construct connect create

FOR OUR COMMUNITIES

APWA

20 14

WASHINGTON

WATERSHEDS AND FISH; TIME FOR A PUBLIC OPTION?

A way to use existing public funds more effectively for watershed restoration and fish recovery

Mediator:
Name, Organization

Speaker(s):
John Milne, Clark County Public Works

Background: Stormwater/watershed approaches

Ecology - strong focus on flow control

County - restore the natural watershed hydrology:

- 1994 stormwater ordinance; volume control of runoff
- 1995 Burnt Bridge Creek Watershed Plan; mandatory roof drain infiltration, headwater wetland restoration
- 1998 Salmon Creek Watershed Plan; runoff volume reduction
- Organizing principle; “Entropy-based watershed management”

This presentation will ……

……introduce how public road projects, watershed capital projects and WSDOT's DAT process can link-up to advance watershed rehabilitation and fish recovery efforts.

- General watershed management principles
- "Sub-basin Retrofit Plan" example
- "Demonstrative Approach" example

“Ask not what you can do for your watershed; ask what your watershed can do for you”

General watershed principles

“Top-down watershed management”
A tale of two whiskies….

"Entropy-based watershed management"
A holistic, watershed-based strategy that mimics natural processes

NATURAL EXAMPLES

SNOWPACK

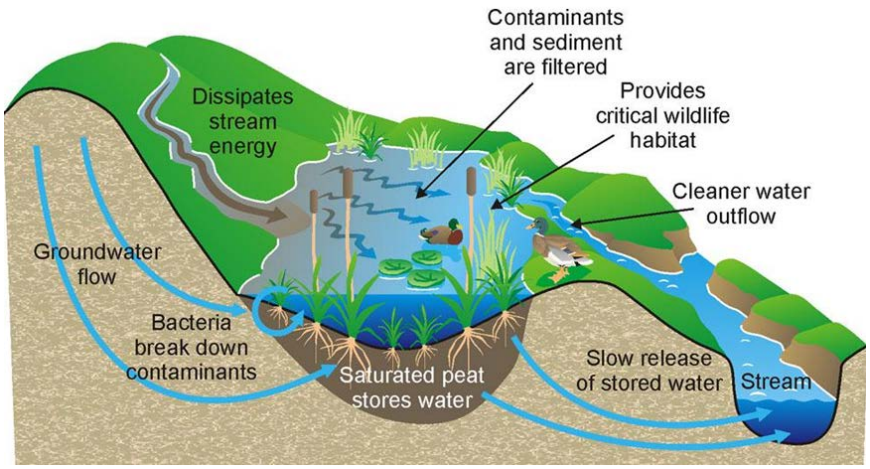
Water in solid phase at the highest potential energy possible.

….next best thing??

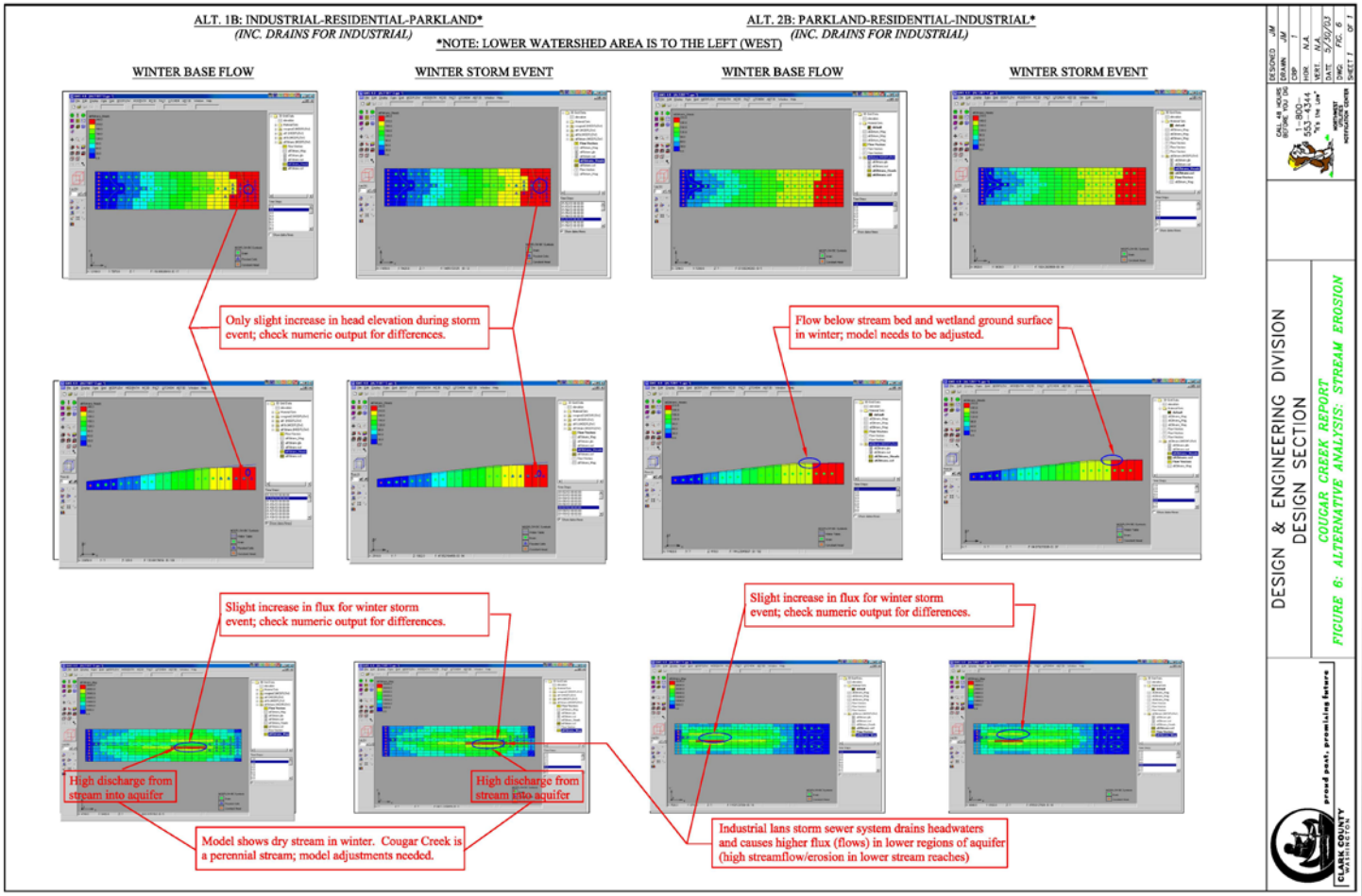
HIGH GROUNDWATER

Water in liquid phase at the highest potential energy possible.

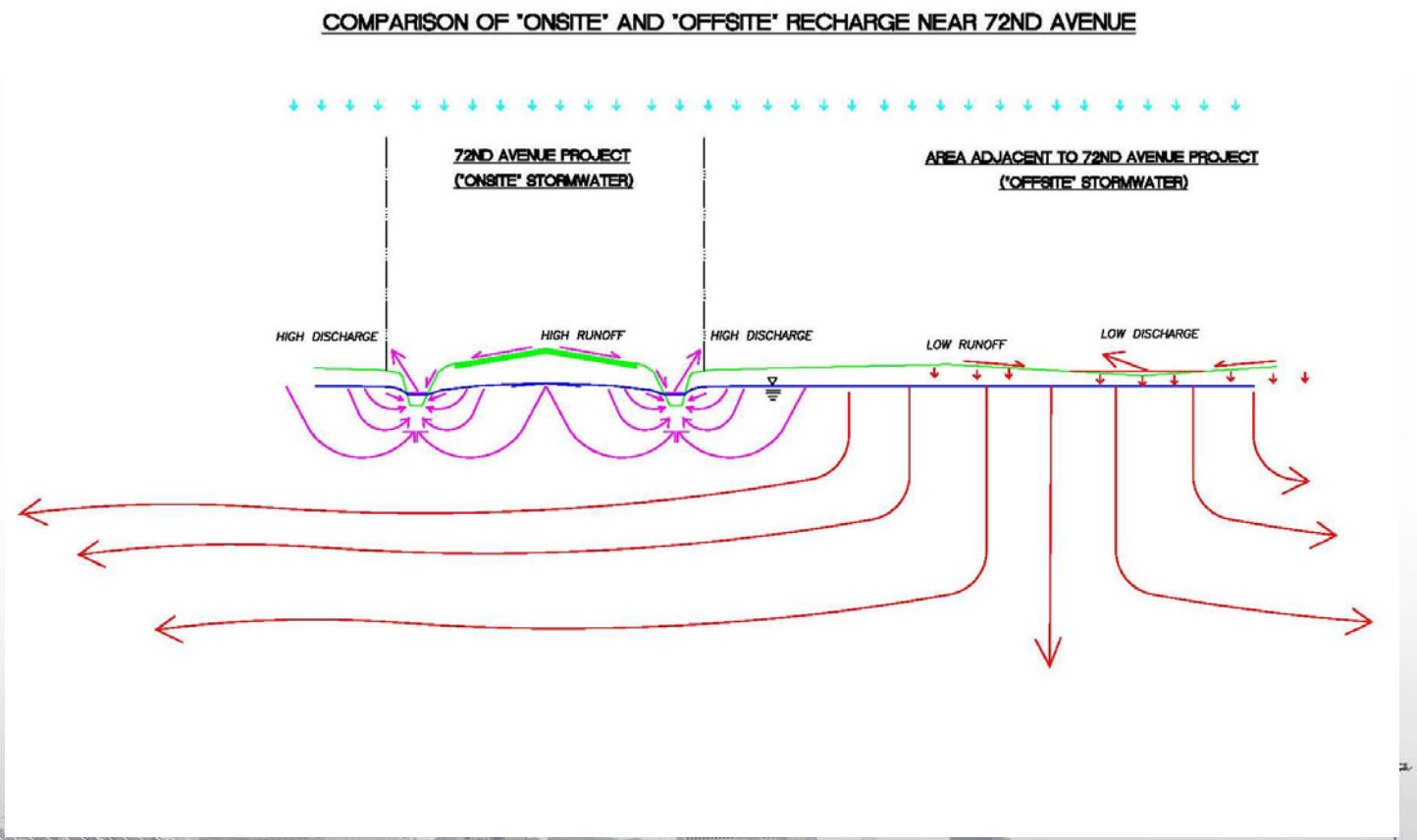
"Pump up the groundwater as high as possible (then plant everything)"



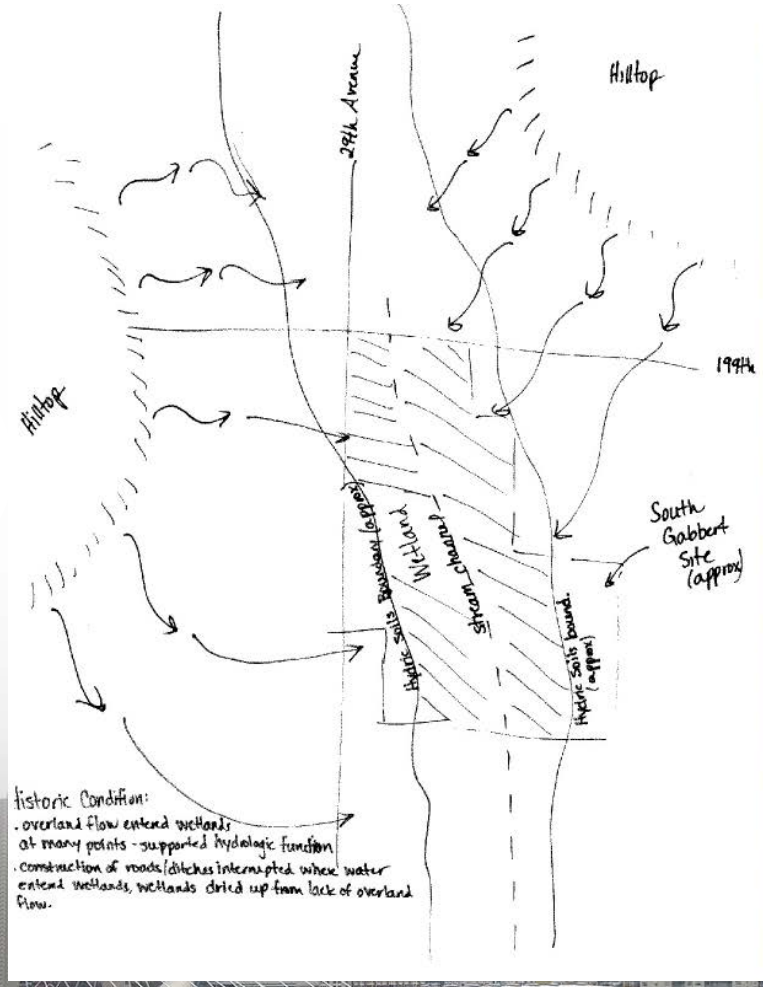
What good is all this recharge if you just discharge it all right away?

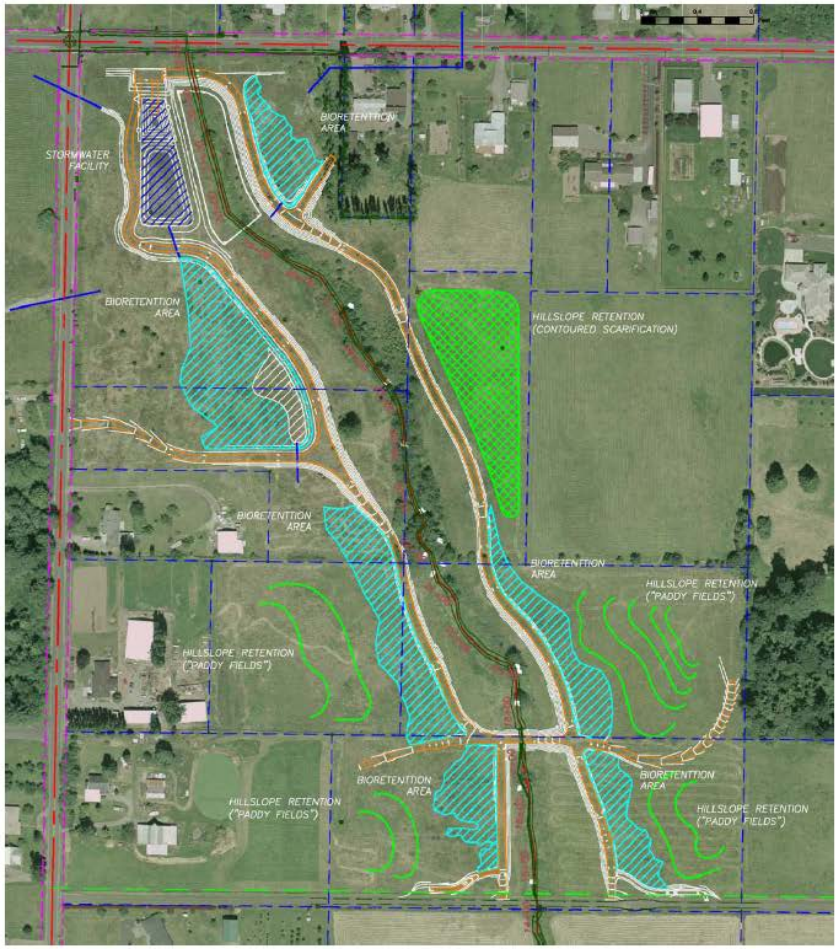


What good is all this recharge if you just discharge it all right away?



"LID on a watershed scale"





“Up on Whipple Creek”

Watershed-based project selection:

Clark County Fairgrounds Sub-basin Retrofit Plan

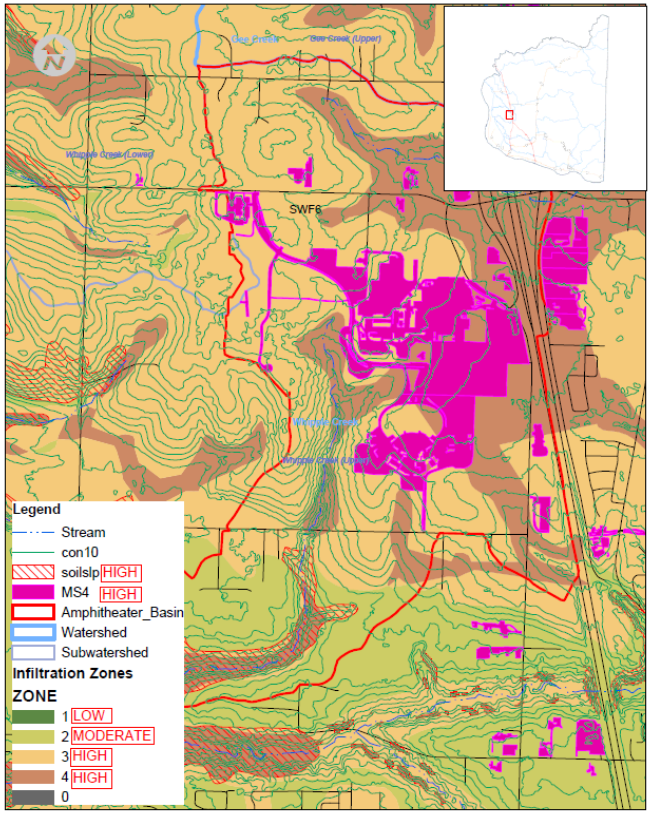
Sub-basin Retrofit Plan Process

- Priority sub-basins identified using Watershed Sensitivity/Impact mapping
- "Top-down" BMP selection
- Uses *Hydrologic Accounting* to select the most cost-effective combination of BMPs for a "Plan Alternative"
- Uses *Hydraulic Accounting* to confirm and adjust the selected Plan Alternative
- Final project design using standard hydrologic and hydraulic models

Selecting a priority basin for retrofit

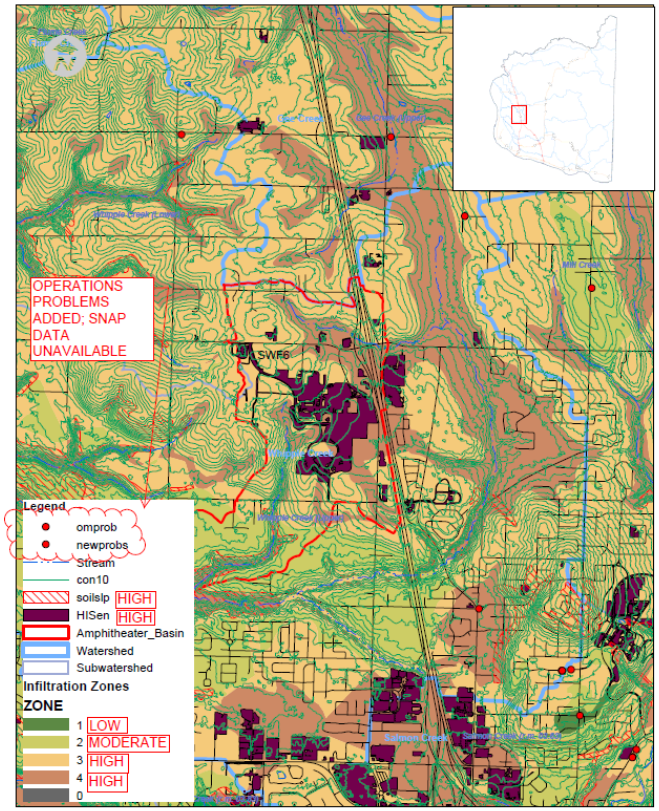
Map-based ***Prediction:***
Watershed Sensitivity/Impact mapping

Clark County Amphitheater Sub-Basin
Watershed Sensitivity and Impact Assessment



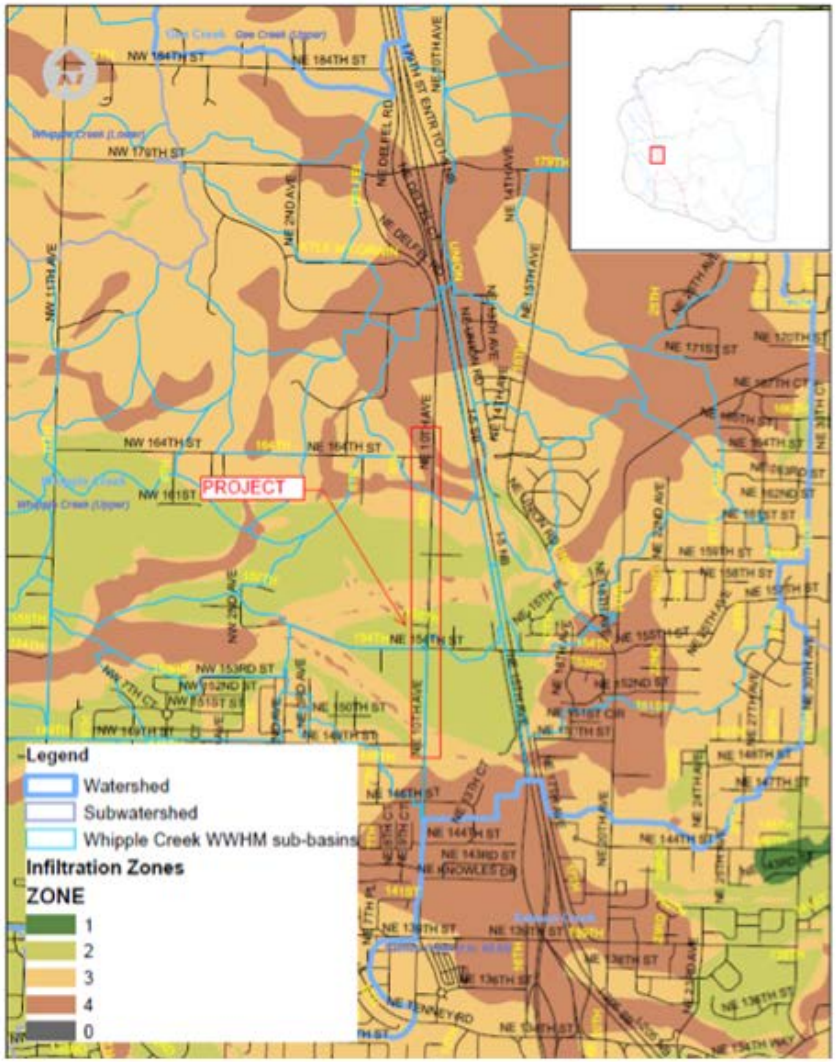
Field-based ***Confirmation:***
Watershed assessment data

Clark County Amphitheater Sub-Basin
Problem Areas (SNAP and Operations-identified)



Identify most cost-effective infiltration BMP at every possible retrofit location

Figure 8: Infiltration Zones



		Hydrologic Soil Groups			
		A*	B	C	D
Depth to GW	D >20 ft	ZONE 1	ZONE 2	ZONE 3	ZONE 3
	D=11 ft to 20 ft	ZONE 2	ZONE 2	ZONE 3	ZONE 3
	D=0 ft to 10 ft	ZONE 3	ZONE 3	ZONE 4	ZONE 4

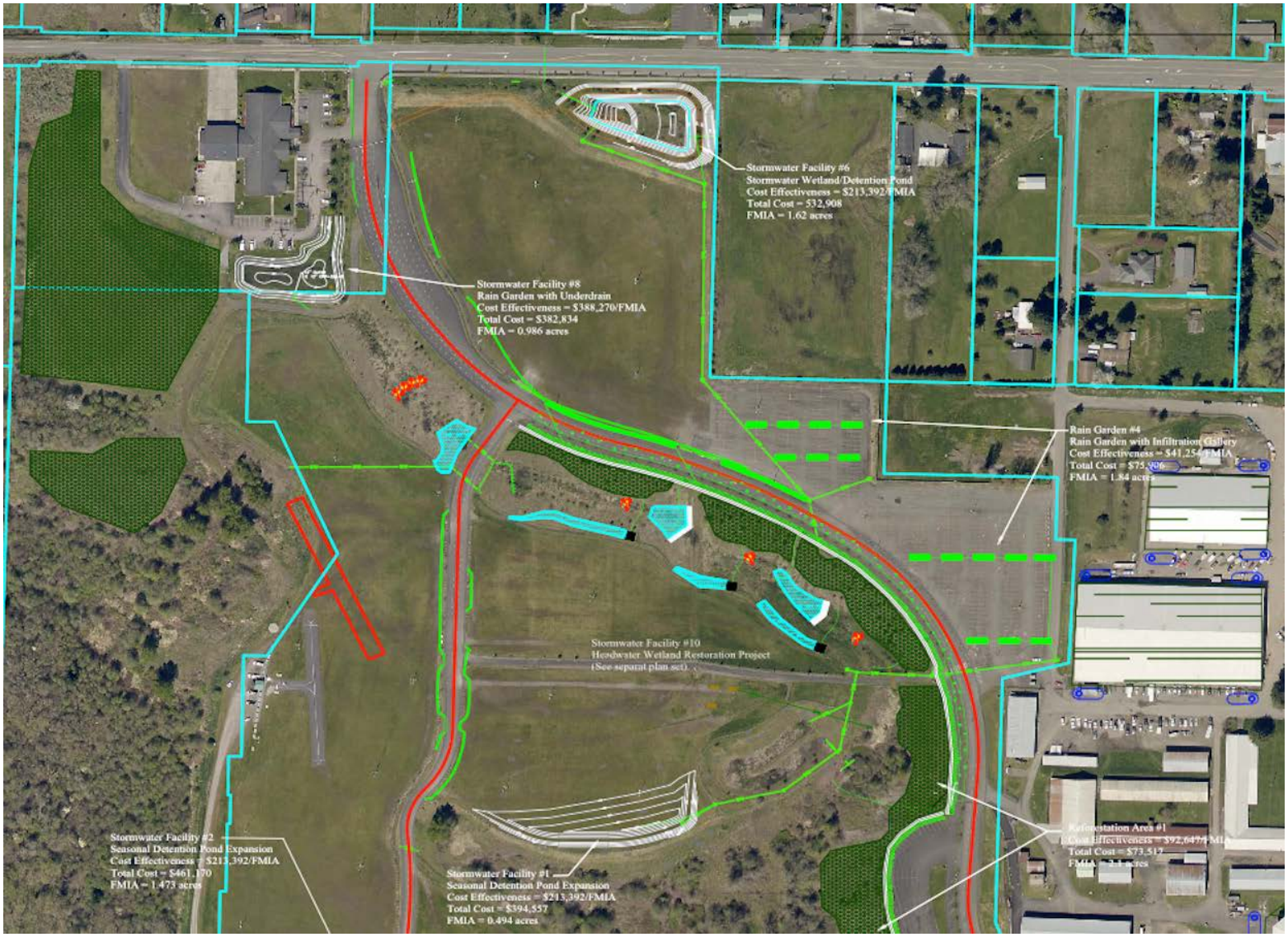
The grid maps were combined to create an "Infiltration Zone Map" with four zones.

- Zone 1 – Good Infiltration Area
- Zone 2 – Potentially Good Infiltration Area (groundwater depth and soil investigation required)
- Zone 3 – Limited Potential Infiltration Area
- Zone 4 – Poor Potential Infiltration Area

BMP COST-EFFECTIVENESS
($/Fully-Mitigated Impervious Acre)

BMP	INFILTRATION ZONE			
	1	2	3	4
Detention Pond	Don't Use	Don't Use	$317,559	$317,559
Rain Garden (w/Inf. Gallery)	$27,168	$50,878	Don't Use	Don't Use
Rain Garden (w/Underdrain)	Don't Use	$535,329	$535,329	$535,329
Green Roof	$2,920,000	$2,920,000	$2,920,000	$2,920,000
Reforestation (of pasture)	$135,021	$135,625	$92,647	$92,647
Reforestation (R & R asphalt)	$1,880,000	$1,880,000	$1,284,000	$1,284,000
Roadside Rain Garden (w/Inf. Gallery)	$47,811	$99,929	Don't Use	Don't Use
Roadside Rain Garden (w/Underdrain)	Don't Use	Don't Use	$917,558	$917,558
Parking Lot Rain Garden (w/Inf. Gallery)	$86,426	$181,856	Don't Use	Don't Use
Parking Lot Rain Garden (w/Underdrain)	Don't Use	Don't Use	$1,745,818	$1,745,818

Develop Plan Alternative #1
"Maximum improvement"



Use Hydrologic Accounting to develop other Plan Alternatives

PLAN ALTERNATIVE 3			
Proposed Improvement	Typical Cost-Effectiveness	Total Cost	Fully Mitigated Impervious Area (Ac.)
A. Stormwater Facility Projects			
~~Stormwater Facility #1; Additional Seasonal Detention~~			
~~Stormwater Facility #2; Additional Seasonal Detention~~			
Stormwater Facility #3; Additional Rain Garden with Underdrain	$388,270/FMIA	$1,333,321	3.43
Stormwater Facility #4, Alt. B; Expanded Stormwater Wetland/Detention	$213,392/FMIA	$1,798,566	8.92
~~Stormwater Facility #5; Expanded Stormwater Wetland/Detention~~			
~~Stormwater Facility #6; Stormwater Wetland/Detention~~			
~~Stormwater Facility #7; Stormwater Wetland/Detention~~			
Stormwater Facility #8; Rain Garden with Underdrain	$388,270/FMIA	$382,835	0.99
B. LID retrofit projects			
~~Rain Garden #1; Roadside Rain Garden with Underdrain~~			
~~Rain Garden #2; Parking Lot Rain Garden with underdrain~~			
~~Rain Garden #3; Parking Lot Rain Garden with underdrain~~			
~~Rain Garden #4; Parking Lot Rain Garden Infiltration Gallery~~			
C. "Growing Green" projects (reforestation)			
~~Reforestation Area #1 (Reforestation of pasture)~~			
Reforestation Area #2 (Reforestation of pasture)	$92,647/FMIA	$48,300	0.52
~~Reforestation Area #3 (Reforestation of pasture)~~			
*D. Wetland Mitigation projects**			
Wetland Rehabilitation Area #1	Varies	$377,659	3.47
* = Potential funding from Transportation projects			
E. Stream stabilization projects			
Stream Stabilization Area #1	NA	$250,000	0.00
~~Stream Stabilization Area #2~~			
~~Stream Stabilization Area #3~~			
TOTALS		**$4,190,681**	**17.34**
***PLAN* COST/EFFECTIVENESS**		**$241,644**	**per Fully Mitigated Impervious Acre**

Sub-basin Retrofit Plans: Conclusions

- Needed, effective and cost-effective
- “Top-down” strategy addresses all watershed needs
- Fast watershed-based project selection method
- Multi-benefits for environmental programs
- Speedy and effective watershed restoration

"A public option"

WSDOT and DOE's Demonstrative Approach:

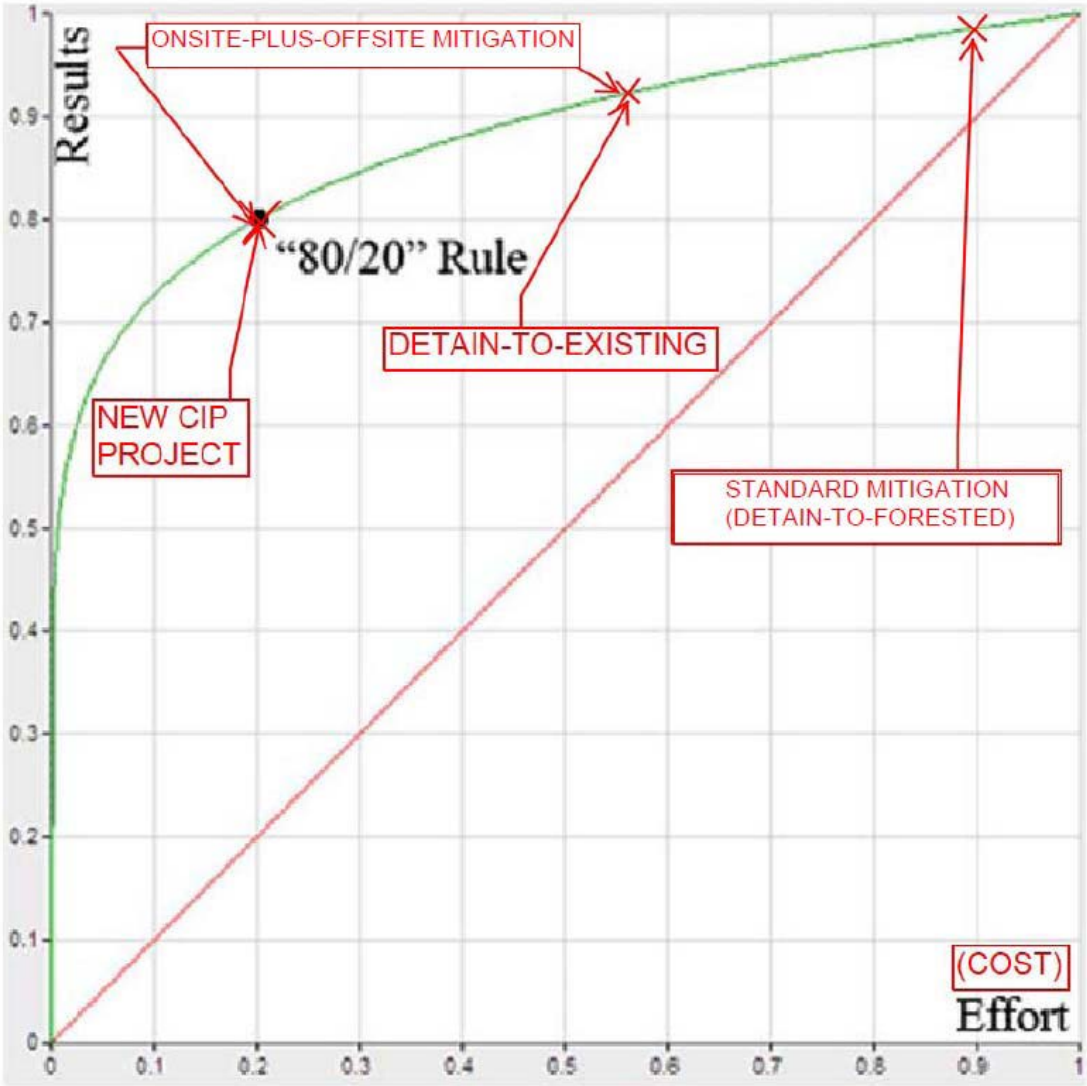
NE 10th Avenue; NE 149th Street to NE 164th Street.

Engineering and Economic Feasibility Evaluation

- 310,155 sf of impervious area.
- Stormwater mitigation cost = $4,724,640.
- Cost/benefit = $15.23/sf, >> $5-$7/sf

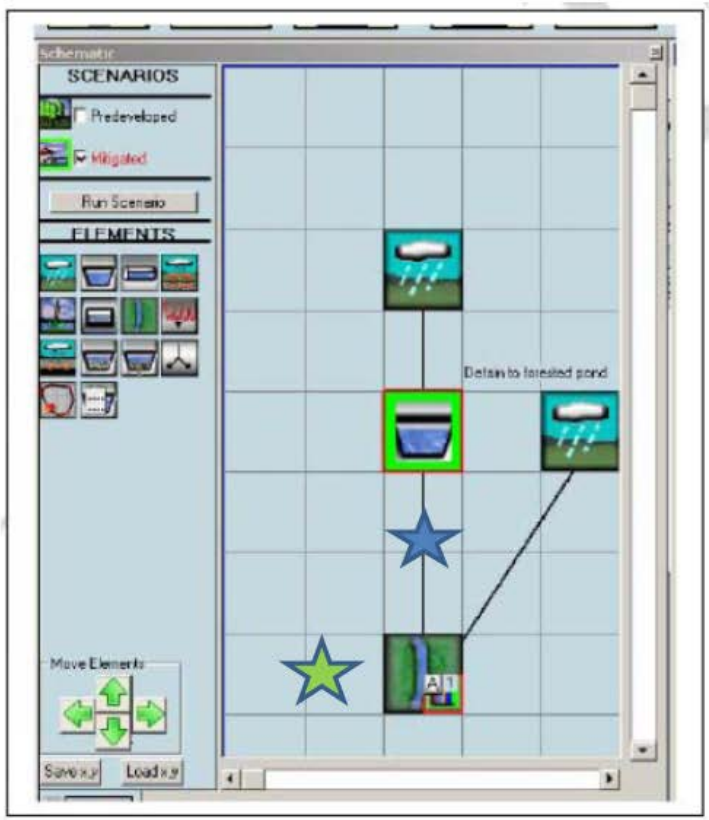
<u>Standard (onsite) stormwater mitigation for the project is considered to be economically infeasible.</u>

Watershed-based proposal: Watershed restoration concept

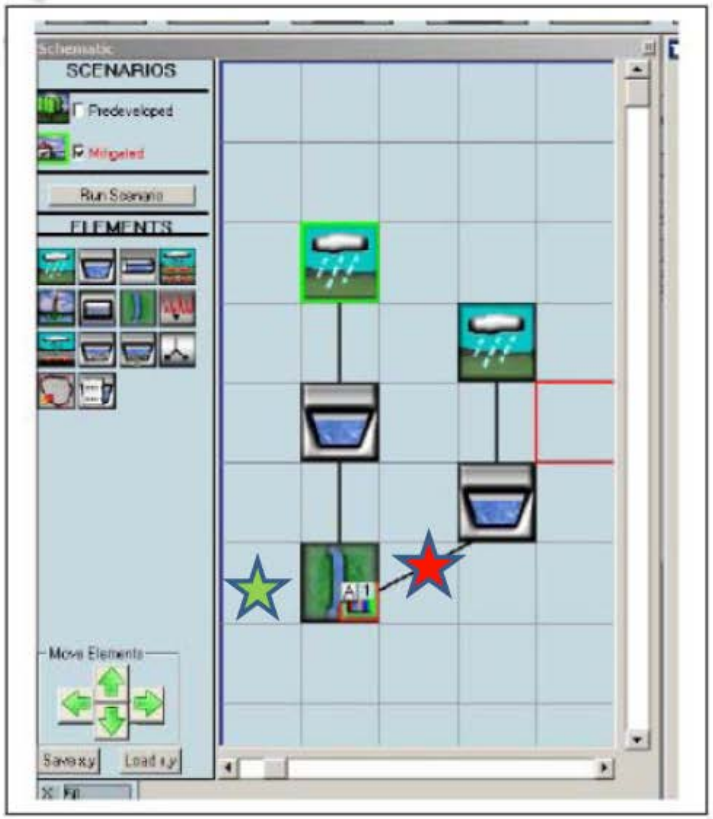


Watershed-based proposal: Watershed restoration concept

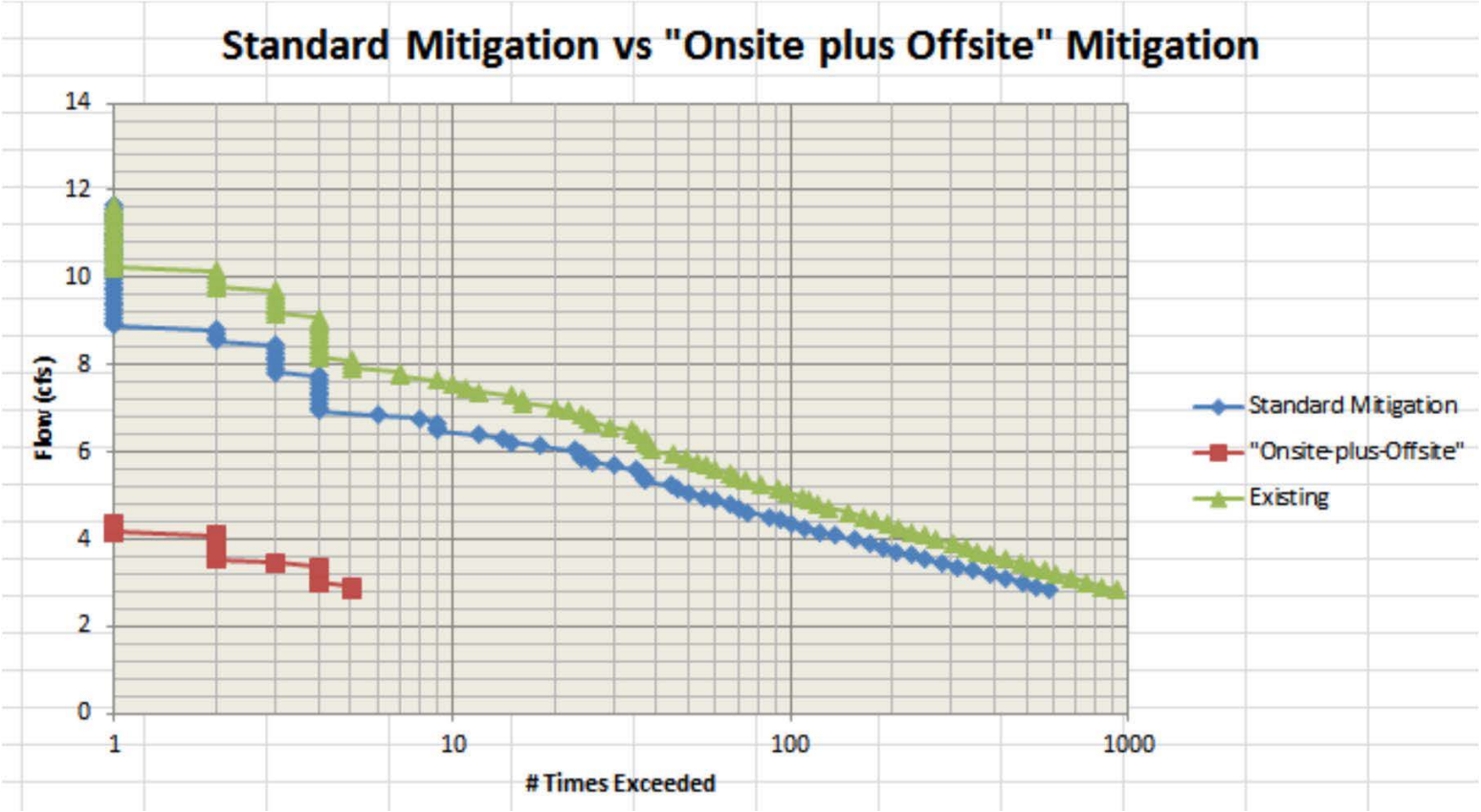
STANDARD MITIGATION



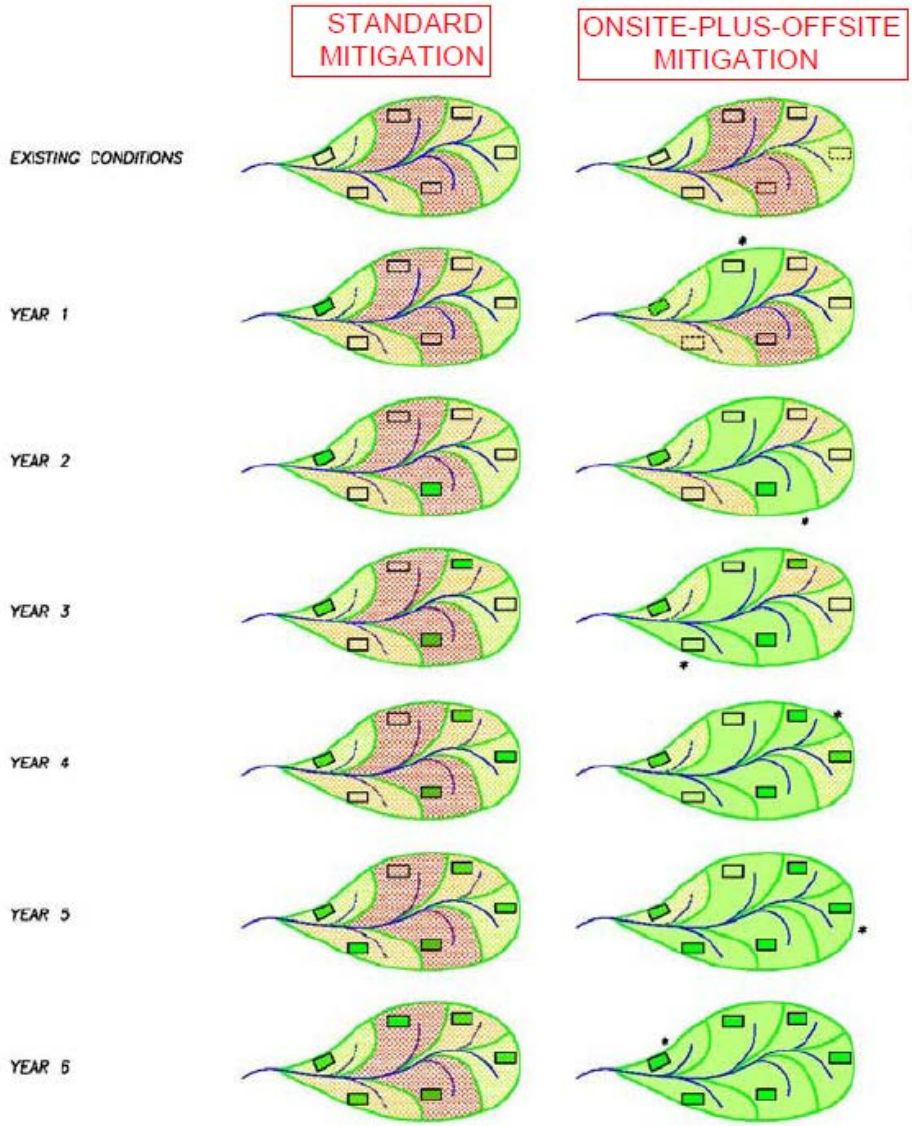
ONSITE-PLUS-OFFSITE MITIGATION



Watershed-based proposal: Watershed restoration concept



Watershed-based proposal: Watershed restoration concept

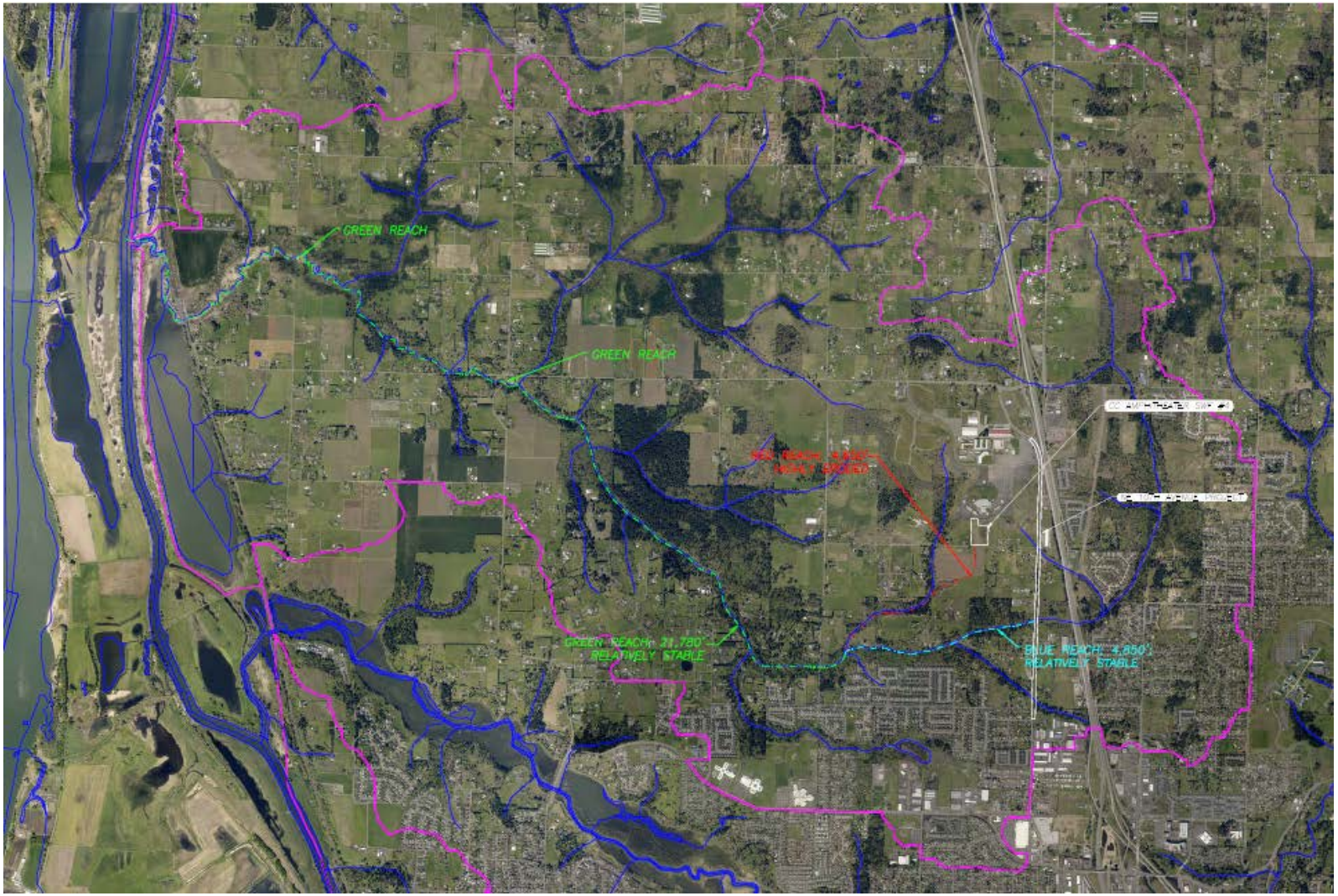


Watershed-based proposal: Offsite mitigation project types

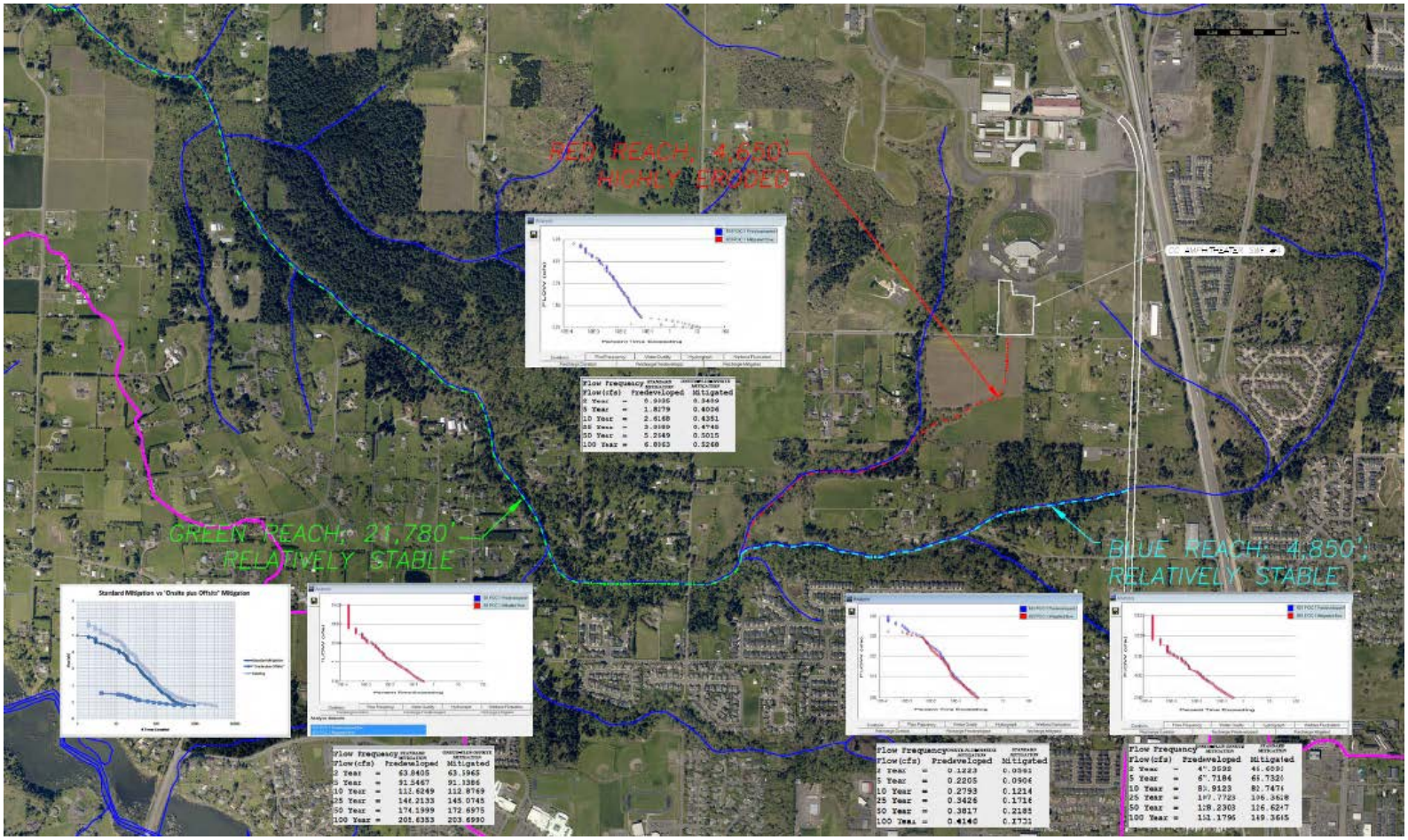
1. Detention pond retrofit
2. New detention pond
3. Headwater wetland restoration
4. Flood plain bench
5. Culvert replacement (for fish passage)*
6. *Stream stabilization project (channel-spanning log jam)*
7. Property acquisition for headwaters protection*

* = no quantitative flow control assessment made

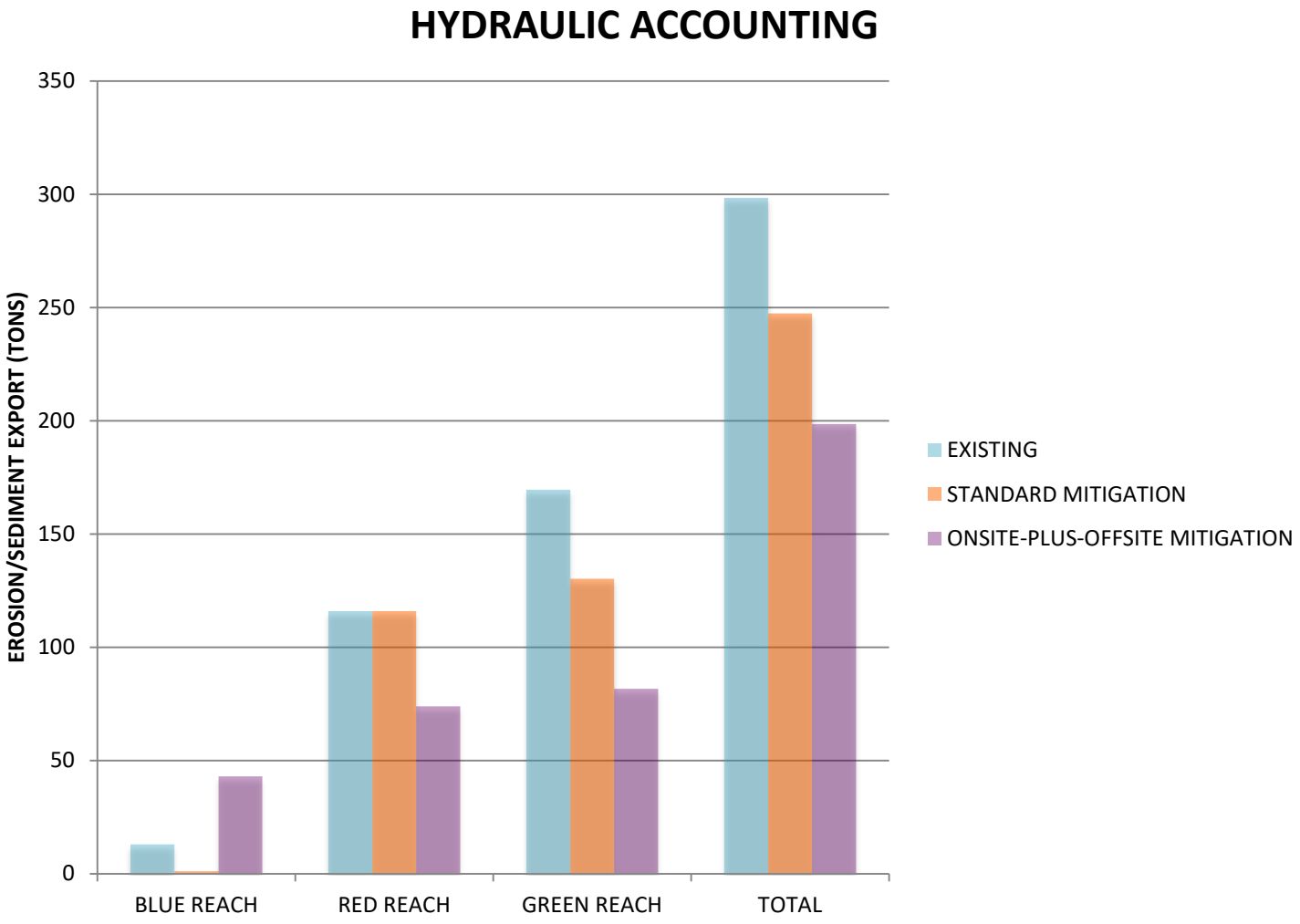
Selected Project: 3-reach assessment
Existing Channel Conditions



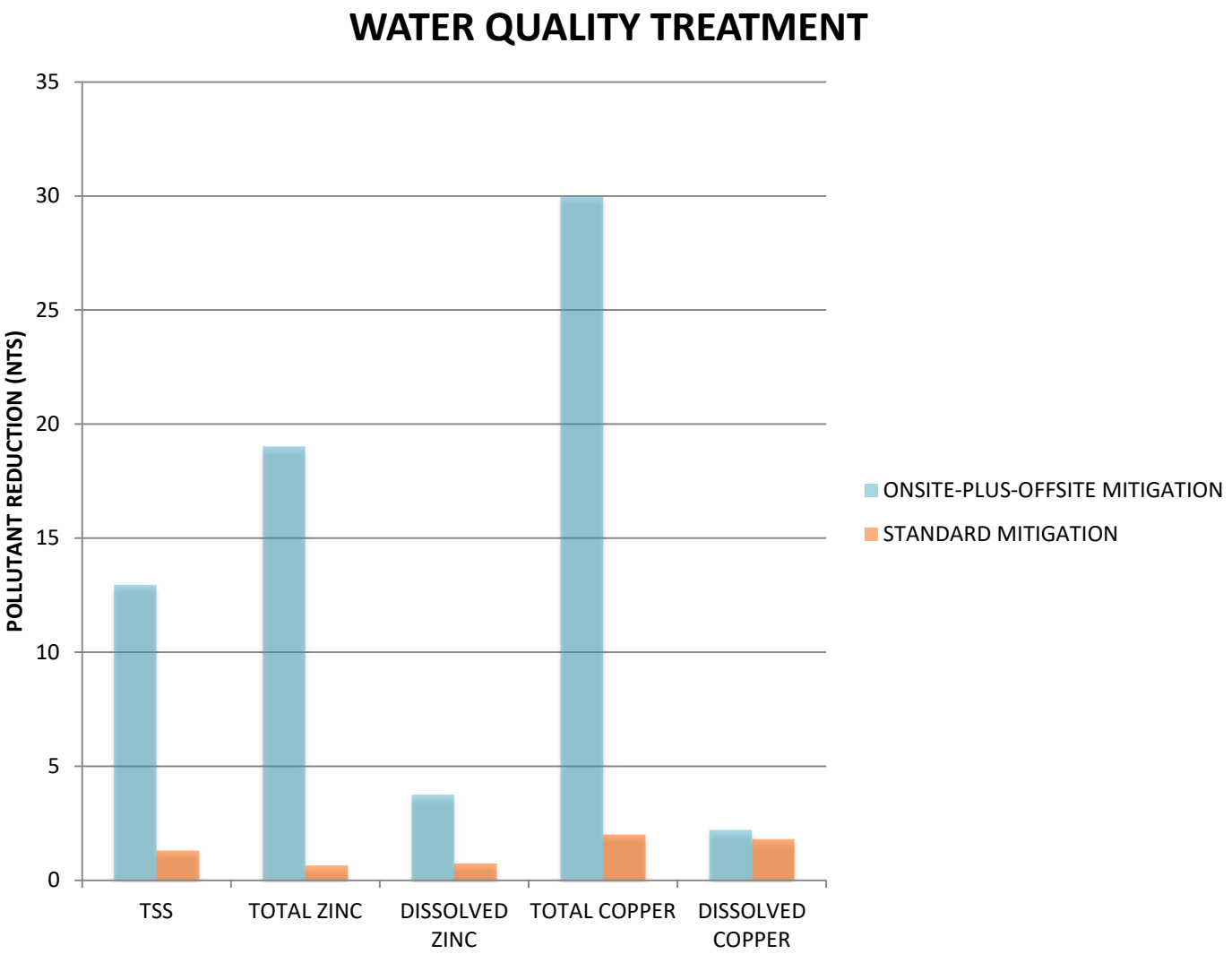
Selected Project: 3-reach Assessment Flow Control Results



Selected Project: 3-Reach Assessment Hydraulic Accounting Results



Selected Project
Water Quality Treatment Results



"Standard Mitigation" vs "Onsite-plus-Offsite Mitigation": Onsite-plus-Offsite is.....

- Cheaper

- Better environmentally
  - better flow control
  - better water quality treatment
  - has additional watershed benefits

- Uses significantly less private property

but.....

The Standard Mitigation alternative is easier to permit

Summary and Conclusions

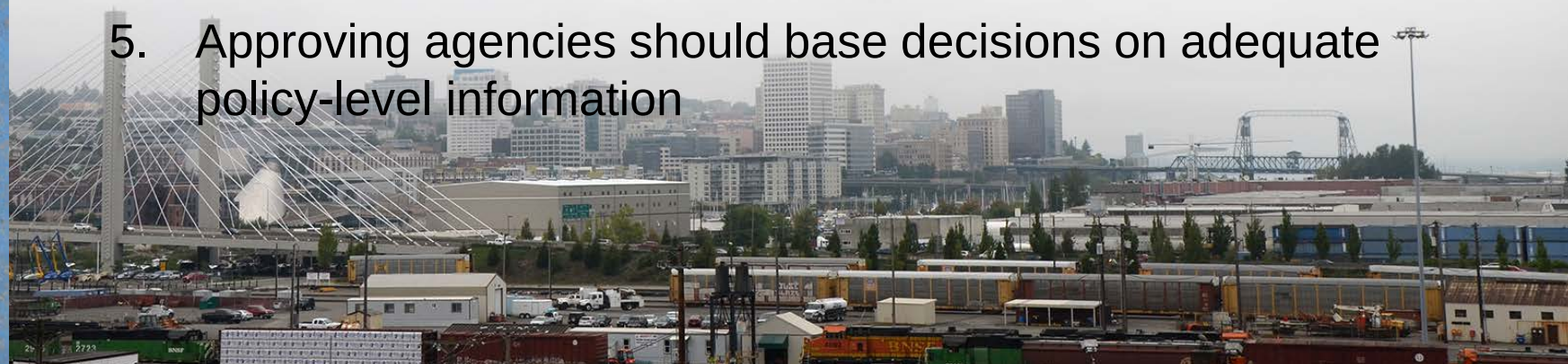
1. Increased use of the DAT process can help develop more cost-effective watershed and fish recovery programs

2. A sub-basin retrofit plan can work well as a watershed-based selection method for offsite stormwater mitigation projects

3. Most watershed project types can be quantifiably linked to flow control needs

4. Providing flow control to the Existing Condition at the road project site is advisable

5. Approving agencies should base decisions on adequate policy-level information



Summary and Conclusions (Cont'd)

6. Expand DAT to allow a wider range of project types
7. Need watershed-based review procedures for all agencies
8. Need good inter-disciplinary and inter-agency cooperation

If all the above can be made to happen, watersheds, fish and all related programs and agencies can benefit.

Watersheds and Fish: Time for a public option?

Eileen Ellison

Bill Wenk

Dr. James Guo

Bob Rodgers

Dr. Phil Gaddis