

K9 Water Leak Detection

Tribal Utility Summit 2024

Presented by:

Carrie Kessler, Water Leak Detection Dogs, LLC

Elisa Jones, Walnut Grove K9s

Daniel Levey, Nose on the Ground

Steve Porter, Water Leak Dog Detectives





Meet Carrie Kessler

Owner of Water Leak Detection Dogs, located in the Little Rock Arkansas area

Specializing in training Water Leak Detection Dogs since 2019

Trained the first WLDD in North America, Vessel, owned by Central Arkansas Water.

Have trained 10 other detection dogs since then.

I grew up on a horse farm in Arkansas and became a professional horse trainer and coach. My background in horse training led me to begin training dogs in 2005.

My dog training background includes family pet training and service dog training. In 2011 I began teaching inmates to train dogs in the Arkansas Paws in Prison program. The first five water leak detection dogs I trained received obedience training in the PIP program.

From training dogs for other people, to teaching people to train their own dogs.....



Meet Elisa Jones



- Working in water and wastewater laboratory since 1999
- Ohio Class 3 Water and Wastewater Operator since 2012
- Training dogs since 1996
- Competing with dogs since 2018
- Started scent sport with a dog that I rescued in 2016.
- Worked with Sport Nose work Instructors, Police K9 instructors, Military Instructors.
- Started judging Detection Sports in 2020
- Sport Detection would lead me to training my own dog in water leak detection and developing the H.O.T. Dog program in 2023.





WALNUT GROVE K9S
LEAK DETECTION AND TRAINING



Meet Daniel Levey

- ❖ Deputy Water Operator Town Of Geneseo 13yrs
- ❖ Class C and D New York water operator's license.
- ❖ 30+ years in Heavy equipment involving water Main repairs and installations.
- ❖ Enjoys fixing and solving water loss issues.
- ❖ Trained labrador Retrievers for waterfowl hunting.
- ❖ Trains Dogs With Elisa Jones H.o.t Dog Program.
- ❖ Currently Working Shadow.
- ❖ 1 1/2 year-old American Labrador Retriever.
- ❖ Imprinted on Treated water.
- ❖ Extreme High Drive.



Meet Steve Porter



In 2015, I started Great Companion Dog Training.

In 2019, I helped train dogs for Veterans with PTSD in my county.

In 2023, I trained Splash as a water leak detection dog using the H.O.T Dog program and started Water Leak Dog Detectives

- Association of Professional Dog Trainers
- Certified Professional Dog Trainer - Knowledge Assessed
 - Certification Council for Professional Dog Trainers
 - Bright & Beautiful Therapy Dog Certification Evaluator
- American Kennel Club (AKC) Canine Good Citizen Evaluator

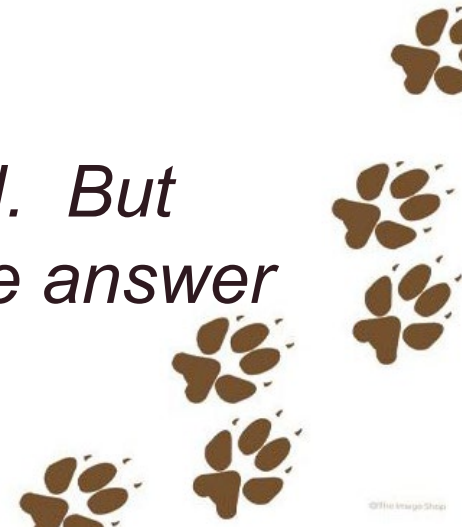
How Much Water Loss?

Non-Revenue Water Loss

- ❖ Average loss %**15-50%**
- ❖ Water that was **filtered, treated and pumped**. But it never made it to the end user.
- ❖ There is a water break in America every **2 mins**
- ❖ **1-2** trillion gallons lost a year
- ❖ At \$5 per 1,000 gals = **10,000,000,000** per year
- ❖ Water loss mostly due to **aging infrastructure**

- ❖ Approx. **2.2 million** miles of water infrastructure in the ground
- ❖ Some pipe as old as 150 years old
- ❖ Replacing **11,000 miles** of pipe per year would take over **200 years**.
- ❖ Household leaks can waste nearly 1 trillion gallons of water annually nationally.

New infrastructure is the goal. But fixing leaks is immediate the answer



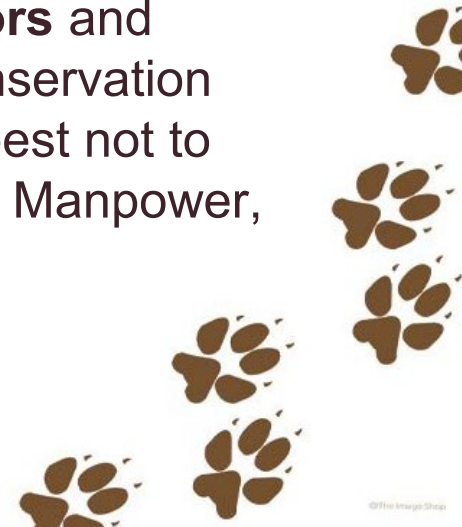
“When it comes to stopping non-revenue water loss every drop counts”

A Worldwide Problem

- ❖ Water Is a **commodity**. (traded like coffee and oil)
- ❖ **17** countries listed as suffering from extreme water stress.
- ❖ This includes the United States.
 - Most recently the Director of IDWR issued an order on May 30, 2024, curtailing ground water rights that pump water from the Eastern Snake Plain Aquifer, in Idaho. This impacted 300,000 acers for farmland The order was lifted June 19, 2024.
- ❖ The cost of water is going up and will **continue to go up**.

Who is responsible?

- ❖ Having access to clean drinking water is a **Human right**.
- ❖ Imposing a cost on water can reduce **excessive** water use.
- ❖ **We as water operators** and stewards of water conservation should be doing our best not to waste our resources. Manpower, electric, water.



The Cost is Going Up!

Rising electricity prices Water and electric don't typically mix, except when you need to pump 80MGPD. Municipalities are one of the biggest user of electricity in America.

New regulations like the **lead and copper** rule will come at a cost. Water services will need to be cataloged, exposed and replaced. The taxpayer is ultimately going to pay the price.

Forever Chemicals past EPA regulations have and advisory at 70 ppt. New regulations will be down to 4ppt. (a few grains of salt in an Olympic swimming pool). The equipment to test and remove PFAS will be a huge cost. Estimated to be \$400 billions dollars. This number is many times greater then then the funding already made available by the federal government

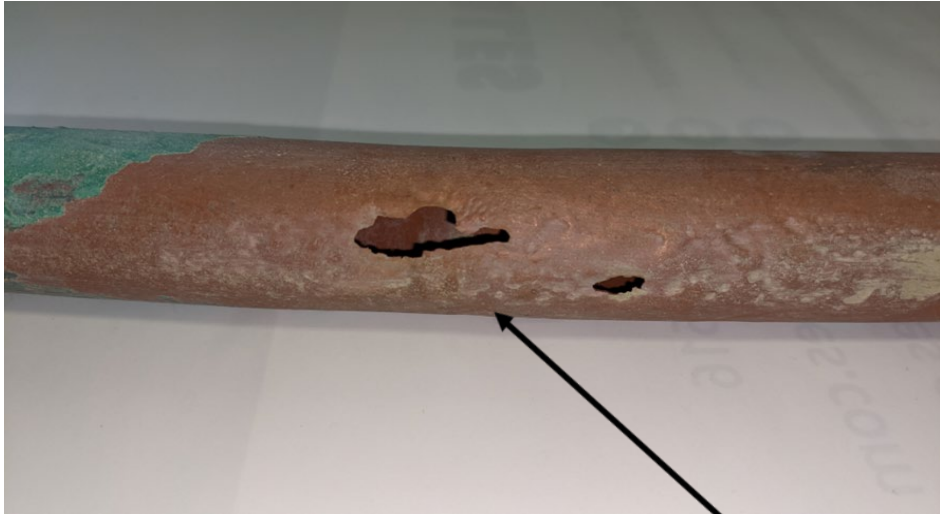


Sink Hole Problems

Sinkholes have both natural and artificial causes. They tend to occur most often in the places where water can erode the bedrock (especially limestone) below the surface causing the overlying rocks to collapse



WHAT IS IN YOUR GROUND?



**1" inch service
lines**



**3" inch
aluminum with
epoxy coating
plastic lined**



SOUND

- ❖ There are many devices that use sound to find water leaks. They work by picking up the sound of water escaping through valves, cracks, holes or joints in the water distribution system.
- ❖ The Big problem with sound is that it is **subjective**. Two people can listen to the same sound and hear something different.
- ❖ Sounds will vary from leak to leak. Leaks will sound different based on.

size of leak- one drop a minute - to 100s of gallons a minute

size of pipe- 1/2 inch to 24 inch and bigger

pipe material- cast, ductile iron, copper, plastic, aluminum etc..

Backfill material- sand, clay, dirt, gravel

pressure- 30 psi -120psi

TYPES Of Leak Detection

Chemical- *Tracing dyes and gases. Example Dye in a toilet*

Pressure- *Low pressure in the system and phone calls from citizens relating to low water flow.*

Sound- *specialized listening devices that can hear leaks and water moving underground*

Thermal imaging and sonar- *able to detect temperature changes in the surrounding area of a leak*

SONOSCOPE

You need to physically contact the water line, valve, hydrant or fixture to listen to a leak. The area must be quite

The results can be subjective. How good is your hearing?

- ❖ Readily available, mass produced
- ❖ Very inexpensive (\$20)
- ❖ No special Training needed
- ❖ No batteries
- ❖ Durable



NOSE ON THE
GROUND
WATER LEAK DETECTION



ACOUSTIC MICROPHONES

- ❖ **Sensitive Microphone**, usually requires a headset (do not turn them up to 11. Your ears will not thank you)
- ❖ **Price Range** \$400- \$5,000. Possibly more depending on the options you choose
- ❖ **Many brands** and options including Aquascope, Fisher Labs and Mueller.
- ❖ **Can be equipped with different adapters.** Some examples are a shaped microphone that is placed on the ground, or a long prod that is pushed into the ground and even a magnet for direct contact with valves and hydrants and pipes.
- ❖ **More expensive models** will offer a analog/digital meter or a computer screen to give a visual of what the microphone is listening to.
- ❖ **Remember sound is subjective.** The meter option will help to bypass this problem but, you still need to be trained in what to look for. When you find a spot that you think might have a leak the device does not say leak found. It is up to the user to interpret the data that is received.
- ❖ **Cost** as much as \$10,000 dollars to properly train someone to be efficient with an acoustic microphone. Travel, teacher, time and gathering real life experience.



NOSE ON THE GROUND
WATER LEAK DETECTION

TABLET SCREEN

Visual data gathering



Headset

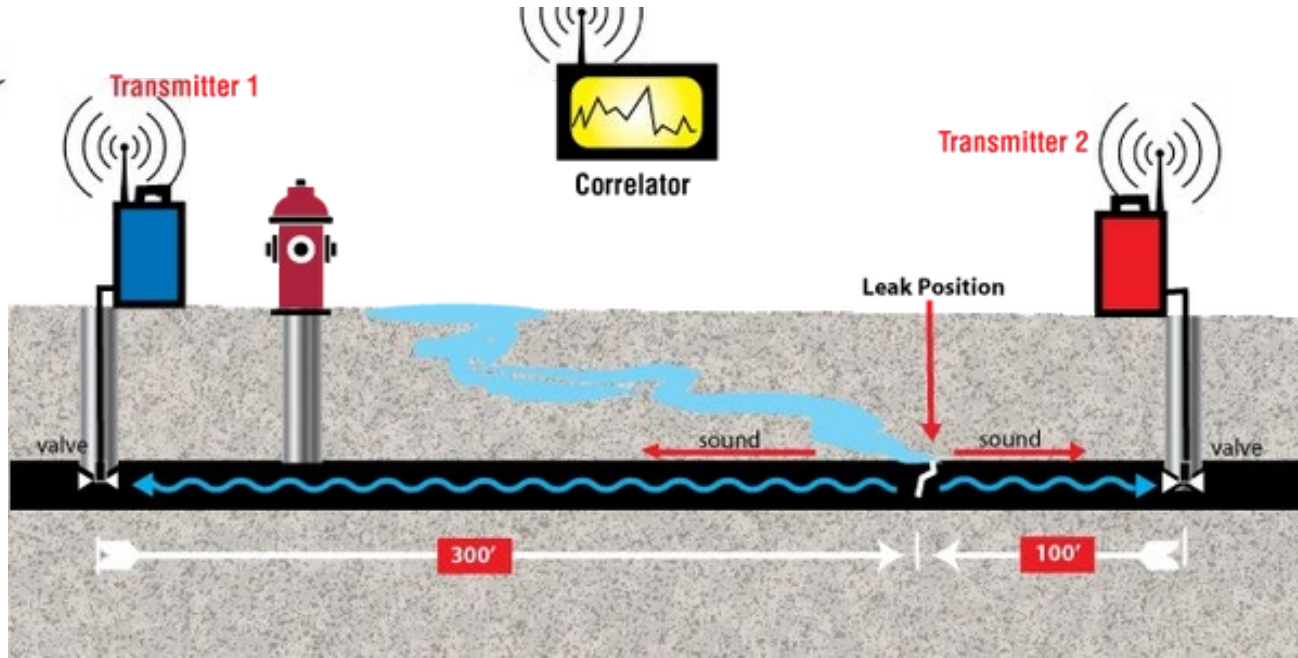
Blue tooth option

MICROPHONE

Sound pick up



Correlators



Expensive \$5,000 and up to let me give you a demo.

sophisticated sensors that communicate wirelessly to each other.

Mostly placed on valves and hydrant

Very sensitive (Do Not Drop)

Require a lot of training and experience

Must input correct data to receive an accurate reading

unknown variables in the search area (size, material, distance)

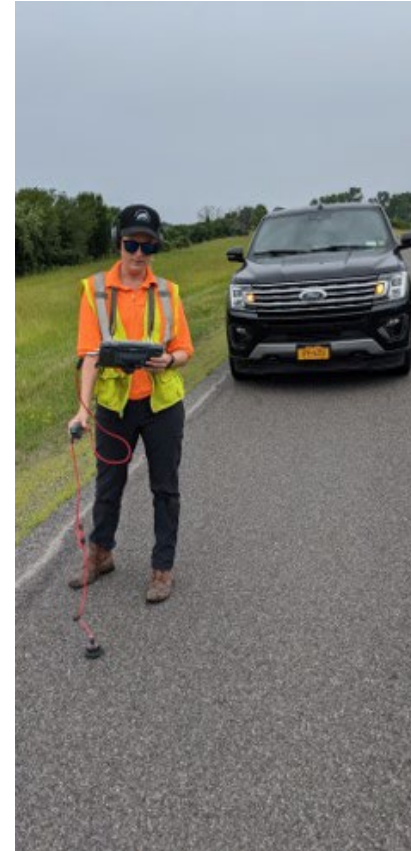
Can struggle with plastic pipe



Problems, Safety and Danger



- ❖ **Plastic Pipe-** More and more plastic pipe is going into the ground. Plastic pipe absorbs the sound of leaks. Sound does not transfer well though plastic pipe.
- ❖ **The weather-** Can make big impact. Wind! Rain! Ice! The noise caused by any one of these can certainly make you give up for the day.
- ❖ **Traffic-** By far the most dangerous and problematic part of leak detection.
 - Can be very frustrating. You can hear cars approaching from a **1/2 mile away**.
 - The **concentration** involved in finding a leak can make it very dangerous to do so.
 - You're often **looking down** to see where you are going and where you will place your microphone.



Be careful and always try to have a look out!



The Industries Answer To Traffic

*On busy roads it is often suggested and common to attempt to **go out at night or afterhours.***

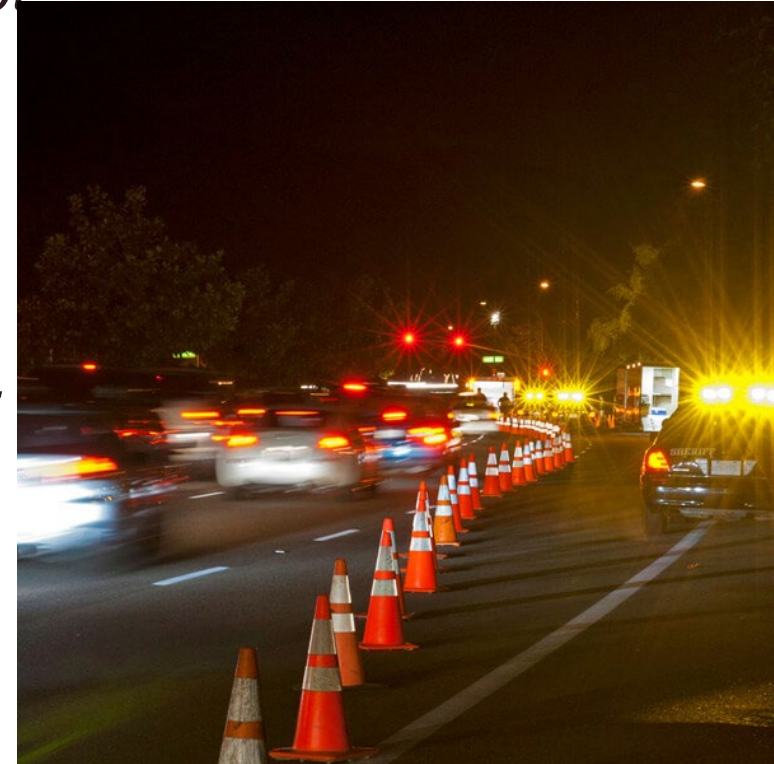
There is less traffic in the evening.

It only takes one car to make this situation dangerous.

Grandpa always said nothing good happens after midnight.

If you have water lines located on the shoulder and in the road use caution.

Example West Lake road Geneseo NY. Winding road, 45-55+ traffic, water line located a few feet under the road in places.



The H2O Leak Detection Dog

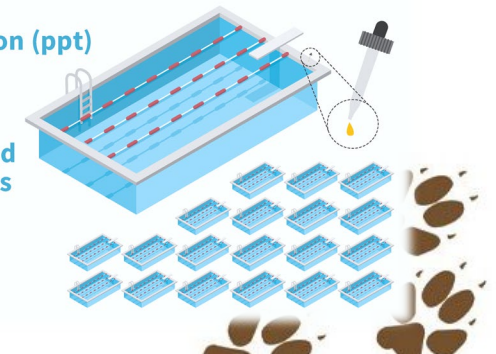
- ❖ Introducing man's best friend the dog.
- ❖ Nature's bio sensor, complementing existing technology
- ❖ E-noses cannot compete
- ❖ A well-trained dog can smell a person from 12 miles away. Dogs can detect its objective 40ft underground.
- ❖ Dogs can smell 1-2 ppt = to 1 drop in 20 Olympic sized swimming pools



1 part per trillion (ppt)

IS EQUIVALENT TO A
SINGLE DROP OF
WATER IN

**20 olympic-sized
swimming pools**

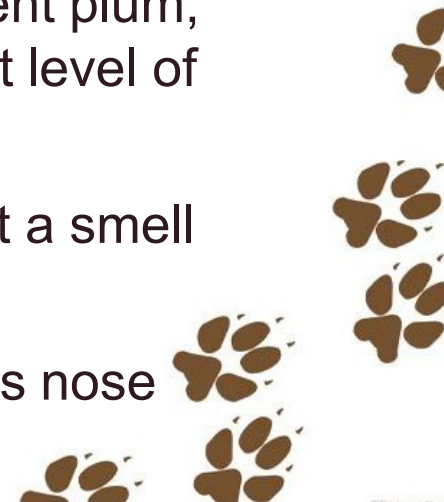




THE DOGS NOSE



- ❖ Dogs have **300 Million** olfactory receptors to locate the Odeur plum from treated water leaks
- ❖ Humans have **60 million** olfactory receptors. We can't even begin to compete with a dog's nose.
- ❖ Once the dog has found the scent plum, they work the area to the highest level of concentration.
- ❖ Dogs can recognize and pick out a smell within a **30th of a mill second**.
- ❖ 40 times stronger than a human's nose



ALL THE BETTER TO SMELL YOU WITH



All the better to smell you with

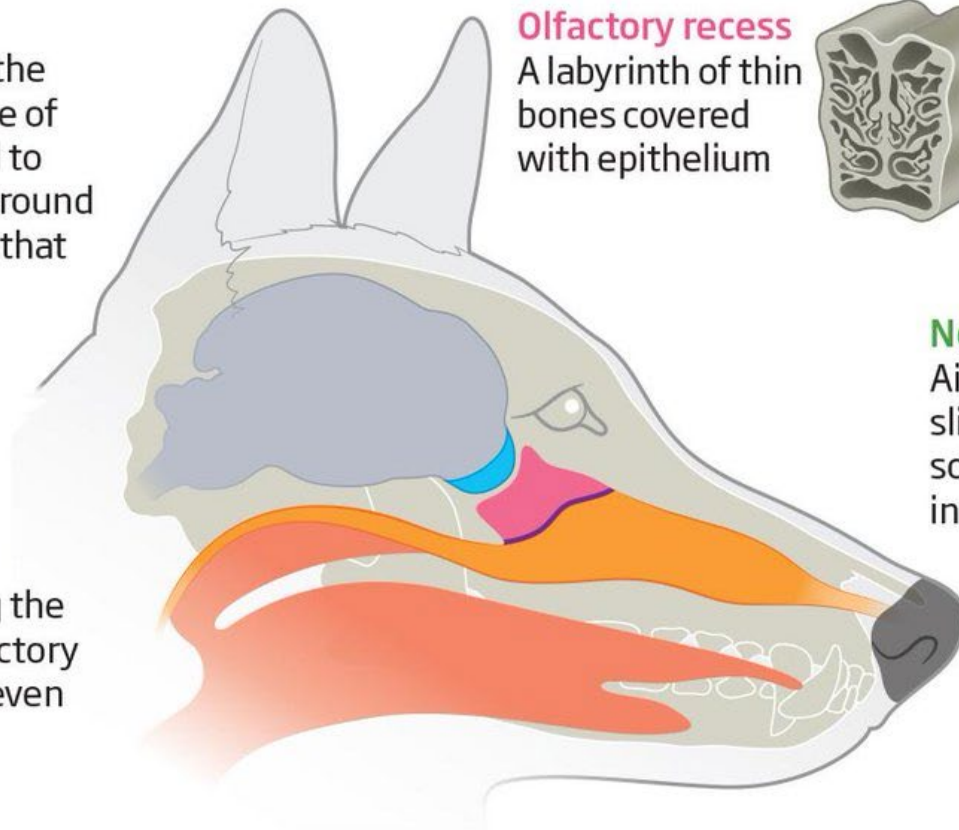
A dog's sense of smell is between 1000 and 100,000 times more sensitive than that of humans, depending on the breed

Olfactory bulb

Processes odours in the brain. The percentage of a dog's brain devoted to analysing odours is around 40 times larger than that of a human

Lamina transversa

This bone separating the main airway and olfactory recess traps odours even after air is exhaled



Olfactory recess

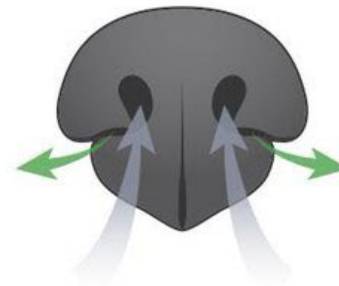
A labyrinth of thin bones covered with epithelium



Home to around 300 million olfactory receptors. The epithelium has a surface area of 150-170cm², compared with just 5-10cm² in the nasal cavity of humans

Nostrils

Air is exhaled through the slits at the side of the nostrils so as not to interfere with incoming smells

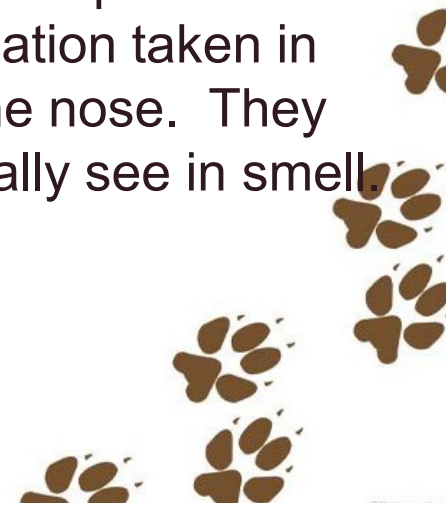


Nostrils can smell independently.

Strong right bias to start sniffing

Switches to the left if the smell is familiar.

They paint themselves a picture with the information taken in through the nose. They can basically see in smell.





K9 Water Leak Detection History

- ❖ **The concept of canine leak detection was first tested in 2017 by Australia's Water company. They conducted a trial with specially trained detection dogs to locate leaks in the underground water mains. The training was done by Steve Austin, an Australian dog trainer who trained dogs to detect different smells for use with feral animal control and narcotics detection.**
- ❖ **Tad Bohannon, CEO of Central Arkansas Water was in Great Britain in 2018 when he heard about a leak detection dog at United Utilities. He learned as much as he could about the dog and the concept and brought it back to central Arkansas.**
- ❖ **Central Arkansas Water began the hunt for a dog. Vessel, a black lab mix was identified as a star student in the Arkansas Paws in Prison program and was recommended to Central Arkansas water as an ideal candidate. Her specialized training to detect water distribution leaks was provided by local trainers Carrie Kessler and Tracy Owen.**

WHY CHOOSE A H2O LEAK DETECTION DOG?



WALNUT GROVE K9S
LEAK DETECTION AND TRAINING



❖ Plastic Pipes – NOT A PROBLEM

They are not listening for anything other than a “good boy” when they alert to a water leak.

❖ Untreated Water - NOT A PROBLEM

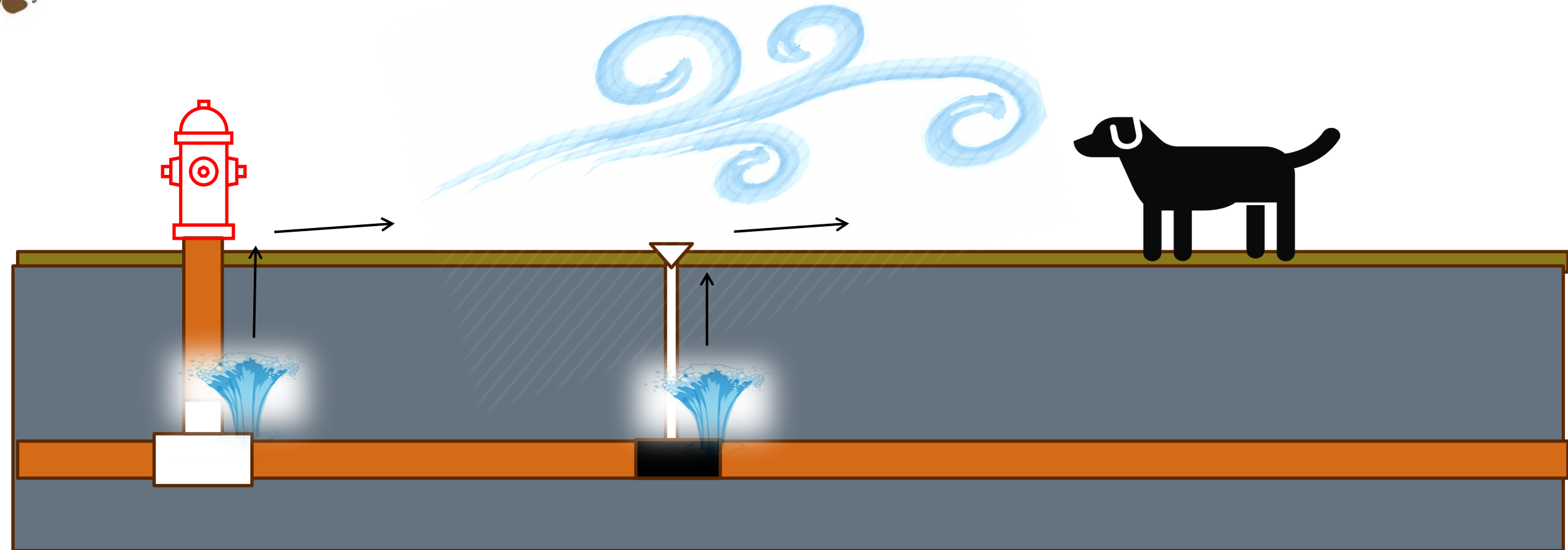
They are trained to sniff out treated water. Suspected wet areas can be cleared by a leak detection dog.

❖ Weather – NOT A PROBLEM

A dog with the right gear can also detect leaks in rain, wind and snow, putting traditional leak detection equipment back on the shelf.



THE UNSEEN WATER LEAK



Where Did My Leak Go?



Water finds the path of least resistance. It can run through cracks in the underlying bedrock only to surface several hundred feet or yards away.

Frustrated Homeowners, Oh My...



Homeowner is having water loss, enough for them to call a national leak detection company.

They searched for 2 WEEKS with NO success.

The owner of the leak detection company called and asked us to come search. It took the 2 dogs a total of 15 minutes to find the leak.

The leak was 3 ft below ground in a retaining wall and the acoustical equipment could not locate the leak.



Who Put The Fire Out???



- 80 Acres of Greeting Card Warehouse
- 2 Miles of Leaking Fire Suppression System
- Loosing 60,000 gallons of water per week
- A National Leak Detection Company would not quote the job because they felt like it was too BIG
- They called in the DOGS
 - 3 dogs searched independently
 - All 3 dogs indicated on the same 5 spots
 - All 5 spots were confirmed after digging
 - Total search time = 2 hours



Homeowners In Panic



A whopping \$1600 water bill left an Arkansas homeowner in panic.

They knew they had a water leak! What do they do now? They knew they were going to have to dig, but where do they even start?

Their irrigation guy recommended the traditional leak detection route and gave them some options. At the end of our conversation, he stopped and said off handedly that he did have a customer that had used a dog. The irrigation guy said that they were incredibly impressed with the accuracy and efficiency of the dog. He unfortunately had no idea who it was. I was totally intrigued! After some research, I was able to track down Carrie Kessler and Water Leak Detection Dogs, LLC.

Carrie and her team of 3 dogs came out on a Wednesday morning. Now I just figured that they would bring one dog and it would take them most of the day, but boy did they come ready to work. Work they did and in just a very short time they had pinpointed my leak.

City Of Oxford, Ohio Case Study



WALNUT GROVE K9S
LEAK DETECTION AND TRAINING

- The water started seeping from the hillside about eight years ago.
- Chief Operator of the plant did not want to investigate. No one knew anything about the old treatment plant.
- The Story says that in the '90's during the construction the EQ tanks the old operator's building was found buried.
- The story goes on to say that "It looked like they left for the night and just buried the building in the morning, documents, furniture and all".
- Water was tested for fluoride at the time and the test was inconclusive. Fluoride was detected but not in high enough levels to act.
- The flow increased in the winter of 2023.
- Water was tested again in the spring and the levels of fluoride increased significantly.
- There was talk about a potential dedicated 4" line to the old plant which was behind the houses.
- investigations turned towards the history of Juniper Hills Subdivision which started in 1957 and had a second phase built in 1970 when the current plant was built.
- In June of 2023, a leak detection dog was called in and had two hits, one in the area of the treatment plant (determined after aerial photos were found) and one in the area of the old 4" line that no one knew about.
- OUPS was called.





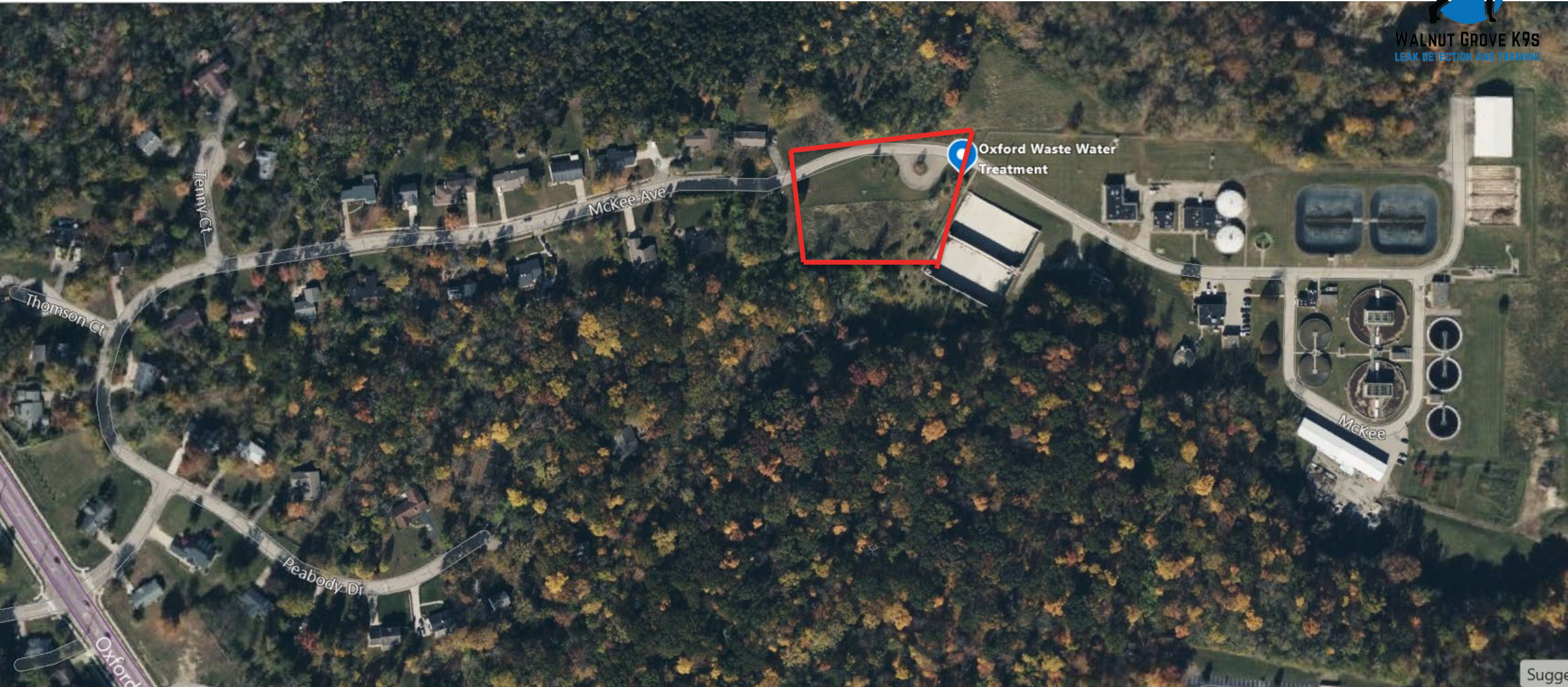
WALNUT GROVE K9S
LEAK DETECTION AND TRAINING



OXFORD WASTEWATER TREATMENT PLANT 2024



WALNUT GROVE K9S
LEAK DETECTION AND TRAINING

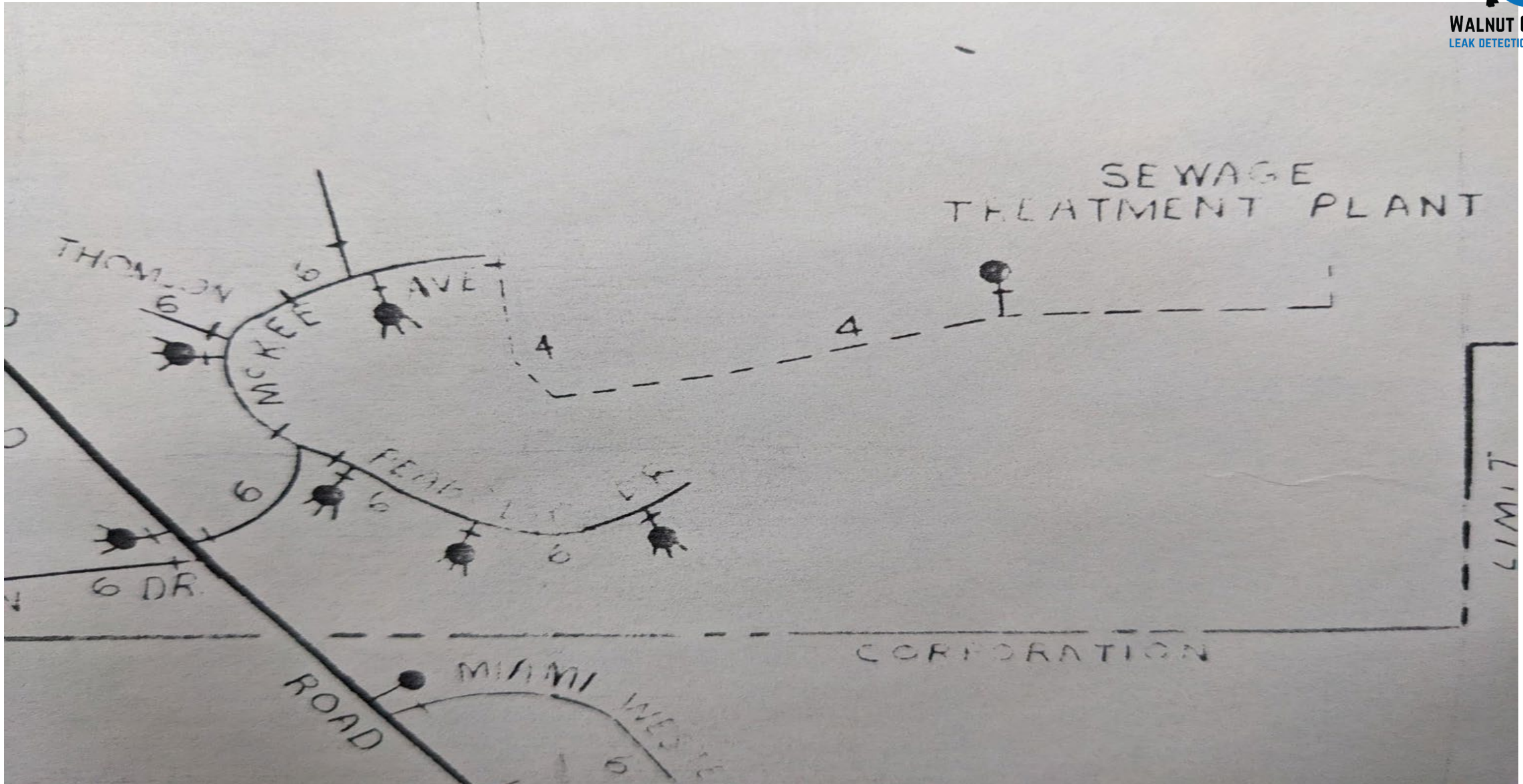


Sugg

Juniper Hills Subdivision, Oxford Ohio



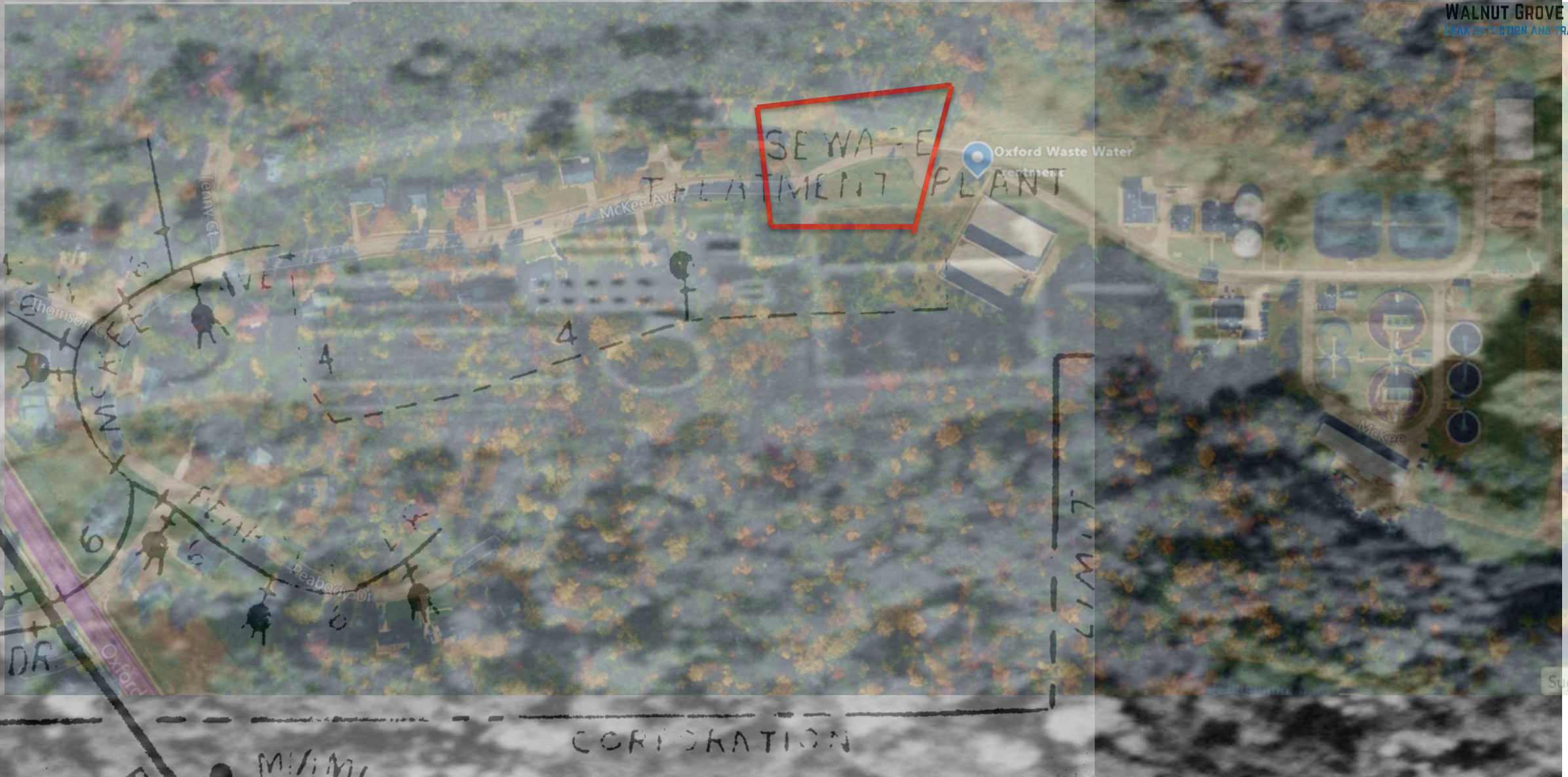
WALNUT GROVE K9S
LEAK DETECTION AND TRAINING



Oxford Wastewater Plant Circa 1956



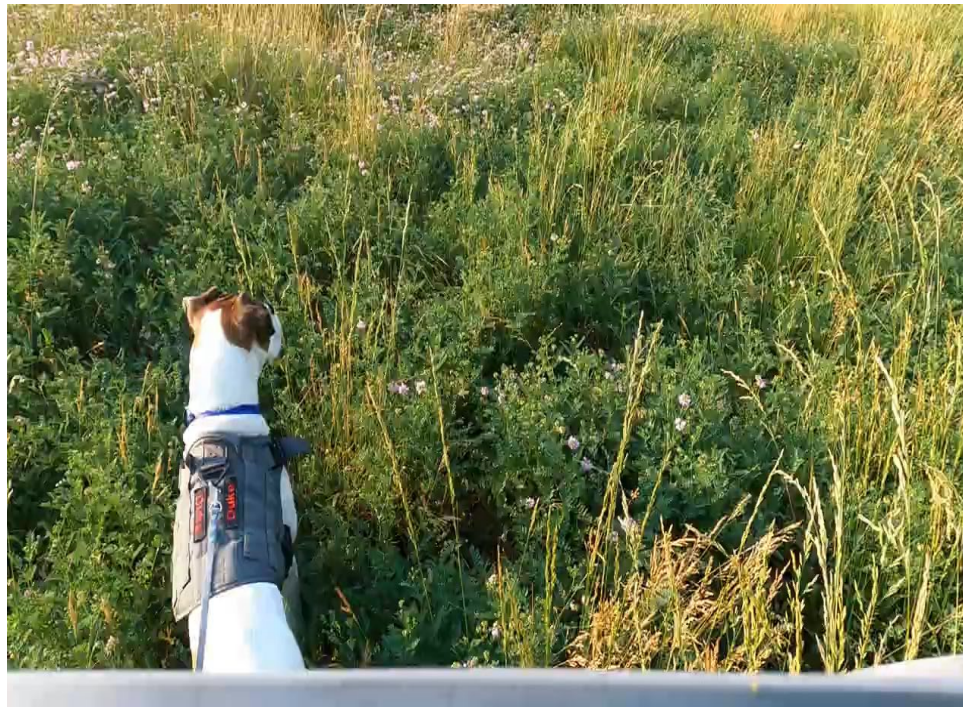
WALNUT GROVE K9S
LEAK DETECTION AND TRAINING



Sugge



The Search



The Excavation

- ❖ Moving water was discovered at the first location where Duke indicated 6-8 feet deep
- ❖ Moving water was found in what looks to be an old wastewater tank



LEAKING VALVE



NOSE ON THE
GROUND
WATER LEAK DETECTION

Alert On Vault



Findings





PUBLIC RELATIONS

Choosing a dog or a dog/handler team to join your municipality is a great way to put a face on your water department.

The Public might not remember the person that turned the water off to the entire town during a catastrophic water break last weekend. However, you can be sure they will remember meeting the canine water leak detection team that walked through the neighborhood. Especially, when they learn that the K9 is helping to combat rising water cost and saving the utility and its customers money

They are great ambassadors for water conservation, and it shows the public that you are being proactive with water loss.



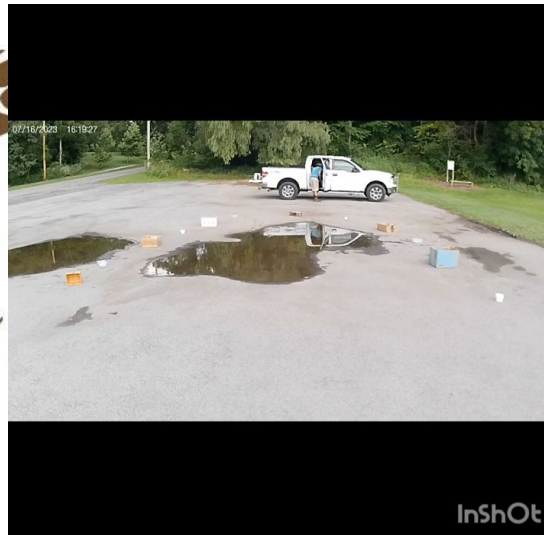
The H.O.T. Dog Program

Is a remote **H**andler **O**wned **T**rained Program that I developed in 2023
It gets you and your dog working as a team in the Water Leak Detection field.

From the first day of training until well after you have completed the course, I am there helping, guiding and cheering you on. The lessons are customized to meet the needs you and your dog.

No dog or human is the same.

We want your team to succeed.



Current H.O.T. Dog Graduates

Sam Copeland – Mr. Gibbs

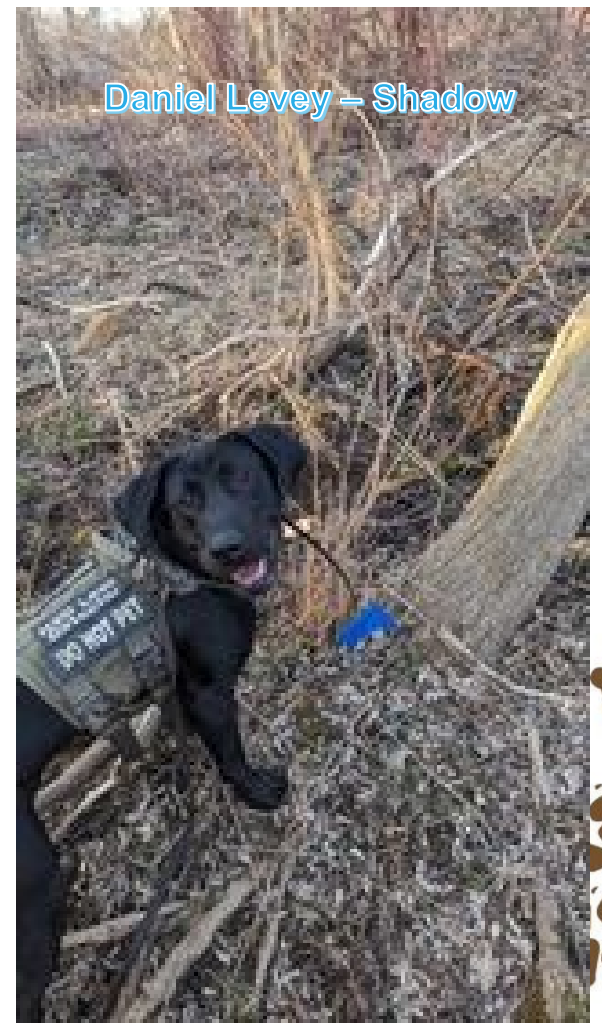


Mindy Eddins – Delta

Steve Porter – Splash



Daniel Levey – Shadow



WE CAN TRAIN A DOG FOR YOU



So, you have decided that a H2O Leak Detection Dog is right for your Business or municipality. We can help select a dog and train the dog for you. When we train for you, you will be certain that your pup is on the right path to success!

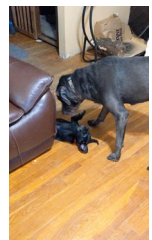
The Perks



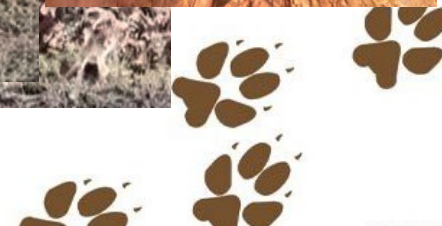
Drive Test



Dog Vs D8



Socialization

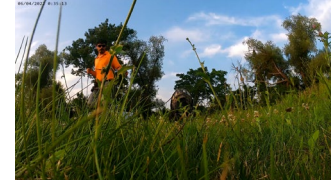


K9 Water Leak Detection Is A Team Thing



- ❖ The handler and dog are learning how to solve complex problems.
- ❖ Is the handler trying to help the dog?
- ❖ Does the team that I am working with have the patience and tenacity to complete all the exercises.
- ❖ Are they doing the series of exercises as outlined?
- ❖ Is the handler adjusting to what the dog is doing?
- ❖ Is the handler influencing the dog?
- ❖ If I, as the trainer, and you as the handler, have done our jobs correctly, we will have created a way for the dog to communicate to the handler and a way for the handler to understand what the dog is saying.
- ❖ We will have also developed proficiency and reliability that can be duplicated with speed and accuracy
- ❖ We will know that when we have the dog on the street, and we tell them to “find the leak” that they will give it all they have to find the leak if there is one.

FINDING THE RIGHT LEAK DETECTION DOG



Nose

What makes a good leak detection dog?

The environmental soundness of the dog...

Is the dog taking in the world with its nose?

Is the dog curious?

Is the dog too shy?

What is the dog afraid of-Cars, Trucks, heavy equipment, Loud noises, People, High grass, Water, Wet grass, rain, Slick surfaces

It is easier to bring high energy dog down than to bring a low energy dog up.

Is the dog trainable?

Does the dog want to learn?

Is the dog good with people and children?



Drive!!

What BREED OF DOG?



- ❖ What breed of dog makes a good detection dog?
- ❖ The best breed for the job is the breed that is happy to work every day. This the dog that you want by your side.
- ❖ A dog that not only has the behaviors but the cognitive ability.
- ❖ A dog that is well socialized and temperamentally sound.
- ❖ A dog that is physically able to do the work.
- ❖ A Papillion or a Chihuahua while they may have the drive and are happy to do the work, they might not be physically able to do the work. Walking miles a day is probably not realistic for that breed.



Current Working Teams



- **Vessel – Central Arkansas Water**
- **Charlie – Aqua Water Corporation - Texas**
- **Flo - Smith Engineering - Arkansas**
- **Guage - Rye Engineering - Tennessee**
- **Jubel – Aqua Terra - Chicago Illinois**
- **Kona – Bama Leak Detection - Springville Alabama**
- **Piper and Draeger – Owned and Handled by Janet Donnelly in Oklahoma**
- **Snowi – Owned and handled by Carrie Kessler (Leak Detection Dogs) - Arkansas**
- **River – Owned by Mansfield Water - Texas**
- **Keena - Owned by DelCo Water - Ohio**
- **Shadow - Owned and handled by Daniel Levey (Nose on the Ground Water Leak Detection) - New York**
- **Duke – Owned and handled by Elisa Jones (Walnut Grove K9s) – Ohio**
- **Splash – Owned and handled by Steve Porter (Great Companion Dog Training) – New York**
- **Delta – Owned and handled by Mindy Eddins (BoonDock Sheps) – North Carolina**
- **Mr. Gibbs – Owned and handled by Sam Copeland (Go Go Water Inspector) - Tennessee**



To Search or Not to Search

- When you have a canine partner, you are their advocate. You must determine...
- Is it safe for me to bring out the dog?
- What are the hazards?
- Can my dog navigate the current conditions?
 - Snow
 - Wind
 - Rain
 - Temperature
 - Heat
 - Humidity
- Do you as the handler have the ability to navigate the same conditions?



Summing It Up

- **Municipalities are growing....more people, more housing. People want safe drinking water.**
- **It is becoming more and more expensive to treat water and get that clean safe drinking water to the customer.**
- **Household budgets are tight.**
- **Water Department budgets are tight.**
- **Utilities and municipalities must explore every way to reduce the non-revenue water loss.**
- **The dog is not a tool to be put in the toolbox to be brought out when you need it, rather it is the face of the water department, out on the street looking for the non-surfacing water main breaks.**
- **The dog is your partner, working alongside all the other acoustical, chemical, satellite and pressure equipment .**





Give Us A Call

- ❖ Presentations and Demonstrations
- ❖ Area Searches
- ❖ Short distance searches hydrant to hydrant
- ❖ Long distance searches, transmission lines, complete districts



What Have We Learned?



1. What is a benefit to having a dog join your team or municipality?

Dogs are swift and accurate, they have unmatched olfactory sensitivity, they are cost effective, and they put a face to your water department

2. How does the dog locate a water leak?

The dog's heightened sense of smell can distinguish between ground water, treated water and wastewater, which provides a level of leak detection that surpasses some of the most experienced human crews. Even when the leak is not surfacing.

3. What kind of dog can I use for H₂O leak detection?

Any dog that has drive and wants to play this game with us. All dogs love to use their nose.

Our Trusted Partners



Discover an Innovative Solution:

Unleash the power of our expertly trained K9 team to revolutionize leak detection for your utility company's distribution system. Our exceptional canines are equipped to swiftly pinpoint both surface and subsurface leaks, offering unparalleled accuracy and efficiency.



K9 Leak Detection Services

Swift and Accurate

Our K9 units excel in rapid and precise leak identification, minimizing downtime and reducing potential damage.

Unmatched Sensitivity

Benefit from our canines unparalleled olfactory sensitivity, ensuring detection of even the faintest traces of leaks.

Cost-Effective Solution

Opt for a more efficient and cost-friendly approach to leak detection, maximizing your utility company's resources.

Contact us today

To explore how our exceptional K9 leak detection services can elevate your distribution system's integrity and performance.



A Sensory Marvel:

The extraordinary advantage of harnessing trained canines for leak detection is rooted in their remarkable olfactory prowess. Their heightened sense of smell enables them to differentiate with precision between ordinary groundwater and treated water seeping from distribution systems, providing a level of detection that surpasses traditional human crews.



Boon Dock Sheps
Southern East Coast



GO-GO WATER
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CANINE LEAK DETECTION..LLC
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Bring a K9 Leak Detection Team to your Water Department?

For immediate assistance with locating *water leaks*, demonstrations, presentations, training and questions please call



WALNUT GROVE K9S
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NOSE ON THE GROUND
WATER LEAK DETECTION



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