TOWN OF DISCOVERY BAY

A COMMUNITY SERVICES DISTRICT

SDLF Platinum-Level of Governance

NOTICE OF THE REGULAR MEETING
OF THE WATER AND WASTEWATER COMMITTEE
OF THE TOWN OF DISCOVERY BAY
Wednesday, September 2, 2020
5:30 P.M. – 6:30 P.M.

NOTICE
Coronavirus COVID-19

In accordance with the Governor's Executive Order N-33-20, and for the period in which the Order remains in effect, the Town of Discovery Bay Community Services District Committee Chambers will be closed to the public.

To accommodate the public during this period of time that the Committee's Chambers are closed to the public, the Town of Discovery Bay Community Services District Committee Members have arranged for members of the public to observe and address the meeting telephonically.

TO ATTEND BY TELECONFERENCE:
Toll-Free Dial-In Number: (866) 848-2216
CONFERENCE ID 5193676302#

Download Agenda Packet and Materials at www.todb.ca.gov/

Water and Wastewater Committee Board Members
Chair Bill Pease
Vice-Chair Bill Mayer

A. ROLL CALL
1. Call business meeting to order 5:30 p.m.
2. Roll Call.

B. PUBLIC COMMENTS (Individual Public Comments will be limited to a 3-minute time limit)
During Public Comments, the public may address the Committee on any issue within the District's jurisdiction which is not on the Agenda. The public may comment on any item on the Agenda at the time the item is before the Committee for consideration by filling out a comment form. The public will be called to comment in the order the comment forms are received. Any person wishing to speak will have 3 minutes to make their comment. There will be no dialog between the Committee and the commenter as the law strictly limits the ability of Committee members to discuss matters not on the agenda. We ask that you refrain from personal attacks during comment, and that you address all comments to the Committee only. Any clarifying questions from the Committee must go through the Chair. Comments from the public do not necessarily reflect the viewpoint of the Committee members.

C. DRAFT MINUTES TO BE APPROVED
1. Approve DRAFT minutes of August 5, 2020 Water and Wastewater Committee meeting.

D. PRESENTATIONS

E. DISCUSSION ITEMS
1. Discussion and Provide Feedback on Scope of Work for Luhdorff & Scalmanini to Prepare and Asset Management Plan in the Amount of $224,612.
2. Discussion and Provide Feedback on Scope of Work for Luhdorff & Scalmanini to Prepare the America's Water Infrastructure Act (AWIA) Risk and Resilience Assessment in the Amount of $25,000.

3. Discussion and Provide Feedback on Scope of Work for Advisian (WorleyParsons Group) to Perform Detailed Design and Construction Support Engineering Services for Outfall Diffuser Replacement Project in the Amount of $145,150.
4. Discussion and Provide Feedback on Scope of Work for Stantec to Perform Computational Fluid Dynamics Modeling Engineering Services for UV System at Plant No. 2 as part of the Denitrification Project in the Amount of $54,500.

F. FUTURE DISCUSSION/AGENDA ITEMS

G. ADJOURNMENT

1. Adjourn to the next Standing Water and Wastewater Committee meeting at the Community Center located at 1601 Discovery Bay Boulevard.

“This agenda shall be made available upon request in alternative formats to persons with a disability, as required by the American with Disabilities Act of 1990 (42 U.S.C. § 12132) and the Ralph M. Brown Act (California Government Code § 54954.2). Persons requesting a disability related modification or accommodation in order to participate in the meeting should contact the Town of Discovery Bay, at (925) 634-1131, during regular business hours, at least forty-eight hours prior to the time of the meeting.”

"Materials related to an item on the Agenda submitted to the Town of Discovery Bay after distribution of the agenda packet are available for public inspection in the District Office located at 1800 Willow Lake Road during normal business hours."

TOWN OF DISCOVERY BAY

A COMMUNITY SERVICES DISTRICT

SDLF Platinum-Level of Governance

PLATINUM LEVEL

President – Bill Mayer • Vice-President – Bill Pease • Director – Kevin Graves • Director – Robert Leete • Director – Bryon Gutow

MINUTES OF THE REGULAR MEETING
OF THE WATER AND WASTEWATER COMMITTEE
OF THE TOWN OF DISCOVERY BAY
Wednesday, August 5, 2020
5:30 P.M. – 6:30 P.M.

NOTICE
Coronavirus COVID-19

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Water and Wastewater Committee Board Members
Chair Bill Pease
Vice-Chair Bill Mayer

A. ROLL CALL

1. Call business meeting to order 5:30 p.m.- By Chair Pease
2. Roll Call- All Present.

B. PUBLIC COMMENTS (Individual Public Comments will be limited to a 3-minute time limit)

None.

C. DRAFT MINUTES TO BE APPROVED

1. July 1, 2020 Regular Water and Wastewater Committee DRAFT meeting minutes.

Motion made by Vice-Chair Bill Mayer to approve items on the Consent Calendar as presented.
Second by Chair Bill Pease.

D. PRESENTATIONS

1. Water and wastewater update coming before the Board tonight. - Please see documents attached to the Regular Board Meeting.
District Water Engineer Gregory Harris discussed with the committee two items previously discussed for proper oxygenation levels in Town waters. District Water Engineer Gregory Harris presented a suggestion to increase budget by $850,000 for the Denitrification Budget. He also discussed the option to reallocate $550,000 from Plant No. 1 to Plant No. 2. Both these options will provide Plant No. 2 some of the funds needed to do a Supplemental Aeriation project to help improve the much needed oxygen levels at the plant.
Chair Pease asked if moving these funds will decommission Plant No. 1.
District Water Engineer Gregory Harris confirmed that Plant No. 1 will be non-functional.

E. DISCUSSION ITEMS

1. Discussion Regarding Laguna/ Willow Lake and Marina Underwater Crossing Repairs.
Water and Wastewater Manager Aaron Goldsworthy provided update on the Marina Underwater Crossing repairs. Indicated a pressure test has recently been done and the PSI has dropped indicating that there might be holes in the pipe. Water and Wastewater Manager Aaron Goldsworthy brought in a piece of pipe from another location to help the Committee get a visual of the damage they could come across. States continuity test is needed on the pipe, but at this time staff does not feel confident adding cathodic protection on this pipe with the knowledge that it could fail. He advised there is an option to put a liner on the pipe however that will require draining the pipe and putting a camera to inspect for intrusion of water.
Chair Pease asked the length of this pipe.
Water and Wastewater Manager Aaron Goldsworthy stated the pipe is roughly 400 feet.
Water and Wastewater Manager Aaron Goldsworthy also gave update regarding Laguna and Willow Lake Underwater Crossing repairs. He stated the Town is currently in talks with Veolia regarding putting together a contract.
Vice-Chair Mayer inquired about time of completion.
Water and Wastewater Manager Aaron Goldsworthy stated it should happen quickly once a contract is awarded.
General Manager Mike Davies assured the committee that this is a priority project and he is constantly reevaluating best processes. He expects this project to move quickly once contract is issued.

2. Discussion Regarding Monitoring Well.
Water Engineer Justin Shobe from Luhdorff & Scalmanini provided update regarding the test hole and monitoring well construction at Well 8 site. Discussed the mailed pamphlet that went out to the public. Permit from Contra Costa County being directed to Environmental Health for approval to preform drilling. Water Engineer Justin Shobe does not anticipate any snags and ensured all the proper steps are being taken to confirm that completion of the test hole at Well 8 site is moving smoothly as scheduled.
Chair Bill Pease asked about timeframe to complete project.
Water Engineer Justin Shobe stated that the test hole should be done in two working weeks and only sampling will need to be done after that.
Chair Pease asked for anticipation date to commence work drilling the new well.
Water Engineer Justin Shobe advised that he estimates work can begin in roughly six months.
Project Manager Mike Yeraka reminded the committee that negotiation will still need to be done with Pantages, and commencement date will more likely be 18 months away.
Vice-Chair Bill Mayer asked if there have been any calls or questions from the public regarding the notice that was mailed out.
Water Engineer Justin Shobe states there have not been any feedback regarding the mailers.
Vice-Chair Bill Mayer asked for an idea of what the project will look like once completed.
Water Engineer Justin Shobe stated it will look similar to the filters at Newport with addition of a small tank and electrical panels. Relayed there are also plans to put up a sound wall.
Vice-Chair Bill Mayer requested to view draft of design once it is received.
Public Comment Regarding:

- If the this new well will be servicing only the Pantages area
  Response by General Manager Mike Davies that it will not only serve Pantages, but the Town also.
- Inquiry if the well would be necessary if we did not have the Pantages Project.
  General Manager Mike Davies stated that since Well 5 would only be used in emergency cases, Well 8 would still be necessary.

3. Discussion and Provide Feedback on Scope of Work Luhdorff & Scalmanini to Perform Engineering Services for Pipeline Replacement Projects in the Amount of $121,032.
There was a planned Pipeline Replacement Project on Discovery Bay Blvd that serves Lakeview Business Plaza. There is also another pipeline on Edgeview Drive between St Andrew's Clubhouse that also needs replacing. This one is leaking; however, the pipeline is under the driveways of some community members. During this replacement, the pipeline will be moved from driveways to the roadway on Edgeview Drive. Both Pipeline Projects have been on the CIP for years and at the present time, the Town has the capacity to move forward with these projects and get them completed. The benefit of combining both projects and addressing them at the same time, instead of individually, allows contractors to bid on a larger project to entice more fiscal competition and make it more cost effective for the Town.
Staff would like to make the following request to the committee;

- Allow staff to present to the Board tonight a scope of work from Luhdorff & Scalmanini to perform engineering services for the Pipeline Replacement Projects.
- Allow staff to request the Board allow General Manager authorization to execute a contract with Luhdorff & Scalmanini Consulting Engineers for the mentioned Pipeline Replacement Projects.

Chair Pease and Vice-Chair both agreed that it should be presented to the Board.

4. Discussion and Provide Feedback on Scope of Work for Luhdorff & Scalmanini to Perform Engineering and Inspection Services for Filter Maintenance at Willow Lake and Newport Drive Water Treatment Plants in the Amount of $68,545.

   Project Manager Mike Yeraka stated media needs to be replaced after tests show it is not performing properly. Two out of the five vessels require immediate replacement. Two others will need to be replaced soon also. There is also a possibility that the coating inside the vessels will need to be redone. Project Manager Mike Yeraka states the best option would be to replace all 5 of the filters and check if vessels need to be recoated while the replacement is being performed. The work being done will allow to bring the vessels to proper standards. Project Manager Mike Yeraka would like the committee to allow the following three options be presented to the Board in tonight's Board meeting;

   - Approval of the Scope of Work presented by Luhdorff & Scalmanini Consulting Engineers to engineer and inspect the project for the Filter Maintenance Program.
   - Allow General Manager authorization to execute contract with Luhdorff & Scalmanini Consulting Engineers to engineer and inspect the project in the amount of $68,545.

   Chair Pease and Vice-Chair Mayer both agreed that the work for all five would be the most beneficial and recommended this item be presented to the Board.

5. Discussion and Provide Feedback on Scope of Work for Luhdorff & Scalmanini to Perform Engineering and Inspection Services for Well 1B Rehabilitation in the Amount of $37,000.

   Water Engineer Justin Shobe explained that the efficiency of Well 1B has had performance issues. It is checked twice a year. The continuous monitoring of this well has shown it is clogging. Well 1B demonstrates slow decline and exhibiting the worst conditions of all the wells in terms of loss capacity. Water Engineer Justin Shobe recommends bringing in a contractor to come in to scrub and air lift to restore capacity. He is suggesting that Luhdorff & Scalmanini Consulting Engineers oversee the maintenance and the rehabilitation of Well 1B. Once this is completed, Luhdorff & Scalmanini Consulting Engineers will produce a report to the Town summarizing work performed. Request from Water Engineer Justin Shobe to the committee is to;

   Allow the Scope of Work from Luhdorff & Scalmanini Consulting Engineers to be presented to the Board for this project

   Present to the Board the option to allow General Manager to execute contract with Luhdorff & Scalmanini Consulting Engineers to perform engineering and inspection services in the amount of $37,000.

   Vice-Chair Mayer asked if this was similar to the project done at Well 4.

   Water Engineer Justin Shobe confirmed it was very close.

   Public Comment Regarding:

   - Is the ten year recommendation being made because it is presumed repairs will need to happen in the next ten years for that pump?

   Water Engineer Justin Shobe said yes. The intent is to be ahead of any issues that may occur.

   Chairs advised they are prepared to take this item to the Board on August 19, 2020 for the next meeting.

F. FUTURE DISCUSSION/AGENDA ITEMS

G. ADJOURNMENT

1. Adjourn at 6:23 p.m. to the next Standing Water and Wastewater Committee meeting at the Community Center located at 1601 Discovery Bay Boulevard.

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Town of Discovery Bay

"A Community Services District"

STAFF REPORT

Meeting Date

September 2, 2020

Prepared By: Mike Yeraka, Projects Manager and Justin Shobe, District Water Engineer
Submitted By: Michael R. Davies, General Manager

Agenda Title

Discussion and Provide Feedback on Scope of Work for Luhdorff & Scalmanini to Prepare and Asset Management Plan in the Amount of $224,612.

Recommended Action

Provide Feedback for Staff to Bring the Item to the Full Board at the September 16, 2020, meeting to Authorize the General Manager to Execute the Town's Standard Consultant Agreement for Luhdorff & Scalmanini to Prepare the Asset Management Plan as per the Attached Scope of Work Outline.

Executive Summary

The District completed the last Water Master Plan in 2012. That plan identified the growth of the water system for the full build-out of the community and it identified the capital projects that will be needed to meet the water demand of the full build-out. The Capital Improvement Plan includes completion of Well 8 that, when completed, will allow the District to meet the water supply, storage and treatment requirements of the water system through full build-out.

Looking ahead to the next 10 to 20 years of planning, there will be refurbishment and replacements (R&R) of water infrastructure needed to continue providing the same level of water supply reliability. The next phase of planning will focus on understanding the condition of infrastructure and the need for R&R as it reaches its useful service life.

The existing assets have varying ages and conditions. The assets also have varying levels of importance or criticality for providing reliable water supplies. The assets are summarized as follows:

Asset Category	Components
Wells and Pump Stations (6 total)	*Wells, pumps, station piping, raw water mains, motor control centers, switchgear, SCADA/PLC, buildings, foundations, site improvements.*
Water Treatment Plants (2 total)	*Filters, storage tanks, backwash tanks, reclaim systems, chlorination facilities, booster pumps, motor controls centers, SCADA/PLC, pipe and controls, buildings, site improvements.*
Water Distribution System (50 miles)	*Pipelines, crossings, valves, fittings, fire hydrants, service saddles, laterals, curb stops, boxes, meters, backflow devices.*

The *Asset Management Plan* will transition the District from a re-active approach to a pro-active approach for R&R planning in the water system. Rather than waiting for issues to occur, the plan will forecast future R&R helping to prolong asset life and identify sustainable rates. It will serve as a tool that documents the inventory of assets, prioritizes the relative risk of failure, forecasts the need to replace assets, and implements R&R in a manner that is consistent with available funding and the ability of the District to implement projects.

"Continued to the next page"

Under this scope of work, the inventory of all water system assets will be prioritized in terms of risk based on two key concepts; 1) the consequences that occur if an asset fails based on its relative importance in providing reliable water service; and 2) the relative likelihood that an asset will fail based on the current conditions and remaining service. The importance of an asset will be assessed based on its strategic role in providing reliable water supply to meet regulations or to provide a desired level of redundancy. The condition and remaining useful life of an asset will be determined from a review of available information, comparison to similar infrastructure, and by completing additional field investigations to gather new information. From these condition assessments, a forecast will be made for replacement and refurbishment (R&R) that are prioritized over the planning horizon. The forecasted projects would be updated over time as projects are implemented and new information becomes available.

The overall approach of the Asset Management Plan will be conducted in three phases:

Phase 1 – Level of Service Analysis
Phase 2 – Condition Assessments
Phase 3 – Plan Development

Phase- **Task**	**Description**	**Outside Services**	**LSCE**	**Total**
Phase 1- **1**	Collect and Review Information	$0	$7,970	**$7,970**
Phase 1- **2**	Evaluate Water Demand	$0	$11,810	**$11,810**
Phase 1- **3**	Water Supply Reliability	$0	$17,440	**$17,440**
Phase 2- **4**	Condition Assessment – Wells and Pump Stations	$17,351	$22,020	**$39,371**
Phase 2- **5**	Condition Assessment – Water Treatment Plants	$21,951	$14,400	**$36,351**
Phase 2- **6**	Condition Assessment – Distribution System	$40,220	$31,360	**$71,580**
Phase 3- **7**	Risk Assessment and Ranking	$0	$17,700	**$17,700**
Phase 3- **8**	Develop Draft and Final AMP	$0	$22,390	**$22,390**
	Total	**$79,522**	**$145,090**	**$224,612**

Subconsultant under this scope of work include:

- JDH Corrosion Consultants (JDH) - will provide an assessment of distribution system piping, including soil resistivity mapping system-wide, soil corrosivity conditions, existing cathodic protection systems, and asbestos cement pipeline conditions.
- Electrical Power Systems (EPS) – will provide condition and code assessment of the motor control centers, electrical panels and switchgear at all system facilities.
- Merkel Associates Structural Engineering (Merkel) – will provide a condition and code assessment of buildings and foundations at the water treatment plants.
- Wallace-Kuhl & Associates Geotechnical (WKA) – will evaluate existing geotechnical studies and inspect asphalt conditions at the treatment plants to provide recommendations for assessing soil stabilization or settlement.

The approved budget for the Asset Management Plan in FY 20/21 is $250,000. The total cost estimate of the work to be performed by LSCE and subconsultants to complete the scope of work is $224,612.

Specific Board Action:

Provide feedback for Staff to ask the Board to take the following action at the September 16, 2020, meeting:

a. Approve the Scope and Budget Contained in the Luhdorff & Scalmanini (LSCE) Scope of Work Outline.

b. Authorize the General Manager to Execute the Town's Standard Form of Consulting Agreement with LSCE to Prepare the Asset Management Plan in the Amount of $224,612.

Previous Relevant Board Actions for This Item

The Board approved a total of $250,000 for FY 20/21 for Asset Management Plan during approval of the FY 19/20 Budget at the June 19, 2019, Board Meeting.

Fiscal Impact: Included in the $250,000 budget for this fiscal year
Amount Requested: $224,612
Sufficient Budgeted Funds Available? Yes
Prog/Fund # Category: TBD

Attachment

1. LSCE Scope of Work Outline.

AGENDA ITEM: E-1

Town of Discovery Bay Community Services District
Water System Asset Management Plan – Outline of Scope and Budget

Background

The Town of Discovery Bay Community Services District (District) owns and operates a water system of approximately 6,700 service connections and a population of over 18,000 people at system build out. The District's 2012 water master plan defined the growth of the community including the build-out and infill. The District's Capital Improvement Plan (CIP) includes completion of Well 8 that, when completed, will provide the water supply, treatment and storage needed to support the planned build out of the water system. A new water master plan should be conducted when there are new developments that go beyond the planned build out that necessitate the need to increase system capacity.

Looking ahead to the next 10- to 20-year horizon, the next phase of planning will focus on the management and upgrade of existing infrastructure as they reach their useful life. The District's water infrastructure consists of the six well pump stations of varying age and condition, two water treatment plants that have been in service about 20 years, and 50 miles of water distribution mains, 18 miles of which have been in service about 50 years. The infrastructure has a useful service life and requires maintenance cycles that must be clearly understood to plan for future capital costs.

Purpose of Asset Management

Asset management is the practice of managing capital assets to minimize the total cost of owning and operating them, while delivering the desired service level to the customers. It occurs as a cycle within all levels of the District's planning, engineering, operation, management, and decision making.

The *Asset Management Plan* will serve as a tool to document the system's asset management practices and strategies and develop a framework that assesses risk and prioritizes replacements. Asset management can have numerous benefits to a system, including, but not limited to prolonging asset life, meeting customer demands, identifying sustainable rates, institutionalizing budget planning, meeting regulatory requirements, and improving emergency response times and methods.

The *Asset Management Plan* completed under this scope of work will put forth a framework for assessing risk for each asset category. Condition assessments will be completed using available information and collection of new information. The plan will provide a recommended prioritization of replacements and an estimate of useful life. The plan will also include recommendations for additional monitoring and data collection to further improve the understanding of risk and prioritization as part of the ongoing asset management cycle. LSCE's work will be consistent with AWWA standards (Attachment 1) and EPA Guidelines (Attachment 2).

Categories of Assets and Risk Analysis

For purposes of this scope of work, the District's assets are separated into the following categories, each of which have a unique set of components and criteria on which to assess risk.

Asset Category	Components
Wells and Pump Stations (6 total)	*Wells, pumps, station piping, raw water mains, motor control centers, switchgear, SCADA/PLC, buildings, foundations, site improvements.*
Water Treatment Plants (2 total)	*Filters, storage tanks, backwash tanks, reclaim systems, chlorination facilities, booster pumps, motor controls centers, SCADA/PLC, pipe and controls, buildings, site improvements.*
Water Distribution System (50 miles)	*Pipelines, crossings, valves, fittings, fire hydrants, service saddles, laterals, curb stops, boxes, meters, backflow devices.*

The risk analysis will rank the assets, typically on a scale of 1-5. An analysis of water supply, reliability and other criteria would be used to rank the Consequence of Failure (CoF) for each asset, on a relative scale. A condition assessment will be made to rank the Likelihood of Failure (LoF) for each asset, on a relative scale. Together, the LoF and CoF rankings are combined to assess the Risk of Failure (RoF) for each asset. A higher LoF and a higher CoF means an asset has a higher risk and should be prioritized before others. An example risk assessment table provided by the District is enclosed (Attachment 3), which is unrelated to the District or it's assets but describes how these risk assessment concepts are used in a matrix for replacement strategy.

This risk analysis involves a unique set of criteria for each asset that will be based on professional judgment as well as policy and desired level of reliability from the District.

Scope of Work

Luhdorff and Scalmanini Consulting Engineers (LSCE) scope of work involves reviewing the inventory of all assets, determining Level of Service goals, conducting condition assessments of those assets, ranking the assets in terms of the risk of failure, and summarizing the analysis in a final report deliverable. The overall approach will be conducted in three phases.

Phase 1 – Level of Service Analysis
Phase 2 – Condition Assessments
Phase 3 – Plan Development

Phase 1 – Level of Service Analysis

In the first phase, the level of service (LoS) goals are established, which defines the level of capacity and quality required for the assets (wells, treatment, distribution). Much of this information is derived from the District's current water master plan and updates to water demand and supplies from recent information. Updates will be made on water demand using recent water meter data, water conservation goals and regulations, and building upon projects that will be in the 2020 Urban Water Management Plan (UWMP). The LoS goals will center on the regulatory requirements and the desired level of water supply reliability and water quality as a basis for this report. This phase will involve three tasks.

Task 1: Collect and Review Information

- Asset inventory (GIS) – provided by Veolia
- Site visit to review inventory (wells and WTPs)
- Collect and review prior plans: Water Master Plan, 2020 UWMP, Wastewater Master Plan, etc.
- Collect and review District data: water meter records, production data, repair records, and customer water quality complaint records.
- **Deliverable:** Identify any data gaps, provide direction for Veolia to revise the GIS inventory as needed.

Task 2: Evaluate Water Demand

- Use the water supply projections from the 2020 UWMP (separate project).
- Review production records to establish Average Day Demand, Maximum Day Demand, and Peak Hour Demand.
- Evaluate water meter data and production data to determine demand by sector: residential, commercial, irrigation, public institution, other.
- Evaluate potential reduction from current and future conservation and regulations.
- Project water demand based on future conservation goals.
- Determine the "planning level" demand used for this analysis.

Task 3: Water Supply Reliability

- Summarize regulations and establish system capacity requirements: wells, pumps, filters, storage, booster pumps, backwash/reclaim systems, chemical systems.
- Evaluate water demand and supply to meet the regulated capacity.
- Conduct a reliability assessment to determine the capacity with offline sources: wells, filters, tanks, booster pumps, complete WTPs, and include the new Well 8 Standalone in this analysis.
- Evaluate and summarize current water quality issues in the supply systems: THM formation, high chlorine demand, salinity, iron/manganese, other.
- Discuss with District and determine the desired level of reliability/safety beyond regulations.
- **Deliverable:** Technical Memo (TM 1) summarizing Task 2 and 3 to define the Level of Service (LoS) goals and the reliability criteria.

<u>Phase 2 – Condition Assessments</u>

The condition assessments will be based a review of available information and conducting site inspections by LSCE and sub-consultants. Methods to assess conditions will be "indirect methods", i.e. data analysis using available records, and "direct methods", i.e. conducting field investigations as noted in this scope of work to develop new information.

JDH Corrosion Consultants (JDH) will provide an assessment of distribution system piping, particularly soil conditions and asbestos cement pipeline conditions. **Electrical Power Systems (EPS)** will provide condition and code assessment of the motor control centers, electrical panels and switchgear at all system facilities. **Merkel Associates Structural Engineering (Merkel)** will provide a condition and code assessment of buildings and foundations at the water treatment plants. **Wallace Kuhl & Associates (WKA)** will evaluate existing geotechnical studies and inspect asphalt conditions at the treatment plants to provide recommendations for assessing soil stabilization or settlement.

Task 4: Wells and Pump Stations

- Establish criteria for Condition Assessment. An example of this criteria is: specific capacity, age, material, water quality, pump performance, maintenance issues, electrical systems, code issues, replacement well sites.
- Indirect methods for condition assessment, involves:
    - Review testing results from Biennial Well and Pump Testing
    - Review well and pump rehabilitation and repairs (2, 4A and 1B)
    - Evaluate and compare well construction details
    - Evaluate and compare pump equipment details
    - Review and summarize water quality issues (e.g. TDS, high Cl demand, THM)
    - Determine feasibility to install replacement wells on each site
- Direct methods for condition assessment to develop further information, include:
    - Conduct site inspections with LSCE and subconsultants.
    - **EPS (sub):** Inspection of electrical systems
    - **JDH Corrosion (sub):** Inspect corrosion of above ground piping
- **Deliverable:** TM 2 summarizing condition assessment findings for Wells and Pump Stations.

Task 5: Water Treatment Plants

- Establish criteria for Condition Assessment. An example of this criteria is: age, material, performance history, maintenance history, visual inspections, testing data, code issues.
- Indirect methods for condition assessment include:
    - Review and confirm inventory list from Veolia
    - Review results of vessel inspections from Filter Repair Project (separate project)
    - Review results of routine tank inspection and cleaning
    - Review findings from booster pump upgrades (e.g. BP#3)
    - Review any prior WTP maintenance records and inspections
- Direct methods for condition assessment to develop further information, include:
    - Conduct site inspections with LSCE and subconsultants.
    - **EPS (sub):** Inspection of electrical systems
    - **JDH Corrosion (sub):** Inspect corrosion of above ground piping
    - **Merkel Structural (sub):** Inspect buildings and foundations
    - Inspect chemical feed systems
    - Recommend testing of booster pumps, if needed (not included in scope)
- **Deliverable**: TM 3 summarizing condition assessment findings for Water Treatment Plants.

Task 6: Distribution System

- Establish criteria for Condition Assessment. An example of this criteria is: age, material, soil corrosivity, leak history, break history, hydrant spacing, pipe sizing.
- Indirect methods for condition assessments include:
    - Review and confirm inventory list from Veolia GIS Database (shape files to be furnished by Veolia).
    - Review historical breaks, leaks, and complaint records
    - Review prior AWWA water audits
    - Review geotechnical information from developments (if available)
    - Review soil survey mapping information (USDA)

    - Conduct hydraulic modeling:
        - Assess pipe sizing required to meet demands, compare to actual.
        - Water Crossing Risk – assess impacts of crossing breaks (2 have recently been assessed, 9 of 11 need to be assessed)
    - **JDH Corrosion (sub):** Conduct a data review and provide initial basis for AC pipe root cause failure to focus the ranking/criteria (pipe integrity versus external forces).
- Direct methods for condition assessment to develop further information:
    - **JDH Corrosion (sub) data development including:**
        - Measure in-situ soil resistivities and GPS coordinate to prepare soil resistivity mapping throughout entire Town.
        - Review chemical analysis from soil samples in Edgeview/Lakeview pipeline replacements (separate project)
        - Determine corrosivity classification of soils throughout Town with respect to identified material types (steel, ductile iron, AC, etc.).
        - Survey all exiting cathodic protection systems throughout the Town and determine how many systems are still active and the level of protection to be provided.
        - Conduct data analysis and engineering report providing assessment of soil resistivities, soil corrosivity, and determination of useful life of AC pipe and guidelines for future monitoring of pipelines.
        - **Assumption:** Veolia will conduct valve turning to provide locations of existing cathodic protection (CP) test stations, known to existing in the newer subdivisions.
- Once condition assessments are complete, LSCE will provide data used in the analysis to Veolia to be incorporated in the GIS database. LSCE will develop mapping to visual the findings and risk assessments for presentation purposes.
- **Deliverable**: TM 4 summarizing condition assessment findings for Distribution System.

The distribution system is the most diverse part of the system in terms of the variability of Likelihood of Failure. This is due to differences in soil conditions; internal pressure; variety of components; installation quality; age; material including a variety of components; depth of installation; traffic on the ground above; and other variables. As a result, the approach is to generalize the predictions in terms of budgeting dollars and timing on geographic regions within the system. There will also be separate assessments for other assets outside of mainline replacements, including water meters and water crossings. There will be a distinction made for emergent issues versus planned replacement costs.

Phase 3 – Plan Development

In the third phase, LSCE will conduct the risk assessments for each asset category and develop the Asset Management Plan. Each asset will be assigned a relative Likelihood of Failure (LoF) from the Condition Assessment in Phase 2 and a Consequence of Failure (CoF) from the Level of Service analysis in Phase 1. The resulting Risk of Failure (RoF) will be used to rank and prioritize the most critical assets derived from this analysis.

Task 7: Risk Analysis and Ranking

- Determine the planning horizon for the plan report (20 to 40 year range) based on District direction.
- Establish LoF ranking for each asset by applying the condition assessment criteria from Phase 2.
- Establish CoF ranking for each asset by applying the LoS identified in Phase 1 and the reliability requirements for each asset.
- Develop tables for organizing and presenting ranking of LoF and CoF. **Any tables preferred by the District will be incorporated (see example table Attachment 3).**
- Assess the RoF for each asset and rank assets in terms of criticality.
- Refine the appropriate weights in the ranking analysis.
- Develop an improvement plan for replacements of assets based on remaining service life, RoF, and criticality to meet the LoS goals.
- Develop an implementation plan for ongoing asset management.
- Develop a monitoring and tracking tool modeled after template in example (Attachment 3)
- Develop funding strategies for Capital Expenditures (CapEx) and Operational Expenditures (OpEx).
- **Deliverable:** Present the draft tables, ranking of assets, and improvement plan. Review findings with District and present findings at an Asset Management Plan Workshop with Board of Directors.

Task 8: Develop Draft and Final AMP

- Prepare a discussion of the state of each asset, the water demand and supply reliability, and the findings of the condition assessments.
- Prepare a discussion and recommendations for methods for on-going asset management: data collection from ongoing maintenance, future projects, and recommended investigations to further refine and update the risk analysis and CIP.
- Prepare draft AMP, including written report, summary of findings, supporting analysis, ranking tables, and a recommended Capital Improvement Program for a 20-year forecast.
- Prepare a final AMP once comments are received by District and Board of Directors on the draft plan.
- **Deliverables:** Draft AMP, Final AMP

Preliminary Report Outline

1. Executive Summary
2. Introduction
3. State of Infrastructure (SOI) – collect data for all the assets in inventory: age, condition, etc.
4. Level of Service (LoS) – customer, regulations, water supply vs demand, etc.
5. Risk Analysis – identify hazards and evaluate risks, Criticality ranking, Likelihood ranking
6. Life Cycle Strategies – maintenance/replacement/useful life of asset
7. Financial Strategies – OPEx and CapEX costs
8. Implementation and Improvement Plan
9. Appendices

SCHEDULE

Asset Management Plan Project Duration (months)

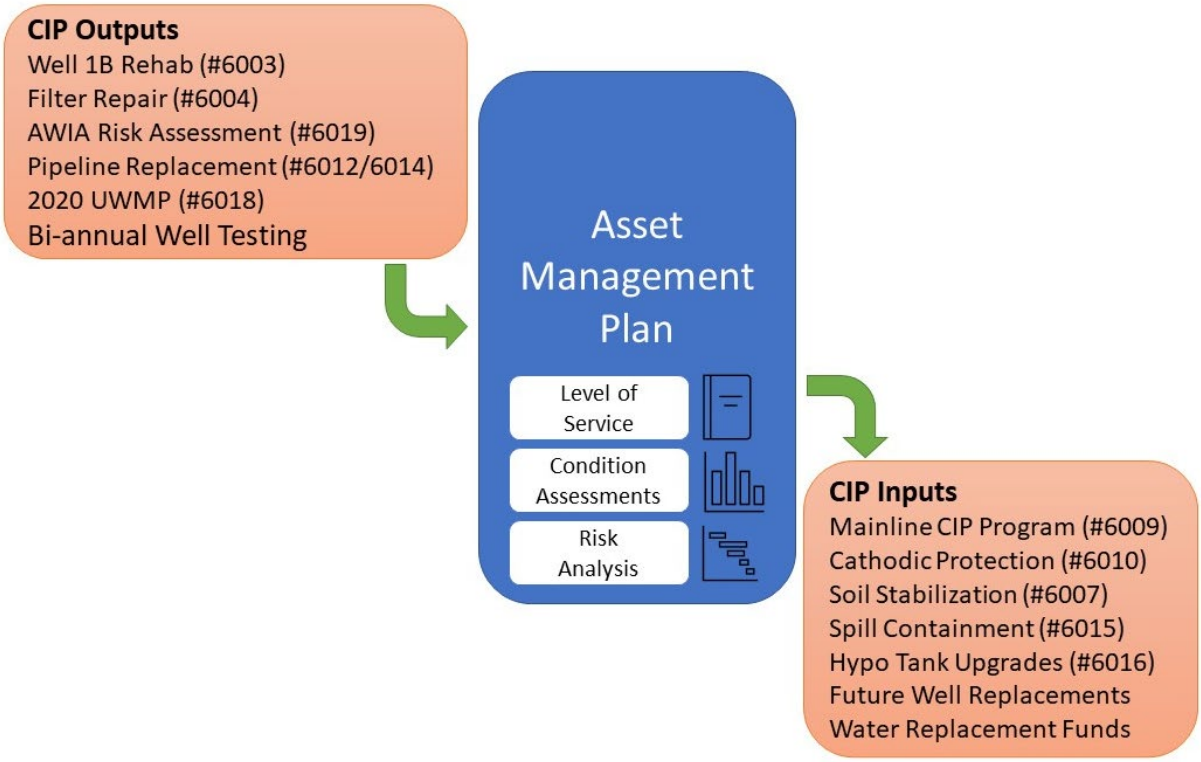
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
		2020		2021												2022		
	Task	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1	Collect and Review Information																	
2	Evaluate Water Demand																	
3	Water Supply Reliability																	
4	Condition Assessment - Wells and Pump Stations																	
5	Condition Assessment - Water Treatment Plants																	
6	Condition Assessment - Distribution System																	
7	Risk Assessment and Ranking																	
8	Develop Draft and Final AMP																	

Information from Separate Projects, Anticipated Schedule

- 2020 UWMP - water supply projections
- Well 1B Rehabilitation - well condition data
- Filter Repair Project - vessel inspections
- Veolia GIS Database Development
- Pipeline Replacement Projects - field data points

CIP Project Coordination

Current CIP projects will be able to provide information used as part of the asset management plan related to determining condition assessments and the level of service (CIP Outputs). Once the Asset Management Plan is completed, the findings from the plan will provide guidance on other CIP projects and information needed to proceed on CIP projects.



BUDGET

Task	Description	Subconsultants *				LSCE	Total
		JDH	EPS	Merkel	WKA		
1	Collect and Review Information	0	0	0	0	$7,970	**$7,970**
2	Evaluate Water Demand	0	0	0	0	$11,810	**$11,810**
3	Water Supply Reliability	0	0	0	0	$17,440	**$17,440**
4	Condition Assessment - Wells and Pump Stations	$2,234	$13,622	$1,495	0	$22,020	**$39,371**
5	Condition Assessment - Water Treatment Plants	$2,234	$13,622	$1,495	$4,600	$14,400	**$36,351**
6	Condition Assessment - Distribution System	$40,220	0	0	0	$31,360	**$71,580**
7	Risk Assessment and Ranking	0	0	0	0	$17,700	**$17,700**
8	Develop Draft and Final AMP	0	0	0	0	$22,390	**$22,390**
Total Budget with Optional Task		**$44,688**	**$27,244**	**$2,990**	**$4,600**	**$145,090**	**$224,612**

*Subconsultant costs include 15% markup. Subconsultants include:

- JDH Corrosion Consultants (JDH) – corrosion engineer
- Electrical Power Systems (EPS) – electrical engineer
- Merkel Associates Structural Engineering (Merkel) – structural engineer
- Wallace-Kuhl & Associates Geotechnical (WKA) – geotechnical engineer

Attachment 1 – AWWA Standards
Attachment 2 – EPA Guidelines
Attachment 3 – Example Asset Management Spreadsheet (Pennsylvania Water Authority)

AWWA Asset Management Guidelines

To Be Followed by LSCE in Developing

District Asset Management Plan

AWWA Leading Business Practices in Asset Management
Case Studies Report

AWWA Manuals

M28 Rehabilitation of Water Mains

M32 Computer Modeling of Water Distribution Systems

M77 Condition Assessment of Water Mains

AWWA Standards

ANSI/AWWA G410-18 Business Practices for O&M

ANSI/AWWA J100-10 Risk and Resilience Management
of Water and Wastewater Systems

EPA Asset Management Guidelines

To Be Followed by LSCE in Developing

District Asset Management Plan

EPA Asset Management Best Practices Guide

EPA Asset Management Plan Development Template

EPA United States Environmental Protection Agency

Asset Management: A Best Practices Guide

Introduction

Purpose	This guide will help you understand: • What asset management means. • The benefits of asset management. • Best practices in asset management. • How to implement an asset management program.
Target Audience	This guide is intended for owners, managers, and operators of water systems, local officials, technical assistance providers, and state personnel.

Asset Management

Asset management is maintaining a desired level of service for what you want your assets to provide at the lowest life cycle cost. Lowest life cycle cost refers to the best appropriate cost for rehabilitating, repairing or replacing an asset. Asset management is implemented through an **asset management program** and typically includes a written **asset management plan**.

Challenges faced by Water Systems

- Determining the best (or optimal) time to rehabilitate/repair/replace aging assets.
- Increasing demand for services.
- Overcoming resistance to rate increases.
- Diminishing resources.
- Rising service expectations of customers.
- Increasingly stringent regulatory requirements.
- Responding to emergencies as a result of asset failures.
- Protecting assets.

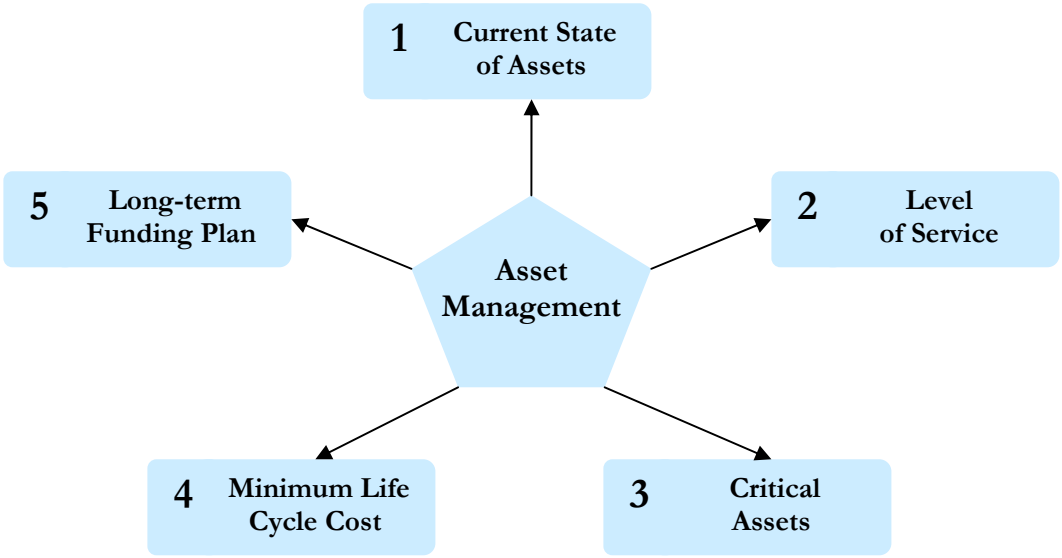
Benefits of Asset Management

- Prolonging asset life and aiding in rehabilitate/repair/replacement decisions through efficient and focused operations and maintenance.
- Meeting consumer demands with a focus on system sustainability.
- Setting rates based on sound operational and financial planning.
- Budgeting focused on activities critical to sustained performance.
- Meeting service expectations and regulatory requirements.
- Improving response to emergencies.
- Improving security and safety of assets.

Implementing Asset Management: Five Core Questions Framework

A good starting point for any size water system is the five core questions framework for asset management. This framework walks you through all of the major activities associated with asset management and can be implemented at the level of sophistication reasonable for a given system. These five core framework questions provide the foundation for many asset management best practices. Several asset management best practices are listed for each core question on the following pages. Keep in mind that these best practices are constantly being improved upon.

Flow Chart: The Five Core Questions of Asset Management Framework



This flow chart shows the relationships and dependencies between each core framework question.

1. What is the current state of my system's assets?

The first step in managing your assets is knowing their current state. Because some of this information may be difficult to find, you should use estimates when necessary. Over time, as assets are rehabilitated, repaired or replaced, your inventory will become more accurate.

You should ask:

- What do I own?
- Where is it?
- What is its condition?
- What is its useful life?
- What is its value?

Best practices include:

- Preparing an asset inventory and system map.
- Developing a condition assessment and rating system.
- Assessing remaining useful life by consulting projected-useful-life tables or decay curves.
- Determining asset values and replacement costs.

2. What is my required "sustainable" level of service?

Knowing your required "sustainable" level of service will help you implement an asset management program and communicate to stakeholders what you are doing. Quality, quantity, reliability, and environmental standards are elements that can define level of service and associated system performance goals, both short- and long-term. You can use information about customer demand, data from utility commissions or boards, and information from other stakeholders to develop your level of service requirements. Your level of service requirements can be updated to account for changes due to growth, regulatory requirements, and technology improvements.

You should ask:

- What level of service do my stakeholders and customers demand?
- What do the regulators require?
- What is my actual performance?
- What are the physical capabilities of my assets?

Best practices include:

- Analyzing current and anticipated customer demand and satisfaction with the system.
- Understanding current and anticipated regulatory requirements.
- Writing and communicating to the public a level of service "agreement" that describes your system's performance targets.
- Using level of service standards to track system performance over time.

3. Which assets are critical to sustained performance?

Because assets fail, how you manage the consequences of failure is vital. Not every asset presents the same failure risk, or is equally critical to your water system's operations. Therefore, it is important to know which assets are required to sustain your water system's performance. Critical assets are those you decide have a high risk of failing (old, poor condition, etc.) and major consequences if they do fail (major expense, system failure, safety concerns, etc.). You can decide how critical each asset is and rank them accordingly. Many water systems may have already accomplished this type of analysis in vulnerability assessments.

You should ask:

- How can assets fail?
- How do assets fail?
- What are the likelihoods (probabilities) and consequences of asset failure?
- What does it cost to repair the asset?
- What are the other costs (social, environmental, etc.) that are associated with asset failure?

Best practices include:

- Listing assets according to how critical they are to system operations.
- Conducting a failure analysis (root cause analysis, failure mode analysis).
- Determining the probability of failure and listing assets by failure type.
- Analyzing failure risk and consequences.
- Using asset decay curves.
- Reviewing and updating your system's vulnerability assessment (if your system has one).

4. What are my minimum life cycle costs?

Operations and maintenance (O&M), personnel, and the capital budget account for an estimated 85 percent of a typical water system's expenses. Asset management enables a system to determine the lowest cost options for providing the highest level of service over time. You want to optimize the work O&M crews are doing, where they are doing it, and why. An asset management program helps make risk-based decisions by choosing the right project, at the right time, for the right reason.

You should ask:

- What alternative strategies exist for managing O&M, personnel, and capital budget accounts?
- What strategies are the most feasible for my organization?
- What are the costs of rehabilitation, repair, and replacement for critical assets?

Best practices include:

- Moving from reactive maintenance to predictive maintenance.
- Knowing the costs and benefits of rehabilitation versus replacement.
- Looking at lifecycle costs, especially for critical assets.
- Deploying resources based on asset conditions.
- Analyzing the causes of asset failure to develop specific response plans.

5. What is my best long-term funding strategy?

Sound financial decisions and developing an effective long-term funding strategy are critical to the implementation of an asset management program. Knowing the full economic costs and revenues generated by your water system will enable you to determine your system's financial forecast. Your system's financial forecast can then help you decide what changes need to be made to your system's long-term funding strategy.

You should ask:

- Do we have enough funding to maintain our assets for our required level of service?
- Is our rate structure sustainable for our system's long-term needs?

Some strategies to consider:

- Revising the rate structure.
- Funding a dedicated reserve from current revenues (i.e., creating an asset annuity).
- Financing asset rehabilitation, repair, and replacement through borrowing or other financial assistance.

Implementing Asset Management: Follow-up and Continuing Steps

The five core questions framework for asset management is the starting point for asset management. Beyond planning, asset management should be implemented to achieve continual improvements through a series of "plan, do, check, act" steps.

- Plan: Five core questions framework (short-term), revise asset management plan (long-term).
- Do: Implement asset management program.
- Check: Evaluate progress, changing factors and new best practices.
- Act: Take action based on review results.

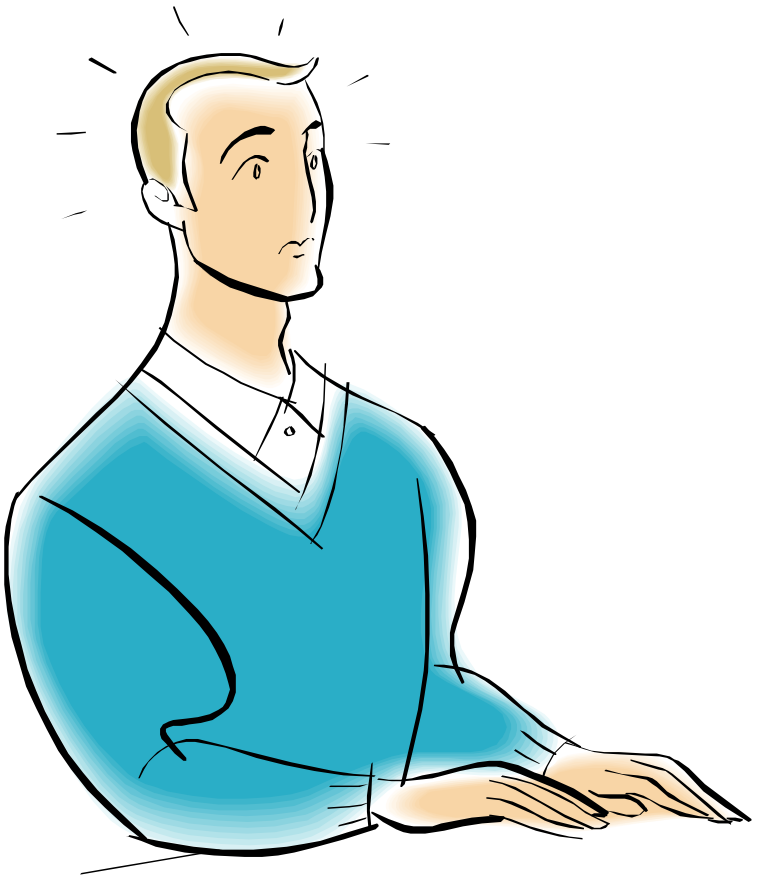
For additional information: Call the Safe Drinking Water Hotline at 1-800-426-4791, visit the EPA Web site at http://www.epa.gov/safewater/smallsystems or contact your state drinking water representative.

Fundamentals of Asset Management

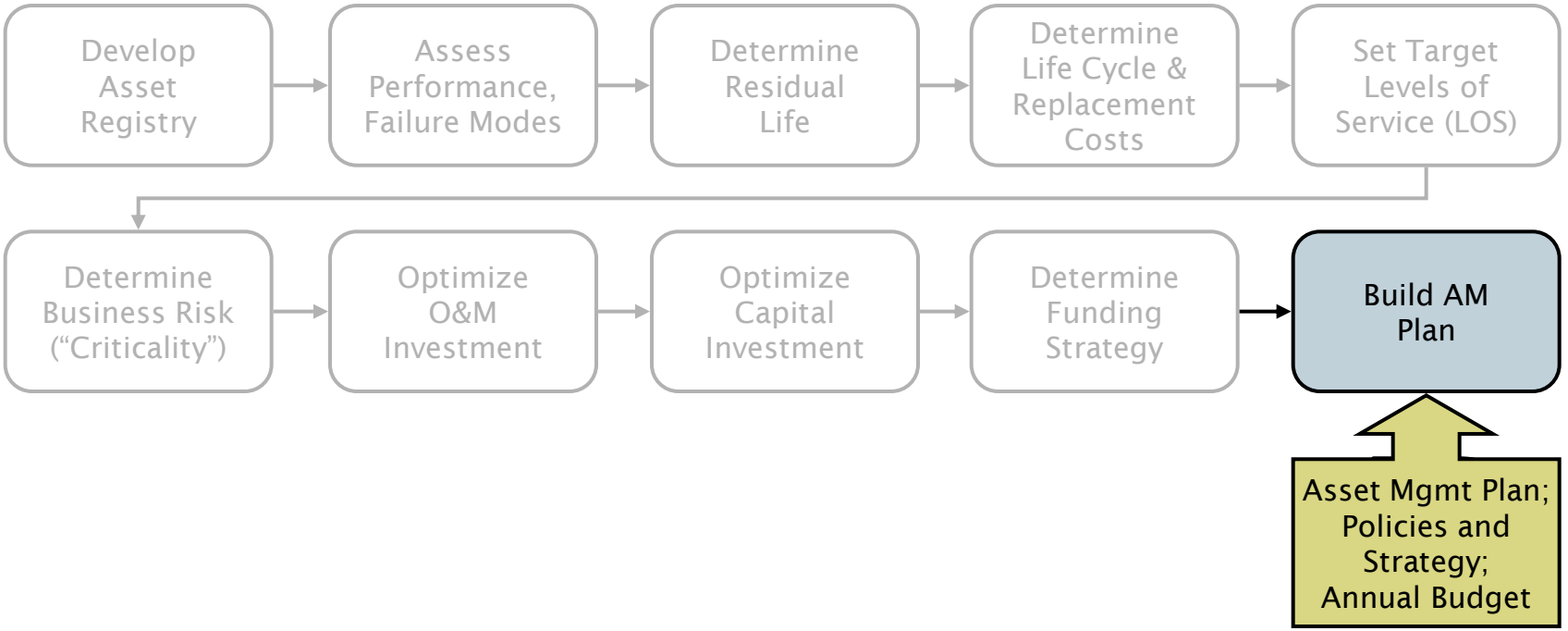
Step 10. Build Asset Management Plan

A Hands-On Approach

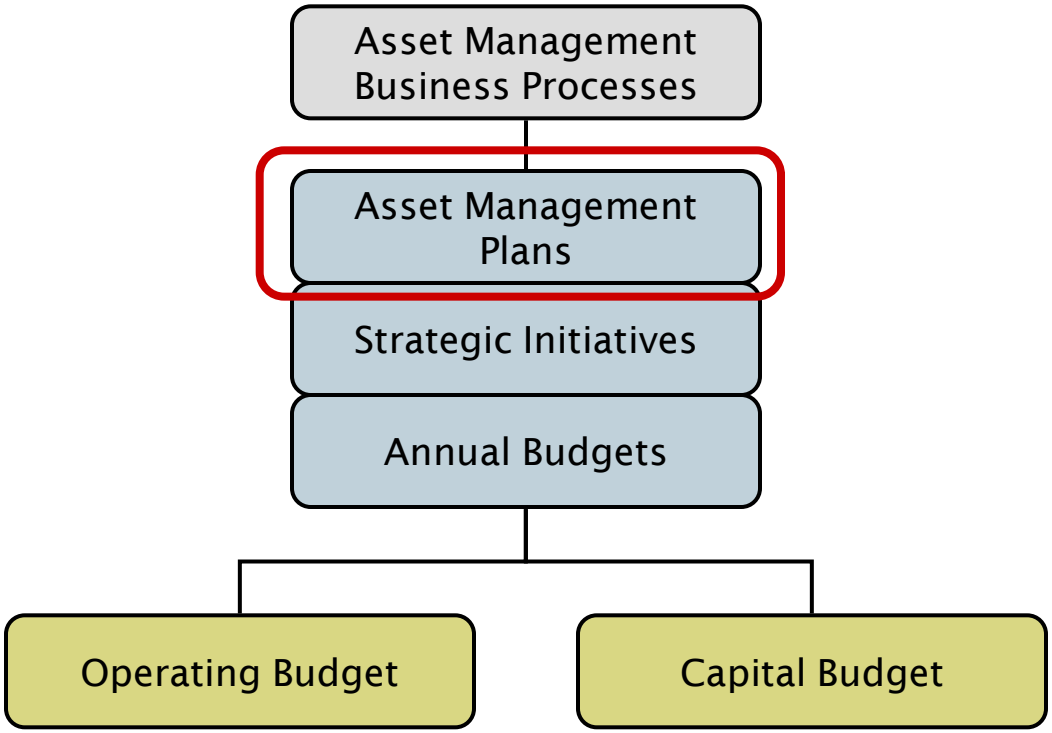
Tom’s bad day…



AM plan 10-step process



Recall View 4: Management framework



Asset decision framework

Big picture

- Whole portfolio perspective
  - Trends
  - Macro forces
- Policy framework
- Budget arena

Micro view

- Event based
- Specific asset focus
- Case-by-case decision points

Maintain? Repair? Refurbish? Replace? Augment?

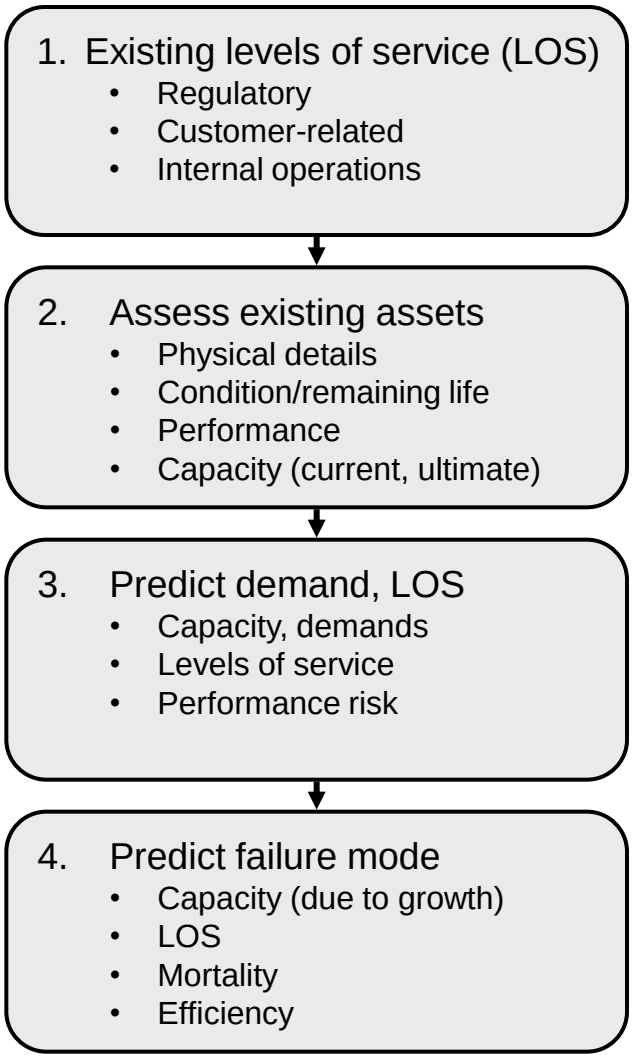
Tom's Jones Street asset management plan: Key points

- *State of the facility*
  - Facility is well into mature stage of life cycle
  - Most imminent major failure mode—capacity
    - Assume two years before peak design flow is exceeded—growth
    - Additional capacity can not be feasibly added
  - Physical state is very poor, especially pumps and motors
  - Asset is largely at 75% to 90% physical life consumed
- *Required LOS*
  - *Stop SSOs*
  - Meet Whispering Oaks flow requirements
- *Critical assets*
  - Roof
  - Power
  - Controls
  - Pump assemblies

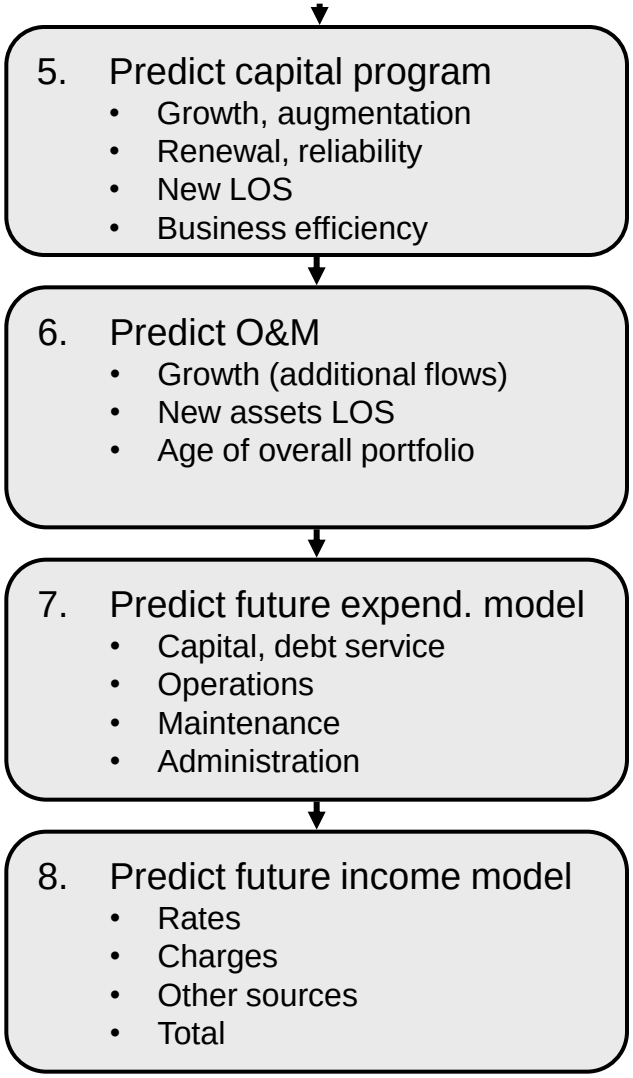
Tom's Jones Street asset management plan: Key points

- *O&M/CIP investment strategies*
  - Keep lift station running for two years, then decommission
  - All replacement equipment sized for reuse in new lift station
  - Move to predictive maintenance (set up monitoring intervals) for dynamic (mechanical/electrical) equipment based on root cause
  - Run to failure with effective reactive response plan for rest
  - Assure that reactive response plan provides for continuous functioning (bypass/supplemental power/supplemental pump)
- *Toward a funding strategy*
  - Identify O&M budget requirements to fund interim O&M strategy
  - Prepare valid capital budget/project to replace lift station
  - Prepare business case and present to Council

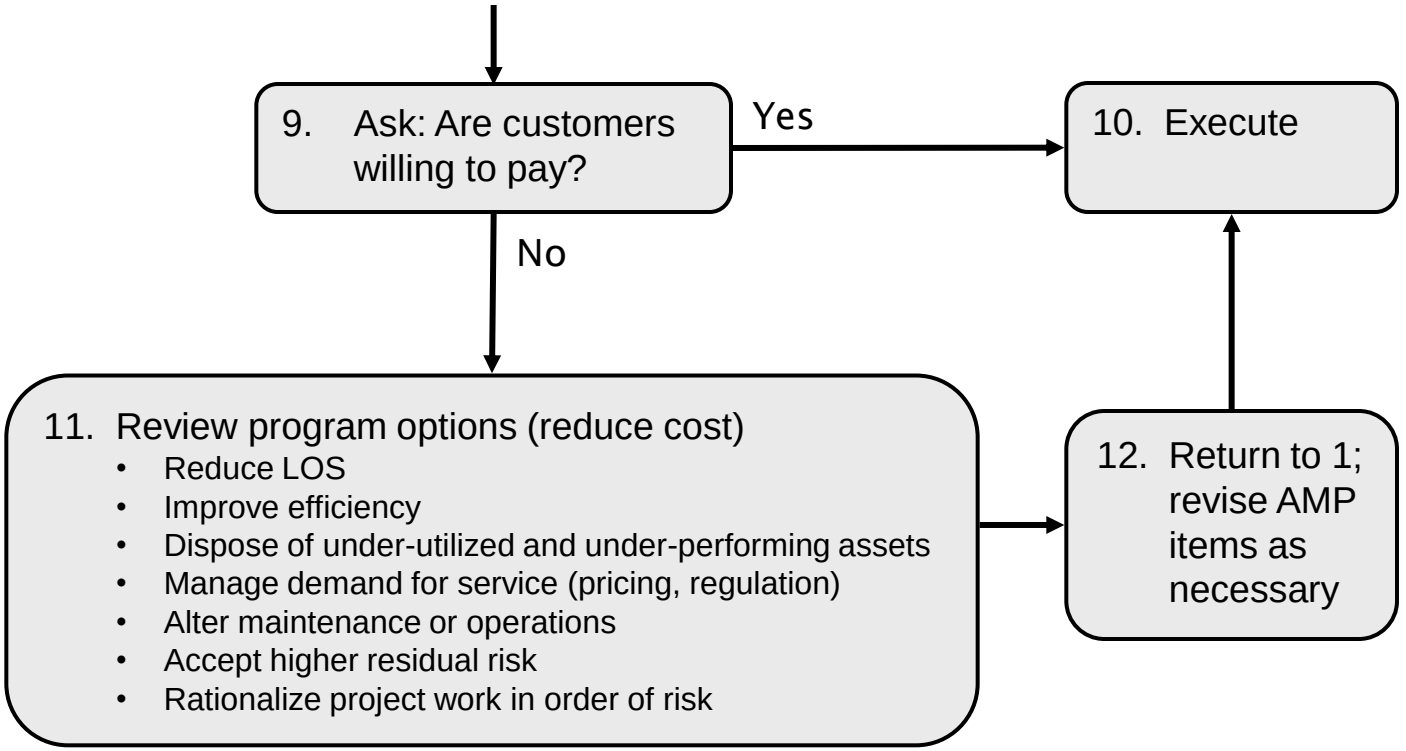
Steps in developing your AMP



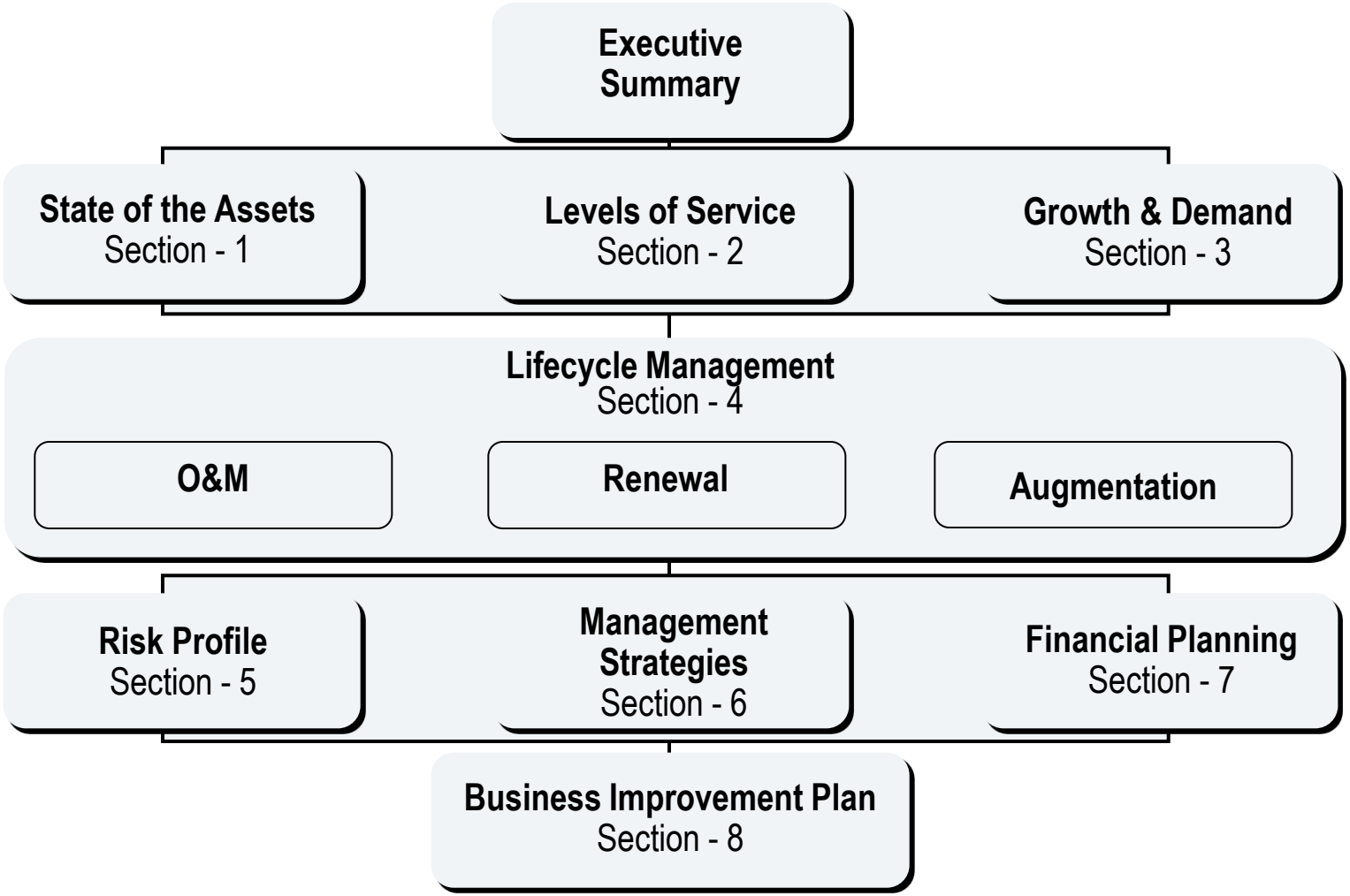
Steps in developing your AMP, cont.



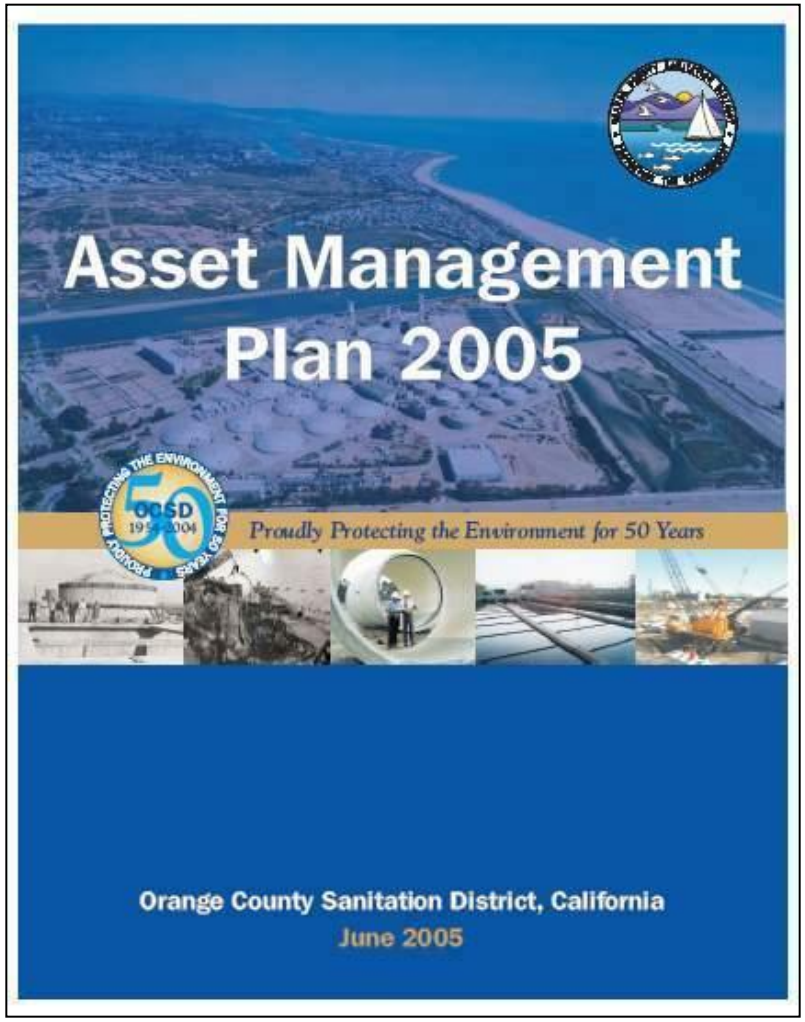
Steps in developing your AMP, cont.

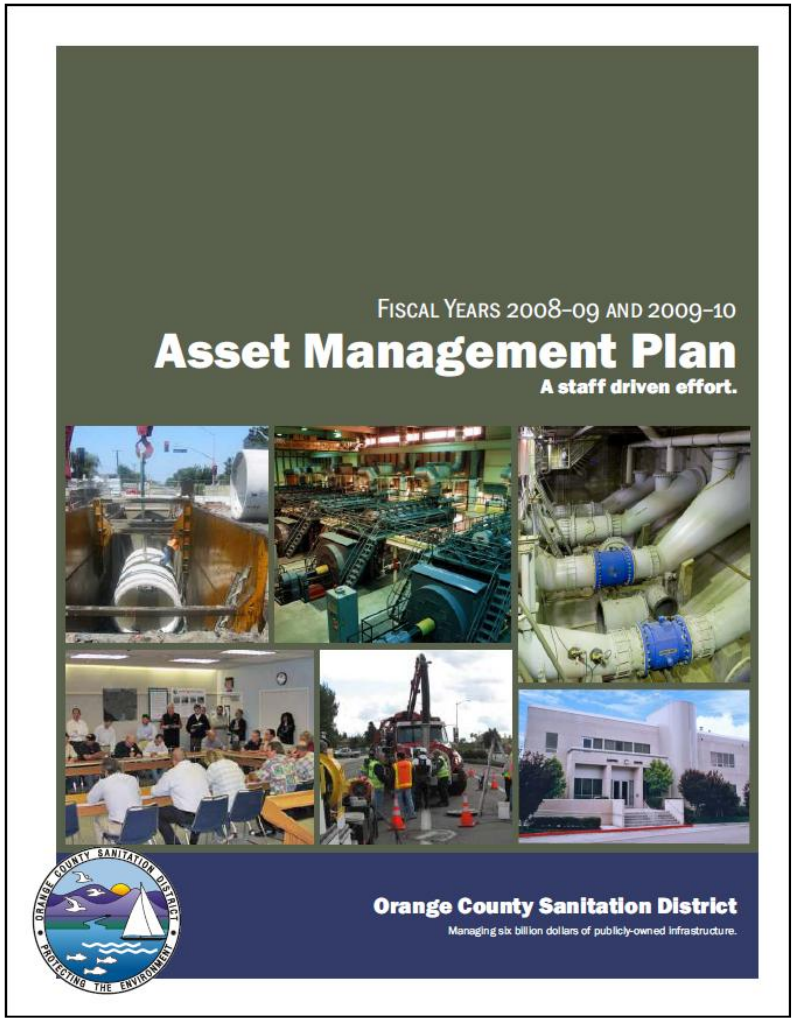


The Enterprise Asset Management Plan



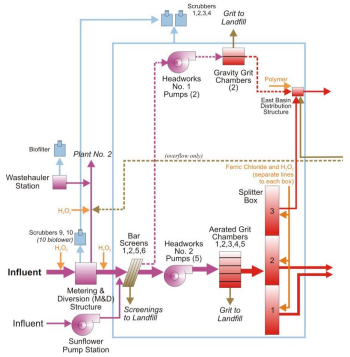
The enterprise asset management plan





The Enterprise Asset Management Plan—asset system summary

1. Asset Profile



Metering & Diversion Structure

A total of six influent trunk lines bring influent into the metering and diversion structure at Plant No. 1. This structure contains magnetic flow meters, pH meters and electro-conductivity meters along with gates that can be raised or lowered to move flows from one trunk-line to another as necessary. A portion of the influent can also be diverted to Plant No. 2 through an interplant pipeline to regulate flow into Plant No. 1.

Headworks #1 & #2

There are two Headworks at Plant 1, which have a total rated pump capacity of 210 mgd with 130 mgd of stand by. Headworks #2 can be increased by another 70 mgd in the future by addition of another pump. It has two support generation units with a power rating of 1000 KW. Headworks #2 is the newest and is the operated system and Headworks #1 is the standby system. Three key processes for Headworks are bar screens, influent pumps, and grit removal.

Screening Station (Bar screens)

Flow from the Metering and Diversion Structure is routed to the influent channel for the mechanically-cleaned bar screens at Headworks #2. There are four individual bar screen channels containing automatically cleaned screens. Two of the screens are operated and the other two are standby. The structure contains space to accommodate two additional screens in the future.

Main Sewage Pumps

After passing through the Headworks #2 bar screens, wastewater flows into the Influent Pump Station wet well. The Influent Pump Station lifts screened wastewater to the influent channel serving the grit removal chambers. There are four 70 mgd variable speed pumps at Headworks #2 and two 30 mgd constant speed pump at Headworks #1, which services as stand by pumps. A sluice gate in this wet well can be opened to allow screened wastewater to flow to the Headworks #1 Influent Pump Station wet well if required allowing the wet wells at Headworks #2 and Headworks #1 to act as one large wet well under extreme wet weather conditions.

Grit System (Grit Removal)

There are five aerated grit removal chambers at Headworks #2 and two at Headworks #1 that are standby. The purpose of these is to remove inorganic solids that are present in the wastewater. The removal of this grit helps prevent clogging in pipes, protects mechanical equipment, and reduces the amount of material that collects in the sludge digesters. Each grit chamber contains four grit collection hoppers. Grit is removed from the chambers using telescoping valves that continuously discharge grit slurry by gravity to classifiers. Grit from the classifiers discharged to the conveyor belt carrying screens normally or to a separate grit bin for off-site disposal. Flow from the Headworks #2 grit removal chambers is collected in an effluent channel that discharges to the Primary Influent Distribution Structure (Splitter Box).

Splitter Box

The splitter structure discharges to the Primary Clarifier Basin # 1 to 5 through a 72 inch-diameter pipeline and/or to the rectangular PCB # 6 to 15 through two 90 inch-diameter pipelines. Splitting is accomplished using the sluice gates.

2. Demand Profile and Performance

Table 1 Peak, Average and Standby Design Capacities

System Sub System(s)	Design Capacity (Min, max, peak and/or average)	Actual Performance
Metering & Diversion Structure	Max. Flowrate 490 MGD	
Hydrogen Peroxide	Max. Pressure 150 psi	
Sunflower Pump Station	30 MGD duty 30 MGD standby?	
Headworks No. 1	30 MGD duty	
Main Sewage Pumps	30 MGD duty 30 MGD standby	
Grit Removal	2 chambers	
Headworks No. 2	210 MGD duty	
Main Sewage Pumps	280 MGD duty 70 MGD standby	
Bar Screens	4 units (+allowance for 2 units to be constructed) 234 MGD max 1 unit standby	
Grit System		
• Grit Chambers	87 MGD duty 25 MGD standby 5 tanks 2 tanks standby	
• Grit Washers	Hydraulic 1800 gpm Overflow Rate 12,000 gpd/ft2 1 duty and 1 standby	
• Grit Storage Capacity	2 days	
Splitter Box	325 MGD	
Odor Control Facilities (Bleach)	3 @ 24000 cfm duty 1 @ 24,000 cfm standby	
• Feed Pumps	3 @ 11.3 gph duty 1 @ 20 gph standby	
• Recirculation Pumps	4 @ 600-700 gpm duty 4 @ 600-700 gpm standby	
• Muriatic Acid Scrubbing Cleaning Pumps	1 @ 30 gpm duty 1 @ 30 gpm standby	
Trunk Line Scrubbers 1 * Caustic 1 * Biotower	24,000 CFM duty 24,000 CFM standby	Insufficient performance
Ferric Chloride • Feed Pump	3 @ 200 gph duty 1 @ 200 gph standby	
Hydrogen Peroxide		
• Headworks	4 duty (See 10H-120, Pump information) 4 standby pumps Flowrate Capacity 85 gpm Pressure 116 psi	
• Splitter Box	Max. Flowrate Capacity 325 gpd Max. Pressure 150 psi	
Support Generators	Power Rating 1000 KW	
Scrubbers Headworks	2 on trunk lines	

3. Failure Mode

Table 2 Failure Summary

Process	Area	Rating				
		Condition	Capacity	Function	Reliability	Efficiency
Metering & Diversion Structure	10A	2				
Headworks #1	10B	5			5	
Headworks #2	10C	3				

4. Key Issues for Further Investigation

General

Project I-10 to increase flow to Plant 1 by 40 MG/D

Metering & Diversion Structure

Concerns about the reliability and accuracy of meters exist due to meter failures. Proper operation of the meters is important because treatment costs are allocated to the various revenue areas based on influent meter readings.

Headworks No. 1

Questions have been raised as to the ability of the headworks to operate properly under emergency conditions.

Headworks No. 2

Grit Chamber No. 2 is out of service.

6. Investment Program

Table 3 5-Year Summary

Investment (thous.)	Total Projected Budget	Cost to date	2005-06	2006-07	2007-08	2008-09
P1-105	4,920	240	393	320	3,430	537
Total	**4,920**	**240**	**393**	**320**	**3,430**	**537**

Table 4 O&M Cost Summary

Cost (thous.)	2002-03	2003-04	2004-05	2005-06	2006-07
Maintenance			208		
Operations			1108		

5. Current Program

Study

TBA

Planning

TBA

Design & Construction

P1-105 - Headworks Rehabilitation and Expansion at Plant No. 1

This project rehabilitates and refurbishes process equipment and infrastructure within the Plant 1 Headworks facility, to ensure that the facility continues to be operational. Several studies have been conducted on the Headworks facility and a number of non-critical items have been identified for repair and upgrade. The bulk of the project includes upgrades to existing bar screens, an additional bar screen, a screenings compressor, improvements to the grit removal facilities, improvements to the power distribution system including three new larger emergency generators, and miscellaneous process, mechanical, structural and I&C upgrades.

This project is in keeping with industry practices as required for reliable and dependable plant operations. The capital budget identified on this sheet is based on the non-critical items necessary to ensure the facility continues to function and conforms to the ultimate layout of the facility. The FY 2004/05 budgets for P1-71 and P1-105 have been reallocated after further evaluation of critical and non-critical work. P1-105 will address increases in the facilities capacity to meet expected increases in wastewater flow projected in the 2001 Interim Strategic Plan Update.

P1-71 - Headworks Rehabilitation/Refurbishment

The scope of work consists of rehabilitating and refurbishing the VFDs for the main sewage pumps and the cable trays and wiring from the VFDs to the pumps. An evaluation of the pumping capacity of Headworks No. 2 at Plant 1 conducted in 2001. Capacity issues will not be addressed through this project as capacity upgrades are being handled through a separate project (Ellis Avenue). There are other potential tasks items for this project which includes: a grit characterization study based on a computer model, gate operators, and installation of ventilation in Headworks 1 to meet NFPA 820. Other tasks that were previously part of this project have been moved to Job No. P1-105.

This project is in keeping with industry practices as required for reliable and dependable plant operations. These reliability of these VFDs must be restored by late 2008 such that Plant 1 may reliably accept diverted flow from Plant 2 during Plant 2 Headworks changeover.

P1-104 – Regional FOG Control Collection at Plant 1

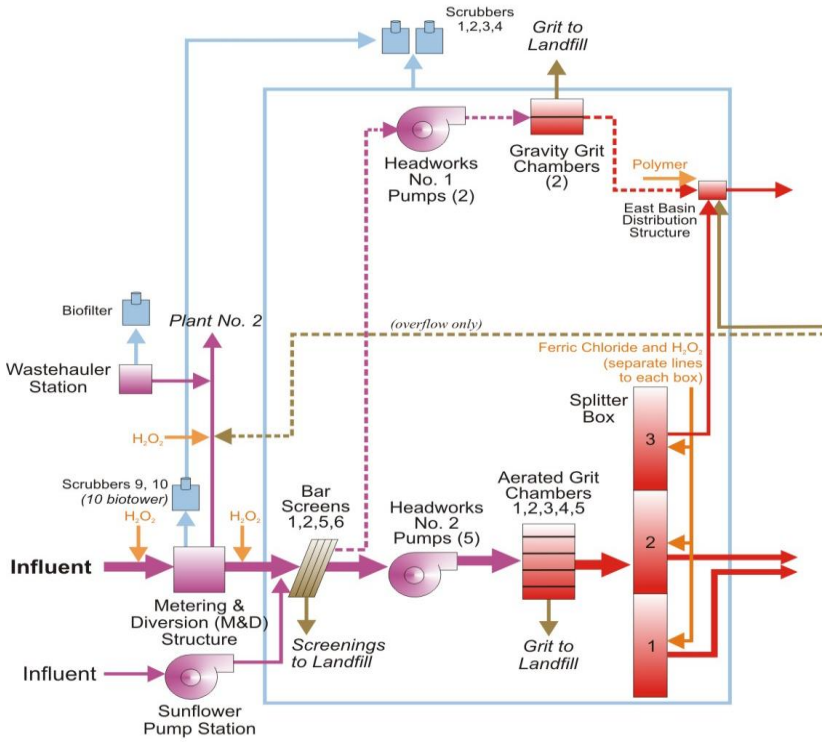
J71-8 – Headwork Scrubbing Replacement

Management Strategies

TBA

Detail, left page

1. Asset Profile



Metering & Diversion Structure

A total of six influent trunk lines bring influent into the metering and diversion structure at Plant No. 1. This structure contains magnetic flow meters, pH meters and electro-conductivity meters along with gates that can be raised or lowered to move flows from one trunk-line to another as necessary. A portion of the influent can also be diverted to Plant No. 2 through an interplant pipeline to regulate flow into Plant No. 1.

2. Demand Profile and Performance

Table 1 Peak, Average and Standby I

System Sub System(s)	Design Capac (Min, max, pe average)
Metering & Diversion Structure	Max. Flowrate
Hydrogen Peroxide	Max. Pressure
Sunflower Pump Station	30 MGD duty 30 MGD stand
Headworks No. 1	30 MGD duty
Main Sewage Pumps	30 MGD duty 30 MGD stand
Grit Removal	2 chambers
Headworks No. 2	210 MGD duty
Main Sewage Pumps	280 MGD duty 70 MGD stand
Bar Screens	4 units (+allow units to be cor 234 MGD max 1 unit standby
Grit System	
• Grit Chambers	87 MGD duty 25 MGD stand 5 tanks 2 tanks standb
• Grit Washers	Hydraulic 180 Overflow Rate

Detail, right page

3. Failure Mode

Table 2 Failure Summary

Process	Area	Rating				
		Condition	Capacity	Function	Reliability	Efficiency
Metering & Diversion Structure	10A	2				
Headworks #1	10B	5			5	
Headworks #2	10C	3				

4. Key Issues for Further Investigation

General

Project I-10 to increase flow to Plant 1 by 40 MG/D

Metering & Diversion Structure

Concerns about the reliability and accuracy of meters exist due to meter failures. Proper operation of the meters is important because treatment costs are allocated to the various revenue areas based on influent meter

5. Current Program

Study

TBA

Planning

TBA

Design & Construction

P1-105 - Headworks Rehabilitation and Expansion at P

This project rehabilitates and refurbishes process equipme infrastructure within the Plant 1 Headworks facility, to ensu facility continues to be operational. Several studies have b on the Headworks facility and a number of non-critical item identified for repair and upgrade. The bulk of the project in upgrades to existing bar screens, an additional bar screen compressor, improvements to the grit removal facilities, im the power distribution system including three new larger en generators, and miscellaneous process, mechanical, struc upgrades.

This project is in keeping with industry practices as require and dependable plant operations. The capital budget ident sheet is based on the non-critical items necessary to ensu continues to function and conforms to the ultimate layout c The FY 2004/05 budgets for P1-71 and P1-105 have been after further evaluation of critical and non-critical work. P1 address increases in the facilities capacity to meet expecte

The asset management improvement plan section

OCSD Asset Management Improvement Program
Staff Lead Program 2005/06 Budget - Overall Timeline

Project No.	Project Name	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May
11 & 12	Data Standards Asset Registers				(GHD)		CMMS						
8	AMIS Function Applications and Strategy									(GHD)			
13	Condition Assessment Guidelines						(GHD)						
2	CIP Validation Stage 4					(JB)							
4	BRE Collections			(NA)									
5	BRE Plant						(JB)						
6	LOS Stage 2									(JH)			
7	4 Box Model									(DS)			
1	Asset Management Plan 2									(AMT-DS)			
10	ORDM / LLCCA					(AMT-DS)							
9	Risk Policy							(AMT-DS)					
14	Organizational Alignment										(AMT-DS)		
3	Reliability Centered Management												

Example: Organizational AM strategies

No.	Description	Remarks /Deliverables	Benefits
1	Asset Management Plan 2006	Increase confidence level rating with better accurate data on condition and performance, more defined management strategies, improve future predictions on changed levels of service overall results / outputs etc including rate modeling. Complete updated asset management plan analysis and assess improvements made. Links and inputs from most projects.	◗ Asset Management Plan output improvements. ◗ Improved Confidence Level Rating. ◗ Improved Business Risk Exposure assessments, funding and rate models, operations and maintenance budgets. ◗ Expenditure prediction Tool enhancements and improved Business Risk Exposure modeling.
2/10	Capital Improvement Program Validation Stage 4 (2005/06)	Add life cycle costs, Business case analysis methodology, including improved maintenance budgets /options and improve risk model to full economic cost and Triple Bottom	◗ Significant benefits derived for 2004 program ($25M in capital) and over $50M in life cycle costs.

ASSET MANAGEMENT POLICIES

Washington Suburban Sanitary Commission

Effective planning, design, construction, operation, maintenance and renewal of infrastructure assets are the primary means by which we meet our obligations to stakeholders and rate-payers.

We are committed to an asset management program that ensures our staff and management will:

1. Provide training in all relevant aspects of asset management to enable staff to perform required functions at a high level of competence while pursuing opportunities for continuous improvement. This includes implementing:
   - Asset management systems and resource management tools to ensure that appropriate skills and resources match our anticipated work;
   - An organization-wide knowledge management system incorporating the retention and /transfer of knowledge of individuals, and
   - Regular training programs that address asset management practices, business processes, and skills requirements.
2. Know what assets we own and for which assets we have responsibility or legal liability. We will record these assets in one register down to a maintenance-managed item (MMI level).
3. Apply best appropriate life cycle processes and practices to our assets. We will acquire and maintain the necessary data and knowledge these processes and practices require. We will store our data and knowledge in suitable enterprise-wide information systems that support our asset management responsibilities.
4. Monitor the condition, performance, use and cost of infrastructure assets down to the appropriate level (part, item, asset, etc.) and against prescribed service levels and regulatory requirements.
5. Understand those infrastructure assets that are critical to our service levels and prioritize their management to ensure they don't fail. (This is not to imply that non-critical assets are ignored).
6. Understand and record the current levels of service with which we provide our customers. We will understand the likely future levels of service required in order to continue to serve our customers.
7. Know the future level of service options available and their associated costs. We will publish future level of service options periodically through our asset management plans and associated funding strategies. We will use future level of service options in our public/customer outreach programs.
8. Link our level of service with our stakeholder expectations, through customer outreach, at a cost that our customers are willing to pay.
9. Understand customer expectations including the non-regulatory aspects of our business (e.g., noise, customer service, appearance, cleanliness, customer outreach).

The AM "charter"

The AM charter

Asset Inventory We will know the assets that we own, or for which we have legal responsibility, and will maintain an accurate computerized asset register developed around an asset hierarchy that supports advanced asset management functions.

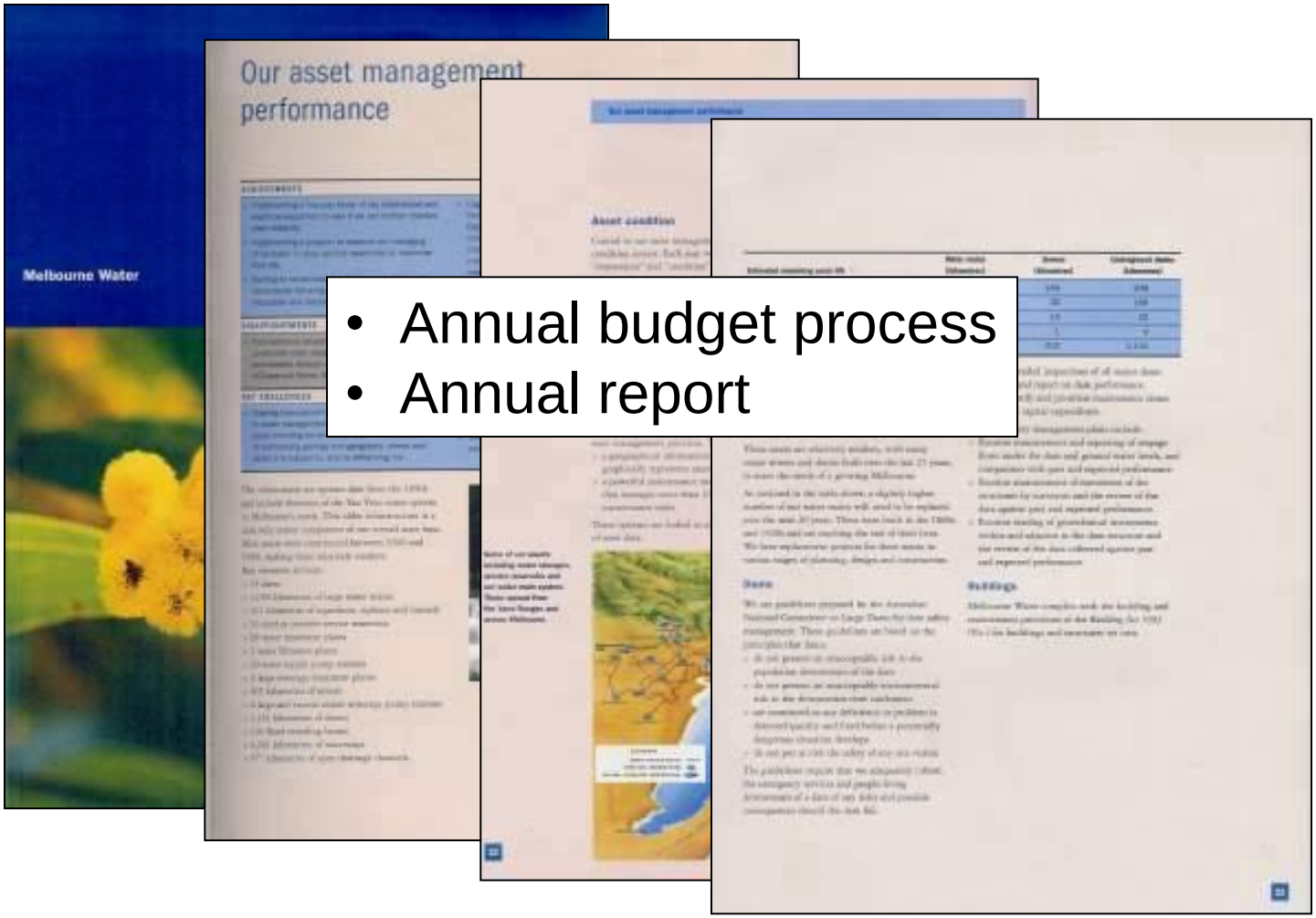
The AM charter

Condition Assessment We will gather, record, and analyze condition assessment data; store and analyze it using user friendly computerized systems; design these systems to support high confidence level asset related decision making; and create a comprehensive and dynamic condition index.

The AM charter

Maintenance We will retain a detailed maintenance policy, and operate a user friendly, accurate, and comprehensive enterprise asset management system (that includes a Computerized Maintenance Management System) to ensure that the assets, facilities, and systems perform to their design criteria and meet their design lives.

Telling the story—institutionalization



- Annual budget process
- Annual report

Key points from this session

What does my asset management plan look like?

Key Points:

- AM focuses relentlessly on providing sustained performance at the lowest life-cycle cost to the organization
- AM is both a way of thinking and a set of specific practices
- The more we understand about our assets, the better we can mange them
- Understanding our assets starts with asking the right questions

Associated Techniques:

- The Enterprise Asset Management Plan
- The Total Enterprise Asset Management Improvement Program
- Best AM Practices; Best Appropriate Practices
- The Five Core AM Questions
- The 10 Step Process to an asset management plan

Example Asset Management Table

Pennsylvania Water Authority
Asset Management
Spreadsheet

Pennsylvania Water Authority Asset Management Spreadsheet

Asset Inventory								State of My Assets?	Which Are Most "Critical"?				Renewal / Replacement Strategy			
Asset Register *					Asset Tag**	Year Installed	Original Cost	Effective Life	Original Planned Replacement Year	Condition Rating	Backup Reduction (Redundancy)	Probability of Failure	Consequence of Failure	BRE Rating	Renewal / Replacement Strategy	Cost of Renewal / Replacement Option	Recommended Renewal / Replacement Year	Future Value of Renewal / Replacement Cost
Levels						Years	$	Years	Years	1 to 10	%	Rel. to col. K	1 to 10		Comments	Current Value		Discount Rate
1	2	3	4	5		Act or Est	Act or Est		(G+I)	(See AM Plan)		(10-K)	(See AM Plan)	=(1-L)*M*N	(See AM Plan)	Estimate	Adjusted per BRE	2.50%
Wastewater System																		
Collection System																		
Piping (clay)																		
Seg: 3A-1 (895' x 8")					CI6.001	1919	$ 8,950	100	2019	8	0%	2	3	6	6	$ 44,750	2020	$ 60,184
Seg: 3A-2 (976' x 8")					CI6.002	1919	$ 9,760	100	2019	8	0%	2	3	6	6	$ 48,800	2021	$ 67,271
Seg: 3A-3 (1015' x 10")					CI6.003	1919	$ 10,150	100	2019	6	0%	4	5	20	6	$ 50,750	2022	$ 71,708
Seg: 4A-1 (885' x 16")					CI10.001	1895	$ 8,850	100	1995	3	0%	7	5	35	6	$ 341,250	2016	$ 350,000
Seg: 4A-2 (1015' x 10")					CI6.004	1936	$ 15,000	100	2036	6	0%	4	3	12	2		2025	$ -
Seg: 4A-3 (667' x 8")					CI6.005	1948	$ 15,000	100	2048	6	0%	4	3	12	2		2045	$ -
Seg: 5A-1 (825' x 16")					CI10.002	2002	$ 285,000	100	2102	10	0%	0	9	0	6	$ 350,000	2075	$ 1,830,489
Seg: 5A-2 (774' x 8")					CI6.006	1936	$ 22,000	100	2036	4	0%	6	5	30	7	$ 110,000	2035	$ 214,258
Seg: 5B-1 (927' x 8")					CI6.007	1942	$ 25,000	100	2042	4	0%	6	5	30	7	$ 110,000	2045	$ 274,268
Seg: 5B-2 (245' x 8")					CI6.008	1936	$ 5,950	100	2036	4	0%	6	3	18	8	$ 59,500	2020	$ 80,021
Seg: 6A-1 (818' x 12")					CI10.003	1936	$ 6,400	100	2036	4	0%	6	3	18	8	$ 64,000	2021	$ 88,225
Seg: 6A-2 (912' x 10")					CI6.009	1936	$ 4,750	100	2036	4	0%	6	3	18	8	$ 47,500	2022	$ 67,116
Seg: 6A-3 (445' x 8")					CI6.010	1936	$ 10,950	100	2036	4	0%	6	3	18	8	$ 109,500	2023	$ 158,589
Seg: 6A-4 (225' x 8")					CI6.011	1945	$ 375	100	2045	6	0%	4	1	4	6	$ 2,250	2024	$ 3,340
Seg: 6A-5 (124' x 8")					CI6.012	1995	$ 61,600	100	2095	8	0%	2	1	2	8	$ 25,200	2035	$ 49,085
Treatment Plant																		
Headworks					H(1-2)(.001-100)	1982	$ 125,000	75	2057	7	0%	2	10	20	6		2057	$ -
Primaries					P(1-2)(.001-100)	1940	$ 100,000	75	2015	6	50%	4	10	20	6	$ 30,000	2018	$ 38,403
Secondaries					S(1-2)(.001-100)	1982	$ 500,000	75	2057	8	50%	2	10	10	3		2060	$ -
Clarifiers					C(1-2)(.001-100)	1982	$ 285,000	75	2057	8	50%	2	10	10	3		2060	$ -
Disinfection					D1(.001)-100)	1940	$ 150,000	75	2015	6	50%	4	10	20	6	$ 50,000	2018	$ 64,004
Disinfection (2)					D2(.001-100)	1948	$ 165,000	75	2023	6	50%	4	10	20	6	$ 60,000	2060	$ 216,667
Solids Handling					S(.001-100)	1982	$ 100,000	75	2057	8	0%	2	10	20	3		2060	$ -
Total Waste							$ 1,914,735									$ 1,503,500		$ 3,633,627

Additional Features that AM systems can provide:

- o Analysis of failure modes
- o Record of repair costs by asset
- o Emergency vs planned repairs
- o Tie to Maint Mgmt Sys
- o Use database system to allow more data and more manipulation
- o Incorporate Env Mgmt Sys concepts to improve performance and save money

Level of detail that asset inventory should provide:

List assets to the level of detail that they would likely be replaced. For example, a system may choose to treat all pipe that is of a given age and material as a single asset if it would likely be replaced or rehab at the same time.

* This asset list is abbreviated for display purposes, Assets are typically listed to the level of detail that lists individual components that would be replaced.

**Drinking water and wastewater systems should use whatever numbering system is appropriate for their system.

Town of Discovery Bay

"A Community Services District"

STAFF REPORT

Meeting Date

September 2, 2020

Prepared By: Mike Yeraka, Projects Manager and Justin Shobe, District Water Engineer
Submitted By: Michael R. Davies, General Manager

Agenda Title

Discussion and Provide Feedback on Scope of Work for Luhdorff & Scalmanini to Prepare the America's Water Infrastructure Act (AWIA) Risk and Resilience Assessment in the Amount of $25,000.

Recommended Action

Provide Feedback for Staff to Bring the Item to the Full Board at the September 16, 2020, meeting to Authorize the General Manager to Execute the Town's Standard Consultant Agreement for Luhdorff & Scalmanini to Prepare the America's Water Infrastructure Act (AWIA) Risk and Resilience Assessment as per the Attached Scope of Work dated August 21, 2020.

Executive Summary

The District must prepare a Risk and Resilience Assessment of the water system as required by the Environmental Protection Agency (EPA) under the America's Water Infrastructure Act of 2018 (AWIA). Under AWIA, drinking water systems serving more than 3,300 people must develop and certify a Risk and Resilience Assessment (RRA). A self-certification must be submitted to the EPA by June 30, 2021 stating that the District has completed the Assessment. A self-certification that the RRA has been evaluated and updated will be submitted every five (5) years thereafter.

The RRA requires water systems to identify vulnerabilities to natural and malevolent/man-made hazards and evaluate potential countermeasures to the system to enhance security and resilience. Components to be reviewed in the RRA include:

- Risk of malevolent acts and natural hazards
- Resilience and security of water facility infrastructure and electronic/automated systems
- Monitoring practices of the system
- Financial infrastructure of the system
- Chemical storage, handling, and use
- Operation and maintenance of the system

The EPA has developed a Vulnerability Self Assessment Tool (VSAT 2.0). The VSAT 2.0 was developed to be aligned with the system parameters required to be evaluated under AWIA. By using the VSAT 2.0 as a guide to conduct the RRA, this will ensure that all requirements of AWIA are met.

Once the RRA is completed, the District will then be required to update its existing Emergency Response Plan (ERP) that is also required under AWIA to be self-certified and submitted to the EPA by December 30, 2021.

Under this scope of work, LSCE will work with the District to prepare the RRA that meets the AWIA requirements and submit a self-certification to the EPA by the June 30, 2021 deadline. The scope does not include preparing the ERP, which will be completed in the next fiscal year after the RRA is completed (before December 30, 2021).

"Continued to the next page"

The work will involve close engagement with District staff to assess risks and resilience in all categories required under AWIA. The work will be completed following standards and guidelines of American Water Works Association (AWWA) J100-10 *Risk and Resilience Management of Water and Wastewater Systems*. In addition, an assessment of cybersecurity of process control and business enterprise IT systems will be completed using the AWWA Cybersecurity Guidance & Tool.

A report will be developed that describes the risks and potential countermeasures for enhancing resilience. This report will not only meet the requirements of the EPA, but it will also improve the District's awareness and understanding of the risks facing the water system from natural and malevolent hazards. Once the District staff are satisfied with the outcome of this assessment, the self-certification form will be completed and uploaded to the EPA's online portal.

The scope of work proposed by LSCE to prepare the RRA includes the two tasks below:

Task	Description	Cost
1	Research and Data Collection	**$11,400**
2	Preparation of Risk and Resilience Assessment	**$13,600**
	Total	**$25,000**

Task 1 provides scope to collect information from all departments of the District that is required to complete the categories of the RRA required under AWIA.

Task 2 provides scope to conduct the RRA using VSAT 2.0, guidance documents from EPA, AWWA Cybersecurity Tool and other materials. Task 2 also provides scope to meet with the District to review the report and make any modifications necessary to the assessment based on District input.

The approved budget for the Asset Management Plan in FY 20/21 is $25,000. The total cost proposed by LSCE to complete the scope of work is $25,000.

Specific Board Action:

Provide feedback for Staff to ask the Board to take the following action at the September 16, 2020, meeting:

a. Approve the Scope and Budget Contained in the Luhdorff & Scalmanini (LSCE) Scope of Work letter dated August 21, 2020.

b. Authorize the General Manager to Execute the Town's Standard Form of Consulting Agreement with LSCE to Prepare the AWIA Risk and Resilience Assessment in the Amount of $25,000.

Previous Relevant Board Actions for This Item

The Board approved a total of $25,000 for FY 20/21 for the AWIA Risk and Resilience Assessment during approval of the FY 19/20 Budget at the June 19, 2019, Board Meeting.

Fiscal Impact: Included in the $25,000 budget for this fiscal year
Amount Requested: $25,000
Sufficient Budgeted Funds Available? Yes
Prog/Fund # Category: TBD

Attachment

1. LSCE Scope of Work dated August 21, 2020.

AGENDA ITEM: E-2

Luhdorff & Scalmanini
Consulting Engineers

August 21, 2020
File No. 20-5-106

Mr. Mike Yeraka
Projects Manager
Town of Discovery Bay CSD
1800 Willow Lake Road
Discovery Bay, CA 94514

SUBJECT: ENGINEERING SERVICES FOR PREPARATION OF AN EPA RISK & RESILIENCE ASSESSMENT FOR THE TOWN OF DISCOVERY BAY COMMUNITY SERVES DISTRICT

Dear Mr. Yeraka:

LSCE is pleased to provide this letter which outlines a scope for engineering services required for the preparation of a Risk and Resilience Assessment to comply with the United States Environmental Protection Agency (U.S. EPA): America's Water Infrastructure Act of 2018 (AWIA) for the Town of Discovery Bay Community Services District (District).

Project Understanding and Approach

Under the AWIA, which was signed into law in October 2018, drinking water systems serving more than 3,300 people must develop and certify a Risk and Resilience Assessment (RRA). A self-certification must be submitted to the EPA for the District by June 30, 2021 stating that the District has completed the Assessment. A self-certification that the RRA has been evaluated and updated will be submitted every five (5) years thereafter.

The RRA requires water systems to identify vulnerabilities to natural and malevolent/man-made hazards and evaluate potential improvements to the system to enhance security and resilience. Components to be reviewed in the RRA include:

- Risk of malevolent acts and natural hazards
- Resilience and security of water facility infrastructure and electronic/automated systems
- Monitoring practices of the system
- Financial infrastructure of the system
- Chemical storage, handling, and use
- Operation and maintenance of the system

The RRA will set the framework for the Emergency Response Plan (ERP) that is also required by the AWIA. A self-certification of completion of the ERP must be submitted to the U.S. EPA within 6 months of submitting the self-certification of the RRA or by December 30, 2021, whichever is first.

Community water systems must self-certify the risk and resilience assessments. No approval of RRA by the State or U.S. EPA is required under AWIA. All that is required is that the systems submit a self-certification form confirming the RRA was completed in accordance with the AWIA requirements.

The EPA has developed a Vulnerability Self Assessment Tool (VSAT 2.0). The categories of information in VSAT Web 2.0 have been aligned to include all the system parameters required under AWIA. Using VSAT as a guide to conduct the RRA will ensure that all requirements of AWIA are met.

Attachment A provides information on the requirements of the RRA including: a 2-page tutorial on VSAT, the 1-page self-certification form, and a 46-page guidance manual from conducting the RRA.

Scope for Engineering Services

LSCE will work with the District to prepare the RRA which will be certified by the District and the self-certification will submitted to the U.S. EPA by June 30, 2021. The scope does not include preparing the ERP, which will be completed after the RRA is completed and submitted to the EPA next fiscal year (before December 30, 2021).

The scope of work for preparing the RRA consists of two tasks: (1) research and data collection and (2) preparation of the Risk and Resilience Assessment which are both further described below.

Task 1: Research and Data Collection

Under this task, LSCE will conduct all necessary research and obtain essential information required to complete the RRA to comply with the AWIA requirements. LSCE will work closely with various District staff and operators to ensure all topics of categories under the VSAT tool are assessed to identify the vulnerability and resilience of the various components of the drinking water system. The categories include of information

- Physical barriers
- Source water
- Pipe and constructed conveyances, water collection, and intake
- Pretreatment and treatment
- Storage and distribution facilities
- Electronic, computer, or other automated systems (including security systems)
- Monitoring practices
- Financial infrastructure
- The use, storage, or handling of chemicals
- The operation and maintenance of the system

Task 2: Preparation of Risk and Resilience Assessment

LSCE will use the information and data collected under Task 1 to complete a RRA. Our primary method will be to utilize the VSAT developed by the EPA. This tool incorporates the topics discussed above to estimate risks from malevolent acts and natural hazards and will allow LSCE and the District to evaluate the status of each category and the countermeasures to increase security and resilience where needed. LSCE will also utilize the AWIA guidance manual to establish the approach for risk management, develop asset categories, and evaluate threats on the various components of the system (**Attachment A**).

The assessment conducted using VSAT will be in accordance with the standards and guidelines set forth in American Water Works Association (AWWA) J100-10 *Risk and Resilience Management of Water and Wastewater Systems*. LSCE will also utilize the AWWA Cybersecurity Guidance & Tool for assessing vulnerability of the process control and business enterprise information technology (IT) systems.

Once all information has been evaluated and provided in the VSAT, a report is developed that describes the risks and potential countermeasures for enhancing resilience. LSCE will provide this information to the District and set up a meeting to discuss the findings. Once the District is satisfied with the outcome, LSCE will supply the self-certification form to be signed by the District. Once signed, LSCE will upload the form to the EPA's online portal.

Following the completion of the RRA and self-certification, LSCE will provide a Scope of Work and Budget for the completion of the Emergency Response Plan (ERP) to be submitted no more than six (6) months following the submittal of the RRA self-certification.

Fee Proposal

LSCE's proposed fee estimate for the engineering and inspection services for the preparation of the Risk and Resilience Assessment are encompassed in the following table. Cost estimates are presented by task and are considered suitable for planning and budgeting purposes.

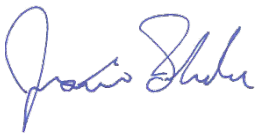
The proposed project sum includes LSCE's labor under each task and outside engineering services, all as delineated in this proposal. LSCE will bill monthly for labor and materials, only as incurred, in accordance with LSCE's Schedule of Fees for Engineering and Field services (Attachment B).

Task	Description	Total
1	Research and Data Collection	$11,400
2	Preparation of a Risk and Resilience Assessment	$13,600
	Total Budget	**$25,000**

If LSCE is directed to deviate from the proposed scope, or as dictated by unforeseen field conditions, LSCE will provide notification of any potential changes in the estimated cost and time to complete the work. LSCE will not proceed with any work that deviates from the approved scope and budget until approval to proceed is granted.

We appreciate the opportunity to provide you with this scope and budget.

Sincerely,
LUHDORFF & SCALMANINI
CONSULTING ENGINEERS



Justin Shobe, P.E.
Supervising Engineer

Attachments:
Attachment A Summary of AWIA Requirements
Attachment B LSCE Schedule of Fees

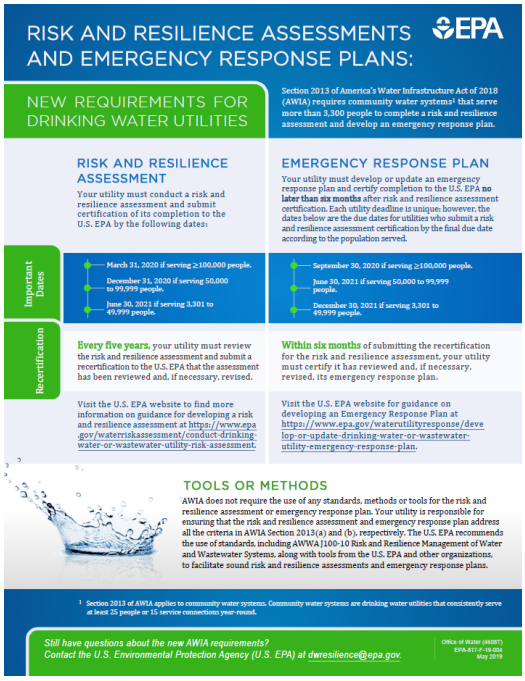
Risk and Resilience Assessment Tutorial

New Requirements for Drinking Water Utilities

Review the tutorial below to learn more about new requirements under *America's Water Infrastructure Act of 2018* (AWIA) for community water systems to conduct risk and resilience assessments. Please note that this tutorial does not address other AWIA requirements, such as developing Emergency Response Plans.

What does AWIA require for Risk and Resilience Assessments?

Each community water system serving more than 3,300 people must assess the risks to and resilience of its system from malevolent acts and natural hazards.



The assessment must include:

- The resilience of the pipes and constructed conveyances, physical barriers, source water, water collection and intake, pretreatment, treatment, storage and distribution facilities, and electronic, computer, or other automated systems (including the security of such systems);
- The monitoring practices of the system;
- The financial infrastructure of the system;
- The use, storage, or handling of various chemicals by the system; and
- The operation and maintenance of the system; and
- May include an evaluation of capital and operational needs for risk and resilience management for the system.

The Asset Categories in VSAT Web 2.0 have been aligned to include all the system parameters required under AWIA. The VSAT Threat Categories include both malevolent acts and natural hazards.

What deadlines apply to the Risk and Resilience Assessments?

Each community water system must submit a certification to the U.S. EPA that the system conducted the risk and resilience assessment (systems do not send the assessment to U.S. EPA). The deadlines for submitting the certification are as follows:

- March 31, 2020 if serving ≥100,000 people.
- December 31, 2020 if serving 50,000 to 99,999 people.
- June 30, 2021 if serving 3,301 to 49,999 people.

Every five years, each community water system must review and, if necessary, revise the risk and resilience assessment and submit a **recertification** to the U.S. EPA.

Are there approved methods for the AWIA risk and resilience assessment?

AWIA does not require the use of any standards, methods or tools for the risk and resilience assessment. Each community water system is responsible for ensuring that the risk and resilience assessment addresses all the system parameters listed in the law (as shown earlier in this tutorial).

The U.S. EPA recommends the use of standards, including the American Water Works Association's J100-10 *Risk and Resilience Management of Water and Wastewater Systems*, along with tools from the U.S. EPA (e.g., VSAT) and other organizations, to facilitate sound risk and resilience assessments.

How is the certification for the risk and resilience assessment submitted to U.S. EPA?

Community water systems self-certify their risk and resilience assessments (i.e., no approval of the risk assessment by the State or U.S. EPA is required under AWIA). The U.S. EPA is providing three options for submittal of the certification: regular mail, email, and a **secure online portal**. The online submission portal will provide drinking water systems with a receipt of submittal. The U.S. EPA recommends using this method. More information on each of these options is available at: https://www.epa.gov/waterresilience/americas-water-infrastructure-act-2018-risk-assessments-and-emergency-response-plans

Can an older risk and resilience assessment be used to comply with AWIA?

AWIA does not prohibit the use of an older risk and resilience assessment to comply with the law. However, water systems should consider the following when deciding whether to use an older risk assessment:

- Does the risk assessment omit any water system components that must be addressed under AWIA?
- Since conducting the risk assessment, has the water system made modifications, including a change in operation or maintenance, to any components that must be addressed under AWIA?
- Since conducting the risk assessment, has the water system added any components that must be addressed under AWIA?

If the water system has omitted, modified, or added components that must be addressed under AWIA, then the water system must assess the risk to and resilience of the omitted, modified, or added components before certifying the assessment.

Attachment A.2

Certification of Community Water System Risk and Resilience Assessment in Compliance with America's Water Infrastructure Act of 2018

Part (A): Community Water System Identification

Community Water System Name: _____

Community Water System Complete Mailing Address: _____

_____

Public Water System Identification Number: _____

Population Served: _____

Part (B): Certification Date

Date of the certification: _____

Part (C): Certification Statement

I, _____

[Name of certifying official]

hereby certify that the community water system named under Part A, above, has *[select all that apply]*

☐ conducted ☐ reviewed ☐ reviewed and revised

an assessment of the risks to, and resilience of, its system. This assessment included an assessment of:

1. The risk to the system from malevolent acts and natural hazards;
2. The resilience of the pipes and constructed conveyances, physical barriers, source water, water collection and intake, pretreatment, treatment, storage and distribution facilities, electronic, computer, or other automated systems (including the security of such systems) which are utilized by the system;
3. The monitoring practices of the system;
4. The financial infrastructure of the system;
5. The use, storage, or handling of various chemicals by the system; and
6. The operation and maintenance of the system; and
7. Optionally, may include an evaluation of capital and operational needs for risk and resilience management for the system.

_____

[Signature of certifying official - click to add a digital signature, or print and sign]

Attachment A.3

Guidance for Small Community Water Systems on Risk and Resilience Assessments under America's Water Infrastructure Act

Who Should Use this Guidance?

- This guidance is intended for small community water systems (CWSs) serving greater than 3,300 but less than 50,000 people to comply with the requirements for **risk and resilience assessments** under *America's Water Infrastructure Act of 2018 (AWIA)*.
- For larger CWSs, EPA recommends the Vulnerability Self-Assessment Tool (VSAT) Web 2.0 or an alternate risk assessment method.
- CWSs serving 3,300 or fewer people are not required to conduct risk and resilience assessments under AWIA. EPA recommends, however, that very small CWSs use this or other guidance to learn how to conduct risk and resilience assessments and address threats from malevolent acts and natural hazards that threaten safe drinking water.

What is the Purpose of this Guidance?

- This guidance will help small CWSs meet the requirements for risk and resilience assessments in AWIA.
- This guidance does not address emergency response plans (ERPs), which are also required under AWIA for CWSs serving more than 3,300 people.
  - EPA has developed an Emergency Response Plan Template and Instructions for CWSs to comply with AWIA.
- Further, this guidance does not cover all aspects of water system security and resilience, such as asset management, climate change, and emergency preparedness and response. Visit EPA's Drinking Water and Wastewater Resilience page to find more information.

What are the Risk and Resilience Assessments Requirements in AWIA?

AWIA requires CWSs serving more than 3,300 people to assess the risks to and resilience of the system to malevolent acts and natural hazards. The law specifies water system assets (e.g., infrastructure) that the assessment must address. These assets are listed in Tables 1a – 10b in the *Risk and Resilience Assessment Checklist* (see fillable checklist below on page 4).

Water systems **must certify to EPA** that the system conducted the assessment not later than the following dates:

- March 31, 2020 for systems serving 100,000 or more
- December 31, 2020 for systems serving 50,000 or more but less than 100,000

- June 30, 2021 for systems serving more than 3,300 but less than 50,000

NOTE: Water systems do not submit the actual assessment to EPA. Visit EPA's informational page on How to Certify Your Risk and Resilience Assessment or ERP for instructions. Every five years, CWSs must review the risk and resilience assessment, revise it as needed, and provide` a new certification to EPA.

What are Risk and Resilience in a Water System?

- **Risk** to critical infrastructure, including water systems, is a function of **threat likelihood**, **vulnerability**, and **consequence**.
  - **Threat** can be a malevolent act, like a cyberattack or process sabotage, or a natural hazard, such as a flood or hurricane.
    - **Threat likelihood** is the probability that a malevolent act will be carried out against the water system or that a natural hazard will occur.
  - **Vulnerability** is a weakness that can be exploited by an adversary or impacted by a natural hazard. It is the probability that if a malevolent act or a natural hazard occurred, then the water system would suffer significant adverse impacts.
  - **Consequences** are the magnitude of loss that would ensue if a threat had an adverse impact against a water system. Consequences may include:
    - Economic loss to the water system from damage to utility assets;
    - Economic loss to the utility service area from a service disruption, and
    - Severe illness or deaths that could result from water system contamination, a hazardous gas release, or other hazard involving the water system.
- **Resilience** is the capability of a water system to maintain operations or recover when a malevolent act or a natural hazard occurs.
- **Countermeasures** are steps that a water system implements to reduce risk and increase resilience. They may include plans, equipment, procedures, and other measures.

How does a Community Water System Assess Risk and Resilience Under AWIA?

Tables 1a – 10b in the *Risk and Resilience Assessment Checklist* (see fillable checklist below on page 4) list the categories of water system assets that you must assess under AWIA. In all tables (i.e., for all asset categories), do the following:

1. Select only the **malevolent acts** from those listed in the table that pose a significant risk to the asset category at the CWS. You may write-in malevolent acts not listed in the table.
   a. Focus the selection of malevolent acts on those that are prevalent in the United States (e.g., cyber-attacks), can exploit vulnerabilities at the CWS (e.g., known security gaps), and have the potential for significant economic or public health consequences (e.g., contamination).

   NOTE: EPA's *Baseline Information on Malevolent Acts Relevant to Community Water Systems* assists water systems with estimating the likelihood of these malevolent acts and provides resources for additional information.

2. For each malevolent act that you identify as a significant risk, briefly describe how the malevolent act could impact the asset category at the CWS. Include major assets that might be damaged or disabled, water service restrictions or loss, and public health impacts as applicable.

3. Select only the **natural hazards** from those listed in the table that may pose a significant risk to the asset category at the CWS. You may write-in natural hazards not listed in the table.
   a. Focus the selection of natural hazards on those that are prevalent in the area where the water system is located, may affect vulnerable water system infrastructure, and have the potential for significant economic or public health consequences related to the CWS.

4. For each natural hazard that you identify as a significant risk, briefly describe or provide examples of how the hazard could impact the asset category at the CWS. Include major assets that might be damaged or disabled, water service restrictions or loss, and public health impacts as applicable.

5. **OPTIONAL Table 11 (*Risk and Resilience Assessment Checklist*, see below):** Identify **countermeasures** that the CWS could potentially implement to reduce risk from the malevolent acts and natural hazards that you selected in in this assessment.
   a. For malevolent acts, countermeasures are intended to deter, delay, detect, and respond to an attack.
   b. For natural hazards, countermeasures are intended to prepare, respond, and recover from an event.

   NOTE: A single countermeasure, such as emergency response planning or power resilience, may reduce risk across multiple malevolent acts, natural hazards and asset categories.

Complete the *Risk and Resilience Assessment Checklist* here

EPA offers the *Risk and Resilience Assessment Checklist* in two formats. A fillable PDF format is provided on the pages that follow. This format has fixed fields and may not be changed by the user. Alternatively, a Word version may be accessed by clicking on the icon below. The Word version may be changed by the user. **The content of the PDF and Word versions is the same.** To access the Word version, the file must be downloaded to your computer.

Risk and Resilience Assessment Checklist

Community Water System
Risk and Resilience Assessment

Enter Community Water System Name

Risk and Resilience Assessment

Please fill in the information below.

Facility Name (if applicable):

PWSID:

Analyst Name(s):

Date of Analysis:

Analysis Notes:

Table 1a: Physical Barriers (Malevolent Acts)[1]

Asset Category: *Physical Barriers* **Examples of Assets in this Category:** Encompasses physical security in place at the CWS. Possible examples include fencing, bollards, and perimeter walls; gates and facility entrances; intrusion detection sensors and alarms; access control systems (e.g., locks, card reader systems); and hardened doors, security grilles, and equipment cages.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Physical Barriers* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[2]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[1] In a risk assessment, physical barriers are usually treated as countermeasures, which reduce the risk of a threat to an asset, rather than being treated as assets. However, under AWIA, a CWS must assess the risks to and resilience of physical barriers.

[2] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Physical Barriers* **Examples of Assets in this Category:** Encompasses physical security in place at the CWS. Possible examples include fencing, bollards, and perimeter walls; gates and facility entrances; intrusion detection sensors and alarms; access control systems (e.g., locks, card reader systems); and hardened doors, security grilles, and equipment cages.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Physical Barriers* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[3]	
☐ Other(s), enter below:	

[3] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 1b: Physical Barriers (Natural Hazards)[4]

Asset Category: *Physical Barriers* **Examples of Assets in this Category:** Encompasses physical security in place at the CWS. Possible examples include fencing, bollards, and perimeter walls; gates and facility entrances; intrusion detection sensors and alarms; access control systems (e.g., locks, card reader systems); and hardened doors, security grilles, and equipment cages.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Physical Barriers* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

[4] In a risk assessment, physical barriers are usually treated as countermeasures, which reduce the risk of a threat to an asset, rather than analyzed as assets themselves. However, under AWIA, a CWS must assess the risks to and resilience of physical barriers.

Asset Category: *Physical Barriers* **Examples of Assets in this Category:** Encompasses physical security in place at the CWS. Possible examples include fencing, bollards, and perimeter walls; gates and facility entrances; intrusion detection sensors and alarms; access control systems (e.g., locks, card reader systems); and hardened doors, security grilles, and equipment cages.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Physical Barriers* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 2a: Source Water (Malevolent Acts)

Asset Category: *Source Water* **Examples of Assets in this Category:** Encompasses all sources that supply water to a water system. Possible examples include rivers, streams, lakes, source water reservoirs, groundwater, and purchased water.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Source Water* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[5]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[5] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Source Water* **Examples of Assets in this Category:** Encompasses all sources that supply water to a water system. Possible examples include rivers, streams, lakes, source water reservoirs, groundwater, and purchased water.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Source Water* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[6]	
☐ Other(s), enter below:	

[6] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 2b: Source Water (Natural Hazards)

Asset Category: *Source Water* **Examples of Assets in this Category:** Encompasses all sources that supply water to a water system. Possible examples include rivers, streams, lakes, source water reservoirs, groundwater, and purchased water.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Source Water* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *Source Water* **Examples of Assets in this Category:** Encompasses all sources that supply water to a water system. Possible examples include rivers, streams, lakes, source water reservoirs, groundwater, and purchased water.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Source Water* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 3a: Pipes and Constructed Conveyances, Water Collection, and Intake (Malevolent Acts)

Asset Category: *Pipes and Constructed Conveyances, Water Collection, and Intake* **Examples of Assets in this Category:** Encompasses the infrastructure that collects and transports water from a source water to treatment or distribution facilities. Possible examples include holding facilities, intake structures and associated pumps and pipes, aqueducts, and other conveyances.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Pipes and Constructed Conveyances, Water Collection, and Intake* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[7]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[7] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Pipes and Constructed Conveyances, Water Collection, and Intake* **Examples of Assets in this Category:** Encompasses the infrastructure that collects and transports water from a source water to treatment or distribution facilities. Possible examples include holding facilities, intake structures and associated pumps and pipes, aqueducts, and other conveyances.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Pipes and Constructed Conveyances, Water Collection, and Intake* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[8]	
☐ Other(s), enter below:	

[8] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 3b: Pipes and Constructed Conveyances, Water Collection, and Intake (Natural Hazards)

Asset Category: *Pipes and Constructed Conveyances, Water Collection, and Intake* **Examples of Assets in this Category:** Encompasses the infrastructure that collects and transports water from a source water to treatment or distribution facilities. Possible examples include holding facilities, intake structures and associated pumps and pipes, aqueducts, and other conveyances.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Pipes and Constructed Conveyances, Water Collection, and Intake* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *Pipes and Constructed Conveyances, Water Collection, and Intake* **Examples of Assets in this Category:** Encompasses the infrastructure that collects and transports water from a source water to treatment or distribution facilities. Possible examples include holding facilities, intake structures and associated pumps and pipes, aqueducts, and other conveyances.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Pipes and Constructed Conveyances, Water Collection, and Intake* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 4a: Pretreatment and Treatment (Malevolent Acts)

Asset Category: *Pretreatment and Treatment* **Examples of Assets in this Category:** Encompasses all unit processes that a water system uses to ensure water meets regulatory public health and aesthetic standards prior to distribution to customers. Possible examples include sedimentation, filtration, disinfection, and chemical treatment. For the risk assessment, individual treatment processes at a facility may be grouped together and analyzed as a single asset if they have a similar risk profile.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Pretreatment and Treatment* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[9]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[9] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Pretreatment and Treatment* **Examples of Assets in this Category:** Encompasses all unit processes that a water system uses to ensure water meets regulatory public health and aesthetic standards prior to distribution to customers. Possible examples include sedimentation, filtration, disinfection, and chemical treatment. For the risk assessment, individual treatment processes at a facility may be grouped together and analyzed as a single asset if they have a similar risk profile.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Pretreatment and Treatment* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[10]	
☐ Other(s), enter below:	

[10] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 4b: Pretreatment and Treatment (Natural Hazards)

Asset Category: *Pretreatment and Treatment*

Examples of Assets in this Category: Encompasses all unit processes that a water system uses to ensure water meets regulatory public health and aesthetic standards prior to distribution to customers. Possible examples include sedimentation, filtration, disinfection, and chemical treatment. For the risk assessment, individual treatment processes at a facility may be grouped together and analyzed as a single asset if they have a similar risk profile.

Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Pretreatment and Treatment* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *Pretreatment and Treatment* **Examples of Assets in this Category:** Encompasses all unit processes that a water system uses to ensure water meets regulatory public health and aesthetic standards prior to distribution to customers. Possible examples include sedimentation, filtration, disinfection, and chemical treatment. For the risk assessment, individual treatment processes at a facility may be grouped together and analyzed as a single asset if they have a similar risk profile.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Pretreatment and Treatment* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 5a: Storage and Distribution Facilities (Malevolent Acts)

Asset Category: *Storage and Distribution Facilities* **Examples of Assets in this Category:** Encompasses all infrastructure used to store water after treatment, maintain water quality, and distribute water to customers. Possible examples include residual disinfection, pumps, tanks, reservoirs, valves, pipes, and meters.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Storage and Distribution Facilities* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[11]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[11] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Storage and Distribution Facilities* **Examples of Assets in this Category:** Encompasses all infrastructure used to store water after treatment, maintain water quality, and distribute water to customers. Possible examples include residual disinfection, pumps, tanks, reservoirs, valves, pipes, and meters.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Storage and Distribution Facilities* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[12]	
☐ Other(s), enter below:	

[12] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 5b: Storage and Distribution Facilities (Natural Hazards)

Asset Category: *Storage and Distribution Facilities* **Examples of Assets in this Category:** Encompasses all infrastructure used to store water after treatment, maintain water quality, and distribute water to customers. Possible examples include residual disinfection, pumps, tanks, reservoirs, valves, pipes, and meters.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Storage and Distribution Facilities* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *Storage and Distribution Facilities* **Examples of Assets in this Category:** Encompasses all infrastructure used to store water after treatment, maintain water quality, and distribute water to customers. Possible examples include residual disinfection, pumps, tanks, reservoirs, valves, pipes, and meters.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Storage and Distribution Facilities* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 6a: Electronic, Computer, or Other Automated Systems (including the security of such systems) (Malevolent Acts)

Asset Category: *Electronic, Computer, or Other Automated Systems (including the security of such systems)* **Examples of Assets in this Category:** Encompasses all treatment and distribution process control systems, business enterprise information technology (IT) and communications systems (other than financial), and the processes used to secure such systems. Possible examples include the sensors, controls, monitors and other interfaces, plus related IT hardware and software and communications, used to control water collection, treatment, and distribution. Also includes IT hardware, software, and communications used in business enterprise operations. The assessment must account for the security of these systems (e.g., cybersecurity, information security).	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Electronic, Computer, or Other Automated Systems (including the security of such systems)* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[13]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[13] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Electronic, Computer, or Other Automated Systems (including the security of such systems)*

Examples of Assets in this Category: Encompasses all treatment and distribution process control systems, business enterprise information technology (IT) and communications systems (other than financial), and the processes used to secure such systems. Possible examples include the sensors, controls, monitors and other interfaces, plus related IT hardware and software and communications, used to control water collection, treatment, and distribution. Also includes IT hardware, software, and communications used in business enterprise operations. The assessment must account for the security of these systems (e.g., cybersecurity, information security).

Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Electronic, Computer, or Other Automated Systems (including the security of such systems)* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[14]	
☐ Other(s), enter below:	

[14] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 6b: Electronic, Computer, or Other Automated Systems (including the security of such systems) (Natural Hazards)

Asset Category: *Electronic, Computer, or Other Automated Systems (including the security of such systems)* **Examples of Assets in this Category:** Encompasses all treatment and distribution process control systems, business enterprise information technology (IT) and communications systems (other than financial), and the processes used to secure such systems. Possible examples include the sensors, controls, monitors and other interfaces, plus related IT hardware and software and communications, used to control water collection, treatment, and distribution. Also includes IT hardware, software, and communications used in business enterprise operations. The assessment must account for the security of these systems (e.g., cybersecurity, information security).	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Electronic, Computer, or Other Automated Systems (including the security of such systems)* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	

Asset Category: *Electronic, Computer, or Other Automated Systems (including the security of such systems)*

Examples of Assets in this Category: Encompasses all treatment and distribution process control systems, business enterprise information technology (IT) and communications systems (other than financial), and the processes used to secure such systems. Possible examples include the sensors, controls, monitors and other interfaces, plus related IT hardware and software and communications, used to control water collection, treatment, and distribution. Also includes IT hardware, software, and communications used in business enterprise operations. The assessment must account for the security of these systems (e.g., cybersecurity, information security).

Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Electronic, Computer, or Other Automated Systems (including the security of such systems)* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Fire	
☐ Other(s), enter below:	

Table 7a: Monitoring Practices (Malevolent Acts)[15]

Asset Category: *Monitoring Practices* **Examples of Assets in this Category:** Encompasses the processes and practices used to monitor source water and finished water quality, along with any monitoring systems not captured in other asset categories. Possible examples include sensors, laboratory resources, sampling capabilities, and data management equipment and systems. Examples are contamination warning systems for the source water or distribution system.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Monitoring Practices* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[16]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[15] Monitoring associated with physical security should be addressed under *Physical Barriers*; monitoring associated with process controls and cybersecurity should be addressed under *Electronic, Computer or Other Automated Systems*; monitoring associated with financial systems should be addressed under *Financial Infrastructure*.

[16] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Monitoring Practices* **Examples of Assets in this Category:** Encompasses the processes and practices used to monitor source water and finished water quality, along with any monitoring systems not captured in other asset categories. Possible examples include sensors, laboratory resources, sampling capabilities, and data management equipment and systems. Examples are contamination warning systems for the source water or distribution system.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Monitoring Practices* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[17]	
☐ Other(s), enter below:	

[17] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 7b: Monitoring Practices (Natural Hazards)[18]

Asset Category: *Monitoring Practices* **Examples of Assets in this Category:** Encompasses the processes and practices used to monitor source water and finished water quality, along with any monitoring systems not captured in other asset categories. Possible examples include sensors, laboratory resources, sampling capabilities, and data management equipment and systems. Examples are contamination warning systems for the source water or distribution system.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Monitoring Practices* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	

[18] Monitoring associated with physical security should be addressed under *Physical Barriers*; monitoring associated with process controls and cybersecurity should be addressed under *Electronic, Computer or Other Automated Systems*; monitoring associated with financial systems should be addressed under *Financial Infrastructure*.

Asset Category: *Monitoring Practices* **Examples of Assets in this Category:** Encompasses the processes and practices used to monitor source water and finished water quality, along with any monitoring systems not captured in other asset categories. Possible examples include sensors, laboratory resources, sampling capabilities, and data management equipment and systems. Examples are contamination warning systems for the source water or distribution system.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Monitoring Practices* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Fire	
☐ Other(s), enter below:	

Table 8a: Financial Infrastructure (Malevolent Acts)

Asset Category: *Financial Infrastructure* **Examples of Assets in this Category:** Encompasses equipment and systems used to operate and manage utility finances. Possible examples include billing, payment, and accounting systems, along with third parties used for these services. This asset category is not intended to address the financial "health" of the water utility (e.g., credit rating, debt-to-equity ratios).	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Financial Infrastructure* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[19]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[19] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *Financial Infrastructure* **Examples of Assets in this Category:** Encompasses equipment and systems used to operate and manage utility finances. Possible examples include billing, payment, and accounting systems, along with third parties used for these services. This asset category is not intended to address the financial "health" of the water utility (e.g., credit rating, debt-to-equity ratios).	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *Financial Infrastructure* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[20]	
☐ Other(s), enter below:	

[20] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 8b: Financial Infrastructure (Natural Hazards)

Asset Category: *Financial Infrastructure* **Examples of Assets in this Category:** Encompasses equipment and systems used to operate and manage utility finances. Possible examples include billing, payment, and accounting systems, along with third parties used for these services. This asset category is not intended to address the financial "health" of the water utility (e.g., credit rating, debt-to-equity ratios).	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Financial Infrastructure* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *Financial Infrastructure* **Examples of Assets in this Category:** Encompasses equipment and systems used to operate and manage utility finances. Possible examples include billing, payment, and accounting systems, along with third parties used for these services. This asset category is not intended to address the financial "health" of the water utility (e.g., credit rating, debt-to-equity ratios).	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *Financial Infrastructure* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 9a: The Use, Storage, or Handing of Chemicals (Malevolent Acts)

Asset Category: *The Use, Storage, or Handling of Chemicals* **Examples of Assets in this Category:** Encompasses the chemicals and associated storage facilities and handling practices used for chemical disinfection and treatment. Assessments under this asset category should focus on the risk of uncontrolled release of a potentially dangerous chemical like chlorine where applicable.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *The Use, Storage, or Handling of Chemicals* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[21]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[21] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *The Use, Storage, or Handling of Chemicals* **Examples of Assets in this Category:** Encompasses the chemicals and associated storage facilities and handling practices used for chemical disinfection and treatment. Assessments under this asset category should focus on the risk of uncontrolled release of a potentially dangerous chemical like chlorine where applicable.	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *The Use, Storage, or Handling of Chemicals* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[22]	
☐ Other(s), enter below:	

[22] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 9b: The Use, Storage, or Handing of Chemicals (Natural Hazards)

Asset Category: *The Use, Storage, or Handling of Chemicals* **Examples of Assets in this Category:** Encompasses the chemicals and associated storage facilities and handling practices used for chemical disinfection and treatment. Assessments under this asset category should focus on the risk of uncontrolled release of a potentially dangerous chemical like chlorine where applicable.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *The Use, Storage, or Handling of Chemicals* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *The Use, Storage, or Handling of Chemicals* **Examples of Assets in this Category:** Encompasses the chemicals and associated storage facilities and handling practices used for chemical disinfection and treatment. Assessments under this asset category should focus on the risk of uncontrolled release of a potentially dangerous chemical like chlorine where applicable.	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the *The Use, Storage, or Handling of Chemicals* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 10a: The Operation and Maintenance of the System (Malevolent Acts)

Asset Category: *The Operation and Maintenance of the System* **Examples of Assets in this Category:** Encompasses critical processes required for operation and maintenance of the water system that are not captured under other asset categories. Possible examples include equipment, supplies, and key personnel. Assessments may focus on the risk to operations associated with dependency threats like loss of utilities (e.g., power outage), loss of suppliers (e.g., interruption in chemical delivery), and loss of key employees (e.g., disease outbreak or employee displacement).	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *The Operation and Maintenance of the System* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Assault on Utility – Physical	
☐ Contamination of Finished Water – Intentional	
☐ Contamination of Finished Water – Accidental[23]	
☐ Theft or Diversion – Physical	
☐ Cyberattack on Business Enterprise Systems	

[23] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Asset Category: *The Operation and Maintenance of the System* **Examples of Assets in this Category:** Encompasses critical processes required for operation and maintenance of the water system that are not captured under other asset categories. Possible examples include equipment, supplies, and key personnel. Assessments may focus on the risk to operations associated with dependency threats like loss of utilities (e.g., power outage), loss of suppliers (e.g., interruption in chemical delivery), and loss of key employees (e.g., disease outbreak or employee displacement).	
Malevolent Acts Select the malevolent acts in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a malevolent act in the left column as a significant risk to the *The Operation and Maintenance of the System* asset category, briefly describe in the right column how the malevolent act could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Cyberattack on Process Control Systems	
☐ Sabotage – Physical	
☐ Contamination of Source Water – Intentional	
☐ Contamination of Source Water – Accidental[24]	
☐ Other(s), enter below:	

[24] Accidental contamination is not a malevolent act. It is included here due to similar potential consequences and because whether a contamination incident is intentional or accidental may not be known during initial response.

Table 10b: The Operation and Maintenance of the System (Natural Hazards)

Asset Category: *The Operation and Maintenance of the System* **Examples of Assets in this Category:** Encompasses critical processes required for operation and maintenance of the water system that are not captured under other asset categories. Possible examples include equipment, supplies, and key personnel. Assessments may focus on the risk to operations associated with dependency threats like loss of utilities (e.g., power outage), loss of suppliers (e.g., interruption in chemical delivery), and loss of key employees (e.g., disease outbreak or employee displacement).	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the T*he Operation and Maintenance of the System* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Hurricane	
☐ Flood	
☐ Earthquake	
☐ Tornado	
☐ Ice storm	
☐ Fire	

Asset Category: *The Operation and Maintenance of the System* **Examples of Assets in this Category:** Encompasses critical processes required for operation and maintenance of the water system that are not captured under other asset categories. Possible examples include equipment, supplies, and key personnel. Assessments may focus on the risk to operations associated with dependency threats like loss of utilities (e.g., power outage), loss of suppliers (e.g., interruption in chemical delivery), and loss of key employees (e.g., disease outbreak or employee displacement).	
Natural Hazards Select the natural hazards in the left column that pose a significant risk to this asset category at the CWS.	**Brief Description of Impacts** If you select a natural hazard in the left column as a significant risk to the T*he Operation and Maintenance of the System* asset category, briefly describe in the right column how the natural hazard could impact this asset category at the CWS. Include effects on major assets, water service, and public health as applicable.
☐ Other(s), enter below:	

Table 11: Countermeasures (Optional)[25]

Countermeasures (optional) List countermeasures in the left column the CWS could potentially implement to reduce risk from the malevolent acts and natural hazards that were selected.	**Brief Description of Risk Reduction or Increased Resilience** For each countermeasure, in the right column, describe how the countermeasure could reduce risk or increase resilience for CWS assets from malevolent acts or natural hazards that were selected in the analysis. A countermeasure may reduce risk across multiple malevolent acts, natural hazards and asset categories.
1.	
2.	
3.	
4.	
5.	

[25] IMPORTANT NOTE: The assessment does not require a specific number of countermeasures. You may have fewer than five countermeasures or add more countermeasures and describe them in a separate document.

Change History

Please describe the changes made to this risk and resilience assessment since its original development, who made the changes, and on what date the changes were incorporated.

Name/Title:	Date:	Description of Change:

Attachment B

Luhdorff & Scalmanini
Consulting Engineers

SCHEDULE OF FEES - ENGINEERING AND FIELD SERVICES 2020

Professional	
Senior Principal	$225/hr
Principal Professional	$220/hr
Supervising Professional	$210/hr
Senior Professional	$192/hr
Project Professional	$150 to 170/hr
Staff Professional	$135 to 145/hr
Technical	
Engineering Inspector	$140/hr
ACAD Drafting/GIS	$135/hr
Engineering Assistant	$105 to 125/hr
Scientist	$105 to 125/hr
Technician	$105 to 125/hr
Clerical Support	
Word Processing, Clerical	$80/hr
Digital Communications Specialist	$90/hr
Project Admin/Accounting Assistant	$100/hr
Other Sevices	
Vehicle Use	$0.58/mi
Subsistence	Cost Plus 15%
Groundwater Sampling Equipment (Includes Operator)	$170.00/hr
Copies	0.20 ea
Professional or Technical Testimony	200% of Regular Rates
Technical Overtime (if required)	150% of Regular Rates
Outside Services/Rentals	Cost Plus 15%
Services by Associate Firms	Cost Plus 15%

Town of Discovery Bay

"A Community Services District"

STAFF REPORT

Meeting Date

September 2, 2020

Prepared By: Gregory Harris, District Wastewater Engineer
Submitted By: Michael R. Davies, General Manager

Agenda Title

Discussion and Provide Feedback on Scope of Work for Advisian (WorleyParsons Group) to Perform Detailed Design and Construction Support Engineering Services for Outfall Diffuser Replacement Project in the Amount of $145,150.

Recommended Action

Provide Feedback for Staff to Bring the Item to the Full Board at the September 16, 2020, meeting to Authorize the General Manager to Execute the Town's Standard Consultant Agreement for Advisian (WorleyParsons Group) to Perform Detailed Design and Construction Support Engineering Services for Outfall Diffuser Replacement Project as per the Attached Scope of Work.

Executive Summary

The Town's wastewater effluent leaving Treatment Plant No. 2 is pumped approximately one mile to Old River where it is discharged through diffusers with multiple diffuser ports to mix the effluent into Old River. The diffuser was constructed in December 2004 to comply with previous Notice of Violation by the Regional Water Quality Control Board.

A diver was hired to inspect the diffuser in 2013. The inspection report indicated several of the diffuser ports are missing and a portion of the diffuser has become plugged and no longer operates properly. During start up of the filtration project, testing of the effluent pump station showed the pump station can no longer pump 4 million gallons per day (MGD) of flow to Old River. 4.3 MGD is the design flow of the pump station and was demonstrated when the pump station was tested in 2004 after the diffuser install. The capacity of the effluent filtration and UV system is 4 MGD and the effluent pump station needs to be able to pump at least that much flow for the plant to properly handle peak wastewater flows. The most likely cause of the poor performance of the export pump station is the plugged diffuser.

Based on this information, the Town previously hired Advisian to prepare a report on options and costs to repair the diffuser. This report was completed in June 2018. From this report, Option 4 to repair the diffuser in place with a larger header pipe was selected as the best alternative going forward by Town Staff. The Town set a CIP item 7012 at a budget cost of $500,000 for the permits, engineering, and construction of the diffuser repairs.

In August 2019, the Town again hired Advisian to prepare environmental reports and CEQA documents for the repair of the diffuser system. The documents have been completed and filed with the appropriate agencies, including the Army Corps of Engineers, State Fish and Wildlife, State Lands Commission, and Contra Costa County.

It is now time to begin design of the final diffuser repairs in parallel with the processing of the permits by the different agencies. While these permits are processing, there is also a continuing need for ongoing interaction between the diffuser design team and the permitting agencies. Comments from the permitting agencies can also impact the design of the diffuser repairs. As a result, Staff recommends that Advisian be hired to continue this agency interaction and prepare the design of the diffuser repairs.

Advisian had prepared a cost proposal to cover the cost of engineering design and construction services and the on-going interaction with permitting agencies. The proposal amount is $145,150. A copy of the proposal is attached for reference. Specific Tasks Include:

1. Project Management
2. Bathymetric Surveys
3. Diffuser Design
4. Regulatory Support
5. Bid Support
6. Engineering Support During Construction
7. Project Closeout Documentation

HERWIT will assist the Town and coordinate activities for the project under their general services agreement with the Town.

The current status of the CIP 7012 ($500K) budget for this project is as follows.

Status	Item	Cost
Completed	Pre-design report	$ 33,582
Completed	Permitting preparation	$ 34,735
	RWQCB Fee	$ 1,949
	Fish and Wildlife	$ 4,560
	State Lands Commission Fee	$ 3,025
Completed	CEQA preparation	$ 27,500
	County Filing Fee	$ 2,457
Pending Approval	Design and construction support	$145,500
Pending	Construction Management	$ 30,000
	Total Soft Costs	$283,308
Pending Bidding	Estimated Construction(1)	$400,000
	Total Project Costs	$683,308

Note 1) Original Construction Cost from Advisian Report was $183,000. Based on Comments from Army Corps, Fish and Wildlife, State Lands Commission, and uncertainty of the bidding climate with COVID-19, Advisian has increased this cost to $400,000. Actual cost will be based on construction bids received as part of the project. A more detailed cost estimate for construction will be provided as part of the diffuser final design.

Because the design of the diffuser repairs is highly specialized, and is integral to the ongoing coordination with the permitting agencies, Staff is recommending with proceeding with Advisian on the design, construction support, and permitting coordination to complete the project.

Specific Committee Action:

Provide feedback for Staff to ask the Board to take the following action at the September 16, 2020, meeting:

a) Approve the Scope and Budget Contained in the Advisian (WorleyParsons Group) Proposal Dated August 18, 2020, to Perform Engineering Services for the Diffuser Repair Project.

b) Authorize the General Manager to Execute the Town's Standard Form of Consulting Agreement with Advisian (WorleyParsons Group) to Perform Engineering Services in the Amount of $145,150.

Previous Relevant Board Actions for This Item

Authorization for construction of outfall diffuser in 2004,
Authorization to hire Advisian to prepare a diffuser report October 2017.
Authorization to hire Advisian to prepare the permits for the diffuser December 5, 2018.
Authorization to hire Advisian to prepare CEQA Documents for the diffuser August 21, 2019.

Fiscal Impact: Budget Exceeds the CIP for 2019/2020.
Amount Requested: $ 145,150
Sufficient Budgeted Funds Available?: Yes
Prog/Fund # Category: TBD

Attachments

1. Advisian (WorleyParsons Group) Proposal Dated August 18, 2020

AGENDA ITEM:

Worley Canada Services Ltd.
Suite 500, 151 Canada Olympic Rd SW
Calgary, AB T3B 6B7
Canada

T: 403 247 0200

advisian.com

18 August 2020

Our Ref: 797011-32200-20-WTRR-AM-0040

Gregory Harris
Herwit Engineering
6200 Center Street, Suite 310
Clayton, CA 945117

Dear Mr. Harris

DISPERSION MODELING, DETAILED DESIGN AND CONSTRUCTION SUPPORT - SANITARY OUTFALL DIFFUSER UPGRADES FOR THE TOWN OF DISCOVERY BAY

1 Introduction / Project Understanding

Herwit Engineering (Herwit), on behalf of the Town of Discovery Bay California (TDBC), has requested Worley Canada Services Ltd, operating as Advisian, to provide a proposal for a plan, schedule, and cost estimate for rehabilitation of the TDBC's wastewater outfall diffuser project (Project). The Project will include preparation of issued-for-construction design drawings, system flow and dispersion modeling, outfall pipe shop fabrication and in-river construction support.

Advisian has a strong understanding of the hydrodynamics of the Sacramento-San Joaquin Delta, the TDBC outfall structure and vast experience on modeling, design, permitting, and construction support of outfall structures. Advisian is currently supporting the TDBC with the outfall rehabilitation permitting with four different regulatory agencies involved in this project. Our experience and familiarity with the permit applications will ensure that Advisian prepares an improved operational design with robust and sustainable maintenance capabilities that is compliant with TDBC's NPDES permit conditions for the continued long-term operation of the outfall.

Advisian submitted a report, dated June 8, 2018, which described the existing condition of the outfall structure and provided an evaluation of four optional approaches to restore functionality to the system. TDBC chose to pursue "Option 4", which entails removing the 10-inch and 6-inch diameter HDPE pipe segments from the existing outfall diffuser structure and replacing them with a single 18-inch segment of the same combined length. The resulting structure would then consist of a continuous 18-inch diameter pipe body throughout its entire length, with the same number of ports (36) as included in the original design.

Since Option 4 involves in-river construction, State of California and federal government regulatory agencies were contacted for obtaining permits and/or amending previously issued permits.

2 Background Information

The outfall diffuser structure was originally designed to meet the effluent dilution requirements included in TDBC's NPDES permit. Over time, system performance degraded due to biotic build-up and sediment accumulation inside the outfall pipe body. The smaller diameter pipe sections were found to be susceptible to clogging and the upward-pointing tideflex ports were vulnerable to damage from boat operators setting anchors down near the structure. Also, the ports are susceptible to breaking off due to collisions with debris driven by elevated seasonal river flows. An underwater visual inspection on May 15, 2013 revealed that out of the 36 diffuser ports, two were missing and no flow was observed from any of the ports within the 16.5-ft long 6-in diameter segment.

Advisian was contracted to prepare all regulatory agency permit applications necessary to allow the outfall rehabilitation project to go forward. Advisian identified the following affected agencies and prepared and submitted the following permit applications:

1. US Army Corps of Engineers (USACE) - Nationwide Permit (NWP) – Type 3 (Maintenance) and 7 (Outfall Structures)
2. California Department of Fish & Wildlife (CDF&W) - Lake and Streambed Alteration Permit (LSA)
3. California Regional Water Quality Control Board (RWQCB) - Section 401 Water Quality Certificate (401Cert)
4. California State Lands Commission (CSLC) - Amendment to previously issued Lease for Use of State Lands
5. California Office of Planning and Research/State Clearinghouse - California Environmental Quality Act (CEQA) – Initial Study/Mitigated Negative Declaration (ISMND)

Each of the first four permit applications required that the ISMND be included with applications submitted to allow the agencies to review the environmental impact of the Project. The ISMND document was prepared under CEQA guidelines for the State of California regulatory agencies. The ISMND was prepared to be compliant under the federal guidelines of the National Environmental Policy Act (NEPA) so that USACE would be able to use it to open consultation under Section 7 of the federal Endangered Species Act with the United States Fish & Wildlife Service (USF&WS).

Due to the expectation of longer permit application processing times because of the nationwide COVID-19 pandemic, Advisian believes that the earliest date to begin construction on the outfall is September 2021. USACE NWP applications typically run 6 - 12 months for review and permit issuance under normal circumstances. The other agencies have similar application processing timelines.

3 Scope of Work

Advisian understands that the TDBC's preferred alternative for the outfall Project will need to achieve the following goals:

- Continuously meet the dilution requirements for several water quality parameters delineated in the NPDES permit. The existing NPDES permit application was prepared by others.
- Allow for routine outfall pipe maintenance by adding an onboard sediment flushing and flush-capture system to periodically remove accumulated sediment within the outfall pipe body, which captures the flush liquid and solids in an onshore holding tank.
- Include design provisions for armoring or structural modifications to reduce the susceptibility of collision from suspended objects or boat anchor snagging.
- Comply with current regulatory NPDES permit conditions issued for the Project.
- Deliver a design that is operationally robust, maintainable, and cost-effective for long-term operation, structural longevity, and survival in the Old River channel.
- Develop a design with a continuous diameter pipe body (e.g. 18 in) with 36 ports, having the same length as the original outfall design.
- The successful Project design will demonstrate a uniform discharge of flow from each of the 36 ports; in other words, each port will discharge approximately 1/36-th of the total effluent flow.

3.1 Project Management

A general project management task has been included to provide effective oversight and track costs accordingly. The project management task includes communication, meetings, progress reporting, budget reports and other actions that will be undertaken by the Project Manager, as well as the Cost Controller to monitor Project status. The Project Management budget includes the following:

- All changes to Advisian's scope, budget, and/or schedule will be approved by the TDBC prior to starting work on the changes.
- All contemplated change notices, change orders, field instructions, RFI and RFC responses and submittal returns will be reviewed by TDBC prior to issuing to the Contractor.
- Conduct progress meetings and issue Project meeting minutes.
- Develop and maintain a Project schedule for the entire program and provide status updates to TDBC as required.
- Advisian's invoices will include a summary table of effort (hours and charges) broken down by task along with the required cover sheet.
- Deliverables shall include, but may not be limited to the following:
  - Records of all project meetings and workshops, and
  - Project Activity Log to include records of submittals received and reviewed, design or construction issues, RFIs, RFCs, change orders issued. The Activity Log will made available prior to every progress meeting for review.

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3.2 Bathymetric Survey

Prior to starting the design, it will be necessary to determine the actual bathymetric plan and profile of the outfall site. The bathymetric survey will allow Advisian to accurately determine the position of the outfall pipe within its trench as well as the location of concrete anchorage blocks. Advisian would normally conduct a bathymetric survey of the area bounded by the State Lands lease to accurately document the depth, slope, and trench profile. Advisian has an in-house team equipped with the latest technology to conduct the bathymetric survey. However, due to travel restriction in place due to the COVID-19 pandemic, our in-house team may not be allowed to travel to the jobsite.

We received an estimate from Meridian Surveying and Engineering Inc. (Meridian). Advisian will arrange a subcontract with Meridian or other local survey firm capable of doing the bathymetric survey. We propose to have the survey done in the fall of 2020, before design work begins on the outfall. A second survey will be done immediately prior to construction to determine if any changes to the river bottom occurred a year after the first survey, that might affect the outfall removal and installation process.

If COVID-19 travel restrictions are lifted between US and Canada, the Advisian team would use a BioSonics MX sonar which is a single beam Aquatic Habitat Echosounder to collect detailed hydroacoustic data from the Old River in the vicinity of the diffuser. The BioSonics unit is capable of providing survey-grade depth data, and has the ability to characterize substrate composition, and map vegetation. The MX unit uses a 200 kHz transducer with a narrow 8° beam with limited side-lobe interference. The unit has an integrated Garmin differential GPS (DGPS) system for georeferencing of all data. All data are recorded to a Panasonic Toughbook computer using BioSonics Visual Acquisition software. During acquisition of data, notes can be added in real time to record specific observations associated with various aspects such as observed substrate, vegetation, underwater structures, or other aspects, ensuring that all relevant notes are georeferenced. Data analysis with Echoview software will allow for visualization and mapping of variable substrate (gravel mounds), vegetation, and other structures (pipe structures) based on the intensity of signal returns from materials of different densities.

Bathymetry work will be conducted from a small boat (12-15') to be rented from the local area. The transducer will be attached to the transom, extended over the starboard side of the boat and positioned 0.1 m to 0.2 m below the water surface. The placement of the transducer will avoid turbulence from the bow or motor affecting measurements. The bathymetric survey will encompass the entire channel of the Old River from bank to bank extending 100 m upstream and 100 m downstream (total area est. 26,000 m^2). The survey will follow a grid pattern with transects at a spacing of about 5 m. More detailed information can be gathered at areas of interest. Based on the area of interest, the actual survey is anticipated to be completed in about two hours. At the time of the survey, water level in the river will be measured against an established elevation benchmark on shore to ensure subsequent assessments are calibrated. To compensate for possible changes in water level associated with tidal influence, a Solinst pressure transducer will be placed in the water along the bank at a depth of 0.25 – 0.5 m. It will record changes in overall water level that can be applied to correct depth data during analysis.

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3.3 Design Considerations

Outfall Pipe Hydraulics and Damage Risk Mitigation

The existing outfall's basic structure and effluent dilution function is described in the NPDES permit. The TDBC prefers not to make major structural changes due to the NPDES permit complexity and risk of triggering a permit amendment if the design is changed. It is essential that the rehabilitated structure must continue to comply with dilution requirements delineated in the NPDES permit. Advisian staff will evaluate the existing configuration and design features to make the outfall pipe more robust for long-term survival in the Old River. We will investigate using side discharge ports instead of risers, shorter length risers, stronger Tideflex ports, risers with greater pipe wall thickness, and armoring the outfall pipe with riprap or other protective devices. We will perform hydraulic modeling to ensure that flow distribution across the 36 outlet ports is uniform, such that each outlet port passes 1/36th of the total flow.

Flushing System

The TDBC indicated a need to periodically remove sediment which accumulates inside the outfall pipe body. The sediment is believed to enter by entrainment in backflow when the Tideflex port check valves are open. Seasonal flows carrying high loads of suspended solids are a periodic occurrence in the Old River, and Advisian believes there will always be some incidental backflow carrying suspended solids into the pipe body. The flushing system feature would be fabricated and installed during the process of replacing the existing 10-inch and 6-inch pipe segments with a continuous 18-inch segment. One alternative we are considering consists of adding a flush pipe that would be installed internally and run axially along the full length inside the outfall pipe, terminating at the Harris siphon breaker onshore. There it would be connected to a manifold that would allow operators to divert high velocity treated wastewater effluent through the flush pipe. The flush pipe will contain a series of nozzle ring arrays pointed toward the outfall pipe interior wall, radially oriented in clock directions 12:00 - 10:00 - 8:00 - 6:00 – 4:00 - 2:00. Flush nozzles will be extended into each of the 36 ports to allow flushing within the interior of the outlet ports. The flush nozzle arrays will be designed with backflow checks to prevent entry of solids into the flush pipe. Several nozzle ring arrays will be spaced axially down the entire interior length of the flush pipe at intervals to be determined during the design process. The nozzle arrays will be designed to stir up and re-mobilize sediment and dislodge algal growth accumulating along the interior walls of the outfall pipe, outlet ports, and invert. The re-mobilized sediment and organic debris will be suctioned backwards up through the outfall pipe and captured in a storage tank or tanker truck onshore. This will prevent the flushed sediment and organic debris from entering ambient water. The flush system design will include an operating procedure written in consultation with Veolia operations staff and will be tested on land prior to installation in the river.

3.3.1 Drawing Production and Cost Estimates

a. **Prepare Construction Plans (30% / 50% / 100% Submittals)** – The design process will have three submittal stages and two opportunities for TDBC to comment on the design drawings. Advisian will produce a set of issued-for-construction (IFC) drawings and specifications suitable for bidding. The design will be based on the goals stated in Section 3 Scope of Work with flow dispersion verified by model results. This task will involve preparing D-size sheets of the design at the 30%, 50%, and 100% design stages. The drawing sheets will include a cover sheet with location maps, the plan and profile of the proposed outfall, and detail sheets for items such as connection details, weighting details, port details, scour protection details, pipe protection details, and pipe support details. Specification sheets

will be included with the drawing sets. The 100% submittal will be stamped by a registered civil engineer and suitable to be issued for construction as the Project Bidding Package.

The design will include features that mitigate or eliminate the risk of future damage by way of collisions with suspended objects or snagging by boat anchors. The design will also include an onboard flushing and flush-capture system that will allow TDBC to routinely and easily remove accumulated sediment from the outfall pipe body.

Deliverables: Electronic pdf files at the 30% and 50% submittals and 100% Issued for Bidding (IFB) submittal; Electronic pdf files only for the 30% and 50%submittlas; Electronic files in AutoCAD and pdf formats; two D-size paper sets, four ½-size paper sets for the 100% submittal.

b. Prepare Engineer's Cost Estimate (30% and 100% Submittal) – This task will involve preparing two cost estimates for fabrication and construction of the rehabilitated outfall diffuser. The documents will be prepared in Microsoft Excel and will detail all task items and materials required including item description, quantity, unit rate, and line item total for each line item.

The 30% cost estimate will be prepared early in the process, ahead of most design work. The Town has requested an early construction estimate to evaluate the cost of the entire outfall replacement project. The 30% cost estimate will be prepared in accordance with AACEI Class 5 estimating practices with expected accuracy ranges of -20% to -50% low variation and +30% to +100% high variation.

The 100% cost estimate will be prepared in accordance with AACEI Class 2 estimating practices with expected accuracy ranges of -5% to -15% low variation and +5% to +20% high variation..

Deliverable: Tabulated construction cost estimate sheets, with descriptive reports for each estimate.

3.4 Regulatory Support

As stated in Section 2 Background Information, Advisian prepared four regulatory permit applications and an Initial Study/Mitigated Negative Declaration to satisfy permitting requirements under CEQA and NEPA. During the course of designing and constructing the outfall, the four agencies will be reviewing our applications, requesting additional information, and asking questions which will require our biological team to address with technical responses. Furthermore, in the Initial Study Mitigated Negative Declaration, the TDBC had stated it would defer the completion of the Mitigation Monitoring Plan until all the approvals were obtained and detailed design was complete. This will ensure all permit conditions are thoroughly known and met, as well as the full extent of the mitigation requirements to be incorporated into a final plan prior to construction. The regulatory support task will ensure that construction can commence without delay while maintaining compliance with the regulatory permits by incorporating the Mitigation Monitoring Plan as required by CEQA.

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3.5 Bid Support

a. **Conduct Pre-Bid Meeting Job Walk** – This task will involve meeting potential contractors on site as well as representatives from the TDBC to discuss the outfall diffuser design and answer any questions that they might have regarding the design.

   Deliverable: A set of written questions and answers brought up at the meeting that will be distributed to all potential contractors as well as the client's representatives.

b. **Respond To the Town & Contractor Inquiries** – This task will involve responding to questions posed after the site walk during the bidding process.

   Deliverable: A set of written questions and answers brought up at the meeting that will be distributed to all potential contractors as well as the client's representatives.

c. **Prepare Project Addendums to drawings, specification During Bidding** – On the basis of results from the two (2) tasks detailed above, project addendums may be required. This task will involve preparing those addendums and issuing them to all potential contractors who are involved in the bidding process as well as the client's representatives.

   Deliverable: Written addendums that will form part of the Project Bidding Package.

3.6 Engineering Support During Construction

a. **Requests For Information During Construction** – This task will involve answering requests for information during the construction process. These requests may come from the contractor, the clients, or the regulatory agencies. Responses to these requests (if from parties other than the clients) will be discussed and approved by the client prior to responding.

   Deliverable: Written questions and answers that will be distributed to the parties who requested the information as well as the client's representatives.

b. **Assist In Change Order Preparation During Construction** – This task will involve assisting the clients or the clients engineers with preparing change orders during the construction process. This assistance may involve written or verbal discussions with the clients, but it has been assumed that the clients will be the parties issuing the actual change order documents.

   Deliverable: A written summary of assistance provided to the clients.

c. **Review Key Shop Drawings** – This task will involve reviewing shop drawings provided by the contractor during construction including items such as diffuser ports (TideFlex), flush system piping and valves, pipe supports, and anchorage details.

   Deliverable: Review and mark-up of shop drawings additional written comments, as necessary.

d. **Inspections During Fabrication and Construction** – This task will involve inspections at key milestone points within the fabrication and construction process. The inspection points will include, at a minimum:

   i. A pneumatic pressure test of the outfall pipe and flush system after assembly, prior to deployment; Pressure test requirements will be included in the specifications package. The pneumatic pressure test will be conducted and witnessed by the Advisian field engineer.
   ii. First of three dive inspections after the outfall has been deployed, prior to burial or cover protection;
   iii. Second of three dive inspections after the outfall has been mounted, bolted to the existing portion of the outfall pipe, and covered and armored with granular material , but prior to being placed into service.
   iv. The third dive inspection should be conducted, once the outfall has been placed into service and is operating, to ensure that the diffuser is functioning as designed.

Dive inspections will be conducted by a commercial dive inspection service subcontractor and may be accompanied by the Advisian field engineer.

Deliverable: Written summaries of inspection results with video of all inspections (visibility permitting).

e. **Attend Project Construction Meetings** – This task will involve periodic conference calls or video meetings with contractor and client representatives to discuss progress made, problems encountered, and solutions rendered since the prior meeting, plus discussing the upcoming work, including scheduling and any conflicts foreseen.

Deliverable: Written summaries of the meeting minutes.

3.7 Project Closeout Support

Advisian will prepare a final "as-built" drawing set and include any changes to shop drawings, material specifications, and change orders in a Construction Completion Report. The field engineer will assemble photographs for inclusion in the Completion Construction Report to accompany the as-built drawings (if available) from shop fabricators and/or construction field personnel. The as-built drawings and Construction Completion Report are required to close out the USACE Nationwide permit. This closeout package will be distributed to the California State Lands Commission, Regional Water Quality Control Board, and California Dept of Fish & Wildlife to close out their respective permits issued for the Project.

4 Cost

Advisian's professional service fees to complete the scope of work specified in this proposal is provided on a lump sum not-to-exceed basis of $145,150 (tax exclusive). Any work outside the current scope will be communicated to the client as a change of scope and, upon approval, will be executed at the standard rates set out in the contract with the Town of Discovery Bay.

Task	Subtotal US$
3.1 – Project Management	8,940
3.2 – Bathymetric Survey	21,520
3.3 – Diffuser and Flush System Design, Hydraulic modeling, Cost Estimate, IFB Drawings and Specifications	62,200
3.4 – Regulatory Support	23,170
3.5 – Bid Support	9,270
3.6 – Engineering Support During Construction	10,620
3.7 – Project Closeout	9,430
Total	145,150 (Adjusted by adding two bathymetric surveys and removing the dispersion model)

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5 Schedule (weeks following issuance of NTP)

The Project's execution schedule is expected to begin in August 14, 2020 and conclude by October 29, 2021, a period of about 64 weeks. During that period, we expect to complete the major Project milestones on the following timeline following issuance of the Notice to Proceed. A Gantt chart with the project schedule is provided below.

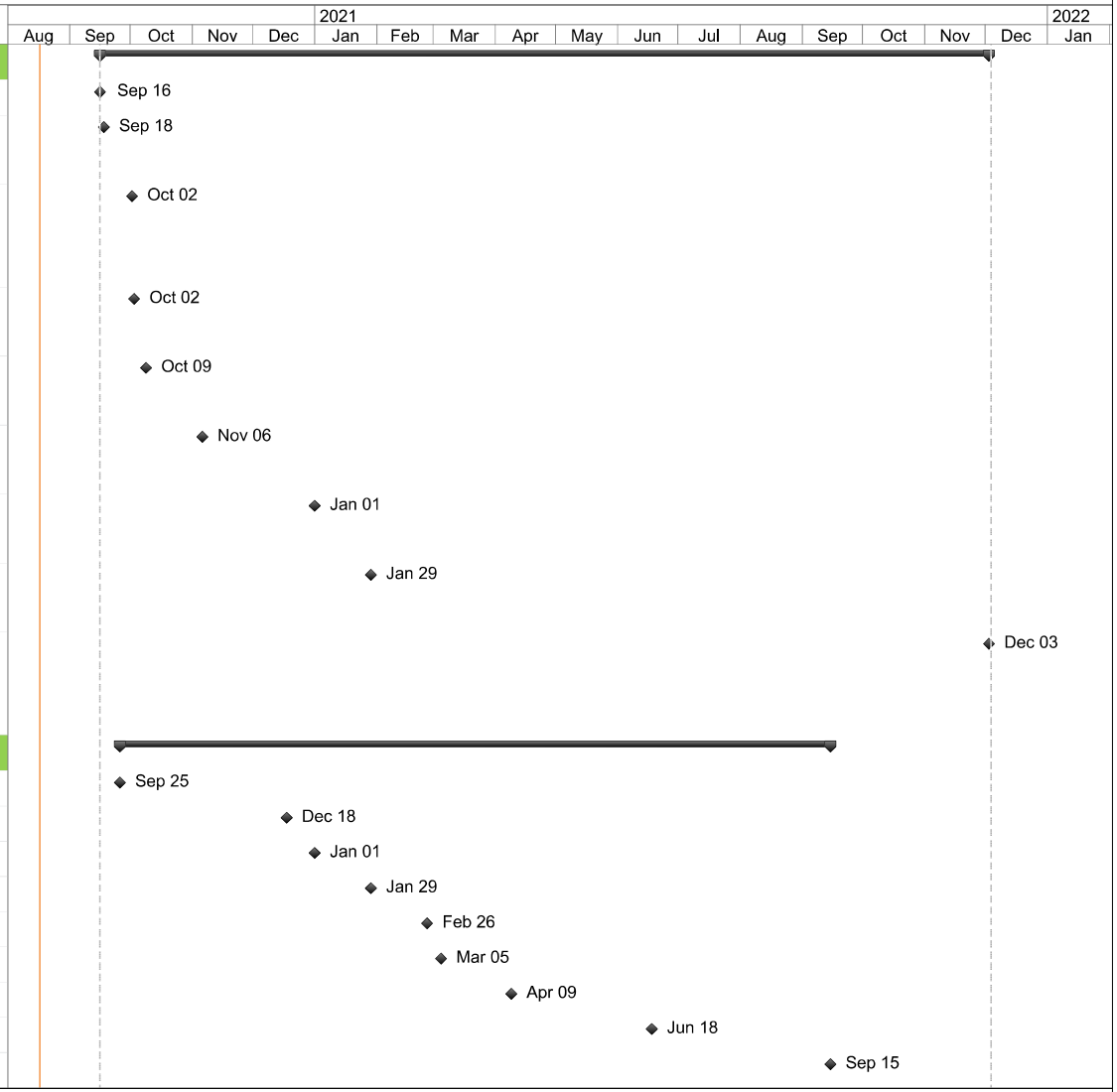
Task (Key Milestone)	Permit Support	Construction
Town Board approves Project; Notice to Proceed ISSUED	Week 0: September 16, 2020, assumed	Week 0: September 16, 2020, assumed
Requested by California State Lands Commission: **Response to engineering staff's questions on Project description**	Week 1	
Requested by USACE: **Biological Assessment** to enable USACE to initiate Section 7 Consultations with USF&WS and NOAAA Fisheries	Week 3	
Requested by California State Land Commission: **Mitigation Management Plan** draft for review	Week 3	
Requested by California State Land Commission: **New Tribal Consultation** per AB52	Week 4	
Regional Water Board – Section 401 Water Quality Cert ISSUED	Week 8	
Bathymetric survey		Week 2
Conceptual design of the outfall*		Week 14
30% Submittal		Week 16
Complete responses to agency comments on LSA permit, Nationwide permit and State Lands Lease	Week 16	
50% Submittal		Week 20
Nationwide Permit, Lake & Streambed Alteration Permit, State Lands Lease - ISSUED	Week 20	
100% Submittal – Issued for Bidding Drawings		Week 24
Project Bidding Package Issued		Week 25
Construction contract award		Week 30
Outfall pipe shop fabrication		Week 40
In river construction begins Sept 15, 2021*		Week 58
Project Close Out – Completion Report; Submit as-builts and photographs to USACE to close Nationwide Permit and other agencies as requested.	Week 64	Week 64

Notes:

* Due to environmental constraints, in-river construction can commence no earlier than the beginning of Week 58, which equates to September 15, 2021. There is approximately 20 weeks of slip built into the schedule to allow for unforeseen permitting issues.

Advisian | **Town of Discovery Bay Sanitary Outfall Upgrade Schedule** | **Town of Discovery Bay**

ID	Task Name	Finish
1	**Permit Support**	**'21 Dec 03**
2	Town Board approves Project; Notice to Proceed ISSUED	'20 Sep 16
3	Requested by California State Lands Commission: Response to engineering staff's questions on Project description	'20 Sep 18
4	Requested by USACE: Biological Assessment to enable USACE to initiate Section 7 Consultations with USF&WS and NOAAA Fisheries	'20 Oct 02
5	Requested by California State Land Commission: Mitigation Management Plan draft for review	'20 Oct 02
6	Requested by California State Land Commission: New Tribal Consultation per AB52	'20 Oct 09
7	Regional Water Board – Section 401 Water Quality Cert ISSUED	'20 Nov 06
8	Complete responses to agency comments on LSA permit, Nationwide permit and State Lands Lease	'21 Jan 01
9	Nationwide Permit, Lake & Streambed Alteration Permit, State Lands Lease - ISSUED	'21 Jan 29
10	Project Close Out – Completion Report; Submit as-builts and photographs to USACE to close Nationwide Permit and other agencies as requested.	'21 Dec 03
11	**Construction**	**'21 Sep 15**
12	Bathymetric survey	'20 Sep 25
13	Conceptual design of the outfall*	'20 Dec 18
14	30% Submittal	'21 Jan 01
15	50% Submittal	'21 Jan 29
16	100% Submittal – Issued for Bidding Drawings	'21 Feb 26
17	Project Bidding Package Issued	'21 Mar 05
18	Construction contract award	'21 Apr 09
19	Outfall pipe shop fabrication	'21 Jun 18
20	In river construction begins Sept 15, 2021*	'21 Sep 15



Project #: Town of Discovery Bay Sanitary Outfall Upgrade Schedule
Prepared by: PB; Checked by: EG
Status Date: NA; Rev 2

Task | Milestone | Project Summary | Manual Summary
Split | Summary | Manual Task | Progress

C:\Users\Pankajkumar.Bhatt\Desktop\Schedules\Efrain\Discovery Bay.mpp

Current Date: '20 Aug 17

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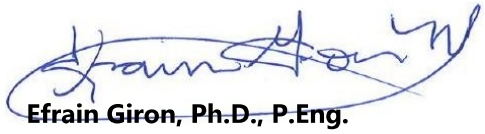
6 Closure

We trust that this letter proposal covers the full range of Project requirements for implementation of the outfall rehabilitation. This work plan is based on our current understanding of your intent to restore functionality to the TDBC's outfall diffuser. If you have any questions or require further details, please contact the undersigned at any time. Advisian Staff Rates are included in Attachment 1.

Sincerely,

Len Marino, P.E. CFM
Senior Consultant



Efrain Giron, Ph.D., P.Eng.
Senior Water Resources Engineer

Management Review:

Jeff Crofton, M.Sc., P.Eng.
Principal Surface Water Engineer

Confidentiality

This document has been prepared for the sole purpose of documenting our tender for consultancy services associated with the Permit Requirements for Option 4 - Sanitary Outfall Diffuser Upgrades for the Town of Discovery Bay.

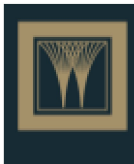
It is expected that this document and its contents, including work scope, methodology and commercial terms will be treated in strict confidence by Herwit Engineering and the Town of Discovery Bay and that the contents will be used by Herwit Engineering only for the purpose of selecting a consultant for the project.

COVID-19

Advisian is committed to providing the proposed Services to you in a timely and professional manner. Advisian is also committed to ensuring the health and safety of everyone, including our people and our customers. In some cases, the COVID-19 pandemic has caused us to modify our working practices. Advisian employees and collaborators may therefore provide some or all of the proposed Services from offices within their homes. In addition, the ability to travel for attendance to business meetings or site may be affected.

Advisian will take reasonable steps to mitigate any delays associated with the measures necessary to keep everyone safe and comply with all government regulations and proclamations regarding the COVID-19 pandemic. Customers will be informed if there is any foreseeable impact on providing the proposed Services.

Attachment 1
Advisian Staff Rates



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3- USA Standard Rate

Rate Currency: USD

26-Jun-2020

Classification		Rate
L1	Engineer/Scientist	$ 206
L2	Engineer/Scientist	$ 193
L3	Engineer/Scientist	$ 180
L4	Engineer/Scientist	$ 167
L5	Engineer/Scientist	$ 154
L6	Engineer/Scientist	$ 141
L7	Engineer/Scientist	$ 128
L8	Engineer/Scientist	$ 115
L9	Engineer/Scientist	$ 103
L10	Engineer/Scientist	$ 90
D1	Designer/Technician	$ 186
D2	Designer/Technician	$ 173
D3	Designer/Technician	$ 160
D4	Designer/Technician	$ 147
D5	Designer/Technician	$ 135
D6	Designer/Technician	$ 122
D7	Designer/Technician	$ 109
D8	Designer/Technician	$ 96
D9	Designer/Technician	$ 83
S2	Sr. Project Manager/Specialist	$ 269
S3	Sr. Project Manager/Specialist	$ 245
S4	Sr. Project Manager/Specialist	$ 224
S5	Project Manager/Specialist	$ 206
S6	Project Manager/Specialist	$ 180
P1	Project Services	$ 145
P2	Project Services	$ 122
P3	Project Services	$ 100
P4	Project Services	$ 78
P5	Project Services	$ 56
S1A	Sr. Project Manager/Specialist	$ 230
S1B	Sr. Project Manager/Specialist	$ 235
S1C	Sr. Project Manager/Specialist	$ 240
S1D	Sr. Project Manager/Specialist	$ 245
S1E	Sr. Project Manager/Specialist	$ 250
S1F	Sr. Project Manager/Specialist	$ 255
S1G	Sr. Project Manager/Specialist	$ 260
S1H	Sr. Project Manager/Specialist	$ 265
S1I	Sr. Project Manager/Specialist	$ 270
S1J	Sr. Project Manager/Specialist	$ 275
S1K	Sr. Project Manager/Specialist	$ 280
S1L	Sr. Project Manager/Specialist	$ 300
S1M	Sr. Project Manager/Specialist	$ 325
S1O	Sr. Project Manager/Specialist	$ 350
S1P	Sr. Project Manager/Specialist	$ 375
S1Q	Sr. Project Manager/Specialist	$ 400
S1N	Sr. Project Manager/Specialist	$ 425
GDCM1	GDC M1 Drafting / Administration / Project Support	$ 69
GDCM2	GDC M2	$ 78
GDCM3	GDC M3 Engineering Design / Sciences / Technical Ser	$ 78
GDCM4	GDC M4 Document Control	$ 69

Town of Discovery Bay

"A Community Services District"

STAFF REPORT

Meeting Date

September 2, 2020

Prepared By: Gregory Harris, District Wastewater Engineer
Submitted By: Michael R. Davies, General Manager

Agenda Title

Discussion and Provide Feedback on Scope of Work for Stantec to Perform Computational Fluid Dynamics Modeling Engineering Services for UV System at Plant No. 2 as part of the Denitrification Project in the Amount of $54,500.

Recommended Action

Provide Feedback for Staff to Bring the Item to the Full Board at the September 16, 2020, meeting to Authorize the General Manager to Execute the Town's Standard Consultant Agreement for Stantec to Perform Computational Fluid Dynamics Modeling Engineering Services for the UV system as part of the Denitrification Project as per the Attached Scope of Work.

Executive Summary

The Town operates an Ultraviolet Light (UV) Disinfection system at Plant No. 2. As part of the recently completed Filtration Project, specialized testing was performed on the UV system to verify full performance to Title 22 standards for all flow conditions specified in the wastewater master plan. During this testing, it is was found that hydraulic turbulence in the UV channels at high flows was interfering with proper operation of the UV equipment. As a result, addressing the hydraulic conditions in the UV channel was added to the list of recommended projects in the most recently completed wastewater master plan update. The project was put on the CIP 7018 at a budget of $160K consistent with masterplan recommendations.

On July 30, 2020, Stantec and HERWIT conducted preliminary hydraulic testing of the UV system and observed the turbulence at higher flows. Based on this site investigation, Stantec has prepared a cost to perform Computational Fluid Dynamics Modeling of the UV channel to identify the specific improvements needed to improve the performance of the existing UV channels. These improvements will be included in the overall construction for the Denitrification Project.

The estimated construction cost of proposed improvements to the UV channel is $100K or less.

Specific Committee Action:

Provide feedback for Staff to ask the Board to take the following action at the September 16, 2020, meeting:

a) Approve the Scope and Budget Contained in the Stantec Proposal Dated August 20, 2020, to Perform Computational Fluid Dynamics Modeling Services for the UV system.

b) Authorize the General Manager to Execute the Town's Standard Form of Consulting Agreement with Stantec to Perform Computational Fluid Dynamics Modeling Services in the Amount of $54,500.

Previous Relevant Board Actions for This Item

Authorization of CIP item 7018.

Fiscal Impact: Part of Existing CIP
Amount Requested: $ 54,500
Sufficient Budgeted Funds Available?: Yes
Prog/Fund # Category: TBD

Attachments

1. Stantec Proposal Dated August 20, 2020

AGENDA ITEM: E-4

Stantec Consulting Services Inc.
3875 Atherton Road
Rocklin, CA 95765

August 20, 2020

Mr. Gregory Harris
Town of Discovery Bay
Discovery Bay, CA

Reference: Proposal for UV Disinfection System Computational Fluid Dynamics Modeling at the Town of Discovery Bay WWTP

Dear Mr. Harris,

We are pleased to present this proposal to provide the Town of Discovery Bay (Town) with engineering services for a site investigation and computational fluid dynamics (CFD) modelling for the ultraviolet (UV) disinfection system at the Discovery Bay Wastewater Treatment Plant (WWTP).

It is proposed to conduct these services on a time and materials basis in accordance with the attached fee schedule with an estimated not to exceed fee of **$41,000**. A contingent estimated fee of **$13,500**, which will not be utilized without the written approval of the Town, is also included in the event that additional modeling is required. The total estimated fee will not be exceeded without prior written approval from the Town. Should additional out-of-scope work be required or requested by the Town, Stantec will request a change order to fund additional services.

SCOPE OF WORK

Task 1 – Site Investigation

On 30 July 2020, Stantec staff conducted a site investigation of the UV channels at the Town's WWTP. Stantec procured a meter with a velocity and depth sensor to observe instantaneous and ten-second average velocities at different depths and different cross-sections along the channel for varying flows. During the site visit, oscillating waves propagating throughout the length of the channel were observed. Additionally, the velocities observed were not uniform for an individual cross-section. These observations indicate that the actual hydraulic capacity of the channel may be less than the design capacity.

The attached fee estimate includes direct costs for the velocity/depth meter procurement and Stantec staff travel expenses.

Reference: Proposal for UV Disinfection System Computational Fluid Dynamics Modeling at the Town of Discovery Bay WWTP

Task 2 – CFD Modeling of the UV Disinfection System

Hydraulics can greatly affect the performance of a UV system. The hydraulic capacity of the channels must be verified to confirm whether it can treat flows up to 4.2 MGD and if preferential paths exist. Potential hydraulic improvements may be recommended based on the results of the CFD modeling.

Task 2.1 – CFD Modeling (One Channel)

Stantec will develop a CFD model for the UV system using ANSYS FLUENT to predict detailed three-dimensional flow patterns in the UV disinfection channel. The model will first be run for one channel for three different flows (4.2 MGD and two lower flows). The CFD model will include the inflow pipe, flow split chamber, UV channel, and the downstream effluent channel. The following inputs to the model are required:

- Drawings for the area to be modeled
- Drawings for UV reactors
- Operating scenarios and flow rates
- Water surface levels in the UV channel

The CFD results will include flow streamlines showing 3D flow patterns, velocity and turbulence contours at key vertical and horizontal planes, forces acting on UV lamps, etc. The model will also show uneven water surface profiles for oscillating waves.

Task 2.2 – CFD Modeling (Potential Hydraulic Improvements)

Based on the results of the CFD modeling, Stantec will modify the model to simulate possible physical hydraulic improvements if short circuiting or excessive turbulence in the UV system channel is determined. The attached estimated fee includes budget for Task 2.2 for modeling up to three potential hydraulic improvements.

Task 2.3 – CFD Modeling Report

Stantec will prepare a technical memorandum detailing the results of the CFD modeling.

Task 3 – Project Management

Stantec will provide project management to oversee project progress and complete management tasks such as scheduling updates, billing, and report coordination. Stantec's Project Manager will directly report to the Town's Project Manager on the below listed management activities. The project management activities will include the following subtasks:

Reference: Proposal for UV Disinfection System Computational Fluid Dynamics Modeling at the Town of Discovery Bay WWTP

- Coordinate and communicate with the Town's Project Manager on a regular basis on project updates, constraints, and answer questions.
- Manage scope and budget for the project through cost control and reporting system.

FEE SCHEDULE

The attached fee table provides billing rates for our proposed personnel, estimated hours per task for each nominated project team member, and direct costs, as well as sub-totals for each task and total estimated staff hours and budget.

Contingent Task 4 – Additional CFD Modeling

The fee schedule also includes a contingency allowance of **$13,500** for the Town's consideration. The funds will not be utilized without obtaining authorization from the Town Project Manager. The contingency allowance is included in case additional modeling (e.g., additional potential hydraulic improvements) is required. Additional modeling may include modeling a dual-channel operation to evaluate whether there is proper flow splitting between the two UV channels if the original results from the single channel CFD modeling indicates no improvements can increase the hydraulic capacity of one channel to 4.2 MGD.

Please, contact us should you have any questions or comments regarding this proposal. I appreciate the opportunity to work with you on this project.

Respectfully,

STANTEC CONSULTING SERVICES INC.

Steve Beck, PE
Sr. Principal/Project Manager
Phone: (916) 773-8100
steven.beck@stantec.com

Beth Cohen, PE
Senior Engineer/Proposal Reviewer
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Stantec

Town of Discovery Bay UV Disinfection Sytem Computational Fluid Dynamics Modeling Fee Estimate

	Project Manager	Senior Process Engineer & QA/QC Reviewer	Hydraulics/ CFD Expert	Hydraulics EIT	Water Quality Specialist				
	Steve Beck, PE	Cristina Fonseca, PhD, PE	Fangbiao Lin, PhD, PE	Haiwen Gao, EIT	Kelly McGartland, EIT				
Billing Rate, $/hr	$244	$219	$244	$165	$165				
Task						**Total Hours**	**Labor**	**Direct Costs**	**Total**
Task 1 – Site Investigation									
Task 1 – Site Investigation	4	0	0	0	8	12	$2,296	$718	$3,014
					Task 1 Total	**12**	**$2,296**	**$718**	**$3,014**
Task 2 – CFD Modeling of the UV Disinfection System									
Task 2.1 – CFD Modeling (One Channel)	2	2	24	52	4	84	$16,022	$0	$16,022
Task 2.2 – CFD Modeling (Potential Hydraulic Improvements)	2	2	24	48	2	78	$15,032	$0	$15,032
Task 2.3 – CFD Modeling Report	2	4	4	12	4	26	$4,980	$0	$4,980
					Task 2 Total	**188**	**$36,034**	**$0**	**$36,034**
Task 3 – Project Management									
Task 3 – Project Management	8	0	0	0	0	8	$1,952	$0	$1,952
					Task 3 Total	**8**	**$1,952**	**$0**	**$1,952**
Total	**18**	**8**	**52**	**112**	**18**	**208**	**$40,282**	**$718**	**$41,000**
Total Fee									**$41,000**
Contingent Task 4 – Additional CFD Modeling									
Task 4 – Additional CFD Modeling	2	2	16	48	2	70	$13,080	$420	$13,500
					Contingent Task 4 Total	**70**	**$13,080**	**$420**	**$13,500**
Total with Contingent Task	**20**	**10**	**68**	**160**	**20**	**278**	**$53,362**	**$1,138**	**$54,500**
Total Fee with Contingent Task									**$54,500**