Morgan County Water District

Established Since 1992

Board of Commissioners
Brian Wells, Chairman
Zachary Engle, Secretary
Steve Gunnell
Raina Helton
Steven Clark

Quality on Tap

May 8, 2023

Linda Bridwell Executive Director
Kentucky Public Service Commission
P.O. Box 615 Frankfort, KY 40602-0615

Re: Case No. 2021-00206

Dear Ms. Bridwell

Pursuant to the Commission's Order of July 8, 2021 in the above-referenced matter, enclosed for filing is Morgan County Water District's s letter and invoice. This letter and the enclosed report are true and accurate copies in paper medium of the electronic version of the documents uploaded to the Public Service Commission's Electronic Filing System this day.

Summary of Work: Please see attached scope of work prepared by ASTERRA. This proposal includes satellite imaging of the entire system and 1-week of leak detection raining. We are looking at the prevent package.

In accordance with 807 KAR 5:001, Section 8, I certify that Morgan County Water District's May 8, 2023 electronic filing of this invoice is a true and accurate copy of the same document being filed in paper medium; that the electronic filing was transmitted to the Commission on May 8, 2023 by electronic means in this proceeding.

Sincerely,

Shannon W. Elam
General Manager

Enclosures

1009 Hwy 172, West Liberty, KY 41472 (606) 743-1204 Phone (606) 743-9585 Fax

ASTERRA

Intelligence to Act

A proposal for Morgan County Water District, KY

MCWD
Morgan County Water District

Proposal & Scope of Work
Prepared by John Stevens, Sales Development Representative

10 April 2023

4180 La Jolla Village Dr., #530 San Diego, CA 92037 858.521.9442 US **asterra.io**

ASTERRA

ASTERRA uses patent protected technology for infrastructure condition assessment, pipe replacement modeling, and leak detection in urban and rural, water or sewage networks, using L-band synthetic aperture radar (SAR) mounted on a satellite. The technology is based on a proprietary algorithm that detects soil moisture resulting from treated water or wastewater leaks, through the analysis of SAR data. This is of considerable value to industry, governments, and citizens. Because the observation point is orbiting 390 miles above the Earth, it does so with a very wide 217-mile (350 km) view, which allows simultaneous monitoring of pipes within a large network.

ASTERRA's Martian Roots

ASTERRA's core technology is based on the search for underground water on Mars and other planets. Lauren Guy, a geophysicist and entrepreneur who developed the approach, quickly recognized the application could be even more effective here on Earth. The water was closer, the need more immediate, and the technology had the potential to solve a number of critical problems. Mr. Guy founded Utilis (now known as ASTERRA) in 2013 to develop applications for the new technology. In 2016, leak detection in underground water systems became the first commercially used application. This product is now called Recover.

A Revolutionary Change

From an orbiting satellite the algorithm, fine-tuned to detect treated drinking water, revealed underground leaks as small as 0.5 liters per minute. Now managers of underground water infrastructure could see the water that was leaking from their systems. Not a prediction, not a likelihood, but the water itself. Even in the largest cities, it could be seen all at once, with unheard-of speed and efficiency. ASTERRA continued to refine the technology and expand its applications beyond leak detection, adding pipeline monitoring and deficiency analysis as well as property assessment to its growing capabilities. In 2021 the product was honored with the American Water Works Association (AWWA) Innovation Award, acknowledging it as an important innovative technology in use in today's largest water utilities around the world.

Impact

Water loss through leaks is often a large component of non-revenue water (NRW). Knowing where the soil shows signatures of moisture caused by potable water can reveal the leaks without breaking ground. Correlating this information with the pipe system map is used to narrow down areas with leaks, so they can be pinpointed and repaired. The general process is outlined below.

1. **Satellite Radar – Image Acquisition**
   Raw images of the area taken by radar over Areas of Interest (AOI) received from client
2. **Radiometric Corrections**
   ASTERRA takes the raw image and prepares it for analysis, by filtering interferences from buildings, manmade objects, vegetation, water bodies, and more
3. **Algorithmic Analysis**
   ASTERRA's unique and patented algorithm targets the spectral signature of treated water or wastewater and its interaction with the soil
4. **Availability to Client**
   Newly detected leak locations are delivered via the EO Discover portal to the client on an ongoing basis, with frequency depending on the level of monitoring purchased.

Advantages of Ongoing Monitoring

Often utilities deprioritize proactive leak detection and standard maintenance efforts due to resource constraints. In most cases utilities are forced to use limited resources for client call-ins or work orders to find, dig, and repair. This results in falling further behind the curve and results in increased pipe breakage. To re-invest in proactive system maintenance and leak detection, Recover provides a highly efficient means to survey points of interest and avoid blindly surveying an entire utility's system of pipes. Ongoing monitoring, as opposed to an analysis of a single moment in time, is recommended to keep up with the demands.

Owing to the nature of the SAR technology not all leaks are identifiable at once, and it has been found that monitoring on a consistent basis will add more leaks within the same AOI, thus increasing the efficiency of the service.

Additionally, leaks are continuously arising and enlarging, thus ongoing monitoring will continue to detect more leaks even in areas previously inspected.

Client Benefits & Impact

ASTERRA provides a comprehensive, accurate, non-disruptive remote sensing solution for locating leaks and monitoring water and sewage network asset status in any potable water or wastewater network in the world. This works over any type of terrain – flat or hilly; sparsely housed or densely populated high-rises. This is done by extracting information from SAR images taken high above the ground, and converting them into coordinates of underground water or wastewater leaks. Reducing NRW additionally has a positive effect on the environment. By reducing drinking water loss, it decreases the amount of processing that must be done, therefore reducing power use and the associated environmental effects. Locating and fixing wastewater leaks in sewer systems also helps the environment by preventing pollution.

Main Benefits of Recover:

- Non-invasive technology: Deployment of sensors or hardware on the ground is not necessary.
- ASTERRA technology is effective irrespective of soil type, pipe material, and pipe diameter.
- Covers large areas at once. Simultaneously surveys an entire system in urban and rural areas, whilst also providing location intelligence at a fine resolution. Identifies potential leaks in areas which traditional acoustic leak detection programs may not typically survey.
- Find more leaks in shorter period: Increases the efficiency of traditional acoustic leak detection programs by prioritizing work locations and offering quicker response times.
- Screening technology that can be used directly or indirectly for condition assessment, asset budget planning and work on structural changes prioritizing network riskier zones.
- Identifies background (i.e., non-surfacing) leaks that might otherwise go undetected for long periods of time.
- Can fit into either CAPEX or OPEX budgets.
- Provides positive impact on the environment (reduces water loss, electricity used, and CO_2 produced).

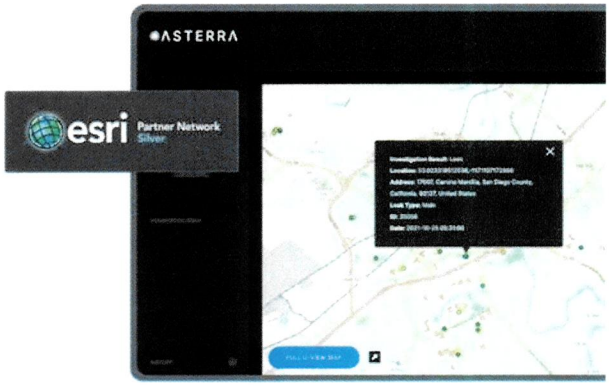
ASTERRA's Solutions

ASTERRA's solutions includes Recover for potable water, Recover for wastewater, MasterPlan, and EarthWorks. All are made available on EO Discover. Recover and MasterPlan are ASTERRA's commercial services offered in this proposal; the "Deliverables" are the actual output from the proprietary algorithm through the analysis of the SAR data combined with other processing techniques owned by Utilis (dba ASTERRA).

Recover for Leak Detection

Recover represents the most significant advance in underground water leak detection in 80 years and won the inaugural AWWA Innovation Award in 2021.

Using synthetic aperture radar (SAR) and proprietary algorithms that have been fine-tuned with the power of AI and machine learning to recognize the signatures of water leaking from different systems.



Recover provides clients with leak detection monitoring for drinking and wastewater systems in a fast, affordable, efficient manner. We help clients improve operational efficiency and optimize budgets with infrastructure intelligence that facilitates proactive pipe repair and planning. With Recover, entire city-wide systems for drinking water can be monitored and analyzed. Recover specializes in locating leaks that are non-surfacing or have left no surface evidence. Ground crews can then be used with maximum efficiency to pinpoint the leak and then digging to repair, rather than digging to look. Compared to current leak detection services and methods, Recover satellite-based leak detection technology not only identifies more leaks, it increases field crew efficiency up to 400%!

Recover offers the water industry the lowest cost per leak found on the market, averaging 3.5 leaks found per crew day vs. 1.3 using traditional acoustic methods. In an industry that loses 17 billion gallons of water a year worldwide, Recover can significantly reduce a company's non-revenue water loss.

Recover Wastewater helps the wastewater industry protect itself from the problems that can arise when underground wastewater leaks go unseen and uncorrected. These include the risk of significant fines, consent decrees, and other legal consequences. Recover can also help avoid damage to a utilities reputation from the introduction of wastewater into underground environments if it had been preventable through early discovery and repair.

Recover Insights

At the start of the client's subscription period, each client is provided access to ASTERRA's EO Discover client portal where they can access the data in the form of GIS files, the U-View application, and view the client's dashboard with individual product and field performance metrics. Each client is also provided access to the U-Collect field investigation application. The portal can be accessed 24/7 during the subscription period to view ASTERRA's analysis, results of field investigations and track success metrics. Recover's specific features include:

Recover (POI Output): A GIS layer containing the POIs, provided in SHP and KML format for import into any GIS system (client-based, ESRI, or ASTERRA-provided U-Collect and U-View) that can be overlaid on a map displaying streets, pipes, hydrants, valves, and potential leak information.

Online Dashboard: A link to the EO Discover password-protected portal displaying data and field results, along with project metrics for monitoring the project/service progress in real time and calculating KPIs.

U-Collect and U-View Licenses: licenses are provided for each of the following: U-Collect (allows field technician to collect data in the field), and U-View (allows field technician to view data from anywhere) (the "Initial Licenses" or the "Licenses"). The Licenses are active upon data first being available to the client

in EO Discover through the end of their subscription period. Additional Licenses may be purchased and/or the Initial License extended at the request of the Client.

MasterPlan for Pipe Deficiency Assessment

Providing unique insights not available from anyone but ASTERRA, MasterPlan is an actual (not predictive) measurement of non-surfacing pipe leaks. It is pipe material and size agnostic and collected non-invasively by a satellite with wide coverage, often imaging a full system instantaneously. MasterPlan provides actionable insights to your asset management plan in one easy data layer. Trained on five years of leaks discovered using Recover, the new algorithm assesses the deficiency of an entire pipe system using multiple SAR images over time.

ASTERRA MasterPlan's key "deliverable" is a GIS dataset containing pipe deficiency levels derived from SAR data. This product is based on the same proven patented algorithm that is used by Recover to detect leaks in your system but is extended to monitor your system over time using statistical analysis.

The general process takes all POIs identified in two consecutive satellite passes (which are exact repeat of coverage and angle) over your area of interest and analyzes the POI results. It then identifies the clustering of observed leaks within one image on a single date, which pipe segments see POIs on the same segment in two satellite passes on different dates, or which see both clustering and repeat issues. These results are processed through a learned statistical algorithm and used to assign pipes a score from 1 to 5, signifying the level of deficiency observed.

With ASTERRA Masterplan we can identify critical areas where the client can focus its future pipeline rehab and replacement efforts. These high deficiency areas can be used for asset management planning purposes, e.g., capital improvement replacement planning.

MasterPlan Insights

The trained algorithm scores pipe segments from one (low deficiency observed) to five (high deficiency observed) for easy input into any GIS system or asset planning/risk model. Compatible with all GIS and GIS-based asset planning model software, MasterPlan provides utilities and engineers with insight into actual pipe condition. Combining this with attribute data such pipe age, material, and work orders from surfacing leaks, it adds further refinement to pipe replacement planning models or water system master plans.

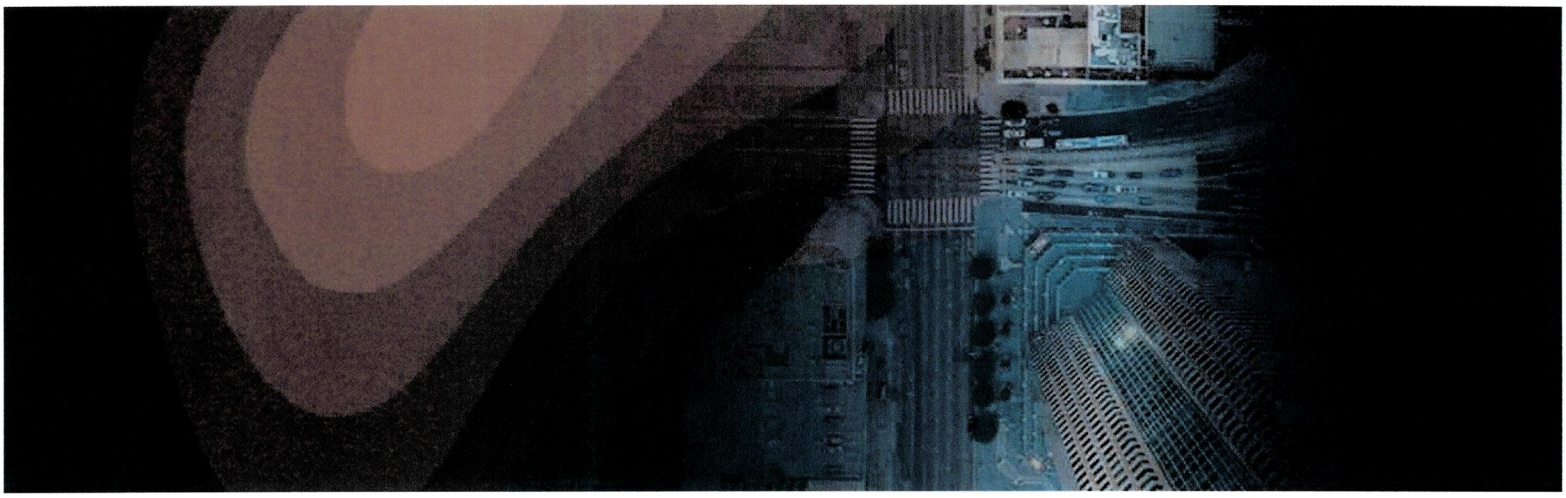
MasterPlan (Pipe Deficiency Output): A GIS layer containing client pipe segments rated based on condition. Provided in SHP and KML format for import into a GIS or risk modeling system (Client-

map displaying streets, pipes, hydrants, valves, and potential leak information.

EO Discover Online Dashboard: A link to the EO Discover password-protected client portal for viewing the pipe data via GIS or U-View applications and for monitoring the project/service progress in real time and calculating KPIs.

MasterPlan Pipe Deficiency Report: A summary report detailing the condition of the clients piping system based on the GIS data output of pipes scored from one (low deficiency observed) to five (high deficiency observed). Provided as a PDF file.

U-View Licenses: Licenses are provided for each of the following: U-View (allows client to view data) (the "Initial Licenses" or the "Licenses") for the duration of the EO Discover subscription period.



Typical Process and Timeline

- After confirmation of the order through contract signature or receipt of a purchase order, ASTERRA will acquire the satellite image(s). ASTERRA must have the order confirmation at least 21 days prior to the first date of satellite coverage to move forward with the satellite data procurement. The date of the acquisition is subject to the technical and operational constraints of the third-party satellite operation company and may change at any time.
- Before image acquisition, the client will provide ASTERRA with an Area of Interest (AOI). Unless agreed otherwise by the parties, the AOI is a designated geographical area to be surveyed using satellite within the client-provided service area.
- During the period prior to the image acquisition, the client will provide ASTERRA with a GIS layer of all available treated water or sewage lines in the AOI to be analyzed. If available, the client will also provide a hydrant and valves layer within the AOI.
- Unless otherwise agreed upon by both the parties, ASTERRA will provide services only in the AOI overlapping with the client's provided GIS pipe system layer.
- After acquiring the image and receiving the GIS pipe layers from the client, data will begin to populate on the EO Discover portal. This is approximately 7-14 business days after the first scheduled image acquisition date. Image acquisition dates may be changed by a third party (satellite operator) or due to technical constraints. Service start dates may be affected due to poor image quality according to ASTERRA' s quality assurance standards.
- Where applicable, leak field inspection work can begin after the leakage data has populated on EO Discover on an agreeable date between both parties.
- Field inspection work should not begin until after ASTERRA has provided training, guidance, and interpretation of the EO Discover portal and data.

Unless otherwise agreed upon by the parties, field work with ASTERRA field engineer will be conducted only within the borders of the AOI and only within the areas within the client's pipe system. Where relevant, client shall furnish access to client's premises, and appropriate workspace for any ASTERRA personnel working at client's premises, as necessary for performance of those portions of the services to be performed at client's premises. Delays in the provision of client materials may result in delays and/or additional cost in performing the services or delivering the deliverables.

Client Expectations

A client is expected to find more leaks per day over the course of a field survey using Recover compared with traditional methods. Examples of traditional methods include either deployable technology such as lift-and-shift loggers and correlation, or contracted leak detection professionals surveying pipe system randomly using various acoustic equipment. The path to a successful project will be achieved through the objective comparative assessment of traditional results to those of Recover.

PROPOSAL

Scope of Work

The scope of work contained herein details the work, product, and deliverables ASTERRA will provide as well as the roles and responsibilities of both ASTERRA and Morgan County Water District, KY **("Client")**. A fee schedule and a work schedule are also part of this scope of work.

Roles, Responsibilities, and Offering – ASTERRA

ASTERRA will provide Recover data as a service via the EO Discover portal, and it will consist of areas identified as potential leaks (i.e., areas containing soil moisture of treated water and wastewater underground) using a proprietary satellite imaging algorithm across the **Client's** water system. ASTERRA will provide a primary contact person for technical and administrative purposes who will interact with the **Client**.

ASTERRA Responsibilities ("Services") Include:

- Acquiring and analyzing the satellite imagery.
- Providing potential leak location data as a service through our password-protected portal, EO Discover. This data can be exported as GIS data files.
- Providing best practices for field inspection protocols to the Client.
- Optional: sub-contracting certified field leak detection teams.
- Optional: providing ASTERRA MasterPlan pipe deficiency map (additional cost may apply if it is not included in the Recover service tier already).
- Optional: Data provided in your ESRI ArcGIS Online Accounts for easy use in ArcGIS Field Maps (additional cost may apply if it is not included in the Recover service tier already).

ASTERRA Solution for Potable Water Includes:

- **Recover (POI Output):** Recover POIs available in the EO Discover Portal, exportable as SHP and KML format for import into a GIS system (**Client**-based, ESRI, ASTERRA-provided U-Collect and U-View, or other) that can be overlaid on a map displaying streets, pipes, hydrants, valves, and potential leak information. Data can be provided in your ESRI ArcGIS Online Accounts for easy use in ArcGIS Field Maps if this level of service or optional service has been purchased.
- **EO Discover Online Dashboard:** AA password to the EO Discover portal for access to the data collected via the U-Collect field app for monitoring the project/service progress in real time and calculating KPIs. The password is for the period of service purchased.
- **U-Collect and U-View Licenses:** Licenses are provided for each of the following: U-Collect (allows field technician to collect data in the field), and U-View (allows field technician to view data from anywhere). The license is active upon delivery for the period of service. Additional licenses may be purchased and/or the initial license extended at the request of the **Client**.
- **Kick-off Meeting:** Prior to field work, an ASTERRA or ASTERRA certified team (regardless of if it is the **Client's** team or a contractor), will call a kick-off meeting to agree on the operational field plan to address the **Client's** specific needs and the best practices required to get the best results.
- **Optional: Acoustic Leak Detection Field Investigation (for potable water pipelines only).** Based upon selecting this option, ASTERRA will provide a certified sub-contractor for a dedicated acoustic field verification effort to investigate provided POI's and pinpoint possible leaks according to ASTERRA best practices and guidance. The leak detection field verification team(s) is proficient and experienced in using and

- operating acoustic equipment, such as amplified leak listeners, ground microphones, and leak noise correlators, at a minimum. The team(s) should be provided with all needed tools to access listening points.
- **Optional: ASTERRA MasterPlan Pipe Deficiency Map**, provided as GIS data set, if purchased within the Recover tier available or as an additional service option.

ASTERRA Solution for Wastewater Includes:

- **Recover (POI Output):** GIS layer containing the POIs, provided in SHP and KML format for import into a GIS system (**Client**-based, ESRI, or other) that can be overlaid on a map displaying streets, pipes, manholes and potential areas of exfiltration.
- **EO Discover Online Dashboard:** A password to the EO Discover portal for access to the data.
- **Portal Demo Meeting:** ASTERRA or ASTERRA certified team will call a virtual Kick-Off meeting to discuss the data delivered and demonstrate the usage of the portal.

In order to meet the objectives listed above, the ASTERRA Recover deliverable under this scope of work shall be a monitoring service containing data of potential leak areas. These potential leak areas identified by the satellite are developed using ASTERRA standard techniques of data collection and analysis. Raw SAR satellite images are received as the input, after which the ASTERRA team applies a proprietary algorithm. The image is then analyzed, and potential leaks of treated water and wastewater are identified. The potential leak target area is displayed as a highlighted pipe length that may be investigated by the **Client**. The delivery report is provided via the EO Discover password-protected web portal, and includes GIS files, graphical leak reports, and/or a GIS web-based application. A report on results can also be provided offline, upon request.

Roles, Responsibilities, and Offering – Client

The Client is responsible for providing baseline system data, work order history and in some cases, an acoustic field verification team to inspect POIs identified by ASTERRA. Client shall identify a primary contact person for technical, administrative, and field inspection coordination. ASTERRA agrees to use the information described below only for Client's specific project and to not share the information with any other third party.

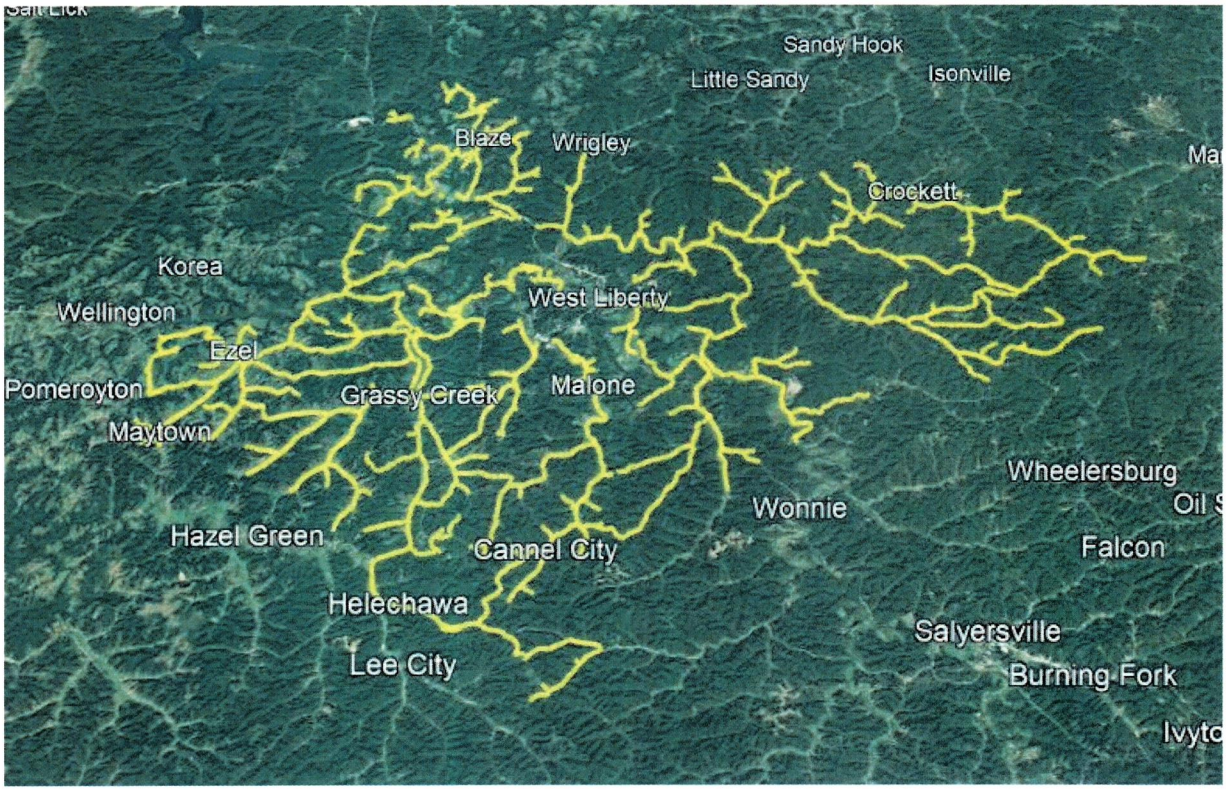
Client Responsibilities Include:

- **Pipe System Information for Potable Waterlines:** Prior to image acquisition, the **Client** shall provide ASTERRA with a detailed and accurate GIS pipe system layer (if available). ASTERRA will use this layer to identify POI locations. The GIS layer should include pipe material and diameter, length of pipeline to be analyzed, hydrants, valves, and any other detailed information available.
- **Pipe System Information for Wastewater Lines:** Prior to image acquisition, the **Client** shall provide ASTERRA with a detailed and accurate GIS pipe system layer (if available). ASTERRA will use this layer to identify POI locations. The GIS layer should include pipe material and diameter, forced and/or gravity lines, length of pipeline to be analyzed, manholes, depth, and any other detailed information available.
- **Leak Detection History (Work Orders):** The **Client** shall provide ASTERRA with a detailed and accurate history of leak findings and repairs beginning one (1) week before the date the first satellite image is acquired and through the project life cycle.
- **Leak Detection Performance Metrics for Potable Waterlines:** The **Client** shall provide ASTERRA with relevant and available performance metric data related to previous **Client**-utilized leak detection methodologies. This information will be used to calculate value metrics of the service and will be provided to the **Client** in the final report for their use.

Client Deliverable for Potable Water Includes:

Areas of Interest (AOI)

During this service, ASTERRA will survey the Area of Interest (AOI) to be determined by the Client, contained to 373 linear miles of main and service pipes as outlined in the image below:



Once ASTERRA receives the full GIS pipe system information from the client, the pipe and total miles analyzed per delivery will be identified. Note: both main and service lines will be counted for total pipe length calculation.

Subscription Based Service Packages

ASTERRA Recover product and features are provided via a subscription to EO Discover with an option to select one of two distinct levels of service (Prevent and Advise). Each service level contains specific features designed to meet clients' current and future needs, with additional add-on services available.

Prevent	Advise
4 licenses: EO discover	**6 licenses:** EO discover
Base line leak analysis	Base line leak analysis
Leak Locations	Leak Locations
U-collect/U-View Apps (4 licenses)	U-collect/U-View Apps (6 licenses)
Temporal and Spatial leak Analysis	**Enhanced** Temporal and Spatial leak Analysis
Prioritized Leak locations for field investigation	Prioritized Leak locations for field investigation
	MasterPlan Pipe Deficiency Map
	ESRI ArcGIS Field Maps Compatibility
	Personal Success Manager
Always Included:	**Always Included:**
Online support	Online support
Customized Success Plan	Customized Success Plan
Best Practices tutorials	Best Practices tutorials

Pricing

Area of interest (AOI) for analysis:

Potable Water Lines: 373 miles

	Prevent		Advise	
	QTY	Price	QTY	Price
Package	12 months	$70,000	12 months	$100,000
Subcontracted Acoustic Leak Detection Team - BOTG (40 hours/ 5 Days)	5 Days	$9,500	5 Days	$9,500
Total	**$79,500**		**$109,500**	

Package price discount for 24 months subscription: 5 %

Package price discount for 36 months subscription: 10 %

Proposal is valid until: August 31, 2023

Note: Once a package is selected, please contact ASTERRA sales team for contract and signature processing.