



**CITY OF NOVI CITY COUNCIL**  
**JULY 10, 2023**

**SUBJECT:** Approval to award condition assessment services to Pure Technologies for inspection of PCCP water main, in the amount of \$61,700.

**SUBMITTING DEPARTMENT:** Department of Public Works, Engineering Division

<b>EXPENDITURE REQUIRED</b>	<b>\$ 61,700.00</b>
<b>AMOUNT BUDGETED</b>	<b>\$ 61,700.00</b>
<b>APPROPRIATION REQUIRED</b>	<b>\$ 0</b>
<b>LINE ITEM NUMBER</b>	<b>592-536.00-816.088</b>

**BACKGROUND INFORMATION:**

During construction operations related to the ongoing I-96 Flex Lane construction, MDOT notified staff of a leak on the city's 30-inch prestressed concrete cylinder pipe (PCCP) water main, on south side of I-96 just east of Novi Road. The cause of the leak not yet determined. MDOT was aware of this main's location and appear to have taken all reasonable precautions throughout their work. Although only a minor amount of water is leaking, it is not clear if there is potential for significant failure, potentially impacting I-96 traffic and flex lane construction. Given the location of the leak is under I-96, inspection of the main is a high priority and staff has begun the process to investigate further. American Leak Detection attempted to locate the leak using acoustic technology. However, the results were inconclusive due to interference caused by the grouted pipe casing and ambient noise from traffic.

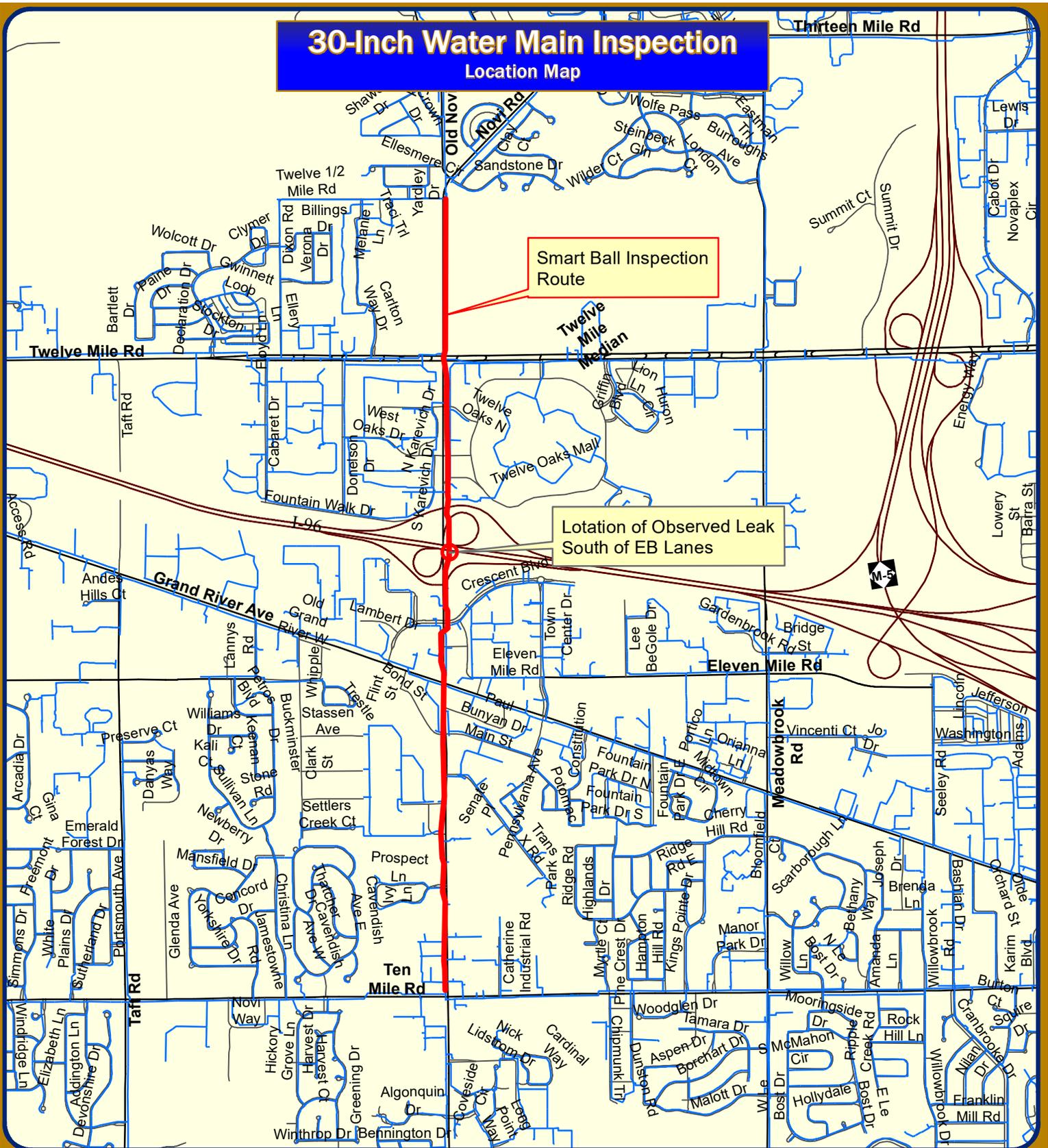
Staff has since consulted with Pure Technologies for inspection of the water main using the Smart Ball, which is their proprietary device capable of detecting the location and severity of leaks. The Smart Ball was previously used to inspect a portion of the water main on Ten Mile with good results. The proposed inspection is approximately 2.4 miles of water main, including areas north and south of the leak, taking advantage of mobilization. Pure Technologies has provided the attached proposal, which has been reviewed by staff and is recommended for approval.

The inspection will take place a few weeks following award and Xylem will provide a report summarizing the inspection and analysis. If required, staff will recommend project solutions based on the report.

**RECOMMENDED ACTION:** Approval to award condition assessment services to Pure Technologies for inspection of PCCP water main, in the amount of \$61,700.

# 30-Inch Water Main Inspection

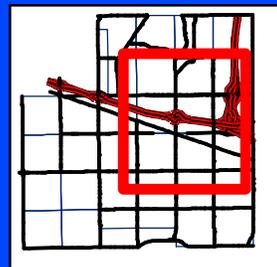
## Location Map



Map Author: Croy  
Date: 6/23/2023  
Project: 30-inch PCCP Leak  
Version #: v1.0

### MAP INTERPRETATION NOTICE

Map information depicted is not intended to replace or substitute for any official or primary source. This map was intended to meet National Map Accuracy Standards and use the most recent, accurate sources available to the people of the City of Novi. Boundary measurements and area calculations are approximate and should not be construed as survey measurements performed by a licensed Michigan Surveyor as defined in Michigan Public Act 132 of 1970 as amended. Please contact the City GIS Manager to confirm source and accuracy information related to this map.



### City of Novi

Engineering Division  
Department of Public Works  
26300 Lee BeGole Drive  
Novi, MI 48375  
cityofnovi.org



1 inch = 2,161 feet





# Proposal for IN-SERVICE WATER PIPELINE LEAK DETECTION

**SmartBall®**

June 16, 2023  
Prepared for  
Ben Croy  
City of Novi  
26399 Lee BeGole Drive  
Field Services Complex  
Novi, MI 48375

Ben Croy  
City of Novi

RE: Budgetary Proposal for Pilot SmartBall Inspection

Dear Mr. Croy;

Pure Technologies U.S. Inc., a Xylem brand is pleased to offer our services to the City of Novi, Michigan for inline leak and air pocket detection of the subject pipeline. The project scope includes the inspection of approximately 2.4 miles of potable water pipeline comprised of prestressed concrete cylinder pipe (PCCP).

We propose using our SmartBall® free-swimming inspection platform to complete this project. SmartBall inspects pipelines while they are in service, detects acoustic activity associated with leaks and pockets of trapped air and can map pipelines by utilizing motion data. Features that make Pure Technologies' SmartBall platform the ideal solution for this project include:

- Reporting the location of leaks and air pockets within  $\pm 6$  feet of their actual location
- The ability to live track and locate the actual position of the SmartBall tool within the pipeline
- The ability to map pipelines using field-collected global positioning system (GPS) points combined with SmartBall motion data
- 24-hour preliminary analysis to identify and investigate medium- and large-leaks prior to demobilizing
- 15+ years of experience successfully inspecting over 7,500 miles and reporting over 3,300 leaks

Pure Technologies continually strives to set the 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.

A handwritten signature in black ink, appearing to read "Evan Biedenbach".

Evan Biedenbach  
Business Development Manager  
Pure Technologies U.S. Inc.  
330-705-0796  
evan.biedenbach@xylem.com

## In-Service Pipeline Leak Detection

Inline leak detection is the best solution for detecting leaks in transmission mains as it brings the leak detection sensor directly to the source of the leak, providing greater sensitivity and accuracy, and covering long distances in a single deployment. The SmartBall inspection platform can be deployed in an active pipeline, avoiding the inconveniences associated with shutting off water flow for the duration of the inspection. Using the SmartBall inspection platform, Pure Technologies has located thousands of leaks saving millions of gallons of water.

**Leak Detection for Condition Assessment.** Buried infrastructure typically accounts for a majority of the asset value of most utilities. The SmartBall platform is a valuable addition to a proactive pipeline management program, helping pipeline owners better understand the condition and location of their buried assets. By detecting leaks and air pockets, SmartBall empowers utilities to address problem areas before they result in larger failures, reducing unplanned capital expenditures while increasing operational confidence.

**Known Leak Resolution.** Finding and resolving a known leak can be a challenge for any utility. Evidence of leaks can be misleading, making them difficult to locate and sometimes creating a public relations issue. Inline leak detection can confirm or deny the existence and locate a known leak with absolute confidence.

**Real Water Losses.** Identifying non-revenue water is becoming an urgent priority with water scarcity, regulation, and increasingly stringent targets calling for tighter control of water from source to tap. Proven technologies to reduce water loss can be critical tools for utilities. While there are many external methods of locating leaks in small diameter distribution systems, they are less reliable and inefficient on large diameter pipes. By detecting leaks and air pockets, the SmartBall platform empowers utilities to reduce water loss and address problem areas before they result in larger failures.

The Pure Technologies team and technical solution bring a host of benefits to bear on this project:

- Project planning site visit that includes GPS point collection
- Development of an in-depth project planning document
- All travel and shipping costs included in our proposed fee
- Confined space entry certified personnel equipped with safety equipment
- Use of current pipeline features where possible, such as existing 4-inch (or larger) taps, blow-offs, and hydrants
- Minimal onsite support requirement from the utility - typically limited to escorting tracking teams, opening manholes, and operating the pipeline
- Post-project support to ensure results and reports are clear and accurate to support excavation, if required.

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 water pipelines involves deploying 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.

## SmartBall

The SmartBall inspection platform (as shown in **Figure 1**) 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.

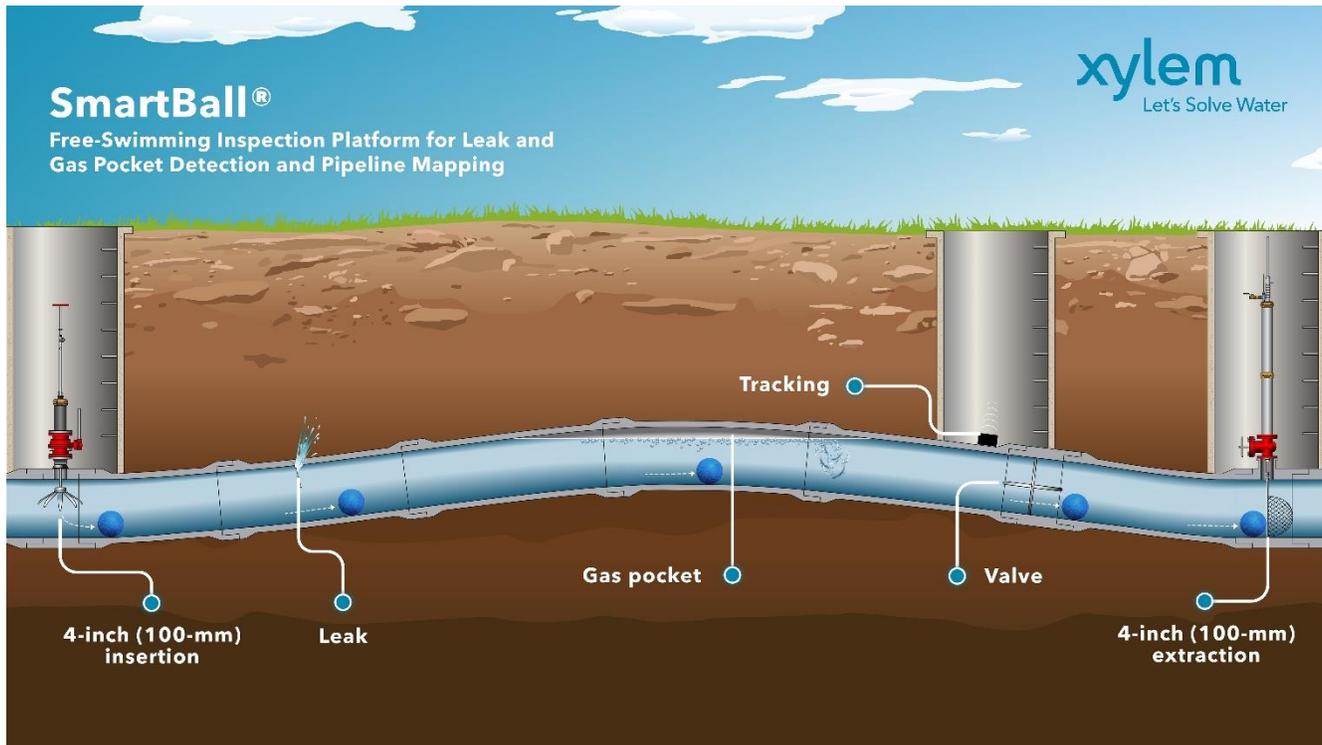
The collected data is evaluated by experienced data analysts using proprietary software and methods to report the location of leaks and air pockets, as well as provide a qualitative estimate of leak magnitudes to help prioritize further investigation and repair activities. When mapping of the pipeline 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.

*Since 2005, utilities around the world have relied on the SmartBall platform to inspect more than 7,500 miles of pipeline and detect over 3,200*



*Figure 1: SmartBall Free-swimming Inspection Platform for Pipeline Leak, Air Pocket Detection and Mapping*

An overview of the SmartBall platform inspection process is shown in **Figure 2**.



*Figure 2: SmartBall Inspection Overview*

## Project Milestones and Deliverables

Additional details regarding insertion, extraction and tracking of the inspection tools are provided in Appendix A, Inspection Considerations.

### Planning and Mobilization

The planning process is an integral element of a successful project. It allows the team to identify features of the site or the pipe that could prevent a successful inspection. Actions can then be implemented to mitigate any potential risk.

Pure Technologies will meet with the City to perform a site visit to access the pipeline and identify potential challenges and risks. As much information as possible on the pipeline will be requested during the planning process. It is our understanding that the City will facilitate all civil activity for pipeline access and tracking sensor installation, which may require modification to existing features, excavation, tapping, traffic control, scaffolding and other activities identified during the planning process necessary to access pipeline features determined to be critical to the inspection. Pure Technologies will make every effort to utilize existing pipeline features where feasible.

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

- Project document review
- Project planning site visit and review
- Pre-inspection coordination/meetings
- Planning document development, including tracking plan and tracking sensor installation details
- Equipment and staffing logistics
- Tool preparation
- Pre-inspection activities required in advance of the scheduled inspection date

Based on the information gathered from the project planning site visit and all available documents, a detailed Project Planning Document (PPD) outlining the inspection plan, including insertion and extraction procedures and tracking sensor locations will be submitted prior to commencing the work. The PPD will be submitted to the City in electronic PDF format at least two weeks prior to the inspection, dependent on the receipt of project data, or as soon as possible in cases of urgent mobilization. The City should review and provide comments or approval of the PPD prior to mobilization. Any changes to the scope that arise in the planning process which impact the pricing in this proposal will be discussed with the City and mutually agreed upon before proceeding.

### Planning and Mobilization Deliverables

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

### Inspection

SmartBall tracking sensor installation will be completed the day prior to inspection and may take one to two days, depending on sensor locations and accessibility. It is expected that the City will aid with any sensor 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 PPD.

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, barrel, or pipeline feature. 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  $\pm 6$  feet.

The inspection is anticipated to take one day 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, the City 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 PPD. Upon

completion of the inspection, data will be downloaded from the SmartBall tool 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 the City 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.

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

## Data Analysis

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.

## Data Analysis 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. Final Inspection Report incorporating comments from Novi

## Novi Responsibilities

It is expected that the activities listed below will be completed by Novi. Requirements will be determined in more detail during the inspection planning process.

- Provide information about the pipeline at least four weeks prior to the inspection date including, but not limited to, plan and profile drawings, lay sheets, shop drawings, manufacturing details, and details of access structures and appurtenances - if available.
- Obtain any required legal right-of-entry on the property.

- Provide support personnel during the inspection for locating the access structures, traffic control, valve operation, pump operation, and other support as necessary.
- Provide Pure Technologies with the typical flow velocities and pressures for pipeline operation, and the expected minimum and maximum values for each. If this data is unavailable, Pure Technologies would like the opportunity to verify flow velocities recommended prior to performing the inspection.
- Provide and maintain safe and reasonable access to all work sites throughout the inspection and obtain permits as required.
- Prepare and/or modify existing pipeline fittings and structures as indicated by Pure Technologies to accommodate insertion and extraction of the equipment as outlined in the Planning Document.
- Render confined areas safe for the services, including lockout tagout of pumps, valves and motors; dewatering chambers and vaults to permit movement of persons and equipment; and vector and rodent control as necessary.
- Excavate, dewater, shore up, and/or provide scaffolding of job area and other civil activity as necessary in compliance with Occupational Safety and Health Administration and local standards and regulations.
- Provide pumping services to allow for insertion of the SmartBall tool through a hydrant, if necessary.
- Operate the pipeline in a manner that will achieve the minimum required flow velocity indicated in the Planning Document throughout the inspection.

## Project Schedule

The proposed schedule for the project is shown below.

Leak Detection	
Task	Timing
Site visit	Within 30 days following Notice to Proceed
Project Planning Document	2 weeks prior to inspection
Inspection	2-4- weeks following approved PPD
Leak investigation prior to demobilization	24 hours after completion of inspection
Draft Report	4-6 weeks after inspection
Final Report	2 weeks after receipt of comments on Draft Report

## Proposed Fee and Payment Schedule

The estimated cost for this project is based on the information provided at the time of this proposal and detailed in the table below.

Project Pricing					
Item	Description	Unit	Unit Price	Quantity	Total Price
1	Project Planning and Mobilization	LS	\$20,000.00	1	\$20,000.00
2	Inspection and Analysis (up to two miles)	LS	\$22,500.00	1	\$22,500.00
3	Inspection and Analysis of additional mileage	EA	\$10,500.00	0.4	\$4,200.00
4	SmartBall Reporting	EA	\$15,000.00	1	\$15,000.00
Estimated Total Project Cost					\$61,700.00
Optional Additional Items					
Item	Description	Unit	Unit Price	Quantity	Total Price
5	Flow Verification	LS	\$5,000.00	1	\$5,000.00
6	Transient Pressure Monitoring	EA	\$7,000.00	1	\$7,000.00
7	Hydrant Extraction	EA	\$4,000.00	1	\$4,000.00

### Notes and Assumptions

- All travel, shipping and related expenses are included in the mobilization and field data collection/inspection fees.
- If additional work is required due to circumstances outside of Pure Technologies' control or based on additional requests from the City, a mutually agreed change order will be required.
- A cancellation charge in the amount of the mobilization fee may apply should the work be cancelled within ten business days prior to the agreed Mobilization Date, as documented in the PPD.
- A rescheduling charge 50% of the mobilization fee may apply should the work be cancelled by the city within two weeks prior to the agreed mobilization date and the crew/equipment resources are already in transit to the work site.
- Pricing does not include custom equipment fabrication, traffic control, civil works, permitting, confined space rescue support, lighting for night inspections, or valve exercising. These tasks and their respective costs are the responsibility of the city unless otherwise agreed, or included in the project estimate above.
- Suitable access points for insertion and extraction of the inspection tool are the responsibility of the City and will be coordinated with Pure Technologies.
- **Additional services for hydrant or blow-off insertion , such as pumping, may be required and Pure Technologies can provide a quote for the temporary pump rental if deemed necessary.**

- Please note that Project Pricing included herein is valid for 120 days from the date of this proposal.

## Payment Schedule

Invoicing Schedule		
Service	Fee	Invoicing Period
Project Planning and Mobilization	\$20,000.00	Upon submittal of the PPD
Inspection and Analysis	\$26,700.00	Upon completion of the inspection
Draft Report	\$10,000.00	Upon submittal of the Draft Report
Final Report	\$ 5,000.00	Upon submittal of the Final Report

# Standard Terms and Conditions

## 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.

### 1. DEFINITIONS

In these Conditions of Engagement the following definitions apply:

- “Client” means any person or persons, firm or company engaging Pure to provide the Services.
- “Contract” means the agreement awarded to Pure as a result of the Proposal.
- “Pure” means Pure Technologies 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.
- “Proposal” means Pure's offer to carry out the Services and includes all related correspondence plus agreed written variations or amendments thereto.
- “Services” mean those services of whatever nature to be supplied by Pure under the Contract.
- “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.

### 2. PURE'S OBLIGATIONS

- 2.1 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.
- 2.2 Pure will ensure that the equipment used in performing the Services is in a good and functional state.

### 3. CLIENT'S OBLIGATIONS

- 3.1 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:
- (i) 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;
  - (ii) 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;
  - (iii) perform such additional duties and responsibilities and provide such information and resources as are described in the Proposal.

- 3.2 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.
- 3.3 Client will pay Pure within 30 days of Client's receipt of an invoice therefrom. Client acknowledges that Pure is entitled to payment for any and all Services performed hereunder up and until the date of the full completion of such Services.
- 3.4 Upon Client's termination of the provision of Services or any goods by Pure hereunder, Pure will be entitled to payment for any and all goods and Services provided up to and until the date Pure receives notice of termination from Client. Such payments will be at the rates as provided to Client in the Proposal.
- 3.5 The pricing provided in the proposal shall remain firm for 12 months from the date hereof. Thereafter, in recognition of the current inflationary environment and potential of labor and component cost increases to Pure, a price adjustment may be requested by Pure to account for such cost increase.

#### **4. PROPRIETARY AND CONFIDENTIAL INFORMATION**

- 4.1 All reports generated in the performance of the Services and delivered by Pure to the Client will become the property of the Client.
- 4.2 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.
- 4.3 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 4.3 will remain in full force and effect after any termination or expiry, as the case may be, of the Contract.
- 4.4 Notwithstanding anything herein to the contrary, Contractor will have a limited, non-exclusive, royalty-free license to utilize data collected and received in the performance of services hereunder for purposes of (a) providing services, (b) analyzing and improving the services, and (iii) internal research and development for the benefit of Contractor and Client's clients.

#### **5. LIABILITY AND WARRANTIES**

- 5.1 Pure will indemnify and hold the Client harmless against any expense, demand, liability, loss, claim, lawsuit 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.

- 5.2 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.
- 5.3 Pure's cumulative liability hereunder, whether in contract, tort, or otherwise, will in no event exceed the greater of (i) the aggregate consideration paid by the City to Pure for the portion of the Services that gave rise to the liability, or (ii) \$2 million; provided, however, that this clause shall not limit Pure's indemnification obligations hereunder. The report(s) 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 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.
- 5.4 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 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.

**6. INSURANCE**

Pure will provide the Client with a certificate of insurance evidencing the following coverages:

6.1	Commercial General Liability	\$2,000,000
6.2	Automobile Liability	\$1,000,000
6.3	Workers Compensation	Statutory
6.4	Professional Liability	\$500,000

**7. SPECIAL CONDITIONS/ACKNOWLEDGEMENT OF EVENTS.**

Pure and Client (the "Parties") acknowledge and agree that the global COVID-19 pandemic ("COVID-19") is ongoing, dynamic, unpredictable, and as such may impact the ability of Pure to meet its obligations under this Agreement. The Parties agree that, for so long as there is an impact of COVID-19 on Pure's performance, all performance efforts by Pure will be on a reasonable efforts basis only and Pure shall not be responsible for failure to meet its obligations, to the extent that it is precluded from doing so as a result of COVID-19. The Parties shall work, in good faith, to make any reasonable adjustments that may be required as a result of COVID-19.

## Appendix A: Inspection Considerations

### Pipeline Pressure

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

During the SmartBall inspection, City staff will need to 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.

### Insertion and Extraction Requirements

The SmartBall tool is typically inserted through a 4-inch (100 mm) 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, and pipeline access must be no less than 3.5 inches (90 mm). A minimum of 4 feet (1.3 mm) 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, or pumping the SmartBall through offset piping such as a hydrant or bypass.

If a hot tap is being performed to add an access point, the drill bit must be at least 3.5 inches (90 mm) in diameter and centered within the newly installed valve. Note that a 4-inch valve on an access point installed with a drill bit smaller than 3.5 inches (90 mm) will not provide the clearance needed.

The SmartBall tool is typically extracted from the pipeline by 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 mm) upstream of the valve. A minimum of 16 feet (5 mm) 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 extraction net utilizes a tracking sensor and a camera to confirm the SmartBall tool has been caught. Other extraction methods, such as retrieval from a

reservoir using a remotely operated vehicle, 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 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 of the pipe approximately 3 inches by 3 inches (75 mm by 75 mm) 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 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 PPD submitted to the City prior to the inspection.

## Flow Requirements

The SmartBall tool requires a fluid velocity of 0.5 feet per second to traverse flat sections of pipeline. The ideal fluid velocity for most pipelines is 2- to 4-feet 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 for leak and air pocket inspection and 3 feet per second for SmartBall mapping. The SmartBall tool usually travels at approximately 70% of average fluid velocity. City staff will control the flow rate to confirm the requisite velocity during tool deployment as defined in the PPD. 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.

## Live Pipeline Inspection Risks

Despite meticulous planning and preparation, live pipeline inspection carries an inherent risk that cannot be avoided. There is a possibility that the inspection platform could encounter problems during the inspection run that could lead to loss of data, requiring a re-inspection or at worst the tool getting stuck in the pipeline due to unforeseen or unknown obstructions. The planning process is used to mitigate any potential risks.



## Tech Notes Report

### Insured/Homeowner Information

<b>Homeowner Name:</b>	Corner Of Novi And I96
<b>Homeowner Address:</b>	Corner Of Novi And I96 Novi, MI 48375
<b>Claim Number:</b>	PO# 592
<b>Date/Time of Inspection:</b>	5/31/2023, 1:00 PM
<b>Technician Name:</b>	Steve Walker

### Findings

<b>Technician Notes:</b>	<p>30" water main that has water steadily steaming from concrete casing surrounding pipe. Leak located near freeway I-96 on south side near Novi Rd.</p> <p>Acoustic geophone testing of exposed concrete casing around pipe found no discernible leak noise above background noise.</p> <p>Correlation testing with microphones at below ground touch points on both sides of interstate found no suspect leaks.</p> <p>Based on pipe casing being 6" solid poured mortar (no hollow areas), it is unlikely water is traveling far. Recommend removing casing in leak area. If leak not nearby, recommend new correlation using exposed pipe as closer touch point. Additional testing within 90days would be at service charge plus hourly rate. If questions call on-site technician Steve 734-368-3351.</p>
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### Images



## Departure

Upon departure, water services to the home were left: On

## Disclaimer

Payment is due in full upon completion of repair/detection. American Leak Detection is not responsible for determining policy coverage, fiscal liabilities or personal responsibility between insured, insurance carrier and/or third parties. It is the responsibility of the homeowner/insured/customer to pay all charges and/or fees associated with any repair and/or service which may not be covered under the homeowner's policy, agreements between homeowner/insured/customer and third parties as it relates to any repairs and/or services performed by, or at the request of, American Leak Detection, to include but not limited to: detection fees, pipe charges, deductibles, additional work and/or services performed outside of the original scope of work, such as installation of new commodes, fixtures, clearing of drain lines, sinks, temporary epoxy patches, drain cover replacement etc. Payment terms for pipe charges, deductibles, and/or any services performed that are not covered by homeowner's policy, agreements between homeowner/insured/customer and third parties, or which are paid directly to homeowner/insured/customer by insurance carrier and/or third parties are owed to American Leak Detection, Cash on Delivery (COD). Payment for services rendered must be received in full by

American Leak Detection in order to maintain warranties for repairs and/or services. American Leak Detection reserves the right to void all warranties for repairs and/or services if homeowner/insured/customer fails to pay any balances owed upon completion of repairs and/or services.

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