

Chapter 2: Alternatives

A wide range of alternatives was originally identified that would extend the life of the Cedar Hills Regional Landfill (CHRLF). Based on a preliminary assessment of operational and engineering feasibility, as well as likely environmental impacts, five action alternatives were selected for assessment through the environmental impact statement (EIS) process described in Chapter 1. This chapter describes those five action alternatives, along with the No Action Alternative, for the landfill. As discussed in Chapter 1, KCSWD is recommending Alternative 2 as the preferred alternative (see Section 2.3.2).

The description of alternatives is divided into four sections. Section 2.1 identifies the key state and local regulations that govern the development and operation of the landfill. Section 2.2 describes the landfill development, design and construction, and operational elements common to all of the action alternatives. Section 2.3 summarizes the unique characteristics of each action alternative and the No Action Alternative. The final section, Section 2.4, provides a comparison of the estimated area, capacity, and landfill life.

2.1 Regulatory and Compliance Requirements

The Washington Administrative Code (WAC) establishes requirements for the development and operation of landfills in Washington State. Additionally, Public Health – Seattle & King County (Public Health) regulates the CHRLF under the Code of the King County Board of Health – Title 10: King County Solid Waste Regulations. The Air Operating Permit issued by the Puget Sound Clean Air Agency (PSCAA) sets forth compliance standards and procedures that the CHRLF must follow.

2.1.1 Washington Administrative Code

KCSWD operates the CHRLF in accordance with state regulations that set standards for landfill design, development, operation, closure, and environmental protection, including the following:

WAC Section	Title
WAC 173-200	Water Quality Standards for Ground Waters of the State of Washington
WAC 173-201A	Water Quality Standards for Surface Waters of the State of Washington
WAC 173-216	State Waste Discharge Permit Program
WAC 173-220	National Pollutant Discharge Elimination System Permit Program
WAC 173-303	Dangerous Waste Regulations
WAC 173-304	Minimum Functional Standards for Solid Waste Handling
WAC 173-340	Model Toxics Control Act – Cleanup
WAC 173-350	Solid Waste Handling Standards

WAC Section	Title
WAC 173-351	Criteria for Municipal Solid Waste Landfills
WAC 173-401	Operating Permit Regulation (Air Quality)

WAC 173-351, Criteria for Municipal Solid Waste Landfills, establishes minimum statewide standards for development, operation, monitoring, and closure of municipal solid waste landfills in Washington State. These criteria also implement rulemaking in the federal Resource Conservation and Recovery Act (RCRA), as amended in 1984, and Section 405(d) of the Clean Water Act (CWA), as amended, to ensure the protection of human health and the environment. The following sections describe some of these measures.

Surface Water Monitoring and Stormwater Management

Under WAC 173-351-200, landfill owners or operators must design, construct, and maintain surface water run-on/runoff control systems to prevent flow onto active portions of the landfill resulting from the 24-hour, 25-year storm event. This regulation also states that landfills shall not discharge pollutants into waters of the state (including wetlands) that cause a violation of surface water quality standards. To meet this requirement, King County conducts monthly surface water monitoring. The existing monitoring program would be evaluated under any of the five action alternatives and revised as appropriate to incorporate the new landfill development.

Stormwater discharges from the landfill also must meet the requirements specified in the Washington State Department of Ecology (Ecology) *Stormwater Management Manual for Western Washington* (Ecology 2005) and the Ecology Industrial Stormwater General Permit (ISWGP) to comply with requirements of WAC173-201A and WAC 173-220. The ISWGP specifies implementation of best management practices (BMPs) for maintaining on-site water quality, the quality of water discharging from the site, and water quality monitoring requirements for the facility. A stormwater pollution prevention plan (SWPPP) is also required by the ISWGP. The current SWPPP for the CHRLF would be modified to incorporate changes necessary to implement any of the five action alternatives selected for implementation.

Groundwater Monitoring

WAC 173-351-400 through 490 provides detailed requirements for groundwater monitoring at landfills including:

- Groundwater monitoring system requirements and corrective actions
- Performance standards for groundwater monitoring system design
- Groundwater sampling and analysis requirements
- Groundwater reporting
- Statistical methods for groundwater monitoring
- Detection monitoring program
- Assessment monitoring program

- Agency roles in corrective actions
- Groundwater modeling
- Hydrogeological reporting requirements

A key purpose of the groundwater monitoring program is to determine if contaminants related to the landfill operations are negatively impacting groundwater. The determination is primarily accomplished through groundwater sampling and analysis. In the event that analysis of groundwater sampling indicates landfill-generated contamination, Ecology and Public Health must be notified and corrective action must be taken.

The CHRLF currently has a groundwater monitoring program in place for its ongoing operations. This existing monitoring program would be evaluated under any of the five action alternatives and revised as appropriate to incorporate any new landfill development.

2.1.2 Public Health – Seattle & King County

KCSWD must operate the CHRLF in compliance with the King County Board of Health Solid Waste Regulations (Title 10), the conditions of the Municipal Solid Waste Handling Permit issued by Public Health (Public Health 2009; see Appendix B), and the approved Plan of Operations required by that permit. The current Municipal Solid Waste Handling Permit requires compliance with the conditions summarized below:

- A. Waste Acceptance and Screening – Requires KCSWD to monitor the solid waste coming to CHRLF for dangerous and hazardous waste materials, and not to accept these materials.
- B. Compaction and Daily Cover – Requires operators at CHRLF to compact solid waste as it is being deposited and cover it daily with an approved cover material.
- C. Minimum Standards of Performance – Requires KCSWD to monitor and ensure that allowable levels of contaminants in groundwater and surface water are not exceeded.
- D. Explosive Gases – Requires KCSWD to control explosive gases (i.e., methane) to ensure that concentrations do not exceed allowable levels.
- E. Air – Prohibits open burning of mixed municipal solid waste, requires KCSWD to comply with odor and nuisance control measures established by PSCAA, and requires that measures and equipment be installed at CHRLF to control the emission of odor-bearing air contaminants.
- F. Disease Vectors – Requires that KCSWD prevent, or control, disease vectors according to the approved Plan of Operations.
- G. Run-on/Runoff Control Systems – Requires that KCSWD manage stormwater run-on and runoff according to the approved Plan of Operations and an approved Stormwater Management Plan.
- H. Liquid Waste Restrictions – Prohibits acceptance of waste containing free liquids. KCSWD must also follow the 2008 Vector Waste Disposal Management Plan.
- I. Records – Requires KCSWD to keep records of activities at the CHRLF, as defined in the approved Plan of Operations.

- J. Operations – Requires KCSWD to ensure that appropriately trained personnel are on-site during hours of operation to control dust created by operations; collect litter at, and adjacent to, the CHRLF; and minimize the occurrence of standing water to prevent mosquito breeding. At least one trained person must be at the active face when the landfill is open for solid waste disposal.
- K. Reserve Operational Equipment – Requires KCSWD to have reserve operational equipment at CHRLF to maintain compliance with the Plan of Operations.
- L. Permanent Boundary Posts – Requires KCSWD to establish and maintain boundary markers at active landfilling areas (and around incremental landfill phases).
- M. Maintenance of Monitoring Systems – Requires KCSWD to maintain monitoring systems for air, groundwater, surface water, leachate, and landfill gas according to the approved Plan of Operations.
- N. Public Access – Specifies that CHRLF not be open to the public. Public dumping is not permitted except as described in the Plan of Operations.
- O. Biosolids Prohibited – Specifies that KCSWD not allow disposal of municipal sewage sludge or biosolids except as described in WAC 173-351-220(10). Composted sewage sludge and biosolids can be used as a component of intermediate and final cover.
- P. Access – Specifies that CHRLF not be open to the public, and that KCSWD is required to prevent unauthorized access. Artificial and natural barriers are to be used to control public and animal access to CHRLF.
- Q. Other Operating Requirements – Requires KCSWD to adhere to the following requirements:
 - Weigh all incoming waste on a scale to provide a measurement of the incoming waste tonnage; keep records of the weight of all incoming waste material and report this information to Public Health.
 - Keep the active working face of the landfill as small as practical to minimize the possibility of nuisances, environmental contamination, or incomplete placement of daily cover.
 - Maintain monitoring systems as specified in the approved Plan of Operations and in WAC 173-351-220(8).
 - Allow authorized employees of Public Health to enter, inspect, sample, and move freely about the CHRLF site.

2.1.3 Puget Sound Clean Air Agency

The CHRLF has an Air Operating Permit (permit number 10138) issued by PSCAA. The permit provides air emission limits, performance standards, and monitoring, reporting, and recordkeeping requirements. PSCAA developed its air permitting requirements in accordance with WAC 173-401 with the stated purpose to "...establish the elements of a comprehensive Washington state air operating permit program consistent with the requirements of Title V of the Federal Clean Air Act (CAA) [42 U.S.C. 7401, et seq.]."

Under the Air Operating Permit, KCSWD is required to monitor surface concentrations of methane along the perimeter of the gas collection area, as well as throughout the landfill, in a pattern that traverses the landfill at 30-meter intervals. A background concentration of methane is determined by moving a monitoring probe inlet upwind and downwind outside the boundary of the landfill at a distance of at least 30 meters from the perimeter wells. Any reading of 500 parts per million or more above background at any location at the CHRLF is recorded as an exceedance, and re-sampling is required. If the exceedance continues, corrective action is required, such as placing additional cover or active gas control in the exceedance area.

KCSWD also monitors opacity, or the degree to which light is blocked, throughout the CHRLF including from the landfill gas flares (North Flare Station), disposal area (fugitive dust), and fueling areas. KCSWD conducts monthly inspections of the facility for visible emissions. Inspections are performed while the equipment is in operation during daylight hours. If visible emissions are observed during the scheduled inspection or at any other time, KCSWD takes corrective action as soon as possible (but no later than within 24 hours of the initial observation) until there are no visible emissions. Alternatively, KCSWD may record the opacity using the reference test method and may shut down the unit or activity until it can be repaired. KCSWD is also required to record, investigate, and respond to complaints regarding odor, fugitive dust, and related nuisances.

2.1.4 Land Uses

As discussed in Chapter 1, solid waste disposal at the CHRLF is allowed under a Special Permit approved by the King County Board of Commissioners in 1960. The permit allows a sanitary landfill, not "an open garbage dump," and specifies that there will be no burning of garbage. The permit specifies that a 1,000-foot-wide buffer zone be maintained around the perimeter of the site for the protection of the surrounding properties. It further stipulates that "no sanitary operations" (i.e., solid waste disposal) should be allowed within the buffer. As stated in Chapter 1, KCSWD is responsible for the maintenance of the buffer, as it pertains to landfill-related activities; however, KCSWD does not have full control of the buffer. King County owns the landfill property, including the buffer; KCSWD pays rent to the county for its use. As the property owner, King County, not KCSWD, may authorize other uses in the buffer.

Both landfill and non-landfill related uses that have been allowed in the buffer since 1960 are summarized below.

Landfill-Related Uses

- In the late 1980s, use of the buffer was modified to allow facilities that would mitigate off-site impacts of the landfill. Accordingly two leachate treatment lagoons were

constructed in the southwest corner of the buffer and other environmental control systems, such as landfill gas monitoring wells, were installed.

- In 1992, a permit was issued for a non-potable water tank in the eastern buffer zone, which provides water for fire suppression and dust control on the CHRLF property.

Non-Landfill-Related Uses

- In 1966, construction of the Cedar Hills Alcohol Treatment Center was approved. In 1975, the treatment center was approved for expansion to include the addition of greenhouses and recreational field facilities. The treatment center has since closed, but the facility was recently approved for renovation as Passage Point. The YWCA will operate the Passage Point facility, which will provide transitional housing and support to parents returning to the community after a period of incarceration who are reuniting with their children. The area of the buffer zone on which the Passage Point facility will be located is not owned or managed by KCSWD.

The Special Permit and related documents are included in Appendix A.

2.2 Common Characteristics of the Action Alternatives

The following subsections discuss the characteristics or activities common to all action alternatives. First is an overview of the landfill development activities that will occur under all alternatives. Next is a more detailed description of the various elements of design and construction that are, or will be, used during all landfill development activities, including environmental controls. And finally are the procedures and guidelines used in the management of the landfill during operations and maintenance activities.

2.2.1 Common Landfill Development Activities

All action alternatives assume that existing landfill disposal Areas 5, 6, and 7 will be filled to capacity and closed. This activity constitutes the No Action alternative discussed in Section 2.3.6. The action alternatives are designed to expand the capacity of the landfill by developing a new disposal area(s) in the southern portion of the landfill.

The following activities would occur under all action alternatives:

- **Excavation/relocation of soil and solid waste and soil surcharging:** Each action alternative would involve the excavation and relocation of a significant amount of soil and solid waste. The clean soil (i.e., soil free of solid waste) would be used for landfill cover material – either daily cover on the active face of the landfill or interim/final cover on areas being prepared for closure. This soil would be stored for use on-site by stockpiling it over previously filled areas as a soil surcharge. Soil surcharging involves placing soil in stockpiles 20 to 30 feet high over previously landfilled areas to increase and accelerate the rate of settlement. After surcharging, the soil stockpile and interim cover would be removed, and additional solid waste would be placed in the disposal area, prior to the placement of final cover. The surcharge soil would then be used as daily or final landfill cover material. At no time during surcharging would the maximum elevation of the surcharged areas exceed 780 to 800 feet above mean sea level.

Soil that is mixed with solid waste will be sorted on-site to separate the materials and recover any clean soil that can be reused at the landfill. Material not recovered for reuse, and any unsorted materials, would be disposed in the active area of the landfill each day.

- **Excavation and future uses of the South Solid Waste Area:** The South Solid Waste Area (SSWA) is a 31.5-acre, unlined disposal area that has been closed for more than 30 years. A small portion of the SSWA, where solid waste was disposed in the 1970s, extends into the southern buffer. For all alternatives, soil and solid waste would be excavated from the entire SSWA, and the area within the buffer would be restored. Restoration involves regrading the area with clean soil and planting it with native vegetation, as appropriate. The major portion of the SSWA (excluding the buffer) would be used for relocation of the contaminated stormwater (CSW) lagoon, southwest siltation pond, and possibly other auxiliary facilities and systems, such as parking, material storage, contractor staging, and habitat enhancement. It is estimated that about 500,000 cubic yards of soil would be recovered from the SSWA.
- **Excavation of solid waste and soil from the SE Pit Refuse Area (*optional*):** In the southeastern area of the buffer, the SE Pit Refuse Area was also used for disposal of solid waste. Excavation of the SE Pit Refuse Area is an optional element of Alternatives 1 through 3. Under Alternatives 1 and 2 the area would be regraded and planted with native vegetation. Under Alternative 3, the area would either be restored or could be considered for relocation of some maintenance and administration facilities. Should KCSWD move forward with excavation of the SE Pit Refuse Area, it would obtain any necessary permits and prepare an operational plan that addresses potential impacts.
- **Relocation of the CSW lagoon, southwest siltation pond, and the main soil stockpile:** For all action alternatives, the CSW lagoon and southwest siltation pond would be moved to the SSWA. Depending on the alternative, all or part of the area containing the main soil stockpile would be excavated. The soil would first be used for soil surcharging on interim closed areas, including Areas 5, 6, and 7, and then as daily cover material for the new disposal area. It is estimated that the main soil stockpile will contain about 800,000 cubic yards of clean surplus soil upon completion of activities under the No Action Alternative.
- **Development of a new disposal area(s):** For all action alternatives, construction of a new landfill disposal area begins with the western portion of the area containing the CSW lagoon, southwest siltation pond, and main soil stockpile area and extends incrementally east toward the boundary of the buffer zone. Prior to any landfilling, the area would be prepared with a liner system and other environmental controls as described in Section 2.2.2.

2.2.2 Common Elements of Design and Construction

Construction and development of the landfill are conducted in accordance with stringent requirements for protection of public health and the environment. What follows is a description of the common design features and systems, and the associated environmental

controls, that will be used in developing all action alternatives. Where applicable, all of the environmental controls would be employed under the No Action Alternative as well.

Liner System

A landfill liner is required on the bottom and side slopes of a landfill cell prior to placement of waste in the cell. The design criteria for landfill liner systems are specified in WAC 173-351-300. The design criteria require a composite liner consisting of an upper and lower component. The upper component consists of a minimum 60-millimeter-thick high-density polyethylene (HDPE) geomembrane. The lower component consists of a minimum 2-foot-thick, low-permeability (1×10^{-7} centimeter per second or less) layer, or approved alternative, such as a geosynthetic clay liner.

Liner systems for the five action alternatives would consist of the following components (from top to bottom):

- Uppermost drainage layer material to facilitate the collection of leachate (see below)
- Geotextile layer over the geomembrane
- 60-millimeter-thick HDPE geomembrane
- A low-permeability liner such as a geosynthetic clay liner or a minimum 2-foot-thick, low-permeability soil layer
- Minimum 1-foot-thick select fill layer underlying the geosynthetic clay liner (if used for the low-permeability liner in place of the 2-foot-thick soil liner)

Quality assurance/quality control (QA/QC) of the integrity of the liner system would follow the requirements of WAC 173-351-730. As required by that regulation, QA/QC would be provided by an independent third-party professional and would include preparation of a construction QA/QC plan.

Leachate Collection System

Leachate is generated when water percolates through the solid waste in a landfill. Design standards for the leachate collection system are provided in WAC 173-351-300, which specifies that the leachate collection system must be designed and constructed to maintain less than a 1-foot depth of leachate over the liner system, except in the leachate sump area, where the depth may not exceed 2 feet.

With all future landfill development, perforated piping would be placed within a minimum 1-foot-thick drainage layer in the landfill cell to collect the leachate. In general, the drainage layer is expected to be between 1.5 and 2 feet thick to provide the required leachate collection, and to provide separation between the liner system and the waste. Leachate would flow by gravity or be pumped from the collection system through subsurface piping to the existing leachate aeration lagoons in the southwest corner of the landfill. The existing leachate lagoons would have adequate capacity to contain the leachate generated by any of the action alternatives. Following pre-treatment in the lagoons by aeration, the leachate would be discharged to the King County Wastewater Treatment Division's sewer system.

Stormwater Management

Clean stormwater is runoff from areas of the landfill with interim or final cover. This stormwater would be collected in ditches or subsurface piping in and around the landfill cell and transported to storage/treatment facilities, such as the south stormwater pond. All other stormwater collected from around the new landfill areas would similarly be collected and transported to a stormwater storage facility. Discharges from the southwest siltation pond currently exit the CHRLF along the south property line and ultimately flow to Queen City Lake. This stormwater routing system would be maintained for all of the action alternatives.

Stormwater that comes into contact with solid waste is considered contaminated stormwater and is kept separated from the clean stormwater via a series of berms and ditches. Under all action alternatives, contaminated stormwater would be collected and conveyed to the existing or newly located CSW lagoon. From the CSW lagoon, stormwater is conveyed to the leachate lagoons and then on to the sewer system for discharge. Future contaminated stormwater discharges may be routed in a similar manner.

Erosion and Sediment Control

Under all action alternatives, erosion and sediment control would be required both during construction of new landfill cells and during filling operations. Erosion and sediment control requirements are presented in Ecology's *Stormwater Management Manual for Western Washington* (Ecology 2005) and the *King County Surface Water Design Manual* (King County 2009). These documents include best management practices to be used to minimize soil erosion and subsequent off-site sediment transport, which minimizes impacts to off-site surface water.

The current CHRLF stormwater pollution prevention plan, which includes an erosion and sediment control plan, would be revised to control erosion and sediment transport during all new construction and filling operations. The revised plan would be reviewed and approved by Ecology. Requirements for erosion and sediment control to be used during construction are contained in Ecology's Construction Stormwater General Permit issued for construction of the landfill disposal areas. Additional requirements are specified in Ecology (2005). Requirements of the Construction Stormwater General Permit would likely include the following:

- Installation of sediment control features
- Protection of drain inlets
- Slope protection and stabilization of soil
- Stabilization of construction site entrances
- Runoff flow control and sediment control

Landfill Gas and Odor Control

For all action alternatives, the existing landfill gas collection system would be expanded to accommodate the new landfill disposal areas. Landfill gas would be collected under vacuum produced by blowers. The landfill gas would initially be collected using horizontal perforated piping placed within the landfilled solid waste at appropriate intervals. The horizontal collection piping would be connected to gas manifold pipes and larger header piping.

Collected landfill gases would then be conveyed through the main header pipe to the North Flare Station where it is either 1) sent on to the landfill gas-to-energy facility for final processing into pipeline-quality gas or 2) combusted at the flare station.

Systems in place to control odor include the landfill gas collection system and the placement of daily or final cover over disposal areas. Under the action alternatives, expansion of the landfill gas collection system would maximize the capture of gas generated during the decomposition of waste over time. The emission of surface odors would be controlled by keeping the active face of the landfill as small as possible and by covering the active and closed areas of the landfill with impermeable materials.

The effectiveness of gas and odor control systems would be monitored regularly, taking corrective measures in the event of any exceedances of regulatory standards.

Excavation of Previously Landfilled Areas

Previously landfilled areas are considered for excavation under the action alternatives to obtain soil that can be recovered for landfill cover material. The excavated material would be sorted on-site; material not recovered for reuse (solid waste), and any unsorted materials, would be landfilled each day. During the excavation of previously landfilled areas, odors would be controlled by keeping the working area as small as practical, covering the working face at the end of each day, and using misting equipment to neutralize odors in the work area, as needed. Prior to commencing any excavation activities, a plan for environmental controls during the excavation would be reviewed and approved by Public Health. Before removing any soil and solid waste and restoring areas of the buffer, KCSWD would confer with the appropriate regulatory agencies as needed.

The following areas are considered for excavation under all or some of the action alternatives:

- **South Solid Waste Area** – As discussed earlier, under all action alternatives the SSWA would be excavated and used for relocation of the CSW lagoon and southwest siltation pond. Preliminary estimates indicate that approximately 700,000 cubic yards of material is located within the area. Of this quantity, approximately 300,000 cubic yards is believed to be cover material that is readily reusable. The remaining 400,000 cubic yards of material is a combination of solid waste and soil. It is estimated that approximately one-half of the 400,000 cubic yards consists of soil that could be sorted and recovered for on-site uses. During this process, the portion of the SSWA that extends into the buffer zone would be restored.

During design of the SSWA excavation project, KCSWD would coordinate with the Bonneville Power Administration (BPA) to ensure that proposed activities would not affect BPA's transmission towers in the area, or transmission line maintenance.

- **SE Pit Refuse Area (optional)** – Under Alternatives 1, 2, and 3, excavation of the SE Pit Refuse Area is an optional element. Under Alternatives 1 and 2 the area would be regraded and planted with native vegetation. Under Alternative 3, the area would either be restored or could be considered for relocation of some maintenance and administration facilities. The area would not be excavated under Alternative 5. Should KCSWD move forward with excavation of the SE Pit Refuse Area, it would

obtain any necessary permits and prepare an operational plan that addresses potential impacts.

Soil Surcharging

Soil to be used for surcharging could come from several areas of the landfill depending on the action alternative approved for implementation. All action alternatives would use soil from all or part of the area containing the main soil stockpile and clean soil recovered from any previously landfilled areas that are excavated. Prior to commencing soil surcharging activities, a plan will be developed to address environmental controls and the impacts of soil loads on the existing controls systems, including the gas collection wells and leachate collection system. The plan will be submitted to Public Health for review and approval.

KCSWD has placed soil surcharge on Area 5 without any negative impacts to the environmental systems. Thus, it is not anticipated that the application of soil surcharge over other landfilled areas, such as Areas 6 and 7, would impact the cover system, leachate collection systems, or bottom liners. Additionally, the soil surcharge should have no impact on vertical landfill gas collection wells and only negligible impacts from settlement on horizontal landfill gas collectors (likely only to the landfill gas collectors in the uppermost layer of the CHRLF below the thickest portion of the soil surcharge stockpile; HDR 2008). Any impact from settlement would be mitigated through regular maintenance activities for the landfill gas collection system.

Use of Construction Equipment

Primarily earthmoving equipment would be needed to excavate landfill cells, prepare underlying soil and bottom (subgrade) layers, construct bottom liners, and build access roads and stormwater conveyance systems. The operation of heavy equipment during construction of a landfill cell would occur within the hours defined for landfill operations (see Section 1.4). Construction activities that generate only low noise levels may occur during other hours.

Typical equipment needed to complete construction would include the following:

- Scrapers, dump trucks, and excavators for cell excavation and transportation of soil to stockpile areas
- Bulldozers for grading and preparation of final subgrade
- Compactors and rollers for compaction of final subgrade
- Dump trucks for delivery of selected fill and drainage material
- Motor graders for construction of access roadways and various other grading activities
- Backhoes or small excavators for installing stormwater conveyance systems

Landfill Operations and Closure

As with daily filling of the active landfill cell, operations activities for all landfilling would include placement of daily cover material at the end of each working day. The maximum final elevation of all landfill disposal areas, including final cover, would be from 780 feet to 800 feet above mean sea level. Generally, once the designed solid waste fill elevation is reached, filling of the landfill cell would cease and cell closure activities would begin. These

activities would include placement of interim cover followed by final cover and installation of the impermeable landfill cap.

Maximizing Landfill Capacity

One or more techniques would be used under all of the action alternatives to create additional capacity or airspace in the landfill disposal areas. The airspace would be used for disposal of additional solid waste, while remaining within the permitted footprint and design elevation of the landfill. Soil surcharging is one technique (discussed in detail earlier); other methods currently in use include the following:

- Recycling and reusing landfill materials such as soil cover, road rock, and tipping area rock.
- Using alternative daily cover materials – This involves using non-soil materials as daily cover on the active landfill area to decrease the volume of soil needed on a daily basis and increase the amount of space available in the landfill. For example, tarps are currently used as alternative daily cover at the landfill.

2.2.3 Summary of Common Operations

Each of the alternatives would entail the following operational activities:

- Monitoring of solid waste delivered to the landfill for unacceptable materials and adherence to a waste acceptance policy
- Compaction of solid waste and application of an approved daily cover material
- Landfilling, stockpiling, and closure at a maximum elevation of between 780 and 800 feet above mean sea level
- Adherence to applicable regulations for surface water and groundwater quality
- Management of landfill gas through operation of a landfill gas collection and treatment system
- Measures to deter birds from the active landfill area
- Collection and treatment of stormwater prior to discharge
- Control of acceptance of liquid wastes
- Maintenance of records according to the approved Plan of Operations
- Measures to control dust, litter, and standing water
- Measures to ensure availability of reserve operational equipment
- Maintenance of boundary markers
- Monitoring programs for fugitive gas emissions from the landfill surface, lateral gas migration, flare emissions, and meteorological conditions to verify that air quality meets appropriate standards
- Monitoring programs for groundwater, surface water, and leachate to ensure water quality standards are met
- Maintenance of fences and barriers to prevent unauthorized access to the landfill
- Adherence to permitted hours of operation
- No solid waste disposal activities in the buffer zone

2.3 Description of Alternatives

The action alternatives are, for the most part, incremental in nature, with added areas of development leading to increased years of landfill life. As discussed in Section 2.2, all of the new development activity would take place in the southern portion of the landfill.

All of the action alternatives include:

- Completion of the final phases of landfilling in Areas 5, 6, and 7
- Excavation and regrading of the SSWA and restoration of the portion of the SSWA located in the buffer
- Relocation of the CSW lagoon, southwest siltation pond, and possibly other auxiliary facilities or systems to the SSWA
- Use of the main soil stockpile for soil surcharging and landfill cover material
- Construction of one or more new disposal areas beginning in the west in the area containing the CSW lagoon, southwest siltation pond, and main soil stockpile area and extending incrementally east toward the boundary of the buffer zone
- To allow uninterrupted landfill operation, construction of each new disposal area(s) beginning 2 to 3 years before filling of the active landfill area is complete (assumes a construction period of April through October)

The unique characteristics of each action alternative and the No Action Alternative are described in the following subsections. Section 2.4 presents a summary of the alternatives, as well as an estimated schedule for landfilling and construction. As discussed in Chapter 1, the division is recommending Alternative 2 as the preferred alternative.

2.3.1 Alternative 1 – Southwest Corner Development

Alternative 1 would develop 31.2 acres for construction of a new disposal area in the southwest portion of the landfill (Figure 2-1). The developed portion would include the area currently containing the CSW lagoon, southwest siltation pond, and approximately one-half of the main soil stockpile area. The new disposal area would be constructed in a single project.

In total, Alternative 1 would add approximately 4.7 million cubic yards of capacity to the CHRLF and extend its useful life by 3 to 4 years.

Soil Management

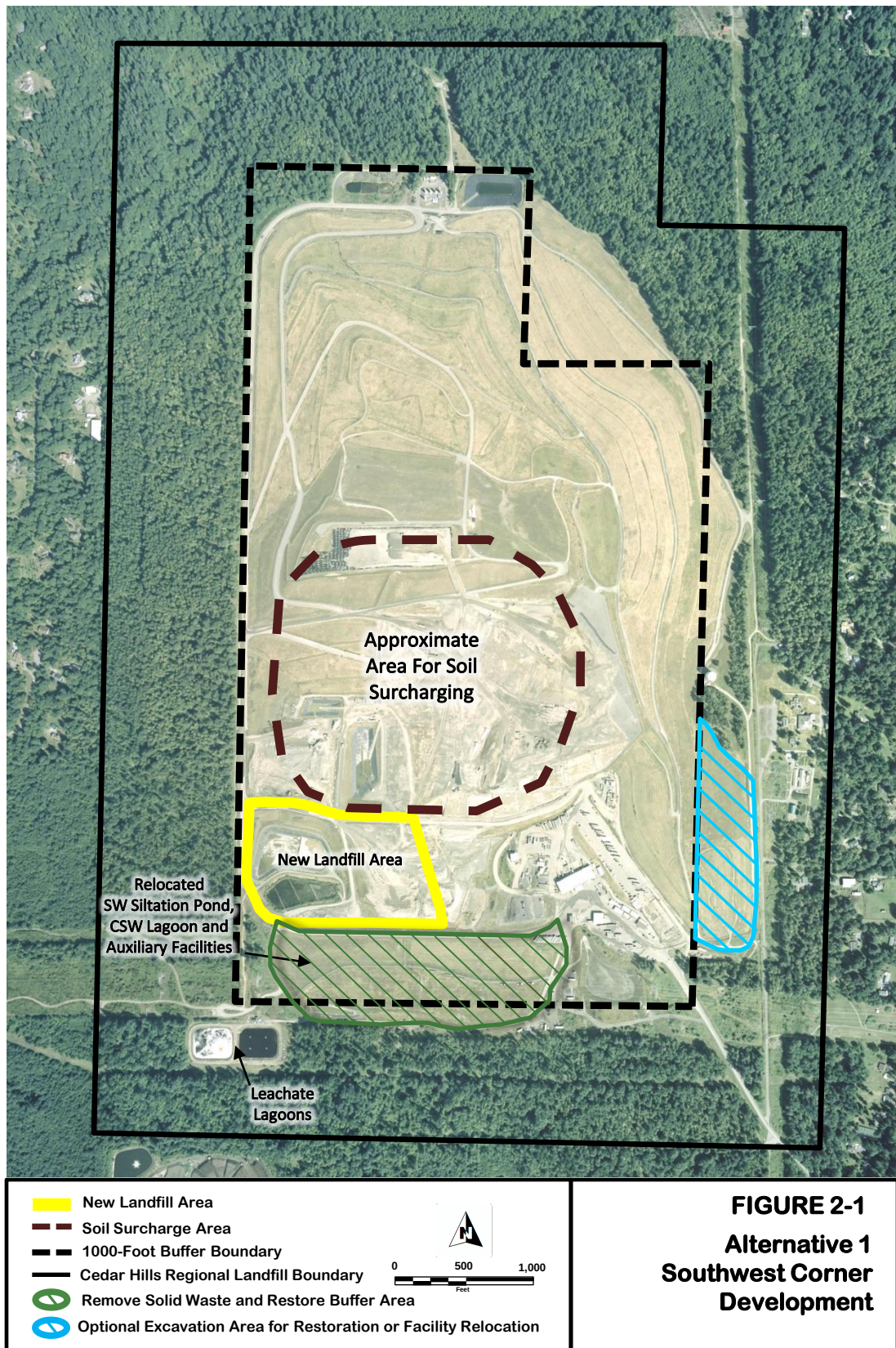
Implementation of Alternative 1 would require about 1.7 million cubic yards of soil for use as daily and final cover over its lifetime. This requirement would be met by excavating approximately 410,000 cubic yards of soil from the new disposal area, about 500,000 cubic yards of soil from the SSWA, and 800,000 cubic yards of surplus soil from the No Action Alternative. The excavated soil would be used for landfill cover material and surcharging for the new and existing disposal areas (as discussed in detail in Section 2.2.1). An option under this alternative is to excavate the SE Pit Refuse Area to obtain additional soil for landfill cover material and surcharging. Should KCSWD move forward with this option, it would obtain any necessary permits and prepare an operational plan that addresses potential impacts. The developed portion of the SSWA within the buffer and the SE Pit Refuse Area would be restored.

Demolition/Construction or Modification of Maintenance, Administrative, and Other Facilities

Under Alternative 1, no facilities (administration buildings, maintenance facilities, etc.) located in the southeast portion of the landfill site would be relocated.

Buffer Zone

Under Alternative 1, no solid waste disposal or relocation of infrastructure is planned within the buffer zone; therefore, all proposed development under Alternative 1 is allowed under the existing Special Permit.



2.3.2 Alternative 2 – Southwest Corner and Main Stockpile Area Development (*Preferred Alternative*)

Alternative 2 would develop 56.5 acres for construction of a new disposal area in the southwest portion of the landfill (Figure 2-2). The developed portion would include the area currently containing the CSW lagoon, southwest siltation pond, and the entire main soil stockpile area. New area development would consist of one to two projects conducted in two phases.

In total, Alternative 2 would add approximately 8.5 million cubic yards of capacity to the CHRLF and extend its useful life by 5 to 6 years.

Soil Management

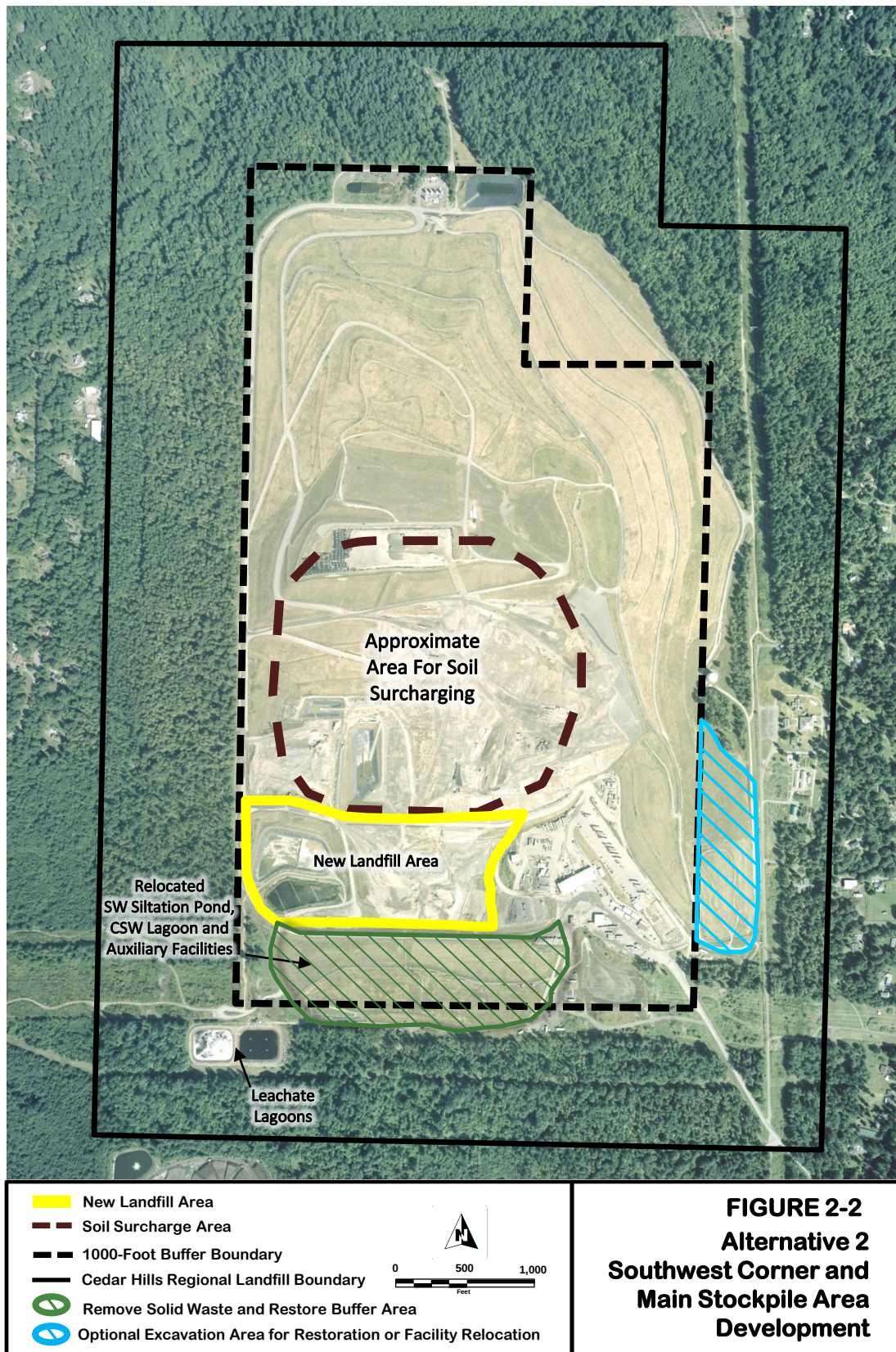
Implementation of Alternative 2 would require about 2.2 million cubic yards of soil for use as daily and final cover over its lifetime. This requirement would be met by excavating approximately 860,000 cubic yards of soil from the new disposal area, about 500,000 cubic yards from the SSWA, and 800,000 cubic yards of surplus soil from the No Action Alternative. The excavated soil would be used for soil surcharging and landfill cover material for the new and existing disposal areas (as discussed in detail in Section 2.2.1). An option under this alternative is to excavate the SE Pit Refuse Area to obtain additional soil for landfill cover material and surcharging. Should KCSWD move forward with this option, it would obtain any necessary permits and prepare an operational plan that addresses potential impacts. The developed portion of the SSWA within the buffer and the SE Pit Refuse Area would be restored.

Demolition/Construction or Modification of Maintenance, Administrative, and Other Facilities

Under Alternative 2, no facilities (administration buildings, maintenance facilities, etc.) located in the southeast portion of the landfill site would be relocated.

Buffer Zone

Under Alternative 2, no solid waste disposal or relocation of infrastructure is planned within the buffer zone; therefore, all proposed development under Alternative 2 is allowed under the existing Special Permit.



2.3.3 Alternative 3 – South Area Development with Partial Wall

Alternative 3 would develop 78.4 acres for construction of a new disposal area in the southern portion of the landfill (Figure 2-3). The developed portion would include the area currently containing the CSW lagoon, southwest siltation pond, main soil stockpile area, heavy equipment maintenance shop (also called the tracked equipment shop), a portion of the trailer parking area, and the area containing the compressor building adjacent to the Southwest Main Hill Refuse Area. The new disposal area would extend eastward to the ridge of the Southwest Main Hill Refuse Area. Facilities located within the proposed area covered by the alternative would require relocation to other areas of the site.

Under Alternative 3, a mechanically stabilized earthen (MSE) wall would be constructed along the eastern end of the landfill cell footprint. The MSE wall would be used to support solid waste placed behind it. The wall would be approximately 1,200 feet long with an average height of 30 feet. The MSE wall would allow continued use of the maintenance shop and administrative facilities (to the south of the disposal area) and would allow development of the area north of the shop for waste disposal. Alternative 3 would consist of up to three landfill development projects.

In total, Alternative 3 would add approximately 12.1 million cubic yards of capacity to the CHRLF and extend its useful life by 8 to 9 years.

Soil Management

Implementation of Alternative 3 would require about 2.4 million cubic yards of soil for use as daily and final cover over its lifetime. This requirement would be met by excavating approximately 920,000 cubic yards of soil from the new disposal area, about 500,000 cubic yards of soil from the SSWA, and 800,000 cubic yards of surplus soil from the No Action Alternative. The excavated soil would be used for soil surcharging and landfill cover material for the new and existing disposal areas (as discussed in Section 2.2.1). The developed portion of the SSWA within the buffer would be restored.

An option under this alternative is to excavate the SE Pit Refuse Area to obtain additional soil for landfill cover material and surcharging. The area would either be restored or could be considered for relocation of some maintenance and administration facilities. Should KCSWD move forward with this option, it would obtain any necessary permits and prepare an operational plan that addresses potential impacts.

Demolition/Construction or Modification of Maintenance, Administrative, and Other Facilities

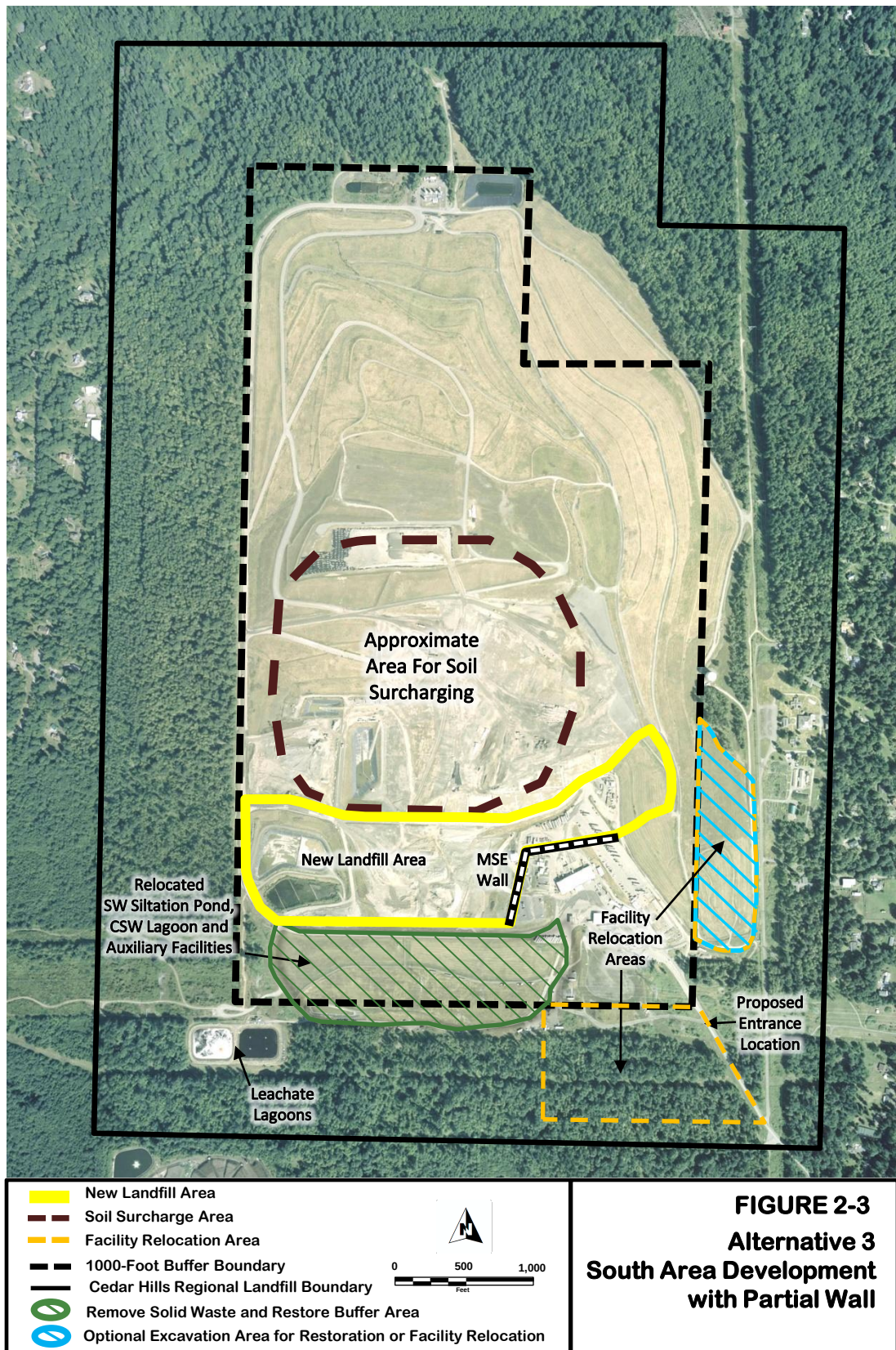
Under Alternative 3, several facilities located in the southeast portion of the landfill site would require relocation. These facilities include the following:

- Heavy equipment maintenance shop (tracked equipment shop)
- Contractor staging areas
- A portion of the transfer trailer parking areas
- Compressor building
- Operator's crew area
- Other small facilities adjacent to the Southwest Main Hill Refuse Area

Proposed areas for relocating facilities are shown in Figure 2-3. The contractor entrance to the south of the existing entrance on 228th Avenue SE could be modified to serve as the new facility entrance.

Buffer Zone

As with all the action alternatives considered, no solid waste disposal is planned within the buffer. Under Alternative 3, relocated facilities may be placed within the buffer near the southeast corner of the CHRLF, which borders an area zoned for mining, other resource extraction, and similar uses. Facility relocation would require permitting through the appropriate regulatory agencies. Also under consideration is restoration or facility relocation in the SE Pit Refuse Area. Similarly, KCSWD would obtain any necessary permits and prepare an operational plan that addresses potential impacts prior to excavation and restoration or facility relocation in this area.



2.3.4 Alternative 4 – South Area Development Including Support Area and Partial Main Hill (*Withdrawn*)

KCSWD has withdrawn Alternative 4 from further consideration in the Final EIS based on comments received on the Draft EIS on potential noise associated with the removal of the Southwest and East Main Hill refuse areas. These two refuse areas, which form the south main hill, provide an additional noise buffer for the Bio Energy (Washington), LLC (BEW) landfill gas-to-energy facility, which began operations in May 2009. Because BEW is still in the process of refining their operations at this time, it is uncertain how the absence of the south main hill could affect noise levels at the property line in the future.

A description of Alternative 4, as proposed in the Draft EIS, is provided below in italics.

Alternative 4 would develop 96.5 acres for construction of a new disposal area in the southern portion of the landfill (Figure 2-4). The developed portion would include the area currently containing the CSW lagoon, southwest siltation pond, and main soil stockpile area, and the southeast area currently containing the administrative and maintenance facilities. Facilities located within the development area would require relocation to other on-site locations, as shown in Figure 2-4. Also under consideration is relocating facilities, such as the maintenance shop, to off-site locations such as a centrally located King County transfer station.

Alternative 4 would extend from approximately the west buffer area to the east buffer area. It would include the southern portion of the main hill (including the Southwest Main Hill Refuse Area, East Main Hill Refuse Area, and SE Pit Refuse Area). Excavated soil would be used for soil surcharging and landfill cover materials; excavated solid waste would be disposed in the active landfill area. Alternative 4 would consist of up to three landfill development projects.

In total, Alternative 4 would add approximately 13.3 million cubic yards of capacity to CHRLF and extend its useful life by 9 to 10 years.

Soil Management

Implementation of Alternative 4 would require an estimated 2.5 million cubic yards of soil for use as daily and final cover material over its lifetime. This requirement would be met by excavating approximately 1.44 million cubic yards of soil from the new disposal area, about 500,000 cubic yards from the SSWA and 600,000 cubic yards from the SE Pit Refuse Area, and about 800,000 cubic yards of surplus soil from the No Action Alternative. The excavated soil would be used for soil surcharging and landfill cover materials for the new and existing disposal areas.

Demolition/Construction or Modification of Maintenance, Administrative, and Other Facilities

Under Alternative 4, most of the existing facilities located in the southeast portion of the landfill site would require relocation. These facilities include the following:

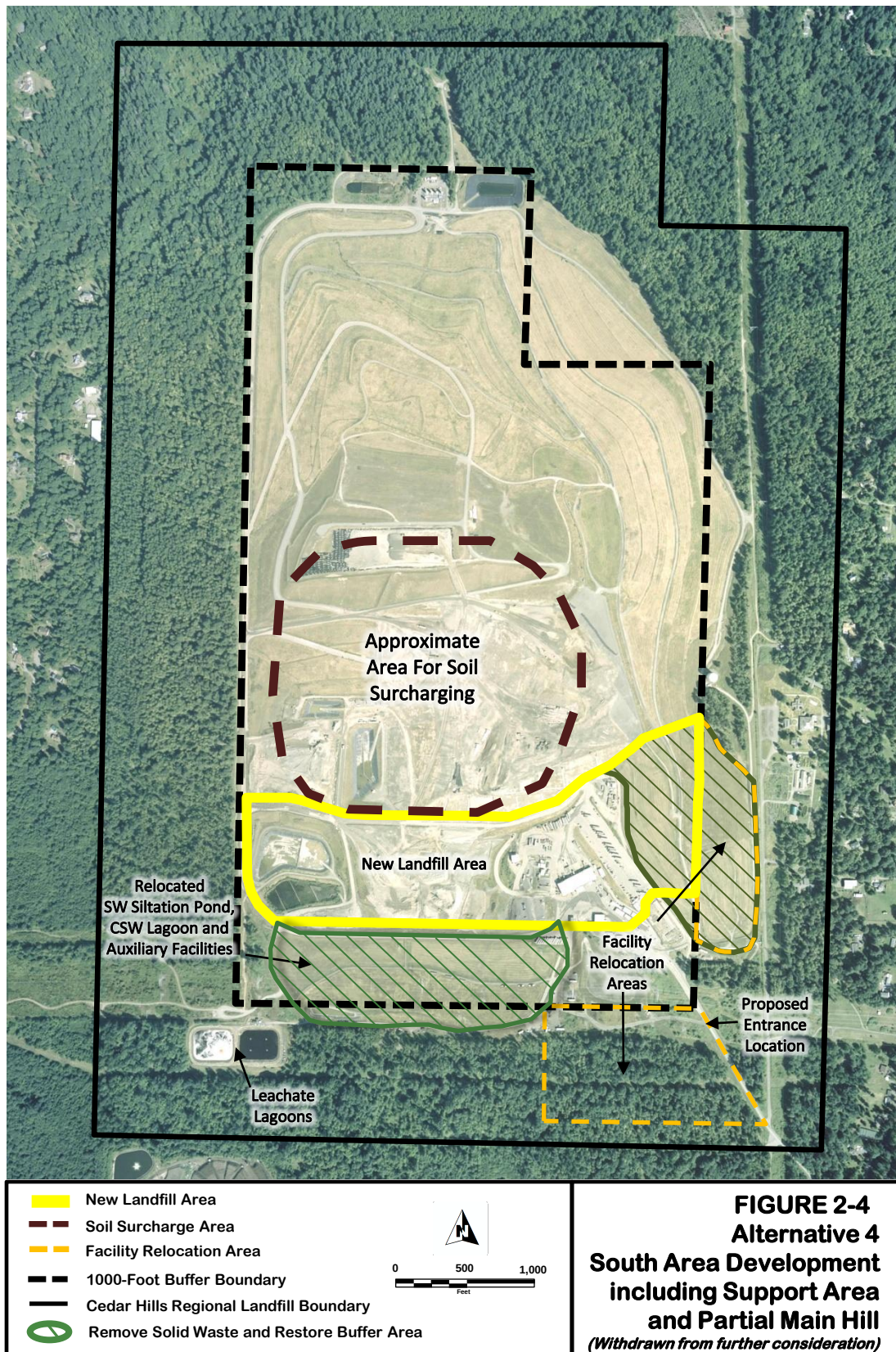
- *Administration buildings*
- *Equipment maintenance shop*

- *Vehicle maintenance shop*
- *Truck wash*
- *Fueling station*
- *Contractor staging areas*
- *Transfer trailer parking areas*
- *Parts and equipment storage area*
- *Compressor building*
- *Operator's crew area*
- *Other small facilities adjacent to the Southwest Main Hill Refuse Area*

Up to 21 acres may be required for relocated facilities. Potential on-site locations for facilities to be relocated are shown in Figure 2-4. The contractor entrance to the south of the existing entrance on 228th Avenue SE could be modified to serve as the new facility entrance, and the existing scalehouse could be relocated to this entrance.

Buffer Zone

With Alternative 4, as with all of the action alternatives, there would be no solid waste disposal in the buffer zone. Facilities requiring on-site relocation could be placed in the southeast corner of the property or in the SE Pit Refuse Area. Facility relocation would require permitting through the appropriate regulatory agencies. Restoration would occur in the portion of the SSWA located in the buffer and in the SE Pit Refuse Area if it is not used for facility relocation.



2.3.5 Alternative 5 – South Area Development Including Support Facility Area

Alternative 5 would develop 95.1 acres for construction of a disposal area in the southern portion of the landfill (Figure 2-5). The developed portion would include the area currently containing the CSW lagoon, southwest siltation pond, main soil stockpile area, and the southeast area currently containing the administrative and maintenance facilities. Facilities located within the development area would require relocation to other on-site locations, as shown in Figure 2-5. Also under consideration is relocating facilities, such as the maintenance shop, to off-site locations such as a centrally located King County transfer station.

Alternative 5 would extend from approximately the west buffer area to the top of the Southwest Main Hill Refuse Area and would overlay the west side of the hill. Under this alternative, the west side slope of the Southwest Main Hill Refuse Area would receive a new liner and leachate collection system, but soil and solid waste would not be excavated from the area. Under this alternative, the SE Pit Refuse Area would not be excavated. Alternative 5 would consist of up to three additional landfill development projects.

In total, Alternative 5 would add approximately 16.5 million cubic yards of capacity to the CHRLF and extend its useful life by 12 to 13 years.

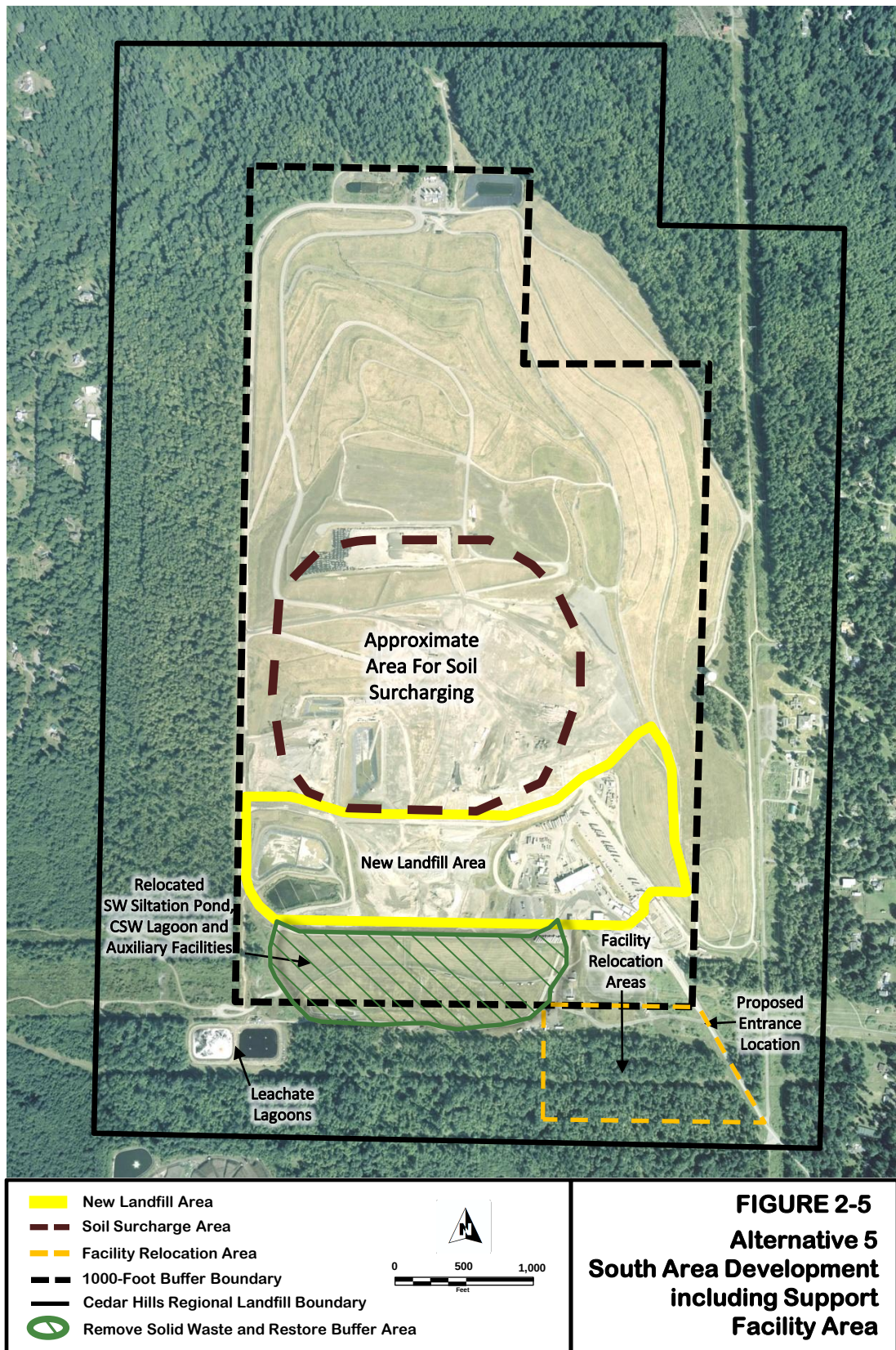
Soil Management

Implementation of Alternative 5 would require about 2.8 million cubic yards of soil for use as daily and final cover over its lifetime. This requirement would be met by excavating approximately 1.8 million cubic yards of soil from the new disposal area, about 500,000 cubic yards from excavation from the SSWA, and 800,000 cubic yards of surplus soil from the No Action Alternative. The excavated soil would be used for soil surcharging and landfill cover material for the new and existing disposal areas (as discussed in detail in Section 2.2.1). The developed portion of the SSWA within the buffer would be restored.

Demolition/Construction or Modification of Maintenance, Administrative, and Other Facilities

Most of the existing facilities located in the southeast portion of the landfill site would require relocation, including:

- Administration buildings
- Equipment maintenance shop
- Vehicle maintenance shop
- Truck wash
- Fueling station
- Contractor staging areas
- Transfer trailer parking areas
- Parts and equipment storage area



- Compressor building
- Operator's crew area
- Other small facilities adjacent to the Southwest Main Hill Refuse Area

Up to 21 acres may be required for relocated facilities. The potential on-site location for facilities to be relocated is shown in Figure 2-5. The contractor entrance to the south of the existing entrance on 228th Avenue SE could be modified to serve as the new facility entrance, and the existing scalehouse could be relocated in this entrance.

Buffer Zone

Under this alternative, there would be no solid waste disposal in the buffer zone. Facilities requiring on-site relocation could be placed in the southeast corner of the property (Figure 2-5). Facility relocation would require permitting through the appropriate regulatory agencies.

2.3.6 No Action Alternative

Under the No Action Alternative, future development at the CHRLF would be limited to those activities that are included in the current Site Development Plan. Under this alternative, no solid waste would be removed from unlined areas of the CHRLF, and no new landfill areas would be developed. Existing Areas 5, 6, and 7 would be filled and closed.

At the current time, the top of Area 5 has received interim cover. The currently active Area 6 is being closed in stages, with interim cover on closed areas. Area 7 opened in June 2010 and would be the final disposal area developed under the No Action Alternative. Portions of Area 5 have received soil surcharging, and other areas have been allowed to settle naturally. Once Area 7 has received interim cover, Areas 5, 6, and 7 will resume receiving additional solid waste and then final cover. Beyond this time, only closure construction, post-closure activities, and monitoring would occur at the site under the No Action Alternative. Based on January 2009 projections of future waste volumes, under the No Action Alternative the CHRLF is expected to reach capacity and close in approximately 2018.

Soil Management

It is estimated that the main soil stockpile will contain about 800,000 cubic yards of clean surplus soil upon completion of activities under the No Action Alternative. The excavated soil has been stockpiled on-site for various operational uses, including daily and final landfill cover for Areas 5, 6, and 7, as appropriate.

Demolition/Construction or Modification of Maintenance, Administrative, and Other Facilities

Under the No Action Alternative, no facilities (administration buildings, maintenance facilities, etc.) located in the southeast portion of the landfill site would be relocated.

Buffer Zone

Under the No Action Alternative, no solid waste disposal or relocation of infrastructure is planned in the buffer. All proposed development under this alternative is allowed under the existing Special Permit.

2.4 Summary of the Alternatives

The action alternatives present a range of options for continued use of the CHRLF beyond the anticipated closure date of 2018 under the No Action Alternative. Each of the action alternatives would be designed and operated in compliance with all applicable federal, state, and local laws and regulations. Table 2-1 provides a comparison of the estimated area, capacity, and landfill life associated with each action alternative.

Table 2-1. Estimated Landfill Area, Capacity, and Life Span by Alternative – Beyond 2018

Alternative	New fill area (acres)¹	Estimated Total Additional Capacity (MCY)	Estimated Extended Landfill Life² (Years)
Alternative 1 – Southwest Corner Development	31.2	4.7	3 to 4
Alternative 2 – Southwest Corner and Main Stockpile Development	56.5	8.5	5 to 6
Alternative 3 – South Area Development with Partial Wall	78.4	12.1	8 to 9
Alternative 5 – South Area Development Including Support Facility Area	95.1	16.5	12 to 13

MCY = million cubic yards.

¹Reflects plan view acres; including filling side slopes of previously lined areas and areas with new liner, but excludes the filling areas in the soil surcharged areas.

²Estimates of extended life assume that all solid waste would be disposed of at CHRLF and are based on forecasted tonnage values shown in Table 1-2. If KCSWD implements a partial waste export program or other disposal options, the useful life of CHRLF could be extended beyond the times shown.

