# West Point Quarterly Report Q4 2017:
# West Point Treatment Plant Progress Report, Implementation Plan for AECOM Recommendations and Requirements of the Washington State Department of Ecology's Administrative Order, and Staff Retention at West Point
# and Staff Reporting Tool

Prepared in accordance with
Motion 14813, Section C,
Ordinance 18627 and Ordinance
18628

**January 2018**

King County
Department of Natural Resources and Parks
Wastewater Treatment Division

# Table of Contents

# Introduction

The King County Council enacted the following legislation related to the February 9, 2017, incident at the West Point Treatment Plant (West Point): Motion 14813, Section C; Ordinance 18627; and Ordinance 18628. The two ordinances included language allowing transmittal of a combined report with the quarterly report required by Motion 14813.

On February 27, 2017, the Council approved Motion 14813 which extended the County Executive's February 9, 2017, Determination of Emergency and Waiver of Competitive Procurement Requirements through May 31, 2018. This action allowed the Wastewater Treatment Division (WTD) of the Department of Natural Resources and Parks to continue its emergency response to the flood event which occurred at West Point on February 9, 2017. Section C of Motion 14813 requires the King County Executive to transmit a quarterly report to the Council on the expenditures and contracting necessary to restore West Point to full operations.

Specifically, the Motion requires the report to include the following, which are each addressed under a separate heading:

a) Expenditures during the previous quarter and anticipated for the next quarter;
b) Project expenditures to date;
c) A current estimate of the total costs of the repairs;
d) A list of the contracts or agreements undertaken under the authority in this waiver, including for each contract or agreement: the name of the vendor, the type of work, the value of the contract or agreement and the level of compliance with the contracting requirements of K.C.C.3.15.100, K.C.C. chapters 72.16*, 12.17, 12.18 and 12.19 and related administrative rules;
e) A summary of procurement actions anticipated, but not yet undertaken under the authority of this procurement waiver; and
f) A discussion of specific actions taken during the previous quarter to continue to obtain competitive prices on behalf of the rate payers despite this waiver, including but not limited to procurements issued or to be issued in accordance with the requirements of K.C.C. chapters 2.93 and achieving compliance with K.C.C. 3.15.100, K.C.C. chapters 12.16, 12.17, 12.18 and I2.19 and related administrative rules.

* Appears to refer to chapter 12.

The West Point Independent Assessment Report, dated July 18, 2017, was prepared by AECOM following the February 9, 2017, event at West Point. The report proposed 98 recommendations to minimize the likelihood of future flooding and performance issues at the plant. Ordinance 18628 requires an Implementation Plan for the AECOM Recommendations which specifically addresses each of the 98 recommendations and the Washington State Department of Ecology's required actions under an Amended Administrative Order #15480.

Ordinance 18627 requested a report on staff retention at West Point and the feasibility of providing or augmenting a tool for staff to report operational concerns.

## Executive Summary

On February 9, 2017, a severe flood occurred at West Point. The flooding inundated electrical and mechanical equipment resulting in emergency bypasses of sewage through the emergency outfall, and discharge of partially treated sewage through the off-shore outfall. WTD began emergency response and restoration work immediately using existing contracts and emergency contracts under a waiver of competitive procurement requirements. The use of emergency contracts ensured that cleanup, repair and replacement of damaged systems and equipment could proceed in an expeditious manner.

During the second quarter of 2017, WTD staff and contractors together achieved the significant milestone of restoring critical plant treatment functions and returned operations to full compliance with the plant's permit and water quality requirements. During the fourth quarter 2017, $2.5 million was expended to bring the plant restoration closer to completion and replace temporary equipment and support systems with long-term sustainable equipment and parts. It is anticipated that WTD will expend approximately between $1.4 million and $3.3 million during the first quarter of 2018 on remaining restoration efforts. Based on current actuals and projections, the total cost estimate has decreased and is now estimated at less than $26 million to complete full restoration of the plant. A list of contracts associated with restoration project work is provided in Attachment A to this report.

With respect to compliance with contracting requirements during the emergency, a portion of the restoration work has been performed under existing WTD contracts that were competitively procured and are in compliance with competitive contracting requirements. Where possible, and to the greatest extent practical, new contracts authorized under the emergency declaration utilized labor rates and contract requirements from existing competitively procured contracts to ensure that competitive pricing was applied to the work to be performed.

The West Point Independent Assessment Report, dated July 18, 2017, was prepared by AECOM, at the direction of the King County Council following the event at West Point. The report proposed 98 recommendations to minimize the likelihood of future flooding and performance issues at the plant. Many recommendations have, or are currently, being implemented, including:

- Implementation of a Life Safety Management system.
- Development, implementation and continuous improvement of more comprehensive emergency/wet weather training.
- Assessment of strategies to address plant constraints and improve redundancy.
- Evaluation and prioritization of potential capital improvement projects to increase redundancy and minimize the risk of flooding.

West Point's remote location, lengthy commute times, and the intensity of operating West Point during wet weather events combined with sewer flows coming into the plant can make working at this plant challenging for employees. The complexity of operating West Point is also a driver for some employees to work at the plant. However, employee tenure at West Point is similar to that of WTD's other regional treatment plants. Most attrition throughout operations is due to retirements, which is an issue facing King County as a whole. WTD remains committed to succession planning efforts and opportunities to encourage employee retention.

WTD recently discussed the possibility of premium pay for workers at West Point with the unions representing plant employees. WTD also explored travel incentives such as paid vanpools, shifting work schedules, and toll-road passes for West Point employees. Premium pay and the travel incentives were rejected in the last round of contract negotiations. Additionally, WTD is looking at adjusting shift schedules so that employees would travel to and from work outside of prime commute times.

WTD uses Bright Ideas as a way for employees to report problems they see in the workplace and to offer solutions. Bright Ideas is a hands-on, employee idea program where employees can submit and track their ideas through an online tool. Bright Ideas will be augmented to be further utilized as a staff reporting tool where employees can report needed workplace improvements and offer ideas on how to address them. Employees will continue to have the option of reporting anonymously.

## West Point Current Status and Future Work
## Motion 14813, Section C

Significant progress was made during the fourth quarter 2017 towards bringing West Point to full system operation with permanent equipment. The repair and replacement of equipment destroyed by the emergency flood event is nearing completion with work wrapping up in all areas of the recovery effort, including restoration of permanent power. Restoration of the secondary treatment system at West Point was completed in April and by May 9, 2017, the plant was again operating and complying with all required permit conditions. The primary and secondary treatment systems, including the digesters, dewatering and solids handling, are all operating, and treating wet-weather flows.

Major work now completed for the repair and restoration of the plant's full function includes the following:

- Repaired, replaced, and tested all but one of 97 flooded pumps
- Replaced all 25 flooded electrical transformers
- Replaced or repaired all 151 damaged electric motors
- Replaced all 200 flooded electrical motor control centers
- Repaired or replaced all 125 electrical panels
- Replaced and rebuilt all of the 125 flooded local electrical control stations

- Dried and tested 100 percent of the miles of flooded electrical conduit and conductors
- Disinfected and replaced more than 2000 flooded light fixtures, including exit signage
- Replaced 100 percent of the more than 1200 flooded outlets and switches
- Replaced or rebuilt 99 percent of more than 200 flooded solenoids
- Inspected, tested, and repaired or replaced 99 percent of 125 flooded instruments
- Replaced all of the miles of flooded insulation
- Replaced all six of the flooded ovations controls (the automated system controls) for odor control
- Replaced the four flooded ovations controls for solids handling
- Completed "cut-over" to permanent electrical motor control centers to operate all systems
- Replaced one air-handler fan that failed after installation, now back in service
- Balanced air flow (via air handling units) throughout the plant galleries
- Restored permanent power to all three of the plant's Boilers

Major work scheduled for completion in 2018 includes the following:

- Complete installation of three environment control panels (HVAC control panels)
- Modify Boiler 2 to switch over to permanent propane and methane dual gas fuel source (currently running on temporary propane only)
- Tune Boilers 1 and 3 to operate at 100 percent of designed capacity (for heating secondary treatment tanks)
- Complete the replacement of 25 temporary doors with permanent doors
- Finish Digester Tunnel air handling unit installation and start-up, including the associated pneumatic controls and hot water circulation pump
- Reconstruction of the flooded employee equipment locker room
- Balancing air flow (via air handling units) in the Solids processing basement

## Contracts Utilized and Contracted Expenditures during the Previous Quarter

Attachment A to this report shows the contracts entered into by firm and the major category of service provided (e.g., electrical contractor, safety supplies). Table 2 on Attachment A lists contracts specifically procured under the waiver extended by Motion 14813, while Table 3 shows contracts utilized that were procured under normal contracting requirements. Attachment A also shows the amount committed and the amount paid in the fourth quarter 2017 and life to date (LTD).

## Project Expenditures to Date and Anticipated Expenditures

The total restoration project expenditures for the fourth quarter 2017 (October-December) were approximately $2.5 million. As shown in Table 1 of Attachment A, both the fourth quarter 2017 and life to date (LTD) totals are reported. This amount

includes the invoices paid to date for each major category of contract and materials or equipment, whether purchased directly by WTD or through a contractor, along with King County labor costs through December 1 which is the latest pay period available. In total, $19.2 million has been spent to date on restoration efforts.

Project expenditures anticipated for the first quarter 2018 are shown in Table 1. Because of the uncertainty associated with estimating future costs of an emergency restoration of this magnitude, an expected low and high cost estimate for first quarter 2018 expenditures is provided to more realistically account for this variability. Relative to initial forecasts of the total restoration cost estimate there is a favorable downward trend in costs suggesting the total cost will be closer to the low end of the estimate. For the final total cost of restoration, the current updated full cost estimate for all work is anticipated to be less than $26 million.

## Status of Insurance Claims

Immediately following the February 9 flooding, WTD began working with King County's Office of Risk Management Services and Marsh LLC, WTD's insurance broker, to initiate the insurance claims process. WTD has insurance coverage up to $25 million from FM Global with a $250,000 deductible and $75 million (from $26 million in losses up to $100 million) from excess insurance carriers.

WTD is receiving insurance reimbursements as it submits the required documentation to demonstrate the costs that have been incurred for restoration. Through December 31, 2017, FM Global reimbursed WTD a total of $12.5 million.

## Summary of Procurement Actions Anticipated Under Waiver Authority

As previously described, the list of contracts obtained under the waiver is displayed on Table 2 of Attachment. A. These emergency contracts allowed WTD to begin cleaning and restoration work immediately after the flooding event in order to fully restore treatment capabilities at the plant in the shortest time possible. No new contracts using the waiver exemption from competitive bidding requirements are expected for this effort in future work.

## Summary of Actions Taken to Obtain Competitive Procurements and Comply with Standard Contracting Requirements

As noted in Attachment A, WTD utilized several existing contracts that were obtained under normal procurement policy (i.e., did not use the waiver as authorized under Motion 14813) to perform the work. These contracts were in place prior to the emergency waiver and, therefore, in compliance with competitive contracting requirements. The waiver allowed WTD to hire contractors without going through the competitive bid process to expeditiously begin restoration work. As directed by the King County Council, the new contracts under the waiver do include most standard contracting requirements under King County Code (referenced in Motion 14813).

Specifically, the existing and new contracts for West Point restoration comply with King County Code sections relating to minimum wage, 12.16 relating to nondiscrimination, 12.17 relating to unfair contracting practices, 12.17 relating to unfair employment practices, and 12.19 relating to nondiscrimination in benefits.

To further King County's equity and social justice goals, WTD is encouraging contractors to utilize Small Contractor and Supplier (SCS) firms while still working to meet schedule requirements. An example of this is the inclusion of a total of six qualified SCS firms as subconsultants to the Engineering Services (CH2M as prime) and Construction Management (Jacobs as prime) contracts obtained under the Motion's waiver exemption. These six firms have a total of $760,000 allocated to them in the contract budgets. Several other SCS firms are also participating in the recovery effort.

WTD also is requesting that all contractors and consultants selected under the waiver exemption provide information on their use of SCS firms through the County's procurement database. To date, $561,000 has been paid to the SCS firms subcontracted under just the CH2M and Jacobs contracts cited earlier.

Moving forward, WTD will continue to use the normal competitive bid process to the greatest extent possible for any newly identified work not already covered by an existing contract. As Attachment A shows, the majority of work is being performed by firms who qualified under normal competitive processes. Small purchase amounts from competitively bid contracts are summarized in the last line of Table 3 in Attachment A for brevity and there are dozens of firms utilized in such purchases, all of them competitively bid. This competitive procurement and utilization of the other firms listed under Table 3 comprise the vast majority of the firms supporting the restoration efforts at West Point.

As plant operations have been successfully brought back online, two waiver-eligible projects were selected to be competitively procured in 2018 in an effort to further execute work under standard contracting requirements. These projects are the replacement of the 25 damaged gallery doors and reconstruction of the flooded employee equipment locker room. These two projects will total approximately $1,000,000 in new contracts.

## Implementation Plan for AECOM Recommendations Ordinance 18628

The West Point Independent Assessment Report, dated July 18, 2017, prepared by AECOM, at the direction of the King County Council following the February 9, 2017, flooding and bypass event at West Point proposed 98 recommendations to minimize the likelihood of future flooding and performance issues at the plant. Many recommendations have, or are currently, being implemented, including:

1. Implementation of a Life Safety Management system.
2. Development, implementation and continuous improvement of more comprehensive emergency/wet weather training.
3. Assessment of strategies to address plant constraints and improve redundancy.
4. Evaluation and prioritization of potential capital improvement projects to increase redundancy and minimize the risk of flooding.

Table 1 breaks down the recommended strategies and summarizes their current accomplishment status. The full list of 98 recommendations can be found on Attachment B.

**Table 1 – Recommended Strategies by Category**

| Category | Total # of Recommendations | Adopted | | Not Incorporated** |
|---|---|---|---|---|
| | | In Progress | Completed and Ongoing* | |
| Plant Hydraulics | 6 | 3 | 1 | 2 |
| Influent Control Structure | 8 | 5 | 1 | 2 |
| Preliminary Treatment | 2 | 2 | | |
| Raw Sewage Pump Station | 8 | 7 | | 1 |
| Pre-aeration and Sedimentation Tanks | 7 | 6 | 1 | |
| Flow Diversion Structure | 3 | 2 | 1 | |
| Effluent Pump Station | 12 | 5 | 2 | 5 |
| Electrical | 9 | 3 | 4 | 2 |
| Instrumentation and Control | 12 | 12 | | |
| Staffing | 2 | 0 | 1 | 1 |
| Operators | 13 | 5 | 7 | 1 |
| Training | 5 | 0 | 5 | |
| Equipment and System Testing | 8 | 3 | 4 | 1 |
| Maintenance Procedures | 3 | 3 | | |
| **Totals** | **98** | **56** | **27** | **15** |

* WTD implemented an alternative for four of the recommendations; more detail is included in Attachment B.
**Attachment B includes an explanation for each recommendation that was not incorporated.

## Implement a Life Safety Management System

Many recommendations fall into what the report refers to as “life safety.” Those recommendations are intended to prevent or minimize the effects of flooding in all parts of West Point.

West Point employees have embraced the implementation of a Life Safety Management system as a high priority. WTD hired a Life Safety Coordinator who is working with key plant staff to evaluate the recommendations and implement a system-wide life safety

strategy. WTD anticipates completing that evaluation and beginning implementation in mid-2018.

### Improve Emergency Training

Immediately following the flood event, staff began developing improvements to existing emergency/wet weather response procedures. In addition to creating new and updating existing standard operating procedures (SOPs), the existing operator training program was expanded to incorporate a wet weather response and life safety focus. In addition, staff is working with a consultant team to prioritize control system alarms and to implement a hydraulic simulation program. This program will realistically simulate the West Point control system and allow operators, regardless of experience, to be trained in a way that more realistically simulates plant operations during high flow events and on equipment failure response procedures.

### Evaluate Plant Constraints and Improve Redundancy

Investigations are in progress to identify potential plant constraints and inadequate hydraulic redundancy. Two high priority evaluations are expected to be complete by the third quarter of 2018. The first evaluation considers options to expand the capacity of the raw sewage pumps (RSP) from 330 MGD to 440 MGD and would resolve an existing plant-wide hydraulic constraint. The second evaluation assesses how best to construct an emergency weir bypass, which would help mitigate or avoid future flooding.

### Prioritization of WTD's Existing Six-Year Capital Improvement Plan

Many of the recommendations are being considered and prioritized as part of WTD's capital project prioritization process. The implementation of these recommendations must be weighed against other capital improvement programs such as combined sewer overflow control, capacity improvements to serve growth in the region, and infrastructure replacement and repair throughout the regional wastewater system.

### Recommendations Not Incorporated

After evaluation, some recommendations were in conflict, others were replaced with a more effective solution, and a few are impractical based on the configuration and control of the collection system and plant hydraulics. An explanation is provided in Attachment B for any recommendation that will not be implemented.

## Requirements of the Washington State Department of Ecology's Administrative Order #15325

The Washington State Department of Ecology issued an Amended Administrative Order #15325 on November 15, 2017, following the flooding event at West Point. The order requires WTD to complete six corrective actions. Five of those corrective actions are addressed as part of the implementation of the AECOM recommendations. The other

corrective action requires the development and implementation of strategies for collecting representative samples of raw sewage at the Influent Control Structure at West Point. Details on the implementation of the six required corrective actions can be found in Attachment B.

## Staff Retention at West Point
## Ordinance 18627

Employee tenure at West Point largely is very similar to that of other WTD facilities. Most attrition throughout Operations is due to retirements, which is an issue facing King County as a whole. WTD has made succession planning a priority division-wide by providing special duty assignments, job shadowing, mentorships, and improvement tools such as the Lominger leadership principles. These efforts ensure that WTD employees understand and are prepared for the available growth and development opportunities.

Another important tool for recruiting new employees, as part of succession planning, has been the Operator in Training (OIT) program that began in 2015. After an eighteen month training program, trainees are qualified for immediate placement into vacancies created by retirement and transfers. An additional benefit of the OIT program is consistent training at each plant that bolsters the skills of all operators. From the first OIT program of 12 new employees, 10 of those OITs are now employed as WTD operators. In 2017, WTD solicited applications for the next OIT cohort and 263 applications were received for 15 positions.

After retirement, transfers to other WTD facilities is the next most common reason for attrition at West Point. Employees have also stated that commute issues are the biggest barrier to working at West Point. Based on employees' home locations, commuting to South Plant or Brightwater are much more attractive options, saving hours per day in commute time. Also, due to the intensity of operating a facility receiving flows from combined sewers during wet weather events, West Point is more complex to operate than the other WTD plants. This high degree of difficulty may discourage some from working at West Point and may encourage others to work at this facility. The implementation of the AECOM recommendation related to improved emergency training, including the hydraulic simulation program, should result in employees feeling more confident about working at West Point.

In 2010, WTD negotiated a contract provision policy that prohibits an employee represented by SEIU 925 from transferring to another location until they have been in the bargaining unit for five years. Results from the first years of this program have been successful in improving employee retention at West Point.

During recent contract negotiations, WTD proposed a monetary incentive to retain employees at West Point. Part of the incentive package included commute incentives such as paid vanpools, shifting work schedules, and toll road passes. SEIU Local 925 representing WTD plant employees rejected the possibility of premium pay for workers

at West Point as unfair to workers at other locations. WTD plans to revisit this issue with the unions in future discussions. WTD is looking to review shift schedules so that employees would travel to and from work outside of the most congested commute times.

## Staff Reporting Tool

Bright Ideas is a hands-on, employee idea program for WTD employees to submit and track their workplace improvement ideas through an online tool. While most employees freely post their name along with their workplace improvement ideas, they also have the option of submitting their ideas anonymously. Bright Ideas encourages creative problem solving, especially among front-line employees who are often the first to see ways to address workplace concerns. WTD also maintains a Safety hotline for employees to report safety concerns.

Bright Ideas will be augmented to be further utilized as a staff reporting tool where employees can report needed workplace improvements and offer ideas on how to address them. Employees will continue to have the option of reporting anonymously.

Currently, WTD employees are introduced to the Bright Ideas program during the onboarding process and icons are added to all WTD employee computers so any WTD employee may submit directly into Bright Ideas. In early 2018, WTD will increase promotion of the Bright Ideas tool and information on how employees can use it to report needs for workplace improvements and offer potential solution. There will be a mechanism to track employees' reporting of needed workplace improvements and WTD's response.

**Cost Tables for West Point Treatment Plant Report (Motion 14813)**

**Table 1:**

| West Point cleanup costs: | 2017 Q4 | Life to Date LTD | forecast low expend. 2018 Q1 | forecast high expend. 2018 Q1 | forecast low LTD through 2018 Q1 | forecast high LTD through 2018 Q1 |
|---|---|---|---|---|---|---|
| Total contracted | $ 2,251,807 | $ 15,433,121 | $ 1,351,084 | $ 3,316,853 | $ 16,784,205 | $ 18,749,974 |
| Total King County labor | $ 221,955 | $ 3,285,343 | $ 133,173 | $ 266,346 | $ 3,418,516 | $ 3,551,689 |
| Total materials/equip. (direct purchase. other) | $ 32,112 | $ 433,097 | $ 25,689 | $ 38,534 | $ 458,787 | $ 471,631 |
| Total | $ 2,505,874 | $ 19,151,561 | $ 1,509,946 | $ 3,621,733 | $ 20,661,508 | $ 22,773,294 |

**Table 2:**

**Contract costs: Contracts procured under emergency waiver**

| Vendor Name | Contract # | Type of work | Current Total $ Authorized | Current Total $ Committed * | Paid 2017 Q4 | Paid LTD |
|---|---|---|---|---|---|---|
| Burke Electric | C001148C17 | Electrical Contractor | $5M | $ 2,437,891 | $ 91,189 | $ 1,216,569 |
| Dutton Electric | C001149C17 | Electrical Contractor | $5M | $ 3,115,578 | $ 806,011 | $ 2,111,136 |
| Valley Electric | C001150C17 | Electrical Contractor | $5M | $ 3,001,764 | $ 130,855 | $ 1,309,667 |
| Hawk Mechanical | C001151C17 | Mechanical Contractor | $5M | $ 4,420,500 | $ - | $ 2,826,392 |
| CH2M Hill | E00484E17 | Planning & Engineering Services | $5M | $ 3,089,493 | $ 444,739 | $ 2,527,289 |
| Jacobs | P00216P17 | Construction Management | $5M | $ 873,251 | $ 48,259 | $ 811,502 |
| Subtotal: | | | $30M | $ 16,938,477 | $ 1,521,053 | $ 10,802,555 |

* Note: Total $ Committed is the contractual "Not to Exceed" value of work orders issued, and is not a guarantee of final contract payout (cost).

**Table 3:**

**Contract costs: Contracts procured under Normal procurement requirements (not via emergency waiver)**

| Vendor Name | Contract # | Type of work | | Current Total $ Committed | Paid 2017 Q4 | Paid LTD | Notes (see below) |
|---|---|---|---|---|---|---|---|
| CH2M | E00159E09 | Assessment Engineering & Cost Estimating | | $ 110,905 | $ 14,209 | $ 110,905 | 1 |
| Aerzen USA Corporation | Multiple Purchase Orders (PO)Issued | Centrifugal blower package | | $ 122,320 | $ - | $ 122,320 | |
| Applied Industrial Technologies, Inc. | Multiple POs Issued | Bearings, belts and related items | | $ 19,500 | $ 639 | $ 19,500 | |
| APSCO, LLC | 5578958 | Pumps, Parts & Service | | $ 21,467 | $ 9,668 | $ 21,467 | |
| Ballard Transfer | Multiple POs Issued | Equipment load and delivery | | $ 13,190 | $ 8,970 | $ 13,190 | |
| Beaver Equipment Specialty CO, Inc. | 5939697 | Wastewater equipment | | $ 43,383 | $ 43,383 | $ 43,383 | |
| Brown and Caldwell, Inc. | 5959166 | Technical Services For West Point Treatment Plant Assessment | | $ 217,763 | $ 217,763 | $ 217,763 | |
| Cole Industrial, Inc. | Multiple POs Issued | Boiler | | $ 133,500 | $ - | $ 133,500 | |
| Day Wireless Systems, Inc. | Multiple POs Issued | Portable radios | | $ 66,716 | $ 7,772 | $ 66,716 | |
| Delta Electric Motors, Inc. | 5851106 | Motor | | $ 259,343 | $ 4,782 | $ 259,343 | |
| Electrical Reliability Services, Inc. | Multiple POs Issued | Electrical equipment diagnostics | | $ 12,929 | $ 2,305 | $ 12,929 | |
| Ferguson Enterprises, Inc. | 480020 | Plumbing parts/supplies | | $ 53,311 | $ 23,943 | $ 53,311 | |
| Flohawks/Skagit Transportation | 525799 | Sludge hauling | | $ 290,858 | $ - | $ 290,858 | |
| Fluid Components International | Multiple POs Issued | Flow meters and related services | | $ 15,293 | $ - | $ 15,293 | |
| Grainger | 5739895 | Supplies | | $ 130,378 | $ 13,060 | $ 130,378 | |
| Granich Engineered Products, Inc. | Multiple POs Issued | Pumps and related equipment | | $ 13,862 | $ - | $ 13,862 | |
| Graybar Electric Company | 5443005 | Electrical and electronic supplies | | $ 13,666 | $ - | $ 13,666 | |
| Hach Company | Multiple POs Issued | Turbidity meters & chlorine analyzers | | $ 13,116 | $ - | $ 13,116 | |
| HDR Engineering, Inc. | 5707708 | Design and Technical Review Services | | $ 273,294 | $ 243,807 | $ 243,807 | |
| Industrial Boiler Service, Inc. | 5921638 | Boiler service and repair | | $ 41,648 | $ - | $ 41,648 | |
| JWC Environmental | 5809030 | JWC proprietary equipment, parts and services (Grinder repair) | | $ 32,397 | $ 20,684 | $ 32,397 | |
| Marsh Risk Consulting | 5925418 | Forensic accounting and claims services | | $ 144,327 | $ 8,798 | $ 144,327 | |
| Micro Motion, Inc. | Multiple POs Issued | Electronic control equipment | | $ 36,111 | $ - | $ 34,587 | |
| Motion and Flow Control Products, Inc. | 5617876 | Hoses and fittings | | $ 42,588 | $ 16,096 | $ 42,588 | |
| National Safety, Inc. | Multiple POs Issued | Safety supplies | | $ 44,686 | $ 456 | $ 44,686 | |
| Nelson Petroleum | 5422698 | Lubricants | | $ 10,087 | $ - | $ 10,087 | |
| North Coast Electric Company | 5401608 | Electric supplies | | $ 60,805 | $ 165 | $ 60,805 | |
| NRC Environmental Services | 5921053 | Site cleanup & disinfection | | $ 851,536 | $ - | $ 851,536 | 2 |
| Pacific Mobile | 5943625 | Temporary facilities | | $ 41,404 | $ 6,826 | $ 41,404 | |
| Pacific Power Group, LLC | 222872 | Low Emission Diesel Engine Generator Sets | | $ 44,460 | $ - | $ 44,460 | |
| Paramount Supply CO, Inc. | Multiple POs Issued | ASCO valves & related parts | | $ 26,840 | $ 153 | $ 26,840 | |
| PCE Pacific, Inc. | Multiple POs Issued | Process control supplies | | $ 25,315 | $ 11,812 | $ 25,315 | |
| PumpTech, Inc. | 5890559 | Pumps | | $ 44,506 | $ 903 | $ 44,506 | |
| Recology Cleanscapes, Inc. | 5540200 | Waste disposal/garbage pick-up | | $ 10,639 | $ - | $ 10,639 | |
| Red Hawk Fire & Security (CA), LLC | 5492659 | Fire Alarm Equipment | | $ 62,983 | $ - | $ 62,983 | |
| Rosemount, Inc. | Multiple POs Issued | Measurement equipment | | $ 48,785 | $ - | $ 48,785 | |
| Seattle Public Utilities | 5412501 | Water | | $ 451,197 | $ - | $ 451,197 | |
| Stellar Industrial Supply | Multiple POs Issued | Industrial items (small tools/supplies) | | $ 19,309 | $ 152 | $ 19,309 | |
| Value Management Strategies, Inc. | Multiple POs Issued | Consulting | | $ 79,764 | $ 36,572 | $ 79,764 | |
| Walashek Industrial & Marine | Multiple POs Issued | Boiler | | $ 561,413 | $ - | $ 561,413 | |
| *Multiple Vendors (each < $10,000)* | | Various Miscellaneous purchases | | $ 155,982 | $ 37,836 | $ 155,982 | |
| Subtotal: | | | | $ 4,661,577 | $ 730,754 | $ 4,630,566 | |

**Notes for Table 3**

1. Existing contract bid normally (not under waiver) - Authorized limit is for tasks related to emergency
2. Existing King County Solid Waste Emergency Cleanup Work Order Contract

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 1 | Table 10 Plant Hydraulics | Evaluate ways to improve control strategies and flow management within the collection system. | Help delay peak flows to West Point. | Under evaluation | mid-2018 2018 Combined Sewer Overflow (CSO) Long-term Control Plan Update | WTD regularly considers collection system (pipeline) storage and control strategies when determining how to best manage flows. Storage is typically considered as an option when addressing collection system capacity constraints and is one of the control strategies currently being evaluated in the CSO long-term control plan update. |
| 2 | Table 10 Plant Hydraulics | Evaluate the collection system to identify new areas for storage. | For example, the Old Fort Lawton Tunnel. | Under evaluation | mid-2018 2018 CSO Long-term Control Plan Update | WTD regularly considers collection system (pipeline) storage and control strategies when determining how to best manage flows. Storage is typically considered as an option when addressing collection system capacity constraints and is one of the control strategies currently being evaluated in the CSO long-term control plan update. |
| 3 | Table 10 Plant Hydraulics | Add primary treatment technologies to the collection system. | Relieve West Point during high flows. | Ongoing | Ongoing | Adding treatment to the collection system has been and will continue to be considered as part of WTD's future long-term planning efforts. For example, the Georgetown Wet Weather Station that is currently under construction will add primary treatment technology to the collection system. Where appropriate, projects with primary treatment technologies, will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. |
| 4 | Table 10 Plant Hydraulics | Consider implementing passive overflows at key locations. | Passive overflows that do not rely on equipment and controls provide the most failsafe mechanism to protect the plant and workforce. | Future Discussion with Regulators | 2019/2020 Discussion of Options with Regulators | This recommendation cannot be implemented because current state and federal regulations, as well as WTD's 2013 Combined Sewer Overflow federal consent decree with the Washington Department of Ecology and EPA, require WTD to control its overflows to a required standard. During discussions with our regulators in 2019/2020 on West Point's National Pollution Discharge Elimination System permit, WTD will explore options with regulators. |
| 5 | Table 10 Plant Hydraulics | Request that West Point Treatment Plant (West Point) be regulated as a combined sewer overflow outfall. | Currently able to discharge to outfalls at other locations.<br><br>This would require coordination with Department of Ecology. | Future Discussion with Regulators | 2019/2020 Discussion of Options with Regulators | This recommendation cannot be implemented because current state and federal regulations, as well as WTD's 2013 CSO federal consent decree with the Washington Department of Ecology and EPA, require WTD to control its overflows to a required standard. During discussions with our regulators in 2019/2020 on West Point's National Pollution Discharge Elimination System permit, WTD will explore with options with regulators. |
| 6 | Table 10 Plant Hydraulics | Evaluate maximizing flow through the overflow weir by allowing head to build in the Influent Control Structure. | There is some freeboard above the weir, but flow is limited because of the elevation of the high-high level alarm, triggering the Emergency Bypass gate to open.<br><br>Increasing the water level in the Influent Control Structure can negatively influence downstream (bar screens) and upstream (Ballard weir) systems. | Under evaluation | 3rd Qtr 2018 Recommendation | A project to evaluate the viability and options to construct a passive weir is currently in progress. If a technologically viable option is identified, a project will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 7 | Table 11 Influent Control Structure | Evaluate adding a passive bypass weir. | Possibility of using the 84-inch Old Fort Lawton Tunnel to back flow to the Marine Outfall Gate at the Flow Diversion Structure. Utilize upstream storage, if any. | Under evaluation | 3rd Qtr 2018 Recommendation | A project to evaluate the viability and options to construct a passive weir is currently in progress. If a technologically viable option is identified, a project will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. Evaluation of this recommendation is part of the evaluation for #6 above. |
| 8 | Table 11 Influent Control Structure | Avoid overriding controls of the Emergency Bypass gate to keep the gate manually closed. | None. | Complete | Implemented and ongoing | Standard operating procedures have been revised to ensure controls on the Emergency Bypass gate cannot be overridden except during maintenance. |
| 9 | Table 11 Influent Control Structure | Add automated Emergency Bypass gate control at the Influent Control Structure. | Consider adding a second solenoid valve for redundancy and switching from hardwired interlock controls to control from the Ovation system. | Under evaluation | 3rd Qtr 2018 Recommendation | This recommendation is being considered as part of West Point's life safety system. Any control system changes will require coordination with a potential passive weir project. |
| 10 | Table 11 Influent Control Structure | Add ability to remotely operate Emergency Bypass gate from Main Control. | Provides rapid response without putting operators in harm's way | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 11 | Table 11 Influent Control Structure | Add ability to control influent gates from Main Control. | Clogged bar screens could cause water to back up in the Influent Control Structure and trigger the Emergency Bypass gate to open but would not close the influent gates. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 12 | Table 11 Influent Control Structure | Add control system programming that closes influent gates automatically when the Emergency Bypass gate is opened. | | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 13 | Table 11 Influent Control Structure | Install flow meters on influent lines. | Provide an instantaneous direct flow reading that can be utilized for overall plant control. | Not incorporated | N/A | WTD considered whether a flow meter would provide additional information to reduce operational risk and determined it would not reduce risk or improve overall plant control. West Point has a small footprint and relies on lift stations to pump wastewater through the treatment process. This means that West Point relies on level not for overall plant control. |
| 14 | Table 11 Influent Control Structure | Add real-time collection system controls. | Incorporate historical collection system and watershed data into control strategies. | Incorporated | Ongoing | WTD considered this recommendation and confirmed that our offsite control system already incorporates real-time control of the collection system. As new collection system facilities come online, WTD will update our real-time control strategies. |
| 15 | Table 12 Preliminary Treatment | Continuously rake bar screen area during wet-weather events. | This is opposed to using a differential-level trigger.<br><br>WTD has made this change. | Completed | Implemented and ongoing | West Point has updated its bar screen standard operating procedures to incorporate this recommendation. |
| 16 | Table 12 Preliminary Treatment | Raise the channel height at the bar screen area. | Provides surge protection and increased head in the Influent Control Structure for flow over the passive bypass weir. | Under evaluation | 3rd Qtr 2018 Recommendation | A project to evaluate the viability and options to construct a passive weir is currently in progress. If a technologically viable option is identified, a project will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 17 | Table 13 Raw Sewage Pump Station | Evaluate options to provide 440 mgd firm pumping capacity at raw sewage pumps. | Options and study items could include:<br>1. Adding a new pump.<br>2. Replacing existing pumps with new/larger capacity pumps.<br>3. Increasing the speed of the existing pumps.<br>4. Changing impellers to provide more flow. This may require a larger engine and modifications to the right-angle gear box.<br>5. Controlling and limiting collection system flow to the plant at 330 mgd.<br>6. Considering providing more on-site and/or off-site CSO storage volume. | Under evaluation | 3rd Qtr 2018 Recommendation | WTD is evaluating all recommendations related to the raw sewage pumps as one single evaluation, including options to increase the capacity of the raw sewage pumps and changes to the collection system are currently being evaluated in Combined Sewer Overflow long-term control plan. If a technologically viable option is identified, a Raw Sewage Pump Improvement project will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. |
| 18 | Table 13 Raw Sewage Pump Station | Develop a detailed plan to operate at 330 mgd in preparation for losing a pump. | Not enough firm capacity at raw sewage pumps . | Under evaluation | 3rd Qtr 2018 Recommendation | WTD is evaluating all recommendations related to the raw sewage pumps as one single evaluation. If a technologically viable option is identified, a Raw Sewage Pump Improvement project will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. |
| 19 | Table 13 Raw Sewage Pump Station | Install flow meters on influent lines. | Provides instantaneous influent flow for faster reaction times during high-flow events (compared to calculating influent flows from the effluent discharge). | Not incorporated | N/A | WTD considered whether a flow meter would provide additional information to reduce operational risk and determined it would not reduce risk or improve overall plant control. West Point has a small footprint and relies on lift stations to pump wastewater through the treatment process. This means that West Point relies on level not flow for overall plant control. |
| 20 | Table 13 Raw Sewage Pump Station | Evaluate incorporating automatic controls through a supervisory control and data acquisition (SCADA) system. | Automatically stop pumps based on critical plant high-high water level set points to help prevent flooding. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 21 | Table 13 Raw Sewage Pump Station | Provide additional staff training on operating raw sewage pumps. | During peak-flow events and various failure events, more training is needed. | In progress | 1st Qtr 2018 | West Point Operations is implementing this recommendation as part of a larger Operator training improvement effort. That larger effort includes creating new, and modifying existing, training modules and standard operating procedures as well as implementing an Operator Training Simulator. |
| 22 | Table 13 Raw Sewage Pump Station | Update safety procedures on operating the raw sewage pumps during peak-flow conditions. | Not enough firm capacity at raw sewage pumps. | In progress | 1st Qtr 2018 | This is being considered as part of the development of West Point's life safety system. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 23 | Table 13 Raw Sewage Pump Station | Replace raw sewage pump engines with electric motors.<br><br>Evaluate current condition of raw sewage pumps and determine expected life span.<br><br>Provide backup systems to increase redundancy.<br><br>Evaluate current condition and determine expected life span of the raw sewage pump station [piping system]. | Electric motors are more reliable and less expensive to maintain (high initial cost).<br><br>Plan/budget for equipment maintenance, updates, and replacements.<br><br>Redundancy reduces opportunity for failure.<br><br>Estimate pressure capacity, and incorporate corrosion inspections and durability to withstand earthquakes. | Under evaluation | 3rd Qtr 2018 Recommendation | WTD is evaluating all recommendations related to the raw sewage pumps as one single evaluation, including options to increase the capacity and/or add redundancy to the raw sewage pumps.<br><br>The raw sewage pump piping condition issue is being evaluated as a separate project from the raw sewage pump evaluation mentioned above.<br><br>If improvements for the pumps or piping are identified, individual projects will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan.<br><br>Also, WTD's current asset management practices regularly assess, track and report the condition and the end-of-life date for all West Point equipment including the raw sewage pumps. |
| 24 | Table 13 Raw Sewage Pump Station | Modify control strategy to include secondary instruments. | Redundancy reduces opportunities for failure.<br><br>Automatically stop pumps based on critical plant high-high water level set points to help prevent flooding. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 25 | Table 14 Preaeration and Sedimentation Tanks | Replace level switches with modern tethered switches that do not require a stilling well and are less likely to fail. | WTD has already done this. | Complete | Implemented | Tethered switches were installed during the restoration work at West Point immediately following the February 9 flooding event. These floats have demonstrated greater reliability in industrial settings and can be tested without possibility of damage. |
| 26 | Table 14 Preaeration and Sedimentation Tanks | Modify control strategy to include secondary instruments. | Redundancy reduces opportunities for failure. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 27 | Table 14 Preaeration and Sedimentation Tanks | Incorporate automatic controls through a supervisory control and data acquisition (SCADA) system. | Multilayered control system is not limited to a single interlock control. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 28 | Table 14 Preaeration and Sedimentation Tanks | Evaluate feasibility of a passive bypass. | Effluent can be diverted to the the Emergency Bypass Outfall within the Flow Diversion Structure. | Under evaluation | 1st Qtr 2018 Recommendation | This recommendation would provide roughly 30 million gallons of diversion, which would not provide significant relief. Diversion opportunities are being considered as part of the development of West Point's life safety system. |
| 29 | Table 14 Preaeration and Sedimentation Tanks | Evaluate feasibility of connecting east and west primary effluent channels. | If one gate fails, near-full utilization of both primary sedimentation basins can continue. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 30 | Table 14 Preaeration and Sedimentation Tanks | Evaluate feasibility of a passive bypass. | Primary Effluent can be diverted to the Emergency Bypass Outfall and 3x3 vent within the Flow Diversion Structure. | Under evaluation | 1st Qtr 2018 Recommendation | This recommendation would provide roughly 30 million gallons of diversion, which would not provide significant relief. Diversion opportunities are being considered as part of the development of West Point's life safety system. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 31 | Table 14 Preaeration and Sedimentation Tanks | Reevaluate control strategy. | The control strategy can be based primarily on influent flow measurement, not a series of cascading system levels. | Not incorporated | N/A | WTD considered whether a flow meter would provide additional information to reduce operational risk and determined it would not reduce risk or improve overall plant control. West Point has a small footprint and relies on lift stations to pump wastewater through the treatment process. This means that West Point relies on level not flow for overall plant control. |
| 32 | Table 15 Flow Diversion Structure | Evaluate feasibility of a passive bypass. | Options include creating a bypass from the Old Fort Lawton Tunnel or directing primary effluent to the Emergency Bypass Outfall pipe. | Under evaluation | 3rd Qtr 2018 Recommendation | A project to evaluate the viability and options to construct a passive weir is currently in progress. If a technologically viable option is identified, a project will be submitted and considered as part of WTD's Six-Year Capital Improvement Plan. |
| 33 | Table 15 Flow Diversion Structure | Add automated Emergency Marine Outfall gate control at Flow Diversion Structure. | Previous practice was to manually override controls at low flow (<250 MGD). The Emergency Bypass gate is now always valved in. | Complete | Implemented and ongoing | Standard operating procedures have been revised to ensure controls on the Emergency Bypass (aka CSO Flow Diversion Gate) and the Emergency Marine Outfall. These gates cannot be overridden except during maintenance. |
| 34 | Table 15 Flow Diversion Structure | Add ability to remotely operate Emergency Marine Outfall gate at the Flow Diversion Structure from Main Control. | Provides rapid response without putting operators in harm's way. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 35 | Table 16 Effluent Pump Station | Provide a spare hydraulic unit that can operate with any pump control valve. | Redundancy reduces opportunity for failure. | In progress | 3rd Qtr 2018 Substantial Completion | One spare hydraulic power unit was added to one series of effluent pump station pumps. A capital project is currently underway to install a hydraulic power unit on the other series. |
| 36 | Table 16 Effluent Pump Station | Provide redundant electrical power supply to all hydraulic power units. | Redundancy reduces opportunity for failure. | Complete | Implemented | Automatic transfer switches, to provide redundant power, were installed in mid-2017. This recommendation also addresses corrective action #1 required by Department of Ecology's Administrative Order. |
| 37 | Table 16 Effluent Pump Station | Add pressure relief valves at pump discharge lines. | Prevents pump from operating at zero flow/shut-off head conditions if control valve is closed while pump is operating. Discharge flow from pressure relief valves to gravity or pump discharge pipeline. | Implementing Alternative | In progress | This recommendation is not being implemented because it does not address the root cause of the Effluent Pump Station failure nor improve reliability. As an alternative, West Point is installing additional hydraulic power units to each Effluent Pump Station pump series. |
| 38 | Table 16 Effluent Pump Station | Provide portable ladder platform and hand wheel to manually operate the butterfly control valve. | | Implementing Alternative | In progress | This recommendation is not being implemented because a hand wheel would take 30-60 minutes to adjust the valves that need to be opened and closed in seconds for successful operation. As an alternative, installation of a secondary hydraulic power unit on a separate electrical power source will address the root cause of failure that resulted in this recommendation. |
| 39 | Table 16 Effluent Pump Station | Routinely examine data from vibration monitors to determine trends to help forecast pump maintenance and repairs. | None. | In progress | 3rd Qtr 2018 | West Point does this type of analysis, but the existing product used by employees is no longer supported by the vendor and is outdated. A procurement process is underway to resume this type of analysis. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 40 | Table 16 Effluent Pump Station | Update vibration monitors. | None. | In progress | 1st Qtr 2020 Substantial Completion | An existing capital project is replacing vibration monitors and variable frequency drives for all Effluent Pump Station pumps. |
| 41 | Table 16 Effluent Pump Station | Evaluate the current condition of the Effluent Pumping System and determine its expected life span. | Plan/budget for spare parts and equipment maintenance, updates, and replacements. | Complete | Implemented and ongoing | WTD's current asset management practices accomplish this function by assessing, tracking and reporting condition and the end-of-life date for all West Point effluent pumping system equipment. |
| 42 | Table 16 Effluent Pump Station | Provide backup systems to increase redundancy. | Redundancy reduces opportunity for failure. | In progress | 4th Qtr 2018 Recommendation | West Point employees are assessing the Effluent Pump Station pump support system redundancy. |
| 43 | Table 16 Effluent Pump Station | Provide good maintenance, closely monitor systems, and stock critical spare parts. | | Complete | Implemented and ongoing | WTD's current asset management practices require maintenance tracking and system monitoring. WTD's asset management and maintenance best practices accurately predict the critical parts which WTD keeps in stock for the effluent pump station. |
| 44 | Table 16 Effluent Pump Station | Use a differential pressure sensor across the pump to estimate flow rate. | An algorithm would be developed that considers pump head/flow curve, pump speed, and pump differential pressure reading. The algorithm can be calibrated using information from the existing effluent flow meter. | Not incorporated | N/A | WTD considered whether developing and calibrating an algorithim would reduce risk or improve overall plant control. We determined this would not provide any additional information beyond what we already receive from the effluent flow meter and would not reduce operational risks. |
| 45 | Table 16 Effluent Pump Station | Provide controls that allow the Effluent Pump Station to operate at constant speed. | As a backup, provide controls that allow the pump to operate at constant speed while using the control valve to throttle discharge flow and maintain the wet-well water level set points.<br><br>This would require adding single-speed starters. | Not incorporated | N/A | This recommendation is not being implemented as it is intended to allow the pumps to operate if the variable frequency drives fail, but does not address the root cause of the failure or improve reliability. West Point has existing equipment redundancy to maintain treatment at full capacity in the event of a variable frequency drive failure. |
| 46 | Table 17 Electrical | Incorporate automatic transfer of switchgear main and tie breakers upon power loss. | Provides rapid response for substations that require faster response time than what personnel can provide. | Not incorporated | N/A | This recommendation is not being implemented because the plant's current, comprehensive procedure is required for safety reasons regardless of whether an automatic transfer system was in place. In addition, implementing this recommendation would be complicated, requiring additional structures at a site where space is limited. |
| 47 | Table 17 Electrical | Staff at least two electricians during high-flow events. | Two electricians are required for life-safety reasons. | Complete | Implemented and ongoing | WTD now requires electricians and mechanics on standby during weekday evenings and weekends to ensure sufficient coverage during high-flow events. |
| 48 | Table 17 Electrical | Provide additional permanently connected hydraulic power unit on the B side. | Include provisions for either unit to power all discharge valves. | In progress | 3rd Qtr 2018 Substantial Completion | One spare hydraulic power unit was added to one series of Effluent Pump Station pumps. A capital project is currently underway to install a hydraulic power unit on the other series. |
| 49 | Table 17 Electrical | Power Effluent Pump Station discharge valve controls from individual variable-frequency drives. | This is rather than powering from the hydraulic power units. | Implementing Alternative | In Progress | As an alternative to this recommendation, WTD improved reliability at the Effluent Pump Station by installing permanent hydraulic power units for each of the two sets of pumps, valves and variable frequency drives. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 50 | Table 17 Electrical | Analyze single points of failure for all components. | For example, a breaker that would feed control power to all Effluent Pump Station pump controllers or both primary and backup Ovation system controllers. | Under evaluation | 1st Qtr 2018 Recommendation | WTD staff are evaluating the benefit of this recommendation as well as possible implementation strategies. |
| 51 | Table 17 Electrical | Add surge suppressors. | Medium-voltage transient surge suppressors on both sides of the main 15 kV switchgear. | Complete | Implemented | Medium-voltage transient surge suppressors have been installed on both sides of the main 15 kV switchgear. |
| 52 | Table 17 Electrical | Install power line monitors with transient waveform capture feature on each substation's main breaker. | A maintenance tool to help analyze power system health and forensic analysis of failures. | Under evaluation | 1st Qtr 2018 Recommendation | This recommendation is under consideration in the development of the 2019-2020 budget as part of WTD's Six-Year Capital Improvement Plan. |
| 53 | Table 17 Electrical | Conduct the remainder of testing related to the main switchgear 722-MSG01 circuit breaker ground fault 52-3 trip. | As soon as a plant shutdown is feasible. | Complete | Implemented | WTD completed the testing and changed the ground trip settings based on new, more accurate, modeling information. |
| 54 | Table 17 Electrical | Update standard operating procedure for Effluent Pump Station restart after ground fault. | Locally reset Effluent Pump Station vibration panels, variable-frequency drives, and pump local control panels upon a fault. | Complete | Implemented | West Point staff updated the standard operating procedures for the Effluent Pump Station. |
| 55 | Table 19 Instrumentation and Control | Add an "Interlock Active" indication light to the local control panels. | Alert the operators when the interlock is engaged (help with troubleshooting). | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 56 | Table 19 Instrumentation and Control | Add a supervisory control and data acquisition (SCADA) system bypass switch to bypass the interlock. | This should be available only to the supervisors. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 57 | Table 19 Instrumentation and Control | Prevent interlock from being activated during high-plant-flow scenarios. | High-flow events pose a life-safety risk. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 58 | Table 19 Instrumentation and Control | Remove the requirement to use both the High and high-high switches to activate the interlock. | Only the high-high switch would be required. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 59 | Table 19 Instrumentation and Control | Add an Ovation-level high-high signal to the hardwired interlock. | The Ovation signal should be set to activate before the float switches. | Under evaluation | 1st Qtr 2018 Recommendation | The floats will be incorporated into West Point's life safety system. Float setpoints will send an alarm through Ovation to notify operators of high flow conditions. |
| 60 | Table 19 Instrumentation and Control | Add remote start/stop pump controls to the Main Control room through the Ovation system. | Provides rapid response without putting operators in harm's way. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 61 | Table 19 Instrumentation and Control | Add a hard-wired emergency stop push button not controlled through Ovation. | Provides rapid response without putting operators in harm's way. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 62 | Table 19 Instrumentation and Control | Add remote start/stop pump controls to the Main Control room through the Ovation system. | Operations must send operators to the raw-sewage wet-well area to locally open/close the gates, taking time and potentially placing operators in harm's way. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 63 | Table 19 Instrumentation and Control | Remove the requirement to use both the High and high-high switches to activate the interlock. | Only the high-high switch would be required. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 64 | Table 19 Instrumentation and Control | Add an Ovation-level high-high signal to the hardwired interlock. | The Ovation signal should be set to activate before the float switches. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 65 | Table 19 Instrumentation and Control | Add remote open/close gate controls to the Main Control room through the Ovation system. | Make these controls highly visible to respond in emergencies. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 66 | Table 19 Instrumentation and Control | Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms. | The system is not optimized to prioritize alarms | Ongoing | Ongoing | An alarm management review workshop was held and Phase 1 of an alarm management improvement process is currently underway. Pending funding availability, a larger WTD-wide effort (Phase 2) will also be implemented. This recommendation in addition to #78 and #94 also address corrective action #2 required by Department of Ecology's Administrative Order. |
| 67 | Table 21 Staffing | Develop incentive programs to retain staff at West Point. | It is difficult to retain employees at West Point. | Ongoing | Ongoing | Attempts to negotiate incentive pay for new employees at West Point through the 925 bargaining process was unsuccessful in Fall 2017. WTD provided more detail on our ongoing staff retention efforts as part of this West Point Quarterly Report due to Council on February 15, 2018. |
| 68 | Table 21 Staffing | Extend aspects of the Operator-in-Training program to existing staff. | Currently the Operator-in-Training Program is only for new hires with no previous wastewater treatment plant experience. | Complete | Implemented and ongoing | WTD-reviewed and updated its standard operating procedures. Operations staff now have 1-on-1 training and more formal communications between crews. |
| 69 | Table 22 Operators | Create an Emergency Bypass standard operating procedure. | If a standardized process is in place, the operators could operate the plant as it is designed. | Complete | Implemented and ongoing | WTD implemented standard operating procedures on use of the Emergency Bypass gate. These procedures will continue to be improved as part of a larger Operator training improvement effort. Also see response to #21. |
| 70 | Table 22 Operators | Change the “no bypass” philosophy. | This is important to protect life safety and equipment and to reduce the amount of time the plant is in bypass mode. | Complete | Implemented and ongoing | WTD management has clearly communicated that the Emergency Bypass gate is a tool to be used as required. Operations has instituted new guidelines regarding the appropriate use of the Emergency Bypass gate. Operators are also being trained using desk-top exercises and scenario-based discussions to train on emergency response procedures. In the near future, these exercises will be part of the new simulator training referred to in recommendation #92. |
| 71 | Table 22 Operators | | Important to keep the environmental protection mission of the organization. | Complete | Implemented and ongoing | See response to #70 above. |
| 72 | Table 22 Operators | Add an Emergency Bypass override button at the Main Control room. | Currently this is embedded in the control strategy. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 73 | Table 22 Operators | Provide hands-on Emergency Response Plan training. | None. | Complete | Implemented and ongoing | Emergency Response training sessions have been increased from one per year to two. |
| 74 | Table 22 Operators | Run the hydraulic simulation model so operators know narrow time margins and potential consequences. | None. | In progress | 2nd Qtr 2018 | This is being considered as part of the development of West Point's life safety system. |
| 75 | Table 22 Operators | Implement a Life Safety Management system. | An aspect of this type of process is that it focuses on the process rather than the individual worker to avoid scapegoating and to effectively reduce risk. | In progress | 1st Qtr 2018 Recommendation | A Life Safety Coordinator has been hired and a Life Safety Evaluation is underway. That evaluation will provide a framework of recommendations that the West Point employees will implement and maintain. |
| 76 | Table 22 Operators | Add an automated call program to contact on-call personnel. | None. | Implemented Alternative | Implemented and ongoing | As an alternative, WTD implemented a two-way communication protocol that is required to confirm contact between personnel. A secondary operator is responsible for making calls while the lead operator manages control of the plant. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 77 | Table 22 Operators | Increase the number of staff on duty in Main Control during wet-weather events. | None. | Complete | Implemented and ongoing | When weather predictions indicate heavy rainfall, the minimum amount of emergency/wet weather staffing has been increased to comply with new high flow protocols and procedures. |
| 78 | Table 22 Operators | Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms. | The system is not optimized to prioritize alarms. | Ongoing | Ongoing | An alarm management review workshop was held and Phase 1 of an alarm management improvement process is currently underway. Pending funding availability, a larger WTD-wide effort (Phase 2) will also be implemented. This recommendation in addition to #66 and #94 also address corrective action #2 required by Department of Ecology's Administrative Order. |
| 79 | Table 22 Operators | Add a visual beacon/strobe-type alarm in the control room. | To warn the operators in the control room that flooding was imminent unless action is taken. | Under evaluation | 1st Qtr 2018 Recommendation | This is being considered as part of the development of West Point's life safety system. |
| 80 | Table 22 Operators | Provide Emergency Communications training. | Should be part of Emergency Response Plan training. | Complete | Implemented and ongoing | Operations staff have been trained and Emergency Communications training has been incorporated into the West Point Emergency Response Plan. |
| 81 | Table 22 Operators | Practice standard operating procedures for Effluent Pump Station restart. | This was listed as a step to be checked on the standard operating procedure for Effluent Pump Station restart. Recent issues with EPS pumps have been related to vibration, and based on this previous experience, the operators did not expect power to the valves to be an issue. | Complete | Implemented and ongoing | WTD updated its standard operating procedures and Operations staff have been trained using those updated materials. |
| 82 | Table 25 Training | Create a designated emergency evacuation path. | Train often on designated emergency evacuation path. | Complete | Implemented and ongoing | A designated emergency evacuation path exists and this has been reinforced and emphasized in the Emergency Response Plan. |
| 83 | Table 25 Training | Develop standard operating procedure for tunnel entry. | Develop a standard operating procedure ~~SOP~~ for tunnel entry, particularly to avoid entering at high flows. | Complete | Implemented and ongoing | Immediately following the flood event, WTD implemented standard operating procedures to limit, and closely monitor, tunnel entry by employees during periods of high flows. As part of a continuous improvement effort, West Point employees are evaluating how best to update existing communication protocols and where to install visual alarm indicators within the tunnels. This work is being done as part of the life safety management system implementation. |
| 84 | Table 25 Training | Review operator training program. | Need to assess the appropriateness and amount of training provided. | Complete | Implemented and ongoing | West Point implemented weekly training with a technical trainer and updated training materials. In addition, Operation staff conduct daily training and lessons learned sessions within and between crews. This recommendation also addresses corrective action #5 required by Department of Ecology's Administrative Order. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 85 | Table 25 Training | Increase number of operators on duty. | Operators need time on nonemergency shifts to gain on-the-job training across the plant. | Complete | Implemented and ongoing | Operations vacancies have been filled. WTD has also expanded it's existing training program to improve the number and quality of candidates for future vacancies. This was done by hiring additional 15 additional operator-in-training and term-limited temporary (TLT) staff who will be trained and eventually hired into career service positions.<br><br>Additionally, West Point has updated standard operating procedures and increased the type and frequency of operator training. West Point employees continues to evaluate how to improve all training, especially emergency response, and will implement training improvements as they are developed. |
| 86 | Table 25 Training | Provide hands-on Emergency Response Plan training. | | Complete | Implemented and ongoing | Emergency Response training sessions have been increased from one per year to two. This recommendation also addresses corrective action #4 required by Department of Ecology's Administrative Order. |
| 87 | Table 26 Equipment and Systems Testing | Add waterproof lighting in the basement. | | Implemented Alternative | Complete | As an alternative to the this recommendation, WTD implemented revised standard operating procedures that limit and monitor tunnel entry during periods of high flow. |
| 88 | Table 26 Equipment and Systems Testing | Have two permanent skids hooked up at all times. | Have online but connected. | In progress | 3rd Qtr 2018 Substantial Completion | One spare hydraulic power unit was added to one series of Effluent Pump Station pumps. A capital project is currently underway to replace the temporary installion for the one on the other series of pumps. |
| 89 | Table 26 Equipment and Systems Testing | Secure walkway covers. | Fixed. | Complete | Implemented | Walkway covers have been bolted down. |
| 90 | Table 26 Equipment and Systems Testing | Revise standard operating procedure for annual plant hydraulic safety. | It was done this way because of multiple tank leaks experienced when water levels are above normal. This has been fixed. | Complete | Implemented and ongoing | A review and update of standard operating procedures has been completed and float testing is scheduled for twice a year. |
| 91 | Table 26 Equipment and Systems Testing | Implement a Life Safety Management system. | A Life Safety Management system should be developed and implemented to reduce risks and improve safety for the staff at the plant, protect the equipment, and reduce the duration of bypass events. | Under evaluation | 1st Qtr 2018 Recommendation | A Life Safety Coordinator has been hired and a Life Safety Evaluation is underway. That evaluation will provide a framework of recommendations that the West Point employees will implement and maintain. |
| 92 | Table 26 Equipment and Systems Testing | Develop a dynamic computer model to simulate plant hydraulic conditions. | | Ongoing | 3rd Qtr 2018 Implementation Complete | A computer model (simulator) is under development and is scheduled for full implementation as part of the larger training program improvements later in 2018. |

| # | AECOM Table # | AECOM Recommendations | AECOM Comments | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| 93 | Table 26 Equipment and Systems Testing | Implement routine testing of the Primary Effluent gate interlock indicator in Area Control Center 1. | | Complete | Implemented and ongoing | West Point Maintenance employees will conduct an interlock test as part of their annual float testing procedure. |
| 94 | Table 26 Equipment and Systems Testing | Conduct an alarm management review workshop to properly prioritize alarms and remove or condition alarms. | Alarm criticality ratings should be reviewed. Only life-safety/hydraulic protection–related alarms should be classified as criticality level 1. These alarms should remain visible until cleared. | Ongoing | 1st Qtr 2018 Recommendation | WTD is developing an initial list of criticality level 1 alarms. This list will be revised as part of the development of West Point's life safety system. This recommendation in addition to #66 and #78 also address corrective action #2 required by Department of Ecology's Administrative Order. |
| 95 | Table 26 Equipment and Systems Testing | Revise standard operating procedure for Effluent Pump Station reset. | Need to specify the amount of time operators have during different flow conditions.<br><br>Standard operating procedure specifies 2 attempts for restart. | Complete | Implemented and ongoing | WTD implemented a standard operating procedure for the Effluent Pump Station that specifies two restart attempts and updated training also emphasizes that procedure. |
| 96 | Table 27 Maintenance Procedures | Implement a Life Safety Management approach to all maintenance not included in Process Safety Management. | Implement a Life Safety Management approach to all maintenance not included in Process Safety Management. | Under evaluation | 1st Qtr 2018 Recommendation | A Life Safety Coordinator has been hired and a Life Safety Evaluation is underway. That evaluation will provide a framework of recommendations that the West Point employees will implement and maintain. |
| 97 | Table 27 Maintenance Procedures | | Maintenance may negatively affect component performance if the execution is incorrect, insufficient, delayed, or excessive. | Under evaluation | 1st Qtr 2018 Recommendation | A Life Safety Coordinator has been hired and a Life Safety Evaluation is underway. That evaluation will provide a framework of recommendations that the West Point employees will implement and maintain. |
| 98 | Table 27 Maintenance Procedures | | Organized communication is a component of a Life Safety Management system. | Under evaluation | 1st Qtr 2018 Recommendation | A Life Safety Coordinator has been hired and a Life Safety Evaluation is underway. That evaluation will provide a framework of recommendations that the West Point employees will implement and maintain. |

| # | WDOE Number | Corrective Actions under Washington Department of Ecology's Administrative Order # 15480 | Ecology Comments and Required Follow-up | Status | Timeline | WTD Response |
|---|---|---|---|---|---|---|
| | 1 | Add redundancy to effluent pump discharge valve (Pratt valve) hydraulic control system by November 30, 2018. | Submit a letter detailing the actions taken to Ecology by December 31, 2018. | Complete | Implemented | Automatic transfer switches, to provide redundant power, were installed in mid-2017. This corrective action also addresses AECOM recommendation #36. |
| | 2 | Improve SCADA alarm prioritization and critical alarm visibility by February 1, 2018. | Submit a letter detailing the actions taken to Ecology by March 1, 2018. | Ongoing | Ongoing | An alarm management review workshop was held and Phase 1 of an alarm management improvement process is currently underway. Pending funding availability, a larger WTD-wide effort (Phase 2) will also be implemented. This corrective action also addresses AECOM recommendations #66, #78, and #94. |
| | 3 | Conduct an integrated evaluation of plant constraints and redundancy by February 1, 2018. | The evaluation must examine the reliability of critical treatment process components and validate the firm hydraulic capacity of West Point. It must also provide recommendations for capital and/or operational improvements at West Point. Submit the completed evaluation to Ecology by March 1, 2018. | Ongoing with Life Safety and Passive Weir Studies | Ongoing | The Life Safety and passive weir evaluations in response to several AECOM recommendations will generate recommendations for capital and/or operational improvements at West Point. |
| | 4 | Develop and implement an emergency operations training program by March 1, 2018. | The training program must use a "Plant Hydraulic Simulator" as a tool for operators to rehearse responses to emergency scenarios during high flow conditions. The emergency operations training must also incorporate site-specific incident command protocols and emergency response Standard Operating Procedures that focus on life safety for workers and the public along with mitigation and recovery efforts related to an emergency response. The County should employ emergency operations strategies similar to those developed by the Federal Emergency Management Agency, the Process Safety Management System used by the petrochemical industry, or comparable protocols. Submit a letter detailing the actions taken to Ecology by April 1, 2018. | Complete | Implemented and ongoing | Emergency Response training sessions have been increased from one per year to two. This corrective action also addresses AECOM recommendation #86. |
| | 5 | Review existing operator training programs and redevelop the programs, as necessary, by March 1, 2018. | The operator training program must ensure all operators receive the same instructions on routine and emergency plant operations, including adherence to Standard Operating Procedures, understanding of critical hydraulic limitations, using effective communication protocols, and knowledge of key safeguards and interlocks installed to protect the plant from flooding. The training program must establish common documentation for operator training that is filed in a secure, central location. Submit a letter detailing the actions taken to Ecology by April 1, 2018. | Complete | Implemented and ongoing | West Point implemented weekly training with a technical trainer and updated training materials. In addition, Operation staff conduct daily training and lessons learned sessions within and between crews. This corrective action also addresses AECOM recommendation #84. |
| | 6 | Develop and implement strategies for collecting representative samples of raw sewage at the Influent Control Structure by July 1, 2018. | The sampling protocol must ensure that operators can safely collect samples of an emergency discharge through the Emergency Bypass Gate. The County must also include protocols for accurately determining the flow rate and total flow volume of an emergency discharge. Submit a letter detailing the actions taken to Ecology by August 1, 2018. | In Progress (Design and Modeling) | Implementation complete by July 1, 2018 | A sampling system to draw a sample representive of the water quality of all emergency bypass flows is in design. WTD staff is working with plant and collection system flow models to provide "real time" flow estimates during all emergency bypass events. |