

A. Below is a summary of some of the key questions from the 1-13-12 worksheet filled out and discussed at the second meeting

1. Goals, objectives and desired outcomes for the natural resources mitigation and enhancement program

- A. Meet no-net-loss and a net increase of natural resource functions
- B. Meet state and federal requirements
- C. Preserve remaining habitat
- D. Create more habitat
- E. Focus on recovery of at risk species

2. Possible Measures to determine if these goals and objectives are met

- A. Spatial ratios – look at how many acres of habitat will be impacted by development (marine terminal and recreation) and add a multiplier based on functions impacted (high, medium and low) and a multiplier based on what type of mitigation will occur (preservation, enhancement, restoration and creation)
- B. Value – determine how much money is appropriate to be spent on mitigation and enhancement and then determine actions that can be completed based on that dollar figure
- C. Use existing models like The Willamette Partnership, Tualatin Basin Water Supply Project, HEP/HEA
- D. End state – determine what the desired future condition is and what actions/costs are needed to achieve that end state

3. Land management goals

- A. Long term monitoring and adaptive management to maintain the 500+ acres of remaining habitat
- B. Flexibility to meet evolving mitigation needs
- C. Create and maintain nature-based public access and recreational amenities

B. Emerging Areas of Potential Agreement

1. Geography – the appropriate geography for mitigation and enhancement actions is the Columbia River from the Sandy River confluence to the downstream Multnomah Channel confluence and the Willamette River to RM 3. This includes both the Oregon and Washington sides of the Columbia River.

2. Permanent Protection – the agreement must include mechanisms to ensure that the 500+ acres of remaining WHI habitat are protected in perpetuity and that a future City Council cannot open up the 500 acres to additional industrial development.

3. Timing – mitigation and enhancement actions should begin before development impacts begin (hand out)

4. Implementation – a combination of zoning, plan district codes, overlay zones, easements, and IGA will be used to implement the mitigation and enhancement program

C. New Materials

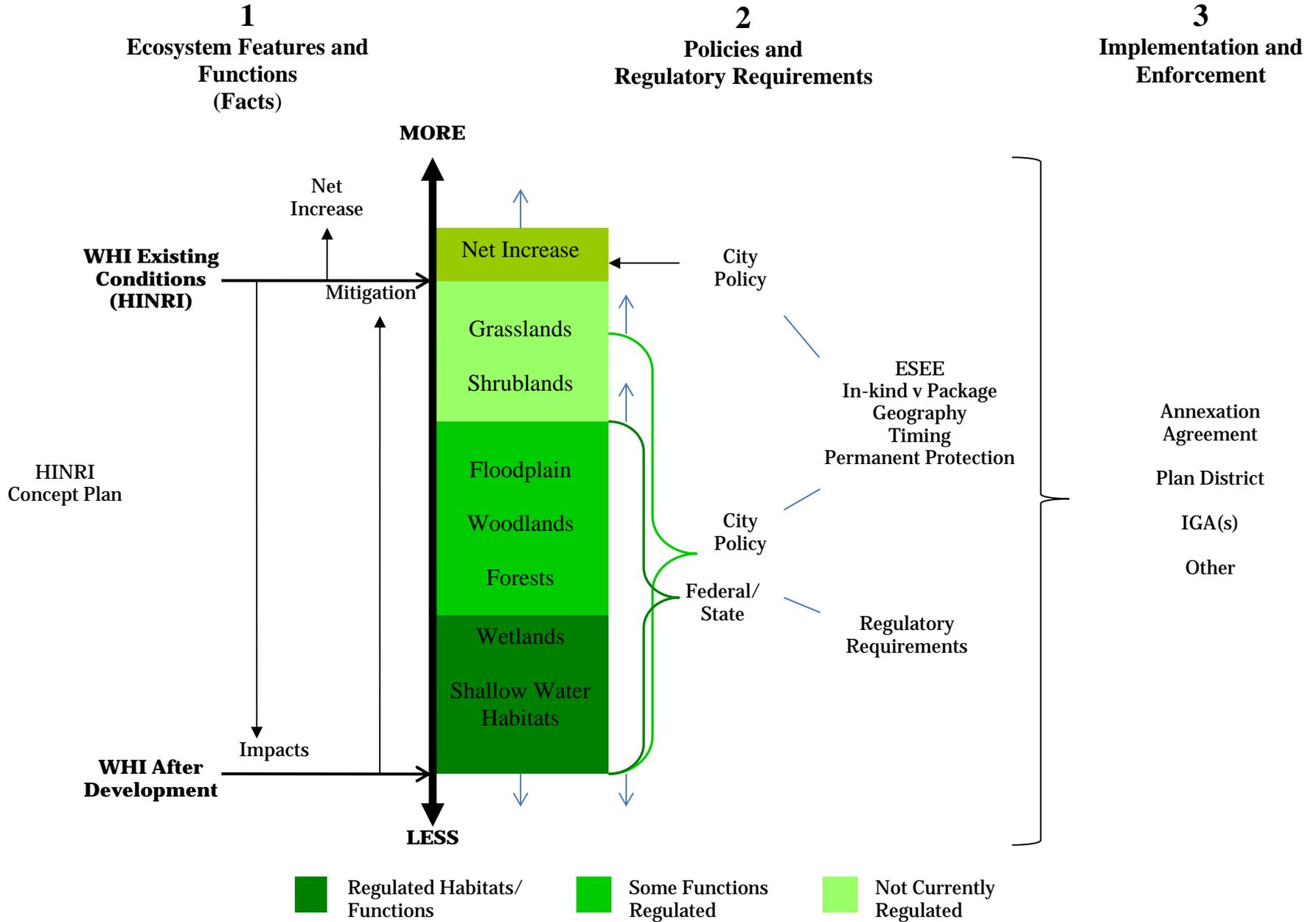
1. City
 - a. Final Base Concept Plan
 - b. Cost estimation memo
 - c. Cost estimation table
2. Port
3. Audubon
4. Metro

D. Discussion

E. Next Steps

F. Discuss Update For Friday's Advisory Committee meeting

Not to Scale



WHI

12/21/11³ Discussion Draft



DATE: 02/27/12
TO: West Hayden Island Mitigation and Enhancement Subcommittee
FROM: Eric Engstrom, BPS
SUBJECT: Natural Resource Mitigation Costs

The purpose of this memo is to describe cost estimates for habitat mitigation related to potential annexation and development on 300 acres of West Hayden Island. The primary sources of information are:

- Worley Parsons Final Base Concept Plan (February 2012)
- Worley Parsons Peer Review of Restoration Projects (February 2012)
- *River Plan/North Reach Willamette River Mitigation In-Lieu Fees Technical Report* produced by Tetra Tech, Inc. (October 2010) and
- A mitigation costs memo from the Bureau of Planning and Sustainability to the Planning and Sustainability Commission (February 17, 2009)

The Tetra Tech in-lieu fees report is the primary source of mitigation cost information. Tetra Tech evaluated three sites in the Portland Harbor, Willamette River, and broke out costs by the actions taken to restore the site. The costs are based primarily on prior US Army Corps of Engineer or City of Portland Environmental Services and Portland Transportation projects.

Worley Parsons performed a peer review the Tetra Tech report and assessed two other restoration studies for comparison. The two other studies were: 1) Evergreen Funding Consultants 2003 restoration primer prepared for the Puget Sound Strategy (2003) which was based on off-channel habitat restoration; and 2) Interstate Technology and Regulatory Council's (IRTC) 2005 wetlands design, construction and monitoring costs. These costs are included for shallow water habitat and wetlands discussed below.

Assumptions

The in-lieu fees report used existing sites where assumptions regarding restoration could be validated by site conditions. West Hayden Island (WHI) itself is the main receiving site for most of the mitigation. There are no designated off-island mitigation receiving sites for impacts. Therefore, assumptions have been made about likely mitigation actions based on impacted habitats within the marine terminal development footprint on the island.

General Assumptions

1. Any off-island mitigation receiving site would be clean; no contamination clean up would be necessary.



2. No real estate acquisition is necessary. Receiving sites would be under Port ownership or there would be an easement or agreement in place.
3. No utility movement or relocation is necessary.
4. All mitigation actions will require long term managements and maintenance.
5. All costs include a contingency markup.

Habitat Assumptions

Shallow Water Habitat and Wetlands

Creation or restoration of shallow water habitat and/or wetlands will require design, engineering, permitting, erosion and pollution control, construction management, excavation, grading, sandy substrate placement, large wood placement, invasive vegetation removal and planting of native vegetation. Removal of more structural elements, such as portions of the groins on the southern bank of the island, could occur.

Forests, Woodlands, Shrublands and Grasslands

It is assumed that mitigation for impacts to forests, woodlands, shrublands and/or grasslands would be conducted either on island or off-island at a site with the same habitat features. In other words, mitigation for impacts to bottomland hardwood forests would occur within the on-island bottomland hardwood forests or at a site with existing bottomland hardwood forests. Restoration actions would include invasive plant removal and planting of native vegetation. Depending on the soil condition, amendments to the soil may be needed. No excavation or grading would be included.

Floodplain

Currently WHI is exempt from balanced cut-and-fill regulations thought Metro's Title 3. Pending FEMA/NOAA legal dispute, Metro and the City may need to revisit the Title 3 exemptions. In addition, the actual elevations of the Dredge Deposit Management Area is likely higher than the 100 year floodplain elevation (that is, there is less actual floodplain fill necessary than the official FEMA floodplain map might suggest). It is assumed that the wetland and forest mitigation will occur inside the floodplain, to provide comparable habitat. However it is *not* assumed a separate requirement to excavate lands in response to future balanced cut and fill rules, which are speculative at this point. This should be stated as an important caveat in the cost estimate. If balanced cut and fill were required, it could add significant costs (potentially in the hundreds of millions of dollars).

Costs

The Tetra Tech in-lieu fees report presents results as line items required to restore general habitat types. Hard costs, like structure removal or excavation and grading, were consistent from project to project; there was no variability based on habitat type or site. However, there are big variations in the amount of hard costs depending on the restoration actions needs. Other costs like markups also varied a great deal. Markups are the costs of design/engineering, permitting, construction management, operation/ maintenance and contingency. They represented standard City markup rates and built projects. (Markups are often also referred to as "soft costs.")



Worley Parsons presented the results of their peer review by line item as well. The two projects did not include similar markups. For example, no long term monitoring was costed for either project. Therefore, Worley Parsons applied the same percentage markups as Tetra Tech used to the two other studies. This provides a consistent comparison between all examples.

Below the costs are presented as a range, an average and by line item.

Shallow Water and Off-Channel Habitat

The Tetra Tech total cost for actions below ordinary high water for the three Portland Harbor sites was \$26 to \$106 per square foot; an average of \$66 per square foot.

Line Item	Average Unit Costs
Site Preparation	\$241,000 - \$2.1M
Erosion and Pollution Control	\$615,000 (project average)
Structure Removal	\$200 / ton
Excavation and Grading	\$35 / ton
Substrate Placement	\$65 / cubic yard
Large Wood Placement	\$1,000 / piece
Revegetation	\$16,000 / acre
Markups	\$1.8M - \$15.5M

The variation in costs depends heavily on the type of structural removal, excavation and markups for each project.

Worley Parsons looked at one off-channel study, which had a similar cost estimate as the Tetra Tech memo: roughly \$25 per square foot.

The estimate based on the Planning Commission mitigation costs memo ranged from \$22.50 to \$25.50 per square foot. The memo did not provide a separate line item for excavation so it is assumed excavation is included in the range of costs in the memo.

WHI is primarily a “green site” and shallow water habitat restoration and enhancement would be less complex than on a developed industrial site. Therefore, a range o \$22.50 to \$66 per sq ft is appropriate.

Riparian

All of WHI above ordinary high water is considered to be within riparian area because it is within the floodplain, except a few small locations where fill has brought the island elevation above the floodplain. There is a mix of habitat types within the riparian area: floodplain, sparsely vegetated, grassland, shrubland, woodland, forest and wetland. The Tetra Tech in-lieu fees report considered all habitats within the riparian area together, which results in a wide range of costs. For example, wetland creation would require significantly more engineering, construction and management costs than just removing invasive and planting native trees.

The total costs for actions within the riparian area for the three Portland Harbor sites was \$10 to \$97 per square foot; an average of \$45 per square foot.



Line Item	Average Unit Costs
Site Preparation	\$380,000 - \$2.1M
Erosion Control	\$3.50 / square foot
Structure Removal	\$200 / ton
Grading	\$35 / ton
Revegetation	\$22,000 / acre
Markups	\$4.6M - \$16M

Below is a break down of assumptions per riparian habitat type on WHI:

Wetlands

- For wetland creation it would be appropriate to use the high end cost of \$97 per square foot. This would include higher markups for design and engineering, construction management, operation and maintenance and contingency. Site preparation costs could also be high.
- For wetland restoration, which would include some excavation and regarding, the average riparian cost of \$45 per square foot can be used.
- For wetland enhancement, no excavation and regarding, no structure removal, the lower end cost of \$10 per square foot can be used. Actions would be focused on revegetation and long term management.

Based on the Worley Parsons Final Concept Plan, wetland actions on WHI would include enhancement and restoration not creation. Worley Parsons looked at the IRTC wetland restoration project which had a cost of \$3.20 per square foot.

Riparian Forest, Woodland and Shrubland Habitats

Based on the Planning Commission mitigation costs memo and the Tetra Tech in-lieu fees report, a range of costs from \$1.35 to \$10 per square foot is appropriate. For WHI it is assumed that actions for impacts to riparian forest, woodland and shrubland would include only invasive removal, native plantings and operation and maintenance. It is assumed that no removal of structures, excavation/grading or erosion control would be included. Therefore the lower cost of the range is likely appropriate for WHI.

Note: The Tetra Tech in-lieu fees report also looked at upland forest restoration at the three Portland Harbor Sites. The average cost for that habitat type was \$10.60 per square foot. There are no upland forests within the development footprint on West Hayden Island; however, it is instructive that the average cost is similar to the lower end riparian restoration cost.

Grasslands and Sparsely Vegetated Areas

The in-lieu fees report did not address grasslands and sparsely vegetated areas. During the Airport Futures Project, staff research costs for restoration based on City of Portland Bureau of Environmental Services projects. Two scenarios were used: one where no soil amendments



were needed prior to invasive removal and seeding with native plants; and one where soil amendments were needed.

The total cost for grassland and sparsely vegetated habitat mitigation would be \$0.17 to \$1.00 per square foot; an average of \$0.60 per square foot.

DRAFT



Scenarios for purposes of estimating mitigation costs for development impacts on West Hayden Island
Update 02/27/12

Table 1: Approximate Habitat Impacts, Restoration and Costs					
	Shallow Water Habitat ^{1,2, 6}	Wetlands ^{1, 2, 3, 6}	Forest/Woodland ^{1, 2, 3}	Shrub ^{1, 2, 3}	Grassy/ Sparsely Vegetated ^{1, 2, 3}
Habitat Impacts and Mitigation (approximate acreages)					
Existing Habitat	170	45	480	25	230
Impacted Habitat ⁴	Total = 3 Terminal = 1 Recreation = 2	Total = 10 Terminal = 10 Recreation = <1	Total = 140 Terminal = 138 Recreation = 2	Total = 5 Terminal = 5 Recreation = <1	Total = 125 Terminal = 123 Recreation = 2
Mitigation Ratios ⁵	2:1 – 5:1	2:1 – 3:1 ⁷	2:1 – 3:1	1:1	1.2:1
Mitigation Needed	6 - 15	20 - 30	280 – 420	5	150
On-Island Habitat Mitigation Opportunity ⁴	195	35	340	18	100
On-Island and Off-Island Mitigation (approximate acreages)					
On-Island Habitat Mitigation ⁹	15	30	340	0 ⁸	0 ¹⁰
Off-Island Mitigation ⁹	0	0	80	0	150 ¹⁰
On-Island Surplus Habitat	180	5	0	18	0
Mitigation Cost Estimates					
Mitigation Costs/sq ft	\$22.50 - \$66.00 ^{11, 12}	\$3.20 - \$45.00 ^{11, 12}	\$1.35 - \$10.00 ¹³	NA	\$0.17 - \$1.00
On-Island Mitigation Costs	\$15 - \$43M	\$4 - \$59 M	\$19M - \$137M	NA	\$0
Off-Island Mitigation Costs	\$0	\$0	\$6M - \$45M	NA	\$1M - \$6.5M
Total Mitigation Costs	\$15 - \$43M	\$4 - \$59 M	\$25M	NA ⁹	\$1M - \$6M



Table 1 Footnotes:

1. Shallow water habitat includes the area below ordinary high water (20ft NAVD88) that was mapped as wetland, forest, woodland, shrubland or grassland in the Hayden Island Natural Resources Inventory based on August 2010 aerial photography. This does not include area within the main river channel as mapped based on August 2010 aerial photography.
2. The floodplain overlaps all habitat types; the floodplain is not reported separately.
3. In the case where wetlands overlap forest, woodland, shrubland or grassy/sparsely vegetated lands, wetlands supersede for the purpose of calculating mitigation needs.
4. Acreages based on the Worley Parsons Final Base Concept Plan, previously called A2 (February 2012).
5. Subject to further discussion. There is disagreement about what the ratios should be. These are intended to provide a ballpark of how much mitigation may be needed.
6. Final mitigation for the shallow water and wetland impacts would be determined by a state and federal process with City participation, which would involve a more specific assessment of functional impacts and the amount of functional lift provided by the specific mitigation proposed.
7. The Port Mitigation Wetland will likely be impacted by development. Mitigating for a mitigation wetland usually carries a higher ratio. In addition, the mitigation wetland is breeding ground for red-legged frog, which could impact the ratio as well.
8. The City is not proposing to require shrubland mitigation. Shrubby vegetation would be included within the forest area enhancements and therefore the costs is captured in the forest mitigation costs.
9. The City used the higher ratio to determine mitigation needs on and off-island.
10. The City suggests that all mitigation for impacts to sparsely vegetated/grassland areas be performed on Government Island because A) much of the grassland mitigation opportunity areas are also where recreation is likely to occur; and B) coupling WHI mitigation with Airport Futures mitigation would take advantage of economies of scale.
11. The upper range of the costs includes actions like removing groins or encountering unexpected material underground (e.g. boat hulls or burial grounds). The lower range includes costs for excavating sandy material.
12. Markups include engineering, permitting, etc. and can vary a great deal depending on the complexity of the project.
13. Forest enhancements like removing invasive and planting native plants would be included in the low range. The upper range would include actions like amending the soil.



Mitigation Cost Scenario:

This scenario assumes low end of the per square foot costs because WHI is a relatively green site with few existing industrial structures that would need to be removed, and fewer subsurface "surprises" than might be expected in the Willamette. Shallow water habitat restoration would include excavation, but the assumption is that most of the site is sandy substrate, rather than any complex structures. Soil amendments are not assumed. All mitigation is on-site unless otherwise noted.

Table 2: Approximate Mitigation Costs			
		Low Ratios Assumed	High Ratios Assumed
Federal/State Mitigation	Shallow Water	\$6M	\$15M
	Wetlands	\$3M	\$4M
Local Mitigation	Forest	\$16M	\$25M (\$20M onsite, \$5M offsite)
	Grassland	\$1M (all offsite)	\$1M (all offsite)
Total		~\$26M	~\$45M

Full Restoration Scenario:

This scenario assumes the full Final Base Concept Plan environmental concept is realized, regardless of what is required as mitigation or is done based on other mandates. Because not all of the 195 acres of shallow water habitat needs enhancement (it is functioning pretty well), this scenario assumes 20 acres total of shallow water habitat restoration and enhancement. Like the mitigation cost scenario, the low end of the per square foot costs is assumed.

Table 3: Full WHI Restoration Costs	
Shallow Water Habitat	\$20M
Wetland	\$5M
Forest	\$20M
Grassland	\$740K
Total	~\$46M