

Cleaning Our Waterways for Salmon Survival

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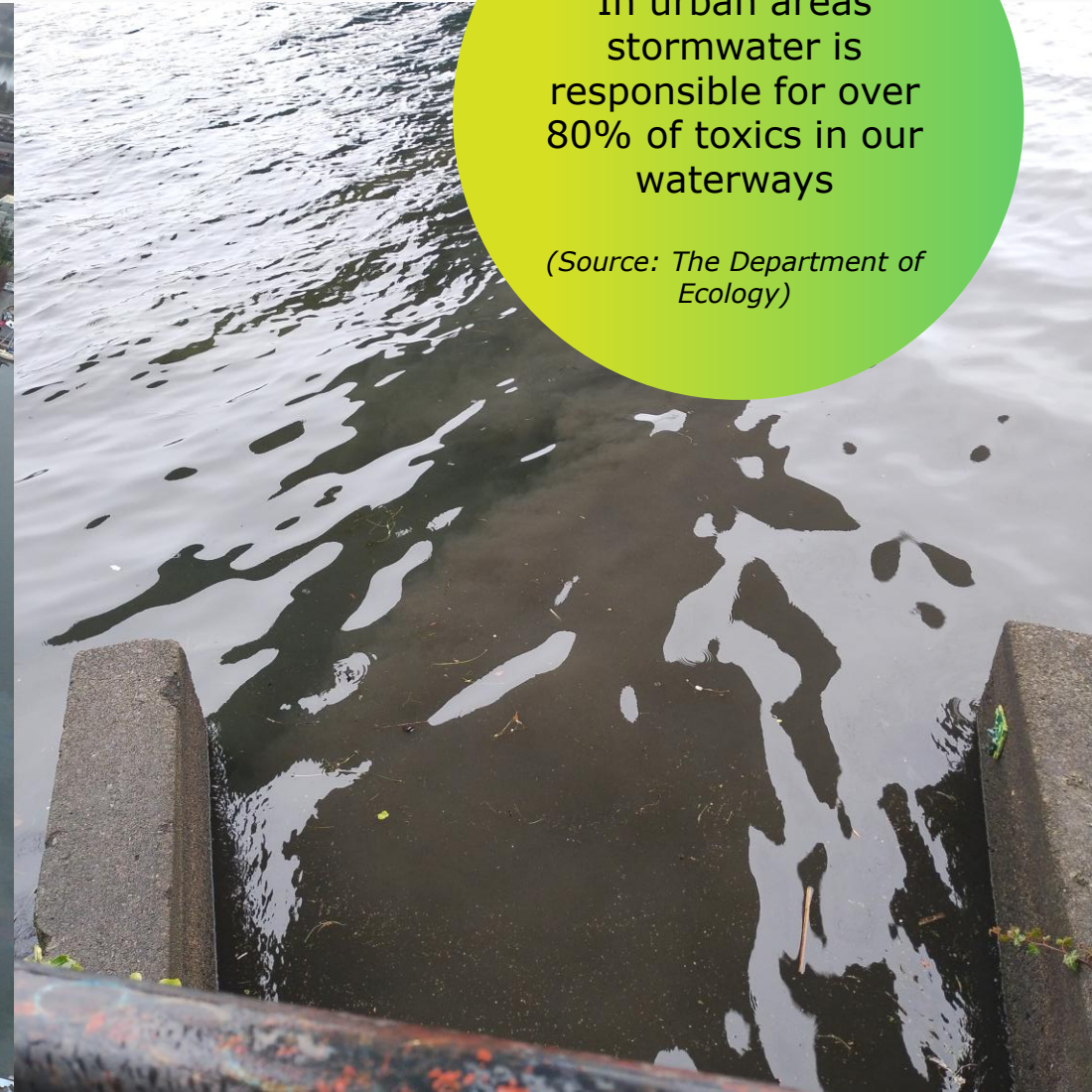


The Problem: Polluted Stormwater

Did you know?

In urban areas
stormwater is
responsible for over
80% of toxics in our
waterways

*(Source: The Department of
Ecology)*



6PPDQ: What is it?

With 6PPD



Without 6PPD

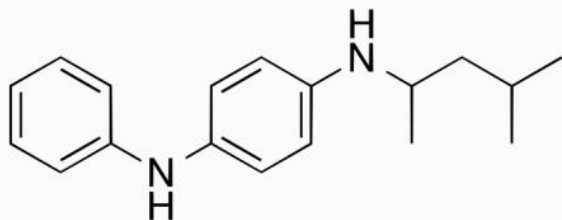


Image credit: U.S. Tire Manufacturers Association

6PPDQ: What is it?

6PPD

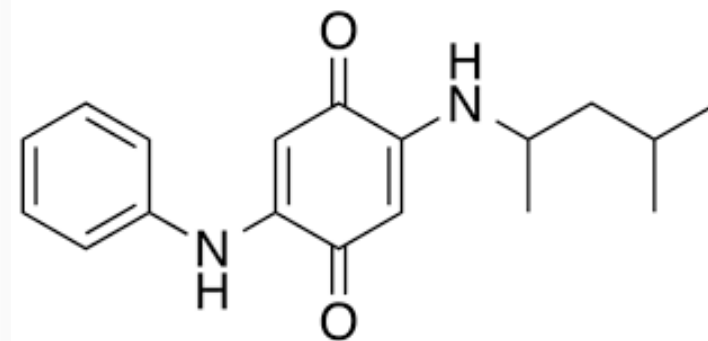
N-(1,3-dimethylbutyl)-*N'*-phenyl-*p*-phenylenediamine



ozone and
tire wear
particles



6PPD-quinone



6PPDQ: Not So Fun Facts

Toxicity of 6PPD-quinone vs other chemicals

(Tian et al. 2022 ES&T Letters)

chemical class	name	most sensitive species	LC ₅₀ (ppb)	95% CI
OP	parathion	<i>Orconectes nais</i>	0.04	0.01–0.2
→ quinone	6PPD-Q	<i>O. kisutch</i>	0.10	0.08–0.11
OC	mirex	<i>Procambaris blandingi</i>	0.10	not reported
OP	guthion	<i>Gammarus fasciatus</i>	0.10	0.073–0.014
OP	chlorpyrifos	<i>Gammarus lacustris</i>	0.11	not reported
OC	endrin	<i>Perca flavescens</i>	0.15	0.12–0.18
OC	4,4'-DDT	<i>O. nais</i>	0.18	0.12–0.30
OP	diazinon	<i>Ceriodaphia dubia</i>	0.25	not reported
metal	cadmium	<i>Oncorhynchus mykiss</i>	0.35	not reported
OC	methoxychlor	<i>O. nais</i>	0.50	0.25–1.8
OC	dieldrin	<i>Pteronarcella badia</i>	0.50	0.37–0.67
OP	malathion	<i>G. fasciatus</i>	0.76	0.63–0.92
OC	toxaphene	<i>Ictalurus punctatus</i>	0.8	0.5–1.2

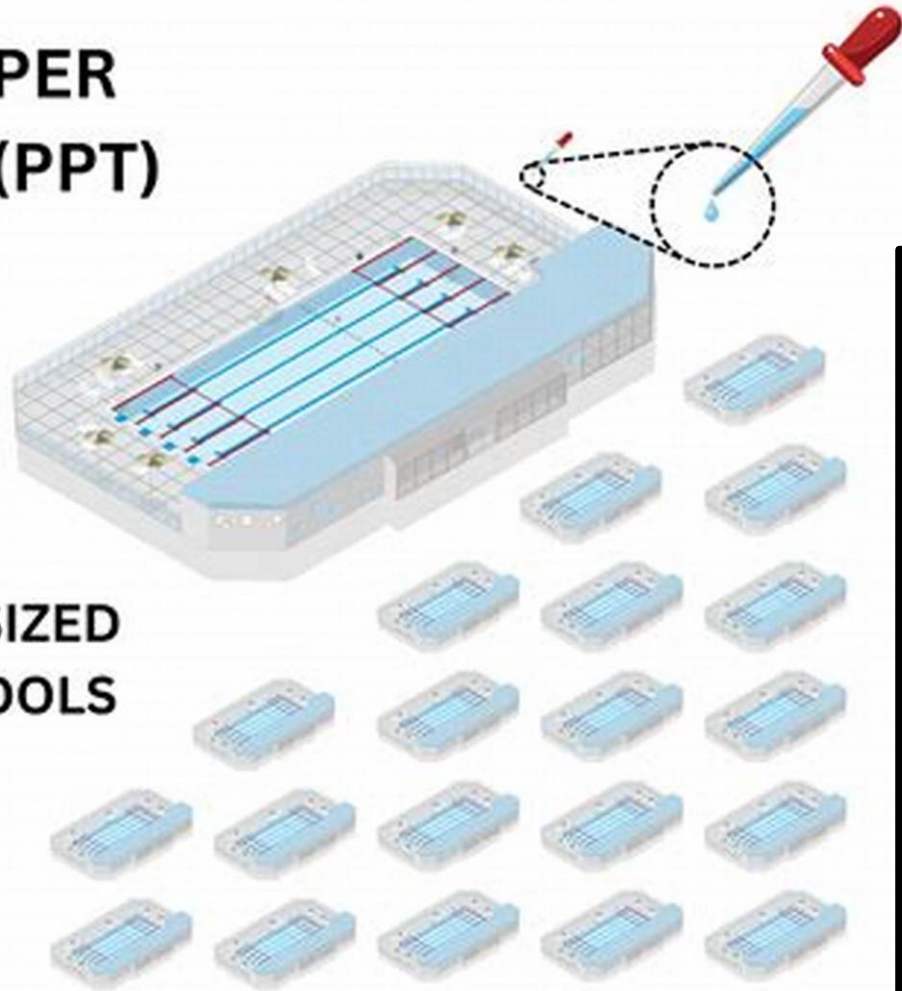
6PPD-quinone is among the most toxic chemicals known for aquatic life

6PPDQ: Not So Fun Facts

**1 PARTS PER
TRILLION (PPT)**

IS EQUIVALENT
TO A **SINGLE**
DROP OF WATER
IN

**20 OLYMPIC-SIZED
SWIMMING POOLS**



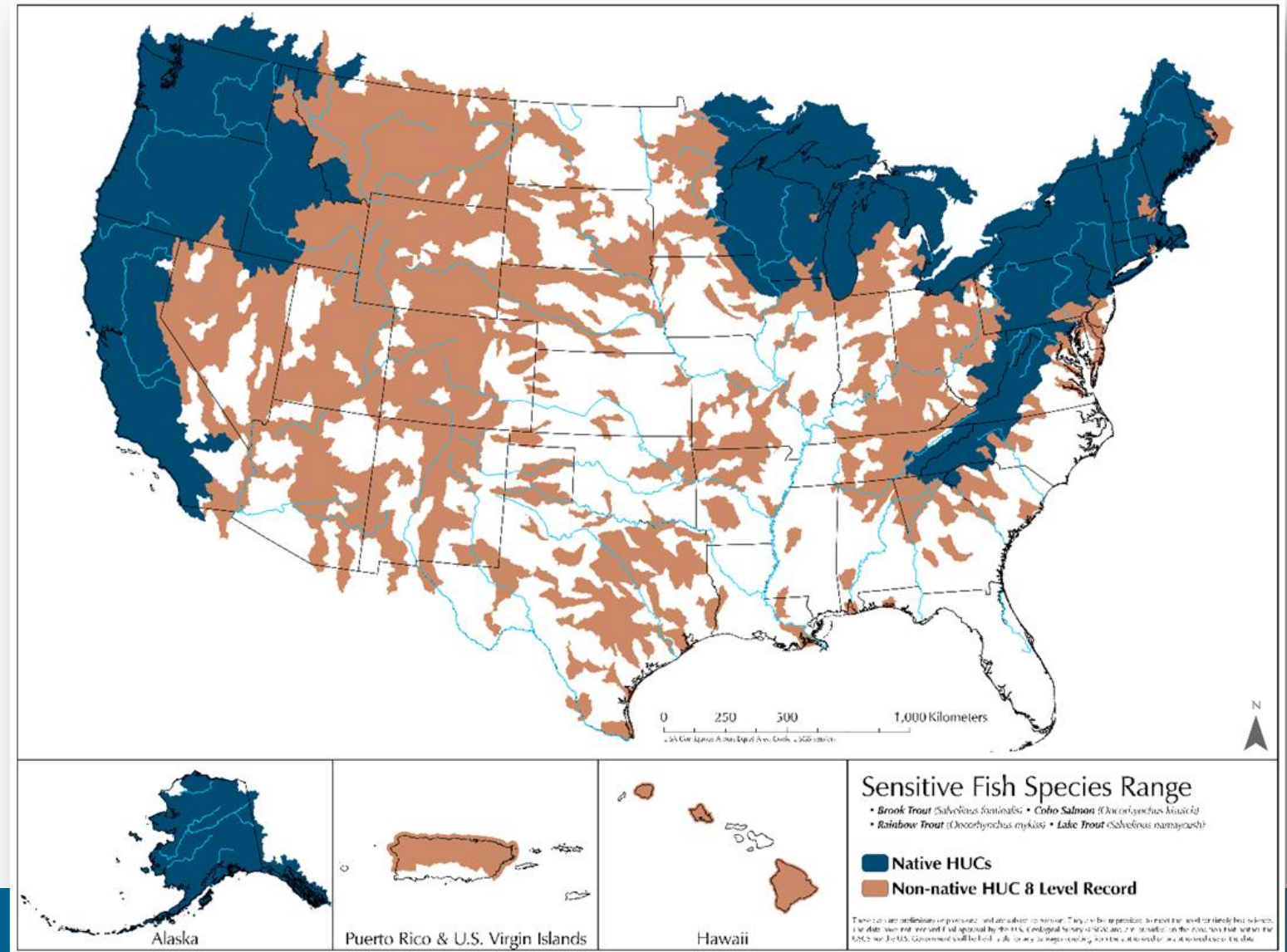
LC₅₀ 6PPDQ = 0.1 ppb = 100 ppt

Measured Stormwater = 925 ppt

In an Olympic sized swimming pool filled with coho salmon 5 drops of 6PPDQ would kill half the fish. **Our stormwater has an equivalent over 45 drops.**

6PPDQ is toxic to:

- Coho salmon
- Coastal cutthroat trout
- Steelhead
- Brook trout
- Lake trout
- Rainbow trout



Source: TRC (Interstate Technology & Regulatory Council), 2024.

Is this a big city problem?

- Small and mid-sized municipalities need to care now — not just large urban centers
- The best habitat is outside cities
- It's the ratio of runoff to stream size that matters, not just traffic count



Regulations: What's Coming Down the Pipe

- **2023:** EPA: Tribal Petition - TSCA Section 6 Regulation of 6PPD, mandated manufacturers submit unpublished health and safety studies
- **2023:** Source Control: CA mandates alternative analysis from manufacturers mandated by Oct 1 2029
- **2024:** EPA identifies acute screening value of 11 ng/L for 6PPDQ (1 hr - not to be exceeded more than 1x/3yrs)
- **2026:** Source Control: WA proposed bill to prohibit sale of 6PPD tires (or regrettable sub) by 2035
- **Stormwater permits:** 6PPDQ noted in current/draft permits

A Solution: Adopt-a-Downspout



The BMP: Box of Rain

One Box of Rain can treat
up to

250K

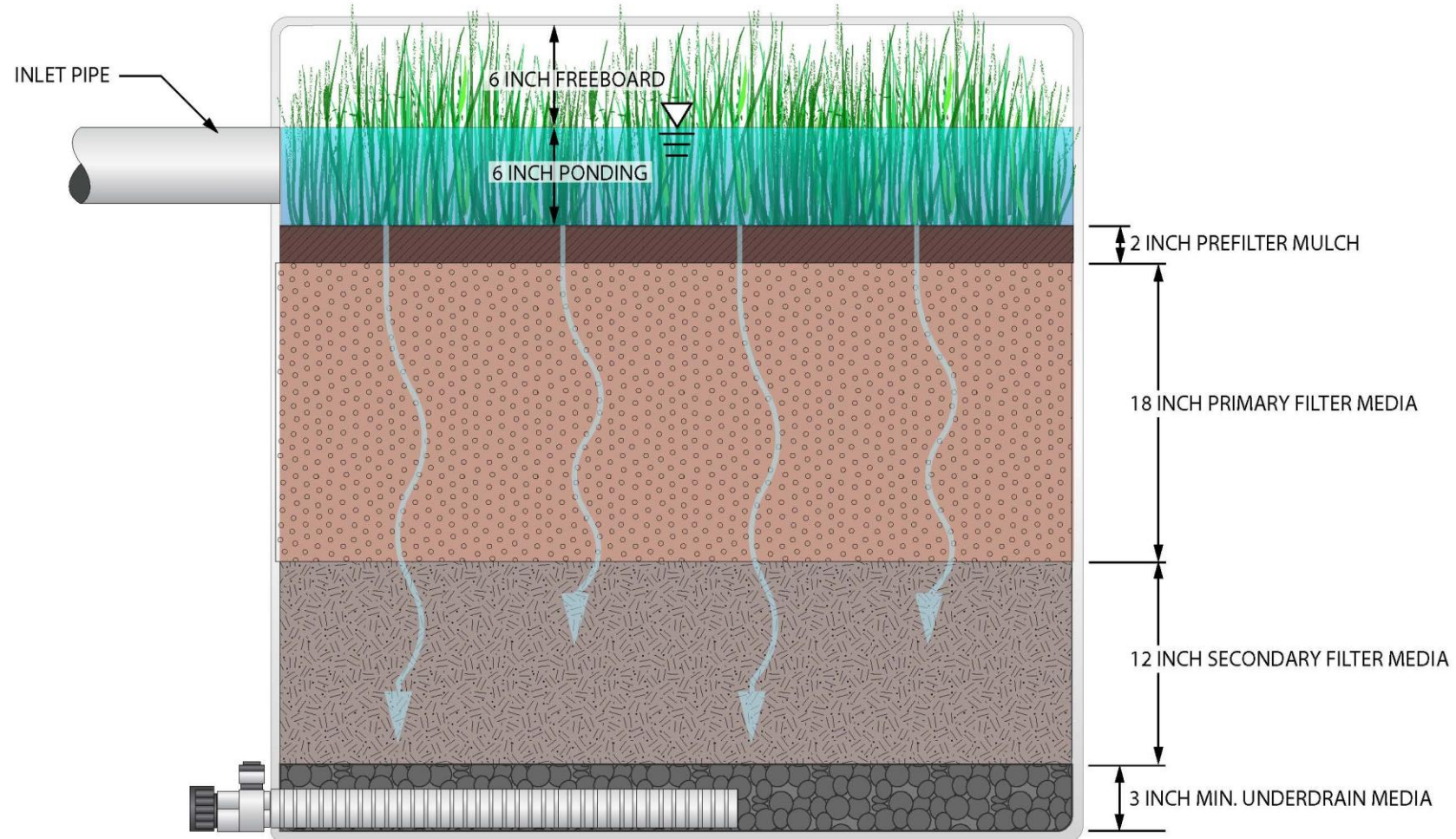
gallons of polluted storm
water each year



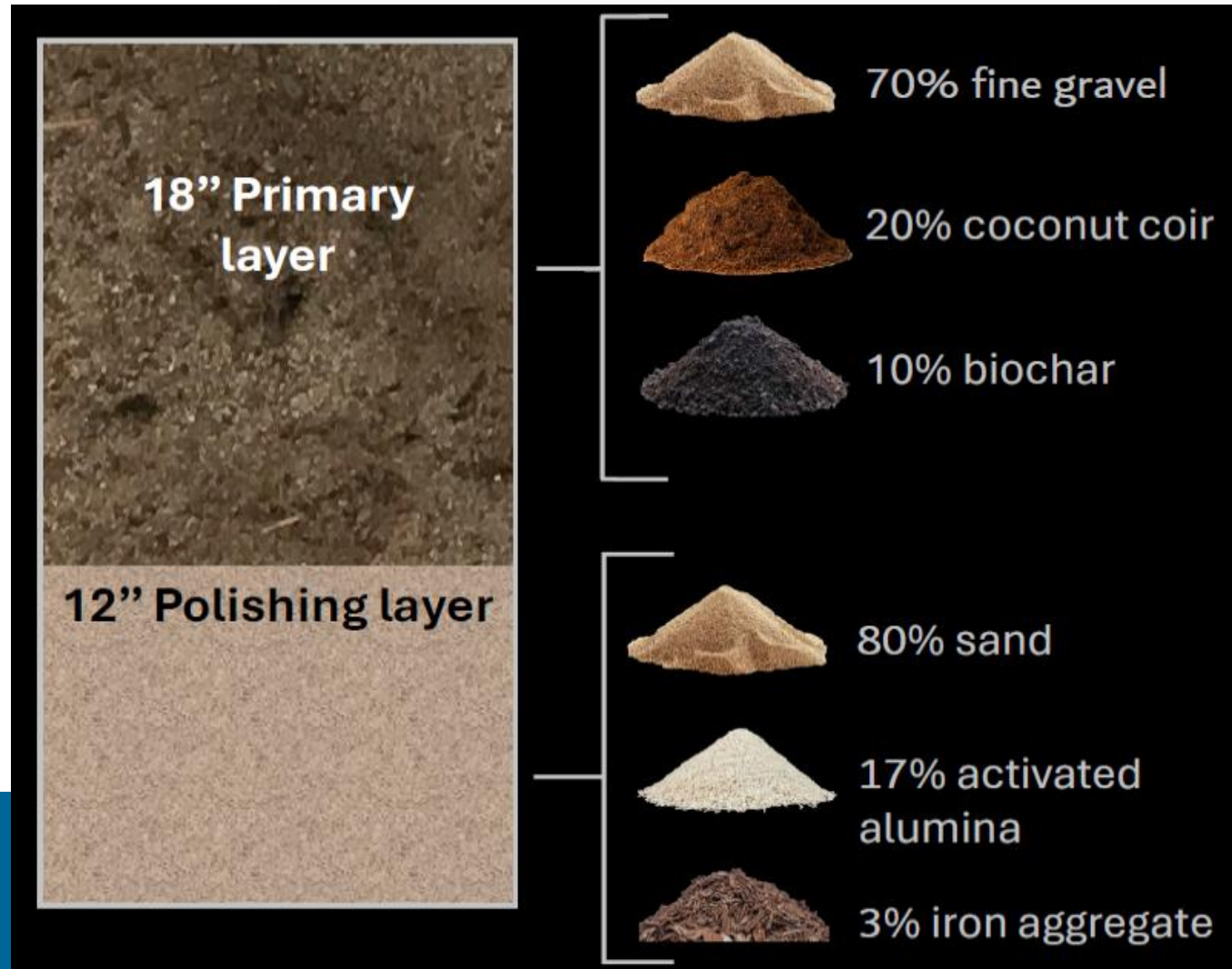
**10x water
treated as much
as typical
bioretention**



Pilot Study: Box of Rain Design



Media: What's in the Box?



Adapted from a great presentation by Chelsea Mitchell, PhD - KC

Adoptees & Maintenance



Pilot Maintenance: Ship Canal Bridge





The Partners: Crowdsourcing Stormwater Treatment

We work with government agencies, environmental groups, global companies, and local communities to maintain and scale the Adopt-a-Downspout program.

Partners and Friends



Adoptees



You?

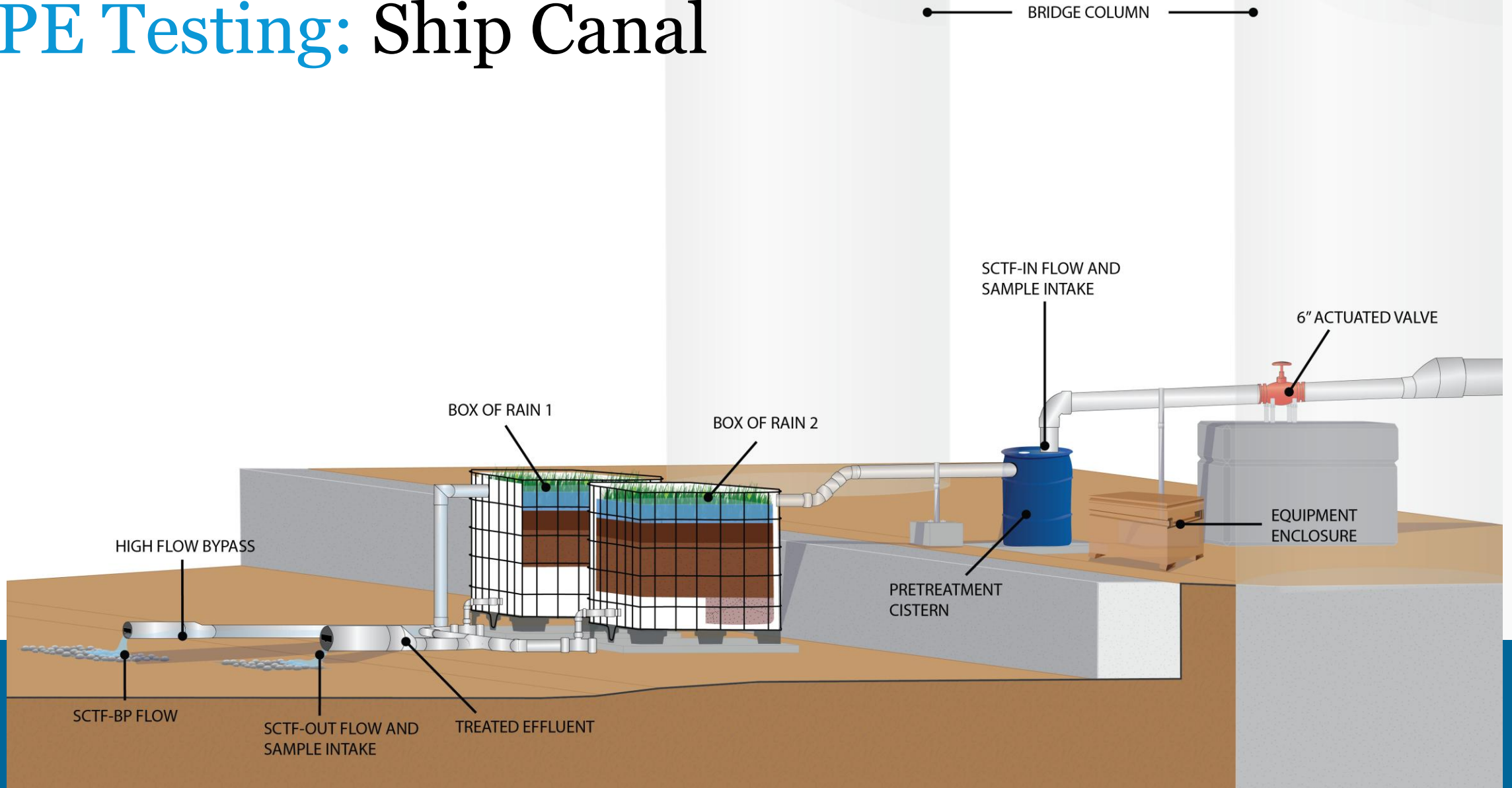
Funders



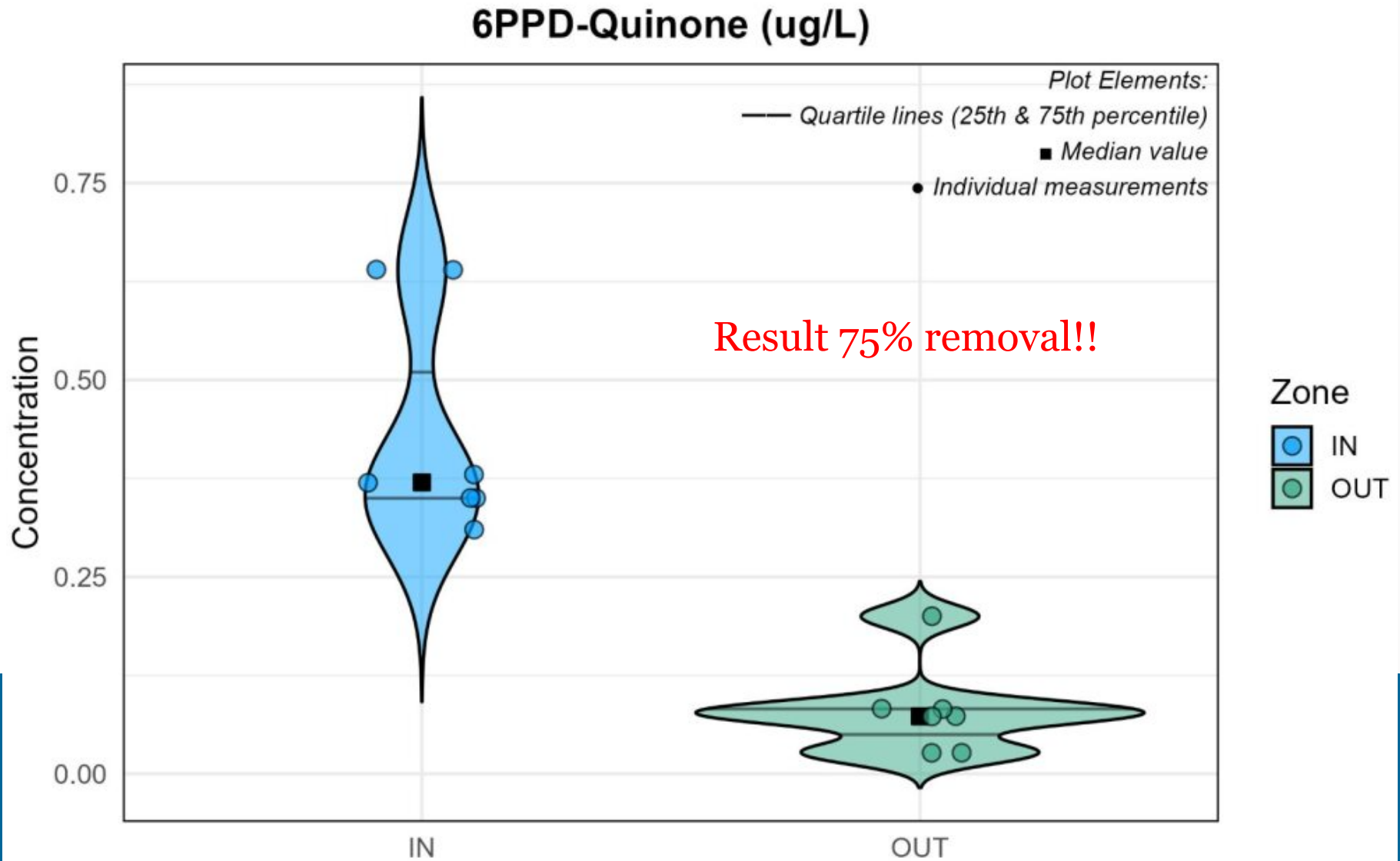
TAPE Testing: Ship Canal



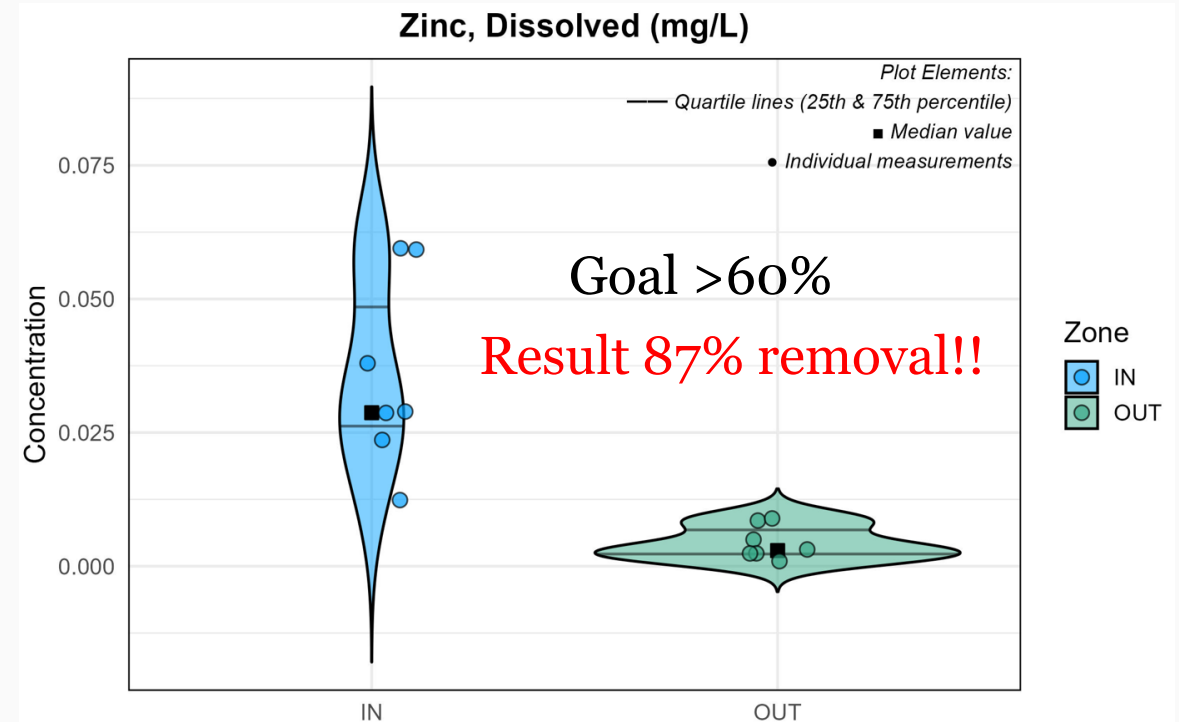
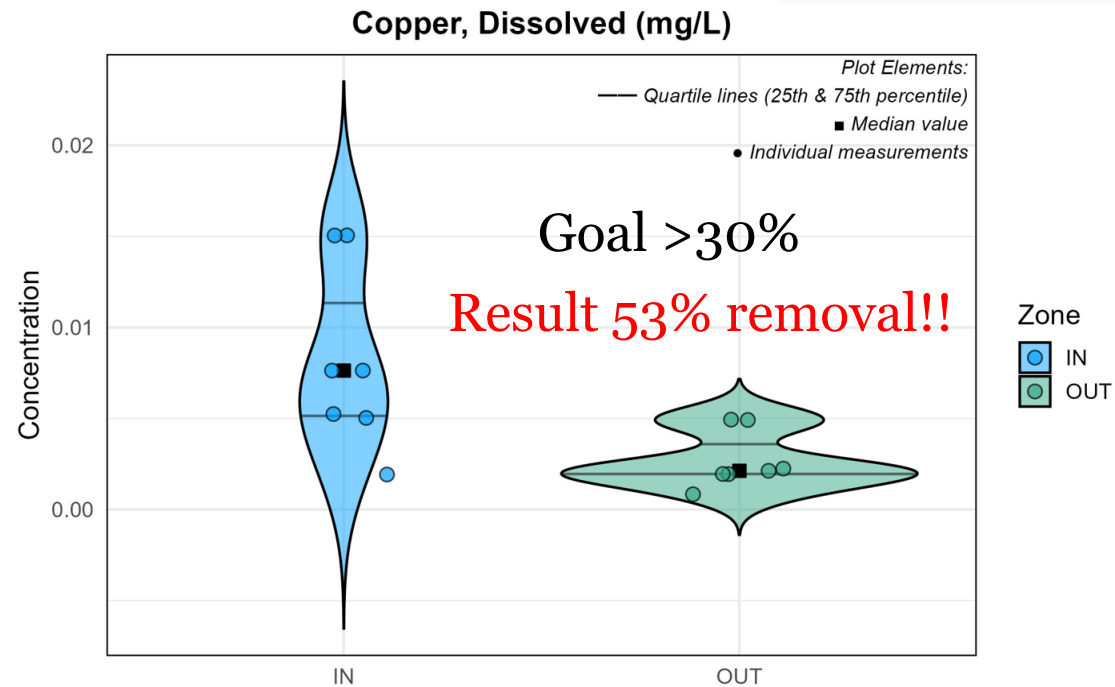
TAPE Testing: Ship Canal



TAPE Monitoring: 6PPDQ Results



TAPE Monitoring: Metals Results



Implication of TAPE Approval

Technology Assessment Protocol – Ecology TAPE

- Most widely recognized and rigorous field-testing protocol in the country
- Approval opens the door for:
 - DOT use
 - Grant funding
 - Use for non-retrofit applications
 - Acceptance across the country



The Pilot: Lessons Learned



Graffiti



Scour and Sediment



Seals

Legacy impacts – some bridges drop untreated stormwater into important aquatic habitat

On bridge treatment options – mostly infeasible

Cost – too high to retrofit all existing surfaces, must prioritize locations and find low-cost solutions

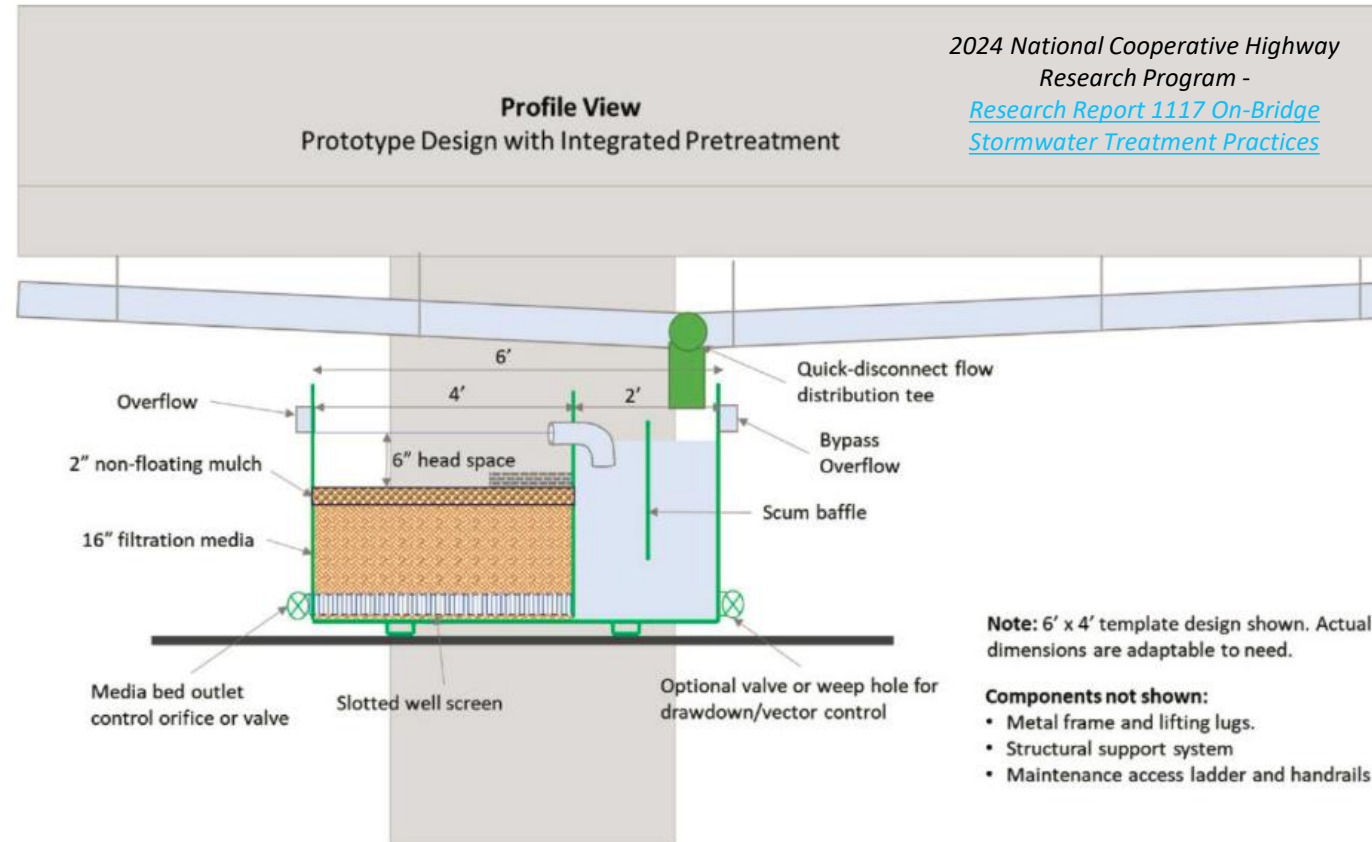


Figure 6. Prototype 1: Integrated Pre-Treatment, Profile View.

WSDOT's Stormwater Retrofit Program

Purpose:
mitigate stormwater impacts
from existing infrastructure

Three types of retrofits

- Project-driven
 - NPDES
 - ESA
- Opportunistic
 - Stormwater and Hydraulic Assessment conducted on all projects
 - can be added to other projects
- Stand-alone
 - above and beyond



compost amended vegetated filter strip



media filter drain



compost amended biofiltration swale

Stormwater and Hydraulic Assessment on Every Fish Passage Project



**SR 106 Twanoh Creek – Remove Fish Barrier
Compost Amended Biofiltration Swale**

First projects meet requirements
for new and replaced PGIS
from WSDOT's HRM and ESA

Then look for opportunities to add
additional retrofit

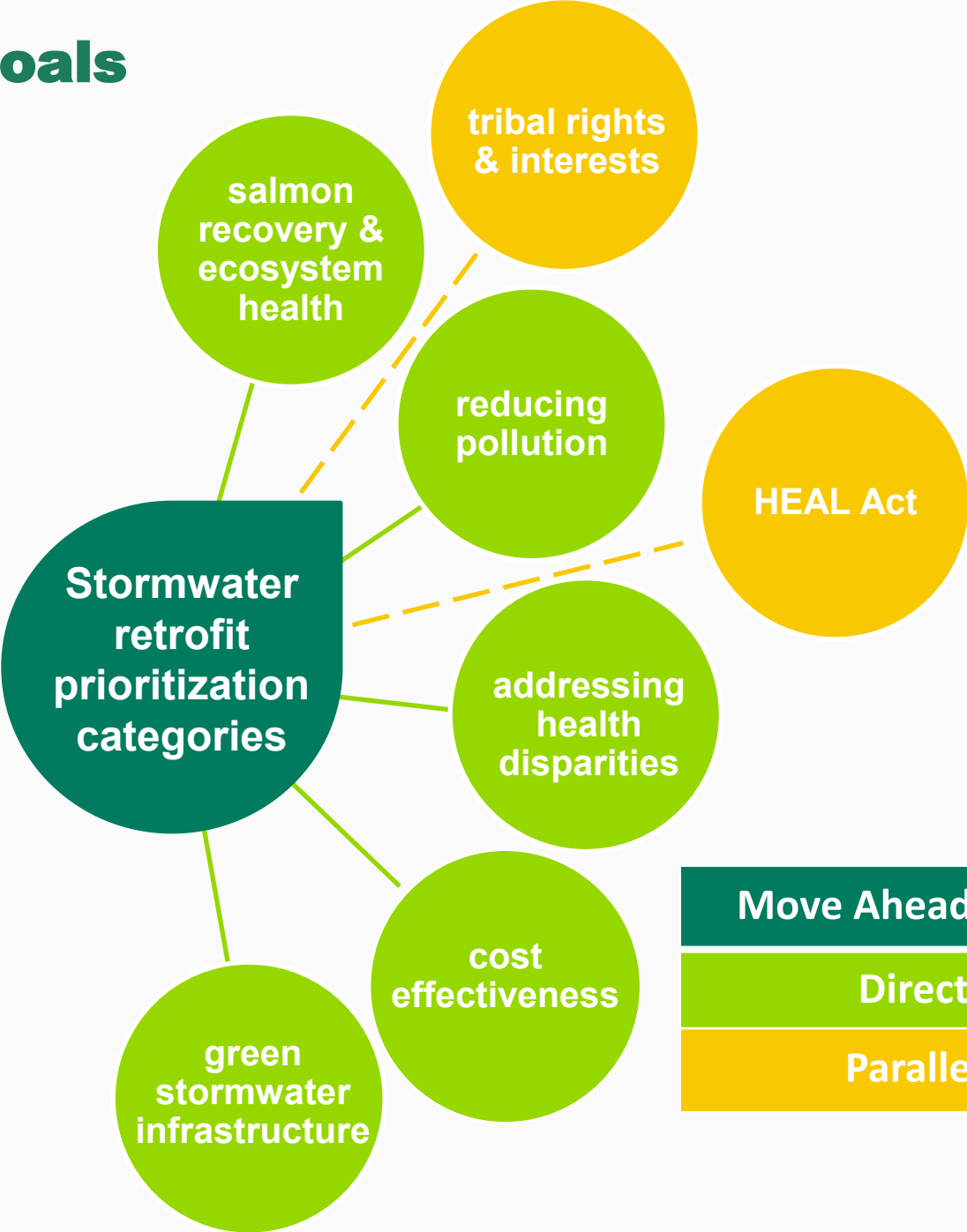
*Many common WSDOT BMPs are GSI,
which are likely to treat 6PPD-quinone



**SR 3 Chico Creek – Remove Fish Barrier
Media Filter Drain**

WSDOT- Chico Creek Remove Fish Barrier Project
05/04/2023 3:13:15 PM

**Move Ahead Washington goals
&
alignment with
goals of other laws**

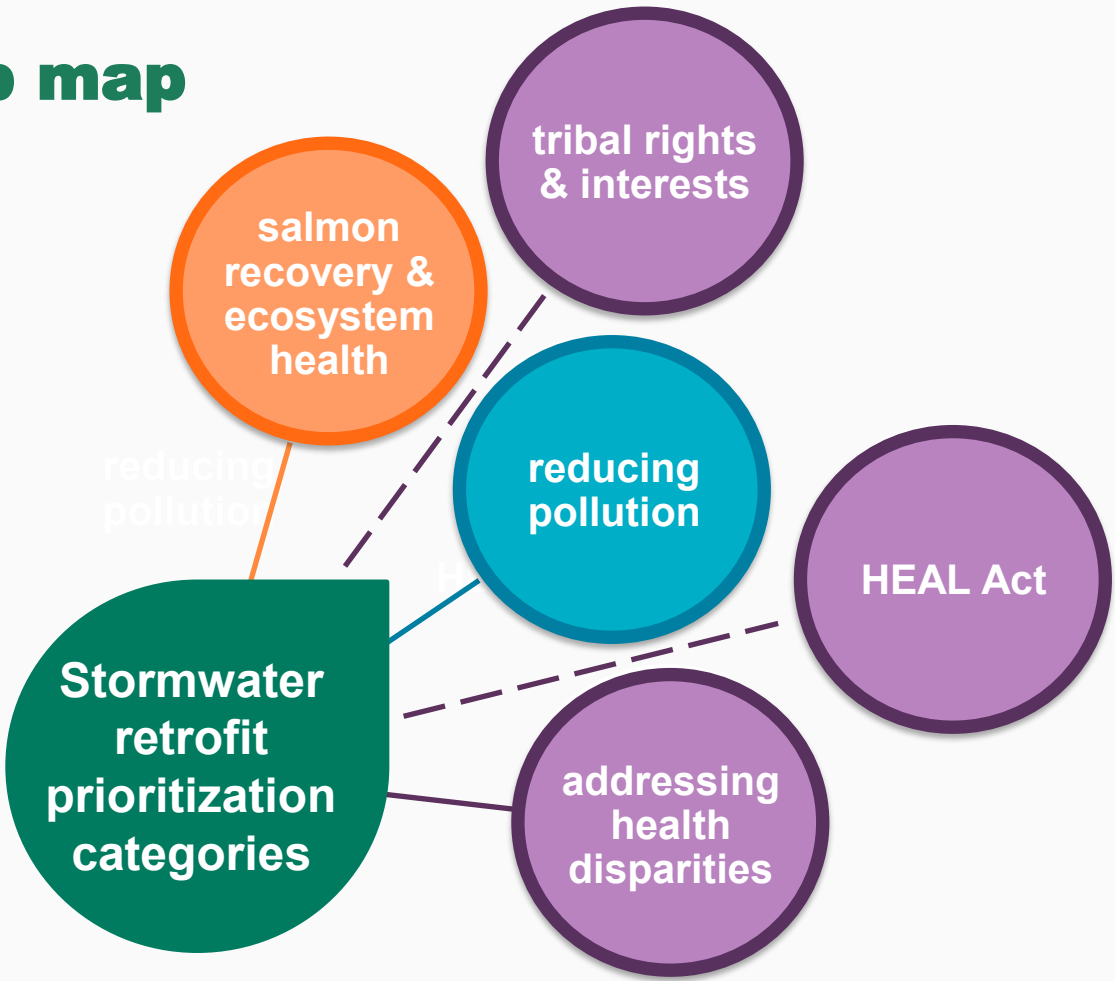


Data populating the prioritization web map

Salmon Recovery and Ecosystem Health
Salmonid presence (coho, steelhead, chinook, redband trout)
Hatcheries
High quality habitat

Reducing Pollution
High traffic
Sensitive waters: small streams with coho, estuaries, outstanding resources waters
Drinking water supply source
Impaired waters

Addressing Health Disparities
Climate & Economic Justice Screening Tool
Environmental Health Disparities Map
Tribal lands
Tribal priority locations (provided individually by tribes)



Survey123

engagement tool
granular data expertise

Invites up to 4 recommended locations per entity for WSDOT consideration

- Elevate tribal priority stormwater retrofit locations to the top of WSDOT's priority list
- Create a data layer related to expertise from tribes, local agencies, and others
 - restoration/preservation priority locations
 - watershed planning goals
 - salmon/orca recovery habitat hot spots
 - environmental justice considerations
 - tribal and cultural focus areas
- Invites and leverages partnership

Survey123 access



<https://arcg.is/1KiCva0>

Learn more:

[Survey123 flier](#)

[Folio](#)

[Toolkit](#)

Engagement – Survey123 success

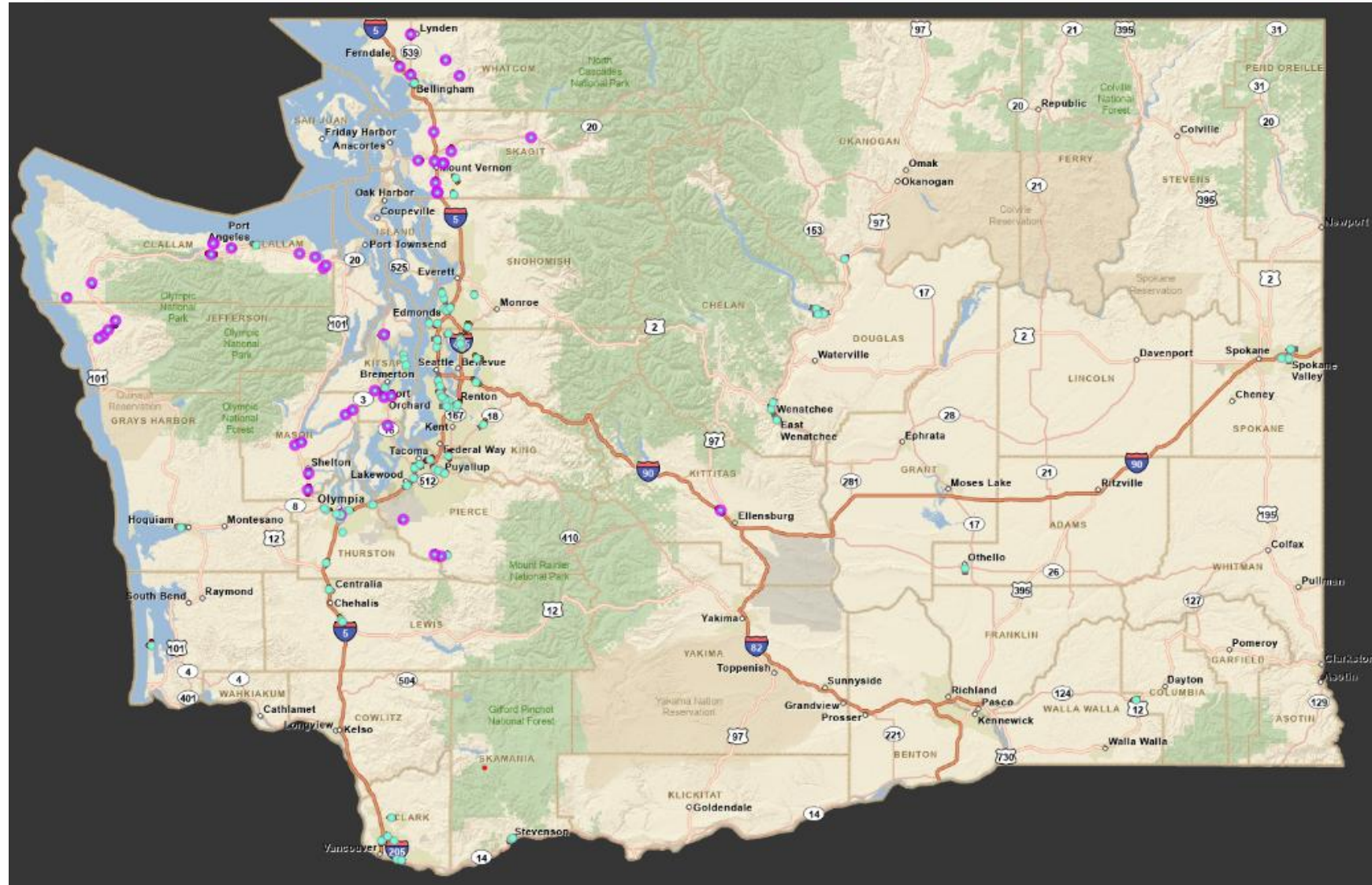
Produced valuable data:

158 recommended priority
retrofit locations

60 different entities

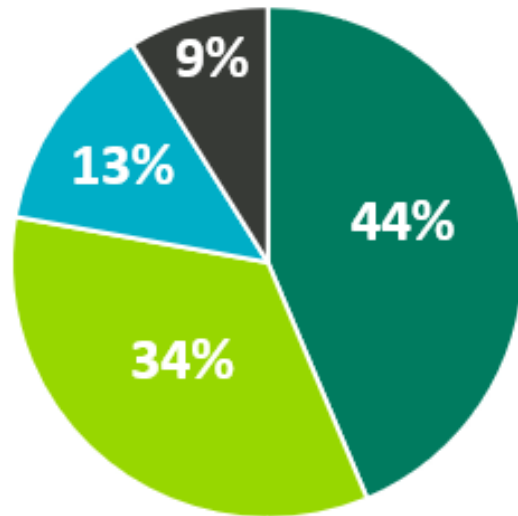
Including 16 tribes

between May 2023 & June
2026



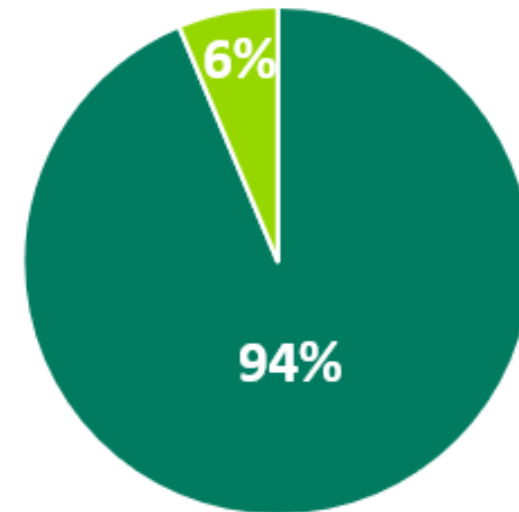
Participation & partnership interest

Locations Provided by Entity



■ cities & towns ■ tribes ■ counties ■ interest groups & others

Partnership Interest



■ yes ■ no

**I-5 Ship Canal Bridge
Stormwater Retrofit - Seattle**

large multi-jurisdictional partnership



I-5 Ship Canal Bridge Stormwater Retrofit

Alternative 3

Area Managed
Total: 66 ac. to 80 ac.

I-5 north of bridge: 39 ac. (100%)

U District: 24 - 38 ac. (65% -100%)

I-5 Ship Canal Bridge Deck: 3 ac. (100%)



Georgetown Stormwater Interpretative Center

community identified needs

Landscape Context

Activate the space for public access

Improve water quality by adding stormwater treatment

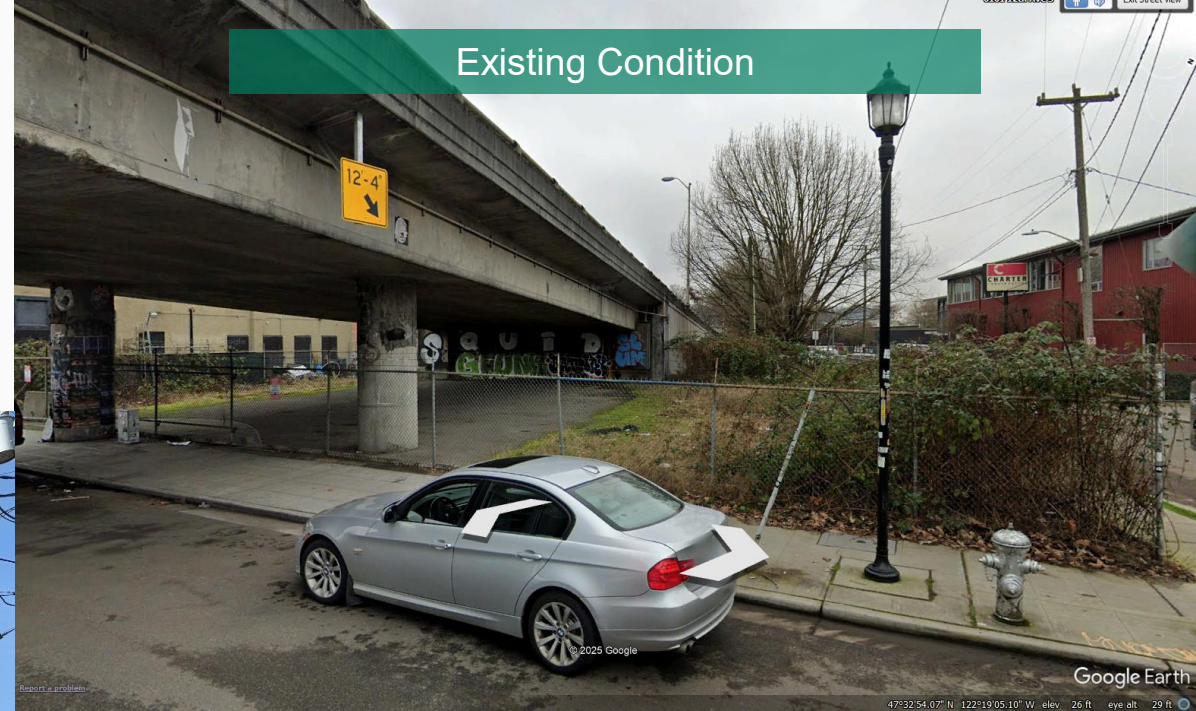
Improve vegetation and unsightly conditions

Educate community about stormwater mitigation

Add public art



Existing Condition



Proposed Condition





Roadside Vegetation & Beautification Permit

Not for use on Managed Access Highways
within incorporated cities or towns; no commercial use

Applicant Name and Address:	Permit Number:	
	RVB	
	State Route:	Milepost: ☐ Left ☐ Right ☐ Both
	Region: v	Maintenance Area:
County:		
Email:	Highway Access Control:	
Phone Number:	☐ Limited Access – Interstate	
	☐ Limited Access – Non-Interstate	
	☐ Managed Access Highway	
Location of Roadside Vegetation & Beautification work if not adjacent to address listed above:	National Scenic Byway? ☐ Yes ☐ No	
	If work is on Interstate right of way, FHWA approval has been obtained?	
	☐ Yes (included as exhibit) ☐ Not Applicable	
	If work is on Interstate right of way, NEPA approval has been obtained?	
		☐ Yes (included as exhibit) ☐ Not Applicable
Pursuant to RCW 47.40.010, the state legislature has declared that the "planting and cultivating of any shrubs, trees, hedges or other domestic or native ornamental growth, the improvement of roadside facilities and view points, and the correction of unsightly conditions, upon the right-of-way of any state highway" are state highway purposes. RCW 47.40.020 authorizes the Washington State Department of Transportation, hereinafter referred to as "WSDOT", to expend Motor Vehicle Funds for the beautification of the state highway system. In addition, certain other facilities or activities on state highway right of way are valid state highway purposes under RCW 47.40, such as facilities that treat stormwater originating from the state highway, litter and graffiti removal, prevention of encampments and other unauthorized uses of the right-of-way, and public educational displays relative to the operation of the state highway system. The applicant, hereinafter referred to as the "Permit Holder," has volunteered to construct and maintain a project on the state highway right-of-way, at its sole cost and expense, that fulfills one or more state highway purpose, including, but not limited to, those highway purposes described above. WSDOT has reviewed the proposed project and determined that it is in the best interest of the state highway system to allow the Permit Holder to construct and maintain the project at the location described above. This Permit authorizes the Permit Holder to construct and maintain the project (hereinafter the "Work") on the state-owned highway right of way as more fully described in Exhibit B, subject to the terms, conditions, and provisions set forth below. This Permit does not authorize the Permit Holder to engage in any of the activities or uses described in Section 1 of the Permit General The term of this Permit is three (3) years commencing on the date of WSDOT's signature below. This Permit may be renewed by WSDOT for successive three (3) year periods on the written request of the Permit Holder, provided the Permit Holder is in compliance with the terms of this Permit.		

Tony Bush

WSDOT Stormwater Branch Manager



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WSDOT Stormwater Retrofit Information

Folio



Prioritization Web Map



Share your priority
recommendations



Tatiana Dreisbach

WSDOT Stormwater Retrofit Outreach & Innovation Lead



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ADOPT
A
DOWNSPOUT

Questions

A map of Washington state highlighting waterways and elevated roadways or bridges. Red dots indicate the locations of elevated roadways or bridges, while blue lines represent rivers and waterways. The map includes labels for various locations such as Lower Elwha Reservation, Dungeness National Wildlife Refuge, Stillaguamish Reservation, Tulalip Reservation, Everett, Redmond, Bellevue, Renton, Kent, Tacoma, and Muckleshoot Reservation. Highway numbers like 20, 525, 99, 5, 16, 101, 512, and 410 are also visible.

Join Us.
Be Part of the Solution

Elevated roadways
or bridges

Rivers and
waterways

**ADOPT
A
DOWNSPOUT**

**We can
scale with
your help**