

Sniffing Out Sources of Stormwater Pollution

*Using Canine-Assisted Screening
to Find PCB Sources*

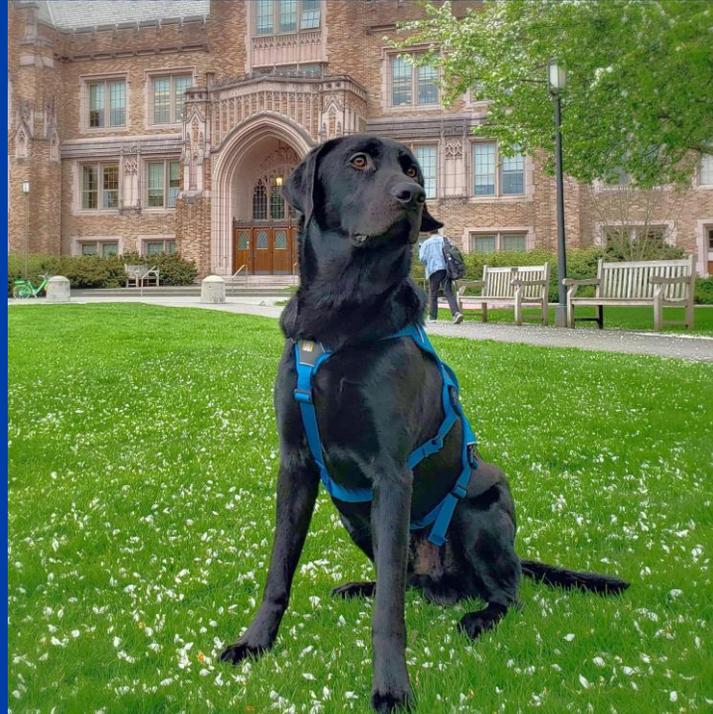
Julianne Ubigau



FieldLab
Company Founder &
Canine Handler



Jasper



FieldLab
Super Sniffer

Jess Huybregts



Seattle Public Utilities
Stormwater Permit Manager



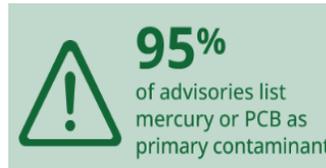
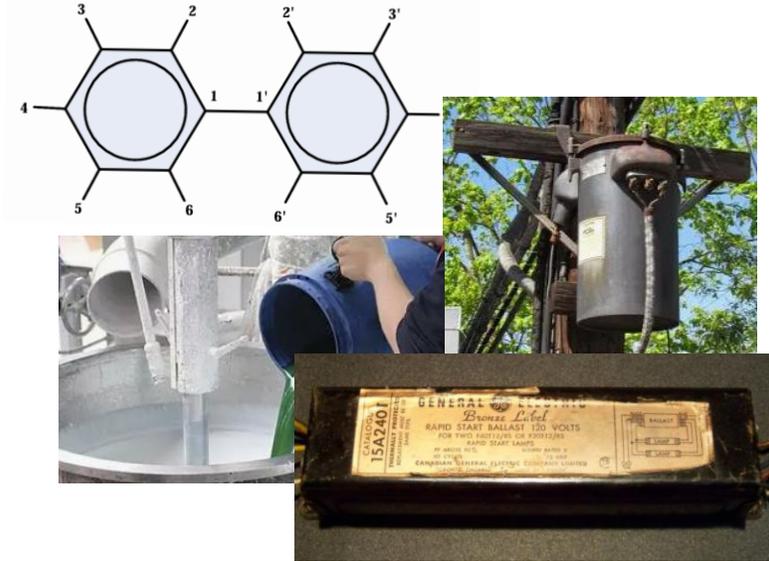
Polychlorinated Biphenyls (PCBs)

- **What are PCBs?**

- Synthetic compounds, usually sold as liquid mixtures (“aroclors”)
- Non-flammable, chemically stable, electrical insulating
- Manufactured in USA from 1929 until 1979, when banned under TSCA

- **Impacts:**

- Persistent, Bioaccumulative and Toxic (PBT), carcinogenic
- PCBs drive sediment cleanup sites, fish/shellfish consumption advisories
- 400+ PCB impairments in WQA



LOWER DUWAMISH RIVER ADVISORY

DO NOT EAT crab, shellfish, or bottom-feeding fish due to high levels of toxic chemicals.

EAT SALMON ONLY. Limit: 1-4 meals per month.

EAT SALMON ONLY. 8-12 meals per month. It's the healthiest choice.

Washington State Department of Health
Toll-free 1-877-485-7316 • www.doh.wa.gov/fish

Finding PCB Sources in Seattle

- Extensive experience in PCB source identification and tracing
- **Building materials** are a remaining exposed PCB source
 - PCB mixtures commonly added to various building materials 1950-1980

Paint

Varnishes, lacquers, resins

Joint materials

- Wall panel, window and door caulk
- Putty, grout, sealants
- Concrete floor joints

Electrical cable jackets

Pipe coatings

Galbestos siding and roofing



- Stormwater and drainage systems can convey PCB-containing materials
- Evidence in stormwater & storm drain solids samples



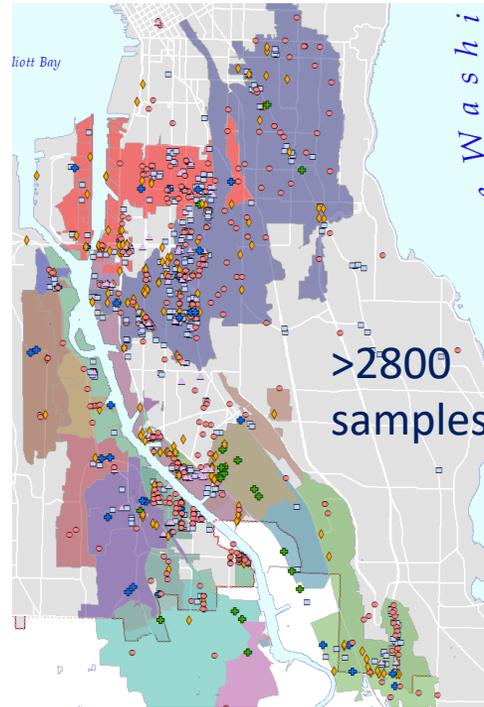
Traditional PCB Source Tracing Approach

Storm drain solids sampling

Grab samples (CB, MH)



In-line sediment traps



- **Strengths:**

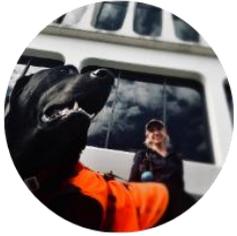
- Analytical, data-driven
- Helps prioritize sub-basins to investigate further
- Consistent data allows for trend analysis

- **Limitations:**

- Hard to pinpoint when multiple PCB sources in basin
- Contingent on sufficient solids to run analysis
- Expensive (~\$300) and slow

In 2015, SPU began investigating **alternative tools to complement the traditional approach...**

A New Tool for PCB Source Tracing

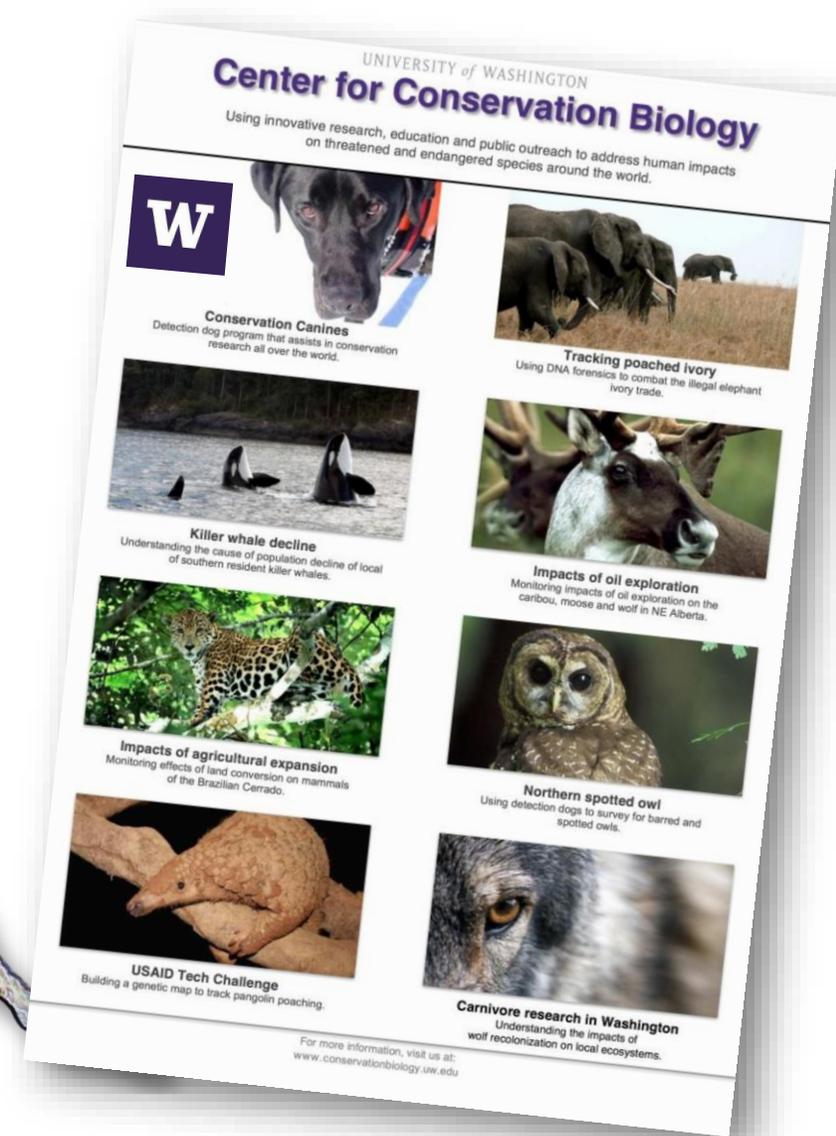
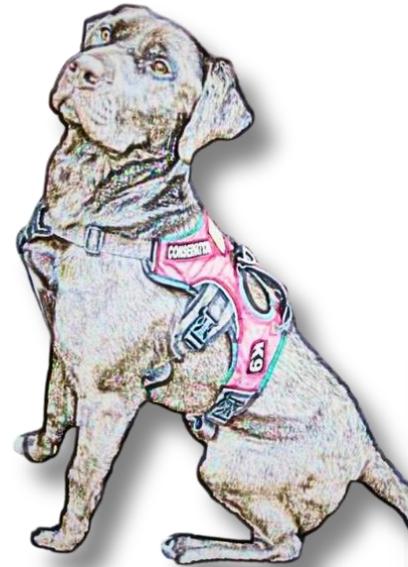
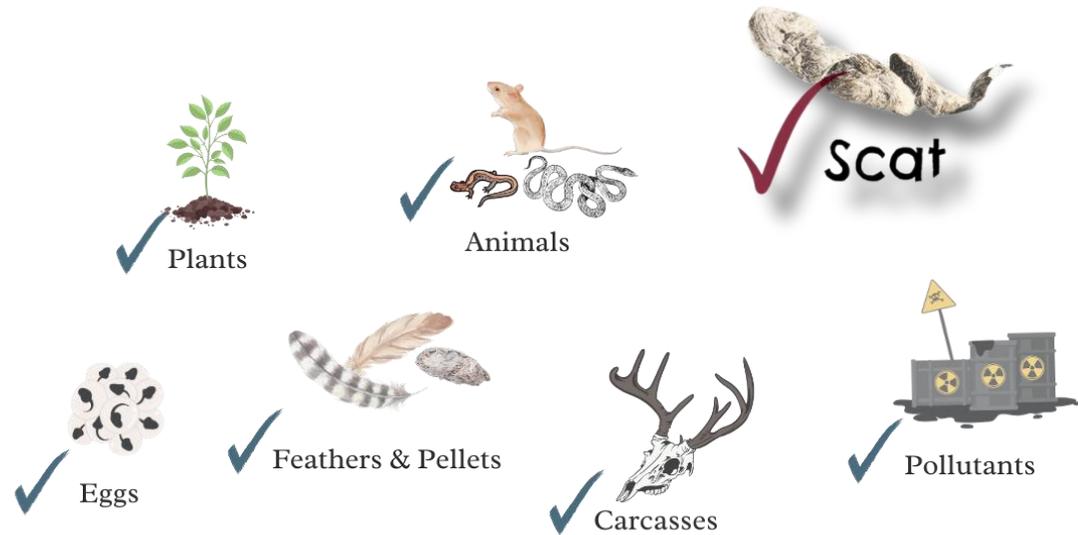


Detection Dogs in Conservation



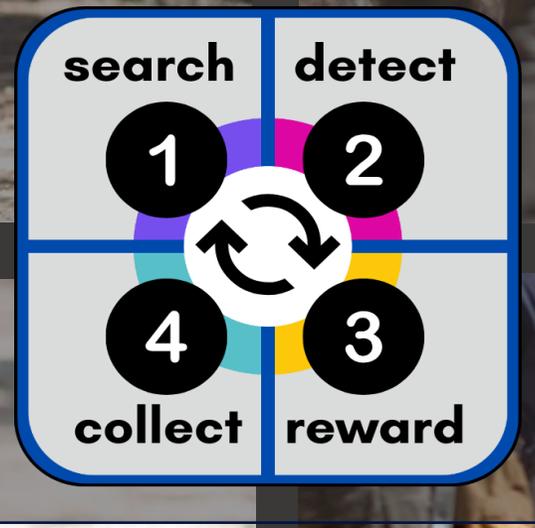
Conservation Canine Program University of Washington

Wildlife monitoring, plant, and pollutant detection





Detect and Collect



Detect and Record



Lookout tower, CJM on 5 seams

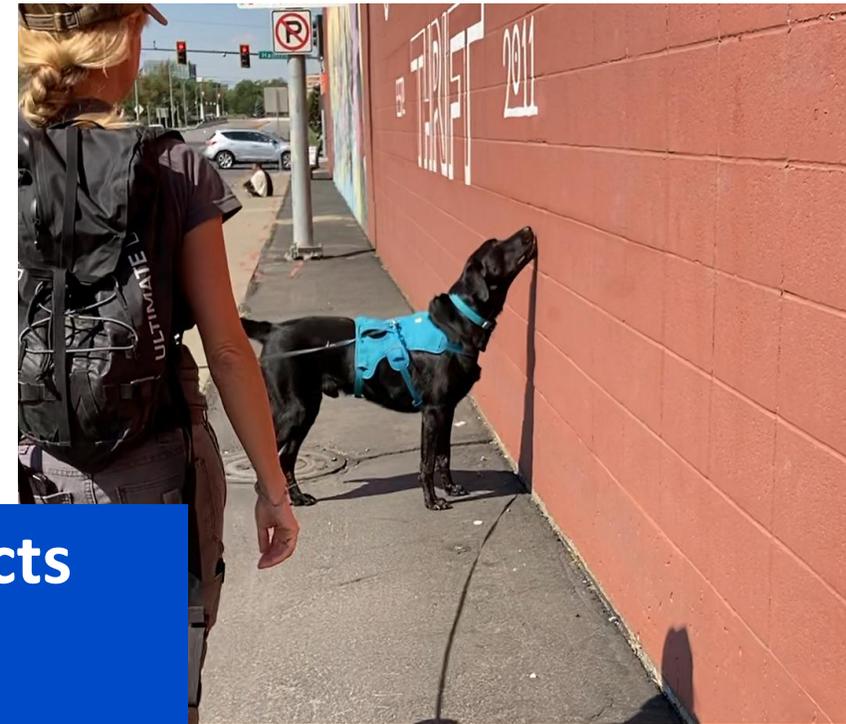
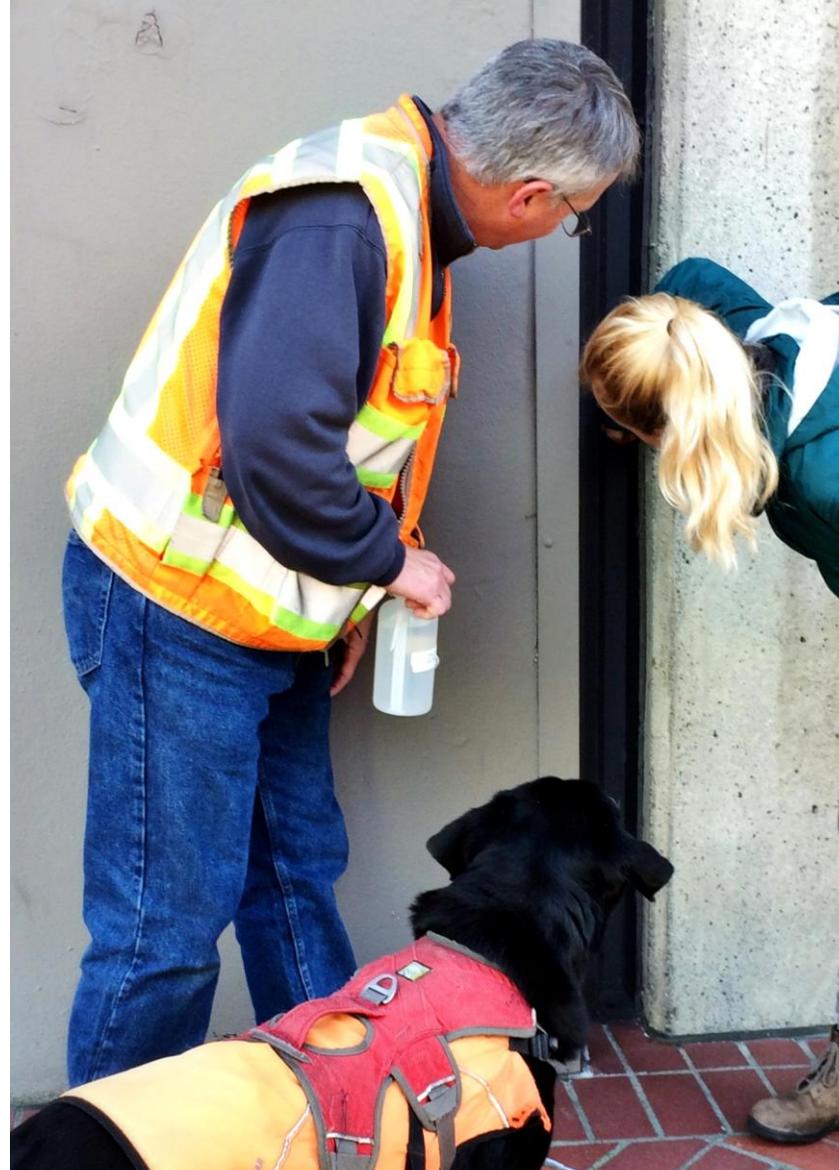
Caulking (concrete-paneling seam)

CJM, S side of bay (double seam)

Symbology

- very high confidence detection
- medium confidence detection
- low confidence detection

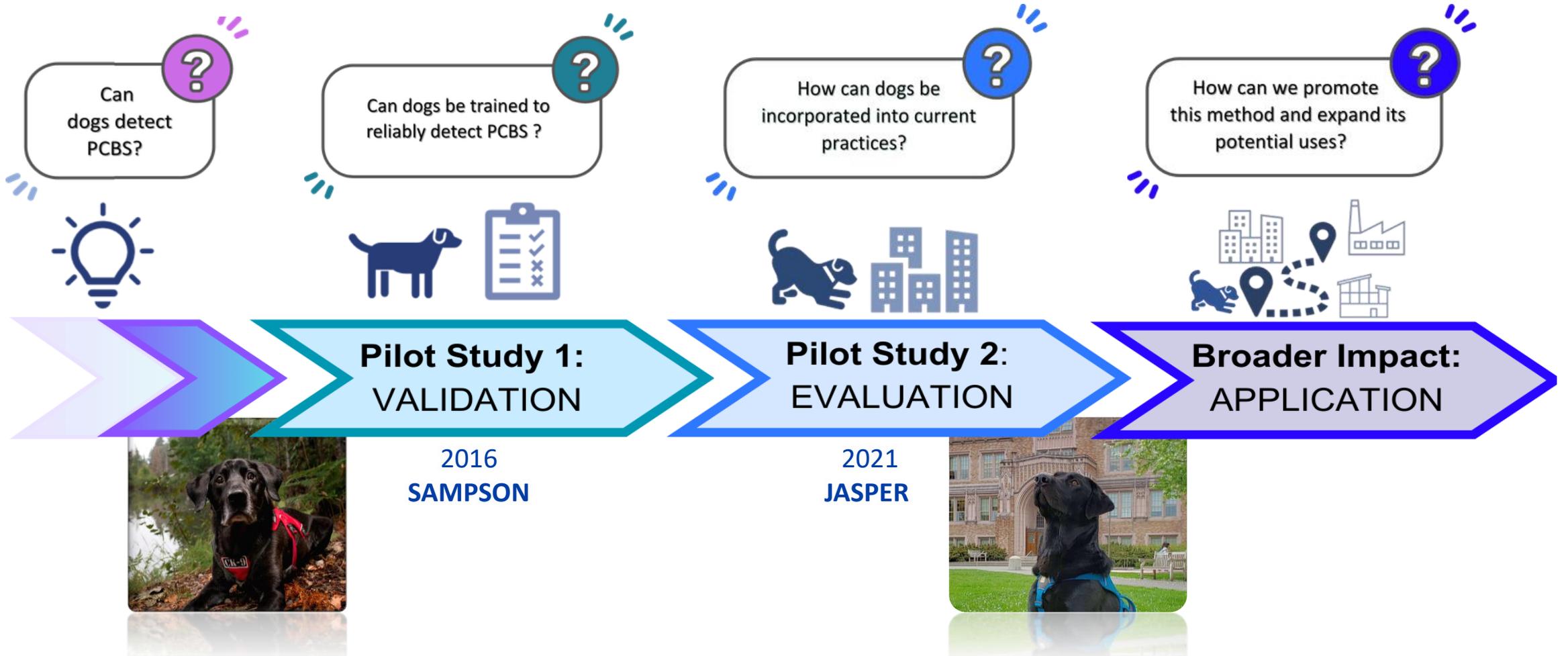




**PCB Detection Dog Pilot Projects
with Seattle Public Utilities**

PCB detection Pilot Projects

University of Washington & Seattle Public Utilities



Training



Train



Control Aroclors



PCB material

Testing



Test



Bench testing



Field testing

Canine Screening



Screen



Confirmed PCB sites



New PCB Sites

Evaluate



Evaluate



Identify material



Odor confirmation?

Report



Report



Record data



Report Findings

Control Testing Results

Pilot Studies 1 & 2

Control Testing



Bench testing



Field testing

Control Testing Results	Pilot 1 (Sampson)	Pilot 2 (Jasper)
Bench Testing	95/96 (98.9%)	22/23 (95.6%)
Field Testing	11/12 (91.7%)	10/11 (90.9%)

* All control and field tests were blind for dog and handler

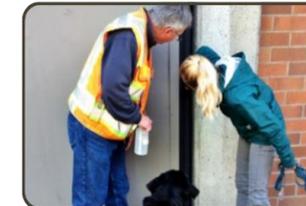
Field Testing Results

Pilot Study 2

Field Testing



Confirmed PCB sites



New PCB Sites

Detectability in Various Conditions

PCB Concentrations

• > 1,000 ug/kg	✓
• 100 – 1,000 ug/kg	✓
• <100 ug/kg	✓-

PCB Aroclor interchangeability

• 1242, 1248, 1254, 1260	✓
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Material Make-up

• Caulking	✓
• Paint	✓-
• Transformer Fluid	✓

Property Conditions

• Site access secured	✓
• At property fence line	✓

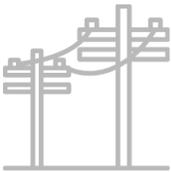
Field Conditions

Optimal conditions for detection dog screening:

- Moderate temperature (50-70 degrees F)
- Mild wind
- Access to site
- Material sources present (caulking, paint, etc.)



Pilot Study Phase 2 Findings: Detectability of PCBs in Various Conditions

	Canine detectability	Detectable by human?	Detection/Behavioral Notes	
	PCB Concentrations			
	> 1,000 ug/kg (ppb)	high	possible	High levels can overwhelm canine in some conditions. Pinpoint
	100 – 1,000 ug/kg (ppb)	high	unlikely*	Change of behavior notable by handler. Canine accuracy dependent on source material.
	<100 ug/kg (ppb)	moderate	no	Canine accuracy is dependent on the source material. Pinpoints possible for building materials such as caulking.
	PCB Aroclor interchangeability			
	1242, 1248, 1254, 1260	high	possible	Canine is able to generalize all PCB odors, including inadvertent PCBs (iPCBs).
	Material Make-up			
Caulking	high	possible	Dog able to pinpoint target. Target material easily identifiable by handler. Odor detectable to human.	
Paint	moderate	no	Pinpoint less clear. Dog shows interest in entire surface area, or at base of building. Handler guidance /interpretation important.	
Transformer Fluid	high	possible	High pcb concentrations make canine detection very useful. Odor often detectable by humans, but sampling locations can be impossible to determine.	
	Property Conditions			
	Site access secured	high	possible	Access to building/site allows dog to work into source target, increasing confidence of detection and identification of source material.
	At property fence line	Moderate	possible	Highly dependent on wind, temperature and concentration variables. Dog may detect odor on the wind but reliable alert is less likely without closer investigation (pinpoint).

*From PCB Detection Dog Phase 2 Report, Seattle Public Utilities, 2022

Targeted Sampling

Increased efficiency
Better coverage
No blind sampling
Source identification

2014

42 samples collected



2016

18 samples collected

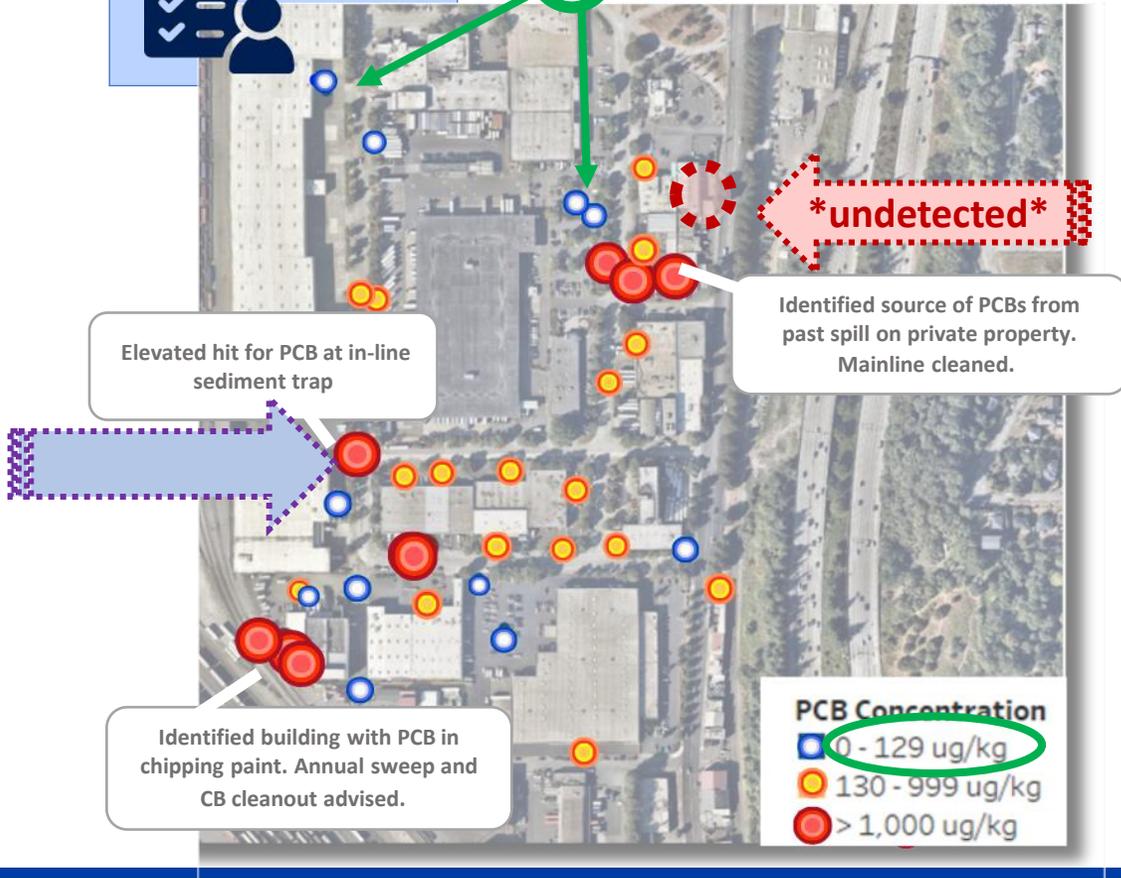


A Comparative Look

NO DOG

2014

42 samples collected



WITH DOG

2016

18 samples collected

No blind sampling



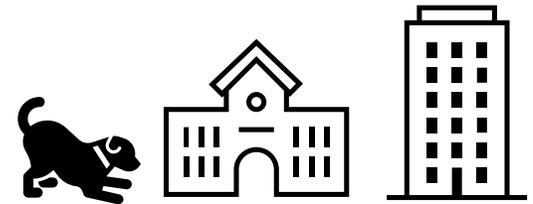
Seattle's Recent PCB Detection Dog-Supported Work



Targeted Investigation to
Pinpoint Source/s



Post-Cleanup
Verification



Building-Specific Screening
to Determine BMPs



Targeted
Investigation

T-117 Upland Area – South Park



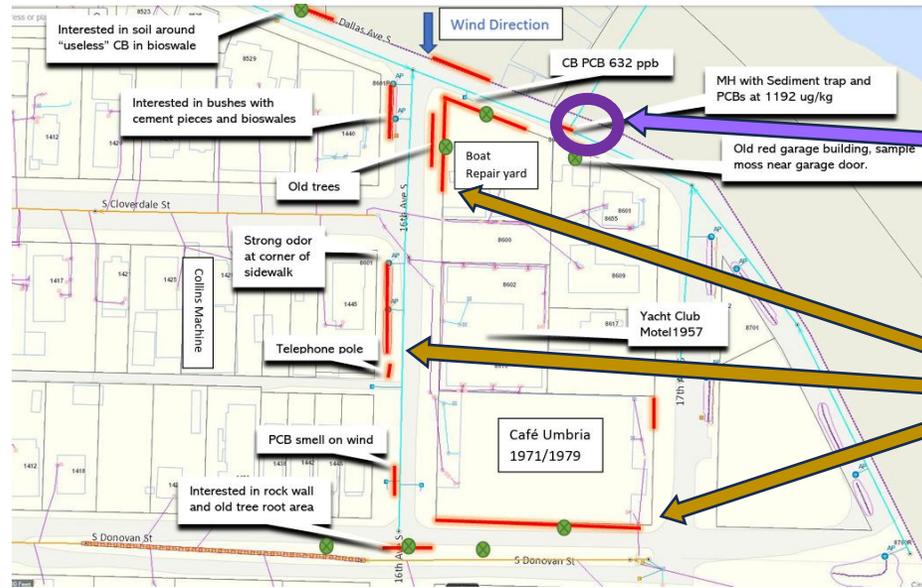
- 2015 - City excavated streets and yards contaminated with PCBs



- Cleaned drainage system
- Installed sediment trap in stormwater pipe near outfall



Targeted Investigation



- 2022: Elevated PCBs in sediment trap
→ Intensive source tracing response
- Deployed PCB Detection Dog



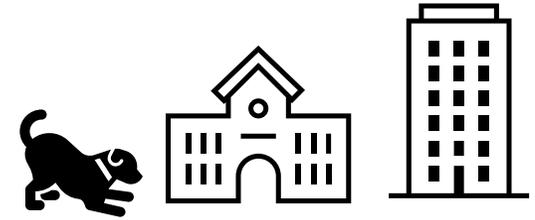
- Jasper interested in soil around tree
- Sampling confirmed PCBs present



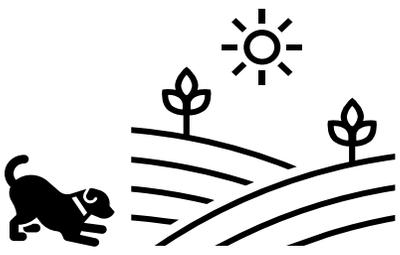
**Targeted Investigation to
Pinpoint Source/s**



**Post-Cleanup
Verification**



**Building-Specific Screening
to Determine BMPs**

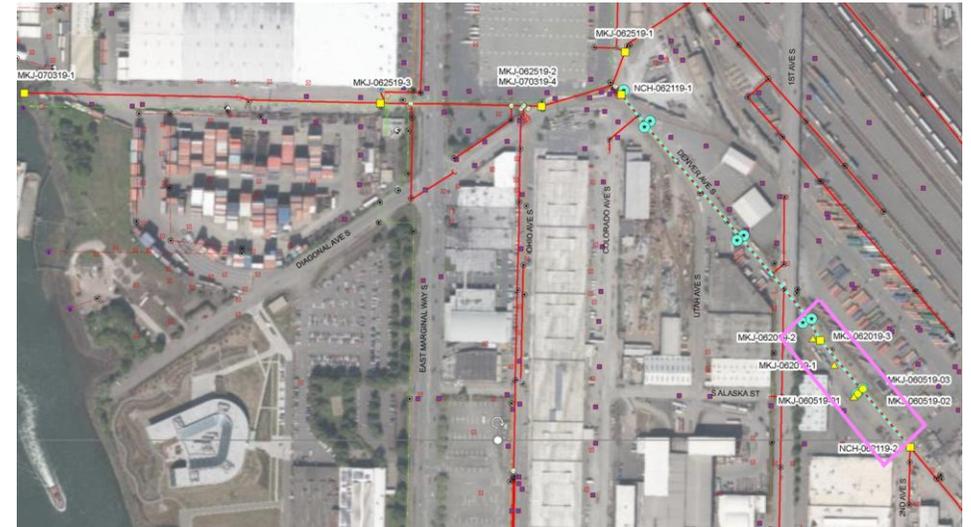


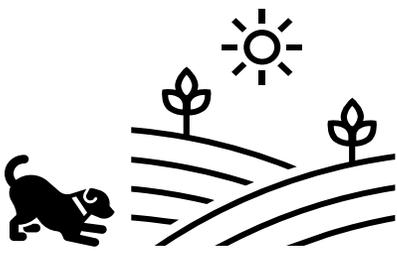
Post-Cleanup
Verification

Denver Ave PCB Spill



- 2019: SPU inspector noticed PCB odor while driving
- Collected samples of soil, nearby inlets, CBs
- High PCB levels, triggered TSCA
- All cleanup tasks completed 2021





Post-Cleanup Verification



Inspector Jasper



Inspector Jeffers

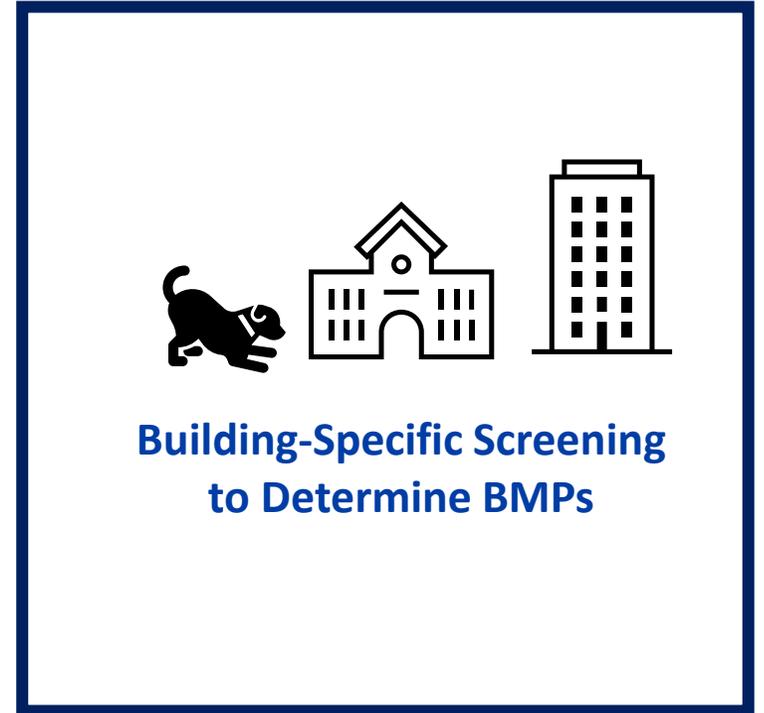
- SPU revisited site with PCB detection dog
- Jasper interested in 3 Eco blocks
- Testing identified minor amount of PCB residue on the 3 blocks
- City arranged for removal and disposal



Targeted Investigation to Pinpoint Source/s



Post-Cleanup Verification



Building-Specific Screening to Determine BMPs



Building-Specific Screening



2024 Municipal Stormwater Permits – New O&M Requirements:

Permittee-owned buildings built or renovated 1950-1980, develop & implement policies, procedures and practices for:

- *Exterior cleaning/maintaining and*
- *Demolition/renovation*

to include Source Control BMPs that minimize PCBs from entering the MS4



Screening for PCBs at City Buildings – Spring 2025

- **What?**

- FieldLab screened building exteriors for PCB presence/absence (no samples)
- Built/renovated 1950-1980, concrete- or masonry-framed, MS4 area
- Prioritized by City's equity index and discharges to LDW

- **Why?**

- Inform application of Source Control BMPs, at individual building scale
- Rapid dog screening approach would take less time, cost less than sampling

- **How many?**

- Screened 90 buildings across 63 parcels!





Property Owner:	FAS
Year Built / Construction Type:	1971 / Masonry
Screening Date:	5/1/2025
Screening Results:	High-level PCB source suspected



LOCATION #21: Suspect Source Materials (SSMs) Detected By PCB Detection Dog

SSM ID:	Detection Confidence:	SSM Description:	# of SSM locations identified:	Suspect Source Material Notes:
1	high	Concrete Joint Material (CJM)	9	1" thick CJM at each seam of concrete building slabs. Strong odor recognizable to humans. Double joint/seam on south side of garage door had higher odor and was exposed to sun and more visibly degraded than seam. Lookout tower (6 stories high) has 3-5 joint seams and is likely a high source load for possible PCB runoff contamination.
2	moderate	Caulk	6	~1/2" wide caulk at concrete-to-wood paneling or doorframes. Sometimes painted over (blue paint).
3	low/inconclusive	Silicone Sidewalk Sealant	1	Variable, low canine interest in several locations with white silicone caulking on sidewalk of patio area. Indicative of material at other locations where dog shows interest. Possible non-arodor.

PCB Canine Screening Conclusions

High confidence (strong dog + human interest)	Moderate confidence (dog interest)	Low/Inconclusive (some dog interest but no pinpoint)	No PCBs Suspected
~1/3		~1/3	~1/3

Suspected PCB Source Material likely present

Actions unclear, further building research needed

No actions necessary

Actions needed to prevent PCB releases to the drainage system



Working with us...

- **Small Contract Detection Services**

FieldLab provides local on-site detection services at an hourly rate*

- **Collaborative Pilot Projects**

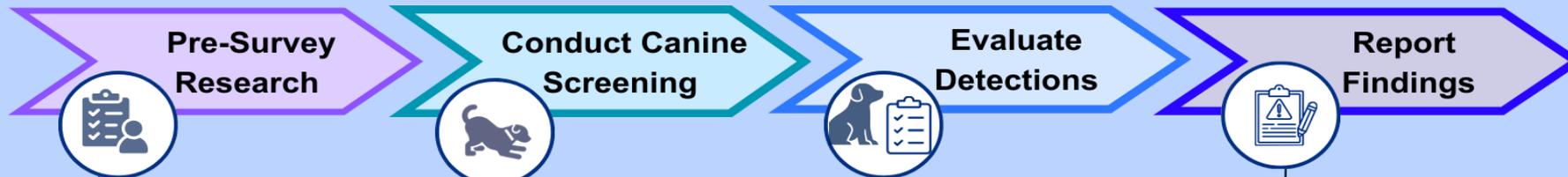
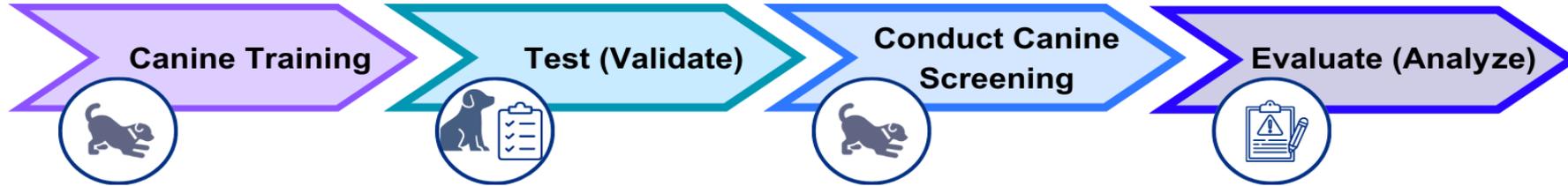
Provides the opportunity for clients to build a framework for integrating canine detection into an existing PCB source control program.

- **On-site Introductory Demonstration**

Meet Jasper and see the method at work.



Working with us...



- Parcel data
- Historical data
- Analytical data
- Site recon

- Schedule solo/assisted visit
- Pre-survey testing
- Collect GPS points, tracklog, and photos.

- Revisit historical data
- SSM research
- Possible re-visit with canine

- Narrative report
- Tracklogs
- Data table of detections
- Photos of SSM
- Recommended sampling



**Thank
you!**



**Interested in working with us?
Contact us!**



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Big thank you to:

