screening primarily focused on the overall reduction in station traffic anticipated under the particular strategy. The strategies analyzed are listed above in **Tier 1/Tier 2 Screening Methodology**. The anticipated peak-hour demand reduction in station traffic under both the with- and without-Renton scenarios during the weekday and Saturday peak hours are summarized in **Attachment F (Demand Management Strategy Trip Reductions)**. The percent reductions shown in the table are based on modeling conducted by the division. Reductions from strategies range from 0 to 34 percent of the peak-hour demand. Mandatory curbside garbage collection was considered has a possible strategy at Shoreline and had a 13.7 percent reduction in traffic. The percentage reductions were provided to Transpo for use in the traffic volume forecasts and modeling.

It is important to note that not all improvement strategies are as effective if combined. Thus, the identification of the improvement combinations accounts for the relationship to one another. In addition to the transportation demand strategies noted above, potential physical station improvements

were identified to address the operational constraints. These improvements considered the addition of a TSO staff member on the commercial floor and the addition of an outbound scale.

Strategy combinations were identified based on the results of the Tier 1 screening process. The Tier 2 screening process included the testing of the strategy combinations using VISSIM. The effectiveness of the strategies were tested for the without-Renton scenario as that time period represents the period with the highest peak-hour demand for the stations. Various strategy combinations were applied for Concepts 0 to 2. No modeling was necessary for Concept 3 based on the results of the modeling. The following combinations were identified for detailed evaluation:

Combination A –

A1. Add a TSO/person on commercial floor

A2. Add a TSO/person on commercial floor and additional outbound scale

Combination B – Add a TSO/person on commercial floor and mandatory curbside collection

The results of the combinations tested on the Concepts are shown and discussed below:

<u>Concept 0</u>

Combinations A and B were tested on the Concept 0 without-Renton traffic volumes as the without-Renton traffic volumes are higher, modeling the worst-case scenarios. Only the Saturday peak hours were evaluated under Concept 0 as the weekday peak hours under Concept 0 already met the adopted standards for service times and thresholds for queues. The queue and service times of the combinations are shown in **Table 29**.

Table 29
Shoreline Combinations Service Times and Queues (Concept 0 – 2023 Without-Renton)

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	***00:16***	***00:30***	***00:16***	***00:30***		***15[3]***	***15***
Existing[6]	00:13	00:17	00:12	00:18		1	2
Concept 0	00:13	00:18	00:23	00:29		3	6
Concept 0 + Combination A1	-[7]	-	00:20	00:29		-	4
Concept 0 + Combination A2	-	-	00:12	00:17		-	4
Concept 0 + Combination B	-	-	00:15	00:22		-	4

1. CH = Commercial-haul
2. SH = Self-haul
3. Vehicle length assumed to be 32 feet.
4. Adopted standards as defined in King County Transfer plan (December 2007)
5. Threshold - Threshold of 15 vehicle queue is approximate distance to adjacent intersection along N 165th Street (Meridian Avenue N / N 165th Street).
6. "Existing" is based on reduced volumes than observed due to the additional vehicles from North Transfer Station in Seattle.
7. Weekday Concept 0 combinations not modeled because Concept 0 meets adopted service times and inbound queue thresholds.

As shown in **Table 29**, Concept 0 with the addition of Combinations A2 or B, meet the adopted standards for service times and thresholds for queues. Concept 0, with Combination A1, exceeds the adopted commercial-haul travel time standards by approximately 4 minutes.

Concept 1

Concept 1 with Combinations A and B were evaluated with Concept 1 for the without-Renton conditions. **Table 30** shows that Concept 1 along with any strategy combination meets the weekday adopted service times and queue thresholds, but only Concept 1 with Combination A2 meet the Saturday adopted service times.

Table 30
Shoreline Combinations Service Times and Queues (Concept 1 – 2023 Without-Renton)

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	***00:16***	***00:30***	***00:16***	***00:30***		***15[3]***	***15***
Existing[6]	00:13	00:17	00:12	00:18		1	2
Concept 0	00:13	00:18	00:23	00:29		3	6
Concept 1	00:18	00:20	00:26	00:35		3	46
Concept 1 + Combination A1	00:15	00:20	00:22	00:37		3	7
Concept 1 + Combination A2	00:13	00:17	00:12	00:17		3	6
Concept 1 + Combination B	00:15	00:19	00:20	00:27		3	5

1. CH = Commercial-haul
2. SH = Self-haul
3. Vehicle length assumed to be 32 feet
4. Adopted standards as defined in King County Transfer plan (December 2007)
5. Threshold - Threshold of 10 vehicle queue is approximate distance to adjacent driveway along SE 32nd Street (station access)
6. Existing conditions based on calibrated VISSIM model – September 2014

Concept 2

The queue and service times of the Combinations A and B were tested with Concept 2 are shown in **Table 31** under the without-Renton conditions.

Table 31
Shoreline Combinations Service Times and Queues (Concept 2 – 2023 Without-Renton)

Scenario	Service Times					Queues	
	Weekday Peak-Hour		Saturday Peak-Hour			Weekday (Vehicles)[3]	Saturday (Vehicles)
	CH[1] (h:mm)	SH[2] (h:mm)	CH (h:mm)	SH (h:mm)			
Standard[4]/ Threshold[5]	***00:16***	***00:30***	***00:16***	***00:30***		***15[3]***	***15***
Existing[6]	00:13	00:17	00:12	00:18		1	2
Concept 0	00:13	00:18	00:23	00:29		3	6
Concept 2	00:25	00:38	00:23	00:29		11	6
Concept 2 + Combination A1	00:23	00:38	00:20	00:29		11	4
Concept 2 + Combination A2	00:13	00:19	00:12	00:17		8	4
Concept 2 + Combination B	00:21	00:28	00:15	00:22		5	4

1. CH = Commercial-haul
2. SH = Self-haul
3. Vehicle length assumed to be 32 feet
4. Adopted standards as defined in King County Transfer plan (December 2007)
5. Threshold - Threshold of 10 vehicle queue is approximate distance to adjacent driveway along SE 32nd Street (station access)
6. Existing conditions based on calibrated VISSIM model – September 2014

Table 31 shows that only Concept 2 along with Combination A2 meets the adopted service times and queue thresholds for both weekday and Saturday. Concept 2 with Combination B meets the adopted service times and queues during the Saturday peak conditions. Concept 2 with Combination A1 does not meet the adopted service times for either the weekday or Saturday peak periods.

Concept 3

Tables 27 and **28** show that Concept 3 is within the adopted travel times and threshold inbound queues, and as such, no combinations were modeled.

Off-station Traffic Analysis Results

The analysis includes an evaluation of intersection operations at seven intersections. The study intersections include and are shown in **Figure 41**:

1. Meridian Ave N / N 175th St
2. I-5 SB Ramps / N 175th St
3. I-5 NB Ramps / N 175th St
4. Meridian Ave N / N 165th St
5. Meridian Ave N / N 145th St
6. Southbound Ramps / N 145th St
7. 5th Ave NE / NE 145th St

These study intersections were evaluated during the weekday and Saturday peak hours at Shoreline, and identified during the station observations in September 2014. The peak hours identified were 12:00 to 1:00 p.m., and 2:00 to 3:00 p.m. for the weekday and Saturday conditions, respectively.

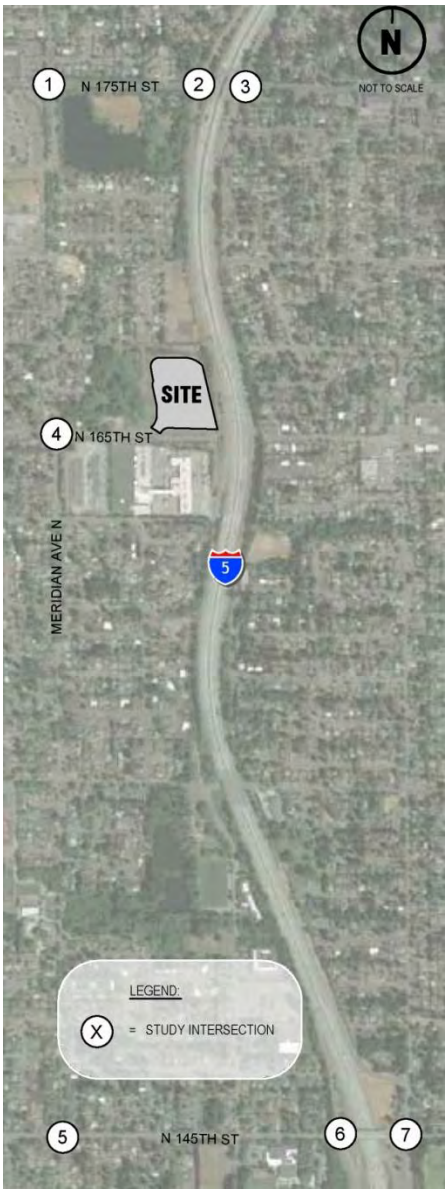


Figure 41
Shoreline Study Intersections

Intersection LOS was calculated at the study intersections using the LOS method described previously. Based on the City of Shoreline's Comprehensive Plan, the adopted standard LOS is LOS D.

Existing Conditions

Existing peak-hour intersection turning movements were collected at the off-station intersections in October 2014 for both weekday and Saturday periods. Detailed intersection turning movement traffic volumes are provided in **Attachment G (Off-Station Intersection Traffic Counts)**. The weekday and Saturday existing intersection traffic volumes are shown in **Figure 42**.

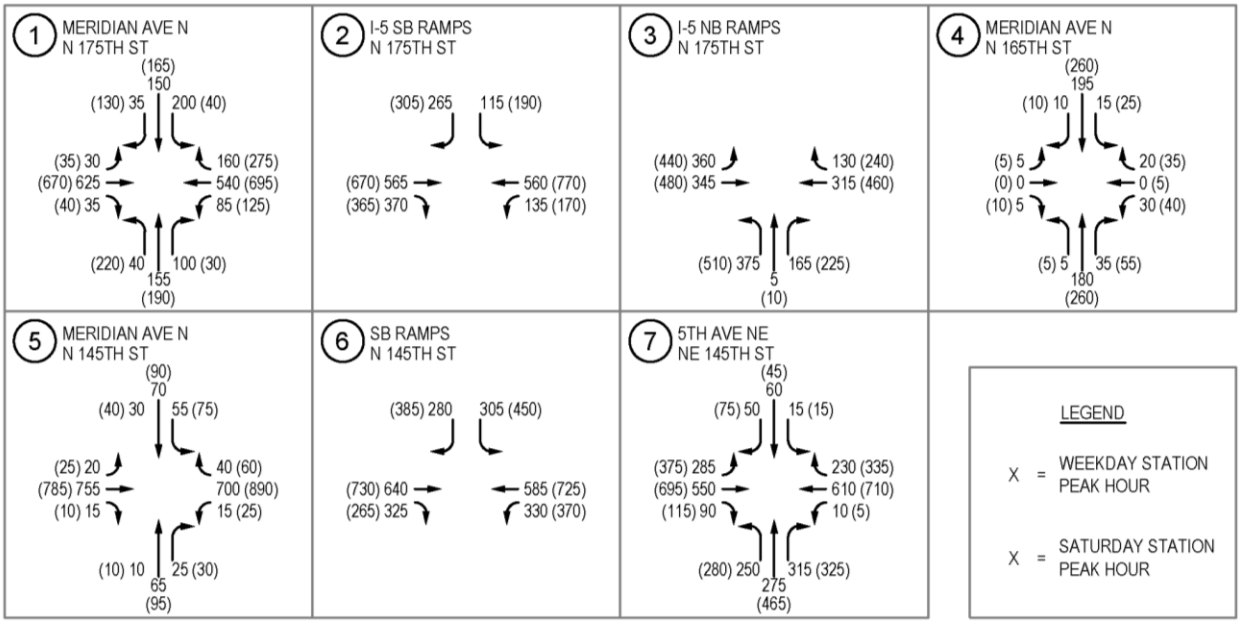


Figure 42
Shoreline Existing Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 32 summarizes the existing weekday and Saturday peak-hour LOS. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

Table 32
Shoreline Existing Weekday and Saturday Station Peak Hours LOS Summary

Intersection	Traffic Control	Weekday Station Peak-Hour (12 – 1 p.m.)				Saturday Station Peak-Hour (2 – 3 p.m.)		
		LOS[1]	Delay[2]	V/C[3] or WM[4]		LOS	Delay	V/C or WM
1. Meridian Ave N / N 175th St	Signalized	C	22			C	28	
2. I-5 SB Ramps / N 175th St[5]	Signalized	B	19	0.54		B	19	0.57
3. I-5 NB Ramps / N 175th St[5]	Signalized	B	16	0.56		D	48	0.87
4. Meridian Ave N / N 165th St	Two-Way Stop Controlled	B	13	WB		C	15	WB
5. Meridian Ave N / N 145th St	Signalized	A	8			A	10	
6. I-5 SB Ramps / N 145th St	Signalized	C	28			B	14	
7. 5th Ave NE / NE 145th St	Signalized	D	36			D	46	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology, 2000 methodology utilized where 2010 could not be applied.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections. Only reported for HCM 2000 methodology.
4. WM= Worst movement reported for unsignalized intersections where WB = westbound.
5. N 175th Street and the I-5 Ramp intersections were evaluated using 2000 HCM methodology.

As shown in **Table 32**, under existing conditions all study intersections operate at LOS D or better during both weekday and Saturday, meeting the City of Shoreline's LOS standard.

Future 2023 Without-Project Conditions

Based on a review of the City of Shoreline's *(2015-2020) Transportation Improvement Program*, the following improvements were identified:

- **Meridian Avenue N / N 175th Street intersection** – A northbound through lane along Meridian Avenue N is planned which will include widening of the northbound approach and re-channelization of the southbound approach to a single southbound left turn lane as well as extending the length of the westbound left turn pocket.
- **N 175th Street / I-5 Ramps** – Extend the left-turn pockets along NE 175th Street and improve the interchanges through coordination with WSDOT.
- **Re-channelization along Meridian Avenue N** – Re-channelize Meridian Avenue N to provide a two-way center left-turn lane and bicycle lanes by removing on-street parking.
- **145th Street Corridor Improvement** – The corridor is planned to be studied to help identify the specific improvements. Some that have been identified at this point include improvements to accommodate the future light rail station, and multiple non-motorized improvements along the

corridor. This project is anticipated to continue past 2020, and due to no specific operational improvements identified no changes to the future network were included.

The 2023 without-project weekday and Saturday peak-hour traffic volumes were estimated by growing existing traffic volumes by 0.25 percent per year to 2023 conditions. This growth rate was determined in coordination with the City of Shoreline. No pipeline projects were identified within the study area. The 2023 without-project weekday and Saturday peak-hour traffic volumes are shown in **Figure 43**. Without-project conditions represent a condition that assumes that the station continues to operate as-is. No changes in station volumes outside of normal background growth was assumed. This scenario is not consistent with Concept 0.

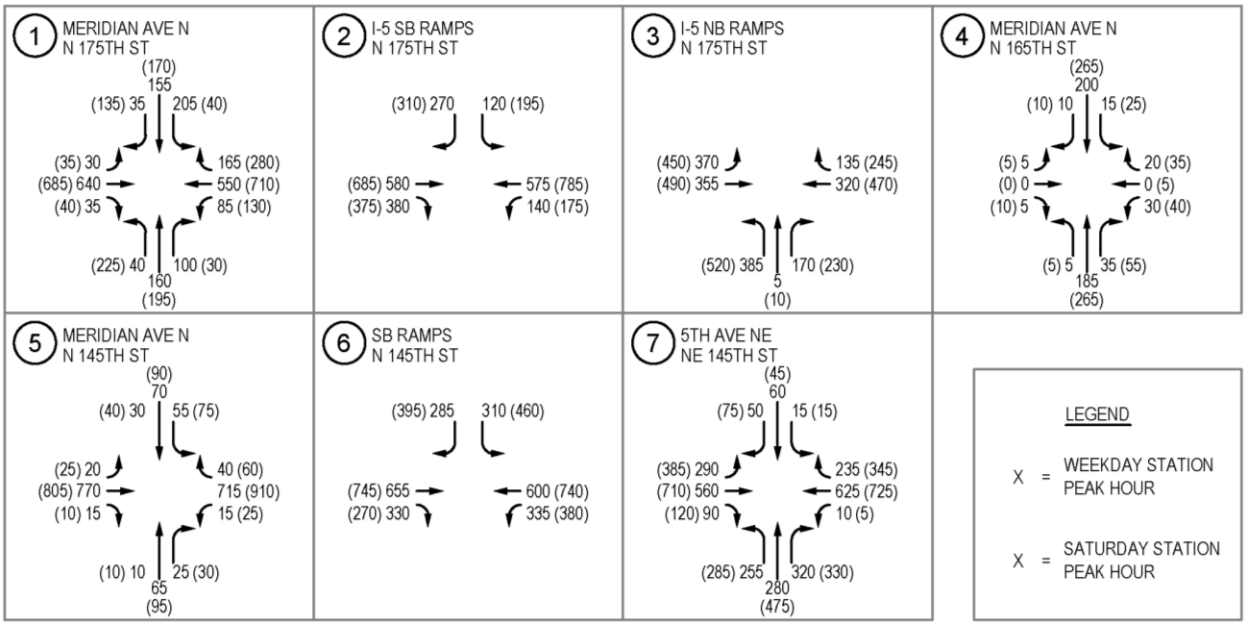


Figure 43
Shoreline 2023 Without-Project Weekday and Saturday Station Peak-Hour Traffic Volumes

For all study intersections, lane geometrics and traffic control remained consistent with existing conditions for 2023 without-project conditions except for the inclusion of the transportation improvement projects noted above. Signal timing was optimized for the 2023 analysis; optimizing the traffic signal timing takes into consideration the actuated nature of the signals and changes that would occur with growth in traffic volumes. **Table 33** summarizes the LOS results for the without-project weekday and Saturday peak hours.

Table 33
Shoreline 2023 Without-Project Weekday and Saturday Station Peak Hours LOS Summary

Intersection	Traffic Control	Existing				2023 Without-Project		
		LOS[1]	Delay[2]	V/C[3] or WM[4]		LOS	Delay	V/C or WM
Weekday Station Peak-Hour (12 – 1 p.m.)								
1. Meridian Ave N / N 175th St	Signalized	C	22			C	23	
2. I-5 SB Ramps / N 175th St[5]	Signalized	B	19	0.54		B	20	0.55
3. I-5 NB Ramps / N 175th St[5]	Signalized	B	16	0.56		B	16	0.58
4. Meridian Ave N / N 165th St	Two-Way Stop Controlled	B	13	WB		B	13	WB
5. Meridian Ave N / N 145th St	Signalized	A	8			A	8	
6. I-5 SB Ramps / N 145th St	Signalized	C	28			C	27	
7. 5th Ave NE / NE 145th St	Signalized	D	36			D	38	
Saturday Station Peak-Hour (2 – 3 p.m.)								
1. Meridian Ave N / N 175th St	Signalized	C	28			C	30	
2. I-5 SB Ramps / N 175th St	Signalized	B	19	0.57		C	21	0.69
3. I-5 NB Ramps / N 175th St	Signalized	D	48	0.87		D	52	0.89
4. Meridian Ave N / N 165th St	Two-Way Stop Controlled	C	15	WB		C	16	WB
5. Meridian Ave N / N 145th St	Signalized	A	10			A	10	
6. I-5 SB Ramps / N 145th St	Signalized	B	14			C	30	
7. 5th Ave NE / NE 145th St	Signalized	D	46			D	48	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology, 2000 methodology utilized where 2010 could not be applied.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections. Only reported for HCM 2000 methodology.
4. WM= Worst movement reported for unsignalized intersections where WB = westbound.
5. N 175th Street and the I-5 Ramp intersections were evaluated using 2000 HCM methodology.

Table 33 shows, under 2023 without-project conditions, all study intersections continue to operate within City of Shoreline standards; operating at LOS D or better with the greatest increase in delay of 16 seconds occurring at the I-5 Southbound Ramps / N 145th Street intersection during the Saturday station peak-hour under without-project conditions compared to existing conditions.

2023 Concept 2 Conditions

As previously discussed, the Concept 2 peak-hour traffic volumes are largest relative to the other concepts (see **Figure 40**) and as such the Concept 2 forecasts were utilized for the off-site intersection analysis. As this is an existing station, the net new trips were calculated and assigned to the off-site study intersections. To calculate the net new trips the station transactions (inbound trips) were provided by King County for the same day the off-station traffic volumes were collected in order to ensure the data was consistent. The net-new trips under 2023 Concept 2 conditions were then calculated by subtracting the existing transactions, which were doubled to account for in- and outbound trips from the station, from the 2023 Concept 2 forecast number of trips. This is shown in the Trip Generation **Tables 34** and **35** for with- and without-Renton conditions, respectively.

Table 34
Shoreline Concept 2 With-Renton Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*45*	*45*	90		68	68	136
Concept 2							
Commercial-haul	4	4	8		3	3	6
Self-haul	72	72	144		82	82	164
Total	76	76	152		85	85	170
Net New Project Trips (2023 Concept 2 – Existing)	31	31	62		17	17	34

1. Existing total based on on-site transactions during the peak hours on the day the off-site intersection traffic volumes were collected.

As shown in **Table 34**, with Concept 2, 62 net new weekday station peak-hour trips and 34 net new Saturday station peak-hour trips are forecast to impact off-site intersections.

Table 35
Shoreline Concept 2 Without-Renton Trip Generation Summary

	Weekday Station Peak-Hour				Saturday Station Peak-Hour		
	Inbound	**Outbound**	**Total**		**Inbound**	**Outbound**	**Total**
Existing Total[1]	*45*	*45*	90		68	68	136
Concept 2							
Commercial-haul	4	4	8		3	3	6
Self-haul	92	92	184		82	82	164
Total	96	96	192		85	85	170
Net New Project Trips (2023 Concept 2 – Existing)	51	51	102		17	17	34

1. Existing total based on on-site transactions during the peak hours on the day the off-site intersection traffic volumes were collected.

The weekday peak-hour trips are approximately 60 percent larger under without-Renton conditions compared to with-Renton conditions. The Saturday peak-hour trips are the same under with- and without-Renton conditions. This is because under Concept 2 conditions, only the weekday is affected due to the restriction of vehicles at Factoria. As shown in **Table 35**, during the weekday peak-hour 102 net new trips are estimated, and during the Saturday peak-hour 34 net new trips are estimated.

The trip distribution pattern for the self-haul vehicles was developed based on the survey respondents on the weekday and Saturday. As noted above, the survey respondents told the closest intersection and zip code they were coming from. Each respondents answer was plotted so the trip distribution could be estimated. Due to the closure of Houghton, the users that go to Houghton under existing conditions that would shift to Shoreline were included. The closure of Renton does not affect the Shoreline distribution, resulting in the same distribution for with- and without-Renton. The trip distributions for Shoreline on the weekday and Saturday under both with- and without-Renton conditions are shown in **Figure 44**.

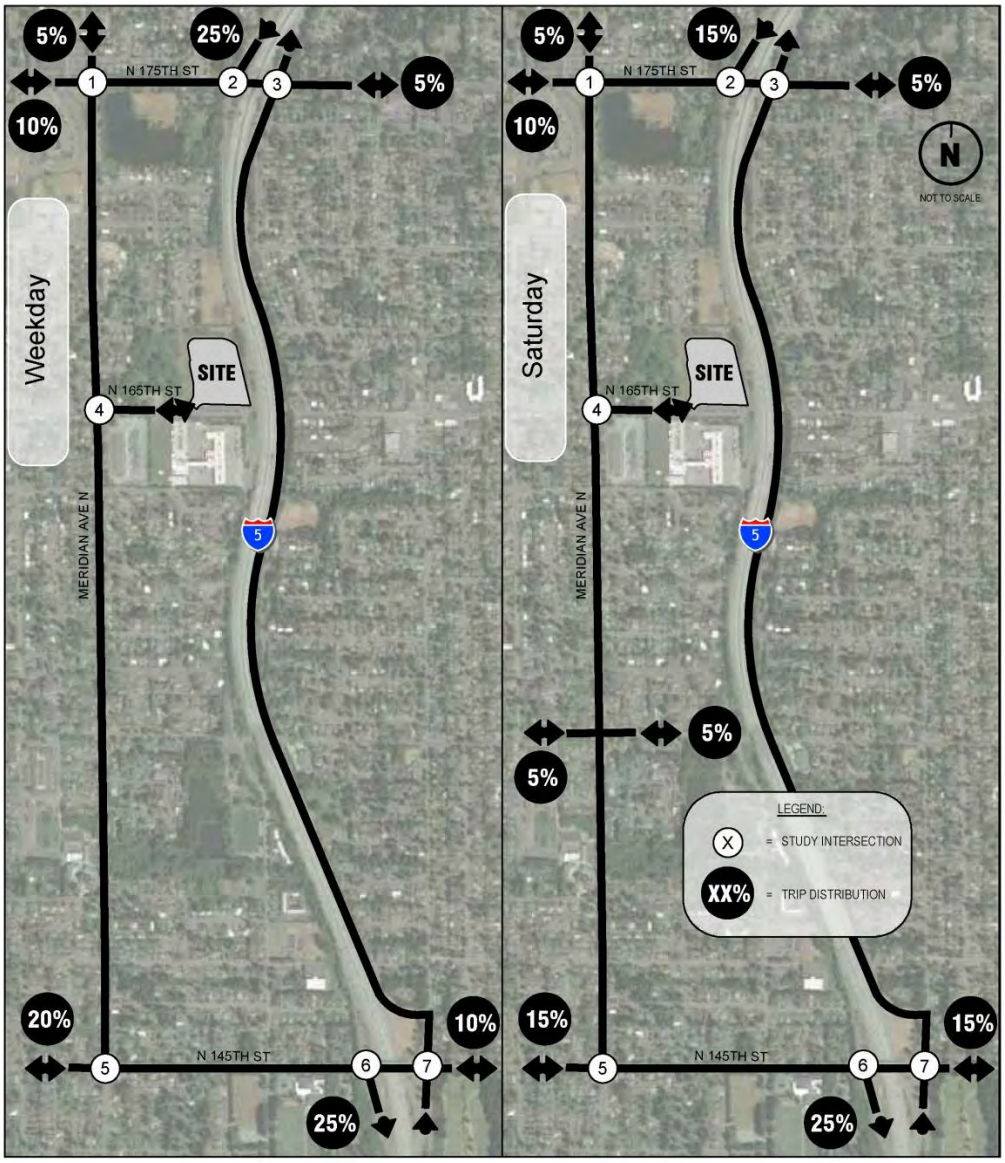


Figure 44
Shoreline Weekday and Saturday Trip Distribution (With and Without-Renton)

The net-new trips associated with each scenario was assigned to the study intersections based on the trip distributions. The net-new project trip assignment for weekday and Saturday under both with- and without-Renton conditions are shown in **Figure 45**.

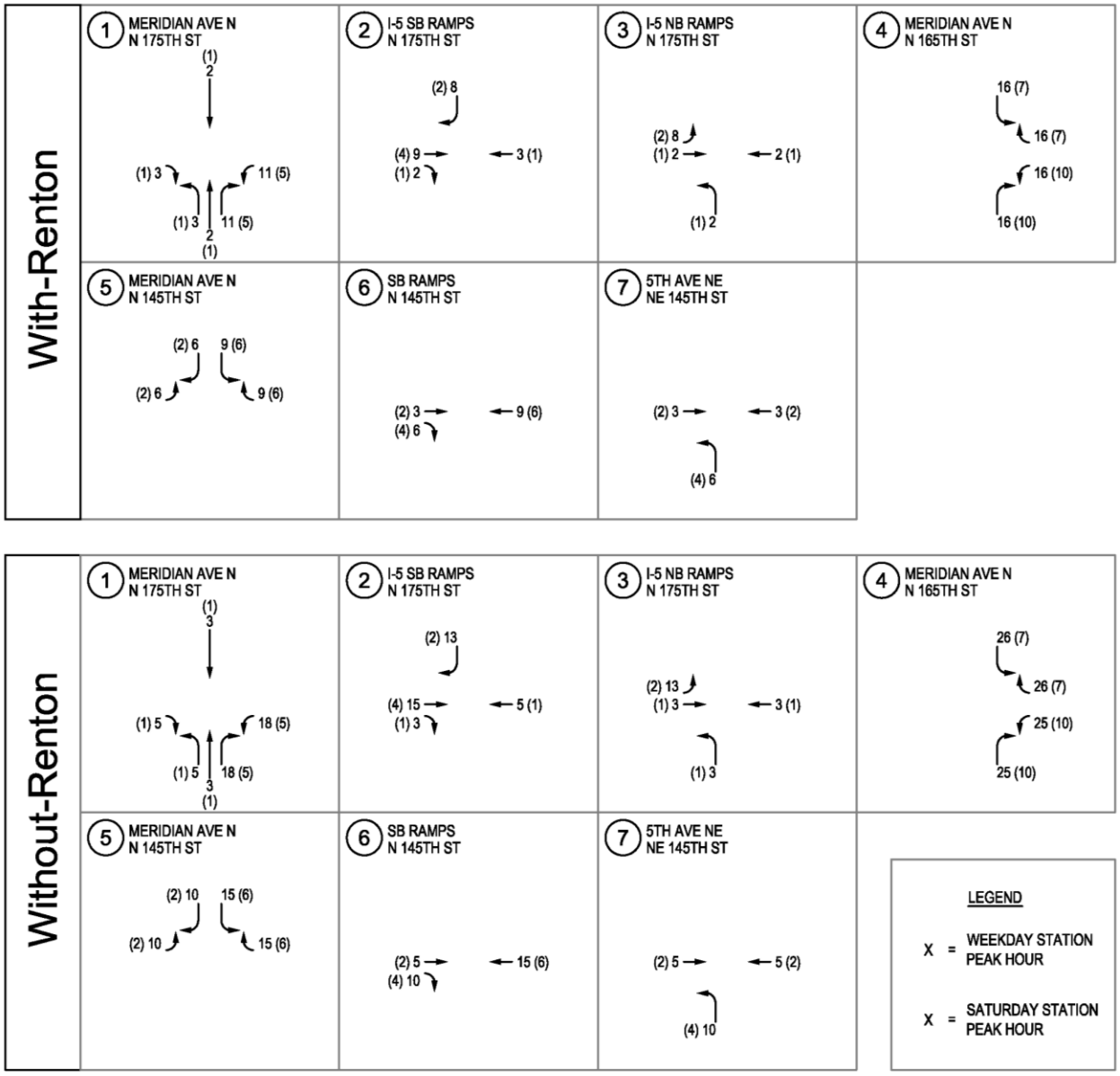


Figure 45
Shoreline Concept 2 With and Without-Renton Net-New Trip Assignment

The with-project 2023 Concept 2 weekday and Saturday peak-hour traffic volumes both with- and without-Renton are shown in **Figure 46**. The largest percent impact of the Concept 2 traffic volumes relative to the without-project conditions was at the station access intersection, the Meridian Avenue N / N 165th Street intersection, under all Concept 2 scenarios. During the weekday station peak-hour percent increases under Concept 2 compared to without-project conditions range from 13 percent to 20 percent under with- and without-Renton conditions, respectively. Similarly, during the Saturday station peak-hour percent increases under Concept 2 compared to without-project conditions are 5 percent during both with- and without-Renton conditions.

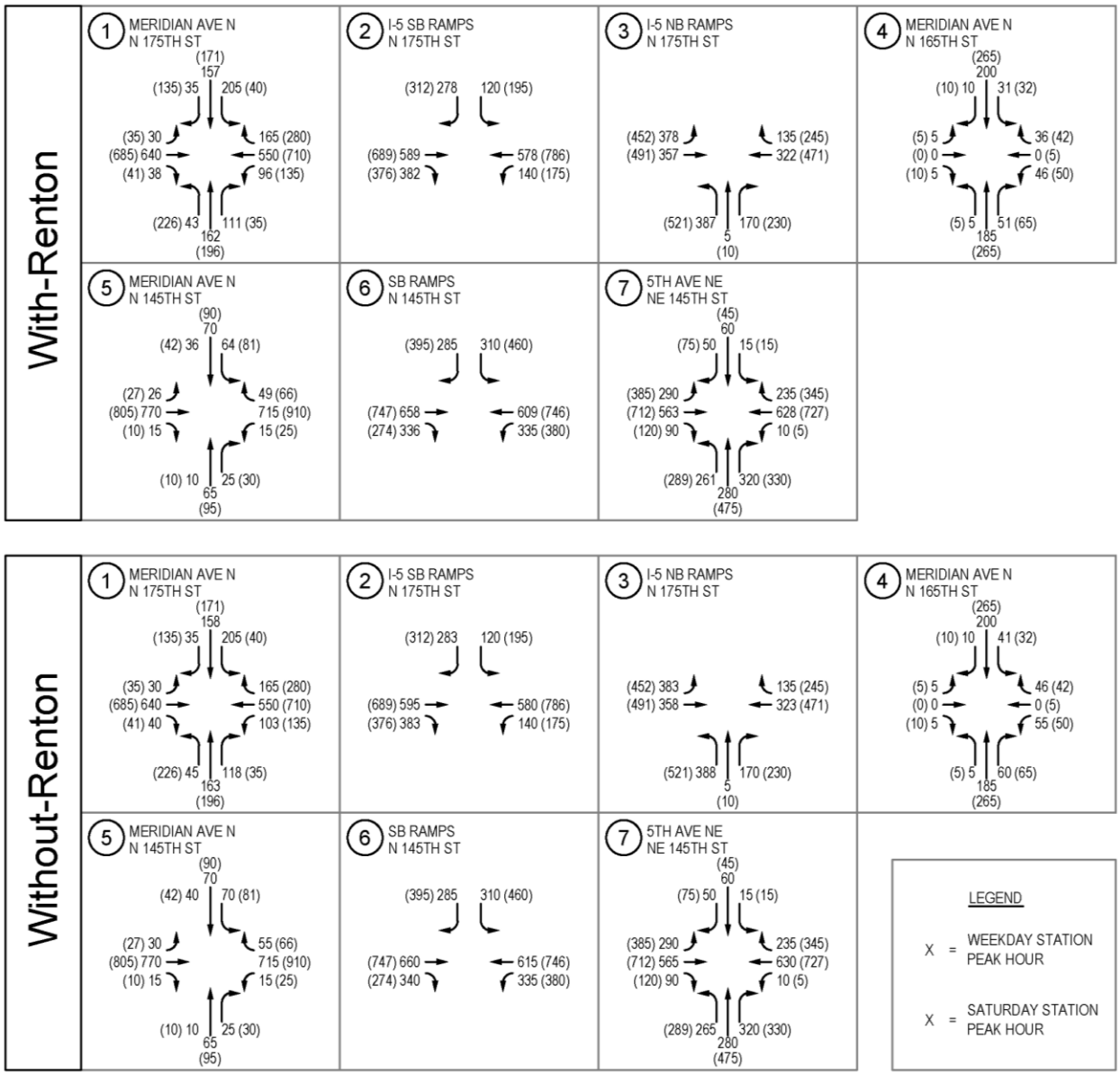


Figure 46
Shoreline Concept 2 Weekday and Saturday Station Peak-Hour Traffic Volumes

Table 36 provides a comparison between the 2023 Concept 2 and without-project conditions both with- and without-Renton conditions. The detailed LOS worksheets are included in **Attachment H (LOS Worksheets)**.

Table 36
Shoreline Concept 2 Weekday and Saturday Station Peak Hours LOS Summary

Intersection	2023 Without-Project				Concept 2 – With-Renton				Concept 2 – Without-Renton		
	LOS[1]	Delay[2]	V/C[3] or WM[4]		LOS	Delay	V/C or WM		LOS	Delay	V/C or WM
Weekday Station Peak-Hour (12 – 1 p.m.)											
1. Meridian Ave N / N 175th St	C	23			C	24			C	24	
2. I-5 SB Ramps / N 175th St[5]	B	20	0.55		B	20	0.56		B	20	0.57
3. I-5 NB Ramps / N 175th St[5]	B	16	0.58		B	16	0.59		B	17	0.59
4. Meridian Ave N / N 165th St	B	13	WB		B	14	WB		B	15	WB
5. Meridian Ave N / N 145th St	A	8			A	9			A	9	
6. I-5 SB Ramps / N 145th St	C	27			C	27			C	26	
7. 5th Ave NE / NE 145th St	D	38			D	38			D	38	
Saturday Station Peak-Hour (2 – 3 p.m.)											
1. Meridian Ave N / N 175th St	C	30			C	30			C	30	
2. I-5 SB Ramps / N 175th St	C	21	0.69		C	21	0.69		C	21	0.69
3. I-5 NB Ramps / N 175th St	D	52	0.89		D	54	0.89		D	54	0.89
4. Meridian Ave N / N 165th St	C	16	WB		C	17	WB		C	17	WB
5. Meridian Ave N / N 145th St	A	10			B	10			B	10	
6. I-5 SB Ramps / N 145th St	C	30			C	30			C	30	
7. 5th Ave NE / NE 145th St	D	48			D	48			D	48	

1. Level of service (LOS), based on 2010 Highway Capacity Manual methodology, 2000 methodology utilized where 2010 could not be applied.
2. Average delay in seconds per vehicle.
3. Volume-to-capacity ratio reported for signalized intersections. Only reported for HCM 2000 methodology.
4. WM= Worst movement reported for unsignalized intersections where WB = westbound.
5. N 175th Street and the I-5 Ramp intersections were evaluated using 2000 HCM methodology.

As shown in **Table 36**, all study intersections continue to operate at LOS D or better, meeting the City of Shoreline LOS standard, with the addition of Concept 2 traffic. Furthermore, no intersections change in LOS between 2023 without-project conditions and Concept 2 conditions with the exception of the Meridian Avenue N / N 145th Street intersection. This intersection degrades from LOS B to LOS C with the addition of Concept 2 traffic compared to without-project conditions.

Shoreline Station Summary

- Increases in station traffic range from 44 to 76 between the different concepts during the weekday peak period under with-Renton conditions and range from 44 to 96 during the weekday peak period under the without-Renton conditions. During the Saturday peak period, peak demand volumes range from 67 to 86 under with-Renton conditions and range from 67 to 92 under without-Renton conditions.
- Analysis of on-site operations showed operational issues at the commercial-haul tipping floor and the outbound scale resulting commercial-haul service times exceeding the adopted service times primarily during the Saturday peak periods.
    - Three improvement strategy combinations were analyzed to improve on-site operations under Concepts 0 to 2 without-Renton conditions, both during the weekday and Saturday peak periods. Combinations A2 (add a TSO/person on commercial floor and additional outbound scale) under Concepts 0 to 2 meet both the weekday and Saturday adopted service times and queue thresholds. The other combinations under the without-Renton conditions exceed either the adopted service times or the queue thresholds.
- Evaluation of off-station intersections showed minimal increases in off-station intersections for Concept 2. Concept 2 represented the highest peak demand thus represents a more conservative analysis when considering the impacts to the other concepts and the greatest impact to the off-station intersections.

References

City of Bellevue. 2014. *City of Bellevue 2015-2020 Transportation Improvement Program*. May 19.

_____, 2010. *Bellevue Comprehensive Plan: Transportation Element*.

City of Renton. August 2014. *City of Renton 2015-2020 Six-Year Transportation Improvement Program*.

_____, 2011. *Renton Comprehensive Plan*.

City of SeaTac. 2014. *City of SeaTac 2015-2024 Transportation Improvement Program*. July.

_____, 2004. *SeaTac Comprehensive Plan*.

City of Shoreline. 2014. *City of Shoreline 2015-2020 Transportation Improvement Plan*.

_____, 2012. *Shoreline Comprehensive Plan*. December.

City of Tukwila. 2014. *City of Tukwila, Washington 2015-2020 Financial Planning Model and Capital Improvement Program*. November.

_____, 2013. *Tukwila Comprehensive Plan*. October.

Institute of Technology. 2012. *Trip Generation Manual, 9th Edition*. Washington DC.

_____, 2010. *Parking Generation, 4th Edition*. Washington DC.

King County. 2007. *King County Transfer Plan*. December.

_____, 2010. *Factoria Recycling and Transfer Station 2010 Facility Master Plan*. November.

_____, February 2007. *2006 Facility Master Plan Update Bow Lake Transfer/Recycling Station*.

Synchro, Trafficware. Version 8.0, build 806, revision 61 (8.0.806.61)

Transportation Research Board. 2000. *Highway Capacity Manual: HCM 2000*. Washington DC.

_____, 2010. *Highway Capacity Manual: HCM 2010*. Washington DC.

VISSIM. PTV Group. Version 7.00 – 03 [49944].

Noise

This study shows that the proposed concepts for handling increased system capacity in the King County Solid Waste system, if the Northeast Transfer and Recycling Station is not constructed, are not anticipated to be associated with significant noise effects. Minimal instances of anticipated exceedance of regulatory standards are identified, and potential mitigation measures are proposed to resolve these conditions. Only one analysis scenario (nighttime operations at Renton Transfer Station) increased existing conditions above common thresholds for adverse community reaction (5 decibels [dB]). While this 6 dB increase (1 dB above the 5 dB threshold) is minor and may be associated with conservative modeling assumptions, it may also identify Renton as having a potential sensitivity to increased nighttime operations. Aside from this result, no unmitigable noise impacts are anticipated. However, due to the breadth of this study, covering numerous potential traffic and operational scenarios, refinement of the environmental noise assessment is recommended once an action is proposed. The intent of this study is to inform the planning and preparation process for updating the King County Comprehensive Solid Waste Management Plan.

Terminology

General Principles

The auditory response to sound is a complex process that occurs over a wide range of levels. Decibel levels, or “dB,” are a form of shorthand that compress this broad range of levels with a convenient numerical scale. The decibel scale is logarithmic. For example, using the decibel scale, a doubling of energy causes the sound level to increase by 3 dB. Three (3) dB is generally considered to be the minimum increase perceptible to a human observer. However, a 3-dB increase does not double the perceived loudness. Six (6) to 10 times the energy is needed to result in a perceived doubling of loudness, which is an increase of 8 to 10 dB.

The human ear has a unique response to sound pressure. It is less sensitive to those sounds falling outside of the speech frequency range. Sound level meters and monitors utilize a filtering system to approximate human perception of sound. Measurements made using this filtering system are referred to as “A weighted” and are called “dBA.”

Noise is generally defined as “unwanted sound” and is a subjective response to a particular sound source or environment. “Noise impacts” identify an expectation that a particular sound source or group of sound sources may negatively impact noise-sensitive receptors within an existing environment. This is largely dependent on the existing sound environment and the acoustical characteristics of the new sound sources.

Metrics

The following mathematical descriptors correlate with human response to sound, and are used to assess sounds that vary over time:

- **Equivalent Sound Level (L_{eq})**

  L_{eq} is the average of a time-varying A-weighted sound level during a specified interval. The L_{eq} is used to characterize complex, fluctuating sound levels with a single number. This study utilizes an hourly L_{eq}.

- **Maximum Sound Level (L_{max})**

  L_{max} is the maximum recorded A-weighted sound level for a given time interval or event. This study utilizes an hourly L_{max} "fast" (125-millisecond averaging time) to correlate with the typical response time of the human ear.

- **Percent Sound Level (L_n)**

  L_n is the sound level that is exceeded 'n' percent of the time; for example, L_{08} is the level exceeded 8 percent of the time. L_{25} is the sound level exceeded 25 percent of the time. Percent sound levels isolate louder events of short duration in a given measurement period, the smaller the percentage, the more shorter-duration events influence the value.

- **Sound Power Level (L_w or PWL)**
  Sound power is the amount of energy per second generated by a source, measured in watts. The sound power level (PWL) is a decibel representation with a reference value of 1 pico-watt (pW). Sound power is independent of distance, path, or influence from any nearby surfaces and is the most prevalent method for describing the amount of sound radiating from a noise source.

- **Sound Pressure Level (L_p or SPL)**

  Sound pressure level (SPL) correlates the sound emissions from the noise source with what is heard by the human ear, based on the acoustic environment that bounds the noise source and receiver. SPL is a decibel representation with a reference value of 20 micro-pascals (µPa). Distance, path, barriers, directivity, etc… affect sound pressure.

The appropriate descriptor for a given situation will depend on the following sound source, receiver, and analysis conditions:

- Transient character of the sound (constant level, changes frequently over time, etc.)
- Jurisdictional criteria (descriptors defined by municipal code, interpretations of code requirements, existing sound levels, etc.)
- Source characterization (influence of each sound source)

Common sound levels are shown in **Table N-1**.

Table N-1
Common Sound Levels, dBA

Sound Source	Sound Level[1]	Approximate Relative Loudness[2]
Jet Plane @ 100 feet	130	128
Rock Music with Amplifier	120	64
Thunder, Danger of Permanent Hearing Loss	110	32
Boiler Shop, Power Mower	100	16
Orchestral Crescendo at 25 feet	90	8
Busy Street	80	4
Interior of Department Store	70	2
Ordinary Conversation @ 3 feet	60	1
Quiet Car at Low Speed	50	1/2
Average Office	40	1/4
City Residence, Interior	30	1/8
Quiet Country Residence, Interior	20	1/16
Rustle of Leaves	10	1/32
Threshold of Hearing	0	1/64

1. Sound pressure level, dBA re: 20 μPa
2. As compared to ordinary conversation at 3 feet.
Source: US Department of Housing and Urban Development, Aircraft Noise Impact Planning Guidelines for Local Agencies, November 1972.

Methodology

The primary methodology used for the analysis and prediction of the environmental sound level was a computer noise model. This model was created with the acoustic modeling software Cadna/A. Cadna/A uses the Control of Accuracy and Debugging for Numerical Applications (CADNA) computation engine developed by the Pierre et Marie Curie University of Paris. The Cadna/A model utilizes the International Organization for Standardization (ISO) 9613 standard for predicting outdoor sound levels.

Sound propagation over distances greater than 1,000 feet is strongly influenced by meteorological conditions. Special atmospheric conditions, such as inverted thermal gradients or downwind conditions, can create a downward-refracting atmosphere that could potentially increase sound levels at large distances. The effects of a moderately downward-refractive atmosphere are included in the standard algorithm of the Cadna/A model, consistent with ISO 9613, to create a conservative representation of the predicted sound environment. While the sound levels at great distances may be greater, under some atmospheric conditions the received sound levels should generally be less (when no downward-refraction occurs) or much less (when upward-refraction occurs).

The Cadna/A model was built from computer aided design (CAD) drawings and Geographic Information System data provided by King County, satellite imagery, and on-site observations. The data contained within the noise model includes: existing site layouts, topography, property boundaries, zoning, and streets (where applicable). In order to calibrate the model, sound emissions from the existing facility and the dominant surrounding noise sources (e.g., freeways) were activated in the model and compared with measured ambient conditions. After the calibration process was complete, sound emissions from various analysis conditions were provided based on future traffic conditions predicted by The Transpo Group.

Due to the substantial number of traffic modeling scenarios, prediction of future sound emissions was limited to the conditions with the greatest potential increase in noise emissions to determine the maximum "noise capacity" for each site. Where potential impacts were identified during this assessment, potential mitigation measures were identified.

Data Collection

The analysis performed in this study includes three locations: Bow Lake Recycling and Transfer Station, Renton Recycling and Transfer Station, and Shoreline Recycling and Transfer Station. Data collection was conducted at each location, over multiple days, which included weekday and Saturday operations. Ambient monitoring was completed by an un-manned Sound Level Meter (SLM) that was deployed, locked and set to record, at a fixed location. The SLM recorded for the set time span, after which the recorded ambient sounds are manually uploaded for further evaluation.

Documenting the sound levels associated with discreet sources and with the influence of the reverberant-field sound was conducted with a manned SLM. These measurements characterized specific noise sources, such as goat trucks, vehicles, compactors, and tipping floor activities. During these manual collection periods, traffic data was collected by others, which allowed for synchronization of the collected noise data with actual on-site operations. Site visits during the weekday and Saturday were necessary to capture the vast change in volume of activity and type of activity between days.

Measurements were not conducted at the Factoria Recycling and Transfer Station, due to ongoing construction at that site renovating the existing facility. A noise analysis prepared for the renovation served as the basis for an assessment of potential effects of changes to operations at the site, scheduled to open for service in late 2017 (HDR 2012).

Existing Environmental Noise Levels

Sound level meters were installed near property lines and noise-sensitive receivers to document hourly sound levels for extended time periods, typically 4 weekdays and 3 Saturday days (see **Figures N-1**, **N-2**, and **N-3**). The purpose of this monitoring was to document sound emissions from site activity and other ambient noise sources to correlate with vehicle count data collected by others and for use in calibration of the noise model. A summary of measured ambient sound levels, including both site sound emissions and ambient environmental noise sources, is shown in **Table N-2**.

Table N-2
Existing Sound Levels, Median of Hourly L_{eq} values, dBA

Site and Duration		Weekday (Loc A / B)		Saturday (Loc A / B)	
		Daytime	Nighttime	Daytime	Nighttime
Bow Lake	9/10-12/14	66 / 64	61 / 59	64 / 62	57 / 58
	9/26-29/14				
Renton	9/17-22/14	58 / 53	45 / 42	53 / 51	48 / 45
Shoreline	9/12-13/14	57 / 63	57 / 60	56 / 62	60 / 61
	9/13-17/14				

All equipment was laboratory calibrated within 1-year of the measurement date. Field calibrations were also performed prior to the start of monitoring and verified at the end of the monitoring periods. Equipment used during the ambient noise monitoring was as follows:

- Location A (Bow Lake, Renton, and Shoreline)
  - Rion NL-32 sound level meter SN 00161681
    - Rion NH-21 preamplifier SN 18454
    - Rion UC-53A microphone SN 309751
  - Larson Davis CAL200 SN 5463
- Location B (Bow Lake, Renton, and Shoreline)
  - Rion NL-52 sound level meter SN 821097
    - Rion NH-25 preamplifier SN 21138
    - Rion UC-59 microphone SN 4064
  - Larson Davis CAL200 SN 5463

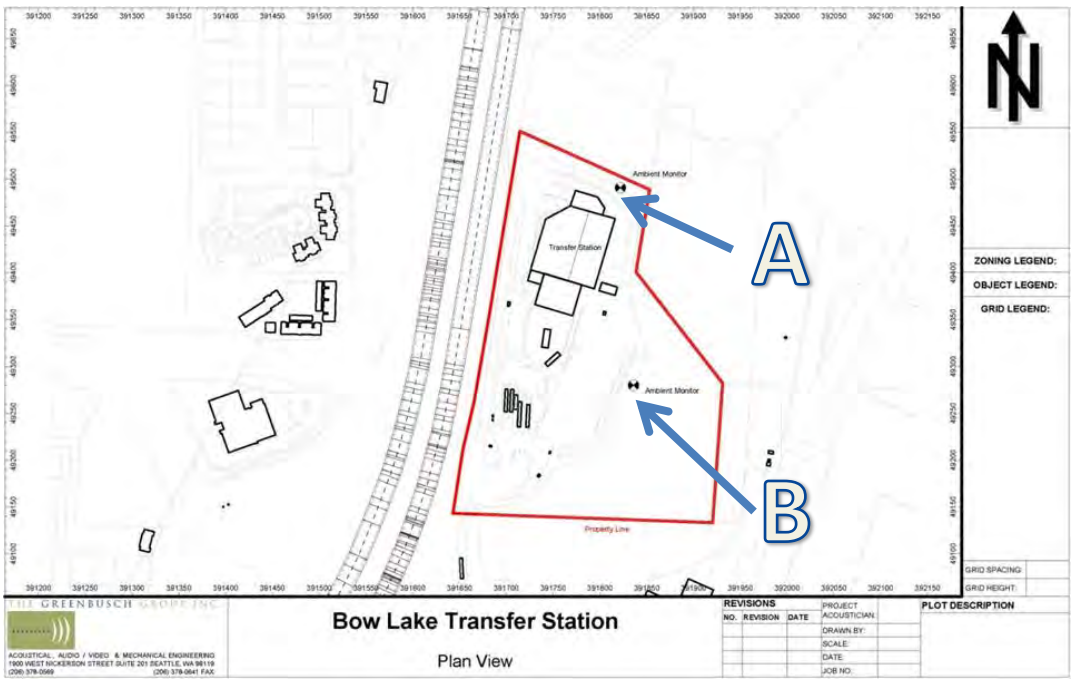


Figure N-1
Bow Lake Recycling and Transfer Station –Noise Monitoring Locations

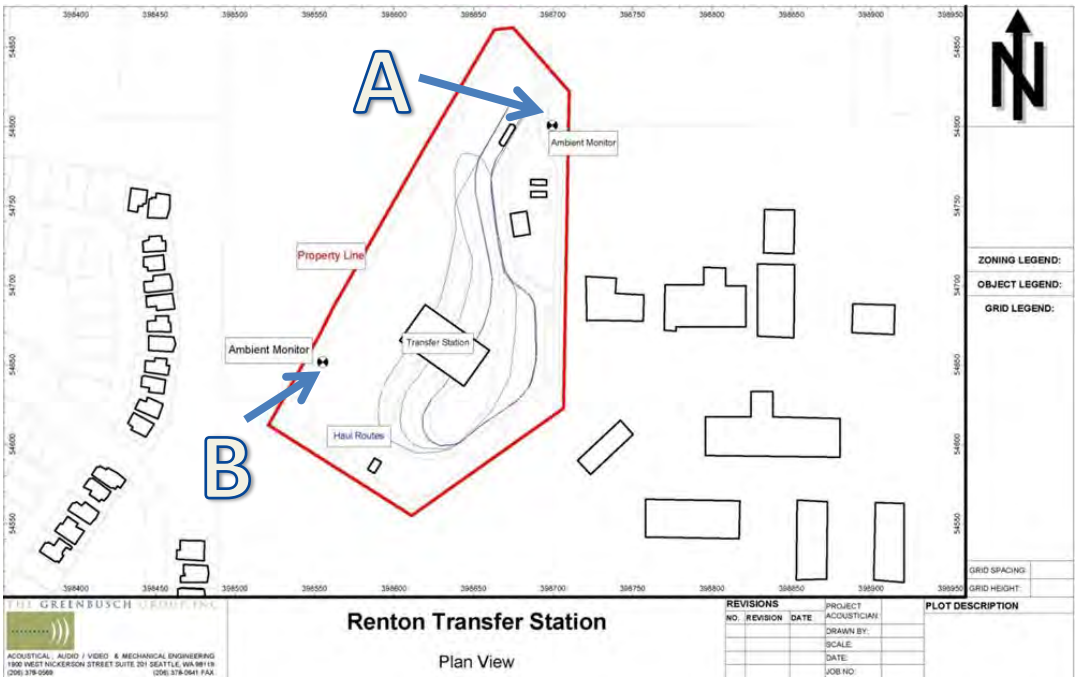


Figure N-2
Renton Recycling and Transfer Station –Noise Monitoring Locations

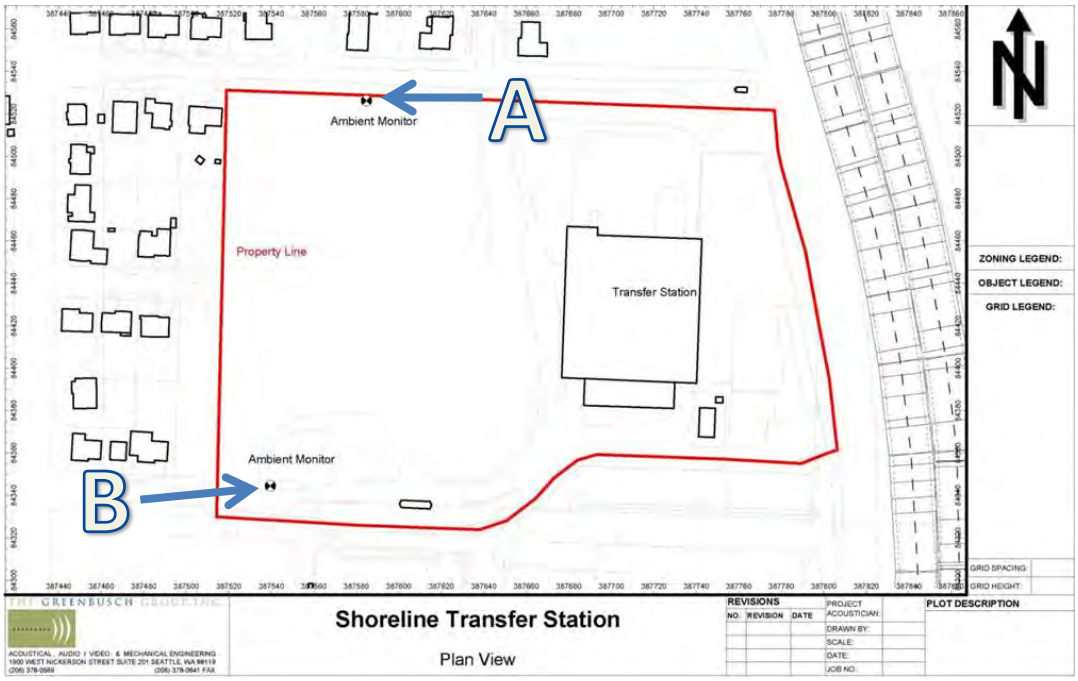


Figure N-3
Shoreline Recycling and Transfer Station –Noise Monitoring Locations

Sounds Levels for Individual Sources

In order to predict sound levels associated with changes to site activity, sound monitoring was conducted for individual sources. During this shorter time window, ambient monitoring conducted near the property lines (discussed in **Existing Environmental Noise Levels**) continued to allow for comparisons of specific on-site noise sources and far field sound levels received at the noise monitoring stations. Two general methods were used to document specific activities: free field and reverberant field measurements.

Free field measurements include performing a SPL measurement at a specific distance from a noise source. Using the resulting SPL and measured distance (a last distance measurement device was used to improve accuracy), the overall sound emission of the noise source can be determined. This results in the PWL. For indoor acoustic environments where multiple noise sources blend together, measurements become more complex due to reverberation and interference from other noise sources. In these scenarios, reverberant field measurements can be used to determine the total sound emissions within the space. For example, a tipping floor typically includes equipment to maintain the waste pile (front end loader, bulldozer, etc.), vehicles entering and leaving the building, recycling and compaction activities, and various other noise sources common to a solid waste transfer facility. With a microphone placed in the reverberant field, far from the noise sources, the reverberant properties of the building and measured SPLs can be used to calculate the overall sound emission level, or PWL, from all of the noise sources within the building.

After the dominant noise sources are documented, hourly occurrences of these individual sound sources can be adjusted to reflect the current, planned, and potential conditions of site activity. Therefore, making individual sound sources a dynamic tool in the computer sound modeling process. A summary of sound source data that was collected during the fieldwork is presented in **Table N-3**.

Table N-3
Measured Individual Noise Sources

Noise Source	Bow Lake		Renton		Shoreline	
	Weekday	Saturday	Weekday	Weekday	Weekday	Saturday
Self-haul vehicle	5	5	24	24	19	9
Commercial haul vehicle	9	9	9	9	29	9
Compactor	1	1	1	1	1	1
Recycling dumpster	1	1	-	-	-	-
Goat truck	2	2	1	1	1	1

Modeling Input Parameters

On-Site Equipment, Vehicles, and Activities

Sound levels used in the modeling process are summarized in **Table N-4**, based on sound level measurements at the existing facilities.

Table N-4
Modeled Noise Sources for Existing Conditions, L_{eq}, dBA

Noise Source	Bow Lake		Renton		Shoreline	
	Weekday	Saturday	Weekday	Weekday	Weekday	Saturday
Residential vehicle	65 @ 50’	65 @ 50’	58 @ 50’	58 @ 50’	57 @ 50’	58 @ 50’
Commercial vehicle	79 @ 59’	79 @ 59’	64 @ 50’	64 @ 50’	64 @ 50’	64 @ 50’
Tipping floor	81 @ rev	79 @ rev	73-83 @ openings	70-77 @ openings	77 @ rev	77 @ rev
Compactor	84 @ rev	84 @ rev	66 @ 5’	66 @ 5’	84 @ rev	84 @ rev
Recycling dumpster	87 @ 6’	87 @ 6’	87 @ 6’	87 @ 6’	87 @ 6’	87 @ 6’
Goat truck pulling trailer	79-82 @ 25’	79-82 @ 25’	77 @ 17’	77 @ 17’	85 @ 10’	85 @ 10’
Note: “rev” represents reverberant field measurements.						

Traffic Volumes

In order to predict changes to sound emissions from the sites, the noise model requires input for the quantity and class of vehicles accessing the site, including speeds and travel routes. Once these parameters are known, they were paired with sound levels of the respective vehicle class. Analysis in the noise model was focused on the peak-hour, defined as the hour during the day with the highest amount

of expected traffic. Vehicle count data collected by Transpo Group was used to determine these peak hours, and the distribution of residential and commercial vehicles at each site.

For future conditions, the trip generation estimates generated by Transpo Group for the year 2023 (including applying future mix percentages) were used to predict future conditions. Existing conditions of vehicle mix were estimated based on overall vehicle count data collected by Transpo Group during field investigations. Traffic data used as modeling input for the existing condition is summarized in **Table N-5**.

Table N-5
Modeled Peak-Hour Traffic Volumes, Existing Peak-Hour

Site	Day			Night		
	Commercial Haul	Self-Haul	Hauling Trucks	Commercial Haul	Self-Haul	Hauling Trucks
Bow Lake – weekday	7	59	1	2	4	0
Bow Lake – Saturday	1	73	1	1	27	0
Renton – weekday	6	32	1	1	4	0
Renton – Saturday	3	45	1	1	27	0
Shoreline – weekday	3	55	1	1	9	0
Shoreline – Saturday	0	83	0	0	30	0

Source: Transpo Group, The Greenbusch Group, Inc.

Due to the large number of traffic conditions being modeled for the facilities, the maximum expected traffic at each site was modeled for the future (2023) condition to determine potential worst-case noise effects. Some of the traffic modeling concepts included in the future trip generation estimates are as follows:

- Extended operating hours
- Provide wait time information
- Lower cost curbside bulky waste collection
- Mandatory curbside garbage collection
- Lower regional direct fee to encourage haulers to use their own transfer stations
- Banner materials – yard/wood waste and hazardous household waste
- Incentive/peak pricing
- Higher minimum fee
- Increased tipping floor capacity
- Increased staffing to reduce tipping floor dwell time
- Closure of the Renton Transfer Station

Modeling input conditions for the worst-case site usage results based on anticipated future conditions based on the above concepts is summarized in **Table N-6**.

Table N-6
Modeled Peak-Hour Traffic Volumes, Peak-Hour Maximum Traffic – 2023

Site	Day			Night		
	Commercial Haul	Self-Haul	Transfer Trailer Trucks	Commercial Haul	Self-Haul	Transfer Trailer Trucks
Bow Lake – weekday	25	94	7	8	19	2
Bow Lake – Saturday	9	149	5	5	55	2
Renton – weekday	10	44	2	1	6	0
Renton – Saturday	9	56	2	2	34	0
Shoreline – weekday	14	103	3	1	17	0
Shoreline - Saturday	19	89	3	0	32	0

Source: Transpo Group, The Greenbusch Group, Inc.

Issue Identification

Potential noise issues were identified using a two-prong method during the screening process (described in **Analysis**); compliance with regulatory requirements and increases to existing noise conditions.

Regulatory Compliance

Regulatory requirements vary between each site, based on the governing codes of the station and nearby properties. However, none of the regulatory standards described in this section define noise metrics for the permissible sound levels. Common interpretation of the sound level limits is for the typical hourly sound level limit between two properties is an L_{25}, with increased sound level limits permitted for louder sound events not to exceed 15 minutes, 5 minutes, and 1.5 minutes as L_8, L_2, and L_{max} respectively. For the purposes of this analysis, given the level of detail available for projected site operations, the analysis assesses hourly L_{eq} values only, and compares the resulting levels against the standard code limits, taking no allowances for louder events of short duration.

Bow Lake

The Bow Lake station is located within the City of Tukwila and is zoned Commercial. Surrounding properties to the East are also in Tukwila, while properties to the West are in the City of SeaTac. The City of Tukwila controls sound emissions within City limits in Tukwila Municipal Code (TMC) Chapter 8.22, based on the land use zoning of the source and receiving properties. The SeaTac Municipal Code includes a nuisance ordinance in Chapter 8.05.360, but does not establish permissible sound level limits between adjacent properties. Therefore, sound level limits in SeaTac would default to those identified in the Washington Administrative Code (WAC) Chapter 173.60 (**Table N-7**). WAC sound level limits as based on the Environmental Designation for Noise Abatement (EDNA) of the properties, which are by default based on land use, unless the local jurisdiction adopts a zoning ordinance that correlates land use zoning with EDNA. While the sound level limits are comparable between TMC and WAC, WAC sound level limits are based on land use, while TMC limits are based on zoning. However, due to the proximity

of vacant residential parcels, application of this code to the analysis applies sound level limits at all properties based on zoning, not use.

Table N-7
Bow Lake Hourly Sound Level Limits, dBA

Receiving Property	Day	Night
Residential zoning (Class A EDNA)	57	47
Commercial zoning (Class B EDNA)	60	60
Industrial zoning (Class C EDNA)	65	65

Source: TMC Chapter 8.22, WAC 173.60

Renton

The Renton station and all surrounding properties are located within the City of Renton. The zoning of the transfer station site is Industrial (Class C EDNA) and nearby properties are a mixture of Residential (Class A EDNA), Commercial (Class B EDNA), and Industrial. The Renton Municipal Code (RMC) adopts WAC sound level limits and assigns land use zonings to EDNAs in RMC Section 8.7.4 (**Table N-8**).

Table N-8
Renton Hourly Sound Level Limits, dBA

Receiving Property	Day	Night
Residential zoning (Class A EDNA)	60	50
Commercial zoning (Class B EDNA)	65	65
Industrial zoning (Class C EDNA)	70	70

Source: RMC 8.7.4, WAC 173.60

Factoria

The Factoria station is located within the City of Bellevue, which regulates sound emissions within City limits in Bellevue City Code (BCC) Chapter 9.18 (**Table N-9**). BCC adopts WAC sound level limits and applies land use zoning to EDNA classifications for properties. The site is zoned Industrial, which corresponds to Class C EDNA . Receiving properties adjacent to the site are Industrial and Commercial zoning (Class B EDNA). Residential properties (Class A EDNA) are located northeast of the site. Nighttime hours are defined between 10:00 p.m. and 7:00 a.m., 7 days a week.

Table N-9
Factoria Hourly Sound Level Limits, dBA

Receiving Property	Day	Night
Residential zoning (Class A EDNA)	60	50
Commercial zoning (Class B EDNA)	65	65
Industrial zoning (Class C EDNA)	70	70

Source: BCC Chapter 9.18

Shoreline

The Shoreline station, and all surrounding properties, are located within the City of Shoreline. The Shoreline Municipal Code (SMC) does not include sound level limits, only a nuisance ordinance codified in Chapter 9.05 (**Table N-10**). Therefore, the regulatory criteria would default to WAC limits, based on land use.

Table N-10
Shoreline Hourly Sound Level Limits, dBA

Receiving Property	Day	Night
Residential use (Class A EDNA)	60	50
Commercial use (Class B EDNA)	65	65
Industrial use (Class C EDNA)	70	70

Source: TMC Chapter 8.22, WAC 173.60

Increases to Existing Noise Condition

This section discusses the potential noise effects of proposed operational options. It is important to note that satisfaction of applicable noise ordinances do not, in itself, ensure the absence of noise impacts. It is possible for sound emissions to be below these prescribed limits and still disturb nearby properties. Therefore, it is common industry practice to also assess increases to existing noise conditions to predict the level of community annoyance from a project under review. **Table N-11** details criteria that were developed from U.S. Environmental Protection Agency (EPA) guidelines to analyze impacts (EPA 1973).

Table N-11
Noise Impact Criteria based on Increases to Existing Conditions

Impact Scale	Criteria and Description
None/Negligible	Existing sound levels at nearby noise-sensitive properties would experience little or no increase. Project sound emissions would be below regulatory thresholds.
Minor	Existing sound levels at nearby noise-sensitive properties would experience a minor increase of up to 5 dB, likely resulting in few noise complaints. Project sound emissions would be within or below regulatory thresholds. Mitigation measures would reduce potential adverse effects.
Moderate	Existing sound levels at nearby noise-sensitive properties would experience a moderate increase of up to 10 dB, likely resulting in more noise complaints. Mitigation measures would likely be necessary to reduce project sound emissions below regulatory thresholds and/or reduce adverse effects.
Major	Existing sound levels at nearby noise-sensitive properties would experience a major increase in excess of 10 dB, likely resulting in a substantial number of noise complaints. Mitigation measures would be necessary to reduce adverse effects, though non-compliance with regulatory thresholds and long-term increases to existing noise conditions would be expected.

Analysis

The intent of the noise screening process for this study is to compare the predicted site noise emissions based on the "worst case" condition from the traffic study concepts and criteria defined, both to assess regulatory compliance and increases to existing noise conditions that may constitute noise impacts.

Bow Lake

Results from the noise modeling for future conditions (2023) are shown in **Tables N-12** and **N-13**.

As shown in **Tables N-12** and **N-13**, regulatory compliance may require mitigation at the southern adjacent properties during the day and western adjacent properties at night. Mitigation measures could include a noise wall at the southwest corner or a mixture of operational restrictions, such as:

- Reducing weekday nighttime commercial haul to a maximum of six vehicles per hour
- Limit Saturday operations to the following:
    - Self-haul Garbage, 90 vehicles per hour
    - Self-haul Yard and Recycle, 23 vehicles per hour
    - Commercial haul, 6 vehicles per hour
    - Hauling trucks, 3 vehicles per hour

No noise impacts due to increasing the existing condition are expected since increases are all 5 dB or less.

Table N-12
Bow Lake Regulatory Compliance, Peak-Hour Maximum Traffic – 2023

Time Period	Day Period	Predicted Sound Levels (Code limits)			
		North	West	East	South
Day	Weekday	53 (57)	54 (57)	54 (60)	**65 (60)**
	Saturday	49 (57)	50 (57)	53 (60)	**62 (60)**
Night	Weekday	47 (47)	**48 (47)**	51 (60)	60 (60)
	Saturday	46 (47)	47 (47)	51 (60)	60 (60)

Source: Transpo Group, The Greenbusch Group, Inc.

Table N-13
Bow Lake Increase to Existing, Peak-Hour Maximum Traffic – 2023

Time Period	Day Period	Existing Sound Levels[1]		Future Sound Levels (increase to existing)[1,2]	
		Location A	Location B	Location A	Location B
Day	Weekday	63	68	65 (2)	69 (1)
	Saturday	62	65	65 (3)	68 (3)
Night	Weekday	61	64	65 (4)	67 (3)
	Saturday	62	67	65 (3)	67 (0)

1. Includes contributions from site and ambient noise sources, assessed at ambient monitoring locations.
2. Assumes no changes to existing ambient, such as increased traffic on local roadways and highways.

Source: Transpo Group, The Greenbusch Group, Inc.

Renton

Results from the noise modeling for future conditions (2023) are shown in **Tables N-14** and **N-15**.

Table N-14
Renton Regulatory Compliance, Peak-Hour Maximum Traffic – 2023

Time Period	Day Period	Predicted Sound Levels (Code limits)			
		North	West	East	South
Day	Weekday	36 (65)	50 (60)	60 (70)	45 (60)
	Saturday	36 (65)	50 (60)	60 (70)	45 (60)
Night	Weekday	34 (65)	50 (50)	59 (70)	45 (50)
	Saturday	34 (65)	50 (50)	59 (70)	45 (50)

Source: Transpo Group, The Greenbusch Group, Inc.

Table N-15
Renton Increase to Existing, Peak-Hour Maximum Traffic – 2023

Time Period	Day Period	Existing Sound Levels[1]		Future Sound Levels (increase to existing)[1,2]	
		Location A	Location B	Location A	Location B
Day	Weekday	56	61	56	61
	Saturday	54	56	54	56
Night	Weekday	50	62	50	62
	Saturday	54	57	54	57

1. Includes contributions from site and ambient noise sources, assessed at ambient monitoring locations.
2. Assumes no changes to existing ambient, such as increased traffic on local roadways and highways.

Source: Transpo Group, The Greenbusch Group, Inc.

As shown in **Tables N-14** and **N-15**, regulatory compliance is anticipated. One potential noise impact was identified due to increasing the existing condition during nighttime hours at Location A by 6 dB, which is likely due to the conservative modeling assumptions. However, it does reveal a potential noise sensitivity to nighttime operations at the Renton site.

Factoria

The highest anticipated utilizations of the Factoria station are a 215 percent increase in vehicles during the peak weekday hour (1:00 to 2:00 p.m.) and a 254 percent increase during the peak Saturday day hour (2:00 to 3:00 p.m.). These increases would result in an overall increase in site noise emissions of 3 dB for the weekday peak-hour and 4 dB for the Saturday peak-hour. This analysis assumes increased site activity is evenly distributed throughout the site, and not focused in particular areas.

Sound emission levels from operation of the facility currently under construction, once the facility is operational, are expected to be 44 dBA at nearby properties and result in no substantive increase to existing sound levels at nearby residential properties (HDR 2012). An increase of 4 dB (based on a 254 percent increase in hourly traffic) would result in a 48 dBA facility sound level, which complies with Code limits. This facility sound level would be expected to increase the cumulative sound level of the site and ambient environment of 54 dBA (HDR 2012) to 55 dBA, 1 dB increase. This is less than the 5 dB threshold for anticipated noise effects, therefore mitigation would not be warranted.

Shoreline

Results from the noise modeling for future conditions (2023) are shown in **Tables N-16** and **N-17**.

As shown in **Tables N-16** and **N-17**, regulatory compliance may require mitigation at the northern adjacent properties during the night. Mitigation measures could include extending the existing noise wall 30 to 40 feet west or closing roll up doors on the northwest side transfer station building.

No noise impacts due to increasing the existing condition are expected since increases are all 5 dB or less.

Table N-16
Shoreline Regulatory Compliance, Peak-Hour Maximum Traffic – 2023

Time Period	Day Period	Predicted Sound Levels (Code limits)			
		North	West	East	South
Day	Weekday	51 (60)	52 (60)	46 (60)	39 (60)
	Saturday	51 (60)	52 (60)	44 (60)	38 (60)
Night	Weekday	**52 (50)**	47 (50)	46 (50)	38 (50)
	Saturday	49 (50)	46 (50)	43 (50)	36 (50)

Source: Transpo Group, The Greenbusch Group, Inc.

Table N-17
Shoreline Increase to Existing, Peak-Hour Maximum Traffic – 2023

Time Period	Day Period	Existing Sound Levels[1]		Future Sound Levels (increase to existing)[1,2]	
		Location A	Location B	Location A	Location B
Day	Weekday	57	65	57	65
	Saturday	54	64	54	64
Night	Weekday	60	62	60	62
	Saturday	57	63	57	63

1. Includes contributions from site and ambient noise sources, assessed at ambient monitoring locations.
2. Assumes no changes to existing ambient, such as increased traffic on local roadways and highways.

Source: Transpo Group, The Greenbusch Group, Inc.

References

_____, 2015. *Noise Technical Memorandum: Factoria Recycling and Transfer Station Replacement Project*. Bellevue, Washington.

Bellevue City Code. *Chapter 9.18, Noise Control.* Bellevue, Washington.

Renton Municipal Code. *Chapter 7, Noise Level Regulations.* Renton, Washington.

Shoreline Municipal Code. *Chapter 9.05, Public Disturbance Noise.* Shoreline, Washington.

Tukwila Municipal Code. *Chapter 8.22, Noise.* Tukwila, Washington.

Washington Administrative Code (WAC). *Chapter 173-60, Maximum Environmental Noise Levels.* Washington State.

U.S. Department of Housing and Urban Development. 1972. *Aircraft Noise Impact Planning Guidelines for Local Agencies*. November.

U.S. Environmental Protection Agency (EPA). *Environmental Impact Statement Guidelines*. 1973. Region X.

_____, 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.* Region X.

Air Quality

This report presents the air quality analysis for King County's Transfer Plan update. It addresses the transportation elements only, as these are unique for each station by concept; air quality associated with solid waste and landfills is not included, as this does not change between concepts. This report describes how air quality is measured and categorized, and discusses appropriate regulatory criteria, the expected effects of the Transfer Plan update, and potential mitigation measures. This report includes evaluation of existing year 2014 and design year 2023 concepts. Only Concept 0 is evaluated for this update, as this concept incorporates a redistribution of disposal, thereby affecting traffic patterns. Four stations are evaluated for air quality: Factoria, Renton, Shoreline, and Bow Lake. Each of these is evaluated with and without Renton being open.

Existing Air Quality

Air quality in the project area is regulated by the U.S. Environmental Protection Agency (EPA), the Washington State Department of Ecology (Ecology), and Puget Sound Clean Air Agency (PSCAA). Under the Clean Air Act (CAA) and its amendments (CAAA), EPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), ozone (O_3), sulfur oxides (SO_x), lead (Pb), and nitrogen dioxide (NO_2). Current Washington State Ambient Air Quality Standards are established in the Washington Administrative Code (WAC) Title 173. The federal standards (NAAQS) were adopted in December 2013, per WAC 173-476. Federal and state standards for the four pollutants relevant to vehicular emissions (CO, PM_{10}, $PM_{2.5}$, and O_3) are listed in **Table A-1**.

Nonattainment areas are geographic regions where air pollutant concentrations exceed the NAAQS for a pollutant. Air quality maintenance areas are regions that have recently attained compliance with the NAAQS. The project study area is located in the Central Puget Sound region which is currently considered a maintenance area for CO and ozone (see **Figure A-1**). Air quality emissions in the region are currently being managed under the provisions of the State Implementation Plan (SIP), which has adopted the Central Puget Sound Area CO maintenance plan (FR 1996a) and the ozone maintenance plan for the Seattle-Tacoma Puget Sound Area (FR 1996b); these plans were updated on August 5, 2004, when EPA approved the Central Puget Sound Area 2nd 10-year CO/ozone maintenance plan (69 FR 47365).

Ozone is considered a "regional" pollutant, with emissions directly at the source and effects occurring at considerable distances from emission sources due to complex atmospheric reactions (with precursor pollutants, such as hydrocarbons [HC] and nitrogen oxides [NO_x]) and prevailing meteorological conditions. Therefore, emissions of ozone and its reactive precursors from the Central Puget Sound area can contribute to ambient concentrations recorded at monitoring locations throughout the region. Other air quality effects, such as odor, fugitive dust, and CO from vehicle traffic are more localized in nature. The air quality analysis for Transfer Plan update only addresses the transportation portion of air

emissions. On a regional level, there are little to no changes in emissions between the Concept 0 options, as traffic is only being redistributed. Therefore, the air quality study area is local near-field effects, defined as the immediate vicinity (i.e., within 1-mile) of the scenario routes for the four solid waste facilities included in this air quality analysis.

Table A-1
Ambient Air Quality Standards

Pollutant	Averaging Time	Level	Remarks
Particulate Matter Less than or Equal to 2.5 micrometers in Diameter ($PM_{2.5}$)	Annual	12.0 µg/m^3	Annual mean, averaged over 3 years.
	24-hour	35 µg/m^3	98th percentile, averaged over 3 years.
Particulate Matter Less than or Equal to 10 micrometers in Diameter (PM_{10})	24-hour	150 µg/m^3	Not to be exceeded more than once per year averaged over 3 years.
Ozone (O_3)	8-hour	0.075 ppmv (147 µg/m^3)	Annual fourth highest daily maximum 8-hr concentration, averaged over 3 years.
Carbon Monoxide (CO)	8-hour	9 ppmv (10 mg/m^3)	Not to be exceeded more than once per year.
	1-hour	35 ppmv (40 mg/m^3)	

Notes:
mg/m^3 = milligrams per cubic meter.
µg/m^3 = micrograms per cubic meter.
ppbv = parts per billion by volume.
ppmv = parts per million by volume.

Source: EPA 40 CFR Part 50 (http://www.epa.gov/air/criteria.html) and WAC Chapter 173-476 (http://www.ecy.wa.gov/laws-rules/ecywac.html#air)

Historically, concentrations of CO have exceeded the NAAQS in the Central Puget Sound area. Ozone levels have remained fairly stable; however, the ozone NAAQS has been lowered (and is expected to be revised lower again in the near future). Therefore, concentrations have more recently exceeded the NAAQS. Consequently, these two pollutants are of concern in the project area. High ozone concentrations may occur at locations downwind of the source of the pollutants; therefore, emissions control strategies must address sources in the entire Central Puget Sound area. In contrast, high CO volumes are more localized and are strongly influenced by emissions of CO from nearby vehicles. The maintenance plans for both pollutants (see above) focus on reducing emissions from vehicles, reducing the total miles traveled by vehicles in the area, and (more specifically for CO) reducing congestion conditions. Any regionally significant transportation project in these areas must conform to the SIP. Conformity is demonstrated by showing that the project would not cause or contribute to any new violation of any NAAQS, would not increase the frequency or severity of any existing violation of any NAAQS, or would not delay timely attainment of the NAAQS. Puget Sound Regional Council (PSRC) is the local Metropolitan Planning Organization (MPO) responsible for coordinating the regional transportation processes, including performing regional conformity assessments.

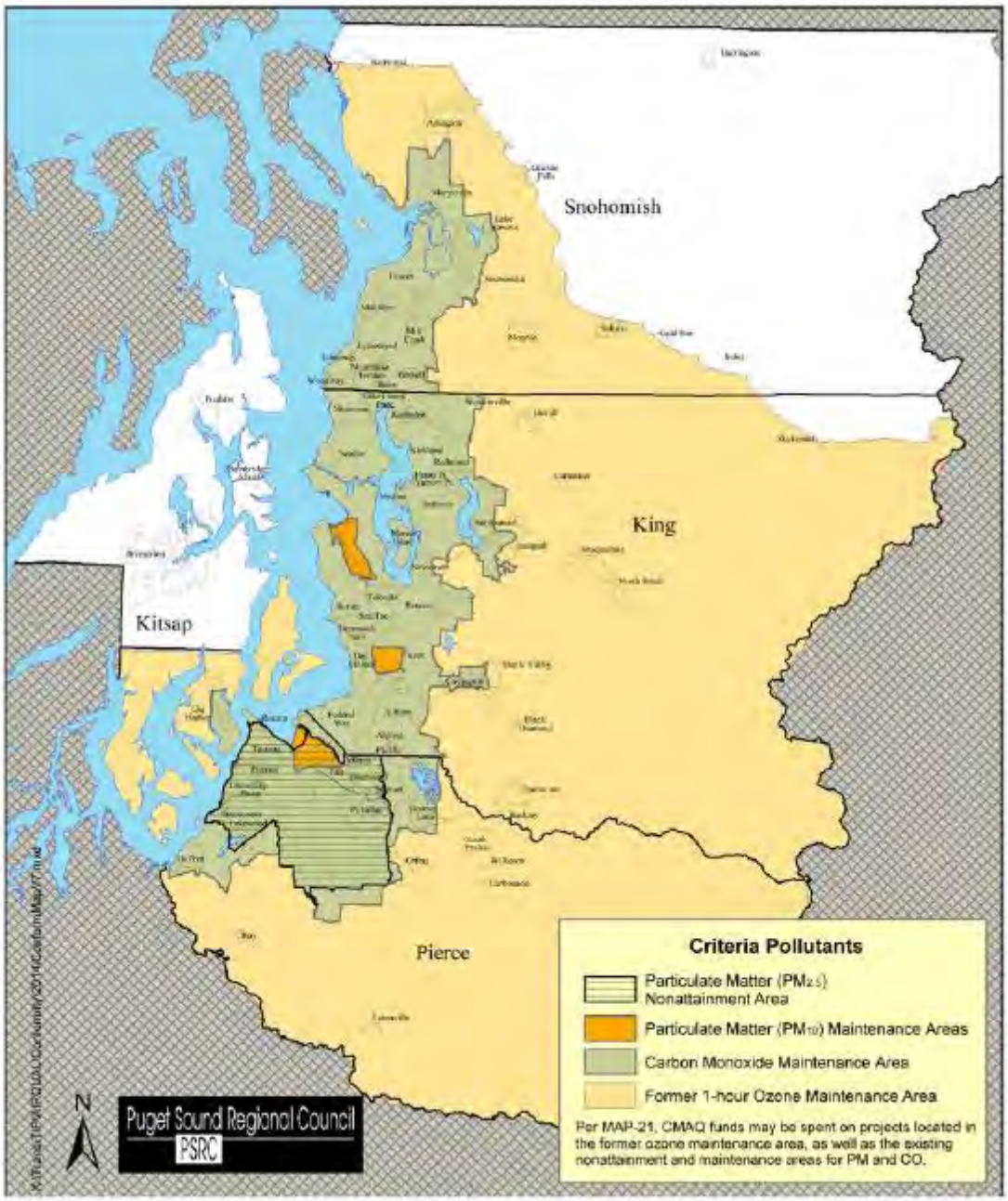


Figure A-1

Current Central Puget Sound Region Designated Maintenance and Nonattainment Areas

Puget Sound Regional Council, February 2014 (http://www.psrc.org/assets/11904/Designated-Maint-Nonattain-Areas-201402.pdf)

Methodology

Proposed projects must meet conformity rules on a regional level and on a localized (i.e., project) level. The facility locations included this Transfer Plan update analysis lie within the CO and O_3 maintenance area and must comply with the project-level conformity criteria of the EPA Conformity Rule. As discussed earlier, regional emissions should not be affected by the Transfer Plan update, as Concept 0

only redistributes traffic. Therefore, it is expected to meet conformity on a regional basis. In addition, because Concept 0 is not expected to have an effect on regional emissions, no evaluations are made for Mobile Source Area Toxics (MSAT) or greenhouse gases (GHG); these pollutants are expected to be unaffected by the Transfer Plan update.

To meet conformity at a localized or project level, a project must not cause or contribute to a new violation of the NAAQS, increase the severity of an existing violation, or delay timely attainment or maintenance of the standards. To determine whether a proposed project meets project-level conformity, traffic levels at local intersections must be examined. A hot-spot analysis is required if the project is forecast to increase intersection-level traffic and degrade the intersection performance. A hot-spot analysis may involve air quality modeling to determine whether a project meets the NAAQS.

Traffic data for the No-Build and Build Alternatives for existing year 2014 (No-Build only), and design year 2023 is provided in **Attachment H** of the Traffic Section. Based on this data/report, 'critical intersections' near the facilities were evaluated by level-of-service (LOS) and volume-to-capacity ratio (v/c) to assess the need for hot-spot analyses. Typically, evaluations are not required for intersections LOS C or better.

Environmental Consequences

Table A-2 lists intersection operations (LOS and v/c) by each facility (Factoria, Renton, Shoreline, and Bow Lake) for Concept 0. The table is also broken out by weekday and Saturday operations.

All of the intersections associated with the Factoria station show LOS C or better for each scenario. Therefore, no hot-spot analysis would be required to demonstrate compliance with the CO standards. In addition, these intersections show no change in LOS due to Concept 0, except for an LOS improvement (C to B) for Intersection 1 (Richards Rd / Lake Hills Connector).

For the Renton station, Intersection 2 (I-405 SB Ramps / SR900 / Maple Valley Hwy / SR 169) shows LOS D for the future weekday operation, and LOS E for the future Saturday operation, without the project and for Concept 0. There are no differences in LOS or v/c between the future without the project or for Concept 0. Intersection 3 (SR 900 / NE 3rd St) shows similar results, with LOS E for both weekday and Saturday future operations, and no differences in LOS or v/c between the future without the project, or for Concept 0. Intersection 5 (Duvall Ave NE / NE 4th St) shows LOS D for Saturday future operations without the project and for Concept 0. The v/c for Concept 0 is slightly higher than without the project (0.87 vs. 0.86). This minor difference is expected to have no impact on air quality between the alternatives.

For the Shoreline station, Intersections 3 (I-5 NB Ramps / N 175th St) and 7 (5th Ave NE / NE 145th St) show LOS D for both the existing and future Saturday operations. There are no differences in LOS or v/c between the future without the project or for Concept 0.

The four intersections associated with the Bow Lake station show LOS of E or F for all future (2023) weekday operation alternatives (without project and for Concept 0). One of these, Intersection 3 (Orillia

Rd S / S 188th St, which is unsignalized), shows a future LOS of F for all future operation alternatives. There are no differences in LOS, and only minor differences in v/c between the future without the project and for Concept 0. These minor differences are expected to have no impact on air quality between the alternatives.

Although increased vehicle density is expected to create potential intersection congestion in future years, vehicle emission improvements are expected to create an overall decrease in emissions. Traffic associated with the transfer stations would be a small percentage of total regional traffic. In addition, the geographic dispersion of stations in King County already minimizes the potential for transfer vehicles to adversely affect air quality at any one intersection. In summary, the King County Transfer Plan would not cause or contribute to any violation of the NAAQS for CO. The project would not cause significant adverse air quality impacts.

The King County Transfer Plan would meet air quality conformity criteria, as discussed earlier; no operational air quality mitigation would be required. There is no construction associated with this project; therefore, no construction or equipment emission control measures would be required.

Table 2
Intersection Operations

	Weekday								Saturday							
	2014		2023						2014							
	Existing		Without Project		Concept 0 With Renton		Concept 0 Without Renton		Existing		Without Project		Concept 0 With Renton		Concept 0 Without Renton	
Intersection	LOS	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio	LOS	V/C Ratio
RENTON																
1. I-405 NB Ramps / Maple Valley Hwy / SR 169	B	0.40	C	0.65	C	0.65	--	--	B	0.39	B	0.55	B	0.55	--	--
2. I-405 SB Ramps / SR 900 / Maple Valley Hwy / SR 169	C	0.78	D	0.98	D	0.98	--	--	D	0.85	E	1.01	E	1.01	--	--
3. SR 900 / NE 3rd St	D	0.74	E	0.91	E	0.91	--	--	D	0.81	E	0.97	E	0.97	--	--
4. Jefferson Ave NE / NE 3rd St	A	0.45	B	0.54	B	0.54	--	--	B	0.51	B	0.61	B	0.61	--	--
5. Duvall Ave NE / NE 4th St	C	0.55	C	0.66	C	0.66	--	--	C	0.71	D	0.86	D	0.87	--	--
SHORELINE																
1. Meridian Ave N / N 175th St	C	0.60	C	0.61	C	0.61	C	0.61	C	0.70	C	0.72	C	0.72	C	0.72
2. I-5 SB Ramps / N 175th St	B	0.54	B	0.55	B	0.56	B	0.56	B	0.57	B	0.57	B	0.58	B	0.58
3. I-5 NB Ramps / N 175th St	B	0.56	B	0.58	B	0.58	B	0.58	D	0.87	D	0.89	D	0.89	D	0.89
4. Meridian Ave N / N 165th St (unsignalized)	B	--	B	--	B	--	B	--	B	--	B	--	B	--	B	--
5. Meridian Ave N / N 145th St	A	0.35	A	0.36	A	0.36	A	0.36	A	0.44	A	0.45	A	0.46	A	0.46
6. SB Ramps / N 145th St	C	0.64	C	0.65	C	0.65	C	0.65	B	0.86	B	0.87	B	0.88	B	0.88
7. 5th Ave NE / NE 145th St	C	0.80	C	0.82	C	0.82	C	0.82	D	1.06	D	1.09	D	1.09	D	1.09
BOW LAKE																
1. I-5 SB Ramps / S 188th St	B	0.36	E	1.04	E	1.06	E	1.06	B	0.36	B	0.68	B	0.71	B	0.74
2. I-5 NB Ramps / S 188th St	B	0.51	E	1.33	E	1.35	E	1.36	B	0.54	B	0.74	B	0.76	C	0.78
3. Orilla Rd S / S 188th St (unsignalized)	D	--	F	--	F	--	F	--	C	--	F	--	F	--	F	--
4. Orilla Rd S / S 200th St	C	0.52	F	1.13	F	1.14	F	1.14	B	0.33	C	0.71	C	0.71	C	0.72
FACTORIA																
1. Richards Rd / Lake Hills Connector	B	0.52	B	0.61	B	0.61	B	0.61	B	0.41	C	0.39	B	0.48	B	0.48
2. Richards Rd / SE 26th St	B	0.46	B	0.54	B	0.56	B	0.56	B	0.38	B	0.45	B	0.49	B	0.49
3. Richards Rd / SE 32nd St	A	0.39	A	0.45	A	0.52	A	0.54	A	0.36	A	0.43	A	0.55	A	0.57
4. Richards Rd / SE Eastgate Way	B	0.57	B	0.65	B	0.66	B	0.66	B	0.61	C	0.72	C	0.73	C	0.73
5. Factoria Blvd SE / I-90 EB Ramp	C	0.78	C	0.99	C	0.84	C	0.85	C	0.70	C	0.84	C	0.94	C	0.95
6. Factoria Blvd SE / Coal Creek Pkwy SE	B	0.47	B	0.54	B	0.54	B	0.55	B	0.68	C	0.82	C	0.82	C	0.83
7. 148th Ave SE / Eastgate Way	C	0.68	C	0.78	C	0.79	C	0.79	C	0.61	C	0.72	C	0.74	C	0.74

Note: v/c info not available for unsignalized intersections.

References

Federal Register (FR), 1996a. *Volume 61, Number 199*. October 11.

_____, 1996b. *Volume 61, Number 50438*. September 26.

Puget Sound Regional Council, 2014. Accessed at: http://www.psrc.org/assets/11904/Designated-Maint-Nonattain-Areas-201402.pdf February.

U.S. Environmental Protection Agency (EPA), 2015. *EPA 40 CFR Part 50*, accessed at: http://www.epa.gov/air/criteria.html

Washington Administrative Code (WAC), 2013. December.

_____, 2015. *WAC Chapter 173-476*, accessed at: http://www.ecy.wa.gov/laws-rules/ecywac.html#air

ATTACHMENTS A - I

ATTACHMENT A

Data Collection Element	Description	Applicable Sites	Responsible for Data Collection	Responsible for Data Entry	Responsible for Analysis
Site Access Volumes	24-hour volumes at the site ingress and egress points. Collected via video or tubes – focus on daily counts and peak hour volumes for a 2-week period.	Renton, Factoria, Shoreline, Houghton	Idax	Transpo Group/ Idax	Transpo Group
Site ingress/Egress Queuing	Record inbound/outbound queuing levels for 2-week period - video.	Renton, Factoria, Shoreline, Houghton	Idax	Transpo Group/ Idax	Transpo Group
Internal Queuing	Record queuing levels at internal material transfer points – Video or observations	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group / Idax / URS	Transpo Group / Idax / URS	Transpo Group
Internal trip patterns	Document the number and percentage of shared trips between multiple material transfers (i.e. garbage only vs. garbage and recycling).	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group / URS	Transpo Group / URS	Transpo Group
Vehicle Duration/ Travel Time Onsite	Recording of entry and exit times of vehicles onsite via observation	Renton, Factoria, Shoreline, Houghton	Transpo Group / URS	Transpo Group / URS	Transpo Group
Customer Trip Origin	Identify customer origins via intercept surveys – recorded on paper or electronic format at the point of intercept.	Renton, Factoria, Shoreline, Houghton	Transpo Group / URS	Transpo Group / URS	Transpo Group
Offsite Turning Movement Counts	Peak-hour traffic volumes collected at offsite study intersection locations.	Renton, Factoria, Shoreline, Houghton	Idax	Transpo Group/ Idax	Transpo Group
Customer Processing Rates	Identify processing rates at key points. Including entry, exit, tipping floor, and HHW or recycling areas.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group / URS	Transpo Group / URS	Transpo Group
Haul Weight per Vehicle	Average haul weights per vehicle for the different uses will be observed at noted.	Renton, Factoria, Shoreline, Houghton	King County	King County	Transpo Group
Waste Stream Forecasts	Waste stream forecasts to be provided reflecting with and without the Renton facility. This would include information for garbage, recycling, and household hazardous waste.	Renton, Factoria, Shoreline, Houghton	King County	King County	Transpo Group

ATTACHMENT B

Highway Capacity Manual 2010

Signalized intersection level of service (LOS) is defined in terms of a weighted average control delay for the entire intersection. Control delay quantifies the increase in travel time that a vehicle experiences due to the traffic signal control as well as provides a surrogate measure for driver discomfort and fuel consumption. Signalized intersection LOS is stated in terms of average control delay per vehicle (in seconds) during a specified time period (e.g., weekday PM peak hour). Control delay is a complex measure based on many variables, including signal phasing and coordination (i.e., progression of movements through the intersection and along the corridor), signal cycle length, and traffic volumes with respect to intersection capacity and resulting queues. Table 1 summarizes the LOS criteria for signalized intersections, as described in the *Highway Capacity Manual 2010* (Transportation Research Board, 2010).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)	General Description
A	≤10	Free Flow
B	>10 – 20	Stable Flow (slight delays)
C	>20 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F[1]	>80	Forced flow (congested and queues fail to clear)

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio for a lane group exceeds 1.0 LOS F is assigned to the individual lane group. LOS for overall approach or intersection is determined solely by the control delay.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop and two-way stop control. All-way stop control intersection LOS is expressed in terms of the weighted average control delay of the overall intersection or by approach. Two-way stop-controlled intersection LOS is defined in terms of the average control delay for each minor-street movement (or shared movement) as well as major-street left-turns. This approach is because major-street through vehicles are assumed to experience zero delay, a weighted average of all movements results in very low overall average delay, and this calculated low delay could mask deficiencies of minor movements. Table 2 shows LOS criteria for unsignalized intersections.

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (seconds/vehicle)
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F[1]	>50

Source: *Highway Capacity Manual 2010*, Transportation Research Board, 2010.

1. If the volume-to-capacity (v/c) ratio exceeds 1.0, LOS F is assigned an individual lane group for all unsignalized intersections, or minor street approach at two-way stop-controlled intersections. Overall intersection LOS is determined solely by control delay.

Highway Capacity Manual, 2000

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Transportation Research Board, Special Report 209, 2000).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Source: *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

ATTACHMENT C

Shoreline Data Collection Plan - Camera / Tubes

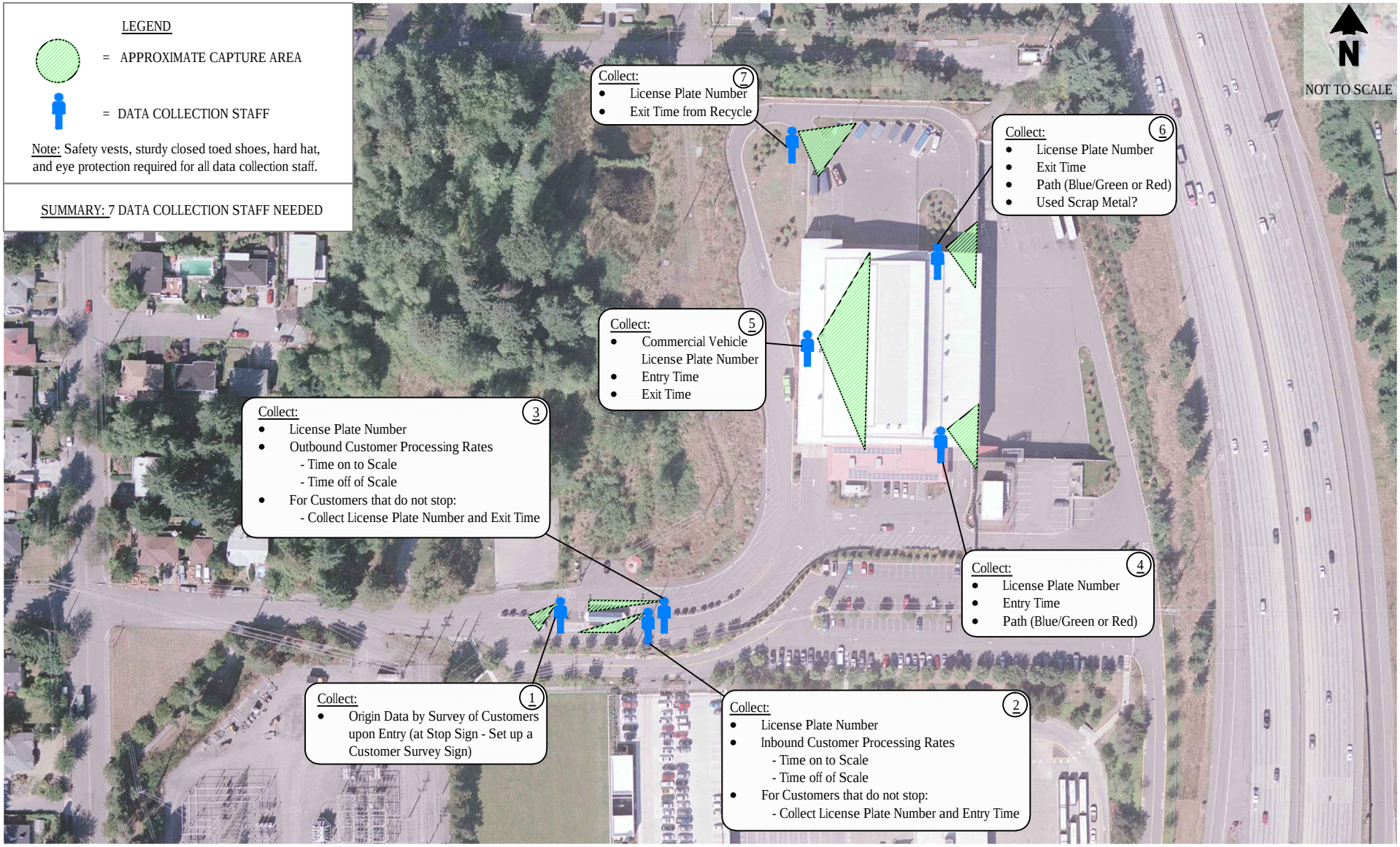
EXHIBIT

1

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Shoreline_Camera> kassil 08/18/14 14:26

transpoGROUP



Shoreline Data Collection Plan - Manual

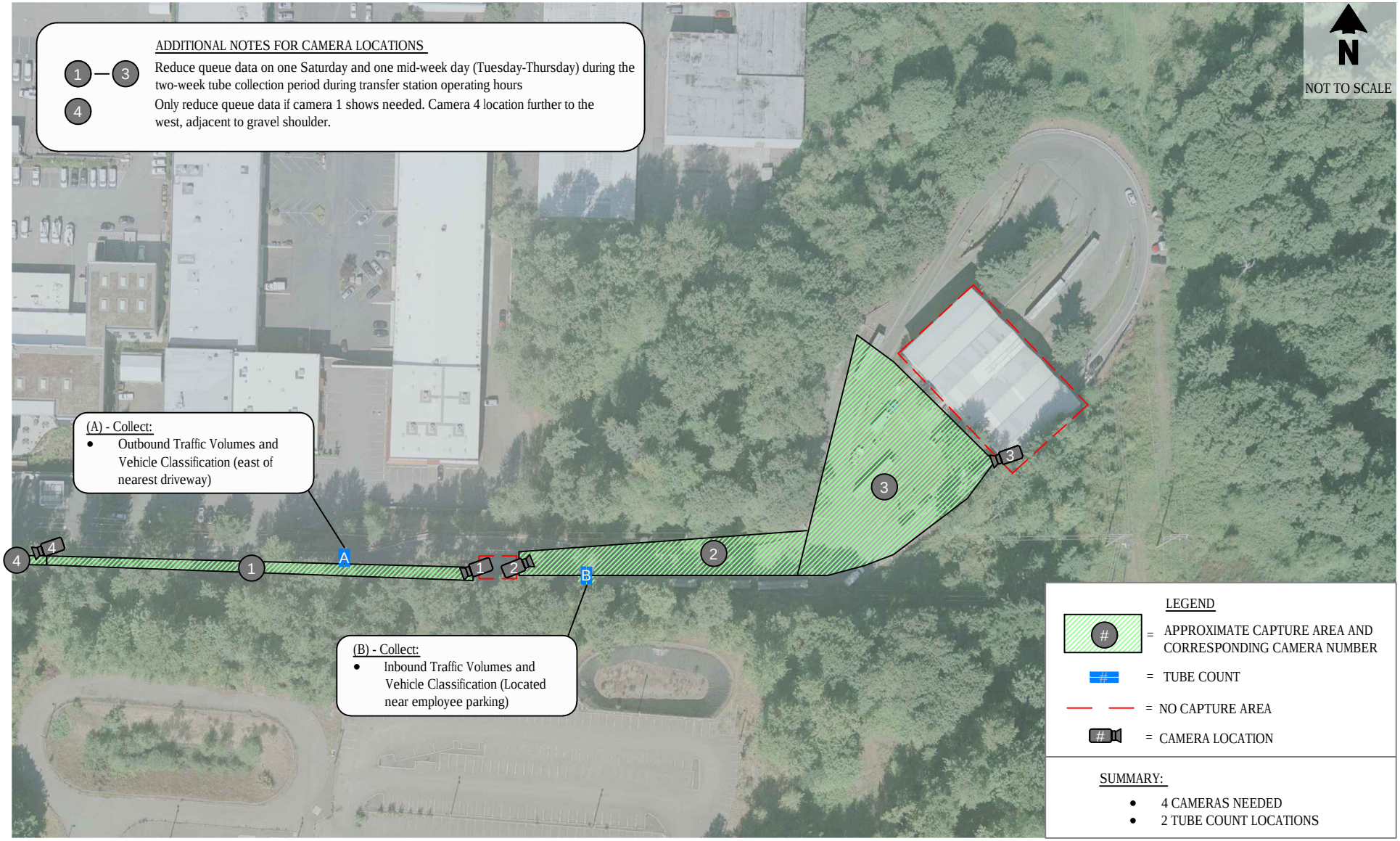
EXHIBIT

2

Northeast Recycling and Transfer Station No Action

transpoGROUP

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Shoreline_Person> kassil 08/18/14 14:26



Factoria Transfer Station Data Collection Plan - Camera / Tubes

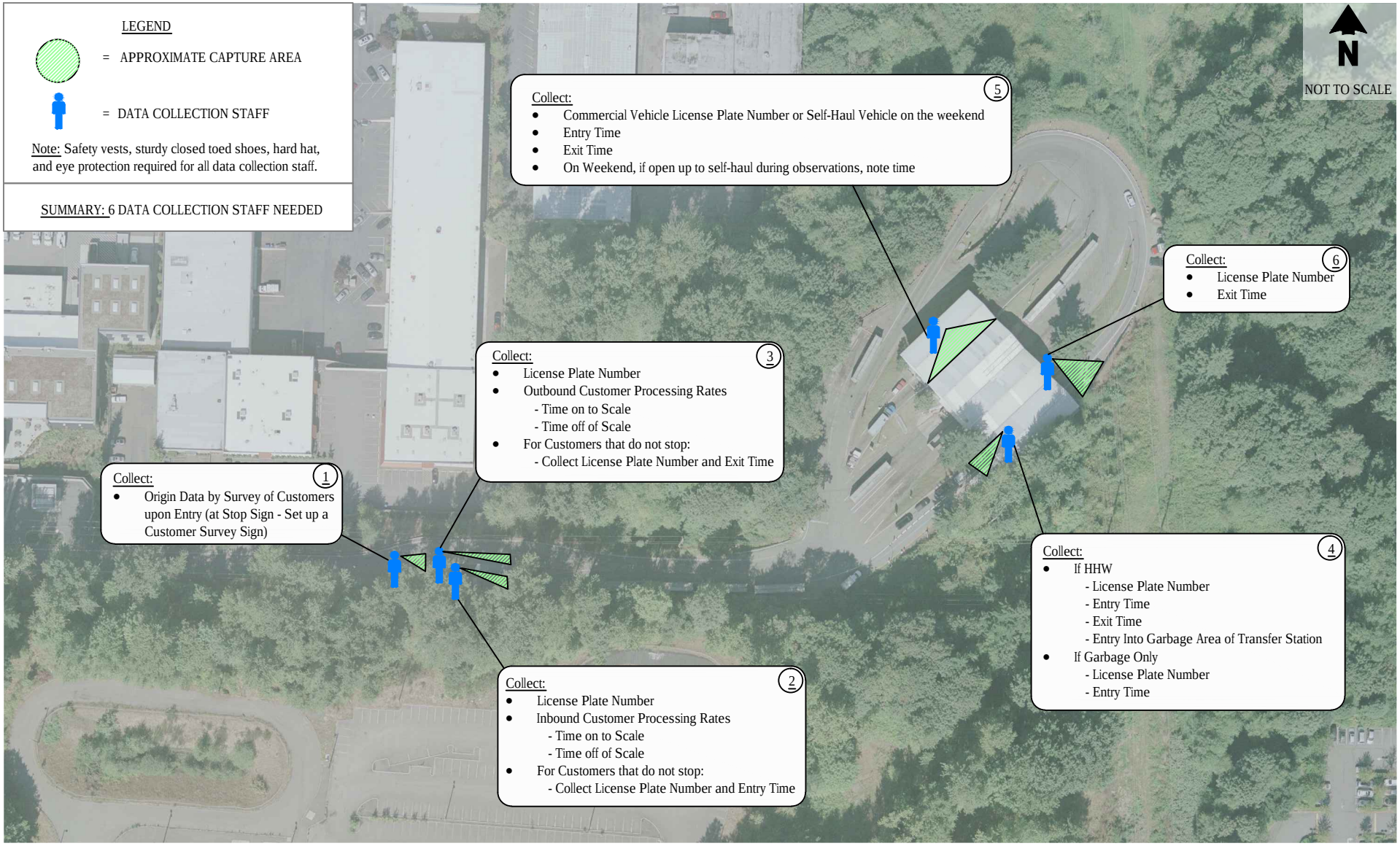
EXHIBIT

3

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Factoria> kassil 08/18/14 14:26

transpoGROUP



Factoria Transfer Station Data Collection Plan - Manual

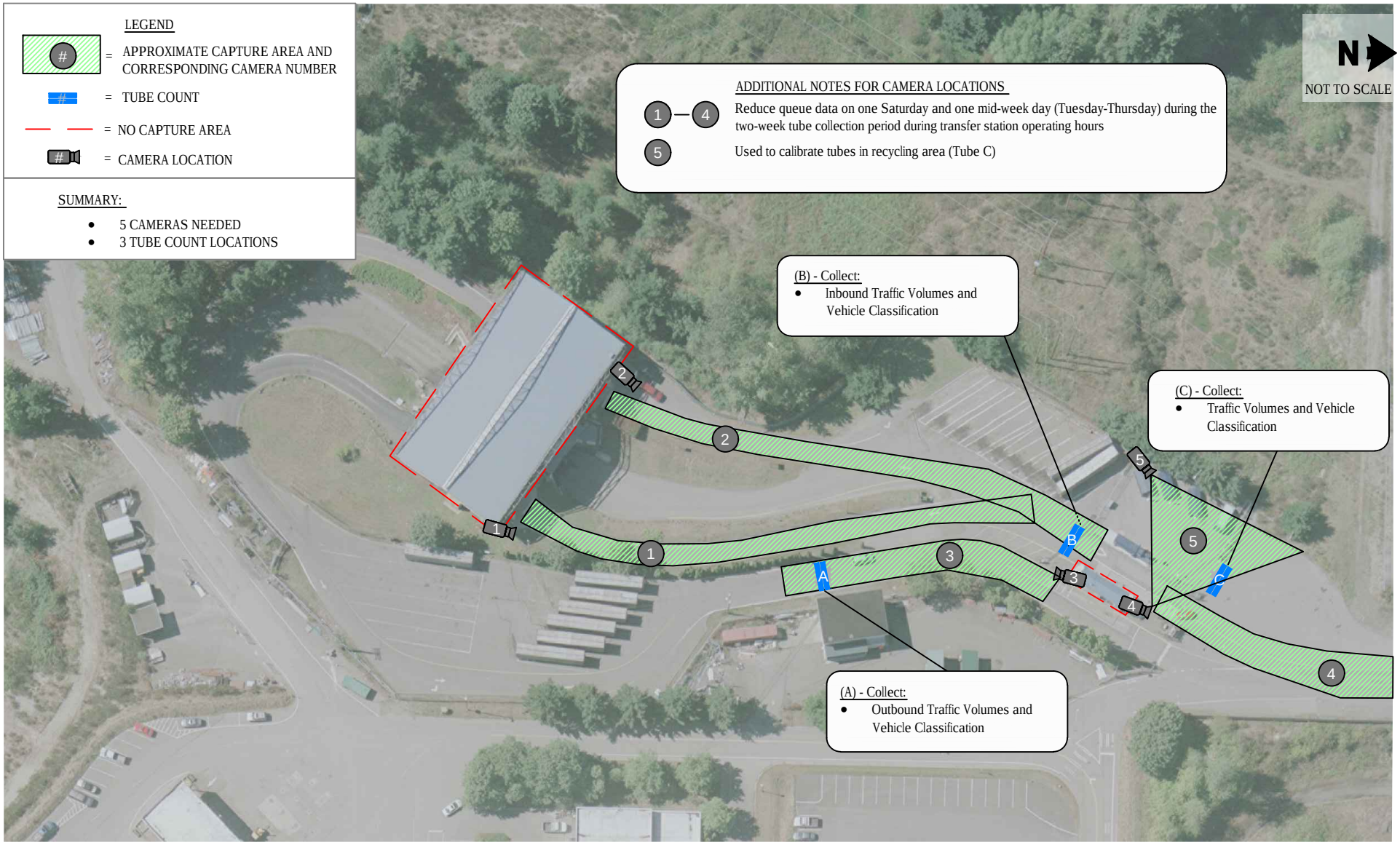
EXHIBIT

4

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Factoria> kassil 08/18/14 14:26

transpoGROUP



Renton Transfer Station Data Collection Plan - Camera / Tubes

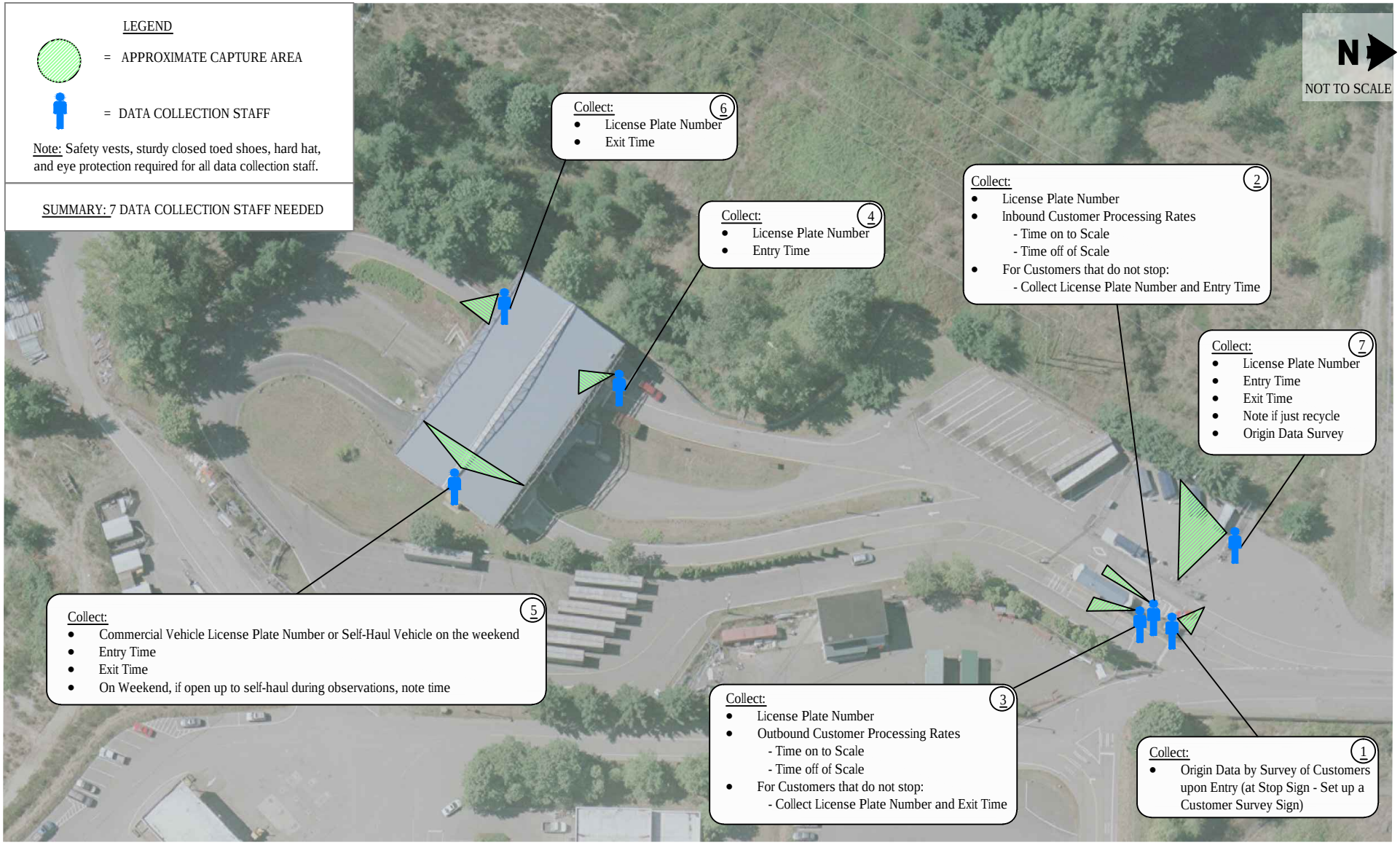
EXHIBIT

5

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Shoreline_Camera> kassil 08/18/14 14:26

transpoGROUP



Renton Transfer Station Data Collection Plan - Manual

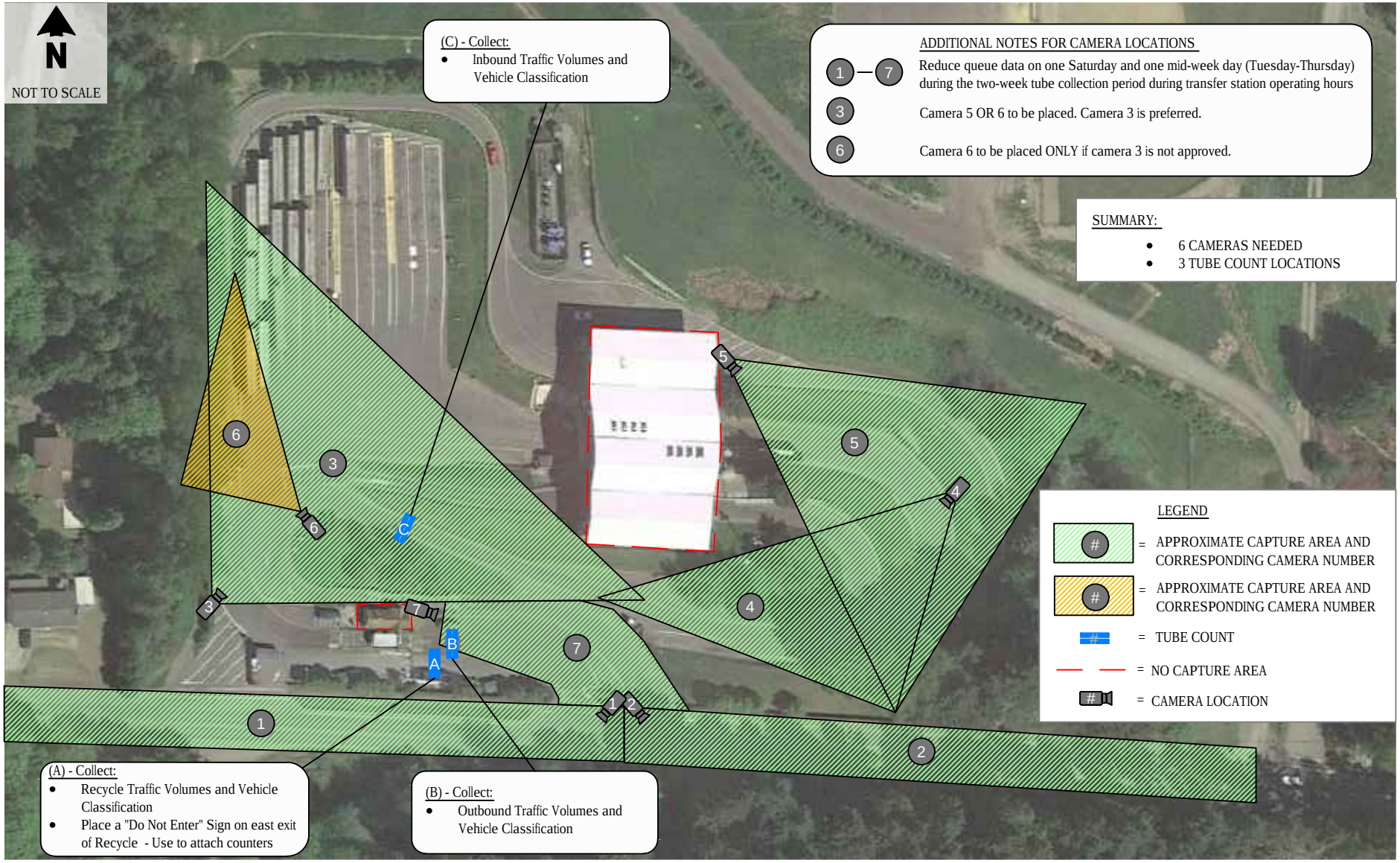
EXHIBIT

6

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Shoreline_Camera> kassil 08/18/14 14:26

transpoGROUP



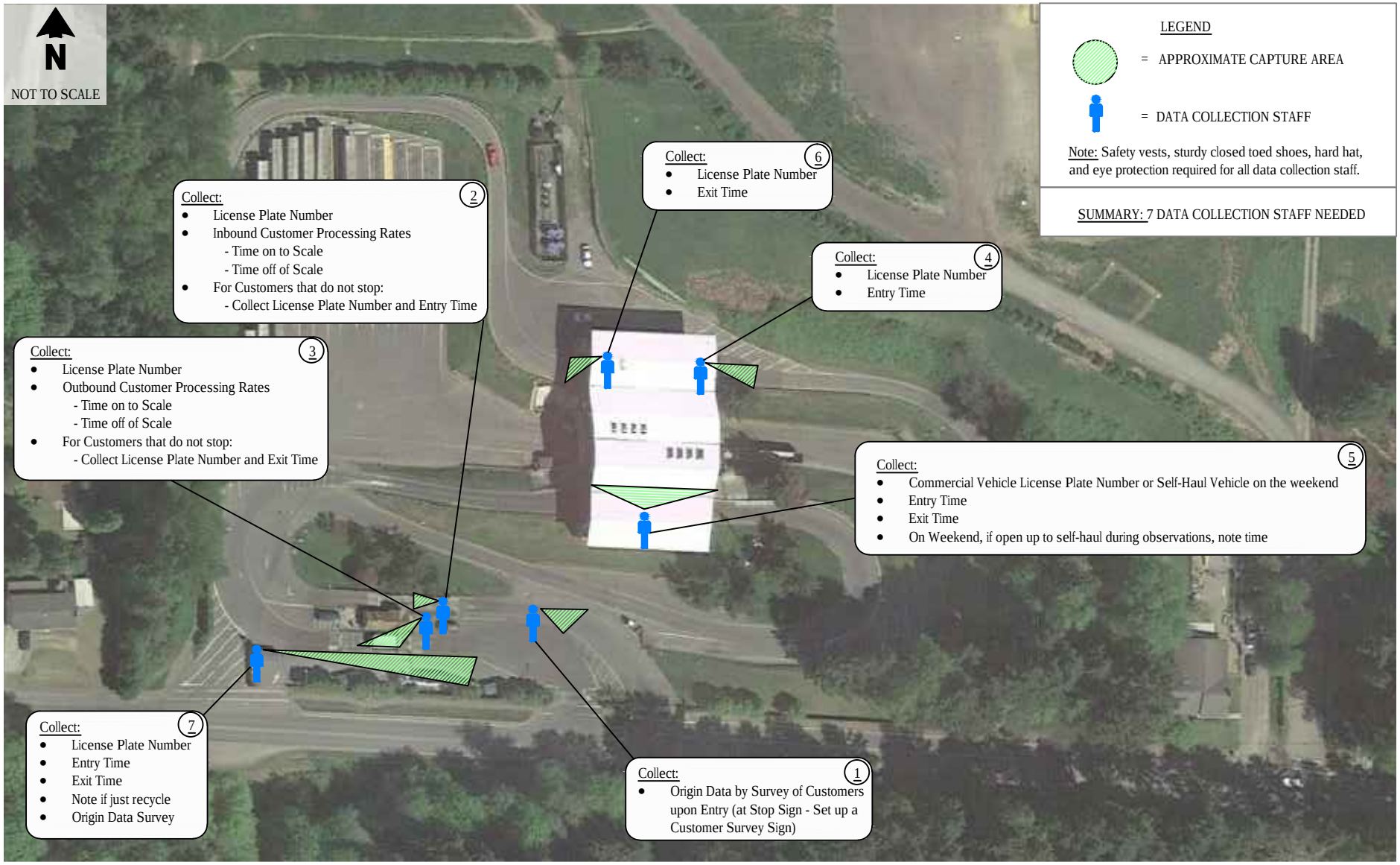
Houghton Transfer Station Data Collection Plan - Camera / Tubes

EXHIBIT **7**

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Houghton> kassil 08/18/14 14:26

transpoGROUP



Houghton Transfer Station Data Collection Plan - Manual

EXHIBIT **8**

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Houghton> kassil 08/18/14 14:26

transpoGROUP

ADDITIONAL NOTES FOR CAMERA LOCATIONS

1 , 5 Only reduce queue data if camera 3 shows needed

2 — 4 Reduce queue data on one Saturday and one mid-week day (Tuesday-Thursday) during the tube collection period during transfer station operating hours

6 Reduce queue data on one Saturday and one mid-week day (Tuesday-Thursday) during the tube collection period during transfer station operating hours

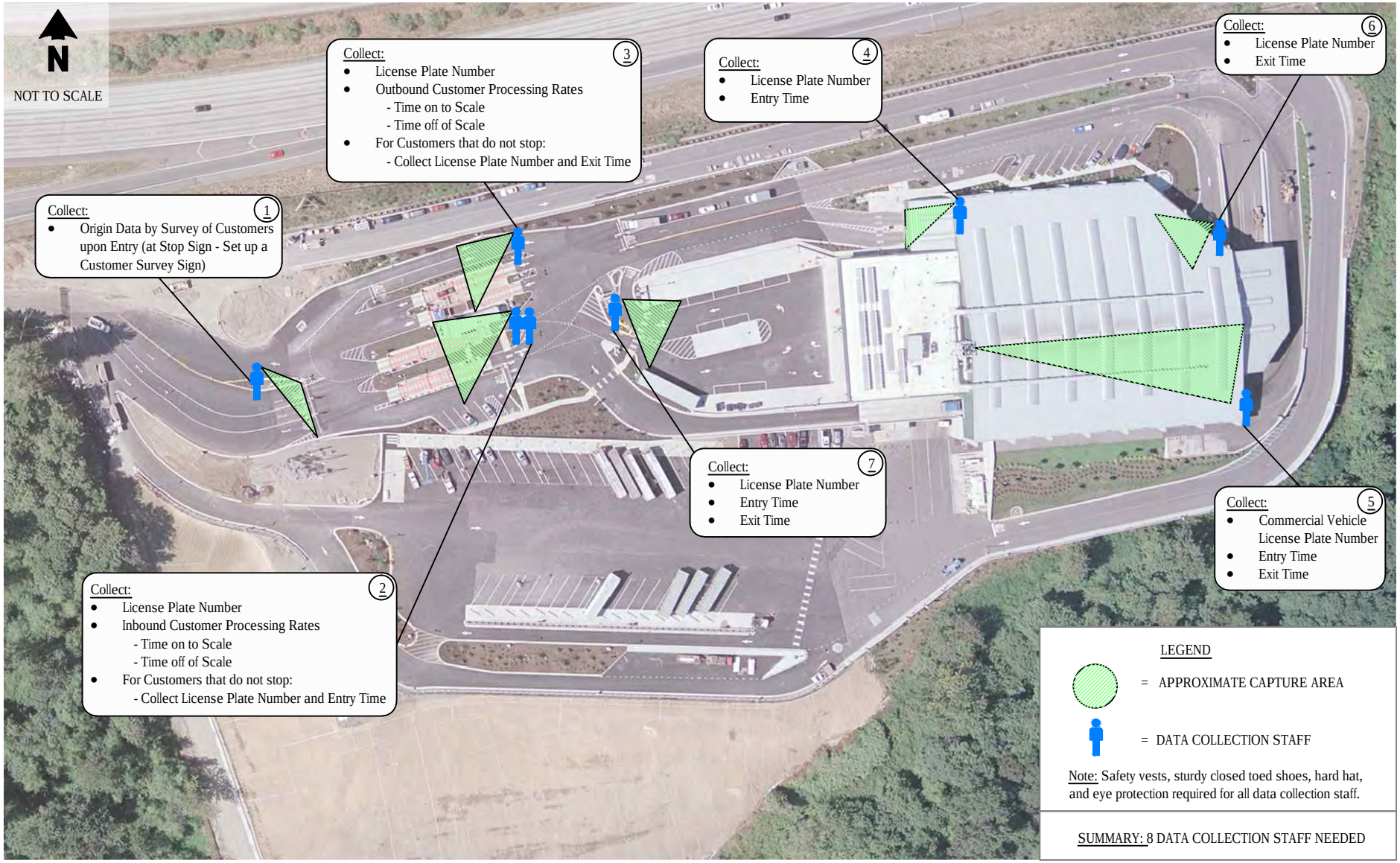
Bow Lake Transfer Station Data Collection Plan - Camera / Tubes

EXHIBIT 9

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Houghton> kassil 08/18/14 14:26

transpoGROUP



Bow Lake Transfer Station Data Collection Plan - Manual

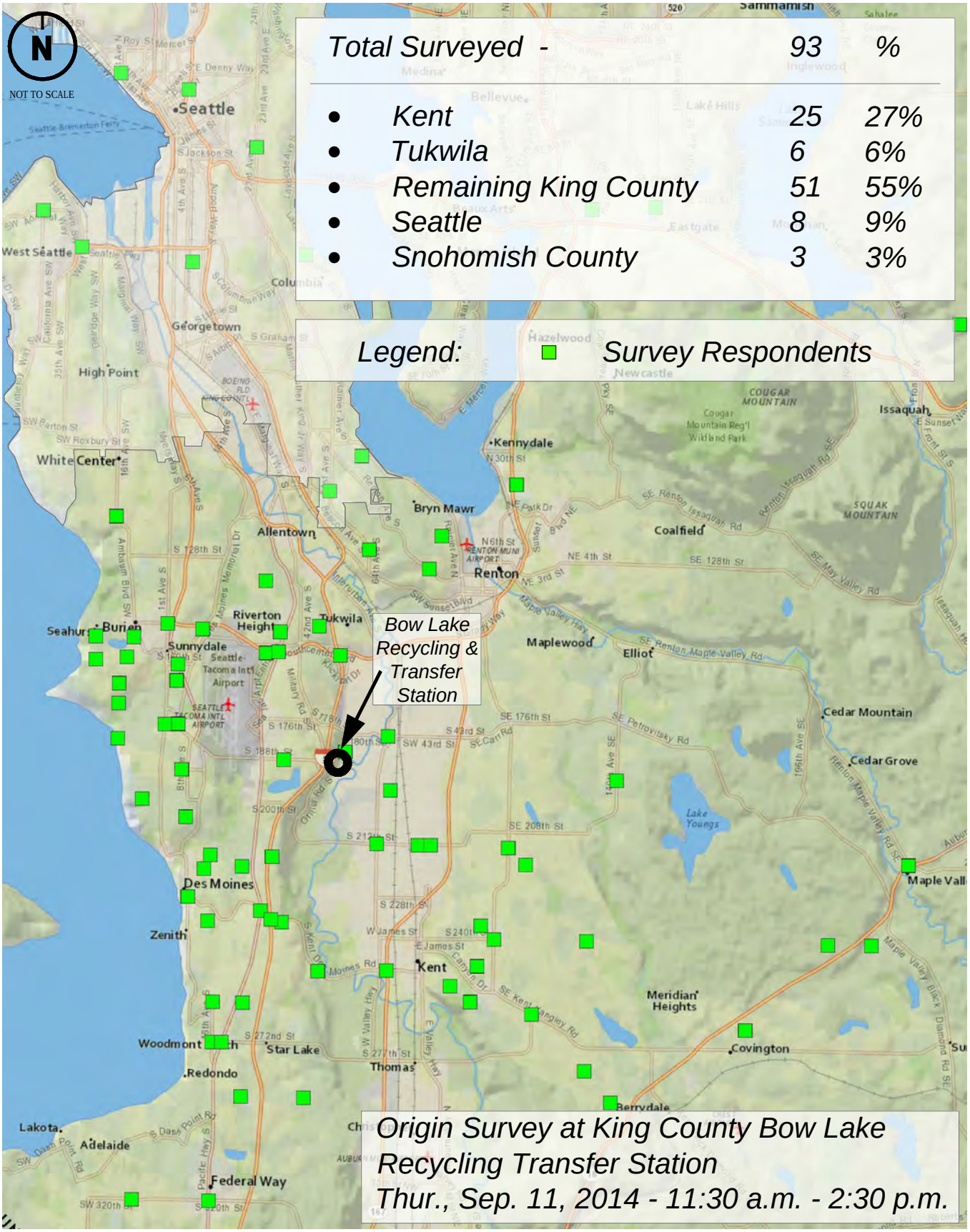
EXHIBIT **10**

Northeast Recycling and Transfer Station No Action

\\SRV-DFS-WA\mm_projects\Projects\12\12014.00 - King County Recycling & Transfer Station\NE txfr facilities\Graphics\NE txfr facilities_12014 <Houghton> kassil 08/18/14 14:26

transpoGROUP

ATTACHMENT D



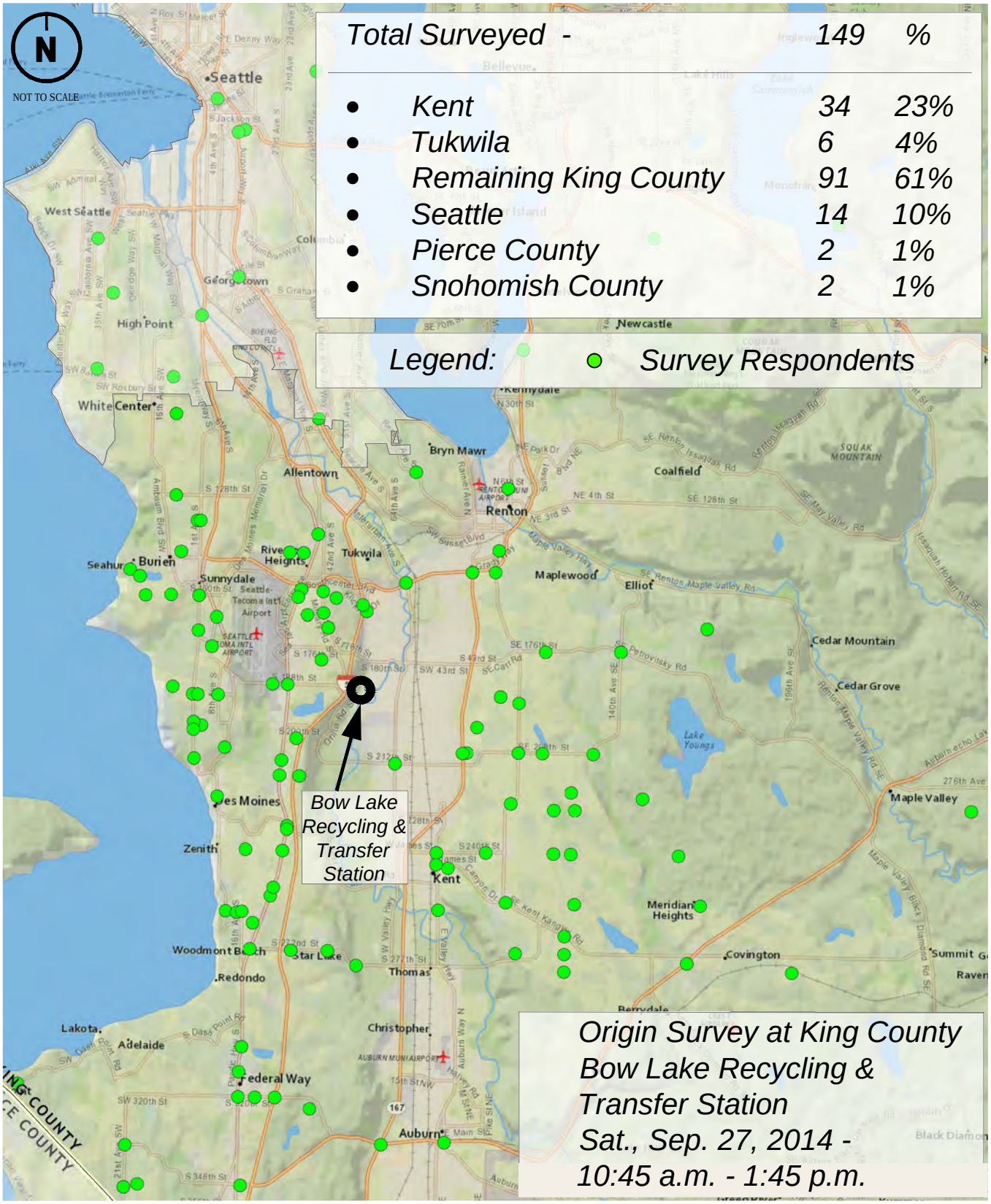
Weekday Bow Lake Survey Data

ATTACHMENT

D-1

Transfer Plan Review

URS transpogroup WHAT TRANSPORTATION CAN BE.

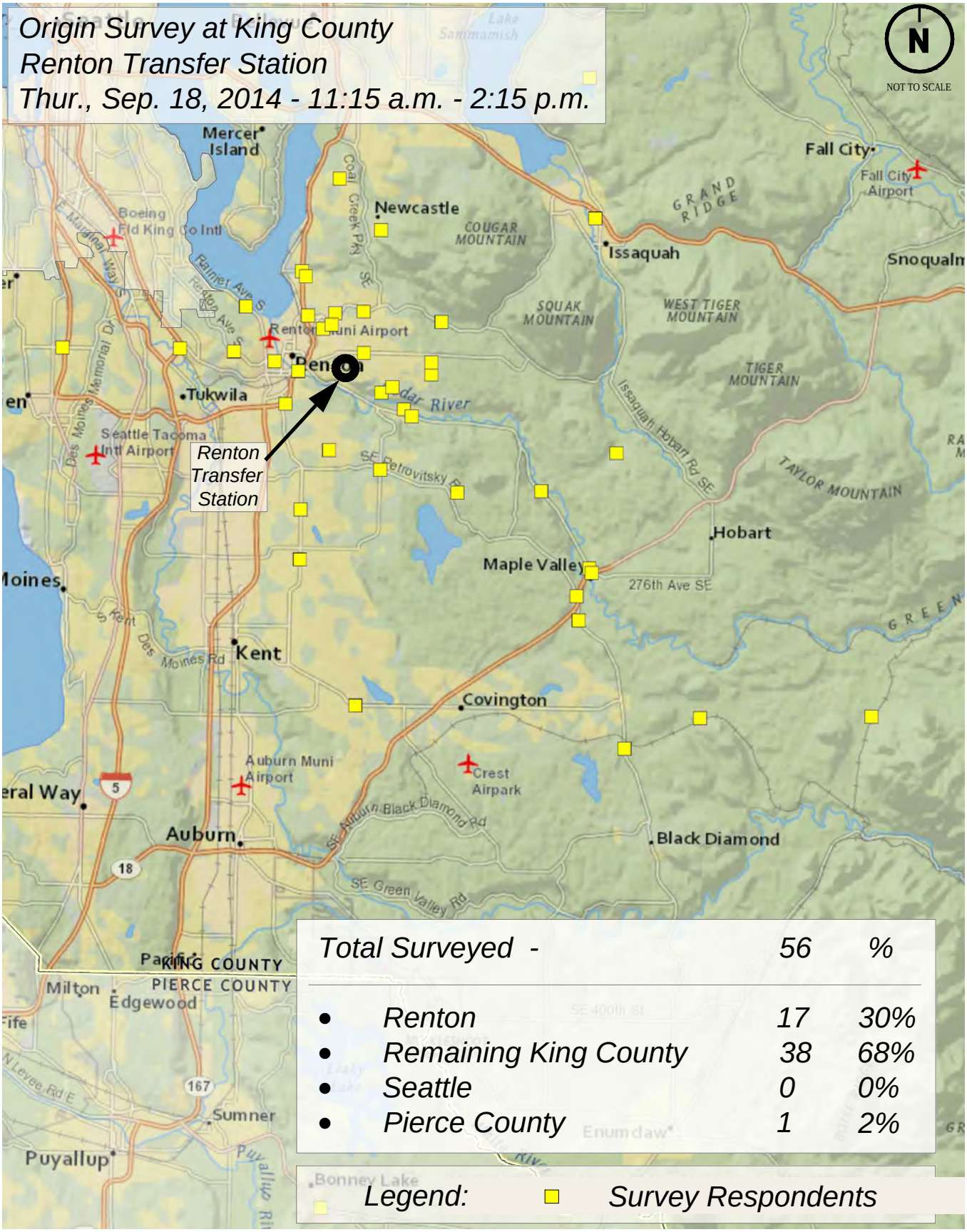


Saturday Bow Lake Survey Data

Transfer Plan Review

ATTACHMENT

D-2

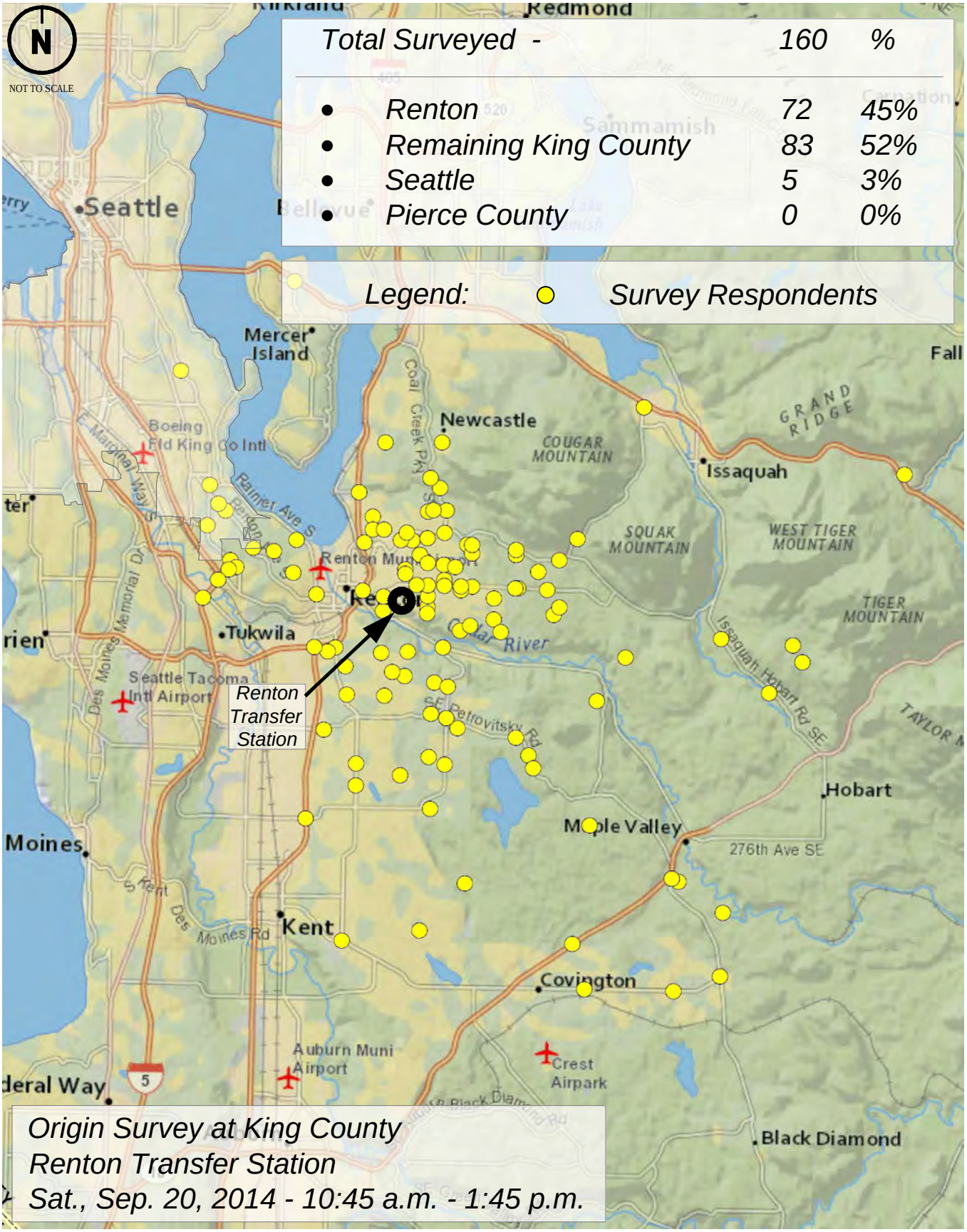


Weekday Renton Survey Data

Transfer Plan Review

ATTACHMENT

D-3

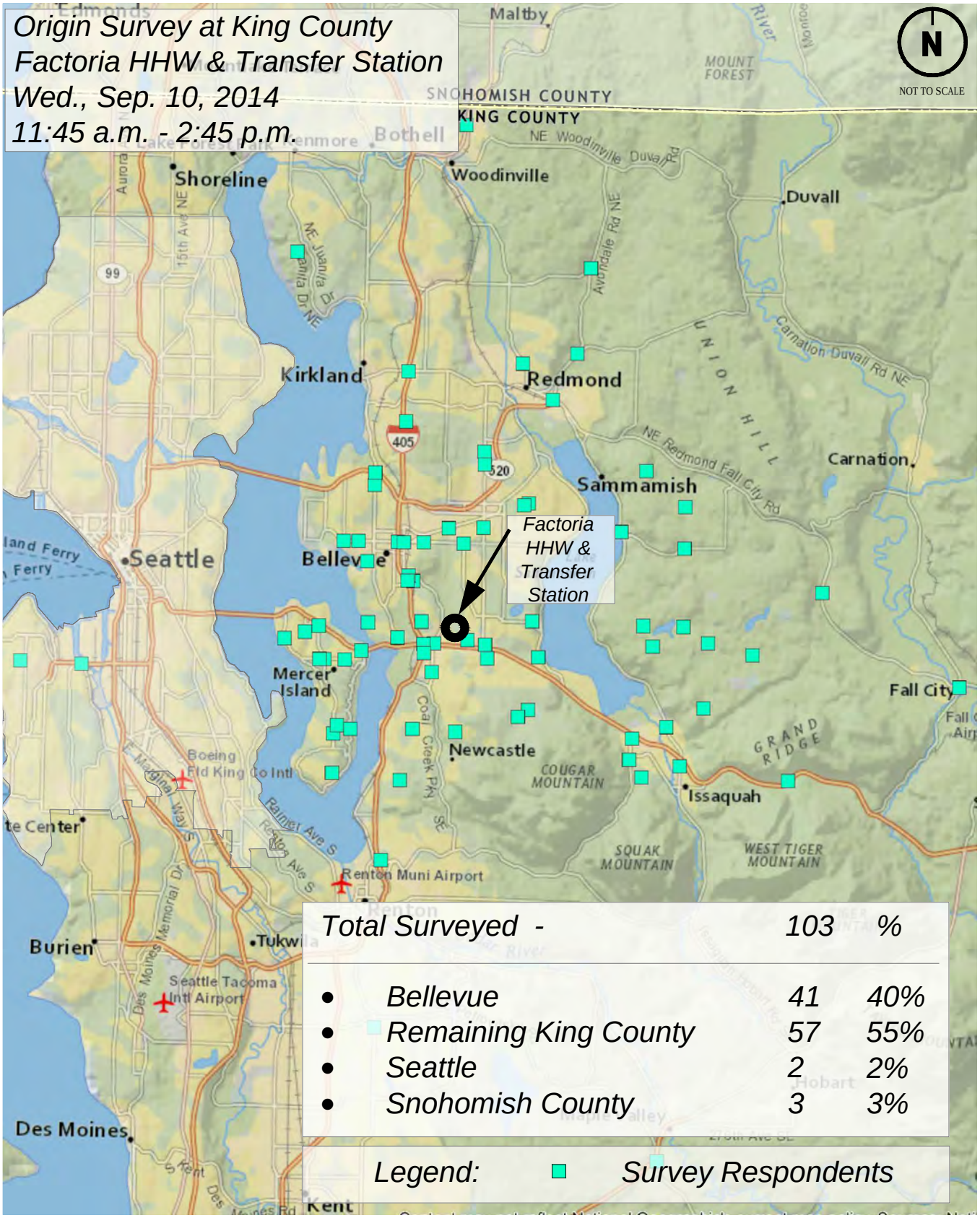


Saturday Renton Survey Data

Transfer Plan Review

ATTACHMENT

D-4



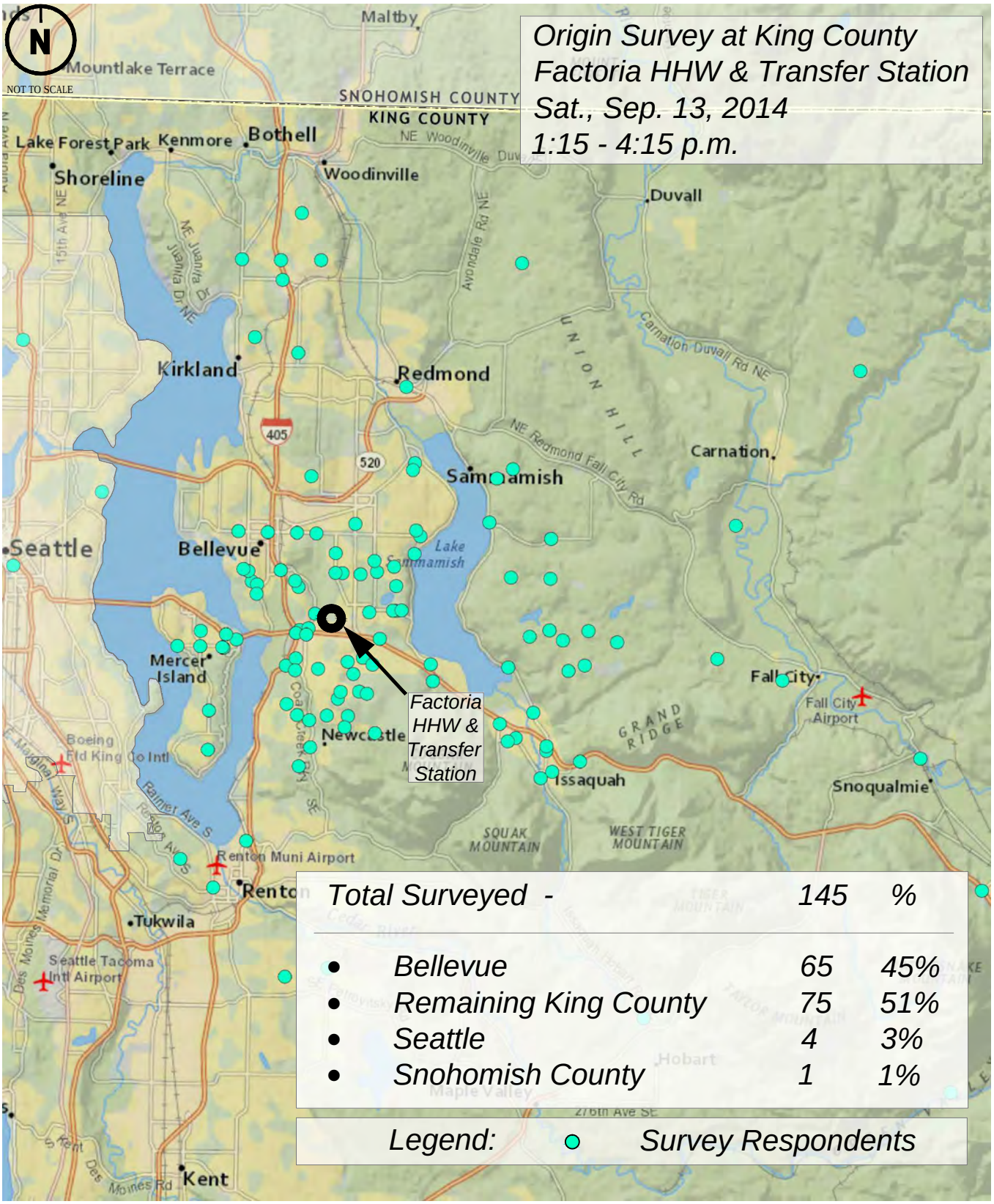
Weekday Factoria Survey Data

ATTACHMENT

D-5

Transfer Plan Review

URS transpogroup WHAT TRANSPORTATION CAN BE.

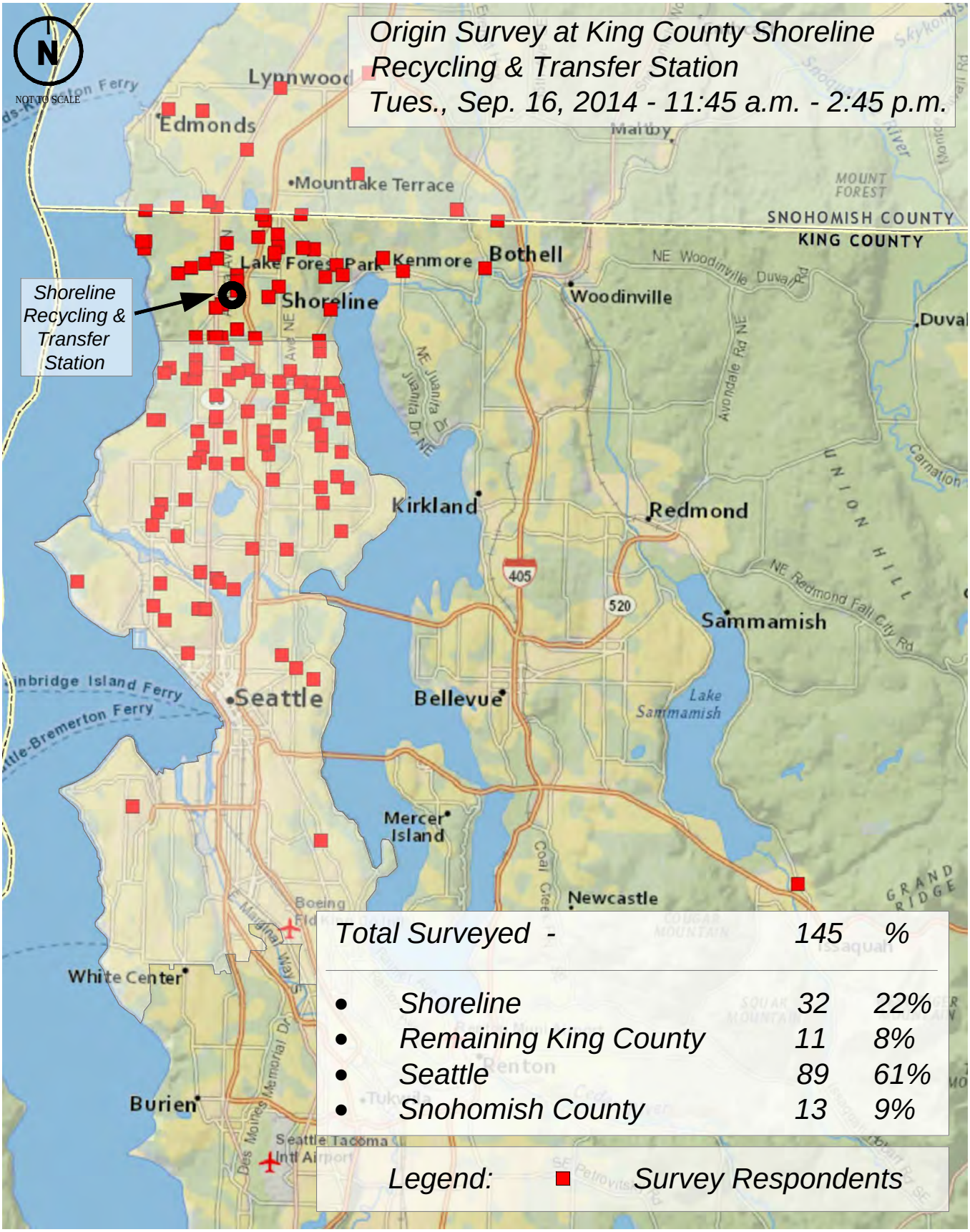


Saturday Factoria Survey Data

Transfer Plan Review

ATTACHMENT

D-6



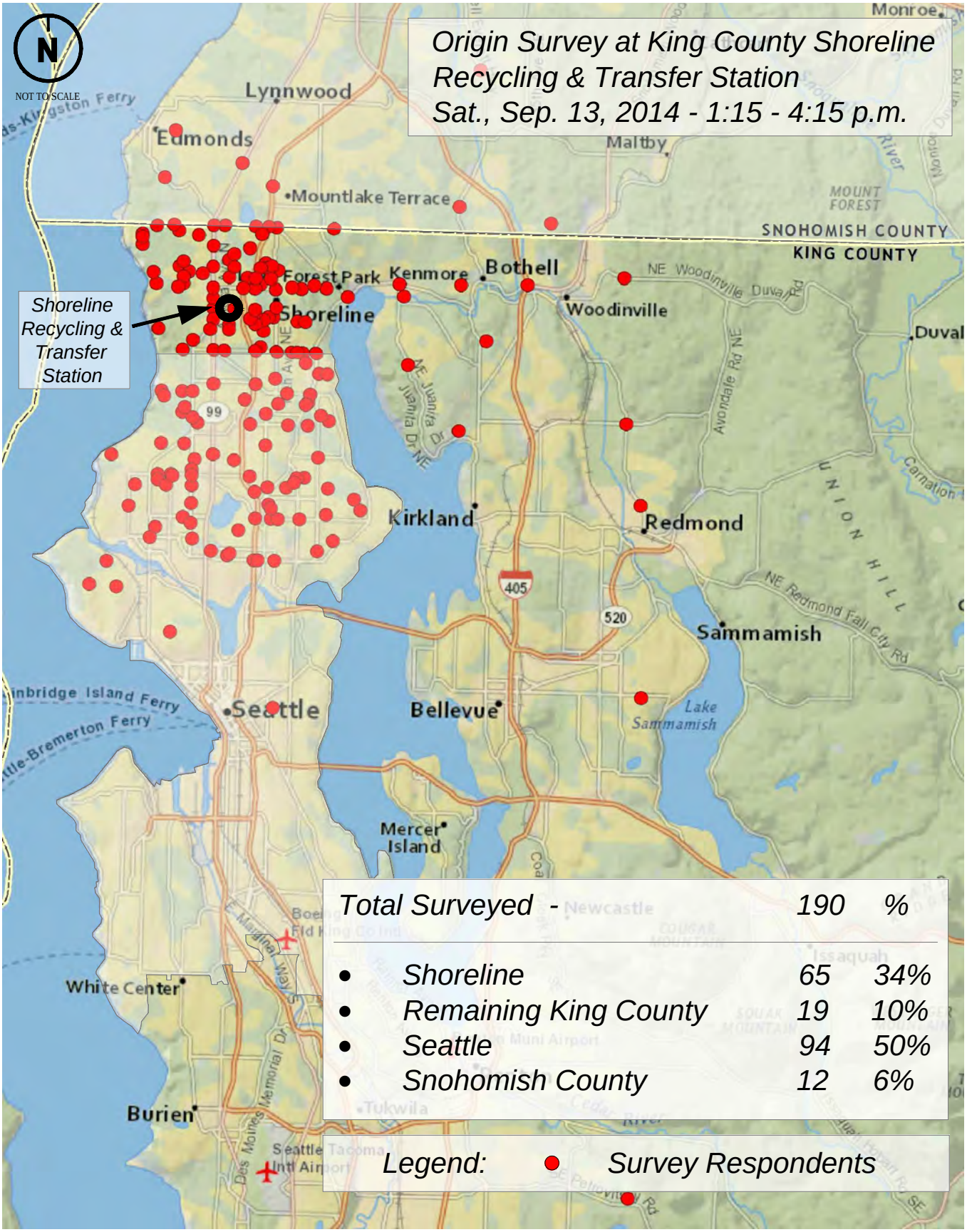
Weekday Shoreline Survey Data

ATTACHMENT

D-7

Transfer Plan Review

URS transpogroup WHAT TRANSPORTATION CAN BE.

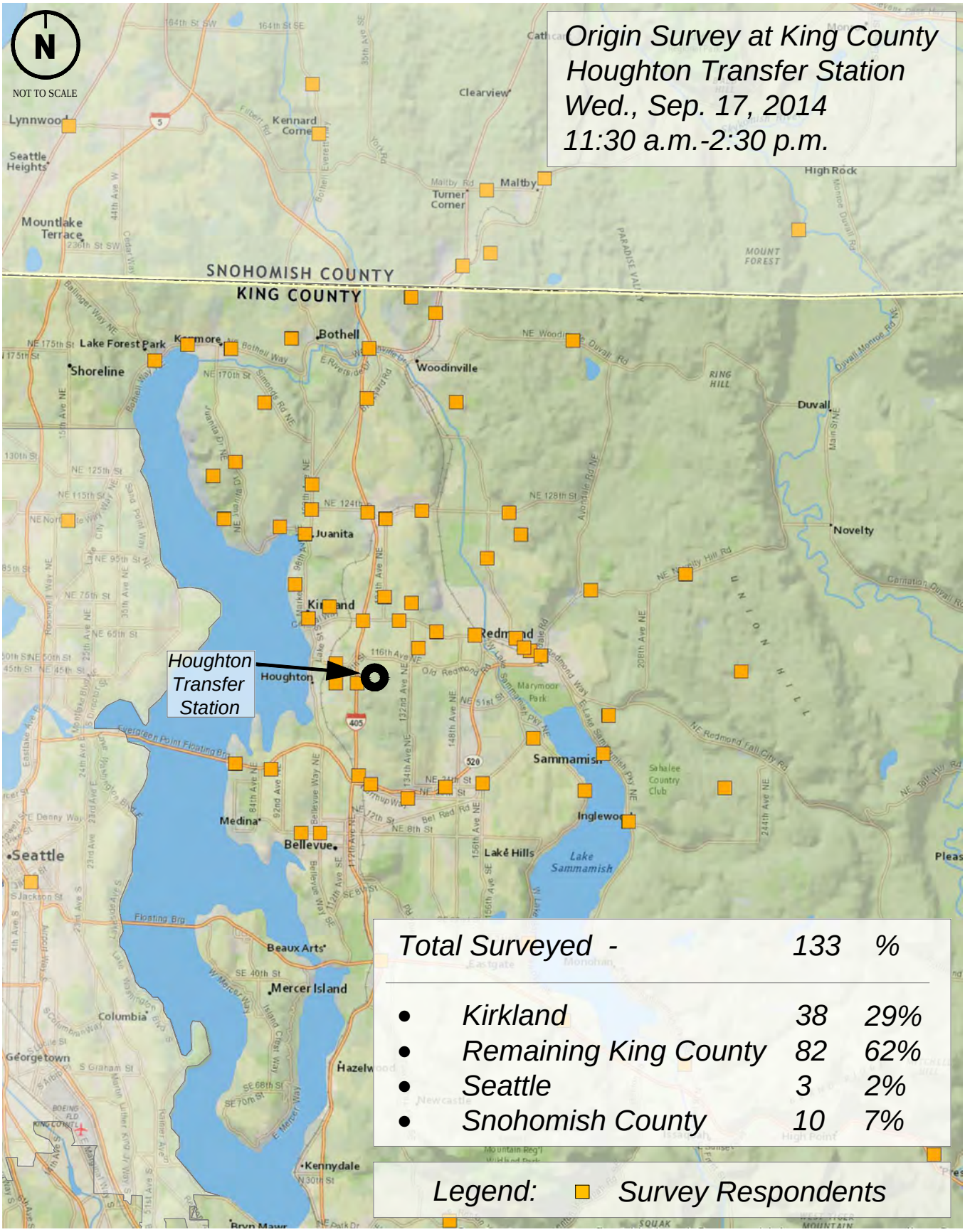


Saturday Shoreline Survey Data

Transfer Plan Review

ATTACHMENT

D-8

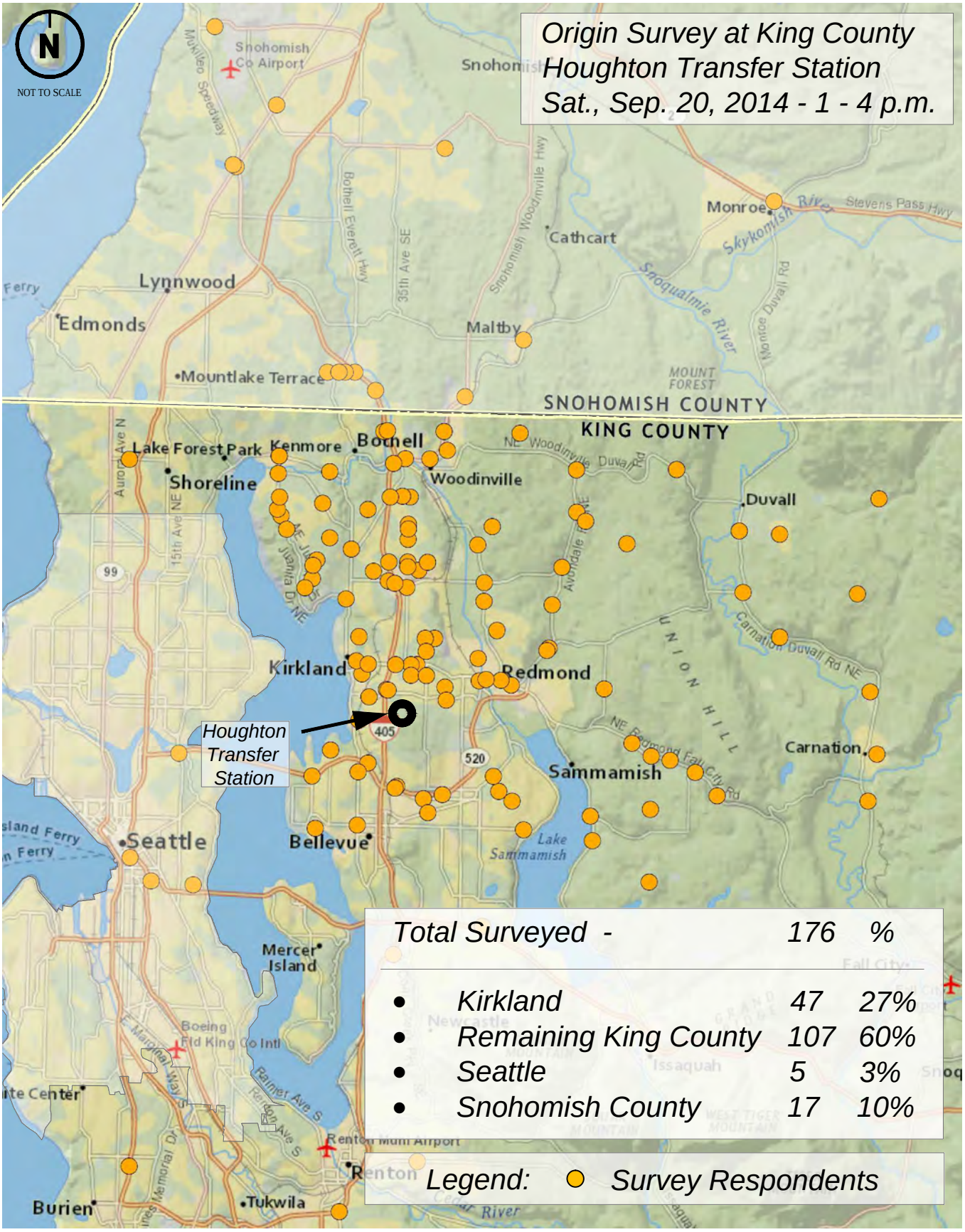


Weekday Houghton Survey Data

Transfer Plan Review

ATTACHMENT

D-9



Saturday Houghton Survey Data

Transfer Plan Review

ATTACHMENT

D-10

ATTACHMENT E

2023 - King County Transfer Station Trip Generation - Bow Lake Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	9,431	5,356	5.25	0.30	3,592	35,706		**39,298**
Hazardous Waste[2]								
Garbage[3]	**218,782**	**52,318**	5.25	0.35	83,346	298,960		**382,306**
Yard Waste[4]		3,748	5.25	0.25	0	29,984		**29,984**
Hauling Away[5]							25,646	**25,646**
Total								**477,234**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	22,495			**22,495**
Hazardous Waste[2]							
Garbage[3]	94%	78,345	63%	188,345			**266,690**
Yard Waste[4]	94%	0	63%	18,890			**18,890**
Hauling Away[5]					75%	19,235	**19,235**
Total							**327,310**

Material	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	6%		37%	13,211			**13,211**
Hazardous Waste[2]							
Garbage[3]	6%	5,001	37%	110,615			**115,616**
Yard Waste[4]	6%	0	37%	11,094			**11,094**
Hauling Away[5]					25%	6,412	**6,412**
Total							**146,333**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	3,592	94%	3,376	6%	216	259	103	94%	14	6%	4
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	83,346	94%	78,345	6%	5,001	259	103	94%	329	6%	101
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	86,938		81,721		5,217				343		105
Self Haul	Recycle	35,706	63%	22,495	37%	13,211	259	103	63%	115	37%	164
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	298,960	63%	188,345	37%	110,615	259	103	63%	967	37%	1,371
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138
	Total	364,650		229,730		134,920				1,179		1,673
Hauling Trucks	Hauling Away	25,646	75%	19,235	25%	6,412	259	103	75%	92	25%	80
Total		*477,234*		*330,686*		*146,549*				**1,614**		**1,858**
									Existing Trips	**750**		**900**
									Increase	**864**		**958**

Commercial Haul					
Self Haul	waste	91.7%	5.043137		
Hauling Trucks	recycle	8.3%	0.913726		

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

WEEKDAY	Bow Lake Commercial	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercial	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	11	11
7:00	8%	28	3%	4	3%	0	3%	32	3%	3	39	6%	6	73
8:00	9%	32	5%	6	5%	0	5%	53	5%	5	64	12%	11	107
9:00	9%	32	8%	9	8%	0	8%	74	8%	7	90	9%	8	130
10:00	11%	39	10%	11	10%	0	10%	92	10%	9	112	12%	11	162
11:00	12%	41	11%	12	11%	0	11%	106	11%	11	129	9%	8	178
12:00	12%	41	11%	13	11%	0	11%	110	11%	12	135	9%	8	184
13:00	11%	38	11%	13	11%	0	11%	110	11%	11	134	6%	6	178
14:00	9%	32	11%	13	11%	0	11%	110	11%	11	134	9%	8	174
15:00	8%	28	10%	12	10%	0	10%	99	10%	10	121	6%	6	155
16:00	5%	18	10%	11	10%	0	10%	92	10%	9	112	3%	3	133
17:00	4%	14	9%	11	9%	0	9%	89	9%	9	109	3%	3	126
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**343**	**100%**	**115**	**100%**	**0**	**100%**	**967**	**100%**	**97**	**1179**	**97%**	**89**	**1611**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	14	14
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	6	6
8:00	14%	14	4%	7	4%	0	4%	61	4%	6	74	10%	8	96
9:00	14%	14	8%	13	8%	0	8%	105	8%	11	129	10%	8	151
10:00	9%	10	10%	17	10%	0	10%	138	10%	14	169	10%	8	187
11:00	14%	14	12%	20	12%	0	12%	165	12%	17	202	7%	6	222
12:00	9%	10	13%	21	13%	0	13%	172	13%	17	210	10%	8	228
13:00	9%	9	13%	20	13%	0	13%	176	13%	17	213	7%	5	227
14:00	9%	9	13%	21	13%	0	13%	176	13%	18	215	10%	8	232
15:00	9%	10	12%	20	12%	0	12%	169	12%	17	206	7%	6	222
16:00	9%	10	11%	18	11%	0	11%	152	11%	15	185	0%	0	195
17:00	5%	5	4%	7	4%	0	4%	57	4%	6	70	0%	0	75
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**105**	**100%**	**164**	**100%**	**0**	**100%**	**1371**	**100%**	**138**	**1673**	**97%**	**77**	**1855**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	8,682	5,356	5.25	0.30	3,308	35,706		**39,014**
Hazardous Waste[2]								
Garbage[3]	**201,411**	**52,318**	5.25	0.35	76,728	298,960		**375,688**
Yard Waste[4]		3,748	5.25	0.25	0	29,984		**29,984**
Hauling Away[5]							24,284	**24,284**
Total								**468,970**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	22,495			**22,495**	6%		37%	13,211			**13,211**
Hazardous Waste[2]														
Garbage[3]	94%	72,124	63%	188,345			**260,469**	6%	4,604	37%	110,615			**115,219**
Yard Waste[4]	94%	0	63%	18,890			**18,890**	6%	0	37%	11,094			**11,094**
Hauling Away[5]					75%	18,213	**18,213**					25%	6,071	**6,071**
Total							**320,067**							**145,595**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	3,308	94%	3,110	6%	198	259	103	94%	13	6%	4
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	76,728	94%	72,124	6%	4,604	259	103	94%	303	6%	93
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	80,036		75,234		4,802				316		97
Self Haul	Recycle	35,706	63%	22,495	37%	13,211	259	103	63%	115	37%	164
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	298,960	63%	188,345	37%	110,615	259	103	63%	967	37%	1,371
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138
	Total	364,650		229,730		134,920				1,179		1,673
Hauling Trucks	Hauling Away	24,284	75%	18,213	25%	6,071	259	103	75%	87	25%	76
Total		*468,970*		*323,177*		*145,793*				**1,582**		**1,846**
									Existing Trips	**750**		**900**
									Increase	**832**		**946**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	91.6%	0	
Self Haul	recycle	8.4%	0	
Hauling Trucks				

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	11	11
7:00	8%	26	3%	4	3%	0	3%	32	3%	3	39	6%	5	70
8:00	9%	29	5%	6	5%	0	5%	53	5%	5	64	12%	11	104
9:00	9%	29	8%	9	8%	0	8%	74	8%	7	90	9%	8	127
10:00	11%	35	10%	11	10%	0	10%	92	10%	9	112	12%	11	158
11:00	12%	38	11%	12	11%	0	11%	106	11%	11	129	9%	8	175
12:00	12%	38	11%	13	11%	0	11%	110	11%	12	135	9%	8	181
13:00	11%	34	11%	13	11%	0	11%	110	11%	11	134	6%	5	173
14:00	9%	29	11%	13	11%	0	11%	110	11%	11	134	9%	8	171
15:00	8%	26	10%	12	10%	0	10%	99	10%	10	121	6%	5	152
16:00	5%	16	10%	11	10%	0	10%	92	10%	9	112	3%	3	131
17:00	4%	13	9%	11	9%	0	9%	89	9%	9	109	3%	3	125
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**313**	**100%**	**115**	**100%**	**0**	**100%**	**967**	**100%**	**97**	**1179**	**97%**	**86**	**1578**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	13	13
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	5	5
8:00	14%	13	4%	7	4%	0	4%	61	4%	6	74	10%	8	95
9:00	14%	13	8%	13	8%	0	8%	105	8%	11	129	10%	8	150
10:00	9%	9	10%	17	10%	0	10%	138	10%	14	169	10%	8	186
11:00	14%	13	12%	20	12%	0	12%	165	12%	17	202	7%	5	220
12:00	9%	9	13%	21	13%	0	13%	172	13%	17	210	10%	8	227
13:00	9%	8	13%	20	13%	0	13%	176	13%	17	213	7%	4	225
14:00	9%	8	13%	21	13%	0	13%	176	13%	18	215	10%	8	231
15:00	9%	9	12%	20	12%	0	12%	169	12%	17	206	7%	5	220
16:00	9%	9	11%	18	11%	0	11%	152	11%	15	185	0%	0	194
17:00	5%	4	4%	7	4%	0	4%	57	4%	6	70	0%	0	74
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**95**	**100%**	**164**	**100%**	**0**	**100%**	**1371**	**100%**	**138**	**1673**	**97%**	**72**	**1840**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	9,431	5,356	5.25	0.30	3,592	35,706		**39,298**	94%		63%	22,495			**22,495**	6%		37%	13,211			**13,211**
Hazardous Waste[2]																						
Garbage[3]	**218,782**	**52,318**	5.25	0.35	83,346	298,960		**382,306**	94%	78,345	63%	188,345			**266,690**	6%	5,001	37%	110,615			**115,616**
Yard Waste[4]		3,748	5.25	0.25	0	29,984		**29,984**	94%	0	63%	18,890			**18,890**	6%	0	37%	11,094			**11,094**
Hauling Away[5]							25,646	**25,646**					75%	19,235	**19,235**					25%	6,412	**6,412**
Total								**477,234**							**327,310**							**146,333**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]	
Commercial Haul	Recycle	3,592	94%	3,376	6%	216	259	103	94%	14	6%	4	Commercial Haul
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0	
	Garbage	83,346	94%	78,345	6%	5,001	259	103	94%	329	6%	101	
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0	
	Total	86,938		81,721		5,217				343		105	
Self Haul	Recycle	35,706	63%	22,495	37%	13,211	259	103	63%	115	37%	164	Self Haul
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0	
	Garbage	298,960	63%	188,345	37%	110,615	259	103	63%	967	37%	1,371	
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138	
	Total	364,650		229,730		134,920				1,179		1,673	
Hauling Trucks	Hauling Away	25,646	75%	19,235	25%	6,412	259	103	75%	92	25%	80	Hauling Trucks
Total		***477,234***		***330,686***		***146,549***				**1,614**		**1,858**	

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

waste	91.7%	0	
recycle	8.3%	0	

	Weekday Trips	Weekend Trips
Existing Trips	**750**	**900**
Increase	**864**	**958**

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	11	11
7:00	8%	28	3%	4	3%	0	3%	32	3%	3	39	6%	6	73
8:00	9%	32	5%	6	5%	0	5%	53	5%	5	64	12%	11	107
9:00	9%	32	8%	9	8%	0	8%	74	8%	7	90	9%	8	130
10:00	11%	39	10%	11	10%	0	10%	92	10%	9	112	12%	11	162
11:00	12%	41	11%	12	11%	0	11%	106	11%	11	129	9%	8	178
12:00	12%	41	11%	13	11%	0	11%	110	11%	12	135	9%	8	184
13:00	11%	38	11%	13	11%	0	11%	110	11%	11	134	6%	6	178
14:00	9%	32	11%	13	11%	0	11%	110	11%	11	134	9%	8	174
15:00	8%	28	10%	12	10%	0	10%	99	10%	10	121	6%	6	155
16:00	5%	18	10%	11	10%	0	10%	92	10%	9	112	3%	3	133
17:00	4%	14	9%	11	9%	0	9%	89	9%	9	109	3%	3	126
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**343**	**100%**	**115**	**100%**	**0**	**100%**	**967**	**100%**	**97**	**1179**	**97%**	**89**	**1611**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	14	14
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	6	6
8:00	14%	14	4%	7	4%	0	4%	61	4%	6	74	10%	8	96
9:00	14%	14	8%	13	8%	0	8%	105	8%	11	129	10%	8	151
10:00	9%	10	10%	17	10%	0	10%	138	10%	14	169	10%	8	187
11:00	14%	14	12%	20	12%	0	12%	165	12%	17	202	7%	6	222
12:00	9%	10	13%	21	13%	0	13%	172	13%	17	210	10%	8	228
13:00	9%	9	13%	20	13%	0	13%	176	13%	17	213	7%	5	227
14:00	9%	9	13%	21	13%	0	13%	176	13%	18	215	10%	8	232
15:00	9%	10	12%	20	12%	0	12%	169	12%	17	206	7%	6	222
16:00	9%	10	11%	18	11%	0	11%	152	11%	15	185	0%	0	195
17:00	5%	5	4%	7	4%	0	4%	57	4%	6	70	0%	0	75
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**105**	**100%**	**164**	**100%**	**0**	**100%**	**1371**	**100%**	**138**	**1673**	**97%**	**77**	**1855**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	9,431	5,356	5.25	0.30	3,592	35,706		**39,298**
Hazardous Waste[2]								
Garbage[3]	**218,395**	**52,937**	5.25	0.35	83,198	302,498		**385,696**
Yard Waste[4]		3,748	5.25	0.25	0	29,984		**29,984**
Hauling Away[5]							25,664	**25,664**
Total								**480,642**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Trips	Self Haul %	Trips	Hauling Trucks %	Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Trips	Self Haul %	Trips	Hauling Trucks %	Trips	Total Trips
Recycling[1]	94%		63%	22,495			**22,495**	6%		37%	13,211			**13,211**
Hazardous Waste[2]														
Garbage[3]	94%	78,206	63%	190,574			**268,780**	6%	4,992	37%	111,924			**116,916**
Yard Waste[4]	94%	0	63%	18,890			**18,890**	6%	0	37%	11,094			**11,094**
Hauling Away[5]					75%	19,248	**19,248**					25%	6,416	**6,416**
Total							**329,413**							**147,637**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Trips	Weekend Trips %	Trips[3]
Commercial Haul	Recycle	3,592	94%	3,376	6%	216	259	103	94%	14	6%	4
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	83,198	94%	78,206	6%	4,992	259	103	94%	329	6%	100
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	86,790		81,582		5,208				343		104
Self Haul	Recycle	35,706	63%	22,495	37%	13,211	259	103	63%	115	37%	164
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	302,498	63%	190,574	37%	111,924	259	103	63%	978	37%	1,388
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138
	Total	368,188		231,959		136,229				1,190		1,690
Hauling Trucks	Hauling Away	25,664	75%	19,248	25%	6,416	259	103	75%	92	25%	80
Total		*480,642*		*332,789*		*147,853*				**1,625**		**1,874**

Commercial Haul				
	waste	91.7%	0	
Self Haul	recycle	8.3%	0	
Hauling Trucks				

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

	Existing Trips	Increase
Weekday	750	875
Weekend	900	974

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	11	11
7:00	8%	28	3%	4	3%	0	3%	32	3%	3	39	6%	6	73
8:00	9%	32	5%	6	5%	0	5%	54	5%	5	65	12%	11	108
9:00	9%	32	8%	9	8%	0	8%	75	8%	7	91	9%	8	131
10:00	11%	39	10%	11	10%	0	10%	93	10%	9	113	12%	11	163
11:00	12%	41	11%	12	11%	0	11%	107	11%	11	130	9%	8	179
12:00	12%	41	11%	13	11%	0	11%	111	11%	12	136	9%	8	185
13:00	11%	38	11%	13	11%	0	11%	111	11%	11	135	6%	6	179
14:00	9%	32	11%	13	11%	0	11%	111	11%	11	135	9%	8	175
15:00	8%	28	10%	12	10%	0	10%	100	10%	10	122	6%	6	156
16:00	5%	18	10%	11	10%	0	10%	93	10%	9	113	3%	3	134
17:00	4%	14	9%	11	9%	0	9%	90	9%	9	110	3%	3	127
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**343**	**100%**	**115**	**100%**	**0**	**100%**	**977**	**100%**	**97**	**1189**	**97%**	**89**	**1621**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	14	14
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	6	6
8:00	14%	14	4%	7	4%	0	4%	62	4%	6	75	10%	8	97
9:00	14%	14	8%	13	8%	0	8%	106	8%	11	130	10%	8	152
10:00	9%	9	10%	17	10%	0	10%	140	10%	14	171	10%	8	188
11:00	14%	14	12%	20	12%	0	12%	168	12%	17	205	7%	6	225
12:00	9%	9	13%	21	13%	0	13%	174	13%	17	212	10%	8	229
13:00	9%	8	13%	20	13%	0	13%	178	13%	17	215	7%	5	228
14:00	9%	8	13%	21	13%	0	13%	178	13%	18	217	10%	8	233
15:00	9%	9	12%	20	12%	0	12%	171	12%	17	208	7%	6	223
16:00	9%	9	11%	18	11%	0	11%	154	11%	15	187	0%	0	196
17:00	5%	5	4%	7	4%	0	4%	58	4%	6	71	0%	0	76
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**99**	**100%**	**164**	**100%**	**0**	**100%**	**1389**	**100%**	**138**	**1691**	**97%**	**77**	**1867**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake without Renton Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle[6]: Commercial Haul	Average Tonnage/Vehicle[6]: Self Haul	Total Annual Trips[7]: Commercial Haul	Total Annual Trips[7]: Self Haul	Total Annual Trips[7]: Hauling Trucks	Total Annual Trips[7]: Total
Recycling[1]	10,892	6,835	5.28	0.30	4,124	45,566		**49,690**
Hazardous Waste[2]								
Garbage[3]	**252,689**	**64,811**	5.28	0.33	95,676	391,934		**487,610**
Yard Waste[4]		3,748	5.28	0.25	0	29,984		**29,984**
Hauling Away[5]							30,382	**30,382**
Total								**597,666**

Material	Total Annual Weekday Trips[8]: Commercial Haul %	Trips	Self Haul %	Trips	Hauling Trucks %	Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Trips	Self Haul %	Trips	Hauling Trucks %	Trips	Total Trips
Recycling[1]	94%		63%	28,707			**28,707**	6%		37%	16,859			**16,859**
Hazardous Waste[2]														
Garbage[3]	94%	89,935	63%	246,918			**336,853**	6%	5,741	37%	145,016			**150,757**
Yard Waste[4]	94%	0	63%	18,890			**18,890**	6%	0	37%	11,094			**11,094**
Hauling Away[5]					75%	22,787	**22,787**					25%	7,596	**7,596**
Total							**407,237**							**186,306**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Average Tonnage/Vehicle reflects a weighted average taking into account the shift in tonnage from Renton

7. Total Annual Trips represents both inbound and outbound trips.

8.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	4,124	94%	3,877	6%	247	259	103	94%	16	6%	5
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	95,676	94%	89,935	6%	5,741	259	103	94%	378	6%	115
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	99,800		93,812		5,988				394		120
Self Haul	Recycle	45,566	63%	28,707	37%	16,859	259	103	63%	147	37%	209
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	391,934	63%	246,918	37%	145,016	259	103	63%	1,267	37%	1,798
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138
	Total	467,484		294,515		172,969				1,511		2,145
Hauling Trucks	Hauling Away	30,382	75%	22,787	25%	7,596	259	103	75%	108	25%	95
Total		*597,666*		*411,114*		*186,553*				**2,013**		**2,360**
									Existing Trips	**750**		**900**
									Increase	**1,263**		**1,460**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul					
	waste	91.6%	5.954594		
Self Haul	recycle	8.4%	1.090813		
Hauling Trucks					

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	13	13
7:00	8%	32	3%	5	3%	0	3%	42	3%	3	50	6%	7	89
8:00	9%	36	5%	8	5%	0	5%	70	5%	5	83	12%	13	132
9:00	9%	36	8%	11	8%	0	8%	97	8%	7	115	9%	10	161
10:00	11%	45	10%	14	10%	0	10%	121	10%	9	144	12%	13	202
11:00	12%	49	11%	16	11%	0	11%	139	11%	11	166	9%	10	225
12:00	12%	49	11%	17	11%	0	11%	144	11%	12	173	9%	10	232
13:00	11%	45	11%	17	11%	0	11%	144	11%	11	172	6%	6	223
14:00	9%	36	11%	17	11%	0	11%	144	11%	11	172	9%	10	218
15:00	8%	32	10%	15	10%	0	10%	130	10%	10	155	6%	7	194
16:00	5%	20	10%	14	10%	0	10%	121	10%	9	144	3%	3	167
17:00	4%	16	9%	13	9%	0	9%	116	9%	9	138	3%	3	157
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**396**	**100%**	**147**	**100%**	**0**	**100%**	**1268**	**100%**	**97**	**1512**	**97%**	**105**	**2013**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	16	16
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	7	7
8:00	14%	16	4%	9	4%	0	4%	80	4%	6	95	10%	10	121
9:00	14%	16	8%	16	8%	0	8%	137	8%	11	164	10%	10	190
10:00	9%	11	10%	21	10%	0	10%	182	10%	14	217	10%	10	238
11:00	14%	16	12%	25	12%	0	12%	217	12%	17	259	7%	7	282
12:00	9%	11	13%	26	13%	0	13%	226	13%	17	269	10%	10	290
13:00	9%	10	13%	27	13%	0	13%	230	13%	17	274	7%	6	290
14:00	9%	10	13%	27	13%	0	13%	230	13%	18	275	10%	9	294
15:00	9%	11	12%	26	12%	0	12%	221	12%	17	264	7%	7	282
16:00	9%	11	11%	23	11%	0	11%	199	11%	15	237	0%	0	248
17:00	5%	5	4%	9	4%	0	4%	75	4%	6	90	0%	0	95
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**117**	**100%**	**209**	**100%**	**0**	**100%**	**1797**	**100%**	**138**	**2144**	**97%**	**92**	**2353**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake without Renton Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	10,988	6,835	5.28	0.30	4,158	45,566		**49,724**	94%		63%	28,707			**28,707**	6%		37%	16,859			**16,859**
Hazardous Waste[2]																						
Garbage[3]	**254,918**	**64,811**	5.28	0.33	96,486	391,934		**488,420**	94%	90,697	63%	246,918			**337,615**	6%	5,789	37%	145,016			**150,805**
Yard Waste[4]		3,748	5.28	0.25	0	29,984		**29,984**	94%	0	63%	18,890			**18,890**	6%	0	37%	11,094			**11,094**
Hauling Away[5]							30,556	**30,556**					75%	22,917	**22,917**					25%	7,639	**7,639**
Total								**598,684**							**408,129**							**186,397**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	4,158	94%	3,909	6%	249	259	103	94%	16	6%	5
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	96,486	94%	90,697	6%	5,789	259	103	94%	381	6%	116
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	100,644		94,606		6,038				397		121
Self Haul	Recycle	45,566	63%	28,707	37%	16,859	259	103	63%	147	37%	209
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	391,934	63%	246,918	37%	145,016	259	103	63%	1,267	37%	1,798
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138
	Total	467,484		294,515		172,969				1,511		2,145
Hauling Trucks	Hauling Away	30,556	75%	22,917	25%	7,639	259	103	75%	109	25%	95
Total		*598,684*		*412,038*		*186,646*				**2,017**		**2,361**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Existing Trips	**750**	**900**
Increase	**1,267**	**1,461**

Commercial Haul	waste	91.6%	0
Self Haul	recycle	8.4%	0

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	13	13
7:00	8%	32	3%	5	3%	0	3%	42	3%	3	50	6%	7	89
8:00	9%	36	5%	8	5%	0	5%	70	5%	5	83	12%	13	132
9:00	9%	36	8%	11	8%	0	8%	97	8%	7	115	9%	10	161
10:00	11%	46	10%	14	10%	0	10%	121	10%	9	144	12%	13	203
11:00	12%	50	11%	16	11%	0	11%	139	11%	11	166	9%	10	226
12:00	12%	50	11%	17	11%	0	11%	144	11%	12	173	9%	10	233
13:00	11%	46	11%	17	11%	0	11%	144	11%	11	172	6%	6	224
14:00	9%	36	11%	17	11%	0	11%	144	11%	11	172	9%	10	218
15:00	8%	32	10%	15	10%	0	10%	130	10%	10	155	6%	7	194
16:00	5%	20	10%	14	10%	0	10%	121	10%	9	144	3%	3	167
17:00	4%	16	9%	13	9%	0	9%	116	9%	9	138	3%	3	157
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**400**	**100%**	**147**	**100%**	**0**	**100%**	**1268**	**100%**	**97**	**1512**	**97%**	**105**	**2017**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	16	16
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	7	7
8:00	14%	17	4%	9	4%	0	4%	80	4%	6	95	10%	10	122
9:00	14%	17	8%	16	8%	0	8%	137	8%	11	164	10%	10	191
10:00	9%	11	10%	21	10%	0	10%	182	10%	14	217	10%	10	238
11:00	14%	17	12%	25	12%	0	12%	217	12%	17	259	7%	7	283
12:00	9%	11	13%	26	13%	0	13%	226	13%	17	269	10%	10	290
13:00	9%	10	13%	27	13%	0	13%	230	13%	17	274	7%	6	290
14:00	9%	10	13%	27	13%	0	13%	230	13%	18	275	10%	9	294
15:00	9%	11	12%	26	12%	0	12%	221	12%	17	264	7%	7	282
16:00	9%	11	11%	23	11%	0	11%	199	11%	15	237	0%	0	248
17:00	5%	6	4%	9	4%	0	4%	75	4%	6	90	0%	0	96
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**121**	**100%**	**209**	**100%**	**0**	**100%**	**1797**	**100%**	**138**	**2144**	**97%**	**92**	**2357**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake without Renton Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	10,892	6,945	5.28	0.30	4,124	46,300		**50,424**	94%		63%	29,169			**29,169**	6%		37%	17,131			**17,131**
Hazardous Waste[2]																						
Garbage[3]	**252,689**	**69,960**	5.28	0.33	95,676	429,216		**524,892**	94%	89,935	63%	270,406			**360,341**	6%	5,741	37%	158,810			**164,551**
Yard Waste[4]		4,045	5.28	0.25	0	32,360		**32,360**	94%	0	63%	20,387			**20,387**	6%	0	37%	11,973			**11,973**
Hauling Away[5]							30,900	**30,900**					75%	23,175	**23,175**					25%	7,725	**7,725**
Total								**638,576**							**433,072**							**201,380**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	4,124	94%	3,877	6%	247	259	103	94%	16	6%	5
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	95,676	94%	89,935	6%	5,741	259	103	94%	378	6%	115
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	99,800		93,812		5,988				394		120
Self Haul	Recycle	46,300	63%	29,169	37%	17,131	259	103	63%	150	37%	212
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	429,216	63%	270,406	37%	158,810	259	103	63%	1,388	37%	1,969
	Yard Waste	32,360	63%	20,387	37%	11,973	259	103	63%	105	37%	148
	Total	507,876		319,962		187,914				1,643		2,329
Hauling Trucks	Hauling Away	30,900	75%	23,175	25%	7,725	259	103	75%	110	25%	96
Total		*638,576*		*436,949*		*201,627*				**2,147**		**2,545**
									Existing Trips	**750**		**900**
									Increase	**1,397**		**1,645**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul				
	waste	92.0%	0	
Self Haul	recycle	8.0%	0	
Hauling Trucks				

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	13	13
7:00	8%	32	3%	5	3%	0	3%	46	3%	3	54	6%	7	93
8:00	9%	36	5%	8	5%	0	5%	76	5%	6	90	12%	13	139
9:00	9%	36	8%	12	8%	0	8%	107	8%	8	127	9%	10	173
10:00	11%	45	10%	14	10%	0	10%	132	10%	10	156	12%	13	214
11:00	12%	49	11%	16	11%	0	11%	153	11%	12	181	9%	10	240
12:00	12%	49	11%	17	11%	0	11%	158	11%	13	188	9%	10	247
13:00	11%	45	11%	17	11%	0	11%	158	11%	12	187	6%	6	238
14:00	9%	36	11%	17	11%	0	11%	158	11%	12	187	9%	10	233
15:00	8%	32	10%	15	10%	0	10%	142	10%	11	168	6%	7	207
16:00	5%	20	10%	14	10%	0	10%	132	10%	10	156	3%	3	179
17:00	4%	16	9%	14	9%	0	9%	127	9%	10	151	3%	3	170
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**396**	**100%**	**149**	**100%**	**0**	**100%**	**1389**	**100%**	**107**	**1645**	**97%**	**105**	**2146**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	17	17
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	7	7
8:00	14%	16	4%	9	4%	0	4%	87	4%	7	103	10%	10	129
9:00	14%	16	8%	16	8%	0	8%	150	8%	11	177	10%	10	203
10:00	9%	11	10%	21	10%	0	10%	199	10%	15	235	10%	10	256
11:00	14%	16	12%	26	12%	0	12%	238	12%	18	282	7%	7	305
12:00	9%	11	13%	27	13%	0	13%	247	13%	19	293	10%	10	314
13:00	9%	10	13%	27	13%	0	13%	252	13%	18	297	7%	6	313
14:00	9%	10	13%	27	13%	0	13%	252	13%	19	298	10%	9	317
15:00	9%	11	12%	26	12%	0	12%	242	12%	18	286	7%	7	304
16:00	9%	11	11%	23	11%	0	11%	218	11%	16	257	0%	0	268
17:00	5%	5	4%	9	4%	0	4%	82	4%	6	97	0%	0	102
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**117**	**100%**	**211**	**100%**	**0**	**100%**	**1967**	**100%**	**147**	**2325**	**97%**	**93**	**2535**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Bow Lake without Renton Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	10,892	6,835	5.28	0.30	4,124	45,566		**49,690**	94%		63%	28,707			**28,707**	6%		37%	16,859			**16,859**
Hazardous Waste[2]																						
Garbage[3]	**252,302**	**65,430**	5.28	0.33	95,528	395,460		**490,988**	94%	89,796	63%	249,140			**338,936**	6%	5,732	37%	146,320			**152,052**
Yard Waste[4]		3,748	5.28	0.25	0	29,984		**29,984**	94%	0	63%	18,890			**18,890**	6%	0	37%	11,094			**11,094**
Hauling Away[5]							30,400	**30,400**					75%	22,800	**22,800**					25%	7,600	**7,600**
Total								**601,062**							**409,333**							**187,605**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Bow Lake Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Bow Lake site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	4,124	94%	3,877	6%	247	259	103	94%	16	6%	5
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	95,528	94%	89,796	6%	5,732	259	103	94%	377	6%	115
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	99,652		93,673		5,979				393		120
Self Haul	Recycle	45,566	63%	28,707	37%	16,859	259	103	63%	147	37%	209
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	395,460	63%	249,140	37%	146,320	259	103	63%	1,279	37%	1,814
	Yard Waste	29,984	63%	18,890	37%	11,094	259	103	63%	97	37%	138
	Total	471,010		296,737		174,273				1,523		2,161
Hauling Trucks	Hauling Away	30,400	75%	22,800	25%	7,600	259	103	75%	109	25%	95
Total		*601,062*		*413,210*		*187,852*				**2,025**		**2,376**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Existing Trips	**750**	**900**
Increase	**1,275**	**1,476**

Commercial Haul			
	waste	91.7%	0
Self Haul	recycle	8.3%	0
Hauling Trucks			

WEEKDAY	Bow Lake Commercia	SelfHaul	Total
Median	159	329	489
90th Percentile	173	437	603
Peak Increase	**108.8%**	**132.9%**	**123.3%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Bow Lake Commercia	SelfHaul	Total
Median	11	420	430
90th Percentile	20.7	536	551
Peak Increase	**197.1%**	**127.7%**	**128.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	13	13
7:00	8%	32	3%	5	3%	0	3%	42	3%	3	50	6%	7	89
8:00	9%	36	5%	8	5%	0	5%	70	5%	5	83	12%	13	132
9:00	9%	36	8%	11	8%	0	8%	98	8%	7	116	9%	10	162
10:00	11%	45	10%	14	10%	0	10%	122	10%	9	145	12%	13	203
11:00	12%	49	11%	16	11%	0	11%	141	11%	11	168	9%	10	227
12:00	12%	49	11%	17	11%	0	11%	145	11%	12	174	9%	10	233
13:00	11%	45	11%	17	11%	0	11%	145	11%	11	173	6%	6	224
14:00	9%	36	11%	17	11%	0	11%	145	11%	11	173	9%	10	219
15:00	8%	32	10%	15	10%	0	10%	131	10%	10	156	6%	7	195
16:00	5%	20	10%	14	10%	0	10%	122	10%	9	145	3%	3	168
17:00	4%	16	9%	13	9%	0	9%	117	9%	9	139	3%	3	158
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**396**	**100%**	**147**	**100%**	**0**	**100%**	**1278**	**100%**	**97**	**1522**	**97%**	**105**	**2023**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	17%	16	16
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	7	7
8:00	14%	16	4%	9	4%	0	4%	80	4%	6	95	10%	10	121
9:00	14%	16	8%	16	8%	0	8%	139	8%	11	166	10%	10	192
10:00	9%	11	10%	21	10%	0	10%	183	10%	14	218	10%	10	239
11:00	14%	16	12%	25	12%	0	12%	219	12%	17	261	7%	7	284
12:00	9%	11	13%	26	13%	0	13%	228	13%	17	271	10%	10	292
13:00	9%	10	13%	27	13%	0	13%	232	13%	17	276	7%	6	292
14:00	9%	10	13%	27	13%	0	13%	232	13%	18	277	10%	9	296
15:00	9%	11	12%	26	12%	0	12%	223	12%	17	266	7%	7	284
16:00	9%	11	11%	23	11%	0	11%	201	11%	15	239	0%	0	250
17:00	5%	5	4%	9	4%	0	4%	76	4%	6	91	0%	0	96
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**117**	**100%**	**209**	**100%**	**0**	**100%**	**1813**	**100%**	**138**	**2160**	**97%**	**92**	**2369**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 2 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Renton Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]		599	5.49	0.30	0	3,994		**3,994**
Hazardous Waste[2]								
Garbage[3]	**50,861**	**18,739**	5.49	0.25	18,528	149,912		**168,440**
Yard Waste[4]			5.49	0.25	0	0		**0**
Hauling Away[5]							5,902	**5,902**
Total								**178,336**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Trips	Self Haul %	Trips	Hauling Trucks %	Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Trips	Self Haul %	Trips	Hauling Trucks %	Trips	Total Trips
Recycling[1]	92%		58%	2,317			**2,317**	8%		42%	1,677			**1,677**
Hazardous Waste[2]														
Garbage[3]	92%	17,046	58%	86,949			**103,995**	8%	1,482	42%	62,963			**64,445**
Yard Waste[4]	92%	0	58%	0			**0**	8%	0	42%	0			**0**
Hauling Away[5]					77%	4,545	**4,545**					23%	1,357	**1,357**
Total							**110,857**							**67,479**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Renton Site.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Renton site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Trips	Weekend Trips %	Trips[3]
Commercial Haul	Recycle	0	92%	0	8%	0	259	103	92%	0	8%	0
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	18,528	92%	17,046	8%	1,482	259	103	92%	77	8%	60
	Yard Waste	0	92%	0	8%	0	259	103	92%	0	8%	0
	Total	18,528		17,046		1,482				77		60
Self Haul	Recycle	3,994	58%	2,317	42%	1,677	259	103	58%	12	42%	21
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	149,912	58%	86,949	42%	62,963	259	103	58%	444	42%	800
	Yard Waste	0	58%	0	42%	0	259	103	58%	0	42%	0
	Total	153,906		89,266		64,640				456		821
Hauling Trucks	Hauling Away	5,902	77%	4,545	23%	1,357	259	103	77%	22	23%	17
Total		*178,336*		*110,857*		*67,479*				**555**		**898**

Commercial Haul			
Self Haul	waste	97.8%	0.489103
	recycle	2.2%	0.021794
Hauling Trucks			

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

WEEKDAY	Renton Commercia	SelfHaul	Total
Median	35	134	169
90th Percentile	41	177	213
Peak Increase	**117.1%**	**132.3%**	**126.2%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Renton Commercia	SelfHaul	Total
Median	1	254	257
90th Percentile	4	332	333
Peak Increase	**400.0%**	**130.9%**	**129.9%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Trips	Self Haul: Recycle %	Trips	Hazardous Waste %	Trips	Garbage %	Trips	Yard Waste %	Trips	TOTAL	Hauling Trucks %	Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	13%	3	3
7:00	5%	4	3%	0	3%	0	3%	13	3%	0	13	6%	1	18
8:00	8%	6	6%	1	6%	0	6%	25	6%	0	26	6%	1	33
9:00	13%	10	9%	1	9%	0	9%	38	9%	0	39	6%	1	50
10:00	13%	10	11%	1	11%	0	11%	48	11%	0	49	6%	2	61
11:00	13%	10	12%	1	12%	0	12%	54	12%	0	55	6%	2	67
12:00	13%	10	12%	2	12%	0	12%	54	12%	0	56	6%	2	68
13:00	16%	13	12%	2	12%	0	12%	54	12%	0	56	6%	2	71
14:00	11%	8	12%	2	12%	0	12%	53	12%	0	55	13%	3	66
15:00	5%	4	11%	1	11%	0	11%	51	11%	0	52	6%	1	57
16:00	3%	2	11%	1	11%	0	11%	51	11%	0	52	6%	1	55
17:00	0%	0	1%	0	1%	0	1%	3	1%	0	3	6%	1	4
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	6%	1	1
Daily Trips	**100%**	**77**	**100%**	**12**	**100%**	**0**	**100%**	**444**	**100%**	**0**	**456**	**94%**	**21**	**554**

Weekend Summary

Hour	Commercial Haul %	Trips	Self Haul: Recycle %	Trips	Hazardous Waste %	Trips	Garbage %	Trips	Yard Waste %	Trips	TOTAL	Hauling Trucks %	Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	1	1
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	1	1
8:00	18%	11	5%	1	5%	0	5%	37	5%	0	38	8%	1	50
9:00	9%	5	8%	2	8%	0	8%	65	8%	0	67	8%	2	74
10:00	9%	6	11%	2	11%	0	11%	87	11%	0	89	8%	2	97
11:00	9%	6	13%	3	13%	0	13%	102	13%	0	105	8%	2	113
12:00	9%	6	14%	3	14%	0	14%	109	14%	0	112	8%	2	120
13:00	9%	6	14%	3	14%	0	14%	109	14%	0	112	8%	1	119
14:00	9%	5	13%	3	13%	0	13%	105	13%	0	108	8%	1	114
15:00	9%	5	12%	2	12%	0	12%	93	12%	0	95	8%	1	101
16:00	9%	5	9%	2	9%	0	9%	74	9%	0	76	8%	1	82
17:00	9%	5	2%	0	2%	0	2%	19	2%	0	19	8%	1	25
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**60**	**100%**	**21**	**100%**	**0**	**100%**	**800**	**100%**	**0**	**821**	**92%**	**16**	**897**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Renton facility.

2023 - King County Transfer Station Trip Generation - Renton Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]		599	5.42	0.30	0	3,994		**3,994**
Hazardous Waste[2]								
Garbage[3]	**75,810**	**18,739**	5.42	0.25	28,000	149,912		**177,912**
Yard Waste[4]			5.42	0.25	0	0		**0**
Hauling Away[5]							7,860	**7,860**
Total								**189,766**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	92%		58%	2,317			**2,317**	8%		42%	1,677			**1,677**
Hazardous Waste[2]														
Garbage[3]	92%	25,760	58%	86,949			**112,709**	8%	2,240	42%	62,963			**65,203**
Yard Waste[4]	92%	0	58%	0			**0**	8%	0	42%	0			**0**
Hauling Away[5]					77%	6,052	**6,052**					23%	1,808	**1,808**
Total							**121,078**							**68,688**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Renton Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Renton site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	0	92%	0	8%	0	259	103	92%	0	8%	0
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	28,000	92%	25,760	8%	2,240	259	103	92%	117	8%	91
	Yard Waste	0	92%	0	8%	0	259	103	92%	0	8%	0
	Total	28,000		25,760		2,240				117		91
Self Haul	Recycle	3,994	58%	2,317	42%	1,677	259	103	58%	12	42%	21
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	149,912	58%	86,949	42%	62,963	259	103	58%	444	42%	800
	Yard Waste	0	58%	0	42%	0	259	103	58%	0	42%	0
	Total	153,906		89,266		64,640				456		821
Hauling Trucks	Hauling Away	7,860	77%	6,052	23%	1,808	259	103	77%	29	23%	23
Total		*189,766*		*121,078*		*68,688*				**602**		**935**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer					
	waste	98.0%	0		
Self Haul	recycle	2.0%	0		
Hauling Trucks					

WEEKDAY	Renton Commercia	SelfHaul	Total
Median	35	134	169
90th Percentile	41	177	213
Peak Increase	**117.1%**	**132.3%**	**126.2%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Renton Commercia	SelfHaul	Total
Median	1	254	257
90th Percentile	4	332	333
Peak Increase	**400.0%**	**130.9%**	**129.9%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	13%	4	4
7:00	5%	6	3%	0	3%	0	3%	13	3%	0	13	6%	2	21
8:00	8%	9	6%	1	6%	0	6%	25	6%	0	26	6%	2	37
9:00	13%	15	9%	1	9%	0	9%	38	9%	0	39	6%	2	56
10:00	13%	15	11%	1	11%	0	11%	48	11%	0	49	6%	3	67
11:00	13%	15	12%	1	12%	0	12%	54	12%	0	55	6%	3	73
12:00	13%	15	12%	2	12%	0	12%	54	12%	0	56	6%	3	74
13:00	16%	19	12%	2	12%	0	12%	54	12%	0	56	6%	3	78
14:00	11%	12	12%	2	12%	0	12%	53	12%	0	55	13%	4	71
15:00	5%	6	11%	1	11%	0	11%	51	11%	0	52	6%	2	60
16:00	3%	3	11%	1	11%	0	11%	51	11%	0	52	6%	2	57
17:00	0%	0	1%	0	1%	0	1%	3	1%	0	3	6%	2	5
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	6%	2	2
Daily Trips	**100%**	**115**	**100%**	**12**	**100%**	**0**	**100%**	**444**	**100%**	**0**	**456**	**94%**	**34**	**605**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
8:00	18%	17	5%	1	5%	0	5%	37	5%	0	38	8%	2	57
9:00	9%	8	8%	2	8%	0	8%	65	8%	0	67	8%	3	78
10:00	9%	9	11%	2	11%	0	11%	87	11%	0	89	8%	3	101
11:00	9%	9	13%	3	13%	0	13%	102	13%	0	105	8%	3	117
12:00	9%	9	14%	3	14%	0	14%	109	14%	0	112	8%	3	124
13:00	9%	9	14%	3	14%	0	14%	109	14%	0	112	8%	2	123
14:00	9%	8	13%	3	13%	0	13%	105	13%	0	108	8%	2	118
15:00	9%	8	12%	2	12%	0	12%	93	12%	0	95	8%	2	105
16:00	9%	8	9%	2	9%	0	9%	74	9%	0	76	8%	2	86
17:00	9%	8	2%	0	2%	0	2%	19	2%	0	19	8%	2	29
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**93**	**100%**	**21**	**100%**	**0**	**100%**	**800**	**100%**	**0**	**821**	**92%**	**28**	**942**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Renton facility.

2023 - King County Transfer Station Trip Generation - Renton Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]		845	5.49	0.30	0	5,634		**5,634**
Hazardous Waste[2]								
Garbage[3]	**50,861**	**26,463**	5.49	0.27	18,528	198,668		**217,196**
Yard Waste[4]			5.49	0.25	0	0		**0**
Hauling Away[5]							6,690	**6,690**
Total								**229,520**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	92%		58%	3,268			**3,268**	8%		42%	2,366			**2,366**
Hazardous Waste[2]														
Garbage[3]	92%	17,046	58%	115,227			**132,273**	8%	1,482	42%	83,441			**84,923**
Yard Waste[4]	92%	0	58%	0			**0**	8%	0	42%	0			**0**
Hauling Away[5]					77%	5,151	**5,151**					23%	1,539	**1,539**
Total							**140,692**							**88,828**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Renton Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Renton site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	0	92%	0	8%	0	259	103	92%	0	8%	0
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	18,528	92%	17,046	8%	1,482	259	103	92%	77	8%	60
	Yard Waste	0	92%	0	8%	0	259	103	92%	0	8%	0
	Total	18,528		17,046		1,482				77		60
Self Haul	Recycle	5,634	58%	3,957	42%	1,677	259	103	58%	20	42%	21
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	198,668	58%	135,705	42%	62,963	259	103	58%	693	42%	800
	Yard Waste	0	58%	0	42%	0	259	103	58%	0	42%	0
	Total	204,302		139,662		64,640				713		821
Hauling Trucks	Hauling Away	6,690	77%	5,333	23%	1,357	259	103	77%	26	23%	17
Total		*229,520*		*162,041*		*67,479*				**816**		**898**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	Recycle	waste	97.5%	0	
Self Haul	Recycle	recycle	2.5%	0	
Hauling Trucks	Hauling Trucks				

WEEKDAY	Renton Commercia	Renton SelfHaul	Renton Total
Median	35	134	169
90th Percentile	41	177	213
Peak Increase	**117.1%**	**132.3%**	**126.2%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Renton Commercia	Renton SelfHaul	Renton Total
Median	1	254	257
90th Percentile	4	332	333
Peak Increase	**400.0%**	**130.9%**	**129.9%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	13%	3	3
7:00	5%	4	3%	1	3%	0	3%	20	3%	0	21	6%	2	27
8:00	8%	6	6%	1	6%	0	6%	40	6%	0	41	6%	2	49
9:00	13%	10	9%	2	9%	0	9%	59	9%	0	61	6%	2	73
10:00	13%	10	11%	2	11%	0	11%	74	11%	0	76	6%	3	89
11:00	13%	10	12%	2	12%	0	12%	84	12%	0	86	6%	3	99
12:00	13%	10	12%	3	12%	0	12%	84	12%	0	87	6%	3	100
13:00	16%	13	12%	3	12%	0	12%	84	12%	0	87	6%	3	103
14:00	11%	8	12%	3	12%	0	12%	83	12%	0	86	13%	3	97
15:00	5%	4	11%	2	11%	0	11%	79	11%	0	81	6%	2	87
16:00	3%	2	11%	2	11%	0	11%	79	11%	0	81	6%	2	85
17:00	0%	0	1%	0	1%	0	1%	5	1%	0	5	6%	2	7
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	6%	2	2
Daily Trips	**100%**	**77**	**100%**	**21**	**100%**	**0**	**100%**	**691**	**100%**	**0**	**712**	**94%**	**32**	**821**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	1	1
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	1	1
8:00	18%	11	5%	1	5%	0	5%	37	5%	0	38	8%	1	50
9:00	9%	5	8%	2	8%	0	8%	65	8%	0	67	8%	2	74
10:00	9%	6	11%	2	11%	0	11%	87	11%	0	89	8%	2	97
11:00	9%	6	13%	3	13%	0	13%	102	13%	0	105	8%	2	113
12:00	9%	6	14%	3	14%	0	14%	109	14%	0	112	8%	2	120
13:00	9%	6	14%	3	14%	0	14%	109	14%	0	112	8%	1	119
14:00	9%	5	13%	3	13%	0	13%	105	13%	0	108	8%	1	114
15:00	9%	5	12%	2	12%	0	12%	93	12%	0	95	8%	1	101
16:00	9%	5	9%	2	9%	0	9%	74	9%	0	76	8%	1	82
17:00	9%	5	2%	0	2%	0	2%	19	2%	0	19	8%	1	25
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**60**	**100%**	**21**	**100%**	**0**	**100%**	**800**	**100%**	**0**	**821**	**92%**	**16**	**897**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Renton facility.

2023 - King County Transfer Station Trip Generation - Renton Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]		599	5.49	0.30	0	3,994		**3,994**
Hazardous Waste[2]								
Garbage[3]	**50,861**	**18,739**	5.49	0.25	18,528	149,912		**168,440**
Yard Waste[4]			5.49	0.25	0	0		**0**
Hauling Away[5]							5,902	**5,902**
Total								**178,336**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	92%		58%	2,317			**2,317**	8%		42%	1,677			**1,677**
Hazardous Waste[2]														
Garbage[3]	92%	17,046	58%	86,949			**103,995**	8%	1,482	42%	62,963			**64,445**
Yard Waste[4]	92%	0	58%	0			**0**	8%	0	42%	0			**0**
Hauling Away[5]					77%	4,545	**4,545**					23%	1,357	**1,357**
Total							**110,857**							**67,479**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Renton Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Renton site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	0	92%	0	8%	0	259	103	92%	0	8%	0
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	18,528	92%	17,046	8%	1,482	259	103	92%	77	8%	60
	Yard Waste	0	92%	0	8%	0	259	103	92%	0	8%	0
	Total	18,528		17,046		1,482				77		60
Self Haul	Recycle	3,994	58%	2,317	42%	1,677	259	103	58%	12	42%	21
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	149,912	58%	86,949	42%	62,963	259	103	58%	444	42%	800
	Yard Waste	0	58%	0	42%	0	259	103	58%	0	42%	0
	Total	153,906		89,266		64,640				456		821
Hauling Trucks	Hauling Away	5,902	77%	4,545	23%	1,357	259	103	77%	22	23%	17
Total		*178,336*		*110,857*		*67,479*				**555**		**898**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer	waste	97.8%	0		
Self Haul	recycle	2.2%	0		
Hauling Trucks					

WEEKDAY	Renton Commercia	SelfHaul	Total
Median	35	134	169
90th Percentile	41	177	213
Peak Increase	**117.1%**	**132.3%**	**126.2%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Renton Commercia	SelfHaul	Total
Median	1	254	257
90th Percentile	4	332	333
Peak Increase	**400.0%**	**130.9%**	**129.9%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	13%	3	3
7:00	5%	4	3%	0	3%	0	3%	13	3%	0	13	6%	1	18
8:00	8%	6	6%	1	6%	0	6%	25	6%	0	26	6%	1	33
9:00	13%	10	9%	1	9%	0	9%	38	9%	0	39	6%	1	50
10:00	13%	10	11%	1	11%	0	11%	48	11%	0	49	6%	2	61
11:00	13%	10	12%	1	12%	0	12%	54	12%	0	55	6%	2	67
12:00	13%	10	12%	2	12%	0	12%	54	12%	0	56	6%	2	68
13:00	16%	13	12%	2	12%	0	12%	54	12%	0	56	6%	2	71
14:00	11%	8	12%	2	12%	0	12%	53	12%	0	55	13%	3	66
15:00	5%	4	11%	1	11%	0	11%	51	11%	0	52	6%	1	57
16:00	3%	2	11%	1	11%	0	11%	51	11%	0	52	6%	1	55
17:00	0%	0	1%	0	1%	0	1%	3	1%	0	3	6%	1	4
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	6%	1	1
Daily Trips	**100%**	**77**	**100%**	**12**	**100%**	**0**	**100%**	**444**	**100%**	**0**	**456**	**94%**	**21**	**554**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	1	1
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	1	1
8:00	18%	11	5%	1	5%	0	5%	37	5%	0	38	8%	1	50
9:00	9%	5	8%	2	8%	0	8%	65	8%	0	67	8%	2	74
10:00	9%	6	11%	2	11%	0	11%	87	11%	0	89	8%	2	97
11:00	9%	6	13%	3	13%	0	13%	102	13%	0	105	8%	2	113
12:00	9%	6	14%	3	14%	0	14%	109	14%	0	112	8%	2	120
13:00	9%	6	14%	3	14%	0	14%	109	14%	0	112	8%	1	119
14:00	9%	5	13%	3	13%	0	13%	105	13%	0	108	8%	1	114
15:00	9%	5	12%	2	12%	0	12%	93	12%	0	95	8%	1	101
16:00	9%	5	9%	2	9%	0	9%	74	9%	0	76	8%	1	82
17:00	9%	5	2%	0	2%	0	2%	19	2%	0	19	8%	1	25
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**60**	**100%**	**21**	**100%**	**0**	**100%**	**800**	**100%**	**0**	**821**	**92%**	**16**	**897**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Renton facility.

2023 - King County Transfer Station Trip Generation - Factoria Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle[6]: Commercial Haul	Average Tonnage/Vehicle[6]: Self Haul	Total Annual Trips[7]: Commercial Haul	Total Annual Trips[7]: Self Haul	Total Annual Trips[7]: Hauling Trucks	Total Annual Trips[7]: Total
Recycling[1]	6,803	6,137	5.80	0.30	2,346	40,914		**43,260**
Hazardous Waste[2]		385		0.03		29,352		**29,352**
Garbage[3]	**227,280**	**55,170**	5.80	0.31	78,364	360,346		**438,710**
Yard Waste[4]		2,997	5.80	0.25	0	23,976		**23,976**
Hauling Away[5]							27,188	**27,188**
Total								**562,486**

Material	Total Annual Weekday Trips[8]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	25,776			**25,776**	6%		37%	15,138			**15,138**
Hazardous Waste[2]			63%	18,492			**18,492**			37%	10,860			**10,860**
Garbage[3]	94%	73,662	63%	227,018			**300,680**	6%	4,702	37%	133,328			**138,030**
Yard Waste[4]	94%	0	63%	15,105			**15,105**	6%	0	37%	8,871			**8,871**
Hauling Away[5]					81%	22,022	**22,022**					19%	5,166	**5,166**
Total							**382,075**							**178,065**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Average Tonnage/Vehicle reflects a weighted average taking into account the shift in tonnage from Houghton.

7. Total Annual Trips represents both inbound and outbound trips.

8.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	2,346	94%	2,205	6%	141	259	103	94%	10	6%	4
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	78,364	94%	73,662	6%	4,702	259	103	94%	322	6%	144
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	80,710		75,867		4,843				332		148
Self Haul	Recycle	40,914	63%	25,776	37%	15,138	259	103	63%	132	37%	199
	Hazardous Waste	29,352	63%	18,492	37%	10,860	259	103	63%	95	37%	143
	Garbage	360,346	63%	227,018	37%	133,328	259	103	63%	1,167	37%	1,754
	Yard Waste	23,976	63%	15,105	37%	8,871	259	103	63%	78	37%	117
	Total	454,588		286,391		168,197				1,472		2,213
Hauling Trucks	Hauling Away	27,188	81%	22,022	19%	5,166	259	103	81%	106	19%	68
Total		*562,486*		*384,280*		*178,206*				**1,910**		**2,429**

Commercial Haul	waste	92.3%	5.075177084
Self Haul	recycle	7.7%	0.849645833
Hauling Trucks			

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

WEEKDAY	Factoria Commercial	SelfHaul	Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all*weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercial	SelfHaul	Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all*weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	8	8
7:00	13%	44	4%	6	4%	4	4%	52	4%	4	66	11%	11	121
8:00	15%	49	6%	8	6%	6	6%	72	6%	5	91	11%	11	151
9:00	10%	33	10%	13	10%	9	10%	111	10%	7	140	11%	11	184
10:00	11%	38	12%	16	12%	11	12%	138	12%	9	174	7%	7	219
11:00	10%	33	13%	17	13%	12	13%	151	13%	10	190	7%	7	230
12:00	10%	33	13%	18	13%	13	13%	157	13%	11	199	7%	7	239
13:00	11%	38	14%	18	14%	13	14%	164	14%	10	205	7%	7	250
14:00	11%	38	13%	18	13%	13	13%	157	13%	11	199	7%	8	245
15:00	7%	22	13%	18	13%	13	13%	157	13%	11	199	7%	8	229
16:00	2%	5	1%	1	1%	1	1%	7	1%	0	9	7%	8	22
17:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	8	8
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	4%	4	4
Daily Trips	**100%**	**333**	**100%**	**133**	**100%**	**95**	**100%**	**1166**	**100%**	**78**	**1472**	**100%**	**105**	**1910**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	7	7
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	4	4
8:00	13%	20	5%	9	5%	7	5%	84	5%	6	106	11%	7	133
9:00	7%	10	7%	14	7%	10	7%	122	7%	8	154	5%	4	168
10:00	7%	10	10%	20	10%	15	10%	180	10%	12	227	11%	7	244
11:00	13%	20	12%	24	12%	17	12%	212	12%	14	267	5%	3	290
12:00	13%	20	13%	27	13%	18	13%	225	13%	15	285	5%	3	308
13:00	13%	21	13%	27	13%	18	13%	225	13%	15	285	5%	3	309
14:00	13%	21	14%	28	14%	20	14%	245	14%	17	310	11%	6	337
15:00	13%	21	13%	26	13%	19	13%	231	13%	15	291	5%	4	316
16:00	7%	10	10%	20	10%	15	10%	180	10%	12	227	5%	4	241
17:00	0%	0	3%	6	3%	4	3%	51	3%	3	64	5%	4	68
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**153**	**100%**	**201**	**100%**	**143**	**100%**	**1755**	**100%**	**117**	**2216**	**84%**	**56**	**2425**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Factoria facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	10,140	6,137	5.80	0.30	3,496	40,914		**44,410**	94%		63%	25,776			**25,776**	6%		37%	15,138			**15,138**
Hazardous Waste[2]		385		0.03		29,352		**29,352**			63%	18,492			**18,492**			37%	10,860			**10,860**
Garbage[3]	**212,639**	**55,170**	5.80	0.31	73,316	360,346		**433,662**	94%	68,917	63%	227,018			**295,935**	6%	4,399	37%	133,328			**137,727**
Yard Waste[4]		2,997	5.80	0.25	0	23,976		**23,976**	94%	0	63%	15,105			**15,105**	6%	0	37%	8,871			**8,871**
Hauling Away[5]							26,040	**26,040**					81%	21,092	**21,092**					19%	4,948	**4,948**
Total								**557,440**							**376,400**							**177,544**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Transfer Station Open[2] Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	3,496	94%	3,286	6%	210	259	103	94%	14	6%	6
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	73,316	94%	68,917	6%	4,399	259	103	94%	301	6%	135
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	76,812		72,203		4,609				315		141
Self Haul	Recycle	40,914	63%	25,776	37%	15,138	259	103	63%	132	37%	199
	Hazardous Waste	29,352	63%	18,492	37%	10,860	259	103	63%	95	37%	143
	Garbage	360,346	63%	227,018	37%	133,328	259	103	63%	1,167	37%	1,754
	Yard Waste	23,976	63%	15,105	37%	8,871	259	103	63%	78	37%	117
	Total	454,588		286,391		168,197				1,472		2,213
Hauling Trucks	Hauling Away	26,040	81%	21,092	19%	4,948	259	103	81%	102	19%	65
Total		*557,440*		*379,686*		*177,754*				**1,889**		**2,419**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	91.9%	1.837911	
Self Haul	recycle	8.1%	0.324177	
Hauling Trucks				

WEEKDAY	Factoria Commercia	Factoria SelfHaul	Factoria Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	Factoria SelfHaul	Factoria Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	7	7
7:00	13%	41	4%	6	4%	4	4%	52	4%	4	66	11%	11	118
8:00	15%	46	6%	8	6%	6	6%	72	6%	5	91	11%	11	148
9:00	10%	31	10%	13	10%	9	10%	111	10%	7	140	11%	11	182
10:00	11%	36	12%	16	12%	11	12%	138	12%	9	174	7%	6	216
11:00	10%	31	13%	17	13%	12	13%	151	13%	10	190	7%	6	227
12:00	10%	31	13%	18	13%	13	13%	157	13%	11	199	7%	6	236
13:00	11%	36	14%	18	14%	13	14%	164	14%	10	205	7%	6	247
14:00	11%	36	13%	18	13%	13	13%	157	13%	11	199	7%	7	242
15:00	7%	21	13%	18	13%	13	13%	157	13%	11	199	7%	7	227
16:00	2%	5	1%	1	1%	1	1%	7	1%	0	9	7%	7	21
17:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	7	7
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	4%	4	4
Daily Trips	**100%**	**314**	**100%**	**133**	**100%**	**95**	**100%**	**1166**	**100%**	**78**	**1472**	**100%**	**96**	**1882**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	7	7
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	3	3
8:00	13%	19	5%	9	5%	7	5%	84	5%	6	106	11%	7	132
9:00	7%	9	7%	14	7%	10	7%	122	7%	8	154	5%	3	166
10:00	7%	9	10%	20	10%	15	10%	180	10%	12	227	11%	7	243
11:00	13%	19	12%	24	12%	17	12%	212	12%	14	267	5%	2	288
12:00	13%	19	13%	27	13%	18	13%	225	13%	15	285	5%	2	306
13:00	13%	20	13%	27	13%	18	13%	225	13%	15	285	5%	2	307
14:00	13%	20	14%	28	14%	20	14%	245	14%	17	310	11%	6	336
15:00	13%	20	13%	26	13%	19	13%	231	13%	15	291	5%	3	314
16:00	7%	9	10%	20	10%	15	10%	180	10%	12	227	5%	3	239
17:00	0%	0	3%	6	3%	4	3%	51	3%	3	64	5%	3	67
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**144**	**100%**	**201**	**100%**	**143**	**100%**	**1755**	**100%**	**117**	**2216**	**84%**	**48**	**2408**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Factoria facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	6,803	4,419	5.80	0.30	2,346	29,460		**31,806**	94%		63%	18,560			**18,560**	6%		37%	10,900			**10,900**
Hazardous Waste[2]		385		0.03		29,352		**29,352**			48%	14,089			**14,089**			52%	15,263			**15,263**
Garbage[3]	**227,280**	**39,722**	5.80	0.31	78,364	259,448		**337,812**	94%	73,662	63%	163,452			**237,114**	6%	4,702	37%	95,996			**100,698**
Yard Waste[4]		2,158	5.80	0.25	0	17,264		**17,264**	94%	0	63%	10,876			**10,876**	6%	0	37%	6,388			**6,388**
Hauling Away[5]							24,612	**24,612**					81%	19,936	**19,936**					19%	4,676	**4,676**
Total								**440,846**							**300,575**							**137,925**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC. 15% shift from weekday to weekend for concept 2 provided by KC.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Transfer Station Open[2] Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	2,346	94%	2,205	6%	141	259	103	94%	10	6%	4
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	78,364	94%	73,662	6%	4,702	259	103	94%	322	6%	144
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	80,710		75,867		4,843				332		148
Self Haul	Recycle	29,460	63%	14,322	37%	15,138	259	103	63%	74	37%	199
	Hazardous Waste	29,352	48%	18,492	52%	10,860	259	103	48%	95	52%	143
	Garbage	259,448	63%	126,120	37%	133,328	259	103	63%	648	37%	1,754
	Yard Waste	17,264	63%	8,393	37%	8,871	259	103	63%	43	37%	117
	Total	335,524		167,327		168,197				860		2,213
Hauling Trucks	Hauling Away	24,612	81%	19,446	19%	5,166	259	103	81%	94	19%	68
Total		*440,846*		*262,640*		*178,206*				**1,286**		**2,429**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	93.2%	0	
Self Haul	recycle	6.8%	0	
Hauling Trucks				

WEEKDAY	Factoria Commercia	Factoria SelfHaul	Factoria Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	Factoria SelfHaul	Factoria Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	5%	17	0%	0	0%	0	0%	0	0%	0	0	7%	7	24
7:00	10%	33	0%	0	0%	0	0%	0	0%	0	0	11%	10	43
8:00	12%	40	0%	0	0%	0	0%	0	0%	0	0	11%	10	50
9:00	11%	37	0%	0	0%	0	0%	0	0%	0	0	11%	10	47
10:00	11%	37	0%	0	0%	0	0%	0	0%	0	0	7%	6	43
11:00	10%	33	2%	1	2%	2	2%	13	2%	1	17	7%	6	56
12:00	10%	33	2%	1	2%	2	2%	13	2%	1	17	7%	6	56
13:00	11%	37	1%	1	1%	1	1%	6	1%	0	8	7%	6	51
14:00	11%	37	0%	0	0%	0	0%	0	0%	0	0	7%	7	44
15:00	7%	23	25%	19	25%	24	25%	162	25%	11	216	7%	7	246
16:00	2%	7	20%	15	20%	19	20%	130	20%	9	173	7%	7	187
17:00	0%	0	15%	11	15%	14	15%	97	15%	6	128	7%	7	135
18:00	0%	0	10%	7	10%	10	10%	65	10%	4	86	4%	3	89
19:00	0%	0	10%	7	10%	10	10%	65	10%	4	86	0%	0	86
20:00	0%	0	10%	7	10%	10	10%	65	10%	4	86	0%	0	86
21:00	0%	0	5%	4	5%	5	5%	32	5%	2	43	0%	0	43
Daily Trips	**100%**	**334**	**100%**	**73**	**100%**	**97**	**100%**	**648**	**100%**	**42**	**645**	**1**	**92**	**1286**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0		0		0		0	0	11%	7	7
7:00	0%	0	0%	0		0		0		0	0	5%	4	4
8:00	13%	20	5%	10	5%	7	5%	88	5%	6	111	11%	7	138
9:00	7%	10	7%	14	7%	10	7%	123	7%	8	155	5%	4	169
10:00	7%	10	9%	18	9%	13	9%	158	9%	11	200	11%	7	217
11:00	13%	20	10%	20	10%	14	10%	175	10%	12	221	5%	3	244
12:00	13%	20	10%	21	10%	14	10%	175	10%	12	222	5%	3	245
13:00	13%	21	10%	21	10%	14	10%	175	10%	12	222	5%	3	246
14:00	13%	21	10%	20	10%	14	10%	176	10%	13	223	11%	6	250
15:00	13%	21	9%	18	9%	13	9%	158	9%	11	200	5%	4	225
16:00	7%	10	9%	18	9%	13	9%	158	9%	11	200	5%	4	214
17:00	0%	0	8%	16	8%	11	8%	140	8%	9	176	5%	4	180
18:00	0%	0	7%	14	7%	10	7%	123	7%	8	155	0%	0	155
19:00	0%	0	6%	12	6%	9	6%	105	6%	7	133	0%	0	133
20:00														
21:00														
Daily Trips	**100%**	**153**	**100%**	**202**	**100%**	**142**	**100%**	**1754**	**100%**	**120**	**2218**	**84%**	**56**	**2427**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	4,607	3,154	5.59	0.30	1,648	21,026		**22,674**
Hazardous Waste[2]		385		0.03		29,352		**29,352**
Garbage[3]	**94,805**	**24,795**	5.59	0.29	33,920	171,000		**204,920**
Yard Waste[4]		1,703	5.59	0.25	0	13,624		**13,624**
Hauling Away[5]							12,062	**12,062**
Total								**282,632**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	13,246			**13,246**	6%		37%	7,780			**7,780**
Hazardous Waste[2]			63%	18,492			**18,492**			37%	10,860			**10,860**
Garbage[3]	94%	31,885	63%	107,730			**139,615**	6%	2,035	37%	63,270			**65,305**
Yard Waste[4]	94%	0	63%	8,583			**8,583**	6%	0	37%	5,041			**5,041**
Hauling Away[5]					81%	9,770	**9,770**					19%	2,292	**2,292**
Total							**189,706**							**91,278**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips	Weekend Trips %	Weekend Trips[3]
Commercial Haul	Recycle	1,648	94%	1,549	6%	99	259	103	94%	7	6%	3
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	33,920	94%	31,885	6%	2,035	259	103	94%	139	6%	62
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	35,568		33,434		2,134				146		65
Self Haul	Recycle	21,026	63%	13,246	37%	7,780	259	103	63%	68	37%	102
	Hazardous Waste	29,352	63%	18,492	37%	10,860	259	103	63%	95	37%	143
	Garbage	171,000	63%	107,730	37%	63,270	259	103	63%	554	37%	832
	Yard Waste	13,624	63%	8,583	37%	5,041	259	103	63%	44	37%	66
	Total	235,002		148,051		86,951				761		1,143
Hauling Trucks	Hauling Away	12,062	81%	9,770	19%	2,292	259	103	81%	47	19%	30
Total		*282,632*		*191,255*		*91,377*				**954**		**1,238**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	91.8%	1.836956	
Self Haul	recycle	8.2%	0.326088	
Hauling Trucks				

WEEKDAY	Factoria Commercia	SelfHaul	Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	SelfHaul	Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	3	3
7:00	13%	19	4%	3	4%	4	4%	25	4%	2	34	11%	5	58
8:00	15%	22	6%	4	6%	6	6%	34	6%	3	47	11%	5	74
9:00	10%	14	10%	6	10%	9	10%	53	10%	4	72	11%	5	91
10:00	11%	17	12%	8	12%	11	12%	65	12%	5	89	7%	2	108
11:00	10%	14	13%	9	13%	12	13%	72	13%	6	99	7%	2	115
12:00	10%	14	13%	9	13%	13	13%	75	13%	6	103	7%	2	119
13:00	11%	17	14%	9	14%	13	14%	78	14%	5	105	7%	2	124
14:00	11%	17	13%	9	13%	13	13%	75	13%	6	103	7%	3	123
15:00	7%	10	13%	9	13%	13	13%	75	13%	6	103	7%	3	116
16:00	2%	2	1%	0	1%	1	1%	3	1%	0	4	7%	3	9
17:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	7%	3	3
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	4%	2	2
Daily Trips	**100%**	**146**	**100%**	**66**	**100%**	**95**	**100%**	**555**	**100%**	**43**	**759**	**100%**	**40**	**945**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	3	3
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
8:00	13%	9	5%	5	5%	7	5%	40	5%	3	55	11%	3	67
9:00	7%	4	7%	7	7%	10	7%	58	7%	5	80	5%	2	86
10:00	7%	4	10%	10	10%	15	10%	85	10%	7	117	11%	3	124
11:00	13%	9	12%	12	12%	17	12%	101	12%	8	138	5%	1	148
12:00	13%	9	13%	14	13%	18	13%	107	13%	8	147	5%	1	157
13:00	13%	10	13%	14	13%	18	13%	107	13%	8	147	5%	1	158
14:00	13%	10	14%	14	14%	20	14%	117	14%	10	161	11%	2	173
15:00	13%	10	13%	13	13%	19	13%	110	13%	9	151	5%	2	163
16:00	7%	4	10%	10	10%	15	10%	85	10%	7	117	5%	2	123
17:00	0%	0	3%	3	3%	4	3%	24	3%	2	33	5%	2	35
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**69**	**100%**	**102**	**100%**	**143**	**100%**	**834**	**100%**	**67**	**1146**	**84%**	**24**	**1239**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Factoria facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria without Renton Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle[6]: Commercial Haul	Average Tonnage/Vehicle[6]: Self Haul	Total Annual Trips[7]: Commercial Haul	Total Annual Trips[7]: Self Haul	Total Annual Trips[7]: Hauling Trucks	Total Annual Trips[7]: Total
Recycling[1]	7,147	6,584	5.78	0.30	2,474	43,894		**46,368**
Hazardous Waste[2]		385		0.03		29,352		**29,352**
Garbage[3]	**244,234**	**61,416**	5.78	0.30	84,524	408,774		**493,298**
Yard Waste[4]		2,997	5.78	0.25	0	23,976		**23,976**
Hauling Away[5]							29,340	**29,340**
Total								**622,334**

Material	Total Annual Weekday Trips[8]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	27,653			**27,653**	6%		37%	16,241			**16,241**
Hazardous Waste[2]			63%	18,492			**18,492**			37%	10,860			**10,860**
Garbage[3]	94%	79,453	63%	257,528			**336,981**	6%	5,071	37%	151,246			**156,317**
Yard Waste[4]	94%	0	63%	15,105			**15,105**	6%	0	37%	8,871			**8,871**
Hauling Away[5]					81%	23,765	**23,765**					19%	5,575	**5,575**
Total							**421,996**							**197,864**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Average Tonnage/Vehicle reflects a weighted average taking into account the shift in tonnage from Houghton and Renton.

7. Total Annual Trips represents both inbound and outbound trips.

8.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	2,474	94%	2,326	6%	148	259	103	94%	10	6%	5
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	84,524	94%	79,453	6%	5,071	259	103	94%	347	6%	155
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	86,998		81,779		5,219				357		160
Self Haul	Recycle	43,894	63%	27,653	37%	16,241	259	103	63%	142	37%	214
	Hazardous Waste	29,352	63%	18,492	37%	10,860	259	103	63%	95	37%	143
	Garbage	408,774	63%	257,528	37%	151,246	259	103	63%	1,324	37%	1,990
	Yard Waste	23,976	63%	15,105	37%	8,871	259	103	63%	78	37%	117
	Total	505,996		318,778		187,218				1,639		2,464
Hauling Trucks	Hauling Away	29,340	81%	23,765	19%	5,575	259	103	81%	115	19%	73
Total		***622,334***		***424,322***		***198,012***				**2,111**		**2,697**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer						
	waste	92.5%	6.476097			
Self Haul	recycle	7.5%	1.047806			
Hauling Trucks						

WEEKDAY	Factoria Commercia	SelfHaul	Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	SelfHaul	Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	14	14
7:00	13%	47	4%	6	4%	4	4%	60	4%	4	74	6%	7	128
8:00	15%	53	6%	9	6%	6	6%	82	6%	5	102	12%	14	169
9:00	10%	35	10%	14	10%	9	10%	126	10%	7	156	9%	10	201
10:00	11%	41	12%	17	12%	11	12%	156	12%	9	193	12%	14	248
11:00	10%	35	13%	18	13%	12	13%	171	13%	10	211	9%	10	256
12:00	10%	36	13%	19	13%	13	13%	179	13%	10	221	9%	10	267
13:00	11%	42	14%	21	14%	13	14%	185	14%	11	230	6%	8	280
14:00	11%	42	13%	19	13%	13	13%	179	13%	11	222	9%	10	274
15:00	7%	23	13%	19	13%	13	13%	179	13%	11	222	6%	8	253
16:00	2%	6	1%	1	1%	1	1%	7	1%	0	9	3%	3	18
17:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	3%	3	3
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**360**	**100%**	**143**	**100%**	**95**	**100%**	**1324**	**100%**	**78**	**1640**	**97%**	**111**	**2111**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	8	8
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	4	4
8:00	13%	21	5%	10	5%	7	5%	95	5%	6	118	11%	8	147
9:00	7%	11	7%	15	7%	10	7%	138	7%	8	171	5%	4	186
10:00	7%	11	10%	22	10%	15	10%	204	10%	12	253	11%	8	272
11:00	13%	21	12%	26	12%	17	12%	241	12%	14	298	5%	4	323
12:00	13%	21	13%	27	13%	18	13%	255	13%	15	315	5%	3	339
13:00	13%	21	13%	26	13%	18	13%	255	13%	15	314	5%	3	338
14:00	13%	21	14%	30	14%	20	14%	278	14%	17	345	11%	7	373
15:00	13%	21	13%	28	13%	19	13%	263	13%	15	325	5%	4	350
16:00	7%	11	10%	22	10%	15	10%	204	10%	12	253	5%	4	268
17:00	0%	0	3%	6	3%	4	3%	58	3%	3	71	5%	4	75
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**159**	**100%**	**212**	**100%**	**143**	**100%**	**1991**	**100%**	**117**	**2463**	**84%**	**61**	**2683**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Factoria facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria without Renton Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	4,844	6,584	5.78	0.30	1,674	43,894		**45,568**
Hazardous Waste[2]		385		0.03		29,352		**29,352**
Garbage[3]	**165,524**	**61,416**	5.78	0.30	57,232	408,774		**466,006**
Yard Waste[4]		2,997	5.78	0.25	0	23,976		**23,976**
Hauling Away[5]							23,166	**23,166**
Total								**588,068**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	27,653			**27,653**	6%		37%	16,241			**16,241**
Hazardous Waste[2]			63%	18,492			**18,492**			37%	10,860			**10,860**
Garbage[3]	94%	53,798	63%	257,528			**311,326**	6%	3,434	37%	151,246			**154,680**
Yard Waste[4]	94%	0	63%	15,105			**15,105**	6%	0	37%	8,871			**8,871**
Hauling Away[5]					81%	18,764	**18,764**					19%	4,402	**4,402**
Total							**391,340**							**195,054**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	1,674	94%	1,574	6%	100	259	103	94%	7	6%	3
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	57,232	94%	53,798	6%	3,434	259	103	94%	235	6%	105
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	58,906		55,372		3,534				242		108
Self Haul	Recycle	43,894	63%	27,653	37%	16,241	259	103	63%	142	37%	214
	Hazardous Waste	29,352	63%	18,492	37%	10,860	259	103	63%	95	37%	143
	Garbage	408,774	63%	257,528	37%	151,246	259	103	63%	1,324	37%	1,990
	Yard Waste	23,976	63%	15,105	37%	8,871	259	103	63%	78	37%	117
	Total	505,996		318,778		187,218				1,639		2,464
Hauling Trucks	Hauling Away	23,166	81%	18,764	19%	4,402	259	103	81%	91	19%	58
Total		*588,068*		*392,914*		*195,154*				**1,972**		**2,630**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer	waste	92.2%	1.843769	
Self Haul	recycle	7.8%	0.312463	
Hauling Trucks				

WEEKDAY	Factoria Commercia	SelfHaul	Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	SelfHaul	Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	11	11
7:00	13%	32	4%	6	4%	4	4%	60	4%	4	74	6%	6	112
8:00	15%	36	6%	9	6%	6	6%	82	6%	5	102	12%	11	149
9:00	10%	24	10%	14	10%	9	10%	126	10%	7	156	9%	8	188
10:00	11%	28	12%	17	12%	11	12%	156	12%	9	193	12%	11	232
11:00	10%	24	13%	18	13%	12	13%	171	13%	10	211	9%	8	243
12:00	10%	25	13%	19	13%	13	13%	179	13%	10	221	9%	8	254
13:00	11%	29	14%	21	14%	13	14%	185	14%	11	230	6%	7	266
14:00	11%	29	13%	19	13%	13	13%	179	13%	11	222	9%	8	259
15:00	7%	16	13%	19	13%	13	13%	179	13%	11	222	6%	7	245
16:00	2%	4	1%	1	1%	1	1%	7	1%	0	9	3%	3	16
17:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	3%	3	3
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**247**	**100%**	**143**	**100%**	**95**	**100%**	**1324**	**100%**	**78**	**1640**	**97%**	**91**	**1978**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	6	6
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	3	3
8:00	13%	14	5%	10	5%	7	5%	95	5%	6	118	11%	6	138
9:00	7%	7	7%	15	7%	10	7%	138	7%	8	171	5%	3	181
10:00	7%	7	10%	22	10%	15	10%	204	10%	12	253	11%	6	266
11:00	13%	14	12%	26	12%	17	12%	241	12%	14	298	5%	3	315
12:00	13%	14	13%	27	13%	18	13%	255	13%	15	315	5%	2	331
13:00	13%	14	13%	26	13%	18	13%	255	13%	15	314	5%	2	330
14:00	13%	14	14%	30	14%	20	14%	278	14%	17	345	11%	5	364
15:00	13%	14	13%	28	13%	19	13%	263	13%	15	325	5%	3	342
16:00	7%	7	10%	22	10%	15	10%	204	10%	12	253	5%	3	263
17:00	0%	0	3%	6	3%	4	3%	58	3%	3	71	5%	3	74
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**105**	**100%**	**212**	**100%**	**143**	**100%**	**1991**	**100%**	**117**	**2463**	**84%**	**45**	**2613**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Factoria facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria without Renton Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	7,147	4,079	5.78	0.30	2,474	27,194		**29,668**
Hazardous Waste[2]		385		0.03		29,352		**29,352**
Garbage[3]	**244,234**	**40,820**	5.78	0.30	84,524	274,330		**358,854**
Yard Waste[4]		1,992	5.78	0.25	0	15,936		**15,936**
Hauling Away[5]							25,756	**25,756**
Total								**459,566**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	17,132			**17,132**	6%		37%	10,062			**10,062**
Hazardous Waste[2]			48%	14,089			**14,089**			52%	15,263			**15,263**
Garbage[3]	94%	79,453	63%	172,828			**252,281**	6%	5,071	37%	101,502			**106,573**
Yard Waste[4]	94%	0	63%	10,040			**10,040**	6%	0	37%	5,896			**5,896**
Hauling Away[5]					81%	20,862	**20,862**					19%	4,894	**4,894**
Total							**314,404**							**142,688**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC. 15% shift from weekday to weekend for concept 2 provided by KC.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	2,474	94%	2,326	6%	148	259	103	94%	10	6%	5
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	84,524	94%	79,453	6%	5,071	259	103	94%	347	6%	155
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	86,998		81,779		5,219				357		160
Self Haul	Recycle	27,194	63%	10,953	37%	16,241	259	103	63%	56	37%	214
	Hazardous Waste	29,352	48%	18,492	52%	10,860	259	103	48%	95	52%	143
	Garbage	274,330	63%	123,084	37%	151,246	259	103	63%	633	37%	1,990
	Yard Waste	15,936	63%	7,065	37%	8,871	259	103	63%	36	37%	117
	Total	346,812		159,594		187,218				820		2,464
Hauling Trucks	Hauling Away	25,756	81%	20,181	19%	5,575	259	103	81%	97	19%	73
Total		*459,566*		*261,554*		*198,012*				**1,274**		**2,697**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	94.5%	0	
Self Haul	recycle	5.5%	0	
Hauling Trucks				

WEEKDAY	Factoria Commercia	SelfHaul	Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	SelfHaul	Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	5%	18	0%	0	0%	0	0%	0	0%	0	0	12%	12	30
7:00	10%	36	0%	0	0%	0	0%	0	0%	0	0	6%	6	42
8:00	12%	43	0%	0	0%	0	0%	0	0%	0	0	12%	12	55
9:00	11%	39	0%	0	0%	0	0%	0	0%	0	0	9%	9	48
10:00	11%	39	0%	0	0%	0	0%	0	0%	0	0	12%	12	51
11:00	10%	36	2%	1	2%	2	2%	13	2%	1	17	9%	9	62
12:00	10%	37	2%	1	2%	2	2%	13	2%	1	17	9%	9	63
13:00	11%	40	1%	1	1%	1	1%	5	1%	0	7	6%	7	54
14:00	11%	40	0%	0	0%	0	0%	0	0%	0	0	9%	9	49
15:00	7%	25	25%	14	25%	24	25%	158	25%	9	205	6%	7	237
16:00	2%	7	20%	11	20%	19	20%	127	20%	7	164	3%	3	174
17:00	0%	0	15%	8	15%	14	15%	95	15%	5	122	3%	3	125
18:00	0%	0	10%	6	10%	10	10%	63	10%	4	83	0%	0	83
19:00	0%	0	10%	6	10%	10	10%	63	10%	4	83	0%	0	83
20:00	0%	0	10%	6	10%	10	10%	63	10%	4	83	0%	0	83
21:00	0%	0	5%	3	5%	5	5%	32	5%	2	42	0%	0	42
Daily Trips	**100%**	**360**	**100%**	**57**	**100%**	**97**	**100%**	**632**	**100%**	**37**	**823**	**97%**	**98**	**1281**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0		0		0		0		0	0	11%	8	8
7:00	0%	0		0		0		0		0	0	5%	4	4
8:00	13%	21	5%	11	5%	7	5%	100	5%	6	124	11%	8	153
9:00	7%	11	7%	15	7%	10	7%	139	7%	8	172	5%	4	187
10:00	7%	11	9%	19	9%	13	9%	179	9%	11	222	11%	8	241
11:00	13%	21	10%	21	10%	14	10%	199	10%	12	246	5%	4	271
12:00	13%	21	10%	21	10%	14	10%	199	10%	12	246	5%	3	270
13:00	13%	21	10%	20	10%	14	10%	199	10%	12	245	5%	3	269
14:00	13%	21	10%	21	10%	14	10%	200	10%	13	248	11%	7	276
15:00	13%	21	9%	19	9%	13	9%	180	9%	11	223	5%	4	248
16:00	7%	11	9%	19	9%	13	9%	179	9%	11	222	5%	4	237
17:00	0%	0	8%	17	8%	11	8%	159	8%	9	196	5%	4	200
18:00	0%	0	7%	15	7%	10	7%	139	7%	8	172	0%	0	172
19:00			6%	13	6%	9	6%	119	6%	7	148		0	148
20:00														
21:00														
Daily Trips	**100%**	**159**	**100%**	**211**	**100%**	**142**	**100%**	**1991**	**100%**	**120**	**2464**	**84%**	**61**	**2684**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Bow Lake facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Factoria without Renton Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	4,950	3,601	5.57	0.30	1,776	24,006		**25,782**
Hazardous Waste[2]		385		0.03		29,352		**29,352**
Garbage[3]	**111,758**	**31,042**	5.57	0.28	40,094	220,194		**260,288**
Yard Waste[4]		1,703	5.57	0.25	0	13,624		**13,624**
Hauling Away[5]							14,214	**14,214**
Total								**343,260**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	94%		63%	15,124			**15,124**	6%		37%	8,882			**8,882**
Hazardous Waste[2]			63%	18,492			**18,492**			37%	10,860			**10,860**
Garbage[3]	94%	37,688	63%	138,722			**176,410**	6%	2,406	37%	81,472			**83,878**
Yard Waste[4]	94%	0	63%	8,583			**8,583**	6%	0	37%	5,041			**5,041**
Hauling Away[5]					81%	11,513	**11,513**					19%	2,701	**2,701**
Total							**230,122**							**111,362**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. HHW tonnage provided by KC. Only Self-Haul assumed to carry HHW. Average pounds per vehicle assumed to be 52.4, provided by KC.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Factoria site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips	Weekend Trips %	Weekend Trips[3]
Commercial Haul	Recycle	1,776	94%	1,669	6%	107	259	103	94%	7	6%	3
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	40,094	94%	37,688	6%	2,406	259	103	94%	164	6%	74
	Yard Waste	0	94%	0	6%	0	259	103	94%	0	6%	0
	Total	41,870		39,357		2,513				171		77
Self Haul	Recycle	24,006	63%	15,124	37%	8,882	259	103	63%	78	37%	117
	Hazardous Waste	29,352	63%	18,492	37%	10,860	259	103	63%	95	37%	143
	Garbage	220,194	63%	138,722	37%	81,472	259	103	63%	713	37%	1,072
	Yard Waste	13,624	63%	8,583	37%	5,041	259	103	63%	44	37%	66
	Total	287,176		180,921		106,255				930		1,398
Hauling Trucks	Hauling Away	14,214	81%	11,513	19%	2,701	259	103	81%	56	19%	35
Total		*343,260*		*231,791*		*111,469*				**1,157**		**1,510**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	92.4%	1.847529	
Self Haul	recycle	7.6%	0.304942	
Hauling Trucks				

WEEKDAY	Factoria Commercia	SelfHaul	Total
Median	69	175	244
90th Percentile	78	232	305
Peak Increase	**113.0%**	**133.1%**	**125.0%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Factoria Commercia	SelfHaul	Total
Median	1	278	280
90th Percentile	3	376	377
Peak Increase	**300.0%**	**135.5%**	**134.8%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	12%	7	7
7:00	13%	22	4%	4	4%	4	4%	32	4%	2	42	6%	3	67
8:00	15%	25	6%	5	6%	6	6%	44	6%	3	58	12%	7	90
9:00	10%	17	10%	7	10%	9	10%	68	10%	4	88	9%	5	110
10:00	11%	20	12%	9	12%	11	12%	84	12%	5	109	12%	7	136
11:00	10%	17	13%	10	13%	12	13%	92	13%	6	120	9%	5	142
12:00	10%	18	13%	11	13%	13	13%	96	13%	5	125	9%	5	148
13:00	11%	21	14%	12	14%	13	14%	99	14%	6	130	6%	4	155
14:00	11%	21	13%	11	13%	13	13%	96	13%	6	126	9%	5	152
15:00	7%	11	13%	11	13%	13	13%	96	13%	6	126	6%	4	141
16:00	2%	3	1%	0	1%	1	1%	4	1%	0	5	3%	2	10
17:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	3%	2	2
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**175**	**100%**	**80**	**100%**	**95**	**100%**	**711**	**100%**	**43**	**929**	**97%**	**56**	**1160**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	4	4
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
8:00	13%	10	5%	6	5%	7	5%	51	5%	3	67	11%	4	81
9:00	7%	5	7%	8	7%	10	7%	75	7%	5	98	5%	2	105
10:00	7%	5	10%	12	10%	15	10%	110	10%	7	144	11%	4	153
11:00	13%	10	12%	14	12%	17	12%	130	12%	8	169	5%	2	181
12:00	13%	10	13%	15	13%	18	13%	137	13%	8	178	5%	1	189
13:00	13%	10	13%	14	13%	18	13%	137	13%	8	177	5%	1	188
14:00	13%	10	14%	16	14%	20	14%	150	14%	10	196	11%	3	209
15:00	13%	10	13%	15	13%	19	13%	142	13%	9	185	5%	2	197
16:00	7%	5	10%	12	10%	15	10%	110	10%	7	144	5%	2	151
17:00	0%	0	3%	3	3%	4	3%	31	3%	2	40	5%	2	42
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**75**	**100%**	**115**	**100%**	**143**	**100%**	**1073**	**100%**	**67**	**1398**	**84%**	**29**	**1502**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Factoria facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 8 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle[6]		Total Annual Trips[7]				Total Annual Weekday Trips[8]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	1,045	4,199	5.68	0.30	368	27,994		**28,362**	87%		65%	18,196			**18,196**	13%		35%	9,798			**9,798**
Hazardous Waste[2]																						
Garbage[3]	**34,551**	**31,669**	5.68	0.31	12,162	202,528		**214,690**	87%	10,581	65%	131,643			**142,224**	13%	1,581	35%	70,885			**72,466**
Yard Waste[4]		5,726	5.68	0.25	0	45,808		**45,808**	87%	0	65%	29,775			**29,775**	13%	0	35%	16,033			**16,033**
Hauling Away[5]							8,940	**8,940**					69%	6,169	**6,169**					31%	2,771	**2,771**
Total								**297,800**							**196,364**							**101,068**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

17628.05

7. Total Annual Trips represents both inbound and outbound trips.

8.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]	
Commercial Haul	Recycle	368	87%	320	13%	48	259	103	87%	2	13%	2	Commer
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0	
	Garbage	12,162	87%	10,581	13%	1,581	259	103	87%	52	13%	64	
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0	
	Total	12,530		10,901		1,629				54		66	
Self Haul	Recycle	27,994	65%	18,196	35%	9,798	259	103	65%	94	35%	127	Self Haul
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0	
	Garbage	202,528	65%	131,643	35%	70,885	259	103	65%	677	35%	918	
	Yard Waste	45,808	65%	29,775	35%	16,033	259	103	65%	153	35%	208	
	Total	276,330		179,614		96,716				924		1,253	
Hauling Trucks	Hauling Away	8,940	69%	6,169	31%	2,771	259	103	69%	31	31%	36	Hauling Trucks
Total		***297,800***		***196,684***		***101,116***				**1,009**		**1,355**	

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

waste	90.3%	0.902811	
recycle	9.7%	0.194378	

WEEKDAY	Shoreline Commerci	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commerci	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
7:00	8%	4	3%	3	3%	0	3%	19	3%	4	26	8%	2	32
8:00	12%	6	5%	5	5%	0	5%	37	5%	8	50	8%	2	58
9:00	8%	4	8%	7	8%	0	8%	53	8%	12	72	8%	2	78
10:00	15%	8	10%	10	10%	0	10%	69	10%	16	95	8%	3	106
11:00	15%	8	12%	11	12%	0	12%	79	12%	17	107	8%	3	118
12:00	12%	7	13%	12	13%	0	13%	86	13%	19	117	8%	3	127
13:00	12%	7	12%	11	12%	0	12%	82	12%	19	112	8%	3	122
14:00	8%	5	13%	12	13%	0	13%	85	13%	19	116	8%	3	124
15:00	8%	4	13%	12	13%	0	13%	85	13%	19	116	8%	2	122
16:00	4%	2	12%	11	12%	0	12%	82	12%	19	112	8%	2	116
17:00	0%	0	0%	0	0%	0	0%	3	0%	1	4	8%	2	6
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
Daily Trips	**100%**	**55**	**100%**	**94**	**100%**	**0**	**100%**	**680**	**100%**	**153**	**927**	**100%**	**31**	**1013**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	4	4
8:00	9%	6	4%	5	4%	0	4%	37	4%	8	50	11%	4	60
9:00	9%	6	7%	8	7%	0	7%	60	7%	14	82	5%	2	90
10:00	18%	12	9%	12	9%	0	9%	86	9%	20	118	11%	4	134
11:00	9%	7	12%	15	12%	0	12%	110	12%	25	150	11%	4	161
12:00	9%	7	13%	17	13%	0	13%	120	13%	27	164	5%	2	173
13:00	9%	6	13%	17	13%	0	13%	123	13%	27	167	5%	2	175
14:00	9%	6	14%	18	14%	0	14%	128	14%	29	175	11%	3	184
15:00	9%	6	13%	16	13%	0	13%	118	13%	27	161	11%	3	170
16:00	9%	6	12%	15	12%	0	12%	107	12%	24	146	5%	2	154
17:00	9%	6	3%	4	3%	0	3%	29	3%	7	40	0%	0	46
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**68**	**100%**	**127**	**100%**	**0**	**100%**	**918**	**100%**	**208**	**1253**	**89%**	**32**	**1353**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	1,259	4,199	5.70	0.30	442	27,994		**28,436**	87%		65%	18,196			**18,196**	13%		35%	9,798			**9,798**
Hazardous Waste[2]																						
Garbage[3]	**41,608**	**31,669**	5.70	0.31	14,594	202,528		**217,122**	87%	12,697	65%	131,643			**144,340**	13%	1,897	35%	70,885			**72,782**
Yard Waste[4]		5,726	5.70	0.25	0	45,808		**45,808**	87%	0	65%	29,775			**29,775**	13%	0	35%	16,033			**16,033**
Hauling Away[5]							9,494	**9,494**					69%	6,551	**6,551**					31%	2,943	**2,943**
Total								**300,860**							**198,862**							**101,556**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Transfer Station Open[2] Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	442	87%	385	13%	57	259	103	87%	2	13%	2
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	14,594	87%	12,697	13%	1,897	259	103	87%	62	13%	77
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	15,036		13,082		1,954				64		79
Self Haul	Recycle	27,994	65%	18,196	35%	9,798	259	103	65%	94	35%	127
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	202,528	65%	131,643	35%	70,885	259	103	65%	677	35%	918
	Yard Waste	45,808	65%	29,775	35%	16,033	259	103	65%	153	35%	208
	Total	276,330		179,614		96,716				924		1,253
Hauling Trucks	Hauling Away	9,494	69%	6,551	31%	2,943	259	103	69%	33	31%	38
Total		*300,860*		*199,247*		*101,613*				**1,021**		**1,370**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	90.4%	0	
Self Haul	recycle	9.6%	0	
Hauling Trucks				

WEEKDAY	Shoreline Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	3	3
7:00	8%	5	3%	3	3%	0	3%	19	3%	4	26	8%	3	34
8:00	12%	7	5%	5	5%	0	5%	37	5%	8	50	8%	3	60
9:00	8%	5	8%	7	8%	0	8%	53	8%	12	72	8%	3	80
10:00	15%	10	10%	10	10%	0	10%	69	10%	16	95	8%	3	108
11:00	15%	10	12%	11	12%	0	12%	79	12%	17	107	8%	3	120
12:00	12%	8	13%	12	13%	0	13%	86	13%	19	117	8%	3	128
13:00	12%	8	12%	11	12%	0	12%	82	12%	19	112	8%	3	123
14:00	8%	6	13%	12	13%	0	13%	85	13%	19	116	8%	3	125
15:00	8%	5	13%	12	13%	0	13%	85	13%	19	116	8%	3	124
16:00	4%	2	12%	11	12%	0	12%	82	12%	19	112	8%	3	117
17:00	0%	0	0%	0	0%	0	0%	3	0%	1	4	8%	3	7
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	3	3
Daily Trips	**100%**	**66**	**100%**	**94**	**100%**	**0**	**100%**	**680**	**100%**	**153**	**927**	**100%**	**39**	**1032**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	4	4
8:00	9%	7	4%	5	4%	0	4%	37	4%	8	50	11%	4	61
9:00	9%	7	7%	8	7%	0	7%	60	7%	14	82	5%	2	91
10:00	18%	14	9%	12	9%	0	9%	86	9%	20	118	11%	4	136
11:00	9%	8	12%	15	12%	0	12%	110	12%	25	150	11%	4	162
12:00	9%	8	13%	17	13%	0	13%	120	13%	27	164	5%	2	174
13:00	9%	7	13%	17	13%	0	13%	123	13%	27	167	5%	2	176
14:00	9%	7	14%	18	14%	0	14%	128	14%	29	175	11%	3	185
15:00	9%	7	13%	16	13%	0	13%	118	13%	27	161	11%	3	171
16:00	9%	7	12%	15	12%	0	12%	107	12%	24	146	5%	2	155
17:00	9%	7	3%	4	3%	0	3%	29	3%	7	40	0%	0	47
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**79**	**100%**	**127**	**100%**	**0**	**100%**	**918**	**100%**	**208**	**1253**	**89%**	**32**	**1364**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	1,045	5,223	5.68	0.30	368	34,820		**35,188**	87%		65%	22,633			**22,633**	13%		35%	12,187			**12,187**
Hazardous Waste[2]																						
Garbage[3]	**34,551**	**39,393**	5.68	0.31	12,162	252,960		**265,122**	87%	10,581	65%	164,424			**175,005**	13%	1,581	35%	88,536			**90,117**
Yard Waste[4]		7,122	5.68	0.25	0	56,976		**56,976**	87%	0	65%	37,034			**37,034**	13%	0	35%	19,942			**19,942**
Hauling Away[5]							10,460	**10,460**					69%	7,217	**7,217**					31%	3,243	**3,243**
Total								**367,746**							**241,889**							**125,489**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Transfer Station Open[2] Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	368	87%	320	13%	48	259	103	87%	2	13%	2
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	12,162	87%	10,581	13%	1,581	259	103	87%	52	13%	64
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	12,530		10,901		1,629				54		66
Self Haul	Recycle	34,820	65%	25,022	35%	9,798	259	103	65%	129	35%	127
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	252,960	65%	182,075	35%	70,885	259	103	65%	936	35%	918
	Yard Waste	56,976	65%	40,943	35%	16,033	259	103	65%	210	35%	208
	Total	344,756		248,040		96,716				1,275		1,253
Hauling Trucks	Hauling Away	10,460	69%	7,689	31%	2,771	259	103	69%	39	31%	36
Total		*367,746*		*266,630*		*101,116*				**1,368**		**1,355**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	90.2%	0
Self Haul	recycle	9.8%	0
Hauling Trucks			

WEEKDAY	Shoreline Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	3	3
7:00	8%	4	3%	4	3%	0	3%	26	3%	6	36	8%	3	43
8:00	12%	6	5%	7	5%	0	5%	51	5%	11	69	8%	3	78
9:00	8%	4	8%	10	8%	0	8%	73	8%	16	99	8%	3	106
10:00	15%	8	10%	13	10%	0	10%	95	10%	21	129	8%	3	140
11:00	15%	8	12%	15	12%	0	12%	110	12%	24	149	8%	3	160
12:00	12%	7	13%	16	13%	0	13%	118	13%	26	160	8%	3	170
13:00	12%	7	12%	16	12%	0	12%	113	12%	25	154	8%	3	164
14:00	8%	5	13%	16	13%	0	13%	117	13%	26	159	8%	3	167
15:00	8%	4	13%	16	13%	0	13%	117	13%	26	159	8%	3	166
16:00	4%	2	12%	16	12%	0	12%	113	12%	25	154	8%	3	159
17:00	0%	0	0%	1	0%	0	0%	4	0%	1	6	8%	3	9
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	3	3
Daily Trips	**100%**	**55**	**100%**	**130**	**100%**	**0**	**100%**	**937**	**100%**	**207**	**1274**	**100%**	**39**	**1368**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	4	4
8:00	9%	6	4%	5	4%	0	4%	37	4%	8	50	11%	4	60
9:00	9%	6	7%	8	7%	0	7%	60	7%	14	82	5%	2	90
10:00	18%	12	9%	12	9%	0	9%	86	9%	20	118	11%	4	134
11:00	9%	7	12%	15	12%	0	12%	110	12%	25	150	11%	4	161
12:00	9%	7	13%	17	13%	0	13%	120	13%	27	164	5%	2	173
13:00	9%	6	13%	17	13%	0	13%	123	13%	27	167	5%	2	175
14:00	9%	6	14%	18	14%	0	14%	128	14%	29	175	11%	3	184
15:00	9%	6	13%	16	13%	0	13%	118	13%	27	161	11%	3	170
16:00	9%	6	12%	15	12%	0	12%	107	12%	24	146	5%	2	154
17:00	9%	6	3%	4	3%	0	3%	29	3%	7	40	0%	0	46
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**68**	**100%**	**127**	**100%**	**0**	**100%**	**918**	**100%**	**208**	**1253**	**89%**	**32**	**1353**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle		Total Annual Trips[6]				Total Annual Weekday Trips[7]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	801	3,868	5.57	0.30	288	25,786		**26,074**	87%		65%	16,761			**16,761**	13%		35%	9,025			**9,025**
Hazardous Waste[2]																						
Garbage[3]	**24,767**	**23,333**	5.57	0.31	8,892	150,536		**159,428**	87%	7,736	65%	97,848			**105,584**	13%	1,156	35%	52,688			**53,844**
Yard Waste[4]		5,726	5.57	0.25	0	45,808		**45,808**	87%	0	65%	29,775			**29,775**	13%	0	35%	16,033			**16,033**
Hauling Away[5]							7,274	**7,274**					69%	5,019	**5,019**					31%	2,255	**2,255**
Total								**238,584**							**157,139**							**81,157**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	288	87%	251	13%	37	259	103	87%	1	13%	2
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	8,892	87%	7,736	13%	1,156	259	103	87%	38	13%	47
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	9,180		7,987		1,193				39		49
Self Haul	Recycle	25,786	65%	16,761	35%	9,025	259	103	65%	86	35%	117
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	150,536	65%	97,848	35%	52,688	259	103	65%	503	35%	682
	Yard Waste	45,808	65%	29,775	35%	16,033	259	103	65%	153	35%	208
	Total	222,130		144,384		77,746				742		1,007
Hauling Trucks	Hauling Away	7,274	69%	5,019	31%	2,255	259	103	69%	25	31%	29
Total		*238,584*		*157,390*		*81,194*				**806**		**1,085**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commerci			
	waste	88.8%	0
Self Haul	recycle	11.2%	0
Hauling Trucks			

	Shoreline		
WEEKDAY	Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

	Shoreline		
WEEKEND	Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Hour	Weekday Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
7:00	8%	3	3%	2	3%	0	3%	14	3%	4	20	8%	2	25
8:00	12%	5	5%	5	5%	0	5%	28	5%	8	41	8%	2	48
9:00	8%	3	8%	7	8%	0	8%	39	8%	12	58	8%	2	63
10:00	15%	6	10%	9	10%	0	10%	51	10%	16	76	8%	2	84
11:00	15%	6	12%	10	12%	0	12%	59	12%	17	86	8%	2	94
12:00	12%	6	13%	11	13%	0	13%	64	13%	19	94	8%	2	102
13:00	12%	6	12%	10	12%	0	12%	61	12%	19	90	8%	2	98
14:00	8%	4	13%	11	13%	0	13%	63	13%	19	93	8%	2	99
15:00	8%	3	13%	11	13%	0	13%	63	13%	19	93	8%	2	98
16:00	4%	2	12%	10	12%	0	12%	61	12%	19	90	8%	2	94
17:00	0%	0	0%	0	0%	0	0%	2	0%	1	3	8%	2	5
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
Daily Trips	**100%**	**44**	**100%**	**86**	**100%**	**0**	**100%**	**505**	**100%**	**153**	**744**	**100%**	**26**	**814**

Hour	Weekend Summary: Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	3	3
8:00	9%	4	4%	5	4%	0	4%	27	4%	8	40	11%	3	47
9:00	9%	4	7%	8	7%	0	7%	45	7%	14	67	5%	2	73
10:00	18%	9	9%	11	9%	0	9%	64	9%	20	95	11%	3	107
11:00	9%	5	12%	14	12%	0	12%	82	12%	25	121	11%	3	129
12:00	9%	5	13%	15	13%	0	13%	89	13%	27	131	5%	2	138
13:00	9%	4	13%	16	13%	0	13%	91	13%	27	134	5%	2	140
14:00	9%	4	14%	16	14%	0	14%	95	14%	29	140	11%	2	146
15:00	9%	4	13%	15	13%	0	13%	87	13%	27	129	11%	2	135
16:00	9%	4	12%	14	12%	0	12%	80	12%	24	118	5%	2	124
17:00	9%	4	3%	4	3%	0	3%	21	3%	7	32	0%	0	36
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**47**	**100%**	**118**	**100%**	**0**	**100%**	**681**	**100%**	**208**	**1007**	**89%**	**26**	**1080**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline without Renton Concept 0

Annual

2023 Annual Trip Generation Summary

Material	Tonnage		Average Tonnage/Vehicle[6]		Total Annual Trips[7]				Total Annual Weekday Trips[8]							Total Annual Weekend Trips						
									Commercial Haul		Self Haul		Hauling Trucks			Commercial Haul		Self Haul		Hauling Trucks		
	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Commercial Haul	Self Haul	Hauling Trucks	Total	%	Trips	%	Trips	%	Trips	Total Trips	%	Trips	%	Trips	%	Trips	Total Trips
Recycling[1]	1,045	4,199	5.68	0.30	368	27,994		**28,362**	87%		65%	18,196			**18,196**	13%		35%	9,798			**9,798**
Hazardous Waste[2]																						
Garbage[3]	**34,551**	**31,669**	5.68	0.31	12,162	202,528		**214,690**	87%	10,581	65%	131,643			**142,224**	13%	1,581	35%	70,885			**72,466**
Yard Waste[4]		5,726	5.68	0.25	0	45,808		**45,808**	87%	0	65%	29,775			**29,775**	13%	0	35%	16,033			**16,033**
Hauling Away[5]							8,940	**8,940**					69%	6,169	**6,169**					31%	2,771	**2,771**
Total								**297,800**							**196,364**							**101,068**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Average Tonnage/Vehicle reflects a weighted average taking into account the shift in tonnage from Houghton.

7. Total Annual Trips represents both inbound and outbound trips.

8.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2] Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	368	87%	320	13%	48	259	103	87%	2	13%	2
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	12,162	87%	10,581	13%	1,581	259	103	87%	52	13%	64
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	12,530		10,901		1,629				54		66
Self Haul	Recycle	27,994	65%	18,196	35%	9,798	259	103	65%	94	35%	127
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	202,528	65%	131,643	35%	70,885	259	103	65%	677	35%	918
	Yard Waste	45,808	65%	29,775	35%	16,033	259	103	65%	153	35%	208
	Total	276,330		179,614		96,716				924		1,253
Hauling Trucks	Hauling Away	8,940	69%	6,169	31%	2,771	259	103	69%	31	31%	36
Total		*297,800*		*196,684*		*101,116*				**1,009**		**1,355**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer

waste 90.3% 0.902811

Self Haul recycle 9.7% 0.194378

Hauling Trucks

WEEKDAY	Shoreline Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
7:00	8%	4	3%	3	3%	0	3%	19	3%	4	26	8%	2	32
8:00	12%	6	5%	5	5%	0	5%	37	5%	8	50	8%	2	58
9:00	8%	4	8%	7	8%	0	8%	53	8%	12	72	8%	2	78
10:00	15%	9	10%	10	10%	0	10%	69	10%	16	95	8%	3	107
11:00	15%	9	12%	11	12%	0	12%	79	12%	17	107	8%	3	119
12:00	12%	7	13%	12	13%	0	13%	86	13%	19	117	8%	3	127
13:00	12%	6	12%	11	12%	0	12%	82	12%	19	112	8%	3	121
14:00	8%	4	13%	12	13%	0	13%	85	13%	19	116	8%	3	123
15:00	8%	4	13%	12	13%	0	13%	85	13%	19	116	8%	2	122
16:00	4%	2	12%	11	12%	0	12%	82	12%	19	112	8%	2	116
17:00	0%	0	0%	0	0%	0	0%	3	0%	1	4	8%	2	6
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
Daily Trips	**100%**	**55**	**100%**	**94**	**100%**	**0**	**100%**	**680**	**100%**	**153**	**927**	**100%**	**31**	**1013**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	4	4
8:00	9%	6	4%	5	4%	0	4%	37	4%	8	50	11%	4	60
9:00	9%	6	7%	8	7%	0	7%	60	7%	14	82	5%	2	90
10:00	18%	12	9%	12	9%	0	9%	86	9%	20	118	11%	4	134
11:00	9%	6	12%	15	12%	0	12%	110	12%	25	150	11%	4	160
12:00	9%	6	13%	17	13%	0	13%	120	13%	27	164	5%	2	172
13:00	9%	7	13%	17	13%	0	13%	123	13%	27	167	5%	2	176
14:00	9%	7	14%	18	14%	0	14%	128	14%	29	175	11%	3	185
15:00	9%	6	13%	16	13%	0	13%	118	13%	27	161	11%	3	170
16:00	9%	6	12%	15	12%	0	12%	107	12%	24	146	5%	2	154
17:00	9%	6	3%	4	3%	0	3%	29	3%	7	40	0%	0	46
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**68**	**100%**	**127**	**100%**	**0**	**100%**	**918**	**100%**	**208**	**1253**	**89%**	**32**	**1353**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline without Renton Concept 1

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	3,348	4,199	5.75	0.30	1,164	27,994		**29,158**
Hazardous Waste[2]								
Garbage[3]	**110,642**	**31,669**	5.75	0.31	38,498	202,528		**241,026**
Yard Waste[4]		6,299	5.75	0.25	0	50,392		**50,392**
Hauling Away[5]							14,972	**14,972**
Total								**335,548**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	87%		65%	18,196			**18,196**	13%		35%	9,798			**9,798**
Hazardous Waste[2]														
Garbage[3]	87%	33,493	65%	131,643			**165,136**	13%	5,005	35%	70,885			**75,890**
Yard Waste[4]	87%	0	65%	32,755			**32,755**	13%	0	35%	17,637			**17,637**
Hauling Away[5]					69%	10,331	**10,331**					31%	4,641	**4,641**
Total							**226,418**							**107,966**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	1,164	87%	1,013	13%	151	259	103	87%	5	13%	6
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	38,498	87%	33,493	13%	5,005	259	103	87%	165	13%	204
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	39,662		34,506		5,156				170		210
Self Haul	Recycle	27,994	65%	18,196	35%	9,798	259	103	65%	94	35%	127
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	202,528	65%	131,643	35%	70,885	259	103	65%	677	35%	918
	Yard Waste	50,392	65%	32,755	35%	17,637	259	103	65%	168	35%	228
	Total	280,914		182,594		98,320				939		1,273
Hauling Trucks	Hauling Away	14,972	69%	10,331	31%	4,641	259	103	69%	52	31%	60
Total		*335,548*		*227,431*		*108,117*				**1,161**		**1,543**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer				
	waste	91.2%	0	
Self Haul	recycle	8.8%	0	
Hauling Trucks				

WEEKDAY	Shoreline Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	4	4
7:00	8%	13	3%	3	3%	0	3%	19	3%	5	27	8%	4	44
8:00	12%	20	5%	5	5%	0	5%	37	5%	9	51	8%	4	75
9:00	8%	13	8%	7	8%	0	8%	53	8%	13	73	8%	4	90
10:00	15%	27	10%	10	10%	0	10%	69	10%	17	96	8%	5	128
11:00	15%	27	12%	11	12%	0	12%	79	12%	19	109	8%	5	141
12:00	12%	21	13%	12	13%	0	13%	86	13%	21	119	8%	5	145
13:00	12%	20	12%	11	12%	0	12%	82	12%	20	113	8%	5	138
14:00	8%	13	13%	12	13%	0	13%	85	13%	21	118	8%	5	136
15:00	8%	13	13%	12	13%	0	13%	85	13%	21	118	8%	4	135
16:00	4%	7	12%	11	12%	0	12%	82	12%	20	113	8%	4	124
17:00	0%	0	0%	0	0%	0	0%	3	0%	1	4	8%	4	8
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	4	4
Daily Trips	**100%**	**174**	**100%**	**94**	**100%**	**0**	**100%**	**680**	**100%**	**167**	**941**	**100%**	**57**	**1172**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	Self Haul TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	3	3
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	6	6
8:00	9%	19	4%	5	4%	0	4%	37	4%	9	51	11%	6	76
9:00	9%	19	7%	8	7%	0	7%	60	7%	15	83	5%	3	105
10:00	18%	38	9%	12	9%	0	9%	86	9%	21	119	11%	6	163
11:00	9%	19	12%	15	12%	0	12%	110	12%	27	152	11%	6	177
12:00	9%	19	13%	17	13%	0	13%	120	13%	30	167	5%	3	189
13:00	9%	20	13%	17	13%	0	13%	123	13%	30	170	5%	3	193
14:00	9%	20	14%	18	14%	0	14%	128	14%	32	178	11%	5	203
15:00	9%	19	13%	16	13%	0	13%	118	13%	29	163	11%	5	187
16:00	9%	19	12%	15	12%	0	12%	107	12%	27	149	5%	3	171
17:00	9%	19	3%	4	3%	0	3%	29	3%	7	40	0%	0	59
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**211**	**100%**	**127**	**100%**	**0**	**100%**	**918**	**100%**	**227**	**1272**	**89%**	**49**	**1532**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline without Renton Concept 2

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	1,045	6,248	5.68	0.30	368	41,654		**42,022**
Hazardous Waste[2]								
Garbage[3]	**34,551**	**47,117**	5.68	0.31	12,162	303,398		**315,560**
Yard Waste[4]		8,519	5.68	0.25	0	68,152		**68,152**
Hauling Away[5]							11,980	**11,980**
Total								**437,714**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	87%		65%	27,075			**27,075**	13%		35%	14,579			**14,579**
Hazardous Waste[2]														
Garbage[3]	87%	10,581	65%	197,209			**207,790**	13%	1,581	35%	106,189			**107,770**
Yard Waste[4]	87%	0	65%	44,299			**44,299**	13%	0	35%	23,853			**23,853**
Hauling Away[5]					69%	8,266	**8,266**					31%	3,714	**3,714**
Total							**287,430**							**149,916**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	368	87%	320	13%	48	259	103	87%	2	13%	2
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	12,162	87%	10,581	13%	1,581	259	103	87%	52	13%	64
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	12,530		10,901		1,629				54		66
Self Haul	Recycle	41,654	65%	31,856	35%	9,798	259	103	65%	164	35%	127
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	303,398	65%	232,513	35%	70,885	259	103	65%	1,195	35%	918
	Yard Waste	68,152	65%	52,119	35%	16,033	259	103	65%	268	35%	208
	Total	413,204		316,488		96,716				1,627		1,253
Hauling Trucks	Hauling Away	11,980	69%	9,209	31%	2,771	259	103	69%	46	31%	36
Total		*437,714*		*336,598*		*101,116*				**1,727**		**1,355**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commercial Haul	waste	90.2%	0	
Self Haul	recycle	9.8%	0	
Hauling Trucks				

WEEKDAY	Shoreline Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	4	4
7:00	8%	4	3%	4	3%	0	3%	33	3%	7	44	8%	4	52
8:00	12%	6	5%	9	5%	0	5%	65	5%	15	89	8%	4	99
9:00	8%	4	8%	13	8%	0	8%	93	8%	21	127	8%	4	135
10:00	15%	9	10%	17	10%	0	10%	121	10%	27	165	8%	5	179
11:00	15%	9	12%	19	12%	0	12%	140	12%	30	189	8%	5	203
12:00	12%	7	13%	21	13%	0	13%	150	13%	34	205	8%	5	217
13:00	12%	6	12%	20	12%	0	12%	145	12%	32	197	8%	5	208
14:00	8%	4	13%	21	13%	0	13%	149	13%	34	204	8%	5	213
15:00	8%	4	13%	21	13%	0	13%	149	13%	34	204	8%	4	212
16:00	4%	2	12%	20	12%	0	12%	145	12%	32	197	8%	4	203
17:00	0%	0	0%	1	0%	0	0%	5	0%	1	7	8%	4	11
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	4	4
Daily Trips	**100%**	**55**	**100%**	**166**	**100%**	**0**	**100%**	**1195**	**100%**	**267**	**1628**	**100%**	**57**	**1740**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	4	4
8:00	9%	6	4%	5	4%	0	4%	37	4%	8	50	11%	4	60
9:00	9%	6	7%	8	7%	0	7%	60	7%	14	82	5%	2	90
10:00	18%	12	9%	12	9%	0	9%	86	9%	20	118	11%	4	134
11:00	9%	6	12%	15	12%	0	12%	110	12%	25	150	11%	4	160
12:00	9%	6	13%	17	13%	0	13%	120	13%	27	164	5%	2	172
13:00	9%	7	13%	17	13%	0	13%	123	13%	27	167	5%	2	176
14:00	9%	7	14%	18	14%	0	14%	128	14%	29	175	11%	3	185
15:00	9%	6	13%	16	13%	0	13%	118	13%	27	161	11%	3	170
16:00	9%	6	12%	15	12%	0	12%	107	12%	24	146	5%	2	154
17:00	9%	6	3%	4	3%	0	3%	29	3%	7	40	0%	0	46
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**68**	**100%**	**127**	**100%**	**0**	**100%**	**918**	**100%**	**208**	**1253**	**89%**	**32**	**1353**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

2023 - King County Transfer Station Trip Generation - Shoreline without Renton Concept 3

Annual

2023 Annual Trip Generation Summary

Material	Tonnage: Commercial Haul	Tonnage: Self Haul	Average Tonnage/Vehicle: Commercial Haul	Average Tonnage/Vehicle: Self Haul	Total Annual Trips[6]: Commercial Haul	Total Annual Trips[6]: Self Haul	Total Annual Trips[6]: Hauling Trucks	Total Annual Trips[6]: Total
Recycling[1]	801	3,868	5.57	0.30	288	25,786		**26,074**
Hazardous Waste[2]								
Garbage[3]	**24,767**	**23,333**	5.57	0.31	8,892	150,536		**159,428**
Yard Waste[4]		5,726	5.57	0.25	0	45,808		**45,808**
Hauling Away[5]							7,274	**7,274**
Total								**238,584**

Material	Total Annual Weekday Trips[7]: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips	Total Annual Weekend Trips: Commercial Haul %	Commercial Haul Trips	Self Haul %	Self Haul Trips	Hauling Trucks %	Hauling Trucks Trips	Total Trips
Recycling[1]	87%		65%	16,761			**16,761**	13%		35%	9,025			**9,025**
Hazardous Waste[2]														
Garbage[3]	87%	7,736	65%	97,848			**105,584**	13%	1,156	35%	52,688			**53,844**
Yard Waste[4]	87%	0	65%	29,775			**29,775**	13%	0	35%	16,033			**16,033**
Hauling Away[5]					69%	5,019	**5,019**					31%	2,255	**2,255**
Total							**157,139**							**81,157**

1. Tonnage provided by King County assuming Houghton closes before 2023 and Bellevue leaves in 2029. Commercial average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site) and self haul is consistent with ton.veh used at South County Recycling and Transfer Station site.

2. No Hazardous Waste at the Shoreline Site.

3. Garbage tonnage provided by King County for concept. Average Tonnage/Vehicle provided by KC for commericial vs self haul, self haul assumed to be without an account.

4. Yard Waste/Wood Waste and compostable paper provided by KC. Average tonnage/vehicle estimated using garbage as guide (consistent with South County Recycling and Transfer Station site)

5. Hauling away total annual trucks provided by King County. Average Tonnage/Vehicle consistent with South County Recycling and Transfer Station site.

6. Total Annual Trips represents both inbound and outbound trips.

7.Annual weekday vs weekend trips based on 9/1/13-9/1/14 transaction data for Shoreline site provided by King county including self haul vs commercial.

Daily

Daily Trip Generation Summary - PEAK

	Material	Annual Trips[1]	Weekday %	Weekday Trips	Weekend %	Weekend Trips	Transfer Station Open[2]: Weekdays/Year	Transfer Station Open[2]: Weekend Days/Year	Weekday Trips %	Weekday Trips Trips	Weekend Trips %	Weekend Trips Trips[3]
Commercial Haul	Recycle	288	87%	251	13%	37	259	103	87%	1	13%	2
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	8,892	87%	7,736	13%	1,156	259	103	87%	38	13%	47
	Yard Waste	0	87%	0	13%	0	259	103	87%	0	13%	0
	Total	9,180		7,987		1,193				39		49
Self Haul	Recycle	25,786	65%	16,761	35%	9,025	259	103	65%	86	35%	117
	Hazardous Waste	0	0%	0	100%	0	259	103	0%	0	100%	0
	Garbage	150,536	65%	97,848	35%	52,688	259	103	65%	503	35%	682
	Yard Waste	45,808	65%	29,775	35%	16,033	259	103	65%	153	35%	208
	Total	222,130		144,384		77,746				742		1,007
Hauling Trucks	Hauling Away	7,274	69%	5,019	31%	2,255	259	103	69%	25	31%	29
Total		*238,584*		*157,390*		*81,194*				**806**		**1,085**

1. Annual Trips based on peak month

2. Assumes one holiday on a weekday and two on a weekend.

3. Weekend average increased by 5% to account for more vehicles on Saturday than Sunday.

Commer	waste	88.8%	0	
Self Haul	recycle	11.2%	0	
Hauling Trucks				

WEEKDAY	Shoreline Commercia	SelfHaul	Total
Median	22	185	207
90th Percentile	28	246	269
Peak Increase	**127.3%**	**133.1%**	**130.1%**

Note: Median and 90th Percentile include all *weekdays* January 2013 - December 2013

WEEKEND	Shoreline Commercia	SelfHaul	Total
Median	1	271	272
90th Percentile	4	361	363
Peak Increase	**400.0%**	**133.3%**	**133.3%**

Note: Median and 90th Percentile include all *weekends* January 2013 - December 2013

Time of Day Summary

Time of Day Summary of Trips

Weekday Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
7:00	8%	3	3%	2	3%	0	3%	14	3%	4	20	8%	2	25
8:00	12%	5	5%	5	5%	0	5%	28	5%	8	41	8%	2	48
9:00	8%	3	8%	7	8%	0	8%	39	8%	12	58	8%	2	63
10:00	15%	7	10%	9	10%	0	10%	51	10%	16	76	8%	3	86
11:00	15%	7	12%	10	12%	0	12%	59	12%	17	86	8%	3	96
12:00	12%	6	13%	11	13%	0	13%	64	13%	19	94	8%	3	103
13:00	12%	5	12%	10	12%	0	12%	61	12%	19	90	8%	3	98
14:00	8%	3	13%	11	13%	0	13%	63	13%	19	93	8%	3	99
15:00	8%	3	13%	11	13%	0	13%	63	13%	19	93	8%	2	98
16:00	4%	2	12%	10	12%	0	12%	61	12%	19	90	8%	2	94
17:00	0%	0	0%	0	0%	0	0%	2	0%	1	3	8%	2	5
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	8%	2	2
Daily Trips	**100%**	**44**	**100%**	**86**	**100%**	**0**	**100%**	**505**	**100%**	**153**	**744**	**100%**	**31**	**819**

Weekend Summary

Hour	Commercial Haul %	Commercial Haul Trips	Self Haul: Recycle %	Recycle Trips	Hazardous Waste %	Hazardous Waste Trips	Garbage %	Garbage Trips	Yard Waste %	Yard Waste Trips	TOTAL	Hauling Trucks %	Hauling Trucks Trips	Total Trips
6:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	5%	2	2
7:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	11%	3	3
8:00	9%	4	4%	5	4%	0	4%	27	4%	8	40	11%	3	47
9:00	9%	4	7%	8	7%	0	7%	45	7%	14	67	5%	2	73
10:00	18%	9	9%	11	9%	0	9%	64	9%	20	95	11%	3	107
11:00	9%	4	12%	14	12%	0	12%	82	12%	25	121	11%	3	128
12:00	9%	4	13%	15	13%	0	13%	89	13%	27	131	5%	2	137
13:00	9%	5	13%	16	13%	0	13%	91	13%	27	134	5%	2	141
14:00	9%	5	14%	16	14%	0	14%	95	14%	29	140	11%	2	147
15:00	9%	4	13%	15	13%	0	13%	87	13%	27	129	11%	2	135
16:00	9%	4	12%	14	12%	0	12%	80	12%	24	118	5%	2	124
17:00	9%	4	3%	4	3%	0	3%	21	3%	7	32	0%	0	36
18:00	0%	0	0%	0	0%	0	0%	0	0%	0	0	0%	0	0
Daily Trips	**100%**	**47**	**100%**	**118**	**100%**	**0**	**100%**	**681**	**100%**	**208**	**1007**	**89%**	**26**	**1080**

Note: Time of day percentages for commercial and self-haul based on observed trends at the Shoreline facility.

Total trips based on tonnage and does not include reduction to account for shared trips (i.e. a recycle and garbage trip by a single customer). Modeling assumed an approximate 7 percent reduction in self haul trips.

ATTACHMENT F

Attachment F- 1
Bow Lake Tier 1 Weekday With-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		61	0%	91	91	89	89	91	91	91	91
Provide wait time information		61	1%	91	90	89	88	91	90	91	90
Lower cost curbside bulky waste collection		61	3.3%	91	89	89	87	91	89	91	89
Mandatory curbside garbage collection		61	14.9%	91	81	89	79	91	81	91	81
Lower regional direct fee to encourage haulers to use their own transfer stations		61	5%	91	88	89	86	91	88	91	88
Banned Materials	Banning yard/wood waste from both disposal and recycling	61	34%	91	69	89	67	91	69	91	69
	Reduction in HHW only transactions	61	0%	91	91	89	89	91	91	91	91
Incentive/peak pricing		61	0%	91	91	89	89	91	91	91	91
Minimum Fee	Factoria Only - Doubling the minimum fee	61	0%	91	91	89	89	91	91	91	91
	System Wide	61	7.5%	91	86	89	84	91	86	91	86
Drop Box	Northeast	61	0%	91	91	89	89	91	91	91	91
	Southeast	61	0%	91	91	89	89	91	91	91	91
Ban non-system Self Haul (effective 2029)		61	1%	91	88						

Attachment F- 2
Bow Lake Tier 1 Saturday With-Renton Summary

Improvements	Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
			C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours	70	0%	115	115	114	114	115	115	115	115
Provide wait time information	70	1%	115	114	114	113	115	114	115	114
Lower cost curbside bulky waste collection	70	3.3%	115	112	114	111	115	112	115	112
Mandatory curbside garbage collection	70	14.9%	115	99	114	98	115	99	115	99

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Lower regional direct fee to encourage haulers to use their own transfer stations		70	5%	115	110	114	109	115	110	115	110
Banned Materials	Banning yard/wood waste from both disposal and recycling	70	34%	115	79	114	78	115	79	115	79
	Reduction in HHW only transactions	70	0%	115	115	114	114	115	115	115	115
Incentive/peak pricing		70	0%	115	115	114	114	115	115	115	115
Minimum Fee	Factoria Only - Doubling the minimum fee	70	0%	115	115	114	114	115	115	115	115
	System Wide	70	7.5%	115	107	114	106	115	107	115	107
Drop Box	Northeast	70	0%	115	115	114	114	115	115	115	115
	Southeast	70	0%	115	115	114	114	115	115	115	115
Ban non-system Self Haul (effective 2029)		70	1%	115	109						

Attachment F- 3
Bow Lake Tier 1 Weekday Without-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		61	0%	115	115	115	115	123	123	116	116
Provide wait time information		61	1%	115	114	115	114	123	122	116	115
Lower cost curbside bulky waste collection		61	3.3%	115	112	115	112	123	120	116	113
Mandatory curbside garbage collection		61	14.9%	115	102	115	102	123	109	116	103
Lower regional direct fee to encourage haulers to use their own transfer stations		61	5%	115	111	115	111	123	118	116	112
Banned Materials	Banning yard/wood waste from both disposal and recycling	61	34%	115	86	115	86	123	91	116	87
	Reduction in HHW only transactions	61	0%	115	115	115	115	123	123	116	116
Incentive/peak pricing		61	0%	115	115	115	115	123	123	116	116

Improvements		Site Capacity (Trips)	Percent Reduction		Concept 0			Concept 1			Concept 2			Concept 3	
					C0 Trips	Adjusted Trips		C1 Trips	Adjusted Trips		C2 Trips	Adjusted Trips		C3 Trips	Adjusted Trips
Minimum Fee	Factoria Only - Doubling the minimum fee	61	0%		115	115		115	115		123	123		116	116
	System Wide	61	7.5%		115	109		115	109		123	116		116	110
Drop Box	Northeast	61	0%		115	115		115	115		123	123		116	116
	Southeast	61	5%		115	111		115	111		123	118		116	112
Ban non-system Self Haul (effective 2029)		61	1%		115	110									

Attachment F- 4
Bow Lake Tier 1 Saturday Without-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction		Concept 0			Concept 1			Concept 2			Concept 3	
					C0 Trips	Adjusted Trips		C1 Trips	Adjusted Trips		C2 Trips	Adjusted Trips		C3 Trips	Adjusted Trips
Extend Operating Hours		70	0%		145	145		145	145		157	157		146	146
Provide wait time information		70	1%		145	144		145	144		157	156		146	145
Lower cost curbside bulky waste collection		70	3.3%		145	141		145	141		157	152		146	142
Mandatory curbside garbage collection		70	14.9%		145	125		145	125		157	135		146	126
Lower regional direct fee to encourage haulers to use their own transfer stations		70	5%		145	138		145	138		157	150		146	139
Banned Materials	Banning yard/wood waste from both disposal and recycling	70	34%		145	99		145	99		157	107		146	100
	Reduction in HHW only transactions	70	0%		145	145		145	145		157	157		146	146
Incentive/peak pricing		70	0%		145	145		145	145		157	157		146	146
Minimum Fee	Factoria Only - Doubling the minimum fee	70	0%		145	145		145	145		157	157		146	146
	System Wide	70	7.5%		145	135		145	135		157	146		146	136
Drop Box	Northeast	70	0%		145	145		145	145		157	157		146	146
	Southeast	70	5%		145	138		145	138		157	150		146	139
Ban non-system Self Haul (effective 2029)		70	1%		145	141									

Attachment F- 5
Factoria Tier 1 Weekday With-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		64	4%	117	113	115	111	111	107	56	54
Provide wait time information		64	1%	117	116	115	114	111	110	56	56
Lower cost curbside bulky waste collection		64	3.40%	117	114	115	112	111	108	56	54
Mandatory curbside garbage collection		64	4%	117	113	115	111	111	107	56	54
Lower regional direct fee to encourage haulers to use their own transfer stations		64	0%	117	117	115	115	111	111	56	56
Banned Materials	Banning yard/wood waste from both disposal and recycling	64	34%	117	85	115	83	111	78	56	40
	Reduction in HHW only transactions	64	3%	117	114	115	112	111	108	56	55
Incentive/peak pricing		64	15%	117	103	115	101	111	97	56	49
Minimum Fee	Factoria Only - Doubling the minimum fee	64	20%	117	98	115	96	111	92	56	47
	System Wide	64	7.50%	117	110	115	108	111	104	56	53
Drop Box	Northeast	64	6%	117	111	115	109	111	105	56	53
	Southeast	64	0%	117	117	115	115	111	111	56	56
Ban non-system Self Haul (effective 2029)		64	43%	107	67						

Attachment F- 6
Factoria Tier 1 Saturday With-Renton Summary

Improvements	Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
			C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours	96	4%	154	148	154	148	115	111	75	72
Provide wait time information	96	1%	154	153	154	153	115	114	75	74
Lower cost curbside bulky waste collection	96	3.40%	154	149	154	149	115	112	75	73
Mandatory curbside garbage collection	96	4%	154	148	154	148	115	111	75	72

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Lower regional direct fee to encourage haulers to use their own transfer stations		96	0%	154	154	154	154	115	115	75	75
Banned Materials	Banning yard/wood waste from both disposal and recycling	96	34%	154	106	154	106	115	81	75	52
	Reduction in HHW only transactions	96	3%	154	150	154	150	115	112	75	73
Incentive/peak pricing		96	15%	154	133	154	133	115	100	75	65
Minimum Fee	Factoria Only - Doubling the minimum fee	96	20%	154	126	154	126	115	95	75	61
	System Wide	96	7.50%	154	143	154	143	115	107	75	70
Drop Box	Northeast	96	6%	154	146	154	146	115	109	75	71
	Southeast	96	0%	154	154	154	154	115	115	75	75
Ban non-system Self Haul (effective 2029)		96	43%	154	89						

Attachment F- 7
Factoria Tier 1 Weekday Without-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		64	4%	131	127	124	120	109	105	71	69
Provide wait time information		64	1%	131	130	124	123	109	108	71	70
Lower cost curbside bulky waste collection		64	3.40%	131	127	124	120	109	106	71	69
Mandatory curbside garbage collection		64	4%	131	127	124	120	109	105	71	69
Lower regional direct fee to encourage haulers to use their own transfer stations		64	0%	131	131	124	124	109	109	71	71
Banned Materials	Banning yard/wood waste from both disposal and recycling	64	34%	131	95	124	88	109	77	71	51
	Reduction in HHW only transactions	64	3%	131	128	124	121	109	106	71	69

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Incentive/peak pricing		64	15%	131	115	124	108	109	95	71	62
Minimum Fee	Factoria Only - Doubling the minimum fee	64	20%	131	110	124	103	109	90	71	59
	System Wide	64	7.50%	131	123	124	116	109	102	71	67
Drop Box	Northeast	64	6%	131	125	124	118	109	103	71	68
	Southeast	64	9%	131	121	124	114	109	101	71	66
Ban non-system Self Haul (effective 2029)		64	43%	131	80						

Attachment F- 8
Factoria Tier 1 Saturday Without-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		96	4%	171	165	167	161	127	122	93	90
Provide wait time information		96	1%	171	169	167	165	127	126	93	92
Lower cost curbside bulky waste collection		96	3.40 %	171	166	167	162	127	123	93	90
Mandatory curbside garbage collection		96	4%	171	165	167	161	127	122	93	90
Lower regional direct fee to encourage haulers to use their own transfer stations		96	0%	171	171	167	167	127	127	93	93
Banned Materials	Banning yard/wood waste from both disposal and recycling	96	34%	171	118	167	114	127	89	93	64
	Reduction in HHW only transactions	96	3%	171	166	167	162	127	124	93	90
Incentive/peak pricing		96	15%	171	147	167	143	127	110	93	80
Minimum Fee	Factoria Only - Doubling the minimum fee	96	20%	171	140	167	136	127	104	93	76
	System Wide	96	7.50 %	171	159	167	155	127	119	93	87
Drop Box	Northeast	96	6%	171	162	167	158	127	120	93	88
	Southeast	96	9%	171	157	167	153	127	117	93	85
Ban non-system Self Haul (effective 2029)		96	43%	171	102						

Attachment F- 9
Shoreline Tier 1 Weekday With-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		73	4%	58	56	58	56	78	75	45	43
Provide wait time information		73	1%	58	57	58	57	78	77	45	45
Lower cost curbside bulky waste collection		73	3.7%	58	56	58	56	78	75	45	43
Mandatory curbside garbage collection		73	13.7%	58	51	58	51	78	68	45	39
Lower regional direct fee to encourage haulers to use their own transfer stations		73	0%	58	58	58	58	78	78	45	45
Banned Materials	Banning yard/wood waste from both disposal and recycling	73	34%	58	40	58	40	78	54	45	31
	Reduction in HHW only transactions	73	0%	58	58	58	58	78	78	45	45
Incentive/peak pricing		73	0%	58	58	58	58	78	78	45	45
Minimum Fee	Factoria Only - Doubling the minimum fee	73	0%	58	58	58	58	78	78	45	45
	System Wide	73	7.5%	58	54	58	54	78	73	45	42
Drop Box	Northeast	73	2%	58	57	58	57	78	77	45	44
	Southeast	73	0%	58	58	58	58	78	78	45	45
Ban non-system Self Haul (effective 2029)		73	8%	57	53						

Attachment F- 10
Shoreline Tier 1 Saturday With-Renton Summary

Improvements	Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
			C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours	66	4%	88	85	88	85	88	85	68	65
Provide wait time information	66	1%	88	87	88	87	88	87	68	67
Lower cost curbside bulky waste collection	66	3.70%	88	85	88	85	88	85	68	66
Mandatory curbside garbage collection	66	13.7%	88	77	88	77	88	77	68	59

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Lower regional direct fee to encourage haulers to use their own transfer stations		66	0%	88	88	88	88	88	88	68	68
Banned Materials	Banning yard/wood waste from both disposal and recycling	66	34%	88	60	88	60	88	60	68	46
	Reduction in HHW only transactions	66	0%	88	88	88	88	88	88	68	68
Incentive/peak pricing		66	0%	88	88	88	88	88	88	68	68
Minimum Fee	Factoria Only - Doubling the minimum fee	66	0%	88	88	88	88	88	88	68	68
	System Wide	66	7.50%	88	82	88	82	88	82	68	63
Drop Box	Northeast	66	2%	88	86	88	86	88	86	68	67
	Southeast	66	0%	88	88	88	88	88	88	68	68
Ban non-system Self Haul (effective 2029)		66	8%	88	79						

Attachment F- 11
Shoreline Tier 1 Weekday Without-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		73	4%	58	56	67	65	99	95	46	44
Provide wait time information		73	1%	58	57	67	66	99	98	46	46
Lower cost curbside bulky waste collection		73	3.70%	58	56	67	65	99	96	46	44
Mandatory curbside garbage collection		73	13.7%	58	51	67	60	99	86	46	40
Lower regional direct fee to encourage haulers to use their own transfer stations		73	0%	58	58	67	67	99	99	46	46
Banned Materials	Banning yard/wood waste from both disposal and recycling	73	34%	58	40	67	49	99	68	46	32
	Reduction in HHW only transactions	73	0%	58	58	67	67	99	99	46	46
Incentive/peak pricing		73	0%	58	58	67	67	99	99	46	46

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Minimum Fee	Factoria Only - Doubling the minimum fee	73	0%	58	58	67	67	99	99	46	46
	System Wide	73	7.50%	58	54	67	63	99	92	46	43
Drop Box	Northeast	73	2%	58	57	67	66	99	97	46	45
	Southeast	73	0%	58	58	67	67	99	99	46	46
Ban non-system Self Haul (effective 2029)		73	8%	57	53						

Attachment F- 12
Shoreline Tier 1 Saturday Without-Renton Summary

Improvements		Site Capacity (Trips)	Percent Reduction	Concept 0		Concept 1		Concept 2		Concept 3	
				C0 Trips	Adjusted Trips	C1 Trips	Adjusted Trips	C2 Trips	Adjusted Trips	C3 Trips	Adjusted Trips
Extend Operating Hours		66	4%	88	85	96	93	88	85	69	66
Provide wait time information		66	1%	88	87	96	95	88	87	69	68
Lower cost curbside bulky waste collection		66	3.70%	88	85	96	93	88	85	69	67
Mandatory curbside garbage collection		66	13.7%	88	77	96	85	88	77	69	60
Lower regional direct fee to encourage haulers to use their own transfer stations		66	0%	88	88	96	96	88	88	69	69
Banned Materials	Banning yard/wood waste from both disposal and recycling	66	34%	88	60	96	68	88	60	69	47
	Reduction in HHW only transactions	66	0%	88	88	96	96	88	88	69	69
Incentive/peak pricing		66	0%	88	88	96	96	88	88	69	69
Minimum Fee	Factoria Only - Doubling the minimum fee	66	0%	88	88	96	96	88	88	69	69
	System Wide	66	7.50%	88	82	96	90	88	82	69	64
Drop Box	Northeast	66	2%	88	86	96	94	88	86	69	68
	Southeast	66	0%	88	88	96	96	88	88	69	69
Ban non-system Self Haul (effective 2029)		66	8%	88	79						

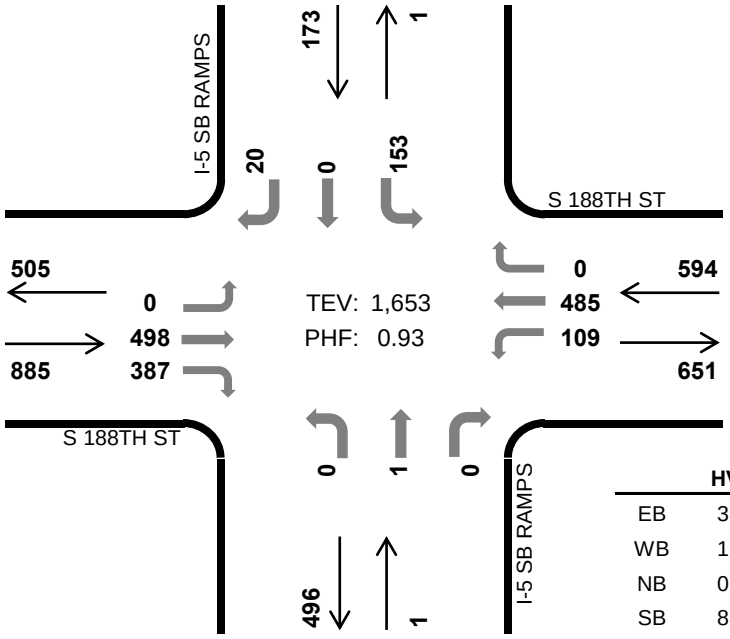
ATTACHMENT G

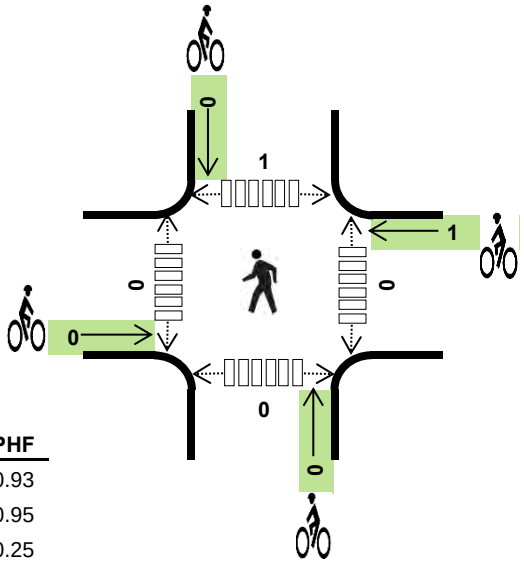
I-5 SB RAMPS
S 188TH ST

Date: Sat, Oct 04, 2014
Count Period: 11:15 AM to 1:15 PM
Peak Hour: 12:15 PM to 1:15 PM

N

Peak Hour





	HV %:	PHF
EB	3.3%	0.93
WB	1.5%	0.95
NB	0.0%	0.25
SB	8.7%	0.82
TOTAL	3.2%	0.93

Two-Hour Count Summaries

Interval Start	S 188TH ST Eastbound			S 188TH ST Westbound			I-5 SB RAMPS Northbound			I-5 SB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:15 AM	0	136	79	26	117	0	0	0	0	38	0	6	402	
11:30 AM	0	111	73	28	128	0	0	0	0	31	0	7	378	
11:45 AM	0	123	69	15	108	0	0	0	0	50	0	10	375	
12:00 PM	0	124	61	29	115	0	0	0	0	42	0	13	384	1,539
12:15 PM	**0**	**108**	**80**	**31**	**119**	**0**	**0**	**1**	**0**	**39**	**0**	**3**	**381**	1,518
12:30 PM	**0**	**144**	**89**	**30**	**126**	**0**	**0**	**0**	**0**	**26**	**0**	**4**	**419**	1,559
12:45 PM	**0**	**112**	**113**	**25**	**112**	**0**	**0**	**0**	**0**	**38**	**0**	**10**	**410**	1,594
1:00 PM	**0**	**134**	**105**	**23**	**128**	**0**	**0**	**0**	**0**	**50**	**0**	**3**	**443**	**1,653**
Count Total	0	992	669	207	953	0	0	1	0	314	0	56	3,192	
Peak Hr	**0**	**498**	**387**	**109**	**485**	**0**	**0**	**1**	**0**	**153**	**0**	**20**	**1,653**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:15 AM	9	4	0	1	*14*	0	0	0	0	*0*	0	0	0	0	*0*
11:30 AM	10	6	0	2	*18*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	9	4	0	7	*20*	0	0	0	0	*0*	0	0	0	1	*1*
12:00 PM	6	6	0	3	*15*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	**5**	**3**	**0**	**5**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:30 PM	**6**	**2**	**0**	**2**	***10***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**1**	**0**	***1***
12:45 PM	**10**	**2**	**0**	**3**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**8**	**2**	**0**	**5**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	63	29	0	28	*120*	0	1	0	0	*1*	0	0	1	1	*2*
Peak Hr	**29**	**9**	**0**	**15**	***53***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**1**	**0**	***1***

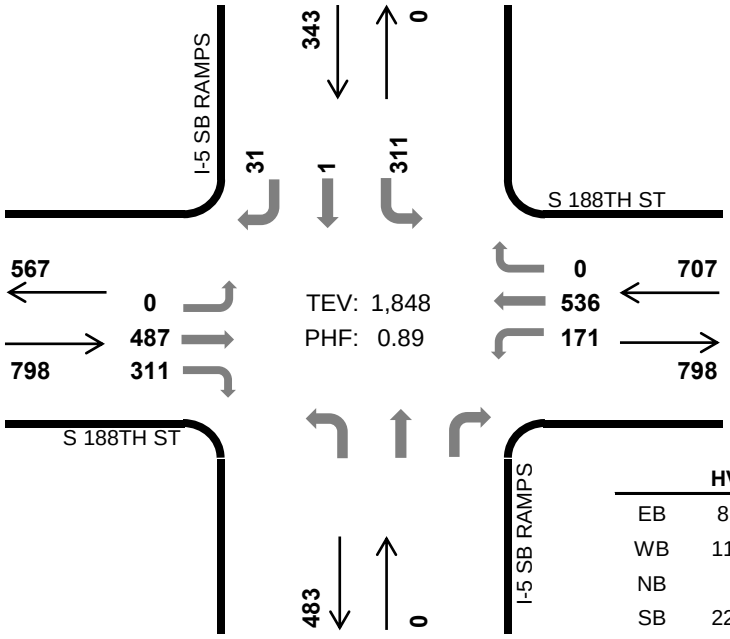
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

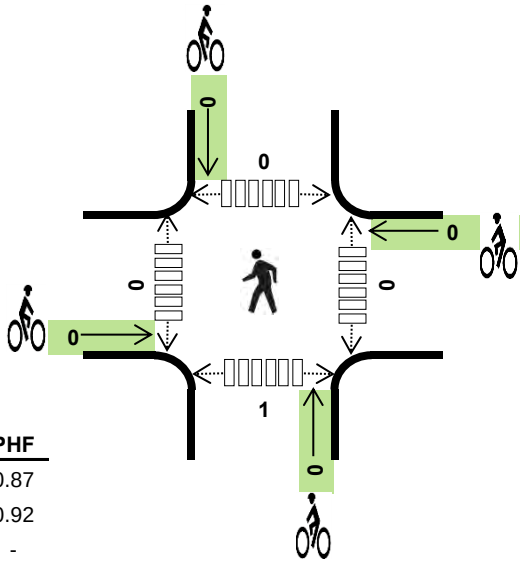
I-5 SB RAMPS
S 188TH ST

Date: Tue, Oct 07, 2014
Count Period: 11:30 AM to 1:30 PM
Peak Hour: 12:30 PM to 1:30 PM

N

Peak Hour





	HV %:	PHF
EB	8.5%	0.87
WB	11.0%	0.92
NB	-	-
SB	22.4%	0.86
TOTAL	12.1%	0.89

Two-Hour Count Summaries

Interval Start	S 188TH ST Eastbound			S 188TH ST Westbound			I-5 SB RAMPS Northbound			I-5 SB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:30 AM	0	107	81	41	113	0	0	0	0	62	0	8	412	
11:45 AM	0	111	87	25	130	0	0	0	0	73	0	10	436	
12:00 PM	0	125	59	30	117	0	0	0	0	66	0	7	404	
12:15 PM	0	102	74	22	136	0	0	0	0	74	0	8	416	1,668
12:30 PM	**0**	**117**	**85**	**39**	**137**	**0**	**0**	**0**	**0**	**65**	**1**	**8**	**452**	1,708
12:45 PM	**0**	**119**	**71**	**32**	**130**	**0**	**0**	**0**	**0**	**79**	**0**	**7**	**438**	1,710
1:00 PM	**0**	**118**	**58**	**50**	**127**	**0**	**0**	**0**	**0**	**75**	**0**	**8**	**436**	1,742
1:15 PM	**0**	**133**	**97**	**50**	**142**	**0**	**0**	**0**	**0**	**92**	**0**	**8**	**522**	**1,848**
Count Total	0	932	612	289	1,032	0	0	0	0	586	1	64	3,516	
Peak Hr	**0**	**487**	**311**	**171**	**536**	**0**	**0**	**0**	**0**	**311**	**1**	**31**	**1,848**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:30 AM	11	23	0	18	*52*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	14	10	0	15	*39*	0	0	0	0	*0*	0	0	0	0	*0*
12:00 PM	21	13	0	19	*53*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	13	14	0	17	*44*	0	0	0	0	*0*	0	0	1	0	*1*
12:30 PM	**14**	**16**	**0**	**21**	***51***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**18**	**20**	**0**	**10**	***48***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**7**	**21**	**0**	**21**	***49***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
1:15 PM	**29**	**21**	**0**	**25**	***75***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	127	138	0	146	*411*	0	0	0	0	*0*	0	0	1	1	*2*
Peak Hr	**68**	**78**	**0**	**77**	***223***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***

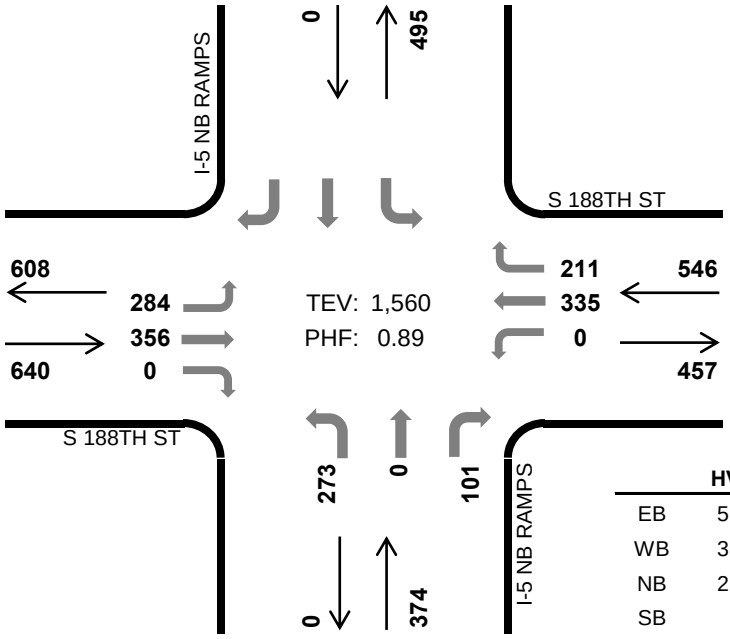
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

I-5 NB RAMPS
S 188TH ST

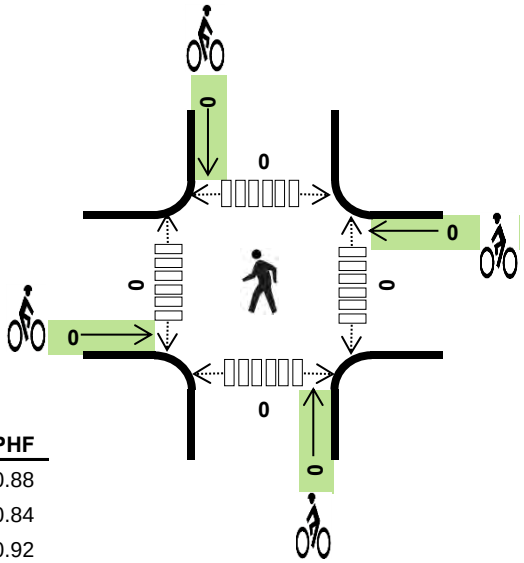
Date: Sat, Oct 04, 2014
Count Period: 11:15 AM to 1:15 PM
Peak Hour: 12:15 PM to 1:15 PM

N

Peak Hour



	HV %:	PHF
EB	5.6%	0.88
WB	3.1%	0.84
NB	2.7%	0.92
SB	-	-
TOTAL	4.0%	0.89



Two-Hour Count Summaries

Interval Start	S 188TH ST Eastbound			S 188TH ST Westbound			I-5 NB RAMPS Northbound			I-5 NB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:15 AM	72	96	0	0	82	67	65	1	21	0	0	0	404	
11:30 AM	65	86	0	0	73	52	70	0	20	0	0	0	366	
11:45 AM	55	111	0	0	70	63	60	0	29	0	0	0	388	
12:00 PM	64	105	0	0	83	57	69	0	16	0	0	0	394	1,552
12:15 PM	**50**	**85**	**0**	**0**	**76**	**50**	**70**	**0**	**31**	**0**	**0**	**0**	**362**	1,510
12:30 PM	**92**	**89**	**0**	**0**	**78**	**50**	**69**	**0**	**17**	**0**	**0**	**0**	**395**	1,539
12:45 PM	**58**	**92**	**0**	**0**	**81**	**49**	**61**	**0**	**24**	**0**	**0**	**0**	**365**	1,516
1:00 PM	**84**	**90**	**0**	**0**	**100**	**62**	**73**	**0**	**29**	**0**	**0**	**0**	**438**	**1,560**
Count Total	540	754	0	0	643	450	537	1	187	0	0	0	3,112	
Peak Hr	**284**	**356**	**0**	**0**	**335**	**211**	**273**	**0**	**101**	**0**	**0**	**0**	**1,560**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:15 AM	8	7	3	0	*18*	0	0	0	0	*0*	0	0	0	1	*1*
11:30 AM	10	6	1	0	*17*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	15	12	1	0	*28*	0	0	0	0	*0*	1	0	0	0	*1*
12:00 PM	7	7	6	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	**9**	**4**	**3**	**0**	***16***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:30 PM	**7**	**4**	**2**	**0**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**9**	**4**	**2**	**0**	***15***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**11**	**5**	**3**	**0**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	76	49	21	0	*146*	0	0	0	0	*0*	1	0	0	1	*2*
Peak Hr	**36**	**17**	**10**	**0**	***63***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

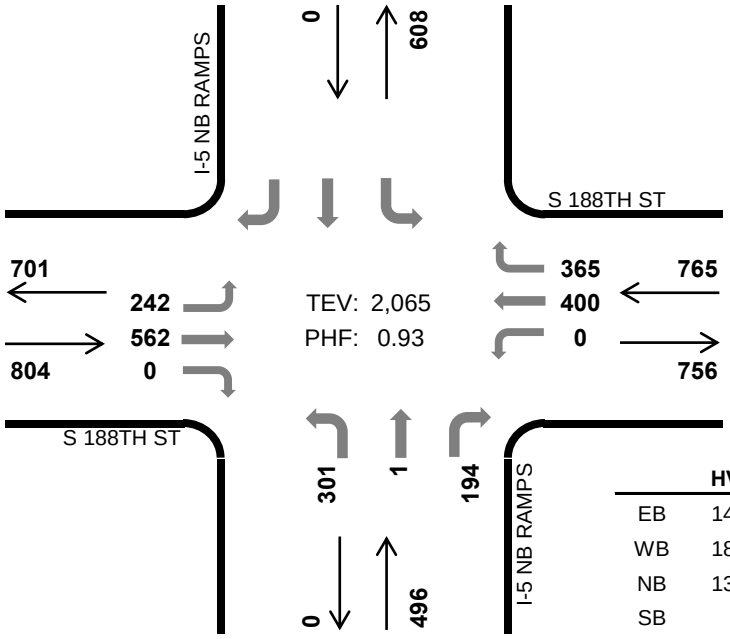
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

I-5 NB RAMPS
S 188TH ST

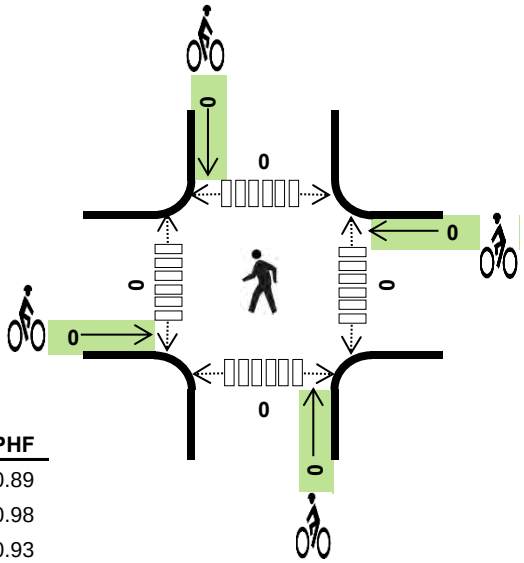
Date: Tue, Oct 07, 2014
Count Period: 11:30 AM to 1:30 PM
Peak Hour: 12:30 PM to 1:30 PM

N

Peak Hour



	HV %:	PHF
EB	14.9%	0.89
WB	18.7%	0.98
NB	13.7%	0.93
SB	-	-
TOTAL	16.0%	0.93



Two-Hour Count Summaries

Interval Start	S 188TH ST Eastbound			S 188TH ST Westbound			I-5 NB RAMPS Northbound			I-5 NB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:30 AM	61	122	0	0	90	99	62	1	37	0	0	0	472	
11:45 AM	53	130	0	0	95	97	60	1	30	0	0	0	466	
12:00 PM	61	136	0	0	75	87	72	1	37	0	0	0	469	
12:15 PM	56	113	0	0	85	77	64	0	34	0	0	0	429	1,836
12:30 PM	**63**	**138**	**0**	**0**	**108**	**85**	**64**	**0**	**48**	**0**	**0**	**0**	**506**	1,870
12:45 PM	**57**	**137**	**0**	**0**	**92**	**91**	**73**	**0**	**48**	**0**	**0**	**0**	**498**	1,902
1:00 PM	**52**	**132**	**0**	**0**	**103**	**90**	**79**	**0**	**50**	**0**	**0**	**0**	**506**	1,939
1:15 PM	**70**	**155**	**0**	**0**	**97**	**99**	**85**	**1**	**48**	**0**	**0**	**0**	**555**	**2,065**
Count Total	473	1,063	0	0	745	725	559	4	332	0	0	0	3,901	
Peak Hr	**242**	**562**	**0**	**0**	**400**	**365**	**301**	**1**	**194**	**0**	**0**	**0**	**2,065**	

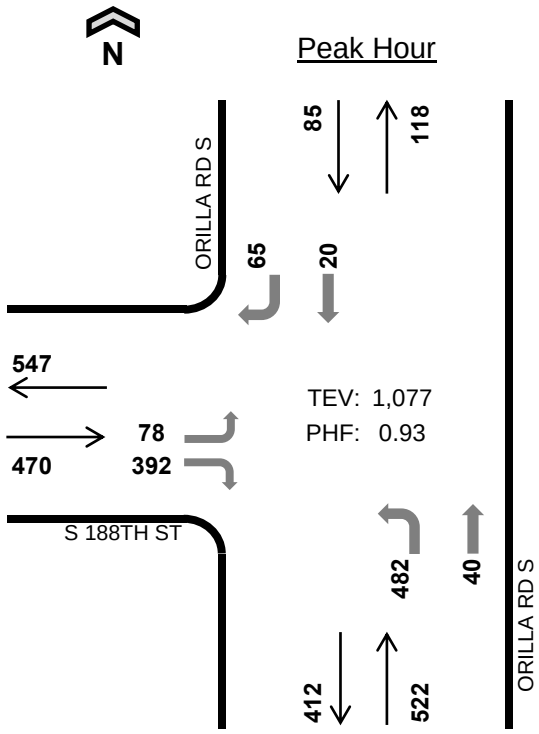
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

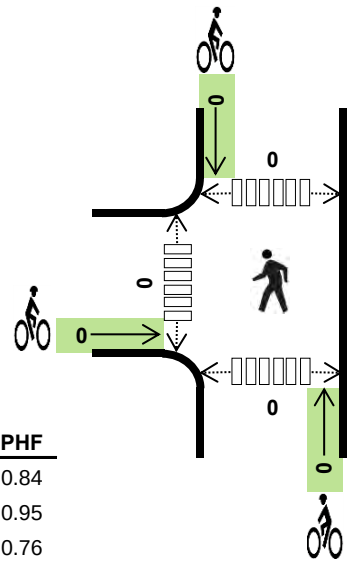
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:30 AM	25	40	12	0	*77*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	29	25	16	0	*70*	0	0	0	0	*0*	0	0	0	0	*0*
12:00 PM	38	29	15	0	*82*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	19	31	14	0	*64*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	**29**	**29**	**22**	**0**	***80***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**23**	**29**	**13**	**0**	***65***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**27**	**45**	**19**	**0**	***91***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:15 PM	**41**	**40**	**14**	**0**	***95***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	231	268	125	0	*624*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**120**	**143**	**68**	**0**	***331***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

ORILLA RD S
S 188TH ST

Date: Sat, Oct 04, 2014
Count Period: 11:15 AM to 1:15 PM
Peak Hour: 11:15 AM to 12:15 PM





	HV %:	PHF
EB	6.4%	0.84
NB	3.4%	0.95
SB	16.5%	0.76
TOTAL	5.8%	0.93

Two-Hour Count Summaries

Interval Start	S 188TH ST Eastbound			S 188TH ST Westbound			ORILLA RD S Northbound			ORILLA RD S Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:15 AM	**19**	**0**	**90**	**0**	**0**	**0**	**133**	**4**	**0**	**0**	**5**	**13**	**264**	
11:30 AM	**16**	**0**	**87**	**0**	**0**	**0**	**111**	**13**	**0**	**0**	**3**	**16**	**246**	
11:45 AM	**20**	**0**	**120**	**0**	**0**	**0**	**118**	**10**	**0**	**0**	**5**	**15**	**288**	
12:00 PM	**23**	**0**	**95**	**0**	**0**	**0**	**120**	**13**	**0**	**0**	**7**	**21**	**279**	**1,077**
12:15 PM	16	0	98	0	0	0	114	3	0	0	5	19	255	1,068
12:30 PM	13	0	93	0	0	0	107	13	0	0	2	21	249	1,071
12:45 PM	12	0	104	0	0	0	107	5	0	0	2	17	247	1,030
1:00 PM	19	0	99	0	0	0	143	12	0	0	6	25	304	1,055
Count Total	138	0	786	0	0	0	953	73	0	0	35	147	2,132	
Peak Hr	**78**	**0**	**392**	**0**	**0**	**0**	**482**	**40**	**0**	**0**	**20**	**65**	**1,077**	

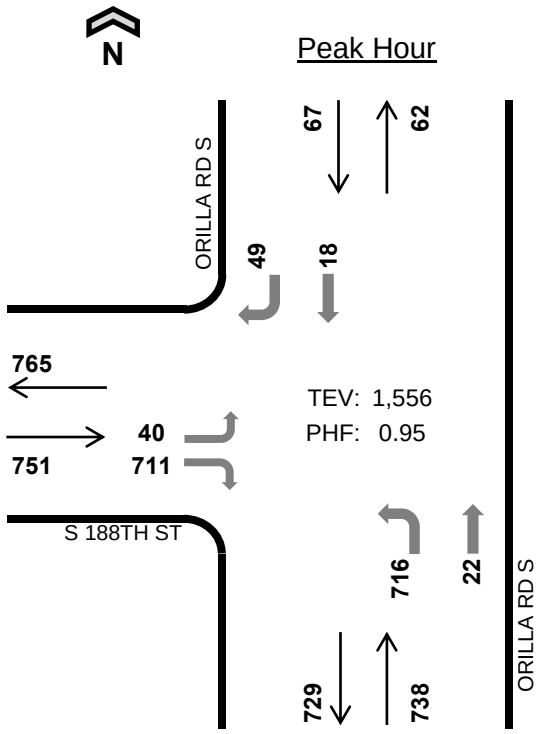
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

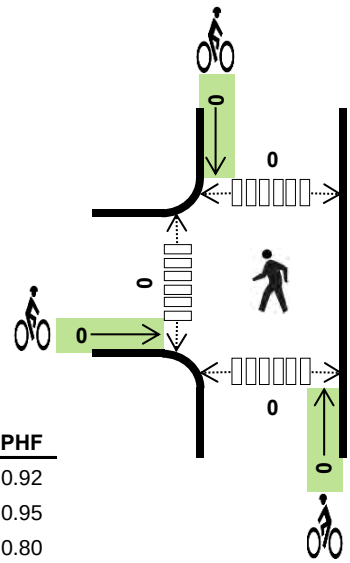
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:15 AM	**7**	**0**	**4**	**2**	***13***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
11:30 AM	**6**	**0**	**5**	**3**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
11:45 AM	**14**	**0**	**8**	**3**	***25***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:00 PM	**3**	**0**	**1**	**6**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:15 PM	7	0	2	2	*11*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	5	0	4	2	*11*	0	0	0	0	*0*	0	0	0	0	*0*
12:45 PM	8	0	2	2	*12*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	9	0	5	1	*15*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	59	0	31	21	*111*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**30**	**0**	**18**	**14**	***62***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

ORILLA RD S
S 188TH ST

Date: Tue, Oct 07, 2014
Count Period: 11:30 AM to 1:30 PM
Peak Hour: 12:30 PM to 1:30 PM





	HV %:	PHF
EB	19.7%	0.92
NB	18.0%	0.95
SB	34.3%	0.80
TOTAL	19.5%	0.95

Two-Hour Count Summaries

Interval Start	S 188TH ST Eastbound			S 188TH ST Westbound			ORILLA RD S Northbound			ORILLA RD S Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:30 AM	7	0	147	0	0	0	176	11	0	0	4	13	358	
11:45 AM	6	0	148	0	0	0	179	4	0	0	1	14	352	
12:00 PM	12	0	157	0	0	0	153	2	0	0	5	5	334	
12:15 PM	9	0	133	0	0	0	148	10	0	0	3	9	312	1,356
12:30 PM	**8**	**0**	**171**	**0**	**0**	**0**	**182**	**3**	**0**	**0**	**4**	**12**	**380**	1,378
12:45 PM	**13**	**0**	**178**	**0**	**0**	**0**	**170**	**7**	**0**	**0**	**6**	**15**	**389**	1,415
1:00 PM	**6**	**0**	**172**	**0**	**0**	**0**	**178**	**4**	**0**	**0**	**4**	**13**	**377**	1,458
1:15 PM	**13**	**0**	**190**	**0**	**0**	**0**	**186**	**8**	**0**	**0**	**4**	**9**	**410**	**1,556**
Count Total	74	0	1,296	0	0	0	1,372	49	0	0	31	90	2,912	
Peak Hr	**40**	**0**	**711**	**0**	**0**	**0**	**716**	**22**	**0**	**0**	**18**	**49**	**1,556**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:30 AM	27	0	35	5	*67*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	33	0	22	6	*61*	0	0	0	0	*0*	0	0	0	0	*0*
12:00 PM	37	0	26	2	*65*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	27	0	31	4	*62*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	**39**	**0**	**26**	**7**	***72***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**27**	**0**	**29**	**3**	***59***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**39**	**0**	**38**	**6**	***83***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:15 PM	**43**	**0**	**40**	**7**	***90***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	272	0	247	40	*559*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**148**	**0**	**133**	**23**	***304***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

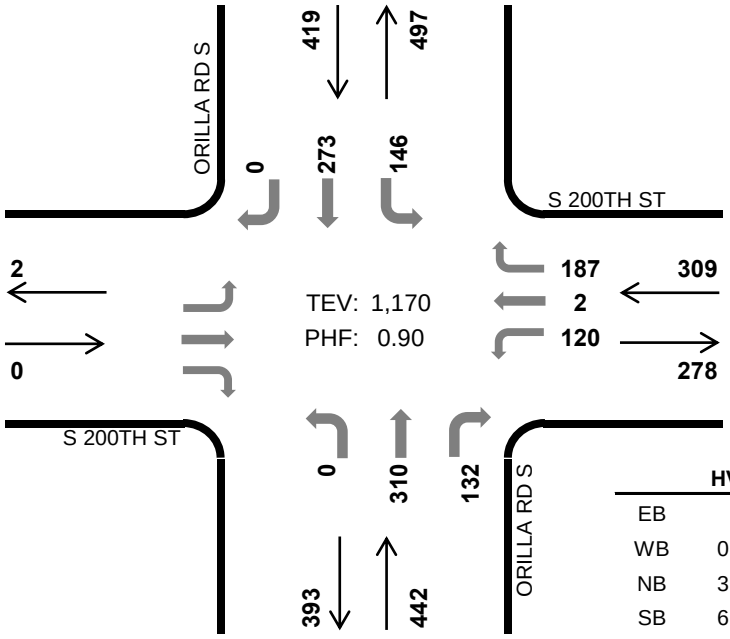
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

ORILLA RD S
S 200TH ST

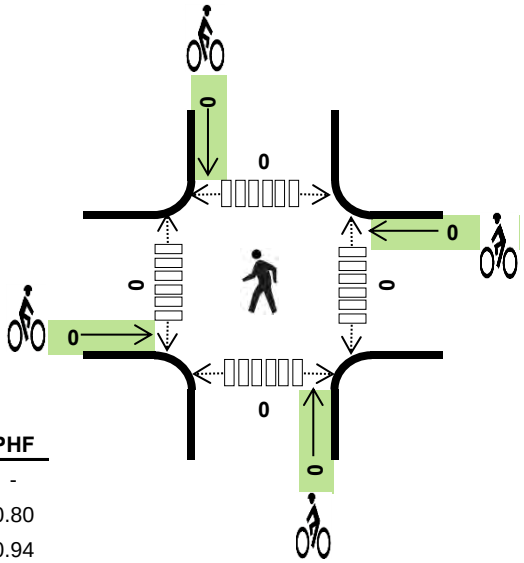
Date: Sat, Oct 04, 2014
Count Period: 11:15 AM to 1:15 PM
Peak Hour: 12:15 PM to 1:15 PM

N

Peak Hour



	HV %:	PHF
EB	-	-
WB	0.6%	0.80
NB	3.4%	0.94
SB	6.2%	0.94
TOTAL	3.7%	0.90



Two-Hour Count Summaries

Interval Start	S 200TH ST Eastbound			S 200TH ST Westbound			ORILLA RD S Northbound			ORILLA RD S Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:15 AM	0	1	0	18	0	41	0	94	26	33	64	0	277	
11:30 AM	0	0	0	28	0	36	0	89	21	30	64	0	268	
11:45 AM	0	0	0	24	0	30	0	95	25	61	69	0	304	
12:00 PM	0	0	0	23	0	66	0	74	25	37	69	0	294	1,143
12:15 PM	**0**	**0**	**0**	**21**	**2**	**38**	**0**	**70**	**36**	**33**	**70**	**0**	**270**	1,136
12:30 PM	**0**	**0**	**0**	**34**	**0**	**49**	**0**	**71**	**43**	**34**	**62**	**0**	**293**	1,161
12:45 PM	**0**	**0**	**0**	**24**	**0**	**44**	**0**	**79**	**26**	**38**	**71**	**0**	**282**	1,139
1:00 PM	**0**	**0**	**0**	**41**	**0**	**56**	**0**	**90**	**27**	**41**	**70**	**0**	**325**	**1,170**
Count Total	0	1	0	213	2	360	0	662	229	307	539	0	2,313	
Peak Hr	**0**	**0**	**0**	**120**	**2**	**187**	**0**	**310**	**132**	**146**	**273**	**0**	**1,170**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:15 AM	0	3	1	2	*6*	0	0	0	0	*0*	0	0	0	0	*0*
11:30 AM	0	4	3	5	*12*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	0	3	6	9	*18*	0	0	0	0	*0*	0	0	0	0	*0*
12:00 PM	0	1	1	5	*7*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	**0**	**0**	**3**	**6**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:30 PM	**0**	**2**	**5**	**5**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**0**	**0**	**2**	**8**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**0**	**0**	**5**	**7**	***12***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	0	13	26	47	*86*	0	0	0	0	*0*	0	0	0	0	*0*
Peak Hr	**0**	**2**	**15**	**26**	***43***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

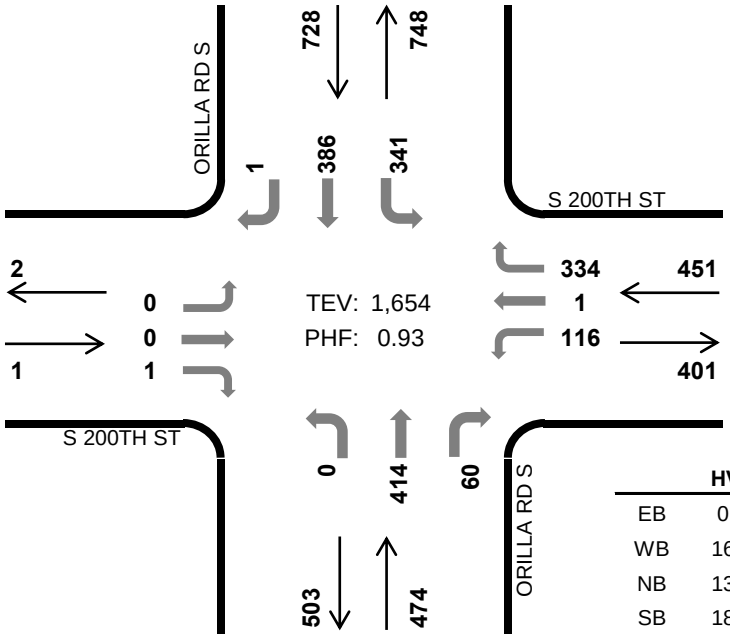
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

ORILLA RD S
S 200TH ST

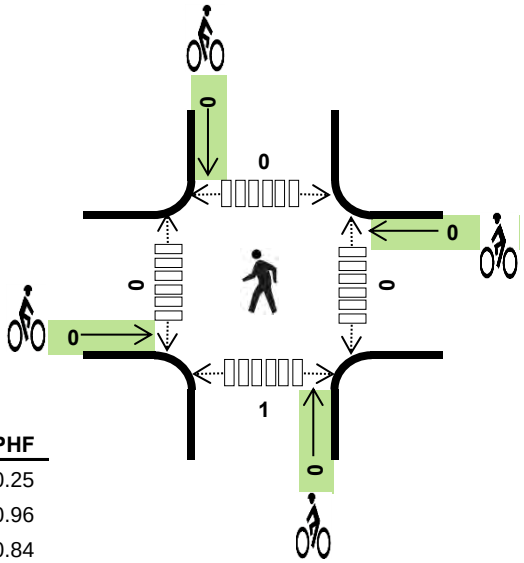
Date: Tue, Oct 07, 2014
Count Period: 11:30 AM to 1:30 PM
Peak Hour: 12:30 PM to 1:30 PM

N

Peak Hour



	HV %:	PHF
EB	0.0%	0.25
WB	16.0%	0.96
NB	13.9%	0.84
SB	18.7%	0.93
TOTAL	16.6%	0.93



Two-Hour Count Summaries

Interval Start	S 200TH ST Eastbound			S 200TH ST Westbound			ORILLA RD S Northbound			ORILLA RD S Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:30 AM	0	0	0	14	0	78	0	104	16	68	85	0	365	
11:45 AM	0	1	0	25	0	72	0	103	22	63	91	0	377	
12:00 PM	1	1	0	27	0	69	1	89	27	71	87	0	373	
12:15 PM	0	0	1	24	0	54	0	110	16	78	75	0	358	1,473
12:30 PM	**0**	**0**	**0**	**30**	**1**	**86**	**0**	**94**	**13**	**79**	**87**	**0**	**390**	1,498
12:45 PM	**0**	**0**	**1**	**29**	**0**	**83**	**0**	**102**	**13**	**80**	**104**	**1**	**413**	1,534
1:00 PM	**0**	**0**	**0**	**27**	**0**	**84**	**0**	**97**	**14**	**86**	**96**	**0**	**404**	1,565
1:15 PM	**0**	**0**	**0**	**30**	**0**	**81**	**0**	**121**	**20**	**96**	**99**	**0**	**447**	**1,654**
Count Total	1	2	2	206	1	607	1	820	141	621	724	1	3,127	
Peak Hr	**0**	**0**	**1**	**116**	**1**	**334**	**0**	**414**	**60**	**341**	**386**	**1**	**1,654**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:30 AM	0	21	16	31	*68*	0	0	0	0	*0*	0	0	0	0	*0*
11:45 AM	0	11	12	29	*52*	0	0	0	0	*0*	0	0	0	0	*0*
12:00 PM	0	11	16	40	*67*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	0	11	23	31	*65*	0	0	1	0	*1*	0	0	0	0	*0*
12:30 PM	**0**	**16**	**9**	**35**	***60***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**0**	**16**	**16**	**26**	***58***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**0**	**20**	**14**	**34**	***68***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
1:15 PM	**0**	**20**	**27**	**41**	***88***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	0	126	133	267	*526*	0	0	1	0	*1*	0	0	0	1	*1*
Peak Hr	**0**	**72**	**66**	**136**	***274***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***

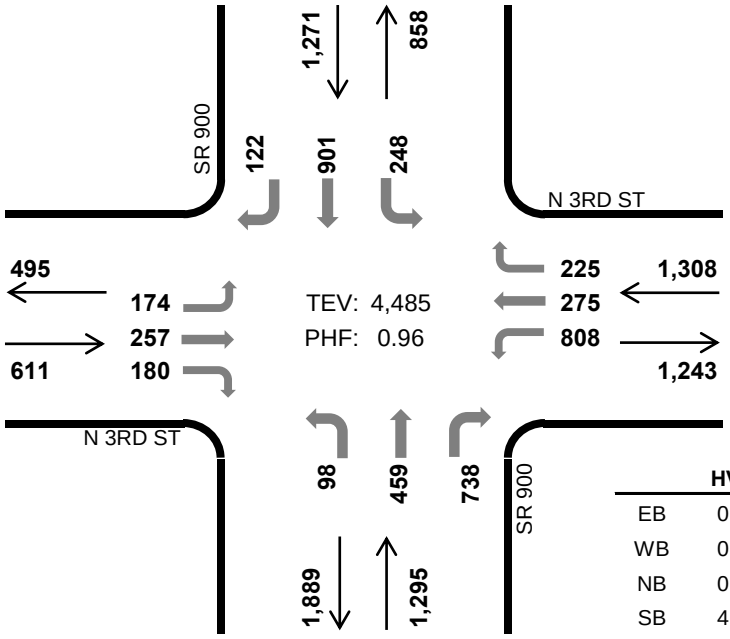
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

SR 900
N 3RD ST

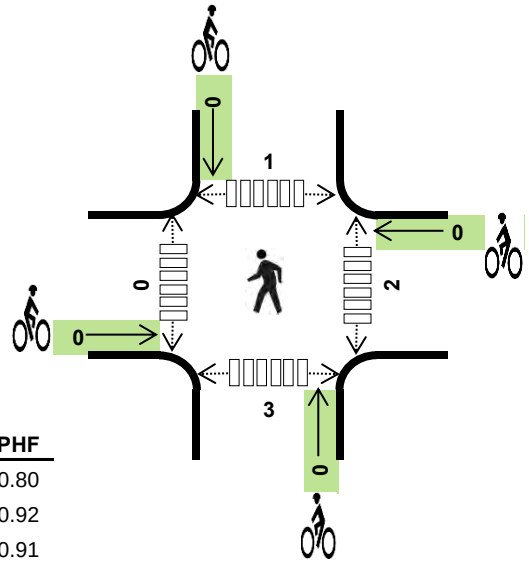
Date: Sat, Oct 04, 2014
Count Period: 11:45 AM to 1:45 PM
Peak Hour: 12:45 PM to 1:45 PM

N

Peak Hour



	HV %:	PHF
EB	0.2%	0.80
WB	0.4%	0.92
NB	0.8%	0.91
SB	4.5%	0.93
TOTAL	1.6%	0.96



Two-Hour Count Summaries

Interval Start	N 3RD ST Eastbound			N 3RD ST Westbound			SR 900 Northbound			SR 900 Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:45 AM	45	59	18	200	77	75	26	90	183	58	205	30	1,066	
12:00 PM	42	55	40	193	64	72	15	109	208	56	218	32	1,104	
12:15 PM	50	43	42	206	74	69	22	112	200	78	195	27	1,118	
12:30 PM	45	56	36	212	56	81	31	109	205	58	231	25	1,145	4,433
12:45 PM	**26**	**67**	**33**	**209**	**69**	**25**	**21**	**98**	**189**	**71**	**215**	**33**	**1,056**	4,423
1:00 PM	**49**	**53**	**42**	**190**	**70**	**75**	**37**	**139**	**180**	**56**	**211**	**25**	**1,127**	4,446
1:15 PM	**51**	**65**	**35**	**218**	**76**	**62**	**18**	**107**	**182**	**59**	**226**	**32**	**1,131**	4,459
1:30 PM	**48**	**72**	**70**	**191**	**60**	**63**	**22**	**115**	**187**	**62**	**249**	**32**	**1,171**	**4,485**
Count Total	356	470	316	1,619	546	522	192	879	1,534	498	1,750	236	8,918	
Peak Hr	**174**	**257**	**180**	**808**	**275**	**225**	**98**	**459**	**738**	**248**	**901**	**122**	**4,485**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

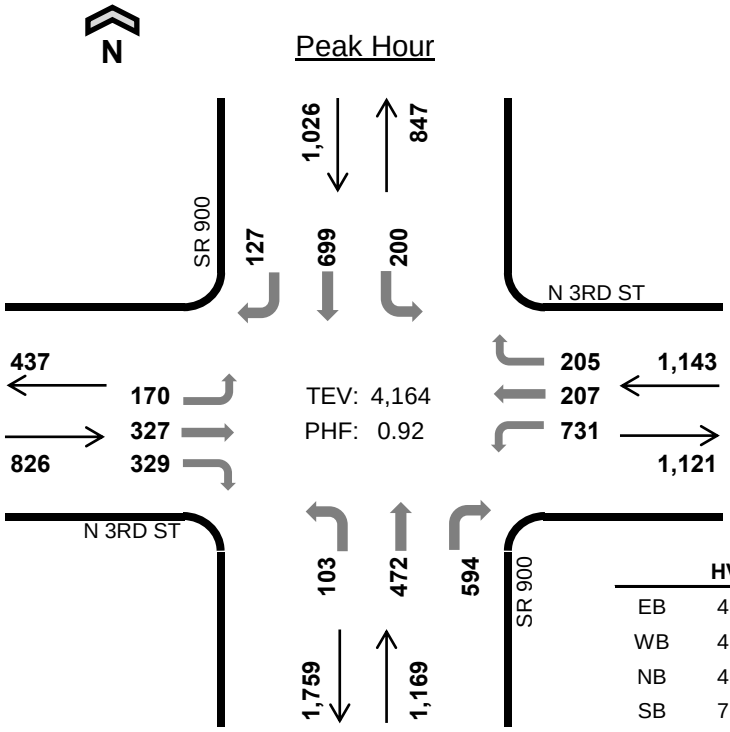
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:45 AM	0	1	5	15	*21*	0	0	0	0	*0*	0	0	2	0	*2*
12:00 PM	0	6	5	16	*27*	0	0	0	0	*0*	5	2	1	5	*13*
12:15 PM	0	2	6	15	*23*	0	1	0	0	*1*	2	0	1	2	*5*
12:30 PM	0	0	4	13	*17*	0	0	0	0	*0*	2	2	4	0	*8*
12:45 PM	**0**	**0**	**1**	**11**	***12***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
1:00 PM	**0**	**1**	**4**	**14**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**2**	***2***
1:15 PM	**0**	**2**	**3**	**17**	***22***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	***2***
1:30 PM	**1**	**2**	**3**	**15**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
Count Total	1	14	31	116	*162*	0	1	0	0	*1*	11	4	9	10	*34*
Peak Hr	**1**	**5**	**11**	**57**	***74***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**1**	**3**	***6***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

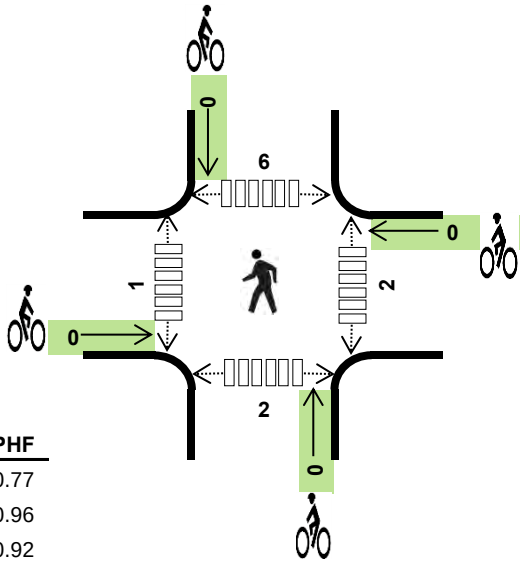
SR 900
N 3RD ST

Date: Thu, Oct 02, 2014
Count Period: 12:15 PM to 2:15 PM
Peak Hour: 1:15 PM to 2:15 PM

Peak Hour



	HV %:	PHF
EB	4.0%	0.77
WB	4.1%	0.96
NB	4.4%	0.92
SB	7.4%	0.86
TOTAL	5.0%	0.92



Two-Hour Count Summaries

Interval Start	N 3RD ST Eastbound			N 3RD ST Westbound			SR 900 Northbound			SR 900 Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:15 PM	43	42	27	183	63	47	21	106	126	43	172	29	902	
12:30 PM	40	50	26	167	56	64	21	112	102	43	224	30	935	
12:45 PM	35	32	36	163	62	71	26	84	135	41	182	35	902	
1:00 PM	47	65	62	158	57	70	33	103	163	40	185	33	1,016	3,755
1:15 PM	**21**	**53**	**46**	**174**	**59**	**53**	**18**	**99**	**141**	**49**	**133**	**29**	**875**	3,728
1:30 PM	**55**	**97**	**116**	**189**	**48**	**61**	**34**	**141**	**141**	**51**	**160**	**33**	**1,126**	3,919
1:45 PM	**36**	**83**	**81**	**188**	**53**	**49**	**23**	**110**	**163**	**60**	**212**	**26**	**1,084**	4,101
2:00 PM	**58**	**94**	**86**	**180**	**47**	**42**	**28**	**122**	**149**	**40**	**194**	**39**	**1,079**	**4,164**
Count Total	335	516	480	1,402	445	457	204	877	1,120	367	1,462	254	7,919	
Peak Hr	**170**	**327**	**329**	**731**	**207**	**205**	**103**	**472**	**594**	**200**	**699**	**127**	**4,164**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:15 PM	3	5	9	23	*40*	0	0	0	0	*0*	1	4	1	2	*8*
12:30 PM	9	12	12	24	*57*	0	0	0	0	*0*	1	4	2	1	*8*
12:45 PM	1	13	12	25	*51*	0	0	0	0	*0*	0	0	2	1	*3*
1:00 PM	4	14	13	17	*48*	0	0	0	0	*0*	0	2	2	0	*4*
1:15 PM	**6**	**15**	**10**	**27**	***58***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
1:30 PM	**6**	**11**	**7**	**21**	***45***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**2**	**0**	***2***
1:45 PM	**12**	**10**	**20**	**12**	***54***	**0**	**0**	**0**	**0**	***0***	**1**	**1**	**3**	**1**	***6***
2:00 PM	**9**	**11**	**15**	**16**	***51***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	***2***
Count Total	50	91	98	165	*404*	0	0	0	0	*0*	4	11	13	6	*34*
Peak Hr	**33**	**47**	**52**	**76**	***208***	**0**	**0**	**0**	**0**	***0***	**2**	**1**	**6**	**2**	***11***

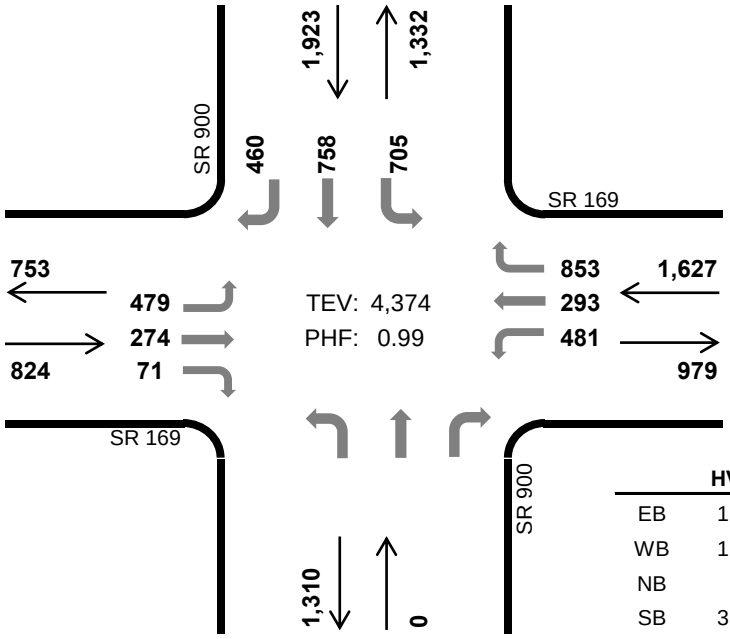
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

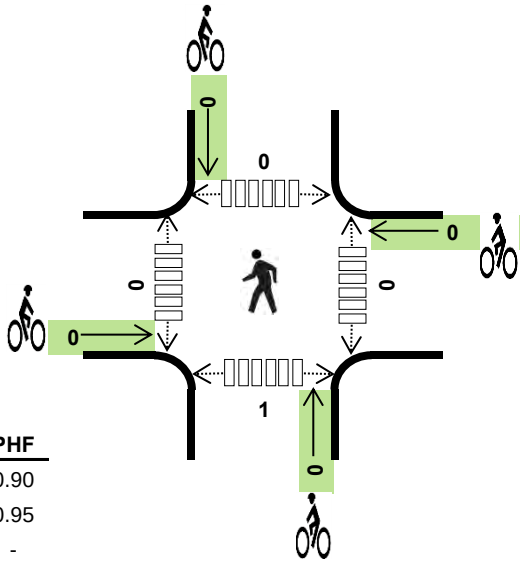
SR 900
SR 169

Date: Sat, Oct 04, 2014
Count Period: 11:45 AM to 1:45 PM
Peak Hour: 12:15 PM to 1:15 PM

N

Peak Hour





	HV %:	PHF
EB	1.1%	0.90
WB	1.8%	0.95
NB	-	-
SB	3.6%	0.92
TOTAL	2.4%	0.99

Two-Hour Count Summaries

Interval Start	SR 169 Eastbound			SR 169 Westbound			SR 900 Northbound			SR 900 Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:45 AM	124	54	8	121	72	201	0	0	0	144	203	124	1,051	
12:00 PM	93	67	11	113	78	228	0	0	0	156	203	90	1,039	
12:15 PM	**132**	**84**	**14**	**119**	**83**	**225**	**0**	**0**	**0**	**152**	**190**	**107**	**1,106**	
12:30 PM	**107**	**51**	**22**	**121**	**69**	**214**	**0**	**0**	**0**	**187**	**212**	**123**	**1,106**	4,302
12:45 PM	**129**	**77**	**22**	**117**	**56**	**197**	**0**	**0**	**0**	**186**	**178**	**116**	**1,078**	4,329
1:00 PM	**111**	**62**	**13**	**124**	**85**	**217**	**0**	**0**	**0**	**180**	**178**	**114**	**1,084**	**4,374**
1:15 PM	116	68	19	128	64	205	0	0	0	173	198	100	1,071	4,339
1:30 PM	110	55	23	135	72	177	0	0	0	217	204	109	1,102	4,335
Count Total	922	518	132	978	579	1,664	0	0	0	1,395	1,566	883	8,637	
Peak Hr	**479**	**274**	**71**	**481**	**293**	**853**	**0**	**0**	**0**	**705**	**758**	**460**	**4,374**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:45 AM	0	10	0	18	*28*	0	0	0	0	*0*	0	0	0	0	*0*
12:00 PM	4	11	0	22	*37*	0	0	0	0	*0*	0	0	0	1	*1*
12:15 PM	**3**	**10**	**0**	**17**	***30***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:30 PM	**2**	**6**	**0**	**16**	***24***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**1**	**5**	**0**	**17**	***23***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**3**	**8**	**0**	**19**	***30***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
1:15 PM	2	6	0	17	*25*	0	0	0	0	*0*	0	0	0	2	*2*
1:30 PM	3	15	0	20	*38*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	18	71	0	146	*235*	0	0	0	0	*0*	0	0	0	4	*4*
Peak Hr	**9**	**29**	**0**	**69**	***107***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***

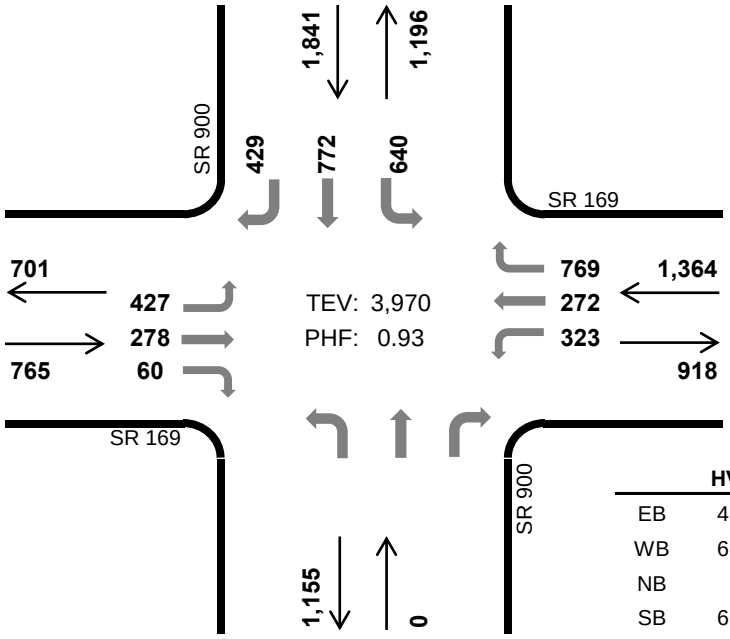
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

SR 900
SR 169

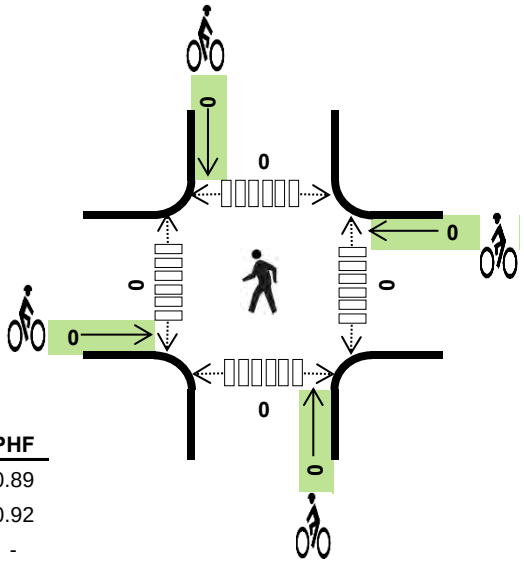
Date: Thu, Oct 02, 2014
Count Period: 12:15 PM to 2:15 PM
Peak Hour: 1:15 PM to 2:15 PM

N

Peak Hour



	HV %:	PHF
EB	4.2%	0.89
WB	6.9%	0.92
NB	-	-
SB	6.6%	0.91
TOTAL	6.2%	0.93



Two-Hour Count Summaries

Interval Start	SR 169 Eastbound			SR 169 Westbound			SR 900 Northbound			SR 900 Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:15 PM	92	66	8	74	60	153	0	0	0	106	176	107	842	
12:30 PM	70	42	11	91	73	174	0	0	0	128	171	102	862	
12:45 PM	100	44	11	92	54	159	0	0	0	112	152	104	828	
1:00 PM	99	59	13	76	72	209	0	0	0	151	167	83	929	3,461
1:15 PM	**107**	**71**	**5**	**87**	**65**	**161**	**0**	**0**	**0**	**95**	**148**	**104**	**843**	3,462
1:30 PM	**92**	**55**	**17**	**92**	**69**	**209**	**0**	**0**	**0**	**175**	**211**	**108**	**1,028**	3,628
1:45 PM	**102**	**88**	**25**	**70**	**71**	**203**	**0**	**0**	**0**	**186**	**207**	**115**	**1,067**	3,867
2:00 PM	**126**	**64**	**13**	**74**	**67**	**196**	**0**	**0**	**0**	**184**	**206**	**102**	**1,032**	**3,970**
Count Total	788	489	103	656	531	1,464	0	0	0	1,137	1,438	825	7,431	
Peak Hr	**427**	**278**	**60**	**323**	**272**	**769**	**0**	**0**	**0**	**640**	**772**	**429**	**3,970**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:15 PM	11	14	0	28	*53*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	4	17	0	25	*46*	0	0	0	0	*0*	0	0	0	0	*0*
12:45 PM	2	24	0	29	*55*	0	0	0	0	*0*	0	0	0	1	*1*
1:00 PM	4	23	0	25	*52*	0	0	0	0	*0*	0	0	0	1	*1*
1:15 PM	**3**	**28**	**0**	**31**	***62***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:30 PM	**4**	**24**	**0**	**27**	***55***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:45 PM	**17**	**27**	**0**	**32**	***76***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**8**	**15**	**0**	**31**	***54***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	53	172	0	228	*453*	0	0	0	0	*0*	0	0	0	2	*2*
Peak Hr	**32**	**94**	**0**	**121**	***247***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***

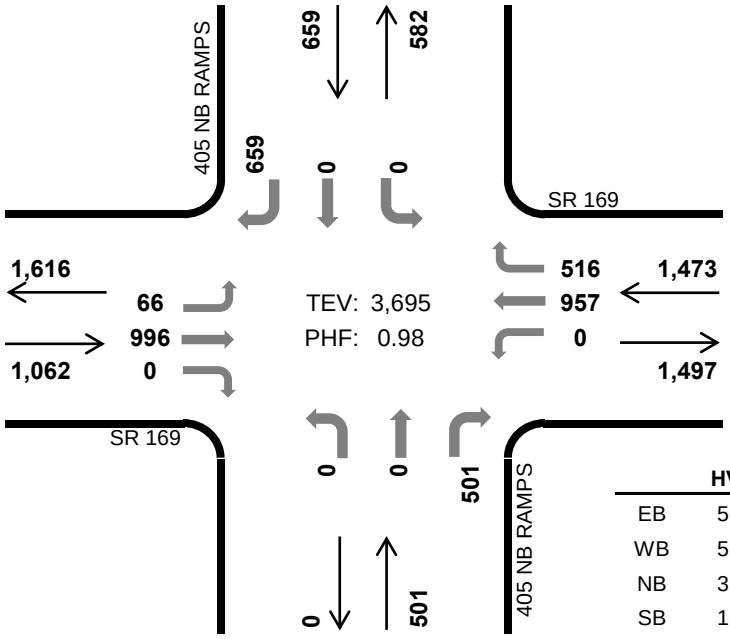
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

405 NB RAMPS
SR 169

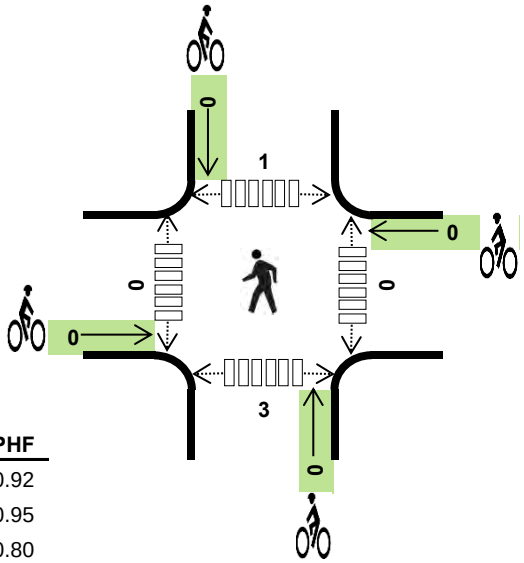
Date: Sat, Oct 04, 2014
Count Period: 11:45 AM to 1:45 PM
Peak Hour: 12:45 PM to 1:45 PM

N

Peak Hour



	HV %:	PHF
EB	5.0%	0.92
WB	5.1%	0.95
NB	3.6%	0.80
SB	1.5%	0.96
TOTAL	4.2%	0.98



Two-Hour Count Summaries

Interval Start	SR 169 Eastbound			SR 169 Westbound			405 NB RAMPS Northbound			405 NB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:45 AM	3	198	0	0	249	132	0	0	112	0	1	150	845	
12:00 PM	24	207	0	0	230	153	0	0	125	0	0	195	934	
12:15 PM	18	213	0	0	274	133	0	0	103	0	0	170	911	
12:30 PM	25	226	0	0	236	142	0	0	111	0	1	177	918	3,608
12:45 PM	**23**	**246**	**0**	**0**	**232**	**139**	**0**	**0**	**133**	**0**	**0**	**152**	**925**	3,688
1:00 PM	**20**	**231**	**0**	**0**	**249**	**130**	**0**	**0**	**108**	**0**	**0**	**171**	**909**	3,663
1:15 PM	**9**	**245**	**0**	**0**	**256**	**130**	**0**	**0**	**104**	**0**	**0**	**170**	**914**	3,666
1:30 PM	**14**	**274**	**0**	**0**	**220**	**117**	**0**	**0**	**156**	**0**	**0**	**166**	**947**	**3,695**
Count Total	136	1,840	0	0	1,946	1,076	0	0	952	0	2	1,351	7,303	
Peak Hr	**66**	**996**	**0**	**0**	**957**	**516**	**0**	**0**	**501**	**0**	**0**	**659**	**3,695**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

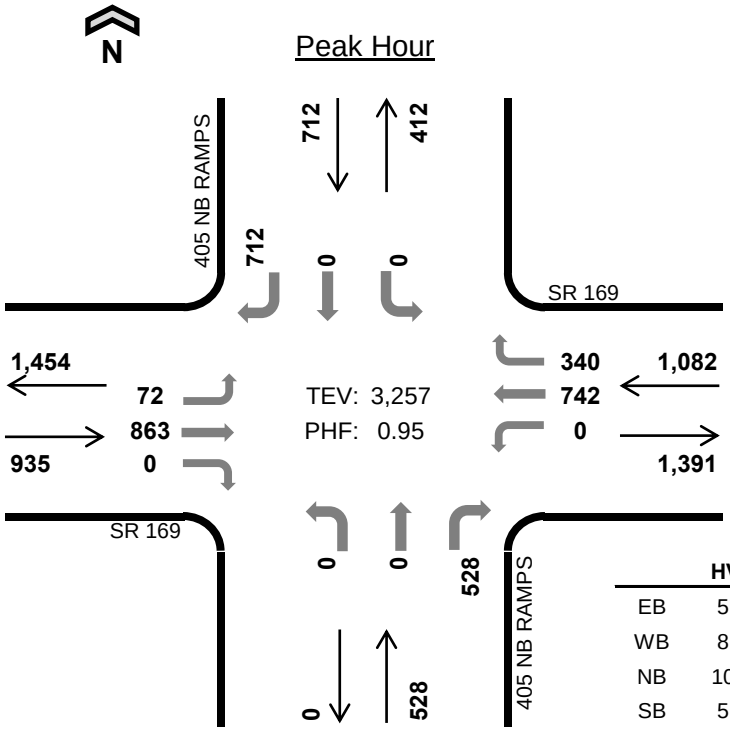
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:45 AM	17	13	2	5	*37*	0	2	0	0	*2*	0	0	0	0	*0*
12:00 PM	17	18	3	3	*41*	0	2	0	0	*2*	0	0	0	1	*1*
12:15 PM	15	13	3	4	*35*	0	3	0	0	*3*	0	0	0	0	*0*
12:30 PM	15	16	7	1	*39*	0	1	0	0	*1*	0	0	0	0	*0*
12:45 PM	**13**	**15**	**7**	**3**	***38***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:00 PM	**13**	**16**	**1**	**2**	***32***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
1:15 PM	**15**	**21**	**5**	**2**	***43***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**2**	***3***
1:30 PM	**12**	**23**	**5**	**3**	***43***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	117	135	33	23	*308*	0	8	0	0	*8*	0	0	1	4	*5*
Peak Hr	**53**	**75**	**18**	**10**	***156***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**3**	***4***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

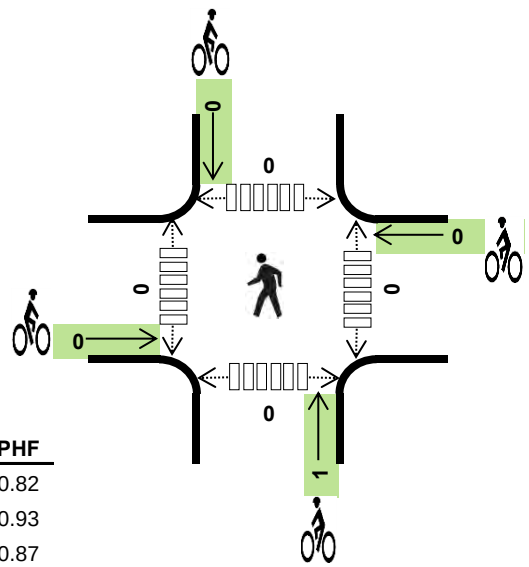
405 NB RAMPS
SR 169

Date: Thu, Oct 02, 2014
Count Period: 12:15 PM to 2:15 PM
Peak Hour: 1:15 PM to 2:15 PM

Peak Hour



	HV %:	PHF
EB	5.9%	0.82
WB	8.4%	0.93
NB	10.0%	0.87
SB	5.3%	0.91
TOTAL	7.3%	0.95



Two-Hour Count Summaries

Interval Start	SR 169 Eastbound			SR 169 Westbound			405 NB RAMPS Northbound			405 NB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:15 PM	23	165	0	0	174	96	0	0	109	0	0	135	702	
12:30 PM	15	175	0	0	186	95	0	0	94	0	0	139	704	
12:45 PM	6	159	0	0	166	99	0	0	117	0	0	125	672	
1:00 PM	18	212	0	0	169	108	0	0	110	0	0	166	783	2,861
1:15 PM	**22**	**146**	**0**	**0**	**192**	**98**	**0**	**0**	**117**	**0**	**0**	**155**	**730**	2,889
1:30 PM	**22**	**216**	**0**	**0**	**196**	**85**	**0**	**0**	**122**	**0**	**0**	**179**	**820**	3,005
1:45 PM	**17**	**269**	**0**	**0**	**175**	**71**	**0**	**0**	**137**	**0**	**0**	**182**	**851**	3,184
2:00 PM	**11**	**232**	**0**	**0**	**179**	**86**	**0**	**0**	**152**	**0**	**0**	**196**	**856**	**3,257**
Count Total	134	1,574	0	0	1,437	738	0	0	958	0	0	1,277	6,118	
Peak Hr	**72**	**863**	**0**	**0**	**742**	**340**	**0**	**0**	**528**	**0**	**0**	**712**	**3,257**	

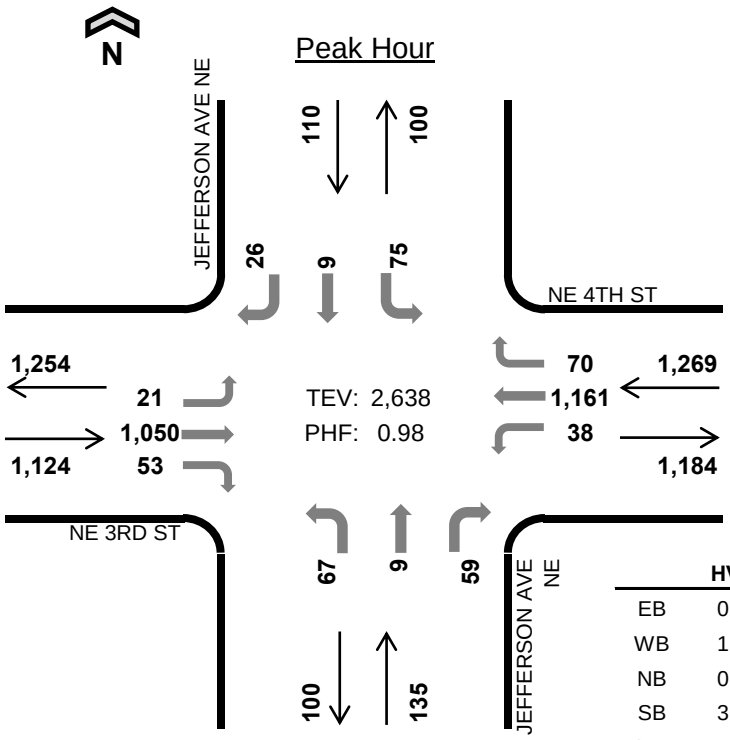
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:15 PM	17	24	19	1	*61*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	13	30	12	4	*59*	0	0	0	0	*0*	0	0	0	0	*0*
12:45 PM	13	30	11	9	*63*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	14	30	9	7	*60*	0	0	0	0	*0*	0	0	0	0	*0*
1:15 PM	**9**	**37**	**13**	**7**	***66***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:30 PM	**10**	**18**	**18**	**8**	***54***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:45 PM	**16**	**22**	**9**	**15**	***62***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**20**	**14**	**13**	**8**	***55***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
Count Total	112	205	104	59	*480*	0	0	1	0	*1*	0	0	0	0	*0*
Peak Hr	**55**	**91**	**53**	**38**	***237***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***

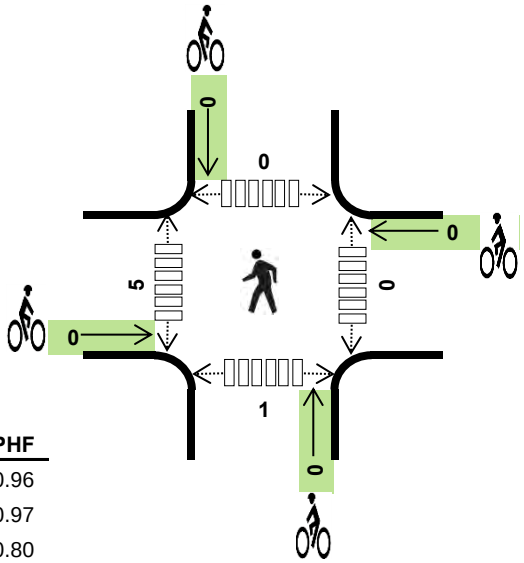
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

Jefferson AVE NE
NE 4TH ST

Date: Sat, Oct 04, 2014
Count Period: 11:45 AM to 1:45 PM
Peak Hour: 12:00 PM to 1:00 PM



	HV %:	PHF
EB	0.7%	0.96
WB	1.0%	0.97
NB	0.7%	0.80
SB	3.6%	0.81
TOTAL	1.0%	0.98



Two-Hour Count Summaries

Interval Start	NE 3RD ST Eastbound			NE 4TH ST Westbound			Jefferson AVE NE Northbound			Jefferson AVE NE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:45 AM	6	253	15	15	303	18	24	1	12	12	0	4	663	
12:00 PM	**2**	**264**	**18**	**10**	**289**	**15**	**9**	**2**	**14**	**21**	**3**	**8**	**655**	
12:15 PM	**6**	**246**	**9**	**8**	**299**	**19**	**16**	**3**	**9**	**23**	**3**	**8**	**649**	
12:30 PM	**10**	**262**	**14**	**8**	**294**	**14**	**22**	**4**	**14**	**15**	**1**	**6**	**664**	2,631
12:45 PM	**3**	**278**	**12**	**12**	**279**	**22**	**20**	**0**	**22**	**16**	**2**	**4**	**670**	**2,638**
1:00 PM	8	232	10	11	294	17	35	5	17	13	2	5	649	2,632
1:15 PM	4	245	13	9	294	11	20	5	19	11	1	9	641	2,624
1:30 PM	6	251	10	10	290	24	22	1	15	11	5	6	651	2,611
Count Total	45	2,031	101	83	2,342	140	168	21	122	122	17	50	5,242	
Peak Hr	**21**	**1,050**	**53**	**38**	**1,161**	**70**	**67**	**9**	**59**	**75**	**9**	**26**	**2,638**	

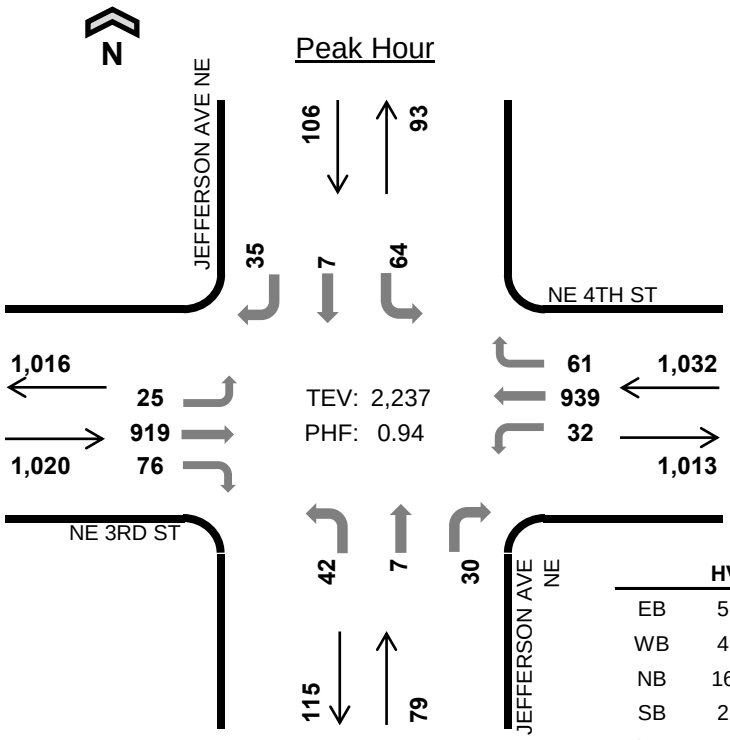
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:45 AM	3	3	1	1	*8*	0	0	0	0	*0*	0	2	0	0	*2*
12:00 PM	**0**	**4**	**0**	**1**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**4**	**0**	**0**	***4***
12:15 PM	**3**	**4**	**0**	**1**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
12:30 PM	**3**	**2**	**1**	**1**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
12:45 PM	**2**	**3**	**0**	**1**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***
1:00 PM	4	3	1	0	*8*	0	0	0	0	*0*	0	0	0	0	*0*
1:15 PM	1	6	0	1	*8*	0	0	0	0	*0*	0	6	0	0	*6*
1:30 PM	5	4	0	0	*9*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	21	29	3	6	*59*	0	0	0	0	*0*	0	13	0	1	*14*
Peak Hr	**8**	**13**	**1**	**4**	***26***	**0**	**0**	**0**	**0**	***0***	**0**	**5**	**0**	**1**	***6***

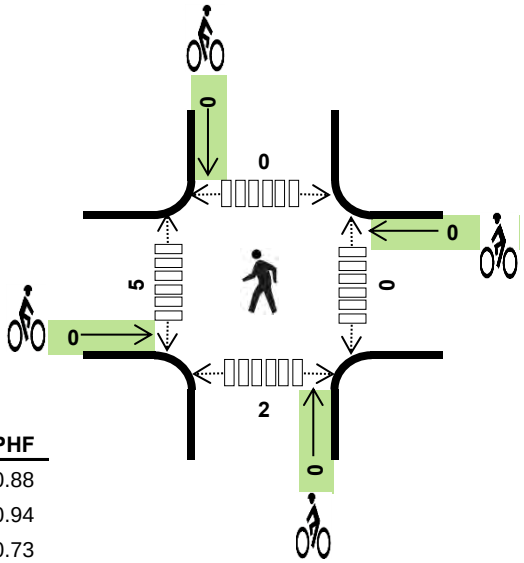
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

Jefferson AVE NE
NE 4TH ST

Date: Thu, Oct 02, 2014
Count Period: 12:15 PM to 2:15 PM
Peak Hour: 1:15 PM to 2:15 PM



	HV %:	PHF
EB	5.3%	0.88
WB	4.3%	0.94
NB	16.5%	0.73
SB	2.8%	0.76
TOTAL	5.1%	0.94



Two-Hour Count Summaries

Interval Start	NE 3RD ST Eastbound			NE 4TH ST Westbound			Jefferson AVE NE Northbound			Jefferson AVE NE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:15 PM	6	202	13	6	229	15	12	2	2	16	0	6	509	
12:30 PM	3	176	7	5	242	19	9	0	7	18	0	6	492	
12:45 PM	4	170	21	5	242	20	12	4	3	15	1	3	500	
1:00 PM	4	194	19	6	227	12	17	0	12	15	2	5	513	2,014
1:15 PM	**4**	**192**	**13**	**11**	**232**	**19**	**7**	**4**	**6**	**17**	**0**	**7**	**512**	2,017
1:30 PM	**7**	**244**	**17**	**4**	**259**	**12**	**15**	**2**	**10**	**19**	**2**	**3**	**594**	2,119
1:45 PM	**6**	**251**	**32**	**10**	**238**	**23**	**4**	**0**	**9**	**13**	**3**	**7**	**596**	2,215
2:00 PM	**8**	**232**	**14**	**7**	**210**	**7**	**16**	**1**	**5**	**15**	**2**	**18**	**535**	**2,237**
Count Total	42	1,661	136	54	1,879	127	92	13	54	128	10	55	4,251	
Peak Hr	**25**	**919**	**76**	**32**	**939**	**61**	**42**	**7**	**30**	**64**	**7**	**35**	**2,237**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:15 PM	9	2	2	1	*14*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	14	9	4	1	*28*	0	0	0	0	*0*	0	0	0	0	*0*
12:45 PM	11	11	3	2	*27*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	11	11	7	2	*31*	0	0	0	0	*0*	0	0	0	0	*0*
1:15 PM	**10**	**12**	**4**	**1**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**2**	***3***
1:30 PM	**13**	**9**	**4**	**0**	***26***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	***2***
1:45 PM	**18**	**13**	**1**	**2**	***34***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**13**	**10**	**4**	**0**	***27***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	***2***
Count Total	99	77	29	9	*214*	0	0	0	0	*0*	0	5	0	2	*7*
Peak Hr	**54**	**44**	**13**	**3**	***114***	**0**	**0**	**0**	**0**	***0***	**0**	**5**	**0**	**2**	***7***

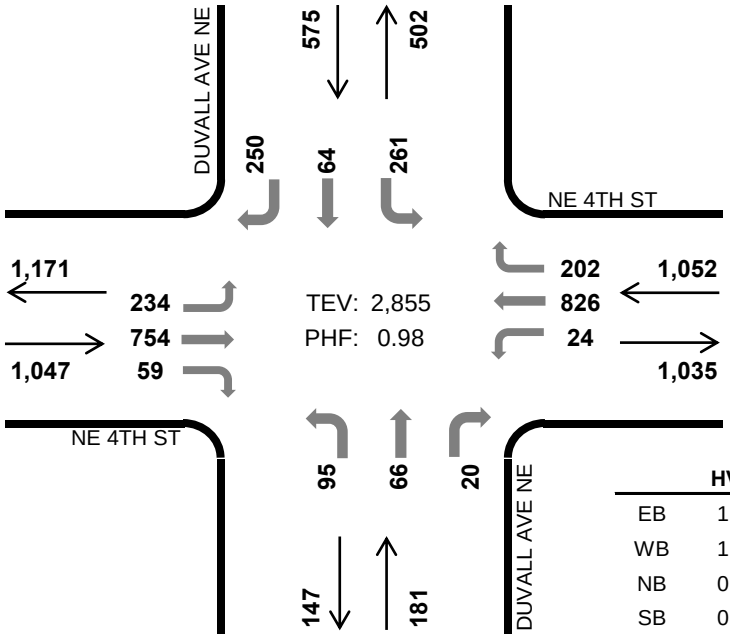
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

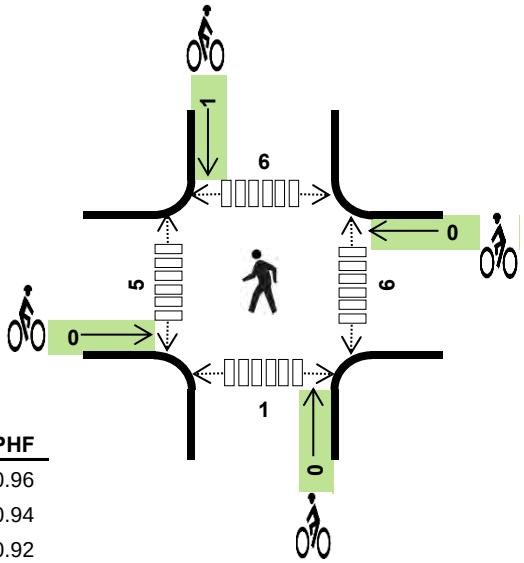
Duvall AVE NE
NE 4TH ST

Date: Sat, Oct 04, 2014
Count Period: 11:45 AM to 1:45 PM
Peak Hour: 11:45 AM to 12:45 PM

N

Peak Hour





	HV %:	PHF
EB	1.4%	0.96
WB	1.0%	0.94
NB	0.6%	0.92
SB	0.3%	0.91
TOTAL	1.0%	0.98

Two-Hour Count Summaries

Interval Start	NE 4TH ST Eastbound			NE 4TH ST Westbound			Duvall AVE NE Northbound			Duvall AVE NE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
11:45 AM	**61**	**199**	**13**	**4**	**198**	**51**	**19**	**11**	**10**	**72**	**11**	**75**	**724**	
12:00 PM	**55**	**186**	**17**	**7**	**200**	**45**	**28**	**13**	**3**	**65**	**28**	**47**	**694**	
12:15 PM	**68**	**177**	**14**	**6**	**214**	**60**	**25**	**20**	**4**	**69**	**11**	**57**	**725**	
12:30 PM	**50**	**192**	**15**	**7**	**214**	**46**	**23**	**22**	**3**	**55**	**14**	**71**	**712**	**2,855**
12:45 PM	54	193	10	13	209	52	22	10	8	46	17	64	698	2,829
1:00 PM	64	168	18	8	172	46	19	11	5	59	25	62	657	2,792
1:15 PM	45	182	11	6	194	56	19	12	4	56	16	67	668	2,735
1:30 PM	56	177	15	6	191	70	14	20	3	54	12	49	667	2,690
Count Total	453	1,474	113	57	1,592	426	169	119	40	476	134	492	5,545	
Peak Hr	**234**	**754**	**59**	**24**	**826**	**202**	**95**	**66**	**20**	**261**	**64**	**250**	**2,855**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
11:45 AM	**3**	**4**	**0**	**1**	***8***	**0**	**0**	**0**	**1**	***1***	**0**	**0**	**2**	**0**	***2***
12:00 PM	**5**	**4**	**1**	**0**	***10***	**0**	**0**	**0**	**0**	***0***	**3**	**0**	**4**	**1**	***8***
12:15 PM	**4**	**2**	**0**	**1**	***7***	**0**	**0**	**0**	**0**	***0***	**2**	**2**	**0**	**0**	***4***
12:30 PM	**3**	**0**	**0**	**0**	***3***	**0**	**0**	**0**	**0**	***0***	**1**	**3**	**0**	**0**	***4***
12:45 PM	2	1	1	0	*4*	0	0	0	1	*1*	0	0	0	0	*0*
1:00 PM	2	3	2	1	*8*	0	0	0	0	*0*	0	0	1	0	*1*
1:15 PM	0	3	0	2	*5*	0	0	0	0	*0*	0	1	6	0	*7*
1:30 PM	1	0	1	2	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	20	17	5	7	*49*	0	0	0	2	*2*	6	6	13	1	*26*
Peak Hr	**15**	**10**	**1**	**2**	***28***	**0**	**0**	**0**	**1**	***1***	**6**	**5**	**6**	**1**	***18***

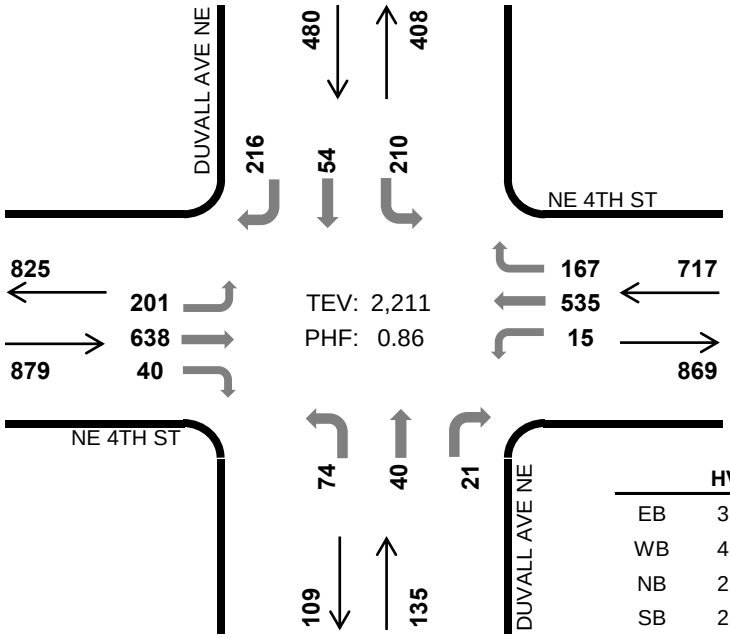
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

Duvall AVE NE
NE 4TH ST

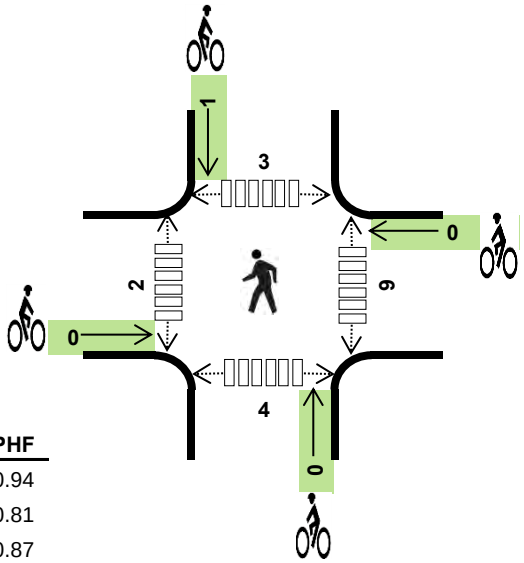
Date: Thu, Oct 02, 2014
Count Period: 12:15 PM to 2:15 PM
Peak Hour: 1:15 PM to 2:15 PM

N

Peak Hour



	HV %:	PHF
EB	3.1%	0.94
WB	4.2%	0.81
NB	2.2%	0.87
SB	2.1%	0.79
TOTAL	3.2%	0.86



Two-Hour Count Summaries

Interval Start	NE 4TH ST Eastbound			NE 4TH ST Westbound			Duvall AVE NE Northbound			Duvall AVE NE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:15 PM	37	143	14	6	127	36	19	19	5	42	22	57	527	
12:30 PM	48	110	13	4	166	37	22	8	6	40	14	54	522	
12:45 PM	43	133	15	1	135	35	17	9	6	46	8	45	493	
1:00 PM	37	119	9	2	127	34	24	12	4	46	10	49	473	2,015
1:15 PM	**46**	**141**	**7**	**3**	**126**	**40**	**18**	**12**	**4**	**50**	**14**	**48**	**509**	1,997
1:30 PM	**54**	**168**	**8**	**3**	**142**	**40**	**17**	**9**	**6**	**44**	**13**	**52**	**556**	2,031
1:45 PM	**50**	**158**	**13**	**4**	**104**	**33**	**15**	**10**	**5**	**48**	**14**	**46**	**500**	2,038
2:00 PM	**51**	**171**	**12**	**5**	**163**	**54**	**24**	**9**	**6**	**68**	**13**	**70**	**646**	**2,211**
Count Total	366	1,143	91	28	1,090	309	156	88	42	384	108	421	4,226	
Peak Hr	**201**	**638**	**40**	**15**	**535**	**167**	**74**	**40**	**21**	**210**	**54**	**216**	**2,211**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:15 PM	7	9	3	3	*22*	0	0	0	0	*0*	0	1	5	2	*8*
12:30 PM	7	8	0	3	*18*	0	0	0	0	*0*	0	2	2	0	*4*
12:45 PM	5	6	1	2	*14*	0	0	6	0	*6*	2	1	0	4	*7*
1:00 PM	5	2	2	4	*13*	0	0	0	0	*0*	4	0	0	4	*8*
1:15 PM	**2**	**9**	**1**	**0**	***12***	**0**	**0**	**0**	**0**	***0***	**3**	**0**	**1**	**0**	***4***
1:30 PM	**11**	**3**	**0**	**3**	***17***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**1**	***3***
1:45 PM	**5**	**10**	**0**	**4**	***19***	**0**	**0**	**0**	**1**	***1***	**4**	**2**	**1**	**1**	***8***
2:00 PM	**9**	**8**	**2**	**3**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**2**	***3***
Count Total	51	55	9	22	*137*	0	0	6	1	*7*	15	6	10	14	*45*
Peak Hr	**27**	**30**	**3**	**10**	***70***	**0**	**0**	**0**	**1**	***1***	**9**	**2**	**3**	**4**	***18***

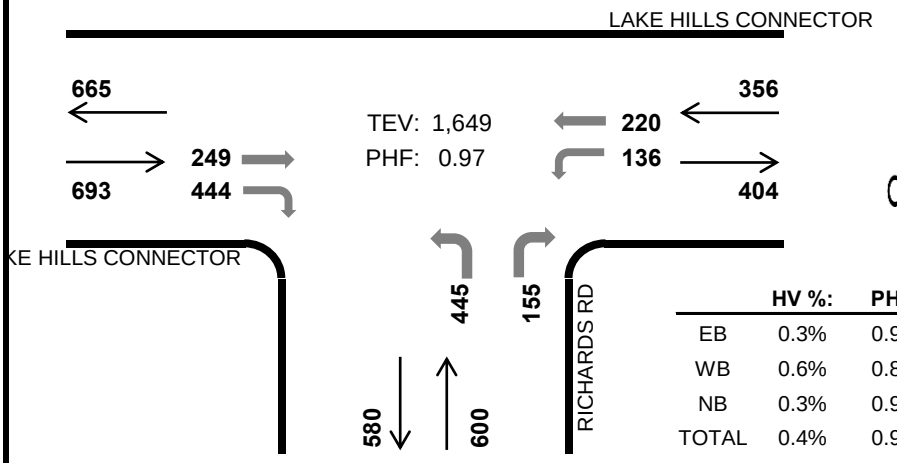
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

RICHARDS RD
LAKE HILLS CONNECTOR

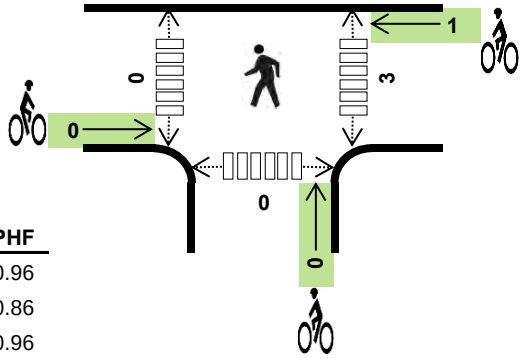
N

Peak Hour

Date: Sat, Dec 06, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:30 PM to 3:30 PM



	HV %:	PHF
EB	0.3%	0.96
WB	0.6%	0.86
NB	0.3%	0.96
TOTAL	0.4%	0.97



Two-Hour Count Summaries

Interval Start	LAKE HILLS CONNECTOR			LAKE HILLS CONNECTOR			RICHARDS RD			RICHARDS RD			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	0	57	91	23	50	0	132	0	28	0	0	0	381	
1:45 PM	0	48	111	23	63	0	119	0	30	0	0	0	394	
2:00 PM	0	57	123	25	46	0	111	0	40	0	0	0	402	
2:15 PM	0	54	89	18	60	0	129	0	27	0	0	0	377	1,554
2:30 PM	**0**	**62**	**110**	**26**	**57**	**0**	**107**	**0**	**39**	**0**	**0**	**0**	**401**	1,574
2:45 PM	**0**	**68**	**112**	**36**	**54**	**0**	**106**	**0**	**36**	**0**	**0**	**0**	**412**	1,592
3:00 PM	**0**	**58**	**117**	**36**	**44**	**0**	**111**	**0**	**46**	**0**	**0**	**0**	**412**	1,602
3:15 PM	**0**	**61**	**105**	**38**	**65**	**0**	**121**	**0**	**34**	**0**	**0**	**0**	**424**	**1,649**
Count Total	0	465	858	225	439	0	936	0	280	0	0	0	3,203	
Peak Hr	**0**	**249**	**444**	**136**	**220**	**0**	**445**	**0**	**155**	**0**	**0**	**0**	**1,649**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	0	1	1	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
1:45 PM	1	0	1	0	*2*	0	0	0	0	*0*	0	0	0	0	*0*
2:00 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	0	0	*0*
2:15 PM	0	0	0	0	*0*	0	0	0	0	*0*	1	0	0	0	*1*
2:30 PM	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:45 PM	**1**	**0**	**0**	**0**	***1***	**0**	**1**	**0**	**0**	***1***	**1**	**0**	**0**	**0**	***1***
3:00 PM	**0**	**1**	**1**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
3:15 PM	**1**	**0**	**1**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
Count Total	3	4	4	0	*11*	0	1	0	0	*1*	4	0	0	0	*4*
Peak Hr	**2**	**2**	**2**	**0**	***6***	**0**	**1**	**0**	**0**	***1***	**3**	**0**	**0**	**0**	***3***

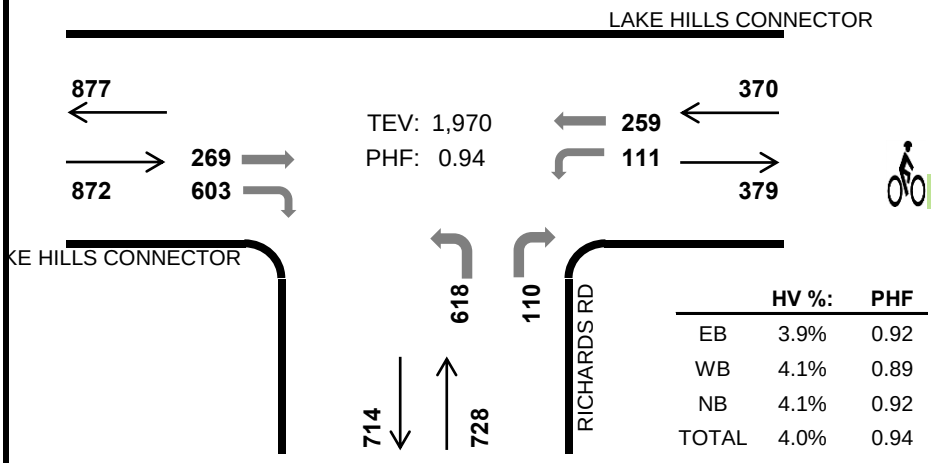
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

RICHARDS RD
LAKE HILLS CONNECTOR

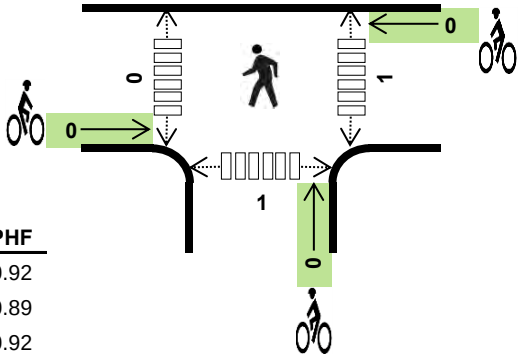
N

Peak Hour

Date: Tue, Nov 25, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 1:30 PM to 2:30 PM



	HV %:	PHF
EB	3.9%	0.92
WB	4.1%	0.89
NB	4.1%	0.92
TOTAL	4.0%	0.94



Two-Hour Count Summaries

Interval Start	LAKE HILLS CONNECTOR			LAKE HILLS CONNECTOR			RICHARDS RD			RICHARDS RD			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	0	43	137	16	75	0	136	0	41	0	0	0	448	
12:45 PM	0	58	136	27	57	0	130	0	22	0	0	0	430	
1:00 PM	0	49	152	25	55	0	131	0	31	0	0	0	443	
1:15 PM	0	72	170	33	37	0	135	0	29	0	0	0	476	1,797
1:30 PM	**0**	**52**	**167**	**30**	**64**	**0**	**138**	**0**	**33**	**0**	**0**	**0**	**484**	1,833
1:45 PM	**0**	**68**	**122**	**22**	**62**	**0**	**153**	**0**	**26**	**0**	**0**	**0**	**453**	1,856
2:00 PM	**0**	**64**	**162**	**29**	**59**	**0**	**173**	**0**	**24**	**0**	**0**	**0**	**511**	1,924
2:15 PM	**0**	**85**	**152**	**30**	**74**	**0**	**154**	**0**	**27**	**0**	**0**	**0**	**522**	**1,970**
Count Total	0	491	1,198	212	483	0	1,150	0	233	0	0	0	3,767	
Peak Hr	**0**	**269**	**603**	**111**	**259**	**0**	**618**	**0**	**110**	**0**	**0**	**0**	**1,970**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

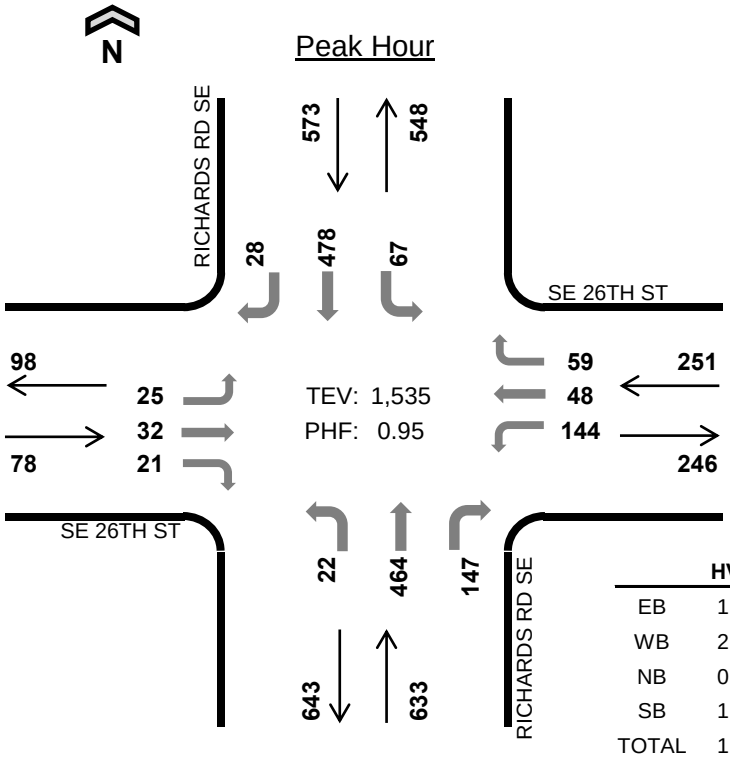
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	7	2	1	0	*10*	0	0	1	0	*1*	0	0	0	0	*0*
12:45 PM	8	3	6	0	*17*	0	0	0	0	*0*	1	0	0	0	*1*
1:00 PM	11	3	7	0	*21*	0	0	0	0	*0*	0	0	0	0	*0*
1:15 PM	10	4	6	0	*20*	0	0	0	0	*0*	0	0	0	0	*0*
1:30 PM	**13**	**3**	**6**	**0**	***22***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
1:45 PM	**7**	**4**	**7**	**0**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**8**	**3**	**7**	**0**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
2:15 PM	**6**	**5**	**10**	**0**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	70	27	50	0	*147*	0	0	1	0	*1*	2	0	0	1	*3*
Peak Hr	**34**	**15**	**30**	**0**	***79***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	***2***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

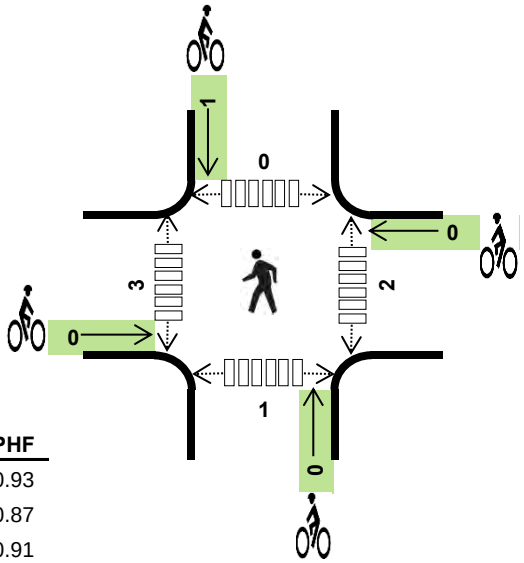
RICHARDS RD SE
SE 26TH ST

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:30 PM to 3:30 PM

Peak Hour



	HV %:	PHF
EB	1.3%	0.93
WB	2.4%	0.87
NB	0.9%	0.91
SB	1.2%	0.89
TOTAL	1.3%	0.95



Two-Hour Count Summaries

Interval Start	SE 26TH ST Eastbound			SE 26TH ST Westbound			RICHARDS RD SE Northbound			RICHARDS RD SE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	8	10	8	40	13	16	4	134	46	7	78	4	368	
1:45 PM	4	9	10	47	12	26	6	107	50	14	128	5	418	
2:00 PM	5	13	2	37	11	17	5	114	35	23	111	6	379	
2:15 PM	5	7	6	37	10	15	5	117	27	10	96	7	342	1,507
2:30 PM	**6**	**9**	**6**	**28**	**8**	**14**	**4**	**120**	**38**	**19**	**101**	**5**	**358**	1,497
2:45 PM	**8**	**8**	**4**	**36**	**15**	**19**	**4**	**106**	**31**	**14**	**137**	**10**	**392**	1,471
3:00 PM	**5**	**7**	**5**	**48**	**13**	**11**	**10**	**122**	**42**	**20**	**113**	**6**	**402**	1,494
3:15 PM	**6**	**8**	**6**	**32**	**12**	**15**	**4**	**116**	**36**	**14**	**127**	**7**	**383**	**1,535**
Count Total	47	71	47	305	94	133	42	936	305	121	891	50	3,042	
Peak Hr	**25**	**32**	**21**	**144**	**48**	**59**	**22**	**464**	**147**	**67**	**478**	**28**	**1,535**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	1	2	0	1	*4*	0	0	0	1	*1*	0	0	0	1	*1*
1:45 PM	0	3	1	0	*4*	0	0	0	0	*0*	1	0	0	0	*1*
2:00 PM	0	1	6	1	*8*	0	1	0	0	*1*	0	0	0	0	*0*
2:15 PM	1	3	3	1	*8*	0	0	0	0	*0*	0	1	0	0	*1*
2:30 PM	**1**	**1**	**2**	**1**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	***2***
2:45 PM	**0**	**4**	**0**	**2**	***6***	**0**	**0**	**0**	**1**	***1***	**0**	**1**	**0**	**1**	***2***
3:00 PM	**0**	**0**	**2**	**2**	***4***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
3:15 PM	**0**	**1**	**2**	**2**	***5***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
Count Total	3	15	16	10	*44*	0	1	0	2	*3*	3	4	0	2	*9*
Peak Hr	**1**	**6**	**6**	**7**	***20***	**0**	**0**	**0**	**1**	***1***	**2**	**3**	**0**	**1**	***6***

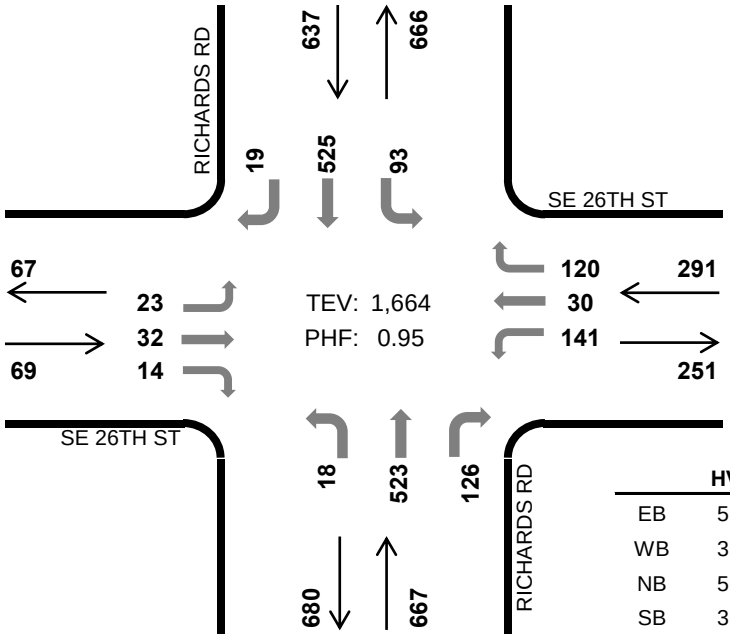
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

RICHARDS RD
SE 26TH ST

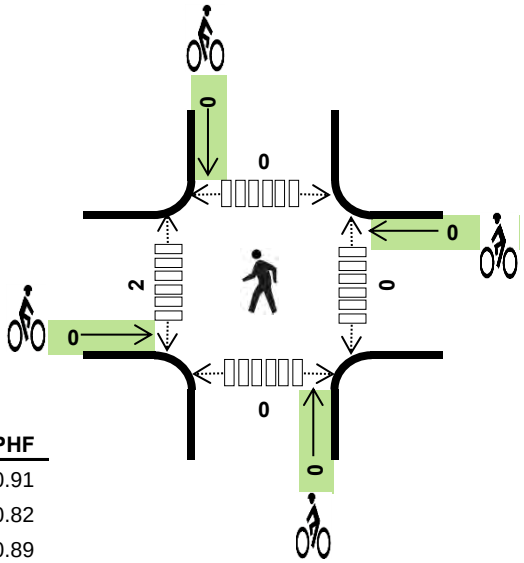
Date: Tue, Oct 07, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 1:00 PM to 2:00 PM

N

Peak Hour



	HV %:	PHF
EB	5.8%	0.91
WB	3.8%	0.82
NB	5.7%	0.89
SB	3.6%	0.94
TOTAL	4.6%	0.95



Two-Hour Count Summaries

Interval Start	SE 26TH ST Eastbound			SE 26TH ST Westbound			RICHARDS RD Northbound			RICHARDS RD Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	3	11	3	40	10	33	4	129	41	14	112	4	404	
12:45 PM	5	10	4	45	9	21	4	135	36	32	109	3	413	
1:00 PM	**8**	**8**	**3**	**40**	**6**	**29**	**5**	**122**	**37**	**21**	**121**	**4**	**404**	
1:15 PM	**5**	**9**	**4**	**24**	**9**	**24**	**5**	**109**	**30**	**23**	**142**	**4**	**388**	1,609
1:30 PM	**3**	**10**	**4**	**27**	**7**	**36**	**4**	**154**	**29**	**27**	**132**	**5**	**438**	1,643
1:45 PM	**7**	**5**	**3**	**50**	**8**	**31**	**4**	**138**	**30**	**22**	**130**	**6**	**434**	**1,664**
2:00 PM	4	6	2	29	6	31	6	116	29	18	127	5	379	1,639
2:15 PM	6	10	5	41	9	33	4	117	31	20	119	3	398	1,649
Count Total	41	69	28	296	64	238	36	1,020	263	177	992	34	3,258	
Peak Hr	**23**	**32**	**14**	**141**	**30**	**120**	**18**	**523**	**126**	**93**	**525**	**19**	**1,664**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

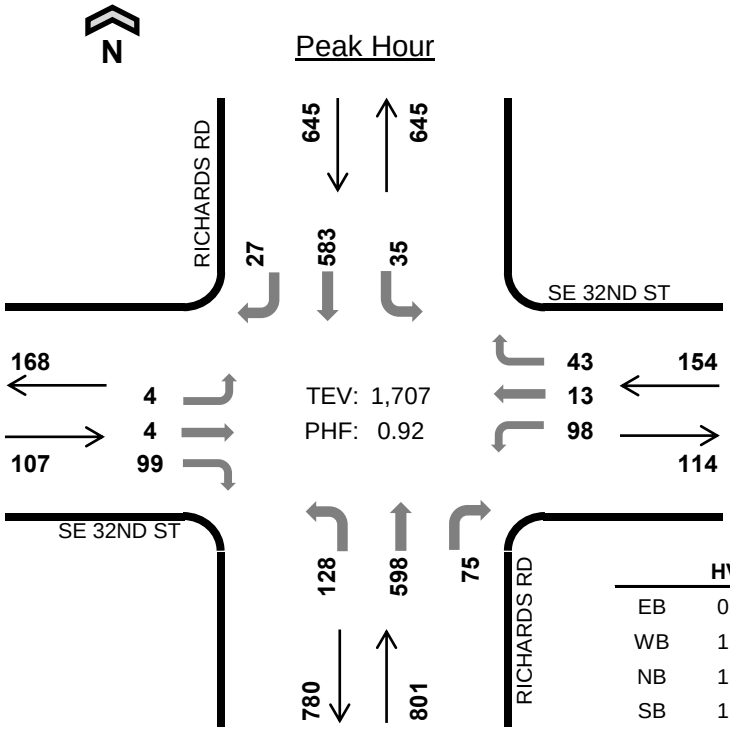
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	0	3	7	7	*17*	0	0	0	0	*0*	1	0	0	0	*1*
12:45 PM	1	1	8	5	*15*	0	0	0	0	*0*	0	2	0	0	*2*
1:00 PM	**1**	**2**	**8**	**8**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***
1:15 PM	**2**	**2**	**10**	**3**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***
1:30 PM	**1**	**3**	**10**	**8**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:45 PM	**0**	**4**	**10**	**4**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	1	3	5	6	*15*	0	0	0	0	*0*	0	0	0	0	*0*
2:15 PM	2	0	8	3	*13*	0	0	0	0	*0*	0	2	0	0	*2*
Count Total	8	18	66	44	*136*	0	0	0	0	*0*	1	6	0	0	*7*
Peak Hr	**4**	**11**	**38**	**23**	***76***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	***2***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

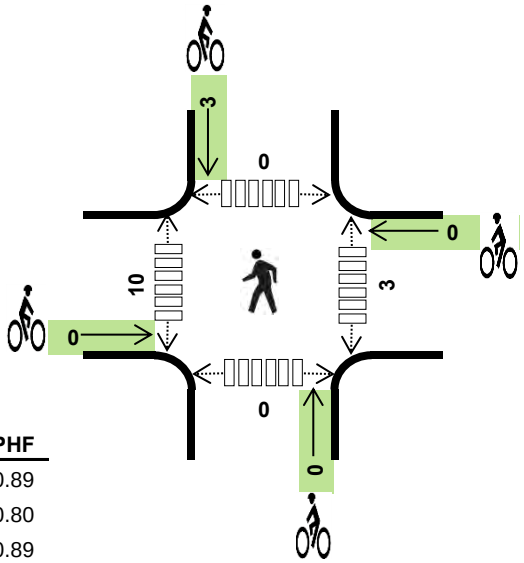
RICHARDS RD
SE 32ND ST

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:30 PM to 2:30 PM

Peak Hour



	HV %:	PHF
EB	0.9%	0.89
WB	1.3%	0.80
NB	1.4%	0.89
SB	1.2%	0.90
TOTAL	1.3%	0.92



Two-Hour Count Summaries

Interval Start	SE 32ND ST Eastbound			SE 32ND ST Westbound			RICHARDS RD Northbound			RICHARDS RD Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	**1**	**2**	**26**	**34**	**3**	**11**	**28**	**151**	**15**	**11**	**126**	**8**	**416**	
1:45 PM	**2**	**1**	**22**	**19**	**2**	**12**	**33**	**163**	**29**	**9**	**164**	**7**	**463**	
2:00 PM	**1**	**0**	**22**	**25**	**4**	**9**	**33**	**141**	**17**	**6**	**154**	**4**	**416**	
2:15 PM	**0**	**1**	**29**	**20**	**4**	**11**	**34**	**143**	**14**	**9**	**139**	**8**	**412**	**1,707**
2:30 PM	1	1	18	28	1	4	37	156	21	8	129	6	410	1,701
2:45 PM	2	2	18	3	2	17	30	131	14	7	144	7	377	1,615
3:00 PM	2	1	25	14	2	10	24	182	18	4	159	12	453	1,652
3:15 PM	2	0	27	18	0	14	20	138	24	6	152	8	409	1,649
Count Total	11	8	187	161	18	88	239	1,205	152	60	1,167	60	3,356	
Peak Hr	**4**	**4**	**99**	**98**	**13**	**43**	**128**	**598**	**75**	**35**	**583**	**27**	**1,707**	

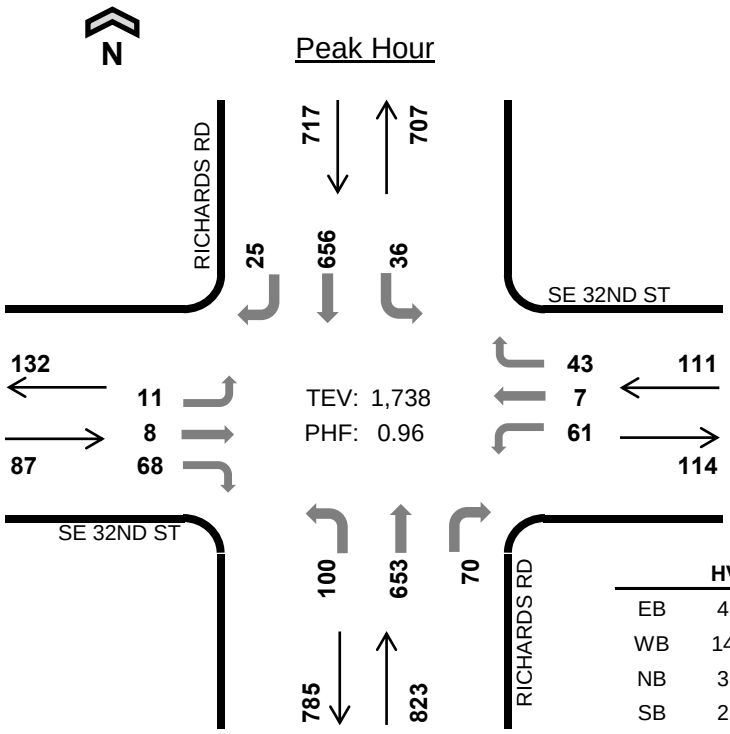
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

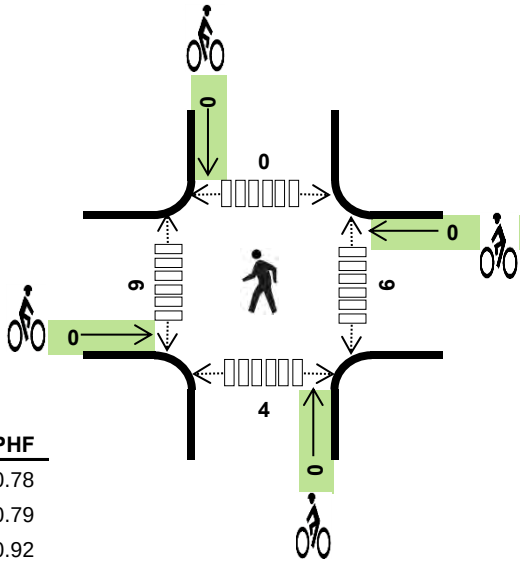
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	**0**	**1**	**0**	**1**	***2***	**0**	**0**	**0**	**1**	***1***	**0**	**2**	**0**	**0**	***2***
1:45 PM	**0**	**1**	**1**	**1**	***3***	**0**	**0**	**0**	**1**	***1***	**0**	**1**	**0**	**0**	***1***
2:00 PM	**0**	**0**	**5**	**2**	***7***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***
2:15 PM	**1**	**0**	**5**	**4**	***10***	**0**	**0**	**0**	**1**	***1***	**1**	**7**	**0**	**0**	***8***
2:30 PM	0	3	3	2	*8*	0	0	0	0	*0*	1	1	0	0	*2*
2:45 PM	2	1	1	3	*7*	0	0	0	0	*0*	0	0	0	0	*0*
3:00 PM	1	2	1	0	*4*	0	0	0	0	*0*	2	0	0	0	*2*
3:15 PM	0	1	2	1	*4*	0	0	0	0	*0*	5	2	2	0	*9*
Count Total	4	9	18	14	*45*	0	0	0	3	*3*	11	13	2	0	*26*
Peak Hr	**1**	**2**	**11**	**8**	***22***	**0**	**0**	**0**	**3**	***3***	**3**	**10**	**0**	**0**	***13***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

RICHARDS RD
SE 32ND ST

Date: Tue, Oct 07, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 1:00 PM to 2:00 PM





	HV %:	PHF
EB	4.6%	0.78
WB	14.4%	0.79
NB	3.9%	0.92
SB	2.9%	0.90
TOTAL	4.2%	0.96

Two-Hour Count Summaries

Interval Start	SE 32ND ST Eastbound			SE 32ND ST Westbound			RICHARDS RD Northbound			RICHARDS RD Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	6	2	18	20	2	11	18	153	23	10	140	9	412	
12:45 PM	2	2	15	16	5	11	27	169	18	5	154	12	436	
1:00 PM	**1**	**2**	**16**	**15**	**1**	**13**	**31**	**156**	**23**	**6**	**154**	**6**	**424**	
1:15 PM	**2**	**3**	**16**	**19**	**2**	**8**	**20**	**156**	**15**	**7**	**161**	**9**	**418**	1,690
1:30 PM	**6**	**2**	**20**	**9**	**3**	**6**	**32**	**175**	**16**	**12**	**157**	**6**	**444**	1,722
1:45 PM	**2**	**1**	**16**	**18**	**1**	**16**	**17**	**166**	**16**	**11**	**184**	**4**	**452**	**1,738**
2:00 PM	4	0	18	12	2	8	26	160	15	3	164	11	423	1,737
2:15 PM	4	0	19	15	1	5	15	154	17	8	165	14	417	1,736
Count Total	27	12	138	124	17	78	186	1,289	143	62	1,279	71	3,426	
Peak Hr	**11**	**8**	**68**	**61**	**7**	**43**	**100**	**653**	**70**	**36**	**656**	**25**	**1,738**	

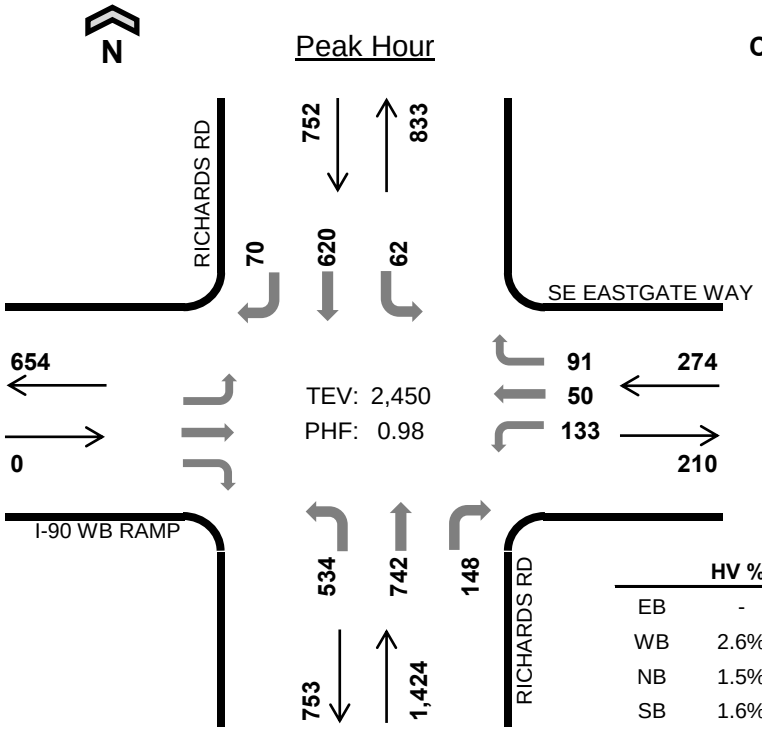
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	1	6	10	7	*24*	0	0	0	0	*0*	2	0	1	0	*3*
12:45 PM	1	5	11	4	*21*	0	0	0	0	*0*	8	2	0	0	*10*
1:00 PM	**0**	**4**	**13**	**5**	***22***	**0**	**0**	**0**	**0**	***0***	**1**	**2**	**0**	**0**	***3***
1:15 PM	**1**	**3**	**8**	**8**	***20***	**0**	**0**	**0**	**0**	***0***	**2**	**5**	**0**	**2**	***9***
1:30 PM	**2**	**3**	**4**	**5**	***14***	**0**	**0**	**0**	**0**	***0***	**3**	**2**	**0**	**2**	***7***
1:45 PM	**1**	**6**	**7**	**3**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	0	4	5	6	*15*	0	0	0	0	*0*	0	0	0	0	*0*
2:15 PM	1	2	11	2	*16*	0	0	0	0	*0*	1	0	0	0	*1*
Count Total	7	33	69	40	*149*	0	0	0	0	*0*	17	11	1	4	*33*
Peak Hr	**4**	**16**	**32**	**21**	***73***	**0**	**0**	**0**	**0**	***0***	**6**	**9**	**0**	**4**	***19***

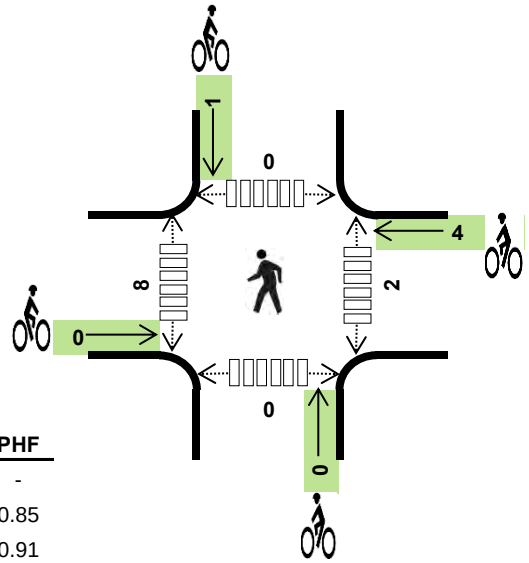
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

RICHARDS RD
SE EASTGATE WAY

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:45 PM to 2:45 PM



	HV %:	PHF
EB	-	-
WB	2.6%	0.85
NB	1.5%	0.91
SB	1.6%	0.89
TOTAL	1.6%	0.98



Two-Hour Count Summaries

Interval Start	I-90 WB RAMP			SE EASTGATE WAY			RICHARDS RD			RICHARDS RD			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	0	0	0	27	7	24	127	189	32	11	149	14	580	
1:45 PM	**0**	**0**	**0**	**37**	**12**	**32**	**116**	**187**	**32**	**19**	**175**	**18**	**628**	
2:00 PM	**0**	**0**	**0**	**26**	**13**	**18**	**160**	**189**	**41**	**16**	**142**	**20**	**625**	
2:15 PM	**0**	**0**	**0**	**35**	**12**	**17**	**125**	**170**	**39**	**16**	**155**	**17**	**586**	2,419
2:30 PM	**0**	**0**	**0**	**35**	**13**	**24**	**133**	**196**	**36**	**11**	**148**	**15**	**611**	**2,450**
2:45 PM	0	0	0	46	6	18	141	145	45	23	124	14	562	2,384
3:00 PM	0	0	0	38	9	30	129	209	24	14	168	14	635	2,394
3:15 PM	0	0	0	48	7	23	117	163	25	15	176	9	583	2,391
Count Total	0	0	0	292	79	186	1,048	1,448	274	125	1,237	121	4,810	
Peak Hr	**0**	**0**	**0**	**133**	**50**	**91**	**534**	**742**	**148**	**62**	**620**	**70**	**2,450**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

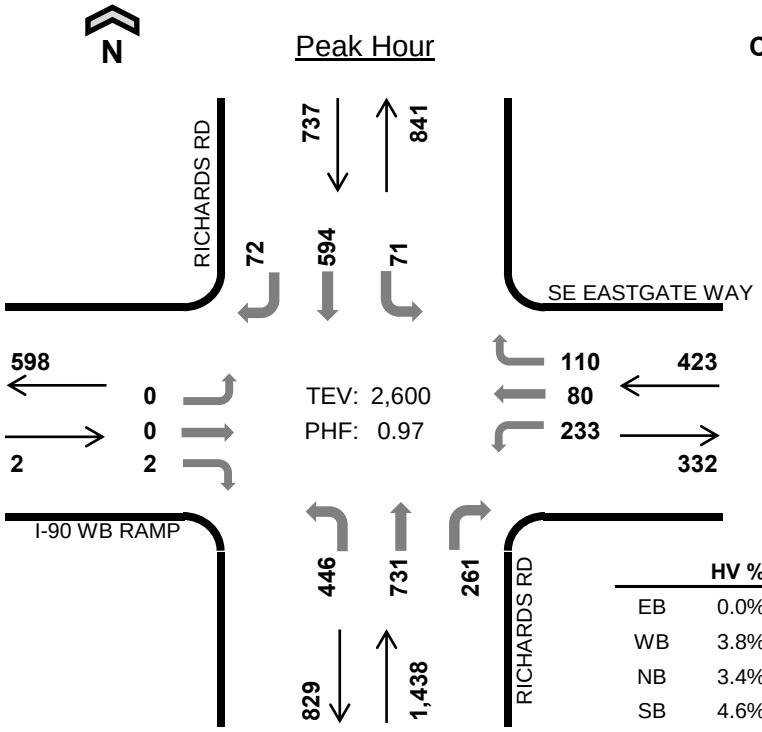
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	0	1	0	4	*5*	0	0	0	0	*0*	0	3	1	0	*4*
1:45 PM	**0**	**1**	**5**	**2**	***8***	**0**	**0**	**0**	**1**	***1***	**0**	**2**	**0**	**0**	***2***
2:00 PM	**0**	**1**	**5**	**2**	***8***	**0**	**4**	**0**	**0**	***4***	**1**	**2**	**0**	**0**	***3***
2:15 PM	**0**	**1**	**8**	**5**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**4**	**0**	**0**	***4***
2:30 PM	**0**	**4**	**3**	**3**	***10***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
2:45 PM	0	2	4	2	*8*	0	1	1	0	*2*	0	0	0	0	*0*
3:00 PM	0	0	6	2	*8*	0	0	0	0	*0*	4	0	0	0	*4*
3:15 PM	0	4	3	3	*10*	0	0	0	0	*0*	0	2	0	1	*3*
Count Total	0	14	34	23	*71*	0	5	1	1	*7*	6	13	1	1	*21*
Peak Hr	**0**	**7**	**21**	**12**	***40***	**0**	**4**	**0**	**1**	***5***	**2**	**8**	**0**	**0**	***10***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

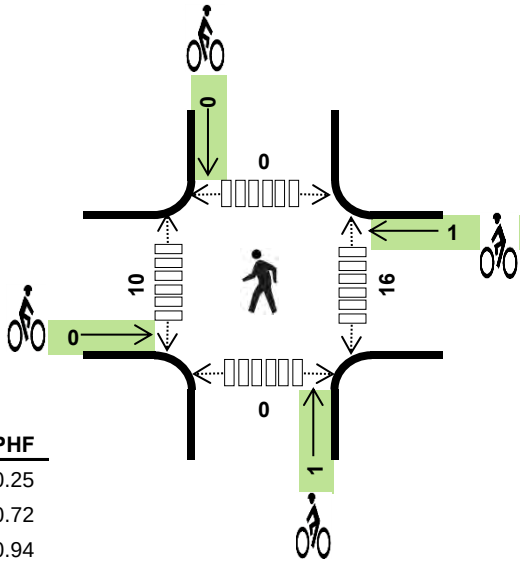
RICHARDS RD
SE EASTGATE WAY

Date: Tue, Oct 07, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 12:30 PM to 1:30 PM

Peak Hour



	HV %:	PHF
EB	0.0%	0.25
WB	3.8%	0.72
NB	3.4%	0.94
SB	4.6%	0.94
TOTAL	3.8%	0.97



Two-Hour Count Summaries

Interval Start	I-90 WB RAMP			SE EASTGATE WAY			RICHARDS RD			RICHARDS RD			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	**0**	**0**	**2**	**86**	**29**	**31**	**112**	**176**	**57**	**12**	**151**	**14**	**670**	
12:45 PM	**0**	**0**	**0**	**56**	**19**	**25**	**109**	**199**	**74**	**26**	**122**	**24**	**654**	
1:00 PM	**0**	**0**	**0**	**41**	**9**	**24**	**112**	**188**	**72**	**17**	**150**	**26**	**639**	
1:15 PM	**0**	**0**	**0**	**50**	**23**	**30**	**113**	**168**	**58**	**16**	**171**	**8**	**637**	**2,600**
1:30 PM	0	0	0	38	17	29	92	184	60	18	165	9	612	2,542
1:45 PM	0	0	0	37	16	24	122	175	59	22	188	14	657	2,545
2:00 PM	0	0	0	82	24	25	121	173	50	10	152	20	657	2,563
2:15 PM	0	0	0	42	14	18	111	157	47	14	167	19	589	2,515
Count Total	0	0	2	432	151	206	892	1,420	477	135	1,266	134	5,115	
Peak Hr	**0**	**0**	**2**	**233**	**80**	**110**	**446**	**731**	**261**	**71**	**594**	**72**	**2,600**	

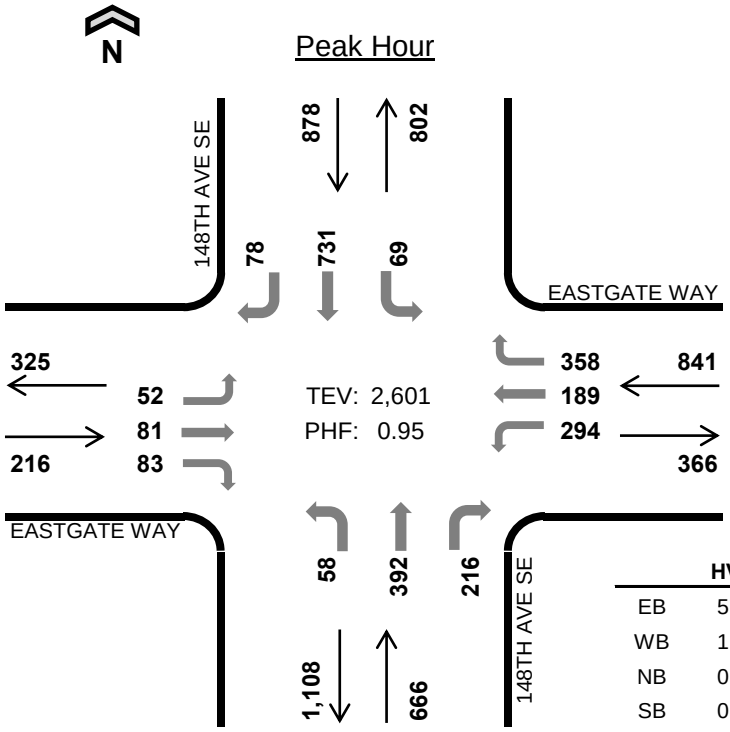
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	**0**	**6**	**11**	**10**	***27***	**0**	**0**	**0**	**0**	***0***	**4**	**3**	**0**	**0**	***7***
12:45 PM	**0**	**1**	**14**	**10**	***25***	**0**	**0**	**0**	**0**	***0***	**6**	**3**	**0**	**0**	***9***
1:00 PM	**0**	**4**	**16**	**4**	***24***	**0**	**0**	**1**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
1:15 PM	**0**	**5**	**8**	**10**	***23***	**0**	**1**	**0**	**0**	***1***	**6**	**4**	**0**	**0**	***10***
1:30 PM	0	2	5	4	*11*	0	0	1	0	*1*	0	1	0	0	*1*
1:45 PM	0	4	12	4	*20*	0	0	0	0	*0*	0	0	0	0	*0*
2:00 PM	0	4	12	8	*24*	0	0	0	0	*0*	0	2	0	0	*2*
2:15 PM	0	3	15	6	*24*	0	0	0	0	*0*	0	3	0	0	*3*
Count Total	0	29	93	56	*178*	0	1	2	0	*3*	16	16	0	0	*32*
Peak Hr	**0**	**16**	**49**	**34**	***99***	**0**	**1**	**1**	**0**	***2***	**16**	**10**	**0**	**0**	***26***

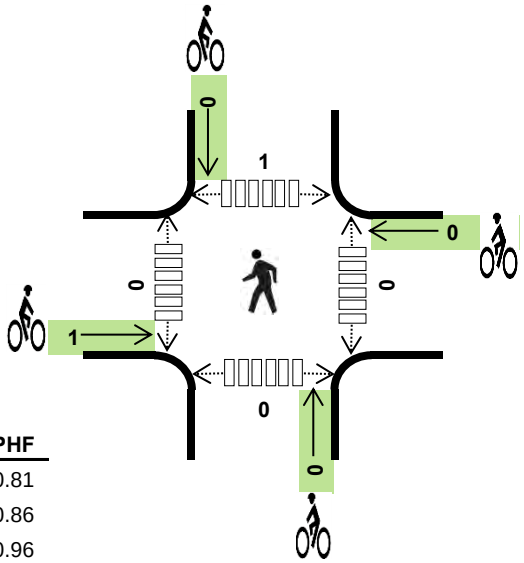
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

148TH AVE SE
EASTGATE WAY

Date: Sat, Oct 11, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:30 PM to 2:30 PM



	HV %:	PHF
EB	5.1%	0.81
WB	1.0%	0.86
NB	0.3%	0.96
SB	0.3%	0.91
TOTAL	0.9%	0.95



Two-Hour Count Summaries

Interval Start	EASTGATE WAY Eastbound			EASTGATE WAY Westbound			148TH AVE SE Northbound			148TH AVE SE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	**16**	**23**	**28**	**91**	**40**	**113**	**19**	**94**	**57**	**21**	**164**	**20**	**686**	
1:45 PM	**16**	**22**	**14**	**64**	**52**	**93**	**14**	**107**	**49**	**13**	**169**	**16**	**629**	
2:00 PM	**11**	**20**	**21**	**82**	**54**	**74**	**15**	**97**	**61**	**18**	**193**	**22**	**668**	
2:15 PM	**9**	**16**	**20**	**57**	**43**	**78**	**10**	**94**	**49**	**17**	**205**	**20**	**618**	**2,601**
2:30 PM	16	16	23	62	20	67	10	76	53	17	180	22	562	2,477
2:45 PM	21	20	28	52	42	88	8	70	56	52	198	76	711	2,559
3:00 PM	14	21	15	52	37	86	17	79	51	34	193	48	647	2,538
3:15 PM	14	14	21	57	44	72	13	85	49	12	166	18	565	2,485
Count Total	117	152	170	517	332	671	106	702	425	184	1,468	242	5,086	
Peak Hr	**52**	**81**	**83**	**294**	**189**	**358**	**58**	**392**	**216**	**69**	**731**	**78**	**2,601**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	**3**	**1**	**0**	**0**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
1:45 PM	**5**	**3**	**1**	**2**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**2**	**3**	**0**	**1**	***6***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:15 PM	**1**	**1**	**1**	**0**	***3***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
2:30 PM	3	0	1	2	*6*	0	0	0	0	*0*	0	0	0	0	*0*
2:45 PM	4	0	2	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
3:00 PM	2	1	1	1	*5*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	3	2	2	1	*8*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	23	11	8	7	*49*	1	0	0	0	*1*	0	0	1	0	*1*
Peak Hr	**11**	**8**	**2**	**3**	***24***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**1**	**0**	***1***

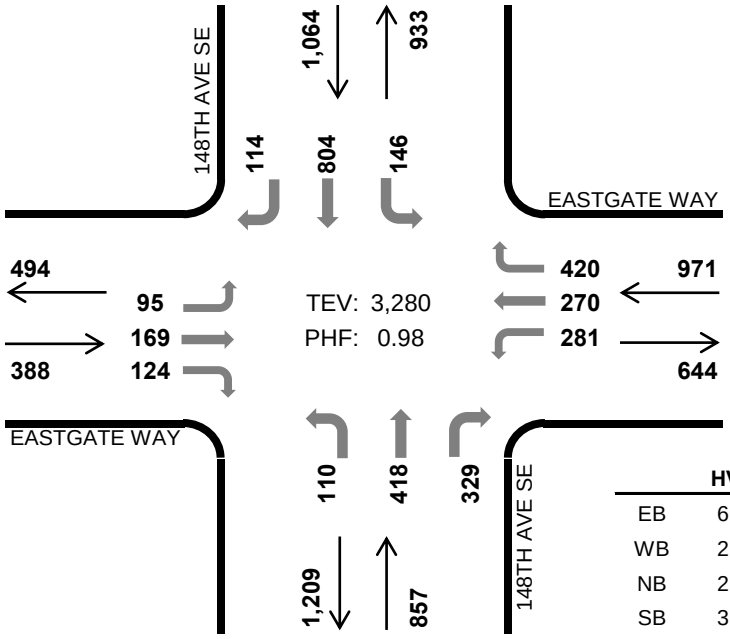
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

148TH AVE SE
EASTGATE WAY

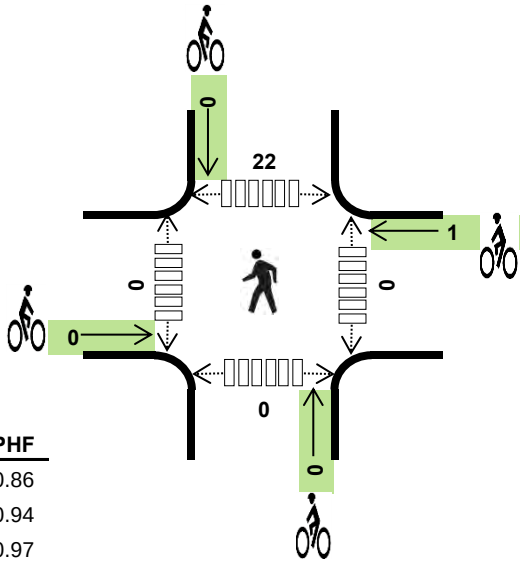
Date: Tue, Oct 07, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 12:30 PM to 1:30 PM

N

Peak Hour



	HV %:	PHF
EB	6.7%	0.86
WB	2.3%	0.94
NB	2.1%	0.97
SB	3.0%	0.90
TOTAL	3.0%	0.98



Two-Hour Count Summaries

Interval Start	EASTGATE WAY Eastbound			EASTGATE WAY Westbound			148TH AVE SE Northbound			148TH AVE SE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	**34**	**45**	**34**	**62**	**75**	**91**	**27**	**95**	**83**	**41**	**223**	**31**	**841**	
12:45 PM	**19**	**33**	**31**	**79**	**61**	**104**	**32**	**111**	**74**	**39**	**170**	**23**	**776**	
1:00 PM	**26**	**48**	**28**	**63**	**74**	**122**	**27**	**98**	**97**	**34**	**187**	**25**	**829**	
1:15 PM	**16**	**43**	**31**	**77**	**60**	**103**	**24**	**114**	**75**	**32**	**224**	**35**	**834**	**3,280**
1:30 PM	21	35	26	70	41	67	26	95	86	38	232	25	762	3,201
1:45 PM	19	44	26	69	47	90	22	94	83	14	146	30	684	3,109
2:00 PM	32	32	40	60	59	77	21	91	64	25	205	26	732	3,012
2:15 PM	23	31	25	74	48	95	24	114	77	20	189	22	742	2,920
Count Total	190	311	241	554	465	749	203	812	639	243	1,576	217	6,200	
Peak Hr	**95**	**169**	**124**	**281**	**270**	**420**	**110**	**418**	**329**	**146**	**804**	**114**	**3,280**	

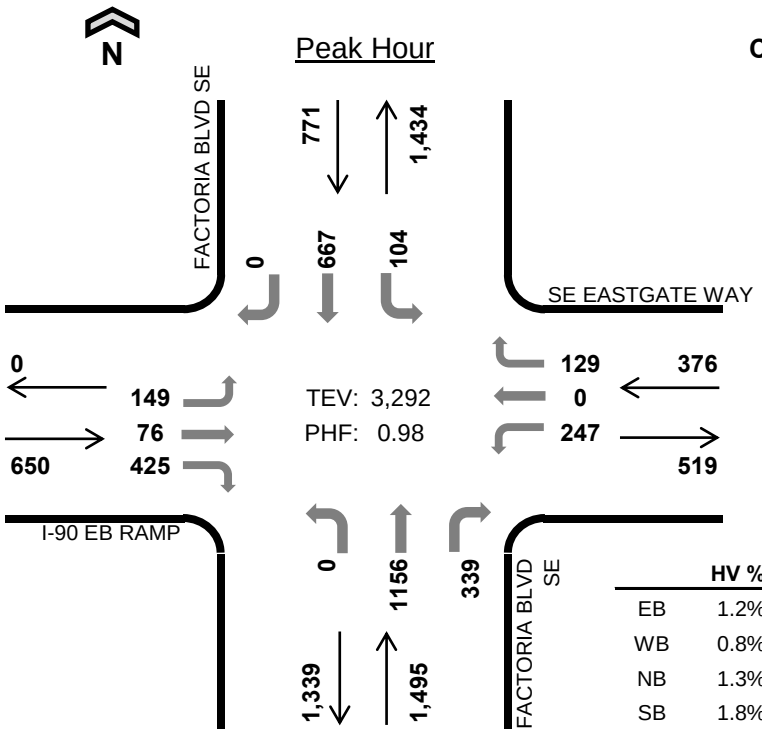
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	**6**	**7**	**2**	**6**	***21***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**7**	**0**	***7***
12:45 PM	**8**	**2**	**3**	**9**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**3**	**0**	***3***
1:00 PM	**4**	**7**	**3**	**8**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**5**	**0**	***5***
1:15 PM	**8**	**6**	**10**	**9**	***33***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**7**	**0**	***7***
1:30 PM	6	3	4	8	*21*	0	2	0	0	*2*	0	0	5	0	*5*
1:45 PM	6	4	1	8	*19*	0	0	0	0	*0*	0	0	7	0	*7*
2:00 PM	4	6	6	7	*23*	0	0	0	0	*0*	0	0	3	0	*3*
2:15 PM	7	5	8	5	*25*	0	0	0	0	*0*	0	0	3	0	*3*
Count Total	49	40	37	60	*186*	0	3	0	0	*3*	0	0	40	0	*40*
Peak Hr	**26**	**22**	**18**	**32**	***98***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**22**	**0**	***22***

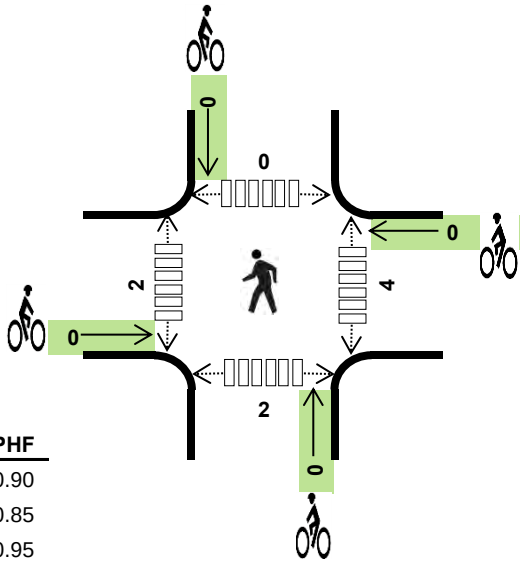
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

FACTORIA BLVD SE
SE EASTGATE WAY

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:45 PM to 2:45 PM



	HV %:	PHF
EB	1.2%	0.90
WB	0.8%	0.85
NB	1.3%	0.95
SB	1.8%	0.94
TOTAL	1.3%	0.98



Two-Hour Count Summaries

Interval Start	I-90 EB RAMP			SE EASTGATE WAY			FACTORIA BLVD SE			FACTORIA BLVD SE			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	37	24	87	68	0	34	0	274	98	29	163	0	814	
1:45 PM	**41**	**19**	**117**	**63**	**0**	**34**	**0**	**267**	**87**	**26**	**178**	**0**	**832**	
2:00 PM	**41**	**14**	**89**	**58**	**0**	**27**	**0**	**311**	**81**	**29**	**144**	**0**	**794**	
2:15 PM	**25**	**17**	**107**	**76**	**0**	**34**	**0**	**295**	**83**	**32**	**170**	**0**	**839**	3,279
2:30 PM	**42**	**26**	**112**	**50**	**0**	**34**	**0**	**283**	**88**	**17**	**175**	**0**	**827**	**3,292**
2:45 PM	37	23	105	75	0	41	0	237	79	25	171	0	793	3,253
3:00 PM	31	20	102	65	0	37	0	278	84	17	178	0	812	3,271
3:15 PM	30	10	104	60	0	34	0	250	92	23	218	0	821	3,253
Count Total	284	153	823	515	0	275	0	2,195	692	198	1,397	0	6,532	
Peak Hr	**149**	**76**	**425**	**247**	**0**	**129**	**0**	**1,156**	**339**	**104**	**667**	**0**	**3,292**	

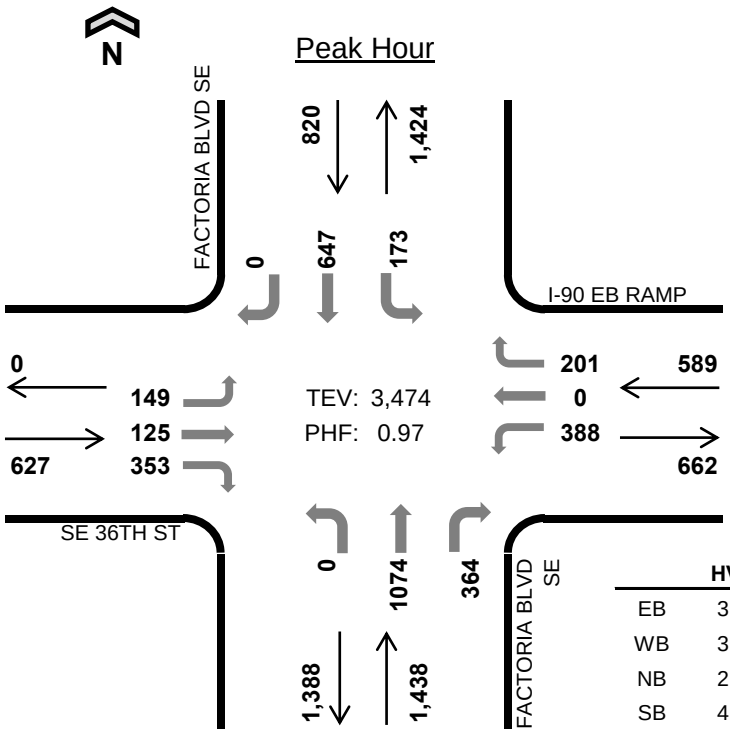
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	2	2	0	2	*6*	0	0	0	0	*0*	0	0	0	0	*0*
1:45 PM	**3**	**1**	**6**	**4**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**4**	**2**	**3**	**3**	***12***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**2**	***4***
2:15 PM	**0**	**0**	**7**	**4**	***11***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***
2:30 PM	**1**	**0**	**3**	**3**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	***2***
2:45 PM	1	1	1	5	*8*	0	0	0	0	*0*	0	3	0	1	*4*
3:00 PM	3	2	2	1	*8*	0	0	0	0	*0*	2	1	0	0	*3*
3:15 PM	1	1	4	3	*9*	0	0	0	0	*0*	1	1	0	0	*2*
Count Total	15	9	26	25	*75*	0	0	0	0	*0*	7	7	0	3	*17*
Peak Hr	**8**	**3**	**19**	**14**	***44***	**0**	**0**	**0**	**0**	***0***	**4**	**2**	**0**	**2**	***8***

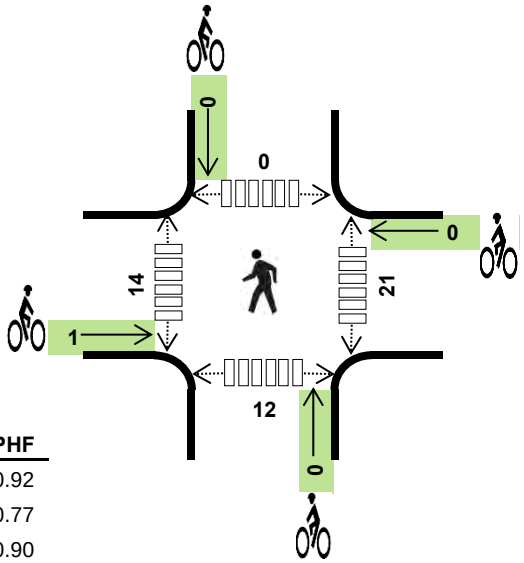
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

FACTORIA BLVD SE
I-90 EB RAMP

Date: Tue, Oct 07, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 12:30 PM to 1:30 PM



	HV %:	PHF
EB	3.5%	0.92
WB	3.2%	0.77
NB	2.6%	0.90
SB	4.1%	0.94
TOTAL	3.2%	0.97



Two-Hour Count Summaries

Interval Start	SE 36TH ST			I-90 EB RAMP			FACTORIA BLVD SE			FACTORIA BLVD SE			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	**44**	**35**	**91**	**137**	**0**	**54**	**0**	**234**	**75**	**34**	**178**	**0**	**882**	
12:45 PM	**33**	**28**	**91**	**103**	**0**	**52**	**0**	**304**	**97**	**44**	**147**	**0**	**899**	
1:00 PM	**40**	**30**	**84**	**79**	**0**	**47**	**0**	**272**	**106**	**47**	**152**	**0**	**857**	
1:15 PM	**32**	**32**	**87**	**69**	**0**	**48**	**0**	**264**	**86**	**48**	**170**	**0**	**836**	**3,474**
1:30 PM	33	31	64	68	0	52	0	269	88	34	166	0	805	3,397
1:45 PM	49	40	79	72	0	51	0	245	78	49	179	0	842	3,340
2:00 PM	34	22	79	67	0	66	0	262	88	31	161	0	810	3,293
2:15 PM	36	35	104	61	0	50	0	260	80	48	170	0	844	3,301
Count Total	301	253	679	656	0	420	0	2,110	698	335	1,323	0	6,775	
Peak Hr	**149**	**125**	**353**	**388**	**0**	**201**	**0**	**1,074**	**364**	**173**	**647**	**0**	**3,474**	

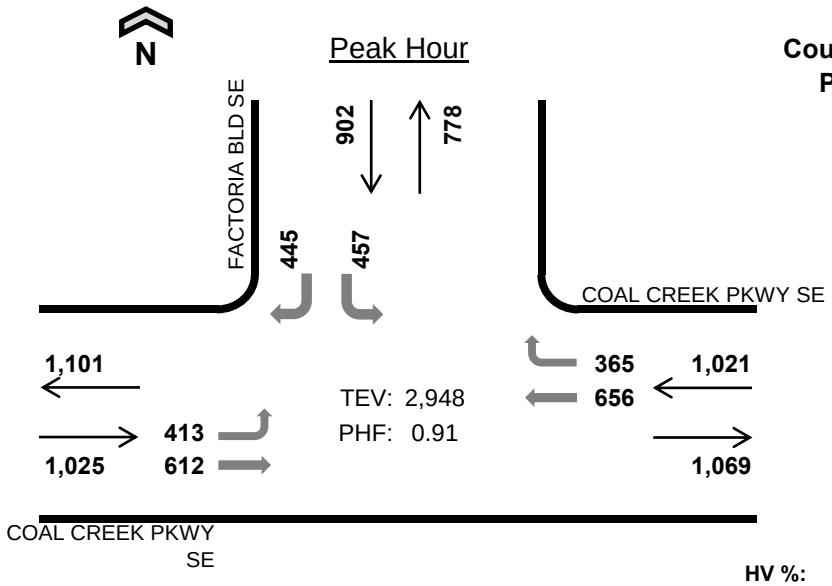
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

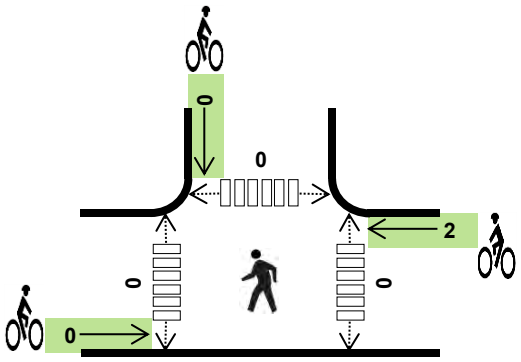
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	**12**	**7**	**9**	**13**	***41***	**1**	**0**	**0**	**0**	***1***	**10**	**0**	**0**	**4**	***14***
12:45 PM	**6**	**4**	**10**	**10**	***30***	**0**	**0**	**0**	**0**	***0***	**6**	**6**	**0**	**3**	***15***
1:00 PM	**3**	**5**	**9**	**4**	***21***	**0**	**0**	**0**	**0**	***0***	**1**	**2**	**0**	**1**	***4***
1:15 PM	**1**	**3**	**9**	**7**	***20***	**0**	**0**	**0**	**0**	***0***	**4**	**6**	**0**	**4**	***14***
1:30 PM	5	2	5	3	*15*	2	1	0	0	*3*	0	1	0	0	*1*
1:45 PM	3	5	7	3	*18*	0	0	0	0	*0*	0	0	0	1	*1*
2:00 PM	6	2	7	4	*19*	0	0	0	0	*0*	0	5	0	1	*6*
2:15 PM	5	3	8	6	*22*	0	0	0	0	*0*	0	4	0	1	*5*
Count Total	41	31	64	50	*186*	3	1	0	0	*4*	21	24	0	15	*60*
Peak Hr	**22**	**19**	**37**	**34**	***112***	**1**	**0**	**0**	**0**	***1***	**21**	**14**	**0**	**12**	***47***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

FACTORIA BLD SE
COAL CREEK PKWY SE

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:00 PM to 3:00 PM





	HV %:	PHF
EB	1.0%	0.87
WB	0.7%	0.99
SB	1.6%	0.82
TOTAL	1.1%	0.91

Two-Hour Count Summaries

Interval Start	COAL CREEK PKWY SE Eastbound			COAL CREEK PKWY SE Westbound			FACTORIA BLD SE Northbound			FACTORIA BLD SE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	104	168	0	0	139	93	0	0	0	103	0	99	706	
1:45 PM	92	160	0	0	170	81	0	0	0	102	0	98	703	
2:00 PM	**113**	**164**	**0**	**0**	**165**	**92**	**0**	**0**	**0**	**136**	**0**	**140**	**810**	
2:15 PM	**88**	**144**	**0**	**0**	**158**	**90**	**0**	**0**	**0**	**115**	**0**	**98**	**693**	2,912
2:30 PM	**78**	**142**	**0**	**0**	**167**	**90**	**0**	**0**	**0**	**89**	**0**	**97**	**663**	2,869
2:45 PM	**134**	**162**	**0**	**0**	**166**	**93**	**0**	**0**	**0**	**117**	**0**	**110**	**782**	**2,948**
3:00 PM	88	155	0	0	142	80	0	0	0	99	0	112	676	2,814
3:15 PM	81	178	0	0	170	83	0	0	0	125	0	89	726	2,847
Count Total	778	1,273	0	0	1,277	702	0	0	0	886	0	843	5,759	
Peak Hr	**413**	**612**	**0**	**0**	**656**	**365**	**0**	**0**	**0**	**457**	**0**	**445**	**2,948**	

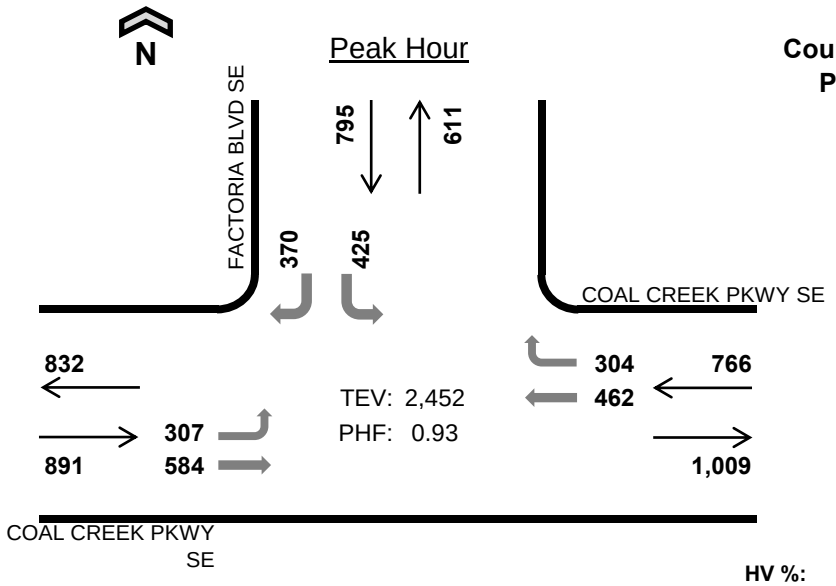
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

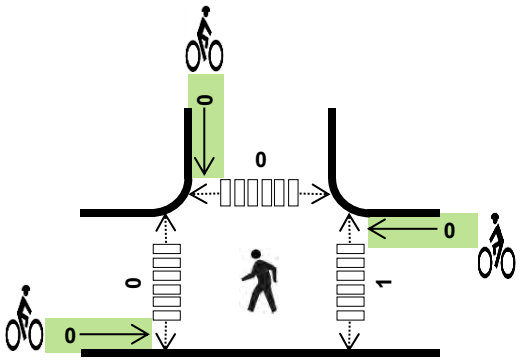
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	5	3	0	2	*10*	0	0	0	1	*1*	0	0	0	0	*0*
1:45 PM	2	1	0	6	*9*	0	0	0	0	*0*	0	0	0	0	*0*
2:00 PM	**6**	**1**	**0**	**1**	***8***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:15 PM	**2**	**2**	**0**	**3**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:30 PM	**2**	**2**	**0**	**5**	***9***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
2:45 PM	**0**	**2**	**0**	**5**	***7***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***
3:00 PM	1	5	0	0	*6*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	1	0	0	3	*4*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	19	16	0	25	*60*	0	2	0	1	*3*	0	0	0	0	*0*
Peak Hr	**10**	**7**	**0**	**14**	***31***	**0**	**2**	**0**	**0**	***2***	**0**	**0**	**0**	**0**	***0***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

FACTORIA BLVD SE
COAL CREEK PKWY SE

Date: Tue, Oct 07, 2014
Count Period: 12:30 PM to 2:30 PM
Peak Hour: 1:30 PM to 2:30 PM





	HV %:	PHF
EB	3.3%	0.92
WB	3.5%	0.84
SB	3.1%	0.96
TOTAL	3.3%	0.93

Two-Hour Count Summaries

Interval Start	COAL CREEK PKWY SE Eastbound			COAL CREEK PKWY SE Westbound			FACTORIA BLVD SE Northbound			FACTORIA BLVD SE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:30 PM	102	115	0	0	151	58	0	0	0	110	0	96	632	
12:45 PM	85	106	0	0	120	79	0	0	0	72	0	82	544	
1:00 PM	94	97	0	0	95	71	0	0	0	110	0	63	530	
1:15 PM	82	127	0	0	119	70	0	0	0	113	0	78	589	2,295
1:30 PM	**78**	**140**	**0**	**0**	**111**	**66**	**0**	**0**	**0**	**114**	**0**	**77**	**586**	2,249
1:45 PM	**72**	**128**	**0**	**0**	**101**	**62**	**0**	**0**	**0**	**102**	**0**	**102**	**567**	2,272
2:00 PM	**76**	**154**	**0**	**0**	**114**	**85**	**0**	**0**	**0**	**113**	**0**	**95**	**637**	2,379
2:15 PM	**81**	**162**	**0**	**0**	**136**	**91**	**0**	**0**	**0**	**96**	**0**	**96**	**662**	**2,452**
Count Total	670	1,029	0	0	947	582	0	0	0	830	0	689	4,747	
Peak Hr	**307**	**584**	**0**	**0**	**462**	**304**	**0**	**0**	**0**	**425**	**0**	**370**	**2,452**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

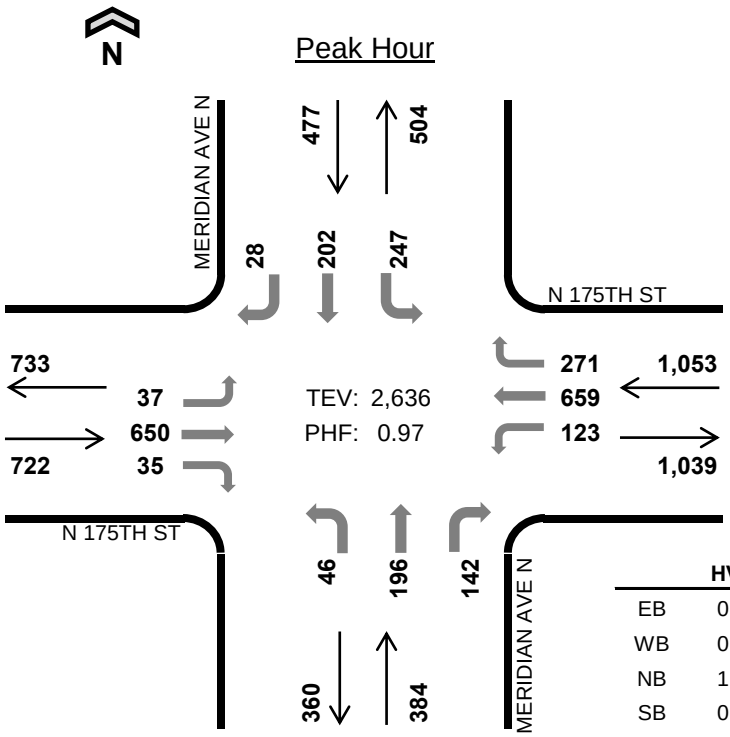
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:30 PM	7	8	0	6	*21*	1	0	0	0	*1*	0	0	0	0	*0*
12:45 PM	7	3	0	4	*14*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	13	7	0	4	*24*	0	0	0	0	*0*	0	0	1	0	*1*
1:15 PM	6	7	0	7	*20*	0	0	0	0	*0*	0	0	0	0	*0*
1:30 PM	**5**	**8**	**0**	**5**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:45 PM	**9**	**7**	**0**	**8**	***24***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**7**	**8**	**0**	**6**	***21***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
2:15 PM	**8**	**4**	**0**	**6**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	62	52	0	46	*160*	1	0	0	0	*1*	1	0	1	0	*2*
Peak Hr	**29**	**27**	**0**	**25**	***81***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

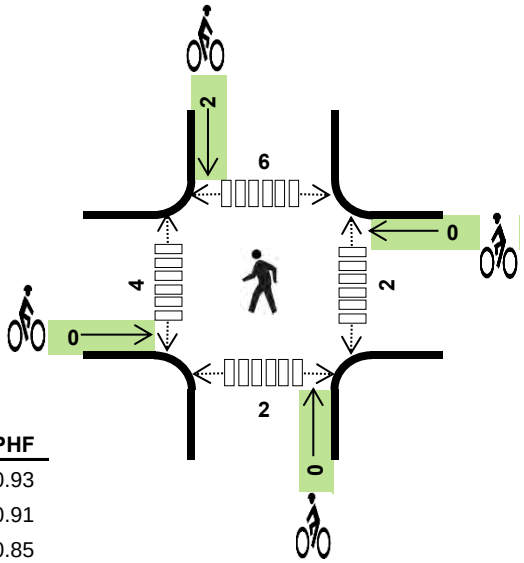
MERIDIAN AVE N
N 175TH ST

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:15 PM to 3:15 PM

Peak Hour



	HV %:	PHF
EB	0.6%	0.93
WB	0.9%	0.91
NB	1.6%	0.85
SB	0.8%	0.94
TOTAL	0.9%	0.97



Two-Hour Count Summaries

Interval Start	N 175TH ST Eastbound			N 175TH ST Westbound			MERIDIAN AVE N Northbound			MERIDIAN AVE N Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	9	184	13	33	162	56	18	25	20	77	42	5	644	
1:45 PM	7	150	6	31	150	62	6	40	36	80	45	14	627	
2:00 PM	8	166	12	30	197	55	6	27	34	44	35	9	623	
2:15 PM	**6**	**179**	**7**	**32**	**162**	**59**	**8**	**49**	**38**	**74**	**45**	**8**	**667**	2,561
2:30 PM	**15**	**170**	**9**	**30**	**167**	**73**	**12**	**42**	**27**	**43**	**52**	**8**	**648**	2,565
2:45 PM	**8**	**157**	**10**	**33**	**169**	**87**	**13**	**49**	**33**	**61**	**56**	**6**	**682**	2,620
3:00 PM	**8**	**144**	**9**	**28**	**161**	**52**	**13**	**56**	**44**	**69**	**49**	**6**	**639**	**2,636**
3:15 PM	8	164	16	32	170	64	8	47	30	50	46	4	639	2,608
Count Total	69	1,314	82	249	1,338	508	84	335	262	498	370	60	5,169	
Peak Hr	**37**	**650**	**35**	**123**	**659**	**271**	**46**	**196**	**142**	**247**	**202**	**28**	**2,636**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

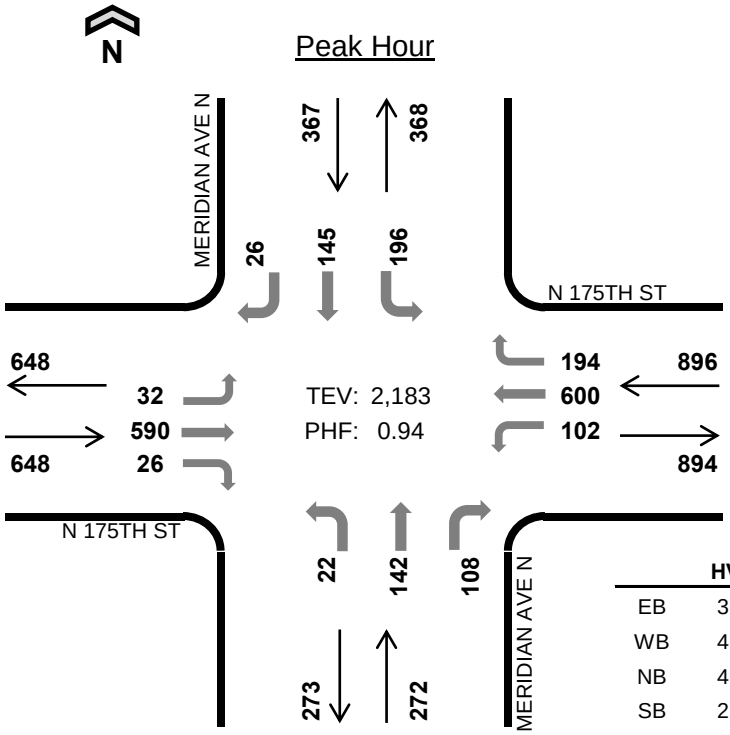
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	2	4	2	4	*12*	0	0	0	1	*1*	1	1	1	0	*3*
1:45 PM	2	5	1	2	*10*	0	0	0	0	*0*	0	0	0	8	*8*
2:00 PM	0	1	0	3	*4*	0	0	0	1	*1*	1	0	3	1	*5*
2:15 PM	**3**	**3**	**3**	**0**	***9***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**3**	**0**	***3***
2:30 PM	**0**	**1**	**1**	**1**	***3***	**0**	**0**	**0**	**0**	***0***	**1**	**2**	**2**	**0**	***5***
2:45 PM	**0**	**3**	**1**	**0**	***4***	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**1**	**2**	***3***
3:00 PM	**1**	**3**	**1**	**3**	***8***	**0**	**0**	**0**	**0**	***0***	**1**	**2**	**0**	**0**	***3***
3:15 PM	2	6	1	0	*9*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	10	26	10	13	*59*	0	0	0	4	*4*	4	5	10	12	*31*
Peak Hr	**4**	**10**	**6**	**4**	***24***	**0**	**0**	**0**	**2**	***2***	**2**	**4**	**6**	**2**	***14***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

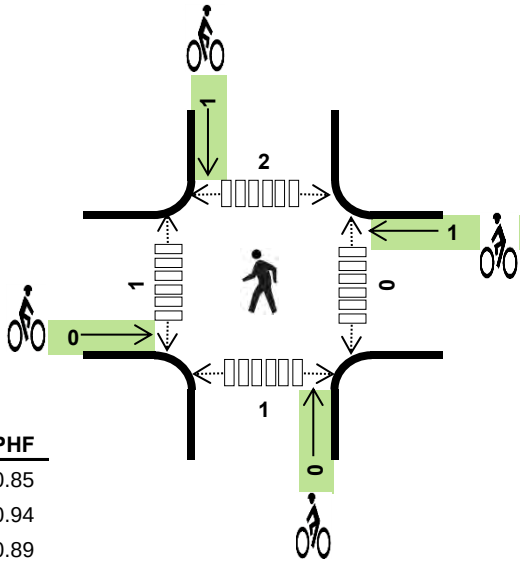
MERIDIAN AVE N
N 175TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 1:00 PM to 2:00 PM

Peak Hour



	HV %:	PHF
EB	3.7%	0.85
WB	4.0%	0.94
NB	4.4%	0.89
SB	2.5%	0.86
TOTAL	3.7%	0.94



Two-Hour Count Summaries

Interval Start	N 175TH ST Eastbound			N 175TH ST Westbound			MERIDIAN AVE N Northbound			MERIDIAN AVE N Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	6	138	8	32	133	48	11	61	36	50	44	11	578	
12:15 PM	12	154	6	14	156	34	12	36	27	53	35	6	545	
12:30 PM	4	193	5	21	123	41	11	26	15	54	32	9	534	
12:45 PM	6	141	15	16	129	36	4	32	21	45	39	8	492	2,149
1:00 PM	**3**	**143**	**6**	**19**	**159**	**61**	**8**	**40**	**28**	**41**	**32**	**8**	**548**	2,119
1:15 PM	**10**	**146**	**5**	**30**	**114**	**42**	**5**	**32**	**33**	**54**	**48**	**5**	**524**	2,098
1:30 PM	**11**	**127**	**7**	**27**	**162**	**44**	**6**	**37**	**24**	**45**	**34**	**8**	**532**	2,096
1:45 PM	**8**	**174**	**8**	**26**	**165**	**47**	**3**	**33**	**23**	**56**	**31**	**5**	**579**	**2,183**
Count Total	60	1,216	60	185	1,141	353	60	297	207	398	295	60	4,332	
Peak Hr	**32**	**590**	**26**	**102**	**600**	**194**	**22**	**142**	**108**	**196**	**145**	**26**	**2,183**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	7	9	3	2	*21*	0	0	0	0	*0*	0	2	0	2	*4*
12:15 PM	7	3	1	1	*12*	0	0	0	0	*0*	0	2	0	0	*2*
12:30 PM	7	6	4	1	*18*	0	0	0	0	*0*	1	0	0	1	*2*
12:45 PM	6	9	6	2	*23*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	**5**	**8**	**4**	**0**	***17***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**2**	**1**	***3***
1:15 PM	**7**	**5**	**4**	**4**	***20***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:30 PM	**7**	**14**	**1**	**3**	***25***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**0**	**0**	***1***
1:45 PM	**5**	**9**	**3**	**2**	***19***	**0**	**0**	**0**	**1**	***1***	**0**	**0**	**0**	**0**	***0***
Count Total	51	63	26	15	*155*	0	1	0	1	*2*	1	5	2	4	*12*
Peak Hr	**24**	**36**	**12**	**9**	***81***	**0**	**1**	**0**	**1**	***2***	**0**	**1**	**2**	**1**	***4***

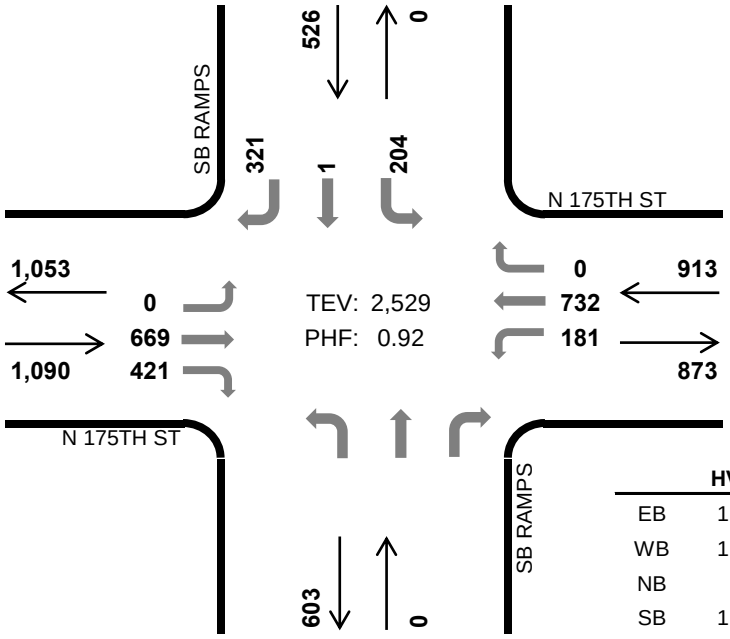
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

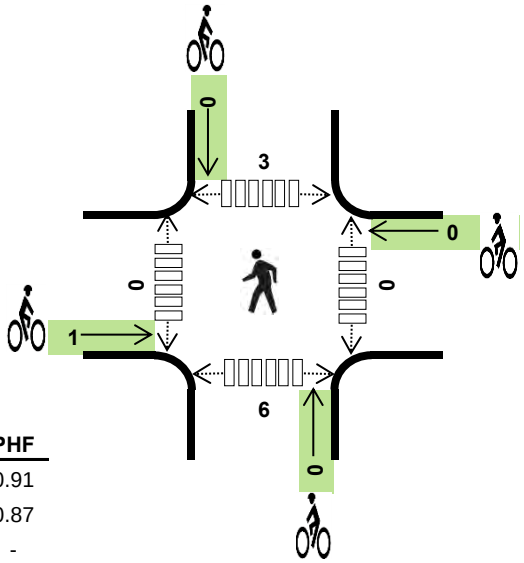
SB RAMPS
N 175TH ST

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:30 PM to 2:30 PM

N

Peak Hour





	HV %:	PHF
EB	1.3%	0.91
WB	1.3%	0.87
NB	-	-
SB	1.0%	0.90
TOTAL	1.2%	0.92

Two-Hour Count Summaries

Interval Start	N 175TH ST Eastbound			N 175TH ST Westbound			SB RAMPS Northbound			SB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	**0**	**164**	**130**	**39**	**173**	**0**	**0**	**0**	**0**	**51**	**1**	**80**	**638**	
1:45 PM	**0**	**155**	**96**	**39**	**159**	**0**	**0**	**0**	**0**	**54**	**0**	**92**	**595**	
2:00 PM	**0**	**150**	**95**	**45**	**196**	**0**	**0**	**0**	**0**	**56**	**0**	**68**	**610**	
2:15 PM	**0**	**200**	**100**	**58**	**204**	**0**	**0**	**0**	**0**	**43**	**0**	**81**	**686**	**2,529**
2:30 PM	0	159	78	32	162	0	0	1	0	50	0	97	579	2,470
2:45 PM	0	163	91	35	209	0	0	0	0	43	0	59	600	2,475
3:00 PM	0	157	96	41	187	0	0	0	0	33	0	79	593	2,458
3:15 PM	0	161	92	47	175	0	0	0	0	38	0	76	589	2,361
Count Total	0	1,309	778	336	1,465	0	0	1	0	368	1	632	4,890	
Peak Hr	**0**	**669**	**421**	**181**	**732**	**0**	**0**	**0**	**0**	**204**	**1**	**321**	**2,529**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	**2**	**3**	**0**	**2**	***7***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**2**	***2***
1:45 PM	**5**	**4**	**0**	**1**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**3**	***3***
2:00 PM	**2**	**1**	**0**	**1**	***4***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**2**	**1**	***3***
2:15 PM	**5**	**4**	**0**	**1**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
2:30 PM	0	1	0	0	*1*	0	0	0	0	*0*	0	0	1	0	*1*
2:45 PM	0	3	0	2	*5*	0	0	0	0	*0*	0	0	1	1	*2*
3:00 PM	4	3	0	1	*8*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	1	1	0	2	*4*	0	0	0	0	*0*	0	0	2	1	*3*
Count Total	19	20	0	10	*49*	1	0	0	0	*1*	0	0	7	8	*15*
Peak Hr	**14**	**12**	**0**	**5**	***31***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**3**	**6**	***9***

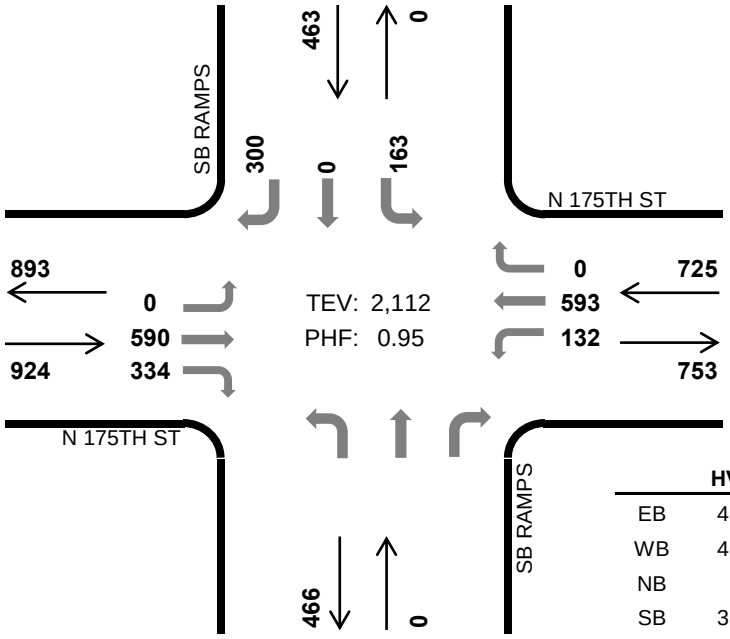
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

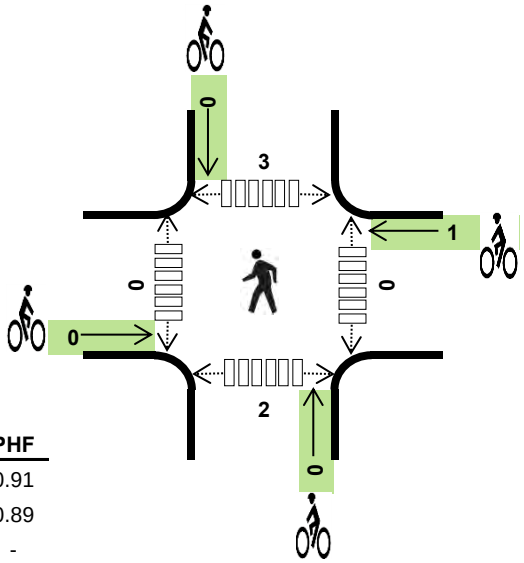
SB RAMPS
N 175TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 1:00 PM to 2:00 PM

N

Peak Hour





	HV %:	PHF
EB	4.0%	0.91
WB	4.4%	0.89
NB	-	-
SB	3.9%	0.80
TOTAL	4.1%	0.95

Two-Hour Count Summaries

Interval Start	N 175TH ST Eastbound			N 175TH ST Westbound			SB RAMPS Northbound			SB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	0	134	93	25	164	0	0	0	0	22	0	68	506	
12:15 PM	0	132	99	41	150	0	0	0	0	36	0	60	518	
12:30 PM	0	185	97	41	115	0	0	0	0	27	0	67	532	
12:45 PM	0	114	83	29	131	0	0	0	0	31	0	71	459	2,015
1:00 PM	**0**	**136**	**80**	**28**	**145**	**0**	**0**	**0**	**0**	**31**	**0**	**68**	**488**	1,997
1:15 PM	**0**	**172**	**82**	**38**	**144**	**0**	**0**	**0**	**0**	**39**	**0**	**69**	**544**	2,023
1:30 PM	**0**	**128**	**82**	**31**	**172**	**0**	**0**	**0**	**0**	**32**	**0**	**79**	**524**	2,015
1:45 PM	**0**	**154**	**90**	**35**	**132**	**0**	**0**	**0**	**0**	**61**	**0**	**84**	**556**	**2,112**
Count Total	0	1,155	706	268	1,153	0	0	0	0	279	0	566	4,127	
Peak Hr	**0**	**590**	**334**	**132**	**593**	**0**	**0**	**0**	**0**	**163**	**0**	**300**	**2,112**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	9	11	0	3	*23*	0	0	0	0	*0*	0	0	0	1	*1*
12:15 PM	6	2	0	3	*11*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	8	6	0	5	*19*	0	0	0	0	*0*	0	0	1	0	*1*
12:45 PM	6	8	0	4	*18*	0	0	0	0	*0*	0	0	1	0	*1*
1:00 PM	**10**	**3**	**0**	**4**	***17***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**3**	**1**	***4***
1:15 PM	**12**	**5**	**0**	**5**	***22***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:30 PM	**10**	**16**	**0**	**5**	***31***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
1:45 PM	**5**	**8**	**0**	**4**	***17***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	66	59	0	33	*158*	0	1	0	0	*1*	0	0	5	3	*8*
Peak Hr	**37**	**32**	**0**	**18**	***87***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**3**	**2**	***5***

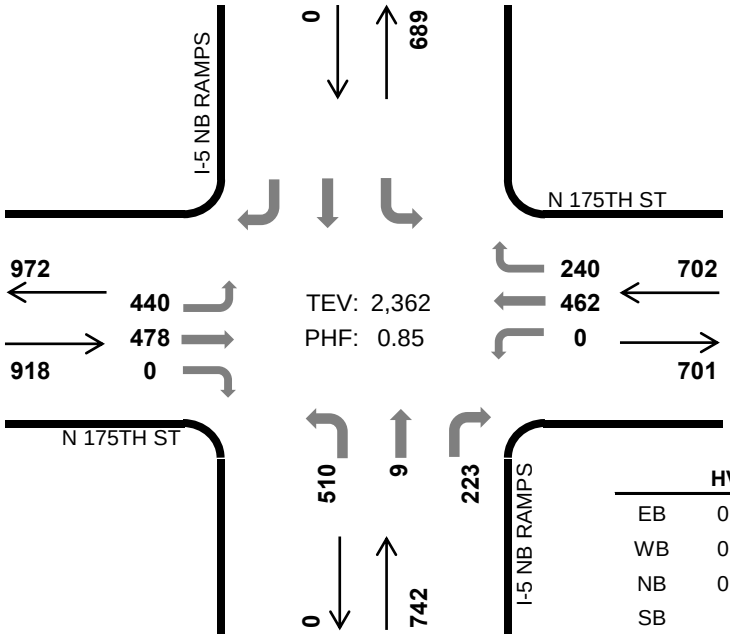
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

I-5 NB RAMPS
N 175TH ST

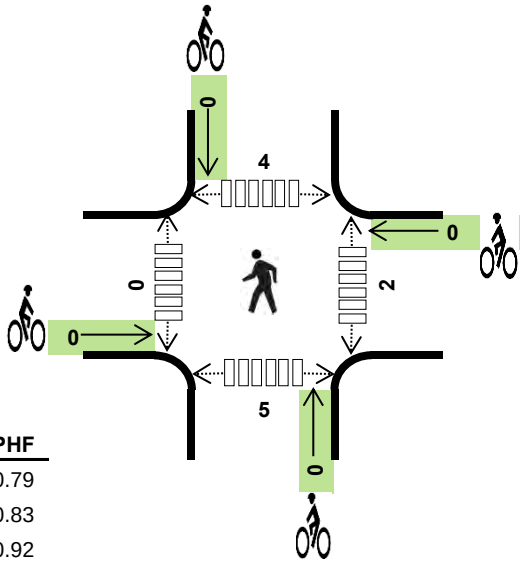
Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:00 PM to 3:00 PM

N

Peak Hour



	HV %:	PHF
EB	0.3%	0.79
WB	0.9%	0.83
NB	0.7%	0.92
SB	-	-
TOTAL	0.6%	0.85



Two-Hour Count Summaries

Interval Start	N 175TH ST Eastbound			N 175TH ST Westbound			I-5 NB RAMPS Northbound			I-5 NB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	78	103	0	0	125	58	107	1	40	0	0	0	512	
1:45 PM	108	138	0	0	81	63	117	2	33	0	0	0	542	
2:00 PM	**111**	**105**	**0**	**0**	**131**	**53**	**103**	**1**	**45**	**0**	**0**	**0**	**549**	
2:15 PM	**146**	**143**	**0**	**0**	**147**	**65**	**133**	**2**	**61**	**0**	**0**	**0**	**697**	2,300
2:30 PM	**108**	**108**	**0**	**0**	**88**	**69**	**131**	**1**	**64**	**0**	**0**	**0**	**569**	2,357
2:45 PM	**75**	**122**	**0**	**0**	**96**	**53**	**143**	**5**	**53**	**0**	**0**	**0**	**547**	**2,362**
3:00 PM	92	108	0	0	92	64	130	0	44	0	0	0	530	2,343
3:15 PM	98	107	0	0	105	46	117	0	40	0	0	0	513	2,159
Count Total	816	934	0	0	865	471	981	12	380	0	0	0	4,459	
Peak Hr	**440**	**478**	**0**	**0**	**462**	**240**	**510**	**9**	**223**	**0**	**0**	**0**	**2,362**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	1	3	1	0	*5*	0	0	0	0	*0*	0	0	0	1	*1*
1:45 PM	0	2	3	0	*5*	0	0	0	0	*0*	0	0	0	4	*4*
2:00 PM	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**3**	***3***
2:15 PM	**2**	**2**	**2**	**0**	***6***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**1**	**2**	***4***
2:30 PM	**0**	**1**	**1**	**0**	***2***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
2:45 PM	**1**	**2**	**2**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**2**	**0**	***3***
3:00 PM	2	1	2	0	*5*	0	0	0	0	*0*	0	0	0	1	*1*
3:15 PM	3	2	2	0	*7*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	9	14	13	0	*36*	0	0	0	0	*0*	2	0	4	12	*18*
Peak Hr	**3**	**6**	**5**	**0**	***14***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**4**	**5**	***11***

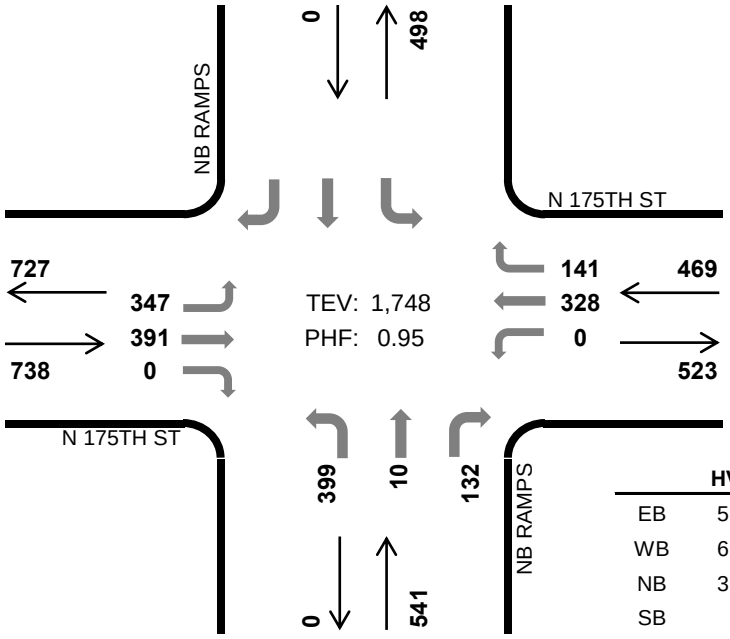
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

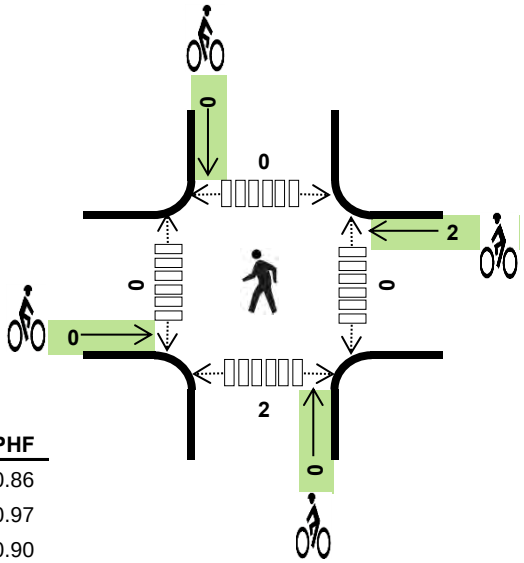
NB RAMPS
N 175TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 1:00 PM to 2:00 PM

N

Peak Hour





	HV %:	PHF
EB	5.0%	0.86
WB	6.0%	0.97
NB	3.9%	0.90
SB	-	-
TOTAL	4.9%	0.95

Two-Hour Count Summaries

Interval Start	N 175TH ST Eastbound			N 175TH ST Westbound			NB RAMPS Northbound			NB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	78	93	0	0	73	23	105	2	46	0	0	0	420	
12:15 PM	82	85	0	0	87	32	93	1	36	0	0	0	416	
12:30 PM	112	92	0	0	85	43	81	2	42	0	0	0	457	
12:45 PM	86	73	0	0	70	34	94	0	40	0	0	0	397	1,690
1:00 PM	**76**	**83**	**0**	**0**	**76**	**45**	**104**	**1**	**32**	**0**	**0**	**0**	**417**	1,687
1:15 PM	**107**	**107**	**0**	**0**	**86**	**31**	**81**	**1**	**34**	**0**	**0**	**0**	**447**	1,718
1:30 PM	**66**	**86**	**0**	**0**	**89**	**31**	**111**	**2**	**38**	**0**	**0**	**0**	**423**	1,684
1:45 PM	**98**	**115**	**0**	**0**	**77**	**34**	**103**	**6**	**28**	**0**	**0**	**0**	**461**	**1,748**
Count Total	705	734	0	0	643	273	772	15	296	0	0	0	3,438	
Peak Hr	**347**	**391**	**0**	**0**	**328**	**141**	**399**	**10**	**132**	**0**	**0**	**0**	**1,748**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	10	5	8	0	*23*	0	0	0	0	*0*	1	0	0	0	*1*
12:15 PM	9	2	5	0	*16*	0	0	0	0	*0*	0	0	1	0	*1*
12:30 PM	4	6	3	0	*13*	0	0	0	0	*0*	0	0	0	0	*0*
12:45 PM	2	8	8	0	*18*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	**13**	**5**	**2**	**0**	***20***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**1**	***1***
1:15 PM	**11**	**5**	**2**	**0**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:30 PM	**4**	**10**	**11**	**0**	***25***	**0**	**1**	**0**	**0**	***1***	**0**	**0**	**0**	**1**	***1***
1:45 PM	**9**	**8**	**6**	**0**	***23***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
Count Total	62	49	45	0	*156*	0	2	0	0	*2*	1	0	1	2	*4*
Peak Hr	**37**	**28**	**21**	**0**	***86***	**0**	**2**	**0**	**0**	***2***	**0**	**0**	**0**	**2**	***2***

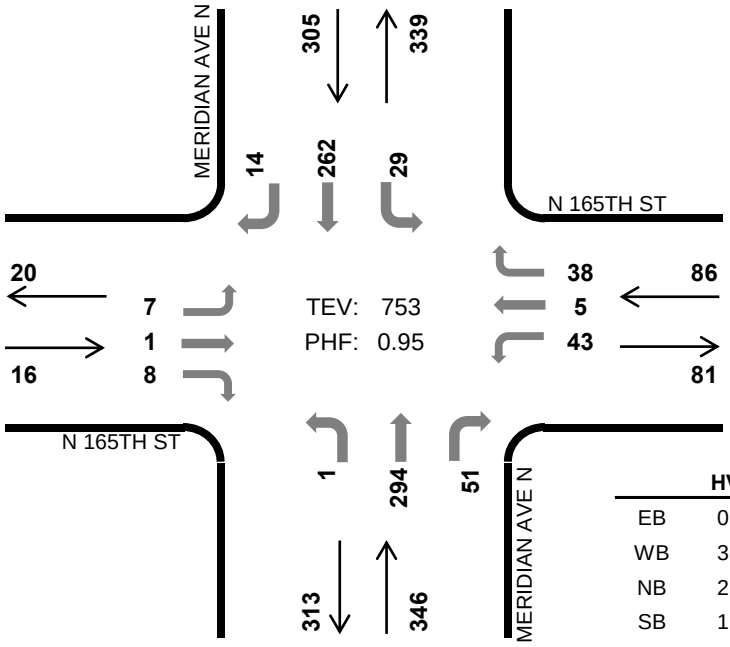
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

MERIDIAN AVE N
N 165TH ST

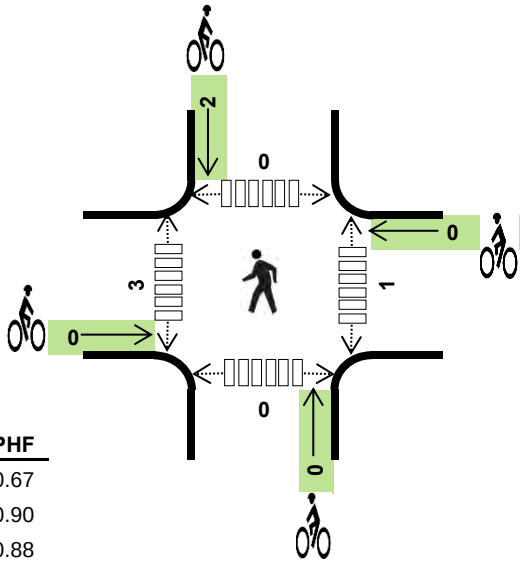
Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:15 PM to 3:15 PM

N

Peak Hour



	HV %:	PHF
EB	0.0%	0.67
WB	3.5%	0.90
NB	2.3%	0.88
SB	1.6%	0.85
TOTAL	2.1%	0.95



Two-Hour Count Summaries

Interval Start	N 165TH ST Eastbound			N 165TH ST Westbound			MERIDIAN AVE N Northbound			MERIDIAN AVE N Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	2	1	1	10	0	8	0	60	14	8	66	0	170	
1:45 PM	0	0	0	14	0	9	0	56	15	6	59	4	163	
2:00 PM	2	0	0	8	0	10	3	51	15	5	60	1	155	
2:15 PM	**2**	**0**	**2**	**11**	**2**	**11**	**0**	**72**	**15**	**8**	**55**	**2**	**180**	668
2:30 PM	**0**	**0**	**3**	**10**	**1**	**9**	**0**	**64**	**14**	**5**	**67**	**3**	**176**	674
2:45 PM	**3**	**0**	**3**	**12**	**1**	**6**	**1**	**71**	**11**	**8**	**76**	**6**	**198**	709
3:00 PM	**2**	**1**	**0**	**10**	**1**	**12**	**0**	**87**	**11**	**8**	**64**	**3**	**199**	**753**
3:15 PM	0	0	1	15	1	4	0	64	10	6	66	4	171	744
Count Total	11	2	10	90	6	69	4	525	105	54	513	23	1,412	
Peak Hr	**7**	**1**	**8**	**43**	**5**	**38**	**1**	**294**	**51**	**29**	**262**	**14**	**753**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

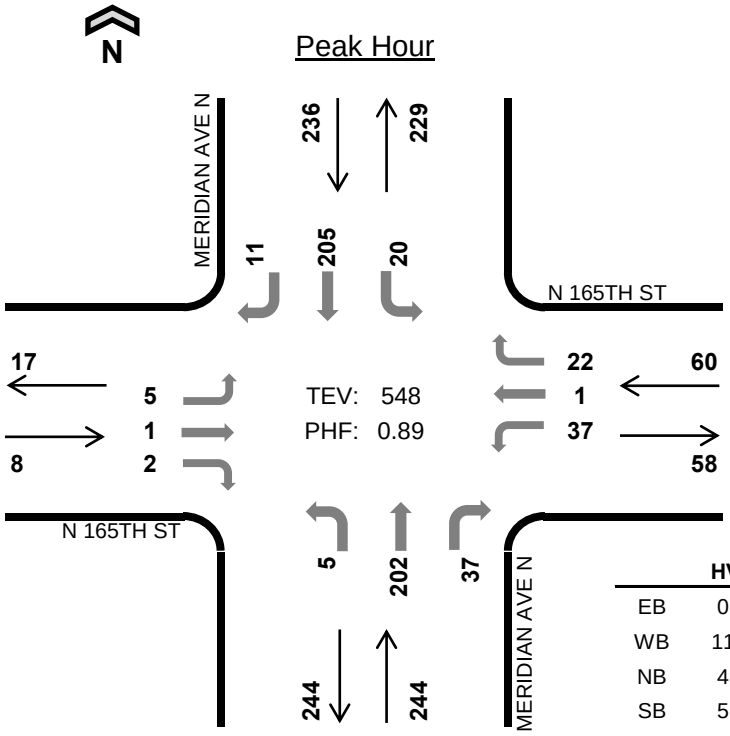
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	0	1	2	1	*4*	0	0	0	1	*1*	0	2	0	0	*2*
1:45 PM	0	2	1	1	*4*	0	0	0	0	*0*	0	0	0	0	*0*
2:00 PM	0	0	1	2	*3*	0	0	0	0	*0*	0	4	0	0	*4*
2:15 PM	**0**	**1**	**3**	**1**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:30 PM	**0**	**1**	**1**	**2**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:45 PM	**0**	**1**	**2**	**0**	***3***	**0**	**0**	**0**	**2**	***2***	**1**	**1**	**0**	**0**	***2***
3:00 PM	**0**	**0**	**2**	**2**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**2**	**0**	**0**	***2***
3:15 PM	0	0	2	0	*2*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	0	6	14	9	*29*	0	0	0	3	*3*	1	9	0	1	*11*
Peak Hr	**0**	**3**	**8**	**5**	***16***	**0**	**0**	**0**	**2**	***2***	**1**	**3**	**0**	**0**	***4***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

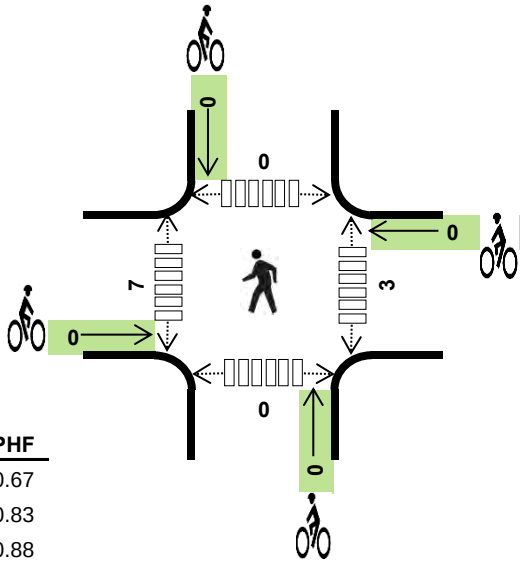
MERIDIAN AVE N
N 165TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 1:00 PM to 2:00 PM

Peak Hour



	HV %:	PHF
EB	0.0%	0.67
WB	11.7%	0.83
NB	4.5%	0.88
SB	5.1%	0.84
TOTAL	5.5%	0.89



Two-Hour Count Summaries

Interval Start	N 165TH ST Eastbound			N 165TH ST Westbound			MERIDIAN AVE N Northbound			MERIDIAN AVE N Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	2	0	0	11	0	2	0	43	9	6	56	2	131	
12:15 PM	3	0	1	12	0	10	0	50	11	5	52	1	145	
12:30 PM	1	0	0	6	0	5	1	42	10	3	45	4	117	
12:45 PM	1	0	1	2	0	4	0	45	5	3	43	1	105	498
1:00 PM	**2**	**1**	**0**	**10**	**0**	**8**	**0**	**53**	**13**	**3**	**51**	**2**	**143**	510
1:15 PM	**2**	**0**	**1**	**7**	**0**	**5**	**2**	**57**	**10**	**6**	**60**	**4**	**154**	519
1:30 PM	**0**	**0**	**0**	**7**	**1**	**4**	**0**	**49**	**8**	**4**	**45**	**2**	**120**	522
1:45 PM	**1**	**0**	**1**	**13**	**0**	**5**	**3**	**43**	**6**	**7**	**49**	**3**	**131**	**548**
Count Total	12	1	4	68	1	43	6	382	72	37	401	19	1,046	
Peak Hr	**5**	**1**	**2**	**37**	**1**	**22**	**5**	**202**	**37**	**20**	**205**	**11**	**548**	

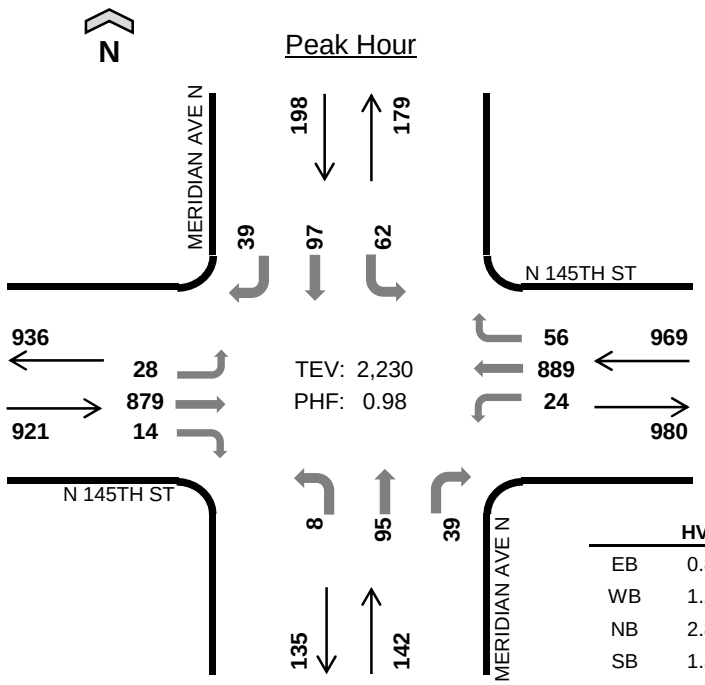
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	0	3	3	6	*12*	0	0	0	0	*0*	0	1	0	1	*2*
12:15 PM	0	3	1	0	*4*	0	0	0	1	*1*	1	1	0	0	*2*
12:30 PM	0	1	5	0	*6*	0	0	0	0	*0*	1	0	0	0	*1*
12:45 PM	0	0	6	3	*9*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	**0**	**2**	**6**	**3**	***11***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
1:15 PM	**0**	**3**	**0**	**2**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:30 PM	**0**	**1**	**2**	**3**	***6***	**0**	**0**	**0**	**0**	***0***	**1**	**7**	**0**	**0**	***8***
1:45 PM	**0**	**1**	**3**	**4**	***8***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**0**	***1***
Count Total	0	14	26	21	*61*	0	0	0	1	*1*	5	9	0	1	*15*
Peak Hr	**0**	**7**	**11**	**12**	***30***	**0**	**0**	**0**	**0**	***0***	**3**	**7**	**0**	**0**	***10***

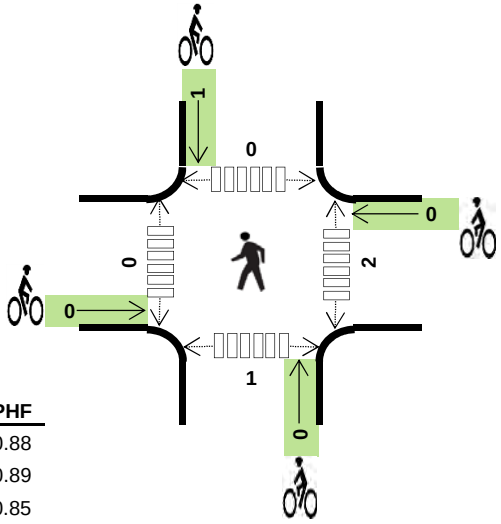
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

MERIDIAN AVE N
N 145TH ST

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:30 PM to 2:30 PM



	HV %:	PHF
EB	0.8%	0.88
WB	1.2%	0.89
NB	2.8%	0.85
SB	1.5%	0.92
TOTAL	1.2%	0.98



Two-Hour Count Summaries

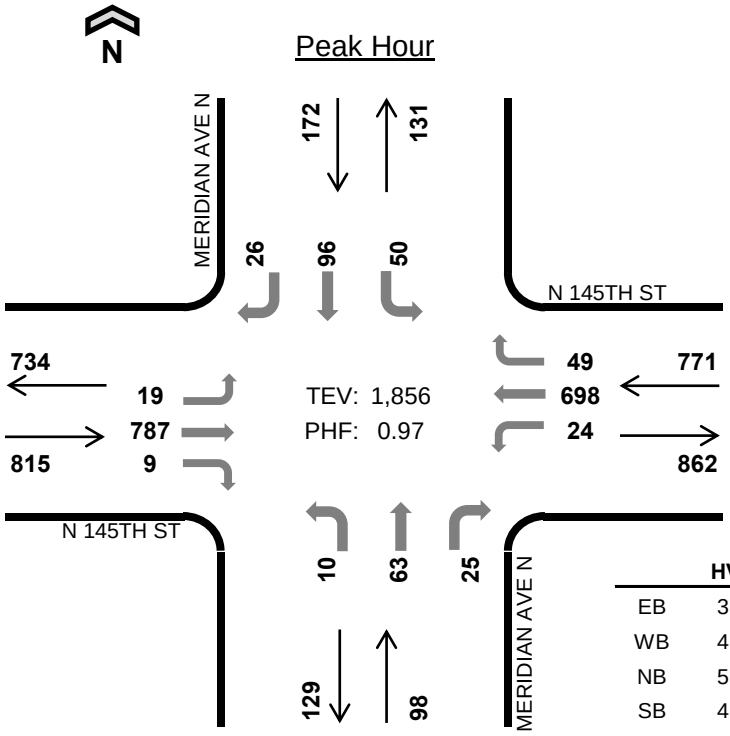
Interval Start	N 145TH ST Eastbound			N 145TH ST Westbound			MERIDIAN AVE N Northbound			MERIDIAN AVE N Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	**5**	**252**	**4**	**3**	**212**	**12**	**3**	**18**	**8**	**13**	**27**	**7**	**564**	
1:45 PM	**9**	**232**	**5**	**6**	**208**	**12**	**1**	**28**	**13**	**15**	**26**	**13**	**568**	
2:00 PM	**6**	**212**	**3**	**10**	**222**	**13**	**2**	**24**	**11**	**17**	**23**	**12**	**555**	
2:15 PM	**8**	**183**	**2**	**5**	**247**	**19**	**2**	**25**	**7**	**17**	**21**	**7**	**543**	**2,230**
2:30 PM	4	190	3	2	205	11	5	29	9	20	19	6	503	2,169
2:45 PM	7	201	2	7	218	19	0	18	4	22	28	13	539	2,140
3:00 PM	11	221	1	7	196	13	5	21	8	19	25	11	538	2,123
3:15 PM	4	183	4	5	212	10	1	16	6	13	29	12	495	2,075
Count Total	54	1,674	24	45	1,720	109	19	179	66	136	198	81	4,305	
Peak Hr	**28**	**879**	**14**	**24**	**889**	**56**	**8**	**95**	**39**	**62**	**97**	**39**	**2,230**	

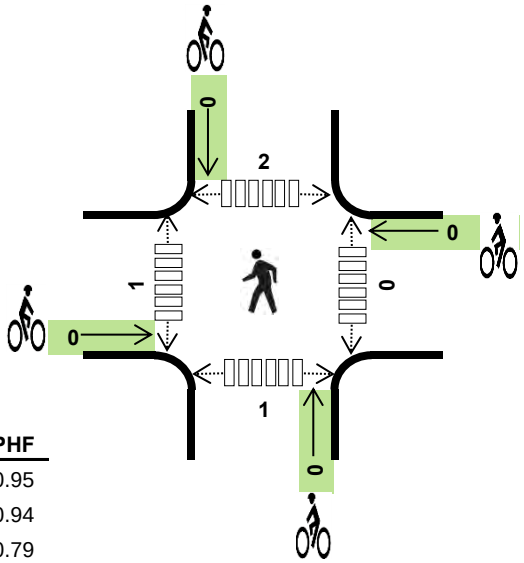
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	**2**	**1**	**0**	**0**	***3***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:45 PM	**2**	**5**	**1**	**2**	***10***	**0**	**0**	**0**	**1**	***1***	**0**	**0**	**0**	**0**	***0***
2:00 PM	**2**	**0**	**1**	**1**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
2:15 PM	**1**	**6**	**2**	**0**	***9***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**0**	***2***
2:30 PM	4	2	0	1	*7*	0	0	0	0	*0*	0	0	0	0	*0*
2:45 PM	4	4	1	1	*10*	0	0	0	0	*0*	0	2	0	0	*2*
3:00 PM	2	0	0	1	*3*	0	0	0	0	*0*	1	2	0	0	*3*
3:15 PM	0	2	2	1	*5*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	17	20	7	7	*51*	0	0	0	1	*1*	3	4	0	1	*8*
Peak Hr	**7**	**12**	**4**	**3**	***26***	**0**	**0**	**0**	**1**	***1***	**2**	**0**	**0**	**1**	***3***

MERIDIAN AVE N
N 145TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 1:00 PM to 2:00 PM





	HV %:	PHF
EB	3.2%	0.95
WB	4.2%	0.94
NB	5.1%	0.79
SB	4.7%	0.93
TOTAL	3.8%	0.97

Two-Hour Count Summaries

Interval Start	N 145TH ST Eastbound			N 145TH ST Westbound			MERIDIAN AVE N Northbound			MERIDIAN AVE N Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	6	165	5	5	178	16	1	12	6	21	21	10	446	
12:15 PM	5	185	3	7	151	7	2	24	11	11	25	10	441	
12:30 PM	6	201	3	0	187	12	3	9	4	13	12	7	457	
12:45 PM	3	206	4	4	185	3	4	19	4	11	13	4	460	1,804
1:00 PM	**8**	**204**	**2**	**8**	**159**	**9**	**3**	**14**	**5**	**9**	**22**	**10**	**453**	1,811
1:15 PM	**3**	**189**	**3**	**2**	**181**	**8**	**1**	**21**	**9**	**11**	**26**	**6**	**460**	1,830
1:30 PM	**4**	**190**	**2**	**7**	**177**	**15**	**4**	**13**	**6**	**17**	**24**	**5**	**464**	1,837
1:45 PM	**4**	**204**	**2**	**7**	**181**	**17**	**2**	**15**	**5**	**13**	**24**	**5**	**479**	**1,856**
Count Total	39	1,544	24	40	1,399	87	20	127	50	106	167	57	3,660	
Peak Hr	**19**	**787**	**9**	**24**	**698**	**49**	**10**	**63**	**25**	**50**	**96**	**26**	**1,856**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	6	7	0	3	*16*	0	0	0	0	*0*	0	0	0	0	*0*
12:15 PM	10	6	3	2	*21*	0	0	0	0	*0*	0	0	0	1	*1*
12:30 PM	8	10	1	0	*19*	0	0	0	0	*0*	0	0	0	0	*0*
12:45 PM	6	10	2	1	*19*	0	0	0	0	*0*	0	0	0	0	*0*
1:00 PM	**4**	**9**	**1**	**0**	***14***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
1:15 PM	**8**	**7**	**1**	**3**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
1:30 PM	**9**	**6**	**2**	**2**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**1**	**0**	***2***
1:45 PM	**5**	**10**	**1**	**3**	***19***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**1**	***1***
Count Total	56	65	11	14	*146*	0	0	0	0	*0*	0	1	2	2	*5*
Peak Hr	**26**	**32**	**5**	**8**	***71***	**0**	**0**	**0**	**0**	***0***	**0**	**1**	**2**	**1**	***4***

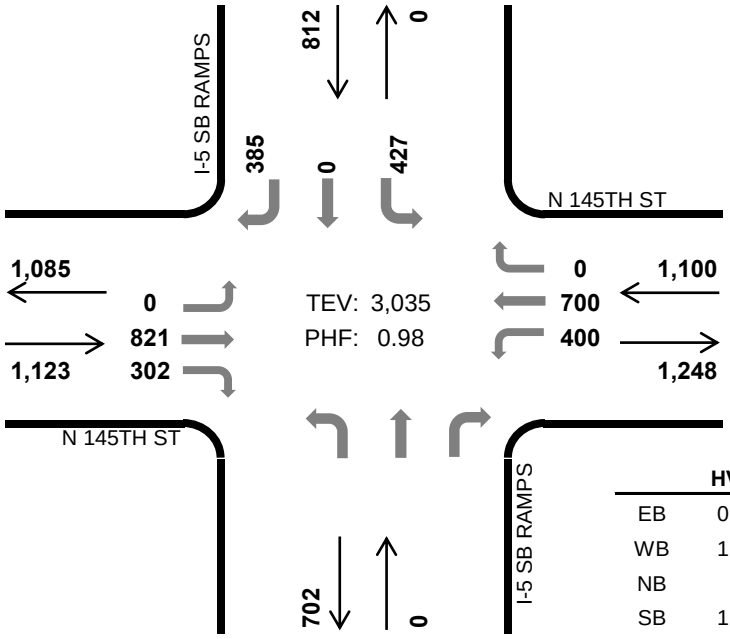
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

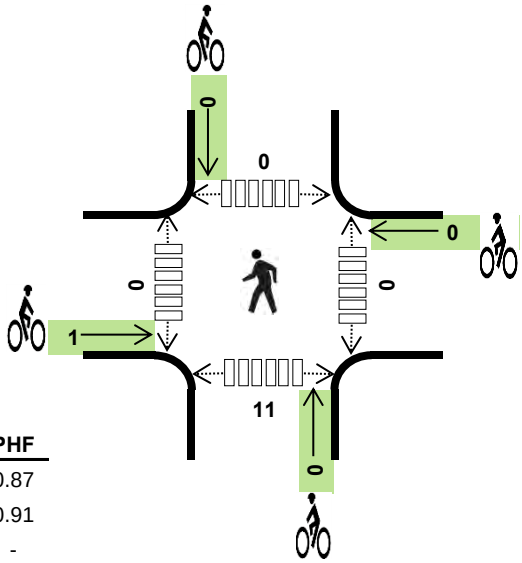
I-5 SB RAMPS
N 145TH ST

Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 1:30 PM to 2:30 PM

N

Peak Hour





	HV %:	PHF
EB	0.9%	0.87
WB	1.4%	0.91
NB	-	-
SB	1.0%	0.92
TOTAL	1.1%	0.98

Two-Hour Count Summaries

Interval Start	N 145TH ST Eastbound			N 145TH ST Westbound			I-5 SB RAMPS Northbound			I-5 SB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	**0**	**221**	**60**	**95**	**173**	**0**	**0**	**0**	**0**	**111**	**0**	**98**	**758**	
1:45 PM	**0**	**229**	**95**	**100**	**148**	**0**	**0**	**0**	**0**	**107**	**0**	**98**	**777**	
2:00 PM	**0**	**186**	**84**	**103**	**198**	**0**	**0**	**0**	**0**	**91**	**0**	**86**	**748**	
2:15 PM	**0**	**185**	**63**	**102**	**181**	**0**	**0**	**0**	**0**	**118**	**0**	**103**	**752**	**3,035**
2:30 PM	0	157	61	79	166	0	0	0	0	130	0	97	690	2,967
2:45 PM	0	202	59	86	179	0	0	0	0	110	0	98	734	2,924
3:00 PM	0	208	64	108	157	0	0	0	0	100	0	91	728	2,904
3:15 PM	0	170	61	96	172	0	0	0	0	124	0	89	712	2,864
Count Total	0	1,558	547	769	1,374	0	0	0	0	891	0	760	5,899	
Peak Hr	**0**	**821**	**302**	**400**	**700**	**0**	**0**	**0**	**0**	**427**	**0**	**385**	**3,035**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	**1**	**4**	**0**	**0**	***5***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**4**	***4***
1:45 PM	**3**	**6**	**0**	**2**	***11***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**2**	***2***
2:00 PM	**2**	**1**	**0**	**1**	***4***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
2:15 PM	**4**	**4**	**0**	**5**	***13***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**5**	***5***
2:30 PM	3	1	0	3	*7*	0	0	0	0	*0*	0	0	0	1	*1*
2:45 PM	5	2	0	3	*10*	0	0	0	0	*0*	0	0	0	1	*1*
3:00 PM	2	0	0	4	*6*	0	0	0	0	*0*	0	0	0	0	*0*
3:15 PM	4	4	0	5	*13*	0	0	0	0	*0*	0	0	0	1	*1*
Count Total	24	22	0	23	*69*	1	0	0	0	*1*	0	0	0	14	*14*
Peak Hr	**10**	**15**	**0**	**8**	***33***	**1**	**0**	**0**	**0**	***1***	**0**	**0**	**0**	**11**	***11***

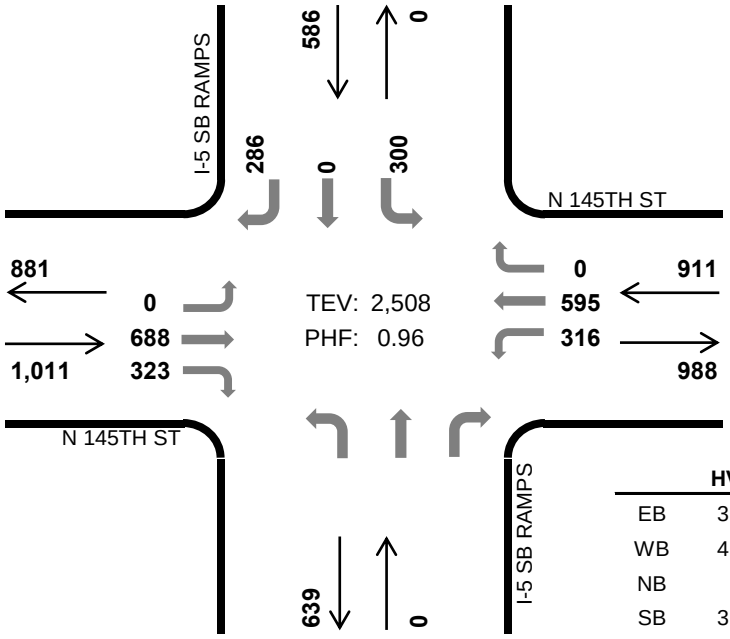
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

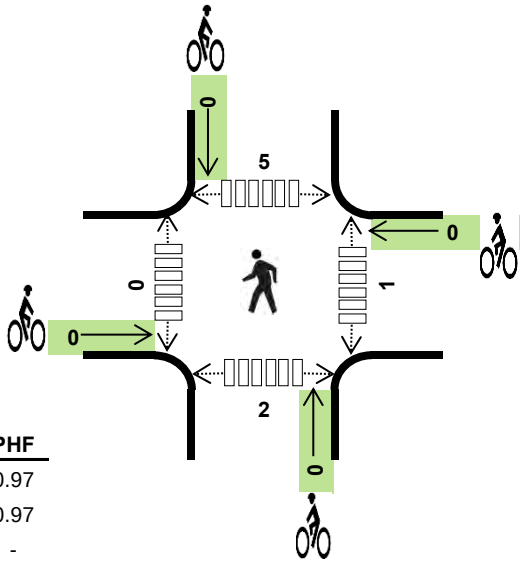
I-5 SB RAMPS
N 145TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 12:30 PM to 1:30 PM

N

Peak Hour





	HV %:	PHF
EB	3.1%	0.97
WB	4.4%	0.97
NB	-	-
SB	3.6%	0.93
TOTAL	3.7%	0.96

Two-Hour Count Summaries

Interval Start	N 145TH ST Eastbound			N 145TH ST Westbound			I-5 SB RAMPS Northbound			I-5 SB RAMPS Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	0	152	66	75	144	0	0	0	0	57	0	78	572	
12:15 PM	0	150	80	89	138	0	0	0	0	85	0	58	600	
12:30 PM	**0**	**167**	**87**	**84**	**146**	**0**	**0**	**0**	**0**	**73**	**0**	**74**	**631**	
12:45 PM	**0**	**171**	**90**	**81**	**155**	**0**	**0**	**0**	**0**	**89**	**0**	**68**	**654**	2,457
1:00 PM	**0**	**176**	**82**	**67**	**146**	**0**	**0**	**0**	**0**	**63**	**0**	**84**	**618**	2,503
1:15 PM	**0**	**174**	**64**	**84**	**148**	**0**	**0**	**0**	**0**	**75**	**0**	**60**	**605**	**2,508**
1:30 PM	0	162	76	77	147	0	0	0	0	80	0	77	619	2,496
1:45 PM	0	168	70	70	158	0	0	0	0	83	0	88	637	2,479
Count Total	0	1,320	615	627	1,182	0	0	0	0	605	0	587	4,936	
Peak Hr	**0**	**688**	**323**	**316**	**595**	**0**	**0**	**0**	**0**	**300**	**0**	**286**	**2,508**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	6	9	0	6	*21*	0	0	0	0	*0*	0	0	0	1	*1*
12:15 PM	8	7	0	8	*23*	0	0	0	0	*0*	0	0	0	0	*0*
12:30 PM	**7**	**9**	**0**	**8**	***24***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**0**	***1***
12:45 PM	**9**	**12**	**0**	**7**	***28***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**1**	**1**	***2***
1:00 PM	**5**	**11**	**0**	**2**	***18***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**3**	**0**	***3***
1:15 PM	**10**	**8**	**0**	**4**	***22***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	***2***
1:30 PM	8	10	0	4	*22*	0	0	0	0	*0*	0	0	0	0	*0*
1:45 PM	7	9	0	1	*17*	0	0	0	0	*0*	0	0	0	0	*0*
Count Total	60	75	0	40	*175*	0	0	0	0	*0*	1	0	5	3	*9*
Peak Hr	**31**	**40**	**0**	**21**	***92***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**5**	**2**	***8***

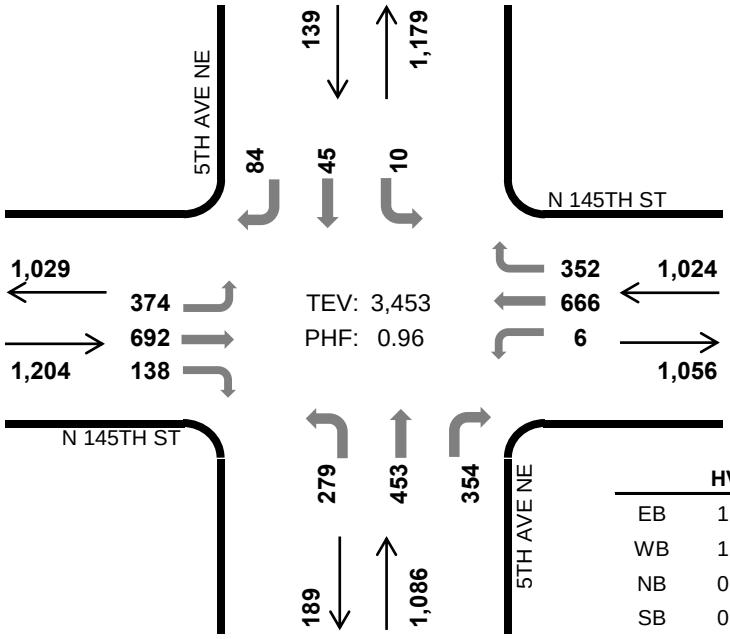
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

5TH AVE NE
N 145TH ST

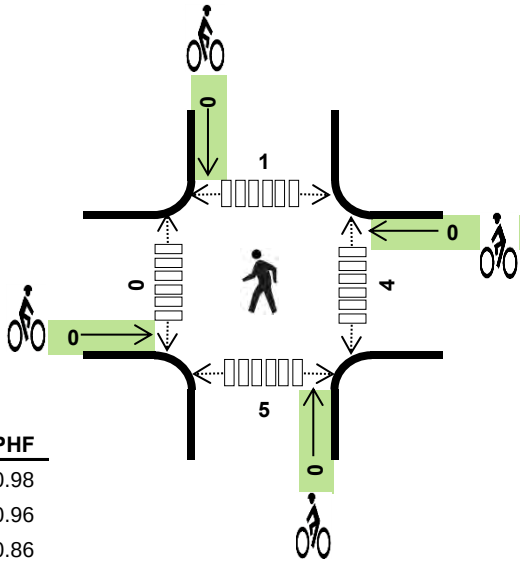
Date: Sat, Oct 04, 2014
Count Period: 1:30 PM to 3:30 PM
Peak Hour: 2:15 PM to 3:15 PM

N

Peak Hour



	HV %:	PHF
EB	1.4%	0.98
WB	1.5%	0.96
NB	0.6%	0.86
SB	0.7%	0.91
TOTAL	1.2%	0.96



Two-Hour Count Summaries

Interval Start	N 145TH ST Eastbound			N 145TH ST Westbound			5TH AVE NE Northbound			5TH AVE NE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
1:30 PM	93	182	36	1	167	90	74	98	85	4	15	17	862	
1:45 PM	107	197	26	1	180	70	59	89	68	6	13	29	845	
2:00 PM	96	169	14	2	203	75	67	122	72	6	12	18	856	
2:15 PM	**100**	**181**	**27**	**1**	**169**	**97**	**78**	**120**	**81**	**3**	**10**	**21**	**888**	3,451
2:30 PM	**87**	**170**	**39**	**0**	**166**	**91**	**54**	**88**	**76**	**2**	**14**	**16**	**803**	3,392
2:45 PM	**93**	**173**	**33**	**4**	**173**	**72**	**81**	**135**	**98**	**4**	**11**	**20**	**897**	3,444
3:00 PM	**94**	**168**	**39**	**1**	**158**	**92**	**66**	**110**	**99**	**1**	**10**	**27**	**865**	**3,453**
3:15 PM	87	176	33	1	174	76	69	92	111	7	11	20	857	3,422
Count Total	757	1,416	247	11	1,390	663	548	854	690	33	96	168	6,873	
Peak Hr	**374**	**692**	**138**	**6**	**666**	**352**	**279**	**453**	**354**	**10**	**45**	**84**	**3,453**	

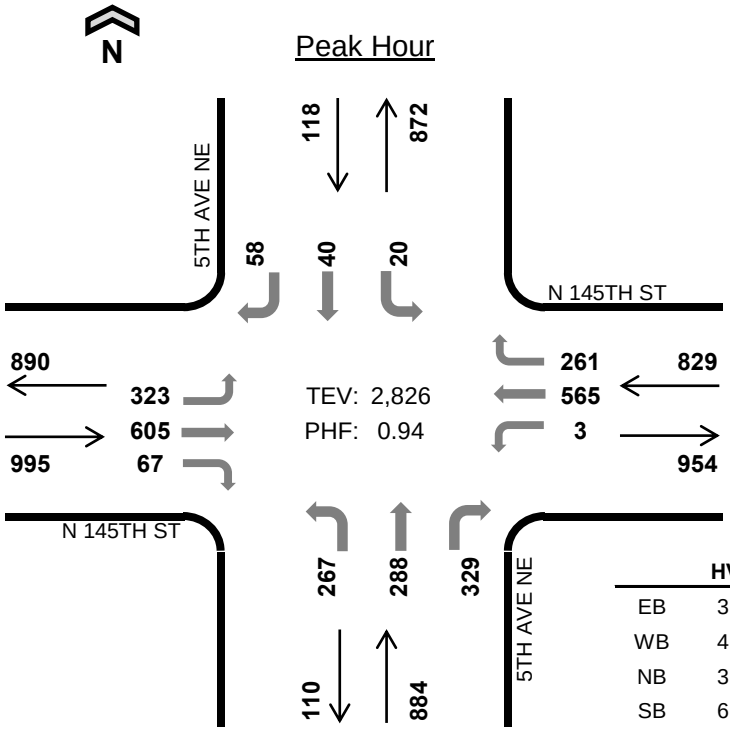
Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
1:30 PM	2	5	2	2	*11*	0	0	0	0	*0*	3	0	0	1	*4*
1:45 PM	4	7	1	1	*13*	0	0	0	0	*0*	0	0	0	1	*1*
2:00 PM	2	1	2	1	*6*	0	0	0	0	*0*	0	0	0	0	*0*
2:15 PM	**3**	**6**	**1**	**0**	***10***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**1**	***2***
2:30 PM	**4**	**4**	**1**	**1**	***10***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**1**	**3**	***5***
2:45 PM	**5**	**3**	**2**	**0**	***10***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**0**	**1**	***3***
3:00 PM	**5**	**2**	**3**	**0**	***10***	**0**	**0**	**0**	**0**	***0***	**0**	**0**	**0**	**0**	***0***
3:15 PM	9	4	3	1	*17*	0	0	0	0	*0*	2	0	0	0	*2*
Count Total	34	32	15	6	*87*	0	0	0	0	*0*	9	0	1	7	*17*
Peak Hr	**17**	**15**	**7**	**1**	***40***	**0**	**0**	**0**	**0**	***0***	**4**	**0**	**1**	**5**	***10***

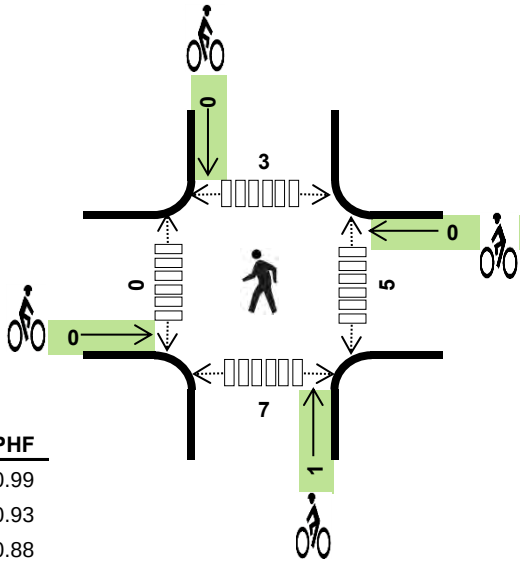
Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

5TH AVE NE
N 145TH ST

Date: Tue, Oct 07, 2014
Count Period: 12:00 PM to 2:00 PM
Peak Hour: 12:45 PM to 1:45 PM



	HV %:	PHF
EB	3.0%	0.99
WB	4.9%	0.93
NB	3.8%	0.88
SB	6.8%	0.82
TOTAL	4.0%	0.94



Two-Hour Count Summaries

Interval Start	N 145TH ST Eastbound			N 145TH ST Westbound			5TH AVE NE Northbound			5TH AVE NE Southbound			15-min Total	Rolling One Hour
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
12:00 PM	65	128	20	1	137	55	65	53	75	2	15	14	630	
12:15 PM	75	140	25	2	166	49	51	55	88	4	13	10	678	
12:30 PM	69	132	21	4	156	56	62	72	70	3	19	13	677	
12:45 PM	**76**	**149**	**26**	**1**	**151**	**72**	**73**	**94**	**83**	**4**	**11**	**14**	**754**	2,739
1:00 PM	**87**	**152**	**8**	**1**	**129**	**65**	**66**	**53**	**77**	**3**	**14**	**9**	**664**	2,773
1:15 PM	**80**	**157**	**12**	**1**	**157**	**62**	**56**	**77**	**74**	**4**	**5**	**18**	**703**	2,798
1:30 PM	**80**	**147**	**21**	**0**	**128**	**62**	**72**	**64**	**95**	**9**	**10**	**17**	**705**	**2,826**
1:45 PM	87	140	22	0	123	61	81	85	100	4	14	18	735	2,807
Count Total	619	1,145	155	10	1,147	482	526	553	662	33	101	113	5,546	
Peak Hr	**323**	**605**	**67**	**3**	**565**	**261**	**267**	**288**	**329**	**20**	**40**	**58**	**2,826**	

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
12:00 PM	8	7	7	1	*23*	0	0	0	0	*0*	0	0	0	1	*1*
12:15 PM	9	6	9	2	*26*	0	0	0	0	*0*	1	0	0	3	*4*
12:30 PM	8	9	5	1	*23*	0	0	0	0	*0*	0	0	1	2	*3*
12:45 PM	**13**	**15**	**9**	**2**	***39***	**0**	**0**	**1**	**0**	***1***	**1**	**0**	**0**	**2**	***3***
1:00 PM	**4**	**8**	**9**	**1**	***22***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**2**	**0**	***3***
1:15 PM	**5**	**8**	**7**	**3**	***23***	**0**	**0**	**0**	**0**	***0***	**2**	**0**	**1**	**3**	***6***
1:30 PM	**8**	**10**	**9**	**2**	***29***	**0**	**0**	**0**	**0**	***0***	**1**	**0**	**0**	**2**	***3***
1:45 PM	5	6	7	0	*18*	0	0	0	0	*0*	1	0	1	3	*5*
Count Total	60	69	62	12	*203*	0	0	1	0	*1*	7	0	5	16	*28*
Peak Hr	**30**	**41**	**34**	**8**	***113***	**0**	**0**	**1**	**0**	***1***	**5**	**0**	**3**	**7**	***15***

Mark Skaggs: 425 - 250 - 0777 mark.skaggs@idaxdata.com

ATTACHMENT H

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	465	290	125	520	0	0	0	0	285	5	30
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1743	1743	1727	1727	0				1570	1570	1900
Adj Flow Rate, veh/h	0	489	0	132	547	0				333	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	9	9	10	10	0				21	21	21
Cap, veh/h	0	2082	931	641	2421	0				435	229	0
Arrive On Green	0.00	0.63	0.00	0.05	0.74	0.00				0.15	0.00	0.00
Sat Flow, veh/h	0	3399	1482	1645	3368	0				2991	1570	0
Grp Volume(v), veh/h	0	489	0	132	547	0				333	0	0
Grp Sat Flow(s),veh/h/ln	0	1656	1482	1645	1641	0				1495	1570	0
Q Serve(g_s), s	0.0	5.8	0.0	2.3	4.7	0.0				9.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	5.8	0.0	2.3	4.7	0.0				9.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	2082	931	641	2421	0				435	229	0
V/C Ratio(X)	0.00	0.23	0.00	0.21	0.23	0.00				0.76	0.00	0.00
Avail Cap(c_a), veh/h	0	2082	931	827	2421	0				1063	558	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	7.3	0.0	4.7	3.7	0.0				37.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.2	0.2	0.0				3.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	2.7	0.0	1.1	2.2	0.0				4.2	0.0	0.0
LnGrp Delay(d),s/veh	0.0	7.5	0.0	4.8	3.9	0.0				40.4	0.0	0.0
LnGrp LOS		A		A	A					D		
Approach Vol, veh/h		489			679						333	
Approach Delay, s/veh		7.5			4.1						40.4	
Approach LOS		A			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	9.8	62.1				71.9		18.1
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	15.0	27.5				47.5		32.0
Max Q Clear Time (g_c+I1), s	4.3	7.8				6.7		11.6
Green Ext Time (p_c), s	0.2	10.5				15.1		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	13.3
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	235	525	0	0	360	340	275	5	165	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1667	1667	0	0	1624	1624	1652	1652	1900			
Adj Flow Rate, veh/h	250	559	0	0	383	0	237	83	176			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	14	14	0	0	17	17	15	15	15			
Cap, veh/h	632	2114	0	0	1589	711	340	102	216			
Arrive On Green	0.10	0.67	0.00	0.00	0.52	0.00	0.22	0.22	0.22			
Sat Flow, veh/h	1587	3250	0	0	3167	1380	1573	473	1002			
Grp Volume(v), veh/h	250	559	0	0	383	0	237	0	259			
Grp Sat Flow(s),veh/h/ln	1587	1583	0	0	1543	1380	1573	0	1475			
Q Serve(g_s), s	6.2	6.4	0.0	0.0	6.2	0.0	12.5	0.0	15.0			
Cycle Q Clear(g_c), s	6.2	6.4	0.0	0.0	6.2	0.0	12.5	0.0	15.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		0.68			
Lane Grp Cap(c), veh/h	632	2114	0	0	1589	711	340	0	318			
V/C Ratio(X)	0.40	0.26	0.00	0.00	0.24	0.00	0.70	0.00	0.81			
Avail Cap(c_a), veh/h	831	2114	0	0	1589	711	524	0	492			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	7.7	6.0	0.0	0.0	12.1	0.0	32.6	0.0	33.6			
Incr Delay (d2), s/veh	0.4	0.3	0.0	0.0	0.4	0.0	3.1	0.0	6.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	2.7	2.9	0.0	0.0	2.7	0.0	5.7	0.0	6.7			
LnGrp Delay(d),s/veh	8.1	6.3	0.0	0.0	12.4	0.0	35.7	0.0	40.4			
LnGrp LOS	A	A			B		D		D			
Approach Vol, veh/h		809			383			496				
Approach Delay, s/veh		6.9			12.4			38.2				
Approach LOS		A			B			D				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		65.6		24.4	13.7	51.9		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		49.5		30.0	20.0	24.5		
Max Q Clear Time (g_c+I1), s		8.4		17.0	8.2	8.2		
Green Ext Time (p_c), s		13.0		2.4	0.6	8.3		

Intersection Summary	
HCM 2010 Ctrl Delay	17.3
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	40	640	655	20	20	40
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	19	19	17	17	27	27
Mvmt Flow	44	703	720	22	22	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	742	0	-	0	1171	371
Stage 1	-	-	-	-	731	-
Stage 2	-	-	-	-	440	-
Critical Hdwy	4.48	-	-	-	7.34	7.44
Critical Hdwy Stg 1	-	-	-	-	6.34	-
Critical Hdwy Stg 2	-	-	-	-	6.34	-
Follow-up Hdwy	2.39	-	-	-	3.77	3.57
Pot Cap-1 Maneuver	758	-	-	-	152	560
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	549	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	758	-	-	-	143	560
Mov Cap-2 Maneuver	-	-	-	-	143	-
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	517	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	19.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	758	-	-	-	143	560
HCM Lane V/C Ratio	0.058	-	-	-	0.154	0.078
HCM Control Delay (s)	10	-	-	-	34.7	12
HCM Lane LOS	B	-	-	-	D	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.5	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	110	5	290	5	395	70	310	355	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1681	1681	1681	1667	1667	1900	1583	1583	1900
Adj Flow Rate, veh/h	5	5	5	118	0	315	5	425	75	333	382	5
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	13	13	13	14	14	14	20	20	20
Cap, veh/h	11	11	11	237	0	859	11	644	113	447	1172	15
Arrive On Green	0.02	0.02	0.02	0.15	0.00	0.15	0.01	0.24	0.24	0.15	0.39	0.39
Sat Flow, veh/h	589	589	589	1601	0	2858	1587	2689	471	2925	3041	40
Grp Volume(v), veh/h	15	0	0	118	0	315	5	249	251	333	189	198
Grp Sat Flow(s),veh/h/ln	1767	0	0	1601	0	1429	1587	1583	1576	1463	1504	1576
Q Serve(g_s), s	0.4	0.0	0.0	3.1	0.0	3.9	0.1	6.4	6.5	4.9	4.0	4.0
Cycle Q Clear(g_c), s	0.4	0.0	0.0	3.1	0.0	3.9	0.1	6.4	6.5	4.9	4.0	4.0
Prop In Lane	0.33		0.33	1.00		1.00	1.00		0.30	1.00		0.03
Lane Grp Cap(c), veh/h	34	0	0	237	0	859	11	379	378	447	580	608
V/C Ratio(X)	0.45	0.00	0.00	0.50	0.00	0.37	0.47	0.66	0.66	0.75	0.33	0.33
Avail Cap(c_a), veh/h	389	0	0	741	0	1759	175	558	556	516	630	660
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.0	0.0	0.0	17.8	0.0	12.5	22.5	15.6	15.6	18.4	9.8	9.8
Incr Delay (d2), s/veh	3.4	0.0	0.0	0.6	0.0	0.1	11.4	0.7	0.8	4.0	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.2	0.0	0.0	1.4	0.0	1.5	0.1	2.8	2.9	2.2	1.6	1.7
LnGrp Delay(d),s/veh	25.5	0.0	0.0	18.4	0.0	12.6	33.8	16.3	16.4	22.4	9.9	9.9
LnGrp LOS	C			B		B	C	B	B	C	A	A
Approach Vol, veh/h		15			433			505			720	
Approach Delay, s/veh		25.5			14.2			16.5			15.7	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.9	15.9		5.9	5.3	22.5		11.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	16.0		10.0	5.0	19.0		21.0
Max Q Clear Time (g_c+I1), s	6.9	8.5		2.4	2.1	6.0		5.9
Green Ext Time (p_c), s	0.1	2.3		0.0	0.0	3.1		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	15.6
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	490	345	115	470	0	0	0	0	145	0	30
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1863	1863	0				1776	1776	1900
Adj Flow Rate, veh/h	0	516	0	121	495	0				183	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	3	3	2	2	0				7	7	7
Cap, veh/h	0	1307	585	588	2114	0				439	231	0
Arrive On Green	0.00	0.37	0.00	0.09	0.60	0.00				0.13	0.00	0.00
Sat Flow, veh/h	0	3597	1568	1774	3632	0				3382	1776	0
Grp Volume(v), veh/h	0	516	0	121	495	0				183	0	0
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1774	1770	0				1691	1776	0
Q Serve(g_s), s	0.0	4.2	0.0	1.4	2.5	0.0				1.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	4.2	0.0	1.4	2.5	0.0				1.9	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	1307	585	588	2114	0				439	231	0
V/C Ratio(X)	0.00	0.39	0.00	0.21	0.23	0.00				0.42	0.00	0.00
Avail Cap(c_a), veh/h	0	1867	835	743	2989	0				2813	1477	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	8.9	0.0	5.3	3.6	0.0				15.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.2	0.1	0.0				0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	2.1	0.0	0.7	1.2	0.0				0.9	0.0	0.0
LnGrp Delay(d),s/veh	0.0	9.1	0.0	5.5	3.7	0.0				16.2	0.0	0.0
LnGrp LOS		A		A	A					B		
Approach Vol, veh/h		516			616						183	
Approach Delay, s/veh		9.1			4.1						16.2	
Approach LOS		A			A						B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	8.6	19.9				28.5		10.0
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	7.0	20.5				32.5		32.0
Max Q Clear Time (g_c+I1), s	3.4	6.2				4.5		3.9
Green Ext Time (p_c), s	0.1	8.2				12.3		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	7.8
HCM 2010 LOS	A

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	265	370	0	0	320	205	270	0	90	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1810	1810	0	0	1827	1827	1827	1827	1900			
Adj Flow Rate, veh/h	276	385	0	0	333	0	188	131	94			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	5	5	0	0	4	4	4	4	4			
Cap, veh/h	607	1799	0	0	882	394	387	220	158			
Arrive On Green	0.15	0.52	0.00	0.00	0.25	0.00	0.22	0.22	0.22			
Sat Flow, veh/h	1723	3529	0	0	3563	1553	1740	991	711			
Grp Volume(v), veh/h	276	385	0	0	333	0	188	0	225			
Grp Sat Flow(s),veh/h/ln	1723	1719	0	0	1736	1553	1740	0	1701			
Q Serve(g_s), s	4.3	2.5	0.0	0.0	3.3	0.0	3.9	0.0	4.9			
Cycle Q Clear(g_c), s	4.3	2.5	0.0	0.0	3.3	0.0	3.9	0.0	4.9			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		0.42			
Lane Grp Cap(c), veh/h	607	1799	0	0	882	394	387	0	378			
V/C Ratio(X)	0.45	0.21	0.00	0.00	0.38	0.00	0.49	0.00	0.59			
Avail Cap(c_a), veh/h	644	2415	0	0	1429	639	1285	0	1257			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	7.9	5.3	0.0	0.0	12.7	0.0	14.0	0.0	14.4			
Incr Delay (d2), s/veh	0.5	0.1	0.0	0.0	0.6	0.0	1.1	0.0	1.8			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	2.1	1.2	0.0	0.0	1.6	0.0	2.0	0.0	2.4			
LnGrp Delay(d),s/veh	8.4	5.4	0.0	0.0	13.3	0.0	15.1	0.0	16.2			
LnGrp LOS	A	A			B		B		B			
Approach Vol, veh/h		661			333			413				
Approach Delay, s/veh		6.6			13.3			15.7				
Approach LOS		A			B			B				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		27.1		14.2	11.1	16.0		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		29.0		30.5	7.0	17.0		
Max Q Clear Time (g_c+I1), s		4.5		6.9	6.3	5.3		
Green Ext Time (p_c), s		7.9		2.4	0.1	5.2		

Intersection Summary	
HCM 2010 Ctrl Delay	10.9
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	65	390	450	35	15	80
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	5	2	2	13	13
Mvmt Flow	70	419	484	38	16	86

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	522	0	-	0	852	261
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	349	-
Critical Hdwy	4.2	-	-	-	7.06	7.16
Critical Hdwy Stg 1	-	-	-	-	6.06	-
Critical Hdwy Stg 2	-	-	-	-	6.06	-
Follow-up Hdwy	2.25	-	-	-	3.63	3.43
Pot Cap-1 Maneuver	1020	-	-	-	278	705
Stage 1	-	-	-	-	542	-
Stage 2	-	-	-	-	654	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1020	-	-	-	259	705
Mov Cap-2 Maneuver	-	-	-	-	259	-
Stage 1	-	-	-	-	542	-
Stage 2	-	-	-	-	609	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	12.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1020	-	-	-	259	705
HCM Lane V/C Ratio	0.069	-	-	-	0.062	0.122
HCM Control Delay (s)	8.8	-	-	-	19.8	10.8
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.2	-	-	-	0.2	0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	100	5	195	0	295	130	140	270	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1845	1845	1900	1792	1792	1900
Adj Flow Rate, veh/h	0	0	0	103	0	204	0	304	134	144	278	0
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	1	1	1	3	3	3	6	6	6
Cap, veh/h	0	6	0	268	0	846	6	601	259	380	1797	0
Arrive On Green	0.00	0.00	0.00	0.15	0.00	0.15	0.00	0.25	0.25	0.11	0.53	0.00
Sat Flow, veh/h	0	1900	0	1792	0	3198	1757	2387	1029	3312	3495	0
Grp Volume(v), veh/h	0	0	0	103	0	204	0	221	217	144	278	0
Grp Sat Flow(s),veh/h/ln	0	1900	0	1792	0	1599	1757	1752	1663	1656	1703	0
Q Serve(g_s), s	0.0	0.0	0.0	1.6	0.0	1.6	0.0	3.4	3.5	1.2	1.3	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	1.6	0.0	1.6	0.0	3.4	3.5	1.2	1.3	0.0
Prop In Lane	0.00		0.00	1.00		1.00	1.00		0.62	1.00		0.00
Lane Grp Cap(c), veh/h	0	6	0	268	0	846	6	441	419	380	1797	0
V/C Ratio(X)	0.00	0.00	0.00	0.38	0.00	0.24	0.00	0.50	0.52	0.38	0.15	0.00
Avail Cap(c_a), veh/h	0	613	0	1213	0	2532	283	904	858	854	2087	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	11.9	0.0	9.0	0.0	9.9	10.0	12.7	3.8	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.3	0.4	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	0.8	0.0	0.7	0.0	1.6	1.6	0.6	0.6	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	12.2	0.0	9.0	0.0	10.3	10.3	12.9	3.8	0.0
LnGrp LOS				B		A		B	B	B	A	
Approach Vol, veh/h		0			307			438			422	
Approach Delay, s/veh		0.0			10.1			10.3			6.9	
Approach LOS					B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	12.8		0.0	0.0	21.4		9.6
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	16.0		10.0	5.0	19.0		21.0
Max Q Clear Time (g_c+I1), s	3.2	5.5		0.0	0.0	3.3		3.6
Green Ext Time (p_c), s	0.1	2.4		0.0	0.0	2.8		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	9.0
HCM 2010 LOS	A

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	720	330	715	1025	0	0	0	0	515	5	35
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1743	1743	1727	1727	0				1570	1570	1900
Adj Flow Rate, veh/h	0	758	0	753	1079	0				580	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	9	9	10	10	0				21	21	21
Cap, veh/h	0	874	391	763	2343	0				631	332	0
Arrive On Green	0.00	0.26	0.00	0.41	0.71	0.00				0.21	0.00	0.00
Sat Flow, veh/h	0	3399	1482	1645	3368	0				2991	1570	0
Grp Volume(v), veh/h	0	758	0	753	1079	0				580	0	0
Grp Sat Flow(s),veh/h/ln	0	1656	1482	1645	1641	0				1495	1570	0
Q Serve(g_s), s	0.0	30.6	0.0	56.5	19.6	0.0				26.6	0.0	0.0
Cycle Q Clear(g_c), s	0.0	30.6	0.0	56.5	19.6	0.0				26.6	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	874	391	763	2343	0				631	332	0
V/C Ratio(X)	0.00	0.87	0.00	0.99	0.46	0.00				0.92	0.00	0.00
Avail Cap(c_a), veh/h	0	874	391	763	2343	0				684	359	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	49.2	0.0	32.8	8.5	0.0				54.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	11.3	0.0	29.4	0.7	0.0				17.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	15.4	0.0	34.9	9.1	0.0				12.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	60.5	0.0	62.1	9.2	0.0				71.1	0.0	0.0
LnGrp LOS		E		E	A					E		
Approach Vol, veh/h		758			1832						580	
Approach Delay, s/veh		60.5			30.9						71.1	
Approach LOS		E			C						E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	63.0	42.4				105.4		34.6
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	58.0	34.5				97.5		32.0
Max Q Clear Time (g_c+I1), s	58.5	32.6				21.6		28.6
Green Ext Time (p_c), s	0.0	1.8				45.3		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	45.4
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	270	975	0	0	1415	820	315	5	440	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1667	1667	0	0	1624	1624	1652	1652	1900			
Adj Flow Rate, veh/h	287	1037	0	0	1505	0	335	5	468			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	14	14	0	0	17	17	15	15	15			
Cap, veh/h	224	1972	0	0	1473	659	443	4	392			
Arrive On Green	0.10	0.62	0.00	0.00	0.48	0.00	0.28	0.28	0.28			
Sat Flow, veh/h	1587	3250	0	0	3167	1380	1573	15	1392			
Grp Volume(v), veh/h	287	1037	0	0	1505	0	335	0	473			
Grp Sat Flow(s),veh/h/ln	1587	1583	0	0	1543	1380	1573	0	1407			
Q Serve(g_s), s	11.0	20.2	0.0	0.0	52.5	0.0	21.4	0.0	31.0			
Cycle Q Clear(g_c), s	11.0	20.2	0.0	0.0	52.5	0.0	21.4	0.0	31.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		0.99			
Lane Grp Cap(c), veh/h	224	1972	0	0	1473	659	443	0	396			
V/C Ratio(X)	1.28	0.53	0.00	0.00	1.02	0.00	0.76	0.00	1.19			
Avail Cap(c_a), veh/h	224	1972	0	0	1473	659	443	0	396			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	34.9	11.6	0.0	0.0	28.8	0.0	36.0	0.0	39.5			
Incr Delay (d2), s/veh	155.8	1.0	0.0	0.0	29.2	0.0	7.5	0.0	109.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	16.5	9.1	0.0	0.0	28.3	0.0	10.2	0.0	24.0			
LnGrp Delay(d),s/veh	190.7	12.6	0.0	0.0	57.9	0.0	43.5	0.0	148.8			
LnGrp LOS	F	B			F		D		F			
Approach Vol, veh/h		1324			1505			808				
Approach Delay, s/veh		51.2			57.9			105.1				
Approach LOS		D			E			F				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		74.0		36.0	16.0	58.0		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		68.5		31.0	11.0	52.5		
Max Q Clear Time (g_c+I1), s		22.2		33.0	13.0	54.5		
Green Ext Time (p_c), s		42.1		0.0	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	66.0
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	41.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	45	1360	2185	25	25	45
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	19	19	17	17	27	27
Mvmt Flow	49	1495	2401	27	27	49

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2429	0	-	0	3261	1214
Stage 1	-	-	-	-	2415	-
Stage 2	-	-	-	-	846	-
Critical Hdwy	4.48	-	-	-	7.34	7.44
Critical Hdwy Stg 1	-	-	-	-	6.34	-
Critical Hdwy Stg 2	-	-	-	-	6.34	-
Follow-up Hdwy	2.39	-	-	-	3.77	3.57
Pot Cap-1 Maneuver	148	-	-	-	~ 4	141
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	324	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	148	-	-	-	~ 3	141
Mov Cap-2 Maneuver	-	-	-	-	~ 3	-
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	217	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	$ 2143.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	148	-	-	-	3	141
HCM Lane V/C Ratio	0.334	-	-	-	9.158	0.351
HCM Control Delay (s)	41.1	-	-	$ 5923.8		43.7
HCM Lane LOS	E	-	-	-	F	E
HCM 95th %tile Q(veh)	1.4	-	-	-	5.1	1.4

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	485	5	1770	5	450	235	980	405	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1681	1681	1681	1667	1667	1900	1583	1583	1900
Adj Flow Rate, veh/h	5	5	5	522	0	1906	5	484	253	1054	435	5
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	13	13	13	14	14	14	20	20	20
Cap, veh/h	9	9	9	473	0	1748	10	466	242	926	1651	19
Arrive On Green	0.02	0.02	0.02	0.30	0.00	0.30	0.01	0.23	0.23	0.32	0.54	0.54
Sat Flow, veh/h	589	589	589	1601	0	2858	1587	2007	1043	2925	3046	35
Grp Volume(v), veh/h	15	0	0	522	0	1906	5	381	356	1054	215	225
Grp Sat Flow(s),veh/h/ln	1767	0	0	1601	0	1429	1587	1583	1466	1463	1504	1577
Q Serve(g_s), s	1.2	0.0	0.0	42.0	0.0	42.0	0.4	33.0	33.0	45.0	10.8	10.9
Cycle Q Clear(g_c), s	1.2	0.0	0.0	42.0	0.0	42.0	0.4	33.0	33.0	45.0	10.8	10.9
Prop In Lane	0.33		0.33	1.00		1.00	1.00		0.71	1.00		0.02
Lane Grp Cap(c), veh/h	28	0	0	473	0	1748	10	367	340	926	815	855
V/C Ratio(X)	0.54	0.00	0.00	1.10	0.00	1.09	0.50	1.04	1.05	1.14	0.26	0.26
Avail Cap(c_a), veh/h	124	0	0	473	0	1748	56	367	340	926	815	855
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.5	0.0	0.0	50.1	0.0	27.6	70.4	54.6	54.6	48.6	17.4	17.4
Incr Delay (d2), s/veh	5.9	0.0	0.0	72.8	0.0	50.6	13.6	57.2	61.1	75.6	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.6	0.0	0.0	28.1	0.0	46.3	0.2	20.2	19.1	27.8	4.5	4.7
LnGrp Delay(d),s/veh	75.4	0.0	0.0	122.9	0.0	78.2	84.1	111.8	115.8	124.3	17.5	17.5
LnGrp LOS	E			F		F	F	F	F	F	B	B
Approach Vol, veh/h		15			2428			742			1494	
Approach Delay, s/veh		75.4			87.8			113.5			92.8	
Approach LOS		E			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	50.0	38.0		7.2	5.9	82.1		47.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	45.0	33.0		10.0	5.0	73.0		42.0
Max Q Clear Time (g_c+I1), s	47.0	35.0		3.2	2.4	12.9		44.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	5.9		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	93.4
HCM 2010 LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	740	395	285	650	0	0	0	0	345	0	35
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1863	1863	0				1776	1776	1900
Adj Flow Rate, veh/h	0	779	0	300	684	0				398	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	3	3	2	2	0				7	7	7
Cap, veh/h	0	1353	605	519	2176	0				619	325	0
Arrive On Green	0.00	0.39	0.00	0.13	0.61	0.00				0.18	0.00	0.00
Sat Flow, veh/h	0	3597	1568	1774	3632	0				3382	1776	0
Grp Volume(v), veh/h	0	779	0	300	684	0				398	0	0
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1774	1770	0				1691	1776	0
Q Serve(g_s), s	0.0	9.1	0.0	4.7	4.8	0.0				5.7	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.1	0.0	4.7	4.8	0.0				5.7	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	1353	605	519	2176	0				619	325	0
V/C Ratio(X)	0.00	0.58	0.00	0.58	0.31	0.00				0.64	0.00	0.00
Avail Cap(c_a), veh/h	0	1518	679	625	2555	0				2084	1094	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	12.6	0.0	8.2	4.8	0.0				19.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.6	0.0	1.0	0.2	0.0				1.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	4.4	0.0	2.3	2.3	0.0				2.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	13.2	0.0	9.3	4.9	0.0				21.0	0.0	0.0
LnGrp LOS		B		A	A					C		
Approach Vol, veh/h		779			984						398	
Approach Delay, s/veh		13.2			6.3						21.0	
Approach LOS		B			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	11.9	25.5				37.4		14.5
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	10.0	22.5				37.5		32.0
Max Q Clear Time (g_c+I1), s	6.7	11.1				6.8		7.7
Green Ext Time (p_c), s	0.3	8.9				19.1		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	11.5
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	305	780	0	0	635	350	310	0	340	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1810	1810	0	0	1827	1827	1827	1827	1900			
Adj Flow Rate, veh/h	318	812	0	0	661	0	323	0	354			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	5	5	0	0	4	4	4	4	4			
Cap, veh/h	482	1833	0	0	1035	463	520	0	464			
Arrive On Green	0.15	0.53	0.00	0.00	0.30	0.00	0.30	0.00	0.30			
Sat Flow, veh/h	1723	3529	0	0	3563	1553	1740	0	1553			
Grp Volume(v), veh/h	318	812	0	0	661	0	323	0	354			
Grp Sat Flow(s),veh/h/ln	1723	1719	0	0	1736	1553	1740	0	1553			
Q Serve(g_s), s	7.3	9.0	0.0	0.0	10.3	0.0	10.0	0.0	12.9			
Cycle Q Clear(g_c), s	7.3	9.0	0.0	0.0	10.3	0.0	10.0	0.0	12.9			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	482	1833	0	0	1035	463	520	0	464			
V/C Ratio(X)	0.66	0.44	0.00	0.00	0.64	0.00	0.62	0.00	0.76			
Avail Cap(c_a), veh/h	601	2145	0	0	1110	497	849	0	758			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	12.3	8.9	0.0	0.0	19.0	0.0	18.9	0.0	19.9			
Incr Delay (d2), s/veh	1.9	0.2	0.0	0.0	1.7	0.0	1.5	0.0	3.2			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	3.6	4.2	0.0	0.0	5.1	0.0	5.0	0.0	5.9			
LnGrp Delay(d),s/veh	14.1	9.2	0.0	0.0	20.7	0.0	20.3	0.0	23.1			
LnGrp LOS	B	A			C		C		C			
Approach Vol, veh/h		1130			661			677				
Approach Delay, s/veh		10.6			20.7			21.8				
Approach LOS		B			C			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		38.8		23.7	14.7	24.1		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		39.0		30.5	14.0	20.0		
Max Q Clear Time (g_c+I1), s		11.0		14.9	9.3	12.3		
Green Ext Time (p_c), s		18.1		3.8	0.4	6.3		

Intersection Summary	
HCM 2010 Ctrl Delay	16.4
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	1.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	75	1040	900	40	15	90
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	5	2	2	13	13
Mvmt Flow	81	1118	968	43	16	97

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1011	0	-	0	1709	505
Stage 1	-	-	-	-	989	-
Stage 2	-	-	-	-	720	-
Critical Hdwy	4.2	-	-	-	7.06	7.16
Critical Hdwy Stg 1	-	-	-	-	6.06	-
Critical Hdwy Stg 2	-	-	-	-	6.06	-
Follow-up Hdwy	2.25	-	-	-	3.63	3.43
Pot Cap-1 Maneuver	664	-	-	-	73	484
Stage 1	-	-	-	-	297	-
Stage 2	-	-	-	-	415	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	664	-	-	-	64	484
Mov Cap-2 Maneuver	-	-	-	-	64	-
Stage 1	-	-	-	-	297	-
Stage 2	-	-	-	-	364	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	23.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	664	-	-	-	64	484
HCM Lane V/C Ratio	0.121	-	-	-	0.252	0.2
HCM Control Delay (s)	11.2	-	-	-	79.2	14.3
HCM Lane LOS	B	-	-	-	F	B
HCM 95th %tile Q(veh)	0.4	-	-	-	0.9	0.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	210	5	605	0	335	300	755	310	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1845	1845	1900	1792	1792	1900
Adj Flow Rate, veh/h	0	0	0	216	0	627	0	345	309	778	320	0
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	1	1	1	3	3	3	6	6	6
Cap, veh/h	0	3	0	347	0	1514	3	449	395	926	2127	0
Arrive On Green	0.00	0.00	0.00	0.19	0.00	0.19	0.00	0.25	0.25	0.28	0.62	0.00
Sat Flow, veh/h	0	1900	0	1792	0	3198	1757	1766	1557	3312	3495	0
Grp Volume(v), veh/h	0	0	0	216	0	627	0	342	312	778	320	0
Grp Sat Flow(s),veh/h/ln	0	1900	0	1792	0	1599	1757	1752	1570	1656	1703	0
Q Serve(g_s), s	0.0	0.0	0.0	6.1	0.0	7.1	0.0	10.0	10.2	12.2	2.1	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	6.1	0.0	7.1	0.0	10.0	10.2	12.2	2.1	0.0
Prop In Lane	0.00		0.00	1.00		1.00	1.00		0.99	1.00		0.00
Lane Grp Cap(c), veh/h	0	3	0	347	0	1514	3	445	399	926	2127	0
V/C Ratio(X)	0.00	0.00	0.00	0.62	0.00	0.41	0.00	0.77	0.78	0.84	0.15	0.00
Avail Cap(c_a), veh/h	0	345	0	683	0	2114	159	541	485	1323	2127	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	20.4	0.0	9.5	0.0	19.0	19.1	18.7	4.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.1	0.0	4.2	5.3	2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	3.1	0.0	3.1	0.0	5.3	5.0	5.8	1.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	21.0	0.0	9.6	0.0	23.2	24.4	21.1	4.3	0.0
LnGrp LOS				C		A		C	C	C	A	
Approach Vol, veh/h		0			843			654			1098	
Approach Delay, s/veh		0.0			12.5			23.8			16.2	
Approach LOS					B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	20.4	19.0		0.0	0.0	39.4		15.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	22.0	17.0		10.0	5.0	34.0		21.0
Max Q Clear Time (g_c+I1), s	14.2	12.2		0.0	0.0	4.1		9.1
Green Ext Time (p_c), s	1.2	1.8		0.0	0.0	4.7		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	730	330	732	1035	0	0	0	0	530	5	35
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1743	1743	1727	1727	0				1570	1570	1900
Adj Flow Rate, veh/h	0	768	0	771	1089	0				596	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	9	9	10	10	0				21	21	21
Cap, veh/h	0	860	385	756	2329	0				644	338	0
Arrive On Green	0.00	0.26	0.00	0.41	0.71	0.00				0.22	0.00	0.00
Sat Flow, veh/h	0	3399	1482	1645	3368	0				2991	1570	0
Grp Volume(v), veh/h	0	768	0	771	1089	0				596	0	0
Grp Sat Flow(s),veh/h/ln	0	1656	1482	1645	1641	0				1495	1570	0
Q Serve(g_s), s	0.0	31.3	0.0	58.0	20.2	0.0				27.3	0.0	0.0
Cycle Q Clear(g_c), s	0.0	31.3	0.0	58.0	20.2	0.0				27.3	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	860	385	756	2329	0				644	338	0
V/C Ratio(X)	0.00	0.89	0.00	1.02	0.47	0.00				0.93	0.00	0.00
Avail Cap(c_a), veh/h	0	860	385	756	2329	0				684	359	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	50.0	0.0	33.7	8.8	0.0				53.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	13.7	0.0	37.7	0.7	0.0				18.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	15.9	0.0	37.1	9.3	0.0				13.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	63.6	0.0	71.5	9.5	0.0				72.0	0.0	0.0
LnGrp LOS		E		F	A					E		
Approach Vol, veh/h		768			1860						596	
Approach Delay, s/veh		63.6			35.2						72.0	
Approach LOS		E			D						E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	63.0	41.8				104.8		35.2
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	58.0	34.5				97.5		32.0
Max Q Clear Time (g_c+I1), s	60.0	33.3				22.2		29.3
Green Ext Time (p_c), s	0.0	1.2				45.8		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	48.8
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	270	1000	0	0	1441	835	315	5	457	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1667	1667	0	0	1624	1624	1652	1652	1900			
Adj Flow Rate, veh/h	287	1064	0	0	1533	0	335	5	486			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	14	14	0	0	17	17	15	15	15			
Cap, veh/h	224	1972	0	0	1473	659	443	4	392			
Arrive On Green	0.10	0.62	0.00	0.00	0.48	0.00	0.28	0.28	0.28			
Sat Flow, veh/h	1587	3250	0	0	3167	1380	1573	14	1392			
Grp Volume(v), veh/h	287	1064	0	0	1533	0	335	0	491			
Grp Sat Flow(s),veh/h/ln	1587	1583	0	0	1543	1380	1573	0	1406			
Q Serve(g_s), s	11.0	21.0	0.0	0.0	52.5	0.0	21.4	0.0	31.0			
Cycle Q Clear(g_c), s	11.0	21.0	0.0	0.0	52.5	0.0	21.4	0.0	31.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		0.99			
Lane Grp Cap(c), veh/h	224	1972	0	0	1473	659	443	0	396			
V/C Ratio(X)	1.28	0.54	0.00	0.00	1.04	0.00	0.76	0.00	1.24			
Avail Cap(c_a), veh/h	224	1972	0	0	1473	659	443	0	396			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	34.9	11.8	0.0	0.0	28.8	0.0	36.0	0.0	39.5			
Incr Delay (d2), s/veh	155.8	1.1	0.0	0.0	34.9	0.0	7.5	0.0	127.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	16.5	9.3	0.0	0.0	29.4	0.0	10.2	0.0	26.0			
LnGrp Delay(d),s/veh	190.7	12.9	0.0	0.0	63.6	0.0	43.5	0.0	166.8			
LnGrp LOS	F	B			F		D		F			
Approach Vol, veh/h		1351			1533			826				
Approach Delay, s/veh		50.6			63.6			116.8				
Approach LOS		D			E			F				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		74.0		36.0	16.0	58.0		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		68.5		31.0	11.0	52.5		
Max Q Clear Time (g_c+I1), s		23.0		33.0	13.0	54.5		
Green Ext Time (p_c), s		41.8		0.0	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	70.7
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	189.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	86	1360	2185	32	32	86
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	19	19	17	17	27	27
Mvmt Flow	95	1495	2401	35	35	95

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2436	0	-	0	3355	1218
Stage 1	-	-	-	-	2419	-
Stage 2	-	-	-	-	936	-
Critical Hdwy	4.48	-	-	-	7.34	7.44
Critical Hdwy Stg 1	-	-	-	-	6.34	-
Critical Hdwy Stg 2	-	-	-	-	6.34	-
Follow-up Hdwy	2.39	-	-	-	3.77	3.57
Pot Cap-1 Maneuver	147	-	-	-	~ 4	140
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	288	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	147	-	-	-	~ 1	140
Mov Cap-2 Maneuver	-	-	-	-	~ 1	-
Stage 1	-	-	-	-	37	-
Stage 2	-	-	-	-	102	-

Approach	EB	WB	SB
HCM Control Delay, s	3.9	0	$ 6036.4
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	147	-	-	-	1	140
HCM Lane V/C Ratio	0.643	-	-	-	35.165	0.675
HCM Control Delay (s)	65.5	-	-	$	22065.1	72.3
HCM Lane LOS	F	-	-	-	F	F
HCM 95th %tile Q(veh)	3.5	-	-	-	6.3	3.8

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	485	5	1772	5	455	235	982	410	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1681	1681	1681	1667	1667	1900	1583	1583	1900
Adj Flow Rate, veh/h	5	5	5	522	0	1908	5	489	253	1056	441	5
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	13	13	13	14	14	14	20	20	20
Cap, veh/h	9	9	9	473	0	1748	10	467	241	926	1652	19
Arrive On Green	0.02	0.02	0.02	0.30	0.00	0.30	0.01	0.23	0.23	0.32	0.54	0.54
Sat Flow, veh/h	589	589	589	1601	0	2858	1587	2014	1037	2925	3047	35
Grp Volume(v), veh/h	15	0	0	522	0	1908	5	384	358	1056	218	228
Grp Sat Flow(s),veh/h/ln	1767	0	0	1601	0	1429	1587	1583	1468	1463	1504	1577
Q Serve(g_s), s	1.2	0.0	0.0	42.0	0.0	42.0	0.4	33.0	33.0	45.0	11.0	11.0
Cycle Q Clear(g_c), s	1.2	0.0	0.0	42.0	0.0	42.0	0.4	33.0	33.0	45.0	11.0	11.0
Prop In Lane	0.33		0.33	1.00		1.00	1.00		0.71	1.00		0.02
Lane Grp Cap(c), veh/h	28	0	0	473	0	1748	10	367	341	926	815	855
V/C Ratio(X)	0.54	0.00	0.00	1.10	0.00	1.09	0.50	1.04	1.05	1.14	0.27	0.27
Avail Cap(c_a), veh/h	124	0	0	473	0	1748	56	367	341	926	815	855
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.5	0.0	0.0	50.1	0.0	27.6	70.4	54.6	54.6	48.6	17.4	17.4
Incr Delay (d2), s/veh	5.9	0.0	0.0	72.8	0.0	51.0	13.6	59.1	63.0	76.5	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.6	0.0	0.0	28.1	0.0	46.4	0.2	20.4	19.3	28.0	4.6	4.8
LnGrp Delay(d),s/veh	75.4	0.0	0.0	122.9	0.0	78.6	84.1	113.7	117.7	125.1	17.5	17.5
LnGrp LOS	E			F		F	F	F	F	F	B	B
Approach Vol, veh/h		15			2430			747			1502	
Approach Delay, s/veh		75.4			88.1			115.4			93.2	
Approach LOS		E			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	50.0	38.0		7.2	5.9	82.1		47.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	45.0	33.0		10.0	5.0	73.0		42.0
Max Q Clear Time (g_c+I1), s	47.0	35.0		3.2	2.4	13.0		44.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	5.9		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	94.0
HCM 2010 LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	747	395	298	657	0	0	0	0	353	0	35
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1863	1863	0				1776	1776	1900
Adj Flow Rate, veh/h	0	786	0	314	692	0				407	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	3	3	2	2	0				7	7	7
Cap, veh/h	0	1343	601	521	2178	0				626	329	0
Arrive On Green	0.00	0.38	0.00	0.14	0.62	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	3597	1568	1774	3632	0				3382	1776	0
Grp Volume(v), veh/h	0	786	0	314	692	0				407	0	0
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1774	1770	0				1691	1776	0
Q Serve(g_s), s	0.0	9.4	0.0	5.0	4.9	0.0				5.9	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.4	0.0	5.0	4.9	0.0				5.9	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	1343	601	521	2178	0				626	329	0
V/C Ratio(X)	0.00	0.59	0.00	0.60	0.32	0.00				0.65	0.00	0.00
Avail Cap(c_a), veh/h	0	1497	670	614	2520	0				2055	1079	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	12.9	0.0	8.5	4.8	0.0				19.9	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.6	0.0	1.2	0.2	0.0				1.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	4.6	0.0	2.5	2.4	0.0				2.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	13.6	0.0	9.7	5.0	0.0				21.3	0.0	0.0
LnGrp LOS		B		A	A					C		
Approach Vol, veh/h		786			1006						407	
Approach Delay, s/veh		13.6			6.5						21.3	
Approach LOS		B			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	12.2	25.7				37.9		14.8
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	10.0	22.5				37.5		32.0
Max Q Clear Time (g_c+I1), s	7.0	11.4				6.9		7.9
Green Ext Time (p_c), s	0.3	8.8				19.3		1.9

Intersection Summary	
HCM 2010 Ctrl Delay	11.7
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	305	795	0	0	655	358	310	0	353	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1810	1810	0	0	1827	1827	1827	1827	1900			
Adj Flow Rate, veh/h	318	828	0	0	682	0	323	0	368			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	5	5	0	0	4	4	4	4	4			
Cap, veh/h	470	1819	0	0	1028	460	533	0	475			
Arrive On Green	0.15	0.53	0.00	0.00	0.30	0.00	0.31	0.00	0.31			
Sat Flow, veh/h	1723	3529	0	0	3563	1553	1740	0	1553			
Grp Volume(v), veh/h	318	828	0	0	682	0	323	0	368			
Grp Sat Flow(s),veh/h/ln	1723	1719	0	0	1736	1553	1740	0	1553			
Q Serve(g_s), s	7.5	9.5	0.0	0.0	11.0	0.0	10.1	0.0	13.7			
Cycle Q Clear(g_c), s	7.5	9.5	0.0	0.0	11.0	0.0	10.1	0.0	13.7			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	470	1819	0	0	1028	460	533	0	475			
V/C Ratio(X)	0.68	0.46	0.00	0.00	0.66	0.00	0.61	0.00	0.77			
Avail Cap(c_a), veh/h	582	2103	0	0	1089	487	832	0	743			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	12.8	9.3	0.0	0.0	19.7	0.0	18.8	0.0	20.1			
Incr Delay (d2), s/veh	2.3	0.3	0.0	0.0	2.0	0.0	1.3	0.0	3.3			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	3.8	4.5	0.0	0.0	5.5	0.0	5.0	0.0	6.3			
LnGrp Delay(d),s/veh	15.0	9.6	0.0	0.0	21.7	0.0	20.2	0.0	23.4			
LnGrp LOS	B	A			C		C		C			
Approach Vol, veh/h		1146			682			691				
Approach Delay, s/veh		11.1			21.7			21.9				
Approach LOS		B			C			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		39.2		24.5	14.9	24.4		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		39.0		30.5	14.0	20.0		
Max Q Clear Time (g_c+I1), s		11.5		15.7	9.5	13.0		
Green Ext Time (p_c), s		18.3		3.8	0.4	5.9		

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	103	1040	900	45	20	118
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	5	2	2	13	13
Mvmt Flow	111	1118	968	48	22	127

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1016	0	-	0	1773	508
Stage 1	-	-	-	-	992	-
Stage 2	-	-	-	-	781	-
Critical Hdwy	4.2	-	-	-	7.06	7.16
Critical Hdwy Stg 1	-	-	-	-	6.06	-
Critical Hdwy Stg 2	-	-	-	-	6.06	-
Follow-up Hdwy	2.25	-	-	-	3.63	3.43
Pot Cap-1 Maneuver	661	-	-	-	66	482
Stage 1	-	-	-	-	295	-
Stage 2	-	-	-	-	385	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	661	-	-	-	55	482
Mov Cap-2 Maneuver	-	-	-	-	55	-
Stage 1	-	-	-	-	295	-
Stage 2	-	-	-	-	320	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	28.5
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	661	-	-	-	55	482
HCM Lane V/C Ratio	0.168	-	-	-	0.391	0.263
HCM Control Delay (s)	11.5	-	-	-	107.5	15.1
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.6	-	-	-	1.4	1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	210	5	606	0	339	300	756	314	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1845	1845	1900	1792	1792	1900
Adj Flow Rate, veh/h	0	0	0	216	0	628	0	349	309	779	324	0
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	1	1	1	3	3	3	6	6	6
Cap, veh/h	0	3	0	347	0	1515	3	452	394	927	2128	0
Arrive On Green	0.00	0.00	0.00	0.19	0.00	0.19	0.00	0.25	0.25	0.28	0.62	0.00
Sat Flow, veh/h	0	1900	0	1792	0	3198	1757	1776	1548	3312	3495	0
Grp Volume(v), veh/h	0	0	0	216	0	628	0	344	314	779	324	0
Grp Sat Flow(s),veh/h/ln	0	1900	0	1792	0	1599	1757	1752	1571	1656	1703	0
Q Serve(g_s), s	0.0	0.0	0.0	6.1	0.0	7.1	0.0	10.1	10.3	12.2	2.2	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	6.1	0.0	7.1	0.0	10.1	10.3	12.2	2.2	0.0
Prop In Lane	0.00		0.00	1.00		1.00	1.00		0.99	1.00		0.00
Lane Grp Cap(c), veh/h	0	3	0	347	0	1515	3	446	400	927	2128	0
V/C Ratio(X)	0.00	0.00	0.00	0.62	0.00	0.41	0.00	0.77	0.78	0.84	0.15	0.00
Avail Cap(c_a), veh/h	0	344	0	682	0	2112	159	540	484	1321	2128	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	20.4	0.0	9.5	0.0	19.1	19.2	18.7	4.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.1	0.0	4.4	5.5	2.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	3.1	0.0	3.1	0.0	5.4	5.1	5.8	1.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	21.1	0.0	9.6	0.0	23.5	24.6	21.1	4.3	0.0
LnGrp LOS				C		A		C	C	C	A	
Approach Vol, veh/h		0			844			658			1103	
Approach Delay, s/veh		0.0			12.5			24.0			16.2	
Approach LOS					B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	20.4	19.0		0.0	0.0	39.5		15.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	22.0	17.0		10.0	5.0	34.0		21.0
Max Q Clear Time (g_c+I1), s	14.2	12.3		0.0	0.0	4.2		9.1
Green Ext Time (p_c), s	1.2	1.8		0.0	0.0	4.7		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	17.0
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	731	330	739	1036	0	0	0	0	539	5	35
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1743	1743	1727	1727	0				1570	1570	1900
Adj Flow Rate, veh/h	0	769	0	778	1091	0				605	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	9	9	10	10	0				21	21	21
Cap, veh/h	0	852	381	754	2321	0				651	342	0
Arrive On Green	0.00	0.26	0.00	0.41	0.71	0.00				0.22	0.00	0.00
Sat Flow, veh/h	0	3399	1482	1645	3368	0				2991	1570	0
Grp Volume(v), veh/h	0	769	0	778	1091	0				605	0	0
Grp Sat Flow(s),veh/h/ln	0	1656	1482	1645	1641	0				1495	1570	0
Q Serve(g_s), s	0.0	31.4	0.0	58.0	20.4	0.0				27.8	0.0	0.0
Cycle Q Clear(g_c), s	0.0	31.4	0.0	58.0	20.4	0.0				27.8	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	852	381	754	2321	0				651	342	0
V/C Ratio(X)	0.00	0.90	0.00	1.03	0.47	0.00				0.93	0.00	0.00
Avail Cap(c_a), veh/h	0	852	381	754	2321	0				684	359	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	50.3	0.0	33.9	9.0	0.0				53.7	0.0	0.0
Incr Delay (d2), s/veh	0.0	14.7	0.0	41.2	0.7	0.0				18.9	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	16.2	0.0	37.7	9.3	0.0				13.2	0.0	0.0
LnGrp Delay(d),s/veh	0.0	65.0	0.0	75.1	9.7	0.0				72.5	0.0	0.0
LnGrp LOS		E		F	A					E		
Approach Vol, veh/h		769			1869						605	
Approach Delay, s/veh		65.0			36.9						72.5	
Approach LOS		E			D						E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	63.0	41.5				104.5		35.5
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	58.0	34.5				97.5		32.0
Max Q Clear Time (g_c+I1), s	60.0	33.4				22.4		29.8
Green Ext Time (p_c), s	0.0	1.0				45.8		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	50.2
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	270	1010	0	0	1450	844	315	5	464	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1667	1667	0	0	1624	1624	1652	1652	1900			
Adj Flow Rate, veh/h	287	1074	0	0	1543	0	335	5	494			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94			
Percent Heavy Veh, %	14	14	0	0	17	17	15	15	15			
Cap, veh/h	224	1972	0	0	1473	659	443	4	392			
Arrive On Green	0.10	0.62	0.00	0.00	0.48	0.00	0.28	0.28	0.28			
Sat Flow, veh/h	1587	3250	0	0	3167	1380	1573	14	1392			
Grp Volume(v), veh/h	287	1074	0	0	1543	0	335	0	499			
Grp Sat Flow(s),veh/h/ln	1587	1583	0	0	1543	1380	1573	0	1406			
Q Serve(g_s), s	11.0	21.3	0.0	0.0	52.5	0.0	21.4	0.0	31.0			
Cycle Q Clear(g_c), s	11.0	21.3	0.0	0.0	52.5	0.0	21.4	0.0	31.0			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		0.99			
Lane Grp Cap(c), veh/h	224	1972	0	0	1473	659	443	0	396			
V/C Ratio(X)	1.28	0.54	0.00	0.00	1.05	0.00	0.76	0.00	1.26			
Avail Cap(c_a), veh/h	224	1972	0	0	1473	659	443	0	396			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	34.9	11.8	0.0	0.0	28.8	0.0	36.0	0.0	39.5			
Incr Delay (d2), s/veh	155.8	1.1	0.0	0.0	37.1	0.0	7.5	0.0	135.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	16.5	9.5	0.0	0.0	29.9	0.0	10.2	0.0	26.9			
LnGrp Delay(d),s/veh	190.7	12.9	0.0	0.0	65.8	0.0	43.5	0.0	175.0			
LnGrp LOS	F	B			F		D		F			
Approach Vol, veh/h		1361			1543			834				
Approach Delay, s/veh		50.4			65.8			122.2				
Approach LOS		D			E			F				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		74.0		36.0	16.0	58.0		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		68.5		31.0	11.0	52.5		
Max Q Clear Time (g_c+I1), s		23.3		33.0	13.0	54.5		
Green Ext Time (p_c), s		41.7		0.0	0.0	0.0		

Intersection Summary	
HCM 2010 Ctrl Delay	72.8
HCM 2010 LOS	E

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	231.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	105	1360	2185	36	36	105
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	19	19	17	17	27	27
Mvmt Flow	115	1495	2401	40	40	115

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	2441	0	-	0	3399	1220
Stage 1	-	-	-	-	2421	-
Stage 2	-	-	-	-	978	-
Critical Hdwy	4.48	-	-	-	7.34	7.44
Critical Hdwy Stg 1	-	-	-	-	6.34	-
Critical Hdwy Stg 2	-	-	-	-	6.34	-
Follow-up Hdwy	2.39	-	-	-	3.77	3.57
Pot Cap-1 Maneuver	146	-	-	-	~ 3	140
Stage 1	-	-	-	-	~ 37	-
Stage 2	-	-	-	-	273	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	146	-	-	-	~ 1	140
Mov Cap-2 Maneuver	-	-	-	-	~ 1	-
Stage 1	-	-	-	-	~ 37	-
Stage 2	-	-	-	-	58	-

Approach	EB	WB	SB
HCM Control Delay, s	6.3	0	$ 6221.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	146	-	-	-	1	140
HCM Lane V/C Ratio	0.79	-	-	-	39.56	0.824
HCM Control Delay (s)	87.3	-	-	$ 24086.3		96.5
HCM Lane LOS	F	-	-	-	F	F
HCM 95th %tile Q(veh)	4.9	-	-	-	7	5.2

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	485	5	1774	5	457	235	984	412	5
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1681	1681	1681	1667	1667	1900	1583	1583	1900
Adj Flow Rate, veh/h	5	5	5	522	0	1911	5	491	253	1058	443	5
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	13	13	13	14	14	14	20	20	20
Cap, veh/h	9	9	9	473	0	1748	10	468	240	926	1652	19
Arrive On Green	0.02	0.02	0.02	0.30	0.00	0.30	0.01	0.23	0.23	0.32	0.54	0.54
Sat Flow, veh/h	589	589	589	1601	0	2858	1587	2017	1034	2925	3047	34
Grp Volume(v), veh/h	15	0	0	522	0	1911	5	385	359	1058	219	229
Grp Sat Flow(s),veh/h/ln	1767	0	0	1601	0	1429	1587	1583	1468	1463	1504	1577
Q Serve(g_s), s	1.2	0.0	0.0	42.0	0.0	42.0	0.4	33.0	33.0	45.0	11.1	11.1
Cycle Q Clear(g_c), s	1.2	0.0	0.0	42.0	0.0	42.0	0.4	33.0	33.0	45.0	11.1	11.1
Prop In Lane	0.33		0.33	1.00		1.00	1.00		0.70	1.00		0.02
Lane Grp Cap(c), veh/h	28	0	0	473	0	1748	10	367	341	926	815	855
V/C Ratio(X)	0.54	0.00	0.00	1.10	0.00	1.09	0.50	1.05	1.05	1.14	0.27	0.27
Avail Cap(c_a), veh/h	124	0	0	473	0	1748	56	367	341	926	815	855
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	69.5	0.0	0.0	50.1	0.0	27.6	70.4	54.6	54.6	48.6	17.4	17.5
Incr Delay (d2), s/veh	5.9	0.0	0.0	72.8	0.0	51.7	13.6	59.9	63.8	77.3	0.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.6	0.0	0.0	28.1	0.0	46.6	0.2	20.5	19.4	28.1	4.6	4.9
LnGrp Delay(d),s/veh	75.4	0.0	0.0	122.9	0.0	79.3	84.1	114.5	118.4	126.0	17.5	17.5
LnGrp LOS	E			F		F	F	F	F	F	B	B
Approach Vol, veh/h		15			2433			749			1506	
Approach Delay, s/veh		75.4			88.6			116.2			93.7	
Approach LOS		E			F			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	50.0	38.0		7.2	5.9	82.1		47.0
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	45.0	33.0		10.0	5.0	73.0		42.0
Max Q Clear Time (g_c+I1), s	47.0	35.0		3.2	2.4	13.1		44.0
Green Ext Time (p_c), s	0.0	0.0		0.0	0.0	6.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	94.6
HCM 2010 LOS	F

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	747	395	304	657	0	0	0	0	373	0	35
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1863	1863	0				1776	1776	1900
Adj Flow Rate, veh/h	0	786	0	320	692	0				428	0	0
Adj No. of Lanes	0	2	1	1	2	0				2	1	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95				0.95	0.95	0.95
Percent Heavy Veh, %	0	3	3	2	2	0				7	7	7
Cap, veh/h	0	1328	594	519	2165	0				648	340	0
Arrive On Green	0.00	0.38	0.00	0.14	0.61	0.00				0.19	0.00	0.00
Sat Flow, veh/h	0	3597	1568	1774	3632	0				3382	1776	0
Grp Volume(v), veh/h	0	786	0	320	692	0				428	0	0
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1774	1770	0				1691	1776	0
Q Serve(g_s), s	0.0	9.6	0.0	5.2	5.0	0.0				6.3	0.0	0.0
Cycle Q Clear(g_c), s	0.0	9.6	0.0	5.2	5.0	0.0				6.3	0.0	0.0
Prop In Lane	0.00		1.00	1.00		0.00				1.00		0.00
Lane Grp Cap(c), veh/h	0	1328	594	519	2165	0				648	340	0
V/C Ratio(X)	0.00	0.59	0.00	0.62	0.32	0.00				0.66	0.00	0.00
Avail Cap(c_a), veh/h	0	1476	660	603	2483	0				2025	1063	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	13.3	0.0	8.8	5.0	0.0				20.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.7	0.0	1.5	0.2	0.0				1.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	4.7	0.0	2.6	2.5	0.0				3.0	0.0	0.0
LnGrp Delay(d),s/veh	0.0	14.0	0.0	10.3	5.2	0.0				21.4	0.0	0.0
LnGrp LOS		B		B	A					C		
Approach Vol, veh/h		786			1012						428	
Approach Delay, s/veh		14.0			6.8						21.4	
Approach LOS		B			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	12.4	25.8				38.2		15.2
Change Period (Y+Rc), s	5.0	5.5				5.5		5.0
Max Green Setting (Gmax), s	10.0	22.5				37.5		32.0
Max Q Clear Time (g_c+I1), s	7.2	11.6				7.0		8.3
Green Ext Time (p_c), s	0.3	8.7				19.2		2.0

Intersection Summary	
HCM 2010 Ctrl Delay	12.1
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	305	814	0	0	660	378	310	0	359	0	0	0
Number	5	2	12	1	6	16	7	4	14			
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0			
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Adj Sat Flow, veh/h/ln	1810	1810	0	0	1827	1827	1827	1827	1900			
Adj Flow Rate, veh/h	318	848	0	0	688	0	323	0	374			
Adj No. of Lanes	1	2	0	0	2	1	1	1	0			
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96			
Percent Heavy Veh, %	5	5	0	0	4	4	4	4	4			
Cap, veh/h	467	1814	0	0	1025	458	538	0	480			
Arrive On Green	0.15	0.53	0.00	0.00	0.30	0.00	0.31	0.00	0.31			
Sat Flow, veh/h	1723	3529	0	0	3563	1553	1740	0	1553			
Grp Volume(v), veh/h	318	848	0	0	688	0	323	0	374			
Grp Sat Flow(s),veh/h/ln	1723	1719	0	0	1736	1553	1740	0	1553			
Q Serve(g_s), s	7.6	9.9	0.0	0.0	11.2	0.0	10.1	0.0	14.1			
Cycle Q Clear(g_c), s	7.6	9.9	0.0	0.0	11.2	0.0	10.1	0.0	14.1			
Prop In Lane	1.00		0.00	0.00		1.00	1.00		1.00			
Lane Grp Cap(c), veh/h	467	1814	0	0	1025	458	538	0	480			
V/C Ratio(X)	0.68	0.47	0.00	0.00	0.67	0.00	0.60	0.00	0.78			
Avail Cap(c_a), veh/h	576	2086	0	0	1080	483	826	0	737			
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Upstream Filter(I)	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00			
Uniform Delay (d), s/veh	13.0	9.5	0.0	0.0	19.9	0.0	18.8	0.0	20.2			
Incr Delay (d2), s/veh	2.4	0.3	0.0	0.0	2.2	0.0	1.3	0.0	3.5			
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
%ile BackOfQ(-26165%),veh/ln	2.8	4.8	0.0	0.0	5.7	0.0	5.0	0.0	6.5			
LnGrp Delay(d),s/veh	15.4	9.8	0.0	0.0	22.1	0.0	20.1	0.0	23.7			
LnGrp LOS	B	A			C		C		C			
Approach Vol, veh/h		1166			688			697				
Approach Delay, s/veh		11.3			22.1			22.0				
Approach LOS		B			C			C				

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		39.4		24.9	14.9	24.5		
Change Period (Y+Rc), s		5.5		5.0	5.0	5.5		
Max Green Setting (Gmax), s		39.0		30.5	14.0	20.0		
Max Q Clear Time (g_c+I1), s		11.9		16.1	9.6	13.2		
Green Ext Time (p_c), s		18.3		3.8	0.4	5.8		

Intersection Summary	
HCM 2010 Ctrl Delay	17.1
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	128	1040	900	50	25	143
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	-	50	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	93	93	93	93	93	93
Heavy Vehicles, %	5	5	2	2	13	13
Mvmt Flow	138	1118	968	54	27	154

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1022	0	-	0	1829	511
Stage 1	-	-	-	-	995	-
Stage 2	-	-	-	-	834	-
Critical Hdwy	4.2	-	-	-	7.06	7.16
Critical Hdwy Stg 1	-	-	-	-	6.06	-
Critical Hdwy Stg 2	-	-	-	-	6.06	-
Follow-up Hdwy	2.25	-	-	-	3.63	3.43
Pot Cap-1 Maneuver	657	-	-	-	60	480
Stage 1	-	-	-	-	294	-
Stage 2	-	-	-	-	360	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	657	-	-	-	47	480
Mov Cap-2 Maneuver	-	-	-	-	47	-
Stage 1	-	-	-	-	294	-
Stage 2	-	-	-	-	284	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	36.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	657	-	-	-	47	480
HCM Lane V/C Ratio	0.209	-	-	-	0.572	0.32
HCM Control Delay (s)	11.9	-	-	-	155.5	16
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.8	-	-	-	2.2	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	210	5	608	0	342	300	758	317	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1881	1845	1845	1900	1792	1792	1900
Adj Flow Rate, veh/h	0	0	0	216	0	630	0	353	309	781	327	0
Adj No. of Lanes	0	1	0	1	0	2	1	2	0	2	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	0	0	0	1	1	1	3	3	3	6	6	6
Cap, veh/h	0	3	0	348	0	1518	3	454	392	929	2129	0
Arrive On Green	0.00	0.00	0.00	0.19	0.00	0.19	0.00	0.25	0.25	0.28	0.63	0.00
Sat Flow, veh/h	0	1900	0	1792	0	3198	1757	1785	1540	3312	3495	0
Grp Volume(v), veh/h	0	0	0	216	0	630	0	346	316	781	327	0
Grp Sat Flow(s),veh/h/ln	0	1900	0	1792	0	1599	1757	1752	1573	1656	1703	0
Q Serve(g_s), s	0.0	0.0	0.0	6.1	0.0	7.1	0.0	10.2	10.4	12.3	2.2	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	6.1	0.0	7.1	0.0	10.2	10.4	12.3	2.2	0.0
Prop In Lane	0.00		0.00	1.00		1.00	1.00		0.98	1.00		0.00
Lane Grp Cap(c), veh/h	0	3	0	348	0	1518	3	446	400	929	2129	0
V/C Ratio(X)	0.00	0.00	0.00	0.62	0.00	0.42	0.00	0.78	0.79	0.84	0.15	0.00
Avail Cap(c_a), veh/h	0	344	0	680	0	2111	159	539	483	1317	2129	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	20.4	0.0	9.5	0.0	19.2	19.2	18.7	4.3	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.1	0.0	4.6	5.7	2.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	3.1	0.0	3.1	0.0	5.5	5.1	5.9	1.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	21.1	0.0	9.6	0.0	23.8	25.0	21.2	4.3	0.0
LnGrp LOS				C		A		C	C	C	A	
Approach Vol, veh/h		0			846			662			1108	
Approach Delay, s/veh		0.0			12.5			24.4			16.2	
Approach LOS					B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	20.5	19.1		0.0	0.0	39.6		15.7
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	22.0	17.0		10.0	5.0	34.0		21.0
Max Q Clear Time (g_c+I1), s	14.3	12.4		0.0	0.0	4.2		9.1
Green Ext Time (p_c), s	1.2	1.7		0.0	0.0	4.8		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	17.1
HCM 2010 LOS	B

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	845	0	0	730	360	0	0	485	0	0	680
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			3.0	3.0			3.0			5.0
Lane Util. Factor	1.00	0.95			0.91	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (prot)	1719	3438			4715	1468			1494			1565
Flt Permitted	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (perm)	1719	3438			4715	1468			1494			1565
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	85	899	0	0	777	383	0	0	516	0	0	723
RTOR Reduction (vph)	0	0	0	0	0	124	0	0	115	0	0	633
Lane Group Flow (vph)	85	899	0	0	777	259	0	0	401	0	0	90
Heavy Vehicles (%)	5%	5%	5%	10%	10%	10%	10%	10%	10%	5%	5%	5%
Turn Type	Prot	NA			NA	Perm			Perm			Over
Protected Phases	1	6 8			2							1
Permitted Phases						2			2			
Actuated Green, G (s)	14.9	120.0			81.1	81.1			81.1			14.9
Effective Green, g (s)	14.9	120.0			81.1	81.1			81.1			14.9
Actuated g/C Ratio	0.12	1.00			0.68	0.68			0.68			0.12
Clearance Time (s)	5.0				3.0	3.0			3.0			5.0
Vehicle Extension (s)	3.0				0.2	0.2			0.2			3.0
Lane Grp Cap (vph)	213	3438			3186	992			1009			194
v/s Ratio Prot	0.05	c0.26			0.16							c0.06
v/s Ratio Perm						0.18			c0.27			
v/c Ratio	0.40	0.26			0.24	0.26			0.40			0.46
Uniform Delay, d1	48.4	0.0			7.5	7.7			8.6			48.8
Progression Factor	0.71	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	0.9	0.0			0.0	0.1			0.1			1.7
Delay (s)	35.3	0.0			7.6	7.7			8.7			50.6
Level of Service	D	A			A	A			A			D
Approach Delay (s)		3.1			7.6			8.7			50.6	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	15.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	400	275	60	325	275	780	0	0	0	605	735	410
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00				0.91	0.86	0.91
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85				1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (prot)	3367	3369		1687	3374	1509				1535	3009	1374
Flt Permitted	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (perm)	3367	3369		1687	3374	1509				1535	3009	1374
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	440	302	66	357	302	857	0	0	0	665	808	451
RTOR Reduction (vph)	0	17	0	0	0	20	0	0	0	0	2	196
Lane Group Flow (vph)	440	351	0	357	302	837	0	0	0	492	1024	210
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	4%	4%	4%	7%	7%	7%	0%	0%	0%	7%	7%	7%
Turn Type	Prot	NA		Split	NA	custom				Split	NA	Perm
Protected Phases	5	2		3	3	7				4	4	
Permitted Phases						3						4
Actuated Green, G (s)	20.9	20.9		32.0	32.0	90.1				52.1	52.1	52.1
Effective Green, g (s)	20.9	20.9		32.0	32.0	90.1				52.1	52.1	52.1
Actuated g/C Ratio	0.17	0.17		0.27	0.27	0.75				0.43	0.43	0.43
Clearance Time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	586	586		449	899	1133				666	1306	596
v/s Ratio Prot	c0.13	0.10		0.21	0.09	c0.55				0.32	0.34	
v/s Ratio Perm												0.15
v/c Ratio	0.75	0.60		0.80	0.34	0.74				0.74	0.78	0.35
Uniform Delay, d1	47.1	45.7		40.9	35.4	8.4				28.3	29.1	22.7
Progression Factor	1.00	1.00		0.96	1.00	0.73				1.02	1.05	2.18
Incremental Delay, d2	5.4	1.7		8.4	0.2	2.3				4.9	3.2	1.1
Delay (s)	52.5	47.4		47.7	35.6	8.4				33.8	33.8	50.4
Level of Service	D	D		D	D	A				C	C	D
Approach Delay (s)		50.1			23.0			0.0			37.3	
Approach LOS		D			C			A			D	

Intersection Summary			
HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	68.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	160	300	305	710	215	235	110	455	610	200	690	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1579	3316	1532	1579	3225	1513	1736	4988	1534	1671	4803	1476
Flt Permitted	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1579	3316	1532	1579	3225	1513	1736	4988	1534	1671	4803	1476
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	176	330	335	780	236	258	121	500	670	220	758	132
RTOR Reduction (vph)	0	0	157	0	0	202	0	0	0	0	0	0
Lane Group Flow (vph)	158	348	179	390	626	56	121	500	670	220	758	132
Confl. Peds. (#/hr)	8		1	1		8	3		1	1		3
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	8%	8%	8%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	2	2		1	1		3	8		7	4	
Permitted Phases			2			1			Free			Free
Actuated Green, G (s)	26.1	26.1	26.1	26.0	26.0	26.0	12.1	27.1	120.0	20.8	35.8	120.0
Effective Green, g (s)	26.1	26.1	26.1	26.0	26.0	26.0	12.1	27.1	120.0	20.8	35.8	120.0
Actuated g/C Ratio	0.22	0.22	0.22	0.22	0.22	0.22	0.10	0.23	1.00	0.17	0.30	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	6.0	6.0	6.0	7.0	7.0	7.0	3.0	4.0		4.0	5.0	
Lane Grp Cap (vph)	343	721	333	342	698	327	175	1126	1534	289	1432	1476
v/s Ratio Prot	0.10	0.10		c0.25	0.19		c0.07	0.10		c0.13	c0.16	
v/s Ratio Perm			c0.12			0.04			0.44			0.09
v/c Ratio	0.46	0.48	0.54	1.14	1.09dl	0.17	0.69	0.44	0.44	0.76	0.53	0.09
Uniform Delay, d1	40.8	41.0	41.6	47.0	45.7	38.2	52.1	40.0	0.0	47.2	35.1	0.0
Progression Factor	1.00	1.00	1.00	0.89	0.88	1.68	1.05	1.14	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	1.4	3.9	91.4	15.5	0.8	8.2	0.9	0.6	11.9	1.4	0.1
Delay (s)	43.6	42.5	45.5	133.1	55.5	65.2	62.9	46.4	0.6	59.1	36.5	0.1
Level of Service	D	D	D	F	E	E	E	D	A	E	D	A
Approach Delay (s)		43.9			81.2			24.2			36.6	
Approach LOS		D			F			C			D	

Intersection Summary			
HCM 2000 Control Delay	47.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	880	80	30	955	65	45	5	35	65	5	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1719	3389		1736	3438		1512	1385			1729	1514
Flt Permitted	0.95	1.00		0.95	1.00		0.71	1.00			0.71	1.00
Satd. Flow (perm)	1719	3389		1736	3438		1127	1385			1283	1514
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	22	946	86	32	1027	70	48	5	38	70	5	22
RTOR Reduction (vph)	0	4	0	0	2	0	0	34	0	0	0	20
Lane Group Flow (vph)	22	1028	0	32	1095	0	48	9	0	0	75	2
Confl. Peds. (#/hr)			2	2			3					3
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	19%	19%	19%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	4.8	86.3		5.2	86.7		13.2	13.2			13.2	13.2
Effective Green, g (s)	4.8	86.3		5.2	86.7		13.2	13.2			13.2	13.2
Actuated g/C Ratio	0.04	0.72		0.04	0.72		0.11	0.11			0.11	0.11
Clearance Time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Vehicle Extension (s)	3.0	6.0		3.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	68	2437		75	2483		123	152			141	166
v/s Ratio Prot	0.01	0.30		c0.02	c0.32			0.01				
v/s Ratio Perm							0.04				c0.06	0.00
v/c Ratio	0.32	0.42		0.43	0.44		0.39	0.06			0.53	0.01
Uniform Delay, d1	56.0	6.8		55.9	6.8		49.7	47.8			50.5	47.6
Progression Factor	1.02	0.64		1.09	0.49		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.5	0.5		3.8	0.6		2.0	0.2			3.8	0.0
Delay (s)	59.8	4.8		64.8	3.9		51.7	48.0			54.3	47.6
Level of Service	E	A		E	A		D	D			D	D
Approach Delay (s)		6.0			5.6			50.0			52.8	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	9.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	185	585	35	10	500	145	75	45	20	190	50	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1	4.0		5.1		5.1	5.1	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97		0.95	0.97	1.00
Satd. Flow (prot)	1752	3468		1736	3471	1520		1769		1665	1702	1548
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.76		0.95	0.97	1.00
Satd. Flow (perm)	1752	3468		1736	3471	1520		1377		1665	1702	1548
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	201	636	38	11	543	158	82	49	22	207	54	212
RTOR Reduction (vph)	0	3	0	0	0	0	0	5	0	0	0	0
Lane Group Flow (vph)	201	671	0	11	543	158	0	148	0	128	133	212
Confl. Peds. (#/hr)	2		6	6		2	2		13	13		2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	3%	3%	3%
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Split	NA	Free
Protected Phases	5	2		1	6			3		4	4	
Permitted Phases						Free	3					Free
Actuated Green, G (s)	17.9	63.4		1.5	47.0	120.0		18.2		16.5	16.5	120.0
Effective Green, g (s)	17.9	63.4		1.5	47.0	120.0		18.2		16.5	16.5	120.0
Actuated g/C Ratio	0.15	0.53		0.01	0.39	1.00		0.15		0.14	0.14	1.00
Clearance Time (s)	5.1	5.1		5.1	5.1			5.1		5.1	5.1	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	261	1832		21	1359	1520		208		228	234	1548
v/s Ratio Prot	c0.11	0.19		0.01	c0.16					0.08	c0.08	
v/s Ratio Perm						0.10		c0.11				0.14
v/c Ratio	0.77	0.37		0.52	0.40	0.10		0.71		0.56	0.57	0.14
Uniform Delay, d1	49.1	16.6		58.9	26.3	0.0		48.4		48.4	48.4	0.0
Progression Factor	1.07	0.51		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	12.4	0.5		21.6	0.9	0.1		11.6		3.8	3.8	0.2
Delay (s)	65.0	9.0		80.5	27.2	0.1		60.0		52.2	52.2	0.2
Level of Service	E	A		F	C	A		E		D	D	A
Approach Delay (s)		21.8			22.0			60.0			28.9	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	890	0	0	970	565	0	0	470	0	0	695
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			3.0	3.0			3.0			5.0
Lane Util. Factor	1.00	0.95			0.91	1.00			1.00			1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.98			1.00			1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (prot)	1703	3406			4988	1517			1580			1611
Flt Permitted	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (perm)	1703	3406			4988	1517			1580			1611
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	91	899	0	0	980	571	0	0	475	0	0	702
RTOR Reduction (vph)	0	0	0	0	0	183	0	0	113	0	0	618
Lane Group Flow (vph)	91	899	0	0	980	388	0	0	362	0	0	84
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)						6						
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	4%	4%	4%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm			Perm			Over
Protected Phases	1	6 8			2							1
Permitted Phases						2			2			
Actuated Green, G (s)	14.3	120.0			81.6	81.6			81.6			14.3
Effective Green, g (s)	14.3	120.0			81.6	81.6			81.6			14.3
Actuated g/C Ratio	0.12	1.00			0.68	0.68			0.68			0.12
Clearance Time (s)	5.0				3.0	3.0			3.0			5.0
Vehicle Extension (s)	3.0				0.2	0.2			0.2			3.0
Lane Grp Cap (vph)	202	3406			3391	1031			1074			191
v/s Ratio Prot	c0.05	c0.26			0.20							0.05
v/s Ratio Perm						c0.26			0.23			
v/c Ratio	0.45	0.26			0.29	0.38			0.34			0.44
Uniform Delay, d1	49.2	0.0			7.6	8.3			8.0			49.1
Progression Factor	0.69	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	1.1	0.0			0.0	0.1			0.1			1.6
Delay (s)	35.0	0.0			7.7	8.3			8.0			50.7
Level of Service	D	A			A	A			A			D
Approach Delay (s)		3.2			7.9			8.0			50.7	
Approach LOS		A			A			A			D	

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.39		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	460	280	70	470	285	865	0	0	0	680	785	435
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00				0.91	0.86	0.91
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85				1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (prot)	3467	3457		1770	3539	1583				1579	3093	1413
Flt Permitted	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (perm)	3467	3457		1770	3539	1583				1579	3093	1413
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	469	286	71	480	291	883	0	0	0	694	801	444
RTOR Reduction (vph)	0	19	0	0	0	10	0	0	0	0	2	222
Lane Group Flow (vph)	469	338	0	480	291	873	0	0	0	500	1037	178
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	0%	0%	0%	4%	4%	4%
Turn Type	Prot	NA		Split	NA	custom				Split	NA	Perm
Protected Phases	5	2		3	3	7				4	4	
Permitted Phases						3						4
Actuated Green, G (s)	20.6	20.6		35.9	35.9	90.4				48.5	48.5	48.5
Effective Green, g (s)	20.6	20.6		35.9	35.9	90.4				48.5	48.5	48.5
Actuated g/C Ratio	0.17	0.17		0.30	0.30	0.75				0.40	0.40	0.40
Clearance Time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	595	593		529	1058	1192				638	1250	571
v/s Ratio Prot	c0.14	0.10		c0.27	0.08	0.55				0.32	c0.34	
v/s Ratio Perm												0.13
v/c Ratio	0.79	0.57		0.91	0.28	0.73				0.78	0.83	0.31
Uniform Delay, d1	47.6	45.6		40.5	32.1	8.1				31.2	32.0	24.4
Progression Factor	1.00	1.00		0.99	1.06	0.73				1.14	1.16	3.34
Incremental Delay, d2	6.8	1.3		17.5	0.1	2.1				6.4	4.4	1.0
Delay (s)	54.5	46.9		57.6	34.3	8.1				42.1	41.7	82.4
Level of Service	D	D		E	C	A				D	D	F
Approach Delay (s)		51.2			27.0			0.0			50.2	
Approach LOS		D			C			A			D	

Intersection Summary			
HCM 2000 Control Delay	41.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	220	150	820	265	245	90	430	800	265	860	115
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1643	3432	1577	1626	3323	1562	1787	5136	1575	1736	4988	1532
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1643	3432	1577	1626	3323	1562	1787	5136	1575	1736	4988	1532
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	170	227	155	845	273	253	93	443	825	273	887	119
RTOR Reduction (vph)	0	0	129	0	0	198	0	0	0	0	0	0
Lane Group Flow (vph)	129	268	26	422	696	55	93	443	825	273	887	119
Confl. Peds. (#/hr)	6		7	7		6	4		10	10		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	2	2		1	1		3	8		7	4	
Permitted Phases			2			1			Free			Free
Actuated Green, G (s)	20.3	20.3	20.3	26.0	26.0	26.0	11.5	28.2	120.0	25.5	42.2	120.0
Effective Green, g (s)	20.3	20.3	20.3	26.0	26.0	26.0	11.5	28.2	120.0	25.5	42.2	120.0
Actuated g/C Ratio	0.17	0.17	0.17	0.22	0.22	0.22	0.10	0.23	1.00	0.21	0.35	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	6.0	6.0	6.0	7.0	7.0	7.0	3.0	4.0		4.0	5.0	
Lane Grp Cap (vph)	277	580	266	352	719	338	171	1206	1575	368	1754	1532
v/s Ratio Prot	0.08	0.08		c0.26	0.21		0.05	0.09		c0.16	0.18	
v/s Ratio Perm			0.02			0.04			c0.52			0.08
v/c Ratio	0.47	0.46	0.10	1.20	1.15dl	0.16	0.54	0.37	0.52	0.74	0.51	0.08
Uniform Delay, d1	45.0	44.9	42.1	47.0	46.6	38.2	51.7	38.4	0.0	44.2	30.7	0.0
Progression Factor	1.00	1.00	1.00	0.70	0.69	0.84	1.03	1.12	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.5	1.6	0.5	112.2	25.2	0.7	2.4	0.6	0.9	8.3	1.0	0.1
Delay (s)	48.4	46.6	42.6	145.1	57.3	33.0	55.6	43.7	0.9	52.5	31.7	0.1
Level of Service	D	D	D	F	E	C	E	D	A	D	C	A
Approach Delay (s)		45.9			79.8			18.5			33.2	
Approach LOS		D			E			B			C	

Intersection Summary			
HCM 2000 Control Delay	44.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	20	1050	55	40	1160	70	65	10	60	75	10	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1787	3544		1787	3544		1778	1639			1750	1525
Flt Permitted	0.95	1.00		0.95	1.00		0.69	1.00			0.70	1.00
Satd. Flow (perm)	1787	3544		1787	3544		1292	1639			1279	1525
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	20	1071	56	41	1184	71	66	10	61	77	10	26
RTOR Reduction (vph)	0	2	0	0	2	0	0	53	0	0	0	23
Lane Group Flow (vph)	20	1125	0	41	1253	0	66	18	0	0	87	3
Confl. Peds. (#/hr)			1	1			5					5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	3.3	82.5		6.9	86.1		15.3	15.3			15.3	15.3
Effective Green, g (s)	3.3	82.5		6.9	86.1		15.3	15.3			15.3	15.3
Actuated g/C Ratio	0.03	0.69		0.06	0.72		0.13	0.13			0.13	0.13
Clearance Time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Vehicle Extension (s)	3.0	6.0		3.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	49	2436		102	2542		164	208			163	194
v/s Ratio Prot	0.01	0.32		c0.02	c0.35			0.01				
v/s Ratio Perm							0.05				c0.07	0.00
v/c Ratio	0.41	0.46		0.40	0.49		0.40	0.09			0.53	0.02
Uniform Delay, d1	57.4	8.6		54.6	7.4		48.1	46.2			49.0	45.8
Progression Factor	1.05	0.80		1.04	0.34		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.7	0.5		2.2	0.6		1.6	0.2			3.3	0.0
Delay (s)	65.1	7.4		59.2	3.1		49.8	46.4			52.3	45.8
Level of Service	E	A		E	A		D	D			D	D
Approach Delay (s)		8.4			4.9			48.0			50.8	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	10.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	58.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	750	55	35	835	205	100	65	20	235	70	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1	4.0		5.1		5.1	5.1	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97		0.95	0.97	1.00
Satd. Flow (prot)	1770	3497		1787	3574	1564		1796		1715	1757	1593
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.74		0.95	0.97	1.00
Satd. Flow (perm)	1770	3497		1787	3574	1564		1370		1715	1757	1593
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	230	765	56	36	852	209	102	66	20	240	71	245
RTOR Reduction (vph)	0	4	0	0	0	0	0	3	0	0	0	0
Lane Group Flow (vph)	230	817	0	36	852	209	0	185	0	154	157	245
Confl. Peds. (#/hr)	4		1	1		4	5		6	6		5
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Split	NA	Free
Protected Phases	5	2		1	6			3		4	4	
Permitted Phases						Free	3					Free
Actuated Green, G (s)	18.8	57.1		4.7	43.0	120.0		20.9		16.9	16.9	120.0
Effective Green, g (s)	18.8	57.1		4.7	43.0	120.0		20.9		16.9	16.9	120.0
Actuated g/C Ratio	0.16	0.48		0.04	0.36	1.00		0.17		0.14	0.14	1.00
Clearance Time (s)	5.1	5.1		5.1	5.1			5.1		5.1	5.1	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	277	1663		69	1280	1564		238		241	247	1593
v/s Ratio Prot	c0.13	0.23		0.02	c0.24					c0.09	0.09	
v/s Ratio Perm						0.13		c0.13				0.15
v/c Ratio	0.83	0.49		0.52	0.67	0.13		0.78		0.64	0.64	0.15
Uniform Delay, d1	49.1	21.5		56.5	32.4	0.0		47.3		48.7	48.6	0.0
Progression Factor	1.01	0.57		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	17.3	1.0		6.9	2.7	0.2		15.4		6.1	5.9	0.2
Delay (s)	67.1	13.3		63.5	35.2	0.2		62.7		54.8	54.6	0.2
Level of Service	E	B		E	D	A		E		D	D	A
Approach Delay (s)		25.1			29.4			62.7			30.7	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	1010	0	0	870	430	0	0	580	0	0	815
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			3.0	3.0			3.0			5.0
Lane Util. Factor	1.00	0.95			0.91	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (prot)	1719	3438			4715	1468			1494			1565
Flt Permitted	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (perm)	1719	3438			4715	1468			1494			1565
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	101	1074	0	0	926	457	0	0	617	0	0	867
RTOR Reduction (vph)	0	0	0	0	0	304	0	0	194	0	0	192
Lane Group Flow (vph)	101	1074	0	0	926	153	0	0	423	0	0	675
Heavy Vehicles (%)	5%	5%	5%	10%	10%	10%	10%	10%	10%	5%	5%	5%
Turn Type	Prot	NA			NA	Perm			Perm			Over
Protected Phases	1	6 8			2							1
Permitted Phases						2			2			
Actuated Green, G (s)	54.1	120.0			40.1	40.1			40.1			54.1
Effective Green, g (s)	54.1	120.0			40.1	40.1			40.1			54.1
Actuated g/C Ratio	0.45	1.00			0.33	0.33			0.33			0.45
Clearance Time (s)	5.0				3.0	3.0			3.0			5.0
Vehicle Extension (s)	3.0				0.2	0.2			0.2			3.0
Lane Grp Cap (vph)	774	3438			1575	490			499			705
v/s Ratio Prot	0.06	c0.31			0.20							c0.43
v/s Ratio Perm						0.10			c0.28			
v/c Ratio	0.13	0.31			0.59	0.31			0.85			0.96
Uniform Delay, d1	19.2	0.0			33.1	29.7			37.1			31.8
Progression Factor	1.65	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	0.0	0.0			0.4	0.1			12.1			23.6
Delay (s)	31.8	0.0			33.5	29.8			49.2			55.4
Level of Service	C	A			C	C			D			E
Approach Delay (s)		2.8			32.3			49.2			55.4	
Approach LOS		A			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	31.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	74.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	480	330	70	390	330	930	0	0	0	725	880	490
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00				0.91	0.86	0.91
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85				1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (prot)	3367	3371		1687	3374	1509				1535	3009	1374
Flt Permitted	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (perm)	3367	3371		1687	3374	1509				1535	3009	1374
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	527	363	77	429	363	1022	0	0	0	797	967	538
RTOR Reduction (vph)	0	15	0	0	0	4	0	0	0	0	2	241
Lane Group Flow (vph)	527	425	0	429	363	1018	0	0	0	590	1226	243
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	4%	4%	4%	7%	7%	7%	0%	0%	0%	7%	7%	7%
Turn Type	Prot	NA		Split	NA	custom				Split	NA	Perm
Protected Phases	5	2		3	3	7				4	4	
Permitted Phases						3						4
Actuated Green, G (s)	20.0	20.0		31.8	31.8	91.0				53.2	53.2	53.2
Effective Green, g (s)	20.0	20.0		31.8	31.8	91.0				53.2	53.2	53.2
Actuated g/C Ratio	0.17	0.17		0.27	0.27	0.76				0.44	0.44	0.44
Clearance Time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	561	561		447	894	1144				680	1333	609
v/s Ratio Prot	c0.16	0.13		c0.25	0.11	c0.67				0.38	0.41	
v/s Ratio Perm												0.18
v/c Ratio	0.94	0.76		0.96	0.41	0.89				0.87	0.92	0.40
Uniform Delay, d1	49.4	47.7		43.5	36.3	10.8				30.2	31.4	22.6
Progression Factor	1.00	1.00		1.14	1.16	1.46				0.85	0.86	1.96
Incremental Delay, d2	23.7	5.8		24.0	0.2	5.8				8.4	7.1	1.1
Delay (s)	73.1	53.5		73.6	42.4	21.6				33.9	33.9	45.3
Level of Service	E	D		E	D	C				C	C	D
Approach Delay (s)		64.2			38.0			0.0			36.3	
Approach LOS		E			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	42.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	360	365	850	255	280	130	545	730	240	825	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1579	3317	1532	1579	3224	1513	1736	4988	1534	1671	4803	1476
Flt Permitted	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1579	3317	1532	1579	3224	1513	1736	4988	1534	1671	4803	1476
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	209	396	401	934	280	308	143	599	802	264	907	159
RTOR Reduction (vph)	0	0	157	0	0	208	0	0	0	0	0	0
Lane Group Flow (vph)	188	417	244	467	747	100	143	599	802	264	907	159
Confl. Peds. (#/hr)	8		1	1		8	3		1	1		3
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	8%	8%	8%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	2	2		1	1		3	8		7	4	
Permitted Phases			2			1			Free			Free
Actuated Green, G (s)	22.0	22.0	22.0	39.0	39.0	39.0	11.8	17.2	120.0	21.8	27.2	120.0
Effective Green, g (s)	22.0	22.0	22.0	39.0	39.0	39.0	11.8	17.2	120.0	21.8	27.2	120.0
Actuated g/C Ratio	0.18	0.18	0.18	0.32	0.32	0.32	0.10	0.14	1.00	0.18	0.23	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	6.0	6.0	6.0	7.0	7.0	7.0	3.0	4.0		4.0	5.0	
Lane Grp Cap (vph)	289	608	280	513	1047	491	170	714	1534	303	1088	1476
v/s Ratio Prot	0.12	0.13		c0.30	0.23		0.08	c0.12		0.16	c0.19	
v/s Ratio Perm			c0.16			0.07			c0.52			0.11
v/c Ratio	0.65	0.69	0.87	0.91	0.87dl	0.20	0.84	0.84	0.52	0.87	0.83	0.11
Uniform Delay, d1	45.4	45.8	47.6	38.8	35.6	29.3	53.2	50.1	0.0	47.7	44.2	0.0
Progression Factor	1.00	1.00	1.00	0.93	0.92	1.79	1.12	1.13	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.2	4.8	27.0	21.0	3.5	0.7	14.1	5.0	0.5	23.4	7.5	0.1
Delay (s)	53.6	50.6	74.6	57.3	36.1	53.1	73.6	61.4	0.5	71.2	51.8	0.1
Level of Service	D	D	E	E	D	D	E	E	A	E	D	A
Approach Delay (s)		60.7			46.0			30.9			49.5	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	45.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	1050	95	35	1140	80	55	5	40	80	5	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.95	1.00
Satd. Flow (prot)	1719	3389		1736	3437		1512	1382			1728	1514
Flt Permitted	0.95	1.00		0.95	1.00		0.68	1.00			0.70	1.00
Satd. Flow (perm)	1719	3389		1736	3437		1079	1382			1272	1514
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	27	1129	102	38	1226	86	59	5	43	86	5	27
RTOR Reduction (vph)	0	4	0	0	3	0	0	37	0	0	0	23
Lane Group Flow (vph)	27	1227	0	38	1309	0	59	11	0	0	91	4
Confl. Peds. (#/hr)			2	2			3					3
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	19%	19%	19%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	4.9	83.5		5.4	84.0		15.8	15.8			15.8	15.8
Effective Green, g (s)	4.9	83.5		5.4	84.0		15.8	15.8			15.8	15.8
Actuated g/C Ratio	0.04	0.70		0.05	0.70		0.13	0.13			0.13	0.13
Clearance Time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Vehicle Extension (s)	3.0	6.0		3.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	70	2358		78	2405		142	181			167	199
v/s Ratio Prot	0.02	0.36		c0.02	c0.38			0.01				
v/s Ratio Perm							0.05				c0.07	0.00
v/c Ratio	0.39	0.52		0.49	0.54		0.42	0.06			0.54	0.02
Uniform Delay, d1	56.1	8.7		55.9	8.7		47.9	45.6			48.7	45.3
Progression Factor	0.99	1.00		1.01	0.58		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.7	0.6		4.5	0.9		2.0	0.1			3.6	0.0
Delay (s)	58.2	9.3		60.9	5.9		49.8	45.7			52.3	45.4
Level of Service	E	A		E	A		D	D			D	D
Approach Delay (s)		10.4			7.5			48.0			50.7	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	220	700	40	10	600	175	90	55	25	225	60	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1	4.0		5.1		5.1	5.1	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97		0.95	0.97	1.00
Satd. Flow (prot)	1752	3470		1725	3471	1520		1769		1665	1703	1548
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.75		0.95	0.97	1.00
Satd. Flow (perm)	1752	3470		1725	3471	1520		1358		1665	1703	1548
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	761	43	11	652	190	98	60	27	245	65	255
RTOR Reduction (vph)	0	3	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	239	802	0	11	652	190	0	179	0	154	156	255
Confl. Peds. (#/hr)	2		6	6		2	2		13	13		2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	3%	3%	3%
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Split	NA	Free
Protected Phases	5	2		1	6			3		4	4	
Permitted Phases						Free	3					Free
Actuated Green, G (s)	20.4	60.0		0.8	40.4	120.0		21.0		17.8	17.8	120.0
Effective Green, g (s)	20.4	60.0		0.8	40.4	120.0		21.0		17.8	17.8	120.0
Actuated g/C Ratio	0.17	0.50		0.01	0.34	1.00		0.18		0.15	0.15	1.00
Clearance Time (s)	5.1	5.1		5.1	5.1			5.1		5.1	5.1	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	297	1735		11	1168	1520		237		246	252	1548
v/s Ratio Prot	c0.14	0.23		0.01	c0.19					c0.09	0.09	
v/s Ratio Perm						0.12		c0.13				0.16
v/c Ratio	0.80	0.46		1.00	0.56	0.12		0.76		0.63	0.62	0.16
Uniform Delay, d1	47.9	19.5		59.6	32.5	0.0		47.1		48.0	47.9	0.0
Progression Factor	0.88	0.92		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	13.2	0.8		271.4	1.9	0.2		13.6		5.5	5.1	0.2
Delay (s)	55.5	18.7		331.0	34.4	0.2		60.7		53.5	53.0	0.2
Level of Service	E	B		F	C	A		E		D	D	A
Approach Delay (s)		27.1			30.6			60.7			29.3	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	31.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	59.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	1065	0	0	1160	675	0	0	560	0	0	830
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			3.0	3.0			3.0			5.0
Lane Util. Factor	1.00	0.95			0.91	1.00			1.00			1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97			1.00			1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (prot)	1703	3406			4988	1512			1580			1611
Flt Permitted	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (perm)	1703	3406			4988	1512			1580			1611
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	111	1076	0	0	1172	682	0	0	566	0	0	838
RTOR Reduction (vph)	0	0	0	0	0	434	0	0	184	0	0	205
Lane Group Flow (vph)	111	1076	0	0	1172	248	0	0	382	0	0	633
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)						6						
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	4%	4%	4%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm			Perm			Over
Protected Phases	1	6 8			2							1
Permitted Phases						2			2			
Actuated Green, G (s)	50.2	120.0			43.7	43.7			43.7			50.2
Effective Green, g (s)	50.2	120.0			43.7	43.7			43.7			50.2
Actuated g/C Ratio	0.42	1.00			0.36	0.36			0.36			0.42
Clearance Time (s)	5.0				3.0	3.0			3.0			5.0
Vehicle Extension (s)	3.0				0.2	0.2			0.2			3.0
Lane Grp Cap (vph)	712	3406			1816	550			575			673
v/s Ratio Prot	0.07	c0.32			0.23							c0.39
v/s Ratio Perm						0.16			c0.24			
v/c Ratio	0.16	0.32			0.65	0.45			0.66			0.94
Uniform Delay, d1	21.7	0.0			31.7	29.0			32.0			33.5
Progression Factor	1.64	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	0.0	0.0			0.6	0.2			2.3			21.4
Delay (s)	35.6	0.0			32.3	29.2			34.3			54.8
Level of Service	D	A			C	C			C			D
Approach Delay (s)		3.4			31.2			34.3			54.8	
Approach LOS		A			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	81.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	550	335	85	560	340	1035	0	0	0	815	940	520
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00				0.91	0.86	0.91
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85				1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (prot)	3467	3455		1770	3539	1583				1579	3093	1413
Flt Permitted	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (perm)	3467	3455		1770	3539	1583				1579	3093	1413
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	561	342	87	571	347	1056	0	0	0	832	959	531
RTOR Reduction (vph)	0	19	0	0	0	4	0	0	0	0	2	235
Lane Group Flow (vph)	561	410	0	571	347	1052	0	0	0	599	1243	243
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	0%	0%	0%	4%	4%	4%
Turn Type	Prot	NA		Split	NA	custom				Split	NA	Perm
Protected Phases	5	2		3	3	7				4	4	
Permitted Phases						3						4
Actuated Green, G (s)	19.0	19.0		38.0	38.0	92.0				48.0	48.0	48.0
Effective Green, g (s)	19.0	19.0		38.0	38.0	92.0				48.0	48.0	48.0
Actuated g/C Ratio	0.16	0.16		0.32	0.32	0.77				0.40	0.40	0.40
Clearance Time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	548	547		560	1120	1213				631	1237	565
v/s Ratio Prot	c0.16	0.12		c0.32	0.10	0.66				0.38	c0.40	
v/s Ratio Perm												0.17
v/c Ratio	1.02	0.75		1.02	0.31	0.87				0.95	1.00	0.43
Uniform Delay, d1	50.5	48.2		41.0	31.1	9.7				34.8	36.0	26.1
Progression Factor	1.00	1.00		1.22	1.24	1.69				0.85	0.86	2.04
Incremental Delay, d2	44.6	5.7		35.4	0.1	4.5				18.1	21.1	1.5
Delay (s)	95.1	54.0		85.4	38.8	20.9				47.7	52.0	54.6
Level of Service	F	D		F	D	C				D	D	D
Approach Delay (s)		77.3			42.7			0.0			51.4	
Approach LOS		E			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	53.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	195	265	180	980	315	295	110	515	955	315	1030	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1643	3432	1577	1626	3323	1563	1787	5136	1575	1736	4988	1532
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1643	3432	1577	1626	3323	1563	1787	5136	1575	1736	4988	1532
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	201	273	186	1010	325	304	113	531	985	325	1062	139
RTOR Reduction (vph)	0	0	129	0	0	205	0	0	0	0	0	0
Lane Group Flow (vph)	153	321	57	505	830	99	113	531	985	325	1062	139
Confl. Peds. (#/hr)	6		7	7		6	4		10	10		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	2	2		1	1		3	8		7	4	
Permitted Phases			2			1			Free			Free
Actuated Green, G (s)	19.8	19.8	19.8	39.0	39.0	39.0	8.8	17.7	120.0	23.5	32.4	120.0
Effective Green, g (s)	19.8	19.8	19.8	39.0	39.0	39.0	8.8	17.7	120.0	23.5	32.4	120.0
Actuated g/C Ratio	0.17	0.17	0.17	0.32	0.32	0.32	0.07	0.15	1.00	0.20	0.27	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	6.0	6.0	6.0	7.0	7.0	7.0	3.0	4.0		4.0	5.0	
Lane Grp Cap (vph)	271	566	260	528	1079	507	131	757	1575	339	1346	1532
v/s Ratio Prot	0.09	0.09		c0.31	0.25		0.06	0.10		c0.19	0.21	
v/s Ratio Perm			0.04			0.06			c0.63			0.09
v/c Ratio	0.56	0.57	0.22	0.96	0.92dl	0.19	0.86	0.70	0.63	0.96	0.79	0.09
Uniform Delay, d1	46.1	46.2	43.4	39.7	36.5	29.2	55.0	48.6	0.0	47.8	40.6	0.0
Progression Factor	1.00	1.00	1.00	0.74	0.72	1.22	1.11	1.14	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	2.7	1.2	26.9	4.1	0.6	19.8	2.1	0.7	37.8	4.8	0.1
Delay (s)	51.6	48.8	44.6	56.4	30.3	36.3	81.0	57.4	0.7	85.6	45.4	0.1
Level of Service	D	D	D	E	C	D	F	E	A	F	D	A
Approach Delay (s)		48.3			39.4			24.8			49.8	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	85.1%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	1255	65	50	1385	85	80	10	70	90	10	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1787	3544		1787	3543		1778	1634			1748	1525
Flt Permitted	0.95	1.00		0.95	1.00		0.65	1.00			0.69	1.00
Satd. Flow (perm)	1787	3544		1787	3543		1208	1634			1260	1525
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	26	1281	66	51	1413	87	82	10	71	92	10	31
RTOR Reduction (vph)	0	2	0	0	2	0	0	61	0	0	0	27
Lane Group Flow (vph)	26	1345	0	51	1498	0	82	20	0	0	102	4
Confl. Peds. (#/hr)			1	1			5					5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	4.5	80.6		7.4	83.5		16.7	16.7			16.7	16.7
Effective Green, g (s)	4.5	80.6		7.4	83.5		16.7	16.7			16.7	16.7
Actuated g/C Ratio	0.04	0.67		0.06	0.70		0.14	0.14			0.14	0.14
Clearance Time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Vehicle Extension (s)	3.0	6.0		3.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	67	2380		110	2465		168	227			175	212
v/s Ratio Prot	0.01	0.38		c0.03	c0.42			0.01				
v/s Ratio Perm							0.07				c0.08	0.00
v/c Ratio	0.39	0.57		0.46	0.61		0.49	0.09			0.58	0.02
Uniform Delay, d1	56.4	10.4		54.4	9.6		47.7	45.0			48.4	44.6
Progression Factor	1.03	0.88		1.03	0.75		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.7	0.7		1.8	0.7		2.2	0.2			4.9	0.0
Delay (s)	60.6	9.9		58.0	7.9		49.9	45.2			53.3	44.6
Level of Service	E	A		E	A		D	D			D	D
Approach Delay (s)		10.9			9.5			47.6			51.2	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	270	895	65	40	1000	245	120	80	25	280	85	285
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1	4.0		5.1		5.1	5.1	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97		0.95	0.97	1.00
Satd. Flow (prot)	1770	3498		1787	3574	1564		1795		1715	1757	1593
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.73		0.95	0.97	1.00
Satd. Flow (perm)	1770	3498		1787	3574	1564		1345		1715	1757	1593
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	276	913	66	41	1020	250	122	82	26	286	87	291
RTOR Reduction (vph)	0	4	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	276	975	0	41	1020	250	0	226	0	183	190	291
Confl. Peds. (#/hr)	4		1	1		4	5		6	6		5
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Split	NA	Free
Protected Phases	5	2		1	6			3		4	4	
Permitted Phases						Free	3					Free
Actuated Green, G (s)	23.5	51.5		4.1	32.1	120.0		24.8		19.2	19.2	120.0
Effective Green, g (s)	23.5	51.5		4.1	32.1	120.0		24.8		19.2	19.2	120.0
Actuated g/C Ratio	0.20	0.43		0.03	0.27	1.00		0.21		0.16	0.16	1.00
Clearance Time (s)	5.1	5.1		5.1	5.1			5.1		5.1	5.1	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	346	1501		61	956	1564		277		274	281	1593
v/s Ratio Prot	c0.16	0.28		0.02	c0.29					0.11	c0.11	
v/s Ratio Perm						0.16		c0.17				0.18
v/c Ratio	0.80	0.65		0.67	1.07	0.16		0.82		0.67	0.68	0.18
Uniform Delay, d1	46.0	27.1		57.3	44.0	0.0		45.4		47.4	47.5	0.0
Progression Factor	0.92	0.83		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	10.6	1.9		25.4	48.7	0.2		17.5		6.6	6.9	0.3
Delay (s)	53.0	24.4		82.7	92.6	0.2		62.9		54.0	54.3	0.3
Level of Service	D	C		F	F	A		E		D	D	A
Approach Delay (s)		30.7			74.7			62.9			30.6	
Approach LOS		C			E			E			C	

Intersection Summary			
HCM 2000 Control Delay	49.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	1016	0	0	876	430	0	0	580	0	0	817
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			3.0	3.0			3.0			5.0
Lane Util. Factor	1.00	0.95			0.91	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (prot)	1719	3438			4715	1468			1494			1565
Flt Permitted	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (perm)	1719	3438			4715	1468			1494			1565
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	101	1081	0	0	932	457	0	0	617	0	0	869
RTOR Reduction (vph)	0	0	0	0	0	305	0	0	193	0	0	192
Lane Group Flow (vph)	101	1081	0	0	932	152	0	0	424	0	0	677
Heavy Vehicles (%)	5%	5%	5%	10%	10%	10%	10%	10%	10%	5%	5%	5%
Turn Type	Prot	NA			NA	Perm			Perm			Over
Protected Phases	1	6 8			2							1
Permitted Phases						2			2			
Actuated Green, G (s)	54.1	120.0			39.8	39.8			39.8			54.1
Effective Green, g (s)	54.1	120.0			39.8	39.8			39.8			54.1
Actuated g/C Ratio	0.45	1.00			0.33	0.33			0.33			0.45
Clearance Time (s)	5.0				3.0	3.0			3.0			5.0
Vehicle Extension (s)	3.0				0.2	0.2			0.2			3.0
Lane Grp Cap (vph)	774	3438			1563	486			495			705
v/s Ratio Prot	0.06	c0.31			0.20							c0.43
v/s Ratio Perm						0.10			c0.28			
v/c Ratio	0.13	0.31			0.60	0.31			0.86			0.96
Uniform Delay, d1	19.2	0.0			33.4	29.9			37.4			31.9
Progression Factor	1.66	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	0.0	0.0			0.4	0.1			13.1			24.5
Delay (s)	31.9	0.0			33.8	30.0			50.6			56.4
Level of Service	C	A			C	C			D			E
Approach Delay (s)		2.7			32.6			50.6			56.4	
Approach LOS		A			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	31.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	483	330	70	390	330	938	0	0	0	731	882	493
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00				0.91	0.86	0.91
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85				1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (prot)	3367	3371		1687	3374	1509				1535	3009	1374
Flt Permitted	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (perm)	3367	3371		1687	3374	1509				1535	3009	1374
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	531	363	77	429	363	1031	0	0	0	803	969	542
RTOR Reduction (vph)	0	15	0	0	0	4	0	0	0	0	2	243
Lane Group Flow (vph)	531	425	0	429	363	1027	0	0	0	594	1230	245
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	4%	4%	4%	7%	7%	7%	0%	0%	0%	7%	7%	7%
Turn Type	Prot	NA		Split	NA	custom				Split	NA	Perm
Protected Phases	5	2		3	3	7				4	4	
Permitted Phases						3						4
Actuated Green, G (s)	20.0	20.0		31.8	31.8	91.0				53.2	53.2	53.2
Effective Green, g (s)	20.0	20.0		31.8	31.8	91.0				53.2	53.2	53.2
Actuated g/C Ratio	0.17	0.17		0.27	0.27	0.76				0.44	0.44	0.44
Clearance Time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	561	561		447	894	1144				680	1333	609
v/s Ratio Prot	c0.16	0.13		0.25	0.11	c0.68				0.39	0.41	
v/s Ratio Perm												0.18
v/c Ratio	0.95	0.76		0.96	0.41	0.90				0.87	0.92	0.40
Uniform Delay, d1	49.5	47.7		43.5	36.3	11.0				30.3	31.5	22.6
Progression Factor	1.00	1.00		1.14	1.16	1.47				0.84	0.85	1.94
Incremental Delay, d2	25.1	5.8		23.8	0.2	6.2				8.6	7.2	1.1
Delay (s)	74.6	53.5		73.5	42.4	22.3				34.2	34.0	44.9
Level of Service	E	D		E	D	C				C	C	D
Approach Delay (s)		65.0			38.4			0.0			36.4	
Approach LOS		E			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	42.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	190	360	365	861	255	282	130	545	741	242	825	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.97	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1579	3317	1532	1579	3224	1513	1736	4988	1534	1671	4803	1476
Flt Permitted	0.95	1.00	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1579	3317	1532	1579	3224	1513	1736	4988	1534	1671	4803	1476
Peak-hour factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	209	396	401	946	280	310	143	599	814	266	907	159
RTOR Reduction (vph)	0	0	157	0	0	209	0	0	0	0	0	0
Lane Group Flow (vph)	188	417	244	473	753	101	143	599	814	266	907	159
Confl. Peds. (#/hr)	8		1	1		8	3		1	1		3
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	8%	8%	8%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	2	2		1	1		3	8		7	4	
Permitted Phases			2			1			Free			Free
Actuated Green, G (s)	22.0	22.0	22.0	39.0	39.0	39.0	11.8	17.2	120.0	21.8	27.2	120.0
Effective Green, g (s)	22.0	22.0	22.0	39.0	39.0	39.0	11.8	17.2	120.0	21.8	27.2	120.0
Actuated g/C Ratio	0.18	0.18	0.18	0.32	0.32	0.32	0.10	0.14	1.00	0.18	0.23	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	6.0	6.0	6.0	7.0	7.0	7.0	3.0	4.0		4.0	5.0	
Lane Grp Cap (vph)	289	608	280	513	1047	491	170	714	1534	303	1088	1476
v/s Ratio Prot	0.12	0.13		c0.30	0.23		0.08	c0.12		0.16	c0.19	
v/s Ratio Perm			c0.16			0.07			c0.53			0.11
v/c Ratio	0.65	0.69	0.87	0.92	0.88dl	0.21	0.84	0.84	0.53	0.88	0.83	0.11
Uniform Delay, d1	45.4	45.8	47.6	39.0	35.7	29.3	53.2	50.1	0.0	47.8	44.2	0.0
Progression Factor	1.00	1.00	1.00	0.93	0.91	1.74	1.12	1.13	1.00	1.00	1.00	1.00
Incremental Delay, d2	8.2	4.8	27.0	22.7	3.6	0.7	13.6	4.8	0.5	24.2	7.5	0.1
Delay (s)	53.6	50.6	74.6	59.0	36.1	51.7	73.1	61.3	0.5	72.0	51.8	0.1
Level of Service	D	D	E	E	D	D	E	E	A	E	D	A
Approach Delay (s)		60.7			46.3			30.6			49.7	
Approach LOS		E			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	45.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	1050	108	41	1140	80	68	6	46	80	6	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1719	3383		1736	3437		1512	1383			1729	1514
Flt Permitted	0.95	1.00		0.95	1.00		0.68	1.00			0.70	1.00
Satd. Flow (perm)	1719	3383		1736	3437		1075	1383			1267	1514
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	27	1129	116	44	1226	86	73	6	49	86	6	27
RTOR Reduction (vph)	0	4	0	0	3	0	0	43	0	0	0	23
Lane Group Flow (vph)	27	1241	0	44	1309	0	73	12	0	0	92	4
Confl. Peds. (#/hr)			2	2			3					3
Heavy Vehicles (%)	5%	5%	5%	4%	4%	4%	19%	19%	19%	5%	5%	5%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	4.9	81.8		7.0	83.9		15.9	15.9			15.9	15.9
Effective Green, g (s)	4.9	81.8		7.0	83.9		15.9	15.9			15.9	15.9
Actuated g/C Ratio	0.04	0.68		0.06	0.70		0.13	0.13			0.13	0.13
Clearance Time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Vehicle Extension (s)	3.0	6.0		3.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	70	2306		101	2403		142	183			167	200
v/s Ratio Prot	0.02	0.37		c0.03	c0.38			0.01				
v/s Ratio Perm							0.07				c0.07	0.00
v/c Ratio	0.39	0.54		0.44	0.54		0.51	0.07			0.55	0.02
Uniform Delay, d1	56.1	9.6		54.6	8.8		48.5	45.6			48.7	45.3
Progression Factor	0.99	1.00		1.01	0.58		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.7	0.7		2.9	0.9		3.1	0.2			3.9	0.0
Delay (s)	58.0	10.3		58.0	6.0		51.6	45.7			52.6	45.3
Level of Service	E	B		E	A		D	D			D	D
Approach Delay (s)		11.3			7.7			49.1			50.9	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	12.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	57.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	221	703	40	10	603	175	90	55	25	225	60	236
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1	4.0		5.1		5.1	5.1	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97		0.95	0.97	1.00
Satd. Flow (prot)	1752	3470		1725	3471	1520		1769		1665	1703	1548
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.75		0.95	0.97	1.00
Satd. Flow (perm)	1752	3470		1725	3471	1520		1358		1665	1703	1548
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	240	764	43	11	655	190	98	60	27	245	65	257
RTOR Reduction (vph)	0	3	0	0	0	0	0	6	0	0	0	0
Lane Group Flow (vph)	240	805	0	11	655	190	0	179	0	154	156	257
Confl. Peds. (#/hr)	2		6	6		2	2		13	13		2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	2%	2%	2%	3%	3%	3%
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Split	NA	Free
Protected Phases	5	2		1	6			3		4	4	
Permitted Phases						Free	3					Free
Actuated Green, G (s)	20.5	60.0		0.8	40.3	120.0		21.0		17.8	17.8	120.0
Effective Green, g (s)	20.5	60.0		0.8	40.3	120.0		21.0		17.8	17.8	120.0
Actuated g/C Ratio	0.17	0.50		0.01	0.34	1.00		0.18		0.15	0.15	1.00
Clearance Time (s)	5.1	5.1		5.1	5.1			5.1		5.1	5.1	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	299	1735		11	1165	1520		237		246	252	1548
v/s Ratio Prot	c0.14	0.23		0.01	c0.19					c0.09	0.09	
v/s Ratio Perm						0.12		c0.13				0.17
v/c Ratio	0.80	0.46		1.00	0.56	0.12		0.76		0.63	0.62	0.17
Uniform Delay, d1	47.8	19.5		59.6	32.6	0.0		47.1		48.0	47.9	0.0
Progression Factor	0.87	0.87		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	12.8	0.8		271.4	2.0	0.2		13.6		5.5	5.1	0.2
Delay (s)	54.3	17.8		331.0	34.6	0.2		60.7		53.5	53.0	0.2
Level of Service	D	B		F	C	A		E		D	D	A
Approach Delay (s)		26.2			30.8			60.7			29.2	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	30.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	1066	0	0	1161	675	0	0	560	0	0	831
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			3.0	3.0			3.0			5.0
Lane Util. Factor	1.00	0.95			0.91	1.00			1.00			1.00
Frpb, ped/bikes	1.00	1.00			1.00	0.97			1.00			1.00
Flpb, ped/bikes	1.00	1.00			1.00	1.00			1.00			1.00
Frt	1.00	1.00			1.00	0.85			0.86			0.86
Flt Protected	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (prot)	1703	3406			4988	1512			1580			1611
Flt Permitted	0.95	1.00			1.00	1.00			1.00			1.00
Satd. Flow (perm)	1703	3406			4988	1512			1580			1611
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	111	1077	0	0	1173	682	0	0	566	0	0	839
RTOR Reduction (vph)	0	0	0	0	0	434	0	0	183	0	0	204
Lane Group Flow (vph)	111	1077	0	0	1173	248	0	0	383	0	0	635
Confl. Peds. (#/hr)			1	1								
Confl. Bikes (#/hr)						6						
Heavy Vehicles (%)	6%	6%	6%	4%	4%	4%	4%	4%	4%	2%	2%	2%
Turn Type	Prot	NA			NA	Perm			Perm			Over
Protected Phases	1	6 8			2							1
Permitted Phases						2			2			
Actuated Green, G (s)	50.3	120.0			43.6	43.6			43.6			50.3
Effective Green, g (s)	50.3	120.0			43.6	43.6			43.6			50.3
Actuated g/C Ratio	0.42	1.00			0.36	0.36			0.36			0.42
Clearance Time (s)	5.0				3.0	3.0			3.0			5.0
Vehicle Extension (s)	3.0				0.2	0.2			0.2			3.0
Lane Grp Cap (vph)	713	3406			1812	549			574			675
v/s Ratio Prot	0.07	c0.32			0.24							c0.39
v/s Ratio Perm						0.16			c0.24			
v/c Ratio	0.16	0.32			0.65	0.45			0.67			0.94
Uniform Delay, d1	21.7	0.0			31.8	29.1			32.1			33.4
Progression Factor	1.64	1.00			1.00	1.00			1.00			1.00
Incremental Delay, d2	0.0	0.0			0.6	0.2			2.3			21.2
Delay (s)	35.5	0.0			32.4	29.3			34.4			54.6
Level of Service	D	A			C	C			C			D
Approach Delay (s)		3.3			31.3			34.4			54.6	
Approach LOS		A			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	28.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	551	335	85	560	340	1038	0	0	0	816	941	521
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00				0.91	0.86	0.91
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00				1.00	1.00	1.00
Frt	1.00	0.97		1.00	1.00	0.85				1.00	0.99	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (prot)	3467	3455		1770	3539	1583				1579	3093	1413
Flt Permitted	0.95	1.00		0.95	1.00	1.00				0.95	0.99	1.00
Satd. Flow (perm)	3467	3455		1770	3539	1583				1579	3093	1413
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	562	342	87	571	347	1059	0	0	0	833	960	532
RTOR Reduction (vph)	0	19	0	0	0	4	0	0	0	0	2	236
Lane Group Flow (vph)	562	410	0	571	347	1055	0	0	0	600	1244	243
Confl. Peds. (#/hr)			1	1								
Heavy Vehicles (%)	1%	1%	1%	2%	2%	2%	0%	0%	0%	4%	4%	4%
Turn Type	Prot	NA		Split	NA	custom				Split	NA	Perm
Protected Phases	5	2		3	3	7				4	4	
Permitted Phases						3						4
Actuated Green, G (s)	19.0	19.0		38.0	38.0	92.0				48.0	48.0	48.0
Effective Green, g (s)	19.0	19.0		38.0	38.0	92.0				48.0	48.0	48.0
Actuated g/C Ratio	0.16	0.16		0.32	0.32	0.77				0.40	0.40	0.40
Clearance Time (s)	5.0	5.0		5.0	5.0	4.0				5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0				3.0	3.0	3.0
Lane Grp Cap (vph)	548	547		560	1120	1213				631	1237	565
v/s Ratio Prot	c0.16	0.12		c0.32	0.10	0.67				0.38	c0.40	
v/s Ratio Perm												0.17
v/c Ratio	1.03	0.75		1.02	0.31	0.87				0.95	1.01	0.43
Uniform Delay, d1	50.5	48.2		41.0	31.1	9.8				34.9	36.0	26.1
Progression Factor	1.00	1.00		1.22	1.24	1.69				0.85	0.86	2.04
Incremental Delay, d2	45.1	5.7		35.4	0.1	4.5				18.3	21.2	1.5
Delay (s)	95.6	54.0		85.3	38.7	21.1				47.8	52.1	54.7
Level of Service	F	D		F	D	C				D	D	D
Approach Delay (s)		77.6			42.7			0.0			51.5	
Approach LOS		E			D			A			D	

Intersection Summary			
HCM 2000 Control Delay	53.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	92.4%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	195	265	180	984	315	295	110	515	959	315	1030	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0
Lane Util. Factor	0.91	0.91	1.00	0.91	0.91	1.00	1.00	0.91	1.00	1.00	0.91	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1643	3432	1577	1626	3323	1563	1787	5136	1575	1736	4988	1532
Flt Permitted	0.95	0.99	1.00	0.95	0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1643	3432	1577	1626	3323	1563	1787	5136	1575	1736	4988	1532
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	201	273	186	1014	325	304	113	531	989	325	1062	139
RTOR Reduction (vph)	0	0	129	0	0	205	0	0	0	0	0	0
Lane Group Flow (vph)	153	321	57	507	832	99	113	531	989	325	1062	139
Confl. Peds. (#/hr)	6		7	7		6	4		10	10		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Free	Prot	NA	Free
Protected Phases	2	2		1	1		3	8		7	4	
Permitted Phases			2			1			Free			Free
Actuated Green, G (s)	19.8	19.8	19.8	39.0	39.0	39.0	8.8	17.7	120.0	23.5	32.4	120.0
Effective Green, g (s)	19.8	19.8	19.8	39.0	39.0	39.0	8.8	17.7	120.0	23.5	32.4	120.0
Actuated g/C Ratio	0.17	0.17	0.17	0.32	0.32	0.32	0.07	0.15	1.00	0.20	0.27	1.00
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	6.0	6.0	6.0	7.0	7.0	7.0	3.0	4.0		4.0	5.0	
Lane Grp Cap (vph)	271	566	260	528	1079	507	131	757	1575	339	1346	1532
v/s Ratio Prot	0.09	0.09		c0.31	0.25		0.06	0.10		c0.19	0.21	
v/s Ratio Perm			0.04			0.06			c0.63			0.09
v/c Ratio	0.56	0.57	0.22	0.96	0.92dl	0.19	0.86	0.70	0.63	0.96	0.79	0.09
Uniform Delay, d1	46.1	46.2	43.4	39.7	36.5	29.2	55.0	48.6	0.0	47.8	40.6	0.0
Progression Factor	1.00	1.00	1.00	0.74	0.72	1.21	1.12	1.14	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	2.7	1.2	27.6	4.1	0.6	19.6	2.1	0.7	37.8	4.8	0.1
Delay (s)	51.6	48.8	44.6	57.2	30.4	36.0	80.9	57.3	0.7	85.6	45.4	0.1
Level of Service	D	D	D	E	C	D	F	E	A	F	D	A
Approach Delay (s)		48.3			39.7			24.7			49.8	
Approach LOS		D			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	39.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	85.2%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	1255	69	54	1385	85	84	10	74	90	10	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00			1.00	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00			1.00	0.98
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00			1.00	1.00
Frt	1.00	0.99		1.00	0.99		1.00	0.87			1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1787	3543		1787	3543		1778	1632			1748	1525
Flt Permitted	0.95	1.00		0.95	1.00		0.65	1.00			0.68	1.00
Satd. Flow (perm)	1787	3543		1787	3543		1208	1632			1247	1525
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	26	1281	70	55	1413	87	86	10	76	92	10	31
RTOR Reduction (vph)	0	2	0	0	2	0	0	65	0	0	0	27
Lane Group Flow (vph)	26	1349	0	55	1498	0	86	21	0	0	102	4
Confl. Peds. (#/hr)			1	1			5					5
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	4%	4%	4%
Turn Type	Prot	NA		Prot	NA		Perm	NA		Perm	NA	Perm
Protected Phases	5	2		1	6			4			4	
Permitted Phases							4			4		4
Actuated Green, G (s)	4.5	80.4		7.6	83.5		16.7	16.7			16.7	16.7
Effective Green, g (s)	4.5	80.4		7.6	83.5		16.7	16.7			16.7	16.7
Actuated g/C Ratio	0.04	0.67		0.06	0.70		0.14	0.14			0.14	0.14
Clearance Time (s)	5.1	5.1		5.1	5.1		5.1	5.1			5.1	5.1
Vehicle Extension (s)	3.0	6.0		3.0	6.0		3.0	3.0			3.0	3.0
Lane Grp Cap (vph)	67	2373		113	2465		168	227			173	212
v/s Ratio Prot	0.01	0.38		c0.03	c0.42			0.01				
v/s Ratio Perm							0.07				c0.08	0.00
v/c Ratio	0.39	0.57		0.49	0.61		0.51	0.09			0.59	0.02
Uniform Delay, d1	56.4	10.6		54.3	9.6		47.9	45.0			48.4	44.6
Progression Factor	1.04	0.88		1.03	0.75		1.00	1.00			1.00	1.00
Incremental Delay, d2	2.7	0.7		1.9	0.7		2.6	0.2			5.1	0.0
Delay (s)	61.1	10.0		57.9	7.9		50.5	45.2			53.5	44.6
Level of Service	E	B		E	A		D	D			D	D
Approach Delay (s)		11.0			9.7			47.8			51.4	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.3
Intersection Capacity Utilization	67.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	270	898	65	40	1003	245	120	80	25	280	85	285
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.1	5.1		5.1	5.1	4.0		5.1		5.1	5.1	4.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00		0.95	0.95	1.00
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00		1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85		0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.97		0.95	0.97	1.00
Satd. Flow (prot)	1770	3498		1787	3574	1564		1795		1715	1757	1593
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.73		0.95	0.97	1.00
Satd. Flow (perm)	1770	3498		1787	3574	1564		1345		1715	1757	1593
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	276	916	66	41	1023	250	122	82	26	286	87	291
RTOR Reduction (vph)	0	4	0	0	0	0	0	4	0	0	0	0
Lane Group Flow (vph)	276	978	0	41	1023	250	0	226	0	183	190	291
Confl. Peds. (#/hr)	4		1	1		4	5		6	6		5
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	2%	2%	2%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	Prot	NA		Prot	NA	Free	Perm	NA		Split	NA	Free
Protected Phases	5	2		1	6			3		4	4	
Permitted Phases						Free	3					Free
Actuated Green, G (s)	23.5	51.5		4.1	32.1	120.0		24.8		19.2	19.2	120.0
Effective Green, g (s)	23.5	51.5		4.1	32.1	120.0		24.8		19.2	19.2	120.0
Actuated g/C Ratio	0.20	0.43		0.03	0.27	1.00		0.21		0.16	0.16	1.00
Clearance Time (s)	5.1	5.1		5.1	5.1			5.1		5.1	5.1	
Vehicle Extension (s)	3.0	4.0		3.0	4.0			4.0		4.0	4.0	
Lane Grp Cap (vph)	346	1501		61	956	1564		277		274	281	1593
v/s Ratio Prot	c0.16	0.28		0.02	c0.29					0.11	c0.11	
v/s Ratio Perm						0.16		c0.17				0.18
v/c Ratio	0.80	0.65		0.67	1.07	0.16		0.82		0.67	0.68	0.18
Uniform Delay, d1	46.0	27.1		57.3	44.0	0.0		45.4		47.4	47.5	0.0
Progression Factor	0.92	0.83		1.00	1.00	1.00		1.00		1.00	1.00	1.00
Incremental Delay, d2	10.5	1.9		25.4	49.8	0.2		17.5		6.6	6.9	0.3
Delay (s)	53.0	24.3		82.7	93.7	0.2		62.9		54.0	54.3	0.3
Level of Service	D	C		F	F	A		E		D	D	A
Approach Delay (s)		30.6			75.6			62.9			30.6	
Approach LOS		C			E			E			C	

Intersection Summary			
HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.4
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	240	610	110	220	555	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3438	1538	1736	3471	3502	1594
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3438	1538	1736	3471	3502	1594
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	250	635	115	229	578	125
RTOR Reduction (vph)	0	389	0	0	0	94
Lane Group Flow (vph)	250	246	115	229	578	31
Confl. Peds. (#/hr)		1	1			1
Heavy Vehicles (%)	5%	5%	4%	4%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.8	22.8	7.6	36.4	14.5	14.5
Effective Green, g (s)	22.8	22.8	7.6	36.4	14.5	14.5
Actuated g/C Ratio	0.39	0.39	0.13	0.62	0.25	0.25
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1330	595	224	2145	862	392
v/s Ratio Prot	0.07	c0.16	c0.07	0.07	c0.17	
v/s Ratio Perm						0.02
v/c Ratio	0.19	0.41	0.51	0.11	0.67	0.08
Uniform Delay, d1	11.9	13.2	23.9	4.6	20.0	17.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	2.1	2.0	0.0	2.1	0.1
Delay (s)	12.2	15.3	25.9	4.6	22.1	17.2
Level of Service	B	B	C	A	C	B
Approach Delay (s)	14.4			11.7	21.2	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	58.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	51.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	30	15	140	30	120	20	525	125	95	525	20
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1827	1827	1900	1792	1792	1900	1827	1827	1900
Adj Flow Rate, veh/h	26	32	16	147	32	126	21	553	132	100	553	21
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	4	4	4	6	6	6	4	4	4
Cap, veh/h	317	238	119	419	68	269	485	1061	252	484	1515	57
Arrive On Green	0.21	0.21	0.21	0.21	0.21	0.21	0.03	0.39	0.39	0.08	0.44	0.44
Sat Flow, veh/h	1177	1129	564	1326	324	1277	1707	2730	649	1740	3410	129
Grp Volume(v), veh/h	26	0	48	147	0	158	21	344	341	100	281	293
Grp Sat Flow(s),veh/h/ln	1177	0	1693	1326	0	1602	1707	1703	1676	1740	1736	1804
Q Serve(g_s), s	0.8	0.0	1.0	4.3	0.0	3.7	0.3	6.6	6.6	1.4	4.5	4.6
Cycle Q Clear(g_c), s	4.5	0.0	1.0	5.3	0.0	3.7	0.3	6.6	6.6	1.4	4.5	4.6
Prop In Lane	1.00		0.33	1.00		0.80	1.00		0.39	1.00		0.07
Lane Grp Cap(c), veh/h	317	0	357	419	0	338	485	662	651	484	771	802
V/C Ratio(X)	0.08	0.00	0.13	0.35	0.00	0.47	0.04	0.52	0.52	0.21	0.36	0.37
Avail Cap(c_a), veh/h	875	0	1160	1048	0	1097	642	1054	1037	601	1127	1172
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.6	0.0	13.6	15.7	0.0	14.6	7.4	9.9	9.9	6.9	7.8	7.8
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.5	0.0	1.0	0.0	0.6	0.7	0.2	0.3	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.3	0.0	0.5	1.6	0.0	1.7	0.1	3.2	3.1	0.7	2.2	2.3
LnGrp Delay(d),s/veh	16.7	0.0	13.7	16.2	0.0	15.6	7.4	10.6	10.6	7.1	8.1	8.1
LnGrp LOS	B		B	B		B	A	B	B	A	A	A
Approach Vol, veh/h		74			305			706			674	
Approach Delay, s/veh		14.8			15.9			10.5			7.9	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.0	20.9		13.4	5.6	23.3		13.4
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	6.3	26.2		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.4	8.6		6.5	2.3	6.6		7.3
Green Ext Time (p_c), s	0.1	7.6		1.8	0.0	8.3		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	10.6
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	10	70	60	5	45	100	655	70	35	655	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1900	1667	1900	1827	1827	1900	1845	1845	1900
Adj Flow Rate, veh/h	10	10	0	62	5	0	104	682	73	36	682	26
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	14	14	14	4	4	4	3	3	3
Cap, veh/h	413	203	0	358	10	0	590	1852	198	571	2016	77
Arrive On Green	0.11	0.11	0.00	0.11	0.11	0.00	0.59	0.59	0.59	0.59	0.59	0.59
Sat Flow, veh/h	1354	1810	0	1117	90	0	722	3162	338	697	3442	131
Grp Volume(v), veh/h	10	10	0	67	0	0	104	374	381	36	347	361
Grp Sat Flow(s),veh/h/ln	1354	1810	0	1208	0	0	722	1736	1764	697	1752	1820
Q Serve(g_s), s	0.0	0.1	0.0	1.5	0.0	0.0	2.6	3.4	3.4	0.9	3.0	3.1
Cycle Q Clear(g_c), s	0.2	0.1	0.0	1.6	0.0	0.0	5.6	3.4	3.4	4.3	3.0	3.1
Prop In Lane	1.00		0.00	0.93		0.00	1.00		0.19	1.00		0.07
Lane Grp Cap(c), veh/h	413	203	0	368	0	0	590	1017	1034	571	1027	1066
V/C Ratio(X)	0.02	0.05	0.00	0.18	0.00	0.00	0.18	0.37	0.37	0.06	0.34	0.34
Avail Cap(c_a), veh/h	1442	1578	0	1328	0	0	773	1456	1480	747	1470	1527
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.8	11.8	0.0	12.5	0.0	0.0	4.6	3.3	3.3	4.4	3.2	3.2
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.2	0.0	0.0	0.1	0.2	0.2	0.0	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.1	0.1	0.0	0.5	0.0	0.0	0.5	1.6	1.7	0.2	1.5	1.6
LnGrp Delay(d),s/veh	11.8	11.9	0.0	12.8	0.0	0.0	4.8	3.5	3.5	4.4	3.4	3.4
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		20			67			859			744	
Approach Delay, s/veh		11.9			12.8			3.6			3.4	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		22.0		7.8		22.0		7.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		7.6		2.2		6.3		3.6
Green Ext Time (p_c), s		9.8		0.4		10.2		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	4.0
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	165	65	105	440	715	250	75	675	55
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1827	1827	1827	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h				118	139	0	454	737	258	77	696	57
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %				4	4	4	3	3	3	3	3	3
Cap, veh/h				224	235	200	673	1883	820	115	1395	340
Arrive On Green				0.13	0.13	0.00	0.38	0.54	0.54	0.07	0.22	0.22
Sat Flow, veh/h				1740	1827	1553	1757	3505	1526	1757	6346	1547
Grp Volume(v), veh/h				118	139	0	454	737	258	77	696	57
Grp Sat Flow(s),veh/h/ln				1740	1827	1553	1757	1752	1526	1757	1586	1547
Q Serve(g_s), s				3.2	3.6	0.0	10.8	6.2	4.7	2.2	4.8	1.5
Cycle Q Clear(g_c), s				3.2	3.6	0.0	10.8	6.2	4.7	2.2	4.8	1.5
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				224	235	200	673	1883	820	115	1395	340
V/C Ratio(X)				0.53	0.59	0.00	0.67	0.39	0.31	0.67	0.50	0.17
Avail Cap(c_a), veh/h				935	981	834	926	2650	1154	227	2272	554
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				20.5	20.7	0.0	12.9	6.8	6.5	23.0	17.2	15.9
Incr Delay (d2), s/veh				1.9	2.4	0.0	1.2	0.1	0.2	6.5	0.3	0.2
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				1.6	2.0	0.0	5.4	3.0	2.0	1.3	2.2	0.7
LnGrp Delay(d),s/veh				22.4	23.0	0.0	14.1	6.9	6.7	29.5	17.5	16.1
LnGrp LOS				C	C		B	A	A	C	B	B
Approach Vol, veh/h					257			1449			830	
Approach Delay, s/veh					22.7			9.1			18.5	
Approach LOS					C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	7.8	31.5			23.8	15.5		11.0
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	6.5	38.0			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	4.2	8.2			12.8	6.8		5.6
Green Ext Time (p_c), s	0.0	9.0			6.5	3.8		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	13.6
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	155	135	315	290	0	200	0	1050	360	180	665	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1845	0	1845	0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	160	139	325	299	0	206	0	1082	371	186	686	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	3	0	3	0	2	2	2	2	0
Cap, veh/h	497	522	435	0	0	0	0	2137	661	359	2926	0
Arrive On Green	0.28	0.28	0.28	0.00	0.00	0.00	0.00	0.42	0.42	0.08	0.58	0.00
Sat Flow, veh/h	1774	1863	1552		0		0	5253	1574	1774	5253	0
Grp Volume(v), veh/h	160	139	325		0.0		0	1082	371	186	686	0
Grp Sat Flow(s),veh/h/ln	1774	1863	1552				0	1695	1574	1774	1695	0
Q Serve(g_s), s	4.5	3.6	11.9				0.0	9.8	11.2	3.4	4.1	0.0
Cycle Q Clear(g_c), s	4.5	3.6	11.9				0.0	9.8	11.2	3.4	4.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	497	522	435				0	2137	661	359	2926	0
V/C Ratio(X)	0.32	0.27	0.75				0.00	0.51	0.56	0.52	0.23	0.00
Avail Cap(c_a), veh/h	1081	1135	945				0	2527	782	368	3343	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.8	17.5	20.4				0.0	13.3	13.7	9.8	6.5	0.0
Incr Delay (d2), s/veh	0.4	0.3	2.6				0.0	0.2	0.7	1.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.2	1.9	5.4				0.0	4.5	4.9	1.7	1.9	0.0
LnGrp Delay(d),s/veh	18.1	17.7	23.0				0.0	13.5	14.5	11.0	6.5	0.0
LnGrp LOS	B	B	C					B	B	B	A	
Approach Vol, veh/h		624						1453			872	
Approach Delay, s/veh		20.6						13.8			7.5	
Approach LOS		C						B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	9.7	30.7		22.0		40.4		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	5.5	31.0		38.0		41.0		
Max Q Clear Time (g_c+I1), s	5.4	13.2		13.9		6.1		
Green Ext Time (p_c), s	0.0	12.7		2.5		19.8		

Intersection Summary	
HCM 2010 Ctrl Delay	13.3
HCM 2010 LOS	B

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	325	490	425	270	440	320
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1845	1845
Adj Flow Rate, veh/h	339	510	443	281	458	333
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	4	3	3
Cap, veh/h	792	2026	884	747	773	724
Arrive On Green	0.23	0.58	0.25	0.25	0.23	0.23
Sat Flow, veh/h	3375	3563	3563	1550	3408	1568
Grp Volume(v), veh/h	339	510	443	281	458	333
Grp Sat Flow(s),veh/h/ln	1688	1736	1736	1550	1704	1568
Q Serve(g_s), s	4.1	3.4	5.2	5.5	5.7	0.0
Cycle Q Clear(g_c), s	4.1	3.4	5.2	5.5	5.7	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	792	2026	884	747	773	724
V/C Ratio(X)	0.43	0.25	0.50	0.38	0.59	0.46
Avail Cap(c_a), veh/h	2804	6899	3687	1999	3548	2000
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	15.5	4.8	15.1	7.8	16.4	8.8
Incr Delay (d2), s/veh	0.4	0.1	0.4	0.3	0.7	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.9	1.6	2.5	3.4	2.7	4.4
LnGrp Delay(d),s/veh	15.9	4.9	15.6	8.1	17.1	9.2
LnGrp LOS	B	A	B	A	B	A
Approach Vol, veh/h		849	724		791	
Approach Delay, s/veh		9.3	12.7		13.8	
Approach LOS		A	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		32.3		15.3	15.7	16.6		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		94.5		49.5	39.5	50.5		
Max Q Clear Time (g_c+I1), s		5.4		7.7	6.1	7.5		
Green Ext Time (p_c), s		5.4		3.1	5.2	4.4		

Intersection Summary	
HCM 2010 Ctrl Delay	11.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	170	110	280	220	380	100	400	340	120	790	115
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.96	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1776	1863	1863	1863	1863	1863	1900	1845	1845	1900
Adj Flow Rate, veh/h	86	242	79	301	237	409	108	430	0	129	849	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	7	7	7	2	2	2	2	2	2	3	3	3
Cap, veh/h	175	367	228	1060	574	593	233	1044	0	307	1115	0
Arrive On Green	0.10	0.10	0.10	0.31	0.31	0.31	0.05	0.29	0.00	0.08	0.32	0.00
Sat Flow, veh/h	1691	3551	1404	3442	1863	1525	1774	3632	0	1757	3597	0
Grp Volume(v), veh/h	86	242	79	301	237	409	108	430	0	129	849	0
Grp Sat Flow(s),veh/h/ln	1691	1776	1404	1721	1863	1525	1774	1770	0	1757	1752	0
Q Serve(g_s), s	4.0	5.5	0.0	5.5	8.4	18.8	0.0	8.1	0.0	4.7	18.2	0.0
Cycle Q Clear(g_c), s	4.0	5.5	0.0	5.5	8.4	18.8	0.0	8.1	0.0	4.7	18.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	175	367	228	1060	574	593	233	1044	0	307	1115	0
V/C Ratio(X)	0.49	0.66	0.35	0.28	0.41	0.69	0.46	0.41	0.00	0.42	0.76	0.00
Avail Cap(c_a), veh/h	289	608	323	1298	702	699	350	1699	0	445	1808	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	35.4	36.0	31.2	21.9	22.9	21.5	35.9	23.6	0.0	23.6	25.6	0.0
Incr Delay (d2), s/veh	2.1	2.0	0.9	0.1	0.5	2.3	1.4	0.3	0.0	0.9	1.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.0	2.8	1.7	2.7	4.4	8.3	2.5	4.0	0.0	2.3	8.9	0.0
LnGrp Delay(d),s/veh	37.5	38.1	32.1	22.1	23.4	23.8	37.3	23.9	0.0	24.5	26.7	0.0
LnGrp LOS	D	D	C	C	C	C	D	C		C	C	
Approach Vol, veh/h		407			947			538			978	
Approach Delay, s/veh		36.8			23.2			26.6			26.4	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.0	29.1		13.1	9.1	31.1		30.2
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	13.1	40.1		14.3	10.1	43.1		31.5
Max Q Clear Time (g_c+I1), s	6.7	10.1		7.5	2.0	20.2		20.8
Green Ext Time (p_c), s	0.2	3.4		1.2	2.0	6.4		3.2

Intersection Summary	
HCM 2010 Ctrl Delay	26.9
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	240	435	105	215	455	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3610	1615	1787	3574	3502	1592
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3610	1615	1787	3574	3502	1592
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	247	448	108	222	469	144
RTOR Reduction (vph)	0	269	0	0	0	111
Lane Group Flow (vph)	247	179	108	222	469	33
Confl. Peds. (#/hr)						2
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.8	22.8	7.3	36.1	13.0	13.0
Effective Green, g (s)	22.8	22.8	7.3	36.1	13.0	13.0
Actuated g/C Ratio	0.40	0.40	0.13	0.63	0.23	0.23
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1441	644	228	2259	797	362
v/s Ratio Prot	0.07	c0.11	c0.06	0.06	c0.13	
v/s Ratio Perm						0.02
v/c Ratio	0.17	0.28	0.47	0.10	0.59	0.09
Uniform Delay, d1	11.1	11.6	23.1	4.1	19.7	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.1	1.6	0.0	1.1	0.1
Delay (s)	11.3	12.7	24.7	4.1	20.8	17.5
Level of Service	B	B	C	A	C	B
Approach Delay (s)	12.2			10.9	20.0	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	57.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	35	20	140	45	65	20	455	130	65	445	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1827	1827	1900	1863	1863	1900	1881	1881	1900
Adj Flow Rate, veh/h	27	37	21	149	48	69	21	484	138	69	473	32
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	4	4	4	2	2	2	1	1	1
Cap, veh/h	308	223	127	360	136	195	576	1341	380	546	1788	121
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.02	0.49	0.49	0.06	0.53	0.53
Sat Flow, veh/h	1256	1105	627	1312	673	967	1774	2722	771	1792	3392	229
Grp Volume(v), veh/h	27	0	58	149	0	117	21	314	308	69	248	257
Grp Sat Flow(s),veh/h/ln	1256	0	1733	1312	0	1639	1774	1770	1723	1792	1787	1834
Q Serve(g_s), s	1.0	0.0	1.5	5.8	0.0	3.4	0.3	6.0	6.1	1.0	4.2	4.2
Cycle Q Clear(g_c), s	4.4	0.0	1.5	7.3	0.0	3.4	0.3	6.0	6.1	1.0	4.2	4.2
Prop In Lane	1.00		0.36	1.00		0.59	1.00		0.45	1.00		0.12
Lane Grp Cap(c), veh/h	308	0	349	360	0	331	576	872	849	546	942	967
V/C Ratio(X)	0.09	0.00	0.17	0.41	0.00	0.35	0.04	0.36	0.36	0.13	0.26	0.27
Avail Cap(c_a), veh/h	719	0	917	789	0	868	693	872	849	619	942	967
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.7	0.0	18.1	21.1	0.0	18.8	6.5	8.6	8.6	6.1	7.1	7.1
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.8	0.0	0.6	0.0	1.2	1.2	0.1	0.7	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.7	2.1	0.0	1.6	0.1	3.2	3.1	0.5	2.2	2.3
LnGrp Delay(d),s/veh	20.8	0.0	18.3	21.9	0.0	19.4	6.5	9.7	9.8	6.2	7.8	7.8
LnGrp LOS	C		B	C		B	A	A	A	A	A	A
Approach Vol, veh/h		85			266			643			574	
Approach Delay, s/veh		19.1			20.8			9.7			7.6	
Approach LOS		B			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	7.8	31.5		15.6	5.9	33.4		15.6
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.5	27.0		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.0	8.1		6.4	2.3	6.2		9.3
Green Ext Time (p_c), s	0.0	7.0		1.6	0.0	7.3		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	11.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	85	75	10	40	135	570	65	30	565	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1900	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	5	0	77	10	0	139	588	67	31	582	26
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	414	175	0	362	15	0	659	1859	211	635	2001	89
Arrive On Green	0.09	0.09	0.00	0.09	0.09	0.00	0.58	0.58	0.58	0.58	0.58	0.58
Sat Flow, veh/h	1385	1845	0	1235	160	0	807	3201	364	773	3446	154
Grp Volume(v), veh/h	5	5	0	87	0	0	139	324	331	31	298	310
Grp Sat Flow(s),veh/h/ln	1385	1845	0	1395	0	0	807	1770	1796	773	1770	1831
Q Serve(g_s), s	0.0	0.1	0.0	1.6	0.0	0.0	2.9	2.6	2.6	0.6	2.4	2.4
Cycle Q Clear(g_c), s	0.1	0.1	0.0	1.7	0.0	0.0	5.3	2.6	2.6	3.2	2.4	2.4
Prop In Lane	1.00		0.00	0.89		0.00	1.00		0.20	1.00		0.08
Lane Grp Cap(c), veh/h	414	175	0	377	0	0	659	1027	1043	635	1027	1063
V/C Ratio(X)	0.01	0.03	0.00	0.23	0.00	0.00	0.21	0.32	0.32	0.05	0.29	0.29
Avail Cap(c_a), veh/h	1581	1729	0	1584	0	0	918	1595	1618	883	1595	1650
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	11.4	11.4	0.0	12.2	0.0	0.0	4.3	3.0	3.0	3.8	2.9	2.9
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.3	0.0	0.0	0.2	0.2	0.2	0.0	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	0.7	0.0	0.0	0.6	1.3	1.3	0.1	1.1	1.2
LnGrp Delay(d),s/veh	11.4	11.5	0.0	12.5	0.0	0.0	4.4	3.2	3.2	3.8	3.1	3.1
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		10			87			794			639	
Approach Delay, s/veh		11.4			12.5			3.4			3.1	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		20.6		7.1		20.6		7.1
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		7.3		2.1		5.2		3.7
Green Ext Time (p_c), s		8.7		0.4		9.2		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	3.8
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	140	45	75	560	700	160	65	570	65
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.96
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1845	1845	1845	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h				97	117	0	589	737	168	68	600	68
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				3	3	3	1	1	1	2	2	2
Cap, veh/h				194	204	173	765	2020	880	107	1272	303
Arrive On Green				0.11	0.11	0.00	0.43	0.57	0.57	0.06	0.20	0.20
Sat Flow, veh/h				1757	1845	1568	1792	3574	1558	1774	6408	1525
Grp Volume(v), veh/h				97	117	0	589	737	168	68	600	68
Grp Sat Flow(s),veh/h/ln				1757	1845	1568	1792	1787	1558	1774	1602	1525
Q Serve(g_s), s				2.7	3.1	0.0	14.4	5.8	2.7	1.9	4.2	1.9
Cycle Q Clear(g_c), s				2.7	3.1	0.0	14.4	5.8	2.7	1.9	4.2	1.9
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				194	204	173	765	2020	880	107	1272	303
V/C Ratio(X)				0.50	0.57	0.00	0.77	0.36	0.19	0.63	0.47	0.22
Avail Cap(c_a), veh/h				928	974	828	928	2691	1173	208	2255	537
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				21.4	21.6	0.0	12.5	6.1	5.4	23.5	18.1	17.2
Incr Delay (d2), s/veh				2.0	2.5	0.0	3.3	0.1	0.1	6.0	0.3	0.4
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				1.4	1.7	0.0	7.7	2.8	1.1	1.1	1.9	0.8
LnGrp Delay(d),s/veh				23.4	24.1	0.0	15.8	6.2	5.5	29.5	18.4	17.6
LnGrp LOS				C	C		B	A	A	C	B	B
Approach Vol, veh/h					214			1494			736	
Approach Delay, s/veh					23.8			9.9			19.3	
Approach LOS					C			A			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	7.6	33.4			26.3	14.7		10.1
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	6.0	38.5			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	3.9	7.8			16.4	6.2		5.1
Green Ext Time (p_c), s	0.0	9.4			5.5	3.4		0.9

Intersection Summary	
HCM 2010 Ctrl Delay	14.0
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	145	80	415	260	0	135	0	1125	330	105	660	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	0	1881	0	1881	1881	1863	1863	0
Adj Flow Rate, veh/h	149	82	428	268	0	139	0	1160	340	108	680	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	0	1	0	1	1	2	2	0
Cap, veh/h	570	598	507	0	0	0	0	2217	687	303	2829	0
Arrive On Green	0.32	0.32	0.32	0.00	0.00	0.00	0.00	0.43	0.43	0.06	0.56	0.00
Sat Flow, veh/h	1792	1881	1594		0		0	5305	1592	1774	5253	0
Grp Volume(v), veh/h	149	82	428		0.0		0	1160	340	108	680	0
Grp Sat Flow(s),veh/h/ln	1792	1881	1594				0	1712	1592	1774	1695	0
Q Serve(g_s), s	4.4	2.2	17.9				0.0	11.9	11.0	2.2	4.9	0.0
Cycle Q Clear(g_c), s	4.4	2.2	17.9				0.0	11.9	11.0	2.2	4.9	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	570	598	507				0	2217	687	303	2829	0
V/C Ratio(X)	0.26	0.14	0.84				0.00	0.52	0.49	0.36	0.24	0.00
Avail Cap(c_a), veh/h	951	999	847				0	2217	687	317	2829	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	18.2	17.4	22.7				0.0	14.9	14.7	10.7	8.1	0.0
Incr Delay (d2), s/veh	0.2	0.1	4.1				0.0	0.9	2.5	0.7	0.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.2	1.2	8.4				0.0	5.8	5.3	1.1	2.3	0.0
LnGrp Delay(d),s/veh	18.4	17.5	26.8				0.0	15.8	17.2	11.4	8.3	0.0
LnGrp LOS	B	B	C					B	B	B	A	
Approach Vol, veh/h		659						1500			788	
Approach Delay, s/veh		23.8						16.1			8.8	
Approach LOS		C						B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	8.9	35.4		27.3		44.3		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	5.0	30.3		38.0		39.8		
Max Q Clear Time (g_c+I1), s	4.2	13.9		19.9		6.9		
Green Ext Time (p_c), s	0.0	12.2		2.4		19.7		

Intersection Summary	
HCM 2010 Ctrl Delay	15.9
HCM 2010 LOS	B

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	415	610	655	365	455	445
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1863	1863
Adj Flow Rate, veh/h	456	670	720	401	500	489
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	1	2	2
Cap, veh/h	521	2057	1200	916	842	625
Arrive On Green	0.15	0.58	0.34	0.34	0.24	0.24
Sat Flow, veh/h	3476	3668	3668	1564	3442	1583
Grp Volume(v), veh/h	456	670	720	401	500	489
Grp Sat Flow(s),veh/h/ln	1738	1787	1787	1564	1721	1583
Q Serve(g_s), s	6.4	4.9	8.4	7.2	6.4	6.0
Cycle Q Clear(g_c), s	6.4	4.9	8.4	7.2	6.4	6.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	521	2057	1200	916	842	625
V/C Ratio(X)	0.88	0.33	0.60	0.44	0.59	0.78
Avail Cap(c_a), veh/h	521	2927	2070	1297	2062	1186
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.8	5.6	13.8	5.9	16.7	13.3
Incr Delay (d2), s/veh	15.4	0.1	0.5	0.3	0.7	2.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.2	2.4	4.2	5.0	3.1	9.0
LnGrp Delay(d),s/veh	36.2	5.6	14.3	6.3	17.4	15.5
LnGrp LOS	D	A	B	A	B	B
Approach Vol, veh/h		1126	1121		989	
Approach Delay, s/veh		18.0	11.4		16.4	
Approach LOS		B	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		33.3		16.8	12.0	21.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		41.0		30.0	7.5	29.0		
Max Q Clear Time (g_c+I1), s		6.9		8.4	8.4	10.4		
Green Ext Time (p_c), s		7.4		3.8	0.0	6.4		

Intersection Summary	
HCM 2010 Ctrl Delay	15.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	55	70	90	255	160	305	45	335	220	105	775	140
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1810	1881	1881	1881	1881	1881	1900	1900	1900	1900
Adj Flow Rate, veh/h	41	157	67	283	178	339	50	372	0	117	861	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	1	1	1	1	1	1	0	0	0
Cap, veh/h	151	317	204	911	493	534	243	1033	0	336	1135	0
Arrive On Green	0.09	0.09	0.09	0.26	0.26	0.26	0.05	0.29	0.00	0.07	0.31	0.00
Sat Flow, veh/h	1723	3619	1516	3476	1881	1599	1792	3668	0	1810	3705	0
Grp Volume(v), veh/h	41	157	67	283	178	339	50	372	0	117	861	0
Grp Sat Flow(s),veh/h/ln	1723	1810	1516	1738	1881	1599	1792	1787	0	1810	1805	0
Q Serve(g_s), s	1.4	2.6	0.0	4.1	4.8	11.1	0.0	5.1	0.0	3.1	13.3	0.0
Cycle Q Clear(g_c), s	1.4	2.6	0.0	4.1	4.8	11.1	0.0	5.1	0.0	3.1	13.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	151	317	204	911	493	534	243	1033	0	336	1135	0
V/C Ratio(X)	0.27	0.50	0.33	0.31	0.36	0.63	0.21	0.36	0.00	0.35	0.76	0.00
Avail Cap(c_a), veh/h	430	902	450	1739	941	915	306	1363	0	401	1469	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	26.5	27.1	24.4	18.4	18.7	17.5	26.4	17.5	0.0	18.0	19.2	0.0
Incr Delay (d2), s/veh	1.0	1.2	0.9	0.2	0.4	1.3	0.4	0.2	0.0	0.6	1.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.7	1.3	1.1	2.0	2.5	5.0	0.8	2.6	0.0	1.6	6.8	0.0
LnGrp Delay(d),s/veh	27.5	28.3	25.3	18.6	19.1	18.7	26.8	17.8	0.0	18.6	20.9	0.0
LnGrp LOS	C	C	C	B	B	B	C	B		B	C	
Approach Vol, veh/h		265			800			422			978	
Approach Delay, s/veh		27.4			18.8			18.8			20.6	
Approach LOS		C			B			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.0	22.5		9.9	7.4	24.0		20.8
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	6.7	23.7		15.5	5.1	25.3		31.1
Max Q Clear Time (g_c+I1), s	5.1	7.1		4.6	2.0	15.3		13.1
Green Ext Time (p_c), s	0.0	2.3		0.9	0.8	4.2		3.2

Intersection Summary	
HCM 2010 Ctrl Delay	20.5
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	730	130	265	665	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3438	1538	1736	3471	3502	1594
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3438	1538	1736	3471	3502	1594
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	297	760	135	276	693	151
RTOR Reduction (vph)	0	477	0	0	0	112
Lane Group Flow (vph)	297	283	135	276	693	39
Confl. Peds. (#/hr)		1	1			1
Heavy Vehicles (%)	5%	5%	4%	4%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.7	22.7	8.3	37.0	15.9	15.9
Effective Green, g (s)	22.7	22.7	8.3	37.0	15.9	15.9
Actuated g/C Ratio	0.37	0.37	0.14	0.61	0.26	0.26
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1281	573	236	2108	914	416
v/s Ratio Prot	0.09	c0.18	c0.08	0.08	c0.20	
v/s Ratio Perm						0.02
v/c Ratio	0.23	0.49	0.57	0.13	0.76	0.09
Uniform Delay, d1	13.1	14.7	24.6	5.1	20.7	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.0	3.3	0.0	3.6	0.1
Delay (s)	13.5	17.7	28.0	5.1	24.4	17.1
Level of Service	B	B	C	A	C	B
Approach Delay (s)	16.5			12.6	23.1	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	35	20	165	35	145	25	625	150	115	625	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1827	1827	1900	1792	1792	1900	1827	1827	1900
Adj Flow Rate, veh/h	32	37	21	174	37	153	26	658	158	121	658	26
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	4	4	4	6	6	6	4	4	4
Cap, veh/h	297	251	142	419	73	300	438	1106	265	434	1560	62
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.41	0.41	0.08	0.46	0.46
Sat Flow, veh/h	1144	1075	610	1314	312	1288	1707	2725	654	1740	3404	134
Grp Volume(v), veh/h	32	0	58	174	0	190	26	411	405	121	335	349
Grp Sat Flow(s),veh/h/ln	1144	0	1685	1314	0	1600	1707	1703	1675	1740	1736	1803
Q Serve(g_s), s	1.2	0.0	1.3	5.9	0.0	5.0	0.4	9.2	9.2	1.9	6.3	6.3
Cycle Q Clear(g_c), s	6.2	0.0	1.3	7.2	0.0	5.0	0.4	9.2	9.2	1.9	6.3	6.3
Prop In Lane	1.00		0.36	1.00		0.81	1.00		0.39	1.00		0.07
Lane Grp Cap(c), veh/h	297	0	393	419	0	373	438	691	680	434	795	826
V/C Ratio(X)	0.11	0.00	0.15	0.42	0.00	0.51	0.06	0.59	0.60	0.28	0.42	0.42
Avail Cap(c_a), veh/h	713	0	1006	897	0	955	562	919	904	516	983	1021
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.9	0.0	14.8	17.6	0.0	16.2	8.0	11.3	11.3	7.9	8.8	8.8
Incr Delay (d2), s/veh	0.2	0.0	0.2	0.7	0.0	1.1	0.1	0.8	0.8	0.3	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.6	2.2	0.0	2.3	0.2	4.4	4.3	0.9	3.1	3.2
LnGrp Delay(d),s/veh	19.1	0.0	15.0	18.3	0.0	17.3	8.0	12.1	12.1	8.2	9.2	9.2
LnGrp LOS	B		B	B		B	A	B	B	A	A	A
Approach Vol, veh/h		90			364			842			805	
Approach Delay, s/veh		16.4			17.8			12.0			9.0	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.5	24.2		15.8	6.0	26.8		15.8
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	6.3	26.2		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.9	11.2		8.2	2.4	8.3		9.2
Green Ext Time (p_c), s	0.1	8.3		2.2	0.0	9.7		2.1

Intersection Summary	
HCM 2010 Ctrl Delay	12.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	10	85	70	5	55	120	785	85	40	785	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1900	1667	1900	1827	1827	1900	1845	1845	1900
Adj Flow Rate, veh/h	10	10	0	73	5	0	125	818	89	42	818	31
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	14	14	14	4	4	4	3	3	3
Cap, veh/h	393	208	0	338	9	0	529	1945	212	507	2122	80
Arrive On Green	0.11	0.11	0.00	0.11	0.11	0.00	0.62	0.62	0.62	0.62	0.62	0.62
Sat Flow, veh/h	1355	1810	0	1129	77	0	633	3156	343	605	3442	130
Grp Volume(v), veh/h	10	10	0	78	0	0	125	450	457	42	416	433
Grp Sat Flow(s),veh/h/ln	1355	1810	0	1206	0	0	633	1736	1763	605	1752	1821
Q Serve(g_s), s	0.0	0.2	0.0	2.0	0.0	0.0	4.1	4.5	4.5	1.3	4.0	4.0
Cycle Q Clear(g_c), s	0.2	0.2	0.0	2.1	0.0	0.0	8.2	4.5	4.5	5.8	4.0	4.0
Prop In Lane	1.00		0.00	0.94		0.00	1.00		0.19	1.00		0.07
Lane Grp Cap(c), veh/h	393	208	0	347	0	0	529	1070	1087	507	1080	1122
V/C Ratio(X)	0.03	0.05	0.00	0.23	0.00	0.00	0.24	0.42	0.42	0.08	0.39	0.39
Avail Cap(c_a), veh/h	1290	1405	0	1180	0	0	612	1296	1316	586	1308	1359
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.2	13.2	0.0	14.1	0.0	0.0	5.3	3.3	3.3	4.8	3.2	3.2
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.3	0.0	0.0	0.2	0.3	0.3	0.1	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.1	0.1	0.0	0.7	0.0	0.0	0.7	2.2	2.2	0.2	1.9	2.0
LnGrp Delay(d),s/veh	13.2	13.3	0.0	14.5	0.0	0.0	5.5	3.6	3.6	4.9	3.5	3.4
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		20			78			1032			891	
Approach Delay, s/veh		13.3			14.5			3.8			3.5	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.1		8.3		25.1		8.3
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		10.2		2.2		7.8		4.1
Green Ext Time (p_c), s		10.5		0.4		11.7		0.4

Intersection Summary	
HCM 2010 Ctrl Delay	4.2
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	195	80	125	525	855	300	90	805	65
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1827	1827	1827	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h				142	165	0	541	881	309	93	830	67
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %				4	4	4	3	3	3	3	3	3
Cap, veh/h				244	257	218	705	1959	853	119	1430	349
Arrive On Green				0.14	0.14	0.00	0.40	0.56	0.56	0.07	0.23	0.23
Sat Flow, veh/h				1740	1827	1553	1757	3505	1526	1757	6346	1547
Grp Volume(v), veh/h				142	165	0	541	881	309	93	830	67
Grp Sat Flow(s),veh/h/ln				1740	1827	1553	1757	1752	1526	1757	1586	1547
Q Serve(g_s), s				4.4	4.9	0.0	15.4	8.6	6.5	3.0	6.8	2.0
Cycle Q Clear(g_c), s				4.4	4.9	0.0	15.4	8.6	6.5	3.0	6.8	2.0
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				244	257	218	705	1959	853	119	1430	349
V/C Ratio(X)				0.58	0.64	0.00	0.77	0.45	0.36	0.78	0.58	0.19
Avail Cap(c_a), veh/h				811	852	724	804	2299	1001	197	1972	481
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				23.3	23.5	0.0	15.0	7.5	7.1	26.6	20.0	18.2
Incr Delay (d2), s/veh				2.2	2.7	0.0	4.0	0.2	0.3	10.7	0.4	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				2.3	2.7	0.0	8.1	4.1	2.7	1.8	3.0	0.9
LnGrp Delay(d),s/veh				25.5	26.2	0.0	19.0	7.7	7.3	37.3	20.4	18.4
LnGrp LOS				C	C		B	A	A	D	C	B
Approach Vol, veh/h					307			1731			990	
Approach Delay, s/veh					25.9			11.2			21.8	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	8.4	36.9			27.7	17.5		12.6
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	6.5	38.0			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	5.0	10.6			17.4	8.8		6.9
Green Ext Time (p_c), s	0.0	11.2			5.8	4.0		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	16.1
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	185	160	375	345	0	240	0	1255	430	215	795	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1845	0	1845	0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	191	165	387	356	0	247	0	1294	443	222	820	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	3	0	3	0	2	2	2	2	0
Cap, veh/h	551	579	483	0	0	0	0	2054	636	328	2867	0
Arrive On Green	0.31	0.31	0.31	0.00	0.00	0.00	0.00	0.40	0.40	0.10	0.56	0.00
Sat Flow, veh/h	1774	1863	1553		0		0	5253	1574	1774	5253	0
Grp Volume(v), veh/h	191	165	387		0.0		0	1294	443	222	820	0
Grp Sat Flow(s),veh/h/ln	1774	1863	1553				0	1695	1574	1774	1695	0
Q Serve(g_s), s	6.0	4.8	16.4				0.0	14.6	16.8	4.8	6.0	0.0
Cycle Q Clear(g_c), s	6.0	4.8	16.4				0.0	14.6	16.8	4.8	6.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	551	579	483				0	2054	636	328	2867	0
V/C Ratio(X)	0.35	0.28	0.80				0.00	0.63	0.70	0.68	0.29	0.00
Avail Cap(c_a), veh/h	939	986	822				0	2167	671	420	3244	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.1	18.7	22.7				0.0	17.1	17.8	14.0	8.1	0.0
Incr Delay (d2), s/veh	0.4	0.3	3.1				0.0	0.5	3.0	2.9	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.0	2.5	7.4				0.0	6.9	7.8	2.5	2.8	0.0
LnGrp Delay(d),s/veh	19.5	19.0	25.9				0.0	17.7	20.7	16.9	8.2	0.0
LnGrp LOS	B	B	C					B	C	B	A	
Approach Vol, veh/h		743						1737			1042	
Approach Delay, s/veh		22.7						18.4			10.1	
Approach LOS		C						B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	11.5	33.5		26.8		45.0		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	10.7	30.6		38.0		45.8		
Max Q Clear Time (g_c+I1), s	6.8	18.8		18.4		8.0		
Green Ext Time (p_c), s	0.2	10.1		2.9		25.6		

Intersection Summary	
HCM 2010 Ctrl Delay	16.9
HCM 2010 LOS	B

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	390	585	510	325	525	380
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1845	1845
Adj Flow Rate, veh/h	406	609	531	339	547	396
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	4	3	3
Cap, veh/h	842	2075	938	800	837	776
Arrive On Green	0.25	0.60	0.27	0.27	0.25	0.25
Sat Flow, veh/h	3375	3563	3563	1550	3408	1568
Grp Volume(v), veh/h	406	609	531	339	547	396
Grp Sat Flow(s),veh/h/ln	1688	1736	1736	1550	1704	1568
Q Serve(g_s), s	5.9	4.9	7.6	7.8	8.3	0.0
Cycle Q Clear(g_c), s	5.9	4.9	7.6	7.8	8.3	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	842	2075	938	800	837	776
V/C Ratio(X)	0.48	0.29	0.57	0.42	0.65	0.51
Avail Cap(c_a), veh/h	2320	5709	3051	1744	2936	1742
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.4	5.6	18.1	8.6	19.5	9.8
Incr Delay (d2), s/veh	0.4	0.1	0.5	0.4	0.9	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.8	2.3	3.7	5.1	4.0	6.4
LnGrp Delay(d),s/veh	18.8	5.7	18.6	9.0	20.4	10.3
LnGrp LOS	B	A	B	A	C	B
Approach Vol, veh/h		1015	870		943	
Approach Delay, s/veh		11.0	14.9		16.1	
Approach LOS		B	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		38.9		18.6	18.8	20.0		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		94.5		49.5	39.5	50.5		
Max Q Clear Time (g_c+I1), s		6.9		10.3	7.9	9.8		
Green Ext Time (p_c), s		6.8		3.8	6.5	5.5		

Intersection Summary	
HCM 2010 Ctrl Delay	13.9
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	205	130	335	265	455	120	480	405	145	945	135
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.96	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1776	1863	1863	1863	1863	1863	1900	1845	1845	1900
Adj Flow Rate, veh/h	102	290	93	360	285	489	129	516	0	156	1016	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	7	7	7	2	2	2	2	2	2	3	3	3
Cap, veh/h	185	389	230	1070	579	611	196	1108	0	311	1224	0
Arrive On Green	0.11	0.11	0.11	0.31	0.31	0.31	0.05	0.31	0.00	0.09	0.35	0.00
Sat Flow, veh/h	1691	3551	1410	3442	1863	1525	1774	3632	0	1757	3597	0
Grp Volume(v), veh/h	102	290	93	360	285	489	129	516	0	156	1016	0
Grp Sat Flow(s),veh/h/ln	1691	1776	1410	1721	1863	1525	1774	1770	0	1757	1752	0
Q Serve(g_s), s	5.7	7.9	0.5	8.0	12.4	28.4	0.9	11.7	0.0	6.6	26.5	0.0
Cycle Q Clear(g_c), s	5.7	7.9	0.5	8.0	12.4	28.4	0.9	11.7	0.0	6.6	26.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	185	389	230	1070	579	611	196	1108	0	311	1224	0
V/C Ratio(X)	0.55	0.75	0.40	0.34	0.49	0.80	0.66	0.47	0.00	0.50	0.83	0.00
Avail Cap(c_a), veh/h	242	509	278	1086	588	618	287	1422	0	390	1513	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.1	43.1	37.6	26.5	28.0	26.7	44.2	27.6	0.0	26.2	29.8	0.0
Incr Delay (d2), s/veh	2.5	4.3	1.1	0.2	0.6	7.4	3.7	0.3	0.0	1.2	3.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.8	4.1	2.3	3.8	6.5	13.1	3.6	5.8	0.0	3.3	13.4	0.0
LnGrp Delay(d),s/veh	44.7	47.4	38.7	26.7	28.6	34.1	47.9	27.9	0.0	27.4	33.1	0.0
LnGrp LOS	D	D	D	C	C	C	D	C		C	C	
Approach Vol, veh/h		485			1134			645			1172	
Approach Delay, s/veh		45.1			30.4			31.9			32.4	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.1	35.7		15.4	9.5	39.3		35.5
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	13.1	40.1		14.3	10.1	43.1		31.5
Max Q Clear Time (g_c+I1), s	8.6	13.7		9.9	2.9	28.5		30.4
Green Ext Time (p_c), s	0.2	4.1		1.0	2.2	6.3		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	33.4
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	520	125	255	545	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3610	1615	1787	3574	3502	1592
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3610	1615	1787	3574	3502	1592
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	294	536	129	263	562	170
RTOR Reduction (vph)	0	330	0	0	0	128
Lane Group Flow (vph)	294	206	129	263	562	42
Confl. Peds. (#/hr)						2
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.8	22.8	8.0	36.8	14.5	14.5
Effective Green, g (s)	22.8	22.8	8.0	36.8	14.5	14.5
Actuated g/C Ratio	0.38	0.38	0.13	0.62	0.24	0.24
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1387	620	241	2217	856	389
v/s Ratio Prot	0.08	c0.13	c0.07	0.07	c0.16	
v/s Ratio Perm						0.03
v/c Ratio	0.21	0.33	0.54	0.12	0.66	0.11
Uniform Delay, d1	12.2	12.9	23.9	4.6	20.2	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.4	2.3	0.0	1.8	0.1
Delay (s)	12.6	14.3	26.2	4.6	22.0	17.5
Level of Service	B	B	C	A	C	B
Approach Delay (s)	13.7			11.7	20.9	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	59.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	40	25	165	55	80	25	545	155	80	530	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1827	1827	1900	1863	1863	1900	1881	1881	1900
Adj Flow Rate, veh/h	32	43	27	176	59	85	27	580	165	85	564	37
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	4	4	4	2	2	2	1	1	1
Cap, veh/h	316	243	153	381	154	222	510	1280	363	476	1716	112
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.47	0.47	0.06	0.50	0.50
Sat Flow, veh/h	1226	1060	666	1298	672	968	1774	2720	772	1792	3400	223
Grp Volume(v), veh/h	32	0	70	176	0	144	27	377	368	85	296	305
Grp Sat Flow(s),veh/h/ln	1226	0	1726	1298	0	1640	1774	1770	1723	1792	1787	1835
Q Serve(g_s), s	1.3	0.0	1.9	7.2	0.0	4.3	0.4	8.2	8.3	1.3	5.6	5.7
Cycle Q Clear(g_c), s	5.6	0.0	1.9	9.1	0.0	4.3	0.4	8.2	8.3	1.3	5.6	5.7
Prop In Lane	1.00		0.39	1.00		0.59	1.00		0.45	1.00		0.12
Lane Grp Cap(c), veh/h	316	0	396	381	0	376	510	833	811	476	902	926
V/C Ratio(X)	0.10	0.00	0.18	0.46	0.00	0.38	0.05	0.45	0.45	0.18	0.33	0.33
Avail Cap(c_a), veh/h	654	0	872	739	0	829	610	833	811	532	902	926
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.0	0.0	17.8	21.4	0.0	18.7	7.4	10.2	10.2	7.2	8.4	8.4
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.9	0.0	0.6	0.0	1.8	1.8	0.2	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.9	2.7	0.0	2.0	0.2	4.4	4.3	0.6	3.0	3.0
LnGrp Delay(d),s/veh	21.2	0.0	18.0	22.3	0.0	19.3	7.4	12.0	12.1	7.4	9.4	9.4
LnGrp LOS	C		B	C		B	A	B	B	A	A	A
Approach Vol, veh/h		102			320			772			686	
Approach Delay, s/veh		19.0			20.9			11.9			9.1	
Approach LOS		B			C			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	31.5		17.7	6.2	33.5		17.7
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.5	27.0		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.3	10.3		7.6	2.4	7.7		11.1
Green Ext Time (p_c), s	0.0	8.0		1.9	0.0	8.7		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	12.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	100	90	10	50	160	680	80	35	675	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1900	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	5	0	93	10	0	165	701	82	36	696	31
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	395	184	0	344	13	0	602	1956	229	576	2113	94
Arrive On Green	0.10	0.10	0.00	0.10	0.10	0.00	0.61	0.61	0.61	0.61	0.61	0.61
Sat Flow, veh/h	1385	1845	0	1256	135	0	723	3191	373	686	3447	153
Grp Volume(v), veh/h	5	5	0	103	0	0	165	389	394	36	357	370
Grp Sat Flow(s),veh/h/ln	1385	1845	0	1391	0	0	723	1770	1794	686	1770	1831
Q Serve(g_s), s	0.0	0.1	0.0	2.2	0.0	0.0	4.5	3.4	3.4	0.9	3.1	3.1
Cycle Q Clear(g_c), s	0.1	0.1	0.0	2.3	0.0	0.0	7.6	3.4	3.4	4.3	3.1	3.1
Prop In Lane	1.00		0.00	0.90		0.00	1.00		0.21	1.00		0.08
Lane Grp Cap(c), veh/h	395	184	0	357	0	0	602	1085	1100	576	1085	1122
V/C Ratio(X)	0.01	0.03	0.00	0.29	0.00	0.00	0.27	0.36	0.36	0.06	0.33	0.33
Avail Cap(c_a), veh/h	1406	1530	0	1397	0	0	735	1411	1430	702	1411	1460
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.7	12.7	0.0	13.8	0.0	0.0	4.8	3.0	3.0	4.1	2.9	2.9
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.4	0.0	0.0	0.2	0.2	0.2	0.0	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	0.9	0.0	0.0	0.9	1.7	1.7	0.2	1.5	1.6
LnGrp Delay(d),s/veh	12.8	12.8	0.0	14.2	0.0	0.0	5.0	3.2	3.2	4.1	3.1	3.1
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		10			103			948			763	
Approach Delay, s/veh		12.8			14.2			3.5			3.2	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		23.7		7.6		23.7		7.6
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		9.6		2.1		6.3		4.3
Green Ext Time (p_c), s		9.7		0.5		11.0		0.5

Intersection Summary	
HCM 2010 Ctrl Delay	4.0
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	165	55	90	670	835	190	80	680	80
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.96
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1845	1845	1845	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h				116	139	0	705	879	200	84	716	84
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				3	3	3	1	1	1	2	2	2
Cap, veh/h				214	224	191	790	2084	908	113	1318	314
Arrive On Green				0.12	0.12	0.00	0.44	0.58	0.58	0.06	0.21	0.21
Sat Flow, veh/h				1757	1845	1568	1792	3574	1558	1774	6408	1526
Grp Volume(v), veh/h				116	139	0	705	879	200	84	716	84
Grp Sat Flow(s),veh/h/ln				1757	1845	1568	1792	1787	1558	1774	1602	1526
Q Serve(g_s), s				3.6	4.2	0.0	21.1	7.9	3.6	2.7	5.8	2.7
Cycle Q Clear(g_c), s				3.6	4.2	0.0	21.1	7.9	3.6	2.7	5.8	2.7
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				214	224	191	790	2084	908	113	1318	314
V/C Ratio(X)				0.54	0.62	0.00	0.89	0.42	0.22	0.74	0.54	0.27
Avail Cap(c_a), veh/h				814	855	727	815	2362	1029	183	1980	471
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				24.1	24.3	0.0	15.0	6.7	5.8	26.8	20.7	19.5
Incr Delay (d2), s/veh				2.1	2.8	0.0	11.9	0.1	0.1	9.2	0.4	0.5
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				1.9	2.3	0.0	13.0	3.8	1.5	1.6	2.6	1.2
LnGrp Delay(d),s/veh				26.2	27.1	0.0	26.9	6.9	5.9	36.0	21.0	19.9
LnGrp LOS				C	C		C	A	A	D	C	B
Approach Vol, veh/h					255			1784			884	
Approach Delay, s/veh					26.7			14.7			22.4	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	8.2	38.5			30.2	16.5		11.6
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	6.0	38.5			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	4.7	9.9			23.1	7.8		6.2
Green Ext Time (p_c), s	0.0	11.8			2.6	3.7		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	18.1
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	175	95	495	310	0	160	0	1345	395	125	790	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	0	1881	0	1881	1881	1863	1863	0
Adj Flow Rate, veh/h	180	98	510	320	0	165	0	1387	407	129	814	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	0	1	0	1	1	2	2	0
Cap, veh/h	652	685	580	0	0	0	0	2044	633	250	2638	0
Arrive On Green	0.36	0.36	0.36	0.00	0.00	0.00	0.00	0.40	0.40	0.06	0.52	0.00
Sat Flow, veh/h	1792	1881	1595		0		0	5305	1591	1774	5253	0
Grp Volume(v), veh/h	180	98	510		0.0		0	1387	407	129	814	0
Grp Sat Flow(s),veh/h/ln	1792	1881	1595				0	1712	1591	1774	1695	0
Q Serve(g_s), s	5.5	2.7	22.9				0.0	17.1	15.9	3.1	7.0	0.0
Cycle Q Clear(g_c), s	5.5	2.7	22.9				0.0	17.1	15.9	3.1	7.0	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	652	685	580				0	2044	633	250	2638	0
V/C Ratio(X)	0.28	0.14	0.88				0.00	0.68	0.64	0.52	0.31	0.00
Avail Cap(c_a), veh/h	887	932	790				0	2044	633	255	2638	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.3	16.4	22.8				0.0	19.0	18.7	15.4	10.6	0.0
Incr Delay (d2), s/veh	0.2	0.1	8.6				0.0	1.8	5.0	1.7	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.7	1.4	11.4				0.0	8.3	7.8	1.6	3.3	0.0
LnGrp Delay(d),s/veh	17.5	16.5	31.4				0.0	20.9	23.6	17.1	10.9	0.0
LnGrp LOS	B	B	C					C	C	B	B	
Approach Vol, veh/h		788						1794			943	
Approach Delay, s/veh		26.4						21.5			11.7	
Approach LOS		C						C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	9.3	35.0		32.4		44.3		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	5.0	30.3		38.0		39.8		
Max Q Clear Time (g_c+I1), s	5.1	19.1		24.9		9.0		
Green Ext Time (p_c), s	0.0	9.8		2.6		22.7		

Intersection Summary	
HCM 2010 Ctrl Delay	20.0
HCM 2010 LOS	B

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	495	730	785	435	545	530
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1863	1863
Adj Flow Rate, veh/h	544	802	863	478	599	582
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	1	2	2
Cap, veh/h	421	1944	1250	1044	1069	684
Arrive On Green	0.12	0.54	0.35	0.35	0.31	0.31
Sat Flow, veh/h	3476	3668	3668	1564	3442	1583
Grp Volume(v), veh/h	544	802	863	478	599	582
Grp Sat Flow(s),veh/h/ln	1738	1787	1787	1564	1721	1583
Q Serve(g_s), s	7.5	8.2	12.8	9.2	9.0	12.9
Cycle Q Clear(g_c), s	7.5	8.2	12.8	9.2	9.0	12.9
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	421	1944	1250	1044	1069	684
V/C Ratio(X)	1.29	0.41	0.69	0.46	0.56	0.85
Avail Cap(c_a), veh/h	421	2369	1675	1230	1669	960
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.2	8.3	17.2	5.1	17.8	15.8
Incr Delay (d2), s/veh	147.8	0.1	0.8	0.3	0.5	5.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	12.2	4.0	6.4	7.7	4.3	14.5
LnGrp Delay(d),s/veh	175.0	8.4	18.0	5.4	18.3	21.1
LnGrp LOS	F	A	B	A	B	C
Approach Vol, veh/h		1346	1341		1181	
Approach Delay, s/veh		75.7	13.5		19.7	
Approach LOS		E	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		38.1		23.7	12.0	26.1		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		41.0		30.0	7.5	29.0		
Max Q Clear Time (g_c+I1), s		10.2		14.9	9.5	14.8		
Green Ext Time (p_c), s		9.2		4.3	0.0	6.8		

Intersection Summary	
HCM 2010 Ctrl Delay	37.0
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	85	110	305	190	365	55	400	265	125	925	165
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1810	1881	1881	1881	1881	1881	1900	1900	1900	1900
Adj Flow Rate, veh/h	48	189	81	339	211	406	61	444	0	139	1028	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	1	1	1	1	1	1	0	0	0
Cap, veh/h	158	332	214	1004	544	592	201	1047	0	325	1176	0
Arrive On Green	0.09	0.09	0.09	0.29	0.29	0.29	0.05	0.29	0.00	0.08	0.33	0.00
Sat Flow, veh/h	1723	3619	1516	3476	1881	1599	1792	3668	0	1810	3705	0
Grp Volume(v), veh/h	48	189	81	339	211	406	61	444	0	139	1028	0
Grp Sat Flow(s),veh/h/ln	1723	1810	1516	1738	1881	1599	1792	1787	0	1810	1805	0
Q Serve(g_s), s	1.9	3.7	0.0	5.6	6.6	15.7	0.0	7.4	0.0	4.3	19.7	0.0
Cycle Q Clear(g_c), s	1.9	3.7	0.0	5.6	6.6	15.7	0.0	7.4	0.0	4.3	19.7	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	158	332	214	1004	544	592	201	1047	0	325	1176	0
V/C Ratio(X)	0.30	0.57	0.38	0.34	0.39	0.69	0.30	0.42	0.00	0.43	0.87	0.00
Avail Cap(c_a), veh/h	364	764	394	1471	796	807	239	1153	0	343	1243	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	31.2	32.0	28.7	20.6	20.9	19.5	33.0	21.0	0.0	20.7	23.4	0.0
Incr Delay (d2), s/veh	1.1	1.5	1.1	0.2	0.5	1.5	0.8	0.3	0.0	0.9	6.9	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.0	1.9	1.5	2.7	3.5	7.1	1.2	3.7	0.0	2.2	10.8	0.0
LnGrp Delay(d),s/veh	32.2	33.5	29.8	20.8	21.4	21.0	33.8	21.2	0.0	21.6	30.3	0.0
LnGrp LOS	C	C	C	C	C	C	C	C		C	C	
Approach Vol, veh/h		318			956			505			1167	
Approach Delay, s/veh		32.3			21.0			22.8			29.2	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	26.0		11.2	8.1	28.4		25.7
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	6.7	23.7		15.5	5.1	25.3		31.1
Max Q Clear Time (g_c+I1), s	6.3	9.4		5.7	2.0	21.7		17.7
Green Ext Time (p_c), s	0.0	2.7		1.1	0.9	2.2		3.5

Intersection Summary	
HCM 2010 Ctrl Delay	25.8
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	771	130	265	706	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3438	1538	1736	3471	3502	1594
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3438	1538	1736	3471	3502	1594
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	297	803	135	276	735	151
RTOR Reduction (vph)	0	507	0	0	0	111
Lane Group Flow (vph)	297	296	135	276	735	40
Confl. Peds. (#/hr)		1	1			1
Heavy Vehicles (%)	5%	5%	4%	4%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.7	22.7	8.4	37.1	16.5	16.5
Effective Green, g (s)	22.7	22.7	8.4	37.1	16.5	16.5
Actuated g/C Ratio	0.37	0.37	0.14	0.60	0.27	0.27
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1266	566	236	2090	938	426
v/s Ratio Prot	0.09	c0.19	c0.08	0.08	c0.21	
v/s Ratio Perm						0.03
v/c Ratio	0.23	0.52	0.57	0.13	0.78	0.09
Uniform Delay, d1	13.4	15.2	24.9	5.3	20.9	16.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.4	3.3	0.0	4.3	0.1
Delay (s)	13.9	18.6	28.2	5.3	25.2	17.0
Level of Service	B	B	C	A	C	B
Approach Delay (s)	17.4			12.9	23.8	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	61.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	35	20	168	35	145	25	666	153	115	666	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1827	1827	1900	1792	1792	1900	1827	1827	1900
Adj Flow Rate, veh/h	32	37	21	177	37	153	26	701	161	121	701	26
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	4	4	4	6	6	6	4	4	4
Cap, veh/h	291	250	142	413	73	300	425	1148	263	421	1598	59
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.42	0.42	0.08	0.47	0.47
Sat Flow, veh/h	1144	1075	610	1314	312	1288	1707	2751	631	1740	3413	127
Grp Volume(v), veh/h	32	0	58	177	0	190	26	434	428	121	356	371
Grp Sat Flow(s),veh/h/ln	1144	0	1685	1314	0	1600	1707	1703	1679	1740	1736	1804
Q Serve(g_s), s	1.3	0.0	1.4	6.2	0.0	5.2	0.4	10.0	10.0	1.9	6.9	6.9
Cycle Q Clear(g_c), s	6.5	0.0	1.4	7.6	0.0	5.2	0.4	10.0	10.0	1.9	6.9	6.9
Prop In Lane	1.00		0.36	1.00		0.81	1.00		0.38	1.00		0.07
Lane Grp Cap(c), veh/h	291	0	392	413	0	373	425	711	701	421	812	845
V/C Ratio(X)	0.11	0.00	0.15	0.43	0.00	0.51	0.06	0.61	0.61	0.29	0.44	0.44
Avail Cap(c_a), veh/h	685	0	972	866	0	923	544	915	902	470	950	987
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.6	0.0	15.3	18.3	0.0	16.8	8.0	11.4	11.4	8.0	8.9	8.9
Incr Delay (d2), s/veh	0.2	0.0	0.2	0.7	0.0	1.1	0.1	0.9	0.9	0.4	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.6	2.3	0.0	2.4	0.2	4.7	4.7	0.9	3.4	3.5
LnGrp Delay(d),s/veh	19.8	0.0	15.5	19.0	0.0	17.9	8.0	12.3	12.3	8.4	9.3	9.3
LnGrp LOS	B		B	B		B	A	B	B	A	A	A
Approach Vol, veh/h		90			367			888			848	
Approach Delay, s/veh		17.0			18.4			12.2			9.2	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	25.5		16.2	6.0	28.0		16.2
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.5	27.0		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.9	12.0		8.5	2.4	8.9		9.6
Green Ext Time (p_c), s	0.0	8.8		2.2	0.0	10.1		2.1

Intersection Summary	
HCM 2010 Ctrl Delay	12.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	10	85	100	5	100	120	785	115	85	785	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1900	1667	1900	1827	1827	1900	1845	1845	1900
Adj Flow Rate, veh/h	10	10	0	104	5	0	125	818	120	89	818	31
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	14	14	14	4	4	4	3	3	3
Cap, veh/h	423	250	0	360	10	0	510	1839	270	475	2086	79
Arrive On Green	0.14	0.14	0.00	0.14	0.14	0.00	0.61	0.61	0.61	0.61	0.61	0.61
Sat Flow, veh/h	1357	1810	0	1157	70	0	633	3035	445	588	3442	130
Grp Volume(v), veh/h	10	10	0	109	0	0	125	468	470	89	416	433
Grp Sat Flow(s),veh/h/ln	1357	1810	0	1227	0	0	633	1736	1744	588	1752	1820
Q Serve(g_s), s	0.0	0.2	0.0	2.8	0.0	0.0	4.5	5.1	5.1	3.4	4.3	4.3
Cycle Q Clear(g_c), s	0.2	0.2	0.0	3.0	0.0	0.0	8.8	5.1	5.1	8.5	4.3	4.3
Prop In Lane	1.00		0.00	0.95		0.00	1.00		0.26	1.00		0.07
Lane Grp Cap(c), veh/h	423	250	0	370	0	0	510	1051	1057	475	1062	1103
V/C Ratio(X)	0.02	0.04	0.00	0.29	0.00	0.00	0.24	0.44	0.44	0.19	0.39	0.39
Avail Cap(c_a), veh/h	1238	1337	0	1124	0	0	576	1233	1239	537	1245	1293
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	13.1	0.0	14.4	0.0	0.0	5.9	3.7	3.7	6.0	3.6	3.6
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.4	0.0	0.0	0.2	0.3	0.3	0.2	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.1	0.1	0.0	1.0	0.0	0.0	0.8	2.4	2.4	0.6	2.0	2.1
LnGrp Delay(d),s/veh	13.2	13.2	0.0	14.8	0.0	0.0	6.1	4.0	4.0	6.2	3.8	3.8
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		20			109			1063			938	
Approach Delay, s/veh		13.2			14.8			4.3			4.0	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.8		9.4		25.8		9.4
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		10.8		2.2		10.5		5.0
Green Ext Time (p_c), s		10.5		0.6		10.7		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	4.8
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	195	80	144	525	866	300	93	824	73
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1827	1827	1827	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h				142	165	0	541	893	309	96	849	75
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %				4	4	4	3	3	3	3	3	3
Cap, veh/h				244	256	218	704	1956	852	123	1445	352
Arrive On Green				0.14	0.14	0.00	0.40	0.56	0.56	0.07	0.23	0.23
Sat Flow, veh/h				1740	1827	1553	1757	3505	1526	1757	6346	1547
Grp Volume(v), veh/h				142	165	0	541	893	309	96	849	75
Grp Sat Flow(s),veh/h/ln				1740	1827	1553	1757	1752	1526	1757	1586	1547
Q Serve(g_s), s				4.5	5.0	0.0	15.5	8.8	6.5	3.1	7.0	2.3
Cycle Q Clear(g_c), s				4.5	5.0	0.0	15.5	8.8	6.5	3.1	7.0	2.3
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				244	256	218	704	1956	852	123	1445	352
V/C Ratio(X)				0.58	0.64	0.00	0.77	0.46	0.36	0.78	0.59	0.21
Avail Cap(c_a), veh/h				806	846	719	799	2225	969	226	1960	478
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				23.5	23.7	0.0	15.1	7.6	7.1	26.7	20.1	18.3
Incr Delay (d2), s/veh				2.2	2.7	0.0	4.0	0.2	0.3	10.2	0.4	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				2.3	2.7	0.0	8.3	4.3	2.8	1.9	3.0	1.0
LnGrp Delay(d),s/veh				25.7	26.4	0.0	19.2	7.8	7.4	36.9	20.4	18.6
LnGrp LOS				C	C		B	A	A	D	C	B
Approach Vol, veh/h					307			1743			1020	
Approach Delay, s/veh					26.0			11.3			21.9	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	8.6	37.0			27.8	17.8		12.7
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	7.5	37.0			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	5.1	10.8			17.5	9.0		7.0
Green Ext Time (p_c), s	0.0	11.1			5.8	4.0		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	16.3
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	193	160	375	345	0	240	0	1258	430	230	798	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1845	0	1845	0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	199	165	387	356	0	247	0	1297	443	237	823	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	3	0	3	0	2	2	2	2	0
Cap, veh/h	551	579	482	0	0	0	0	2034	629	335	2873	0
Arrive On Green	0.31	0.31	0.31	0.00	0.00	0.00	0.00	0.40	0.40	0.10	0.56	0.00
Sat Flow, veh/h	1774	1863	1553		0		0	5253	1573	1774	5253	0
Grp Volume(v), veh/h	199	165	387		0.0		0	1297	443	237	823	0
Grp Sat Flow(s),veh/h/ln	1774	1863	1553				0	1695	1573	1774	1695	0
Q Serve(g_s), s	6.3	4.8	16.5				0.0	14.9	17.0	5.2	6.1	0.0
Cycle Q Clear(g_c), s	6.3	4.8	16.5				0.0	14.9	17.0	5.2	6.1	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	551	579	482				0	2034	629	335	2873	0
V/C Ratio(X)	0.36	0.29	0.80				0.00	0.64	0.70	0.71	0.29	0.00
Avail Cap(c_a), veh/h	932	979	816				0	2138	661	426	3235	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.4	18.9	22.9				0.0	17.5	18.1	14.2	8.2	0.0
Incr Delay (d2), s/veh	0.4	0.3	3.2				0.0	0.6	3.2	3.8	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.2	2.5	7.5				0.0	7.0	7.9	2.8	2.8	0.0
LnGrp Delay(d),s/veh	19.7	19.1	26.0				0.0	18.1	21.3	18.1	8.2	0.0
LnGrp LOS	B	B	C					B	C	B	A	
Approach Vol, veh/h		751						1740			1060	
Approach Delay, s/veh		22.9						18.9			10.4	
Approach LOS		C						B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	11.9	33.4		27.0		45.3		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	11.1	30.4		38.0		46.0		
Max Q Clear Time (g_c+I1), s	7.2	19.0		18.5		8.1		
Green Ext Time (p_c), s	0.2	9.8		2.9		25.7		

Intersection Summary	
HCM 2010 Ctrl Delay	17.2
HCM 2010 LOS	B

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	393	585	510	325	525	383
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1845	1845
Adj Flow Rate, veh/h	409	609	531	339	547	399
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	4	3	3
Cap, veh/h	844	2076	937	800	837	777
Arrive On Green	0.25	0.60	0.27	0.27	0.25	0.25
Sat Flow, veh/h	3375	3563	3563	1550	3408	1568
Grp Volume(v), veh/h	409	609	531	339	547	399
Grp Sat Flow(s),veh/h/ln	1688	1736	1736	1550	1704	1568
Q Serve(g_s), s	6.0	4.9	7.6	7.8	8.3	0.0
Cycle Q Clear(g_c), s	6.0	4.9	7.6	7.8	8.3	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	844	2076	937	800	837	777
V/C Ratio(X)	0.48	0.29	0.57	0.42	0.65	0.51
Avail Cap(c_a), veh/h	2315	5696	3044	1741	2930	1740
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.4	5.6	18.1	8.7	19.5	9.8
Incr Delay (d2), s/veh	0.4	0.1	0.5	0.4	0.9	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.8	2.3	3.7	5.1	4.0	6.4
LnGrp Delay(d),s/veh	18.9	5.7	18.7	9.0	20.4	10.4
LnGrp LOS	B	A	B	A	C	B
Approach Vol, veh/h		1018	870		946	
Approach Delay, s/veh		11.0	14.9		16.2	
Approach LOS		B	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		38.9		18.6	18.9	20.0		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		94.5		49.5	39.5	50.5		
Max Q Clear Time (g_c+I1), s		6.9		10.3	8.0	9.8		
Green Ext Time (p_c), s		6.9		3.8	6.5	5.5		

Intersection Summary	
HCM 2010 Ctrl Delay	13.9
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	205	130	335	280	455	120	480	405	145	945	135
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.96	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1776	1863	1863	1863	1863	1863	1900	1845	1845	1900
Adj Flow Rate, veh/h	102	290	93	360	301	489	129	516	0	156	1016	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	7	7	7	2	2	2	2	2	2	3	3	3
Cap, veh/h	185	389	230	1070	579	611	196	1108	0	311	1223	0
Arrive On Green	0.11	0.11	0.11	0.31	0.31	0.31	0.05	0.31	0.00	0.09	0.35	0.00
Sat Flow, veh/h	1691	3551	1410	3442	1863	1525	1774	3632	0	1757	3597	0
Grp Volume(v), veh/h	102	290	93	360	301	489	129	516	0	156	1016	0
Grp Sat Flow(s),veh/h/ln	1691	1776	1410	1721	1863	1525	1774	1770	0	1757	1752	0
Q Serve(g_s), s	5.7	7.9	0.5	8.0	13.3	28.4	0.9	11.7	0.0	6.6	26.5	0.0
Cycle Q Clear(g_c), s	5.7	7.9	0.5	8.0	13.3	28.4	0.9	11.7	0.0	6.6	26.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	185	389	230	1070	579	611	196	1108	0	311	1223	0
V/C Ratio(X)	0.55	0.75	0.40	0.34	0.52	0.80	0.66	0.47	0.00	0.50	0.83	0.00
Avail Cap(c_a), veh/h	242	509	278	1086	588	618	287	1421	0	390	1513	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.1	43.1	37.6	26.5	28.3	26.7	44.2	27.6	0.0	26.2	29.8	0.0
Incr Delay (d2), s/veh	2.5	4.3	1.1	0.2	0.8	7.4	3.7	0.3	0.0	1.2	3.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.8	4.1	2.3	3.8	6.9	13.1	3.6	5.8	0.0	3.3	13.4	0.0
LnGrp Delay(d),s/veh	44.7	47.4	38.7	26.7	29.1	34.1	48.0	27.9	0.0	27.4	33.1	0.0
LnGrp LOS	D	D	D	C	C	C	D	C		C	C	
Approach Vol, veh/h		485			1150			645			1172	
Approach Delay, s/veh		45.1			30.4			31.9			32.4	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.1	35.7		15.4	9.5	39.4		35.5
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	13.1	40.1		14.3	10.1	43.1		31.5
Max Q Clear Time (g_c+I1), s	8.6	13.7		9.9	2.9	28.5		30.4
Green Ext Time (p_c), s	0.2	4.1		1.0	2.2	6.3		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	33.4
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	569	125	255	594	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3610	1615	1787	3574	3502	1592
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3610	1615	1787	3574	3502	1592
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	294	587	129	263	612	170
RTOR Reduction (vph)	0	364	0	0	0	127
Lane Group Flow (vph)	294	223	129	263	612	43
Confl. Peds. (#/hr)						2
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.8	22.8	8.0	36.8	15.1	15.1
Effective Green, g (s)	22.8	22.8	8.0	36.8	15.1	15.1
Actuated g/C Ratio	0.38	0.38	0.13	0.61	0.25	0.25
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1374	614	238	2195	882	401
v/s Ratio Prot	0.08	c0.14	c0.07	0.07	c0.17	
v/s Ratio Perm						0.03
v/c Ratio	0.21	0.36	0.54	0.12	0.69	0.11
Uniform Delay, d1	12.5	13.3	24.2	4.8	20.3	17.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	1.7	2.5	0.0	2.4	0.1
Delay (s)	12.9	15.0	26.8	4.8	22.7	17.3
Level of Service	B	B	C	A	C	B
Approach Delay (s)	14.3			12.0	21.5	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	59.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	40	25	171	55	80	25	594	161	80	579	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1827	1827	1900	1863	1863	1900	1881	1881	1900
Adj Flow Rate, veh/h	32	43	27	182	59	85	27	632	171	85	616	37
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	4	4	4	2	2	2	1	1	1
Cap, veh/h	321	248	155	386	157	226	483	1289	348	451	1717	103
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.47	0.47	0.06	0.50	0.50
Sat Flow, veh/h	1226	1060	666	1298	672	968	1774	2753	744	1792	3421	205
Grp Volume(v), veh/h	32	0	70	182	0	144	27	406	397	85	321	332
Grp Sat Flow(s),veh/h/ln	1226	0	1726	1298	0	1640	1774	1770	1728	1792	1787	1839
Q Serve(g_s), s	1.3	0.0	1.9	7.5	0.0	4.3	0.4	9.1	9.2	1.3	6.3	6.3
Cycle Q Clear(g_c), s	5.6	0.0	1.9	9.4	0.0	4.3	0.4	9.1	9.2	1.3	6.3	6.3
Prop In Lane	1.00		0.39	1.00		0.59	1.00		0.43	1.00		0.11
Lane Grp Cap(c), veh/h	321	0	403	386	0	383	483	828	809	451	897	923
V/C Ratio(X)	0.10	0.00	0.17	0.47	0.00	0.38	0.06	0.49	0.49	0.19	0.36	0.36
Avail Cap(c_a), veh/h	651	0	868	735	0	824	583	828	809	506	897	923
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.9	0.0	17.7	21.4	0.0	18.6	7.5	10.6	10.6	7.4	8.7	8.7
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.9	0.0	0.6	0.0	2.1	2.1	0.2	1.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.9	2.8	0.0	2.0	0.2	4.9	4.8	0.7	3.3	3.4
LnGrp Delay(d),s/veh	21.0	0.0	17.9	22.3	0.0	19.2	7.6	12.7	12.7	7.6	9.8	9.8
LnGrp LOS	C		B	C		B	A	B	B	A	A	A
Approach Vol, veh/h		102			326			830			738	
Approach Delay, s/veh		18.9			20.9			12.5			9.6	
Approach LOS		B			C			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	31.5		18.0	6.3	33.5		18.0
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.5	27.0		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.3	11.2		7.6	2.4	8.3		11.4
Green Ext Time (p_c), s	0.0	8.4		1.9	0.0	9.3		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	13.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	100	144	10	104	160	680	134	89	675	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1900	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	5	0	148	10	0	165	701	138	92	696	31
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	458	282	0	399	13	0	557	1736	342	507	2031	90
Arrive On Green	0.15	0.15	0.00	0.15	0.15	0.00	0.59	0.59	0.59	0.59	0.59	0.59
Sat Flow, veh/h	1385	1845	0	1304	88	0	723	2946	580	652	3447	153
Grp Volume(v), veh/h	5	5	0	158	0	0	165	421	418	92	357	370
Grp Sat Flow(s),veh/h/ln	1385	1845	0	1392	0	0	723	1770	1756	652	1770	1831
Q Serve(g_s), s	0.0	0.1	0.0	3.7	0.0	0.0	5.3	4.5	4.5	3.1	3.6	3.6
Cycle Q Clear(g_c), s	0.1	0.1	0.0	3.8	0.0	0.0	8.9	4.5	4.5	7.6	3.6	3.6
Prop In Lane	1.00		0.00	0.94		0.00	1.00		0.33	1.00		0.08
Lane Grp Cap(c), veh/h	458	282	0	412	0	0	557	1043	1035	507	1043	1079
V/C Ratio(X)	0.01	0.02	0.00	0.38	0.00	0.00	0.30	0.40	0.40	0.18	0.34	0.34
Avail Cap(c_a), veh/h	1280	1375	0	1251	0	0	650	1268	1259	590	1268	1312
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.6	12.6	0.0	14.2	0.0	0.0	6.0	3.9	3.9	5.9	3.7	3.7
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.6	0.0	0.0	0.3	0.3	0.3	0.2	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	1.5	0.0	0.0	1.1	2.2	2.2	0.6	1.7	1.8
LnGrp Delay(d),s/veh	12.6	12.6	0.0	14.8	0.0	0.0	6.3	4.1	4.1	6.1	3.9	3.9
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		10			158			1004			819	
Approach Delay, s/veh		12.6			14.8			4.5			4.1	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.1		9.8		25.1		9.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		10.9		2.1		9.6		5.8
Green Ext Time (p_c), s		9.6		0.9		10.3		0.8

Intersection Summary	
HCM 2010 Ctrl Delay	5.2
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	165	55	122	670	857	190	86	723	86
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.96
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1845	1845	1845	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h				116	139	0	705	902	200	91	761	91
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				3	3	3	1	1	1	2	2	2
Cap, veh/h				213	223	190	785	2089	910	117	1358	324
Arrive On Green				0.12	0.12	0.00	0.44	0.58	0.58	0.07	0.21	0.21
Sat Flow, veh/h				1757	1845	1568	1792	3574	1558	1774	6408	1527
Grp Volume(v), veh/h				116	139	0	705	902	200	91	761	91
Grp Sat Flow(s),veh/h/ln				1757	1845	1568	1792	1787	1558	1774	1602	1527
Q Serve(g_s), s				3.7	4.2	0.0	21.5	8.3	3.6	3.0	6.3	2.9
Cycle Q Clear(g_c), s				3.7	4.2	0.0	21.5	8.3	3.6	3.0	6.3	2.9
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				213	223	190	785	2089	910	117	1358	324
V/C Ratio(X)				0.55	0.62	0.00	0.90	0.43	0.22	0.78	0.56	0.28
Avail Cap(c_a), veh/h				804	845	718	805	2333	1017	180	1956	466
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				24.4	24.6	0.0	15.4	6.8	5.8	27.1	20.8	19.5
Incr Delay (d2), s/veh				2.2	2.8	0.0	12.8	0.1	0.1	11.0	0.4	0.5
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				1.9	2.3	0.0	13.4	4.0	1.6	1.8	2.8	1.3
LnGrp Delay(d),s/veh				26.6	27.5	0.0	28.1	7.0	6.0	38.2	21.1	19.9
LnGrp LOS				C	C		C	A	A	D	C	B
Approach Vol, veh/h					255			1807			943	
Approach Delay, s/veh					27.1			15.1			22.7	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	8.4	39.0			30.3	17.0		11.6
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	6.0	38.5			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	5.0	10.3			23.5	8.3		6.2
Green Ext Time (p_c), s	0.0	12.0			2.3	3.9		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	18.5
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	181	95	495	310	0	166	0	1356	395	157	801	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	0	1881	0	1881	1881	1863	1863	0
Adj Flow Rate, veh/h	187	98	510	320	0	171	0	1398	407	162	826	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	0	1	0	1	1	2	2	0
Cap, veh/h	652	685	581	0	0	0	0	2028	628	253	2637	0
Arrive On Green	0.36	0.36	0.36	0.00	0.00	0.00	0.00	0.39	0.39	0.07	0.52	0.00
Sat Flow, veh/h	1792	1881	1595		0		0	5305	1591	1774	5253	0
Grp Volume(v), veh/h	187	98	510		0.0		0	1398	407	162	826	0
Grp Sat Flow(s),veh/h/ln	1792	1881	1595				0	1712	1591	1774	1695	0
Q Serve(g_s), s	5.7	2.7	22.9				0.0	17.4	16.0	4.0	7.2	0.0
Cycle Q Clear(g_c), s	5.7	2.7	22.9				0.0	17.4	16.0	4.0	7.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	652	685	581				0	2028	628	253	2637	0
V/C Ratio(X)	0.29	0.14	0.88				0.00	0.69	0.65	0.64	0.31	0.00
Avail Cap(c_a), veh/h	887	932	790				0	2028	628	253	2637	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.3	16.4	22.8				0.0	19.3	18.9	16.2	10.6	0.0
Incr Delay (d2), s/veh	0.2	0.1	8.6				0.0	1.9	5.1	5.3	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.8	1.4	11.4				0.0	8.5	7.8	2.3	3.4	0.0
LnGrp Delay(d),s/veh	17.6	16.5	31.4				0.0	21.3	24.0	21.5	10.9	0.0
LnGrp LOS	B	B	C					C	C	C	B	
Approach Vol, veh/h		795						1805			988	
Approach Delay, s/veh		26.3						21.9			12.7	
Approach LOS		C						C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	9.5	34.8		32.4		44.3		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	5.0	30.3		38.0		39.8		
Max Q Clear Time (g_c+I1), s	6.0	19.4		24.9		9.2		
Green Ext Time (p_c), s	0.0	9.6		2.7		22.8		

Intersection Summary	
HCM 2010 Ctrl Delay	20.3
HCM 2010 LOS	C

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	501	730	785	441	551	536
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1863	1863
Adj Flow Rate, veh/h	551	802	863	485	605	589
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	1	2	2
Cap, veh/h	417	1932	1246	1049	1085	689
Arrive On Green	0.12	0.54	0.35	0.35	0.32	0.32
Sat Flow, veh/h	3476	3668	3668	1564	3442	1583
Grp Volume(v), veh/h	551	802	863	485	605	589
Grp Sat Flow(s),veh/h/ln	1738	1787	1787	1564	1721	1583
Q Serve(g_s), s	7.5	8.3	13.0	9.4	9.1	13.4
Cycle Q Clear(g_c), s	7.5	8.3	13.0	9.4	9.1	13.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	417	1932	1246	1049	1085	689
V/C Ratio(X)	1.32	0.42	0.69	0.46	0.56	0.85
Avail Cap(c_a), veh/h	417	2346	1659	1230	1653	950
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.5	8.5	17.5	5.1	17.8	15.9
Incr Delay (d2), s/veh	160.3	0.1	0.8	0.3	0.5	5.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	12.8	4.0	6.5	7.9	4.4	14.9
LnGrp Delay(d),s/veh	187.8	8.6	18.3	5.4	18.2	21.6
LnGrp LOS	F	A	B	A	B	C
Approach Vol, veh/h		1353	1348		1194	
Approach Delay, s/veh		81.6	13.7		19.9	
Approach LOS		F	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		38.3		24.2	12.0	26.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		41.0		30.0	7.5	29.0		
Max Q Clear Time (g_c+I1), s		10.3		15.4	9.5	15.0		
Green Ext Time (p_c), s		9.2		4.3	0.0	6.8		

Intersection Summary	
HCM 2010 Ctrl Delay	39.2
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	85	116	305	218	365	61	400	265	125	925	165
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1810	1881	1881	1881	1881	1881	1900	1900	1900	1900
Adj Flow Rate, veh/h	48	192	86	339	242	406	68	444	0	139	1028	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	1	1	1	1	1	1	0	0	0
Cap, veh/h	160	335	219	1008	546	594	203	1049	0	323	1170	0
Arrive On Green	0.09	0.09	0.09	0.29	0.29	0.29	0.05	0.29	0.00	0.08	0.32	0.00
Sat Flow, veh/h	1723	3619	1516	3476	1881	1599	1792	3668	0	1810	3705	0
Grp Volume(v), veh/h	48	192	86	339	242	406	68	444	0	139	1028	0
Grp Sat Flow(s),veh/h/ln	1723	1810	1516	1738	1881	1599	1792	1787	0	1810	1805	0
Q Serve(g_s), s	1.9	3.8	0.0	5.7	7.8	15.9	0.0	7.4	0.0	4.4	20.0	0.0
Cycle Q Clear(g_c), s	1.9	3.8	0.0	5.7	7.8	15.9	0.0	7.4	0.0	4.4	20.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	160	335	219	1008	546	594	203	1049	0	323	1170	0
V/C Ratio(X)	0.30	0.57	0.39	0.34	0.44	0.68	0.33	0.42	0.00	0.43	0.88	0.00
Avail Cap(c_a), veh/h	360	756	395	1457	789	800	236	1142	0	339	1231	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	31.4	32.3	28.8	20.7	21.5	19.7	33.2	21.1	0.0	20.9	23.7	0.0
Incr Delay (d2), s/veh	1.0	1.5	1.2	0.2	0.6	1.5	1.0	0.3	0.0	0.9	7.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.0	2.0	1.6	2.8	4.1	7.2	1.4	3.7	0.0	2.2	11.0	0.0
LnGrp Delay(d),s/veh	32.5	33.8	30.0	20.9	22.0	21.1	34.1	21.4	0.0	21.8	31.0	0.0
LnGrp LOS	C	C	C	C	C	C	C	C		C	C	
Approach Vol, veh/h		326			987			512			1167	
Approach Delay, s/veh		32.6			21.3			23.1			29.9	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	26.3		11.4	8.3	28.5		26.0
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	6.7	23.7		15.5	5.1	25.3		31.1
Max Q Clear Time (g_c+I1), s	6.4	9.4		5.8	2.0	22.0		17.9
Green Ext Time (p_c), s	0.0	2.7		1.1	0.9	2.1		3.6

Intersection Summary	
HCM 2010 Ctrl Delay	26.2
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	775	130	265	710	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3438	1538	1736	3471	3502	1594
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3438	1538	1736	3471	3502	1594
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	297	807	135	276	740	151
RTOR Reduction (vph)	0	510	0	0	0	110
Lane Group Flow (vph)	297	297	135	276	740	41
Confl. Peds. (#/hr)		1	1			1
Heavy Vehicles (%)	5%	5%	4%	4%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.7	22.7	8.4	37.1	16.6	16.6
Effective Green, g (s)	22.7	22.7	8.4	37.1	16.6	16.6
Actuated g/C Ratio	0.37	0.37	0.14	0.60	0.27	0.27
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1264	565	236	2087	942	428
v/s Ratio Prot	0.09	c0.19	c0.08	0.08	c0.21	
v/s Ratio Perm						0.03
v/c Ratio	0.23	0.53	0.57	0.13	0.79	0.09
Uniform Delay, d1	13.5	15.3	25.0	5.3	20.9	16.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.5	3.3	0.0	4.4	0.1
Delay (s)	13.9	18.8	28.3	5.4	25.3	17.0
Level of Service	B	B	C	A	C	B
Approach Delay (s)	17.5			12.9	23.9	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	19.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	61.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	35	20	170	35	145	25	670	155	115	670	25
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1792	1792	1900	1827	1827	1900	1792	1792	1900	1827	1827	1900
Adj Flow Rate, veh/h	32	37	21	179	37	153	26	705	163	121	705	26
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	6	6	6	4	4	4	6	6	6	4	4	4
Cap, veh/h	292	251	143	414	73	301	423	1148	265	418	1599	59
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.42	0.42	0.08	0.47	0.47
Sat Flow, veh/h	1144	1075	610	1314	312	1288	1707	2747	635	1740	3414	126
Grp Volume(v), veh/h	32	0	58	179	0	190	26	437	431	121	358	373
Grp Sat Flow(s),veh/h/ln	1144	0	1685	1314	0	1600	1707	1703	1679	1740	1736	1804
Q Serve(g_s), s	1.3	0.0	1.4	6.3	0.0	5.2	0.4	10.1	10.2	1.9	7.0	7.0
Cycle Q Clear(g_c), s	6.5	0.0	1.4	7.7	0.0	5.2	0.4	10.1	10.2	1.9	7.0	7.0
Prop In Lane	1.00		0.36	1.00		0.81	1.00		0.38	1.00		0.07
Lane Grp Cap(c), veh/h	292	0	394	414	0	374	423	711	701	418	813	845
V/C Ratio(X)	0.11	0.00	0.15	0.43	0.00	0.51	0.06	0.61	0.61	0.29	0.44	0.44
Avail Cap(c_a), veh/h	681	0	967	861	0	919	541	910	897	467	945	983
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.6	0.0	15.3	18.4	0.0	16.8	8.0	11.5	11.5	8.1	9.0	9.0
Incr Delay (d2), s/veh	0.2	0.0	0.2	0.7	0.0	1.1	0.1	0.9	0.9	0.4	0.4	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.7	2.4	0.0	2.4	0.2	4.9	4.8	0.9	3.4	3.5
LnGrp Delay(d),s/veh	19.8	0.0	15.5	19.1	0.0	17.9	8.1	12.4	12.4	8.4	9.4	9.4
LnGrp LOS	B		B	B		B	A	B	B	A	A	A
Approach Vol, veh/h		90			369			894			852	
Approach Delay, s/veh		17.0			18.5			12.3			9.2	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.6	25.6		16.3	6.0	28.2		16.3
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.5	27.0		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.9	12.2		8.5	2.4	9.0		9.7
Green Ext Time (p_c), s	0.0	8.8		2.2	0.0	10.1		2.1

Intersection Summary	
HCM 2010 Ctrl Delay	12.3
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	10	85	110	5	104	120	785	125	89	785	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	0.99		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1900	1900	1667	1900	1827	1827	1900	1845	1845	1900
Adj Flow Rate, veh/h	10	10	0	115	5	0	125	818	130	93	818	31
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	5	5	5	14	14	14	4	4	4	3	3	3
Cap, veh/h	435	269	0	369	12	0	502	1801	286	463	2068	78
Arrive On Green	0.15	0.15	0.00	0.15	0.15	0.00	0.60	0.60	0.60	0.60	0.60	0.60
Sat Flow, veh/h	1358	1810	0	1165	78	0	633	2998	476	583	3442	130
Grp Volume(v), veh/h	10	10	0	120	0	0	125	474	474	93	416	433
Grp Sat Flow(s),veh/h/ln	1358	1810	0	1243	0	0	633	1736	1739	583	1752	1820
Q Serve(g_s), s	0.0	0.2	0.0	3.1	0.0	0.0	4.6	5.4	5.4	3.7	4.5	4.5
Cycle Q Clear(g_c), s	0.2	0.2	0.0	3.3	0.0	0.0	9.1	5.4	5.4	9.1	4.5	4.5
Prop In Lane	1.00		0.00	0.96		0.00	1.00		0.27	1.00		0.07
Lane Grp Cap(c), veh/h	435	269	0	381	0	0	502	1043	1044	463	1053	1094
V/C Ratio(X)	0.02	0.04	0.00	0.31	0.00	0.00	0.25	0.45	0.45	0.20	0.40	0.40
Avail Cap(c_a), veh/h	1217	1311	0	1104	0	0	563	1209	1211	519	1221	1268
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	13.1	13.1	0.0	14.4	0.0	0.0	6.1	3.9	3.9	6.4	3.8	3.8
Incr Delay (d2), s/veh	0.0	0.1	0.0	0.5	0.0	0.0	0.3	0.3	0.3	0.2	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.1	0.1	0.0	1.1	0.0	0.0	0.8	2.6	2.6	0.6	2.2	2.2
LnGrp Delay(d),s/veh	13.1	13.1	0.0	14.9	0.0	0.0	6.4	4.2	4.2	6.7	4.0	4.0
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		20			120			1073			942	
Approach Delay, s/veh		13.1			14.9			4.5			4.3	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		26.1		9.8		26.1		9.8
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		11.1		2.2		11.1		5.3
Green Ext Time (p_c), s		10.4		0.7		10.4		0.7

Intersection Summary	
HCM 2010 Ctrl Delay	5.0
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	195	80	148	525	873	300	95	836	70
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.99
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1827	1827	1827	1845	1845	1845	1845	1845	1845
Adj Flow Rate, veh/h				142	165	0	541	900	309	98	862	72
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %				4	4	4	3	3	3	3	3	3
Cap, veh/h				244	256	217	703	1954	851	126	1454	355
Arrive On Green				0.14	0.14	0.00	0.40	0.56	0.56	0.07	0.23	0.23
Sat Flow, veh/h				1740	1827	1553	1757	3505	1526	1757	6346	1547
Grp Volume(v), veh/h				142	165	0	541	900	309	98	862	72
Grp Sat Flow(s),veh/h/ln				1740	1827	1553	1757	1752	1526	1757	1586	1547
Q Serve(g_s), s				4.5	5.0	0.0	15.6	8.9	6.6	3.2	7.1	2.2
Cycle Q Clear(g_c), s				4.5	5.0	0.0	15.6	8.9	6.6	3.2	7.1	2.2
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				244	256	217	703	1954	851	126	1454	355
V/C Ratio(X)				0.58	0.64	0.00	0.77	0.46	0.36	0.78	0.59	0.20
Avail Cap(c_a), veh/h				803	843	717	796	2217	966	225	1953	476
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				23.5	23.8	0.0	15.2	7.7	7.2	26.7	20.1	18.2
Incr Delay (d2), s/veh				2.2	2.7	0.0	4.1	0.2	0.3	10.0	0.4	0.3
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				2.3	2.7	0.0	8.3	4.3	2.8	1.9	3.2	1.0
LnGrp Delay(d),s/veh				25.8	26.5	0.0	19.3	7.9	7.4	36.7	20.5	18.5
LnGrp LOS				C	C		B	A	A	D	C	B
Approach Vol, veh/h					307			1750			1032	
Approach Delay, s/veh					26.1			11.3			21.9	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	8.7	37.1			27.9	17.9		12.7
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	7.5	37.0			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	5.2	10.9			17.6	9.1		7.0
Green Ext Time (p_c), s	0.0	11.2			5.8	4.0		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	16.3
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	190	160	375	345	0	240	0	1269	430	233	809	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1845	0	1845	0	1863	1863	1863	1863	0
Adj Flow Rate, veh/h	196	165	387	356	0	247	0	1308	443	240	834	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	3	0	3	0	2	2	2	2	0
Cap, veh/h	550	578	482	0	0	0	0	2040	631	335	2879	0
Arrive On Green	0.31	0.31	0.31	0.00	0.00	0.00	0.00	0.40	0.40	0.10	0.57	0.00
Sat Flow, veh/h	1774	1863	1553		0		0	5253	1573	1774	5253	0
Grp Volume(v), veh/h	196	165	387		0.0		0	1308	443	240	834	0
Grp Sat Flow(s),veh/h/ln	1774	1863	1553				0	1695	1573	1774	1695	0
Q Serve(g_s), s	6.2	4.9	16.7				0.0	15.1	17.1	5.3	6.2	0.0
Cycle Q Clear(g_c), s	6.2	4.9	16.7				0.0	15.1	17.1	5.3	6.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	550	578	482				0	2040	631	335	2879	0
V/C Ratio(X)	0.36	0.29	0.80				0.00	0.64	0.70	0.72	0.29	0.00
Avail Cap(c_a), veh/h	926	973	811				0	2145	664	422	3235	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	19.5	19.0	23.1				0.0	17.6	18.2	14.4	8.2	0.0
Incr Delay (d2), s/veh	0.4	0.3	3.2				0.0	0.6	3.1	4.2	0.1	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.1	2.6	7.5				0.0	7.1	7.9	2.9	2.9	0.0
LnGrp Delay(d),s/veh	19.9	19.3	26.3				0.0	18.2	21.3	18.6	8.2	0.0
LnGrp LOS	B	B	C					B	C	B	A	
Approach Vol, veh/h		748						1751			1074	
Approach Delay, s/veh		23.0						19.0			10.6	
Approach LOS		C						B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	12.0	33.7		27.1		45.7		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	11.1	30.7		38.0		46.3		
Max Q Clear Time (g_c+I1), s	7.3	19.1		18.7		8.2		
Green Ext Time (p_c), s	0.2	10.0		2.9		26.1		

Intersection Summary	
HCM 2010 Ctrl Delay	17.3
HCM 2010 LOS	B

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	399	585	510	330	530	389
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1827	1845	1845
Adj Flow Rate, veh/h	416	609	531	344	552	405
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	4	4	4	4	3	3
Cap, veh/h	847	2079	940	803	841	780
Arrive On Green	0.25	0.60	0.27	0.27	0.25	0.25
Sat Flow, veh/h	3375	3563	3563	1550	3408	1568
Grp Volume(v), veh/h	416	609	531	344	552	405
Grp Sat Flow(s),veh/h/ln	1688	1736	1736	1550	1704	1568
Q Serve(g_s), s	6.1	5.0	7.7	8.0	8.5	0.0
Cycle Q Clear(g_c), s	6.1	5.0	7.7	8.0	8.5	0.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	847	2079	940	803	841	780
V/C Ratio(X)	0.49	0.29	0.56	0.43	0.66	0.52
Avail Cap(c_a), veh/h	2288	5630	3009	1727	2896	1725
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.6	5.7	18.3	8.7	19.7	9.9
Incr Delay (d2), s/veh	0.4	0.1	0.5	0.4	0.9	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.9	2.4	3.7	5.2	4.1	6.6
LnGrp Delay(d),s/veh	19.1	5.8	18.8	9.1	20.6	10.5
LnGrp LOS	B	A	B	A	C	B
Approach Vol, veh/h		1025	875		957	
Approach Delay, s/veh		11.2	15.0		16.3	
Approach LOS		B	B		B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		39.4		18.9	19.1	20.3		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		94.5		49.5	39.5	50.5		
Max Q Clear Time (g_c+I1), s		7.0		10.5	8.1	10.0		
Green Ext Time (p_c), s		6.9		3.9	6.5	5.5		

Intersection Summary	
HCM 2010 Ctrl Delay	14.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	205	130	335	283	455	120	480	405	145	945	135
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.93	1.00		0.96	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1776	1776	1776	1863	1863	1863	1863	1863	1900	1845	1845	1900
Adj Flow Rate, veh/h	102	290	93	360	304	489	129	516	0	156	1016	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	7	7	7	2	2	2	2	2	2	3	3	3
Cap, veh/h	185	389	230	1070	579	611	196	1108	0	311	1223	0
Arrive On Green	0.11	0.11	0.11	0.31	0.31	0.31	0.05	0.31	0.00	0.09	0.35	0.00
Sat Flow, veh/h	1691	3551	1410	3442	1863	1525	1774	3632	0	1757	3597	0
Grp Volume(v), veh/h	102	290	93	360	304	489	129	516	0	156	1016	0
Grp Sat Flow(s),veh/h/ln	1691	1776	1410	1721	1863	1525	1774	1770	0	1757	1752	0
Q Serve(g_s), s	5.7	7.9	0.5	8.0	13.4	28.4	0.9	11.7	0.0	6.6	26.5	0.0
Cycle Q Clear(g_c), s	5.7	7.9	0.5	8.0	13.4	28.4	0.9	11.7	0.0	6.6	26.5	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	185	389	230	1070	579	611	196	1108	0	311	1223	0
V/C Ratio(X)	0.55	0.75	0.40	0.34	0.52	0.80	0.66	0.47	0.00	0.50	0.83	0.00
Avail Cap(c_a), veh/h	242	509	278	1086	588	618	287	1421	0	390	1513	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	42.1	43.1	37.6	26.5	28.3	26.7	44.2	27.6	0.0	26.2	29.8	0.0
Incr Delay (d2), s/veh	2.5	4.3	1.1	0.2	0.8	7.4	3.7	0.3	0.0	1.2	3.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.8	4.1	2.3	3.8	7.1	13.1	3.6	5.8	0.0	3.3	13.4	0.0
LnGrp Delay(d),s/veh	44.7	47.4	38.7	26.7	29.2	34.1	48.0	27.9	0.0	27.4	33.1	0.0
LnGrp LOS	D	D	D	C	C	C	D	C		C	C	
Approach Vol, veh/h		485			1153			645			1172	
Approach Delay, s/veh		45.1			30.5			31.9			32.4	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	13.1	35.8		15.4	9.5	39.4		35.5
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	13.1	40.1		14.3	10.1	43.1		31.5
Max Q Clear Time (g_c+I1), s	8.6	13.7		9.9	2.9	28.5		30.4
Green Ext Time (p_c), s	0.2	4.1		1.0	2.2	6.3		0.6

Intersection Summary	
HCM 2010 Ctrl Delay	33.4
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	285	570	125	255	595	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Lane Util. Factor	0.95	1.00	1.00	0.95	0.97	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3610	1615	1787	3574	3502	1592
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3610	1615	1787	3574	3502	1592
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	294	588	129	263	613	170
RTOR Reduction (vph)	0	364	0	0	0	127
Lane Group Flow (vph)	294	224	129	263	613	43
Confl. Peds. (#/hr)						2
Heavy Vehicles (%)	0%	0%	1%	1%	0%	0%
Turn Type	NA	Prot	Prot	NA	Prot	Perm
Protected Phases	2	2	1	6	8	
Permitted Phases						8
Actuated Green, G (s)	22.8	22.8	8.0	36.8	15.1	15.1
Effective Green, g (s)	22.8	22.8	8.0	36.8	15.1	15.1
Actuated g/C Ratio	0.38	0.38	0.13	0.61	0.25	0.25
Clearance Time (s)	5.0	5.0	5.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1374	614	238	2195	882	401
v/s Ratio Prot	0.08	c0.14	c0.07	0.07	c0.18	
v/s Ratio Perm						0.03
v/c Ratio	0.21	0.36	0.54	0.12	0.70	0.11
Uniform Delay, d1	12.5	13.3	24.2	4.8	20.3	17.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	1.7	2.5	0.0	2.4	0.1
Delay (s)	12.9	15.0	26.8	4.8	22.7	17.3
Level of Service	B	B	C	A	C	B
Approach Delay (s)	14.3			12.0	21.5	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	59.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	40	25	172	55	80	25	595	162	80	580	35
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		0.99	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1827	1827	1900	1863	1863	1900	1881	1881	1900
Adj Flow Rate, veh/h	32	43	27	183	59	85	27	633	172	85	617	37
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	0
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	3	3	3	4	4	4	2	2	2	1	1	1
Cap, veh/h	321	248	156	387	157	227	482	1286	349	450	1716	103
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.03	0.47	0.47	0.06	0.50	0.50
Sat Flow, veh/h	1226	1060	666	1298	672	968	1774	2751	746	1792	3421	205
Grp Volume(v), veh/h	32	0	70	183	0	144	27	407	398	85	322	332
Grp Sat Flow(s),veh/h/ln	1226	0	1726	1298	0	1640	1774	1770	1727	1792	1787	1839
Q Serve(g_s), s	1.3	0.0	1.9	7.6	0.0	4.3	0.4	9.2	9.2	1.3	6.3	6.3
Cycle Q Clear(g_c), s	5.6	0.0	1.9	9.4	0.0	4.3	0.4	9.2	9.2	1.3	6.3	6.3
Prop In Lane	1.00		0.39	1.00		0.59	1.00		0.43	1.00		0.11
Lane Grp Cap(c), veh/h	321	0	404	387	0	384	482	828	808	450	896	922
V/C Ratio(X)	0.10	0.00	0.17	0.47	0.00	0.38	0.06	0.49	0.49	0.19	0.36	0.36
Avail Cap(c_a), veh/h	650	0	867	735	0	824	582	828	808	505	896	922
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.9	0.0	17.6	21.4	0.0	18.6	7.6	10.6	10.6	7.5	8.7	8.8
Incr Delay (d2), s/veh	0.1	0.0	0.2	0.9	0.0	0.6	0.0	2.1	2.1	0.2	1.1	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.4	0.0	0.9	2.8	0.0	2.0	0.2	4.9	4.8	0.7	3.3	3.4
LnGrp Delay(d),s/veh	21.0	0.0	17.9	22.3	0.0	19.2	7.6	12.7	12.8	7.7	9.9	9.8
LnGrp LOS	C		B	C		B	A	B	B	A	A	A
Approach Vol, veh/h		102			327			832			739	
Approach Delay, s/veh		18.8			20.9			12.6			9.6	
Approach LOS		B			C			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	8.2	31.5		18.0	6.3	33.5		18.0
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	5.5	27.0		29.0	5.0	27.5		29.0
Max Q Clear Time (g_c+I1), s	3.3	11.2		7.6	2.4	8.3		11.4
Green Ext Time (p_c), s	0.0	8.4		2.0	0.0	9.4		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	13.2
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	100	159	10	106	160	680	149	91	675	30
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1845	1845	1900	1900	1845	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	5	5	0	164	10	0	165	701	154	94	696	31
Adj No. of Lanes	1	1	0	0	1	0	1	2	0	1	2	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	3	3	3	3	3	3	2	2	2	2	2	2
Cap, veh/h	478	311	0	416	13	0	544	1675	368	487	2002	89
Arrive On Green	0.17	0.17	0.00	0.17	0.17	0.00	0.58	0.58	0.58	0.58	0.58	0.58
Sat Flow, veh/h	1385	1845	0	1313	80	0	723	2883	633	642	3447	153
Grp Volume(v), veh/h	5	5	0	174	0	0	165	430	425	94	357	370
Grp Sat Flow(s),veh/h/ln	1385	1845	0	1393	0	0	723	1770	1746	642	1770	1831
Q Serve(g_s), s	0.0	0.1	0.0	4.2	0.0	0.0	5.6	4.8	4.8	3.4	3.8	3.8
Cycle Q Clear(g_c), s	0.1	0.1	0.0	4.3	0.0	0.0	9.4	4.8	4.8	8.3	3.8	3.8
Prop In Lane	1.00		0.00	0.94		0.00	1.00		0.36	1.00		0.08
Lane Grp Cap(c), veh/h	478	311	0	429	0	0	544	1028	1014	487	1028	1063
V/C Ratio(X)	0.01	0.02	0.00	0.41	0.00	0.00	0.30	0.42	0.42	0.19	0.35	0.35
Avail Cap(c_a), veh/h	1248	1336	0	1214	0	0	627	1232	1216	561	1232	1275
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	12.5	12.4	0.0	14.2	0.0	0.0	6.4	4.2	4.2	6.5	4.0	4.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.6	0.0	0.0	0.3	0.3	0.3	0.2	0.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	0.0	1.7	0.0	0.0	1.1	2.3	2.3	0.6	1.8	1.9
LnGrp Delay(d),s/veh	12.5	12.5	0.0	14.9	0.0	0.0	6.7	4.4	4.4	6.6	4.2	4.1
LnGrp LOS	B	B		B			A	A	A	A	A	A
Approach Vol, veh/h		10			174			1020			821	
Approach Delay, s/veh		12.5			14.9			4.8			4.4	
Approach LOS		B			B			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		25.4		10.5		25.4		10.5
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5
Max Green Setting (Gmax), s		25.0		26.0		25.0		26.0
Max Q Clear Time (g_c+I1), s		11.4		2.1		10.3		6.3
Green Ext Time (p_c), s		9.5		1.0		10.1		0.9

Intersection Summary	
HCM 2010 Ctrl Delay	5.6
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	165	55	127	670	867	190	87	736	87
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)				1.00		1.00	1.00		0.97	1.00		0.96
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1845	1845	1845	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h				116	139	0	705	913	200	92	775	92
Adj No. of Lanes				1	1	1	1	2	1	1	4	1
Peak Hour Factor				0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %				3	3	3	1	1	1	2	2	2
Cap, veh/h				212	223	190	783	2090	911	118	1370	327
Arrive On Green				0.12	0.12	0.00	0.44	0.58	0.58	0.07	0.21	0.21
Sat Flow, veh/h				1757	1845	1568	1792	3574	1558	1774	6408	1527
Grp Volume(v), veh/h				116	139	0	705	913	200	92	775	92
Grp Sat Flow(s),veh/h/ln				1757	1845	1568	1792	1787	1558	1774	1602	1527
Q Serve(g_s), s				3.7	4.2	0.0	21.6	8.4	3.6	3.0	6.4	3.0
Cycle Q Clear(g_c), s				3.7	4.2	0.0	21.6	8.4	3.6	3.0	6.4	3.0
Prop In Lane				1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h				212	223	190	783	2090	911	118	1370	327
V/C Ratio(X)				0.55	0.62	0.00	0.90	0.44	0.22	0.78	0.57	0.28
Avail Cap(c_a), veh/h				801	841	715	802	2325	1013	180	1949	464
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)				1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh				24.5	24.7	0.0	15.5	6.9	5.9	27.2	20.8	19.5
Incr Delay (d2), s/veh				2.2	2.8	0.0	13.0	0.1	0.1	11.5	0.4	0.5
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				1.9	2.3	0.0	13.4	4.1	1.6	1.9	2.8	1.3
LnGrp Delay(d),s/veh				26.7	27.6	0.0	28.5	7.0	6.0	38.7	21.2	19.9
LnGrp LOS				C	C		C	A	A	D	C	B
Approach Vol, veh/h					255			1818			959	
Approach Delay, s/veh					27.2			15.2			22.7	
Approach LOS					C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2			5	6		8
Phs Duration (G+Y+Rc), s	8.4	39.1			30.4	17.2		11.7
Change Period (Y+Rc), s	4.5	4.5			4.5	4.5		4.5
Max Green Setting (Gmax), s	6.0	38.5			26.5	18.0		27.0
Max Q Clear Time (g_c+I1), s	5.0	10.4			23.6	8.4		6.2
Green Ext Time (p_c), s	0.0	12.1			2.3	3.9		1.0

Intersection Summary	
HCM 2010 Ctrl Delay	18.6
HCM 2010 LOS	B

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	182	95	495	310	0	167	0	1364	395	162	809	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	0	1881	0	1881	1881	1863	1863	0
Adj Flow Rate, veh/h	188	98	510	320	0	172	0	1406	407	167	834	0
Adj No. of Lanes	1	1	1	2	0	1	0	3	1	1	3	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	0	1	0	1	1	2	2	0
Cap, veh/h	652	685	581	0	0	0	0	2028	628	252	2637	0
Arrive On Green	0.36	0.36	0.36	0.00	0.00	0.00	0.00	0.39	0.39	0.07	0.52	0.00
Sat Flow, veh/h	1792	1881	1595		0		0	5305	1591	1774	5253	0
Grp Volume(v), veh/h	188	98	510		0.0		0	1406	407	167	834	0
Grp Sat Flow(s),veh/h/ln	1792	1881	1595				0	1712	1591	1774	1695	0
Q Serve(g_s), s	5.7	2.7	22.9				0.0	17.5	16.0	4.1	7.2	0.0
Cycle Q Clear(g_c), s	5.7	2.7	22.9				0.0	17.5	16.0	4.1	7.2	0.0
Prop In Lane	1.00		1.00				0.00		1.00	1.00		0.00
Lane Grp Cap(c), veh/h	652	685	581				0	2028	628	252	2637	0
V/C Ratio(X)	0.29	0.14	0.88				0.00	0.69	0.65	0.66	0.32	0.00
Avail Cap(c_a), veh/h	887	931	790				0	2028	628	252	2637	0
HCM Platoon Ratio	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	17.3	16.4	22.8				0.0	19.4	18.9	16.3	10.6	0.0
Incr Delay (d2), s/veh	0.2	0.1	8.6				0.0	2.0	5.1	6.3	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	2.9	1.4	11.4				0.0	8.6	7.8	2.4	3.5	0.0
LnGrp Delay(d),s/veh	17.6	16.5	31.4				0.0	21.3	24.0	22.6	11.0	0.0
LnGrp LOS	B	B	C					C	C	C	B	
Approach Vol, veh/h		796						1813			1001	
Approach Delay, s/veh		26.3						21.9			12.9	
Approach LOS		C						C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		
Phs Duration (G+Y+Rc), s	9.5	34.8		32.4		44.3		
Change Period (Y+Rc), s	4.5	4.5		4.5		4.5		
Max Green Setting (Gmax), s	5.0	30.3		38.0		39.8		
Max Q Clear Time (g_c+I1), s	6.1	19.5		24.9		9.2		
Green Ext Time (p_c), s	0.0	9.5		2.7		22.9		

Intersection Summary	
HCM 2010 Ctrl Delay	20.4
HCM 2010 LOS	C

Notes

User approved changes to right turn type.

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	507	730	785	442	552	542
Number	5	2	6	16	7	14
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			0.98	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1881	1863	1863
Adj Flow Rate, veh/h	557	802	863	486	607	596
Adj No. of Lanes	2	2	2	1	2	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	1	1	1	1	2	2
Cap, veh/h	414	1921	1241	1054	1100	694
Arrive On Green	0.12	0.54	0.35	0.35	0.32	0.32
Sat Flow, veh/h	3476	3668	3668	1564	3442	1583
Grp Volume(v), veh/h	557	802	863	486	607	596
Grp Sat Flow(s),veh/h/ln	1738	1787	1787	1564	1721	1583
Q Serve(g_s), s	7.5	8.4	13.1	9.5	9.2	13.9
Cycle Q Clear(g_c), s	7.5	8.4	13.1	9.5	9.2	13.9
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	414	1921	1241	1054	1100	694
V/C Ratio(X)	1.35	0.42	0.70	0.46	0.55	0.86
Avail Cap(c_a), veh/h	414	2325	1645	1231	1638	942
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.8	8.7	17.7	5.1	17.7	15.9
Incr Delay (d2), s/veh	171.4	0.1	0.8	0.3	0.4	6.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	13.4	4.2	6.5	8.1	4.4	1.2
LnGrp Delay(d),s/veh	199.2	8.8	18.5	5.4	18.1	22.0
LnGrp LOS	F	A	B	A	B	C
Approach Vol, veh/h		1359	1349		1203	
Approach Delay, s/veh		86.9	13.8		20.1	
Approach LOS		F	B		C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		
Phs Duration (G+Y+Rc), s		38.4		24.6	12.0	26.4		
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5		
Max Green Setting (Gmax), s		41.0		30.0	7.5	29.0		
Max Q Clear Time (g_c+I1), s		10.4		15.9	9.5	15.1		
Green Ext Time (p_c), s		9.3		4.3	0.0	6.8		

Intersection Summary	
HCM 2010 Ctrl Delay	41.1
HCM 2010 LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	85	117	305	222	365	62	400	265	125	925	165
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1810	1810	1810	1881	1881	1881	1881	1881	1900	1900	1900	1900
Adj Flow Rate, veh/h	48	192	87	339	247	406	69	444	0	139	1028	0
Adj No. of Lanes	1	2	1	2	1	1	1	2	0	1	2	0
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	5	5	5	1	1	1	1	1	1	0	0	0
Cap, veh/h	160	335	219	1009	546	594	204	1050	0	322	1169	0
Arrive On Green	0.09	0.09	0.09	0.29	0.29	0.29	0.05	0.29	0.00	0.08	0.32	0.00
Sat Flow, veh/h	1723	3619	1516	3476	1881	1599	1792	3668	0	1810	3705	0
Grp Volume(v), veh/h	48	192	87	339	247	406	69	444	0	139	1028	0
Grp Sat Flow(s),veh/h/ln	1723	1810	1516	1738	1881	1599	1792	1787	0	1810	1805	0
Q Serve(g_s), s	1.9	3.8	0.0	5.7	8.0	15.9	0.0	7.4	0.0	4.4	20.0	0.0
Cycle Q Clear(g_c), s	1.9	3.8	0.0	5.7	8.0	15.9	0.0	7.4	0.0	4.4	20.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.00	1.00		0.00
Lane Grp Cap(c), veh/h	160	335	219	1009	546	594	204	1050	0	322	1169	0
V/C Ratio(X)	0.30	0.57	0.40	0.34	0.45	0.68	0.34	0.42	0.00	0.43	0.88	0.00
Avail Cap(c_a), veh/h	360	755	395	1455	788	799	235	1140	0	339	1230	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	31.5	32.3	28.9	20.7	21.5	19.7	33.2	21.2	0.0	21.0	23.7	0.0
Incr Delay (d2), s/veh	1.0	1.5	1.2	0.2	0.6	1.5	1.0	0.3	0.0	0.9	7.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.0	2.0	1.7	2.8	4.2	7.2	1.4	3.7	0.0	2.2	11.0	0.0
LnGrp Delay(d),s/veh	32.5	33.8	30.0	20.9	22.1	21.1	34.2	21.4	0.0	21.9	31.1	0.0
LnGrp LOS	C	C	C	C	C	C	C	C		C	C	
Approach Vol, veh/h		327			992			513			1167	
Approach Delay, s/veh		32.6			21.3			23.1			30.0	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.5	26.3		11.4	8.3	28.5		26.1
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5
Max Green Setting (Gmax), s	6.7	23.7		15.5	5.1	25.3		31.1
Max Q Clear Time (g_c+I1), s	6.4	9.4		5.8	2.0	22.0		17.9
Green Ext Time (p_c), s	0.0	2.7		1.1	0.9	2.1		3.7

Intersection Summary	
HCM 2010 Ctrl Delay	26.2
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	625	35	85	540	160	40	155	100	200	150	35
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1810	1810	1810	1863	1863	1900
Adj Flow Rate, veh/h	32	672	38	91	581	172	43	167	108	138	269	38
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	4	4	4	3	3	3	5	5	5	2	2	2
Cap, veh/h	59	1054	60	116	927	274	249	261	220	267	482	67
Arrive On Green	0.03	0.32	0.32	0.07	0.35	0.35	0.14	0.14	0.14	0.15	0.15	0.15
Sat Flow, veh/h	1740	3339	189	1757	2667	787	1723	1810	1525	1774	3197	446
Grp Volume(v), veh/h	32	349	361	91	381	372	43	167	108	138	155	152
Grp Sat Flow(s),veh/h/ln	1740	1736	1793	1757	1752	1702	1723	1810	1525	1774	1863	1780
Q Serve(g_s), s	1.1	10.7	10.7	3.2	11.2	11.3	1.4	5.4	4.0	4.4	4.8	4.9
Cycle Q Clear(g_c), s	1.1	10.7	10.7	3.2	11.2	11.3	1.4	5.4	4.0	4.4	4.8	4.9
Prop In Lane	1.00		0.11	1.00		0.46	1.00		1.00	1.00		0.25
Lane Grp Cap(c), veh/h	59	548	566	116	609	592	249	261	220	267	281	268
V/C Ratio(X)	0.54	0.64	0.64	0.78	0.63	0.63	0.17	0.64	0.49	0.52	0.55	0.57
Avail Cap(c_a), veh/h	140	673	695	199	736	714	584	614	517	659	692	661
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.4	18.2	18.2	28.5	16.8	16.9	23.2	25.0	24.4	24.2	24.4	24.4
Incr Delay (d2), s/veh	7.4	1.4	1.4	10.8	1.2	1.3	0.3	2.6	1.7	1.5	1.7	1.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.7	5.3	5.4	1.9	5.6	5.5	0.7	2.9	1.8	2.3	2.6	2.5
LnGrp Delay(d),s/veh	36.8	19.6	19.5	39.2	18.0	18.1	23.6	27.6	26.1	25.8	26.1	26.3
LnGrp LOS	D	B	B	D	B	B	C	C	C	C	C	C
Approach Vol, veh/h		742			844			318			445	
Approach Delay, s/veh		20.3			20.4			26.5			26.0	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.1	24.5		14.3	7.1	26.5		13.9
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	7.0	24.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	5.2	12.7		6.9	3.1	13.3		7.4
Green Ext Time (p_c), s	0.0	6.7		2.0	0.0	7.3		1.2

Intersection Summary	
HCM 2010 Ctrl Delay	22.2
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	565	370	135	560	0	0	0	0	115	0	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.98	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3286	1409	1735	3471						1736	1553
Flt Permitted		1.00	1.00	0.27	1.00						0.95	1.00
Satd. Flow (perm)		3286	1409	484	3471						1736	1553
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	595	389	142	589	0	0	0	0	121	0	279
RTOR Reduction (vph)	0	11	181	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	673	119	142	589	0	0	0	0	0	121	279
Confl. Peds. (#/hr)	2		1	1		2						
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	0%	0%	0%	4%	4%	4%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		29.7	29.7	32.7	22.9						20.8	20.8
Effective Green, g (s)		29.7	29.7	32.7	22.9						20.8	20.8
Actuated g/C Ratio		0.40	0.40	0.44	0.31						0.28	0.28
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1302	558	374	1061						482	431
v/s Ratio Prot		c0.20		c0.05	0.17							
v/s Ratio Perm			0.08	0.12							0.07	c0.18
v/c Ratio		0.52	0.21	0.38	0.56						0.25	0.65
Uniform Delay, d1		17.2	14.9	20.3	21.7						21.0	23.8
Progression Factor		1.00	1.00	1.47	0.66						1.00	1.00
Incremental Delay, d2		0.5	0.3	1.1	0.8						0.6	4.5
Delay (s)		17.6	15.2	30.8	15.2						21.6	28.4
Level of Service		B	B	C	B						C	C
Approach Delay (s)		16.9			18.2			0.0			26.3	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	74.9	Sum of lost time (s)	14.6
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	360	345	0	0	315	130	375	5	165	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1735	3471			4694		1649	1655	1533			
Flt Permitted	0.46	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	832	3471			4694		1649	1655	1533			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	391	375	0	0	342	141	408	5	179	0	0	0
RTOR Reduction (vph)	0	0	0	0	86	0	0	0	0	0	0	0
Lane Group Flow (vph)	391	375	0	0	397	0	208	205	179	0	0	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	44.5	29.7			22.9		20.8	20.8	20.8			
Effective Green, g (s)	44.5	29.7			22.9		20.8	20.8	20.8			
Actuated g/C Ratio	0.59	0.40			0.31		0.28	0.28	0.28			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	694	1376			1435		457	459	425			
v/s Ratio Prot	c0.12	0.11			0.08							
v/s Ratio Perm	c0.21						c0.13	0.12	0.12			
v/c Ratio	0.56	0.27			0.28		0.46	0.45	0.42			
Uniform Delay, d1	11.9	15.3			19.7		22.4	22.3	22.1			
Progression Factor	0.64	0.42			1.00		1.00	1.00	1.00			
Incremental Delay, d2	1.1	0.1			0.1		1.5	1.4	1.4			
Delay (s)	8.7	6.5			19.9		23.9	23.8	23.5			
Level of Service	A	A			B		C	C	C			
Approach Delay (s)		7.6			19.9			23.7			0.0	
Approach LOS		A			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	74.9	Sum of lost time (s)	14.6
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	5	30	0	20	5	180	35	15	195	10
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	14	14	14	7	7	7	4	4	4
Mvmt Flow	6	0	6	35	0	23	6	209	41	17	227	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	526	535	239	517	520	235	241	0	0	253	0	0
Stage 1	270	270	-	244	244	-	-	-	-	-	-	-
Stage 2	256	265	-	273	276	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.24	6.64	6.34	4.17	-	-	4.14	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.626	4.126	3.426	2.263	-	-	2.236	-	-
Pot Cap-1 Maneuver	466	454	805	450	444	775	1297	-	-	1301	-	-
Stage 1	740	690	-	734	682	-	-	-	-	-	-	-
Stage 2	753	693	-	707	660	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	443	443	801	438	433	772	1294	-	-	1299	-	-
Mov Cap-2 Maneuver	443	443	-	438	433	-	-	-	-	-	-	-
Stage 1	734	678	-	729	677	-	-	-	-	-	-	-
Stage 2	725	688	-	690	648	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.4	12.6	0.2	0.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1294	-	-	570	530	1299	-	-
HCM Lane V/C Ratio	0.004	-	-	0.02	0.11	0.013	-	-
HCM Control Delay (s)	7.8	0	-	11.4	12.6	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.4	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	755	15	15	700	40	10	65	25	55	70	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1792	1900	1900	1827	1900
Adj Flow Rate, veh/h	20	770	15	15	714	41	10	66	26	56	71	31
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	4	4	4	4	4	4	6	6	6	4	4	4
Cap, veh/h	76	2446	47	66	2368	134	69	249	91	150	163	74
Arrive On Green	0.74	0.74	0.74	0.74	0.74	0.74	0.11	0.11	0.11	0.11	0.11	0.11
Sat Flow, veh/h	40	3310	64	26	3204	182	146	2246	821	681	1468	670
Grp Volume(v), veh/h	416	0	389	402	0	368	55	0	47	87	0	71
Grp Sat Flow(s),veh/h/ln	1762	0	1651	1782	0	1630	1727	0	1486	1275	0	1544
Q Serve(g_s), s	0.0	0.0	6.4	0.0	0.0	6.1	0.0	0.0	2.3	3.3	0.0	3.5
Cycle Q Clear(g_c), s	6.2	0.0	6.4	5.9	0.0	6.1	2.2	0.0	2.3	5.6	0.0	3.5
Prop In Lane	0.05		0.04	0.04		0.11	0.18		0.55	0.65		0.43
Lane Grp Cap(c), veh/h	1349	0	1220	1364	0	1205	245	0	165	215	0	171
V/C Ratio(X)	0.31	0.00	0.32	0.30	0.00	0.31	0.22	0.00	0.29	0.40	0.00	0.42
Avail Cap(c_a), veh/h	1349	0	1220	1364	0	1205	558	0	446	485	0	463
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.95	0.00	0.95	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.5	0.0	3.6	3.5	0.0	3.5	32.6	0.0	32.7	34.2	0.0	33.2
Incr Delay (d2), s/veh	0.6	0.0	0.7	0.5	0.0	0.6	0.5	0.0	0.9	1.2	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.2	0.0	3.2	3.1	0.0	2.9	1.1	0.0	1.0	1.9	0.0	1.5
LnGrp Delay(d),s/veh	4.1	0.0	4.2	4.0	0.0	4.1	33.1	0.0	33.6	35.5	0.0	34.8
LnGrp LOS	A		A	A		A	C		C	D		C
Approach Vol, veh/h		805			770			102			158	
Approach Delay, s/veh		4.2			4.1			33.3			35.1	
Approach LOS		A			A			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.1		14.9		65.1		14.9
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		44.0		24.0		44.0		24.0
Max Q Clear Time (g_c+I1), s		8.4		7.6		8.1		4.3
Green Ext Time (p_c), s		13.7		1.3		13.8		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	8.4
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	640	325	330	585	0	0	0	0	305	0	280
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1827	1827	0				1900	1810	1810
Adj Flow Rate, veh/h	0	681	0	351	622	0				324	0	298
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	4	4	0				5	5	5
Cap, veh/h	0	1038	464	701	2325	0				381	0	340
Arrive On Green	0.00	0.30	0.00	0.64	1.00	0.00				0.22	0.00	0.22
Sat Flow, veh/h	0	3597	1568	1740	3563	0				1723	0	1538
Grp Volume(v), veh/h	0	681	0	351	622	0				324	0	298
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1740	1736	0				1723	0	1538
Q Serve(g_s), s	0.0	18.7	0.0	0.0	0.0	0.0				19.8	0.0	20.6
Cycle Q Clear(g_c), s	0.0	18.7	0.0	0.0	0.0	0.0				19.8	0.0	20.6
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1038	464	701	2325	0				381	0	340
V/C Ratio(X)	0.00	0.66	0.00	0.50	0.27	0.00				0.85	0.00	0.88
Avail Cap(c_a), veh/h	0	1561	698	701	2325	0				454	0	405
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.94	0.00	0.65	0.65	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	33.8	0.0	12.2	0.0	0.0				41.1	0.0	41.4
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.3	0.2	0.0				12.5	0.0	16.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	9.1	0.0	3.9	0.1	0.0				10.8	0.0	10.3
LnGrp Delay(d),s/veh	0.0	34.8	0.0	12.5	0.2	0.0				53.6	0.0	58.2
LnGrp LOS		C		B	A					D		E
Approach Vol, veh/h		681			973						622	
Approach Delay, s/veh		34.8			4.6						55.8	
Approach LOS		C			A						E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	41.1	38.6				79.7		30.3
Change Period (Y+Rc), s	6.0	* 6				6.0		6.0
Max Green Setting (Gmax), s	14.4	* 49				69.0		29.0
Max Q Clear Time (g_c+I1), s	2.0	20.7				2.0		22.6
Green Ext Time (p_c), s	5.0	7.2				8.0		1.7

Intersection Summary	
HCM 2010 Ctrl Delay	27.6
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	285	550	90	10	610	230	250	275	315	15	60	50
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1900	1827	1827	1827	1810	1810	1810
Adj Flow Rate, veh/h	313	604	99	11	670	253	192	418	346	16	66	55
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	5	5	5
Cap, veh/h	381	1996	887	39	972	364	394	827	346	96	101	85
Arrive On Green	0.12	0.58	0.58	0.41	0.41	0.41	0.23	0.23	0.23	0.06	0.06	0.06
Sat Flow, veh/h	1740	3471	1542	14	2394	895	1740	3654	1529	1723	1810	1522
Grp Volume(v), veh/h	313	604	99	511	0	423	192	418	346	16	66	55
Grp Sat Flow(s),veh/h/ln	1740	1736	1542	1805	0	1498	1740	1827	1529	1723	1810	1522
Q Serve(g_s), s	10.9	9.8	3.2	0.0	0.0	25.7	10.6	11.0	24.9	1.0	3.9	3.9
Cycle Q Clear(g_c), s	10.9	9.8	3.2	25.3	0.0	25.7	10.6	11.0	24.9	1.0	3.9	3.9
Prop In Lane	1.00		1.00	0.02		0.60	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	381	1996	887	766	0	608	394	827	346	96	101	85
V/C Ratio(X)	0.82	0.30	0.11	0.67	0.00	0.70	0.49	0.51	1.00	0.17	0.65	0.65
Avail Cap(c_a), veh/h	482	1996	887	766	0	608	394	827	346	233	245	206
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.74	0.74	0.74	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.6	12.0	10.6	26.9	0.0	27.0	37.0	37.2	42.5	49.5	50.9	50.9
Incr Delay (d2), s/veh	6.7	0.3	0.2	4.5	0.0	6.5	0.9	0.5	48.3	0.8	7.0	8.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	5.9	4.8	1.4	13.7	0.0	11.7	5.2	5.6	15.1	0.5	2.2	1.8
LnGrp Delay(d),s/veh	27.3	12.3	10.8	31.5	0.0	33.5	37.9	37.7	90.9	50.3	57.8	58.9
LnGrp LOS	C	B	B	C		C	D	D	F	D	E	E
Approach Vol, veh/h		1016			934			956			137	
Approach Delay, s/veh		16.8			32.4			57.0			57.4	
Approach LOS		B			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		68.8		11.2	18.6	50.2		30.0
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		54.5		14.9	19.9	29.5		24.9
Max Q Clear Time (g_c+I1), s		11.8		5.9	12.9	27.7		26.9
Green Ext Time (p_c), s		19.2		0.3	0.6	1.5		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	36.0
HCM 2010 LOS	D

Notes

User approved pedestrian interval to be less than phase max green.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	670	40	125	695	275	220	190	30	40	165	130
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1900	1863	1863	1863	1881	1881	1900
Adj Flow Rate, veh/h	36	698	42	130	724	286	229	198	31	42	172	135
Adj No. of Lanes	1	2	0	1	2	0	1	1	1	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	1	1	1
Cap, veh/h	65	1032	62	166	887	350	313	329	278	261	293	215
Arrive On Green	0.04	0.30	0.30	0.09	0.35	0.35	0.18	0.18	0.18	0.15	0.15	0.15
Sat Flow, veh/h	1810	3459	208	1792	2501	988	1774	1863	1573	1792	2010	1477
Grp Volume(v), veh/h	36	364	376	130	517	493	229	198	31	42	160	147
Grp Sat Flow(s),veh/h/ln	1810	1805	1862	1792	1787	1702	1774	1863	1573	1792	1881	1606
Q Serve(g_s), s	1.4	12.4	12.4	5.0	18.3	18.3	8.5	6.8	1.2	1.4	5.5	6.0
Cycle Q Clear(g_c), s	1.4	12.4	12.4	5.0	18.3	18.3	8.5	6.8	1.2	1.4	5.5	6.0
Prop In Lane	1.00		0.11	1.00		0.58	1.00		1.00	1.00		0.92
Lane Grp Cap(c), veh/h	65	539	556	166	634	604	313	329	278	261	274	234
V/C Ratio(X)	0.55	0.68	0.68	0.79	0.82	0.82	0.73	0.60	0.11	0.16	0.58	0.63
Avail Cap(c_a), veh/h	130	570	588	231	666	635	534	561	474	591	621	530
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.1	21.5	21.5	31.0	20.4	20.4	27.1	26.5	24.1	26.0	27.8	28.0
Incr Delay (d2), s/veh	7.1	3.0	2.9	11.2	7.5	7.8	3.3	1.8	0.2	0.3	2.0	2.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.8	6.6	6.8	3.0	10.2	9.8	4.4	3.7	0.5	0.7	3.0	2.8
LnGrp Delay(d),s/veh	40.2	24.5	24.4	42.1	27.9	28.3	30.4	28.2	24.3	26.3	29.8	30.7
LnGrp LOS	D	C	C	D	C	C	C	C	C	C	C	C
Approach Vol, veh/h		776			1140			458			349	
Approach Delay, s/veh		25.2			29.7			29.1			29.8	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.4	25.8		15.2	7.5	29.7		17.3
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	9.0	22.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	7.0	14.4		8.0	3.4	20.3		10.5
Green Ext Time (p_c), s	0.1	5.7		1.7	0.0	4.4		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	28.3
HCM 2010 LOS	C

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	670	365	170	770	0	0	0	0	190	0	305
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.99	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3381	1435	1787	3574						1787	1599
Flt Permitted		1.00	1.00	0.22	1.00						0.95	1.00
Satd. Flow (perm)		3381	1435	423	3574						1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	728	397	185	837	0	0	0	0	207	0	332
RTOR Reduction (vph)	0	6	214	0	0	0	0	0	0	0	0	219
Lane Group Flow (vph)	0	782	123	185	837	0	0	0	0	0	207	113
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		29.1	29.1	31.0	31.0						23.1	23.1
Effective Green, g (s)		29.1	29.1	31.0	31.0						23.1	23.1
Actuated g/C Ratio		0.36	0.36	0.39	0.39						0.29	0.29
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1229	521	388	1384						515	461
v/s Ratio Prot		c0.23		0.08	c0.23							
v/s Ratio Perm			0.09	0.11							0.12	0.07
v/c Ratio		0.64	0.24	0.48	0.60						0.40	0.24
Uniform Delay, d1		21.1	17.7	18.1	19.6						22.9	21.8
Progression Factor		1.00	1.00	0.72	0.75						1.00	1.00
Incremental Delay, d2		1.2	0.3	1.5	0.8						1.1	0.6
Delay (s)		22.3	18.0	14.4	15.4						24.0	22.4
Level of Service		C	B	B	B						C	C
Approach Delay (s)		21.0			15.3			0.0			23.0	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.6
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	440	480	0	0	460	240	510	10	225	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1804	3610			4827		1692	1700	1577			
Flt Permitted	0.33	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	626	3610			4827		1692	1700	1577			
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	518	565	0	0	541	282	600	12	265	0	0	0
RTOR Reduction (vph)	0	0	0	0	104	0	0	0	188	0	0	0
Lane Group Flow (vph)	518	565	0	0	719	0	306	306	77	0	0	0
Confl. Peds. (#/hr)	4		5	5		4	4		2	2		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	29.5	29.1			31.0		23.1	23.1	23.1			
Effective Green, g (s)	29.5	29.1			31.0		23.1	23.1	23.1			
Actuated g/C Ratio	0.37	0.36			0.39		0.29	0.29	0.29			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	397	1313			1870		488	490	455			
v/s Ratio Prot	c0.18	0.16			c0.15							
v/s Ratio Perm	c0.30						c0.18	0.18	0.05			
v/c Ratio	1.30	0.43			0.38		0.63	0.62	0.17			
Uniform Delay, d1	24.6	19.2			17.6		24.7	24.7	21.3			
Progression Factor	0.66	0.65			1.00		1.00	1.00	1.00			
Incremental Delay, d2	152.9	0.3			0.2		3.5	3.5	0.4			
Delay (s)	169.2	12.7			17.8		28.3	28.2	21.6			
Level of Service	F	B			B		C	C	C			
Approach Delay (s)		87.6			17.8			26.2			0.0	
Approach LOS		F			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	47.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	14.6
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	10	40	5	35	5	260	55	25	260	10
Conflicting Peds, #/hr	5	0	5	1	0	1	5	0	1	1	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	2	2	2	2	2	2
Mvmt Flow	6	0	11	45	6	39	6	292	62	28	292	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	717	725	308	700	700	329	308	0	0	355	0	0
Stage 1	359	359	-	335	335	-	-	-	-	-	-	-
Stage 2	358	366	-	365	365	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	347	354	737	351	361	708	1253	-	-	1204	-	-
Stage 1	663	631	-	675	639	-	-	-	-	-	-	-
Stage 2	664	626	-	650	620	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	313	340	731	335	347	704	1248	-	-	1199	-	-
Mov Cap-2 Maneuver	313	340	-	335	347	-	-	-	-	-	-	-
Stage 1	656	611	-	670	635	-	-	-	-	-	-	-
Stage 2	615	622	-	619	600	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.4	15.4	0.1	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1248	-	-	506	436	1199	-	-
HCM Lane V/C Ratio	0.005	-	-	0.033	0.206	0.023	-	-
HCM Control Delay (s)	7.9	0	-	12.4	15.4	8.1	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.8	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	785	10	25	890	60	10	95	30	75	90	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1900	1881	1900	1900	1845	1900	1900	1863	1900
Adj Flow Rate, veh/h	26	818	10	26	927	62	10	99	31	78	94	42
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	2	2	2
Cap, veh/h	85	2352	28	76	2251	148	66	382	112	187	210	99
Arrive On Green	0.70	0.70	0.70	0.70	0.70	0.70	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	53	3370	41	41	3226	213	98	2510	734	726	1377	651
Grp Volume(v), veh/h	434	0	420	527	0	488	75	0	65	113	0	101
Grp Sat Flow(s),veh/h/ln	1759	0	1705	1806	0	1674	1796	0	1546	1187	0	1567
Q Serve(g_s), s	0.0	0.0	7.9	0.0	0.0	9.9	0.0	0.0	3.0	4.9	0.0	4.7
Cycle Q Clear(g_c), s	7.3	0.0	7.9	9.4	0.0	9.9	2.9	0.0	3.0	7.9	0.0	4.7
Prop In Lane	0.06		0.02	0.05		0.13	0.13		0.47	0.69		0.42
Lane Grp Cap(c), veh/h	1275	0	1189	1307	0	1168	324	0	235	257	0	239
V/C Ratio(X)	0.34	0.00	0.35	0.40	0.00	0.42	0.23	0.00	0.28	0.44	0.00	0.42
Avail Cap(c_a), veh/h	1275	0	1189	1307	0	1168	580	0	464	463	0	470
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.66	0.00	0.66	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	4.8	0.0	4.8	5.1	0.0	5.2	30.0	0.0	30.0	32.6	0.0	30.7
Incr Delay (d2), s/veh	0.7	0.0	0.8	0.6	0.0	0.7	0.4	0.0	0.6	1.2	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.0	0.0	3.9	5.1	0.0	4.7	1.5	0.0	1.3	2.4	0.0	2.1
LnGrp Delay(d),s/veh	5.5	0.0	5.7	5.7	0.0	5.9	30.3	0.0	30.6	33.8	0.0	31.9
LnGrp LOS	A		A	A		A	C		C	C		C
Approach Vol, veh/h		854			1015			140			214	
Approach Delay, s/veh		5.6			5.8			30.5			32.9	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		61.8		18.2		61.8		18.2
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		44.0		24.0		44.0		24.0
Max Q Clear Time (g_c+I1), s		9.9		9.9		11.9		5.0
Green Ext Time (p_c), s		2.4		1.7		2.4		2.0

Intersection Summary	
HCM 2010 Ctrl Delay	9.9
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	730	265	370	725	0	0	0	0	450	0	385
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1881	1900	1881	0				1900	1881	1881
Adj Flow Rate, veh/h	0	753	0	381	747	0				464	0	397
Adj No. of Lanes	0	2	1	0	3	0				0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97				0.97	0.97	0.97
Percent Heavy Veh, %	1	1	1	1	1	0				1	1	1
Cap, veh/h	0	1730	774	128	1508	0				551	0	492
Arrive On Green	0.00	0.48	0.00	0.48	0.48	0.00				0.31	0.00	0.31
Sat Flow, veh/h	0	3668	1599	6	3271	0				1792	0	1599
Grp Volume(v), veh/h	0	753	0	381	747	0				464	0	397
Grp Sat Flow(s),veh/h/ln	0	1787	1599	6	1558	0				1792	0	1599
Q Serve(g_s), s	0.0	7.9	0.0	25.6	9.4	0.0				13.9	0.0	13.2
Cycle Q Clear(g_c), s	0.0	7.9	0.0	25.6	9.4	0.0				13.9	0.0	13.2
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1730	774	0	1508	0				551	0	492
V/C Ratio(X)	0.00	0.44	0.00	0.00	0.50	0.00				0.84	0.00	0.81
Avail Cap(c_a), veh/h	0	1730	774	0	1517	0				623	0	556
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	9.7	0.0	0.0	10.1	0.0				18.6	0.0	18.3
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.4	0.0				9.3	0.0	7.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	3.9	0.0	0.0	4.0	0.0				8.2	0.0	6.8
LnGrp Delay(d),s/veh	0.0	9.9	0.0	0.0	10.4	0.0				27.9	0.0	26.1
LnGrp LOS		A			B					C		C
Approach Vol, veh/h		753			1128						861	
Approach Delay, s/veh		9.9			6.9						27.1	
Approach LOS		A			A						C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		33.8				33.8		23.7
Change Period (Y+Rc), s		6.0				6.0		6.0
Max Green Setting (Gmax), s		18.4				28.0		20.0
Max Q Clear Time (g_c+I1), s		9.9				27.6		15.9
Green Ext Time (p_c), s		7.6				0.2		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	14.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	375	695	115	5	710	335	280	465	325	15	45	75
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1900	1881	1900	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h	391	724	120	5	740	349	259	531	339	16	47	78
Adj No. of Lanes	0	2	0	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	2	2	2
Cap, veh/h	55	947	157	29	1526	715	344	722	305	54	57	46
Arrive On Green	0.66	0.66	0.66	0.66	0.66	0.66	0.19	0.19	0.19	0.03	0.03	0.03
Sat Flow, veh/h	2	1432	237	4	2307	1081	1792	3762	1589	1774	1863	1521
Grp Volume(v), veh/h	391	0	844	604	0	490	259	531	339	16	47	78
Grp Sat Flow(s),veh/h/ln	2	0	1669	1874	0	1518	1792	1881	1589	1774	1863	1521
Q Serve(g_s), s	135.0	0.0	46.7	0.0	0.0	21.8	18.4	17.9	25.9	1.2	3.4	4.1
Cycle Q Clear(g_c), s	135.0	0.0	46.7	21.6	0.0	21.8	18.4	17.9	25.9	1.2	3.4	4.1
Prop In Lane	1.00		0.14	0.01		0.71	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	0	0	1104	1266	0	1004	344	722	305	54	57	46
V/C Ratio(X)	0.00	0.00	0.76	0.48	0.00	0.49	0.75	0.74	1.11	0.30	0.83	1.69
Avail Cap(c_a), veh/h	0	0	1104	1266	0	1004	344	722	305	54	57	46
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	0.0	0.0	15.6	11.4	0.0	11.4	51.5	51.3	54.5	64.0	65.1	65.4
Incr Delay (d2), s/veh	0.0	0.0	3.3	0.3	0.0	0.4	9.1	3.9	85.1	3.0	62.9	386.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	0.0	22.4	11.2	0.0	9.2	10.0	9.7	18.6	0.6	2.7	6.7
LnGrp Delay(d),s/veh	0.0	0.0	19.0	11.7	0.0	11.9	60.6	55.3	139.7	67.1	128.0	452.0
LnGrp LOS			B	B		B	E	E	F	E	F	F
Approach Vol, veh/h		1235			1094			1129			141	
Approach Delay, s/veh		13.0			11.8			81.8			300.3	
Approach LOS		B			B			F			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		94.8		9.2		94.8		31.0
Change Period (Y+Rc), s		5.5		5.1		5.5		5.1
Max Green Setting (Gmax), s		89.3		4.1		81.1		25.9
Max Q Clear Time (g_c+I1), s		137.0		6.1		23.8		27.9
Green Ext Time (p_c), s		0.0		0.0		44.6		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	45.5
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	640	35	85	550	165	40	160	100	205	155	35
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1810	1810	1810	1863	1863	1900
Adj Flow Rate, veh/h	32	688	38	91	591	177	43	172	108	220	167	38
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	4	4	4	3	3	3	5	5	5	2	2	2
Cap, veh/h	59	1023	56	117	900	269	219	436	193	319	517	115
Arrive On Green	0.03	0.31	0.31	0.07	0.34	0.34	0.13	0.13	0.13	0.18	0.18	0.18
Sat Flow, veh/h	1740	3344	185	1757	2660	795	1723	3438	1524	1774	2876	639
Grp Volume(v), veh/h	32	357	369	91	389	379	43	172	108	220	101	104
Grp Sat Flow(s),veh/h/ln	1740	1736	1793	1757	1752	1702	1723	1719	1524	1774	1770	1745
Q Serve(g_s), s	1.1	11.2	11.2	3.2	11.8	11.8	1.4	2.9	4.2	7.2	3.1	3.2
Cycle Q Clear(g_c), s	1.1	11.2	11.2	3.2	11.8	11.8	1.4	2.9	4.2	7.2	3.1	3.2
Prop In Lane	1.00		0.10	1.00		0.47	1.00		1.00	1.00		0.37
Lane Grp Cap(c), veh/h	59	531	548	117	593	576	219	436	193	319	318	313
V/C Ratio(X)	0.54	0.67	0.67	0.78	0.66	0.66	0.20	0.39	0.56	0.69	0.32	0.33
Avail Cap(c_a), veh/h	140	613	633	254	731	710	581	1159	513	655	653	644
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	29.6	18.9	18.9	28.6	17.5	17.5	24.4	25.0	25.6	23.9	22.2	22.3
Incr Delay (d2), s/veh	7.4	2.4	2.3	10.5	1.5	1.6	0.4	0.6	2.5	2.7	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.7	5.7	5.9	1.9	5.9	5.7	0.7	1.4	1.9	3.8	1.6	1.6
LnGrp Delay(d),s/veh	37.0	21.3	21.2	39.1	19.1	19.2	24.8	25.6	28.1	26.6	22.8	22.9
LnGrp LOS	D	C	C	D	B	B	C	C	C	C	C	C
Approach Vol, veh/h		758			859			323			425	
Approach Delay, s/veh		21.9			21.2			26.3			24.8	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.2	24.1		16.2	7.1	26.1		12.9
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	9.0	22.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	5.2	13.2		9.2	3.1	13.8		6.2
Green Ext Time (p_c), s	0.1	5.7		1.5	0.0	7.2		1.3

Intersection Summary	
HCM 2010 Ctrl Delay	22.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	580	380	140	575	0	0	0	0	120	0	270
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.98	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3286	1409	1735	3471						1736	1553
Flt Permitted		1.00	1.00	0.25	1.00						0.95	1.00
Satd. Flow (perm)		3286	1409	466	3471						1736	1553
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	611	400	147	605	0	0	0	0	126	0	284
RTOR Reduction (vph)	0	11	185	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	692	123	147	605	0	0	0	0	0	126	284
Confl. Peds. (#/hr)	2		1	1		2						
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	0%	0%	0%	4%	4%	4%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		30.4	30.4	33.3	23.5						21.1	21.1
Effective Green, g (s)		30.4	30.4	33.3	23.5						21.1	21.1
Actuated g/C Ratio		0.40	0.40	0.44	0.31						0.28	0.28
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1316	564	368	1074						482	431
v/s Ratio Prot		c0.21		c0.05	0.17							
v/s Ratio Perm			0.09	0.12							0.07	c0.18
v/c Ratio		0.53	0.22	0.40	0.56						0.26	0.66
Uniform Delay, d1		17.3	14.9	21.0	21.9						21.3	24.2
Progression Factor		1.00	1.00	1.48	0.67						1.00	1.00
Incremental Delay, d2		0.5	0.3	1.2	0.8						0.6	4.8
Delay (s)		17.8	15.2	32.2	15.5						21.9	29.1
Level of Service		B	B	C	B						C	C
Approach Delay (s)		17.0			18.8			0.0			26.9	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	14.6
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	370	355	0	0	320	135	385	5	170	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1735	3471			4690		1649	1655	1533			
Flt Permitted	0.45	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	816	3471			4690		1649	1655	1533			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	402	386	0	0	348	147	418	5	185	0	0	0
RTOR Reduction (vph)	0	0	0	0	88	0	0	0	0	0	0	0
Lane Group Flow (vph)	402	386	0	0	407	0	213	210	185	0	0	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	45.2	30.4			23.5		21.1	21.1	21.1			
Effective Green, g (s)	45.2	30.4			23.5		21.1	21.1	21.1			
Actuated g/C Ratio	0.60	0.40			0.31		0.28	0.28	0.28			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	688	1390			1452		458	460	426			
v/s Ratio Prot	c0.13	0.11			0.09							
v/s Ratio Perm	c0.22						c0.13	0.13	0.12			
v/c Ratio	0.58	0.28			0.28		0.47	0.46	0.43			
Uniform Delay, d1	12.5	15.3			19.8		22.7	22.7	22.5			
Progression Factor	0.66	0.42			1.00		1.00	1.00	1.00			
Incremental Delay, d2	1.3	0.1			0.1		1.6	1.5	1.5			
Delay (s)	9.5	6.6			19.9		24.3	24.2	24.0			
Level of Service	A	A			B		C	C	C			
Approach Delay (s)		8.1			19.9			24.1			0.0	
Approach LOS		A			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	75.9	Sum of lost time (s)	14.6
Intersection Capacity Utilization	53.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	1.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	5	30	0	20	5	185	35	15	200	10
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	14	14	14	7	7	7	4	4	4
Mvmt Flow	6	0	6	35	0	23	6	215	41	17	233	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	538	546	244	529	532	240	247	0	0	259	0	0
Stage 1	276	276	-	250	250	-	-	-	-	-	-	-
Stage 2	262	270	-	279	282	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.24	6.64	6.34	4.17	-	-	4.14	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.626	4.126	3.426	2.263	-	-	2.236	-	-
Pot Cap-1 Maneuver	457	448	800	442	437	770	1290	-	-	1294	-	-
Stage 1	735	685	-	728	678	-	-	-	-	-	-	-
Stage 2	747	690	-	702	656	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	435	437	796	430	426	767	1287	-	-	1292	-	-
Mov Cap-2 Maneuver	435	437	-	430	426	-	-	-	-	-	-	-
Stage 1	729	673	-	723	673	-	-	-	-	-	-	-
Stage 2	720	685	-	685	645	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.5	12.8	0.2	0.5
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	563	522	1292	-	-
HCM Lane V/C Ratio	0.005	-	-	0.021	0.111	0.013	-	-
HCM Control Delay (s)	7.8	0	-	11.5	12.8	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.4	0	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	770	15	15	715	40	10	65	25	55	70	30
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1792	1900	1900	1827	1900
Adj Flow Rate, veh/h	20	786	15	15	730	41	10	66	26	56	71	31
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	4	4	4	4	4	4	6	6	6	4	4	4
Cap, veh/h	75	2446	46	65	2370	132	69	251	92	150	164	75
Arrive On Green	0.74	0.74	0.74	0.74	0.74	0.74	0.11	0.11	0.11	0.11	0.11	0.11
Sat Flow, veh/h	38	3313	62	25	3210	178	146	2247	821	683	1468	670
Grp Volume(v), veh/h	424	0	397	411	0	375	55	0	47	87	0	71
Grp Sat Flow(s),veh/h/ln	1763	0	1651	1782	0	1631	1727	0	1486	1276	0	1544
Q Serve(g_s), s	0.0	0.0	6.6	0.0	0.0	6.3	0.0	0.0	2.3	3.3	0.0	3.4
Cycle Q Clear(g_c), s	6.3	0.0	6.6	6.1	0.0	6.3	2.2	0.0	2.3	5.6	0.0	3.4
Prop In Lane	0.05		0.04	0.04		0.11	0.18		0.55	0.65		0.43
Lane Grp Cap(c), veh/h	1349	0	1219	1363	0	1204	246	0	166	217	0	172
V/C Ratio(X)	0.31	0.00	0.33	0.30	0.00	0.31	0.22	0.00	0.28	0.40	0.00	0.41
Avail Cap(c_a), veh/h	1349	0	1219	1363	0	1204	600	0	483	521	0	502
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.94	0.00	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.6	0.0	3.6	3.5	0.0	3.6	32.6	0.0	32.6	34.2	0.0	33.1
Incr Delay (d2), s/veh	0.6	0.0	0.7	0.5	0.0	0.6	0.5	0.0	0.9	1.2	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.4	0.0	3.2	3.2	0.0	2.9	1.1	0.0	1.0	1.9	0.0	1.5
LnGrp Delay(d),s/veh	4.2	0.0	4.3	4.1	0.0	4.2	33.0	0.0	33.5	35.4	0.0	34.7
LnGrp LOS	A		A	A		A	C		C	D		C
Approach Vol, veh/h		821			786			102			158	
Approach Delay, s/veh		4.2			4.1			33.3			35.1	
Approach LOS		A			A			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		65.1		14.9		65.1		14.9
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		42.0		26.0		42.0		26.0
Max Q Clear Time (g_c+I1), s		8.6		7.6		8.3		4.3
Green Ext Time (p_c), s		13.8		1.4		13.9		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	8.4
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	655	330	335	600	0	0	0	0	310	0	285
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1827	1827	0				1900	1810	1810
Adj Flow Rate, veh/h	0	697	0	356	638	0				330	0	303
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	4	4	0				5	5	5
Cap, veh/h	0	1065	476	677	2299	0				394	0	352
Arrive On Green	0.00	0.30	0.00	0.61	1.00	0.00				0.23	0.00	0.23
Sat Flow, veh/h	0	3597	1568	1740	3563	0				1723	0	1538
Grp Volume(v), veh/h	0	697	0	356	638	0				330	0	303
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1740	1736	0				1723	0	1538
Q Serve(g_s), s	0.0	19.0	0.0	0.0	0.0	0.0				20.1	0.0	20.8
Cycle Q Clear(g_c), s	0.0	19.0	0.0	0.0	0.0	0.0				20.1	0.0	20.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1065	476	677	2299	0				394	0	352
V/C Ratio(X)	0.00	0.65	0.00	0.53	0.28	0.00				0.84	0.00	0.86
Avail Cap(c_a), veh/h	0	1065	476	677	2299	0				517	0	461
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.94	0.00	0.71	0.71	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	33.3	0.0	13.6	0.0	0.0				40.5	0.0	40.7
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.4	0.2	0.0				9.0	0.0	12.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	9.4	0.0	4.3	0.1	0.0				10.5	0.0	10.0
LnGrp Delay(d),s/veh	0.0	34.8	0.0	14.0	0.2	0.0				49.5	0.0	53.0
LnGrp LOS		C		B	A					D		D
Approach Vol, veh/h		697			994						633	
Approach Delay, s/veh		34.8			5.2						51.2	
Approach LOS		C			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	39.4	39.4				78.8		31.2
Change Period (Y+Rc), s	6.0	* 6				6.0		6.0
Max Green Setting (Gmax), s	27.4	* 32				65.0		33.0
Max Q Clear Time (g_c+I1), s	2.0	21.0				2.0		22.8
Green Ext Time (p_c), s	7.2	4.6				8.2		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	26.6
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	290	560	90	10	625	235	255	280	320	15	60	50
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1900	1827	1827	1827	1810	1810	1810
Adj Flow Rate, veh/h	319	615	99	11	687	258	196	426	352	16	66	55
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	5	5	5
Cap, veh/h	381	2033	903	39	1002	373	380	797	333	92	97	81
Arrive On Green	0.12	0.59	0.59	0.42	0.42	0.42	0.22	0.22	0.22	0.05	0.05	0.05
Sat Flow, veh/h	1740	3471	1542	14	2398	892	1740	3654	1528	1723	1810	1521
Grp Volume(v), veh/h	319	615	99	523	0	433	196	426	352	16	66	55
Grp Sat Flow(s),veh/h/ln	1740	1736	1542	1805	0	1499	1740	1827	1528	1723	1810	1521
Q Serve(g_s), s	10.9	9.8	3.1	0.0	0.0	26.0	10.9	11.3	24.0	1.0	3.9	3.9
Cycle Q Clear(g_c), s	10.9	9.8	3.1	25.6	0.0	26.0	10.9	11.3	24.0	1.0	3.9	3.9
Prop In Lane	1.00		1.00	0.02		0.60	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	381	2033	903	788	0	627	380	797	333	92	97	81
V/C Ratio(X)	0.84	0.30	0.11	0.66	0.00	0.69	0.52	0.53	1.06	0.17	0.68	0.68
Avail Cap(c_a), veh/h	444	2033	903	788	0	627	380	797	333	103	109	91
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.64	0.64	0.64	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	11.5	10.1	26.1	0.0	26.2	37.9	38.1	43.0	49.7	51.1	51.1
Incr Delay (d2), s/veh	7.8	0.2	0.2	4.4	0.0	6.2	1.2	0.7	64.6	0.9	14.0	15.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.0	4.8	1.4	13.9	0.0	11.8	5.4	5.8	16.1	0.5	2.4	2.0
LnGrp Delay(d),s/veh	28.1	11.7	10.2	30.5	0.0	32.4	39.1	38.8	107.6	50.6	65.2	66.9
LnGrp LOS	C	B	B	C		C	D	D	F	D	E	E
Approach Vol, veh/h		1033			956			974			137	
Approach Delay, s/veh		16.6			31.3			63.7			64.2	
Approach LOS		B			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		69.9		11.0	18.4	51.5		29.1
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		63.7		6.6	17.3	41.3		24.0
Max Q Clear Time (g_c+I1), s		11.8		5.9	12.9	28.0		26.0
Green Ext Time (p_c), s		21.3		0.0	0.4	9.5		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	38.1
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	685	40	130	710	280	225	195	30	40	170	135
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1900	1863	1863	1863	1881	1881	1900
Adj Flow Rate, veh/h	36	714	42	135	740	292	234	203	31	42	177	141
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	1	1	1
Cap, veh/h	65	1024	60	170	888	350	317	633	281	269	292	219
Arrive On Green	0.04	0.30	0.30	0.10	0.35	0.35	0.18	0.18	0.18	0.15	0.15	0.15
Sat Flow, veh/h	1810	3464	204	1792	2503	988	1774	3539	1573	1792	1943	1455
Grp Volume(v), veh/h	36	372	384	135	528	504	234	203	31	42	162	156
Grp Sat Flow(s),veh/h/ln	1810	1805	1863	1792	1787	1704	1774	1770	1573	1792	1787	1611
Q Serve(g_s), s	1.4	13.0	13.1	5.3	19.3	19.3	8.9	3.6	1.2	1.5	6.0	6.5
Cycle Q Clear(g_c), s	1.4	13.0	13.1	5.3	19.3	19.3	8.9	3.6	1.2	1.5	6.0	6.5
Prop In Lane	1.00		0.11	1.00		0.58	1.00		1.00	1.00		0.90
Lane Grp Cap(c), veh/h	65	533	551	170	634	605	317	633	281	269	268	242
V/C Ratio(X)	0.56	0.70	0.70	0.79	0.83	0.83	0.74	0.32	0.11	0.16	0.60	0.65
Avail Cap(c_a), veh/h	127	582	600	201	651	621	522	1042	463	577	576	519
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.8	22.3	22.3	31.6	21.1	21.1	27.7	25.5	24.5	26.4	28.3	28.5
Incr Delay (d2), s/veh	7.3	3.3	3.2	16.7	8.9	9.3	3.3	0.3	0.2	0.3	2.2	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.8	7.0	7.2	3.4	11.1	10.7	4.6	1.8	0.5	0.7	3.1	3.1
LnGrp Delay(d),s/veh	41.1	25.6	25.5	48.3	30.0	30.4	31.1	25.8	24.7	26.7	30.5	31.4
LnGrp LOS	D	C	C	D	C	C	C	C	C	C	C	C
Approach Vol, veh/h		792			1167			468			360	
Approach Delay, s/veh		26.3			32.3			28.4			30.4	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	11.8	26.1		15.7	7.6	30.3		17.8
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	23.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	7.3	15.1		8.5	3.4	21.3		10.9
Green Ext Time (p_c), s	0.0	6.0		1.7	0.0	3.8		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	29.7
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	685	375	175	785	0	0	0	0	195	0	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.99	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3381	1435	1787	3574						1787	1599
Flt Permitted		1.00	1.00	0.22	1.00						0.95	1.00
Satd. Flow (perm)		3381	1435	413	3574						1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	745	408	190	853	0	0	0	0	212	0	337
RTOR Reduction (vph)	0	6	221	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	800	126	190	853	0	0	0	0	0	212	337
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		29.5	29.5	31.4	31.4						23.9	23.9
Effective Green, g (s)		29.5	29.5	31.4	31.4						23.9	23.9
Actuated g/C Ratio		0.36	0.36	0.39	0.39						0.29	0.29
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1228	521	383	1382						525	470
v/s Ratio Prot		c0.24		0.08	c0.24							
v/s Ratio Perm			0.09	0.11							0.12	c0.21
v/c Ratio		0.65	0.24	0.50	0.62						0.40	0.72
Uniform Delay, d1		21.6	18.0	18.5	20.1						22.9	25.6
Progression Factor		1.00	1.00	0.72	0.75						1.00	1.00
Incremental Delay, d2		1.4	0.3	1.6	0.9						1.1	6.4
Delay (s)		22.9	18.4	14.9	15.9						24.0	32.0
Level of Service		C	B	B	B						C	C
Approach Delay (s)		21.6			15.7			0.0			28.9	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	14.6
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	450	490	0	0	470	245	520	10	230	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1804	3610			4827		1692	1700	1577			
Flt Permitted	0.32	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	614	3610			4827		1692	1700	1577			
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	529	576	0	0	553	288	612	12	271	0	0	0
RTOR Reduction (vph)	0	0	0	0	104	0	0	0	0	0	0	0
Lane Group Flow (vph)	529	576	0	0	737	0	312	312	271	0	0	0
Confl. Peds. (#/hr)	4		5	5		4	4		2	2		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	29.9	29.5			31.4		23.9	23.9	23.9			
Effective Green, g (s)	29.9	29.5			31.4		23.9	23.9	23.9			
Actuated g/C Ratio	0.37	0.36			0.39		0.29	0.29	0.29			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	391	1311			1866		498	500	464			
v/s Ratio Prot	c0.19	0.16			c0.15							
v/s Ratio Perm	c0.31						c0.18	0.18	0.17			
v/c Ratio	1.35	0.44			0.39		0.63	0.62	0.58			
Uniform Delay, d1	25.0	19.6			18.0		24.8	24.8	24.4			
Progression Factor	0.67	0.65			1.00		1.00	1.00	1.00			
Incremental Delay, d2	173.3	0.3			0.2		3.5	3.4	2.9			
Delay (s)	190.0	13.0			18.2		28.3	28.2	27.3			
Level of Service	F	B			B		C	C	C			
Approach Delay (s)		97.7			18.2			27.9			0.0	
Approach LOS		F			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	52.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	14.6
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	10	40	5	35	5	265	55	25	265	10
Conflicting Peds, #/hr	5	0	5	1	0	1	5	0	1	1	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	2	2	2	2	2	2
Mvmt Flow	6	0	11	45	6	39	6	298	62	28	298	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	728	737	313	711	711	335	314	0	0	361	0	0
Stage 1	365	365	-	341	341	-	-	-	-	-	-	-
Stage 2	363	372	-	370	370	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	341	348	732	345	356	702	1246	-	-	1198	-	-
Stage 1	658	627	-	670	635	-	-	-	-	-	-	-
Stage 2	660	622	-	646	617	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	307	335	726	329	342	698	1241	-	-	1193	-	-
Mov Cap-2 Maneuver	307	335	-	329	342	-	-	-	-	-	-	-
Stage 1	651	607	-	665	631	-	-	-	-	-	-	-
Stage 2	611	618	-	616	597	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	15.6	0.1	0.7
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1241	-	-	499	429	1193	-	-
HCM Lane V/C Ratio	0.005	-	-	0.034	0.21	0.024	-	-
HCM Control Delay (s)	7.9	0	-	12.5	15.6	8.1	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.8	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	805	10	25	910	60	10	95	30	75	90	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1900	1881	1900	1900	1845	1900	1900	1863	1900
Adj Flow Rate, veh/h	26	839	10	26	948	62	10	99	31	78	94	42
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	2	2	2
Cap, veh/h	83	2353	28	75	2253	145	66	384	112	187	211	99
Arrive On Green	0.70	0.70	0.70	0.70	0.70	0.70	0.15	0.15	0.15	0.15	0.15	0.15
Sat Flow, veh/h	51	3375	40	40	3231	208	98	2510	734	727	1377	651
Grp Volume(v), veh/h	445	0	430	538	0	498	75	0	65	113	0	101
Grp Sat Flow(s),veh/h/ln	1761	0	1705	1805	0	1675	1796	0	1546	1188	0	1567
Q Serve(g_s), s	0.0	0.0	8.2	0.0	0.0	10.3	0.0	0.0	3.0	4.9	0.0	4.7
Cycle Q Clear(g_c), s	7.5	0.0	8.2	9.7	0.0	10.3	2.9	0.0	3.0	7.9	0.0	4.7
Prop In Lane	0.06		0.02	0.05		0.12	0.13		0.47	0.69		0.42
Lane Grp Cap(c), veh/h	1275	0	1189	1306	0	1168	326	0	236	258	0	240
V/C Ratio(X)	0.35	0.00	0.36	0.41	0.00	0.43	0.23	0.00	0.28	0.44	0.00	0.42
Avail Cap(c_a), veh/h	1275	0	1189	1306	0	1168	602	0	483	480	0	490
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.84	0.00	0.84	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	4.8	0.0	4.9	5.1	0.0	5.2	29.9	0.0	30.0	32.6	0.0	30.7
Incr Delay (d2), s/veh	0.8	0.0	0.9	0.8	0.0	1.0	0.4	0.0	0.6	1.2	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.1	0.0	4.1	5.2	0.0	5.0	1.5	0.0	1.3	2.4	0.0	2.1
LnGrp Delay(d),s/veh	5.6	0.0	5.8	5.9	0.0	6.2	30.3	0.0	30.6	33.7	0.0	31.9
LnGrp LOS	A		A	A		A	C		C	C		C
Approach Vol, veh/h		875			1036			140			214	
Approach Delay, s/veh		5.7			6.1			30.4			32.8	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		61.8		18.2		61.8		18.2
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		43.0		25.0		43.0		25.0
Max Q Clear Time (g_c+I1), s		10.2		9.9		12.3		5.0
Green Ext Time (p_c), s		2.5		1.8		2.5		2.0

Intersection Summary	
HCM 2010 Ctrl Delay	9.9
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	745	270	380	740	0	0	0	0	460	0	395
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1881	1881	1881	1881	0				1900	1881	1881
Adj Flow Rate, veh/h	0	768	0	392	763	0				474	0	407
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97				0.97	0.97	0.97
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	1042	466	444	1886	0				483	0	432
Arrive On Green	0.00	0.29	0.00	0.14	0.53	0.00				0.27	0.00	0.27
Sat Flow, veh/h	0	3668	1599	1792	3668	0				1792	0	1599
Grp Volume(v), veh/h	0	768	0	392	763	0				474	0	407
Grp Sat Flow(s),veh/h/ln	0	1787	1599	1792	1787	0				1792	0	1599
Q Serve(g_s), s	0.0	11.5	0.0	8.4	7.6	0.0				15.6	0.0	14.8
Cycle Q Clear(g_c), s	0.0	11.5	0.0	8.4	7.6	0.0				15.6	0.0	14.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1042	466	444	1886	0				483	0	432
V/C Ratio(X)	0.00	0.74	0.00	0.88	0.40	0.00				0.98	0.00	0.94
Avail Cap(c_a), veh/h	0	1085	485	444	1929	0				483	0	432
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	18.9	0.0	13.9	8.4	0.0				21.5	0.0	21.2
Incr Delay (d2), s/veh	0.0	2.8	0.0	18.2	0.2	0.0				35.7	0.0	29.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	6.1	0.0	4.5	3.8	0.0				12.4	0.0	10.0
LnGrp Delay(d),s/veh	0.0	21.8	0.0	32.1	8.6	0.0				57.2	0.0	50.6
LnGrp LOS		C		C	A					E		D
Approach Vol, veh/h		768			1155						881	
Approach Delay, s/veh		21.8			16.6						54.1	
Approach LOS		C			B						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	14.0	23.3				37.3		22.0
Change Period (Y+Rc), s	5.6	6.0				6.0		6.0
Max Green Setting (Gmax), s	8.4	18.0				32.0		16.0
Max Q Clear Time (g_c+I1), s	10.4	13.5				9.6		17.6
Green Ext Time (p_c), s	0.0	3.8				14.7		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	385	710	120	5	725	345	285	475	330	15	45	75
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1900	1881	1900	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h	401	740	125	5	755	359	264	541	344	16	47	78
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	2	2	2
Cap, veh/h	426	2222	990	30	941	444	378	794	336	81	85	70
Arrive On Green	0.17	0.62	0.62	0.41	0.41	0.41	0.21	0.21	0.21	0.05	0.05	0.05
Sat Flow, veh/h	1792	3574	1593	4	2299	1086	1792	3762	1590	1774	1863	1542
Grp Volume(v), veh/h	401	740	125	618	0	501	264	541	344	16	47	78
Grp Sat Flow(s),veh/h/ln	1792	1787	1593	1874	0	1516	1792	1881	1590	1774	1863	1542
Q Serve(g_s), s	20.1	12.8	4.2	0.0	0.0	37.7	17.6	17.1	27.3	1.1	3.2	5.9
Cycle Q Clear(g_c), s	20.1	12.8	4.2	37.4	0.0	37.7	17.6	17.1	27.3	1.1	3.2	5.9
Prop In Lane	1.00		1.00	0.01		0.72	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	426	2222	990	795	0	620	378	794	336	81	85	70
V/C Ratio(X)	0.94	0.33	0.13	0.78	0.00	0.81	0.70	0.68	1.02	0.20	0.55	1.11
Avail Cap(c_a), veh/h	449	2380	1061	852	0	667	378	794	336	81	85	70
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	11.7	10.0	33.6	0.0	33.7	47.2	47.0	51.0	59.4	60.4	61.7
Incr Delay (d2), s/veh	27.7	0.1	0.1	4.5	0.0	7.1	5.6	2.4	55.6	1.2	7.5	140.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
%ile BackOfQ(-26165%),veh/ln	17.3	6.3	1.8	20.4	0.0	17.0	9.3	9.1	17.1	0.6	1.8	5.2
LnGrp Delay(d),s/veh	61.2	11.8	10.1	38.1	0.0	40.9	52.7	49.4	106.6	60.6	67.9	202.2
LnGrp LOS	E	B	B	D		D	D	D	F	E	E	F
Approach Vol, veh/h		1266			1119			1149			141	
Approach Delay, s/veh		27.3			39.3			67.3			141.4	
Approach LOS		C			D			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		85.9		11.0	27.5	58.4		32.4
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		86.1		5.9	24.1	56.9		27.3
Max Q Clear Time (g_c+I1), s		14.8		7.9	22.1	39.7		29.3
Green Ext Time (p_c), s		31.9		0.0	0.3	13.2		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	47.8
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	640	38	96	550	165	43	162	111	205	157	35
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1810	1810	1810	1863	1863	1900
Adj Flow Rate, veh/h	32	688	41	103	591	177	46	174	119	220	169	38
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	4	4	4	3	3	3	5	5	5	2	2	2
Cap, veh/h	59	1002	60	132	911	272	229	456	202	316	514	113
Arrive On Green	0.03	0.30	0.30	0.08	0.34	0.34	0.13	0.13	0.13	0.18	0.18	0.18
Sat Flow, veh/h	1740	3328	198	1757	2660	795	1723	3438	1524	1774	2883	633
Grp Volume(v), veh/h	32	359	370	103	389	379	46	174	119	220	102	105
Grp Sat Flow(s),veh/h/ln	1740	1736	1791	1757	1752	1702	1723	1719	1524	1774	1770	1746
Q Serve(g_s), s	1.2	11.6	11.7	3.7	12.0	12.1	1.5	3.0	4.7	7.4	3.2	3.4
Cycle Q Clear(g_c), s	1.2	11.6	11.7	3.7	12.0	12.1	1.5	3.0	4.7	7.4	3.2	3.4
Prop In Lane	1.00		0.11	1.00		0.47	1.00		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	59	523	539	132	600	583	229	456	202	316	315	311
V/C Ratio(X)	0.54	0.69	0.69	0.78	0.65	0.65	0.20	0.38	0.59	0.70	0.32	0.34
Avail Cap(c_a), veh/h	136	597	616	247	712	691	565	1128	500	638	636	627
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	30.4	19.7	19.7	29.1	17.8	17.8	24.7	25.4	26.1	24.7	22.9	23.0
Incr Delay (d2), s/veh	7.5	2.8	2.7	9.4	1.6	1.7	0.4	0.5	2.7	2.8	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.7	6.0	6.2	2.1	6.0	5.8	0.8	1.4	2.1	3.8	1.6	1.7
LnGrp Delay(d),s/veh	38.0	22.5	22.4	38.4	19.4	19.4	25.2	25.9	28.8	27.4	23.5	23.6
LnGrp LOS	D	C	C	D	B	B	C	C	C	C	C	C
Approach Vol, veh/h		761			871			339			427	
Approach Delay, s/veh		23.1			21.6			26.8			25.6	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	9.8	24.3		16.4	7.2	26.9		13.5
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	9.0	22.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	5.7	13.7		9.4	3.2	14.1		6.7
Green Ext Time (p_c), s	0.1	5.5		1.5	0.0	7.1		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	23.5
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	589	382	140	578	0	0	0	0	120	0	278
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.98	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3287	1409	1735	3471						1736	1553
Flt Permitted		1.00	1.00	0.25	1.00						0.95	1.00
Satd. Flow (perm)		3287	1409	454	3471						1736	1553
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	620	402	147	608	0	0	0	0	126	0	293
RTOR Reduction (vph)	0	11	186	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	701	124	147	608	0	0	0	0	0	126	293
Confl. Peds. (#/hr)	2		1	1		2						
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	0%	0%	0%	4%	4%	4%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		30.5	30.5	33.5	23.7						21.5	21.5
Effective Green, g (s)		30.5	30.5	33.5	23.7						21.5	21.5
Actuated g/C Ratio		0.40	0.40	0.44	0.31						0.28	0.28
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1312	562	363	1076						488	437
v/s Ratio Prot		c0.21		c0.05	0.18							
v/s Ratio Perm			0.09	0.13							0.07	c0.19
v/c Ratio		0.53	0.22	0.40	0.57						0.26	0.67
Uniform Delay, d1		17.5	15.1	21.5	22.0						21.3	24.3
Progression Factor		1.00	1.00	1.47	0.67						1.00	1.00
Incremental Delay, d2		0.5	0.3	1.2	0.8						0.6	5.2
Delay (s)		18.1	15.4	32.9	15.7						21.9	29.5
Level of Service		B	B	C	B						C	C
Approach Delay (s)		17.2			19.0			0.0			27.2	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	76.4	Sum of lost time (s)	14.6
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	378	357	0	0	322	135	387	5	170	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1735	3471			4691		1649	1655	1533			
Flt Permitted	0.45	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	813	3471			4691		1649	1655	1533			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	411	388	0	0	350	147	421	5	185	0	0	0
RTOR Reduction (vph)	0	0	0	0	87	0	0	0	0	0	0	0
Lane Group Flow (vph)	411	388	0	0	410	0	215	211	185	0	0	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	45.3	30.5			23.7		21.5	21.5	21.5			
Effective Green, g (s)	45.3	30.5			23.7		21.5	21.5	21.5			
Actuated g/C Ratio	0.59	0.40			0.31		0.28	0.28	0.28			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	682	1385			1455		464	465	431			
v/s Ratio Prot	c0.13	0.11			0.09							
v/s Ratio Perm	c0.23						c0.13	0.13	0.12			
v/c Ratio	0.60	0.28			0.28		0.46	0.45	0.43			
Uniform Delay, d1	12.7	15.5			19.9		22.7	22.6	22.4			
Progression Factor	0.66	0.42			1.00		1.00	1.00	1.00			
Incremental Delay, d2	1.5	0.1			0.1		1.5	1.5	1.4			
Delay (s)	9.8	6.7			20.1		24.2	24.1	23.9			
Level of Service	A	A			C		C	C	C			
Approach Delay (s)		8.3			20.1			24.1			0.0	
Approach LOS		A			C			C			A	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	76.4	Sum of lost time (s)	14.6
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	5	46	0	36	5	185	51	31	200	10
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	14	14	14	7	7	7	4	4	4
Mvmt Flow	6	0	6	53	0	42	6	215	59	36	233	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	593	602	244	575	578	250	247	0	0	277	0	0
Stage 1	313	313	-	259	259	-	-	-	-	-	-	-
Stage 2	280	289	-	316	319	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.24	6.64	6.34	4.17	-	-	4.14	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.626	4.126	3.426	2.263	-	-	2.236	-	-
Pot Cap-1 Maneuver	420	416	800	412	411	760	1290	-	-	1274	-	-
Stage 1	702	661	-	720	672	-	-	-	-	-	-	-
Stage 2	731	677	-	670	632	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	383	398	796	395	393	757	1287	-	-	1272	-	-
Mov Cap-2 Maneuver	383	398	-	395	393	-	-	-	-	-	-	-
Stage 1	696	638	-	714	666	-	-	-	-	-	-	-
Stage 2	685	671	-	642	610	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.1	13.9	0.2	1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	517	500	1272	-	-
HCM Lane V/C Ratio	0.005	-	-	0.022	0.191	0.028	-	-
HCM Control Delay (s)	7.8	0	-	12.1	13.9	7.9	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.7	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	26	770	15	15	715	49	10	65	25	64	70	36
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1792	1900	1900	1827	1900
Adj Flow Rate, veh/h	27	786	15	15	730	50	10	66	26	65	71	37
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	4	4	4	4	4	4	6	6	6	4	4	4
Cap, veh/h	91	2373	45	65	2310	156	70	273	99	165	160	88
Arrive On Green	0.73	0.73	0.73	0.73	0.73	0.73	0.12	0.12	0.12	0.12	0.12	0.12
Sat Flow, veh/h	60	3256	61	25	3169	215	141	2255	819	738	1317	724
Grp Volume(v), veh/h	424	0	404	416	0	379	55	0	47	95	0	78
Grp Sat Flow(s),veh/h/ln	1725	0	1652	1784	0	1624	1729	0	1487	1243	0	1535
Q Serve(g_s), s	0.0	0.0	7.0	0.0	0.0	6.6	0.0	0.0	2.3	4.0	0.0	3.8
Cycle Q Clear(g_c), s	6.6	0.0	7.0	6.4	0.0	6.6	2.2	0.0	2.3	6.3	0.0	3.8
Prop In Lane	0.06		0.04	0.04		0.13	0.18		0.55	0.69		0.47
Lane Grp Cap(c), veh/h	1305	0	1204	1347	0	1184	263	0	180	227	0	186
V/C Ratio(X)	0.32	0.00	0.34	0.31	0.00	0.32	0.21	0.00	0.26	0.42	0.00	0.42
Avail Cap(c_a), veh/h	1305	0	1204	1347	0	1184	600	0	483	513	0	499
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.94	0.00	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	3.8	0.0	3.9	3.8	0.0	3.8	31.9	0.0	31.9	33.9	0.0	32.6
Incr Delay (d2), s/veh	0.7	0.0	0.8	0.6	0.0	0.7	0.4	0.0	0.8	1.2	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.4	0.0	3.4	3.3	0.0	3.1	1.1	0.0	1.0	2.1	0.0	1.7
LnGrp Delay(d),s/veh	4.5	0.0	4.6	4.4	0.0	4.5	32.3	0.0	32.7	35.1	0.0	34.1
LnGrp LOS	A		A	A		A	C		C	D		C
Approach Vol, veh/h		828			795			102			173	
Approach Delay, s/veh		4.6			4.4			32.5			34.7	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		64.3		15.7		64.3		15.7
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		42.0		26.0		42.0		26.0
Max Q Clear Time (g_c+I1), s		9.0		8.3		8.6		4.3
Green Ext Time (p_c), s		14.0		1.4		14.1		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	8.8
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	658	336	335	609	0	0	0	0	310	0	285
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1827	1827	0				1900	1810	1810
Adj Flow Rate, veh/h	0	700	0	356	648	0				330	0	303
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	4	4	0				5	5	5
Cap, veh/h	0	1067	477	675	2299	0				394	0	352
Arrive On Green	0.00	0.30	0.00	0.61	1.00	0.00				0.23	0.00	0.23
Sat Flow, veh/h	0	3597	1568	1740	3563	0				1723	0	1538
Grp Volume(v), veh/h	0	700	0	356	648	0				330	0	303
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1740	1736	0				1723	0	1538
Q Serve(g_s), s	0.0	19.1	0.0	0.0	0.0	0.0				20.1	0.0	20.8
Cycle Q Clear(g_c), s	0.0	19.1	0.0	0.0	0.0	0.0				20.1	0.0	20.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1067	477	675	2299	0				394	0	352
V/C Ratio(X)	0.00	0.66	0.00	0.53	0.28	0.00				0.84	0.00	0.86
Avail Cap(c_a), veh/h	0	1067	477	675	2299	0				517	0	461
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.94	0.00	0.70	0.70	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	33.2	0.0	13.7	0.0	0.0				40.5	0.0	40.7
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.4	0.2	0.0				9.0	0.0	12.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	9.5	0.0	4.3	0.1	0.0				10.5	0.0	10.0
LnGrp Delay(d),s/veh	0.0	34.8	0.0	14.1	0.2	0.0				49.5	0.0	53.0
LnGrp LOS		C		B	A					D		D
Approach Vol, veh/h		700			1004						633	
Approach Delay, s/veh		34.8			5.1						51.2	
Approach LOS		C			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	39.3	39.5				78.8		31.2
Change Period (Y+Rc), s	6.0	* 6				6.0		6.0
Max Green Setting (Gmax), s	27.4	* 32				65.0		33.0
Max Q Clear Time (g_c+I1), s	2.0	21.1				2.0		22.8
Green Ext Time (p_c), s	7.3	4.6				8.4		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	26.5
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	290	563	90	10	628	235	261	280	320	15	60	50
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1900	1827	1827	1827	1810	1810	1810
Adj Flow Rate, veh/h	319	619	99	11	690	258	198	432	352	16	66	55
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	5	5	5
Cap, veh/h	381	2033	903	39	1004	372	380	797	333	92	97	81
Arrive On Green	0.12	0.59	0.59	0.42	0.42	0.42	0.22	0.22	0.22	0.05	0.05	0.05
Sat Flow, veh/h	1740	3471	1542	14	2401	890	1740	3654	1528	1723	1810	1521
Grp Volume(v), veh/h	319	619	99	524	0	435	198	432	352	16	66	55
Grp Sat Flow(s),veh/h/ln	1740	1736	1542	1805	0	1499	1740	1827	1528	1723	1810	1521
Q Serve(g_s), s	10.9	9.9	3.1	0.0	0.0	26.2	11.0	11.5	24.0	1.0	3.9	3.9
Cycle Q Clear(g_c), s	10.9	9.9	3.1	25.8	0.0	26.2	11.0	11.5	24.0	1.0	3.9	3.9
Prop In Lane	1.00		1.00	0.02		0.59	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	381	2033	903	788	0	627	380	797	333	92	97	81
V/C Ratio(X)	0.84	0.30	0.11	0.67	0.00	0.69	0.52	0.54	1.06	0.17	0.68	0.68
Avail Cap(c_a), veh/h	443	2033	903	788	0	627	380	797	333	103	109	91
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.64	0.64	0.64	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	11.5	10.1	26.1	0.0	26.2	37.9	38.1	43.0	49.7	51.1	51.1
Incr Delay (d2), s/veh	7.9	0.2	0.2	4.4	0.0	6.2	1.3	0.7	64.6	0.9	14.0	15.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.0	4.8	1.4	13.9	0.0	11.8	5.4	5.9	16.1	0.5	2.4	2.0
LnGrp Delay(d),s/veh	28.3	11.7	10.2	30.5	0.0	32.5	39.2	38.9	107.6	50.6	65.2	66.9
LnGrp LOS	C	B	B	C		C	D	D	F	D	E	E
Approach Vol, veh/h		1037			959			982			137	
Approach Delay, s/veh		16.7			31.4			63.6			64.2	
Approach LOS		B			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		69.9		11.0	18.4	51.5		29.1
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		63.7		6.6	17.3	41.3		24.0
Max Q Clear Time (g_c+I1), s		11.9		5.9	12.9	28.2		26.0
Green Ext Time (p_c), s		21.4		0.0	0.4	9.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	38.1
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	685	41	135	710	280	226	196	35	40	171	135
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1900	1863	1863	1863	1881	1881	1900
Adj Flow Rate, veh/h	36	714	43	141	740	292	235	204	36	42	178	141
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	1	1	1
Cap, veh/h	65	1017	61	177	894	353	318	634	282	269	292	218
Arrive On Green	0.04	0.29	0.29	0.10	0.36	0.36	0.18	0.18	0.18	0.15	0.15	0.15
Sat Flow, veh/h	1810	3459	208	1792	2503	988	1774	3539	1573	1792	1948	1451
Grp Volume(v), veh/h	36	372	385	141	528	504	235	204	36	42	162	157
Grp Sat Flow(s),veh/h/ln	1810	1805	1862	1792	1787	1704	1774	1770	1573	1792	1787	1611
Q Serve(g_s), s	1.4	13.2	13.2	5.5	19.4	19.4	9.0	3.6	1.4	1.5	6.1	6.6
Cycle Q Clear(g_c), s	1.4	13.2	13.2	5.5	19.4	19.4	9.0	3.6	1.4	1.5	6.1	6.6
Prop In Lane	1.00		0.11	1.00		0.58	1.00		1.00	1.00		0.90
Lane Grp Cap(c), veh/h	65	531	547	177	638	608	318	634	282	269	268	242
V/C Ratio(X)	0.56	0.70	0.70	0.80	0.83	0.83	0.74	0.32	0.13	0.16	0.61	0.65
Avail Cap(c_a), veh/h	126	577	595	199	646	616	518	1033	459	573	571	515
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	22.6	22.6	31.7	21.1	21.1	27.9	25.7	24.8	26.6	28.6	28.8
Incr Delay (d2), s/veh	7.3	3.5	3.4	18.1	8.7	9.1	3.4	0.3	0.2	0.3	2.2	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.8	7.0	7.2	3.6	11.1	10.6	4.7	1.8	0.6	0.7	3.2	3.1
LnGrp Delay(d),s/veh	41.5	26.0	26.0	49.8	29.8	30.2	31.3	26.0	25.0	26.9	30.8	31.7
LnGrp LOS	D	C	C	D	C	C	C	C	C	C	C	C
Approach Vol, veh/h		793			1173			475			361	
Approach Delay, s/veh		26.7			32.4			28.6			30.7	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.1	26.1		15.8	7.6	30.7		17.9
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	23.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	7.5	15.2		8.6	3.4	21.4		11.0
Green Ext Time (p_c), s	0.0	5.9		1.7	0.0	3.7		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	29.9
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	689	376	175	786	0	0	0	0	195	0	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.99	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3381	1435	1787	3574						1787	1599
Flt Permitted		1.00	1.00	0.22	1.00						0.95	1.00
Satd. Flow (perm)		3381	1435	413	3574						1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	749	409	190	854	0	0	0	0	212	0	339
RTOR Reduction (vph)	0	6	222	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	804	126	190	854	0	0	0	0	0	212	339
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		29.4	29.4	31.4	31.4						24.0	24.0
Effective Green, g (s)		29.4	29.4	31.4	31.4						24.0	24.0
Actuated g/C Ratio		0.36	0.36	0.39	0.39						0.30	0.30
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1224	519	383	1382						528	472
v/s Ratio Prot		c0.24		0.08	c0.24							
v/s Ratio Perm			0.09	0.11							0.12	c0.21
v/c Ratio		0.66	0.24	0.50	0.62						0.40	0.72
Uniform Delay, d1		21.7	18.1	18.5	20.1						22.9	25.6
Progression Factor		1.00	1.00	0.72	0.75						1.00	1.00
Incremental Delay, d2		1.4	0.3	1.6	0.9						1.0	6.4
Delay (s)		23.1	18.4	14.9	15.9						23.9	32.0
Level of Service		C	B	B	B						C	C
Approach Delay (s)		21.7			15.7			0.0			28.9	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	14.6
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	452	491	0	0	471	245	521	10	230	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1804	3610			4828		1692	1700	1577			
Flt Permitted	0.32	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	614	3610			4828		1692	1700	1577			
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	532	578	0	0	554	288	613	12	271	0	0	0
RTOR Reduction (vph)	0	0	0	0	104	0	0	0	0	0	0	0
Lane Group Flow (vph)	532	578	0	0	738	0	313	312	271	0	0	0
Confl. Peds. (#/hr)	4		5	5		4	4		2	2		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	29.8	29.4			31.4		24.0	24.0	24.0			
Effective Green, g (s)	29.8	29.4			31.4		24.0	24.0	24.0			
Actuated g/C Ratio	0.37	0.36			0.39		0.30	0.30	0.30			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	389	1307			1866		500	502	466			
v/s Ratio Prot	c0.19	0.16			c0.15							
v/s Ratio Perm	c0.31						c0.18	0.18	0.17			
v/c Ratio	1.37	0.44			0.40		0.63	0.62	0.58			
Uniform Delay, d1	25.1	19.7			18.0		24.7	24.7	24.3			
Progression Factor	0.67	0.65			1.00		1.00	1.00	1.00			
Incremental Delay, d2	179.6	0.3			0.2		3.4	3.4	2.9			
Delay (s)	196.3	13.1			18.2		28.2	28.1	27.2			
Level of Service	F	B			B		C	C	C			
Approach Delay (s)		100.9			18.2			27.8			0.0	
Approach LOS		F			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	53.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	14.6
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	10	50	5	42	5	265	65	32	265	10
Conflicting Peds, #/hr	5	0	5	1	0	1	5	0	1	1	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	2	2	2	2	2	2
Mvmt Flow	6	0	11	56	6	47	6	298	73	36	298	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	753	763	313	733	733	340	314	0	0	372	0	0
Stage 1	380	380	-	347	347	-	-	-	-	-	-	-
Stage 2	373	383	-	386	386	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	329	337	732	334	345	698	1246	-	-	1186	-	-
Stage 1	646	617	-	665	631	-	-	-	-	-	-	-
Stage 2	652	616	-	633	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	290	321	726	316	329	695	1241	-	-	1181	-	-
Mov Cap-2 Maneuver	290	321	-	316	329	-	-	-	-	-	-	-
Stage 1	639	592	-	660	627	-	-	-	-	-	-	-
Stage 2	596	612	-	598	582	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	16.7	0.1	0.8
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1241	-	-	484	415	1181	-	-
HCM Lane V/C Ratio	0.005	-	-	0.035	0.263	0.03	-	-
HCM Control Delay (s)	7.9	0	-	12.7	16.7	8.1	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	805	10	25	910	66	10	95	30	81	90	42
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1900	1881	1900	1900	1845	1900	1900	1863	1900
Adj Flow Rate, veh/h	28	839	10	26	948	69	10	99	31	84	94	44
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	2	2	2
Cap, veh/h	87	2322	27	75	2219	159	66	397	116	197	209	104
Arrive On Green	0.69	0.69	0.69	0.69	0.69	0.69	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	57	3355	39	40	3206	230	97	2512	733	757	1323	656
Grp Volume(v), veh/h	444	0	433	542	0	501	75	0	65	117	0	105
Grp Sat Flow(s),veh/h/ln	1746	0	1705	1806	0	1671	1796	0	1546	1171	0	1566
Q Serve(g_s), s	0.0	0.0	8.4	0.0	0.0	10.5	0.0	0.0	3.0	5.4	0.0	4.8
Cycle Q Clear(g_c), s	7.6	0.0	8.4	10.0	0.0	10.5	2.8	0.0	3.0	8.3	0.0	4.8
Prop In Lane	0.06		0.02	0.05		0.14	0.13		0.47	0.72		0.42
Lane Grp Cap(c), veh/h	1256	0	1180	1297	0	1156	335	0	244	262	0	247
V/C Ratio(X)	0.35	0.00	0.37	0.42	0.00	0.43	0.22	0.00	0.27	0.45	0.00	0.42
Avail Cap(c_a), veh/h	1256	0	1180	1297	0	1156	602	0	483	475	0	489
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.84	0.00	0.84	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.0	0.0	5.1	5.3	0.0	5.4	29.6	0.0	29.6	32.5	0.0	30.4
Incr Delay (d2), s/veh	0.8	0.0	0.9	0.8	0.0	1.0	0.3	0.0	0.6	1.2	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.2	0.0	4.1	5.4	0.0	5.0	1.5	0.0	1.3	2.5	0.0	2.2
LnGrp Delay(d),s/veh	5.8	0.0	6.0	6.2	0.0	6.4	29.9	0.0	30.2	33.6	0.0	31.5
LnGrp LOS	A		A	A		A	C		C	C		C
Approach Vol, veh/h		877			1043			140			222	
Approach Delay, s/veh		5.9			6.3			30.0			32.7	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		61.4		18.6		61.4		18.6
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		43.0		25.0		43.0		25.0
Max Q Clear Time (g_c+I1), s		10.4		10.3		12.5		5.0
Green Ext Time (p_c), s		2.5		1.8		2.5		2.1

Intersection Summary	
HCM 2010 Ctrl Delay	10.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	747	274	380	746	0	0	0	0	460	0	395
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1881	1881	1881	1881	0				1900	1881	1881
Adj Flow Rate, veh/h	0	770	0	392	769	0				474	0	407
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97				0.97	0.97	0.97
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	1043	467	444	1887	0				483	0	431
Arrive On Green	0.00	0.29	0.00	0.14	0.53	0.00				0.27	0.00	0.27
Sat Flow, veh/h	0	3668	1599	1792	3668	0				1792	0	1599
Grp Volume(v), veh/h	0	770	0	392	769	0				474	0	407
Grp Sat Flow(s),veh/h/ln	0	1787	1599	1792	1787	0				1792	0	1599
Q Serve(g_s), s	0.0	11.5	0.0	8.4	7.7	0.0				15.6	0.0	14.8
Cycle Q Clear(g_c), s	0.0	11.5	0.0	8.4	7.7	0.0				15.6	0.0	14.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1043	467	444	1887	0				483	0	431
V/C Ratio(X)	0.00	0.74	0.00	0.88	0.41	0.00				0.98	0.00	0.94
Avail Cap(c_a), veh/h	0	1085	485	444	1929	0				483	0	431
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	19.0	0.0	13.9	8.4	0.0				21.5	0.0	21.2
Incr Delay (d2), s/veh	0.0	2.8	0.0	18.4	0.2	0.0				35.8	0.0	29.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	6.1	0.0	4.5	3.8	0.0				12.4	0.0	10.0
LnGrp Delay(d),s/veh	0.0	21.8	0.0	32.3	8.6	0.0				57.3	0.0	50.6
LnGrp LOS		C		C	A					E		D
Approach Vol, veh/h		770			1161						881	
Approach Delay, s/veh		21.8			16.6						54.2	
Approach LOS		C			B						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	14.0	23.3				37.3		22.0
Change Period (Y+Rc), s	5.6	6.0				6.0		6.0
Max Green Setting (Gmax), s	8.4	18.0				32.0		16.0
Max Q Clear Time (g_c+I1), s	10.4	13.5				9.7		17.6
Green Ext Time (p_c), s	0.0	3.8				14.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	385	712	120	5	727	345	289	475	330	15	45	75
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1900	1881	1900	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h	401	742	125	5	757	359	265	545	344	16	47	78
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	2	2	2
Cap, veh/h	426	2223	991	30	942	444	378	794	335	81	85	70
Arrive On Green	0.17	0.62	0.62	0.41	0.41	0.41	0.21	0.21	0.21	0.05	0.05	0.05
Sat Flow, veh/h	1792	3574	1593	4	2301	1084	1792	3762	1590	1774	1863	1542
Grp Volume(v), veh/h	401	742	125	619	0	502	265	545	344	16	47	78
Grp Sat Flow(s),veh/h/ln	1792	1787	1593	1874	0	1516	1792	1881	1590	1774	1863	1542
Q Serve(g_s), s	20.1	12.8	4.2	0.0	0.0	37.8	17.7	17.3	27.3	1.1	3.2	5.9
Cycle Q Clear(g_c), s	20.1	12.8	4.2	37.5	0.0	37.8	17.7	17.3	27.3	1.1	3.2	5.9
Prop In Lane	1.00		1.00	0.01		0.72	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	426	2223	991	795	0	620	378	794	335	81	85	70
V/C Ratio(X)	0.94	0.33	0.13	0.78	0.00	0.81	0.70	0.69	1.03	0.20	0.55	1.11
Avail Cap(c_a), veh/h	449	2378	1060	851	0	667	378	794	335	81	85	70
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.6	11.7	10.0	33.6	0.0	33.8	47.3	47.1	51.0	59.5	60.5	61.7
Incr Delay (d2), s/veh	27.8	0.1	0.1	4.6	0.0	7.2	5.7	2.5	55.8	1.2	7.6	140.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
%ile BackOfQ(-26165%),veh/ln	17.3	6.3	1.8	20.4	0.0	17.0	9.4	9.3	17.1	0.6	1.8	5.3
LnGrp Delay(d),s/veh	61.4	11.8	10.1	38.2	0.0	41.0	53.0	49.6	106.9	60.6	68.0	202.6
LnGrp LOS	E	B	B	D		D	D	D	F	E	E	F
Approach Vol, veh/h		1268			1121			1154			141	
Approach Delay, s/veh		27.3			39.4			67.4			141.6	
Approach LOS		C			D			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		86.0		11.0	27.5	58.5		32.4
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		86.1		5.9	24.1	56.9		27.3
Max Q Clear Time (g_c+I1), s		14.8		7.9	22.1	39.8		29.3
Green Ext Time (p_c), s		32.0		0.0	0.3	13.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	47.9
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	640	40	103	550	165	45	163	118	205	158	35
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1900	1845	1845	1900	1810	1810	1810	1863	1863	1900
Adj Flow Rate, veh/h	32	688	43	111	591	177	48	175	127	220	170	38
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	2	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	4	4	4	3	3	3	5	5	5	2	2	2
Cap, veh/h	59	988	62	142	918	274	236	471	209	315	512	112
Arrive On Green	0.03	0.30	0.30	0.08	0.35	0.35	0.14	0.14	0.14	0.18	0.18	0.18
Sat Flow, veh/h	1740	3317	207	1757	2660	795	1723	3438	1525	1774	2886	630
Grp Volume(v), veh/h	32	360	371	111	389	379	48	175	127	220	103	105
Grp Sat Flow(s),veh/h/ln	1740	1736	1789	1757	1752	1702	1723	1719	1525	1774	1770	1747
Q Serve(g_s), s	1.2	12.0	12.0	4.0	12.2	12.2	1.6	3.0	5.1	7.6	3.3	3.4
Cycle Q Clear(g_c), s	1.2	12.0	12.0	4.0	12.2	12.2	1.6	3.0	5.1	7.6	3.3	3.4
Prop In Lane	1.00		0.12	1.00		0.47	1.00		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	59	517	533	142	605	588	236	471	209	315	314	310
V/C Ratio(X)	0.55	0.70	0.70	0.78	0.64	0.65	0.20	0.37	0.61	0.70	0.33	0.34
Avail Cap(c_a), veh/h	133	586	604	243	699	679	555	1107	491	626	624	616
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.0	20.3	20.3	29.4	18.0	18.0	25.0	25.6	26.5	25.2	23.4	23.5
Incr Delay (d2), s/veh	7.7	3.1	3.0	8.9	1.6	1.7	0.4	0.5	2.8	2.8	0.6	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.7	6.1	6.3	2.3	6.1	6.0	0.8	1.5	2.3	4.0	1.6	1.7
LnGrp Delay(d),s/veh	38.7	23.3	23.3	38.2	19.6	19.7	25.4	26.1	29.3	28.0	24.0	24.1
LnGrp LOS	D	C	C	D	B	B	C	C	C	C	C	C
Approach Vol, veh/h		763			879			350			428	
Approach Delay, s/veh		24.0			22.0			27.2			26.1	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	10.3	24.4		16.6	7.2	27.5		13.9
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	9.0	22.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	6.0	14.0		9.6	3.2	14.2		7.1
Green Ext Time (p_c), s	0.1	5.3		1.5	0.0	7.1		1.4

Intersection Summary	
HCM 2010 Ctrl Delay	24.1
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	595	383	140	580	0	0	0	0	120	0	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.98	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3287	1409	1735	3471						1736	1553
Flt Permitted		1.00	1.00	0.24	1.00						0.95	1.00
Satd. Flow (perm)		3287	1409	445	3471						1736	1553
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	626	403	147	611	0	0	0	0	126	0	298
RTOR Reduction (vph)	0	11	186	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	708	124	147	611	0	0	0	0	0	126	298
Confl. Peds. (#/hr)	2		1	1		2						
Heavy Vehicles (%)	3%	3%	3%	4%	4%	4%	0%	0%	0%	4%	4%	4%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		30.7	30.7	33.6	23.8						21.8	21.8
Effective Green, g (s)		30.7	30.7	33.6	23.8						21.8	21.8
Actuated g/C Ratio		0.40	0.40	0.44	0.31						0.28	0.28
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1312	562	358	1074						492	440
v/s Ratio Prot		c0.22		c0.05	0.18							
v/s Ratio Perm			0.09	0.13							0.07	c0.19
v/c Ratio		0.54	0.22	0.41	0.57						0.26	0.68
Uniform Delay, d1		17.7	15.2	21.9	22.3						21.3	24.4
Progression Factor		1.00	1.00	1.48	0.68						1.00	1.00
Incremental Delay, d2		0.5	0.3	1.3	0.8						0.6	5.3
Delay (s)		18.2	15.5	33.7	15.9						21.9	29.8
Level of Service		B	B	C	B						C	C
Approach Delay (s)		17.4			19.4			0.0			27.4	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	14.6
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	383	358	0	0	323	135	388	5	170	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.96		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1735	3471			4692		1649	1655	1533			
Flt Permitted	0.44	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	811	3471			4692		1649	1655	1533			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	416	389	0	0	351	147	422	5	185	0	0	0
RTOR Reduction (vph)	0	0	0	0	87	0	0	0	0	0	0	0
Lane Group Flow (vph)	416	389	0	0	411	0	215	212	185	0	0	0
Confl. Peds. (#/hr)	1					1			1	1		
Heavy Vehicles (%)	4%	4%	4%	5%	5%	5%	4%	4%	4%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	45.5	30.7			23.8		21.8	21.8	21.8			
Effective Green, g (s)	45.5	30.7			23.8		21.8	21.8	21.8			
Actuated g/C Ratio	0.59	0.40			0.31		0.28	0.28	0.28			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	680	1385			1452		467	469	434			
v/s Ratio Prot	c0.13	0.11			0.09							
v/s Ratio Perm	c0.23						c0.13	0.13	0.12			
v/c Ratio	0.61	0.28			0.28		0.46	0.45	0.43			
Uniform Delay, d1	12.9	15.6			20.1		22.7	22.6	22.5			
Progression Factor	0.65	0.42			1.00		1.00	1.00	1.00			
Incremental Delay, d2	1.6	0.1			0.1		1.5	1.4	1.4			
Delay (s)	10.0	6.7			20.2		24.2	24.1	23.9			
Level of Service	A	A			C		C	C	C			
Approach Delay (s)		8.4			20.2			24.1			0.0	
Approach LOS		A			C			C			A	

Intersection Summary			
HCM 2000 Control Delay	16.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	76.9	Sum of lost time (s)	14.6
Intersection Capacity Utilization	54.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	5	55	0	46	5	185	60	41	200	10
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	0	0	0	14	14	14	7	7	7	4	4	4
Mvmt Flow	6	0	6	64	0	53	6	215	70	48	233	12

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	628	637	244	605	608	255	247	0	0	288	0	0
Stage 1	337	337	-	265	265	-	-	-	-	-	-	-
Stage 2	291	300	-	340	343	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.24	6.64	6.34	4.17	-	-	4.14	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.24	5.64	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.626	4.126	3.426	2.263	-	-	2.236	-	-
Pot Cap-1 Maneuver	398	398	800	393	395	755	1290	-	-	1263	-	-
Stage 1	681	645	-	715	668	-	-	-	-	-	-	-
Stage 2	721	669	-	650	617	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	354	376	796	373	373	752	1287	-	-	1261	-	-
Mov Cap-2 Maneuver	354	376	-	373	373	-	-	-	-	-	-	-
Stage 1	675	615	-	709	662	-	-	-	-	-	-	-
Stage 2	665	663	-	615	588	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.5	14.8	0.2	1.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	490	484	1261	-	-
HCM Lane V/C Ratio	0.005	-	-	0.024	0.243	0.038	-	-
HCM Control Delay (s)	7.8	0	-	12.5	14.8	8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.9	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	770	15	15	715	55	10	65	25	70	70	40
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1792	1900	1900	1827	1900
Adj Flow Rate, veh/h	31	786	15	15	730	56	10	66	26	71	71	41
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	4	4	4	4	4	4	6	6	6	4	4	4
Cap, veh/h	101	2328	44	64	2272	172	71	287	104	175	157	96
Arrive On Green	0.72	0.72	0.72	0.72	0.72	0.72	0.13	0.13	0.13	0.13	0.13	0.13
Sat Flow, veh/h	73	3221	61	24	3143	238	138	2260	818	769	1233	754
Grp Volume(v), veh/h	423	0	409	420	0	381	55	0	47	100	0	83
Grp Sat Flow(s),veh/h/ln	1702	0	1652	1785	0	1620	1729	0	1487	1227	0	1529
Q Serve(g_s), s	0.0	0.0	7.3	0.0	0.0	6.8	0.0	0.0	2.3	4.4	0.0	4.0
Cycle Q Clear(g_c), s	6.7	0.0	7.3	6.6	0.0	6.8	2.2	0.0	2.3	6.7	0.0	4.0
Prop In Lane	0.07		0.04	0.04		0.15	0.18		0.55	0.71		0.49
Lane Grp Cap(c), veh/h	1279	0	1194	1337	0	1171	273	0	189	233	0	194
V/C Ratio(X)	0.33	0.00	0.34	0.31	0.00	0.33	0.20	0.00	0.25	0.43	0.00	0.43
Avail Cap(c_a), veh/h	1279	0	1194	1337	0	1171	600	0	483	509	0	497
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.94	0.00	0.94	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	4.0	0.0	4.1	4.0	0.0	4.0	31.4	0.0	31.5	33.7	0.0	32.2
Incr Delay (d2), s/veh	0.7	0.0	0.8	0.6	0.0	0.7	0.4	0.0	0.7	1.2	0.0	1.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	3.5	0.0	3.6	3.5	0.0	3.2	1.1	0.0	1.0	2.2	0.0	1.8
LnGrp Delay(d),s/veh	4.7	0.0	4.9	4.6	0.0	4.7	31.8	0.0	32.2	35.0	0.0	33.7
LnGrp LOS	A		A	A		A	C		C	C		C
Approach Vol, veh/h		832			801			102			183	
Approach Delay, s/veh		4.8			4.6			32.0			34.4	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		63.8		16.2		63.8		16.2
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		42.0		26.0		42.0		26.0
Max Q Clear Time (g_c+I1), s		9.3		8.7		8.8		4.3
Green Ext Time (p_c), s		14.1		1.5		14.2		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	9.0
HCM 2010 LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	660	340	335	615	0	0	0	0	310	0	285
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1845	1845	1827	1827	0				1900	1810	1810
Adj Flow Rate, veh/h	0	702	0	356	654	0				330	0	303
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94				0.94	0.94	0.94
Percent Heavy Veh, %	0	3	3	4	4	0				5	5	5
Cap, veh/h	0	1069	478	674	2299	0				394	0	352
Arrive On Green	0.00	0.31	0.00	0.61	1.00	0.00				0.23	0.00	0.23
Sat Flow, veh/h	0	3597	1568	1740	3563	0				1723	0	1538
Grp Volume(v), veh/h	0	702	0	356	654	0				330	0	303
Grp Sat Flow(s),veh/h/ln	0	1752	1568	1740	1736	0				1723	0	1538
Q Serve(g_s), s	0.0	19.1	0.0	0.0	0.0	0.0				20.1	0.0	20.8
Cycle Q Clear(g_c), s	0.0	19.1	0.0	0.0	0.0	0.0				20.1	0.0	20.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1069	478	674	2299	0				394	0	352
V/C Ratio(X)	0.00	0.66	0.00	0.53	0.28	0.00				0.84	0.00	0.86
Avail Cap(c_a), veh/h	0	1069	478	674	2299	0				517	0	461
HCM Platoon Ratio	1.00	1.00	1.00	2.00	2.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	0.93	0.00	0.70	0.70	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	33.2	0.0	13.7	0.0	0.0				40.5	0.0	40.7
Incr Delay (d2), s/veh	0.0	1.6	0.0	0.4	0.2	0.0				9.0	0.0	12.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	9.5	0.0	4.3	0.1	0.0				10.5	0.0	10.0
LnGrp Delay(d),s/veh	0.0	34.8	0.0	14.1	0.2	0.0				49.5	0.0	53.0
LnGrp LOS		C		B	A					D		D
Approach Vol, veh/h		702			1010						633	
Approach Delay, s/veh		34.8			5.1						51.2	
Approach LOS		C			A						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	39.3	39.6				78.8		31.2
Change Period (Y+Rc), s	6.0	* 6				6.0		6.0
Max Green Setting (Gmax), s	27.4	* 32				65.0		33.0
Max Q Clear Time (g_c+I1), s	2.0	21.1				2.0		22.8
Green Ext Time (p_c), s	7.3	4.6				8.5		2.3

Intersection Summary	
HCM 2010 Ctrl Delay	26.4
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	290	565	90	10	630	235	265	280	320	15	60	50
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.98	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1827	1827	1827	1900	1827	1900	1827	1827	1827	1810	1810	1810
Adj Flow Rate, veh/h	319	621	99	11	692	258	200	436	352	16	66	55
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	5	5	5
Cap, veh/h	380	2033	903	39	1005	371	380	797	333	92	97	81
Arrive On Green	0.12	0.59	0.59	0.42	0.42	0.42	0.22	0.22	0.22	0.05	0.05	0.05
Sat Flow, veh/h	1740	3471	1542	14	2403	888	1740	3654	1528	1723	1810	1521
Grp Volume(v), veh/h	319	621	99	525	0	436	200	436	352	16	66	55
Grp Sat Flow(s),veh/h/ln	1740	1736	1542	1805	0	1500	1740	1827	1528	1723	1810	1521
Q Serve(g_s), s	10.9	9.9	3.1	0.0	0.0	26.2	11.2	11.7	24.0	1.0	3.9	3.9
Cycle Q Clear(g_c), s	10.9	9.9	3.1	25.8	0.0	26.2	11.2	11.7	24.0	1.0	3.9	3.9
Prop In Lane	1.00		1.00	0.02		0.59	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	380	2033	903	788	0	627	380	797	333	92	97	81
V/C Ratio(X)	0.84	0.31	0.11	0.67	0.00	0.70	0.53	0.55	1.06	0.17	0.68	0.68
Avail Cap(c_a), veh/h	443	2033	903	788	0	627	380	797	333	103	109	91
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.63	0.63	0.63	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.4	11.5	10.1	26.1	0.0	26.3	38.0	38.2	43.0	49.7	51.1	51.1
Incr Delay (d2), s/veh	7.9	0.2	0.2	4.4	0.0	6.3	1.4	0.8	64.6	0.9	14.0	15.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	6.0	4.8	1.4	14.0	0.0	11.9	5.5	6.0	16.1	0.5	2.4	2.0
LnGrp Delay(d),s/veh	28.4	11.7	10.2	30.6	0.0	32.5	39.3	39.0	107.6	50.6	65.2	66.9
LnGrp LOS	C	B	B	C		C	D	D	F	D	E	E
Approach Vol, veh/h		1039			961			988			137	
Approach Delay, s/veh		16.7			31.5			63.5			64.2	
Approach LOS		B			C			E			E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		69.9		11.0	18.4	51.5		29.1
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		63.7		6.6	17.3	41.3		24.0
Max Q Clear Time (g_c+I1), s		11.9		5.9	12.9	28.2		26.0
Green Ext Time (p_c), s		21.5		0.0	0.4	9.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	38.1
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	685	41	135	710	280	226	196	35	40	171	135
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1900	1900	1881	1881	1900	1863	1863	1863	1881	1881	1900
Adj Flow Rate, veh/h	36	714	43	141	740	292	235	204	36	42	178	141
Adj No. of Lanes	1	2	0	1	2	0	1	2	1	1	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	0	0	1	1	1	2	2	2	1	1	1
Cap, veh/h	65	1017	61	177	894	353	318	634	282	269	292	218
Arrive On Green	0.04	0.29	0.29	0.10	0.36	0.36	0.18	0.18	0.18	0.15	0.15	0.15
Sat Flow, veh/h	1810	3459	208	1792	2503	988	1774	3539	1573	1792	1948	1451
Grp Volume(v), veh/h	36	372	385	141	528	504	235	204	36	42	162	157
Grp Sat Flow(s),veh/h/ln	1810	1805	1862	1792	1787	1704	1774	1770	1573	1792	1787	1611
Q Serve(g_s), s	1.4	13.2	13.2	5.5	19.4	19.4	9.0	3.6	1.4	1.5	6.1	6.6
Cycle Q Clear(g_c), s	1.4	13.2	13.2	5.5	19.4	19.4	9.0	3.6	1.4	1.5	6.1	6.6
Prop In Lane	1.00		0.11	1.00		0.58	1.00		1.00	1.00		0.90
Lane Grp Cap(c), veh/h	65	531	547	177	638	608	318	634	282	269	268	242
V/C Ratio(X)	0.56	0.70	0.70	0.80	0.83	0.83	0.74	0.32	0.13	0.16	0.61	0.65
Avail Cap(c_a), veh/h	126	577	595	199	646	616	518	1033	459	573	571	515
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	34.1	22.6	22.6	31.7	21.1	21.1	27.9	25.7	24.8	26.6	28.6	28.8
Incr Delay (d2), s/veh	7.3	3.5	3.4	18.1	8.7	9.1	3.4	0.3	0.2	0.3	2.2	2.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.8	7.0	7.2	3.6	11.1	10.6	4.7	1.8	0.6	0.7	3.2	3.1
LnGrp Delay(d),s/veh	41.5	26.0	26.0	49.8	29.8	30.2	31.3	26.0	25.0	26.9	30.8	31.7
LnGrp LOS	D	C	C	D	C	C	C	C	C	C	C	C
Approach Vol, veh/h		793			1173			475			361	
Approach Delay, s/veh		26.7			32.4			28.6			30.7	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4	5	6		8
Phs Duration (G+Y+Rc), s	12.1	26.1		15.8	7.6	30.7		17.9
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0
Max Green Setting (Gmax), s	8.0	23.0		23.0	5.0	26.0		21.0
Max Q Clear Time (g_c+I1), s	7.5	15.2		8.6	3.4	21.4		11.0
Green Ext Time (p_c), s	0.0	5.9		1.7	0.0	3.7		1.5

Intersection Summary	
HCM 2010 Ctrl Delay	29.9
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	689	376	175	786	0	0	0	0	195	0	312
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Lane Util. Factor		0.91	0.91	1.00	0.95						1.00	1.00
Frpb, ped/bikes		1.00	0.99	1.00	1.00						1.00	1.00
Flpb, ped/bikes		1.00	1.00	1.00	1.00						1.00	1.00
Frt		0.99	0.85	1.00	1.00						1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00						0.95	1.00
Satd. Flow (prot)		3381	1435	1787	3574						1787	1599
Flt Permitted		1.00	1.00	0.22	1.00						0.95	1.00
Satd. Flow (perm)		3381	1435	413	3574						1787	1599
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	749	409	190	854	0	0	0	0	212	0	339
RTOR Reduction (vph)	0	6	222	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	804	126	190	854	0	0	0	0	0	212	339
Confl. Peds. (#/hr)	5		2	2		5						
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	0%	0%	0%	1%	1%	1%
Turn Type		NA	Perm	pm+pt	NA					Perm	NA	Perm
Protected Phases		2		1	6						4	
Permitted Phases			2	6						4		4
Actuated Green, G (s)		29.4	29.4	31.4	31.4						24.0	24.0
Effective Green, g (s)		29.4	29.4	31.4	31.4						24.0	24.0
Actuated g/C Ratio		0.36	0.36	0.39	0.39						0.30	0.30
Clearance Time (s)		5.0	5.0	4.6	5.0						5.0	5.0
Vehicle Extension (s)		4.0	4.0	4.5	4.0						5.0	5.0
Lane Grp Cap (vph)		1224	519	383	1382						528	472
v/s Ratio Prot		c0.24		0.08	c0.24							
v/s Ratio Perm			0.09	0.11							0.12	c0.21
v/c Ratio		0.66	0.24	0.50	0.62						0.40	0.72
Uniform Delay, d1		21.7	18.1	18.5	20.1						22.9	25.6
Progression Factor		1.00	1.00	0.72	0.75						1.00	1.00
Incremental Delay, d2		1.4	0.3	1.6	0.9						1.0	6.4
Delay (s)		23.1	18.4	14.9	15.9						23.9	32.0
Level of Service		C	B	B	B						C	C
Approach Delay (s)		21.7			15.7			0.0			28.9	
Approach LOS		C			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	14.6
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	452	491	0	0	471	245	521	10	230	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor	1.00	0.95			0.91		0.95	0.95	1.00			
Frpb, ped/bikes	1.00	1.00			0.99		1.00	1.00	0.99			
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00	1.00			
Frt	1.00	1.00			0.95		1.00	1.00	0.85			
Flt Protected	0.95	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (prot)	1804	3610			4828		1692	1700	1577			
Flt Permitted	0.32	1.00			1.00		0.95	0.95	1.00			
Satd. Flow (perm)	614	3610			4828		1692	1700	1577			
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	532	578	0	0	554	288	613	12	271	0	0	0
RTOR Reduction (vph)	0	0	0	0	104	0	0	0	0	0	0	0
Lane Group Flow (vph)	532	578	0	0	738	0	313	312	271	0	0	0
Confl. Peds. (#/hr)	4		5	5		4	4		2	2		4
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	0%	0%	0%
Turn Type	pm+pt	NA			NA		Perm	NA	Perm			
Protected Phases	5	2			6			8				
Permitted Phases	2						8		8			
Actuated Green, G (s)	29.8	29.4			31.4		24.0	24.0	24.0			
Effective Green, g (s)	29.8	29.4			31.4		24.0	24.0	24.0			
Actuated g/C Ratio	0.37	0.36			0.39		0.30	0.30	0.30			
Clearance Time (s)	4.6	5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)	3.5	4.0			4.0		5.0	5.0	5.0			
Lane Grp Cap (vph)	389	1307			1866		500	502	466			
v/s Ratio Prot	c0.19	0.16			c0.15							
v/s Ratio Perm	c0.31						c0.18	0.18	0.17			
v/c Ratio	1.37	0.44			0.40		0.63	0.62	0.58			
Uniform Delay, d1	25.1	19.7			18.0		24.7	24.7	24.3			
Progression Factor	0.67	0.65			1.00		1.00	1.00	1.00			
Incremental Delay, d2	179.6	0.3			0.2		3.4	3.4	2.9			
Delay (s)	196.3	13.1			18.2		28.2	28.1	27.2			
Level of Service	F	B			B		C	C	C			
Approach Delay (s)		100.9			18.2			27.8			0.0	
Approach LOS		F			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	53.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	81.2	Sum of lost time (s)	14.6
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	10	50	5	42	5	265	65	32	265	10
Conflicting Peds, #/hr	5	0	5	1	0	1	5	0	1	1	0	5
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	89	89	89	89	89	89	89	89	89
Heavy Vehicles, %	0	0	0	4	4	4	2	2	2	2	2	2
Mvmt Flow	6	0	11	56	6	47	6	298	73	36	298	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	753	763	313	733	733	340	314	0	0	372	0	0
Stage 1	380	380	-	347	347	-	-	-	-	-	-	-
Stage 2	373	383	-	386	386	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.14	6.54	6.24	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.14	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.536	4.036	3.336	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	329	337	732	334	345	698	1246	-	-	1186	-	-
Stage 1	646	617	-	665	631	-	-	-	-	-	-	-
Stage 2	652	616	-	633	607	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	290	321	726	316	329	695	1241	-	-	1181	-	-
Mov Cap-2 Maneuver	290	321	-	316	329	-	-	-	-	-	-	-
Stage 1	639	592	-	660	627	-	-	-	-	-	-	-
Stage 2	596	612	-	598	582	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	16.7	0.1	0.8
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1241	-	-	484	415	1181	-	-
HCM Lane V/C Ratio	0.005	-	-	0.035	0.263	0.03	-	-
HCM Control Delay (s)	7.9	0	-	12.7	16.7	8.1	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	1	0.1	-	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	27	805	10	25	910	66	10	95	30	81	90	42
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1881	1900	1900	1881	1900	1900	1845	1900	1900	1863	1900
Adj Flow Rate, veh/h	28	839	10	26	948	69	10	99	31	84	94	44
Adj No. of Lanes	0	2	0	0	2	0	0	2	0	0	2	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	3	3	3	2	2	2
Cap, veh/h	87	2322	27	75	2219	159	66	397	116	197	209	104
Arrive On Green	0.69	0.69	0.69	0.69	0.69	0.69	0.16	0.16	0.16	0.16	0.16	0.16
Sat Flow, veh/h	57	3355	39	40	3206	230	97	2512	733	757	1323	656
Grp Volume(v), veh/h	444	0	433	542	0	501	75	0	65	117	0	105
Grp Sat Flow(s),veh/h/ln	1746	0	1705	1806	0	1671	1796	0	1546	1171	0	1566
Q Serve(g_s), s	0.0	0.0	8.4	0.0	0.0	10.5	0.0	0.0	3.0	5.4	0.0	4.8
Cycle Q Clear(g_c), s	7.6	0.0	8.4	10.0	0.0	10.5	2.8	0.0	3.0	8.3	0.0	4.8
Prop In Lane	0.06		0.02	0.05		0.14	0.13		0.47	0.72		0.42
Lane Grp Cap(c), veh/h	1256	0	1180	1297	0	1156	335	0	244	262	0	247
V/C Ratio(X)	0.35	0.00	0.37	0.42	0.00	0.43	0.22	0.00	0.27	0.45	0.00	0.42
Avail Cap(c_a), veh/h	1256	0	1180	1297	0	1156	602	0	483	475	0	489
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.84	0.00	0.84	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	5.0	0.0	5.1	5.3	0.0	5.4	29.6	0.0	29.6	32.5	0.0	30.4
Incr Delay (d2), s/veh	0.8	0.0	0.9	0.8	0.0	1.0	0.3	0.0	0.6	1.2	0.0	1.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	4.2	0.0	4.1	5.4	0.0	5.0	1.5	0.0	1.3	2.5	0.0	2.2
LnGrp Delay(d),s/veh	5.8	0.0	6.0	6.2	0.0	6.4	29.9	0.0	30.2	33.6	0.0	31.5
LnGrp LOS	A		A	A		A	C		C	C		C
Approach Vol, veh/h		877			1043			140			222	
Approach Delay, s/veh		5.9			6.3			30.0			32.7	
Approach LOS		A			A			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		61.4		18.6		61.4		18.6
Change Period (Y+Rc), s		6.0		6.0		6.0		6.0
Max Green Setting (Gmax), s		43.0		25.0		43.0		25.0
Max Q Clear Time (g_c+I1), s		10.4		10.3		12.5		5.0
Green Ext Time (p_c), s		2.5		1.8		2.5		2.1

Intersection Summary	
HCM 2010 Ctrl Delay	10.1
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	747	274	380	746	0	0	0	0	460	0	395
Number	5	2	12	1	6	16				3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0				0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00				1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1881	1881	1881	1881	0				1900	1881	1881
Adj Flow Rate, veh/h	0	770	0	392	769	0				474	0	407
Adj No. of Lanes	0	2	1	1	2	0				0	1	1
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97				0.97	0.97	0.97
Percent Heavy Veh, %	0	1	1	1	1	0				1	1	1
Cap, veh/h	0	1043	467	444	1887	0				483	0	431
Arrive On Green	0.00	0.29	0.00	0.14	0.53	0.00				0.27	0.00	0.27
Sat Flow, veh/h	0	3668	1599	1792	3668	0				1792	0	1599
Grp Volume(v), veh/h	0	770	0	392	769	0				474	0	407
Grp Sat Flow(s),veh/h/ln	0	1787	1599	1792	1787	0				1792	0	1599
Q Serve(g_s), s	0.0	11.5	0.0	8.4	7.7	0.0				15.6	0.0	14.8
Cycle Q Clear(g_c), s	0.0	11.5	0.0	8.4	7.7	0.0				15.6	0.0	14.8
Prop In Lane	0.00		1.00	1.00		0.00				1.00		1.00
Lane Grp Cap(c), veh/h	0	1043	467	444	1887	0				483	0	431
V/C Ratio(X)	0.00	0.74	0.00	0.88	0.41	0.00				0.98	0.00	0.94
Avail Cap(c_a), veh/h	0	1085	485	444	1929	0				483	0	431
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	1.00
Upstream Filter(I)	0.00	1.00	0.00	1.00	1.00	0.00				1.00	0.00	1.00
Uniform Delay (d), s/veh	0.0	19.0	0.0	13.9	8.4	0.0				21.5	0.0	21.2
Incr Delay (d2), s/veh	0.0	2.8	0.0	18.4	0.2	0.0				35.8	0.0	29.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0				0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	0.0	6.1	0.0	4.5	3.8	0.0				12.4	0.0	10.0
LnGrp Delay(d),s/veh	0.0	21.8	0.0	32.3	8.6	0.0				57.3	0.0	50.6
LnGrp LOS		C		C	A					E		D
Approach Vol, veh/h		770			1161						881	
Approach Delay, s/veh		21.8			16.6						54.2	
Approach LOS		C			B						D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	14.0	23.3				37.3		22.0
Change Period (Y+Rc), s	5.6	6.0				6.0		6.0
Max Green Setting (Gmax), s	8.4	18.0				32.0		16.0
Max Q Clear Time (g_c+I1), s	10.4	13.5				9.7		17.6
Green Ext Time (p_c), s	0.0	3.8				14.8		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	29.8
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	385	712	120	5	727	345	289	475	330	15	45	75
Number	5	2	12	1	6	16	3	8	18	7	4	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1881	1881	1881	1900	1881	1900	1881	1881	1881	1863	1863	1863
Adj Flow Rate, veh/h	401	742	125	5	757	359	265	545	344	16	47	78
Adj No. of Lanes	1	2	1	0	2	0	1	2	1	1	1	1
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	1	1	1	1	1	1	1	1	1	2	2	2
Cap, veh/h	426	2223	991	30	942	444	378	794	335	81	85	70
Arrive On Green	0.17	0.62	0.62	0.41	0.41	0.41	0.21	0.21	0.21	0.05	0.05	0.05
Sat Flow, veh/h	1792	3574	1593	4	2301	1084	1792	3762	1590	1774	1863	1542
Grp Volume(v), veh/h	401	742	125	619	0	502	265	545	344	16	47	78
Grp Sat Flow(s),veh/h/ln	1792	1787	1593	1874	0	1516	1792	1881	1590	1774	1863	1542
Q Serve(g_s), s	20.1	12.8	4.2	0.0	0.0	37.8	17.7	17.3	27.3	1.1	3.2	5.9
Cycle Q Clear(g_c), s	20.1	12.8	4.2	37.5	0.0	37.8	17.7	17.3	27.3	1.1	3.2	5.9
Prop In Lane	1.00		1.00	0.01		0.72	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	426	2223	991	795	0	620	378	794	335	81	85	70
V/C Ratio(X)	0.94	0.33	0.13	0.78	0.00	0.81	0.70	0.69	1.03	0.20	0.55	1.11
Avail Cap(c_a), veh/h	449	2378	1060	851	0	667	378	794	335	81	85	70
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.6	11.7	10.0	33.6	0.0	33.8	47.3	47.1	51.0	59.5	60.5	61.7
Incr Delay (d2), s/veh	27.8	0.1	0.1	4.6	0.0	7.2	5.7	2.5	55.8	1.2	7.6	140.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
%ile BackOfQ(-26165%),veh/ln	17.3	6.3	1.8	20.4	0.0	17.0	9.4	9.3	17.1	0.6	1.8	5.3
LnGrp Delay(d),s/veh	61.4	11.8	10.1	38.2	0.0	41.0	53.0	49.6	106.9	60.6	68.0	202.6
LnGrp LOS	E	B	B	D		D	D	D	F	E	E	F
Approach Vol, veh/h		1268			1121			1154			141	
Approach Delay, s/veh		27.3			39.4			67.4			141.6	
Approach LOS		C			D			E			F	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4	5	6		8
Phs Duration (G+Y+Rc), s		86.0		11.0	27.5	58.5		32.4
Change Period (Y+Rc), s		5.5		5.1	5.1	5.5		5.1
Max Green Setting (Gmax), s		86.1		5.9	24.1	56.9		27.3
Max Q Clear Time (g_c+I1), s		14.8		7.9	22.1	39.8		29.3
Green Ext Time (p_c), s		32.0		0.0	0.3	13.1		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	47.9
HCM 2010 LOS	D

Notes

User approved volume balancing among the lanes for turning movement.

ATTACHMENT I

Attachment I

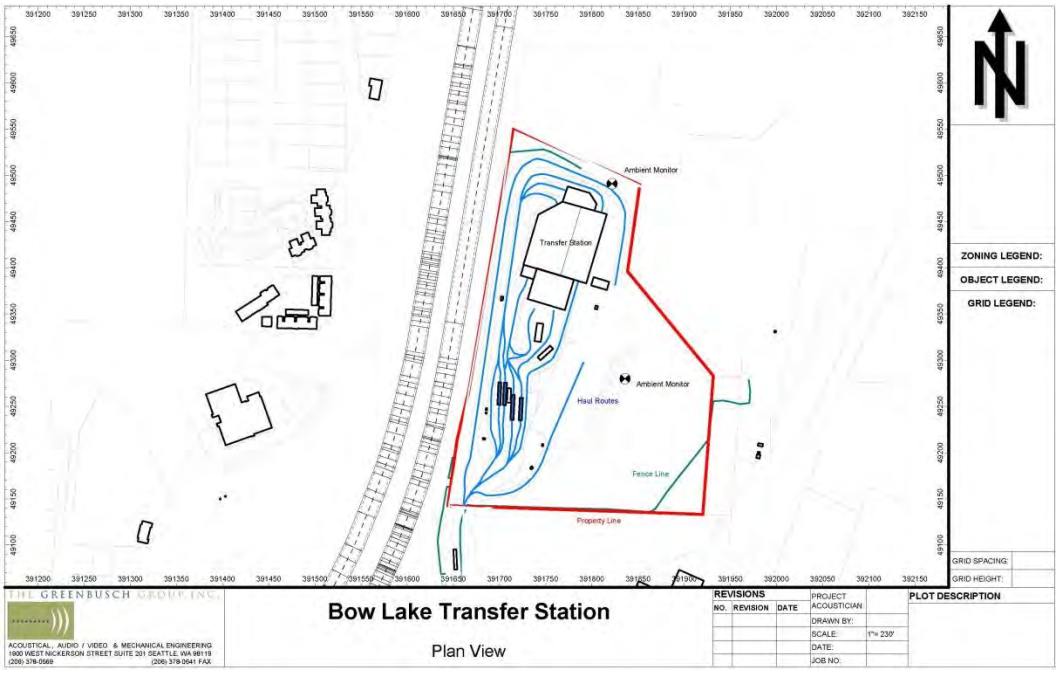


Figure A-4
Bow Lake Noise Model

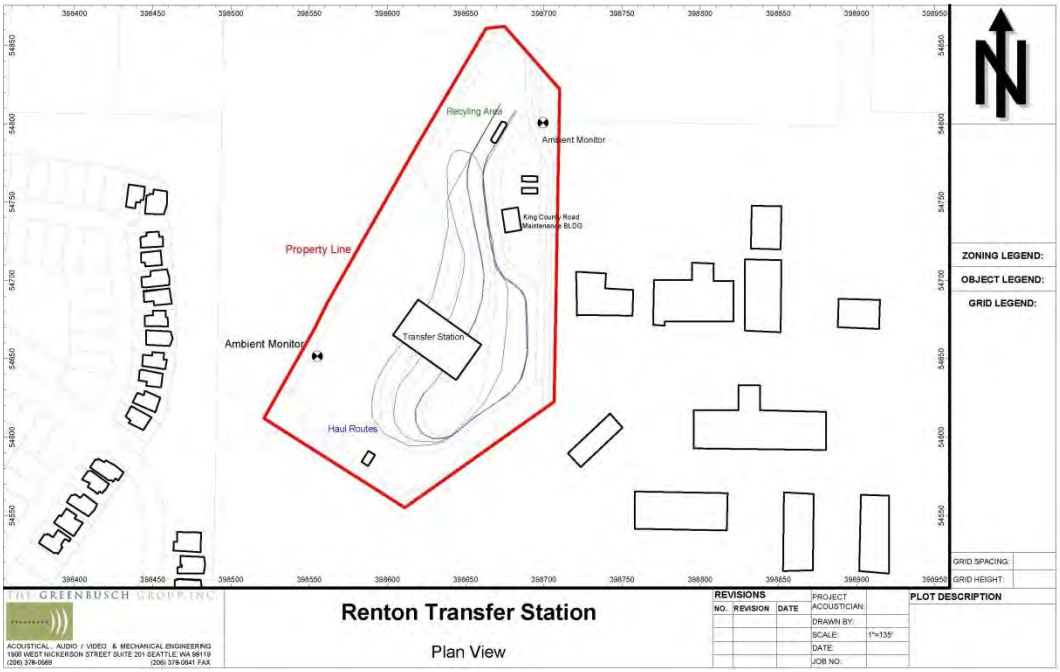


Figure A-5
Renton Noise Model

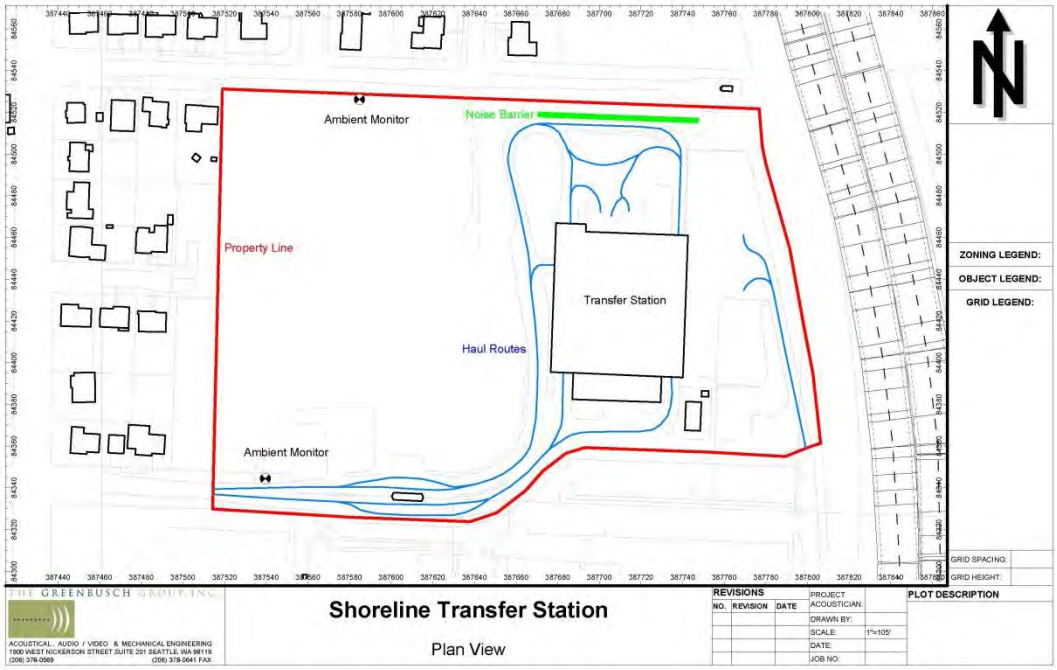


Figure A-6
Shoreline Noise Model

Appendix B: Customer Survey

CASCADIA
CONSULTING GROUP

To: Thea Severn and Beth Humphries, King County Solid Waste Division

From: Jessica Branom-Zwick, Senior Associate

Date: February 19, 2015

Subject: King County Transfer Station User Survey 2014

From November 2014 to early January 2015, Cascadia administered a web-based survey of King County transfer station users. The goals of the survey were to learn:

- How and why respondents currently use the transfer stations.
- Whether users would consider alternative waste disposal options.
- How users would respond to system changes:
  - Closing Houghton Transfer Station.
  - Closing Renton Transfer Station.
  - Increased traffic and wait times at Factoria Transfer Station.

The following sections describe the survey methodology, analysis, and key findings regarding seven cross-tabulations for selected questions.

Survey Methodology

Survey invitation flyers were handed out at the Houghton, Renton, and Factoria transfer stations. A link to the survey was also placed on King County's transfer station information webpage. Each survey invitation method used a different link to enable Cascadia to analyze data based on where the respondent had learned about the survey. The survey was administered using SurveyMonkey.com and was open from November 17, 2014 to January 11, 2015.

Analysis

Data from multiple-choice questions were analyzed into three sets of tables. Two sets of tables present results for all questions based on:

- Where respondents received the survey link (Houghton, Renton, Factoria, or Website)
- How respondents characterized themselves (resident, business, non-profit organization)

A third set of tables presents seven cross-tabulations for key questions. Key findings based on these cross-tabulation results are discussed below. Only respondents who answered both questions of each cross-tabulation were included in each table.

Comments and write-in responses were not analyzed and are included separately in the raw dataset.

Cross-Tabulation Key Findings

Materials Brought Based on Curbside Collection Service

Curbside Garbage Service

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 3a (Does this location have curbside collection service for garbage?).

Because of the relatively small sample size of respondents without curbside garbage service (43 people), compared to respondents with service (402 people), results may not be statistically significant.

- Respondents without curbside garbage service were more likely than respondents with service to report bringing:
  - Garbage created on a regular basis (81% vs. 29%).
  - Cardboard for recycling (70% vs. 39%).
  - Mixed recycling (63% vs. 22%).
  - Yard waste (47% vs. 28%).
- Respondents without curbside garbage service were less likely than respondents with service to report bringing:
  - Bulky items discarded infrequently (40% vs. 57%).
  - Construction, remodeling, or demolition debris (42% vs. 57%).

Curbside Recycling Service

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 3b (Does this location have curbside collection service for recycling?).

Because of the relatively small sample size of respondents without curbside recycling service (50 people), compared to respondents with service (390 people), results may not be statistically significant.

- Respondents without curbside recycling service were more likely than respondents with service to report bringing:
  - Garbage created on a regular basis (76% vs. 28%).
  - Cardboard for recycling (60% vs. 40%).
  - Mixed recycling (58% vs. 23%).
  - Yard waste (44% vs. 28%).

- Respondents without curbside garbage service were less likely than respondents with service to report bringing:
  - Bulky items discarded infrequently (44% vs. 57%).
  - Construction, remodeling, or demolition debris (38% vs. 59%).
  - Household hazardous materials (8% vs. 22%).
  - Scrap wood (22% vs. 33%).

Curbside Yard Waste Service

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 3c (Does this location have curbside collection service for yard waste?).

Because of the relatively small sample size of respondents without curbside yard waste service (89 people), compared to respondents with service (334 people), results may not be statistically significant.

- Respondents without curbside yard waste service were more likely than respondents with service to report bringing:
  - Garbage created on a regular basis (61% vs. 25%).
  - Cardboard for recycling (54% vs. 38%).
  - Mixed recycling (46% vs. 20%).
  - Yard waste (44% vs. 27%).
- Respondents without curbside garbage service were less likely than respondents with service to report bringing:
  - Construction, remodeling, or demolition debris (47% vs. 60%).

Visit Frequency Based on Curbside Collection Service

Curbside Garbage Service

This cross-tabulation presents results for Question 7 (How frequently do you visit a transfer station?) based on responses to Question 3a (Does this location have curbside collection service for garbage?).

Because of the relatively small sample size of respondents without curbside garbage service (43 people), compared to respondents with service (395 people), results may not be statistically significant.

- Respondents without curbside recycling service were more likely than respondents with service to report visiting:
  - Two to three times per month (26% vs. 13%).
- Respondents without curbside recycling service were less likely than respondents with service to report bringing:
  - Two to three times per year (7% vs. 24%).

Curbside Recycling Service

This cross-tabulation presents results for Question 7 (How frequently do you visit a transfer station?) based on responses to Question 3b (Does this location have curbside collection service for recycling?).

Because of the relatively small sample size of respondents without curbside recycling service (50 people), compared to respondents with service (384 people), results may not be statistically significant.

- Respondents without curbside recycling service were more likely than respondents with service to report visiting:
  - About once a month (36% vs. 26%).
- Other differences in visit frequency were less than ten percentage points but still suggest that respondents without curbside recycling service are more likely to visit more frequently than respondents without service.

Curbside Yard Waste Service

This cross-tabulation presents results for Question 7 (How frequently do you visit a transfer station?) based on responses to Question 3c (Does this location have curbside collection service for yard waste?).

Because of the relatively small sample size of respondents without curbside yard waste service (89 people), compared to respondents with service (328 people), results may not be statistically significant.

- Respondents without curbside yard waste service were more likely than respondents with service to report visiting:
  - About once a month (35% vs. 24%).
- Other differences in visit frequency were less than ten percentage points but still suggest that respondents without curbside yard waste service are more likely to visit more frequently than respondents without service.

Materials Brought Based on Visit Frequency

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 7 (How frequently do you visit a transfer station?).

Because of the relatively small sample size of respondents in each visit frequency category (ranging from 10 to 133 respondents each), results may not be statistically significant. Trends are more difficult to describe due to the number of cross-tabulation categories; please refer to the relevant table for detailed percentage breakdowns.

- Respondents visiting one, two, or three times per month were more likely to bring:
  - Garbage created on a regular basis.
  - Cardboard for recycling.
  - Mixed recycling.
- Respondents visiting one, two, or three times per month, and those visiting every two to three months, were more likely to bring the following materials:
  - Yard waste.
- Respondents who visited less frequently tended to be more likely to bring the following materials:
  - Garbage from special clean-ups or events.
  - Bulky items discarded infrequently.
- Respondents who visited more frequently tended to be more likely to bring the following materials:

- Construction, remodeling, or demolition debris.

King County Transfer Station Online Survey Data Summary

By Survey Invitation Source

November 2014 - January 2015

Data Summary 02/13/2015

Please note: Because not all respondents answered every question, response percentages are calculated based on the number of respondents who answered the particular question, not based on the total number of surveys received. Percentages may not sum to 100% due to rounding.

Column headings indicate where respondents received the web link for the survey. Fliers were handed out at three transfer stations (Houghton, Factoria, and Renton) contained location-specific links and a fourth link was used on King County's website.

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
TOTAL RESPONDENTS	239	43%	131	23%	158	28%	30	5%	558	100%

1. Which of the following best describes how you usually use the transfer station?

n = 549 9 blank (1.6% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
As a resident	190	81%	108	83%	144	92%	25	96%	467	85%
As a business	45	19%	21	16%	13	8%	1	4%	80	15%
As a nonprofit organization	1	0%	1	1%	0	0%	0	0%	2	0%
TOTAL RESPONDENTS	**236**	**100%**	**130**	**100%**	**157**	**100%**	**26**	**100%**	**549**	**100%**

2. Which of the following best describes the source of waste you most frequently take to a transfer station?

n = 547 11 blank (2.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Waste from my own home	179	76%	98	75%	133	85%	22	88%	432	79%
Waste from friends' or relatives' homes	6	3%	6	5%	5	3%	2	8%	19	3%
Waste from helping a customer clean out their home or facility	4	2%	4	3%	1	1%	1	4%	10	2%
Waste created at my business or organization's own facilities	13	6%	6	5%	3	2%	0	0%	22	4%
Waste or unusable items dropped off at my business	1	0%	0	0%	0	0%	0	0%	1	0%
Waste created by my business at a customer's home or facility	26	11%	15	12%	12	8%	0	0%	53	10%
Waste created by my customers at their home or facility	6	3%	1	1%	3	2%	0	0%	10	2%
TOTAL RESPONDENTS	**235**	**100%**	**130**	**100%**	**157**	**100%**	**25**	**100%**	**547**	**100%**

Respondents who indicated that the waste came from their own home or their business's or organization's facility were asked questions 3 and 4 about that location; all other respondents were skipped to question 5.

3. Does this location currently have curbside collection service for the following materials?

3a. Curbside collection service for garbage

n = 445 10 blank (2.2% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Yes has service	174	93%	94	94%	112	83%	22	100%	402	90%
No service	14	7%	6	6%	23	17%	0	0%	43	10%
TOTAL RESPONDENTS	**188**	**100%**	**100**	**100%**	**135**	**100%**	**22**	**100%**	**445**	**100%**

3b. Curbside collection service for recycling

n = 440 15 blank (3.3% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Yes has service	170	91%	89	91%	111	83%	20	91%	390	89%
No service	16	9%	9	9%	23	17%	2	9%	50	11%
TOTAL RESPONDENTS	**186**	**100%**	**98**	**100%**	**134**	**100%**	**22**	**100%**	**440**	**100%**

3c. Curbside collection service for yard waste

n = 423 32 blank (7.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Yes has service	146	82%	83	85%	90	70%	15	79%	334	79%
No service	32	18%	15	15%	38	30%	4	21%	89	21%
TOTAL RESPONDENTS	**178**	**100%**	**98**	**100%**	**128**	**100%**	**19**	**100%**	**423**	**100%**

4. What is the zip code for this location?

n = 431 24 blank (5.3% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Responded	181	NA	97	NA	132	NA	21	NA	431	NA
TOTAL RESPONDENTS	**181**	**NA**	**97**	**NA**	**132**	**NA**	**21**	**NA**	**431**	**NA**

5. What do you usually bring to the transfer station? (Select all that apply.)

n = 541 17 blank (3.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Garbage created on a regular basis	59	25%	24	19%	83	53%	7	29%	173	32%
Garbage from a special clean-up, move, party, or other event	157	67%	65	51%	101	65%	15	63%	338	62%
Yard waste	65	28%	29	23%	50	32%	8	33%	152	28%
Construction, remodeling, or demolition debris	150	64%	70	55%	90	58%	11	46%	321	59%
Bulky items discarded infrequently, such as furniture	129	55%	56	44%	71	46%	15	63%	271	50%
Cardboard for recycling	90	39%	15	12%	99	63%	10	42%	214	40%
Mixed recycling, such as paper, cans, glass jars, and bottles	49	21%	8	6%	72	46%	9	38%	138	26%
Scrap metal	36	15%	19	15%	21	13%	6	25%	82	15%
Scrap wood	78	33%	32	25%	45	29%	7	29%	162	30%
Household hazardous materials	17	7%	69	54%	11	7%	3	13%	100	18%
[illegible]	11	5%	7	5%	1	1%	0	0%	19	4%
TOTAL RESPONDENTS	**233**	**NA**	**128**	**NA**	**156**	**NA**	**24**	**NA**	**541**	**NA**

Respondents who reported bringing bulky items were asked question 6; all other respondents were skipped to question 7.

6. Would you use a special pick-up service if it cost $35 for a refrigerator or freezer and $25 for another appliance or piece of furniture?

n = 271 0 blank (0.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Definitely yes	14	11%	14	25%	7	10%	2	13%	37	14%
Maybe yes	41	32%	19	34%	17	24%	6	40%	83	31%
Not sure	26	20%	7	13%	15	21%	2	13%	50	18%
Maybe no	21	16%	7	13%	11	15%	3	20%	42	15%
Definitely no	27	21%	9	16%	21	30%	2	13%	59	22%
TOTAL RESPONDENTS	**129**	**100%**	**56**	**100%**	**71**	**100%**	**15**	**100%**	**271**	**100%**

7. How frequently do you visit a transfer station?

n = 537 21 blank (3.8% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Three or more times per week	8	3%	2	2%	0	0%	0	0%	10	2%
Once or twice per week	24	10%	8	6%	11	7%	0	0%	43	8%
Two to three times per month	31	13%	16	13%	42	27%	1	4%	90	17%
About once a month	59	25%	17	13%	44	28%	13	57%	133	25%
Every two to three months	54	23%	33	26%	42	27%	2	9%	131	24%
Two to three times per year	46	20%	39	31%	15	10%	5	22%	105	20%
About once a year or less	10	4%	11	9%	2	1%	2	9%	25	5%
TOTAL RESPONDENTS	**232**	**100%**	**126**	**100%**	**156**	**100%**	**23**	**100%**	**537**	**100%**

8. Overall, how satisfied or dissatisfied are you with King County's current transfer stations?

n = 534 24 blank (4.3% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Very satisfied	185	80%	84	67%	126	81%	15	65%	410	77%
Somewhat satisfied	36	16%	31	25%	26	17%	8	35%	101	19%
Neither satisfied nor dissatisfied	4	2%	5	4%	3	2%	0	0%	12	2%
Somewhat dissatisfied	4	2%	3	2%	1	1%	0	0%	8	1%
Very dissatisfied	1	0%	2	2%	0	0%	0	0%	3	1%
TOTAL RESPONDENTS	**230**	**100%**	**125**	**100%**	**156**	**100%**	**23**	**100%**	**534**	**100%**

9. What are the top two days and hours you prefer to use a transfer station? (Select up two responses.)

n = 529 29 blank (5.2% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Weekday mornings (Monday-Friday from 6 a.m. to noon)	67	29%	40	32%	52	34%	5	23%	164	31%
Weekday afternoons (Monday-Friday from noon to 5 p.m.)	80	35%	42	34%	54	35%	8	36%	184	35%
Weekday evenings (Monday-Friday from 5 p.m. to 10 p.m.)	12	5%	11	9%	12	8%	3	14%	38	7%
Weekday nights (Monday-Friday from 10 p.m. to 6 a.m.)	1	0%	0	0%	2	1%	0	0%	3	1%
Weekend mornings (Saturday-Sunday from 6 a.m. to noon)	112	49%	57	46%	69	45%	9	41%	247	47%
Weekend afternoons (Saturday-Sunday from noon to 5 p.m.)	121	53%	53	43%	77	50%	9	41%	260	49%
Weekend evenings (Saturday-Sunday from 5 p.m. to 10 p.m.)	12	5%	7	6%	6	4%	3	14%	28	5%
Weekend nights (Saturday-Sunday from 10 p.m. to 6 a.m.)	3	1%	0	0%	1	1%	1	5%	5	1%
TOTAL RESPONDENTS	**229**	**NA**	**124**	**NA**	**154**	**NA**	**22**	**NA**	**529**	**NA**

10. What are the two most important factors when you choose a transfer station? (Select up two responses.)

n = 525 33 blank (5.9% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Days and hours of operation	92	41%	52	42%	67	44%	7	32%	218	42%
Geographic location	204	90%	101	81%	137	90%	17	77%	459	87%
Services available (such as hazardous waste collection)	48	21%	40	32%	41	27%	5	23%	134	26%
Wait time or time it takes to use the transfer station	41	18%	28	22%	26	17%	7	32%	102	19%
Convenient layout	31	14%	10	8%	11	7%	5	23%	57	11%
Other (please explain)	3	1%	1	1%	3	2%	0	0%	7	1%
TOTAL RESPONDENTS	**226**	**NA**	**125**	**NA**	**152**	**NA**	**22**	**NA**	**525**	**NA**

11. Which transfer stations do you usually use? (See map below.)

n = 542 16 blank (2.9% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Algona	1	0%	4	3%	4	3%	4	15%	13	2%
Bow Lake	1	0%	3	2%	6	4%	1	4%	11	2%
Cedar Falls (drop box)	3	1%	1	1%	1	1%	0	0%	5	1%
Enumclaw	1	0%	2	2%	4	3%	1	4%	8	1%
Houghton	228	97%	13	10%	2	1%	3	11%	246	45%
Renton	5	2%	9	7%	155	100%	9	33%	178	33%
Factoria	32	14%	126	100%	12	8%	5	19%	175	32%
Seattle - North	3	1%	1	1%	1	1%	1	4%	6	1%
Seattle - South	4	2%	6	5%	3	2%	3	11%	16	3%
Shoreline	10	4%	1	1%	1	1%	3	11%	15	3%
Skykomish (drop box)	0	0%	0	0%	0	0%	0	0%	0	0%
Vashon	1	0%	0	0%	0	0%	0	0%	1	0%
TOTAL RESPONDENTS	**234**	**NA**	**126**	**NA**	**155**	**NA**	**27**	**NA**	**542**	**NA**

The survey used skip logic to answer questions about Houghton, Renton, or Factoria transfer stations based on their responses to Question 11. Respondents who did not report using any of these transfer stations were skipped to Question 21 at the end of the survey

Houghton Transfer Station

People who replied that they usually use Houghton Transfer Station were asked this set of questions.

12. If the Houghton Transfer Station were permanently closed, what would you do with waste you normally take to this facility?

n = 242 4 blank (1.6% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Subscribe to or increase curbside collection service	6	3%	0	0%	0	0%	0	0%	6	2%
Use the Factoria Transfer Station	105	47%	10	77%	1	50%	1	33%	117	48%
Use the Shoreline Transfer Station	30	13%	0	0%	1	50%	0	0%	31	13%
Contact a hauler for a bulky item pickup	8	4%	0	0%	0	0%	1	33%	9	4%
Hire a junk collector to remove the waste	10	4%	0	0%	0	0%	1	33%	11	5%
Other (please explain)	65	29%	3	23%	0	0%	0	0%	68	28%
TOTAL RESPONDENTS	**224**	**100%**	**13**	**100%**	**2**	**100%**	**3**	**100%**	**242**	**100%**

13. Please use this box if you have comments about the Houghton Transfer Station.

This question was added partway through surveying.

n = 75 171 blank (69.5% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Response	71	NA	2	NA	0	NA	2	NA	75	NA
TOTAL RESPONDENTS	**71**	**NA**	**2**	**NA**	**0**	**NA**	**2**	**NA**	**75**	**NA**

14. How satisfied or dissatisfied would you be with this alternative? [alternative selected in Question 12]

n = 240 6 blank (2.4% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Very satisfied	11	5%	3	23%	0	0%	0	0%	14	6%
Somewhat satisfied	13	6%	5	38%	0	0%	0	0%	18	8%
Neither satisfied nor dissatisfied	15	7%	2	15%	1	50%	0	0%	18	8%
Somewhat dissatisfied	52	23%	2	15%	0	0%	2	67%	56	23%
Very dissatisfied	131	59%	1	8%	1	50%	1	33%	134	56%
TOTAL RESPONDENTS	**222**	**100%**	**13**	**100%**	**2**	**100%**	**3**	**100%**	**240**	**100%**

15. Replacing the Houghton Transfer Station with a new nearby facility would require increasing transfer station fees. Would you be willing to pay...

Respondents randomly received one of two variations of the question about fees.

15a. $2 more per trip for the minimum fee and $8 more per ton for larger loads

n = 119 0 blank (0.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Definitely yes	58	52%	2	40%	1	100%	2	100%	63	53%
Maybe yes	32	29%	0	0%	0	0%	0	0%	32	27%
Not sure	6	5%	1	20%	0	0%	0	0%	7	6%
Maybe no	4	4%	1	20%	0	0%	0	0%	5	4%
Definitely no	11	10%	1	20%	0	0%	0	0%	12	10%
TOTAL RESPONDENTS	**111**	**100%**	**5**	**100%**	**1**	**100%**	**2**	**100%**	**119**	**100%**

15b. $5 more per trip for the minimum fee and $15 more per ton for larger loads

n = 124 0 blank (0.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Definitely yes	49	43%	0	0%	0	0%	1	100%	50	40%
Maybe yes	34	30%	3	38%	0	0%	0	0%	37	30%
Not sure	15	13%	3	38%	0	0%	0	0%	18	15%
Maybe no	7	6%	1	13%	0	0%	0	0%	8	6%
Definitely no	9	8%	1	13%	1	100%	0	0%	11	9%
TOTAL RESPONDENTS	**114**	**100%**	**8**	**100%**	**1**	**100%**	**1**	**100%**	**124**	**100%**

Renton Transfer Station

People who replied that they usually use Renton Transfer Station, but not Houghton Transfer Station, responded to this set of questions.

16. If the Renton Transfer Station were permanently closed, what would you do with waste you normally take to this facility?

n = 171 3 blank (1.7% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Use the Bow Lake Transfer Station	1	33%	0	0%	26	17%	1	13%	28	16%
Contact a hauler for a bulky item pickup	0	0%	0	0%	4	3%	0	0%	4	2%
Use the Enumclaw Transfer Station	0	0%	0	0%	11	7%	0	0%	11	6%
Hire a junk collector to remove the waste	0	0%	0	0%	6	4%	0	0%	6	4%
Subscribe to or increase curbside collection service	0	0%	0	0%	5	3%	0	0%	5	3%
Use the Algona Transfer Station	0	0%	1	13%	6	4%	1	13%	8	5%
Use the Factoria Transfer Station	1	33%	7	88%	72	47%	3	38%	83	49%
Other (please explain)	1	33%	0	0%	22	14%	3	38%	126	74%
TOTAL RESPONDENTS	**3**	**100%**	**8**	**100%**	**152**	**100%**	**8**	**100%**	**171**	**100%**

17. Please use this box if you have comments about the Renton Transfer Station.

This question was added partway through surveying.

n = 93 81 blank (46.6% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Response	3	NA	1	NA	84	NA	5	NA	93	NA
TOTAL RESPONDENTS	**3**	**NA**	**1**	**NA**	**84**	**NA**	**5**	**NA**	**93**	**NA**

18. How satisfied or dissatisfied would you be with this alternative? [alternative selected in Question 15]

n = 173 1 blank (0.6% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Very satisfied	0	0%	2	25%	1	1%	0	0%	3	2%
Somewhat satisfied	0	0%	0	0%	5	3%	1	13%	6	3%
Neither satisfied nor dissatisfied	1	25%	1	13%	8	5%	0	0%	10	6%
Somewhat dissatisfied	0	0%	2	25%	31	20%	2	25%	35	20%
Very dissatisfied	3	75%	3	38%	108	71%	5	63%	119	69%
TOTAL RESPONDENTS	**4**	**100%**	**8**	**100%**	**153**	**100%**	**8**	**100%**	**173**	**100%**

Factoria Transfer Station

People who replied that they usually use Factoria Transfer Station, but not the Houghton or Renton transfer stations, responded to this question.

19. Suppose the Factoria Transfer Station regularly had a wait time of 1 hour during peak hours of 10 a.m. to 5 p.m. but was open longer hours. The new hours of operation would be from 6 a.m. to 10 p.m. on weekdays and 8 a.m. to 8 p.m. on weekends. What would you do?

n = 106 2 blank (1.9% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Hire a junk collector to remove the waste	0	0%	1	1%	0	0%	0	0%	1	1%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%	0	0%
Use the Renton Transfer Station	0	0%	6	6%	0	0%	0	0%	6	6%
Delay my trip to before 10 a.m. or after 5 p.m.	0	0%	78	76%	0	0%	3	100%	81	76%
Still use the Factoria Transfer Station despite the wait time	0	0%	12	12%	0	0%	0	0%	12	11%
Contact a hauler for a bulky item pickup	0	0%	0	0%	0	0%	0	0%	0	0%
Use the Shoreline Transfer Station	0	0%	1	1%	0	0%	0	0%	1	1%
Use the Bow Lake Transfer Station	0	0%	0	0%	0	0%	0	0%	0	0%
TOTAL RESPONDENTS	**0**	**0%**	**103**	**100%**	**0**	**0%**	**3**	**100%**	**106**	**100%**

20. Suppose the Factoria Transfer Station charged higher fees to use the facility during peak times to reduce wait times to 30 minutes or less. What would you do if Factoria charged a surcharge per trip during the peak times of 10 a.m. to 5 p.m.?

Respondents were randomly assigned to the following questions about fees.

20a. $5 surcharge

n = 49 0 blank (0.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Contact a hauler for a bulky item pickup	0	0%	0	0%	0	0%	0	0%	0	0%
I already use transfer stations during off-peak times	0	0%	6	13%	0	0%	0	0%	6	12%
Delay my trip to Factoria Transfer Station until an off-peak time	0	0%	25	52%	0	0%	1	100%	26	53%
Use the Shoreline Transfer Station (no surcharge)	0	0%	2	4%	0	0%	0	0%	2	4%
Still use the Factoria Transfer Station during the peak time	0	0%	11	23%	0	0%	0	0%	11	22%
Use the Renton Transfer Station (no surcharge)	0	0%	2	4%	0	0%	0	0%	2	4%
Hire a junk collector to remove the waste	0	0%	0	0%	0	0%	0	0%	0	0%
Use the Bow Lake Transfer Station (no surcharge)	0	0%	1	2%	0	0%	0	0%	1	2%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%	0	0%
Other (please explain)	0	0%	1	2%	0	0%	0	0%	1	2%
TOTAL RESPONDENTS	**0**	**0%**	**48**	**100%**	**0**	**0%**	**1**	**100%**	**49**	**100%**

20b. $10 surcharge

n = 59 0 blank (0.0% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Contact a hauler for a bulky item pickup	0	0%	1	2%	0	0%	0	0%	1	2%
I already use transfer stations during off-peak times	0	0%	5	9%	0	0%	1	50%	6	10%
Delay my trip to Factoria Transfer Station until an off-peak time	0	0%	33	58%	0	0%	1	50%	34	58%
Use the Shoreline Transfer Station (no surcharge)	0	0%	0	0%	0	0%	0	0%	0	0%
Still use the Factoria Transfer Station during the peak time	0	0%	8	14%	0	0%	0	0%	8	14%
Use the Renton Transfer Station (no surcharge)	0	0%	4	7%	0	0%	0	0%	4	7%
Hire a junk collector to remove the waste	0	0%	2	4%	0	0%	0	0%	2	3%
Use the Bow Lake Transfer Station (no surcharge)	0	0%	0	0%	0	0%	0	0%	0	0%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%	0	0%
Other (please explain)	0	0%	4	7%	0	0%	0	0%	4	7%
TOTAL RESPONDENTS	**0**	**0%**	**57**	**100%**	**0**	**0%**	**2**	**100%**	**59**	**100%**

21. Placeholder for comments

Comments will be presented separately

n = 221 337 blank (60.4% of eligible respondents)

	Houghton		Factoria		Renton		Website		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Response	83	NA	53	NA	75	NA	10	NA	221	NA
TOTAL RESPONDENTS	**83**	**NA**	**53**	**NA**	**75**	**NA**	**10**	**NA**	**221**	**NA**

King County Transfer Station Online Survey Data Summary

By Respondent Type (resident, business, non-profit organization)

November 2014 - January 2015

Data Summary 02/13/2015

Please note: Because not all respondents answered every question, response percentages are calculated based on the number of respondents who answered the particular question, not based on the total number of surveys received. Percentages may not sum to 100% due to rounding.

Column headings indicate the respondents answer to Question 1, askng how the respondent typically uses the transfer station. Nine people did not answer this question and are excluded from this set of tables.

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
TOTAL RESPONDENTS	467	85%	80	15%	2	0%	549	100%

1. Which of the following best describes how you usually use the transfer station?

n = 549 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
As a resident	467	100%	0	0%	0	0%	467	85%
As a business	0	0%	80	100%	0	0%	80	15%
As a nonprofit organization	0	0%	0	0%	2	100%	2	0%
TOTAL RESPONDENTS	**467**	**100%**	**80**	**100%**	**2**	**100%**	**549**	**100%**

2. Which of the following best describes the source of waste you most frequently take to a transfer station?

n = 547 2 blank (0.4% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Waste from my own home	432	93%	0	0%	0	0%	432	79%
Waste from friends' or relatives' homes	19	4%	0	0%	0	0%	19	3%
Waste from helping a customer clean out their home or facility	2	0%	8	10%	0	0%	10	2%
Waste created at my business or organization's own facilities	4	1%	17	21%	1	50%	22	4%
Waste or unusable items dropped off at my business	0	0%	1	1%	0	0%	1	0%
Waste created by my business at a customer's home or facility	6	1%	46	58%	1	50%	53	10%
Waste created by my customers at their home or facility	2	0%	8	10%	0	0%	10	2%
TOTAL RESPONDENTS	**465**	**100%**	**80**	**100%**	**2**	**100%**	**547**	**100%**

Respondents who indicated that the waste came from their own home or their business's or organization's facility were asked questions 3 and 4 about that location; all other respondents were skipped to question 5.

3. Does this location currently have curbside collection service for the following materials?

3a. Curbside collection service for garbage

n = 445 10 blank (2.2% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Yes has service	388	91%	14	82%	0	0%	402	90%
No service	39	9%	3	18%	1	100%	43	10%
TOTAL RESPONDENTS	**427**	**100%**	**17**	**100%**	**1**	**100%**	**445**	**100%**

3b. Curbside collection service for recycling

n = 439 16 blank (3.5% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Yes has service	374	89%	14	82%	1	100%	389	89%
No service	47	11%	3	18%	0	0%	50	11%
TOTAL RESPONDENTS	**421**	**100%**	**17**	**100%**	**1**	**100%**	**439**	**100%**

3c. Curbside collection service for yard waste

n = 423 32 blank (7.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Yes has service	321	79%	12	71%	1	100%	334	79%
No service	84	21%	5	29%	0	0%	89	21%
TOTAL RESPONDENTS	**405**	**100%**	**17**	**100%**	**1**	**100%**	**423**	**100%**

4. What is the zip code for this location?

n = 429 26 blank (5.7% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Responded	410	NA	18	NA	1	NA	429	NA
TOTAL RESPONDENTS	**410**	**NA**	**18**	**NA**	**1**	**NA**	**429**	**NA**

5. What do you usually bring to the transfer station? (Select all that apply.)

n = 541 8 blank (1.5% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Garbage created on a regular basis	155	34%	17	21%	1	50%	173	32%
Garbage from a special clean-up, move, party, or other event	318	69%	18	23%	2	100%	338	62%
Yard waste	139	30%	11	14%	2	100%	152	28%
Construction, remodeling, or demolition debris	251	55%	68	85%	2	100%	321	59%
Bulky items discarded infrequently, such as furniture	255	56%	16	20%	0	0%	271	50%
Cardboard for recycling	193	42%	21	26%	0	0%	214	40%
Mixed recycling, such as paper, cans, glass jars, and bottles	126	27%	12	15%	0	0%	138	26%
Scrap metal	70	15%	12	15%	0	0%	82	15%
Scrap wood	136	30%	26	33%	0	0%	162	30%
Household hazardous materials	95	21%	5	6%	0	0%	100	18%
Other (please explain)	16	3%	3	4%	0	0%	19	4%
TOTAL RESPONDENTS	**459**	**NA**	**80**	**NA**	**2**	**NA**	**541**	**NA**

Respondents who reported bringing bulky items were asked question 6; all other respondents were skipped to question 7.

6. Would you use a special pick-up service if it cost $35 for a refrigerator or freezer and $25 for another appliance or piece of furniture?

n = 271 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Definitely yes	36	14%	1	6%	0	0%	37	14%
Maybe yes	77	30%	6	38%	0	0%	83	31%
Not sure	49	19%	1	6%	0	0%	50	18%
Maybe no	40	16%	2	13%	0	0%	42	15%
Definitely no	53	21%	6	38%	0	0%	59	22%
TOTAL RESPONDENTS	**255**	**100%**	**16**	**100%**	**0**	**0%**	**271**	**100%**

7. How frequently do you visit a transfer station?

n = 537 12 blank (2.2% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Three or more times per week	0	0%	10	13%	0	0%	10	2%
Once or twice per week	13	3%	30	38%	0	0%	43	8%
Two to three times per month	64	14%	26	33%	0	0%	90	17%
About once a month	121	27%	11	14%	1	50%	133	25%
Every two to three months	128	28%	3	4%	0	0%	131	24%
Two to three times per year	104	23%	0	0%	1	50%	105	20%
About once a year or less	25	5%	0	0%	0	0%	25	5%
TOTAL RESPONDENTS	**455**	**100%**	**80**	**100%**	**2**	**100%**	**537**	**100%**

8. Overall, how satisfied or dissatisfied are you with King County's current transfer stations?

n = 534 15 blank (2.7% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Very satisfied	356	79%	53	67%	1	50%	410	77%
Somewhat satisfied	78	17%	22	28%	1	50%	101	19%
Neither satisfied nor dissatisfied	10	2%	2	3%	0	0%	12	2%
Somewhat dissatisfied	8	2%	0	0%	0	0%	8	1%
Very dissatisfied	1	0%	2	3%	0	0%	3	1%
TOTAL RESPONDENTS	**453**	**100%**	**79**	**100%**	**2**	**100%**	**534**	**100%**

9. What are the top two days and hours you prefer to use a transfer station? (Select up two responses.)

n = 529 20 blank (3.6% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Weekday mornings (Monday-Friday from 6 a.m. to noon)	121	27%	41	52%	2	100%	164	31%
Weekday afternoons (Monday-Friday from noon to 5 p.m.)	130	29%	52	66%	2	100%	184	35%
Weekday evenings (Monday-Friday from 5 p.m. to 10 p.m.)	31	7%	7	9%	0	0%	38	7%
Weekday nights (Monday-Friday from 10 p.m. to 6 a.m.)	3	1%	0	0%	0	0%	3	1%
Weekend mornings (Saturday-Sunday from 6 a.m. to noon)	224	50%	23	29%	0	0%	247	47%
Weekend afternoons (Saturday-Sunday from noon to 5 p.m.)	248	55%	12	15%	0	0%	260	49%
Weekend evenings (Saturday-Sunday from 5 p.m. to 10 p.m.)	25	6%	3	4%	0	0%	28	5%
Weekend nights (Saturday-Sunday from 10 p.m. to 6 a.m.)	4	1%	1	1%	0	0%	5	1%
TOTAL RESPONDENTS	**448**	**NA**	**79**	**NA**	**2**	**NA**	**529**	**NA**

10. What are the two most important factors when you choose a transfer station? (Select up two responses.)

n = 525 24 blank (4.4% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Days and hours of operation	174	39%	44	56%	0	0%	218	42%
Geographic location	384	86%	73	94%	2	100%	459	87%
Services available (such as hazardous waste collection)	129	29%	5	6%	0	0%	134	26%
Wait time or time it takes to use the transfer station	90	20%	12	15%	0	0%	102	19%
Convenient layout	50	11%	6	8%	1	50%	57	11%
Other (please explain)	7	2%	0	0%	0	0%	7	1%
TOTAL RESPONDENTS	**445**	**NA**	**78**	**NA**	**2**	**NA**	**525**	**NA**

11. Which transfer stations do you usually use? (See map below.)

n = 535 14 blank (2.6% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Algona	8	2%	4	5%	0	0%	12	2%
Bow Lake	7	2%	3	4%	0	0%	10	2%
Cedar Falls (drop box)	4	1%	1	1%	0	0%	5	1%
Enumclaw	8	2%	0	0%	0	0%	8	1%
Houghton	192	42%	51	64%	1	50%	244	46%
Renton	158	35%	19	24%	0	0%	177	33%
Factoria	138	30%	36	45%	1	50%	175	33%
Seattle - North	3	1%	3	4%	0	0%	6	1%
Seattle - South	7	2%	8	10%	0	0%	15	3%
Shoreline	8	2%	7	9%	0	0%	15	3%
Skykomish (drop box)	0	0%	0	0%	0	0%	0	0%
Vashon	0	0%	0	0%	0	0%	0	0%
TOTAL RESPONDENTS	**453**	**NA**	**80**	**NA**	**2**	**NA**	**535**	**NA**

The survey used skip logic to answer questions about Houghton, Renton, or Factoria transfer stations based on their responses to Question 11. Respondents who did not report using any of these transfer stations were skipped to Question 21 at the end of the survey

Houghton Transfer Station

People who replied that they usually use Houghton Transfer Station were asked this set of questions.

12. If the Houghton Transfer Station were permanently closed, what would you do with waste you normally take to this facility?

n = 242 2 blank (0.8% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Subscribe to or increase curbside collection service	5	3%	1	2%	0	0%	6	2%
Use the Factoria Transfer Station Use the Shoreline Transfer Station Contact a hauler for a bulky item pickup Hire a junk collector to remove the waste Other (please explain)	84	44%	32	63%	1	100%	117	48%
	25	13%	6	12%	0	0%	31	13%
	8	4%	1	2%	0	0%	9	4%
	10	5%	1	2%	0	0%	11	5%
	58	31%	10	20%	0	0%	68	28%
TOTAL RESPONDENTS	**190**	**100%**	**51**	**100%**	**1**	**100%**	**242**	**100%**

13. Please use this box if you have comments about the Houghton Transfer Station.

This question was added partway through surveying.

n = 75 169 blank (69.3% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Response	61	NA	14	NA	0	NA	75	NA
TOTAL RESPONDENTS	**61**	**NA**	**14**	**NA**	**0**	**NA**	**75**	**NA**

14. How satisfied or dissatisfied would you be with this alternative? [alternative selected in Question 12]

n = 240 4 blank (1.6% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Very satisfied	12	6%	2	4%	0	0%	14	6%
Somewhat satisfied	14	7%	4	8%	0	0%	18	8%
Neither satisfied nor dissatisfied	13	7%	5	10%	0	0%	18	8%
Somewhat dissatisfied	45	24%	11	22%	0	0%	56	23%
Very dissatisfied	104	55%	29	57%	1	100%	134	56%
TOTAL RESPONDENTS	**188**	**100%**	**51**	**100%**	**1**	**100%**	**240**	**100%**

15. Replacing the Houghton Transfer Station with a new nearby facility would require increasing transfer station fees. Would you be willing to pay...

Respondents randomly received one of two variations of the question about fees.

15a. $2 more per trip for the minimum fee and $8 more per ton for larger loads

n = 119 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Definitely yes	53	55%	10	45%	0	0%	63	53%
Maybe yes	26	27%	5	23%	1	100%	32	27%
Not sure	6	6%	1	5%	0	0%	7	6%
Maybe no	3	3%	2	9%	0	0%	5	4%
Definitely no	8	8%	4	18%	0	0%	12	10%
TOTAL RESPONDENTS	**96**	**100%**	**22**	**100%**	**1**	**100%**	**119**	**100%**

15b. $5 more per trip for the minimum fee and $15 more per ton for larger loads

n = 124 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Definitely yes	38	40%	12	41%	0	0%	50	40%
Maybe yes	32	34%	5	17%	0	0%	37	30%
Not sure	11	12%	7	24%	0	0%	18	15%
Maybe no	7	7%	1	3%	0	0%	8	6%
Definitely no	7	7%	4	14%	0	0%	11	9%
TOTAL RESPONDENTS	**95**	**100%**	**29**	**100%**	**0**	**0%**	**124**	**100%**

Renton Transfer Station

People who replied that they usually use Renton Transfer Station, but not Houghton Transfer Station, responded to this set of questions.

16. If the Renton Transfer Station were permanently closed, what would you do with waste you normally take to this facility?

n = 171 2 blank (1.2% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Use the Bow Lake Transfer Station	27	17%	1	7%	0	0%	28	16%
Contact a hauler for a bulky item pickup	4	3%	0	0%	0	0%	4	2%
Use the Enumclaw Transfer Station	11	7%	0	0%	0	0%	11	6%
Hire a junk collector to remove the waste	6	4%	0	0%	0	0%	6	4%
Subscribe to or increase curbside collection service	4	3%	1	7%	0	0%	5	3%
Use the Algona Transfer Station	8	5%	0	0%	0	0%	8	5%
Use the Factoria Transfer Station	71	46%	12	80%	0	0%	83	49%
Other (please explain)	25	16%	1	7%	0	0%	26	15%
TOTAL RESPONDENTS	**156**	**100%**	**15**	**100%**	**0**	**0%**	**171**	**100%**

17. Please use this box if you have comments about the Renton Transfer Station.

This question was added partway through surveying.

n = 93 80 blank (46.2% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Response	85	NA	8	NA	0	NA	93	NA
TOTAL RESPONDENTS	**85**	**NA**	**8**	**NA**	**0**	**NA**	**93**	**NA**

18. How satisfied or dissatisfied would you be with this alternative? [alternative selected in Question 15]

n = 173 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Very satisfied	3	2%	0	0%	0	0%	3	2%
Somewhat satisfied	6	4%	0	0%	0	0%	6	3%
Neither satisfied nor dissatisfied	7	4%	3	19%	0	0%	10	6%
Somewhat dissatisfied	33	21%	2	13%	0	0%	35	20%
Very dissatisfied	108	69%	11	69%	0	0%	119	69%
TOTAL RESPONDENTS	**157**	**100%**	**16**	**100%**	**0**	**0%**	**173**	**100%**

Factoria Transfer Station

People who replied that they usually use Factoria Transfer Station, but not the Houghton or Renton transfer stations, responded to this question.

19. Suppose the Factoria Transfer Station regularly had a wait time of 1 hour during peak hours of 10 a.m. to 5 p.m. but was open longer hours. The new hours of operation would be from 6 a.m. to 10 p.m. on weekdays and 8 a.m. to 8 p.m. on weekends. What would you do?

n = 106 2 blank (1.9% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Hire a junk collector to remove the waste	1	1%	0	0%	0	0%	1	1%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%
Use the Renton Transfer Station	5	5%	1	8%	0	0%	6	6%
Delay my trip to before 10 a.m. or after 5 p.m.	73	78%	8	67%	0	0%	81	76%
Still use the Factoria Transfer Station despite the wait time	9	10%	2	17%	1	100%	12	11%
Contact a hauler for a bulky item pickup	0	0%	0	0%	0	0%	0	0%
Use the Shoreline Transfer Station	1	1%	0	0%	0	0%	1	1%
Use the Bow Lake Transfer Station	0	0%	0	0%	0	0%	0	0%
Other (please explain)	4	4%	1	8%	0	0%	5	5%
TOTAL RESPONDENTS	**93**	**100%**	**12**	**100%**	**1**	**100%**	**106**	**100%**

20. Suppose the Factoria Transfer Station charged higher fees to use the facility during peak times to reduce wait times to 30 minutes or less. What would you do if Factoria charged a surcharge per trip during the peak times of 10 a.m. to 5 p.m.?

Respondents were randomly assigned to the following questions about fees.

20a. $5 surcharge

n = 49 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Contact a hauler for a bulky item pickup	0	0%	0	0%	0	0%	0	0%
I already use transfer stations during off-peak times	5	12%	1	17%	0	0%	6	12%
Delay my trip to Factoria Transfer Station until an off-peak time	23	55%	3	50%	0	0%	26	53%
Use the Shoreline Transfer Station (no surcharge)	2	5%	0	0%	0	0%	2	4%
Still use the Factoria Transfer Station during the peak time	9	21%	1	17%	1	100%	11	22%
Use the Renton Transfer Station (no surcharge)	2	5%	0	0%	0	0%	2	4%
Hire a junk collector to remove the waste	0	0%	0	0%	0	0%	0	0%
Use the Bow Lake Transfer Station (no surcharge)	0	0%	1	17%	0	0%	1	2%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%
Other (please explain)	1	2%	0	0%	0	0%	1	2%
TOTAL RESPONDENTS	**42**	**100%**	**6**	**100%**	**1**	**100%**	**49**	**100%**

20b. $10 surcharge

n = 59 0 blank (0.0% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Contact a hauler for a bulky item pickup	1	2%	0	0%	0	0%	1	2%
I already use transfer stations during off-peak times	5	10%	1	14%	0	0%	6	10%
Delay my trip to Factoria Transfer Station until an off-peak time	34	65%	0	0%	0	0%	34	58%
Use the Shoreline Transfer Station (no surcharge)	0	0%	0	0%	0	0%	0	0%
Still use the Factoria Transfer Station during the peak time	4	8%	4	57%	0	0%	8	14%
Use the Renton Transfer Station (no surcharge)	3	6%	1	14%	0	0%	4	7%
Hire a junk collector to remove the waste	2	4%	0	0%	0	0%	2	3%
Use the Bow Lake Transfer Station (no surcharge)	0	0%	0	0%	0	0%	0	0%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%
Other (please explain)	3	6%	1	14%	0	0%	4	7%
TOTAL RESPONDENTS	**52**	**100%**	**7**	**100%**	**0**	**0%**	**59**	**100%**

21. Placeholder for comments

Comments will be presented separately

n = 221 328 blank (59.7% of eligible respondents)

	As a Resident		As a Business		Non-Profit		TOTAL	
	n	%	n	%	n	%	n	%
Response	185	NA	35	NA	1	NA	221	NA
TOTAL RESPONDENTS	**185**	**NA**	**35**	**NA**	**1**	**NA**	**221**	**NA**

King County Transfer Station Online Survey Data Summary

Cross-Tabulations

November 2014 - January 2015

Data Summary 02/13/2015

3a. Curbside collection service for garbage.

X

5. What do you usually bring to the transfer station? (Select all that apply.)

n= 445 10 blank (2.2% of eligible respondents)

	Yes has service		No service		TOTAL	
	n	%	n	%	n	%
Garbage created on a regular basis	115	29%	35	81%	150	34%
Garbage from a move, party, or other event	278	69%	27	63%	305	69%
Yard waste	113	28%	20	47%	133	30%
Construction, remodeling, or demolition debris	231	57%	18	42%	249	56%
Bulky items discarded infrequently, such as furniture	230	57%	17	40%	247	56%
Cardboard for recycling	155	39%	30	70%	185	42%
Mixed recycling (paper, cans, jars, and bottles)	90	22%	27	63%	117	26%
Scrap metal	64	16%	7	16%	71	16%
Scrap wood	126	31%	14	33%	140	31%
Household hazardous materials	83	21%	6	14%	89	20%
Other (please explain)	14	3%	1	2%	15	3%
TOTAL RESPONDENTS	**402**	**NA**	**43**	**NA**	**445**	**NA**

3c. Curbside collection service for recycling.

X

5. What do you usually bring to the transfer station? (Select all that apply.)

n= 440 15 blank (3.3% of eligible respondents)

	Yes has service		No service		TOTAL	
	n	%	n	%	n	%
Garbage created on a regular basis	111	28%	38	76%	149	34%
Garbage from a move, party, or other event	272	70%	32	64%	304	69%
Yard waste	110	28%	22	44%	132	30%
Construction, remodeling, or demolition debris	230	59%	19	38%	249	57%
Bulky items discarded infrequently, such as furniture	222	57%	22	44%	244	55%
Cardboard for recycling	155	40%	30	60%	185	42%
Mixed recycling (paper, cans, jars, and bottles)	88	23%	29	58%	117	27%
Scrap metal	64	16%	6	12%	70	16%
Scrap wood	129	33%	11	22%	140	32%
Household hazardous materials	85	22%	4	8%	89	20%
	13	3%	2	4%	15	3%
TOTAL RESPONDENTS	**390**	**NA**	**50**	**NA**	**440**	**NA**

3c. Curbside collection service for yard waste
X
5. What do you usually bring to the transfer station? (Select all that apply.)

n= 423 32 blank (7.0% of eligible respondents)

	Yes has service		No service		TOTAL	
	n	%	n	%	n	%
Garbage created on a regular basis	84	25%	54	61%	138	33%
Garbage from a move, party, or other event	234	70%	59	66%	293	69%
Yard waste	89	27%	39	44%	128	30%
Construction, remodeling, or demolition debris	199	60%	42	47%	241	57%
Bulky items discarded infrequently, such as furniture	191	57%	44	49%	235	56%
Cardboard for recycling	126	38%	48	54%	174	41%
Mixed recycling (paper, cans, jars, and bottles)	68	20%	41	46%	109	26%
Scrap metal	58	17%	11	12%	69	16%
Scrap wood	104	31%	30	34%	134	32%
Household hazardous materials	75	22%	13	15%	88	21%
	10	3%	4	4%	14	3%
TOTAL RESPONDENTS	**334**	**NA**	**89**	**NA**	**423**	**NA**

3a. Curbside collection service for garbage.
X
7. How frequently do you visit a transfer station?

n= 438 17 blank (3.7% of eligible respondents)

	Yes has service		No service		TOTAL	
	n	%	n	%	n	%
Three or more times per week	0	0%	0	0%	0	0%
Once or twice per week	14	4%	1	2%	15	3%
Two to three times per month	53	13%	11	26%	64	15%
About once a month	107	27%	14	33%	121	28%
Every two to three months	106	27%	13	30%	119	27%
Two to three times per year	94	24%	3	7%	97	22%
About once a year or less	21	5%	1	2%	22	5%
TOTAL RESPONDENTS	**395**	**100%**	**43**	**100%**	**438**	**100%**

3b. Curbside collection service for recycling.
X
7. How frequently do you visit a transfer station?

n= 434 21 blank (4.6% of eligible respondents)

	Yes has service		No service		TOTAL	
	n	%	n	%	n	%
Three or more times per week	0	0%	0	0%	0	0%
Once or twice per week	14	4%	1	2%	15	3%
Two to three times per month	53	14%	11	22%	64	15%
About once a month	101	26%	18	36%	119	27%
Every two to three months	106	28%	13	26%	119	27%
Two to three times per year	89	23%	7	14%	96	22%
About once a year or less	21	5%	0	0%	21	5%
TOTAL RESPONDENTS	**384**	**100%**	**50**	**100%**	**434**	**100%**

3c. Curbside collection service for yard waste
X
7. How frequently do you visit a transfer station?

n= 417 38 blank (8.4% of eligible respondents)

	Yes has service		No service		TOTAL	
	n	%	n	%	n	%
Three or more times per week	0	0%	0	0%	0	0%
Once or twice per week	11	3%	4	4%	15	4%
Two to three times per month	43	13%	18	20%	61	15%
About once a month	80	24%	31	35%	111	27%
Every two to three months	95	29%	21	24%	116	28%
Two to three times per year	80	24%	13	15%	93	22%
About once a year or less	19	6%	2	2%	21	5%
TOTAL RESPONDENTS	**328**	**100%**	**89**	**100%**	**417**	**100%**

7. How frequently do you visit a transfer station?
X
5. What do you usually bring to the transfer station? (Select all that apply.)

n= 537 21 blank (3.8% of eligible respondents)

	Three or more times per week		Once or twice per week		Two to three times per month		About once a month		Every two to three months		Two to three times per year		About once a year or less		TOTAL	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Garbage created on a regular basis	2	20%	15	35%	47	52%	72	54%	30	23%	6	6%	1	4%	173	32%
Garbage from a move, party, or other event	3	30%	13	30%	50	56%	86	65%	95	73%	74	70%	15	60%	336	63%
Yard waste	1	10%	8	19%	38	42%	39	29%	45	34%	18	17%	2	8%	151	28%
Construction, remodeling, or demolition debris	8	80%	31	72%	64	71%	70	53%	77	59%	58	55%	11	44%	319	59%
Bulky items discarded infrequently, such as furniture	3	30%	7	16%	34	38%	65	49%	73	56%	72	69%	15	60%	269	50%
Cardboard for recycling	3	30%	13	30%	49	54%	75	56%	52	40%	20	19%	2	8%	214	40%
Mixed recycling (paper, cans, jars, and bottles)	3	30%	10	23%	35	39%	48	36%	33	25%	8	8%	0	0%	137	26%
Scrap metal	0	0%	7	16%	21	23%	15	11%	20	15%	15	14%	4	16%	82	15%
Scrap wood	3	30%	14	33%	37	41%	34	26%	37	28%	29	28%	8	32%	162	30%
Household hazardous materials	1	10%	4	9%	16	18%	15	11%	24	18%	29	28%	9	36%	98	18%
TOTAL RESPONDENTS	**10**	**NA**	**43**	**NA**	**90**	**NA**	**133**	**NA**	**131**	**NA**	**105**	**NA**	**25**	**NA**	**537**	**NA**

CASCADIA
CONSULTING GROUP

To: Thea Severn and Beth Humphries, King County Solid Waste Division

From: Jessica Branom-Zwick, Senior Associate

Date: February 19, 2015. Updated April 28, 2015

Subject: King County Transfer Station User Survey 2014

From November 2014 to early January 2015, Cascadia administered a web-based survey of King County transfer station users. The goals of the survey were to learn:

- How and why respondents currently use the transfer stations.
- Whether users would consider alternative waste disposal options.
- How users would respond to system changes:
  - Closing Houghton Transfer Station.
  - Closing Renton Transfer Station.
  - Increased traffic and wait times at Factoria Transfer Station.

The following sections describe the survey methodology, analysis, and key findings regarding seven cross-tabulations for selected questions.

Survey Methodology

Survey invitation flyers were handed out at the Houghton, Renton, and Factoria transfer stations. A link to the survey was also placed on King County's transfer station information webpage. Each survey invitation method used a different link to enable Cascadia to analyze data based on where the respondent had learned about the survey. The survey was administered using SurveyMonkey.com and was open from November 17, 2014 to January 11, 2015.

Analysis

Data from multiple-choice questions were analyzed into five sets of tables. Two sets of tables present results for all questions based on:

- Where respondents received the survey link (Houghton, Renton, Factoria, or Website)
- How respondents characterized themselves (resident, business, non-profit organization)

A third set of tables presents seven cross-tabulations for key questions. Key findings based on these cross-tabulation results are discussed below. Only respondents who answered both questions of each cross-tabulation were included in each table.

A fourth set of tables, requested by King County in April, presents additional cross-tabulations and incorporates data from an onsite survey conducted in 2011 to estimate the percentage of total visits attributable to people who reported a specific visit frequency.

Comments and write-in responses were not analyzed and are included separately in the raw dataset.

Original Cross-Tabulation Key Findings (conducted in February)

Materials Brought Based on Curbside Collection Service

Curbside Garbage Service

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 3a (Does this location have curbside collection service for garbage?).

Because of the relatively small sample size of respondents without curbside garbage service (43 people), compared to respondents with service (402 people), results may not be statistically significant.

- Respondents without curbside garbage service were more likely than respondents with service to report bringing:
  - Garbage created on a regular basis (81% vs. 29%).
  - Cardboard for recycling (70% vs. 39%).
  - Mixed recycling (63% vs. 22%).
  - Yard waste (47% vs. 28%).
- Respondents without curbside garbage service were less likely than respondents with service to report bringing:
  - Bulky items discarded infrequently (40% vs. 57%).
  - Construction, remodeling, or demolition debris (42% vs. 57%).

Curbside Recycling Service

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 3b (Does this location have curbside collection service for recycling?).

Because of the relatively small sample size of respondents without curbside recycling service (50 people), compared to respondents with service (390 people), results may not be statistically significant.

- Respondents without curbside recycling service were more likely than respondents with service to report bringing:
  - Garbage created on a regular basis (76% vs. 28%).

  - Cardboard for recycling (60% vs. 40%).
  - Mixed recycling (58% vs. 23%).
  - Yard waste (44% vs. 28%).
- Respondents without curbside recycling service were less likely than respondents with service to report bringing:
  - Bulky items discarded infrequently (44% vs. 57%).
  - Construction, remodeling, or demolition debris (38% vs. 59%).
  - Household hazardous materials (8% vs. 22%).
  - Scrap wood (22% vs. 33%).

Curbside Yard Waste Service

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 3c (Does this location have curbside collection service for yard waste?).

Because of the relatively small sample size of respondents without curbside yard waste service (89 people), compared to respondents with service (334 people), results may not be statistically significant.

- Respondents without curbside yard waste service were more likely than respondents with service to report bringing:
  - Garbage created on a regular basis (61% vs. 25%).
  - Cardboard for recycling (54% vs. 38%).
  - Mixed recycling (46% vs. 20%).
  - Yard waste (44% vs. 27%).
- Respondents without curbside yard waste service were less likely than respondents with service to report bringing:
  - Construction, remodeling, or demolition debris (47% vs. 60%).

Visit Frequency Based on Curbside Collection Service

Curbside Garbage Service

This cross-tabulation presents results for Question 7 (How frequently do you visit a transfer station?) based on responses to Question 3a (Does this location have curbside collection service for garbage?).

Because of the relatively small sample size of respondents without curbside garbage service (43 people), compared to respondents with service (395 people), results may not be statistically significant.

- Respondents without curbside garbage service were more likely than respondents with service to report visiting:
  - Two to three times per month (26% vs. 13%).
- Respondents without curbside garbage service were less likely than respondents with service to report bringing:
  - Two to three times per year (7% vs. 24%).

Curbside Recycling Service

This cross-tabulation presents results for Question 7 (How frequently do you visit a transfer station?) based on responses to Question 3b (Does this location have curbside collection service for recycling?).

Because of the relatively small sample size of respondents without curbside recycling service (50 people), compared to respondents with service (384 people), results may not be statistically significant.

- Respondents without curbside recycling service were more likely than respondents with service to report visiting:
  - About once a month (36% vs. 26%).
- Other differences in visit frequency were less than ten percentage points but still suggest that respondents without curbside recycling service are more likely to visit more frequently than respondents without service.

Curbside Yard Waste Service

This cross-tabulation presents results for Question 7 (How frequently do you visit a transfer station?) based on responses to Question 3c (Does this location have curbside collection service for yard waste?).

Because of the relatively small sample size of respondents without curbside yard waste service (89 people), compared to respondents with service (328 people), results may not be statistically significant.

- Respondents without curbside yard waste service were more likely than respondents with service to report visiting:
  - About once a month (35% vs. 24%).
- Other differences in visit frequency were less than ten percentage points but still suggest that respondents without curbside yard waste service are more likely to visit more frequently than respondents without service.

Materials Brought Based on Visit Frequency

This cross-tabulation presents results for Question 5 (What do you usually bring to the transfer station?) based on responses to Question 7 (How frequently do you visit a transfer station?).

Because of the relatively small sample size of respondents in each visit frequency category (ranging from 10 to 133 respondents each), results may not be reliable. Trends are more difficult to describe due to the number of cross-tabulation categories; please refer to the relevant table for detailed percentage breakdowns.

- Respondents visiting one, two, or three times per month were more likely to bring:
  - Garbage created on a regular basis.
  - Cardboard for recycling.
  - Mixed recycling.
- Respondents visiting one, two, or three times per month, and those visiting every two to three months, were more likely to bring the following materials:
  - Yard waste.

- Respondents who visited less frequently tended to be more likely to bring the following materials:
  - Garbage from special clean-ups or events.
  - Bulky items discarded infrequently.
- Respondents who visited more frequently tended to be more likely to bring the following materials:
  - Construction, remodeling, or demolition debris.

Additional Cross-Tabulation Key Findings (conducted in April)

These additional cross-tabulations, conducted in April 2015, attempted to estimate the number of visits associated with certain materials and that could be shifted if wait time or surcharges occurred at Factoria. To do so, these cross-tabulations used responses to question #7 related to frequency of transfer station visits. However, the online survey was conducted over several months and attempts were made to limit responses to one per person. As a result, Cascadia hypothesized that the survey data may not accurately represent the number of visits by visit frequency. Using online survey data we can say that 20% of respondents visit two to three times per year, but that does not mean that 20% of visits are by customers who visit that infrequently.

In 2011, Cascadia conducted an onsite survey at King County Transfer Stations in which nearly every residential and commercial self-haul customer was surveyed every time they visited during the survey days. These surveys included a question about how frequently the customer visits a survey. As a result, these survey data accurately represent the distribution of visits by customer visit frequency.

This cross-tabulation first presents tables with the number and percentages of respondents within each visit frequency category, followed by tables with these data reweighted by the number of visits from 2011 in each frequency category. Cascadia used the following steps to reweight the data:

1. Establish the boundaries for visit frequency categories in the 2011 onsite survey data to align as reasonably as possible with the 2014 online survey data, as shown in the table below:

2014 Online Survey	2011 Onsite Survey
Two or more visits per month	Seventeen or more visits per year
About once a month	Eleven to sixteen visits per year
Every two to three months	four to ten visits per year
Three or fewer times per year	Three or fewer visits per year

2. Calculate the percentage distribution of visits from the 2011 onsite survey to each visit frequency category and apply those percentages to the total number of visits recorded by King County in 2011. For example:
    a. 28% (192 out of 674) of Factoria visits recorded in the 2011 survey were by respondents who reported visiting a transfer station 17 or more times per year (aligned with two or more visits per month in the 2014 online survey).
    b. The Factoria Transfer Station reported 80,404 total self-haul visits in 2011, so an estimated 22,904 these visits are assumed to have been from customers who visit 17 or more times per year.[1]
3. For each visit frequency category (such as two or more times per month), calculate the percentage of online respondents in 2014 who reported visiting that frequently in each response category of interest. For example:
    a. 2% of Factoria respondents who visit two or more times per month reported bringing only bulky items or bulky items and garbage from special cleanups.
    b. 23% of these respondents reported bringing bulky items and something else.
    c. 74% of these respondents (the remainder) did not report bringing bulky items.
4. For each visit frequency category, apply the distribution of responses from the 2014 online survey to the estimated number of visits from 2011 data to estimate the number and percentage of visits in each category of interest. For example:
    a. In 2011, an estimated 22,904 visits to Factoria were from people who visit 17 or more times per year (see step 2b) and in 2014 approximately 2% of Factoria respondents who reported visiting two or more times per month reported bringing only bulky items (potentially with garbage from special cleanups). As result, Cascadia estimated that approximately 487 visits in 2011 were attributable to these respondents. (Note that the rounded 2% here represents a slightly higher percentage, roughly 2.128.)

Because of the relatively small sample size of respondents in each visit frequency category, results may not be reliable. Visit frequencies were collapsed to increase the number of respondents in each category, but sample sizes are still extremely small and may not accurately represent reality.

Because King County anticipates closing the Houghton and Renton transfer stations, Cascadia also analyzed all respondents who visited the Factoria, Houghton, or Renton transfer stations and reported bringing bulky, items, C&D debris, or yard waste. However, this analysis did not attempt to account for Houghton and Renton customers who may switch to a different transfer station or find another way to handle their waste instead of using the Factoria Transfer Station.

Estimates are rounded to the nearest whole percent, and therefore may not appear equal to 100% when summated.

[1] Cascadia used the most recent data that were available at the time of analysis. These figures could be recalculated as newer data on visits becomes available.

Estimated Visits Related to C&D Debris and Yard Waste

Factoria

- Among respondents who reported visiting the Factoria Transfer Station:
  - 11% reported bringing C&D debris and/or yard waste but no other materials. The majority of these respondents also reported visiting two or more times per month.
  - 59% reported bringing C&D debris and/or yard waste along with other materials.
  - 30% did not report bringing any C&D debris or yard waste. These respondents were more likely to report visiting three times a year or fewer.
- Reweighting based on 2011 visit frequency did not change results much. Overall:
  - An estimated 12% of visits were by customers who bring only C&D debris and/or yard waste but no other materials.
  - An estimate 58% of visits were by customers who bring both C&D debris or yard waste and some other materials; however, the percentage of these visits that would be eliminated by banning C&D debris and yard waste is not known.
  - An estimated 31% of visits were by customers who do not bring C&D debris or yard waste.

Factoria, Houghton, and Renton

When reviewing these results, keep in mind that not all Houghton and Renton customers will switch to Factoria if their transfer stations close.

- Among respondents who reported visiting the Factoria, Houghton, or Renton Transfer Stations:
  - 8% reported bringing C&D debris and/or yard waste but no other materials. Just over half of these respondents also reported visiting two or more times per month.
  - 63% reported bringing C&D debris and/or yard waste along with other materials.
  - 28% did not report bringing any C&D debris or yard waste.
- Reweighting based on 2011 visit frequency did not change results much. Overall:
  - An estimated 9% of visits were by customers who bring only C&D debris and/or yard waste but no other materials.
  - An estimate 62% of visits were by customers who bring both C&D debris or yard waste and some other materials; however, the percentage of these visits that would be eliminated by banning C&D debris and yard waste is not known.
  - An estimated 30% of visits were by customers who do not bring C&D debris or yard waste.

Estimated Visits Related to Bulky Items

Factoria

- Among respondents who reported visiting the Factoria Transfer Station:
  - 3% reported bringing only bulky items or bulky items and garbage from a clean-up or event. Most of these respondents reported to visit three or fewer times per year.
  - 41% reported bringing bulky items along with other materials beyond garbage from a clean-up or event. These respondents were likely to report visiting every two to three months or less often.
  - 56% reported bringing no bulky items.
- Respondents who brought bulky items were asked if they would use a special pick-up service. Among these respondents who bring bulky items to the Factoria Transfer Station:
  - 58% said that they maybe or definitely would be willing to use a pick-up service.
  - 42% said that they were not sure or that they maybe or definitely would not use a pick-up service.
- Reweighting based on 2011 visit frequency did not change results much. Overall:
  - An estimated 2% of visits would be by customers who bring only bulky items or bulky items and garbage from a clean-up or event and who would be willing to use a special pick-up service.
  - Another 25% of visits were by customers who bring bulky items and other materials and who would be willing to use a pick-up service for the bulky items. It is not known what share of these visits consist of only bulky items and could be eliminated by a pick-up service.
  - An estimated 55% of visits were by customer who do not bring bulky items and would not be affected by a pick-up service.

Factoria, Houghton, and Renton

When reviewing these results, keep in mind that not all Houghton and Renton customers will switch to Factoria if their transfer stations close.

- Among respondents who reported visiting the Factoria, Houghton, or Renton Transfer Stations:
  - 4% reported bringing only bulky items or bulky items and garbage from a clean-up or event. Most of these respondents reported to visit three or fewer times per year.
  - 46% reported bringing bulky items along with other materials beyond garbage from a clean-up or event.
  - 56% reported bringing no bulky items. These respondents were likely to report visiting the transfer station on a frequent basis.
- Respondents who brought bulky items were asked if they would use a special pick-up service. Among these respondents who bring bulky items:
  - 44% said that they maybe or definitely would be willing to use a pick-up service.
  - 56% said that they were not sure or that they maybe or definitely would not use a pick-up service.
- Reweighting based on 2011 visit frequency did not change results much. Overall:
  - An estimated 2% of visits would be by customers who bring only bulky items or bulky items and garbage from a clean-up or event and who would be willing to use a special pick-up service.

- Another 22% of visits were by customers who bring bulky items and other materials and who would be willing to use a pick-up service for the bulky items. It is not known what share of these visits consist of only bulky items and could be eliminated by a pick-up service.
- An estimated 49% of visits were by customer who do not bring bulky items and would not be affected by a pick-up service.

Estimated Factoria Visits Shifted by Wait Times

The data below represent responses in the event that the Factoria Transfer Station regularly had a wait time of 1 hour during peak hours of 10 a.m. to 5 p.m. but was open for longer hours.

- Among respondents who reported visiting the Factoria Transfer Station:
  - 11% would continue using the Factoria Transfer Station regardless of the wait time.
  - 76% would change the time of the visit to non-peak hours (before 10 a.m. or after 5 p.m.). Most of these respondents reported visiting every two to three months or less often.
  - 12% would use another transfer station or take other measures.
- Reweighting based on 2011 visit frequency did not change results much. Overall:
  - An estimated 13% of visits would still take place at Factoria Transfer Station regardless of the wait time.
  - An estimated 72% of visits would be shifted to non-peak hours (before 10 a.m. or after 5 p.m.).
  - An estimated 15% of visits would be shifted to another transfer station or other means.

Estimated Factoria Visits Shifted by Surcharges

The data below represent responses in the event that the Factoria Transfer Station were to charge a surcharge to use the facility during peak times (10 a.m. to 5 p.m.) to reduce wait times to 30 minutes or less. The 2014 online survey asked two variations of this question: with a $5 surcharge and a $10 surcharge. For this analysis, responses to the two variations were combined. Consequently, results should be considered a conservative estimate for a $10 surcharge.

- Among respondents who reported visiting the Factoria Transfer Station:
  - 18% would continue using the Factoria Transfer Station during peak hours regardless of the additional charge. Most of these respondents report visiting three times per year or less.
  - 11% reported to already use the transfer station during off-peak hours. These respondents were relatively evenly divided among the different visit frequencies.
  - 55% would delay their trip to Factoria Transfer Station to off-peak hours. Most of these respondents reported visiting every two to three months or less often.
  - 16% would use another transfer station or take other measures. These respondents were relatively evenly divided among the different visit frequencies.

- Reweighting based on 2011 visit frequency did not change results much. Overall:
  - An estimated 20% of visits would still take place at Factoria Transfer Station during peak hours regardless of the charge.
  - An estimated 11% of visits would not change, as the visitors already use Factoria Transfer Station during off-peak hours.
  - An estimated 51% of visits would shift to off-peak hours.
  - An estimated 17% of visits would be shifted to another transfer station or other means.

King County Transfer Station Online Survey Data Summary

By Visit Frequency (Question 7) for Factoria Respondents

November 2014 - January 2015
Data Summary 04/28/2015

Please note: Because not all respondents answered every question, response percentages are calculated based on the number of respondents who answered the particular question, not based on the total number of surveys received. Percentages may not sum to 100% due to rounding.

Column headings indicate the respondent's answer to Question 7, asking how frequently the respondent visits a transfer station. Response categories have been collapsed.

Distribution of Respondents by Visit Frequency? (2014 online survey data for Factoria)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
TOTAL ONLINE SURVEY RESPONDENTS	47	27%	28	16%	40	23%	59	34%	174	100%

Distribution of Total Visits by Visits per Year of Customer (2011 intercept data for Factoria)

	17 or more		11 to 16		4 to 10		0 to 3		TOTAL	
	n	%	n	%	n	%	n	%	n	%
2011 FACILITY STUDY DATAPOINTS (FACTORIA)	192	28%	98	15%	123	18%	261	39%	674	100%
2011 FACILITY VISITS (FACTORIA)	22,904	28%	11,691	15%	14,673	18%	31,136	39%	80,404	100%

5. What do you usually bring to the transfer station? (Select all that apply.)

5.What do you bring? (Online survey response distribution as entered by respondents.)

n = 174 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Garbage created on a regular basis	15	32%	12	43%	8	20%	2	3%	37	21%
Garbage from a special clean-up, move, party, or other event	13	28%	19	68%	28	70%	35	59%	95	55%
Yard waste	10	21%	12	43%	13	33%	9	15%	44	25%
Construction, remodeling, or demolition debris	35	74%	17	61%	21	53%	29	49%	102	59%
Bulky items discarded infrequently, such as furniture	12	26%	13	46%	18	45%	34	58%	77	44%
Cardboard for recycling	14	30%	10	36%	8	20%	5	8%	37	21%
Mixed recycling, such as paper, cans, glass jars, and bottles	5	11%	8	29%	5	13%	1	2%	19	11%
Scrap metal	6	13%	3	11%	7	18%	8	14%	24	14%
Scrap wood	14	30%	7	25%	11	28%	12	20%	44	25%
Household hazardous materials	13	28%	12	43%	20	50%	32	54%	77	44%
Other (please explain)	2	4%	2	7%	1	3%	3	5%	8	5%
TOTAL RESPONDENTS	**47**	**NA**	**28**	**NA**	**40**	**NA**	**59**	**NA**	**174**	**NA**

Respondents who reported bringing bulky items were asked question 6; all other respondents were skipped to question 7.

5a. What do you bring? (Online survey responses re-coded to highlight C&D debris and yard waste.)

n = 174 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Only C&D debris	12	26%	0	0%	1	3%	4	7%	17	10%
Only C&D debris and yard waste*	1	2%	0	0%	0	0%	1	2%	2	1%
C&D debris and something else (not yard waste)	16	34%	10	36%	15	38%	20	34%	61	35%
Yard waste and something else (not C&D debris)	3	6%	5	18%	8	20%	4	7%	20	11%
C&D debris, yard waste, and something else	6	13%	7	25%	5	13%	4	7%	22	13%
No yard waste or C&D debris	9	19%	6	21%	11	28%	26	44%	52	30%
TOTAL RESPONDENTS	**47**	**NA**	**28**	**NA**	**40**	**NA**	**59**	**NA**	**174**	**NA**

** Only respondent brought only yard waste and no other materials.*

5a. Estimated visits by materials brought (C&D debris and yard waste) and visit frequency, weighted by 2011 visit frequency and total self-haul visits in 2011

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Only C&D debris	5,848	26%	0	0%	367	3%	2,111	7%	8,326	10%
Only C&D debris and yard waste*	487	2%	0	0%	0	0%	528	2%	1,015	1%
C&D debris and something else	7,797	34%	4,175	36%	5,502	38%	10,554	34%	28,029	35%
Yard waste and something else	1,462	6%	2,088	18%	2,935	20%	2,111	7%	8,595	11%
C&D debris, yard waste, and something else	2,924	13%	2,923	25%	1,834	13%	2,111	7%	9,792	12%
No yard waste or C&D debris	4,386	19%	2,505	21%	4,035	28%	13,721	44%	24,647	31%
TOTAL RESPONDENTS	**22,904**	**100%**	**11,691**	**100%**	**14,673**	**100%**	**31,136**	**100%**	**80,404**	**100%**

5b. What do you bring? (Online survey responses re-coded to highlight bulky items.)

n = 174 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Only bulky items or bulky items & garbage from clean-up or event	1	2%	0	0%	1	3%	4	7%	6	3%
Bulky items and something else	11	23%	13	46%	17	43%	30	51%	71	41%
No bulky items	35	74%	15	54%	22	55%	25	42%	97	56%
TOTAL RESPONDENTS	**47**	**100%**	**28**	**100%**	**40**	**100%**	**59**	**100%**	**174**	**100%**

Respondents who reported bringing bulky items were asked question 6; all other respondents were skipped to question 7.

6. Would you use a special pick-up service if it cost $35 for a refrigerator or freezer and $25 for another appliance or piece of furniture?

n = 77 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Definitely yes	2	17%	4	31%	3	17%	6	18%	15	19%
Maybe yes	5	42%	4	31%	5	28%	16	47%	30	39%
Not sure	0	0%	1	8%	2	11%	9	26%	12	16%
Maybe no	3	25%	2	15%	2	11%	2	6%	9	12%
Definitely no	2	17%	2	15%	6	33%	1	3%	11	14%
TOTAL RESPONDENTS	**12**	**100%**	**13**	**100%**	**18**	**100%**	**34**	**100%**	**77**	**100%**

Q5&Q6. Distribution of online survey respondents by bulky items brought and willingness to use pick-up service.

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Bulky and special garbage only (yes use)	1	2%	0	0%	0	0%	2	3%	3	2%
Bulky and special garbage only (not sure or not use)	0	0%	0	0%	1	3%	2	3%	3	2%
Bulky and other items (yes use)	6	13%	8	29%	8	20%	20	34%	42	24%
Bulky and other items (not sure or not use)	5	11%	5	18%	9	23%	10	17%	29	17%
No bulky items	35	74%	15	54%	22	55%	25	42%	97	56%
TOTAL RESPONDENTS	**47**	**100%**	**28**	**100%**	**40**	**100%**	**59**	**100%**	**174**	**100%**

Q5&Q6. Estimated visits by willingness to use bulky pick-up service and visit frequency, weighted by 2011 visit frequency and total self-haul visits in 2011

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Bulky and special garbage only (yes use)	487	2%	0	0%	0	0%	1,055	3%	1,543	2%
Bulky and special garbage only (not sure or not use)	0	0%	0	0%	367	3%	1,055	3%	1,422	2%
Bulky and other items (yes use)	2,924	13%	3,340	29%	2,935	20%	10,554	34%	19,753	25%
Bulky and other items (not sure or not use)	2,437	11%	2,088	18%	3,301	23%	5,277	17%	13,103	16%
No bulky items	17,056	74%	6,263	54%	8,070	55%	13,193	42%	44,583	55%
TOTAL RESPONDENTS	**22,904**	**100%**	**11,691**	**100%**	**14,673**	**100%**	**31,136**	**100%**	**80,404**	**100%**

Note: These data do not represent the number of visits that would be shifted because the majority of respondents who bring bulky items also bring other items and may not, except for people who visits three or fewer times per year, bring bulky items every time they visit.

7. How frequently do you visit a transfer station?

n = 174 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Three or more times per week	5	11%	0	0%	0	0%	0	0%	5	3%
Once or twice per week	16	34%	0	0%	0	0%	0	0%	16	9%
Two to three times per month	26	55%	0	0%	0	0%	0	0%	26	15%
About once a month	0	0%	28	100%	0	0%	0	0%	28	16%
Every two to three months	0	0%	0	0%	40	100%	0	0%	40	23%
Two to three times per year	0	0%	0	0%	0	0%	46	78%	46	26%
About once a year or less	0	0%	0	0%	0	0%	13	22%	13	7%
TOTAL RESPONDENTS	**47**	**100%**	**28**	**100%**	**40**	**100%**	**59**	**100%**	**174**	**100%**

Factoria Transfer Station

People who replied that they usually use Factoria Transfer Station, but not the Houghton or Renton transfer stations, responded to this question.

19. Suppose the Factoria Transfer Station regularly had a wait time of 1 hour during peak hours of 10 a.m. to 5 p.m. but was open longer hours. The new hours of operation would be from 6 a.m. to 10 p.m. on weekdays and 8 a.m. to 8 p.m. on weekends. What would you do?

19a. What would you do if wait times were long? (Online survey response distribution as entered by respondents.)

n = 105 2 blank (1.9% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Hire a junk collector to remove the waste	1	6%	0	0%	0	0%	0	0%	1	1%
Subscribe to or increase curbside collection service	0	0%	0	0%	0	0%	0	0%	0	0%
Use the Renton Transfer Station	2	13%	1	6%	0	0%	3	7%	6	6%
Delay my trip to before 10 a.m. or after 5 p.m.	8	50%	14	78%	24	83%	34	81%	80	76%
Still use the Factoria Transfer Station despite the wait time	3	19%	2	11%	2	7%	5	12%	12	11%
Contact a hauler for a bulky item pickup	0	0%	0	0%	0	0%	0	0%	0	0%
Use the Shoreline Transfer Station	0	0%	0	0%	1	3%	0	0%	1	1%
Use the Bow Lake Transfer Station	0	0%	0	0%	0	0%	0	0%	0	0%
Other (please explain)	2	13%	1	6%	2	7%	0	0%	5	5%
TOTAL RESPONDENTS	**16**	**100%**	**18**	**100%**	**29**	**100%**	**42**	**100%**	**105**	**100%**

19a. What would you do if wait times were long? (Online survey responses re-coded to collapse other measures.)

n = 105 2 blank (1.9% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Still use the Factoria Transfer Station despite the wait time	3	19%	2	11%	2	7%	5	12%	12	11%
Delay my trip to before 10 a.m. or after 5 p.m.	8	50%	14	78%	24	83%	34	81%	80	76%
Use another transfer station or take other measures	5	31%	2	11%	3	10%	3	7%	13	12%
TOTAL RESPONDENTS	**16**	**100%**	**18**	**100%**	**29**	**100%**	**42**	**100%**	**105**	**100%**

19. Estimated visits shifted by long wait time, weighted by 2011 visit frequency and visits for Factoria

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Still use the Factoria Transfer Station despite the wait time	4,295	19%	1,299	11%	1,012	7%	3,707	12%	10,312	13%
Delay my trip to before 10 a.m. or after 5 p.m.	11,452	50%	9,093	78%	12,143	83%	25,205	81%	57,893	72%
Use another transfer station or take other measures	7,158	31%	1,299	11%	1,518	10%	2,224	7%	12,198	15%
TOTAL RESPONDENTS	**22,904**	**100%**	**11,691**	**100%**	**14,673**	**100%**	**31,136**	**100%**	**80,404**	**100%**

20. Suppose the Factoria Transfer Station charged higher fees to use the facility during peak times to reduce wait times to 30 minutes or less. What would you do if Factoria charged a surcharge per trip during the peak times of 10 a.m. to 5 p.m.?

Respondents were randomly assigned to the following questions about fees.

20. Online survey response distribution (Online survey responses combined for $5 and $10 surcharge and re-coded to collapse other measures.)

n = 107 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Still use the Factoria Transfer Station during the peak time	5	29%	2	11%	3	10%	9	21%	19	18%
I already use transfer stations during off-peak times	1	6%	4	22%	1	3%	6	14%	12	11%
Delay my trip to Factoria Transfer Station until an off-peak time	6	35%	8	44%	21	70%	24	57%	59	55%
Use another transfer station or take other measures	5	29%	4	22%	5	17%	3	7%	17	16%
TOTAL RESPONDENTS	**17**	**100%**	**18**	**100%**	**30**	**100%**	**42**	**100%**	**107**	**100%**

Note: Responses for a $5 and $10 surcharge have been combined to increase sample sizes. Results should be interpreted as a conservative estimate of responses to a hypothetical $10 surcharge.

20. Estimated visits shifted by surcharge, weighted by 2011 visit frequency and visits for Factoria

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr.		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Still use the Factoria Transfer Station during the peak time	6,737	29%	1,299	11%	1,467	10%	6,672	21%	16,175	20%
I already use transfer stations during off-peak times	1,347	6%	2,598	22%	489	3%	4,448	14%	8,882	11%
Delay my trip to Factoria Transfer Station until an off-peak time	8,084	35%	5,196	44%	10,271	70%	17,792	57%	41,343	51%
Use another transfer station or take other measures	6,737	29%	2,598	22%	2,446	17%	2,224	7%	14,004	17%
TOTAL RESPONDENTS	**22,904**	**100%**	**11,691**	**100%**	**14,673**	**100%**	**31,136**	**100%**	**80,404**	**100%**

King County Transfer Station Online Survey Data Summary

By Visit Frequency (Question 7) for Factoria, Houghton, and Renton Respondents

November 2014 - January 2015
Data Summary 04/28/2015

Please note: Because not all respondents answered every question, response percentages are calculated based on the number of respondents who answered the particular question, not based on the total number of surveys received. Percentages may not sum to 100% due to rounding.

Column headings indicate the respondent's answer to Question 7, asking how frequently the respondent visits a transfer station. Response categories have been collapsed.

Distribution of Respondents by Visit Frequency? (2014 online survey data)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
TOTAL ONLINE SURVEY RESPONDENTS	141	27%	127	24%	128	24%	127	24%	523	100%

Distribution of Total Visits by Visits per Year of Customer (2011 intercept data for Renton, Houghton, and Factoria)

	17 or more		11 to 16		4 to 10		0 to 3		TOTAL	
	n	%	n	%	n	%	n	%	n	%
2011 FACILITY STUDY DATAPOINTS	462	27%	282	17%	340	20%	613	36%	1,697	100%
2011 FACILITY VISITS	63,024	27%	38,469	17%	46,381	20%	83,623	36%	231,498	100%

5. What do you usually bring to the transfer station? (Select all that apply.)

5.What do you bring? (Online survey response distribution as entered by respondents.)

n = 523 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Garbage created on a regular basis	64	45%	70	55%	30	23%	7	6%	171	33%
Garbage from a special clean-up, move, party, or other event	64	45%	82	65%	94	73%	87	69%	327	63%
Yard waste	46	33%	37	29%	45	35%	20	16%	148	28%
Construction, remodeling, or demolition debris	101	72%	68	54%	76	59%	68	54%	313	60%
Bulky items discarded infrequently, such as furniture	43	30%	60	47%	71	55%	85	67%	259	50%
Cardboard for recycling	65	46%	74	58%	50	39%	21	17%	210	40%
Mixed recycling, such as paper, cans, glass jars, and bottles	47	33%	48	38%	33	26%	7	6%	135	26%
Scrap metal	28	20%	14	11%	18	14%	19	15%	79	15%
Scrap wood	54	38%	32	25%	37	29%	36	28%	159	30%
Household hazardous materials	20	14%	15	12%	24	19%	38	30%	97	19%
Other (please explain)	4	3%	4	3%	5	4%	4	3%	17	3%
TOTAL RESPONDENTS	**141**	**NA**	**127**	**NA**	**128**	**NA**	**127**	**NA**	**523**	**NA**

Respondents who reported bringing bulky items were asked question 6; all other respondents were skipped to question 7.

5a. What do you bring? (Online survey responses re-coded to highlight C&D debris and yard waste.)

n = 523 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Only C&D debris	23	16%	6	5%	5	4%	4	3%	38	7%
Only C&D debris and/or yard waste*	1	1%	0	0%	2	2%	3	2%	6	1%
C&D debris and something else	47	33%	42	33%	47	37%	52	41%	188	36%
Yard waste and something else	15	11%	17	13%	21	16%	8	6%	61	12%
C&D debris, yard waste, and something else	30	21%	20	16%	22	17%	9	7%	81	15%
No yard waste or C&D debris	25	18%	42	33%	31	24%	51	40%	149	28%
TOTAL RESPONDENTS	**141**	**NA**	**127**	**NA**	**128**	**NA**	**127**	**NA**	**523**	**NA**

** Most respondents in this category brought both C&D debris and yard waste.*

5a. Estimated visits by materials brought (C&D debris and yard waste) and visit frequency, weighted by 2011 visit frequency and total self-haul visits in 2011

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Only C&D debris	10,281	16%	1,817	5%	1,812	4%	2,634	3%	16,544	7%
Only C&D debris and/or yard waste*	447	1%	0	0%	725	2%	1,975	2%	3,147	1%
C&D debris and something else	21,008	33%	12,722	33%	17,031	37%	34,239	41%	85,000	37%
Yard waste and something else	6,705	11%	5,149	13%	7,609	16%	5,268	6%	24,731	11%
C&D debris, yard waste, and something else	13,409	21%	6,058	16%	7,972	17%	5,926	7%	33,365	14%
No yard waste or C&D debris	11,175	18%	12,722	33%	11,233	24%	33,581	40%	68,711	30%
TOTAL RESPONDENTS	**63,024**	**100%**	**38,469**	**100%**	**46,381**	**100%**	**83,623**	**100%**	**231,498**	**100%**

** Most respondents in this category brought both C&D debris and yard waste.*

5b. What do you bring? (Online survey responses re-coded to highlight bulky items.)

n = 523 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Only bulky items or bulky items & garbage from clean-up or event	1	1%	3	2%	3	2%	13	10%	20	4%
Bulky items and something else	42	30%	57	45%	68	53%	72	57%	239	46%
No bulky items	98	70%	67	53%	57	45%	42	33%	264	50%
TOTAL RESPONDENTS	**141**	**100%**	**127**	**100%**	**128**	**100%**	**127**	**100%**	**523**	**100%**

Respondents who reported bringing bulky items were asked question 6; all other respondents were skipped to question 7.

6. Would you use a special pick-up service if it cost $35 for a refrigerator or freezer and $25 for another appliance or piece of furniture?

n = 259 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Definitely yes	5	12%	7	12%	6	8%	16	19%	34	13%
Maybe yes	14	33%	15	25%	22	31%	30	35%	81	31%
Not sure	5	12%	8	13%	11	15%	24	28%	48	19%
Maybe no	6	14%	16	27%	9	13%	8	9%	39	15%
Definitely no	13	30%	14	23%	23	32%	7	8%	57	22%
TOTAL RESPONDENTS	**43**	**100%**	**60**	**100%**	**71**	**100%**	**85**	**100%**	**259**	**100%**

Q5&Q6. Distribution of online survey respondents by bulky items brought and willingness to use pick-up service.

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Bulky and special garbage only (yes use)	1	1%	2	2%	1	1%	5	4%	9	2%
Bulky and special garbage only (not sure or not use)	0	0%	1	1%	2	2%	8	6%	11	2%
Bulky and other items (yes use)	18	13%	20	16%	27	21%	41	32%	106	20%
Bulky and other items (not sure or not use)	24	17%	37	29%	41	32%	31	24%	133	25%
No bulky items	98	70%	67	53%	57	45%	42	33%	264	50%
TOTAL RESPONDENTS	**141**	**100%**	**127**	**100%**	**128**	**100%**	**127**	**100%**	**523**	**100%**

Q5&Q6. Estimated visits by willingness to use bulky pick-up service and visit fraquency, weighted by 2011 visit frequency and total self-haul visits in 2011

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Bulky and special garbage only (yes use)	447	1%	606	2%	362	1%	3,292	4%	4,707	2%
Bulky and special garbage only (not sure or not use)	0	0%	303	1%	725	2%	5,268	6%	6,295	3%
Bulky and other items (yes use)	8,046	13%	6,058	16%	9,784	21%	26,996	32%	50,884	22%
Bulky and other items (not sure or not use)	10,728	17%	11,206	29%	14,857	32%	20,412	24%	57,204	25%
No bulky items	43,804	70%	20,295	53%	20,654	45%	27,655	33%	112,408	49%
TOTAL RESPONDENTS	**63,024**	**100%**	**38,469**	**100%**	**46,381**	**100%**	**83,623**	**100%**	**231,498**	**100%**
	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE

Note: These data do not represent tha number of visits that would be shifted because the majority of respondents who bring bulky items also bring other items and may not, except for people who visits three or fewer times per year, bring bulky items every time they visit.

7. How frequently do you visit a transfer station?

n = 523 0 blank (0.0% of eligible respondents)

	2+ per month		Once a month		Every 2-3 mo.		3 or less/yr		TOTAL	
	n	%	n	%	n	%	n	%	n	%
Three or more times per week	10	7%	0	0%	0	0%	0	0%	10	2%
Once or twice per week	43	30%	0	0%	0	0%	0	0%	43	8%
Two to three times per month	88	62%	0	0%	0	0%	0	0%	88	17%
About once a month	0	0%	127	100%	0	0%	0	0%	127	24%
Every two to three months	0	0%	0	0%	128	100%	0	0%	128	24%
Two to three times per year	0	0%	0	0%	0	0%	104	82%	104	20%
About once a year or less	0	0%	0	0%	0	0%	23	18%	23	4%
TOTAL RESPONDENTS	**141**	**100%**	**127**	**100%**	**128**	**100%**	**127**	**100%**	**523**	**100%**

Appendix C: Hauler Survey

King County Solid Waste Division
Transfer Plan Review
October 7, 2014

Questions for Haulers

1. How would the following changes to the current transfer system affect your company's costs – capital and operating? How would it affect routing of collection vehicles? How many additional miles would collection trucks travel? How might cost increases be distributed to customers, i.e., would customers in certain cities or areas see higher costs?
    a. Closure of the Renton Transfer Station – no replacement facility

       No current impact unless Factoria and/or Bow Lake are impacted.

    b. Closure of the Houghton Transfer Station – no replacement facility

       No current impact

    c. Closure of the Houghton Transfer Station – replacement transfer station in service area (for purposes of analysis only, we are considering locations near the end of 520 in Redmond and in the Totem Lake area)

       No current impact

2. In an effort to more evenly distribute tonnage in the transfer system, the county is considering directing solid waste collected curbside to particular transfer stations. Looking at the table below, if solid waste from the cities and surrounding unincorporated area was directed as shown, how would that change your company's capital and operating costs? How would it affect routing of collection vehicles? How many additional miles would collection trucks travel? How might cost increases be distributed to customers, i.e., would customers in certain cities or areas see higher costs?

	cities/surrounding areas directed to Factoria	cities/surrounding areas directed to Shoreline	cities/surrounding areas directed to Renton	cities/surrounding areas directed to Bow Lake
a)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Issaquah, Medina, Newcastle, North Bend, Redmond, Sammamish, Snoqualmie, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	n/a – Renton closed or not accepting commercial	Mercer Island, Renton
b)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Medina, Mercer Island, Redmond, Sammamish, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	Issaquah, Newcastle, North Bend, Renton, Snoqualmie	

Note: Cities/surrounding areas not shown in the table would not be directed to a specific transfer station.

3. If the Factoria Transfer Station were open until 10 or 11 p.m. would your company use the extended hours? If so, how many trucks would come in? At approximately what times? What station/hours do those trucks use now?

Yes, we would use the extended hours primarily for trucks coming from Issaquah or Carnation.

4. Are there other changes to station hours that your company would like considered? How many trucks would use the different hours? When are those trucks using the station now?

   We recommend extending Bow Lake Transfer Station to 24 hours, 7 days per week. We support any extension of hours at the Factoria Transfer Station.

5. If the county were to reduce the regional direct fee at Cedar Hills, would your company bypass county transfer stations, instead using private transfer stations, and bring transfer-trailers to Cedar Hills? And if so:
   a. How much waste?

      See attachment **[ISSAQUAH FACTORIA HAULS]**

   b. From which county transfer stations would waste be diverted?

      This depends on the station closures but probably Factoria.

   c. How would it affect routing of collection vehicles?

      It would negatively impact the efficiency of our collection routes.

   d. How would it affect total miles driven (collection vehicles and transfer-trailers)?

      Going to Cedar Hills rather than Factoria for instance has the potential to add an additional 15,000 miles per month.

   e. Is adequate private transfer capacity available or could it be made available?

      We are not aware of viable capacity in this regard.

   f. Would additional transfer station(s) need to be constructed and/or permitted?

   g. Would additional trucks be needed? Additional staff?

      Certainly diverting to Cedar Hills would create more inefficient routing, adding to staff time and truck time.

   h. At what price point would it be worth it to make needed changes?

      We would probably need the cost per ton to be at a lower price than the current transfer station fee in order to make this a viable, cost-effective alternative given the additional staff time, fuel use, and truck time.

6. So that we can consider possible environmental impacts related to changes in miles driven, what type of fuel are your company's vehicles currently using? Do you anticipate changes to fuel type and/or fuel efficiency?

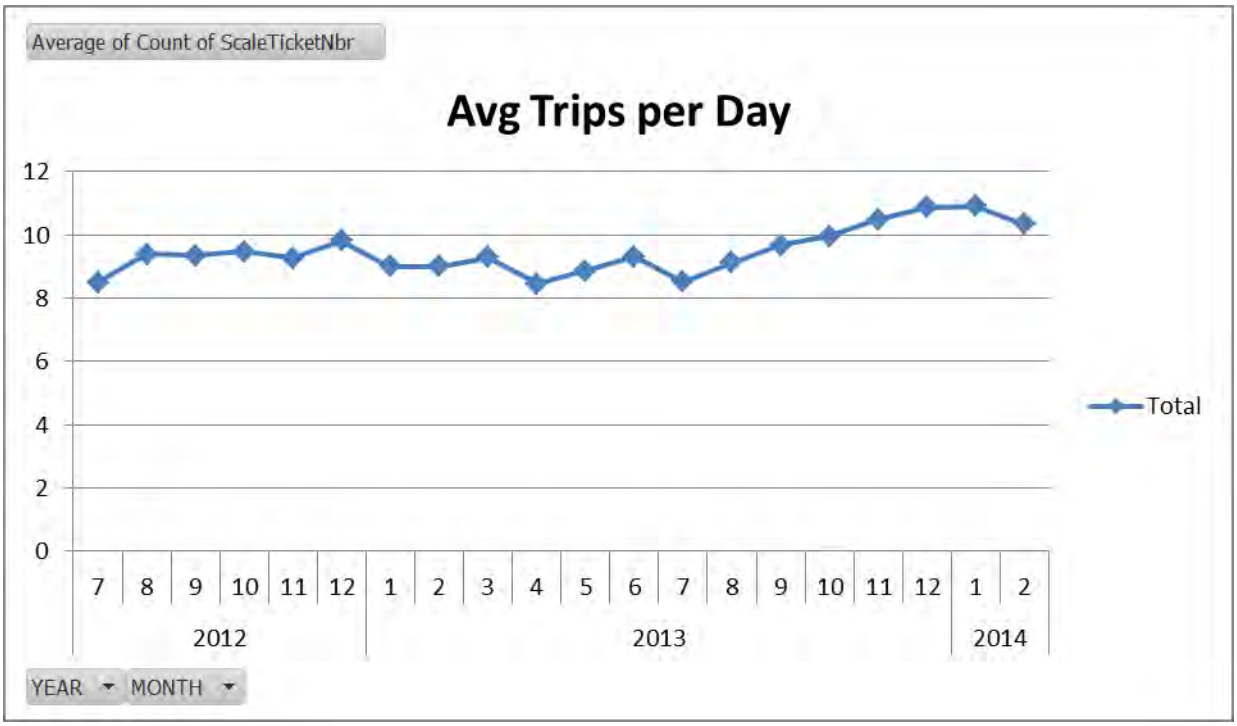
   We primarily use compressed natural gas in our collection fleet.

7. Because a significant portion of the waste brought to the transfer stations by self-haulers is bulky waste, such as furniture, it may be beneficial to collect more of this type of waste curbside – does your company have ideas that would make this service more convenient and cost effective for customers? What would need to change? Costs?

   We currently offer curbside bulky collection to several of our communities at different rate structures. Some are allowed a free collection of one yard worth of material once per year in lieu of a community collection event.

8. Is there other information you think would be helpful in our analysis of options?

ISSAQUAH FACTORIA HAULS



Supplemental Hauler Questions
January 16, 2015

1. If your trucks could no longer use the Renton transfer station, what would the cost impacts be to the curbside customers in the area? For the average 1-can residential customer?
   Recology CleanScapes does not currently use the Renton Transfer Station except for rare instances. The closure of the Renton Transfer would not have any impact to the cost of our operations.

2. If your trucks could no longer use the Houghton transfer station and there was no NERTS, what would the cost impacts be to the curbside customers in the area? For the average 1-can residential customer?
   Recology CleanScapes submitted a proposal to the City of Bothell for service based on the assumption that our garbage would be directed to the Shoreline Transfer Station. While we occasionally use the Houghton Transfer Station, we estimate there would be limited cost impacts to our operations based on the closure of Houghton.

3. If your trucks were directed to use transfer stations as shown in the table below, what would the cost impacts be to the curbside customers in the area? For the average 1-can residential customer?
   Recology CleanScapes would only be impacted through the options outlined below in Issaquah. If our trucks from Issaquah were directed to use the Renton Transfer Station rather than Factoria, we project this to have a negative impact to the productivity of our Issaquah routes. This would add approximately 20 miles of round trip driving, most of which would occur on a very congested highway. We estimate that this would result in us adding an additional hour of cost to each haul coming from Issaquah. In addition to the potential for cost increases through inefficient routing we would be concerned about the environmental impacts resulting from increased drive time and increased time idling in traffic.
   Without knowing if there will be additional wait times at the transfer station, we can only estimate a range of 2-3% increase, which would lead to $0.29 to $0.43 per month on top of the current rate of $14.33 for a 35 gallon cart in Issaquah.

	cities/surrounding areas directed to Factoria	cities/surrounding areas directed to Shoreline	cities/surrounding areas directed to Renton	cities/surrounding areas directed to Bow Lake
a)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Issaquah, Medina, Newcastle, North Bend, Redmond, Sammamish, Snoqualmie, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	n/a – Renton closed or not accepting commercial	Mercer Island, Renton
b)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Medina, Mercer Island, Redmond, Sammamish, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	Issaquah, Newcastle, North Bend, Renton, Snoqualmie	

Note: Cities/surrounding areas not shown in the table would not be directed to a specific transfer station.

King County Solid Waste Division
Transfer Plan Review
October 7, 2014

Questions for Haulers

1. How would the following changes to the current transfer system affect your company's costs – capital and operating? How would it affect routing of collection vehicles? How many additional miles would collection trucks travel? How might cost increases be distributed to customers, i.e., would customers in certain cities or areas see higher costs?

   a. Closure of the Renton Transfer Station – no replacement facility

   114 loads per month from Division 176 would be diverted to Bow Lake resulting in an additional 570 miles per month and 19 hours (at $100 per hour = $1,900 per month x 12 months = $22,800 in additional labor / fuel and maintenance costs).
   In addition we put approximately 2,340 operating hours on a collection vehicle each year , with the additional 19 hours per month x 12 = 228 additional hours per year. Roughly 10% more, thereby pulling forward the life of the vehicle 10%. Typically we depreciate a collection vehicle over 10 years, so we would be looking at increased maintenance costs or depreciating over a short time frame. Estimated impact is $3k per year. So total impact is $26k.

   b. Closure of the Houghton Transfer Station – no replacement facility

   253 loads per month for Division 172 would be diverted to Factoria resulting in an additional 1874 miles per month and 62 hours(at $100 per hour = $6,200 per month x 12 months = $74,400 in additional labor / fuel and maintenance costs).

   In addition we put approximately 2,340 operating hours on a collection vehicle each year , with the additional 62 hours per month x 12 =744 additional hours per year. Roughly 10% more, thereby pulling forward the life of the vehicle 10%. Typically we depreciate a collection vehicle over 10 years, so we would be looking at increased maintenance costs or depreciating over a short time frame. Estimated impact is $3k per year. So total impact is $77k.

   c. Closure of the Houghton Transfer Station – replacement transfer station in service area (for purposes of analysis only, we are considering locations near the end of 520 in Redmond and in the Totem Lake area)

   253 loads per month for Division 172 would be diverted to Totem Lake resulting in an additional 989 miles per month and 33 hours(at $100 per hour = $3,300 per month x 12 months = $39,600 in additional labor / fuel and maintenance costs).
   In addition we put approximately 2,340 operating hours on a collection vehicle each year , with the additional 19 hours per month x 12 = 396 additional hours per year. Roughly 10% more, thereby pulling forward the life of the vehicle 10%. Typically we depreciate a collection vehicle over 10 years, so we would be looking at increased maintenance costs or depreciating over a short time frame. Estimated impact is $3k per year. So total impact is $43k.

2. In an effort to more evenly distribute tonnage in the transfer system, the county is considering directing solid waste collected curbside to particular transfer stations. Looking at the table below, if solid waste from the cities and surrounding unincorporated area was directed as shown, how would that change your company's capital and operating costs? How would it affect routing of collection vehicles? How many additional miles would collection trucks travel? How might cost increases be distributed to customers, i.e., would customers in certain cities or areas see higher costs?

We would prefer the County did not direct tons to specific transfer station. Option B would be the best choice if required. In Option A Taking Mercer Island to Bow Lake and North Bend to Renton would be problematic.

	cities/surrounding areas directed to Factoria	cities/surrounding areas directed to Shoreline	cities/surrounding areas directed to Renton	cities/surrounding areas directed to Bow Lake
a)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Issaquah, Medina, Newcastle, North Bend, Redmond, Sammamish, Snoqualmie, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	n/a – Renton closed or not accepting commercial	Mercer Island, Renton
b)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Medina, Mercer Island, Redmond, Sammamish, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	Issaquah, Newcastle, North Bend, Renton, Snoqualmie	

Note: Cities/surrounding areas not shown in the table would not be directed to a specific transfer station.

3. If the Factoria Transfer Station were open until 10 or 11 p.m. would your company use the extended hours? If so, how many trucks would come in? At approximately what times? What station/hours do those trucks use now?

Yes-Division 172 would take full advantage of the extended hours. 20 trucks per day if there is distribution requirements, 40 trucks per day if no distribution requirements. 7pm to 10pm. Currently use Houghton, Shoreline

4. Are there other changes to station hours that your company would like considered? How many trucks would use the different hours? When are those trucks using the station now?

Having early morning hours 4am would allow us to dump previous day routes. Number of trucks is undetermined at this time.

5. If the county were to reduce the regional direct fee at Cedar Hills, would your company bypass county transfer stations, instead using private transfer stations, and bring transfer-trailers to Cedar Hills? ***Yes possibly*** And if so:

    d. How much waste?

Undetermined at this time

e. From which county transfer stations would waste be diverted?

Mostly Bow Lake and Algona

f. How would it affect routing of collection vehicles?

Undetermined at this time

g. How would it affect total miles driven (collection vehicles and transfer-trailers)?

Undetermined at this time

h. Is adequate private transfer capacity available or could it be made available?

Not at this time

i. Would additional transfer station(s) need to be constructed and/or permitted?

Yes

j. Would additional trucks be needed? Additional staff?

Undetermined at this time

k. At what price point would it be worth it to make needed changes?

Undetermined at this time

6. So that we can consider possible environmental impacts related to changes in miles driven, what type of fuel are your company's vehicles currently using? Do you anticipate changes to fuel type and/or fuel efficiency?

Diesel & CNG. More conversions to CNG if the future.

7. Because a significant portion of the waste brought to the transfer stations by self-haulers is bulky waste, such as furniture, it may be beneficial to collect more of this type of waste curbside – does your company have ideas that would make this service more convenient and cost effective for customers? What would need to change? Costs?

We currently offer special pickup services for these types of items with a different type of truck. Rates vary depending on the area.

8. Is there other information you think would be helpful in our analysis of options?

King County Solid Waste Division
Transfer Plan Review
October 7, 2014

As we communicated during the first transfer plan review, Waste Management fully supports the Base Plan option, which includes building a Northeast facility, likely in the Redmond area. Building a Northeast facility, as part of a well-dispersed transfer station network, ensures that costs and impacts are more equitably distributed across the solid waste system and among the ratepayers. Level of service would also be more relatively uniform across the regional system.

As between Alternative E1 and E2, we would strongly advocate that King County choose Alternative E2, if the Council requires the choice of between those two alternatives; otherwise, we continue to support the Base Plan option. Alternative E1 requires redirecting haulers to underutilized transfer stations, which would be an expensive option for ratepayers, particularly in the cities which will be redirected. Conversely, Alternative E2 only limits self hauler use of the Factoria Transfer station until after 4:00pm, weekdays. Although, a certain amount of self haulers might be affected by the hours restriction under Alternative E2; many, many more ratepayers will be impacted if the County selects Alternative E1. Thus, we strongly urge King County to not select Alternative E1 in this transfer review process.

<u>Questions for Haulers</u>

1. How would the following changes to the current transfer system affect your company's costs – capital and operating? How would it affect routing of collection vehicles? How many additional miles would collection trucks travel? How might cost increases be distributed to customers, i.e., would customers in certain cities or areas see higher costs?

   l. Closure of the Renton Transfer Station – no replacement facility ***When we worked on the transfer station review last year, the estimates we presented for various alternatives each assumed the closure of the Renton Transfer Station. We projected an increase of $1 to $1.5 million in operating expenses (any operating expenses presented are on an annual basis) and an approximate $3 million surge in capital costs.***

   m. Closure of the Houghton Transfer Station – no replacement facility ***With the closure of Houghton, our trucks which currently visit Houghton, would be instead routed to Factoria. We would incur at least an increase of $1 million in operating expenses with this change. We estimate that the capital costs could be upwards of $1.5 to $3 million, as additional trucks will be required.***

   n. Closure of the Houghton Transfer Station – replacement transfer station in service area (for purposes of analysis only, we are considering locations near the end of 520 in Redmond and in the Totem Lake area). ***As stated above, we definitely support the construction of a new facility in Northeast King County. However, even with the construction of a Northeast facility, Houghton would be closed and thus, there would still be operating expense and capital cost increases of $1 to 2 million and $3 million, respectively.***

2. In an effort to more evenly distribute tonnage in the transfer system, the county is considering directing solid waste collected curbside to particular transfer stations. Looking at the table below, if solid waste from the cities and surrounding unincorporated area was directed as shown, how would that change your company's capital and operating costs? How would it affect routing of collection vehicles? How many additional miles would collection trucks travel?

How might cost increases be distributed to customers, i.e., would customers in certain cities or areas see higher costs?

	cities/surrounding areas directed to Factoria	cities/surrounding areas directed to Shoreline	cities/surrounding areas directed to Renton	cities/surrounding areas directed to Bow Lake
a)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Issaquah, Medina, Newcastle, North Bend, Redmond, Sammamish, Snoqualmie, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	n/a – Renton closed or not accepting commercial	Mercer Island, Renton
b)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Medina, Mercer Island, Redmond, Sammamish, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	Issaquah, Newcastle, North Bend, Renton, Snoqualmie	

Note: Cities/surrounding areas not shown in the table would not be directed to a specific transfer station.

2(a): If the listed cities were redirected to either Factoria or Shoreline, we would experience an increase of $3 to 4 million in operating expenses. Capital costs, in the form of adding new trucks, would rise by $3.5 million. Any city that is redirected would see their costs rise, including those cities in which a transfer station closes.

2(b): In the second scenario, operating expenses would augment by $2.5 million to $3 million. Capital costs would increase by $2.6 million. Again, any municipalities which are redirected would expectedly experience an increase in rates.

3. If the Factoria Transfer Station were open until 10 or 11 p.m. would your company use the extended hours? If so, how many trucks would come in? At approximately what times? What station/hours do those trucks use now? ***We would not need to use the extended late hours at Factoria. However, opening Factoria one hour earlier would be operationally beneficial for some of our routes.***

4. Are there other changes to station hours that your company would like considered? How many trucks would use the different hours? When are those trucks using the station now? ***We favor the proposal, as part of Alternative E2, of keeping Factoria open only to commercial haulers and account customers before 4:00pm on weekdays and limiting self haul customer use until after 4:00pm. This would better facilitate the flow of commercial traffic in and out of Factoria and ultimately benefit our customers.***

5. If the county were to reduce the regional direct fee at Cedar Hills, would your company bypass county transfer stations, instead using private transfer stations, and bring transfer-trailers to Cedar Hills? And if so:

    o. How much waste? ***Approximately 50,000 tons annually.***

p. From which county transfer stations would waste be diverted? ***Renton Transfer Station.***

q. How would it affect routing of collection vehicles? ***The final disposition point would, of course, change, but the routing of the collection trucks in the municipalities (for example, Newcastle) or within the County itself would not change.***

r. How would it affect total miles driven (collection vehicles and transfer-trailers)? ***Our collection vehicles would increase miles driven by approximately 255,000 per year.***

s. Is adequate private transfer capacity available or could it be made available? ***We believe that additional private transfer capacity could be made available, but would need to explore this further.***

t. Would additional transfer station(s) need to be constructed and/or permitted? ***Unknown at this time.***

u. Would additional trucks be needed? Additional staff? ***Given that the mileage would dramatically increase as provided above in 5(d), we could see additional trucks needed over time.***

v. At what price point would it be worth it to make needed changes? ***Because any rate changes would likely be a passed through to the rate-paying customer, it would be difficult to ascertain a price point that would entice us to travel to Cedar Hills Landfill.***

6. So that we can consider possible environmental impacts related to changes in miles driven, what type of fuel are your company's vehicles currently using? Do you anticipate changes to fuel type and/or fuel efficiency? ***We currently have approximately 216 compressed natural gas (CNG) trucks operating in the Puget Sound area. We expect to add a few additional CNG trucks to the fleet.***

7. Because a significant portion of the waste brought to the transfer stations by self-haulers is bulky waste, such as furniture, it may be beneficial to collect more of this type of waste curbside – does your company have ideas that would make this service more convenient and cost effective for customers? What would need to change? Costs? ***We would be happy to discuss cost effective curbside collection solutions for bulky items, if King County goes down this path with whichever Alternative is selected.***

8. Is there other information you think would be helpful in our analysis of options? ***If King County chooses Alternative E1, we would welcome offsets in terms of lower fees or incentive pricing; although, as communicated above, we do not advocate the selection of Alternative E1 as a viable option for the regional transfer station system.***

Supplemental Hauler Questions
January 16, 2015

We cannot emphasize enough that, for all of the following answers, the rate impacts are very rough and mutable estimates. There are too many variables and uncertain information in play to provide determinate numbers. We are also providing cost impacts for the average residential curbside customer. The cities would have to deconstruct the rate impacts to determine the average one can customer rate. In calculating these estimates, we utilized the capital cost and operating expense figures that were previously provided during this transfer review process (see answers submitted on 12/2/14)

1. If your trucks could no longer use the Renton transfer station, what would the cost impacts be to the curbside customers in the area? For the average 1-can residential customer? ***For the cities of Renton, Newcastle, Tukwila, and the UTC area of Seattle (Rainier), we estimate that there would be an increase of the collective average rate of $5.00 to $7.00. Stated differently, curbside customer rates could rise by 24% to 34% with the closure of the Renton transfer station.***

2. If your trucks could no longer use the Houghton transfer station and there was no NERTS, what would the cost impacts be to the curbside customers in the area? For the average 1-can residential customer? ***For the cities of Bothell (remaining annexation), Duvall, Kirkland, Redmond, Snoqualmie, Sammamish, and the UTC area of Northeast King County which includes Woodinville, we estimate there will be an escalation in the collective average rate of $2.50 to $3.75. Alternatively, curbside customers rates could increase by 12% to 18% with the closure of the Houghton transfer station and without the construction of the NERTS.***

3.

	cities/surrounding areas directed to Factoria	cities/surrounding areas directed to Shoreline	cities/surrounding areas directed to Renton	cities/surrounding areas directed to Bow Lake
a)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Issaquah, Medina, Newcastle, North Bend, Redmond, Sammamish, Snoqualmie, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	n/a – Renton closed or not accepting commercial	Mercer Island, Renton
b)	Beaux Arts, Bellevue, Carnation, Clyde Hill, Hunts Point, Medina, Mercer Island, Redmond, Sammamish, Yarrow Point	Bothell, Duvall, Kenmore, Kirkland, Lake Forest Park, Shoreline, Woodinville	Issaquah, Newcastle, North Bend, Renton, Snoqualmie	

Note: Cities/surrounding areas not shown in the table would not be directed to a specific transfer station.

3(a). For the cities of Bothell, Newcastle, Duvall, Kirkland, Redmond, Snoqualmie, Sammamish, and the UTC area of Northeast King County which includes Woodinville, the collective average curbside rate would rise by $5.50 to $8.00. Or, alternatively, residential curbside customers would

experience rate increases of 27% to 38% if their solid waste was redirected to either Factoria or Shoreline.

3(b). For the same cities previously discussed in 3(a) with the addition of Tukwila and Renton, the collective average rate would increase by $3.15 to $4.75. Stated differently, residential curbside customer rates would escalate by 15% to 22% with the redirect scenarios are given.

Appendix D: Maps

The following maps can be found on the division's website.

Solid Waste Collection Service Areas http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-2015-collection-areas-2014-11-17.pdf

2010 Total Population http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-2010-population-2014-11-17.pdf

Forecasted 2025 Total Population http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-2025-population-2014-11-17.pdf

Forecasted 2035 Total Population http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-2035-population-2014-11-17.pdf

Median Household Income http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-ESJ-median-income-2014-11-17.pdf

Percent Below 200% of Federal Poverty Level http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-ESJ-below-poverty-2014-11-17.pdf

Percent People of Color http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-ESJ-people-of-color-2014-11-17.pdf

Percent Speak English Less Than Very Well http://your.kingcounty.gov/solidwaste/about/Planning/documents/transfer-plan-workshop-map-ESJ-speak-less-well-2014-11-17.pdf

Appendix E: Benchmarks

	King County	Seattle	Snohomish County	Pierce County	Kitsap County
Tipping fees for garbage at transfer facility	$129.40 per ton ($120.17 + $4.73 Moderate Risk Waste (MRW) surcharge + 3.6% state refuse tax) $22 min. fee (covers first 320 pounds)	$145 per ton (base rate includes MRW surcharge and 3.6% state refuse tax) $30 min. fee (covers first 420 pounds)	$108.78 per ton ($105.00 + 3.6% state refuse tax) $20 min. fee (covers first 360 pounds)	$139.38 per ton $25.59 min. fee for residential $27.88 min. fee for commercial (covers first 400 pounds)	$70.45 per ton ($68 +3.6% state refuse tax) $19 min. fee (covers first 539 pounds)
Other fees (also see below)					Bulky waste $104.49 per ton ($100.86 +3.6% state refuse tax)
Garbage tons at transfer facilities	2013 total 786,072 Self Haul (SH) 21% Commercial Haul (CH) 79% Algona 139,028 Bow Lake 242,584 Cedar Falls 3,208 Enumclaw 18,217 Factoria 117,111 Houghton 153,932 Renton 60,794 Shoreline 43,576 Skykomish 964 Vashon 7,622	2013 total 247,271 North SH 36,180 (45%) CH 44,182 South SH 37,839 (23%) CH 129,072	2013 total 412,445 SH 81,376 (20%) CH 331,069.15 (80%)	2013 total 56,913	2013 total 178,081 Unable to provide percentages self-haul vs. commercial haul at this time
Organics tons at transfer facilities	2013 total 7,577 Bow Lake 3,127 Shoreline 3,612 Enumclaw 486 Cedar Falls 352	2013 total 72,946 North SH 3,219 (19%) CH 14,172 South SH 3,070 (6%) CH 52,485	2013 total 9,324 SH 8,844 (95%) CH 480 (5%)	2013 total 36,711	2013 total 349 Unable to provide percentages self-haul vs. commercial haul at this time
Transactions at transfer facilities	2013 total 707,255 Self Haul (SH) 85% Commercial Haul (CH) 15% Algona 125,995 Bow Lake 157,312 Cedar Falls 17,419 Enumclaw 39,168 Factoria 92,644 Houghton 114,839 Renton 70,094 Shoreline 67,557	2013 total 264,857 North SH 130,168 (93%) CH 10,263 South SH 94,287 (76%) CH 30,139	2013 total 335,047 SH 267,358 (80%) CH 67,689 (20%)	no data available	2013 Olympic View Transfer Station 122,722 Unable to provide percentages self-haul vs. commercial haul at this time

	King County	Seattle	Snohomish County	Pierce County	Kitsap County
	Skykomish 2,768 Vashon 19,459				
Population (approximate)	Est. 1,385,000 (2013)	Est. 659,000 (2014)	Est. 746,000 (2013)	Est. 820,000 (2013)	Est. 230,000 (2013)
Cities served	37 cities/towns (all except Seattle and Milton), portions of Bothell in Snohomish Co., portions of Auburn and Pacific in Pierce Co., and unincorporated	Seattle	22 cities/towns (all except Bothell) and unincorporated	23 cities/towns (all except Tacoma and Ruston) and unincorporated	4 cities/towns and unincorporated
Area served (approximate)	2,050 sq. mi.	82 sq. mi.	2,087 sq. mi.	1,669 sq. mi.	395 sq. mi.
Number and type of transfer facilities	8 transfer stations, 2 drop boxes, and one recycling only area (Snoqualmie Pass)	2 transfer stations (North currently closed for rebuilding)	3 transfer stations and 3 drop boxes	3 transfer stations and 2 drop boxes	1 transfer station (Olympic View Transfer Station), 3 Recycling & Garbage Facilities (Hansville, Olalla, Silverdale) and 1 Recycle Center (Poulsbo). *All municipal solid waste collected at the recycling and garbage facilities is disposed at the Olympic View Transfer Station.*
Drive time to stations	see drive time maps	no data available	no data available	no data available	no data available
Recycling rate	53% (2013)	56.2% (2013)	44.5% (2013)		2013 Ecology report 34% recycling and 42% diversion

<table>
<tr><th></th><th>King County</th><th>Seattle</th><th>Snohomish County</th><th>Pierce County</th><th>Kitsap County</th></tr>
<tr><td>Wait time</td><td>no data available</td><td>no data available</td><td>per 2012 customer survey: average wait time of just over 1 minute; 62% of customers reported no wait; 3% of customers reported a wait of 10 minutes or longer; 15 minutes was the longest reported wait time</td><td>at largest transfer station the longest wait time under normal operation is less than 2 minutes; exceptions: during the 10, 12 and 2:00 hour wait can be up to 10 minutes due to large number of commercial vehicles; wait times for smaller sites and yard waste tend to be longer</td><td>no data available</td></tr>
<tr><td>Time on site</td><td>2014 <u>average</u> minutes on site (inbound scale to outbound scale)
Weekday
<table>
<tr><th>Site</th><th>CH-Acct</th><th>SH-Acct</th><th>SH-Cash</th></tr>
<tr><td>Algona</td><td>13</td><td>12</td><td>13</td></tr>
<tr><td>Bow Lake</td><td>8</td><td>11</td><td>14</td></tr>
<tr><td>Enumclaw</td><td>9</td><td>8</td><td>12</td></tr>
<tr><td>Factoria</td><td>14</td><td>11</td><td>14</td></tr>
<tr><td>Houghton</td><td>11</td><td>13</td><td>13</td></tr>
<tr><td>Renton</td><td>10</td><td>9</td><td>11</td></tr>
<tr><td>Shoreline</td><td>9</td><td>10</td><td>14</td></tr>
</table>
Weekend
<table>
<tr><th>Site</th><th>CH-Acct</th><th>SH-Acct</th><th>SH-Cash</th></tr>
<tr><td>Algona</td><td>12</td><td>12</td><td>11</td></tr>
<tr><td>Bow Lake</td><td>9</td><td>15</td><td>13</td></tr>
<tr><td>Enumclaw</td><td>6</td><td>18</td><td>12</td></tr>
<tr><td>Factoria</td><td>12</td><td>13</td><td>12</td></tr>
<tr><td>Houghton</td><td>11</td><td>12</td><td>11</td></tr>
<tr><td>Renton</td><td>12</td><td>14</td><td>10</td></tr>
<tr><td>Shoreline</td><td>15</td><td>9</td><td>13</td></tr>
</table></td><td>Average time on site at South Transfer Station: Contractor trips = 7.21 minutes; Self-Haul trips = 12.93 minutes.</td><td>no data available</td><td>average of about 18 minutes on site during the week, weekend peak average closer to 30 minutes</td><td>Two sets of information provided:
1. 2012 data for Olympic View Transfer Station: 14 minute median, 16 minute average
2. 2012 Olympic View Transfer Station annual average 24 minutes (all customers, 7 days a week, time starts at inbound scale window and ends at outbound scale window)</td></tr>
</table>

	King County	Seattle	Snohomish County	Pierce County	Kitsap County
Radio-Frequency Identification (RFID)/Tare Weights	weigh all vehicles, except flat fee, in and out (no tare or RFID used)	collect weight information on all vehicles, even flat fee; tried using tare weights but had "terrible issues" so stopped; use RFID for contract haulers, Seattle Housing Authority, Seattle Parks, and Goodwill - they come in unattended and the RFID operates the gate, they select whether they are bringing garbage or yard waste, and leave via an unattended lane	use RFID for franchise haulers, and one of their sites also has some tare weights stored for some commercial customers	weigh all vehicles in and out (no tare or RFID used)	cannot use RFID due to their proximity to an airport, use tare weights for some commercial haulers
Other information	unattended outbound scale in use at Algona and Bow Lake; unattended service at Skykomish	for self-haul, they have a system "like the airport" where a ticket could be used at an unattended kiosk on the way out to pay, but they have not implemented that yet; all self-haul, even flat fee customers, pay on the way out			

Additional Information

1. City of Tacoma
   All fees are based on one half-hour unloading time. When unloading time exceeds one half-hour, an additional fee of $12.25 for each half-hour increment will be charged. Unloading times are determined by an automated scale system. Any vehicle still being unloaded past closing time may be assessed an additional fee. Per the City, the additional fee is rarely charged.

Appendix F: Stakeholder Engagement

Table 1: Transfer Plan Review Advisory Committee Membership

Member(s)	Representing
Diana Quinn	City of Algona
Joan Nelson	City of Auburn
Alison Bennett, Stephanie Schwenger	City of Bellevue
Chris Searcy	City of Enumclaw
Rob Van Orsow	City of Federal Way
John MacGillivray	City of Kirkland
Mayor Mary Jane Goss	City of Lake Forest Park
The Honorable Stacia Jenkins, Councilmember	City of Normandy Park and Solid Waste Advisory Committee
Nina Rivkin, Jerallyn Roetemeyer, Jon Spangler	City of Redmond
Linda Knight	City of Renton
Deputy Mayor Chris Eggen	City of Shoreline
The Honorable Paula Waters, Councilmember	City of Woodinville
Joe Casalini	Solid Waste Advisory Committee (Republic)
Jean Garber	Solid Waste Advisory Committee (interested citizen)
Kimberly Kaminski	Solid Waste Advisory Committee (Waste Management)
Keith Livingston	Solid Waste Advisory Committee (interested citizen)
Philipp Schmidt-Pathmann	Solid Waste Advisory Committee (waste management industry)

In addition to the committee members appointed from MSWMAC and SWAC, Doreen Booth from the Sound Cities Association and council staff participated in meetings.

Table 2: Stakeholder Engagement – Meetings and Workshops

Event	Date	Materials
Transfer Plan Advisory Committee	Aug. 15, 2014	Agenda Scope Handout Alternatives Handout Presentations Meeting Summary
Transfer Plan Advisory Committee	Sep. 26, 2014	Agenda Handout Presentation Meeting Summary
Transfer Plan Advisory Committee	Oct. 31, 2014	Agenda Draft Nov. 17 Workshop Agenda Transportation Briefing Working Concepts Meeting Summary
Workshop 1	Nov. 17, 2014	Agenda Presentation VISSIM Microsimulation Analysis Video at the Shoreline Recycling & Transfer Station (YouTube video) Waste Haulers Collection Areas 2015 Map 2010 Total Population by Forecast Analysis Zone (FAZ) Map 2025 Total Population by Forecast Analysis Zone (FAZ) Map 2035 Total Population by Forecast Analysis Zone (FAZ) Map Median Household Income Map Percent Below 200% of Federal Poverty Level Map Percent People of Color Map Percent Speak English Less Than Very Well Map Meeting Summary
Workshop 2	Feb. 12, 2015	Agenda Presentation Data Handout Strategy Packages Handout

The City of Bothell would like to thank King County Solid Waste Division for the time and analysis they have invested in reviewing Transfer Station plans for King County residents. We appreciate the detailed review your staff and consultants have provided to cities. The City of Bothell has some comments it would like to submit in response to the recent meeting on February 12th.

- Cities and King County need to identify final options and make final decisions on this. Prolonging the vote may not increase opportunities to identify items that change perspectives outside of the factors and details King County Solid Waste and consultants have already provided.
- The City of Bothell still feels that a Northeast Transfer Station needs to be built and a location identified. At this time, our contracted haulers, Recology CleanScapes and Waste Management, are taking material to Shoreline and Houghton. When Houghton closes, plans have identified that our material will go to Shoreline. Other locations identified in areas south of Houghton do not meet the needs of our residents and the travel time with the increasing traffic on the I-405 corridor will prevent residents of Bothell from utilizing those Transfer Stations. Transfer Stations should be built near citizens for them to access. The growth area is identified as being in the Northeast and it makes sense to include a Transfer Station near that area.
- It is a concern that there may be increased costs for future contract negotiations with haulers and for citizens traveling to stations to utilize services. This may have an impact to future rate structures and usage of facilities for our City. A citizen traveling from Northeast cities can easily access either a King County or Snohomish County Transfer Station for services via I-405 North and I-5 South travel path. Moving stations further South may have a negative impact on overall tonnage and usage fees for the County. There are also additional roadway impacts for routes to Transfer Stations on SR 522 as well for the cities in the path of Transfer Stations.

Thank you for your consideration of our comments.

Sabrina Combs
sabrina.combs@ci.bothell.wa.us
425.806.6846
City of Bothell
21233 20th Ave SE
Bothell, WA 98021

Appendix G: Supporting Documents – Key Findings

Other studies and reports that informed this review are listed below along with major, applicable findings.

Topic	Finding	Reference
Cedar Hills Regional Landfill	Explore options to maximize capacity and extend the life of the landfill subject to environmental constraints, relative cost, and stakeholder interests	*Project Program Plan Cedar Hills Regional Landfill 2010 Site Development Plan* (KCSWD, 2010) *Cedar Hills Regional Landfill Site Development Plan EIS* (KCSWD with HDR et al, 2010) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006)
Transfer system	Modernize the transfer system to accommodate service needs and industry changes and to provide efficient and cost-effective services to customers	*Transfer Plan Review* (KCSWD and revised and amended by the King County Council, 2014) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006)
Transfer system	Include compactors in all new transfer facilities	*Transfer Plan Review* (KCSWD and revised and amended by the King County Council, 2014) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006)
Factoria Recycling & Transfer Station	Replace the Factoria Transfer Station with a Factoria Recycling & Transfer Station at the same location, including household hazardous waste service and recycling	*Ordinance 17830* (as amended by the King County Council, 2014) *Transfer Plan Review* (KCSWD and revised and amended by Council, 2014) *Factoria Recycling and Transfer Station Project Oversight Report* (King County Auditor's Office, 2013) *Factoria Transfer and Recycling Station Master Plan* (HDR, 2010) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006) *Comprehensive Solid Waste Management Plan* (KCSWD, 2001)
South County Recycling & Transfer Station	Replace the Algona Transfer Station with a South County Recycling and Transfer Station at a new location	*Transfer Plan Review* (KCSWD and revised and amended by the King County Council, 2014) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006)
Resource recovery and recycling	Provide space for expanded reuse, recycling, and recovery at new transfer facilities and modify existing facilities	*Sustainable Solid Waste Management Study* (Leidos et al,2014) *Optimized Transfer Station Recycling Feasibility Study* (Herrera et al, 2013) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007)

Topic	Finding	Reference
Resource recovery and recycling	Align policies, fees, and regulations to emphasize, incentivize, and mandate reuse and recycling	*Optimized Transfer Station Recycling Feasibility Study* (Herrera et al, 2013)
Resource recovery and recycling	Institute policies, staff training, and staffing level revisions to support and promote greater diversion of recyclable materials at transfer stations	*Sustainable Solid Waste Management Study* (Leidos et al,2014) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007)
Alternative disposal	Implement anaerobic digestion of source separated organic waste	*Sustainable Solid Waste Management Study* (Leidos et al, 2014)
Alternative disposal	Co-locate energy recovery at existing or new facilities	*Optimized Transfer Station Recycling Feasibility Study* (Herrera et al, 2013)
Alternative disposal	Issue solicitation to private industry to manage a portion of the County-controlled mixed waste stream before the Cedar Hills landfill closes	*Sustainable Solid Waste Management Study* (Leidos et al, 2014) *Independent, Third Party Review of the Solid Waste Transfer and Waste Export System Plan* (GBB, 2007) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006)
Rate structure	Explore options for revenue generation that do not rely on tipping fees for waste	*Sustainable Solid Waste Management Study* (Leidos et al, 2014)
Public/Private	Maintain the current mix of public and private ownership and operation	*Optimized Transfer Station Recycling Feasibility Study* (Herrera et al, 2013) *Solid Waste Transfer and Waste Management Plan* (KCSWD, 2006)

Appendix H: Load Origin – Urban Transfer Stations

Table 1: City of Origin Percentage of Loads Received – Self-Haul*

	Shoreline	Houghton	Factoria	Renton	Bow Lake	Algona
Algona					1%	3%
Auburn					7%	30%
Bellevue		9%	41%	1%	1%	
Bothell	3%	10%	1%			
Burien					10%	2%
Carnation		1%				
Clyde Hill		1%	1%			
Covington				2%	3%	7%
Des Moines					10%	3%
Duvall		3%				
Federal Way					7%	22%
Issaquah			12%	4%		
Kenmore	6%	3%				
Kent			1%	3%	30%	14%
Kirkland	2%	26%	2%			
Lake Forest Park	8%					
Maple Valley				7%	1%	1%
Medina		1%	1%			
Mercer Island		1%	12%			
Newcastle			2%	1%		
Normandy Park					3%	
Pacific					1%	3%
Redmond	1%	21%	3%	1%		
Renton			1%	68%	5%	2%
Sammamish		4%	12%	1%		
Seatac					12%	2%
Shoreline	68%					
Snoqualmie			1%			
Tukwila					5%	1%
Woodinville		13%	2%			
Unincorporated	2%	1%	3%	10%	2%	1%
Outside System	8%	3%	2%		2%	8%

Estimates are rounded to the nearest percent and when added together may not equal 100. Values less than .5% are not shown.

** Source: 2011 King County Waste Characterization and Customer Survey Report*

Table 2: City of Origin Percentage of Loads Received – Commercial-Haul*

	Shoreline	Houghton	Factoria	Renton	Bow Lake	Algona
Algona			1%		1%	1%
Auburn					8%	26%
Bellevue		9%	58%		2%	
Black Diamond					1%	
Bothell		8%				
Burien				1%	8%	3%
Carnation		1%				
Covington					1%	5%
Des Moines					6%	3%
Duvall		4%				
Federal Way					7%	22%
Issaquah			15%			
Kenmore	2%	1%	1%			
Kent					33%	20%
Kirkland	2%	28%				
Lake Forest Park	4%					
Maple Valley				1%	2%	5%
Mercer Island			4%			
Newcastle				6%		
Normandy Park					1%	
North Bend			3%	2%		1%
Pacific						1%
Redmond		31%	2%	3%		
Renton				70%	8%	1%
Sammamish			6%			
Seatac					11%	5%
Shoreline	78%					
Snoqualmie			4%			
Tukwila					10%	2%
Woodinville		6%				
Unincorporated	14%	8%	6%	17%	3%	3%

Estimates are rounded to the nearest percent and when added together may not equal 100. Values less than .5% are not shown.

** Source: [2011 King County Waste Characterization and Customer Survey Report]*

Appendix I: Solid Waste Division Costs

Debt service

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
NERTS	$5,364,511	$5,364,511	$8,954,615	$8,954,615	$8,954,615	$8,954,615	$8,954,615	$8,954,615	$8,954,615	$8,954,615
Renton repair/retain	$160,256	$160,256	$160,256	$160,256	$160,256	$160,256	$160,256	$160,256	$160,256	$160,256

	2033	2034	2035	2036	2037	2038	2039	2040
NERTS	$8,954,615	$8,954,615	$8,954,615	$8,823,371	$8,730,407	$2,940,345	$2,675,414	$2,218,213
Renton repair/retain	$160,256	$160,256	$160,256	$141,143	$4,874	$0	$0	$0

Base operating cost (inflated) and debt service by concept

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
0 Renton closed	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890
0 Renton open	$10,397,181	$10,397,181	$10,397,181	$10,397,181	$10,397,181	$10,397,181	$10,397,181	$10,397,181	$10,397,181	$10,397,181
1 Renton closed	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426
1 Renton open	$11,961,793	$11,961,793	$11,961,793	$11,961,793	$11,961,793	$11,961,793	$11,961,793	$11,961,793	$11,961,793	$11,961,793
2 Renton closed	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845
2 Renton open	$12,601,795	$12,601,795	$12,601,795	$12,601,795	$12,601,795	$12,601,795	$12,601,795	$12,601,795	$12,601,795	$12,601,795
3 Renton closed	$15,744,349	$15,744,349	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453
3 Renton open	$17,367,639	$17,367,639	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743

	2033	2034	2035	2036	2037	2038	2039	2040
0 Renton closed	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890	$8,773,890
0 Renton open	$10,397,181	$10,397,181	$10,397,181	$10,378,068	$10,241,799	$10,236,925	$10,236,925	$10,236,925
1 Renton closed	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426	$10,642,426
1 Renton open	$11,961,793	$11,961,793	$11,961,793	$11,942,681	$11,806,412	$11,801,538	$11,801,538	$11,801,538
2 Renton closed	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845	$10,997,845
2 Renton open	$12,601,795	$12,601,795	$12,601,795	$12,582,682	$12,446,414	$12,441,539	$12,441,539	$12,441,539
3 Renton closed	$19,334,453	$19,334,453	$19,334,453	$19,203,209	$19,110,245	$13,320,184	$13,055,253	$12,598,052
3 Renton open	$20,957,743	$20,957,743	$20,957,743	$20,807,387	$20,578,154	$14,783,218	$14,518,287	$14,061,087

Mitigation Cost

Mitigation Costs Concept 0	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Factoria extend hours staff	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606
Shoreline added staff	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177
Shoreline outbound scale	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651
Total	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**

Mitigation Costs Concept 0	2033	2034	2035	2036	2037	2038	2039	2040
Factoria extend hours staff	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606
Shoreline added staff	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177	$57,177
Shoreline outbound scale	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$0	$0
Total	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,594,433**	**$1,452,782**	**$1,452,782**

Mitigation Costs Concept 1	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Factoria extend hours staff	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606
Shoreline added staff	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941
Shoreline outbound scale	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651
Total	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**

Mitigation Costs Concept 1	2033	2034	2035	2036	2037	2038	2039	2040
Factoria extend hours staff	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606	$1,395,606
Shoreline added staff	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941
Shoreline outbound scale	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$0	$0
Total	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,821,197**	**$1,679,547**	**$1,679,547**

Mitigation Costs Concept 2	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Shoreline added staff	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941
Shoreline outbound scale	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651
YW/WW DB debt service	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355
YW/WW DB operating	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840
Total	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**

Mitigation Costs Concept 2	2033	2034	2035	2036	2037	2038	2039	2040
Shoreline added staff	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941	$283,941
Shoreline outbound scale	$141,651	$141,651	$141,651	$141,651	$141,651	$141,651	$0	$0
YW/WW DB debt service	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355	$1,511,355
YW/WW DB operating	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840	$1,045,840
Total	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,982,786**	**$2,841,136**	**$2,841,136**

Operating and debt service cost including cost of mitigation 2015$

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
0 Renton closed	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323
0 Renton open	$11,991,614	$11,991,614	$11,991,614	$11,991,614	$11,991,614	$11,991,614	$11,991,614	$11,991,614	$11,991,614	$11,991,614
1 Renton closed	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623
1 Renton open	$13,782,991	$13,782,991	$13,782,991	$13,782,991	$13,782,991	$13,782,991	$13,782,991	$13,782,991	$13,782,991	$13,782,991
2 Renton closed	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631
2 Renton open	$15,584,581	$15,584,581	$15,584,581	$15,584,581	$15,584,581	$15,584,581	$15,584,581	$15,584,581	$15,584,581	$15,584,581
3 Renton closed	$15,744,349	$15,744,349	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453	$19,334,453
3 Renton open	$17,367,639	$17,367,639	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743	$20,957,743

	2033	2034	2035	2036	2037	2038	2039	2040
0 Renton closed	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,368,323	$10,226,673	$10,226,673
0 Renton open	$11,991,614	$11,991,614	$11,991,614	$11,972,501	$11,836,232	$11,831,358	$11,689,708	$11,689,708
1 Renton closed	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,463,623	$12,321,973	$12,321,973
1 Renton open	$13,782,991	$13,782,991	$13,782,991	$13,763,878	$13,627,609	$13,622,735	$13,481,085	$13,481,085
2 Renton closed	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,980,631	$13,838,981	$13,838,981
2 Renton open	$15,584,581	$15,584,581	$15,584,581	$15,565,469	$15,429,200	$15,424,326	$15,282,675	$15,282,675
3 Renton closed	$19,334,453	$19,334,453	$19,334,453	$19,203,209	$19,110,245	$13,320,184	$13,055,253	$12,598,052
3 Renton open	$20,957,743	$20,957,743	$20,957,743	$20,807,387	$20,578,154	$14,783,218	$14,518,287	$14,061,087

Annual operating cost estimate

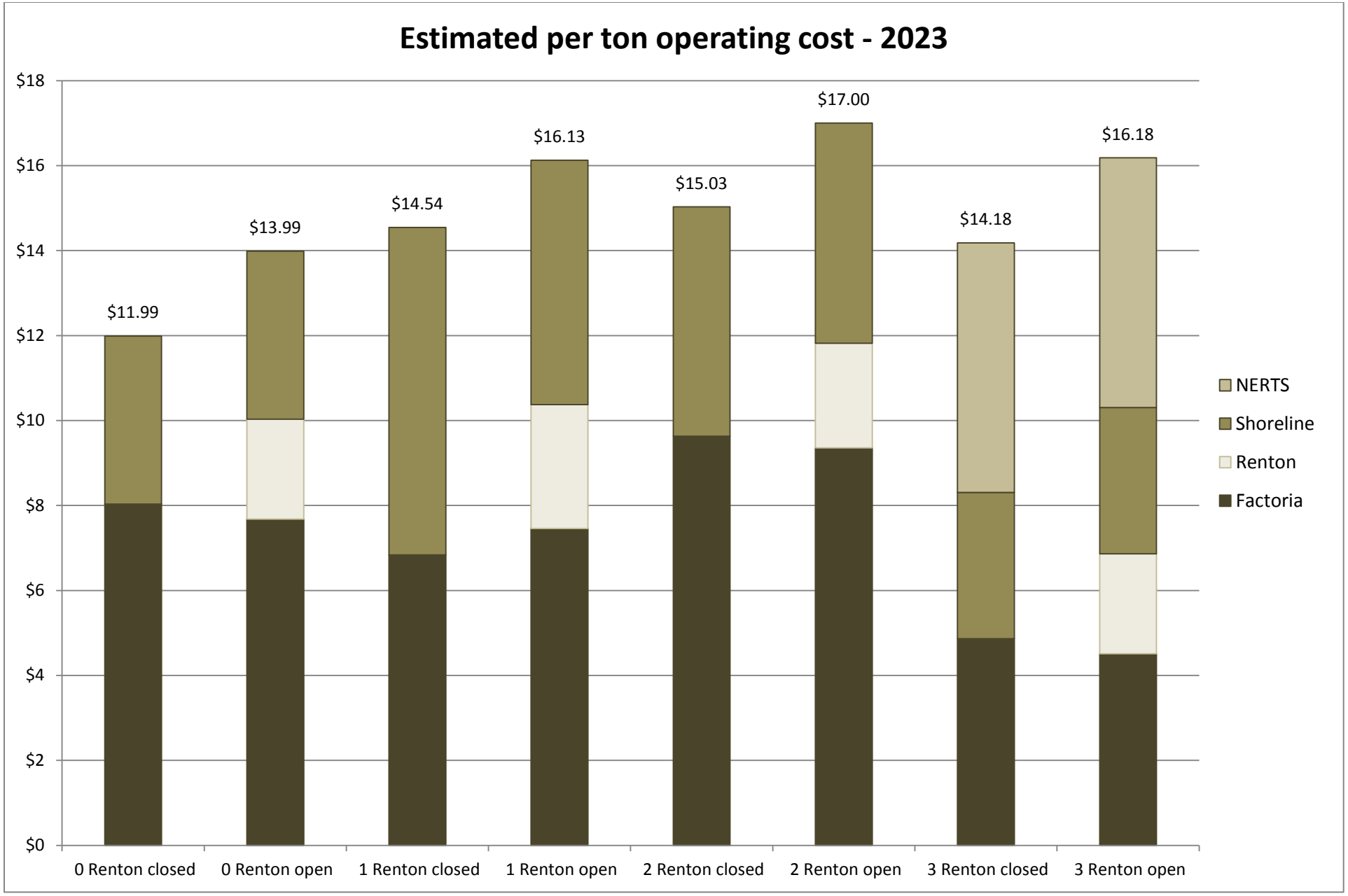
2023 891,000 Tons

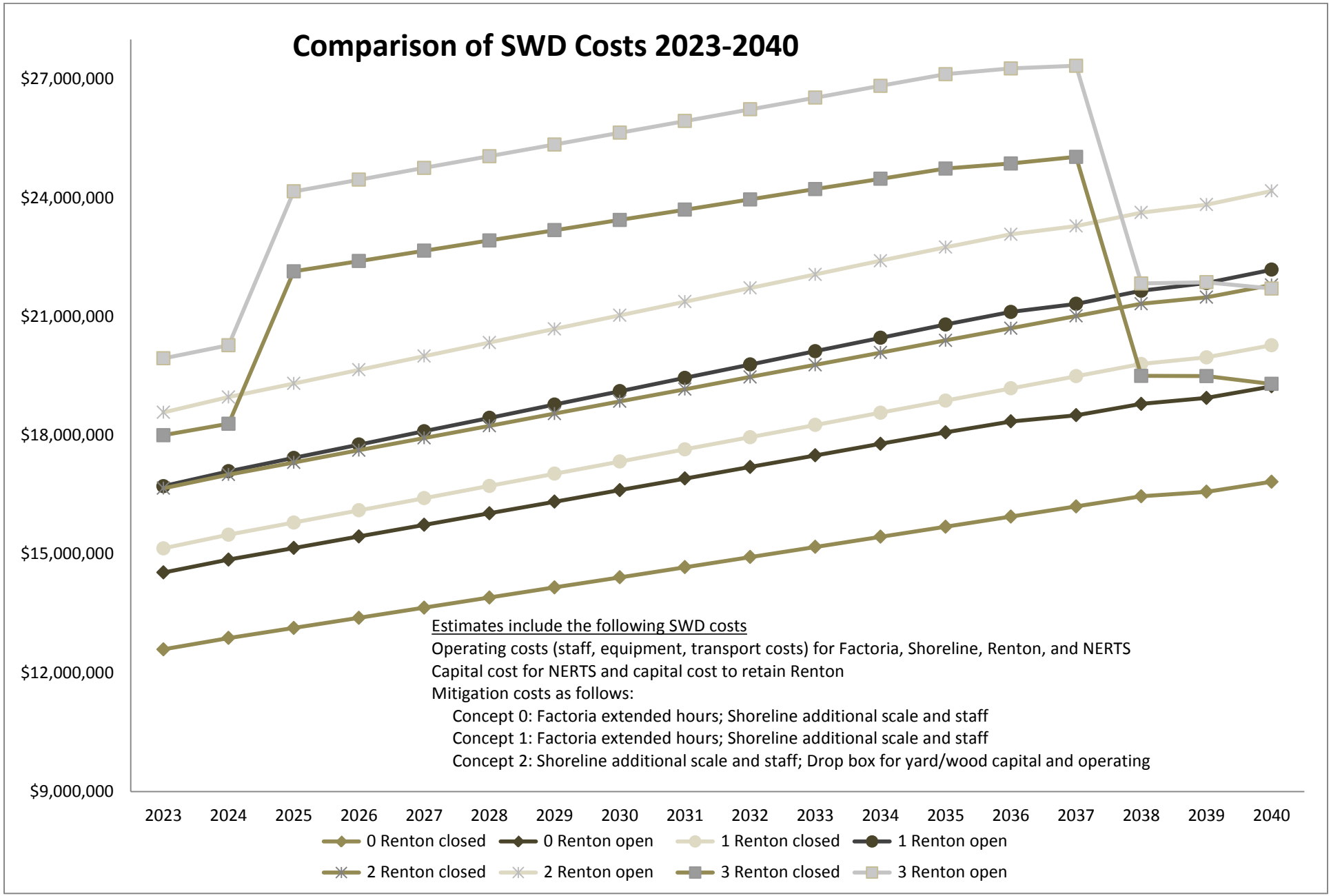
		0 Renton closed	0 Renton open	1 Renton closed	1 Renton open	2 Renton closed	2 Renton open	3 Renton closed	3 Renton open
Factoria	Staff Cost	$2,273,911	$2,273,911	$2,273,911	$2,273,911	$3,973,061	$3,973,061	$1,655,502	$1,655,502
Factoria	Hauling Cost	$4,142,237	$3,827,825	$3,075,547	$3,629,408	$3,863,106	$3,618,477	$1,935,257	$1,620,846
Factoria	Equipment Cost	$742,879	$742,879	$742,879	$742,879	$742,879	$742,879	$742,879	$742,879
Renton	Staff Cost		$964,106		$1,136,934		$964,106		$964,106
Renton	Hauling Cost		$910,899		$1,237,424		$1,011,985		$910,899
Renton	Equipment Cost		$220,651		$220,651		$220,651		$220,651
Shoreline	Staff Cost	$1,309,804	$1,309,804	$2,208,619	$2,208,619	$2,208,619	$2,208,619	$1,309,804	$1,309,804
Shoreline	Hauling Cost	$1,666,826	$1,666,826	$3,582,119	$1,844,468	$2,055,656	$1,861,241	$1,210,727	$1,210,727
Shoreline	Equipment Cost	$546,555	$546,555	$1,074,079	$1,074,079	$546,555	$546,555	$546,555	$546,555
NERTS	Staff Cost							$1,655,502	$1,655,502
NERTS	Hauling Cost							$3,194,608	$3,194,608
NERTS	Equipment Cost							$386,618	$386,618

For equipment includes operating cost and estimated CERP contribution; does not include one-time purchase cost of new equipment.

Estimated per ton operating cost in 2023

	0 Renton closed	0 Renton open	1 Renton closed	1 Renton open	2 Renton closed	2 Renton open	3 Renton closed	3 Renton open
Factoria	$8.03	$7.68	$6.84	$7.46	$9.63	$9.35	$4.86	$4.51
Renton	$0.00	$2.35	$0.00	$2.91	$0.00	$2.47	$0.00	$2.35
Shoreline	$3.95	$3.95	$7.70	$5.75	$5.40	$5.18	$3.44	$3.44
NERTS	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$5.88	$5.88
Total	$11.99	$13.99	$14.54	$16.13	$15.03	$17.00	$14.18	$16.18


Estimated per ton operating cost - 2023
$18
$16
$14
$12
$10
$8
$6
$4
$2
$0
$11.99
$13.99
$14.54
$16.13
$15.03
$17.00
$14.18
$16.18
0 Renton closed
0 Renton open
1 Renton closed
1 Renton open
2 Renton closed
2 Renton open
3 Renton closed
3 Renton open
NERTS
Shoreline
Renton
Factoria


Comparison of SWD Costs 2023-2040
$27,000,000
$24,000,000
$21,000,000
$18,000,000
$15,000,000
$12,000,000
$9,000,000
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
Estimates include the following SWD costs
Operating costs (staff, equipment, transport costs) for Factoria, Shoreline, Renton, and NERTS
Capital cost for NERTS and capital cost to retain Renton
Mitigation costs as follows:
Concept 0: Factoria extended hours; Shoreline additional scale and staff
Concept 1: Factoria extended hours; Shoreline additional scale and staff
Concept 2: Shoreline additional scale and staff; Drop box for yard/wood capital and operating
0 Renton closed
0 Renton open
1 Renton closed
1 Renton open
2 Renton closed
2 Renton open
3 Renton closed
3 Renton open

Net present value for three different time periods

(1% discount rate)

2023-2040

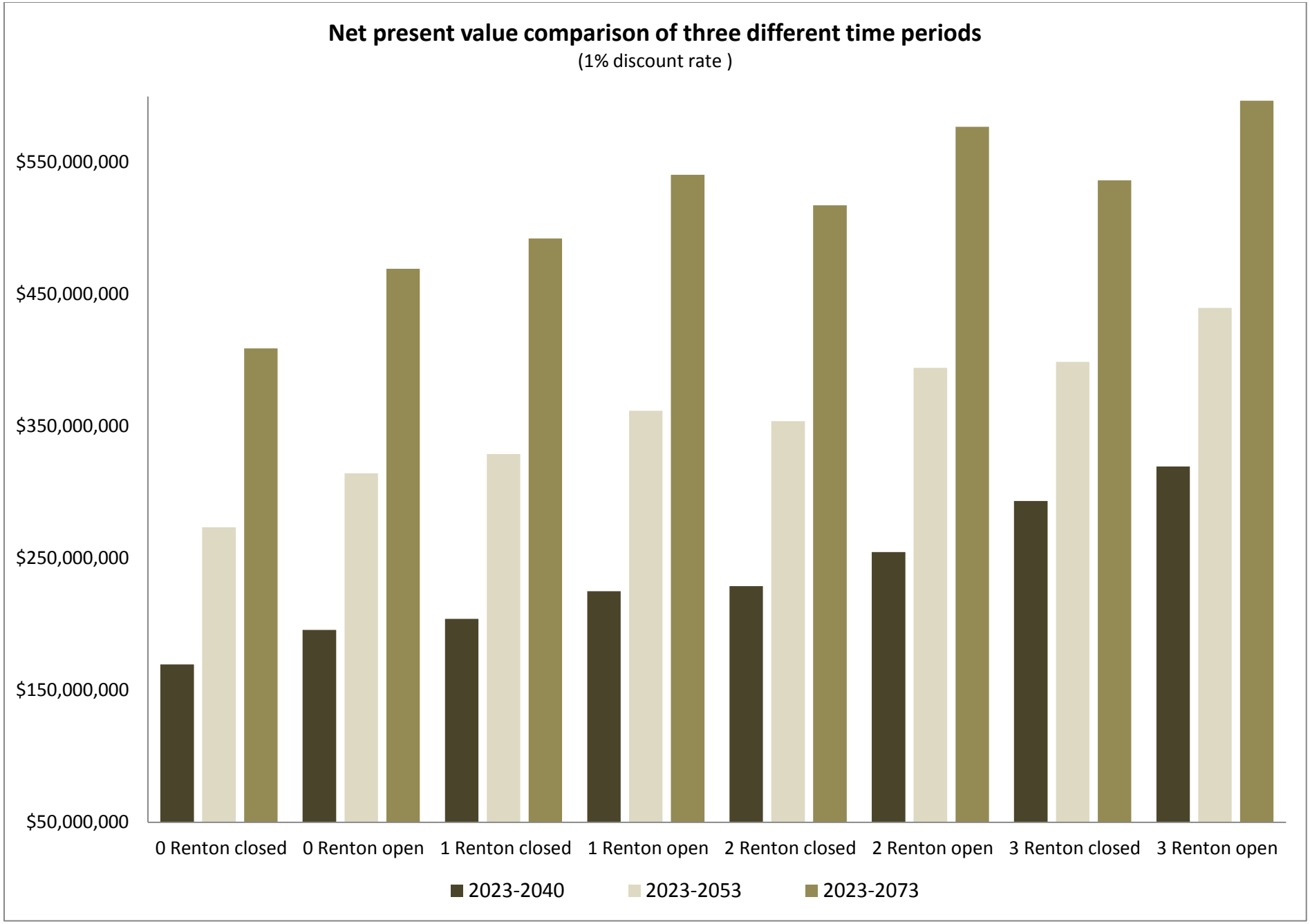
		difference from Concept 0 no Renton
0 Renton closed	$169,784,524	
0 Renton open	$195,847,247	115%
1 Renton closed	$204,143,815	120%
1 Renton open	$225,222,728	133%
2 Renton closed	$229,020,115	135%
2 Renton open	$254,765,694	150%
3 Renton closed	$293,607,473	173%
3 Renton open	$319,670,195	188%

2023-2053

0 Renton closed	$273,524,065	
0 Renton open	$314,427,836	115%
1 Renton closed	$329,138,113	120%
1 Renton open	$361,975,076	132%
2 Renton closed	$354,071,759	129%
2 Renton open	$394,462,199	144%
3 Renton closed	$398,900,728	146%
3 Renton open	$439,804,499	161%

2023-2073

0 Renton closed	$409,087,315	
0 Renton open	$469,384,856	115%
1 Renton closed	$492,476,345	120%
1 Renton open	$540,678,322	132%
2 Renton closed	$517,484,927	126%
2 Renton open	$577,012,768	141%
3 Renton closed	$536,494,317	131%
3 Renton open	$596,791,858	146%


Net present value comparison of three different time periods
(1% discount rate)
$550,000,000
$450,000,000
$350,000,000
$250,000,000
$150,000,000
$50,000,000
0 Renton closed
0 Renton open
1 Renton closed
1 Renton open
2 Renton closed
2 Renton open
3 Renton closed
3 Renton open
2023-2040
2023-2053
2023-2073

Appendix J: Responsiveness Summary

Comments were received from the following interested parties. To see the comments in their entirety see Appendix K.

Cities

City of Auburn
City of Bellevue – City Manager
City of Bellevue – Land Use
City of Bothell
City of Burien
City of Federal Way
City of Kirkland – City Manager
City of Kirkland – Staff
City of Newcastle
City of North Bend
City of Redmond
City of Renton
City of Sammamish

Joint City Letter	Beaux Arts
	City of Bellevue
	City of Bothell
	City of Clyde Hill
	Town of Hunts Point
	City of Lake Forest Park
	City of Medina
	City of Newcastle
	City of Renton
	City of Yarrow Point

SWAC

Chair Jean Garber

Individuals

Anonymous
Bill Boyd
John Brekke
Marie-Anne Harkness
Eleanor Parks

Topic	Commenter	King County Solid Waste Division Response
Review Process		
Public outreach on potential operational and policy changes was inadequate.	• City of Bellevue • Joint City letter • City of Kirkland • City of North Bend	The division recognizes stakeholders would have liked increased opportunities for collaboration; however, the timelines associated with Council Motion 14145 were tight. To maximize stakeholder involvement during data collection and development of the report, the division convened an advisory committee comprised of MSWMAC and SWAC members and met with them four times, as well as discussing the progress of the review with the full advisory committees once a month for six months. This was in addition to two public workshops held to review the modeling assumptions and methods, and an online survey of self-haul transfer station customers.
Process was not collaborative	• City of Kirkland	
Report Structure and Content		
Report should be better organized and more concise; focus on clear description of the alternatives and a comparison of adverse and beneficial impacts and monetary costs – in a matrix form when possible; use consistent language	• Jean Garber	The report has been revised to improve organization, clarity, and consistency of language.
Analyze how each alternative would (or would not) meet the guiding principles listed in the report	• Jean Garber	Although a sample analysis for each guiding principle is not included, the guiding principles are discussed and referenced throughout the report.
Provide data on projected population growth in the various transfer station service areas along with tonnage forecasts	• Jean Garber	Maps showing the population in 2010 and the projected populations in 2025 and 2035 are included in Appendix D. A chart with the tonnage forecast is on page 16 of the report.
Include analysis of Bellevue and four Point Cities staying in the system including costs and traffic	• City of Kirkland • City of Federal Way • City of Renton	Estimates indicate rates would be lower if Bellevue and the four Point Cities remain in the system because fixed costs would be spread over more tons. There could be a minimal increase in the amount of commercial haulers on the road if these cities elect to remain in the system.
Include projections at current recycling rate and at a 60 percent rate	• City of Federal Way	Page 15 shows projections at 60 percent, but does not show projections at current rate of 53 percent. As mentioned on page 14, transactions will be minimally affected by the recycling rate.
Provide more cost information for concepts and	• City of Auburn	Additional cost information is included in the body of the report and in

Topic	Commenter	King County Solid Waste Division Response
strategies, including operational and capital costs; provide information about costs over time	• City of Burien • City of Federal Way • City of Kirkland	Appendix I. The division does not have sufficient information to provide a life cycle cost analysis for each concept
Provide a life cycle cost analysis for each concept	• City of Burien • Jean Garber	
Include discussion of anticipated impact to ratepayers; include the cost of each concept in terms of its effect on the average King County resident's monthly garbage bill	• City of Burien • City of Federal Way • City of Kirkland • Jean Garber	The effect on ratepayers will vary depending where in the county they are located and which concept and strategies are ultimately selected. Building a Northeast Recycling and Transfer Station would increase costs across the county; not building the station and implementing other strategies to manage transactions could lower costs for customers in some geographic areas and raise costs for customers in other areas. Estimates of how the various concepts and strategies would impact the tipping fee and the effect on a resident's monthly garbage bill are included in Appendix I.
Provide objective, evidence-based recommendations in the final report	• Jean Garber	Recommendations are on pages 5 and 6 and in the Conclusion section.
Cities and the County need to identify final options and make final decisions on the Transfer Plan	• City of Bothell	The division anticipates that this final report will lead to additional regional discussions on key policy decisions on the Transfer Plan and broader system issues. Those decisions will be reflected in an updated Comprehensive Solid Waste Management Plan.
Northeast Recycling and Transfer Station		
Keep NERTS as an option/site/build NERTS	• City of Bellevue • City of Bothell • Jean Garber • Joint city letter • City of Kirkland – City Manager • City of Newcastle • City of North Bend • City of Renton • City of Sammamish	The division agrees that a Northeast Recycling and Transfer Station should remain as an option for a future potential facility.
Only two cities, Redmond and Woodinville, do not prefer a new NERTS; the majority of KC cities preferring a system that is equitable to all rate payers and host cities, more effort should be given to exploring siting options of a new NERTS	• City of Renton	There are several options for managing transactional demand in the northeast portion of the county if the region is willing to adopt alternative strategies that balance demand and avoid excessive customer wait times. Under these circumstances, a Northeast Transfer Station is not needed at this time but should remain an option as a potential future facility. The division recommends conducting a pilot
Alternatives that don't include building a NERTS	• Jean Garber	

Topic	Commenter	King County Solid Waste Division Response
should not be called "viable"		program to test the effectiveness and potential impacts of demand management and mitigation strategies.
Support the review and agree with the County's conclusions that another transfer station is not needed	• City of Redmond	
Data does not support the County's conclusion that the operational and policy changes will fully mitigate the decision not to build a new NERTS when Houghton closes, and the solid waste transfer and disposal system will be negatively impacted	• City of Bellevue • City of Renton	
If NERTS is not built, residents living in the north part of the County may find it easier to use transfer stations in Snohomish County	• City of Bothell	
Mitigation Strategies		
Assumptions and strategies, such as mandatory curbside service and variable (peak) pricing, are untested and lack regional support	• City of Bellevue • Joint city letter • City of Kirkland • City of North Bend • City of Renton • City of Sammamish	Though the results show a Northeast is not needed at this time, the modeled demand management strategies are untested and would benefit from real-life analysis. The division recommends conducting a pilot program to test the effectiveness and potential impacts of demand management and mitigation strategies.
Proposed strategies did not adequately consider impacts to large institutional self-haulers or small business owners	• City of Bellevue • Joint City letter • City of Kirkland	The analysis of the strategies did consider effects on large institutional self-haulers and small business owners (See Tables 5 and 6 on pages 29 and 33) in the report. Self-haul restrictions would not apply to customers with charge accounts with the division.
System and Service Equity		
Concepts that do not include NERTS are inconsistent with the County Code requirement for regional equity in siting transfer stations/Comprehensive Plan must strive for regional equity	• City of Bellevue • Jean Garber • Joint city letter • City of Kirkland • City of North Bend • City of Renton	The County's goal is to ensure that residents and businesses within the King County solid waste system have access to services at a reasonable price. Effects of concepts and strategies will be distributed as equitably as possible. The County will continue to work with stakeholders to evaluate options.
Concepts and strategies will result in disproportionate impacts across the County and system inefficiency	• City of Bellevue • City of Bothell • Joint city letter • City of Kirkland	

Topic	Commenter	King County Solid Waste Division Response
	• City of Renton • City of North Bend • City of Sammamish	
Urge the County to carefully consider the future and plan a system that provides a geographically balanced, flexible system of transfer stations that is able to meet the needs of a growing County without placing undue burden on just one area	• Joint City letter • City of Kirkland • City of North Bend • City of Sammamish	To be responsive to the Council motion, the division explored concepts that do not include a Northeast Recycling and Transfer Station; however, the division recommends that it remain as a potential future facility.
Does not support the County policy of equity and social justice	• City of Bellevue • John Brekke • Jean Garber • City of Kirkland	Implementation of any concept and/or strategy will consider equity and social justice and distribute effects as equitably as possible.
Cost and Fee Equity		
Cities in affected areas will experience increased curbside collection costs	• City of Bellevue • City of Bothell • Joint City letter • City of Kirkland • City of Newcastle • City of North Bend • City of Renton • City of Sammamish	In a survey completed for this report, haulers have indicated that some of the concepts and strategies will affect curbside collection rates (see Appendix C).
The fees and rates paid by customers in northeast King County will be supporting higher levels of service and increased capital investments in other parts of the County, but not the northeast	• Joint City letter • City of Kirkland • City of Renton • City of Sammamish	Regardless of the chosen path for managing transactional demand, some customers may face cost increases, such as longer drive times, collection costs, etc., while others may not. In order to effectively manage transactional demand while continuing to provide the same level of service, demand management strategies will be implemented as equitably as possible.
Support service and fee equity to keep collection costs down	• City of Federal Way • Joint city letter • City of Kirkland • City of North Bend • City of Renton • City of Sammamish	The County seeks to ensure that tip fees are kept as low as reasonably possible while achieving our regional environmental and service goals.
Recycling Rate Assumptions and Effect on Recycling		
70% diversion level is/may be unrealistic and	• City of Bellevue	Reaching a 70 percent recycling rate will extend the life of the Cedar

Topic	Commenter	King County Solid Waste Division Response
there is no contingency plan if the region does not reach the 70% recycling rate	• Joint city letter • City of Kirkland • City of Federal Way • City of North Bend • City of Renton • City of Sammamish	Hills landfill, but does not have as much of an effect on the transfer system. Whether materials are brought to the transfer station as garbage or recycling, it is the number of transactions that makes a difference. With higher recycling rates there may be fewer transactions from the commercial haulers, but self-haul traffic, which represents approximately 80 percent of the system's transactional volume, is expected remain at similar levels.
The plan does not provide northeast residents and businesses with the recycling services available at other transfer stations, discouraging recycling and negatively affecting the region's ability to achieve its 70% recycling goal	• City of Kirkland	Some of the concepts and strategies would reduce the availability of recycling options at County transfer stations, so such decisions should consider these impacts as we are develop our roadmap to reach a 70 percent recycling rate.
Effect on Environment and Permits		
Concepts and strategies will cause significant adverse environmental impacts that were not considered in the Factoria Recycling and Transfer Station Conditional Use Permit; additional SEPA review will be needed	• City of Bellevue • Jean Garber • Joint City letter • City of Kirkland	The division recommends conducting a pilot program to test the effectiveness and potential impacts of demand management and mitigation strategies. In addition to pilot programs, the division will work with the City of Bellevue to address their concerns regarding the Conditional Use Permit.
Not building NERTS is against county policy to reduce GHG emissions	• Jean Garber	The recommendations from this review will be incorporated into the Transfer Chapter of the Comprehensive Solid Waste Management Plan, which will be subject to environmental review including consideration of GHG emissions.
Illegal dumping may increase with some alternatives	• Jean Garber	The concern of a potential increase in illegal dumping is noted in Table 6 on page 33. In the past, raising rates or changing hours at our rural stations has not led to measurable increases in illegal dumping.
Effect on other transfer stations and communities		
Customer service will be reduced at Factoria and Shoreline and Increased use at Renton will result in longer queues and wait times.	• City of Renton	If a new Northeast Recycling and Transfer Station is not built, and the Houghton and Renton Transfer Stations are closed, all of the other transfer stations would likely be busier. The division would seek efficiencies and strategies to ensure that customer wait times are not excessive.
Houghton should be closed; County continues to delay closure of the Houghton Transfer Station, now as late as 2023	• City of Kirkland	The County is committed to close the Houghton station as soon as replacement capacity is available, whether through mitigation strategies, identification of additional capacity elsewhere, or siting and building a new facility in the service area. The year 2023 was selected for analysis because it would provide a worst case scenario due to high

Topic	Commenter	King County Solid Waste Division Response
		tonnage and because the Houghton Transfer Station would be closed before that year.
If NERTS is not built, peak pricing places additional trip loads on both regional and local roads	• City of Renton • City of Newcastle	The division recommends conducting a pilot program to test the effectiveness and potential impacts of demand management and mitigation strategies.
Renton Transfer Station		
Do not close the Renton Transfer Station without putting it to a vote and/or providing viable options.	• Anonymous	Council Motion 14145 directed the division to include the Renton Transfer Station in this review to assess the effect its closure might have on customers. Under any of the concepts, closure of the Renton Transfer Station would not have a significant effect on the ability of the system to provide service.
County has not committed to close the Renton Transfer Station unless there is adequate capacity and Concepts 0, 1, and 2 do not provide additional capacity [the City wants the transfer station closed]	• City of Renton	
South County Recycling and Transfer Station		
Supportive of the South County siting process and supportive of City of Algona and County cooperating on equitable mitigation for the timely siting of a new SCRTS	• City of Federal Way	The division is continuing its efforts to site a South County Recycling and Transfer Station.
Transfer Plan Review did not consider the south county; encourage finalizing negotiations with the City of Algona to before the Transfer Plan Review is complete	• Marie-Anne Harkness • John Brekke • Bill Boyd • Eleanor Parks	Council Motion 14145 which required additional review of the Transfer System Plan did not include review of the south county. However, the division analyzed potential effects based on customer use patterns of the system and determined that decisions made for the northeast and Renton areas would have little to no impact on the south county area (see Appendix H).

Appendix K: Comments Received

CITY OF AUBURN

From: Shelley Coleman [mailto:scoleman@auburnwa.gov]
Sent: Friday, May 01, 2015 3:23 PM
To: Yates, Diane
Cc: Bill Peloza; Joan Nelson
Subject: RE: May 8th MSWMAC Meeting: RESPONSE REQUESTED

Diane

I read the executive summary for Agenda item #4, Transfer Plan Review, and I few a few observations and comments.

I note under concepts 0, 1 and 2 there are notes under **Costs** identifying increases or impacts on operational costs, capital costs and revenues should the NE station not be built. On page 6 under concept 3, construction of the NE transfer station, there is note of the $97M capital costs but no mention of the operating costs and revenue for the site or concept under **Costs**. Operational costs for the NE station should be added.

Additionally, if this station is built, there will be an impact on the Factoria and Shoreline stations revenues and costs. I know there is more to this than just the $$, but it is an important factor and we should not ignore the revenue impact the contemplated NE station will have on the other stations. I would anticipate their revenue streams will contract. I think these items should be considered and noted under the **Costs** section of the Factoria and Shoreline stations in concept 3 rather than the comment 'none'.

These were my impressions and thoughts.

Shelley Coleman
Finance Director
City of Auburn
25 W Main St
Auburn, WA 98001
253 804 5019

City of Bellevue
Post Office Box 90012 • Bellevue, Washington • 98009 9012

May 6, 2015

Dow Constantine, King County Executive
King County Chinook Building
401 - 5th Ave, Suite 800
Seattle, WA 98104

RE: Bellevue Comments on Transfer Plan Review Part 2 Draft Report

Dear Executive Constantine:

In response to the request for comments on the Transfer Plan Review Part 2 Draft Report, transmitted to the King County Council on March 31, 2015, Bellevue is writing to strongly urge the County to retain the option of a new northeast transfer station as a potential future facility in the Solid Waste Comprehensive Plan. Although the final report from the Part 1 review recommended that the new northeast transfer station be kept as a potential future facility to retain flexibility in the system, the County Council directed additional review of the northeast and Renton service area needs, which led to the current Transfer Plan Review Part 2 Draft Report ("Draft Report").

The City has the following serious concerns about the true viability of closing the Houghton (and potentially Renton) Transfer Stations without a plan to replace the capacity and service provided by those stations with a new transfer station in the northeast region of the County at some point in the future:

1. The Draft Report is inconsistent with the County Code requirement for regional equity in siting transfer stations.
2. The concepts and strategies relied upon will result in disproportionate impacts across the County and system inefficiency.
3. The Draft Report is based on a combination of assumptions and strategies that are untested and lack the regional support that would be needed for implementation. Even if successfully implemented, there is no data to support the County's conclusion that the operational and policy changes will fully mitigate the decision not to build a new northeast station when Houghton closes.
4. The proposals in the Draft Report are inconsistent with the Factoria Transfer Station Conditional Use Permit (CUP).
5. The Draft Report does not support the County policy of equity and social justice.
6. It is unrealistic to assume that the region can achieve a 70% recycling rate, and there is no contingency plan if the region does not reach that goal.
7. The proposed strategies did not adequately consider impacts to large institutional self-haulers or small business owners.

8. The concepts and strategies relied upon in the Draft Report will cause significant adverse environmental impacts.
9. Northeast cities will experience increased rates in local collection contracts.
10. Public outreach on potential operational and policy changes was inadequate.

Additional information about each of the City's concerns is included below.

1. The Draft Report is inconsistent with the County Code requirement for regional equity in siting transfer stations.

   King County Code 10.08.030 requires that "to the extent practicable, solid waste facilities shall be located in a manner that equalizes their distribution around the county, so that no single area of the county will be required to absorb an undue share of the impact from these facilities." (emphasis added)

   Both the provision of services and the responsibility for supporting those services should be equitably distributed. The proposals in the Draft Report shift an undue share of the impacts from the system to the Factoria Transfer Station and Bellevue, violating County Code.

   Localized impacts include long traffic queues and long wait times at Factoria Transfer Station. Queue lengths would cut off all access to businesses along SE 32nd Street and disrupt traffic all the way to the intersection with Richards Road (a ¼ mile backup on a local street). The Draft Report also proposes to shift self-haul traffic away from the transfer station peak time to later in the afternoon – right into the afternoon rush hour peak. Intersections in the vicinity of Richards Road will likely be severely impacted and were only addressed in a cursory manner in the Draft Report. The environmental impacts associated with the increased traffic in the vicinity of the Factoria Transfer Station include at a minimum air quality and noise, which were also not adequately addressed in the Draft Report.

   In addition to Bellevue, all of the northeast region will experience undue impacts through increased drive times to reach a transfer station, increased queues and wait times, increased traffic congestion, negative air quality impacts, and rate impacts as haulers will charge more in local collection contracts to account for increased travel and wait times to reach transfer services.

2. The concepts and strategies relied upon will result in disproportionate impacts across the County and system inefficiency.

   The proposals effectively create a two class transfer station system in King County, with a lack of consistent policies, services and rates across the system. The northeast portion of the County will be both underserved and overburdened while the other areas of the County will be fully served by transfer stations that are geographically distributed for maximum system efficiency. In fact, currently the County is actively working on the siting and replacement of the Algona Transfer Station, which will serve south King County along with the Bow Lake Transfer Station.

System users in south King County will have a complete range of transfer and recycling services available to them, better and more convenient access to such services, shorter queues, shorter wait times, shorter drive times, fewer environmental impacts and potentially lower fees and rates. These users will not be sharing the impacts that those in the northeast County will be.

Northeast County users will have restricted self-haul and recycling opportunities, restricted access due to operating hours changes and/or peak pricing, longer queues and wait times, negative environmental impacts, and higher fees and rates, both at the transfer station and through increased costs to local collection contracts due to longer hauling distances and increased traffic congestion. At a minimum, the northeast County will be paying the same tipping fee as the rest of the County for services and capital construction projects that they will not benefit from. And, as discussed in more detail below, institutional or business self-haulers will be hit particularly hard by the proposals. Overall, the proposals will result in lower service levels for those that are bearing the most burden of hosting transfer facilities.

3. <u>The Draft Report is based on a combination of assumptions and strategies that are untested and lack the regional support that would be needed for implementation. Even if successfully implemented, there is no data to support the County's conclusion that the operational and policy changes will fully mitigate the decision not to build a new northeast station when Houghton closes.</u>

   The conclusion drawn in the Draft Report that the option to not build a new northeast station is viable is based on a combination of assumptions and strategies that rely heavily on behavioral changes that are notoriously hard to influence and not entirely under the control of the County. Examples include the assumption that the region will achieve a 70% recycling rate by 2030 (discussed in more detail below) and that demand management strategies will significantly change self-haul behavior.

   The County primarily relied on a very limited and flawed data set to support its conclusions. The primary data was drawn from a self-selected transfer station survey that was conducted in less than two months, in the winter time and spanned the holiday season. Such a survey is unlikely to capture the true range of transfer station stakeholders, and it is unwise to rely on such a limited sample to draw conclusions that have very significant and wide-ranging impacts if not successful.

   Several of the strategies assumed in the Draft Report rely upon significant policy changes and other actions by every city in the system and King County. These include adopting mandatory collection ordinances and reducing bulky waste fees in each city's private hauling collection contract. The 70% recycling goal assumption in and of itself is likely to require many more such actions by all cities, including mandates, bans and the funding of garbage "police." There is no evidence and no assurances that cities will be willing to undertake such sweeping policy changes. The County should not rely on contract changes for mitigation when those changes are not under the County's control. Opening up collection contracts could also prove to be problematic for cities. Initiating changes to bulky waste fees may impact other terms in city contracts and lead to higher costs, which

may be compounded if at the same time haulers look to recoup increased costs due to increased drive and wait times.

Even if cities were willing to adopt mandatory collection ordinances and reduce bulky waste fees for curbside pickup, there is very little evidence to suggest that such policy changes will significantly reduce self-haul trips. Only 1/3 of the cities in King County's system have mandatory collection ordinances. Many of those cities have self-haul rates that are similar or even higher than cities that do not have mandatory collection ordinances. The County's data shows that self-haulers in mandatory collection cities represent 40% of the total self-haul traffic at the County's transfer stations.

4. The proposals in the Draft Report are inconsistent with the Factoria Transfer Station Conditional Use Permit (CUP).

   The City will be providing an official letter under separate cover regarding the Factoria Transfer Station Conditional Use Permit because the Draft Report is inconsistent with the CUP approval, which was based on an eight station system and underlying traffic and technical analyses that formed the basis of the approval. Modification of the CUP will be required if and when the County acts on the new transfer plan as part of the Solid Waste Comprehensive Plan to close Houghton and/or Renton and remove the new northeast station from the plan. These actions will trigger a requirement for a full Environmental Impact Statement. The new application will need to address the shift of traffic trips to Bellevue's afternoon peak hours, queuing levels of service at intersections, redistribution of regional traffic, noise and other environmental impacts. The City will begin proceedings to enforce the terms of the CUP should it become necessary. Please see the City's CUP letter for more specific details on enforcement of the CUP.

5. The Draft Report does not support the County policy of equity and social justice.

   The County's equity and social justice ordinance requires the County to "consider equity and social justice impacts in all decision-making so that decisions increase fairness and opportunity for all people, particularly for people of color, low-income communities and people with limited English proficiency or, when decisions that have a negative impact on fairness and opportunity are unavoidable, steps are implemented that mitigate the negative impact."

   The County included several maps in the Draft Report that display the communities in the County using various demographic factors. Several of the maps highlight the disparity between the areas near the Factoria Transfer Station in east Bellevue and the rest of the northeast service area of the County where a new northeast station would need to be sited. In particular, the maps show that median household incomes are significantly lower and the percent of the community below 200% of the federal poverty line is significantly higher in the east Bellevue/Factoria Transfer Station area as compared to the rest of the northeast service area. When combined with the disproportionate impacts discussed above, it appears that the less affluent area of the County is being sacrificed for the benefit of the wealthier service area.

The proposed restrictions to self-haul hours, a potential ban on yard and wood waste disposal at Factoria Transfer Station and peak pricing are all strategies that will disproportionately negatively impact small business landscape companies in northeast King County. These small companies tend to be minority-owned, and the proposed strategies conflict with the County's social justice policies by unfairly burdening the business operations of these landscapers. The landscapers need convenient, fairly priced opportunities to dispose of the yard and/or wood waste from their businesses each day – the same opportunities that are available to landscapers who operate in south King County.

6. <u>It is unrealistic to assume that the region can achieve a 70% recycling rate, and there is no contingency plan if the region does not reach that goal.</u>

King County has set an ambitious goal of achieving a 70% recycling rate County-wide, across all customer sectors (i.e., single-family, multifamily, and commercial) by 2030. Today's recycling rate in the County is 53%. As mentioned above, it will take drastic restrictions, bans, and mandates to achieve – most of which have never been tested alone, much less in combination, and there is no commitment by the cities throughout the County to take such drastic actions on behalf of their customers.

Until all policies, restrictions, bans, and mandates have been adopted, and actual data establishes that progress is being made in a timely fashion towards achieving the 70% recycling rate, this cannot serve as a foundational assumption for such a significant change in the solid waste transfer system plan. The most striking omission in the Draft Report, given the large uncertainty associated with this key assumption, is that there is no recognition that the new northeast station should be kept as an option in the Solid Waste Comprehensive Plan as a contingency in case the region does not achieve the target goal.

The Draft Report states that "a ten percent lower recycling rate by 2030 would equate to an approximate 33 percent increase in tonnage." (pages 3 & 16) Even a small failure to make progress in achieving the recycling goal has a huge impact on tonnage that will need to be handled through the transfer system. Yet the Draft Report concludes that "it is not expected to have a substantial effect on transactional volume." It is not realistic to conclude that a 33% increase in tonnage would not have a substantial effect on transactional volume. This highlights the large risk associated with reliance upon the assumption that the region will achieve the 70% goal.

The City of Seattle has had mandates and bans for years, yet Seattle's recycling rate is only 60% (data taken from Seattle website; the Draft Report states Seattle's rate as 56%). In addition, the Draft Report cites no data from the City of Seattle correlating Seattle's actions and changes to its recycling rate. The King County road to 70% is guaranteed to be more difficult given the diversity of jurisdictions and approaches to recycling, so Seattle's experience should serve as a warning to those who want to rely on recycling as the alternative to building a new northeast station.

Given that the region has not established the policies and actions that will need to be implemented to achieve the 70% target, it is unknown how much of the anticipated

recycling will occur at the curb and how much will be captured through materials processing at the transfer stations through on-site separation. If the latter, then that material has to be accounted for in the tonnage that is being processed through the transfer system, even if it is not garbage. It is unclear if these materials are being accounted for in the volume calculations and impacts on the transfer system.

The Draft Report includes banning yard debris and wood waste from Factoria Transfer Station without a plan for where those materials will go. If banned, it is possible that yard debris and wood waste would end up in the garbage. Landscapers and others may not be willing to drive to less convenient alternative sites, and this could result in these materials being improperly disposed of as garbage.

7. <u>The proposed strategies did not adequately consider impacts to large institutional self-haulers or small business owners.</u>

King County defines "self-haul" as "[a]nyone who brings garbage, recyclables, and/or yard waste to a transfer facility except a commercial collection company." King County fails to account for the fact that self-haul includes large institutions that run their own collection, like Boeing, the Bellevue School District, and Bellevue Community College. Every jurisdiction in the County, including the City of Bellevue, is a self-hauler. Self-haul is not just the mom/pop/weekend warrior hauling their garbage to the transfer station, and the Draft Report does not address this distinction. There has been no outreach to the larger institutional self-haulers to identify their concerns and get their buy-in to the proposed restrictions, changes, and rate impacts.

Additionally, the potential impacts to small businesses in the area, such as the small landscaping companies that depend on being able to dump their loads at the end of the day, have not been evaluated. Illegal dumping may increase, and then jurisdictions are left to try and solve yet another problem with limited resources.

8. <u>The concepts and strategies relied upon in the Draft Report will cause significant adverse environmental impacts.</u>

As mentioned above, the proposals result in long wait times at Factoria Transfer Station, with cars idling in long queues on local streets. This has a significant environmental impact to air quality, noise and greenhouse gasses. Changing operating hours to shift self-haul traffic to peak commute times further exacerbates these impacts. The entire northeast region will experience negative air quality and greenhouse gas environmental impacts from increased traffic congestion on regional and local roads as commercial haulers and self-haulers travel further to reach transfer services.

Traffic and queues also increase pollution in stormwater runoff and negatively impact surface water quality in Bellevue's Greater Kelsey Creek Basin, an important basin for salmon habitat. These significant impacts were not addressed at all in the Draft Report.

9. Northeast cities will experience increased rates in local collection contracts.

The reduction in the number of transfer stations in the northeast area of the County will result in local commercial haulers traveling further to reach transfer services. The increased travel and wait times will result in haulers charging more in local collection contracts for the impacted northeast cities. In addition, one of the strategies relied upon by the County for mitigation is lower bulky waste fees for curbside pickup. This could require all cities opening up local collection contracts to renegotiate services, costs and customer pricing, which is not necessarily an easy or straightforward process for cities to undertake.

10. Public outreach on potential operational and policy changes was inadequate.

The County's public outreach on the Draft Plan was very limited. Given how heavily the County is relying upon behavioral changes, significant outreach would be required to educate various stakeholders on the potential changes and impacts and obtain meaningful feedback. As mentioned above, the limited two month self-selected survey of transfer station users was inadequate in even capturing a true survey of transfer station users. The County did not even attempt to educate and obtain feedback from the general public or the variety of stakeholders that will be impacted regarding the other mitigation strategies it is considering. At a minimum, the County should have conducted several public hearings and meetings with city councils on its transfer station mitigation proposals along with the policy changes that would be needed to achieve a 70% recycling rate.

Thank you for the opportunity to comment on the Draft Plan. We trust that our concerns will be addressed as the County's moves forward in finalizing its transfer plan and Solid Waste Comprehensive Plan.

Sincerely,

Brad Miyake
City Manager

cc: Bellevue City Councilmembers
King County Councilmembers
Diane Carlson, Director of Regional Initiatives, King County Executive
Bob Burns, Deputy Director, Department of Natural Resources and Parks
Christie True, Director, DNRP
Pat McLaughlin, Director, Solid Waste Division, DNRP
Kevin Kiernan, Assistant Division Director, Solid Waste Division, DNRP
Diane Yates, Intergovernmental Liaison, Solid Waste Division, DNRP

City of Bellevue
Post Office Box 90012 • Bellevue, Washington • 98009 9012

May 6, 2015

Christie True, Director
King County Department of Natural Resources and Parks
201 South Jackson Street, Room 700
Seattle, WA 98104

RE: Adequacy of Analysis and Mitigation for the Factoria Recycling and Transfer Station Permits

Dear Ms. True:

This is to provide you with information about the City of Bellevue's concerns regarding revisions currently under study to transfer service plans in the northeast portion of King County. After review of the Transfer Plan Review, Part 2, Draft Report, it is apparent that modifications to the regional system now under consideration by the County will result in environmental impacts to the Factoria Recycling and Transfer Station (RTS) that were not addressed by the Conditional Use Permit applications submitted to City of Bellevue for review in 2012. At that time, the Factoria RTS was characterized as one of eight existing King County transfer stations, and analyzed as such. As described in the new Draft Report, significant changes in (1) existing and planned stations and (2) operational strategies are under consideration. If these changes are implemented, the City will need to require a new Conditional Use Permit in order to analyze and address the anticipated impacts. In addition, a full Environmental Impact Statement (EIS) that evaluates the alternatives being considered by the County will be necessary BEFORE options are foreclosed or actions set in motion that would make the impacts identified in the Draft Transfer Plan a virtual certainty in Factoria.

The Conditional Use Permit (12 110986 LB) and Critical Area Land Use Permit (12 110987 LO) for the Factoria RTS were approved by the City of Bellevue on November 21, 2012. The Mitigated Determination of Non-Significance for these applications was issued by King County on March 8, 2012. The Transportation section of that DNS primarily referenced traffic impacts during construction. Traffic impacts during operation of the site were addressed in the DNS by this statement: "Due to anticipated volume growth at the Factoria RTS, evaluation during operation may be required to assess the need for an additional inbound scale to minimize traffic queuing under future conditions."

Although the City of Bellevue did not issue the DNS for this application, City staff did review and assess long term, mid-range, and short term operational impacts during review of the CUP

application. An approval of the CUP relied upon project disclosures provided by the County. With regard to long term traffic impacts, staff determined that the proposal was consistent with the City's Transportation Facilities Plan EIS. Payment of a traffic impact fee alleviates traffic congestion caused by the cumulative impacts of development. Analysis of mid-range traffic impacts, typically assessed through a Traffic Standards Code (BCC 14.10) concurrency analysis, was not undertaken since the proposal's net p.m. peak hour trip generation of 12 trips did not meet the 30 p.m. peak hour threshold. Information as to short term operational impacts was provided in the "Factoria Recycling and Transfer Station Replacement Project Traffic Impact Analysis" dated January, 2012, by HDR Engineering, Inc. This traffic impact analysis (TIA) was reviewed by City staff, is included in the City's file for this project, and was one of the bases upon which the CUP was conditioned and approved.
Day-of-opening (assumed to be 2014) trip generation was determined to be 12 net new p.m. peak hour trips. Additional trips anticipated for the long term (assumed to be 2042) were forecasted to be 44 net new p.m. peak hour trips. The TIA analyzed both the 2014 and 2042 scenarios and determined that all the study intersections would remain at the same level of service with and without the proposed Factoria RTS improvements.

The County's consultant also provided a Queuing Analysis Technical Memorandum, dated November 3, 2011. This Memorandum indicated that the average queue at the entrance would not produce any negative effects to the adjacent commercial driveway on either the weekdays or the weekends in 2014, but would spill back to the commercial driveway for 10% of the station's operating hours on the weekdays and 60% on the weekends in 2042. The Development Services Department (DSD) of the City of Bellevue concurred with the conclusions reached in the County's DNS and the technical memoranda submitted in support of the County's CUP application. In addition to the King County Department of Natural Resources and Parks, Solid Waste Division (KCSWD), Mitigated DNS and the queuing and traffic impact analyses described above, the following technical memoranda were also used as the bases upon which the CUP was conditioned and approved:

- Visual Quality Impact Assessment
- Geotechnical Report
- Biological Evaluation
- Critical Areas Report
- Noise
- Air Quality

KCSWD is now considering operational, policy, and capital strategies for providing transfer service to northeast King County. These Concepts and their resulting impacts, described in the Transfer Plan Review, Part 2, Draft Report, include abandonment of a Northeast Transfer Station project, closure of the Houghton Transfer Station, closure of the Renton Transfer Station, and various operational strategies regarding hours of operation and restrictions upon classes of users. These strategies prioritize customer wait time and efficient usage of transfer stations.

Unfortunately, these priorities would result in unmitigated impacts on the operation of the Factoria RTS and the surrounding public facilities and on the use of private property in the vicinity. For example, Concept 2 restricts the hours that self-haulers can use the Factoria RTS, and also extends the hours, so that self-haulers are encouraged to use those extended hours. As documented in spreadsheets in Attachment 3 of the Draft Report, this restriction shifts trips to Bellevue's street system peak hours, increasing volumes between 4 p.m. and 6 p.m. by hundreds of trips. This operational change pushes self-haul access to the Factoria RTS into the p.m. traffic peak for the City of Bellevue. This impact was not analyzed as part of the Factoria RTS application review, is not consistent with the terms of the County's CUP approval, represents an unmitigated impact that would be inconsistent with SEPA and GMA, and will not be permitted to occur in the City.

Additionally, as noted in the Draft Report, weekday queues at the Factoria RTS of 130 vehicles and Saturday queues of over 180 vehicles are predicted to occur with closing of the Houghton Transfer Station. Mitigation strategies for these queues are referenced, but are not otherwise detailed. Not only would these queues represent another unmitigated impact on properties in the vicinity of the Factoria RTS, the queue lengths would not meet the County's own level of service standards and would significantly reduce customer functionality at the Factoria RTS and other remaining transfer stations in the system.

The impacts of the range of strategies now contemplated by the County's plan for providing transfer service were not addressed by the Conditional Use Permit approved by Bellevue for the Factoria RTS. Therefore, to the extent that program changes to the transfer station system by KCSWD change assumptions upon which the Factoria RTS CUP was issued and conditioned, the County will be held to impact levels disclosed in the CUP. Modification to the approved CUP will be necessary based on updated analysis of the above-referenced technical memoranda before any operational changes can be made to Factoria. Given the information contained in the Transfer Plan Review Draft Report, the operational changes contemplated in several of the identified Concepts appear likely to cause a significant adverse environmental impact for which mitigation cannot be easily identified. Therefore, a full EIS that evaluates the alternatives being considered by the County will be necessary.

Should the County commit to pursuing any of the Concepts that would change the currently eight station system, a new CUP application would be required based on analysis contained in an EIS. This new application would, at a minimum, need to address increased p.m. peak hour trip generation, queuing, and levels of service at affected City of Bellevue intersections, the air quality impacts associated with the queuing, and the redistribution of regional traffic that would be necessary to access a more distributed system of transfer station facilities as well as the noise impacts associated with expanded station operations that would be necessary to redistribute the solid waste tonnage to fewer stations. It is anticipated that a concurrency analysis would be required as a component of this review. In addition, payment of an updated traffic impact fee, currently anticipated to be $5000 per p.m. peak hour trip as of January 1, 2016, would be

required with any approval of expanded usage at the Factoria RTS. It is our expectation that the County would pursue all necessary approvals and environmental review before any changes are made to the existing system plans that would change Factoria RTS operations disclosed by the County in its application for CUP approval. Please be advised that the City will begin proceedings necessary to enforce the terms of the existing CUP approval should it become necessary.

Sincerely,

Carol V Helland

Carol Helland, Director, Land Use Division
Development Services Department

Cc: Bellevue City Councilmembers
King County Councilmembers
Dow Constantine, King County Executive
Diane Carlson, Director of Regional Initiatives, King County Executive
Pat McLaughlin, Director, King County Solid Waste Division
Bob Burns, Deputy Director, Department of Natural Resources and Parks
Kevin Kiernan, Assistant Division Director, Solid Waste Division, DNRP
Diane Yates, Intergovernmental Liaison, Solid Waste Division, DNRP

CITY OF BOTHELL

The City of Bothell would like to thank King County Solid Waste Division for the time and analysis they have invested in reviewing Transfer Station plans for King County residents. We appreciate the detailed review your staff and consultants have provided to cities. The City of Bothell has some comments it would like to submit in response to the recent meeting on February 12th.

- Cities and King County need to identify final options and make final decisions on this. Prolonging the vote may not increase opportunities to identify items that change perspectives outside of the factors and details King County Solid Waste and consultants have already provided.
- The City of Bothell still feels that a Northeast Transfer Station needs to be built and a location identified. At this time, our contracted haulers, Recology CleanScapes and Waste Management, are taking material to Shoreline and Houghton. When Houghton closes, plans have identified that our material will go to Shoreline. Other locations identified in areas south of Houghton do not meet the needs of our residents and the travel time with the increasing traffic on the I-405 corridor will prevent residents of Bothell from utilizing those Transfer Stations. Transfer Stations should be built near citizens for them to access. The growth area is identified as being in the Northeast and it makes sense to include a Transfer Station near that area.
- It is a concern that there may be increased costs for future contract negotiations with haulers and for citizens traveling to stations to utilize services. This may have an impact to future rate structures and usage of facilities for our City. A citizen traveling from Northeast cities can easily access either a King County or Snohomish County Transfer Station for services via I-405 North and I-5 South travel path. Moving stations further South may have a negative impact on overall tonnage and usage fees for the County. There are also additional roadway impacts for routes to Transfer Stations on SR 522 as well for the cities in the path of Transfer Stations.

Thank you for your consideration of our comments.

Sabrina Combs
sabrina.combs@ci.bothell.wa.us
425.806.6846
City of Bothell
21233 20th Ave SE
Bothell, WA 98021

BOYD, BILL

-----Original Message-----
From: Bill Boyd [mailto:bill_boyd@mac.com]
Sent: Wednesday, May 06, 2015 12:43 PM
To: Yates, Diane
Cc: John Brekke; Eleanor Brekke; Marie-Anne; cindy flanagan; Jon Lindenauer
Subject: Comments on Draft Solid Waste Transfer Plan Review Report

I'm a member of the No North Auburn Garbage Site organization.

The Draft Solid Waste Transfer Plan Review Report has significant shortcomings. It does not consider the needs of South King County residents and businesses in the same holistic way it analyzes the situation in the north part of the county.

Many questions remain unanswered. For instance, the Bow Lake and Enumclaw transfer stations were overbuilt with extra capacity. If the Renton transfer station was left open, is the Algona transfer station needed?

What extra capacity do our neighboring solid waste systems have at transfer stations in Seattle, Snohomish County, Pierce County and Tacoma?

The alternatives analyzed in the transfer plan review limit South King County's future options and increase impacts to South King County stakeholders. For that reason, I agree with Eleanor Brekke of Brekke Properties that concluding negotiations with the City of Algona should come before adoption of the Draft Solid Waste Transfer Plan Review Report.

As she notes, should the siting process for replacing the Algona transfer station be reopened, stakeholders in South King County — including businesses, residents and citizens' groups — will certainly object to the findings of Transfer Plan Review 2. Unfortunately, that could result in further delay and expense for all the proposals now under discussion.

In addition, the business owners and residents in the area deserve a prompt resolution to this situation, as it's difficult to plan and invest for the future in the midst of so much uncertainty.

Our group deeply appreciates the efforts of King County Solid Waste to expedite these negotiations. I strongly encourage you to see them through before a vote is taken on Transfer Plan Review Part 2.

Thanks very much.

Bill Boyd
5282 S. 285th Street
Auburn, WA 98001
206-604-6825

BREKKE, JOHN

Transfer Plan Review Part 2 Public Comment - May 6, 2015

I am a commercial property owner in King County and a member of a coalition which consists of concerned residents, businesses, and commercial property owners. Our coalition has been active in the Transfer Station process for several years. We have participated and provided feedback in meetings with King County Solid Waste, SWAC, MSWMAC, King County Council & Staff, and Cites in South King County. King County should not move forward with the adoption of the Transfer Plan Review Part 2 prior to officially siting the South King County transfer station in Algona. South King County is part of the overall transfer station network and South King County needs to be considered in the Transfer Plan Review Part 2. Further, the following specific concerns and questions need to be addressed:

How would the Algona Transfer Station EIS alternative of not rebuilding the Algona Station impact the Renton and Bow Lake Transfer Stations? How would the Transfer Review Plan 2 need to be revised to account for this possibility?

Bow Lake and Enumclaw Transfer Stations were overbuilt with extra capacity. If the Renton Transfer Station was left open is the Algona Transfer Station or a new South King County Transfer Station needed?

The 4 Concepts studied in the Transfer Plan Review Part 2 have negative impacts of varying degrees to both the existing Algona Transfer Station and a proposed new South King County Transfer Station. What additional impacts, mitigation and capacity is needed for a new South King County Transfer Station in each of the 4 Concepts?

Would the extra capacity at both rural transfer stations and direct haul to Cedar Hills allow King County to build smaller transfer stations at any of the proposed or existing locations in King County?

South King County has some of the lowest incomes in King County. Equity and Social Justice principals have been adopted by King County. Why is Algona/ South King County being left out of the Transfer Plan Review Part 2 when these equity and social justice principals are important to consider?

Bow Lake, Renton, and Algona have overlapping service areas with municipal contract haulers, commercial users and self-haulers making choices between these locations. How would closing Renton and the increase demand at Bow Lake impact both the existing Algona Transfer Station and a new South King County Transfer Station?

Are the negative impacts to Algona in of each of the 4 Concepts being studied in the Transfer Plan Review Part 2 impacting the siting of a new South King County?

Bow Lake, Factoria, Shoreline transfer stations were closely studied in the Transfer Plan Review Part 2. Most cities in South King County have several transfer stations that are within a 30 minute drive-time. Why was the Algona Transfer Station's current traffic patterns and wait times not studied by King County's traffic consultant?

What extra capacity do our neighboring solid waste systems have at transfer stations in the City of Seattle, Snohomish County, Pierce County and the City of Tacoma? What locations and capacity are available in neighboring systems within a 30 minute drive-time of existing or proposed King County transfer stations?

Banning yard waste and wood is being studied. What extra capacity does privately owned transfer stations and yard waste facilities have that might help King County minimize capital improvements to transfer stations?

How would the Algona Transfer Station/South King County EIS alternative of not rebuilding the Algona Station impact the data, outcomes and conclusions of the Transfer Plan Review Part 2?

What extra capacity do the rural transfer stations have in mitigating the need of building more or larger transfer stations in King County?

The Transfer Plan Review 2 has been focused on identifying better solutions for the Northeast. The review has considered alternatives such as closing Renton and shifting load to Bow Lake. These alternatives limit South King County's future options and increase impacts to South King County stakeholders. What risk and associated cost does King County Solid Waste see with this scenario?

In the event an agreement is not reached between the City of Algona and King County Solid Waste, the South King County siting process with have to be revisited. Stakeholders in South King County will object to the scope and findings of the Transfer Plan Review Part 2. This will create cascading impacts to all parts of King County. Has this impact been anticipated by King County Solid Waste?

Time is of the essence in concluding mitigation negotiations with the City Algona to avoid costs of revamping Transfer Plan Review 2 to include Algona/South King County data and the far reaching impacts to all areas of King County. Stakeholders are burdened with the uncertainty and costs associated with not finalizing Algona negotiations. How would the delay of the adoption of the Transfer Plan Review Part 2 to include Algona/South King County data in the Transfer Plan Review Part 2 impact other stakeholders in King County?

Thank you for addressing the specific concerns shared in this public comment period for the Transfer Plan Review Part 2. Both I and our coalition appreciate the opportunity to participate. We look forward to having our concerns addressed prior to the final adoption of the Transfer Plan Review 2.

Sincerely,

John W. Brekke
Pacific West Real Estate, LLC &
Member of the South King County Coalition on Transfer Stations
john@brekkeproperties.com
(206) 227-7990

CITY OF BURIEN

From: Brian Roberts [mailto:brianr@burienwa.gov]
Sent: Monday, April 27, 2015 11:18 AM
To: Yates, Diane
Cc: Kamuron Gurol; Maiya Andrews
Subject: City of Burien - Review Comments for Transfer Plan Review Part 2

Diane,
Burien offers the following general comments on the draft Transfer Plan Review Part 2 report:

- In order to compare the true financial impact of each concept to the solid waste system,, a lifecycle cost analysis should be included. The LCA captures the cost of a facility over a twenty year span in current-year dollars. Elements included in an LCA are capital cost, cost of interest (if the improvements are bonded), cost of maintenance and operations.

  Operations should also include the added number of trips to haul transfer containers to Cedar Hills. There may be a net savings for tonnage hauled from Renton, but this would have to be subtracted from the net increase in tonnage hauled from Shoreline.

- Each option should include a good-faith discussion of the anticipated impact to rates for rate payers of the various cities who currently use Houghton. If the time value of delay can be obtained from haulers, it may be possible to quantify. The analysis has already estimated mitigated delay times for Shorewood, Renton and Bow Lake. This could be added to estimated travel times from each affected municipality to their likely destination transfer station. This total delay time could be multiplied by the number of refuse trucks serving each.

Regards,
Brian H. Roberts, P.E.
Assistant Public Works Director
City of Burien
(206)439-3164
brianr@burienwa.gov
www.burienwa.gov
400 SW 152nd Street, Suite 300
Burien, WA 98166-2209

Jim Ferrell, Mayor

May 5, 2015

King County Executive Dow Constantine
King County Chinook Building
401 5th Avenue, Suite 800
Seattle, WA 98104

RE: City of Federal Way Comments on the Transfer Plan Review – Part Two Draft Report

Dear Executive Constantine,

Thank you for the opportunity to comment on the Draft Report for the "Transfer Plan Review – Part Two." The City of Federal Way appreciates the effort the County has put into this lengthy planning process.

In keeping with prior correspondence, the City remains supportive of the transfer station siting process for South King County. The City also appreciates that the County listened to concerns raised about the proposed transfer station sites adjacent to Federal Way, and incorporated this feedback into this overall planning effort. As this process nears conclusion, it is our understanding that the apparent site of the replacement South King County Transfer Station is adjacent to the existing station in Algona. The City supports the County and Algona (as the "host" city) cooperating on equitable mitigation for this new station, and keeping the process on schedule so that the services and benefits of this new station become available in a timely manner.

The City also supports enhanced service equity throughout our regional system. Specifically, we support siting modern recycling and transfer stations in urban growth areas as necessary to keep collection service costs lower over time, while providing additional opportunities for recycling diversion to extend the working life-span of the Cedar Hills Landfill (which is the lowest cost disposal alternative for the region). It is clear opinions are diverse when it comes to transfer station siting and closure, and that the political nature of this process can be very challenging. From a regional perspective, consistent levels of service and equitable fees throughout the urban transfer system will be fairest for all, even those wishing to avoid any downside associated with a nearby transfer station.

In preparing the final report, the City requests a clear accounting of projected costs and revenues of the proposed preferred mitigation options for each Concept, so that an apples-to-apples comparison of outcomes can be made, and the 40 year (or longer) lifespan of these stations is accounted for. Ideally this will be presented in a projected cost at the residential ratepayer level, incorporating inflation and waste generation projections. The final report should account for Bellevue and Point Cities tonnage remaining in the system long-term. The final report should also include projections at our current diversion level and at a 60% diversion level, in addition to the challenging (and potentially unrealistic) 70% diversion level that is the basis used for the draft report.

Thank you for considering Federal Way's input as the final report is prepared. Please contact Marwan Salloum, P.E., Public Works Director at (253) 835-2710 if you wish to discuss this issue further.

Sincerely,

Jim Ferrell, Mayor

Federal Way City Council

Jeanne Burbidge, Deputy Mayor

Lydia Assefa-Dawson, Councilmember

Bob Celski, Councilmember

Dini Duclos, Councilmember

Susan Honda, Councilmember

Kelly Maloney, Councilmember

Martin Moore, Councilmember

JF/DD:mt

cc: Pete von Reichbauer, King County Councilmember, 516 Third Ave, Room 1200, Seattle WA 98104
Pat McLaughlin, Director, King County Solid Waste Division, King Street Center, 201 S Jackson Street, Suite 701, Seattle, WA 98104
Kevin Kiernan, Assistant Division Director, King County Solid Waste Division, King Street Center, 201 S Jackson Street, Suite 701, Seattle, WA 98104
Federal Way City Councilmembers
Amy Jo Pearsall, City Attorney
Marwan Salloum, P.E., Public Works Director
Rob Van Orsow, Solid Waste & Recycling Coordinator
Day File

JEAN GARBER COMMENTS ON
MARCH 2015 TRANSFER PLAN REVIEW PART 2 DRAFT REPORT

1. I believe the draft report could be better organized and more concise. There is too much detail on background, methodology, and the roles and responsibilities of the consultant team members. To me, that would be better left in an appendix. The primary focus of the report should be on a clear description of the alternatives and a comparison of their adverse and beneficial impacts and monetary costs. The more this can be done in at-a-glance matrix form, the better.

2. Since this is a study report, it could be organized more like a journal article: Summary, Introduction (Purpose, Background, Guiding Principles), Description of Alternatives, Method of Analysis, Conclusions, and Recommendations. I believe it is essential that the Solid Waste Division provide evidence-based recommendations in the final report.

3. It would be helpful if total capital and operating costs for the alternatives were calculated for decades into the future, perhaps a decade or more after the loan for a northeast station would be paid off, if that facility were built. For purposes of cost analysis, it should be assumed that siting of a NE transfer station would begin as soon as possible. Under all alternatives, the cost analysis should take into consideration estimated costs of siting, SEPA review, reasonably anticipated mitigation for transportation impacts, etc.

4. I believe that the discussion of the 2006 Transfer and Waste Management Plan in the Introduction (p. 10) should state that the 2006 Plan – which was peer-reviewed, recommended by SWAC and MSWMAC, and unanimously approved by the King County Council in 2007 – recommends building a northeast station. In general, the draft report seems to have a pre-conceived bias against building a northeast station (see Comments 9 and 10 below). The 2014 Transfer Plan Review Final Report recommends comparing the tradeoffs and benefits of operational strategies that would serve the northeast county without building a northeast station vs. the tradeoffs and benefits of building a northeast station. That implies the need for an objective analysis.

5. The guiding principles on pages 11-12 of the draft report are well stated and critical to the future of the solid waste system. I believe it is essential that the final report analyze whether the alternatives would meet each of these guiding principles. It seems to me it would be difficult, if not impossible, to meet the guiding principles without building a northeast station. For example, one of the guiding principles is to comply with all applicable local, state, and federal regulations. I would ask:
   (a) Without a northeast station, how can the division comply with KCC 10.08.030, which requires that to the extent practicable, solid waste facilities shall be located in a manner that equalizes their distribution around the county, so that no single area of the county will be required to absorb an undue share of the impacts from these facilities? Under the concepts that don't include a northeast station, Bellevue clearly would have to absorb an undue share of impacts from being a host city to the Factoria station, which would have to serve a much larger area of the county than was anticipated during the permitting process.
   (b) Without a northeast station, how can it be argued that there is compliance with the county's equity and social justice ordinance (Ordinance 16948)? The division has already built the Bow Lake Recycling and Transfer Station and is currently trying to site one in Algona. Yet the division is exploring ways to **avoid** building a long-recommended station in the more affluent and less ethnically diverse northeast service area, one of the fastest growing areas of the county.
   (c) Without a northeast station, how can it be argued that there is compliance with the county's policy to reduce greenhouse gas emissions, when there would be shifts in vehicle traffic, resulting in more vehicle miles traveled, and addition of traffic to the already highly congested pm peak hour?

6. It would be helpful if the discussion of tonnage forecasts (p. 15) provided data on projected population growth in the various transfer station service areas shown in the adopted Solid Waste Comprehensive Plan. This would help clarify why the County has built the Bow Lake station and is seeking to build an Algona station, as well as why the 2006 Transfer and Waste Management Plan recommends building a northeast station.

7. I am confused by the discussion of Concept 2 on page 22, which states: "This concept would restrict self-haul use at Factoria during peak commercial hours – 6 a.m. to 3 p.m." The word "restrict" means "to hold down or keep within limits" (America Heritage Dictionary). Wouldn't you actually be **prohibiting** self-haul use during commercial peak hours (6 a.m. to 3 p.m.), and **restricting** self-haul use to only those hours after 3 p.m.? This language needs to be consistent throughout.

8. I am concerned about the adverse impacts of the alternatives that don't include a northeast station, including but not limited to:
    - Increased collection rates for some King County residents, because collection vehicles would have to travel longer distances to the nearest transfer station.
    - Longer travel distances for some self-haulers, and the need to restrict self-haul at Factoria to late afternoon and evening hours.
    - Addition of traffic on I-405 and roads in the Factoria vicinity during the already highly congested pm peak hour.
    - Increased accident potential and greenhouse gas emissions due to the above traffic impacts.
    - Potential for violating noise limits in the Factoria vicinity in the evening.
    - Potential for increased illegal dumping.
    - The need for additional SEPA review of Factoria, with the risk that Bellevue could modify or revoke the conditional use permit for that facility.
    - Inability to meet some, if not all, of the guiding principles listed in the draft report.

9. I don't believe alternatives that don't include building a northeast transfer station should be called "viable alternatives," as on page 45 on the draft report. The word "viable" means "practicable" or "capable of being used for a specific purpose." (American Heritage Dictionary). Because these alternatives would not meet the stated guiding principles, I don't know how they could be called "viable." I think it would be better to refer to them simply as "alternatives," and to objectively analyze their impacts.

10. The Factoria station now under construction became a much costlier project due to delays, and the same thing could happen with a northeast facility. Interest rates are still low, but the federal government will probably begin to let them rise at some point. The analysis in the draft report seems to point to a new northeast station as the least impacting alternative and the one most consistent with King County policies and code. Unless the delay in building it extends on and on, it could also be the most cost-effective alternative, all things considered. **At a minimum, based on the evidence presented in the draft report, building a northeast recycling and transfer station should remain au option in the updated King County Comprehensive Solid Waste Management Plan.**

HARKNESS, MARIE-ANNE

Public Comment draft Transfer Plan Review 2 Report
May 5, 2015

Emailed to Diane Yates Diane.Yates@kingcounty.gov Intergovernmental Relations Liaison
Director's Office
King County Solid Waste Division Director's Office Phone: 206-477-5212
201 S. Jackson St, Suite 701
Seattle WA 98104

My name is Marie-Anne Harkness and I'm part of a coalition which represents numerous community members of North Auburn in South King County.

King County Solid Waste has been in ongoing negotiations with the City of Algona on the final terms of locating and building a new transfer station on the land already owned by KC Solid Waste in Algona.

The Algona Transfer Station should remain in Algona for the very reason it was sited there in the first place—no residential housing is located nearby. Changing the location in South King County near residential areas would devalue property, increase traffic congestion and lower the quality of life for residents living near any other newly sited transfer station.

Our community group appreciates KC Solid Waste on focusing on the merits of a new Algona Transfer Station. We encourage finalizing negotiations with the City of Algona before the draft Transfer Plan 2 is complete because any decisions made for other parts of the county affect the traffic stream and capacity needs of the South County Transfer Station.

Thank you,

Marie-Anne Harkness, Co-Chair
No North Auburn Garbage Site
29780 53rd Ave. South
Auburn, WA 98001

253.797.1414 maharkness@comcast.net

Cc: Councilman Pete von Reichbauer, King County Council District 7
Mayor Nancy Backus, City of Auburn

May 6, 2015

Dow Constantine, King County Executive
King County Chinook Building
401 – 5th Ave, Suite 800
Seattle, WA 98104

RE: Comments on Transfer Plan Review Part 2 Draft Report

Dear Executive Constantine:

In response to the request for comments on the Transfer Plan Review Part 2 Draft Report, we are writing to strongly urge King County to retain the option of a new northeast transfer station as a potential future facility in the Solid Waste Comprehensive Plan. Retaining this option in the Plan ensures that upon closure of the Houghton and Renton Transfer Stations, there are sufficient facilities capable of handling the future tonnage and traffic generated in the northeast region of the County in an efficient and equitable manner.

Without the option of a new northeast transfer station, the negative impacts to the remaining transfer stations, traffic, the environment, regional equity, system efficiency, local collection rates and station users are significant and unacceptable, including the following:

- **Regional equity is not achieved:** The Draft Report is inconsistent with the County Code requirement for regional equity in siting transfer stations. The result will be that one area of the County will absorb an undue share of impacts. Of particular concern is that the proposals are inconsistent with the Factoria Transfer Station Conditional Use Permit, and Bellevue has indicated it will be enforcing the permit as necessary.

- **Disproportionate impacts:** The concepts and strategies relied upon will result in disproportionate impacts across the County, creating a two class transfer station system with inconsistent and unfair policies, services and rates across the system. The northeast portion of the County will be underserved due to restricted self-haul and recycling opportunities. It will be overburdened with increased traffic and negative environmental impacts to air quality and noise. Higher fees and rates, both at the transfer stations and through increased costs to local collection contracts due to longer hauling distances and traffic congestion, will also disproportionately impact the northeast County. The fees and

rates paid by customers in northeast King County will be supporting higher levels of service and increased capital investments in other parts of the County, but not the northeast.

- **Assumptions and mitigation strategies do not appear to be viable:** The Draft Report is based on a combination of assumptions and strategies that are untested. Regional support for sweeping policy changes is uncertain at best. This is particularly true for the County's assumption that the region will reach a 70% recycling rate based on behavioral changes that are notoriously hard to influence. Even if all of the mitigation strategies are successfully implemented, there is no data to support the County's conclusion that the operational and policy changes will fully mitigate the decision not to build a new northeast station, and there is no contingency plan if the strategies fail.

- **Self-haul impacts are not adequately addressed:** The proposed strategies did not adequately consider impacts to large institutional self-haulers or small business owners. King County has failed to consider that self-haul includes large institutions that run their own collection, such as cities, school districts or Boeing. Self-haulers also include small business landscape companies that depend on easy access to self-haul at the end of each business day. These stakeholders need to be specifically targeted to identify concerns and obtain buy-in to the proposed restrictions and rate impacts.

The Draft Report identifies significant impacts to all of northeast King County that have not been adequately addressed nor vetted with stakeholders. We urge the County to carefully consider the future and plan a system that provides a geographically balanced, flexible system of transfer stations that is able to meet the needs of a growing County without placing undue burden on just one area.

Mayor Richard Leider
Town of Beaux Arts Village

Mayor Claudia Balducci
City of Bellevue

Mayor George Martin
City of Clyde Hill

Mayor Joshua Freed
City of Bothell

Mayor Joe Sabey
Town of Hunts Point

Mayor Mary Jane Goss
City of Lake Forest Park

Mayor Patrick Boyd
City of Medina

Mayor Steven J. Buri
City of Newcastle

Mayor Denis Law
City of Renton

Mayor Dicker Cahill
Town of Yarrow Point

cc: King County Councilmembers
Diane Carlson, Director of Regional Initiatives, King County Executive
Christie True, Director, Department of Natural Resources and Parks (DNRP)
Pat McLaughlin, Director, Solid Waste Division, DNRP

CITY OF KIRKLAND

From: John MacGillivray [JMacGillivray@kirklandwa.gov]
Sent: Wednesday, May 06, 2015 4:54 PM
To: Yates, Diane
Cc: Kathy Brown; Tracy Durnell; Jenna Higgins; Rob Jammerman
Subject: Kirkland Comments on the Transfer Plan Review Part 2

Diane,

Please find Kirkland's comments on the Transfer Station Plan Review Part 2 below.

Thank you for the opportunity to comment on the Transfer Plan Review Part 2 Draft Report ("Plan Review") and the outstanding effort made by the King County Solid Waste Division (KCSWD) and its consultants in drafting the Plan Review. Thank you in advance for taking the time to consider and fully address our comments in the final draft of the Plan Review and for your diligence in ensuring that no final conclusions are drawn or recommendations made until all comments received are given due and fair consideration. For you convenience, we have organized our comments under four specific headings: The Closure of the Houghton Transfer Station, Equity and Social Justice and Level and Quality of Service, System Costs, and Other Comments and Questions.

The Closure of the Houghton Transfer Station

Over the past decade, the projected closure date of HTS has slipped from 2016 to 2018 to 2021 and now provisionally to 2023. In September 2013 and February 2014, the Kirkland City Council expressed its desire that HTS be closed by 2021. In May 2014, the Metropolitan Solid Waste Advisory Committee (MSWAC) representing all of the cities in the King County solid waste system, adopted a motion supporting the closure of HTS no later than 2021. By the County's own admission, the facility is outdated, inefficient, not supportive of the County's recycling goals, and is located in a residential area inconsistent with station's industrial use.

Please accept the following questions and comments:

* The Plan Review purports that Concepts 1 and 2 (No build options) are viable if a variety of demand management strategies can be successfully and universally implemented. Kirkland is not optimistic that all of the strategies can be implemented or implemented to a degree where they will be impactful in mitigating transactional capacity to any meaningful degree. For instance, implementing mandatory curbside service will be challenging as there is known resistance from cities without mandatory service, and variable pricing may not be attractive enough to reduce transactions during peak times. In the event the demand management strategies are not as effective as they are projected to be, what would prevent the County from keeping HTS open indefinitely as a fallback?

* The Plan Review links the closure date of HTS to the estimated peak system tonnage in 2023. If the peak tonnage forecast changes to a later year, will the County continue to link the closure with the peak tonnage year assumption and continue push back the HTS closure date?

* The difference between the peak tonnage in 2023 and the tonnage estimate in 2021 is nominal and inconsequential. We believe linking the HTS closure date to the peak tonnage year in 2023 is unnecessary. It stands to reason that the proposed demand management strategies would be just as effective in 2021 (or before) and they would in 2023 so please explain why it necessary to delay the closure of HTS until 2023 when the system would be processing essentially the same amount of tonnage in 2021?

* If a Northeast Recycling and Transfer Station (NERTS) is ultimately not recommended for construction and the Factoria Transfer Station (FTS) is completed in or about 2018, what would prevent the County from immediately implementing all demand management strategies upon the opening of the new FTS? This would render Houghton non-essential to the system and able to be closed well before 2021 or 2023. In the Plan Review, please provide a demand management strategy implementation time line for Concepts 1 and 2.

Equity and Social Justice and Level and Quality of Service

Equity and social justice and level and quality of service considerations are equally as important as cost when evaluating alternatives for the regional transfer system capital improvement program. For example, siting modern recycling and transfer stations in urban growth areas as necessary keeps collection service costs lower for the region, while also providing equitable and convenient access to the variety of recycling services provided at modern transfer stations, in order to extend the working life-span of the Cedar Hills Landfill (which is the lowest cost disposal alternative for the region). It is clear opinions are diverse when it comes to transfer station siting and closure, and that the political nature of this process can be very challenging. However, from a regional perspective, consistent levels of service and equitable fees throughout the urban transfer system will be fairest for all, even those wishing to avoid any perceived negatives associated with a new transfer station facility.

We encourage the KCSWD to consider the relative impacts not building a NERTS will have upon the residents and businesses in the northeast County. In the absence of a new NERTS:

* Contracted solid waste hauling rates, to varying degrees, will increase substantially for many Eastside cities, including Kirkland, as commercial traffic may be directed to either FTS or Shoreline;

* The cities of Bellevue and Shoreline and adjacent cities affected by waste hauler traffic patterns will bear a disproportionate amount of traffic relative to cities located in other areas of the County;

* The level and quality of service provided at Shoreline and FTS will decrease significantly due to increased off-site wait times, doubled or tripled scale-to-scale times for all users, and limited self-haul hours;

* Many Eastside residents and businesses will not have convenient access to the recycling amenities provided at modern transfer and recycling stations which will consequently negatively impact the region's ability to achieve its 70% recycling rate goal;

* Demand management strategies include variable pricing which would presumably result in increased rates at FTS. Eastside users of the FTS would pay higher rates for a lower level and quality of service relative to other cities in the system.

System Costs

The Plan Review shows the increased ongoing operating cost for Concepts 0, 1, and 2. Some operating costs are offset by increased revenues, such as revenues received from variable pricing. For the purposes of attempting make a comparison of the long term operating costs for each "No build" concept versus the one-time $97 million capital cost of a new facility (Concept 3), the annual net operating cost has been multiplied by the 40-year life of a new facility in the table below:

Alternative Costs (not adjusted for inflation, over 40 year period)

Concept

Description

Total Cost

Concept 0

No NERTS, no demand management

$38.8 million

Concept 1

No NERTS, redirect commercial

$49.6 million

Concept 2

No NERTS, limit self-haul

$184.1 million

Concept 3

Build NERTS

$97 million

In the Plan Review, we request that the KCSWD:

- Include a table, similar to the one above, that compares the total net increase in operating costs for Concepts 0, 1, and 2 adjusted for inflation over the 40+ year life of a new facility so the estimated cost of each "No build" concept can be compared apples-for-apples with the capital cost of a new NERTS.

- Include the cost of each concept in terms of its effect on the average King County resident's monthly garbage bill.

- Update the projected annual operating costs for the "No build" concepts to reflect Bellevue's decision to remain in the system after 2028. For example, would an additional compactor or scale house be required for Factoria or would

more staff be required to manage the additional 10% of tonnage and increased transactions that were presumed in the analysis to be eliminated in 2028?

Other Comments and Questions

* The Plan Review was conducted with the underlying assumption that Bellevue and its tonnage and transactions would leave the system in 2028. Shouldn't the KCSWD consider rerunning its traffic model for each "No build" concept now that Bellevue is to remain in the system to ensure that each demand management strategy remains viable and can be implemented with the same presumed effect on increasing transactional capacity?

* The Plan Review states that the region needs to achieve a combined recycling diversion rate of 70% by 2030. The KCSWD had previously stated that the recycling rate needed to be achieved by 2020. This changes indicates that there will be more tonnage moving through the system and more transactions made over the course of a decade. What impact will the increased tonnage and transactions have on the implementation and effect of the demand management strategies in the absence of a NERTS?

Thank you again for the opportunity to comment on the Transfer Station Plan Review.

John MacGillivray
Solid Waste Programs Lead
City of Kirkland
(425) 587-3804

Follow us!
[FaceBook-icon SMALL]<https://www.facebook.com/KirklandEnviro>[Twitter-icon SMALL]<https://twitter.com/KirklandEnviro>[http://ih.constantcontact.com/fs069/1102686599320/img/263.png]<http://cityofkirklandblogs.com/environmentalservices/>

May 13, 2015

Dow Constantine, King County Executive
King County Chinook Building
401 Fifth Ave, Suite 800
Seattle, WA 98104

RE: Comments on Transfer Plan Review Part 2 Draft Report

Dear Honorable Constantine:

In response to the request for comments on the Transfer Plan Review Part 2 Draft Report ("Transfer Plan Review"), several City stakeholders, including the City of Kirkland, have written you a letter, strongly urging King County to retain the option of a new Northeast Recycling and Transfer Station (NERTS) as a potential future facility in the Solid Waste Comprehensive Plan. This letter re-iterates the common concerns of stakeholders and provides feedback from the City of Kirkland on broader policy issues.

Impacts to Solid Waste Handling System

As stated in the joint letter from the Cities, retaining this option in the Transfer Plan Review ensures that upon closure of the Houghton and Renton Transfer Stations, there are sufficient facilities capable of handling the future tonnage and traffic generated in the northeast region of the County in an efficient and equitable manner. It is our opinion that the mitigation strategies suggested in the Transfer Plan Review may not accomplish this goal.

Without the option of a NERTS, the negative impacts to the remaining transfer stations, traffic, the environment, regional equity, system efficiency, local collection rates and station users could be significant and unacceptable, including the following:

- **Regional equity is not achieved:** The Transfer Plan Review is inconsistent with the County Code requirement for regional equity in siting transfer stations. The result will be that one area of the County will absorb an undue share of impacts. Of particular concern is that the proposals are inconsistent with the Factoria Transfer Station Conditional Use Permit, and Bellevue has indicated it will be enforcing those provisions in the permit as necessary.

- **Disproportionate impacts:** The concepts and strategies relied upon will result in disproportionate impacts across the County, creating a two class transfer station system with inconsistent and unfair policies, services and rates across the system. The northeast portion of the County will be underserved due to restricted self-haul and recycling opportunities. It will be overburdened with increased traffic and negative environmental impacts to air quality and noise. Higher fees and rates, both at the transfer stations and through increased costs to local collection contracts due to longer hauling distances and traffic congestion, will also disproportionately impact the

123 Fifth Avenue • Kirkland, Washington 98033-6189 • 425.587.3000 • www.kirklandwa.gov

northeast County. The fees and rates paid by customers in northeast King County will be supporting higher levels of service and increased capital investments in other parts of the County, but not in the northeast.

- **Assumptions and mitigation strategies are untested and results are uncertain:** The Transfer Plan Review is based on a combination of assumptions and strategies that are untested. Regional support for sweeping policy changes is uncertain at best. This is particularly true for the County's assumption that the region will reach a 70% recycling rate based on behavioral changes that are notoriously hard to influence. Even if all of the mitigation strategies are successfully implemented, there is no data to support the County's conclusion that the operational and policy changes will fully mitigate the premature decision to not build a new northeast station, and there is no contingency plan if the strategies fail.

- **Self-haul impacts are not adequately addressed:** The proposed strategies did not adequately consider impacts to large institutional self-haulers or small business owners. King County has failed to consider that self-haulers includes large institutions that run their own collection, such as cities, school districts or Boeing. Self-haulers also include small business landscape companies that depend on easy access to self-haul at the end of each business day. These stakeholders need to be specifically targeted to identify concerns and obtain buy-in to the proposed restrictions and rate impacts.

- **Continued Delay in the Closure of the Houghton Transfer Station:** The Cities of Kirkland and Bellevue are particularly dismayed at yet another proposed delay in the closure of the Houghton Transfer Station. As Metropolitan King County Council Member Jane Hague so eloquently stated during Transfer Plan Review Part 1 deliberations in 2014 concerning the County's commitment to closing the Houghton Transfer Station (HTS), "A promise made is a promise kept." Over the past decade, we have waited patiently—but not without growing concern—as the projected closure date of the Houghton Transfer Station has slipped from 2016 to 2018 to 2021. In September 2013 and February 2014, the Kirkland City Council expressed its desire that the transfer station be closed by 2021. In May 2014, the Metropolitan Solid Waste Advisory Committee (MSWAC) representing all of the cities in the King County solid waste system, adopted a motion supporting the closure of Houghton Transfer Station no later than 2021. By the County's own admission, the facility is outdated, inefficient, not supportive of the County's recycling goals, and is located in a residential area inconsistent with station's industrial use. In spite of the past promises, the clear voice of the MSWAC, and the County's own assessment of the facility, the County is now proposing to delay the closure of the Houghton facility until as late as 2023.

Inconsistencies with King County Policy

As stated in the prologue to King County's Strategic Plan, the Strategic Plan was created to "reflect the values and priorities of the people of King County." The Strategic Plan motto is, "Working together for one King County." The motto is intended to reflect the County's

commitment to working in partnership with others, including local governments. We feel that the "collaboration" effort associated with the Draft Solid Waste Transfer Station Plan failed to meet the spirit of the King County Strategic Plan. In fact, we feel blindsided by the recent conclusion to exclude a NERTS from consideration. Our staffs and elected officials have participated in good faith in the numerous MSWAC meetings where the Transfer Plan Review has been discussed over the past several months. In every meeting, we were given to believe that the option of a NERTS would remain in the Transfer Plan Review, and that King County supported retaining that option. It was not until mid-April, ***after*** your transmittal of the Draft Plan to the King County Council, that MSWAC was given a presentation by King County staff, unveiling the County's position that the option of NERTS was unnecessary.

In addition to the process, we note the following items that are inconsistent with King County's Strategic Plan:

- **Exacerbated Social Inequities:** The April 2015 edition of the King County bulletin titled "Building Equity and Opportunity" notes serious equity and social justice (ESJ) concerns in King County. The bulletin summarizes inequities by zip code in terms of education, good health, diversity, employment, household income and life expectancy. The bulletin identifies the areas with the lowest "quality of life" indicators to be southwest King County and the area of King County in the northwest, bordering Snohomish County. King County's ESJ Initiative seeks to address these inequities, yet the Transfer Plan Review sites nearly all of its garbage transfer stations precisely in these disadvantaged communities. The concept appears to be a policy that hauls garbage from affluent, thriving areas of the County to the County's disadvantaged areas. Additionally, as mentioned above, the added haul times and inequitable fee structure will be particularly hard on small and disadvantaged businesses.

- **Negative Impact on the Regional Transportation System:** The concentration of transfer stations in the southern and northern ends of western King County will add to traffic along the north-south corridor of the Puget Sound Region. Additionally, the fee structure will encourage individual haulers to travel further distances at peak traffic hours to avoid peak fee times at the Factoria and Houghton stations. These trips will adversely affect pass-through cities near existing transfer stations that may maintain lower rates, such as Bothell, Kenmore, and Lake Forest Park.

- **Inadequate Analysis to Support Fiscal Responsibility:** The cost analysis in the Transfer Plan Review did not provide a reasonable comparison of the alternatives. We request that the following be added:
    - Compare the total net increase in operating costs for all concepts, adjusted for inflation over the 40+ year life of a new facility so the estimated cost of each "No Build" concept can be compared apples-to-apples with the capital cost of a new NERTS.
    - Include the cost of each concept in terms of its effect on the average King County resident's monthly garbage bill.
    - Update the projected annual operating costs for the "No build" concepts to reflect Bellevue's recent decision to remain in the system after 2028.

- Provide greater detail on the capital cost assumptions for the NERTS, and allow time for a peer review of the capital cost assumptions.

Environmental Sustainability: Although the entire plan is premised upon achieving the lofty goal of 70% recycling, the path forward will serve to ***discourage*** recycling in northeast King County, by not providing the expanded recycling services available at new transfer stations to those residents living in the northeast area of the County.

In summary, the Transfer Plan Review contains significant service impacts to all of northeast King County that have neither been adequately addressed nor vetted with stakeholders. The conclusions associated with the draft report are in direct conflict with many of King County's regional public policies. We urge the County to carefully consider the future and plan a system that provides a geographically balanced, flexible system of transfer stations that is able to meet the needs of a growing County without placing undue burden on some communities and segments of the population.

Sincerely,

Amy Walen
City of Kirkland Mayor

cc: Mayor Claudia Balducci, City of Bellevue
Mayor Richard Leider, Town of Beaux Arts Village
Mayor George Martin, City of Clyde Hill
Mayor Joshua Freed, City of Bothell
Mayor Joe Sabey, Town of Hunts Point
Mayor Patrick Boyd, City of Medina
Mayor Steven J. Buri, City of Newcastle
Mayor Denis Law, City of Renton
Mayor Dicker Cahill, Town of Yarrow Point
Bellevue City Councilmembers
King County Councilmembers
Brad Miyake, Bellevue City Manager
Diane Carlson, Director of Regional Initiatives, King County Executive
Christie True, Director, Department of Natural Resources and Parks (DNRP)
Bob Burns, Deputy Director, DNRP
Pat McLaughlin, Director, Solid Waste Division, DNRP
Kevin Kiernan, Assistant Division Director, Solid Waste Division, DNRP
Diane Yates, Intergovernmental Liaison, Solid Waste Division, DNRP
Marilynne Beard, Deputy City Manager, City of Kirkland
Tracey Dunlap, Deputy City Manager, City of Kirkland
Kathy Brown, Public Works Director, City of Kirkland
John MacGillivray, Solid Waste Program lead, City of Kirkland
Kurt Triplett, Kirkland City Manager

CITY OF NEWCASTLE

12385 Newcastle Way ◇ Newcastle, WA 98056 Phone 425.649.4444 ◇ Fax 425.649.4363 ◇ www.ci.newcastle.wa.us

May 5, 2015

Diane Yates, Intergovernmental Liaison
Solid Waste Division, DNRP
King Street Center
201 S Jackson Street, Suite 701
Seattle, Washington 98104

SUBJECT: Comments on Transfer Plan Review Part 2 Draft Report

Dear Ms. Yates:

I am writing to provide comments on the Transfer Plan Review Part 2 Draft Report. The planned improvements to the Factoria Transfer Station combined with the proposed closure of the Renton Transfer Station will result in adverse impacts the City of Newcastle. Specific points of concern are as follows:

1. The closing of Houghton and Renton, reducing the number of transfer stations from eight to six, adversely affects the customers from Newcastle, most likely raising their garbage collection costs. The diversion of trucks from Renton to Factoria and the congestion at Factoria will cause this increase in costs.
2. Traffic through Factoria will adversely affect our self-haulers in time spent and possible upcharges for using peak periods at Factoria. Some of our residents are anticipated to experience a substantial jump in increased costs when their yard care costs go up, along with their garbage collection costs.
3. Traffic in the Factoria area will be severely affected, most likely during afternoon rush hour, affecting all Newcastle residents who commute daily to Bellevue and points north.
4. King County should retain a northeast station as a possibility and not eliminate it from the plan entirely.

All of these are key factors and may adversely affect the quality of life in Newcastle.

Sincerely,

Steve Buri
Mayor, City of Newcastle

cc: Newcastle City Councilmembers

NORTH BEND
easy to reach. . .hard to leave

Office of the Mayor

RECEIVED MAY 08 2015
KING COUNTY EXECUTIVE OFFICE
TO
DUE DATE:
AUTHOR:
SUBJECT:
ACTION
RESPONSE FOR EXEC. SIG.
RE:
F.Y.I.

May 6, 2015

Dow Constantine, King County Executive
King County Chinook Building
401 – 5th Ave, Suite 800
Seattle, WA 98104

RE: Comments on Transfer Plan Review Part 2 Draft Report

Dear Executive Constantine:

In response to the request for comments on the Transfer Plan Review Part 2 Draft Report, we are writing to urge King County to retain the option of a new northeast transfer station as a potential future facility in the Solid Waste Comprehensive Plan. Retaining this option in the Plan ensures that upon closure of the Houghton and Renton Transfer Stations, there are sufficient facilities capable of handling the future tonnage and traffic generated in North Bend and in the entire northeast region of the County in an efficient and equitable manner.

Without the option of a new northeast transfer station, the negative impacts to the remaining transfer stations, traffic, the environment, regional equity, system efficiency, local collection rates and station users are significant and unacceptable, including the following:

- **Regional equity is not achieved:** The Draft Report is inconsistent with the County Code requirement for regional equity in siting transfer stations. The result will be that one area of the County will absorb an undue share of impacts.

- **Disproportionate impacts:** The Draft Report results in disproportionate impacts across the County, creating a two class transfer station system. The northeast portion of the County including North Bend will be underserved due to restricted self-haul and recycling opportunities. Our hauler Republic Services has estimated that our residents will experience significant monthly rate hikes if there is no northeast transfer station and even higher if King County mandates our waste no longer go to Factoria but be transferred to Renton or Bow Lake.

- **Assumptions and mitigation strategies do not appear to be viable:** The Draft Report is based on a combination of assumptions and strategies that are untested. Regional support for sweeping policy changes is uncertain at best. This is particularly true for the County's assumption that the region will reach a 70% recycling rate based on behavioral changes that are notoriously hard to influence. Even if all of the mitigation strategies are successfully implemented, there is no data to support the County's conclusion that the operational and policy changes will fully mitigate the decision not to build a new northeast station, and there is no contingency plan if the strategies fail.

The Draft Report identifies significant impacts to all of northeast King County that have not been adequately addressed nor vetted with stakeholders. We urge the County to carefully consider the future and plan a system that provides a geographically balanced, flexible system of transfer stations that is able to meet the needs of a growing County without placing undue burden on just one area.

Sincerely,

Kenneth G. Hearing
Mayor

C: Londi K. Lindell , City Administrator

PARKS, ELEANOR

Transfer Plan Review Part 2 – Public Comment

May 6, 2015

I'm part of a coalition which represents numerous businesses, commercial property owners and concerned residents in South King County.

King County Solid Waste has been engaged in ongoing negotiations with the City of Algona regarding the final terms for siting a new transfer station on the land already owned by KC Solid Waste located in Algona. Our coalition is greatly concerned that these negotiations are concluded prior to the adoption of the Transfer Plan Review 2 for the following reasons:

- The Transfer Plan Review 2 has been focused on identifying better solutions for the Northeast. The review has considered alternatives such as closing Renton and shifting load to Bow Lake. These alternatives limit South King County's future options and increase impacts to South King County stakeholders.

- In the event an agreement is not reached between Algona and KC Solid Waste, the siting process with have to be revisited. Stakeholders in South King County will object to the scope and findings of the Transfer Plan Review 2. This will create cascading impacts on all parts of King County.

- Time is of the essence in concluding negotiations in Algona to avoid costs of revamping Transfer Plan Review 2 and the far reaching impacts to all areas of King County. Stakeholders are burdened with the uncertainty and costs associated with not finalizing the Algona negotiations.

Our coalition appreciates the effort KC Solid Waste has made to date on siting a South King County Transfer Station on its existing Algona property; it is imperative to finalize the negotiations with the City of Algona ASAP. Concluding the siting of the South King County transfer station in Algona will provide clarity to all King County stakeholders as well as provide valuable insight to what is the best overall King County Transfer Station Plan.

Thank you,

Eleanor Parks
Brekke Properties &
Member of South King County Coalition on Transfer Stations

CITY OF REDMOND

From: Susan Cooper [mailto:SCOOPER@REDMOND.GOV] **On Behalf Of** John Marchione
Sent: Tuesday, May 05, 2015 8:16 AM
To: Yates, Diane
Subject: City of Redmond Comments on Draft Transfer Plan Review Part 2 Report

Dear Diane,

Please accept this email as City of Redmond comments on the *Draft Transfer Plan Review Part 2 Report*. I appreciate all of the work Solid Waste Division (SWD) staff has done to conduct additional review and an analysis of options for addressing transfer station transactional demand, particularly in the northeast area of King County. I supported this review and agree with the County's conclusions that another transfer station is not needed. The solid waste system has the flexibility to accommodate peak and seasonal demand in the short- and long-term with the use of demand management strategies and capital improvements at individual transfer stations.

This review follows up on prior work to ensure the solid waste system is right-sized and efficiently managed to meet the long-term needs of the County and its partners. In July 2013, the King County Council directed the SWD to conduct a review of the *2006 Solid Waste Transfer and Waste Management Plan* to:

1. Determine if changes are needed to ensure that the transfer system is sized/configured appropriately to meet current and anticipated needs, and
2. Determine whether changes could be made that could reduce further expenditures while still meeting desired service objectives and levels.

The report was submitted to the King County Council and in June 2014, the Council adopted a motion approving a *Revised and Amended Transfer Plan Review Report*. In summary, the Report concluded there was sufficient capacity to manage the forecasted solid waste tonnage through 2040 and additional review should be conducted to evaluate a mix of capital facilities and operational approaches, such as transaction demand strategies, that would provide service for the northeast area of the County without building an additional transfer station.

The Council adopted motion required further review by the SWD in collaboration with stakeholders on strategies to manage transfer stations. The SWD released their Draft Report in March and has concluded there are viable alternatives to building a new Northeast Recycling and Transfer Station even when the Houghton Transfer Station closes (no later than 2023). A range of mitigation strategies were assessed to avoid over- or under-utilization at the transfer stations by smoothing demand, and manage transactional demand and minimize customer weight times.

The SWD analysis was based on the forecasted *peak tonnage year* between now and 2040. Most of the cities in King County have an agreement with the County for solid waste services through 2040 and five cities have an agreement for services through 2028. The *forecasted peak tonnage year* is 2023, which includes all of the cities that are currently part of the system. The SWD has concluded that transactional demand can be met for all of the current system participants by implementing demand management strategies and capital improvements at individual transfer stations.

The SWD modeled four service concepts against service standards to identify where mitigation would be necessary. If any standard was not met for any one time period during any day during the study period, the transfer station failed to meet that particular standard. In addition, the standard for customer time-on-site has a

90% threshold, so unless the standard was met for 90% of the trips, the transfer station failed to meet the standard. Strategies to mitigate impacts from not meeting a service standard were identified for each transfer station.

Comprehensive traffic analysis was completed as part of this review. Traffic engineering experts were hired to conduct traffic analysis, data collection and modeling for each transfer station during the forecasted peak tonnage year and to assess a range of mitigation strategies. Traffic analysis included an evaluation of on-site circulation at each transfer station and identification of potential impacts to off-site intersections around each transfer station, as well as detailed evaluation and modeling for each of the four service concepts using models that were developed for each transfer station. Traffic experts identified the most effective strategies to address potential impacts.

Strategies that were identified to manage transactional demand include actions specific for the transfer station impacted; these strategies are designed to influence the behavior of customers to decrease their use of specific transfer stations during peak demand, such as pricing incentives and extended hours. Strategies also include capital improvements to increase transactional capacity and the number of customers that can be served, with additional scales and additional stalls for increased tip floor capacity, and queuing lanes and off-site queuing.

The solid waste system has the flexibility to accommodate peak and seasonal demand. Past practice confirms the ability of the system to handle changed conditions. In 2010, the Houghton Transfer Station was closed to self-haul traffic on weekends for six months when the roof was replaced; other transfer stations accommodated these customers without unacceptable impacts. In 2014, one of Seattle's two transfer stations was closed and there was significant use of the Shoreline Transfer Station from Seattle customers. History has shown that the public adapts to the availability of services and changed conditions.

The SWD has proposed targeted demand management strategies to address peak transactional demand at transfer stations. This approach will also allow for the management of seasonal demand. Both peak and seasonal demand are temporal in nature and are most cost effectively managed with actions targeted to the demand.

The SWD wisely took a conservative approach to their review, by basing analysis on the forecasted peak tonnage year, when all of the current city partners are part of the system, and conducting extensive traffic analysis of numerous scenarios to identify strategies to ensure high-threshold service standards are met and all potential impacts are mitigated.

The SWD has proposed an adaptive management approach, with operational and capital improvement strategies to ensure the optimal use of the transfer station system. The flexibility provided by this approach will allow the SWD to manage individual transfer stations to maximize the significant infrastructure investment that has been made in new and remodeled transfer stations throughout King County.

Sincerely,

John

John Marchione
Mayor | City of Redmond
D. 425.556.2101 | **F.** 425.556.2110 | mayor@redmond.gov | www.redmond.gov

Denis Law
Mayor

City of Renton
Mayor's Office

May 4, 2015

Pat D. McLaughlin, Director
King County Solid Waste Division
201 South Jackson Street, Suite 701
Seattle, WA 98104

RE: Draft Transfer System Plan

Dear Mr. McLaughlin:

The City of Renton has participated in discussions regarding the future of the region's transfer and disposal system. The city has completed its review of the Transfer System Plan Review Part 2, Draft Plan (Draft Plan) and is appreciative of the additional analysis of options the region may explore to inform decisions about both capital and operational investments in the system. Please note that this letter does not indicate Renton's position as established by the Renton City Council. The City Council will not have established a position by the May 6, 2015 due date for these comments.

The City of Renton has been consistent in its message to King County that it prefers the Base Plan from the original 2006 Transfer and Waste Management Plan, which in essence is retained in the Draft Plan as Concept 3: Build a New Northeast Transfer Station. With Concept 3, there will be adequate disposal capacity, equitably distributed throughout the county, and the county will be able to close the Renton Transfer Station.

Four concepts are outlined in the Draft Plan and the county conducted extensive data collection and analysis, which has provided new insight into the issues this region faces for future solid waste transfer and disposal needs.

Renton Concerns:

- Without a new Northeast Transfer Station the solid waste transfer and disposal system will be negatively impacted.
- The county has not committed to close the Renton transfer station unless there is adequate capacity. Concepts 0-2 do not provide additional capacity, which in essence maintains the Renton transfer station as an operating transfer station.
- Customer service will be reduced at Factoria and Shoreline. Increased use at Renton will result in longer queues and wait times.
- The county has not considered the Bellevue and Point Cities tonnage in the system for the concepts outlined. Bellevue has indicated an interest in signing on to the "Amended and Restated Interlocal Agreement." Bellevue's tonnage and transactions will place a greater burden on the system than is currently considered in the Draft Plan.
- The county's assumption that the region needs to meet a 70% recycling rate by 2020 is unrealistic unless all cities are willing and able to put in place mandatory collection policies and bans on specific materials, plus invest in additional education and enforcement of the recycling, composting, and garbage collection systems. King County

cities participating in MSWMAC meetings have expressed hesitancy in implementing some or all of these strategies.

- Renton's current single-family recycling rate is at 68%. However our multifamily and commercial recycling rates have continued to hover around only 12% and 22% respectively. This is with mandatory garbage collection, embedded commercial recycling, and technical assistance for commercial customers. Without mandates, bans and additional investment in education it is doubtful that we would be able to meet a full 70% recycling rate for all customer classes.
- Peak hour pricing has not been fully vetted. It is unclear whether customer behavior will change through pricing strategies. Without substantial change in customer behavior, both the Bellevue and Shoreline transfer stations will be impacted. With peak hour pricing, customers who use the Factoria transfer station may redirect to Renton, increasing trip loads on Renton's streets.
- Peak pricing sets up an inequitable rate system that provides a preference to customers who live near and use south county transfer stations; while customers living in the impacted region will either pay additional fees to utilize the station, or will have to drive longer distances to realize cost savings. This places additional trip loads on both regional and local roads.
- Haulers redirected to non-impacted transfer stations may need to increase their rates to cover additional capital and operational costs. These costs will be borne by the rate payer, thus increasing the cost of collection for those customers living in or near the impacted region.
- Only two cities, Woodinville and Redmond, have identified that they do not prefer a new Northeast Transfer Station. With a majority of King County cities preferring a system that is equitable to all rate payers and host cities, more effort should be given to exploring siting options of a new Northeast Transfer Station.

In closing, I would like to thank the King County Solid Waste Division once again for the opportunity to provide Renton's voice in this important discussion about the future of our region's solid waste transfer and disposal system.

Sincerely,

Denis Law
Mayor

cc: Renton City Council Members
Jay Covington, Chief Administrative Officer
Gregg Zimmerman, P.E., Public Works Administrator
Lys Hornsby, P.E., Utility Systems Director
Linda Knight, Solid Waste Coordinator
Kevin Kiernan, King County Solid Waste Assistant Division Director
Diane Yates, King County Solid Waste Division Intergovernmental Liaison

City of Sammamish Washington

801 228th Avenue SE, Sammamish, Washington 98075-9509
Phone: 425-295-0500 • Fax: 425-295-0600 • www.sammamish.us

May 6, 2015

The Honorable Dow Constantine
King County Executive
King County Chinook Building
401 5th Avenue, Suite 800
Seattle, Washington 98104

Dear Executive Constantine:

Thank you for the opportunity to review and provide feedback on the King County Solid Waste Division's Draft Report on the Transfer Plan Review – Part 2. The City of Sammamish encourages King County to preserve as an option building a new northeast transfer in the Solid Waste Comprehensive Plan.

The City of Sammamish makes this recommendation for the following reasons:

- **Overly Optimistic Mitigation Strategies:** The mitigation strategies contemplated in the Draft Report to address demand management issues for the Factoria Transfer Station are overly optimistic. One key assumption is that the region achieves a 70% recycling rate. Yet, the region has thus far been unsuccessful in achieving that objective. Moreover, the steps required to achieve that target may be politically untenable and challenging to achieve.

- **Unfair Burden on Northeast King County Customers:** The demand management strategies put forth in the Draft Report also put an unfair burden on northeast King County customers. Restricting self-haulers' access to the Factoria Transfer Station means that northeast King County customers will not have the same service opportunities as other parts of the County, creating an inequity in the system. Similarly, the peak-pricing strategies would also only be applied at Factoria. Additionally, the anticipated increases in wait times at Factoria will disproportionately impact northeast King County customers. Longer waits times will result in higher costs as commercial haulers need to factor that variable into their rates. The City of Sammamish believes that the Comprehensive Plan must strive for regional equity.

While the City of Sammamish would welcome a scenario whereby the region could realistically and equitably avoid building a new northeast transfer station, we do not believe the current Draft Plan offers that to us. As such, the City of Sammamish urges King County to retain building a new northeast transfer station as an option in the Solid Waste Comprehensive Plan. This would give King County and its partner cities additional time to explore whether additional mitigation strategies create a more viable path while also preserving the opportunity to build additional capacity if the mitigation efforts continue to fall short. Both options require significant planning time to execute. The region should not be removing options—in this case building a new northeast transfer station—until it is certain that the remaining alternatives are viable.

Thank you again for the opportunity to review the Draft Report and offer feedback. The City of Sammamish stands ready to partner with King County as the region continues to address long-term plans for managing the solid waste system.

Sincerely,

Ben Yazici
City Manager

cc: Sammamish City Council
King County Council
Diane Carlson, Director of Regional Initiatives, King County Executive's Office
Christie True, Director, Dept. of Natural Resources & Parks (DNRP)
Bob Burns, Deputy Director, DNRP
Pat McLaughlin, Director, Solid Waste Division
Kevin Kiernan, Assistant Division Director, Solid Waste Division
Diane Yates, Intergovernmental Liaison, Solid Waste Division
Beth Goldberg, Director of Administrative Services, City of Sammamish

From: Severn, Thea
Sent: Tuesday, April 21, 2015 12:25 PM
To: Humphreys, Beth
Subject: FW: WEB SITE COMMENT: Transfer & Waste Management Plan Review

-----Original Message-----
From: SWD, WebSite
Sent: Tuesday, April 21, 2015 8:11 AM
To: SWD, WebSite
Cc: Yates, Diane; Gaisford, Jeff; Severn, Thea
Subject: WEB SITE COMMENT: Transfer & Waste Management Plan Review

Thank you for submitting the following comments via the Solid Waste Division website. Your message has been forwarded to appropriate staff who will contact you shortly.

PERSONNAME:
ADDRESS: 98059
EMAIL:
COMMENTTYPE: Request
PROGRAM: Transfer & Waste Management Plan Review
COMMENTS: Please do not close the Renton Transfer Station. Without putting it to a vote and/or providing viable options.
IMG_VERIFY: black

King County staff: If a reply is necessary, please use the 'Reply All' capability so that the Webmaster is made aware of your response. Thank you.

Sent: 4/21/2015 8:10:38 AM

Metropolitan Solid Waste Management Advisory Committee

April 10, 2015 – excerpt of meeting minutes

Draft Transfer Plan Review Report: Review/Discussion

SWD Assistant Director Kevin Kiernan provided a briefing of the Transfer Plan Review Part 2 Draft Report. The presentation is available on the division's website. The main finding of the report is that there are viable alternatives to building a Northeast transfer station. Discussion included:

- In response to a question about the timeline, Kiernan explained that Houghton is currently scheduled to close by 2023, meaning policy decisions would need to be made on the transfer system before then.
- When asked if there will be a need to revisit the transfer plan again, Kiernan said that plans are based on a set of assumptions and that there is always the possibility of needing to revisit them.
- On page 24 of the report, a member suggested replacing "mandatory curbside garbage collection" with "mandatory curbside collection of garbage, recyclables, and compost."
- One of the potential mitigation strategies is peak pricing, which, as Kiernan explained, could mean varying pricing by location, user, or time of day.
- Kiernan confirmed that if differential pricing were recommended, the financial policies would need to be changed.
- A member noted that the self-haul category includes more than the "weekend warriors." Self-haul customers include large companies, school districts, colleges, cities, and any entity that is not one of the three main commercial haulers.
- A member commented that the "viable options" outlined may not prove to be truly viable in two or three years. To that end, a timeline that includes benchmarks and key dates is requested.
- A member noted that the current draft Comp Plan was developed over the course of eight years, and the county is still operating under the 2001 plan. It is important to ensure the new Comp Plan is valid for a very long time.
- A member commented that discussion of mandates and bans is important, but may not be appropriate to have on a county-wide basis.
- Kiernan confirmed that in addition to city efforts, action in unincorporated King County is necessary to increase diversion rates countywide.
- A member suggested making it more evident in the Executive Summary that all concepts were reviewed with and without the closure of the Renton Transfer Station.
- Kiernan explained that the review focused strictly on transfer station utilization, and how to distribute utilization. Costs to cities and to the environment have not been quantified and taken into consideration in this draft report. Haulers have been consulted regarding cost

impacts, but the information is more qualitative than quantitative. Future steps will require an environmental review.

- In light of the potential impacts to Factoria outlined in the report, a member suggested that a separate queue be reserved for the residents of the City of Bellevue, which hosts the Factoria transfer station.
- Concerns about not having an equitable rate structure were expressed.
- Concerns about decreased convenience and increased costs for residents were expressed.
- Kiernan noted that issues exist with any approach, including building a Northeast station.
- Concerns about not having environmental impacts be a part of the initial analysis were expressed.
- Kiernan noted that the timing is partly driven by the council proviso.
- Kiernan explained that the savings due to not incurring capital expenditures as well as the costs of increasing service would be equally distributed. Collection costs, however, would not be equally distributed.
- A member noted that the draft report states that not building a Northeast station would mean resource recovery constraints at Shoreline, and an estimated overall reduction in the recycling rate potential of about one and one-half percent (page 26). This means the landfill could reach capacity earlier than projected. The member asked if it was possible to quantify the cost associated with the landfill's early closure. Kiernan explained that the next lowest cost disposal alternative would most likely cost $12-14 per ton more, so the cost could be quantified by looking at a couple months of tonnage.
- A member suggested using "discounted" rather than "peak" pricing in order to attract customers rather than discourage them.
- A member recommended consolidating all financial data into one or two tables in the final report. Converting operating costs, capital costs, and bonding costs to fit a 20-year timeframe would be helpful so that it is easy to grasp what the true costs are and how they will be distributed to ratepayers. Being able to identify the financial impacts for cities that may be affected would also be beneficial.
- A member suggested including a statement about any potential impacts on the county's emergency response capacity.
- Cities are asked to provide their input by April 29. The division will transmit the final report along with feedback from stakeholders to council on June 30.
- The draft Comp Plan is expected to be ready for review in early 2017, and will include the Transfer Plan. Prior to implementing any changes, an environmental review will be completed.

Solid Waste Advisory Committee

April 17, 2015 – excerpt of meeting minutes

Draft Transfer Plan Review Report: Review/Discussion

Discussion included:

- Bill Ziegler asked to what degree self-haulers have been involved in discussing potential changes to fees and access at transfer stations.
- SWAC Staff Liaison Diane Yates explained that the division has invited and encouraged feedback through its interactions with self-haul customers. Information is also available on the website, and cities and workshop attendees were notified.
- Elly Bunzendahl asked for more information on projected population growth in the Northeast region, and the associated impacts. McLaughlin explained that on a county scale, population growth will be highest in the northeast and south parts of the county. Growth in the northeast is projected to be centered around Redmond. One of the assumptions is that Houghton would close sometime before 2023. The report is intended to inform policy-makers, who will weigh the costs and benefits of various approaches to serve growing demand in the northeast.
- Keith Livingston noted the importance of keeping the lines open for self-haul customers. He also commented that having a different rate structure at just one of the stations may result in confusion.
- Stephen Strader noted that given the high rates of curbside recycling in Bellevue, instituting peak pricing at Factoria may be regarded by some as an additional tax on services, rather than a direct cost increase.
- Jose Lugo inquired into why the scale-to-scale time for self-haul customers at Factoria would increase if a Northeast station is built. McLaughlin responded that the projected increase is derived from population growth and is not a direct impact of building a Northeast station. The projected population growth may require additional mitigation strategies at Factoria, regardless of whether or not a Northeast station is built.
- While appreciating the complexity and understanding the challenge of implementing actions like mandatory collection and material bans, April Atwood underlined the importance of developing a plan that is consistent with the Roadmap to 70 Percent and the county's long-term goals. Keeping in mind the desired long-term direction is important as shorter-term challenges are faced. McLaughlin agreed that as operational and policy decisions are discussed, it is important to keep in mind larger objectives to ensure actions are not counterproductive. He also noted that transfer stations will play an important role in the solutions.
- Casalini reiterated the importance of evaluating the model according to some guiding principles that were established. He also suggested developing an informational one-page flier to distribute to self-haulers at transfer stations to ensure they know what is being

considered. McLaughlin explained that the review included surveying at the transfer stations that engaged the self-haul community. The surveying provided some insightful and statistically significant reference points.

- Casalini pointed out that establishing rates that vary by time and location may cause confusion for small hauling businesses and their customers.
- Casalini also suggested the report be made more reader-friendly.
- McLaughlin explained that all comments – including those from advisory committee meetings, briefings for cities, the Regional Policy Committee, and the Sound Cities Association - will be incorporated in the final report, which will be transmitted to council on June 30 and will have greater clarity around recommendations.
- Livingston pointed out that material bans at transfer stations require enforcement, which involves additional costs.
- Stacia Jenkins noted that one of the positive impacts of not building a Northeast station is the $97 million in county savings. The report, however, would benefit from a more extensive cost analysis. While some of the costs of investments and improvements are included, many externalized costs are not. For example, some smaller cities may end up needing to look at 100 million dollar transportation investments because of the traffic impacts. The long-term costs of increased carbon emissions from idling trucks should be considered, along with the long-term impacts to communities and businesses. A more thorough cost analysis may lead to the conclusion that it is a better to invest in a transfer station. Jenkins also noted that yard waste bans will require cities to take actions that may take a significant amount of time to implement. In addition, material bans at transfer stations seem to contradict the direction of the 70 percent recycling goal, which implies maximizing resource recovery at transfer stations. It is important to consider the costs that fall to cities and consumers, and not only the county's costs. McLaughlin noted that while calculating extended financial implications is not feasible, the final report will better articulate and consolidate financial data associated with each concept. The report will also illustrate the role the division can play in terms of resource recovery and achieving a 70 percent recycling rate.
- Jerry Bartlett echoed other members' comments that the Transfer Plan must be consistent with the Roadmap to 70 Percent being developed. At transfer stations that have yard waste collection available, yard waste bans should occur sooner rather than later. For transfer stations without capacity to collect yard waste, customers could be directed to local landscaping businesses that accept yard waste in the interim.
- Philipp Schmidt-Pathmann underlined the importance of considering a more holistic approach that addresses resource conservation and climate impacts rather than focusing on managing transactions at transfer stations. He noted that transfer stations are a large capital investment that can lead to debt, potentially limiting the county to the lowest-cost option of landfilling and resulting in an insufficient emphasis on recycling and resource recovery. McLaughlin agreed that the division must address these bigger policy issues and have clarity on the long-term operational roadmap. This report, however, wasn't intended

to answer those questions. When looking at transaction management, a lot of options are available. In the meantime, looking at the big policy issues is very timely.

- Thomas Wray noted that the division should begin thinking through how to implement a monitoring system at transfer stations, which could include penalties or even rejecting loads. McLaughlin pointed out that one of the five guiding principles in creating a Roadmap to 70 Percent is a robust enforcement program. Regardless of the path chosen, enforcement will be key.
- Wray asked if the five cities not signing the Amended and Restated ILA would have an impact. McLaughlin explained that the transactional and tonnage forecasts in the report assume that Bellevue and the four Point Cities will leave the system in 2028. If the cities choose to extend, that would not be problematic in terms of transactions.
- In her comments, Jean Garber made suggestions on how to make the report more accessible, noted that there is no analysis of whether the guiding principles would be met by the concepts and mitigation strategies, and listed adverse impacts of the concepts that don't include building a Northeast station. Lastly, she stated that building a new Northeast station may be the least impacting alternative and the one most consistent with county policies. It could also be the most cost-effective alternative in the long-run, assuming the delay in building it is not severely prolonged.
- McLaughlin noted that a degree of environmental review was included in the draft report, but further and more in-depth analysis would need to be completed in advance of any decision. The goal of the report is to provide substantive information to policy-makers and to inform them about alternatives to the adopted plan.
- Bunzendahl recommended including a very robust infographic at the beginning of the report. This could include a map of the county, existing transfer stations, some of the findings from surveys, average wait times, etc. This could be a helpful way to compare the four concepts assuming each concept measures and articulates the same data. It could also include relative monetary impacts on cities.
- Livingston noted that the base plan included the Northeast station, and that this report is an interesting sidebar to explore alternatives to building it, but the report does not yet have a solid hypothesis and conclusion and as such, cannot serve as a valid planning document.

Appendix L: Data Collection Roles and Responsibilities

Data Collection Element	Description	Applicable Sites	Data Collection	Analysis
Site Access Volumes	24-hour volumes at the site ingress and egress points. Collected via video or tubes – focus on daily counts and peak hour volumes for a 2-week period.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Idax	Transpo Group
Site Ingress /Egress Queuing	Record inbound/outbound queuing levels for 2-week period - video.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Idax	Transpo Group
Internal Queuing	Record queuing levels at internal material transfer points – video or observations.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group/ Idax/ AECOM	Transpo Group
Internal Trip Patterns	Document the number and percentage of shared trips between multiple material transfers (i.e. garbage only vs. garbage and recycling).	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group/ AECOM	Transpo Group
Vehicle Duration/ Travel Time On-site	Recording of entry and exit times of vehicles on-site via observation.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group/ AECOM	Transpo Group
Customer Trip Origin	Identify customer origins via intercept surveys – recorded on paper or electronic format at the point of intercept.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group/ AECOM	Transpo Group
Off-site Turning Movement Counts	Peak-hour traffic volumes collected at off-site study intersection locations.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Idax	Transpo Group
Customer Processing Rates	Identify processing rates at key points, including entry, exit, tipping floor, and household hazardous waste (HHW) or recycling areas.	Renton, Factoria, Shoreline, Houghton, Bow Lake	Transpo Group/ AECOM	Transpo Group
Haul Weight per Vehicle	Average haul weights per vehicle for the different uses will be observed at noted.	Renton, Factoria, Shoreline, Houghton, Bow Lake	King County	Transpo Group
Waste Stream Forecasts	Waste stream forecasts reflecting with and without the Renton Transfer Station.	Renton, Factoria, Shoreline, Houghton, Bow Lake	King County	Transpo Group