King County
West Point Treatment Plant
Secondary Treatment System
Pipeline Rehabilitation Project

Technical Memorandum
BASIS OF DESIGN

DRAFT | May 2022

carollo

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This document is released for the purpose of information exchange review and planning only under the authority of Karl W. Hadler, May 2022, State of Washington PE No. 37811

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Abbreviations

Ω_0	Component Overstrength Factor
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
ap	Component Amplification Factor
ASCE	American Society of Civil Engineers
ASTM	ASTM International
AT	aeration tank
Avg	average
BOD	Basis of Design
Carollo	Carollo Engineers, Inc.
County	King County
CP	cathodic protection
CPS	cathodic protection system
DIP	ductile iron pipe
DNRP	Department of Natural Resources and Parks
FEMA	Federal Emergency Management Agency
fps	feet per second
gpm	gallons per minute
GWT	guided wave technology
HDPE	high-density polyethylene
IBC	International Building Code
ICCP	Impressed Current Cathodic Protection
Ie	Risk Category Importance
Ip	Component importance Factor
IPS	Intermediate Pump Station
ITB	invitation to bid
mA/sq. ft.	milliampere per square foot
max	maximum
MDFT	mils dry film thickness
mg/L	milligrams per liter
MGD	million gallons per day
mils	thousandth of an inch
mS/cm	milli-Siemens per centimeter
NEC	National Electrical Code
NFPA	National Fire Protection Association
NTP	notice to proceed
O&M	operations and maintenance
ohm-cm	ohm centimeter
PE	primary effluent
PMP	Project Management Plan
psig	pounds per square inch gauge
RAS	return activated sludge

Rp	Response Modification Coefficient
S_1	1 Second Spectral Response
SBC	City of Seattle Building Code
S_{DS}	0.2 sec. Design Spectral Response
S_S	0.2 sec. Spectral Response
SST	Secondary Sedimentation Tank
STS	Secondary Treatment System
WAS	waste activated sludge
WPTP	West Point Treatment Plant
WTD	Wastewater Treatment Division

Section 1

GENERAL PROJECT TECHNICAL INFORMATION

1.1 General

This Basis of Design (BOD) Technical Memorandum has been prepared to outline the design criteria for the King County (County) Department of Natural Resources and Parks (DNRP), Wastewater Treatment Division (WTD), West Point Treatment Plant (WPTP), Secondary Treatment System (STS) Pipeline Rehabilitation Project. The BOD notes project standards and design criteria, deviations from WTD Design Guidelines, and special project requirements. The BOD follows the Project Management Plan (PMP) regarding orderly execution of work and quality control as well as the scope, schedule, and cost.

The STS Pipeline Rehabilitation Project is anticipated to have five phases: Planning (performed by the County), Alternatives Analysis and Preliminary Design, Final Design, Bidding Services and Services during Construction, and Close Out. This BOD is an update of the BOD published November 2020 at the beginning of Phase 2A, Alternatives Analysis, that provided data used for analyzing alternatives and selecting the preferred alternative(s). The preferred alternative package of the various pipe rehabilitation recommendations resulted in this project "passing" Gate 2 and getting approval to proceed with pre-design. It is anticipated that the preliminary design (30 percent baseline design) will result in "passing" Gate 3 for approval to proceed to final design.

The BOD is intended to be a "living" document. Updates to the BOD will be issued as the need exists throughout the project and as changes to the design criteria are made as the project is developed and updated with the results of completed tasks. This version of the BOD was prepared in conjunction with the preliminary design (30 percent drawings, specification list, cost estimate, and schedule).

1.2 Project Description

The WPTP secondary treatment facilities were put in service in 1995, providing 300 million gallons per day (MGD) of biological treatment capacity. Since the initial installation, the Primary Effluent (PE)and Return Activated Sludge (RAS) piping systems have experienced varying levels of corrosion.

Previous inspections by the WTD identified significant corrosion on the interior of the PE and RAS pipes. The corrosion is mostly due to high chlorides in the wastewater stream entering the conveyance system through overflow structures during high tide levels and salt-water influenced groundwater infiltration into buried pipelines along the Seattle waterfront. Failure of the PE or RAS pipelines in the Secondary Treatment System due to corrosion would cause an unplanned process interruption that could be a significant concern for operation of the WPTP.

A project team led by Carollo Engineers, Inc. (Carollo) conducted pipe inspections to assess conditions of the PE, RAS, and WAS pipelines with regard to corrosion. The project team developed and evaluated alternatives for rehabilitation as necessary. The pipes included in the project are as follow:

- Primary effluent pipe exposed in the Intermediate Pump Station (IPS), this includes the pump suction exposed above the floor, the pump discharge pipe exposed in the pump room, and the exposed discharge pipe in the enclosed gallery areas (referred to as the catacombs).
- Primary effluent pipe (exposed and buried) above the covers of the Aeration Tanks and exposed pipe in the Aeration Galleries.
- Return activated sludge pipe exposed in the RAS pump stations in the Secondary Sedimentation Tank Galleries as well as in the Aeration Influent Galleries.
- Waste activated sludge pipe from the location where the pipe becomes exposed at the northern end of Secondary Sedimentation Tank Gallery to the WAS flow control system near the Solids Building.

The alternatives analysis phase of the project also included evaluation and development of the following ancillary work:

- Replace existing magnetic flow meters in the PE and RAS pipelines in the Aeration Influent Galleries.
- Install an isolation valve in the upstream end of the WAS line.
- Evaluate existing pipe supports in the STS and identify improvements needed to meet seismic requirements, if necessary.
- Evaluate the cathodic protection (CP) system serving buried steel and ductile iron STS pipelines in the Secondary Sed Tank area and the buried PE headers serving AT 2, 4, and 6. Evaluate soil and groundwater characteristics and alternatives for restoring the CP system.

1.3 Project Scope

The scope of work described below includes the tasks, as currently defined, to provide preliminary design for the WPTP STS Pipeline Rehabilitation Project. Project tasks have been developed to meet the project objectives. Key project tasks are summarized below. The detailed scope of work for the project is in the PMP.

1.3.1 Phase 2A - Alternative Analysis and Selection

The objective of this phase was to identify and evaluate various alternatives for rehabilitating/replacing the PE, RAS, and WAS pipes in the STS, and implementing the other ancillary work items noted in Section 1.2. Based on the inspections and analyses performed, recommended methods for rehabilitating specific STS pipes and implementing the ancillary work items noted in Section 1.2 were developed. Details of the pipe corrosion inspections, pipe rehabilitation alternative analysis, and technical evaluations of the ancillary work items are included in the Alternatives Analysis Summary TM (Carollo, February 2022). The summary of recommended rehabilitation work is shown in Table 1 below.

Table 1 Summary of Recommended Rehabilitation Work

Location	Item	Rehabilitation Alternative Description
Intermediate Pump Station Pump Room	Pump 1 Suction Elbow	Rehabilitate the corroded external areas near the floor level of the 54-inch suction elbow by chipping out the concrete floor adjacent to the corroded areas, welding a butt strap over the most corroded areas, repairing weld-damaged interior lining of the suction elbow, applying epoxy coating to exposed metal surfaces, and patching the floor.
Intermediate Pump Station Pump Room	Pump 2 and 3 Suction Elbows	Rehabilitate the corroded external areas near the floor level of the 54-inch suction elbows by applying an epoxy patching compound followed by an additional high-build epoxy coating.
Intermediate Pump Station Pump Room	Pumps 1 and 2 Discharge PE Piping	Repair internal pitting corrosion on 60-inch PE discharge piping by spot repairs on the exterior wall of the pipe using epoxy resin with Kevlar.
Pipe Chase Adjacent to the Intermediate Pump Station Pump Room	Adding Method of Detecting Leaks from Pipes in the Pipe Chase	Install holes at base of concrete wall that separate the pump room from the pipe chase to provide a way of knowing if the pipe in the pipe chase has developed a leak (visual observation of leakage).
Aeration Tanks	42-inch PE Header Pipes	Reline 42-inch PE header pipes with structural epoxy. Replace the corroded 42-inch butterfly valves in each of four branch lines to the aeration cells.
Aeration Tanks	42-inch PE Header Pipes	Install an isolation valve in the 42-inch header pipe after the branch line to the first cell for each aeration tank.
Aeration Gallery	Magnetic Flow Meter Replacements	Replace the flowmeters in the 42-inch PE and 30-inch RAS lines with polyurethane-lined Rosemount flow meters.
Aeration Gallery	Additional Pipe Inspections	Inspect the interior of the RAS piping during the magnetic flow meter replacement. Determine condition of welds from inside the pipe. (Inspection to be performed by pipe inspection subconsultant.)
Aeration Tanks	Cathodic Protection	Install pipe-to-soil potential monitoring test stations for the buried PE header piping at Aeration Tanks 2, 4 and 6.
Upstream End of WAS Line	WAS Isolation Valve	Install a new 24-inch butterfly valve to allow isolation of approximately 1,700 feet of WAS line.
RAS Pump Stations in Secondary Sed Tank Galleries	RAS Pump Suction Elbows	Replace the 18-inch diameter elbows in the pump suction pipes at SST 1, 10 and 11 with new epoxy-lined elbows.

Location	Item	Rehabilitation Alternative Description
RAS Pump Stations in Secondary Sed Tank Galleries	RAS Pump Suction Riser Pipe	Inspect the RAS riser pipe from the elbow to the floor. Determine the condition of the pipe with regard to corrosion. (Inspection to be performed by pipe inspection subconsultant.)
RAS Pump Stations in Secondary Sed Tank Galleries	RAS Pump Station Discharge Piping	Install additional braces and restraints to reduce seismic risk.
Aeration Tanks	42-inch PE Header Pipes	Install additional braces and restraints to reduce seismic risk.
Aeration Influent Galleries	PE and RAS Piping	Install additional braces and restraints to reduce seismic risk.

1.3.2 Phase 2A - Eliminated Scope Items

The following scope items were investigated during the Alternatives Analysis phase, but no further action is planned on these items.

1.3.2.1 Buried Vacuum Relief Pipes on the PE Manifold

An assessment of the two buried 12-inch diameter vacuum relief valve pipes with regard to internal corrosion was not conducted due to the infeasibility of isolating the pipes, which are directly connected to the PE manifold approximately 16 feet below grade. The assessment would require the temporary shut-down of the secondary process and the partial draining of the PE manifold. The draining of the manifold is problematic as it must be done quickly to get the secondary process back in service and would require reverse flow through the IPS pumps which may damage the pumps.

1.3.2.2 Cathodic Protection Systems Serving the Secondary Sed Tanks

The evaluation of the existing CPS for the Secondary Sed Tanks showed that this system was providing corrosion protection for only 22 percent of the pipelines connected to the system. It was also determined that many of the pipelines in the SST area are shorted to the structures they connect to. Installing an impressed current cathodic protection (ICCP) system to serve these pipelines is problematic for several reasons including high amperage requirements, the potential for stray current corrosion on un-shorted pipe, and the risk and cost associated with installing a deep anode bed in the confined areas between the SSTs where the piping is concentrated. It was determined that it is infeasible to provide an effective CP system to serve the SSTs (See Section 2.4.1 for further details).

1.3.2.3 Cathodic Protection Systems Serving the Buried PE Headers for Aeration Tanks 2, 4, and 6

The evaluation of the existing CPS for the buried PE headers for Aeration Tanks 2, 4, and 6 confirmed that no CPS test stations were installed during the original construction, limiting the ability to evaluate the effectiveness (or even confirm the presence) of the galvanic anodes that were supposedly installed during the original construction. The evaluation determined that the PE headers were shorted to the Aeration Tank structure similar to numerous pipes in the SST as mentioned previously. However, it was also determined that several factors lower the potential for corrosion occurring on the PE headers. The soil has a high resistivity, indicating low conductance that is necessary for the anodic/cathodic corrosion cells to form along the pipe length.

Measurement of the pipe-to-soil potential showed a negligible level of corrosion activity taking place on the header pipes. These tests, plus the fact that the buried steel pipe is tape-wrapped, indicate that a cathodic protection system is not required for the PE headers. It was recommended that test stations be installed on the headers to measure pipe-to-soil potential, and confirm these values remain low (See Section 2.4.2 for further details).

1.3.2.4 WAS Magnetic Flow Meter Replacement

The scope of work included replacing the 20-inch diameter magnetic flow meter in the WAS pipe. However, discussions with the WPTP operation and maintenance staff indicated that this flow meter was not used and therefore would not be replaced (See STS Pipeline Magnetic Flow Meter Replacement TM, July 2021, Carollo Engineers, Inc.).

1.3.3 Phase 2A – Added Scope Items

The following items were added to the scope of the STS Pipeline Rehabilitation Project during the alternative analysis phase to meet the goals and objectives of the project.

1.3.3.1 Isolation Valve on PE Headers

A 42-inch diameter butterfly valve will be installed in the PE headers immediately downstream of the branch lines to Stage 1 of the Aeration Tanks. Currently, normal operation of the ATs is to introduce PE into the first cell with valves to the other three cells closed in the PE header. This results in approximately 172 feet (88 percent) of the total length of the header downstream of the first cell being exposed to the corrosive atmosphere above the stagnant PE. The hydraulics of the system result in the headers being only partially full under normal operations. Installing the isolation valve allows draining and venting of the header pipe after the first cell to eliminate unnecessary exposure of most of the header to corrosive conditions and extend the anticipated service life of the structural liner to 40 years, per the established evaluation criteria.

1.3.3.2 Inspection of RAS Piping in Aeration Influent Galleries During Construction

Past inspections of the RAS pipes in the Aeration Galleries have shown that the welds in the interior of this steel piping are corroding. Welds are difficult to inspect using ultrasonic testing equipment so no data on the welds has been collected thus far under this project. However, it is recommended that the interior of the RAS pipes in the AT galleries be physically inspected when the magnetic flow meters are replaced under the construction phase of this project. The removal of the 30-inch diameter mag meters will allow easy access to the RAS pipe interior. The inspection will include assessing corrosion of the pipes' welds and identifying pits that can be monitored using ultrasonic testing (UT) methods on the exterior of the pipe. It is anticipated that V&A Consulting Engineers will perform these inspections as part of a services during construction contract.

1.3.4 Phase 2B – Preliminary Design

The purpose of the preliminary design phase is to develop the selected alternative with sufficient information for the project team to establish project baselines of scope, schedule, and cost. Preliminary design will include 30 percent design drawings and will provide the framework for completing final design, obtaining permits, and eventually construction work to accomplish the work listed in Table 1. The following tasks are included in Phase 2B.

1.3.4.1 Task 2210 - Permitting and Cultural Resources

Carollo will provide permitting and cultural resources services during preliminary design.

1.3.4.2 Task 2220 - Sustainability, Equity, and Social Justice

For this task, the County will prepare a baseline sustainability scorecard. Carollo will then include it in the Baseline Design Report.

1.3.4.3 Task 2230 - Cost Estimating and Scheduling

Carollo will update the Basis of Estimate and Class 5 cost estimates (to Class 3) for the preliminary design. The conceptual construction schedules will also be updated in line with the selected alternatives.

1.3.4.4 Task 2240 - Project Risk Analysis and Risk Management

This task will identify and assess project risks and determine risks to be addressed and managed during progression and development of the project design. Design related risks are generally related to implementation. Carollo will prepare a quantified project risk register, including risk response strategies and associated action plans for each risk related to implementation, through the facilitation of a project risk register development workshop.

1.3.4.5 Task 2250 - Updated Basis of Design for the Preferred Alternative

This is an update of the BOD (November 2020) that was prepared under Task 2120. This BOD applies to the preferred alternative and includes the following: general statements of design elements and engineering criteria to be used and specific project standards/criteria.

1.3.4.6 Task 2260 - STS Pipelines (RAS, PE) Rehabilitation Baseline Design

Carollo will prepare the baseline design documents following the WTD design guidelines and the updated BOD criteria. The final version of the baseline design documents will establish the basis for final design. The baseline design submittal will include the following:

- Baseline design development drawings at 30 percent complete level, specification table of contents, and draft copies of specialized specification sections.
- Baseline Design Report including:
  - Project description.
  - Baseline project construction schedule.
  - Baseline project construction cost.
  - Design development information related to project risk and risk management, permitting, sustainability, community issues, and environmental and cultural resources.

1.4 Project Schedule

A detailed design schedule is included in Appendix A and a detailed construction schedule is in Appendix B. Key target milestones for major tasks are shown in Table 2. Updates to the schedule will be made monthly as the project progresses and the work is better defined.

Table 2 Schedule of Contract Milestones

Milestone	Contractual Completion Date
Phase 2 - Preliminary Design	August 2022
Phase 3 - Final Design	July 2023
Phase 4	
• Bidding Services for Construction Procurement	November 2023
• Substantial Completion	September 2026
Phase 5 - Services for Close-Out Documentation	December 2026

Section 2

GENERAL STATEMENTS OF DESIGN ELEMENTS AND ENGINEERING CRITERIA

This section provides criteria for design of the project elements, this includes criteria for:

- Rehabilitation of STS pipes.
- Isolation valves in the PE header pipes.
- Flowmeters in the PE and RAS pipes.
- Pipe support seismic improvements.
- Test stations for cathodic monitoring of buried PE header pipes.

2.1 Pipe Rehabilitation Criteria

The design criteria for the systems evaluated for rehabilitation of pipes shall:

- Have a minimum service life of 40 years.
- Provide the same level of service as the original conditions.

The characteristics of the existing pipe that will be rehabilitated are listed in Tables 3 through 6. For the miscellaneous pipes not listed in Tables 3 through 6 the rehabilitation systems shall provide the same level of service (flow rate and pressure capability) as originally designed.

Table 3 Primary Effluent Pipe Rehabilitation Criteria

Size	• 42 to 108-inch
Existing Pipe Material to be Rehabilitated	
60-inch PE Pump Discharge	• Welded Steel
72 to 42-inch PE in AT Galleries	• Welded Steel
42-inch PE on top of AT	• Welded Steel
Existing Lining	• Epoxy primer, 2.5 MDFT, and two coats of coal tar epoxy, 16 MDFT
Existing Coating	
AT 1,3, and 5 (Exposed)	• 2.5 mils epoxy primer, 3.0 mils polyurethane enamel • Polykin tape wrap system
AT 2, 4 and 6 (Buried)	• Specified to be 30 mils but is noted in 2015 Inspection Report to be 80 mils: To be field verified • Concrete encased under roadway
Fluid	• PE
Percent Solids	• 0.02%
Conductivity[(1)]	• 1.25 to 2.51 mS/cm • (1.97 mS/cm Avg)

Chloride Level	• >170 to 500 mg/L (380 mg/L Avg)
Flow Rates[2]	
Max PE from IPS to Aeration Tanks	• 300 MGD
Max PE From Header to Each Aeration Train	• 60 MGD
Max Velocity in 42-inch PE Line at 60 MGD	• 9.9 fps
Max Operating Pressure	• 25 psig

Notes:
(1) Tinnea & Associates, *West Point Treatment Plant, Corrosion Control Investigation*, pg. 15, 2003.
(2) West Point Treatment Plant Secondary Treatment Facilities ST 08 Liquid Stream, Contract W/F49-91, Volume 9 of 20, Sheet G30, July 1991.
Abbreviations: AT - aeration tank; Avg - average, fps - feet per second; Max - Maximum; MDFT - mils dry film thickness; mg/L - milligrams per liter; mils - thousandth of an inch; mS/cm - milli-Siemens per centimeter; psig - pounds per square inch gauge.

Table 4 Intermediate Pump Station Suction Elbow and Discharge Line Rehabilitation Criteria

Size	• 108 to 48-inch Reducing Elbow • 54-inch Pump Discharge Line
Existing Pipe Material to be Rehabilitated	• Welded Steel
Existing Lining	
Suction Elbow	• Two coats of coal tar epoxy for a total of 16 MDFT (No Primer)
Pump Discharge	• Exposed Pipe Lining (2.5 mils epoxy primer and 2 coats of coal tar epoxy, 18.5 MDFT)
Existing Coating	
Suction Elbow (Above Floor)	• Prime coat of 2.5 mils of epoxy primer, based on observations
Pump Discharge	• 2.5 mils of epoxy primer plus two coats of polyurethane, 3 MDFT for a total of 5.5 MDFT per System 5, Spec 09900
Fluid	• PE
Percent Solids	• 0.02%
Conductivity[1]	• 1.25 to 2.51 mS/cm • (1.97 mS/cm Avg)
Chloride Level	• >170 to 500mg/L (380 mg/L Avg)
Flow Rate[2]	
Max. PE suction per IPS pump	• 104,000 gpm (~150 MGD)
Max Velocity in 54-inch Suction Elbow Outlet	• 14.9 fps
Max velocity in 60-inch IPS Pump Discharge	• 12 fps
Max Operating Pressure	• 25 psig

Notes:
(1) Tinnea & Associates, *West Point Treatment Plant, Corrosion Control Investigation*, pg. 15, 2003.
(2) West Point Treatment Plant Secondary Treatment Facilities ST 08 Liquid Stream, Contract W/F49-91, Volume 9 of 20, Sheet G30, July 1991.
Abbreviations: gpm - gallons per minute.

Table 5 Return Activated Sludge Pipe Rehabilitation Criteria

Size	
RAS Pump Suction	• 12-inch
RAS Pump Discharge Header	• 18-inch
RAS Discharge to Aeration Tank	• 60 to 30-inch
Existing Material to be Rehabilitated	
RAS Pump Suction	• Ductile Iron
RAS Pump Discharge	• Welded Steel
RAS Discharge at AT	• Welded Steel
Existing Lining	
Ductile Iron	• Cement mortar
Welded Steel	• Epoxy primer, 2.5 MDFT, and two coats of coal tar epoxy, 16 MDFT (total)
Existing Coating	
Ductile Iron	• 2.5 mil epoxy primer, 3.0 mil polyurethane enamel
Welded Steel	• 2.5 mil epoxy primer, 3.0 mil polyurethane enamel
Fluid	• Return Activated Sludge
Percent Solids	• 0.6%
Conductivity[(1)]	• 0.96 to 1.57 mS/cm (1.26 mS/cm Avg)
Chlorides	• 175-520 mg/l (356 mg/l Avg)
Flow Rates[(2)]: RAS Pump Suction and Discharge Pipes	
Minimum	• 1,750 gpm
Maximum	• 3,950 gpm
Max velocity in 12-inch suction	• 11.2 fps
Max RAS from Sedimentation Tanks to Ats	• 73,606 gpm
Max Velocity in 84-inch RAS manifold	• 4.3 fps
Max RAS to each AT	• 14,721 gpm
Max Velocity in 30-inch RAS line	• 6.9 fps
Max RAS Pump Discharge Header	• 7,694 gpm
Max Velocity in 18-inch Discharge Header	• 10.3 fps
Max Operating Pressure	• 25 psig

Notes:
(1) Tinnea & Associates, *West Point Treatment Plant, Corrosion Control Investigation*, pg. 15, 2003.
(2) West Point Treatment Plant Secondary Treatment Facilities ST 08 Liquid Stream, Contract W/F49-91, Volume 9 of 20, Sheet G30, July 1991.

Table 6 Waste Activated Sludge Pipe Rehabilitation Criteria

Size	
Isolation Valve Location	• 24-inch
Existing Pipe Material to be Rehabilitated	
Exposed	• Ductile Iron
Existing Lining	
Ductile Iron	• Cement Lining
Existing Coating	• 5 to 6 mils of an epoxy and aliphatic polyurethane coating
Fluid	• Waste Activated Sludge
Percent Solids	• 0.6%
Conductivity	• 0.96 to 1.57 mS/cm (1.26 mS/cm Avg)
Chlorides	• 175-520 mg/l (356 mg/l Avg)
Flow Rates(1)	
Minimum	• 1,410 gpm
Velocity in 24-inch WAS line at minimum flow	• 1.0 fps
Maximum	• 5,923 gpm
Velocity in 20-inch WAS line at maximum flow	• 6.0 fps
Max. Operating Pressure	• 25 psig

Notes:
(1) West Point Treatment Plant Secondary Treatment Facilities ST 08 Liquid Stream, Contract W/F49-91, Volume 9 of 20, Sheet G30, July 1991.

2.2 Flow Meter Criteria

The acceptable flow meter to be specified will be per the County guide Specification, Section 40 70 20, which is Rosemount for West Point Treatment Plant. Design criteria for the flow meters installed in the PE and RAS pipelines for process control are listed in Table 7.

Table 7 Magnetic Flow Meter Criteria

	Primary Effluent
Number Required	• 6
Size	• 42-inch diameter
Lining Material	• Polyurethane
Fluid Characteristics	• See Table 3 above
Flow Rates(1)	
Minimum	• 24.3 MGD/16,839 gpm (97 MGD, split between 4 ATs)
Velocity at minimum flow	• 4 fps
Maximum	• 60 MGD/41,664 gpm (300 MGD split between 5 ATs)
Velocity at maximum flow	• 9.9 fps
Max Operating Pressure	• 10 psig

	Return Activated Sludge
Number Required	• 6
Size	• 30-inch diameter
Lining Material	• Polyurethane
Fluid Characteristics	• See Table 5 above
Flow Rates[(1)]	
Minimum	• 3,125gpm (Assumes Minimum RAS flow of 12,500 gpm is equally split between four ATs)
Velocity at Minimum Flow	• 1.42 fps
Maximum	• 14,721 gpm (Assumes Maximum RAS flow of 73,606 gpm is equally split between five ATs)
Velocity at Maximum Flow	• 6.68 fps
Max Operating Pressure	• 25 psig

Notes:
(1) West Point Treatment Plant Secondary Treatment Facilities ST 08 Liquid Stream, Contract W/F49-91, Volume 9 of 20, Sheet G30, July 1991.

2.3 Pipe Supports Design

This section describes the code requirements, standards, and design criteria for seismic improvements to the pipe supports and anchors.

2.3.1 Codes and Standards

The following codes and standards are applicable to the structural design of new anchorage, bracing, and supports:

- Building code: 2018 International Building Code (IBC) as adopted and amended by the City of Seattle Building Code (SBC).
- Referenced standards:
  - Structural loads: American Society of Civil Engineers (ASCE) 7-16.
  - Concrete: American Concrete Institute (ACI) 318-14.
  - Structural steel: American Institute of Steel Construction (AISC) 341-16 and 360-16.
  - Related ASTM International (ASTM) standards referenced in the Building Codes and Referenced Standards.
- County's design standards and guide specifications and typical details where appropriate.

2.3.2 Structural Performance

Risk Category III (buildings and other structures that represent a substantial hazard to human life in the event of failure), per SBC 2018 Table 1604.5 will apply to the project.

2.3.3 Structural Design Criteria

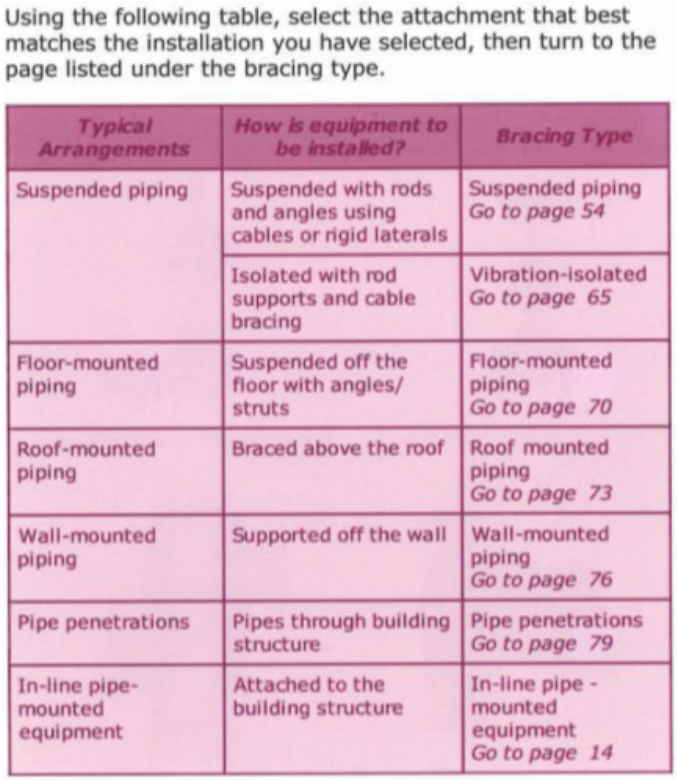
Load design criteria for this project are summarized in Table 8.

Table 8 Load Design Criteria

Description	Design Criteria
Load Combination	Conform to SBC 2018
Dead Loads	Operating weight of pipes and equipment
General	Conform to SBC 2018
Seismic Design Loads	ASCE 7-16, Chapter 13 Seismic Design Requirements for Non-Structural Components

All pipe runs will be braced in accordance with the details and recommendations contained in the King County Standard bracing details unless more relevant seismic bracing details are available in the Federal Emergency Management Agency (FEMA) P-414 Installing Seismic Restraints for Ducts and Pipe or are required to be developed by our design team for specific custom conditions.

FEMA P-414 provides recommendations for longitudinal and transverse bracing requirements using example generic pipe configurations. A variety of bracing "types" are included in the FEMA P-414 documents allowing the user to select the appropriate bracing type for various piping arrangements (see Figure 1). These documents, along with preliminary analytical methods, will be used to provide a rapid evaluation of missing and deficient seismic bracing; however, final recommendations and details will be based on specific analysis of the actual condition and, where required, details for additional braces and restraints will be provided.



Using the following table, select the attachment that best matches the installation you have selected, then turn to the page listed under the bracing type.

Typical Arrangements	*How is equipment to be installed?*	*Bracing Type*
Suspended piping	Suspended with rods and angles using cables or rigid laterals	Suspended piping *Go to page 54*
	Isolated with rod supports and cable bracing	Vibration-isolated *Go to page 65*
Floor-mounted piping	Suspended off the floor with angles/ struts	Floor-mounted piping *Go to page 70*
Roof-mounted piping	Braced above the roof	Roof mounted piping *Go to page 73*
Wall-mounted piping	Supported off the wall	Wall-mounted piping *Go to page 76*
Pipe penetrations	Pipes through building structure	Pipe penetrations *Go to page 79*
In-line pipe-mounted equipment	Attached to the building structure	In-line pipe - mounted equipment *Go to page 14*

Figure 1 FEMA P-414 Pipe Bracing Type Selection Table

For in-line pipe mounted equipment such as large valves, pumps, air separators, and similar equipment the FEMA P-414 document provides appropriate details which can again be selected from a table of typical details (see Figure 2).

Typical Arrangements	*How is equipment to be installed?*	*Attachment Type*
Valve or strainer	Requires additional bracing at the valve and actuator if it weighs more than 20 pounds	Valves and valve actuators *Go to page 144*
Valve actuator	Requires additional bracing if it weighs more than 20 pounds	
Air separator, in-line pump or heat exchanger	Support piping near equipment/valve	Suspended piping and pumps *Go to page 97* Air separator *Go to page 99* Heat exchanger *Go to page 100*

Figure 2 FEMA P-414 Equipment Bracing Type Selection Table

Manufacturer's (Power-Strut, Tolco, Unistrut) provide similar bracing system documents, and these are more recent documents that meet the California Office of Statewide Health Planning and Development preapproval requirements for Healthcare Facilities in California. They are equally suited for use at WPTP. The County's standard details for seismic bracing will be used wherever applicable. If required, special support details and connections to existing structure will be provided that meet the seismic design criteria herein.

2.3.4 Seismic Load Components

The seismic load components are location specific to WPTP as follows:

- Risk Category Importance Factor, Ie.: 1.25
- Site class: D (assumed)
- Seismic design category: D
- 0.2 sec. Spectral Response, S_s: 1.368g
- 1 sec. Spectral Response, S_1: 0.477g
- 0.2 sec. Design Spectral Response, S_{DS}:0.912g
- Component Response Modification Coefficient, Rp = 6.0
- Component Amplification Factor, **a**p = 2.5
- Component Overstrength Factor, Ω_0= 2.5
- Component importance Factor, Ip=1.5

2.4 Cathodic Protection

2.4.1 Secondary Sedimentation Tanks

The evaluation of the existing CP system serving the Secondary Sed Tanks (SSTs) showed many problems with the existing system. A sacrificial galvanic anode cathodic protection system (GACP) was installed during original construction of the SSTs. However, pipe-to-soil potential surveys conducted for the alternatives analysis phase of this project confirmed low or no protection being provided by the existing CP system serving the SSTs. Only 14 (22 percent) of the 63 test locations within the SST area met the NACE SP0169 criteria for adequate corrosion control.

Current requirement testing (to determine the amperage required for a potential impressed current cathodic protection (ICCP) system) revealed several issues that significantly limit the feasibility of providing a CP system to the SST area. Current requirement testing indicated many shorted pipes, probably from contact between the pipe and wall spools that are in contact with structural reinforcement. This limits the ability to use ICCP system, as current requirements are too high and this could lead to "stray current" corrosion damage on other "non-shorted" buried pipe in the confined areas between the SSTs. Another concern with installing an ICCP system in these areas is that a deep anode well (over 100 feet deep), would need to be installed in the landscaped areas between the SST basins where the piping is located. This would not only risk damage to the piping, it would also pose challenges in being able to locate a drilling rig in these confined areas, as the rig would need to be positioned with a crane from the elevated roadway.

Replacing the existing GACP system was also considered, but this would require the installation of numerous sacrificial anodes at a depth near the bottom of the sed tanks (over 20 feet deep). This would be extremely challenging given the density of the piping in these areas. Even if this could be done, the shorted pipe would not be protected with a new GACP system as the anodes would be quickly depleted due to the high current requirements of the shorted pipe. It was concluded that neither an ICCP nor a GACP system should be installed in the SST areas. The fact that the steel pipe is tape-wrapped and the ductile iron pipe used for SST drainage and scum collection has a high resistance to corrosion, lessen (but do not eliminate) the possibility that a significant leak may occur in the SST area.

2.4.2 Buried PE Pipes for Aeration Tanks 2, 4, and 6

The mechanical record drawings for the Aeration Tanks indicate that sacrificial anodes were installed on the buried PE headers serving Aeration Tanks 2, 4, and 6 under the 1995 STS Expansion project. Although the galvanic anodes may have been installed during the original construction, no test stations were installed. Electrical continuity tests conducted for the alternatives analysis phase of this project indicated that the pipe segments are electrically bonded as required for cathodically-protected pipe, however pipe-to-soil potential measurements indicated the header pipe is shorted to the aeration tank structure, potentially via the branch lines to each stage of the aeration tank that enter valve vaults that are constructed integrally with the tank cover. This is similar to the piping in the SST area discussed previously. Current requirements for shorted pipe are usually too high for ICCP system to be economical, and it would be very costly to eliminate the shorts by modifying the pipe penetrations. Soil resistivity testing of the approximately 5-1/2 foot deep layer of soil above the aeration tanks showed that the soil is highly resistive, indicating poor conductive properties, and therefore less able to conduct the current necessary for pipeline corrosion.

Measurement of the pipe-to-soil potential showed a negligible level of corrosion activity taking place on the header pipes. These tests, plus the fact that the buried steel pipe is tape-wrapped, indicate that a cathodic protection system is not required for the PE headers.

The CP Assessment Report recommended that test stations be installed to continue to monitor the native pipe-to-soil potential along the length of the PE Headers, to confirm that corrosion activity remains low. Three post-mounted test stations per header are recommended. The test stations will consist of two test leads exothermically welded to the pipeline at the beginning, middle, and end of each header. The test stations will allow an annual native potential survey consisting of measuring a native pipe-to-soil potential at each test station. The results of each annual survey can be compared to the results of previous years. If the native potentials of the piping increased over time, the County can consider installing a CP system to mitigate corrosion of the pipeline. Table 9 shows characteristics of the existing buried PE header piping serving Aeration Tanks 2, 4, and 6, results of native pipe-to-soil potential measurements, and soil resistivity data.

Table 9 Corrosion Monitoring Criteria for Buried PE Header Pipes for Aeration Tanks 2, 4, and 6

42-inch Primary Effluent Pipes	
Diameter	• 42-inch
Pipe Characteristics	
Material	• Welded Steel
Coating	• 15 mils polyethylene tape wrap with a 50% overlap for a total 30 mil thickness
Native Pipe-to-Soil Potential	• -131 to -290 mV_{CSE}
Soil Resistivity Characteristics	• 8,500 ohm-cm to 61,000 ohm-cm

Notes:

Abbreviations: ohm-cm - ohm centimeter. mV_{CSE}-milli-Volts potential as measured with respect to a saturated copper/copper sulfate (CSE) electrode.

2.5 Code Analysis

The most recent versions of the following codes will be utilized, when applicable.

- King County Code
- Seattle Municipal Code (SMC)
- Seattle Green Factor
- 2020 Seattle Electrical Code
- 2018 International Building Code (IBC)
- 2018 International Fire Code
- 2018 International Mechanical Code (IMC)
- 2018 Seattle Building Code (SBC)
- 2018 Seattle Fire Code
- 2018 Seattle Fuel Gas Code
- 2018 Seattle Mechanical Code
- Institute of Electrical and Electronics Engineers (IEEE) C2, National Electrical Code (NEC)
- National Fire Protection Association (NFPA) 820

2.5.1 Electrical Code

Electrical infrastructure for the flow meters and electrically-actuated or -monitored valves will comply with the National Electrical Code (NEC) and National Fire Protection Association (NFPA) 820.

2.5.2 Structural Code

For structural code and references see Section 2.3.1 and for seismic load components see Section 2.3.4.

Section 3

SPECIFIC PROJECT STANDARDS/CRITERIA

3.1 Special Project Requirement

3.1.1 Construction Schedule

The construction schedule is presented in Table 10. As shown, Notice to Proceed (NTP) is scheduled for February 1, 2024. Construction activities would occur over an approximate 2.5-year period with substantial completion on September 14, 2026. Understanding of Operational and process constraints will be incorporated with pre-design evaluation and selected alternative development, in order to accommodate the Plant's maintenance schedule and needs. This understanding will be incorporated into any final design package. The construction schedule for the secondary treatment system upgrades will be aligned with the WPTP's dry-weather shutdowns for maintenance. The construction schedule can be updated to accommodate any future changes in Plant's schedule for maintenance.

Table 10 Construction Schedule

Task	Duration (days)	Start	Finish
Procure Construction Contractor	52	6/27/23	9/8/23
Bid Package Preparation	52	6/27/23	9/8/23
Prepare and Submit ITB Form	20	6/27/23	7/25/23
Upload ITB Package	1	7/26/23	7/26/23
ITB Package Review	30	7/27/23	9/7/23
PM Approval of ITB	1	9/8/23	9/8/23
Construction Advertise (PRISM Milestone)	0	9/8/23	9/8/23
Advertise	21	9/11/23	10/9/23
Bid Evaluation	20	10/10/23	11/6/23
Notice of Award	1	11/7/23	11/7/23
Contract Execution	20	11/8/23	12/8/23
Phase 4 - Implementation	**955**	**2/1/24**	**9/14/26**
Construction NTP (PRISM Milestone)	0	2/1/24	2/1/24
Preconstruction	20	2/2/24	3/1/24
Construction	791	7/15/24	9/14/26
Substantial Completion Achieved (PRISM Milestone)	0	9/14/26	9/14/26
Phase 5 - Closeout	**60**	**9/15/26**	**12/10/26**
Lessons Learned	20	9/15/26	10/12/26
Punch lists, As Builts, Contractor Closeout	40	9/15/26	12/10/26
Final Acceptance Achieved (PRISM Milestone)	0	12/10/26	12/10/26
Project Completion	**0**	**12/10/26**	**12/10/27**

Notes:
Abbreviations: ITB - invitation to bid.

3.1.2 Construction Operational Constraints

The project requires work in multiple areas of the secondary treatment system which must always be kept in continuous operation. Construction constraints due to process and operational limitations and other schedule maintenance work will govern sequencing of rehabilitation work. The process and operational limitations that are known are outlined in this section. As the project progresses coordination with other scheduled maintenance work will be added.

In the below descriptions the phrase "low flow period" is meant to be the period when influent flows to the plant allow a process unit(s) to be out of service as a normal operating condition, e.g., an Aeration Tank or Secondary Sedimentation Tank. The low flow period is weather dependent and is usually between May and the end of September. The period of late July and August being the time period when the least weather-derived high flows occur.

Anticipated constraints for the different project elements known at this time follow:

3.1.2.1 IPS Pump 1 Suction Elbow Repair

Planned Work

Rehabilitate the corroded external areas near the floor level of the 54-inch suction elbow for IPS Pump 1 by chipping out the concrete floor adjacent to the corroded areas, welding a butt strap over the most corroded areas, repairing weld-damaged interior lining of the suction elbow, applying epoxy coating to exposed metal surfaces, and patch the floor.

Constraints

This work must be performed during dry weather when only 2 of the 3 IPS pumps are required to be available. Rehabilitation of IPS Pump 1 suction elbow is planned to occur by installing a specially fabricated plug in the suction pipe to isolate the pump from the wet well (reference Intermediate Pump Station Suction Elbow Repair, June 2021, Carollo). With the pump isolated, the flexible expansion coupling and knife gate valve supported by the suction elbow flange can be removed to allow the interior lining damaged by the welding activity to be repaired. Once the work is completed the plug in the suction elbow will be removed. As an alternative, the County is coupling this rehabilitation work with a project to re-line the interior of IPS Pump 1. The contractor will install a bulkhead in the suction elbow to isolate the pump versus installing a plug.

Under either scenario, divers must perform a confined space entry of the wet well three times, once to collect information and measurements needed to fabricate the plug or bulkhead, once to install the plug or bulkhead, and once to remove the plug or bulkhead. During each dive, flow to the IPS wet well must be stopped which requires shutting down flow to the WPTP STS. Therefore, each dive must be carefully planned and coordinated with the WPTP operation and maintenance staff.

3.1.2.2 IPS Pump 2 and 3 Suction Elbow Repair

Planned Work

Rehabilitate the corroded external areas near the floor level of the 54-inch suction elbow for IPS Pumps 2 and 3 by cleaning, filling corroded areas with epoxy patching, and recoating with a high-build epoxy.

Constraints

The respective pump should be shut down while the external rehabilitation of the suction elbow is conducted.

3.1.2.3 IPS Pump 1 and 2 Discharge Pipe Repair

Planned Work

Repair internal pitting corrosion on 60-inch PE discharge piping by spot repairs on the exterior wall of the pipe using epoxy resin with Kevlar.

Constraints

The respective pump should be shut down while the external repairs of the discharge line are conducted.

3.1.2.4 Aeration Tank PE and RAS Pipe Rehabilitation and Flow Meter Replacement, PE Header Pipe Isolation Valve Installation, and RAS Pipe Interior Inspections

Planned Work

The planned work for the aeration tank area includes:

- Reline the PE header pipe on top of the Aeration Tanks (including the buried pipe).
- Replace flowmeters in each of the PE and RAS pipes in the Aeration Tank galleries with polyurethane-lined Rosemount flow meters.
- Replace the corroded 42-inch butterfly valves in the PE Header pipes with special corrosion-resistant lined valves.
- Install an isolation valve in each PE Header pipe after the branch line to the first cell for each aeration tank. This may include providing utility vaults for the buried valves in PE header pipes for AT 2, 4, and 6.
- Inspect the interior of each RAS pipe in the Aeration Tank gallery during the flowmeter replacement.
- Install additional braces and restraints to reduce seismic risk.

Constraints

Constraints and restrictions for the aeration tank area includes:

- Typically, two aeration tanks are taken out of service annually during the low flow period, with all six tanks in service the remainder of the year. However, if a severe wet weather event occurred during the low flow period, all six trains could be required.
- The work will extend over multiple years with the planned sequence being work associated with Aeration Tanks 1 and 2 in 2024, Aeration Tanks 3 and 4 in 2025, and Aeration Tanks 5 and 6 in 2026.
- Rehabilitation of the drop pipes from the header into the aeration tanks will require entry into the confined space and installation of scaffolding to reach the drop pipe. Confined space entry will also be required for work inside the aeration tanks and interior inspection of the RAS pipes. The work must account for the fact that isolation valves may have some leakage.
- Work on the headers for Aeration Tanks 2, 4, and 6 will require excavation which will require an archeological plan.

- Construction equipment using the Aeration Tanks access road, such as a crane, will impede use of the road and therefore must be scheduled with other operation and maintenance activities. It is assumed that two aeration tanks can be taken out of service, in a sequential manner, each low flow season.
- Work in the galleries during high flow events will be required to follow WPTP's protocol :
  - At 250 MGD and when a third Raw Sewage Pump Engine is started, a plant wide announcement will be made for personnel to monitor all radio communications due to elevated flows.
  - At 330 MGD an additional plant-wide announcement will be made for personnel to monitor all radio communications due to elevated flows.
    - Only essential, emergent work below grade will be authorized using a buddy system.
    - All authorization will come from Main Control.
    - All other personnel must leave the tunnels.
    - Shift personnel with lockers below grade should access their lockers at this time, using the buddy system, to retrieve personal items.
  - At 400 MGD a plant wide announcement will be made that all tunnels and below grade spaces will be immediately evacuated.
    - No entry will be allowed.
- If emergent work is required, such as IPS/EPS resets, sampling required by permit or equipment analysis, the On-shift Supervisor makes the determination and sets the conditions for tunnel entry.
- Preparatory construction work to install scaffolding, temporary rigging, excavation of buried PE pipes above Tanks 2, 4, and 6, and surface preparation can be performed with the tanks in service. All materials for the work will need to be on-site prior to any pipe being taken out-of-service.

3.1.2.5 Secondary Sedimentation Tank RAS Pipes

Planned Work

- Replace elbows in the pump suction pipes at SST 1, 10, and 11 with new epoxy-lined elbows.
- Interior inspection of the RAS riser pipe from the elbow to the floor to identify any corrosion that may be occurring as the pipe passes through the floor.
- Install additional braces and restraints to reduce seismic risk.

Constraints

Typically, multiple secondary sedimentation tanks are taken out of service annually during low flow periods with all tanks placed in service the remainder of the year. However, if a severe wet weather event occurred during the low flow period, all tanks could be required.

Work will need to coincide with the tanks and RAS pumps being taken out of operation for scheduled maintenance. Replacing the elbows will require the associated tanks to be emptied. Therefore, the work will extend over multiple years with the elbows at RAS Pump Station 6 planned for 2024 and the elbow at RAS Pump Station 1 planned for 2026.

All materials for the work will need be on-site prior to any pipe being taken out-of-service. The period for a pipe to be taken out of service must account for time needed to drain the tank.

3.1.2.6 WAS Isolation Valve

Planned Work

Installation of a new 24-inch butterfly valve to allow isolation of approximately 1,700 feet of WAS line.

Constraints

Installation of the isolation valve requires shutdown, dewatering, and disassembling of the single WAS pipe serving the STS system. This work will interrupt WAS flow and the RAS flow since the WAS line is directly connected to the RAS manifold. It will be necessary to partially drain the RAS manifold, in addition to the WAS line, to allow the disassembly of the WAS line and installation of the new isolation valve.

The installation work must be scheduled with plant operation. It is likely the work will need to occur during a low flow period and when solids inventory in the Secondary Sedimentation Tanks can be managed without wasting of activated sludge for several hours while the valve is being installed. See Figure 3 for the WPTP shut down procedure as referenced from [WPTP: Process Shut Down Site - SDHome (sharepoint.com)].

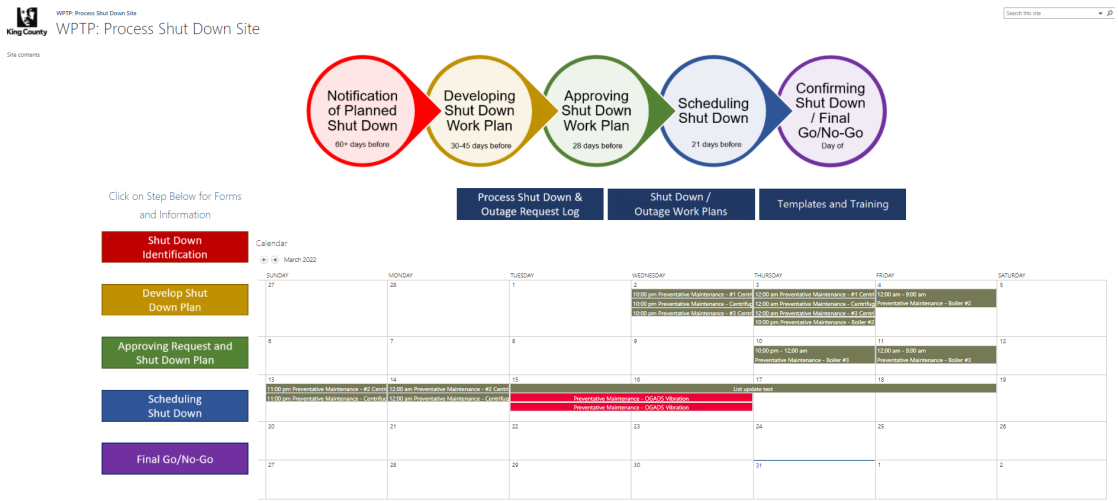


Figure 3 WPTP Process Shut Down Site

All materials needed for the work will need be on-site prior to any pipe being taken out-of-service. The period for a pipe to be taken out of service must account for time to dewater and clean the pipe. The work must account for the fact that isolation valves may have some leakage also.

3.1.2.7 Corrosion Monitoring for PE Headers for Aeration Tanks 2, 4, and 6

Planned Work

Installation of pipe-to-soil potential test stations for the PE header piping at Aeration Tanks 2, 4, and 6.

Constraints

This work requires the coating to be removed where the test lead wires are welded to the steel pipe and the coating repaired. This work will occur when the headers are being rehabilitated. Therefore, no special constraints exist to facilitate this work.

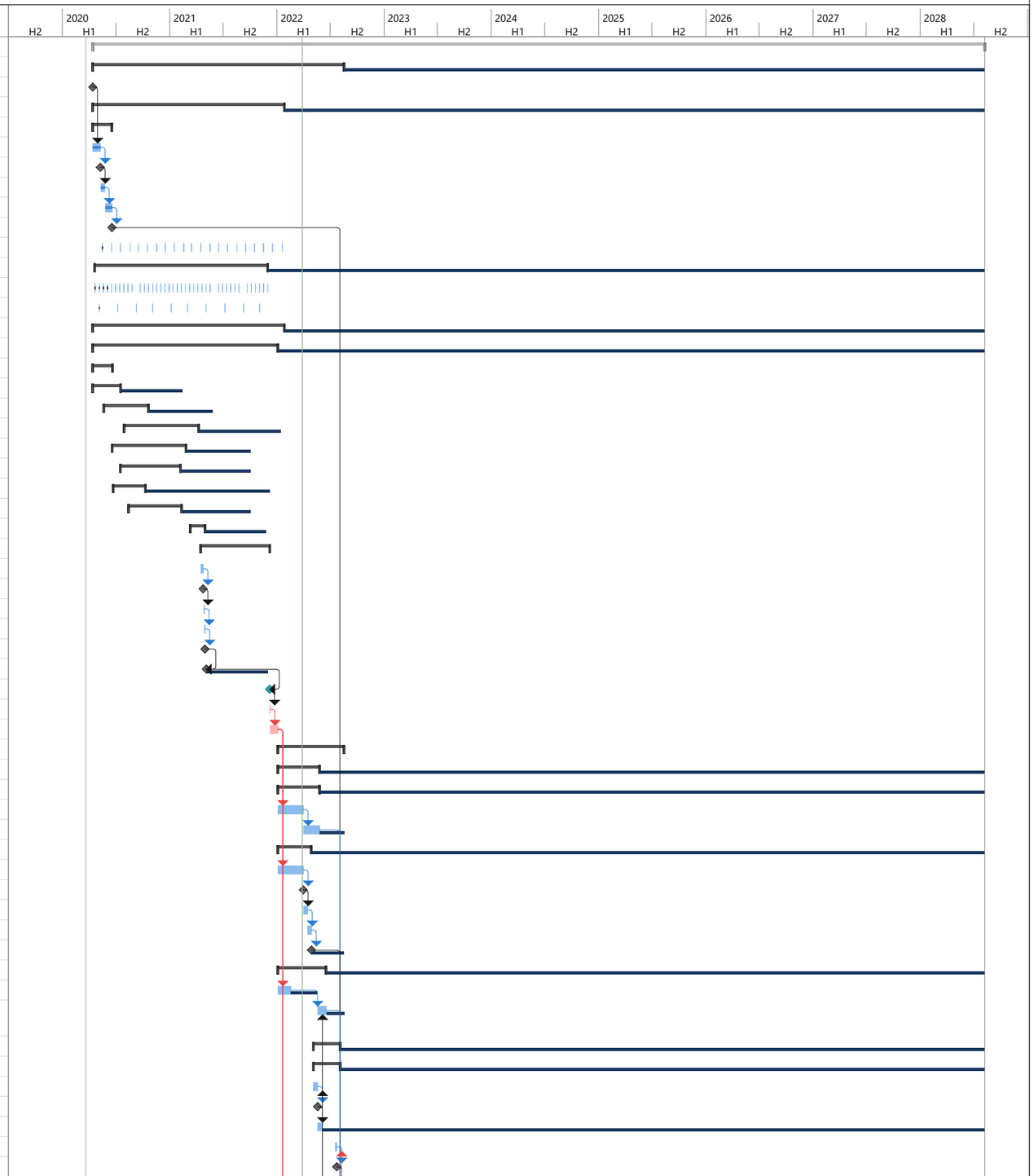
3.1.2.8 Seismic Structural Upgrades

Bracing and supports added for seismic bracing will be completed without the need to take a pipe out of service. However, work may impede access through the area and therefore will need to be coordinated with maintenance and operation.

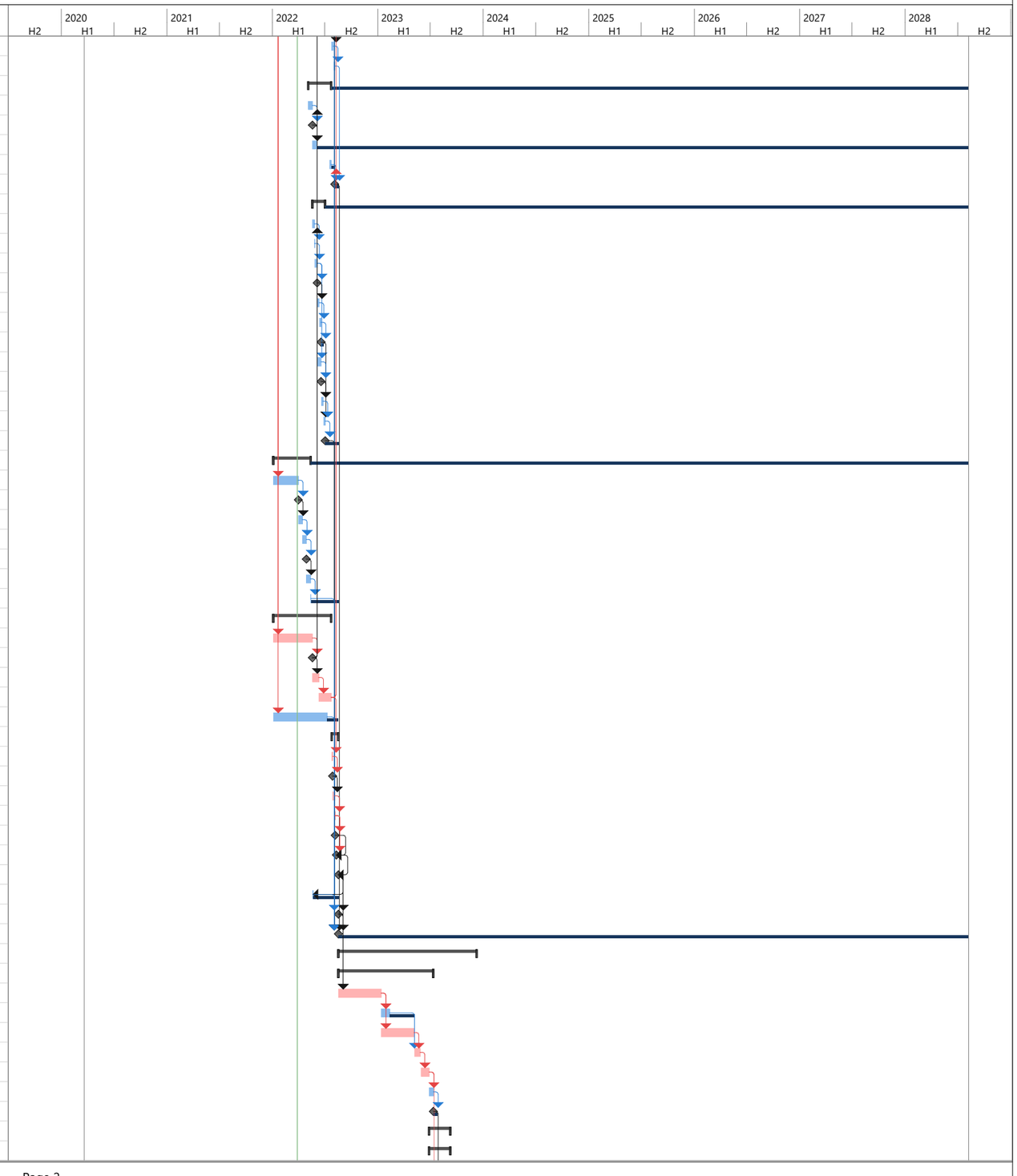
Appendix A

PROPOSED DESIGN SCHEDULE

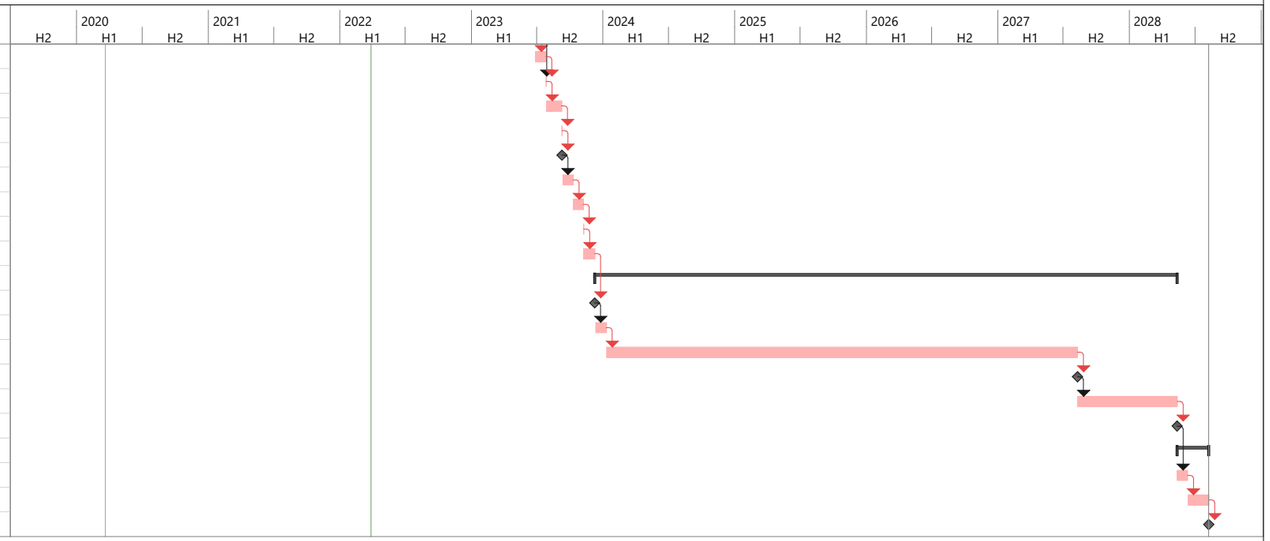
ID	WBS	Name	Duration	Start	Finish
0		**WPTP STS Pipeline Rehabilitation**	**2090 days**	**Mon 4/13/20**	**Mon 8/7/28**
1	**2**	**PHASE 2 - ALTERNATIVES ANALYSIS AND PRE-DESIGN**	**591 days**	**Mon 4/13/20**	**Tue 8/16/22**
2	2.001	Consultant Phase 2 NTP	0 days	Mon 4/13/20	Mon 4/13/20
3	**2.01**	**TASK 2000 - PROJECT MANAGEMENT**	**449 days**	**Mon 4/13/20**	**Tue 1/25/22**
4	**2.01.1**	**Subtask 2000.1 - Project Management Planning**	**46 days**	**Mon 4/13/20**	**Tue 6/16/20**
5	2.01.1.1	Develop Draft Project Management Plan (PMP)	20 days	Mon 4/13/20	Fri 5/8/20
6	2.01.1.2	Consultant Submits Draft PMP to KC	0 days	Fri 5/8/20	Fri 5/8/20
7	2.01.1.3	KC Review Period Draft PMP	10 days	Mon 5/11/20	Fri 5/22/20
8	2.01.1.4	Finalize PMP	16 days	Tue 5/26/20	Tue 6/16/20
9	2.01.1.5	Consultant Submits Final PMP to KC	0 days	Tue 6/16/20	Tue 6/16/20
10	**2.01.2**	**Subtask 2000.2 - Progress Reporting**	**420 days**	**Fri 5/15/20**	**Tue 1/18/22**
32	**2.01.3**	**Subtask 2000.3 - Project Progress Meetings**	**405 days**	**Mon 4/20/20**	**Mon 11/29/21**
33	**2.01.3.1**	**Bi-weekly Teleconference Progress Meeting**	**405 days**	**Mon 4/20/20**	**Mon 11/29/21**
74	**2.01.3.2**	**Bi-monthly In-Person Progress Meetings**	**378 days**	**Mon 5/4/20**	**Mon 11/1/21**
85	**2.01.4**	**Subtask 2000.4 - Project Schedule**	**449 days**	**Mon 4/13/20**	**Tue 1/25/22**
131	**2.1**	**PHASE 2A ALTERNATIVES ANALYSIS**	**434 days**	**Mon 4/13/20**	**Mon 1/3/22**
132	**2.1.1**	**TASK 2110 – PRELIMINARY BASIS OF DESIGN (BOD)**	**49 days**	**Mon 4/13/20**	**Fri 6/19/20**
138	**2.1.2**	**TASK 2120 – REVIEW EXISTING INFORMATION**	**67 days**	**Mon 4/13/20**	**Thu 7/16/20**
147	**2.1.3**	**TASK 2130 – PIPE INSPECTION**	**105 days**	**Thu 5/21/20**	**Mon 10/19/20**
206	**2.1.4**	**TASK 2140 – STS PIPELINE (RAS/PE/WAS) REHABILITATION**	**174 days**	**Wed 7/29/20**	**Thu 4/8/21**
259	**2.1.5**	**TASK 2150 – CATHODIC PROTECTION SYSTEM REHABILITATION**	**171 days**	**Thu 6/18/20**	**Wed 2/24/21**
287	**2.1.6**	**TASK 2160 – PIPE SUPPORT SEISMIC ANALYSIS**	**140 days**	**Thu 7/16/20**	**Fri 2/5/21**
302	**2.1.7**	**TASK 2170 – PERMITTING AND CULTURAL RESOURCES**	**78 days**	**Mon 6/22/20**	**Fri 10/9/20**
322	**2.1.8**	**TASK 2180 – CONSTRUCTION COST ESTIMATES AND SCHEDULING**	**122 days**	**Thu 8/13/20**	**Tue 2/9/21**
392	**2.1.9**	**TASK 2190 – STS PIPELINE REHAB ALTERNATIVES ANALYSIS SUMMARY TM**	**35 days**	**Fri 3/12/21**	**Thu 4/29/21**
398	**2.1.10**	**Gate 2**	**161 days**	**Fri 4/16/21**	**Tue 12/7/21**
399	2.1.10.1	Gate 2 Presentation Development	6 days	Fri 4/16/21	Fri 4/23/21
400	2.1.10.2	Submit Gate 2 Presentation/Documents	0 days	Fri 4/23/21	Fri 4/23/21
401	2.1.10.3	Management Review Gate 2 Presentation/Documents	2 days	Mon 4/26/21	Tue 4/27/21
402	2.1.10.4	Finalize Gate 2 Presentation/Document	2 days	Wed 4/28/21	Thu 4/29/21
403	2.1.10.5	Submit Gate Form to POB Coordinator	0 days	Thu 4/29/21	Thu 4/29/21
404	2.1.10.6	Submit Gate PPT to POB Coordinator	0 days	Tue 5/4/21	Tue 5/4/21
405	2.1.10.7	Gate 2 Approval (PRISM Milestone)	0 days	Tue 12/7/21	Tue 12/7/21
406	2.1.11	Alternative Analysis Phase Complete	1 day	Tue 12/7/21	Tue 12/7/21
407	2.1.12	Pre-Design NTP Issued (PRISM Milestone)	18 days	Wed 12/8/21	Mon 1/3/22
408	**2.2**	**PHASE 2B – PRELIMINARY DESIGN**	**157 days**	**Tue 1/4/22**	**Tue 8/16/22**
409	**2.2.1**	**TASK 2210 – PERMITTING AND CULTURAL RESOURCES**	**100 days**	**Tue 1/4/22**	**Wed 5/25/22**
410	**2.2.1.1**	**Subtask 2210.1 – Permitting Services and Regulatory Compliance**	**100 days**	**Tue 1/4/22**	**Wed 5/25/22**
411	2.2.1.1.1	Review Existing Background Information and Requirements	60 days	Tue 1/4/22	Wed 3/30/22
412	2.2.1.1.2	Develop Updated Permitting Matrix	40 days	Thu 3/31/22	Wed 5/25/22
413	**2.2.1.2**	**Subtask 2210.2 – Archeological and Cultural Resources Evaluation**	**80 days**	**Tue 1/4/22**	**Wed 4/27/22**
414	2.2.1.2.1	Develop Draft Archaeological Survey Reports	60 days	Tue 1/4/22	Wed 3/30/22
415	2.2.1.2.2	Consultant Submits Draft Archaeological Survey Reports to KC	0 days	Wed 3/30/22	Wed 3/30/22
416	2.2.1.2.3	KC Review Period Draft Archaeological Survey Reports	10 days	Thu 3/31/22	Wed 4/13/22
417	2.2.1.2.4	Finalize Archaeological Survey Reports	10 days	Thu 4/14/22	Wed 4/27/22
418	2.2.1.2.5	Consultant Submits Final Archaeological Survey Reports	0 days	Wed 4/27/22	Wed 4/27/22
419	**2.2.2**	**TASK 2220 – SUSTAINABILITY, EQUITY, AND SOCIAL JUSTICE (ESJ)**	**115 days**	**Tue 1/4/22**	**Thu 6/16/22**
420	2.2.2.1	Review Existing KC Sustainability Legislation	30 days	Tue 1/4/22	Tue 2/15/22
421	2.2.2.2	Provide Input on Baseline Sustainable Infrastructure Scorecard and ESJ Assessment and Action Plan	20 days	Thu 5/19/22	Thu 6/16/22
422	**2.2.3**	**TASK 2230 – COST ESTIMATING AND SCHEDULING**	**63 days**	**Thu 5/5/22**	**Wed 8/3/22**
423	**2.2.3.1**	**Cost Estimates**	**63 days**	**Thu 5/5/22**	**Wed 8/3/22**
424	2.2.3.1.1	Develop Basis of Estimate and WTD Class 3 Estimate - Baseline	10 days	Thu 5/5/22	Wed 5/18/22
425	2.2.3.1.2	Submit Draft BOE and and Cost Estimate	0 days	Wed 5/18/22	Wed 5/18/22
426	2.2.3.1.3	KC Review Draft BOE and Cost Estimate	10 days	Thu 5/19/22	Thu 6/2/22
427	2.2.3.1.4	Finalize BOE and Cost Estimate	5 days	Mon 7/18/22	Fri 7/22/22
428	2.2.3.1.5	Submit Draft Final BOE and and Cost Estimate	0 days	Fri 7/22/22	Fri 7/22/22



ID	WBS	Name	Duration	Start	Finish
429	2.2.3.1.6	KC Review Draft Final BOE and Cost Estimate	5 days	Mon 7/25/22	Fri 7/29/22
430	2.2.3.1.7	Finalize Final BOE and and Cost Estimate	3 days	Mon 8/1/22	Wed 8/3/22
431	**2.2.3.2**	**Construction Schedule**	**55 days**	**Thu 5/5/22**	**Fri 7/22/22**
432	2.2.3.2.1	Develop Preliminary Construction Implementation Schedule	10 days	Thu 5/5/22	Wed 5/18/22
433	2.2.3.2.2	Submit Draft Schedule	0 days	Wed 5/18/22	Wed 5/18/22
434	2.2.3.2.3	KC Review Draft Schedule	10 days	Thu 5/19/22	Thu 6/2/22
435	2.2.3.2.4	Finalize Schedule	5 days	Mon 7/18/22	Fri 7/22/22
436	2.2.3.3	Submit Cost Estimate and Construction Schedule	0 days	Wed 8/3/22	Wed 8/3/22
437	**2.2.4**	**TASK 2240 – PROJECT RISK ANALYSIS AND RISK MANAGEMENT**	**31 days**	**Thu 5/19/22**	**Fri 7/1/22**
438	2.2.4.1	Coordination for Risk Workshop	5 days	Thu 5/19/22	Wed 5/25/22
439	2.2.4.2	Conduct Risk Workshop	1 day	Thu 5/26/22	Thu 5/26/22
440	2.2.4.3	Develop Draft Project Risk Register	5 days	Fri 5/27/22	Fri 6/3/22
441	2.2.4.4	Submit Draft Risk Register to KC	0 days	Fri 6/3/22	Fri 6/3/22
442	2.2.4.5	KC to Review Draft Risk Register	5 days	Mon 6/6/22	Fri 6/10/22
443	2.2.4.6	Finalize Risk Register	5 days	Mon 6/13/22	Fri 6/17/22
444	2.2.4.7	Submit Final Risk Register	0 days	Fri 6/17/22	Fri 6/17/22
445	2.2.4.8	Develop Draft Risk Analysis TM	10 days	Mon 6/6/22	Fri 6/17/22
446	2.2.4.9	Submit Draft Risk Analysis TM to KC	0 days	Fri 6/17/22	Fri 6/17/22
447	2.2.4.10	KC to Review Draft Risk Analysis TM	5 days	Mon 6/20/22	Fri 6/24/22
448	2.2.4.11	Finalize Risk Analysis TM	5 days	Mon 6/27/22	Fri 7/1/22
449	2.2.4.12	Submit Final Risk Analysis TM	0 days	Fri 7/1/22	Fri 7/1/22
450	**2.2.5**	**TASK 2250 – UPDATED BASIS OF DESIGN FOR THE PREFERRED ALTERNATIVE**	**91 days**	**Tue 1/4/22**	**Thu 5/12/22**
451	2.2.5.1	Develop Draft Basis of Design (BOD) Report	60 days	Tue 1/4/22	Wed 3/30/22
452	2.2.5.2	Submit Draft BOD Report to KC	0 days	Wed 3/30/22	Wed 3/30/22
453	2.2.5.3	KC to Review Draft BOD Report	10 days	Thu 3/31/22	Wed 4/13/22
454	2.2.5.4	Finalize BOD Report	10 days	Thu 4/14/22	Wed 4/27/22
455	2.2.5.5	Submit Final BOD Report	0 days	Wed 4/27/22	Wed 4/27/22
456	2.2.5.6	Preferred Alternative Summary Presentation Preparation	10 days	Thu 4/28/22	Wed 5/11/22
457	2.2.5.7	Conduct Preferred Alternative Summary Presentation	1 day	Thu 5/12/22	Thu 5/12/22
458	**2.2.6**	**TASK 2260 – STS PIPELINES (RAS, PE, WAS) REHABILITATION BASELINE DESIGN**	**140 days**	**Tue 1/4/22**	**Fri 7/22/22**
459	2.2.6.1	Develop Draft Baseline Design Documents - 30% Level	95 days	Tue 1/4/22	Wed 5/18/22
460	2.2.6.2	Consultant Submits Draft Baseline Design Documents to KC	0 days	Wed 5/18/22	Wed 5/18/22
461	2.2.6.3	KC Review Period Draft Baseline Design Documents	15 days	Thu 5/19/22	Thu 6/9/22
462	2.2.6.4	Finalize Draft Baseline Design Documents	30 days	Fri 6/10/22	Fri 7/22/22
463	2.2.7	TASK 2300 - UNPLANNED AND UNANTICIPATED SERVICES	130 days	Tue 1/4/22	Fri 7/8/22
464	**2.2.8**	**Gate 3**	**17 days**	**Mon 7/25/22**	**Tue 8/16/22**
465	2.2.8.1	Gate 3 Presentation Development	3 days	Mon 7/25/22	Wed 7/27/22
466	2.2.8.2	Submit Gate 3 Presentation/Documents	0 days	Wed 7/27/22	Wed 7/27/22
467	2.2.8.3	Management Review Gate 3 Presentation/Documents	5 days	Thu 7/28/22	Wed 8/3/22
468	2.2.8.4	Finalize Gate 3 Presentation/Document	2 days	Thu 8/4/22	Fri 8/5/22
469	2.2.8.5	Submit Gate Form to POB Coordinator	0 days	Fri 8/5/22	Fri 8/5/22
470	2.2.8.6	Submit Gate PPT to POB Coordinator	0 days	Tue 8/9/22	Tue 8/9/22
471	2.2.8.7	Gate 3 Approval (PRISM Milestone)	0 days	Tue 8/16/22	Tue 8/16/22
472	2.2.9	Final Design Negotiations Started	1 day	Fri 5/20/22	Fri 5/20/22
473	2.2.10	Final Design NTP (PRISM Milestone)	0 days	Tue 8/16/22	Tue 8/16/22
474	2.3	Phase 2 Complete	0 days	Tue 8/16/22	Tue 8/16/22
475	**3**	**PHASE 3 – FINAL DESIGN**	**329 days**	**Wed 8/17/22**	**Fri 12/8/23**
476	**3.1**	**FINAL DESIGN DEVELOPMENT**	**225 days**	**Wed 8/17/22**	**Tue 7/11/23**
477	3.1.1	60% Design Development	100 days	Wed 8/17/22	Wed 1/11/23
478	3.1.2	60% Design Review and Meeting	20 days	Thu 1/12/23	Thu 2/9/23
479	3.1.3	90% Design Development	80 days	Thu 1/12/23	Fri 5/5/23
480	3.1.4	90% Design Review and Meeting	15 days	Mon 5/8/23	Fri 5/26/23
481	3.1.5	100% Design Development	20 days	Tue 5/30/23	Mon 6/26/23
482	3.1.6	100% Design Package Confirmed	10 days	Tue 6/27/23	Tue 7/11/23
483	3.1.7	Final Design Phase Complete	0 days	Tue 7/11/23	Tue 7/11/23
484	**3.2**	**PROCURE CONSTRUCTION CONTRACTOR**	**52 days**	**Tue 6/27/23**	**Fri 9/8/23**
485	**3.2.1**	**Bid Package Preparation**	**52 days**	**Tue 6/27/23**	**Fri 9/8/23**



ID	WBS	Name	Duration	Start	Finish
486	3.2.1.1	Prepare and Submit ITB Form	20 days	Tue 6/27/23	Tue 7/25/23
487	3.2.1.2	Upload ITB Package	1 day	Wed 7/26/23	Wed 7/26/23
488	3.2.1.3	ITB Package Review	30 days	Thu 7/27/23	Thu 9/7/23
489	3.2.1.4	PM Approval of ITB	1 day	Fri 9/8/23	Fri 9/8/23
490	3.3	Construction Advertise (PRISM Milestone)	0 days	Fri 9/8/23	Fri 9/8/23
491	3.4	Advertise	21 days	Mon 9/11/23	Mon 10/9/23
492	3.5	Bid Evaluation	20 days	Tue 10/10/23	Mon 11/6/23
493	3.6	Notice of Award	1 day	Tue 11/7/23	Tue 11/7/23
494	3.7	Contract Execution	20 days	Wed 11/8/23	Fri 12/8/23
495	**4**	**PHASE 4 – IMPLEMENTATION**	**1110 days**	**Fri 12/8/23**	**Thu 5/11/28**
496	4.1	Construction NTP (PRISM Milestone)	0 days	Fri 12/8/23	Fri 12/8/23
497	4.2	Preconstruction	20 days	Mon 12/11/23	Tue 1/9/24
498	4.3	Construction	900 days	Wed 1/10/24	Mon 8/9/27
499	4.4	Substantial Completion Achieved (PRISM Milestone)	0 days	Mon 8/9/27	Mon 8/9/27
500	4.5	Punch lists, As Builts, Contractor Closeout	190 days	Tue 8/10/27	Thu 5/11/28
501	4.6	Final Acceptance Achieved (PRISM Milestone)	0 days	Thu 5/11/28	Thu 5/11/28
502	**5**	**PHASE 5 – CLOSEOUT**	**60 days**	**Fri 5/12/28**	**Mon 8/7/28**
503	5.1	Lessons Learned	20 days	Fri 5/12/28	Fri 6/9/28
504	5.2	Project Closeout	40 days	Mon 6/12/28	Mon 8/7/28
505	6	Project Complete	0 days	Mon 8/7/28	Mon 8/7/28

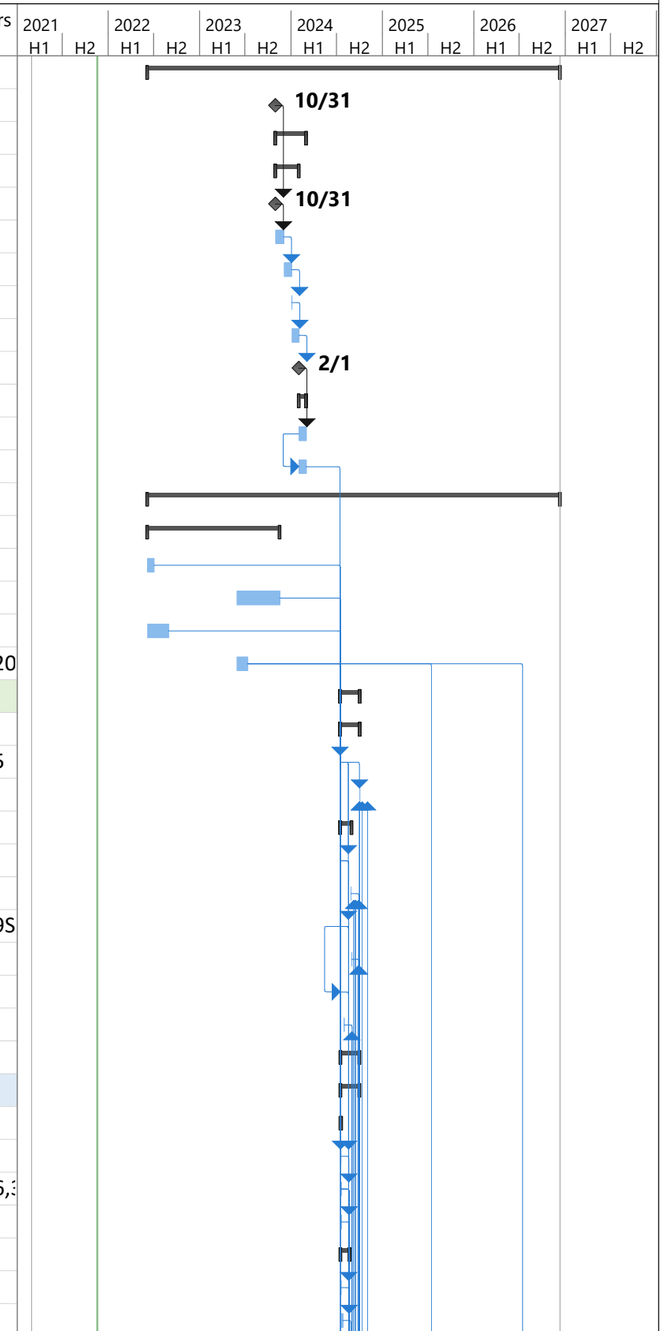


Appendix B

ESTIMATED CONSTRUCTION SCHEDULE

WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
1		**WPTP STS Pipe Rehabilitation Construction Schedule**	**1134 days**	**Mon 6/6/22**	**Thu 12/10/26**		
2	1	PM Approval of Issue to Bid (ITB) Package	0 days	Tue 10/31/23	Tue 10/31/23		5
3	**2**	**Pre-Construction**	**82 days**	**Tue 10/31/23**	**Fri 3/1/24**		
4	**2.1**	**Contractor Procurement**	**62 days**	**Tue 10/31/23**	**Thu 2/1/24**		
5	2.1.1	Construction Advertise (PRISM Milestone)	0 days	Tue 10/31/23	Tue 10/31/23	2	6
6	2.1.2	Advertise	21 days	Tue 10/31/23	Fri 12/1/23	5	7
7	2.1.3	Bid Evaluation	20 days	Mon 12/4/23	Tue 1/2/24	6	8
8	2.1.4	Notice of Award	1 day	Wed 1/3/24	Wed 1/3/24	7	9
9	2.1.5	Contract Execution	20 days	Thu 1/4/24	Thu 2/1/24	8	10
10	2.1.6	Contractor NTP (PRISM Milestone)	0 days	Thu 2/1/24	Thu 2/1/24	9	12
11	**2.2**	**Submittals and Material Procurement**	**20 days**	**Fri 2/2/24**	**Fri 3/1/24**		
12	2.2.1	Initial (Year 1) Contractor Submittals Review and Approval	20 days	Fri 2/2/24	Fri 3/1/24	10	13SS
13	2.2.2	Initial (Year 1) Material and Equipment Procurement	20 days	Fri 2/2/24	Fri 3/1/24	12SS	22
14	**3**	**Construction**	**1134 days**	**Mon 6/6/22**	**Thu 12/10/26**		
15	**3.1**	**External Project Coordination Placeholders**	**366 days**	**Mon 6/6/22**	**Thu 11/16/23**		
16	3.1.1	IPS Pump Re-Build (IPS Pump 1 Suction Elbow Coordination)	20 days	Mon 6/6/22	Fri 7/1/22		83
17	3.1.2	Electrical Upgrades (IPS Pump 1 Suction Elbow Coordination)	120 days	Mon 5/29/23	Thu 11/16/23		83
18	3.1.3	IPS Pumps 1-3 Rebuild	60 days	Mon 6/6/22	Mon 8/29/22		83
19	3.1.4	Mixer Project (Crane coordination)	30 days	Mon 5/29/23	Tue 7/11/23		34,136,20
20	**3.2**	**Year 1 Construction Work Window**	**56 days**	**Mon 7/15/24**	**Tue 10/1/24**		
21	**3.2.1**	**Mobilization, Safety and Demobilization**	**56 days**	**Mon 7/15/24**	**Tue 10/1/24**		
22	3.2.1.1	Year 1 Mobilization and Safety	1 day	Mon 7/15/24	Mon 7/15/24	13	23,27,25
23	3.2.1.2	Year 1 Demobilization	1 day	Tue 10/1/24	Tue 10/1/24	22,74,53,94,1	
24	**3.2.2**	**KC Owner Work**	**34 days**	**Tue 7/16/24**	**Fri 8/30/24**		
25	3.2.2.1	Bring IPS Offline - Close Isolation Valves, Lockout/Tagout	1 day	Tue 7/16/24	Tue 7/16/24	22	83,97
26	3.2.2.2	Restore Isolation Measures & Place IPS Back In Service	1 day	Tue 8/27/24	Tue 8/27/24	109,114,91,9	123
27	3.2.2.3	Remove AT1&2 from Service - Close Isolation Valves, Lock-out/Tag-out	1 day	Tue 7/16/24	Tue 7/16/24	22	34,38,29S
28	3.2.2.4	Remove Isolation Measures - Bring AT1&2 into Service	1 day	Fri 8/30/24	Fri 8/30/24	49,73	123
29	3.2.2.5	SST RAS PS6 - Close Isolation Valves and Lockout/Tagout Pump and Valves	1 day	Tue 7/16/24	Tue 7/16/24	27SS	117
30	3.2.2.6	SST RAS PS6 - Remove Isolation Measures - Bring into Service	1 day	Tue 7/30/24	Tue 7/30/24	119	123
31	**3.2.3**	**Primary Effluent at Aeration Trains**	**53 days**	**Wed 7/17/24**	**Mon 9/30/24**		
32	**3.2.3.1**	**AT 1 42-inch PE Header - Structural Epoxy Liner & Isolation Valve Install**	**53 days**	**Wed 7/17/24**	**Mon 9/30/24**		
33	**3.2.3.1.1**	**Demolition**	**3 days**	**Wed 7/17/24**	**Fri 7/19/24**		
34	3.2.3.1.1.1	Remove Valve at First Cell, Install Suction Hose to Sump Pump, Dewater Riser	1 day	Wed 7/17/24	Wed 7/17/24	27,19	35
35	3.2.3.1.1.2	Remove Valves for Access/Replacement	1 day	Thu 7/18/24	Thu 7/18/24	34	39,56,46,3
36	3.2.3.1.1.3	Rust Removal Per Seismic Upgrades Scope	1 day	Fri 7/19/24	Fri 7/19/24	35	41
37	**3.2.3.1.10**	**New Work**	**27 days**	**Wed 7/17/24**	**Thu 8/22/24**		
38	3.2.3.1.10.1	Install Scaffolding	2 days	Wed 7/17/24	Thu 7/18/24	27	62
39	3.2.3.1.10.2	Holiday Testing/Touch-up Work	5 days	Fri 7/19/24	Thu 7/25/24	35	40

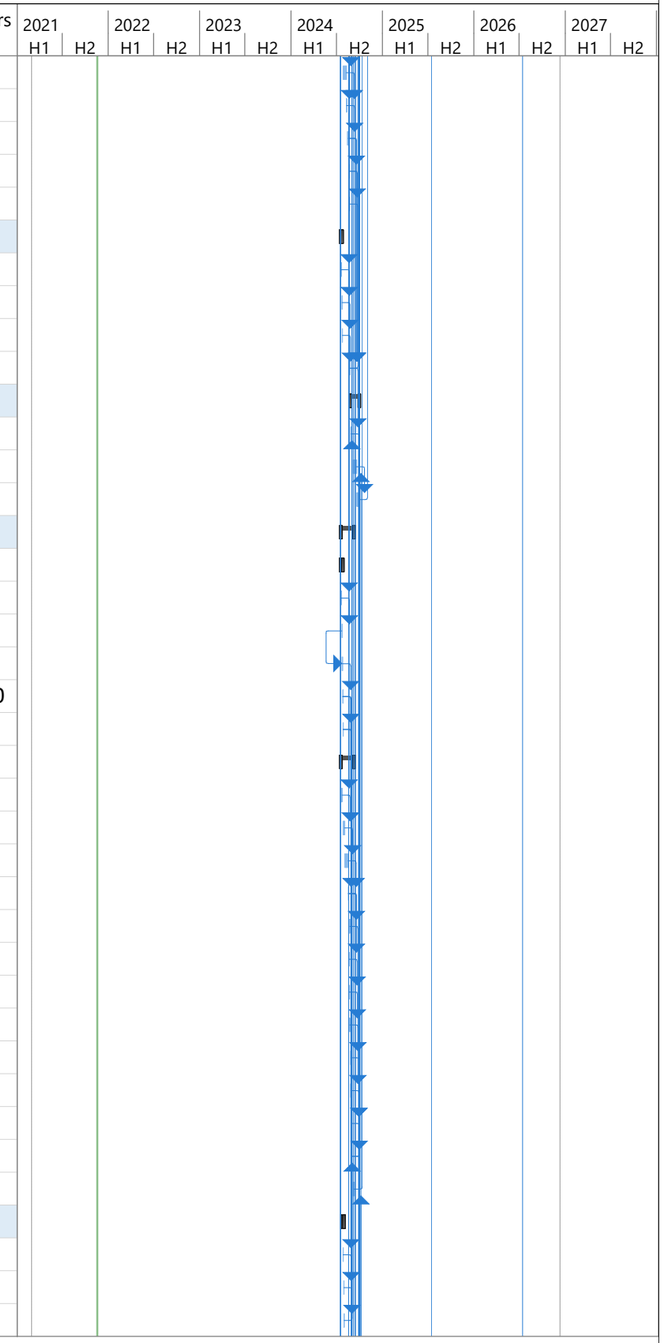


Project: WPTP STS Predesign Phase

Task | Milestone | Summary | Project Summary

WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
40	3.2.3.1.10.3	Prep Surface / Apply Epoxy Coating	10 days	Fri 7/26/24	Thu 8/8/24	39	41
41	3.2.3.1.10.4	Prep and Paint Existing Pipe Supports	1 day	Fri 8/9/24	Fri 8/9/24	36,40	42
42	3.2.3.1.10.5	Install New 42-inch BFVs	5 days	Mon 8/12/24	Fri 8/16/24	41	49,43
43	3.2.3.1.10.6	Install New Stage 1 Mixer Downstream Isolation Valve, Flanges, Isolation Joint	2 days	Mon 8/19/24	Tue 8/20/24	42	44,49
44	3.2.3.1.10.7	Remove Scaffolding	2 days	Wed 8/21/24	Thu 8/22/24	43	49
45	**3.2.3.1.11**	**PE and RAS Magnetic Flow Meter Replacements**	**3 days**	**Fri 7/19/24**	**Tue 7/23/24**		
46	3.2.3.1.11.1	Remove Existing Flow Meters	1 day	Fri 7/19/24	Fri 7/19/24	35	47
47	3.2.3.1.11.2	Clean Existing Location and Prep Surface for Install	1 day	Mon 7/22/24	Mon 7/22/24	46	48
48	3.2.3.1.11.3	Install New Mag Flow Meters	1 day	Tue 7/23/24	Tue 7/23/24	47	49
49	3.2.3.1.12	Fill and Pressure Test Against Closed Valves	1 day	Fri 8/23/24	Fri 8/23/24	42,43,44,48	28,51
50	**3.2.3.1.13**	**Pipe Supports and Seismic Restraints**	**25 days**	**Mon 8/26/24**	**Mon 9/30/24**		
51	3.2.3.1.13.1	Install Seismic Upgrades at PE AT 1	3 days	Mon 8/26/24	Wed 8/28/24	49,119	80
52	3.2.3.1.13.1	Install Seismic Upgrades at RAS Pump Stations	10 days	Thu 9/5/24	Wed 9/18/24	80	53
53	3.2.3.1.13.1	Install Seismic Upgrades at East/West Influent Equipment Rooms	8 days	Thu 9/19/24	Mon 9/30/24	52	23
54	**3.2.3.2**	**AT 2 42-inch PE Header - Structural Epoxy Liner & Isolation Valve Install**	**36 days**	**Fri 7/19/24**	**Mon 9/9/24**		
55	**3.2.3.2.1**	**Demolition**	**6 days**	**Fri 7/19/24**	**Fri 7/26/24**		
56	3.2.3.2.1.1	Remove Hatch Cover to Valve Vault	1 day	Fri 7/19/24	Fri 7/19/24	35	57
57	3.2.3.2.1.2	Remove Valve at First Cell, Install Suction Hose to Sump Pump, Dewater Riser	1 day	Mon 7/22/24	Mon 7/22/24	56	58SS
58	3.2.3.2.1.3	Expose Line	3 days	Mon 7/22/24	Wed 7/24/24	57SS	59
59	3.2.3.2.1.4	Remove Valves for Access/Replacement	1 day	Thu 7/25/24	Thu 7/25/24	58	63,76,60
60	3.2.3.2.1.5	Rust Removal Per Seismic Upgrades Scope	1 day	Fri 7/26/24	Fri 7/26/24	59	65,121
61	**3.2.3.2.10**	**New Work**	**36 days**	**Fri 7/19/24**	**Mon 9/9/24**		
62	3.2.3.2.10.1	Install Scaffolding	2 days	Fri 7/19/24	Mon 7/22/24	38	63
63	3.2.3.2.10.2	Holiday Testing / Touch-up Work	5 days	Fri 7/26/24	Thu 8/1/24	62,59	64
64	3.2.3.2.10.3	Prep Surface / Apply Epoxy Coating	10 days	Fri 8/2/24	Thu 8/15/24	63	65
65	3.2.3.2.10.4	Prep and Paint Existing Pipe Supports Per Seismic Scope	1 day	Fri 8/16/24	Fri 8/16/24	60,64	66,67
66	3.2.3.2.10.5	Install New 42-inch BFVs	5 days	Mon 8/19/24	Fri 8/23/24	65	71
67	3.2.3.2.10.6	Install New Stage 1 Mixer Downstream Isolation Valve, Flanges, Isolation Joint	2 days	Mon 8/19/24	Tue 8/20/24	65	68
68	3.2.3.2.10.7	Isolation Valve Bonding Cables and Pipe Re-Coat (Including Valve)	1 day	Wed 8/21/24	Wed 8/21/24	67	69
69	3.2.3.2.10.8	FRP New Vault for Downstream Isolation Valve	2 days	Thu 8/22/24	Fri 8/23/24	68	70
70	3.2.3.2.10.9	Remove Vault Formwork, Install Channel Drain, Cleaning	2 days	Mon 8/26/24	Tue 8/27/24	69	72
71	3.2.3.2.10.1	Remove Scaffolding	2 days	Mon 8/26/24	Tue 8/27/24	66	72
72	3.2.3.2.10.1	Re-install Hatch Cover to Valve Vault	1 day	Wed 8/28/24	Wed 8/28/24	71,70	73
73	3.2.3.2.10.1	Fill and Pressure Test Against Closed Valves	1 day	Thu 8/29/24	Thu 8/29/24	72,78	28,80
74	3.2.3.2.10.1	Backfill and Compact	3 days	Thu 9/5/24	Mon 9/9/24	80	23
75	**3.2.3.2.11**	**PE and RAS Magnetic Flow Meter Replacement**	**3 days**	**Fri 7/26/24**	**Tue 7/30/24**		
76	3.2.3.2.11.1	Remove Existing Flow Meters	1 day	Fri 7/26/24	Fri 7/26/24	59	77
77	3.2.3.2.11.2	Clean Existing Location and Prep Surface for Install	1 day	Mon 7/29/24	Mon 7/29/24	76	78
78	3.2.3.2.11.3	Install New Mag Flow Meter	1 day	Tue 7/30/24	Tue 7/30/24	77	73

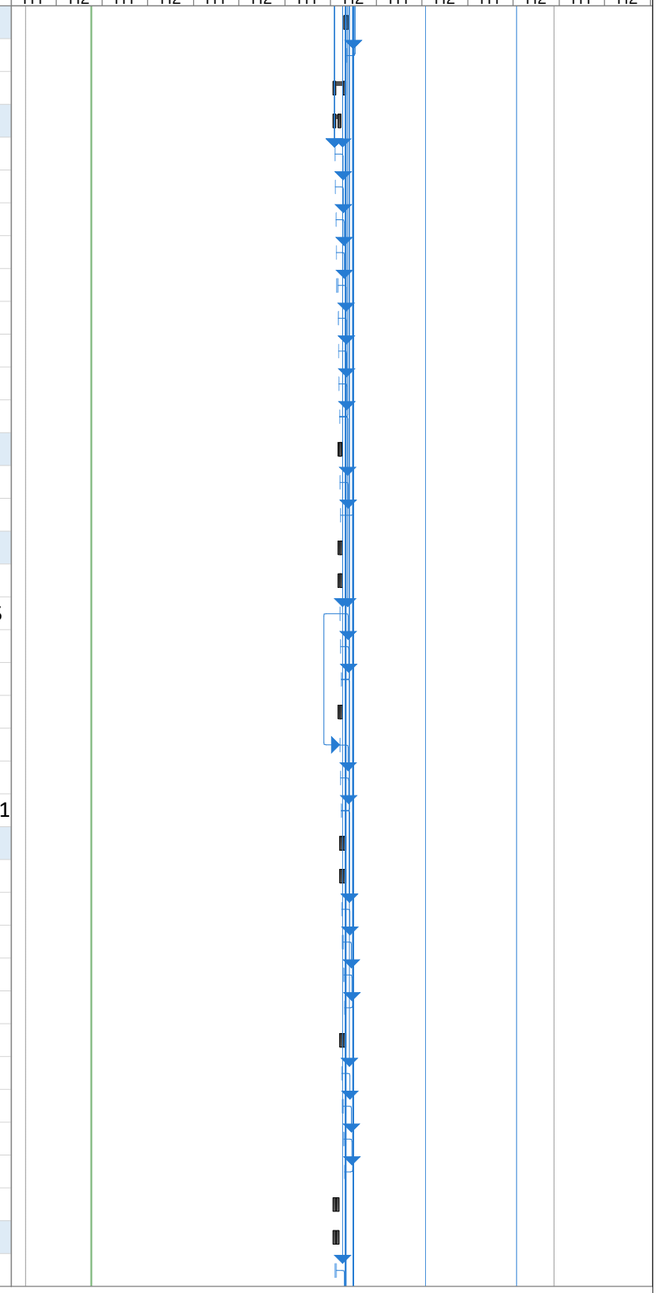


Project: WPTP STS Predesign Phase

Task | Milestone | Summary | Project Summary

WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
79	**3.2.3.2.12**	**Pipe Supports and Seismic Restraints**	**3 days**	**Fri 8/30/24**	**Wed 9/4/24**		
80	3.2.3.2.12.1	Install Seismic Upgrades at PE AT 2	3 days	Fri 8/30/24	Wed 9/4/24	73,51	52,74
81	**3.2.4**	**Intermediate Pump Station - Pump Room**	**29 days**	**Wed 7/17/24**	**Mon 8/26/24**		
82	**3.2.4.1**	**Pump No. 1 Suction Elbow - Butt Strap and Coating**	**14 days**	**Wed 7/17/24**	**Mon 8/5/24**		
83	3.2.4.1.1	Concrete Demo	2 days	Wed 7/17/24	Thu 7/18/24	25,16,17,18	84
84	3.2.4.1.2	Install Inflatable Plug	1 day	Fri 7/19/24	Fri 7/19/24	83	85
85	3.2.4.1.3	Remove Knife Gate Valve	1 day	Mon 7/22/24	Mon 7/22/24	84	86
86	3.2.4.1.4	Prepare Pipe Surface for Epoxy and Butt Strap	1 day	Tue 7/23/24	Tue 7/23/24	85	87
87	3.2.4.1.5	Apply Exterior Epoxy Lining	5 days	Wed 7/24/24	Tue 7/30/24	86	88
88	3.2.4.1.6	Install Butt Strap	1 day	Wed 7/31/24	Wed 7/31/24	87	89
89	3.2.4.1.7	Replace Knife Gate Valve	1 day	Thu 8/1/24	Thu 8/1/24	88	90
90	3.2.4.1.8	Fill and Pressure Test Against Plug	1 day	Fri 8/2/24	Fri 8/2/24	89	91
91	3.2.4.1.9	Remove Inflatable Plug	1 day	Mon 8/5/24	Mon 8/5/24	90	26,93,97
92	**3.2.4.2**	**Pumps No. 1-3 - Install Drain Holes in Catacomb Areas**	**4 days**	**Tue 8/6/24**	**Fri 8/9/24**		
93	3.2.4.2.1	X-Ray Walls	2 days	Tue 8/6/24	Wed 8/7/24	91	94
94	3.2.4.2.2	Concrete Core Drill Work	2 days	Thu 8/8/24	Fri 8/9/24	93	23
95	**3.2.4.3**	**Pumps No. 2 & 3 Suction Elbow Rehab - High Build Epoxy**	**5 days**	**Tue 8/6/24**	**Mon 8/12/24**		
96	**3.2.4.3.1**	**Pump No. 1 Suction Elbow Rehab**	**5 days**	**Tue 8/6/24**	**Mon 8/12/24**		
97	3.2.4.3.1.1	Prepare Surfaces for Epoxy	2 days	Tue 8/6/24	Wed 8/7/24	25,91	98,101SS
98	3.2.4.3.1.2	Apply Epoxy Patching Compound and Coating	2 days	Thu 8/8/24	Fri 8/9/24	97	99
99	3.2.4.3.1.3	Fill and Pressure Test	1 day	Mon 8/12/24	Mon 8/12/24	98	26,106
100	**3.2.4.3.2**	**Pump No. 2 Suction Elbow Rehab**	**5 days**	**Tue 8/6/24**	**Mon 8/12/24**		
101	3.2.4.3.2.1	Prepare Surfaces for Epoxy	2 days	Tue 8/6/24	Wed 8/7/24	97SS	102
102	3.2.4.3.2.2	Apply Epoxy Patching Compound and Coating	2 days	Thu 8/8/24	Fri 8/9/24	101	103
103	3.2.4.3.2.3	Fill and Pressure Test	1 day	Mon 8/12/24	Mon 8/12/24	102	26,106,11
104	**3.2.4.4**	**Pumps No. 1 & 2 Discharge - Epoxy Resin External Repairs**	**10 days**	**Tue 8/13/24**	**Mon 8/26/24**		
105	**3.2.4.4.1**	**Pump No. 1 - External Repair**	**10 days**	**Tue 8/13/24**	**Mon 8/26/24**		
106	3.2.4.4.1.1	Clean and Prepare Pipe	2 days	Tue 8/13/24	Wed 8/14/24	99,103	107
107	3.2.4.4.1.2	Wrap Pipe	5 days	Thu 8/15/24	Wed 8/21/24	106	108
108	3.2.4.4.1.3	Apply Epoxy & Cure	2 days	Thu 8/22/24	Fri 8/23/24	107	109
109	3.2.4.4.1.4	Testing and Inspections	1 day	Mon 8/26/24	Mon 8/26/24	108	26
110	**3.2.4.4.2**	**Pump No. 2 - External Repair**	**10 days**	**Tue 8/13/24**	**Mon 8/26/24**		
111	3.2.4.4.2.1	Clean and Prepare Pipe	2 days	Tue 8/13/24	Wed 8/14/24	103	112
112	3.2.4.4.2.2	Wrap Pipe	5 days	Thu 8/15/24	Wed 8/21/24	111	113
113	3.2.4.4.2.3	Apply Epoxy & Cure	2 days	Thu 8/22/24	Fri 8/23/24	112	114
114	3.2.4.4.2.4	Testing and Inspections	1 day	Mon 8/26/24	Mon 8/26/24	113	26
115	**3.2.5**	**Primary Effluent at Secondary Sediment Tank Galleries**	**9 days**	**Wed 7/17/24**	**Mon 7/29/24**		
116	**3.2.5.1**	**SST Galleries - RAS at Pump Station 6 - Epoxy Resin Elbow Repairs**	**9 days**	**Wed 7/17/24**	**Mon 7/29/24**		
117	3.2.5.1.1	Prep Elbows, 18" DIA	5 days	Wed 7/17/24	Tue 7/23/24	29	118



WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

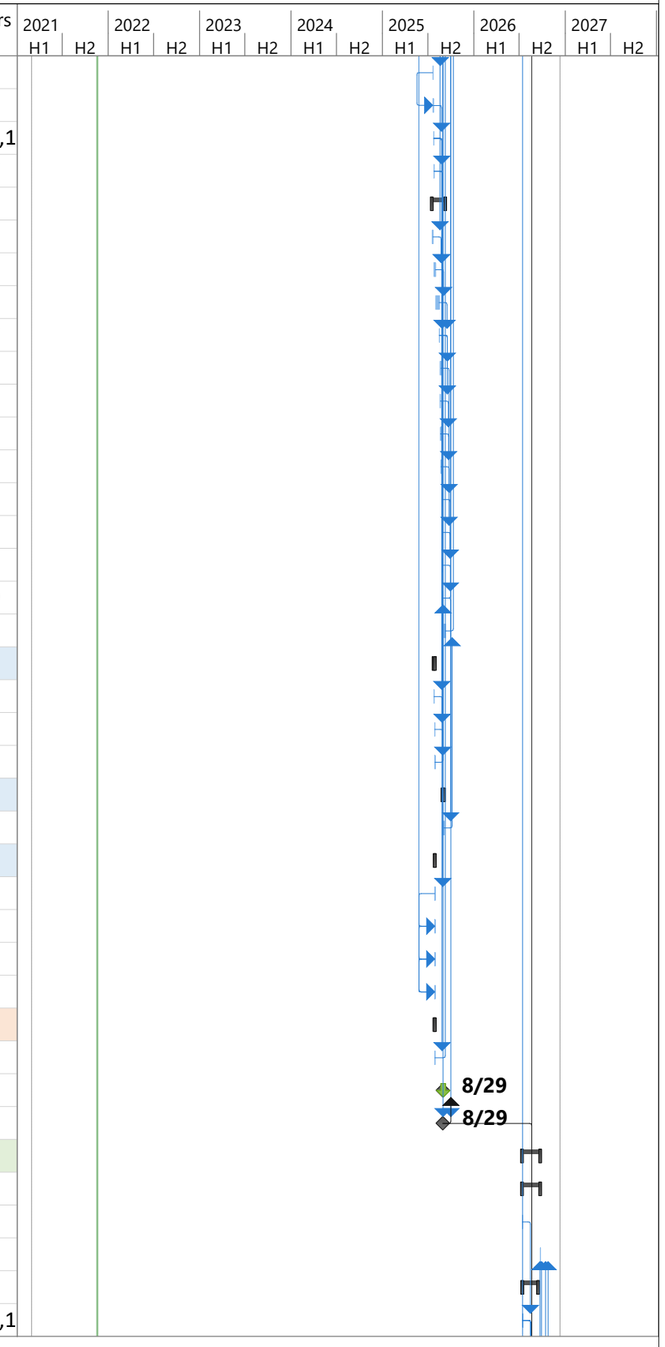
ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
118	3.2.5.1.2	Condition Assessment of Riser Pipe	1 day	Wed 7/24/24	Wed 7/24/24	117	119
119	3.2.5.1.3	Epoxy Resin Application and Cure	3 days	Thu 7/25/24	Mon 7/29/24	118	30,127,51
120	**3.2.6**	**Cathodic Protection**	**2 days**	**Mon 7/29/24**	**Tue 7/30/24**		
121	3.2.6.1	Install Test Stations at AT 2	2 days	Mon 7/29/24	Tue 7/30/24	60	23
122	3.2.7	Year 1 Dry Season Deadline (8/31/24)	0 days	Fri 8/30/24	Fri 8/30/24	123	
123	3.2.8	Year 1 Substantial Completion	0 days	Fri 8/30/24	Fri 8/30/24	28,30,26	122,261
124	**3.3**	**Year 2 Construction Work Window**	**41 days**	**Mon 7/14/25**	**Tue 9/9/25**		
125	**3.3.1**	**Mobilization, Safety and Demobilization**	**41 days**	**Mon 7/14/25**	**Tue 9/9/25**		
126	3.3.1.1	Year 2 Mobilization and Safety	1 day	Mon 7/14/25	Mon 7/14/25		129,130
127	3.3.1.2	Year 2 Demobilization	1 day	Tue 9/9/25	Tue 9/9/25	174,119,153,	
128	**3.3.2**	**KC Owner Work**	**34 days**	**Tue 7/15/25**	**Fri 8/29/25**		
129	3.3.2.1	Remove AT3&4 from Service - Close Isolation Valves, Lock-out/Tag-out	1 day	Tue 7/15/25	Tue 7/15/25	126	136,140
130	3.3.2.2	Isolate RAS System from ATs and Drain WAS Pipe	10 days	Tue 7/15/25	Mon 7/28/25	126	182
131	3.3.2.3	Remove Isolation Measures - Bring AT3&4 into Service	1 day	Fri 8/29/25	Fri 8/29/25	151,173	189
132	3.3.2.4	Restore RAS/WAS Isolation Measures	1 day	Tue 7/29/25	Tue 7/29/25	185SS	189
133	**3.3.3**	**Primary Effluent at Aeration Trains**	**38 days**	**Wed 7/16/25**	**Mon 9/8/25**		
134	**3.3.3.1**	**AT 3 42-inch PE Header - Structural Epoxy Liner & Isolation Valve Install**	**31 days**	**Wed 7/16/25**	**Wed 8/27/25**		
135	**3.3.3.1.1**	**Demolition**	**3 days**	**Wed 7/16/25**	**Fri 7/18/25**		
136	3.3.3.1.1.1	Remove Valve at First Cell, Install Suction Hose to Sump Pump, Dewater Riser	1 day	Wed 7/16/25	Wed 7/16/25	129,19	137
137	3.3.3.1.1.2	Remove Valves for Access/Replacement	1 day	Thu 7/17/25	Thu 7/17/25	136	141,156,1
138	3.3.3.1.1.3	Rust Removal Per Seismic Upgrades Scope	1 day	Fri 7/18/25	Fri 7/18/25	137	143
139	**3.3.3.1.2**	**New Work**	**27 days**	**Wed 7/16/25**	**Thu 8/21/25**		
140	3.3.3.1.2.1	Install Scaffolding	2 days	Wed 7/16/25	Thu 7/17/25	129	162
141	3.3.3.1.2.2	Holiday Testing/Touch-up Work	5 days	Fri 7/18/25	Thu 7/24/25	137	142
142	3.3.3.1.2.3	Prep Surface / Apply Epoxy Coating	10 days	Fri 7/25/25	Thu 8/7/25	141	143
143	3.3.3.1.2.4	Prep and Paint Existing Pipe Supports	1 day	Fri 8/8/25	Fri 8/8/25	138,142	144
144	3.3.3.1.2.5	Install New 42-inch BFVs	5 days	Mon 8/11/25	Fri 8/15/25	143	151,145
145	3.3.3.1.2.6	Install New Stage 1 Mixer Downstream Isolation Valve, Flanges, Isolation Joint	2 days	Mon 8/18/25	Tue 8/19/25	144	146,151
146	3.3.3.1.2.7	Remove Scaffolding	2 days	Wed 8/20/25	Thu 8/21/25	145	151
147	**3.3.3.1.3**	**PE and RAS Magnetic Flow Meter Replacement**	**3 days**	**Fri 7/18/25**	**Tue 7/22/25**		
148	3.3.3.1.3.1	Remove Existing Flow Meters	1 day	Fri 7/18/25	Fri 7/18/25	137	149
149	3.3.3.1.3.2	Clean Existing Location and Prep Surface for Install	1 day	Mon 7/21/25	Mon 7/21/25	148	150
150	3.3.3.1.3.3	Install New Mag Flow Meters	1 day	Tue 7/22/25	Tue 7/22/25	149	151
151	3.3.3.1.4	Fill and Pressure Test Against Closed Valves	1 day	Fri 8/22/25	Fri 8/22/25	144,145,146,	131,153
152	**3.3.3.1.5**	**Pipe Supports and Seismic Restraints**	**3 days**	**Mon 8/25/25**	**Wed 8/27/25**		
153	3.3.3.1.5.1	Install Seismic Upgrades at PE AT 3	3 days	Mon 8/25/25	Wed 8/27/25	151	127
154	**3.3.3.2**	**AT 4 42-inch PE Header - Structural Epoxy Liner & Isolation Valve Install**	**36 days**	**Fri 7/18/25**	**Mon 9/8/25**		
155	**3.3.3.2.1**	**Demolition**	**6 days**	**Fri 7/18/25**	**Fri 7/25/25**		
156	3.3.3.2.1.1	Remove Hatch Cover to Valve Vault	1 day	Fri 7/18/25	Fri 7/18/25	137	157

Project: WPTP STS Predesign Phase

Task Milestone Summary Project Summary

WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
157	3.3.3.2.1.2	Remove Valve at First Cell, Install Suction Hose to Sump Pump, Dewater Riser	1 day	Mon 7/21/25	Mon 7/21/25	156	158SS
158	3.3.3.2.1.3	Expose Line	3 days	Mon 7/21/25	Wed 7/23/25	157SS	159
159	3.3.3.2.1.4	Remove Valves for Access/Replacement	1 day	Thu 7/24/25	Thu 7/24/25	158	163,176,1
160	3.3.3.2.1.5	Rust Removal Per Seismic Upgrades Scope	1 day	Fri 7/25/25	Fri 7/25/25	159	165,187
161	**3.3.3.2**	**New Work**	**36 days**	**Fri 7/18/25**	**Mon 9/8/25**		
162	3.3.3.2.2.1	Install Scaffolding	2 days	Fri 7/18/25	Mon 7/21/25	140	163
163	3.3.3.2.2.2	Holiday Testing / Touch-up Work	5 days	Fri 7/25/25	Thu 7/31/25	162,159	164
164	3.3.3.2.2.3	Prep Surface / Apply Epoxy Coating	10 days	Fri 8/1/25	Thu 8/14/25	163	165
165	3.3.3.2.2.4	Prep and Paint Existing Pipe Supports Per Seismic Scope	1 day	Fri 8/15/25	Fri 8/15/25	160,164	166,167
166	3.3.3.2.2.5	Install New 42-inch BFVs	5 days	Mon 8/18/25	Fri 8/22/25	165	171
167	3.3.3.2.2.6	Install New Stage 1 Mixer Downstream Isolation Valve, Flanges, Isolation Joint	2 days	Mon 8/18/25	Tue 8/19/25	165	168
168	3.3.3.2.2.7	Isolation Valve Bonding Cables and Pipe Re-Coat (Including Valve)	1 day	Wed 8/20/25	Wed 8/20/25	167	169
169	3.3.3.2.2.8	FRP New Vault for Downstream Isolation Valve	2 days	Thu 8/21/25	Fri 8/22/25	168	170
170	3.3.3.2.2.9	Remove Vault Formwork, Install Channel Drain, Cleaning	2 days	Mon 8/25/25	Tue 8/26/25	169	172
171	3.3.3.2.2.10	Remove Scaffolding	2 days	Mon 8/25/25	Tue 8/26/25	166	172
172	3.3.3.2.2.11	Re-install Hatch Cover to Valve Vault	1 day	Wed 8/27/25	Wed 8/27/25	171,170	173
173	3.3.3.2.2.12	Fill and Pressure Test Against Closed Valves	1 day	Thu 8/28/25	Thu 8/28/25	172,178	131,180
174	3.3.3.2.2.13	Backfill and Compact	3 days	Thu 9/4/25	Mon 9/8/25	180	127
175	**3.3.3.2.3**	**PE and RAS Magnetic Flow Meter Replacement**	**3 days**	**Fri 7/25/25**	**Tue 7/29/25**		
176	3.3.3.2.3.1	Remove Existing Flow Meters	1 day	Fri 7/25/25	Fri 7/25/25	159	177
177	3.3.3.2.3.2	Clean Existing Location and Prep Surface for Install	1 day	Mon 7/28/25	Mon 7/28/25	176	178
178	3.3.3.2.3.3	Install New Mag Flow Meter	1 day	Tue 7/29/25	Tue 7/29/25	177	173
179	**3.3.3.2.4**	**Pipe Supports and Seismic Restraints**	**3 days**	**Fri 8/29/25**	**Wed 9/3/25**		
180	3.3.3.2.4.1	Install Seismic Upgrades at PE AT 4	3 days	Fri 8/29/25	Wed 9/3/25	173	174
181	**3.3.3.3**	**WAS Pipe Isolation Valve Installation**	**1 day**	**Tue 7/29/25**	**Tue 7/29/25**		
182	3.3.3.3.1	Dismantle WAS Pipe	1 day	Tue 7/29/25	Tue 7/29/25	130	183SS
183	3.3.3.3.2	Install Isolation Valve and Spool	1 day	Tue 7/29/25	Tue 7/29/25	182SS	184SS
184	3.3.3.3.3	New Pipe Supports and Existing Supports Modifications	1 day	Tue 7/29/25	Tue 7/29/25	183SS	185SS
185	3.3.3.3.4	Fill and Pressure Test New Assembly	1 day	Tue 7/29/25	Tue 7/29/25	184SS	132SS
186	**3.3.4**	**Cathodic Protection**	**2 days**	**Mon 7/28/25**	**Tue 7/29/25**		
187	3.3.4.1	Install Test Stations at AT 4	2 days	Mon 7/28/25	Tue 7/29/25	160	127
188	3.3.5	Year 2 Dry Season Deadline (8/31/25)	0 days	Fri 8/29/25	Fri 8/29/25	189	
189	3.3.6	Year 2 Substantial Completion	0 days	Fri 8/29/25	Fri 8/29/25	131,132	188,261
190	**3.4**	**Year 3 Construction Work Window**	**51 days**	**Mon 7/13/26**	**Tue 9/22/26**		
191	**3.4.1**	**Mobilization, Safety and Demobilization**	**51 days**	**Mon 7/13/26**	**Tue 9/22/26**		
192	3.4.1.1	Year 3 Mobilization and Safety	1 day	Mon 7/13/26	Mon 7/13/26		195
193	3.4.1.2	Year 3 Demobilization	1 day	Tue 9/22/26	Tue 9/22/26	240,219,255,	
194	**3.4.2**	**KC Owner Work**	**44 days**	**Tue 7/14/26**	**Mon 9/14/26**		
195	3.4.2.1	Remove AT5&6 from Service - Close Isolation Valves, Lock-out/Tag-out	1 day	Tue 7/14/26	Tue 7/14/26	192	202,206,1

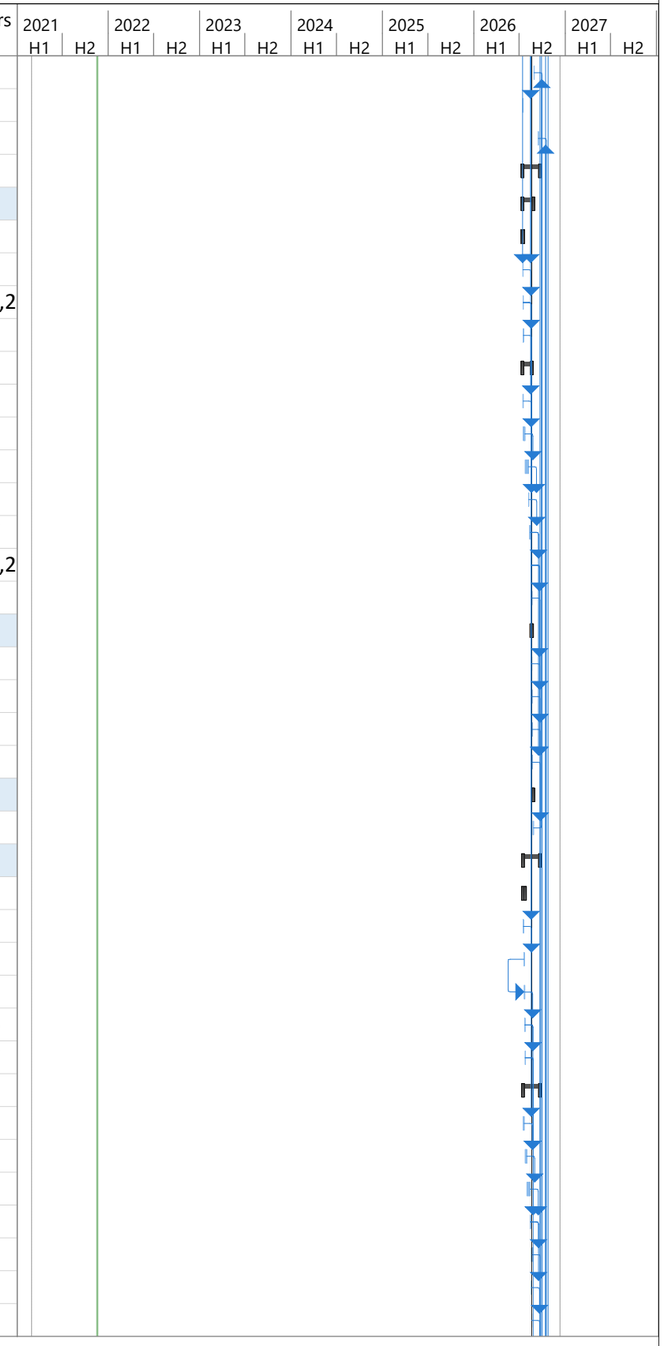


Project: WPTP STS Predesign Phase

Task | Milestone | Summary | Project Summary

WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
196	3.4.2.2	Remove Isolation Measures - Bring AT5&6 into Service	1 day	Fri 8/28/26	Fri 8/28/26	239	259
197	3.4.2.3	SST RAS PS1 - Close Isolation Valves and Lockout/Tagout Pump and Valves	1 day	Wed 7/15/26	Wed 7/15/26	195	
198	3.4.2.4	SST RAS PS1 - Remove Isolation Measures - Bring into Service	1 day	Mon 9/14/26	Mon 9/14/26	255	259
199	**3.4.3**	**Primary Effluent at Aeration Trains**	**48 days**	**Wed 7/15/26**	**Mon 9/21/26**		
200	**3.4.3.1**	**AT 5 42-inch PE Header - Structural Epoxy Liner & Isolation Valve Install**	**31 days**	**Wed 7/15/26**	**Wed 8/26/26**		
201	**3.4.3.1.1**	**Demolition**	**3 days**	**Wed 7/15/26**	**Fri 7/17/26**		
202	3.4.3.1.1.1	Remove Valve at First Cell, Install Suction Hose to Sump Pump, Dewater Riser	1 day	Wed 7/15/26	Wed 7/15/26	195,19	203
203	3.4.3.1.1.2	Remove Valves for Access/Replacement	1 day	Thu 7/16/26	Thu 7/16/26	202	207,222,2
204	3.4.3.1.1.3	Rust Removal Per Seismic Upgrades Scope	1 day	Fri 7/17/26	Fri 7/17/26	203	209
205	**3.4.3.1.2**	**New Work**	**27 days**	**Wed 7/15/26**	**Thu 8/20/26**		
206	3.4.3.1.2.1	Install Scaffolding	2 days	Wed 7/15/26	Thu 7/16/26	195	228
207	3.4.3.1.2.2	Holiday Testing/Touch-up Work	5 days	Fri 7/17/26	Thu 7/23/26	203	208
208	3.4.3.1.2.3	Prep Surface / Apply Epoxy Coating	10 days	Fri 7/24/26	Thu 8/6/26	207	209
209	3.4.3.1.2.4	Prep and Paint Existing Pipe Supports	1 day	Fri 8/7/26	Fri 8/7/26	204,208	210
210	3.4.3.1.2.5	Install New 42-inch BFVs	5 days	Mon 8/10/26	Fri 8/14/26	209	211,217
211	3.4.3.1.2.6	Install New Stage 1 Mixer Downstream Isolation Valve, Flanges, Isolation Joint	2 days	Mon 8/17/26	Tue 8/18/26	210	212,217,2
212	3.4.3.1.2.7	Remove Scaffolding	2 days	Wed 8/19/26	Thu 8/20/26	211	217
213	**3.4.3.1.3**	**PE and RAS Magnetic Flow Meter Replacement**	**3 days**	**Wed 8/19/26**	**Fri 8/21/26**		
214	3.4.3.1.3.1	Remove Existing Flow Meters	1 day	Wed 8/19/26	Wed 8/19/26	211	215
215	3.4.3.1.3.2	Clean Existing Location and Prep Surface for Install	1 day	Thu 8/20/26	Thu 8/20/26	214	216
216	3.4.3.1.3.3	Install New Mag Flow Meters	1 day	Fri 8/21/26	Fri 8/21/26	215	259
217	3.4.3.1.4	Fill and Pressure Test Against Closed Valves	1 day	Fri 8/21/26	Fri 8/21/26	211,210,212	219
218	**3.4.3.1.5**	**Pipe Supports and Seismic Restraints**	**3 days**	**Mon 8/24/26**	**Wed 8/26/26**		
219	3.4.3.1.5.1	Install Seismic Upgrades at PE AT 5	3 days	Mon 8/24/26	Wed 8/26/26	217	193
220	**3.4.3.2**	**AT 6 42-inch PE Header - Structural Epoxy Liner & Isolation Valve Install**	**46 days**	**Fri 7/17/26**	**Mon 9/21/26**		
221	**3.4.3.2.1**	**Demolition**	**6 days**	**Fri 7/17/26**	**Fri 7/24/26**		
222	3.4.3.2.1.1	Remove Hatch Cover to Valve Vault	1 day	Fri 7/17/26	Fri 7/17/26	203	223
223	3.4.3.2.1.2	Remove Valve at First Cell, Install Suction Hose to Sump Pump, Dewater Riser	1 day	Mon 7/20/26	Mon 7/20/26	222	224SS
224	3.4.3.2.1.3	Expose Line	3 days	Mon 7/20/26	Wed 7/22/26	223SS	225
225	3.4.3.2.1.4	Remove Valves for Access/Replacement	1 day	Thu 7/23/26	Thu 7/23/26	224	229,226
226	3.4.3.2.1.5	Rust Removal Per Seismic Upgrades Scope	1 day	Fri 7/24/26	Fri 7/24/26	225	231,257
227	**3.4.3.2.2**	**New Work**	**46 days**	**Fri 7/17/26**	**Mon 9/21/26**		
228	3.4.3.2.2.1	Install Scaffolding	2 days	Fri 7/17/26	Mon 7/20/26	206	229
229	3.4.3.2.2.2	Holiday Testing / Touch-up Work	5 days	Fri 7/24/26	Thu 7/30/26	228,225	230
230	3.4.3.2.2.3	Prep Surface / Apply Epoxy Coating	10 days	Fri 7/31/26	Thu 8/13/26	229	231
231	3.4.3.2.2.4	Prep and Paint Existing Pipe Supports Per Seismic Scope	1 day	Fri 8/14/26	Fri 8/14/26	226,230	232,233
232	3.4.3.2.2.5	Install New 42-inch BFVs	5 days	Mon 8/17/26	Fri 8/21/26	231	237
233	3.4.3.2.2.6	Install New Stage 1 Mixer Downstream Isolation Valve, Flanges, Isolation Joint	2 days	Mon 8/17/26	Tue 8/18/26	231	234
234	3.4.3.2.2.7	Isolation Valve Bonding Cables and Pipe Re-Coat (Including Valve)	1 day	Wed 8/19/26	Wed 8/19/26	233	235



Project: WPTP STS Predesign Phase

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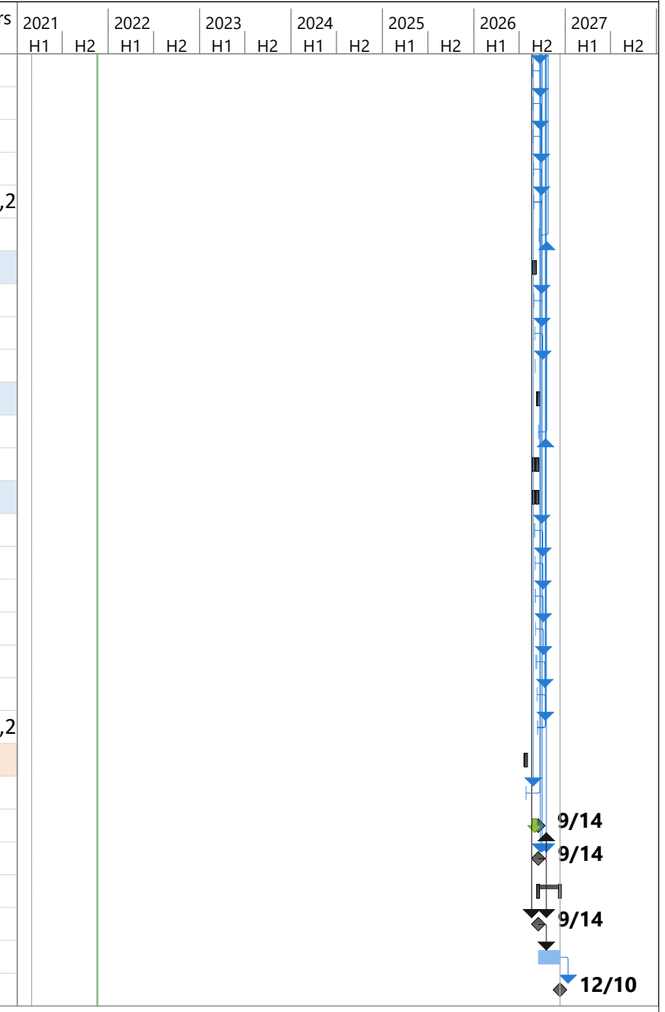
WPTP STS Pipe Rehabilitation Conceptual Construction Schedule

ID	WBS	Task Name	Duration	Start	Finish	Predecessors	Successors
235	3.4.3.2.2.8	FRP New Vault for Downstream Isolation Valve	2 days	Thu 8/20/26	Fri 8/21/26	234	236
236	3.4.3.2.2.9	Remove Vault Formwork, Install Channel Drain, Cleaning	2 days	Mon 8/24/26	Tue 8/25/26	235	238
237	3.4.3.2.2.10	Remove Scaffolding	2 days	Mon 8/24/26	Tue 8/25/26	232	238
238	3.4.3.2.2.11	Re-install Hatch Cover to Valve Vault	1 day	Wed 8/26/26	Wed 8/26/26	237,236	239
239	3.4.3.2.2.12	Fill and Pressure Test Against Closed Valves	1 day	Thu 8/27/26	Thu 8/27/26	238	196,242,2
240	3.4.3.2.2.13	Backfill and Compact	3 days	Thu 9/17/26	Mon 9/21/26	246	193
241	**3.4.3.2.3**	**PE and RAS Magnetic Flow Meter Replacement**	**3 days**	**Fri 8/28/26**	**Tue 9/1/26**		
242	3.4.3.2.3.1	Remove Existing Flow Meters	1 day	Fri 8/28/26	Fri 8/28/26	239	243
243	3.4.3.2.3.2	Clean Existing Location and Prep Surface for Install	1 day	Mon 8/31/26	Mon 8/31/26	242	244
244	3.4.3.2.3.3	Install New Mag Flow Meter	1 day	Tue 9/1/26	Tue 9/1/26	243	
245	**3.4.3.2.4**	**Pipe Supports and Seismic Restraints**	**3 days**	**Mon 9/14/26**	**Wed 9/16/26**		
246	3.4.3.2.4.1	Install Seismic Upgrades at PE AT 6	3 days	Mon 9/14/26	Wed 9/16/26	255	240
247	**3.4.4**	**Primary Effluent at Secondary Sediment Tank Galleries**	**10 days**	**Fri 8/28/26**	**Fri 9/11/26**		
248	**3.4.4.1**	**SST Galleries - RAS at Pump Station 1 - Repair One Elbow**	**10 days**	**Fri 8/28/26**	**Fri 9/11/26**		
249	3.4.4.1.1	Demo Concrete	2 days	Fri 8/28/26	Mon 8/31/26	239	250
250	3.4.4.1.2	Condition Assessment of Riser Pipe	1 day	Tue 9/1/26	Tue 9/1/26	249	251
251	3.4.4.1.3	Inflatable Plug Install	1 day	Wed 9/2/26	Wed 9/2/26	250	252
252	3.4.4.1.4	Knife Gate Valve Removal	1 day	Thu 9/3/26	Thu 9/3/26	251	253
253	3.4.4.1.5	Butt Strap Install	2 days	Fri 9/4/26	Tue 9/8/26	252	254
254	3.4.4.1.6	Repair Interior Lining of Suction Piping	2 days	Wed 9/9/26	Thu 9/10/26	253	255
255	3.4.4.1.7	Replace Knife Gate Valve	1 day	Fri 9/11/26	Fri 9/11/26	254	198,193,2
256	**3.4.5**	**Cathodic Protection**	**2 days**	**Mon 7/27/26**	**Tue 7/28/26**		
257	3.4.5.1	Install Test Stations at AT 6	2 days	Mon 7/27/26	Tue 7/28/26	226	193
258	3.4.6	Year 3 Dry Season Deadline (8/31/26)	0 days	Mon 9/14/26	Mon 9/14/26	259	
259	3.4.7	Year 3 Substantial Completion (PRISM Milestone)	0 days	Mon 9/14/26	Mon 9/14/26	196,198,216	258,261
260	**3.5**	**Project Closeout**	**60 days**	**Mon 9/14/26**	**Thu 12/10/26**		
261	3.5.1	Submit Declaration of Construction Completion	0 days	Mon 9/14/26	Mon 9/14/26	259,189,123	262
262	3.5.2	Final Punch List, As-Builts, and Contractor Closeout	60 days	Tue 9/15/26	Thu 12/10/26	261	263
263	4	Final Acceptance Achieved (PRISM Milestone)	0 days	Thu 12/10/26	Thu 12/10/26	262	



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