INFORMATION

BOARD OF DIRECTORS
STAFF REPORT

To: TVMWD Board of Directors

From: Matthew H. Litchfield, General Manager

Date: October 5, 2022

Subject: **Miramar Transmission Line Leak Detection**

☐ **Funds Budgeted: $** ☒ **Fiscal Impact: $190,000**

Staff Recommendation

No Action Necessary – Informational Item Only

Background

Metropolitan Water District of Southern California [Metropolitan] invoices Three Valleys Municipal Water District [TVMWD] monthly for the imported water delivered into the TVMWD service area. Every month, staff reconciles the total volume of water billed by Metropolitan with the total volume of water sold. Historically, the difference between the billed and sold amount [water loss] was balanced during each year. However, since 2020, the water loss trend has increased, and is continuing to increase to approximately ten percent each year. The Miramar Transmission Line Leak Detection Project [Project] has been developed to identify potential leaks within the pipeline distribution system and develop corrective measures to address the water loss.

Discussion

On average, 14 to 18 percent of total daily treated potable water in the United States is lost through leaks, with some water systems reporting water-loss rates exceeding 60 percent. The water loss identified by TVMWD ranges between five to ten percent, with variations depending on the quantities of flow, i.e., higher losses when the distribution system flow is lower and more noticeable. Water loss control program helps to identify real or physical losses of water from the water system and apparent losses, the water that is consumed but not accounted for. Real losses represent costs to a water system through the additional energy and chemical usage required to treat the lost water. Apparent losses represent a loss of revenue because the water is consumed but not accounted for and thus not billed.

On average, 30 percent of the TVMWD imported water purchases from Metropolitan is through Miramar Treatment Plant and the remaining 70 percent is purchased from Weymouth via direct Metropolitan service connections. From TVMWD's revenue perspective, the treated water purchases from Metropolitan service connections are completely accounted for. The water loss for TVMWD's system occurs mainly in the deliveries associated with the Miramar Treatment Plant. Over the course of the last year, staff has been working to identify physical loss of water within the Miramar Treatment Plant. The investigation has been completed with no significant loss within the treatment plant. Staff has also been working with Metropolitan to identify any potential inaccuracies of the PM-21 service connection into Miramar Treatment Plant.

As a result, the Project has been developed to identify other potential sources that could contribute to the water loss. Staff has developed a two-prong approach to reach a resolution. The first path is through the Project to identify any potential sources/weaknesses within the Miramar pipeline distribution system. The second path is to work with Metropolitan to identify potential deficiencies with the current Metropolitan meter at the Miramar Treatment Plant. Staff has been working with Metropolitan on this second path and will provide future updates as information is available.

The current industry standard has two common methods to detect leaks within buried pipelines. The first method uses a SmartBall® internally within the pipe. The second method uses ultrasonic listening and ground penetrating radar. Proposals were solicited and received for both methods; the two technologies significantly range in cost with the SmartBall® being the highest of the two.

The ultrasonic method requires manpower walking along the pipe alignment to detect any leaks. Since the majority of the Miramar transmission line resides in major arterial streets, this method poses issues with completing the ultrasonic listening and potential traffic/ safety issues on the ground. The SmartBall® platform is a free-swimming inspection tool used to detect leaks and gas pockets and map pipeline networks. This platform assesses pressurized water pipelines in a single deployment, without disrupting regular service. The SmartBall® platform also provides pipeline condition data and confirms the location of underground pipelines and their alignment with other critical assets. The pipeline condition data also provides valuable information for any rehabilitation or asset management decisions. Staff's recommendation is to pursue the SmartBall® technology due to the higher value it provides.

Since both methods are innovative technologies, there are few manufacturers that are local who would be competitive in providing pricing or have sufficient equipment to complete the scope of the project. The SmartBall® Technology is provided by Xylem, a widely recognized name in the water industry. Staff has reviewed the references provided by Xylem and agrees that their expertise in the scope of work will provide a successful project.

Annual system water loss of ten percent or 700 acre-feet results in a potential revenue loss of $750,000. The SmartBall® technology to perform the leak detection analysis is $160,450. TVMWD will be pursuing potential funding opportunities to offset the cost of the Project. As listed in Xylem's proposal, it would be TVMWD responsibility to provide any traffic control to facilitate the inspection. The Project will be presented to the Board of Directors on October 19, 2022 for its consideration to establish a project budget of $190,000 through an amendment of the fiscal year budget and for award of contract to Xylem.

Strategic Plan Objective(s)

1.4 – Maintain water infrastructure to assure 100% reliability

2.7 – Energy Efficiency

Attachment(s)

Exhibit A – Xylem Proposal

Exhibit B – GPRS Proposal

Exhibit C – Budget Amendment

Meeting History

None

NA/KP

xylem
Let's Solve Water

Proposal for

PCCP INSPECTION AND LEAK DETECTION

Miramar System

SmartBall®, PureRobotics® & PipeDiver®

May 11, 2022

Prepared for

Three Valleys MWD

Attn: Kevin Panzer

1021 E. Miramar Avenue

Claremont, CA 91711

pure TECHNOLOGIES
a xylem brand

Kevin Panzer, P.E.
Assistant Engineer
Three Valleys MWD

RE: PCCP Inspection and Leak Detection – Miramar System

Dear Kevin,

Pure Technologies U.S. Inc., a Xylem brand, is pleased to offer our services for inspection, leak detection, and mapping of the Miramar System using our PipeDiver, Robotics and SmartBall platforms. The inspection scope involves approximately 7 miles of 36in, 30in, 24in, and 18in diameter prestressed concrete cylinder pipe (PCCP) potable water pipeline. We propose using the PipeDiver free-swimming electromagnetic inspection platform as well as using our PureRobotics® tethered inspection platform to identify individual pipes with broken steel prestressing wire wraps, a key structural component of PCCP. Our SmartBall® free-swimming inspection platform inspects pipelines while they are in service, detects acoustic activity associated with leaks and pockets of trapped air and can leverage motion data to map pipelines.

Included in this scope is Transient Pressure Monitoring as well as a suite of Condition Assessment Engineering services—design review, finite element analysis, and remaining useful life analysis—to enable you to proactively manage the failure risk and asset life of your pipeline.

The PipeDiver platform has been successfully used to inspect and inform the management of over 1,500 miles of pipelines around the world. Through this experience, we have identified key success factors for free-swimming inspections to minimize risk and disruption to pipeline operations. Highly trained and experienced technicians will work closely with your operations personnel to understand and mitigate inspection risks during project planning and execution. The PureRobotics platform has been successfully used to inspect over 600 miles of pipelines around the world. Through this experience we have identified key factors for success for robotic inspections to minimize risk and pipeline downtime associated with the inspection. The SmartBall platform has been deployed for more than 15 years to successfully inspect over 7,500 miles and report over 3,300 leaks.

Pure Technologies is a recognized industry leader in the inspection, assessment, and management of pressurized water and wastewater pipelines. We continually strive to set the industry standard with the most trusted, technologically advanced tools operated by our highly experienced team.

We look forward to addressing any questions you may have and helping you solve your water challenges.

Christopher Aronitz, PE, PMP
Business Development Manager
619-514-9140
Christopher.Aronitz@Xylem.com

PCCP Inspection & Leak Detection

The best way to proactively manage any pipeline is to better understand its health using proven condition assessment solutions combined with advanced analysis.

A comprehensive condition assessment of PCCP water pipeline involves deploying inspection tools to accurately assess the health of the buried infrastructure along with advanced engineering analysis to provide a clearer understanding of risks that inform short- and long-term repair and replacement strategies.

We propose a comprehensive condition assessment initiative for Three Valleys MWD comprising four phases:

1. Leak and air pocket detection helps determine a pipe's baseline condition. Pure Technologies' free-swimming SmartBall® platform uses acoustic technology to accurately locate leaks and air pockets and operates while the pipeline is in service.
2. Inline wall inspection identifies and locates broken wire wraps to provide a critical baseline for pipe degradation. Prestressing wires are the main structural component in PCCP. The PipeDiver® platform is a free-swimming condition assessment tool that is easy to deploy and operates while the pipeline remains in service.
3. Transient Pressure Monitoring accurately measures the operating pressure in a pipeline to better understand the system hydraulics and the effect of pressure surges on the pipeline.
4. Condition Assessment Engineering turns inspection and monitoring data into actionable recommendations for PCCP owners. Structural evaluation services, such as finite element analysis and degradation modeling, help utilities make long-term capital planning decisions about reinspection, rehabilitation, and replacement while ensuring safe pipeline operation into the future.

FUTURE PROJECT ONLY

Leak and Air Pocket Detection

The first phase of the condition assessment is an initial survey for leaks and air pockets using the SmartBall platform. This inspection will identify potential leaks and air pockets as a preliminary indicator of pipeline condition.

The SmartBall inspection platform is a free-swimming, nondestructive inline inspection technology that detects acoustic activity associated with leaks and pockets of trapped air in pressurized pipelines. Optionally, SmartBall can map the pipeline using the motion data of the tool along with field-collected GPS data.

The SmartBall tool is typically inserted through a valve into an active line. Once deployed, the tool is propelled by the hydraulic flow and can navigate inline valves, 90-degree bends, tees, diameter changes, profile changes, and vertical risers. It is typically extracted by inserting an expandable retrieval net through a pressurized stack attached to a 4-inch full-bore flanged valve.

The SmartBall tool is continuously tracked during an inspection using proprietary tracking devices synchronized with the tool and tracking sensors installed along the pipeline prior to deployment.

The collected data is evaluated by experienced data analysts using proprietary software and methods to report the location of leaks and air pockets, as well as provide a qualitative estimate of leak magnitudes to help prioritize further investigation and repair activities. When mapping of the pipeline is included in the project scope, advanced location algorithms are used to evaluate motion data recorded by the SmartBall tool in combination with field-collected GPS data to determine the alignment of the pipeline.

An overview of the SmartBall platform inspection process is shown in Figure 1. Further details of the SmartBall technology can be found in the data sheets included in this proposal.

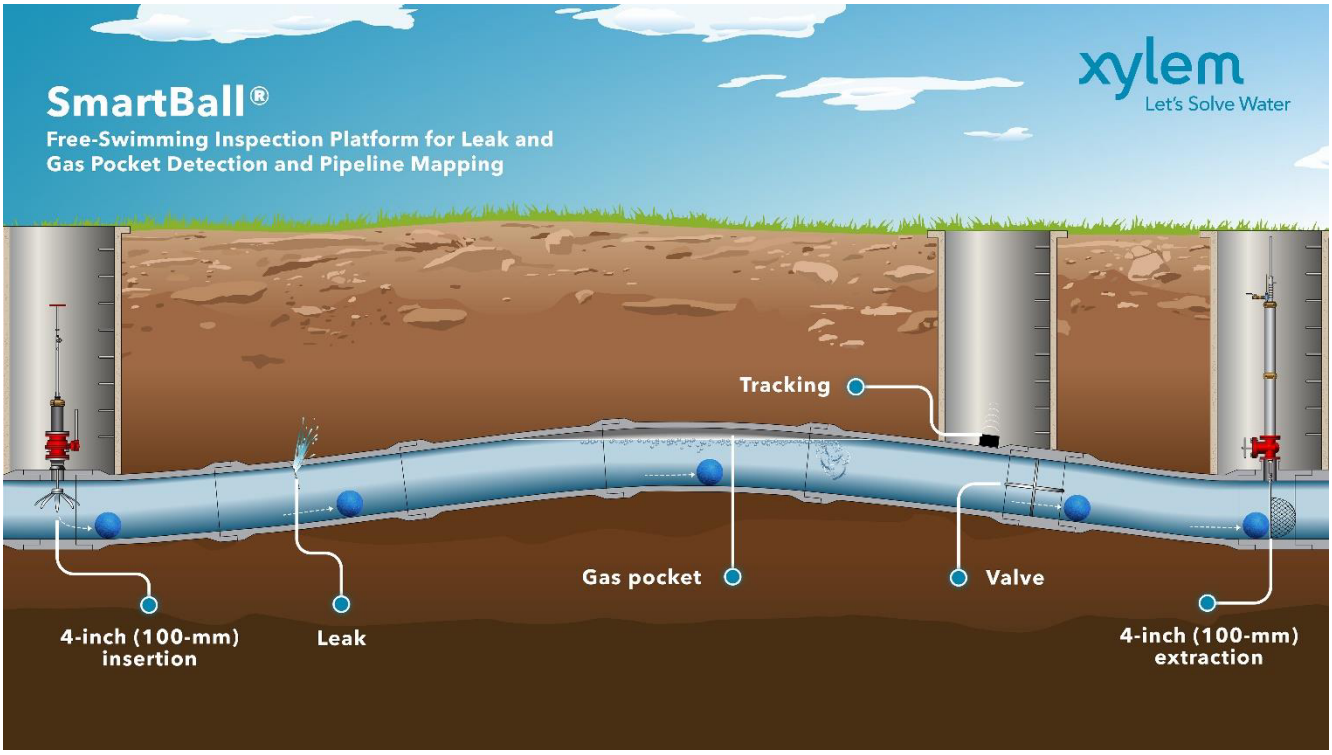


Figure 1: SmartBall Inspection Overview

Inline Wall Inspection

FUTURE PROJECT ONLY

After completing the inline leak and air pocket survey, the pipeline will be inspected with the PipeDiver and PureRobotics platform to identify broken prestressing wire wraps, which are the main structural component in PCCP.

The PipeDiver and PureRobotics platform provides accurate, detailed pipe wall condition data to inform proactive management decisions. Pure Technologies' industry-leading, patented electromagnetic technology can locate groups of as few as five broken wire wraps along the length

Project Milestones and Deliverables

Planning and Mobilization

The planning process is an integral part of the project. Gathering more detailed pipeline information during the planning process facilitates a more successful inspection. Pure Technologies will meet with Three Valleys MWD to perform a site visit to assess access to the pipeline and identify site or pipe features that could pose a challenge during the inspection. Steps are then put into place to mitigate any potential risk. Based on information gathered and the preliminary site visit, the team drafts a detailed Project Planning Document that outlines the inspection plan, including insertion and extraction procedures and tracking sensor locations. The Project Planning Document will be submitted to Three Valleys MWD prior to starting the work. Changes in scope that arise from the planning process that impact pricing outlined in this proposal will be discussed with Three Valleys MWD and mutually agreed upon before proceeding.

Civil work may be required for successful insertion and/or extraction of the PipeDiver, PureRobotics or SmartBall tool and will be identified during the detailed planning process. Civil work may include, but is not necessarily limited to, pipeline fitting modifications, excavation, tapping, shoring, and/or any other activity necessary to access valves and appurtenances identified as critical to the inspection. It is expected that the Three Valleys MWD will complete this work.

[If pipeline mapping is included in scope:] During the site visit, GPS location data will be collected for all Control Points and Reference Points. Chambers and vaults must be opened to ensure that the GPS points can be recorded above the actual pipeline feature or to add an offset to the GPS points. This data collection effort is expected to take an additional one to two days onsite.

Activities undertaken as part of the planning and mobilization process include, but are not necessarily limited to:

- Project document review
- Preliminary site visit and review
- Evaluation of the need for alternative methods for insertion and extraction, such as utilizing pressurized insertion and extraction tubes for PipeDiver or a hydrant insertion for a SmartBall
- Pre-inspection coordination/meetings
- Planning document development
- Equipment and staffing logistics to and from the project sites
- Tool preparation
- Pre-inspection activities required in advance of the scheduled inspection date

Optional Flow Rate Verification. Onsite verification of flow rates under inspection conditions can be conducted during initial site visit. This can be an important step in the planning process for complex pipeline networks that require numerous valves to be operated or for utilities needing additional assistance to verify that operating conditions in the pipeline are suitable for inline inspection.

Planning and Mobilization Deliverables

1. Project Planning Document that outlines the inspection plan, including insertion and extraction procedures and tracking sensor locations.

Leak & Air Pocket Detection & Mapping

Tracking sensor installation will occur for both the PipeDiver and SmartBall tools in the days prior to inspection It is expected that Three Valleys MWD will assist in any installations that require soft digs or pavement coring to access the pipeline and will provide appropriate traffic control during tracking installations, if required, as outlined in the Project Planning Document.

Figure 6

Leak locations are determined using data recorded by the sensors onboard the SmartBall tool as well as that recorded by the tracking devices. This data is also used to determine if a leak is occurring on a pipe joint or barrel. Leaks occurring on the barrel of a pipe may indicate the pipe has been structurally weakened and is in danger of failing. Experience has shown our analysis methods are accurate to within approximately ±6 feet.

The inspection is anticipated to take two days to complete. Immediately preceding the deployment of the SmartBall tool, Pure Technologies personnel will measure the flow speed, flow direction, and pipeline operating pressure to verify the conditions in the pipeline. Several tracking teams will be assigned to monitor the tool's movement through the pipeline. If required, Three Valleys MWD will provide traffic control during the inspection at each tracking sensor location. Coordination with operations staff will be required throughout the duration of the inspection, particularly for activities such as valve operation, pump management, etc. These activities will be outlined in the Project Planning Document. Upon completion of the inspection, data will be downloaded from the SmartBall and shared with the Pure Technologies analysis team.

Prior to demobilizing from the inspection, the Pure Technologies team will review data recorded by the SmartBall tool and investigate suspected medium and large leaks identified during the inspection. The results from this analysis will be communicated directly to Three Valleys MWD through email, phone, or in-person. To investigate, personnel will travel to the location of the suspected leak to look for obvious signs of leakage, listen with a ground microphone, investigate nearby pipeline features and manholes, and will record additional GPS points used to improve the final reported location of the leak that will be delivered in the draft report.

The Pure Technologies analysis team will analyze the data collected by the SmartBall platform to document details of acoustic events including acoustic intensity plots and tracking details. A dig sheet will be developed for each leak to aid in location and excavation. Dig sheets include an aerial view of the pipeline alignment and detail a leak location based on the distance from the leak to the nearest upstream and downstream pipeline features.

[If pipeline mapping is included in scope:] The SmartBall platform will be inserted into the pipeline a second time to complete location data collection. Using the latest accelerometer and gyroscope technologies with advanced location algorithms, the pipeline directional data will be calculated. The Pure Technologies data analysis team will combine this data with aboveground GPS data points to develop a geodatabase of the pipeline location.

[If pipeline mapping is included in scope:] Data analysts will use the SmartBall directional data, along with field-collected aboveground GPS points and pipeline bearing information, to create a geodatabase that characterizes the alignment of the pipeline. This alignment is then compared to available pipeline information, such as an existing pipeline GIS and as built drawings, to identify conflicts or confirm the assumed pipeline alignment. In areas where the SmartBall-derived alignment agrees with a utility's records, the utility can feel more confident the assumed location of the pipeline is close to actual. If a conflict is identified, a targeted effort of exposing the pipeline, line finding and/or surveying at these specific areas may be warranted depending on the location accuracy required for the subject pipeline. The error range of the mapping results will be calculated considering the distance between control points, availability of GPS points and pipeline heading, and quality of rolling motion of the SmartBall tool.

Further details on considerations related to the pipeline inspection such as pressure, flow requirements, or insertion/extraction requirements can be found in Appendix A.

Optional hydrant extraction: Pure Technologies can provide equipment to safely retrieve the SmartBall tool from pipelines utilizing existing fire hydrants when other access points are unavailable. The SmartBall tool can also be inserted into the pipeline using hydrants. This method of insertion is performed at no additional fee from Pure Technologies but may require the utility to provide pumping services.

Leak & Air Pocket Detection Deliverables

1. Immediate notification of suspected medium and large leaks, if needed
2. Draft Inspection Report including:
    - Project background and inspection details
    - Details of acoustic events including acoustic intensity plots and tracking details
    - A table of results identifying locations of acoustic events (e.g., leaks and/or air pockets)
    - Dig sheets to aid in locating and excavating reported leaks, including an aerial view of the pipeline alignment and detail of each leak location
3. [If pipeline mapping is included in scope.] Geodatabase including SmartBall-collected alignment data, GPS points, and range of accuracy.
4. [If pipeline mapping is included in scope.] Identification of conflicts between an existing pipeline alignment dataset and the SmartBall generated GIS alignment.
5. Final Inspection Report incorporating comments from Three Valleys MWD.

Project Schedule

A typical schedule for this project is shown below.

Leak & Air Pocket Detection	
Task	**Timing**
Site visit	Within 30 days following NTP
Project Planning Document	2 weeks before inspection
Field Inspection	8-10 weeks following NTP
Leak investigation prior to demobilization	24 hours after completion of inspection
Draft Report • Leak and air pocket detection only • Leak, air pocket, and XY Alignment, <4 miles • Leak, air pocket, and XY Alignment, >4 miles	4 weeks after inspection 8 weeks after inspection 10 weeks after inspection
Final Report and Geodatabase	2 weeks after receipt of comments on Draft Report

FUTURE PROJECT ONLY

Inline Wall Inspection	
Task	**Timing**
Site visit	Within 30 days following NTP
Project Planning Document	2 weeks after site visit
Field Inspection	1-3 weeks from Project Planning document approval
Draft Report	6 weeks following inspection
Final Report	2 weeks after receipt of comments on Draft Report

Transient Pressure Monitoring	
Task	**Timing**
Site visit	Within 30 days following NTP
Project Planning Document	2 weeks after site visit
Field Inspection	1-3 weeks from Project Planning document approval

Condition Assessment Engineering	
Design Review	Included with draft Inline Wall Inspection Report
Finite Element Analysis	Included with draft Inline Wall Inspection Report
Remaining Useful Life Analysis	Included with draft Inline Wall Inspection Report

Project Pricing – Leak Detection Only

Project Pricing					
Item	Description	Unit	Unit Price	Quantity	Total Price
1.1	SmartBall Project Planning and Mobilization	$20,000	Each	1	$20,000
1.2	SmartBall Inspection (up to 2 miles)	$20,000	Each	1	$20,000
1.3	SmartBall Inspection (2-4 miles)	$9,500	Per Mile	2	$19,000
1.4	SmartBall Inspection (4-7 miles)	$8,650	Per Mile	3	$25,950
1.5	SmartBall Inspection (7-10 miles)	$7,650	Per Mile	0	$0
1.6	SmartBall Additional Insertion	$5,500	Each	1	$11,000
1.7	SmartBall Report	$15,000	Each	1	$15,000
				Estimated Total Project Cost	$110,950

Optional Services Pricing					
Item	Description	Unit	Unit Price	Quantity	Total Price
1.8	SmartBall Mapping	Per Mile	$6,500	7	$45,500
1.9	Flow Testing to confirm flow under inspection conditions (during site visit)	Each	$4,000	1	$4,000

Pricing Notes

- All travel, shipping and related expenses are included in the mobilization and field data collection/inspection fees.
- Pricing is based on available information provided to date.
- If additional work is required due to circumstances outside of Pure Technologies' control or based on additional requests from Three Valleys MWD, a mutually agreed change order will be required.
- A cancellation charge in the amount of the costs incurred to mobilize will apply should the work be cancelled within the two weeks prior to the agreed Mobilization Date.
- If Three Valleys MWD requests a change to the mobilization Date within 2 weeks of the previously agreed Mobilization Date, additional charges will occur.
- A stand-by charge of $5,000 per day applies if the project is delayed by Three Valleys MWD after mobilization.
- Pricing does not include traffic control, civil works, permitting, confined space support, or valve exercising. These tasks are the responsibility of Three Valleys MWD unless otherwise agreed.
- Suitable access points for insertion and extraction of the inspection tools are the responsibility of Three Valleys MWD.
- Structural Analysis Design Check can be completed without developing FEA performance curves.
- Final Engineering Report cannot be completed without the design check and predictive analyses activities.

Payment Schedule

Invoicing Schedule	
Service	Invoicing Period
Project Planning and Mobilization	Upon submittal of the Project Planning Document
Inspection	Upon completion of Inspection
Technology Report	Upon submittal of the final Technology Report
Engineering Report	Upon submittal of the final Engineering Report
SmartBall Mapping	Upon completion of Inspection
Flow Testing	Upon completion of Site Visit

Standard Terms and Conditions

SCHEDULE "A"

CONDITIONS OF ENGAGEMENT FOR THE PROVISION OF SERVICES

(North America)

The Proposal is issued upon and is subject to these Conditions of Engagement. If the Proposal is accepted by the Client, these Conditions of Engagement and the Proposal will be deemed to form part of the Contract between the Client and Pure.

DEFINITIONS

1. In these Conditions of Engagement, the following definitions apply:
    a. **Client** means any person or persons, firm or company engaging Pure to provide the Services.
    b. **Contract** means the agreement awarded to Pure as a result of the Proposal.
    c. **Pure** means Pure Technologies Ltd., Pure Technologies Canada Ltd., Pure Technologies U.S. Inc., PureHM Inc., PureHM U.S. Inc., or any of their affiliates, as the case may be, which submitted the Proposal and is a party to the Contract.
    d. **Proposal** means Pure's offer to carry out the Services and includes all related correspondence plus agreed written variations or amendments thereto.
    e. **Services** mean those services of whatever nature to be supplied by Pure under the Contract.
    f. **Site** means the facility, land, installation or premises to which Pure is granted access for the purposes of the Contract and may include any combination of the foregoing.

PURE'S OBLIGATIONS

2. Pure will perform the Services in accordance with the procedures described in the Proposal, using reasonable skill, care and diligence and consistent with industry standards.
3. Pure will ensure that the equipment used in performing the Services is in a good and functional state.

CLIENT'S OBLIGATIONS

4. The Client will provide to Pure full, good faith co-operation to assist Pure in providing the Services. Unless otherwise specified in the Proposal and without limiting the generality of the foregoing, the Client will at its own expense:
    a. ensure, if required, access to private land will be given to Pure and that any official permits or permissions required for Pure to have access to the Site or carry out the Services are obtained and are in force for the duration of the Services;
    b. inform Pure in writing of any special circumstances or danger which the execution of the Services may entail or which are inherent in the Site, including the existence and identity of any known hazardous substance or material; and

c. perform such additional duties and responsibilities and provide such information and resources as are described in the Proposal.

5. The description of the Services and related compensation amount set out in the Proposal will be based upon information that the Client shall have provided to Pure, and assumptions that Pure shall have identified in the Proposal. The Client acknowledges that if any such information provided by Client is materially incomplete or inaccurate, or if the assumptions identified by Pure are not correct, then the parties will modify the Proposal to reflect the actual information, assumptions, and Services required, and the compensation to Pure will be adjusted accordingly using the change order process set out in the Contract, or if there is no such process, on an equitable basis.

PROPRIETARY AND CONFIDENTIAL INFORMATION

6. All reports generated in the performance of the Services and delivered by Pure to the Client will become the property of the Client.
7. Pure's equipment which is made available to the Client in connection with the Contract and the raw data generated in the performance of the Services will remain the sole and exclusive property of Pure. The Client will not acquire any proprietary rights in Pure's equipment, systems, software, technology, inventions (whether or not patentable), patents, patent applications, documentation, specifications, designs, data, databases, methods, processes or know-how ("Pure's Proprietary Technology"). Any modifications or improvements to the Pure's Proprietary Technology made during the performance of the Services will be the sole and exclusive property of Pure.
8. Both parties agree to keep confidential all documentation and information provided by the other during the performance of the Contract. The obligations set out in this clause 0 will remain in full force and effect after any termination or expiry, as the case may be, of the Contract.
9. Notwithstanding anything herein to the contrary, Pure will have a limited, non-exclusive, royalty-free license to utilize data collected in the performance of services hereunder for purposes of:
    a. providing services
    b. analyzing and improving the services, and
    c. internal research and development for the benefit of Pure clients.

LIABILITY AND WARRANTIES

10. Pure will indemnify the Client against any expense, demand, liability, loss, claim or proceeding whatsoever in respect of personal injury to or the death of any person, or any loss, destruction or damage to any tangible property and arising directly or indirectly from the negligence of Pure, its employees, servants or agents except to the extent caused by the negligence of the Client or any person for whom the Client is responsible. The Client will similarly indemnify Pure.
11. Pure will not be liable for any loss of production, loss of use of property, loss of revenue or profit, equipment downtime, business interruption, loss of goodwill, loss of anticipated savings, cost of procurement of substitute goods or services, or for any consequential,

indirect, incidental, or special loss or damage suffered by the Client or any third party, or for any punitive damages, even if advised of the possibility thereof and notwithstanding the failure of essential purpose of any remedy.

12. Pure's cumulative liability under the Contract, whether in contract, tort (including negligence), or otherwise, will in no event exceed the aggregate consideration paid by the Client to Pure for the portion of the Services that gave rise to the liability, provided, however, that this clause shall not limit Pure's indemnification obligations under these Conditions of Engagement.
13. The report(s), data, and any other recommendations or advice made by Pure relating to the pipeline or the Services will be made in accordance with the procedures described in the Proposal, using reasonable skill, care and diligence consistent with industry standards, but do not and will not constitute a warranty of the pipeline's quality, capacity, safety or fitness for purpose. Pure will not be liable to the Client for any liability or damages that arise from the Client's reliance upon or application or use of such final report, data, or recommendations or advice made by Pure in relation to the pipeline or Services, and the Client will indemnify Pure against any liability to third parties resulting therefrom.
14. Pure's warranties for the Services will be set out in the Contract. Pure disclaims all implied or statutory warranties or conditions, including of merchantability, merchantable quality, durability, or fitness for a particular purpose to the extent allowed by applicable law. This means Pure's warranty obligations will be limited to what is expressly set out in the Contract.

Appendix A – SmartBall Inspection Considerations

Insertion and Extraction

The SmartBall tool is typically inserted through a 4-inch (100mm) or larger full-bore flanged valve into an active pipeline. When using standard insertion equipment, the valve should have direct access to the pipeline with no bends in the connecting riser. The minimum internal diameter of valve opening must be no less than 3.5 inches (90 mm). A minimum of 4 feet (1.3 m) of overhead clearance is required above the flange of the insertion valve. Alternative methods for insertion include utilizing check valves in pump stations, areas where the pipeline transitions to gravity, and pumping the SmartBall through offset piping such as a hydrant or bypass.

The SmartBall tool is typically extracted from the pipeline by a installing a pressurized stack on a 4-inch full bore flanged valve, or larger, with a minimum internal diameter no less than 3.5 inches (90 mm). The valve should be on the crown of the pipe and be located on a flat section of pipeline with no vertical slopes or horizontal bends 30 feet (9 m) upstream of the valve. A minimum of 16 feet (5 m) of overhead clearance is required above the flange of the extraction valve. It is possible to core the roof of a vault above the valve with a 6-inch (150 mm) or greater opening if the vault does not have enough overhead clearance. The net utilizes a tracking sensor and a camera to confirm the SmartBall tool has been caught in the extraction net. Other extraction methods, such as retrieval from a reservoir using a remotely operated vehicle (ROV), are possible and can be evaluated by the SmartBall technical experts for feasibility.

Tracking

Prior to the inspection, tracking sensors will be installed along the pipeline to track the position of the SmartBall tool. The tracking sensors function best when they are installed as close as possible to the water column in the pipeline and are attached to metal surfaces of pipeline appurtenances, such as air release valves, flanges, valves, or any other contact point on the pipeline. At these locations, Pure Technologies staff clean an area approximately 3 inches by 3 inches and will adhere tracking sensors using a fast-drying epoxy. Computers synchronized with the SmartBall tool will be connected to the tracking sensors to calculate the location and velocity of the SmartBall tool as it approaches and passes the tracking location. Tracking teams will set up at tracking sensors before the deploying the SmartBall tool and will 'leap-frog' to subsequent tracking locations as the SmartBall tool traverses the pipeline on its way to the extraction point. A tracking plan and details for installing tracking sensors will be included in the Project Planning Document submitted to Three Valleys MWD prior to the inspection.

Flow Requirements

The SmartBall tool requires a fluid velocity of 0.5 feet per second (0.15 meters per second) to traverse flat sections of pipeline. The ideal fluid velocity for most pipelines is 2 to 4 feet per second (0.6 to 1.2 meters per second) for traversing slopes and allowing tracking teams to relocate to the next tracking location. The maximum fluid velocity before data quality is impacted is 6 feet per second (1.8 meters per second) for leak and air pocket inspection and 3 feet per second (0.9 meters

per second) for SmartBall Mapping. The SmartBall tool usually travels at approximately 70% of average fluid velocity. Three Valleys MWD staff will control the flow rate to confirm the requisite velocity during tool deployment as requested in the Project Planning Document. Pure Technologies will also evaluate pumping rates and cycle times to determine if supplemental water will be required to complete the inspection. It should be noted that air pocket and leak detection surveys should be performed as close to typical operating conditions as feasible.

Pipeline Pressure

Acoustic leak detection functions by detecting the acoustic signature generated by the sudden drop in pressure of water exiting the pipeline at the site of the leak. Inline leak detection technology is inherently more sensitive than external methods and correlators because it brings the acoustic sensor within one pipe diameter of the leak.

SmartBall technology requires a minimum pressure differential of 15 psi (1 bar) for acoustic leak detection. This is the difference in pressure between internal and external pipeline conditions. For pipelines in high water tables, and river crossings, the resultant hydrostatic head acting against the exterior of the pipe wall should be taken into consideration.

Three Valleys MWD staff will operate the system to maintain pipeline pressures as necessary to accommodate the needs of its customers. A review of the pipeline will be performed as part of the planning process to identify potential areas where the pressure may drop below the minimum required pressure differential for acoustic leak detection. Additional factors that affect acoustic leak detection include tunnels and encasements where the sudden drop in pressure that causes the acoustic signature generated by the leak may not occur at the site of the leak inside the pipeline, but rather at the point where the fluid exits the tunnel or encasement if the "leak path" becomes pressurized between the pipe wall and the tunnel or encasement. Approximate pressure measurements may be requested prior to and/or during the inspection to ensure the pipeline is operating within expected conditions.

Appendix B: PipeDiver Inspection Considerations

FUTURE PROJECT ONLY

Insertion and Extraction

The PipeDiver tool is typically inserted through a minimum 12-inch (300mm) access port, however a 16-inch (350mm) access is recommended if installing a new tap. For insertion, a brief shutdown and depressurization of the pipeline will be required to allow a flanged access to be removed and the PipeDiver tool inserted. Once the tool is placed in the pipe the flange is replaced and the pipeline is returned to operation. From the time the access point is depressurized, the process typically takes 2 hours. Depending on the pipeline configuration, equipment may be installed to hold the PipeDiver tool in place during the refill and re-pressurization process. Once optimal flow conditions are met, the tool will be released to perform the inspection.

There are various methods by which the PipeDiver tool can be extracted from the pipeline. Typically, a net is installed into the pipeline during a brief shutdown and depressurization that will stop the

PipeDiver tool at the end of an inspection. Once in the net a second depressurization is required to remove the tool and net from the pipeline through a minimum 12-inch access.

Alternative methods for insertion and extraction, such as utilizing pressurized insertion and extraction tubes or retrieval from a reservoir using a remotely operated vehicle (ROV), are possible and can be evaluated by the PipeDiver technical experts for feasibility.

FUTURE PROJECT ONLY

Tracking PipeDiver

Prior to the inspection, tracking sensors will be installed along the pipeline to track the position of the PipeDiver tool. The tracking sensors function best when they are installed as close as possible to the water column in the pipeline and are attached to metal surfaces of pipeline appurtenances, such as air release valves, flanges, valves, or any other contact point on the pipeline. At these locations, Pure Technologies staff will adhere the tracking sensors to the pipeline using a fast-drying epoxy. Computers that are synchronized with the PipeDiver will be attached to the tracking sensors to calculate the location and velocity of the PipeDiver as it approaches and passes the tracking location. Tracking teams will set up at tracking sensors before the deploying the PipeDiver and will leap-frog to subsequent tracking locations as the PipeDiver traverses the pipeline on its way to the extraction point. A tracking plan and details for installing tracking sensors will be included in the Project Planning Document submitted to Three Valleys MWD prior to the inspection.

Flow Requirements

The PipeDiver requires a fluid velocity of 1.5 feet per second for optimum data quality, traversing slopes and allowing the tracking teams to relocate to the next tracking location. The maximum fluid velocity before data quality is impacted is 3 feet per second. The PipeDiver usually travels at approximately 90% of average fluid velocity. Three Valleys MWD staff will control the flow rate to confirm the requisite velocity during tool deployment as requested in the Project Planning Document. Pure Technologies will also evaluate pumping rates and cycle times to determine if supplemental water will be required to complete the inspection. Flow changes during the inspection may be needed to assist the tools in navigating obstacles in the pipeline or for contingency measures.

Pipeline Pressure

A maximum pressure for a PipeDiver inspection is 250 psi (500 psi for Large Diameter PipeDiver platform). For pipelines with river crossings, the resultant hydrostatic head should be taken into consideration. Three Valleys MWD staff will operate the system to maintain pipeline pressures as necessary to accommodate the needs of its customers. A review of the pipeline will be performed as part of the planning process to identify potential areas where the pressure may exceed the maximum pressure. Approximate pressure measurements may be requested prior to and/or during the inspection to ensure the pipeline is operating within expected conditions.

Appendix C: Robotics Inspection Considerations

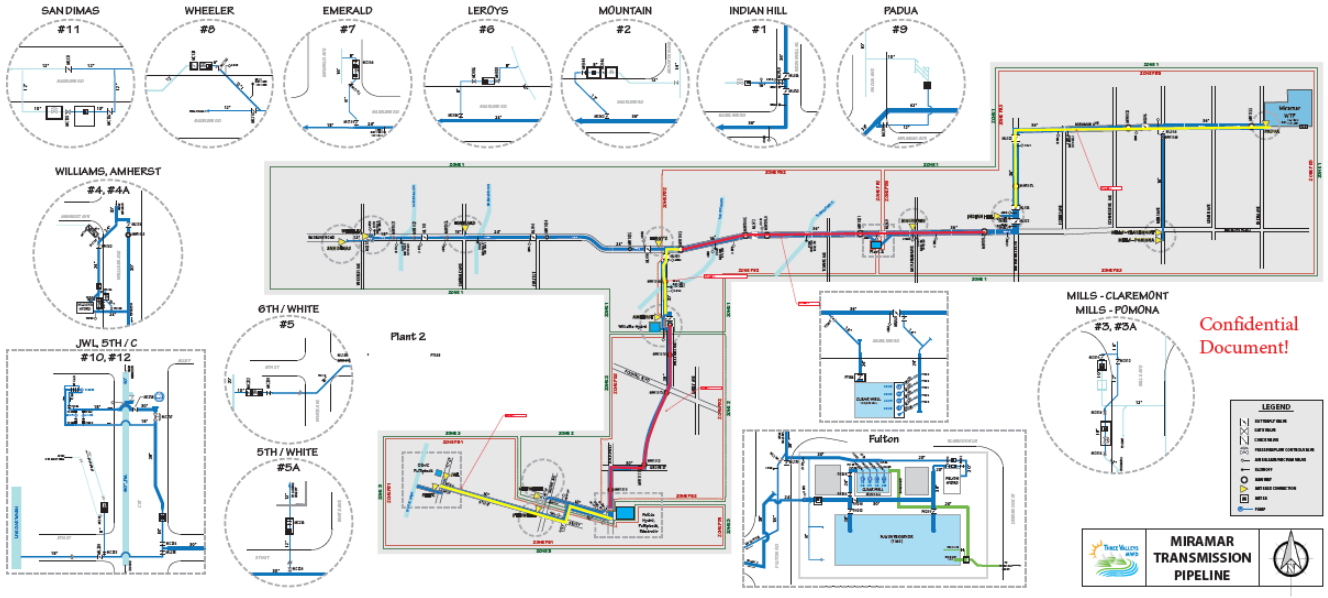
FUTURE PROJET ONLY

Insertion and Extraction

The PureRobotics tool is typically inserted through a minimum 18-inch access port. For insertion, shutdown and depressurization of the pipeline will be required to allow a flanged access to be removed and the Robotics tool inserted. Typically insertion times are between 1 and 2 hours and the inspection generally takes 2 hours after insertion.

Appendix D: Inspection Outline

Without Plan and profile drawings a rough inspection plan can not be provided based. All distances are estimates based on the scale of the diagram provided (image below). Based on this diagram the following runs would be required to perform leak detection and PipeWall inspection of the pipeline.



SmartBall

Run 1: Insert at Manway 1035 and extract at AR120

Run 2: Insert at Manway 1003 and extract at 5th/C pumpback (exact location to be determined)

*Note that tracking points are not identified and will be included in planning document or when plan and profile drawings are provided.

PipeDiver

FUTURE PROJECT ONLY

Run 1: Insert at Manway 1035 and extract at MW1003

Run 2: Insert at Manway 1015 and extract at MW1010

*Note that tracking points are not identified and will be included in planning document or when plan and profile drawings are provided.

Robotics

Location 1: New Manway required to inspect 30in pipe along 5th street

Location 2: Insert at MW1006 and inspect to ML1080 and MH142

Location 3: Insert at MW1025 and inspection to ML090 and ML094

Location 4: Insert at MW1023 and inspection to ML094 and ML108

Location 5: Insert at MW1021 and inspection to ML108 and ML116

Appendix E: Tech Sheets

SmartBall®

FREE-SWIMMING PLATFORM FOR INLINE LEAK AND GAS POCKET DETECTION AND PIPELINE MAPPING

Operating Environment

Pipe Materials	PCCP, RCP, AC, PVC, HDPE, Steel, Ductile Iron, Cast Iron, GRP, and other
Maximum Pressure	500 psi (34.4 bar), higher available upon request
Minimum Recommended Pressure Differential	15 psi (1.0 bar) *Consult with the SmartBall Technical Team for pipe diameters 72 inches (1800 mm) and larger*
Leak Sensitivity	Between 0.03 gallons/minute (0.11 l/min) at 90 psi (6.2 bar) and 0.35 gallons/minute (1.32 l/min) at 15 psi (1.0 bar) *Pipeline pressure, leak volume, and leak shape affect acoustic leak detection capability*
Pipeline Diameters	12 inches (300 mm) and greater for unlined metallic water pipes 6 inches (150 mm) and greater for all other pipe material and wastewater pipes
Maximum Flow Velocity	6 feet/second (1.8 m/s) *Maximum when mapping is 3 feet/second (0.9 m/s)*
Minimum Flow Velocity	0.5 foot/second (0.15 m/s) in flat terrain *For vertical shafts, consult with the SmartBall Technical Team* *Mapping requires a consistent flow rate*
Maximum Deployment Time	24 hours
Maximum Fluid Temperature	158° F / 70°C
Maximum Degree of Bends from Insertion Point	Unlimited

Insertion Requirements

Minimum Tap Diameter	4 inches (100 mm)
Minimum External Clearance from Insertion Tap	4 feet (1.2 m) for insertion claw method; 2.5 feet (0.76 m) for plunger method
Insertion Devide	Insertion claw, plunger, and hydrant

xylem
Let's Solve Water

Insertion Requirements Continued

Insertion Methods	Gate valves, check valves, open ports, swab launchers, reservoirs, and hydrants *Alternative insertion methods may be possible*

Extraction Requirements

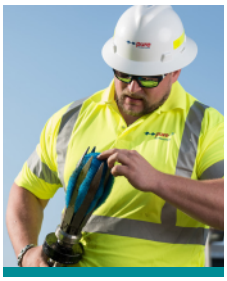
Minimum Tap Diameter	4 inches (100 mm), with a minimum of 3.75 ID *Must be vertical off the pipeline* *Alternative extraction methods may be possible*
Minimum External Clearance from Extraction Tap	13.2 feet (4.02 m)
Extraction Device	SmartBall extraction net, hydrant *Other pipeline specific options available upon request*
Maximum Flow for Net Use	3.2 feet/second (1 m/s) to 6 feet/second (1.8 m/s) depending on pipe diameter *Max flow range may vary if large diameter / high flow extraction is used*

Specifications

SmartBall Tool Components	Pinger, temperature sensor, pressure sensor, magnotometer, acoustic hydrophone, acceleromator, dual gyroscope, and battery
SmartBall Tool Size	SmartBall core – 2.8 inches (7.1 cm) Foam shell – 7 inches (17.8 cm); size is adjustable
Mapping Accuracy	Generates X|Y line for GIS delivrable
Shipping Requirements	All SmartBall leak detection kits can be shipped on a standard pallet
Tracking	Tracked by remote trackers or sensors
Disinfection	All materials that enter the pipeline are thoroughly disinfected based on local water authority standards prior to inspection.

SmartBall Kit

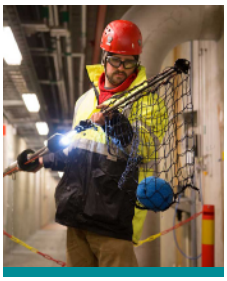
SmartBall Core



Insertion Claw

Live Insertion

SmartBall Tracking



Extraction Net

xylem
Let's Solve Water

www.xylem.com

United States
8920 State Route 108, Suite D
Columbia, Maryland USA 21045
Tel: +1 (443) 766-7873
Fax: +1 (443) 766-7877
info@puretechltd.com

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Tel: +1 (905) 624-1040
Fax: +1 (905) 624-4777
info@puretechltd.com

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Ribamar, Santo Isidoro
Portugal 2640-027
Tel: +351 (261) 863-159
info@puretechltd.com

Asia Pacific
3A International Business Park Rd.
08-14 Tower B, ICON@IBP
Singapore 609935
M: +65 8292 8392
info@puretechltd.com

GPRS

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May 3, 2022

Client: Three Valleys MWD
1021 E. Miramar Avenue, Claremont, CA 91711
Attn: Kevin Panzer
kpanzer@tvmwd.com, 909.225.8507
Project: Three Valleys Leak Detection Survey – Claremont, CA

Submitted By:
Jared Malone
419.250.9170
Jared.Malone@gprsinc.com

GPRS appreciates the opportunity to provide this proposal. I encourage you to visit our website (www.gprsinc.com) and contact any of the numerous references listed. Our insurance certificate and W-9 can also be downloaded here. Please feel free to contact me if you have any questions, or if you need additional information.

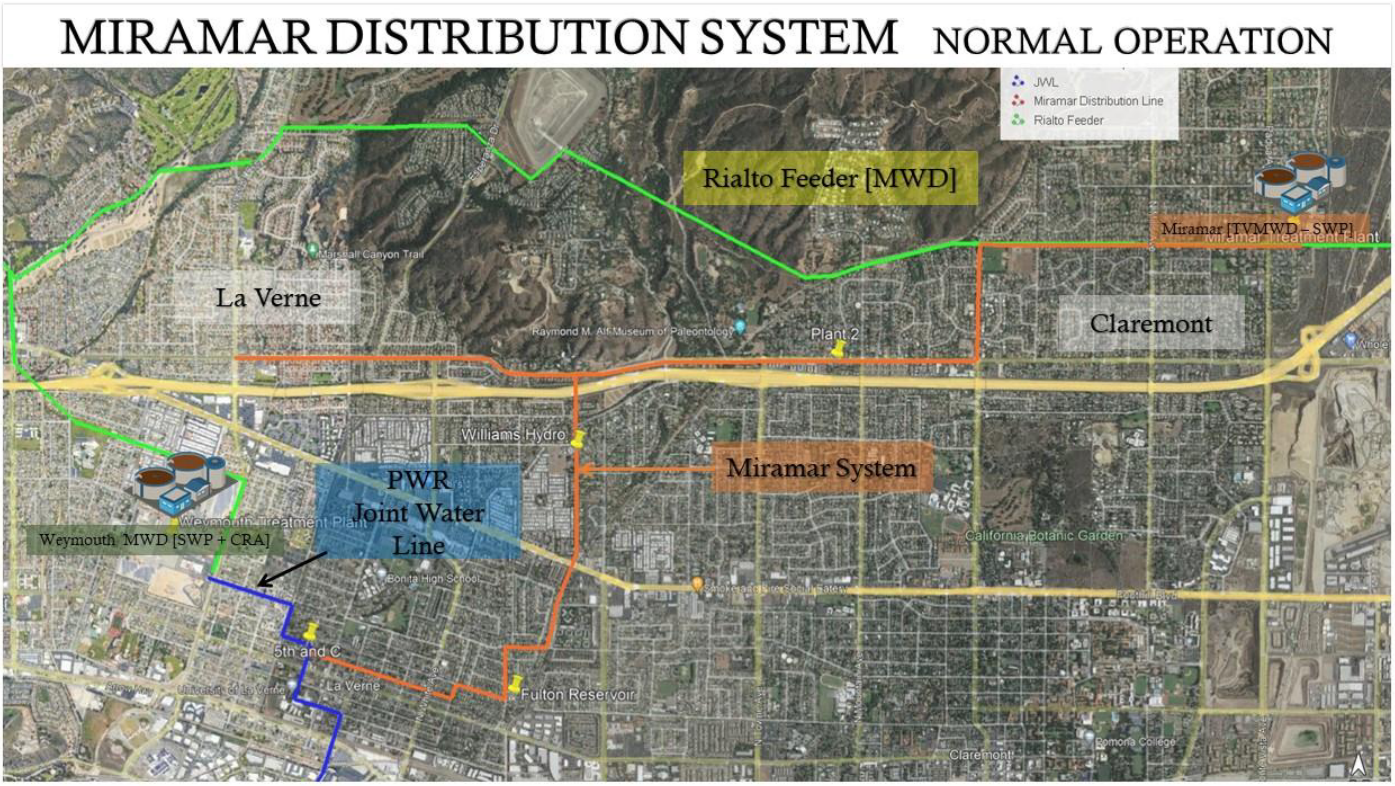
LEAK DETECTION

We understand the scope of work to be to locate potential leaks throughout the water distribution system as shown on the map shown on Page 2 estimated at 8 miles. The system consists of pipe ranging from 24", 30", and 36" precast concrete lined steel pipe. Estimated water loss is between 20 – 60 ac-ft per month. There are multiple contact points throughout the system. Contact points will be listened to using noise amplification equipment throughout the entire system in order to identify general areas with potential leaks. The leak will then be located using a combination of a correlator and ground microphones. Our ability to accurately locate the leak will depend on a variety of factors such as depth, pipe material, soil type, water pressure, and noise interference from traffic, machinery, etc. Any potential leaks can be detailed in a formal report (see Project Costs table).

EQUIPMENT

- **Electronic Microphone.** The leak noise amplification system consists of a control unit, a microphone, and headphones, and is used to listen for a leak signal on a water system contact points (valves, hydrants, etc.) to identify a general location of a potential water leak. This same system will also be used with a ground microphone to further pinpoint the leak location from the surface. Its effectiveness depends on a variety of factors such as pipe size and material, water pressure, leak size, soil type, and noise interference from traffic, machinery, etc.
- **Leak Noise Correlator.** The leak correlator consists of sensors that are placed on water system contact points, and the sound signals between these points will then be processed by mathematical algorithms to provide an approximate distance of the leak between the two points. The accuracy of the potential leak location depends on the ability of the pipe to be located along with the accurate input of pipe attributes such as pipe size and material (size and material information provided by the client).
- **Underground Scanning GPR Antenna.** The antenna frequencies range from 250 MHz-450 MHz is mounted in a stroller frame which rolls over the surface. The surface needs to be reasonably smooth and unobstructed in order to obtain readable scans. Obstructions such as curbs, landscaping, and vegetation will limit the feasibility of GPR. The data is displayed on a screen and marked in the field in real time. The total depth achieved can be as much as 8' or more with this antenna but can vary widely depending on the types of materials being scanned through. Some soil types such as clay may limit maximum depths to 3' or less. As depth increases, targets must be larger in order to be detected and non-metallic targets can be especially difficult to locate. Depths provided should always be treated as estimates as their accuracy can be affected by multiple factors. For more information, please visit: Link
- **Electromagnetic Pipe Locator.** The EM locator can passively detect the signals from live AC power or radio signals travelling along some conductive utilities. It can also be used in conjunction with a transmitter to connect directly to accessible, metallic pipes, risers, or tracer wires. A current is sent through the pipe or tracer wire at a specific frequency and the resulting signal can then be detected by the receiver. A utility's ability to be located depends on a variety of factors including access to the utility, conductivity, grounding, interference from other utilities, and many others. Depths provided should always be treated as estimates as their accuracy can be affected by multiple factors. For more information, please visit: Link
- **Traceable Rodder.** The rodder has a copper wire encased in fiberglass. The line is pushed through accessible pipes before placing a current on the wire and the signal is then traced from the surface. The maximum traceable depth is 10' depending on the soil conditions and the maximum distance is 200'. The line can be pushed through a pipe with direct access such as a sewer line at a cleanout or a storm drain catch basin. It may not be able to be pushed through deeper pipes within manholes. Electrical conduits will not be accessed by GPRS. The signal cannot be located through metallic pipes. For more information, please visit: Link
- **GPS.** This handheld GPS unit offers accuracy down to 4 inches, however, the accuracy achieved will depend on the satellite environment at the time of collection and should not be considered to be survey-grade. Features can be collected as points, lines, or areas and then exported as a KML/KMZ or overlaid on a CAD drawing. For more information, please visit: Link

MAP OF SCAN AREA



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PROJECT COSTS

SERVICE	DESCRIPTION	PRICE
LEAK DETECTION/FIELD MARKINGS	Locate potential leaks throughout the water distribution system as shown on the map shown on Page 2 estimated at 8 miles.	Included
MOBILIZATION		Included
FORMAL REPORT	Detailed report of findings with photos, example data, and a site sketch (if applicable) in addition to the basic summary report that is included with every job. See example: Link	Included
TOTAL (Prevailing Wage)		***$9,550**
OPTIONAL SERVICES (INITIAL IF DESIRED)		

* This price assumes that we will be given access to perform the work during normal, weekday business hours (8am-5pm).
* As-builts and any other applicable drawings should be made available to GPRS prior to the project if possible.
* A thorough utility search can only be completed if GPRS is given access to all utility structures, interior and exterior. This service is never a replacement for the use of the state One Call system (811).
* All of our technicians have OSHA-10 safety training or greater. Site-specific safety training is not included in this quote. Please notify us if this project requires additional safety training.
* These rates assume that there are no certified payroll requirements. GPRS has not been notified of any PLA, DIR, or Certified Payroll requirements. If GPRS receives notice that any of these conditions exist, there will be additional costs

This proposal is subject to the General Terms and Conditions for Services of Ground Penetrating Radar Systems, LLC posted at Link (the "Terms and Conditions") and is hereby incorporated by reference into and made a part of this proposal. Customer acknowledges it has read and agrees to be bound by such Terms and Conditions. In the event of any conflict between the terms of this proposal and the Terms and Conditions, the Terms and Conditions will prevail. Customer also acknowledges that Ground Penetrating Radar Systems, LLC may, from time to time and at its discretion, modify the Terms and Conditions and Customer agrees to be bound by such Terms and Conditions as modified.

PROPOSAL-SPECIFIC TERMS & CONDITIONS

1. Customer agrees to meet and perform all requirements described in this document and has fully read and understands all items listed within this document.
2. It is the customer's responsibility to prepare the site for scanning, including clearly identifying areas to be scanned, securing access to all areas required for scanning, and keeping these areas clear and free of obstructions. Delays caused by customer's failure to do so may result in an increased price.
3. GPRS does not conduct an investigation, analysis, or interpretation of soil composition, soil/concrete conditions, or geophysical, geological, engineering, or land surveying information. Customer acknowledges it understands that we are merely reporting retrieved data and that we do NOT provide geophysical, geological, engineering, or land surveying services. Customer should contact a professional in those fields if such services are needed.
4. If for some reason the technician arrives on site and the work is cancelled there will be a charge of $500.00 per requested technician.

ACCEPTED AND AGREED:

Billing Company Name: _____

Billing Address: _____

Company Phone/Email: _____ PO#: _____ Job#: _____

Print Name: _____ Signature _____ Date: _____

BUDGET AMENDMENT

To: Finance Department **Fiscal Year:** 22/23

From: Water Resources (Department) **Date:** 10/5/22

Subject: Set aside funding for Miramar Transmission Line leak detection project

Please process this request and distribute the budget amendment as follows:

Expenditure Amendment

Ref No.	Line Item Description	Account Number	FY Budget ($)			Reserve Funds ($)		
			Existing	Change (+/-)	Revised	Existing	Change (+/-)	Balance
1	Miramar Trans Line Leak Detection Proj		0	190,000	190,000			0
2	Opportunity Reserves				0	2,350,000	(190,000)	2,160,000
3					0			0
4					0			0
5					0			0
6					0			0
7					0			0
8					0			0
9					0			0
10					0			0
	NET CHANGE:			$190,000			($190,000)	

Attach staff report, motion, committee and/or board minutes associated with this budget amendment

	YES	NO	
Committee Review:	☐	☐	Date:
Board Approval:	☐	☐	Date:

Chief Finance Officer Signature — Date:

General Manager Signature — Date:

Amendment Procedure

1. If required by District policy, General Manager requests Board approval of budget amendment. Request to amend budget must be included in the staff report.
2. Upon Board approval, the Finance Department secures all necessary signatures to complete the Budget Amendment form. The staff report and board minutes, if any, should be attached to the form.
3. Finance Department maintains all appropriate documentation and processes the budget entry.
4. A fiscal year file will also be kept to hold all budget amendment forms for auditor review.

Finance Dept Use Only

Date Received
Board Report Date
Motion #
Date Posted
Posted By