PureTech

Tecnología P-WAVE para inspección de tubería PCCP.

Marco de experiencia de la compañía

PURE TECHNOLOGIES OVERVIEW

Since 1993, Pure Technologies has been providing non-destructive testing and monitoring technologies to better understand and manage the condition of major infrastructure. Pure's primary products are the P-Wave® electromagnetic inspection technique, SoundPrint® acoustic monitoring systems, and the SmartBall® leak detection technology. Pure has been providing inspections with these technologies for PCCP pipelines since 1997 and have developed a reputation for honesty and integrity while improving the state-of-art for pipeline assessments. The acquisition of Openaka Inc. by Pure in 2006 added specialized engineering expertise to complement our inspection and monitoring technologies.

Pure Technologies is a well-funded publicly-traded company and is independent of pipe manufacturers or other vested interests. We are able to deliver an objective assessment of the condition of prestressed concrete pipelines without compromise. Our clients range from medium sized utilities serving fewer than 250,000 customers with limited quantities of PCCP to large utilities in major metropolitan areas with hundreds of miles of PCCP.

Excavations of pipe sections identified as problematic through Pure's inspection technologies have confirmed the validity of the technologies and their performance. Several of Pure's clients credit our technologies with providing the information they needed to avoid catastrophic failure of their PCCP transmission mains.

Some of the notable accomplishments of our company include:

- Provided assessment/inspection service for over 1670 km (1,000 miles) of PCCP transmission mains.
- Acoustically monitored more PCCP than any other company in the world.
- Pure Technologies has researched, designed and developed all the technologies included in this proposal. Pure holds a number of US Patents specific to electromagnetic inspection and acoustic monitoring.
- Pure has been involved with non-destructive testing of PCCP mains since 1997.
- Performed visual and sounding inspections of PCCP for more than 25 years through Openaka.
- Designed and oversaw repairs of approximately 150 pipe sections.
- Provided PCCP assessment/inspection services for 50 utilities throughout the North America and around the world (e.g. Canada, United States, Mexico, Taiwan, France, Belgium and the Great Man Made River Project in Libya)
- Developed state-of-the-art long-term acoustic monitoring solutions for more than 420 km (250 miles) of PCCP transmission mains.
- Currently operating permanent Acoustic Fibre Optic (AFO) monitoring systems on 176 km (in the executive summary you refer to 176 km, I think this should be 76) of PCCP and is the only company in the world with a proven technology of this nature.

A summary of our past and current client base is provided in Table 1.

Table 1
Pure Technologies Pipeline Clients

Client	Diameter of Pipe (metres)	Electromagnetic Inspection	Acoustic Monitoring	Structural Analysis	Pressure Transient Monitoring	Visual/Sounding Inspection	Within Past Three Years	Forensic Investigation	Repairs Made Based on Inspection and/or
San Diego County Water Authority*	1.7 to 2.4	√	√		√		√		√
Tucson Water*	1.4 to 2.4	√	√	√	√	√	√	√	√
WSSC*	1.5	√	√	√		√	√	√	√
Baltimore County- Kennilworth*	1.2	√	√	√		√	√	√	√
City of Phoenix*	1.8 to 3.0	√	√			√	√	√	√
Providence Water*	2.6	√	√				√		√
City of Calgary*	1.2	√	√				√	√	√
Great Manmade River Authority	4.0	√	√	√			√	√	√
New Jersey American Water	0.6 to 1.5	√	√			√	√	√	√
Greater Lawrence Sanitary District	1.8	√	√	√	√	√	√	√	√
Middlesex County Utility Authority	2.6	√	√	√		√	√	√	√
Central Arizona Project	5.6		√				√		√
South Coast Water	1.0 to 1.2		√				√		
Howard County	0.6 – 1.2	√	√	√		√	√	√	√
Springfield Water	1.5	√					√		
San Francisco	1.8	√	√				√		
City of Baltimore	1.4	√	√	√		√	√	√	√
Detroit Water and Sewer	0.9	√					√		
Arizona Public Service		√	√				√		
City of Baltimore	3.0	√				√	√		
Comision de Servicios de Aqua del Estado, Mexicali, Mexico	1.8	√					√	√	√
City of Montreal (project just underway)	varies	√	√				√		
City of Montreal	0.9	√							
Metropolitan Water District	2.4	√							
San Gabriel Valley Water District	1.4	√							
Central Arkansas Water	1.8	√	√						
Southern Nevada Water District	2.4	√							
City of Houston	1.5	√	√						
Tampa Bay Water	2.1	√	√						√
City of Aurora	1.8	√							
Fairfax County Water Authority	0.9		√						√
Denver Water Department	1.8		√						
Tarrant Count Water District	1.8		√						
Halifax Regional Water Commiss.	1.2		√						
Pinellas County Utilities Authority	1.2		√						√

* Clients that have used the SoundPrint acoustic fibre optic monitoring system.

INSPECTION TECHNOLOGIES

P-Wave Electromagnetic Inspection

Pure Technologies has developed and patented the P-Wave® electromagnetic inspection technology and proposes to use it to perform an electromagnetic inspection for the Agency's 78" (Inch) aqueduct. Electromagnetic inspection of metallic pipelines and tubes has been in use since the early 1900's. In the last decade, these techniques have been applied to PCCP as a means of detecting and quantifying the number and location of wire breaks.

There are several designs of prestressed pipe in use in North America. The most common types are AWWA C301-E (Embedded Cylinder Pipe) and C301-L (Lined Cylinder Pipe). Pure has invested significant time and resources and has performed numerous projects to validate P-Wave on both types of pipe. Numerous excavations have confirmed the efficacy of the technology and, consequently, this technology is now considered to the most advanced available for assessing prestressed pipe.

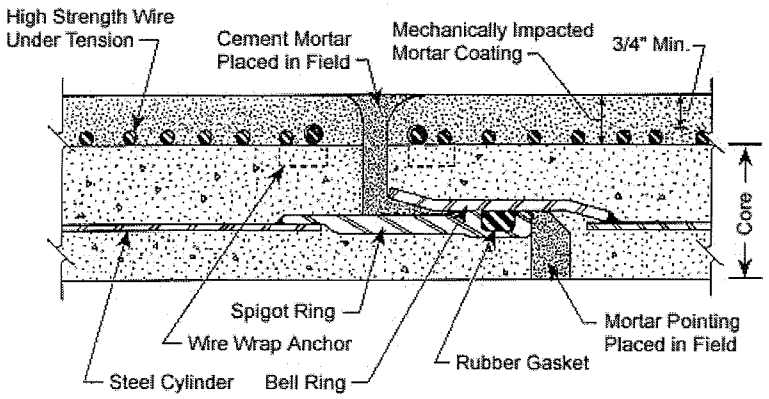

Figure 4: Typical pipe cross-section through the wall of an embedded cylinder pipe.

P-Wave Theory

A common analogy to describe the physics of electromagnetic inspections is to view the prestressing wire as a coiled inductor. The P-Wave equipment consists of transmitter and receiver coils that use the prestressing wire as an inductor that can alter an induced field. The coils are placed in a horizontal configuration with the transmitting coil on one side of the pipe and the receiver coil on the other side. The transmitting coil generates a signal and if the prestressing wire, acting as an antenna, is

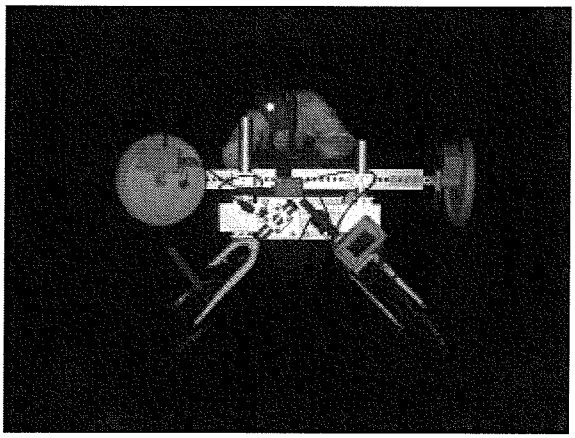

Figure 5: P-Wave inspection equipment in a 60-inch PCCP transmission main.

intact, the receiver coil detects a signal with certain characteristics. When the end of a pipe section is reached, the polarity of the detected field reverses because the coiled inductor ends. However, if the inductor is broken (i.e. the prestressing wire is broken), the signal is altered because a new pole reversal occurs part way through the pipe. These unexpected reversals delay the arrival of the signal at the receiver and can be quantified to estimate the number of wire breaks. Typical P-Wave equipment is shown in Figure 5.

P-Wave inspection involves three important coupling paths that the electromagnetic field follows to travel from the transmitter to the receiver coil: the direct-coupled field (path from transmitter to receiver coils through the air); steel liner-coupled field (path from transmitter to receiver through the steel liner); and the prestressing wire-coupled field (path from transmitter to receiver through the prestressing wire). The direct-coupled field is blocked with a circular disk of high magnetic permeability material, and partially annulled by careful coil orientation. The liner-coupled path is controlled by choosing the correct frequency to minimize the effect of the steel liner. Therefore, the prestressing wire-coupled path and its variations are distinguishable from the unwanted paths, allowing an assessment of the integrity of the prestressing wire.

The P-Wave transmitter produces the electromagnetic field inside the pipe while the data acquisition system and receiver coil measure and record the resulting magnetic field variations on the opposite side of the pipe. This equipment is moved through the pipeline and the resulting data is recorded on the data acquisition system for later analysis.

Calibration

Variations in pipe designs, construction and ambient soil environment can influence the interpretation of anomalies identified by EM inspection. For this reason, we recommend that the EM inspection data be calibrated with reference to the specific type of pipe being inspected. Should the EM or visual/sounding inspections identify anomalies that could be indicative of structural damage, one or more pipes should be excavated to confirm this and to determine the extent of wire failure. The information generated by this process can then be used to calibrate the EM data from all similar pipes. This process provides the optimum level of confidence in the EM inspection results.

In this instance, we understand that pipes are not available for this type of testing. Should an excavation not be possible or desirable, and should the EM and visual/sounding surveys not identify pipes with probable serious damage, the presence and location of zones of wire break activity can be confirmed through the subsequent acoustic monitoring program.

Alternatively, destructive testing of available pipe spools can be carried out above ground to establish a relationship between the number of wire breaks and the extent and characteristics of the resulting anomalies.

In any case, Pure will use its extensive database to develop calibration curves for the project. We have inspected several 78" pipelines, conducted extensive research into this area, and performed calibrations on pipe of this diameter in the past. Using this history, P-Wave inspections undertaken without calibration have generally been proven to

accurately identify distressed pipe sections and relative levels of damage, but level of confidence in accurately quantifying wire break damage can be reduced.

Photographs from a typical above-ground calibration are shown in Figure 6.

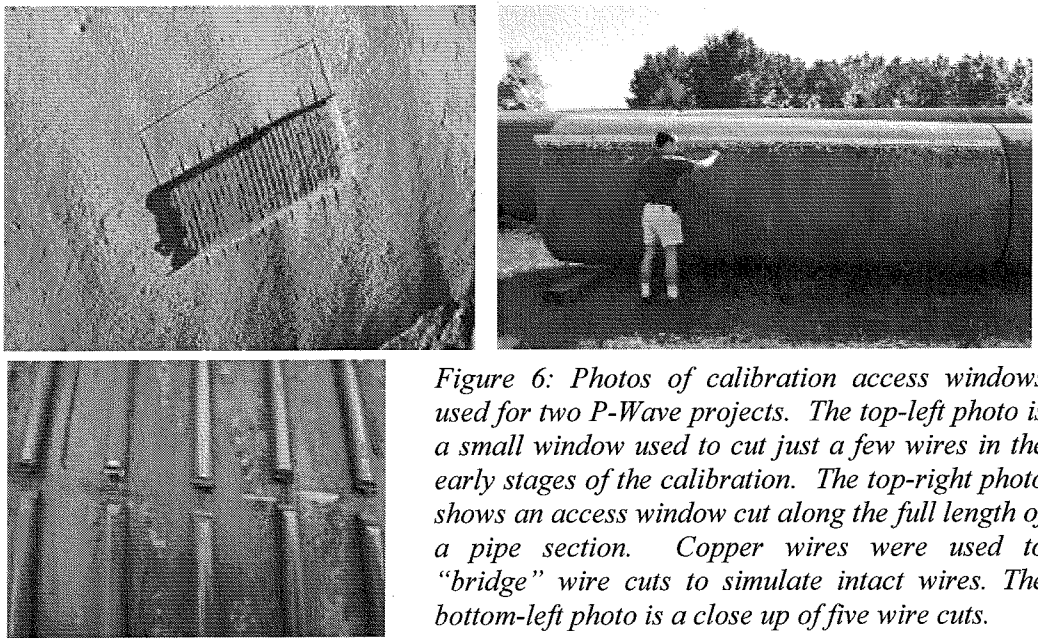

Figure 6: Photos of calibration access windows used for two P-Wave projects. The top-left photo is a small window used to cut just a few wires in the early stages of the calibration. The top-right photo shows an access window cut along the full length of a pipe section. Copper wires were used to "bridge" wire cuts to simulate intact wires. The bottom-left photo is a close up of five wire cuts.

PROJECT REFERENCES

We are pleased to provide details of Four projects where Pure Technologies has utilized a combination of inspection methodologies, including but not limited to, electromagnetic inspection, acoustic monitoring and visual/sounding inspection.

City of Tucson PCCP Transmission Mains

Contact:	Britt Klein, Superintendent Water Operations 520-791-4816 ext. 121
Organization:	City of Tucson
Inspection Dates:	2003 to present
Inspection Technique:	Electromagnetic Inspection, Acoustic Monitoring and Visual and Sounding Inspection and SmartBall 'Beta' testing.
Repair Methodology:	Localized Repairs (Post-Tensioned Tendons)

The City of Tucson has undertaken a proactive condition assessment and management program for all their PCCP transmission mains (approximately 35 km). Upon evaluating all electromagnetic and acoustic monitoring testing technologies, the City of Tucson selected Pure Technologies as their sole provider of electromagnetic and acoustic inspection. The City has extensive experience with various condition assessment technologies and management techniques of PCCP mains. Further they have executed many of the management approaches discussed in this proposal. The proposed team has provided the following services to the City of Tucson:

- Electromagnetic inspections performed by Pure Technologies
- Visual and sounding inspections performed by Openaka
- Structural modeling (performed by others through Pure Technologies)
- GIS-based risk management system implemented by Pure Technologies
- Acoustic monitoring as a condition assessment tool performed by Pure
- Permanent acoustic monitoring with fibre optic sensors. Pure is now performing long term monitoring of all 35 km of Tucson's PCCP transmission mains.
- Design and oversight of pipe strengthening with post-tensioning tendons by Openaka

These services have been performed on several transmission mains ranging in diameter from 1219 mm to 2439mm. Most of the mains were determined to be in good condition with relatively minor damage reported; however, one pipe section was estimated to have approximately 30 wire breaks based on a P-Wave electromagnetic inspection. The City excavated this pipe section and confirmed the damage (35 wire breaks) on the pipe. The wire breaks were though to have been caused by contractor interference. The pipe was repaired using post-tensioning tendons. The City credits the inspection program as having saved a failure of this line.

In 2006, an additional three pipe sections were identified for repairs based on the acoustic and electromagnetic results. Two of these pipes sections where repaired in early 2006 and the remaining damaged pipe was repaired using post-tensioning tendons November 2006.

Included with this proposal (see attached CD-ROM) is a news clip referring to the City of Tucson's pipeline assessment program. In 1999, the City experienced a catastrophic failure of their 2439 mm transmission main, since that time they have moved from a reactive damage control mode to a proactive management mode. The news clip demonstrates a positive media response to the City's condition assessment program.

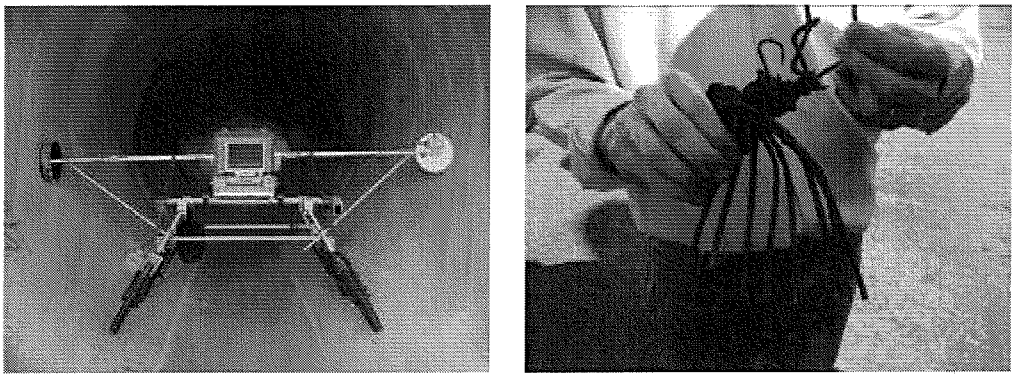

Figure 1: (left) P-Wave electromagnetic inspection equipment in a Tucson PCCP transmission main. (right) Broken PCCP prestressing wires detected by the P-Wave equipment on a 1370 m diameter main. These wires were cut off the pipe and the pipe repaired. Tucson credits identification of this pipe section as avoiding a failure of this important main.

Howard County Transmission Mains

Contact:	Robert Diaz, Project Manager 410-313-6125
Organization:	Howard County Department of Public Works
Inspection Dates:	2000 to present
Inspection Technique:	Electromagnetic Inspection, Acoustic Monitoring and Visual Inspection
Repair Methodology:	Localized Repairs (Carbon Fibre) and Pipe Replacement

Howard County has been proactively assessing and monitoring the condition of their entire PCCP inventory since 2000. From the beginning, Pure Technologies has been involved with their program providing both acoustic monitoring and electromagnetic inspection services. To date, Pure has acoustically monitored over 25 km of the County's PCCP and has recently performed assessments on the following pipelines:

- CSX Transmission Main, 914 mm PCCP potable water transmission main
- Southwestern Transmission Main, 1370 mm PCCP potable water transmission main

- Tollhouse Road Line, 1066 mm PCCP potable water transmission main

The assessment portion of the work for each of these pipelines consisted of an electromagnetic inspection (for all mains) and a visual and sounding inspection (for the 1.0 and 1.4-metre mains). The electromagnetic inspections were performed by Pure Technologies and the visual and sounding inspections were performed by Openaka. Pure Technologies also performed acoustic monitoring of the 1.1-metre main. Following the inspections, structural modeling was done and 26 pipe sections were repaired using carbon fibre lining. The County is currently in the process of procuring a permanent acoustic fibre optic monitoring system to provide continuous information on the deterioration rate of their critical transmission mains.

These assessment projects were executed smoothly and successfully. Due to the extent of deterioration identified by the inspection and acoustic monitoring the 1.1-metre line was replaced. The 1.4-metre and 1.0-metre lines required some carbon fibre repairs. Two photographs of distressed pipe sections are shown in Figure 2.

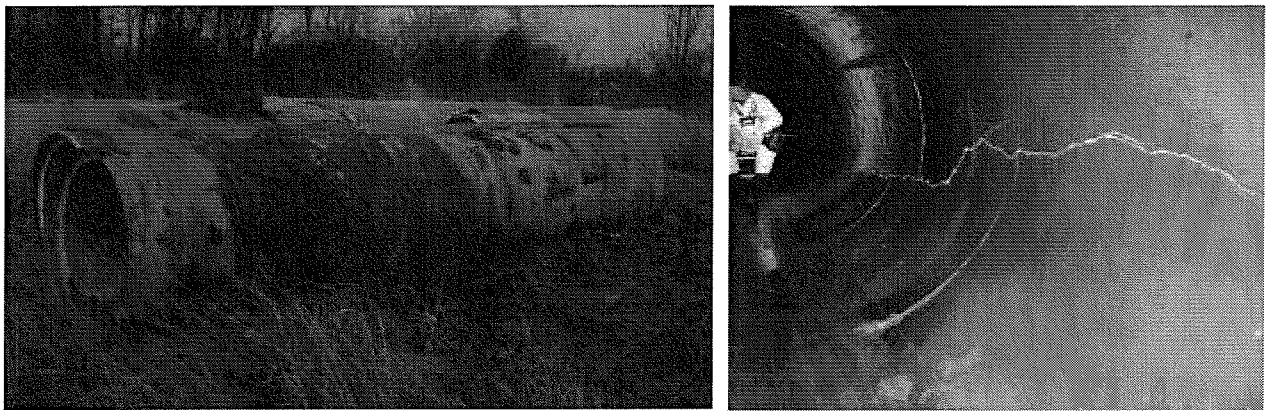

Figure 2: (left) Following electromagnetic testing of a 1067mm (42") PCCP transmission main this pipe section was identified and replaced. (right) Photograph of a pipe deemed to be in a state of incipient failure on the 1370 mm (54") line. The presence of longitudinal cracks with staining is an indication that a pipe section has lost prestressing and is near failure. Not all pipes are this obvious. Openaka's inspection personnel, seen in the background, are experts at visual and sounding inspections. This pipe was repaired with carbon fibre and a failure was avoided.

Washington Suburban Sanitary Commission (WSSC)

Contact: Nathan Leshner, Senior Engineer
301-206-8563
Organization: Washington Suburban Sanitary Commission
Inspection Dates: 2006 to present
Inspection Technique: Visual and Sounding, Electromagnetic Inspection and Acoustic Monitoring
Repair Methodology: Pipeline Replacement and Repairs

In 2001, WSSC performed an electromagnetic inspection (by others) to assess their 1500mm (60") South Adelphi pipeline. WSSC's experience on this project has lead to a

more comprehensive condition inspection program that relies on more than one inspection technique, including:

- Electromagnetic inspection performed by Pure Technologies
- Visual and sounding inspection performed by Openaka
- Forensic analysis of excavated pipe sections by Openaka
- Acoustic monitoring by Pure Technologies

In July 2006, WSSC retained the services of Pure Technologies and Openaka to perform a comprehensive inspection of a 2440mm (96") and 1500mm (60") PCCP water main. The 2440mm (96") inspection was an emergency inspection and included visual and sounding inspection and electromagnetic inspection of just over one-mile of pipe. The results of the inspection identified two pipe sections with extensive wire breaks. Under an emergency contract, WSSC excavated and replaced the problematic pipe sections. A limited forensic evaluation was performed that confirmed the results of the inspection. Unfortunately, an acoustic monitoring system was not deployed due to the fast-track repairs and requirement to place the line back into service. WSSC is considering the installation of acoustic monitoring along this pipeline during the inspection of the adjacent section scheduled for March 2007.

In August 2006, the Pure Technologies team inspected five miles of a 1500mm (60") PCCP water main. The inspection included:

- Electromagnetic inspection performed by Pure Technologies
- Visual and sounding inspection performed by Openaka
- Acoustic monitoring performed by Pure Technologies (installation of fibre optic sensor)
- Accurate locating of damage pipe with surface GIS coordinates to facilitate repair.
- 3D Finite Element Analysis
- Engineering and serviceability recommendations on the remaining pipeline, by Openaka

Two pipe sections where identified with approximately 60 wire breaks. Both of these sections were excavated for repair. The wire break estimates based on the P-Wave inspection where found to be accurate and in both cases identified distressed regions on these pipes.

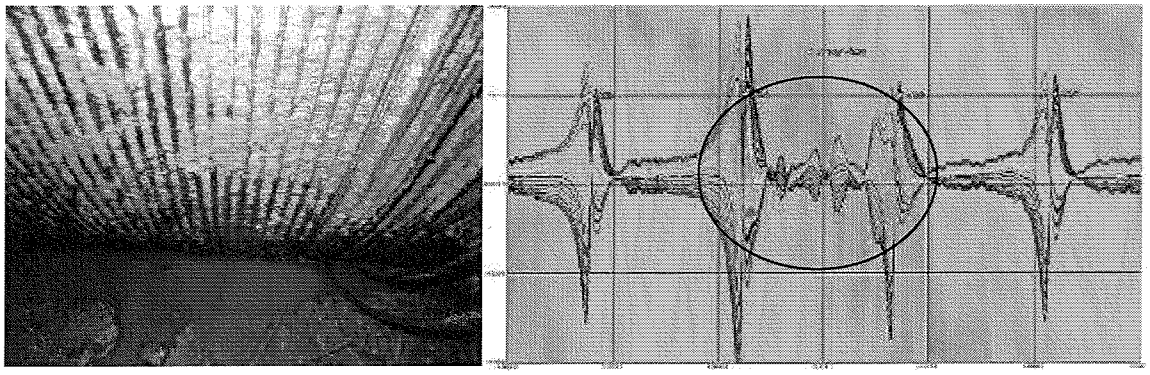

Figure 3: (left) 2400mm (96") pipe identified by electromagnetic and visual inspection. (right) Electromagnetic anomaly on the same pipe section.

Great Man Made River Authority (GMRA) Libya

Located in Libya, the Great Man-Made River pipeline is the one of the largest water projects in the world, with more than 4000km of mainly four metre diameter prestressed concrete cylinder pipe (PCCP) in operation. Water is extracted from underground aquifers deep in the Sahara desert and is conveyed to coastal areas where over 90% of the population lives.

After experiencing failures on their pipeline between 1999 and 2001, the Great Man-Made River Authority (GMRA) undertook an aggressive condition assessment program. This program included using the P-Wave electromagnetic inspection technology to inspect over 500km of pipeline. The technology has been verified on the project by forensic evaluations of excavated pipe sections on a number of occasions, and is a proven method of detecting broken wires.

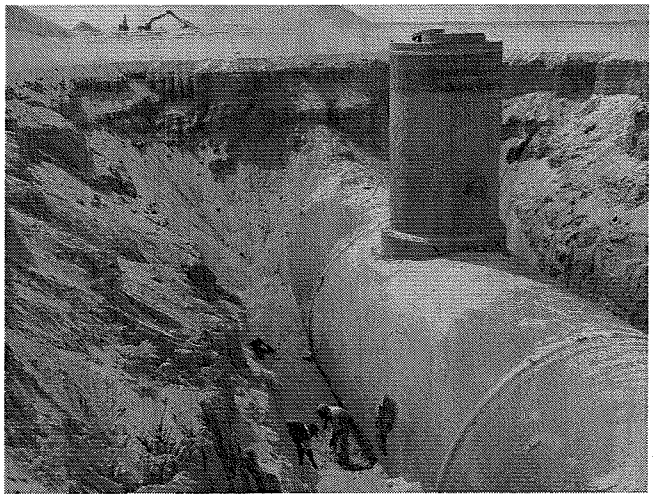

Photo of damaged pipe detected by P-Wave. Note the small area of broken wires.

GMRA has also installed SoundPrint acoustic monitoring equipment to track deterioration remaining pipe sections while the pipeline is in operation. Initially installed in 2001 and able to monitor approximately 40km, the system has since been expanded and now covers almost 100km of pipeline. Further expansion is underway to allow for monitoring of over 700km this critical asset.

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Arizona Public Service/Cholla Power Plant 4801 Frontage Road Joseph City, AZ 86032
Type of Structure:	Circulation Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	60 inch, 66-inch and 72-inch
Product conveyed:	cooling water
Length of Subject Pipe:	Approximately 1.5 miles total
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection
Date Work Performed:	March 2005 and March 2006
Percent of Work Complete:	100%
Key Personnel:	Myron Shenkiryk, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Baltimore County Department of Public Works 111 Chesapeake Road Towson, MD 21204
Type of Structure:	Kennilworth Main- Prestressed Concrete Cylinder Pipe
Internal Diameter:	48-Inch
Product conveyed:	Potable Water
Length of Subject Pipe:	1.5 miles
Description of Work:	Responsible for the following tasks: • Performed electromagnetic inspection • Performed visual and sounding inspection • Performed three months acoustic monitoring
Date Work Performed:	November 2004 to March 2005
Percent of Work Complete:	100%
Key Personnel:	Mark Holley, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection Andrew Pickup- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	City of Baltimore Department of Public Works 309 Abel Wolman Municipal Building 200 N. Holliday Street Baltimore, MD 21202
Type of Structure:	Transmission Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	48-inch and 54-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	Approximately 10 miles total
Description of Work:	Responsible for the following tasks: • Acoustic monitoring with hydrophone arrays or fiber optic sensors • Electromagnetic inspection • Visual and sounding inspection • Forensic investigation of suspect pipe section • Structural modeling
Date Work Performed:	2004 to present
Percent of Work Complete:	30%
Key Personnel:	Mark Holley, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Thomas Dyck, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Structural Modeling, Forensics Ben Reposa, Pure Technologies- Acoustic Monitoring Andrew Pickup, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Middlesex County Utility Authority PO Box 159 Sayreville, NJ 08872
Type of Structure:	Force Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	60-inch and 102-inch
Product conveyed:	Wastewater
Length of Subject Pipe:	Approximately 5 miles total
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection • Permanent acoustic monitoring with surface mounted sensors • Visual and sounding inspection • Forensic investigation of suspect pipe section • Structural modeling • Pipe repair design and oversight
Date Work Performed:	March 2003 to present
Percent of Work Complete:	95% (all work complete except monitoring will continue)
Key Personnel:	Michael Higgins, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Structural Modeling, Forensics, Pipe Repair Ben Reposa, Pure Technologies- Acoustic Monitoring Daniela Vihristencu, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	City of Calgary Waterworks P.O. Box 2100 Station M Calgary, AB T2P 2M5
Type of Structure:	Transmission Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	43, 48 and 84-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	2.5 miles total
Description of Work:	Responsible for the following tasks: • Performed electromagnetic inspection • Acoustic monitoring with hydrophones • Acoustic monitoring with fiber optic sensor
Date Work Performed:	January 2004 to March 2005
Percent of Work Complete:	100%
Key Personnel:	Jack Elliott, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection & Acoustic Monitoring Brad Slessor, Pure Technologies- Acoustic Monitoring Richard Bilow- Acoustic Monitoring Andrew Pickup- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	City of Phoenix Water Service 200 West Washington Street, 8th Floor Phoenix, AZ 85003
Type of Structure:	Various Transmission Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	72-inch to 102-Inch
Product conveyed:	Potable Water
Length of Subject Pipe:	Approximately 50 miles of inspection/monitoring over several projects
Description of Work:	Responsible for the following tasks: • Performed electromagnetic inspection • Performed visual and sounding inspection • Acoustic monitoring with hydrophone arrays • Acoustic monitoring with fiber optic sensor
Date Work Performed:	2003 to September 2006
Percent of Work Complete:	100%
Key Personnel:	Mark Holley, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Brad Slessor, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection Ben Reposa- Acoustic Monitoring Richard Bilow- Acoustic Monitoring Andrew Pickup- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Detroit Water and Sewer 735 Randolph Street Detroit, Michigan 48226
Type of Structure:	Transmission Main- Prestressed Concrete Cylinder Pipe
Internal Diameter:	36-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	1 mile
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection
Date Work Performed:	Oct. 2005
Percent of Work Complete:	100%
Key Personnel:	Mark Holley, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Andrew Pickup, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Client:	Greater Lawrence Sanitary District 240 Charles St. North Andover, MA 01845
Type of Structure:	Prestressed Concrete Cylinder Pipe Sewer Force Main
Internal Diameter:	72-Inch
Product conveyed:	Raw sewage
Length of Subject Pipe:	0.5 miles
Description of Work:	Responsible for the following tasks: • Designed and installed permanent acoustic monitoring system • Provided acoustic monitoring services • Performed electromagnetic inspection • Performed visual and sounding inspection • Structural modeling • Provided pressure transient monitoring services • Forensic investigation of pipe sections • Designed tendon strengthening for corrosion damage pipe section
Date Work Performed:	December 2004 work commenced. Work still ongoing.
Percent of Work Complete:	95% (All work complete except monitoring with acoustic monitoring and transient pressure monitoring systems is ongoing.)
Key Personnel:	Mike Wrigglesworth, Pure Technologies- Acoustic Monitoring Brad Slessor, Pure Technologies- Acoustic monitoring, pressure transient monitoring Michael Higgins, Pure Technologies- Project Director Ed Padewski, Openaka- Visual and sounding inspection, structural modeling, forensic investigation, repair designs Andrew Pickup- data analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Great Manmade River Authority P.O. Box 641 Hawari Road Benghazi, Libya
Type of Structure:	Aqueduct System- Prestressed Concrete Cylinder Pipe
Internal Diameter:	4 meter
Product conveyed:	Water
Length of Subject Pipe:	650 km
Description of Work:	Responsible for the following tasks: • Managing multi-year program to provide non-destructive condition assessment and monitoring technologies • Acoustic monitoring with hydrophones • Acoustic monitoring with fiber optic sensor • Electromagnetic inspection
Date Work Performed:	2000 to present
Percent of Work Complete:	Multiple continuing contracts (existing contracts near completion-95%)
Key Personnel:	Jack Elliott, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection & Acoustic Monitoring Peter Paulson, Technical Director Muthu Chandrasakeran, Electromagnetic Inspection & Acoustic Monitoring Oliver Tozser, Acoustic monitoring Richard Bilow- Acoustic Monitoring Andrew Pickup- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Howard County Bureau of Utilities 8250 Old Montgomery Road Columbia, MD 21045
Type of Structure:	Transmission Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	36-inch to 48-inch
Product conveyed:	Water
Length of Subject Pipe:	Approximately 20 miles total
Description of Work:	Responsible for the following tasks: • Acoustic monitoring with hydrophone arrays • Electromagnetic inspection • Visual and sounding inspection • Forensic investigation of suspect pipe section • Structural modeling
Date Work Performed:	2000 to present
Percent of Work Complete:	95% (all work complete except monitoring will continue)
Key Personnel:	Mark Holley, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Thomas Dyck, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Structural Modeling, Forensics Ben Reposa, Pure Technologies- Acoustic Monitoring Andrew Pickup, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Middlesex County Utility Authority PO Box 159 Sayreville, NJ 08872
Type of Structure:	Force Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	60-inch and 102-inch
Product conveyed:	Wastewater
Length of Subject Pipe:	Approximately 5 miles total
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection • Permanent acoustic monitoring with surface mounted sensors • Visual and sounding inspection • Forensic investigation of suspect pipe section • Structural modeling • Pipe repair design and oversight
Date Work Performed:	March 2003 to present
Percent of Work Complete:	95% (all work complete except monitoring will continue)
Key Personnel:	Michael Higgins, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Structural Modeling, Forensics, Pipe Repair Ben Reposa, Pure Technologies- Acoustic Monitoring Daniela Vihristencu, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Central Arizona Project PO Box 159 Sayreville, NJ 08872
Type of Structure:	Force Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	60-inch and 102-inch
Product conveyed:	Wastewater
Length of Subject Pipe:	Approximately 5 miles total
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection • Permanent acoustic monitoring with surface mounted sensors • Visual and sounding inspection • Forensic investigation of suspect pipe section • Structural modeling • Pipe repair design and oversight
Date Work Performed:	March 2003 to present
Percent of Work Complete:	95% (all work complete except monitoring will continue)
Key Personnel:	Michael Higgins, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Structural Modeling, Forensics, Pipe Repair Ben Reposa, Pure Technologies- Acoustic Monitoring Daniela Vihristencu, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	City of Montreal
Type of Structure:	Transmission Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	Various
Product conveyed:	Potable Water
Length of Subject Pipe:	To be determined
Description of Work:	Responsible for the following tasks: • Managing multi-year program to assess and monitor several large diameter transmission mains • Acoustic monitoring with hydrophones • Acoustic monitoring with fiber optic sensor • Electromagnetic inspection • Structural modeling/risk analysis
Date Work Performed:	October 2006 to present
Percent of Work Complete:	5%
Key Personnel:	Jack Elliott, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Electromagnetic Inspection & Acoustic Monitoring Richard Bilow- Acoustic Monitoring Andrew Pickup- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	New Jersey American Water Netherwood Operations Center 1341 North Avenue Plainfield, NJ 07062
Type of Structure:	Transmission Mains- Prestressed Concrete Cylinder Pipe
Internal Diameter:	24-inch to 60-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	Approximately 9 miles total
Description of Work:	Responsible for the following tasks: • Acoustic monitoring with hydrophone arrays • Electromagnetic inspection • Visual and sounding inspection • Forensic investigation of suspect pipe section • Pipe repair design and oversight
Date Work Performed:	September 2003 to present
Percent of Work Complete:	80% (all work complete except monitoring will continue)
Key Personnel:	Michael Higgins, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Forensics, Pipe Repair Ben Reposa, Pure Technologies- Acoustic Monitoring Daniela Vihristencu, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Providence Water Supply Board 430 Scituate Ave Cranston, RI 02921
Type of Structure:	Aqueduct- Prestressed Concrete Cylinder Pipe
Internal Diameter:	102-inch and 78-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	Approximately 10 miles total
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection • Acoustic monitoring with fiber optic sensor
Date Work Performed:	September 2005 to present
Percent of Work Complete:	50%
Key Personnel:	Michael Higgins, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Acoustic Monitoring Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Richard Bilow, Pure Technologies- Acoustic Monitoring Andrew Pickup, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	San Francisco Public Utilities Commission 1000 El Camino Millbrae, CA 94030
Type of Structure:	Prestressed Concrete Cylinder Pipe
Internal Diameter:	60-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	Approximately 3.5 miles total
Description of Work:	Responsible for the following tasks: • Electromagnetic inspection • Structural modeling
Date Work Performed:	March 2006
Percent of Work Complete:	100%
Key Personnel:	Myron Shenkiryk, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Electromagnetic Inspection Andrew Pickup, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	San Diego Water Authority 4677 Overland Avenue San Diego, CA 92123
Type of Structure:	Prestressed Concrete Cylinder Pipe Transmission Main
Internal Diameter:	66 to 96-Inch
Product conveyed:	Raw Water
Length of Subject Pipe:	14 miles
Description of Work:	Acoustic monitoring with hydrophone arrays (temporary) and acoustic fiber optic sensor (permanent)
Date Work Performed:	November 2004 to Present
Percent of Work Complete:	95% (All work complete except monitoring services are ongoing.)
Key Personnel:	Mark Holley, Pure Technologies- Project Director Mike Wrigglesworth, Pure Technologies- Project Manager Brad Slessor, Pure Technologies- Project Engineer Andrew Pickup- data analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	South Coast Water District 31592 West Street Laguna Beach, CA 92651
Type of Structure:	Prestressed Concrete Cylinder Pipe
Internal Diameter:	60-inch
Product conveyed:	Potable Water
Length of Subject Pipe:	Approximately 2 miles total
Description of Work:	Responsible for the following tasks: • Acoustic monitoring with hydrophone arrays
Date Work Performed:	June – September 2006
Percent of Work Complete:	100%
Key Personnel:	Myron Shenkiryk, Pure Technologies- Project Director Michael Wrigglesworth, Pure Technologies- Project Manager Ben Reposa, Pure Technologies- Acoustic Monitoring Daniela Vihristencu, Pure Technologies- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Springfield Water and Sewer Commission PO Box 995 Springfield, MA 01101
Type of Structure:	Prestressed Concrete Cylinder Pipe Transmission Main
Internal Diameter:	60-Inch
Product conveyed:	Potable Water
Length of Subject Pipe:	3.7 miles
Description of Work:	Performed electromagnetic inspection, visual and sounding inspection.
Date Work Performed:	November 2005
Percent of Work Complete:	100%
Key Personnel:	Michael Higgins, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and sounding inspection Andrew Pickup- data analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Tucson Water 510 West 18th Street Tucson, AZ 85726
Type of Structure:	Prestressed Concrete Cylinder Pipe Transmission Main
Internal Diameter:	48 to 96-inches
Product conveyed:	Potable Water
Length of Subject Pipe:	20 miles
Description of Work:	Responsible for the following tasks: • Designed and installed permanent acoustic monitoring system with fiber optic sensor • Temporary acoustic monitoring with hydrophone arrays • Provided acoustic monitoring services • Performed electromagnetic inspection • Performed visual and sounding inspection • Structural modeling • Provided pressure transient monitoring services • Designed tendon strengthening for damaged pipe section
Date Work Performed:	2003 to present
Percent of Work Complete:	85%
Key Personnel:	Mark Holley, Pure Technologies- Project Director Mike Wrigglesworth, Pure Technologies- Project Manager Ed Padewski, Openaka- Project Manager Brad Slessor, Pure Technologies- Project Engineer Richard Bilow, Pure Technologies- Project Engineer Andrew Pickup- data analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Washington Suburban Sanitation Commission 14501 Sweitzer Lane Laurel, MD 20707
Type of Structure:	North Adelphi Prestressed Concrete Cylinder Pipe
Internal Diameter:	60-Inch
Product conveyed:	Potable Water
Length of Subject Pipe:	4.7 miles
Description of Work:	Responsible for the following tasks: • Performed electromagnetic inspection • Performed visual and sounding inspection • Structural modeling • Estimated remaining useful life • Designed and installed permanent acoustic monitoring system with fiber optic sensor • Provided acoustic monitoring services
Date Work Performed:	September 2006 to Present
Percent of Work Complete:	50% (electromagnetic inspection, visual and sounding inspection complete)
Key Personnel:	Mark Holley, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection, Risk Analysis Richard Bilow, Pure Technologies- Fiber Optic Monitoring System Andrew Pickup- Data Analyst

PROJECT SUMMARY SHEET
Pure Technologies

Name of Client:	Washington Suburban Sanitation Commission 14501 Sweitzer Lane Laurel, MD 20707
Type of Structure:	Potomac Main- Prestressed Concrete Cylinder Pipe
Internal Diameter:	96-Inch
Product conveyed:	Potable Water
Length of Subject Pipe:	1.0 miles
Description of Work:	Responsible for the following tasks: • Performed electromagnetic inspection • Performed visual and sounding inspection
Date Work Performed:	June 2006
Percent of Work Complete:	100%
Key Personnel:	Mark Holley, Pure Technologies- Project Director Brad Slessor, Pure Technologies- Electromagnetic Inspection Ed Padewski, Openaka- Visual and Sounding Inspection Andrew Pickup- Data Analyst Thomas Dyck- Data Analyst