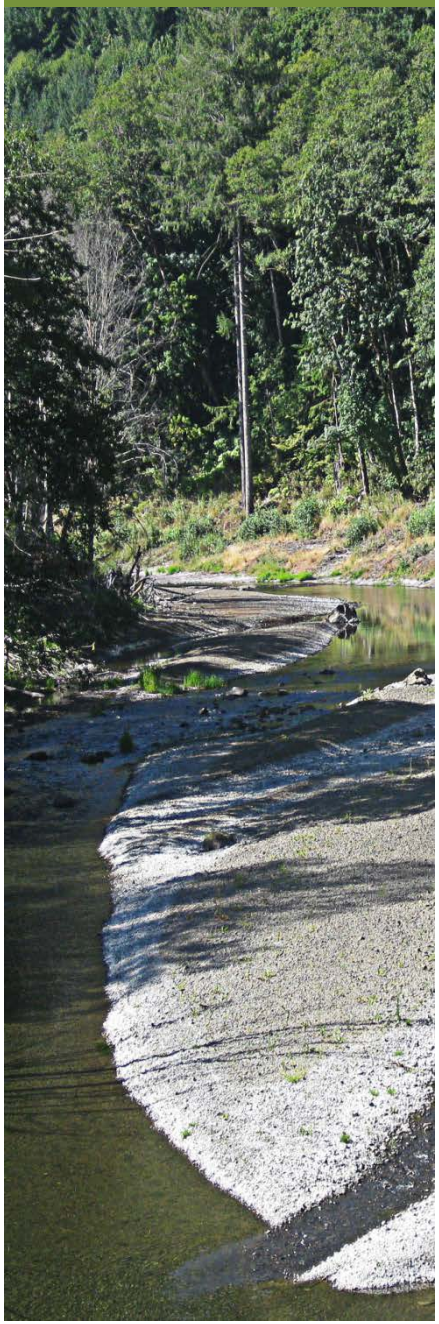
Chehalis Basin Strategy: Reducing Flood Damage and Enhancing Aquatic Species

Comparison of Alternatives:

Methodology Selection Overview & Status



Objective

- Overview of Comparison of Alternatives Process
- Review of Past Economic Evaluation and Critique
- Overview of Economic Environmental & Non-Environmental Evaluation
- Methodology Selection Overview & Recommendations
- Need Input on Recommended Methodology

Analysis of Alternatives Project Timeline

- Methodology Selection
  - Decide on Overall Evaluation Framework to Use for Study
  - First Technical Committee Meeting - October 10 – Discussed Framework Components
  - Technical Work Shop Meeting - October 30-31, 2013 – Provide Overview & Summary
  - Policy Work Shop – November 13, 2013
  - Deliverables: Technical Memo – December 31, 2013

Analysis of Alternatives
Project Timeline (cont'd)

- Evaluation of Components
  1. Environmental Benefits and Costs
  2. Non-Environmental Benefits and Costs
  3. Transportation Benefits and Costs
     - Determination of components to include and methodology for valuation of each component
     - Deliverable: Technical memo
     - Schedule 1/1/2014 – 5/1/2014

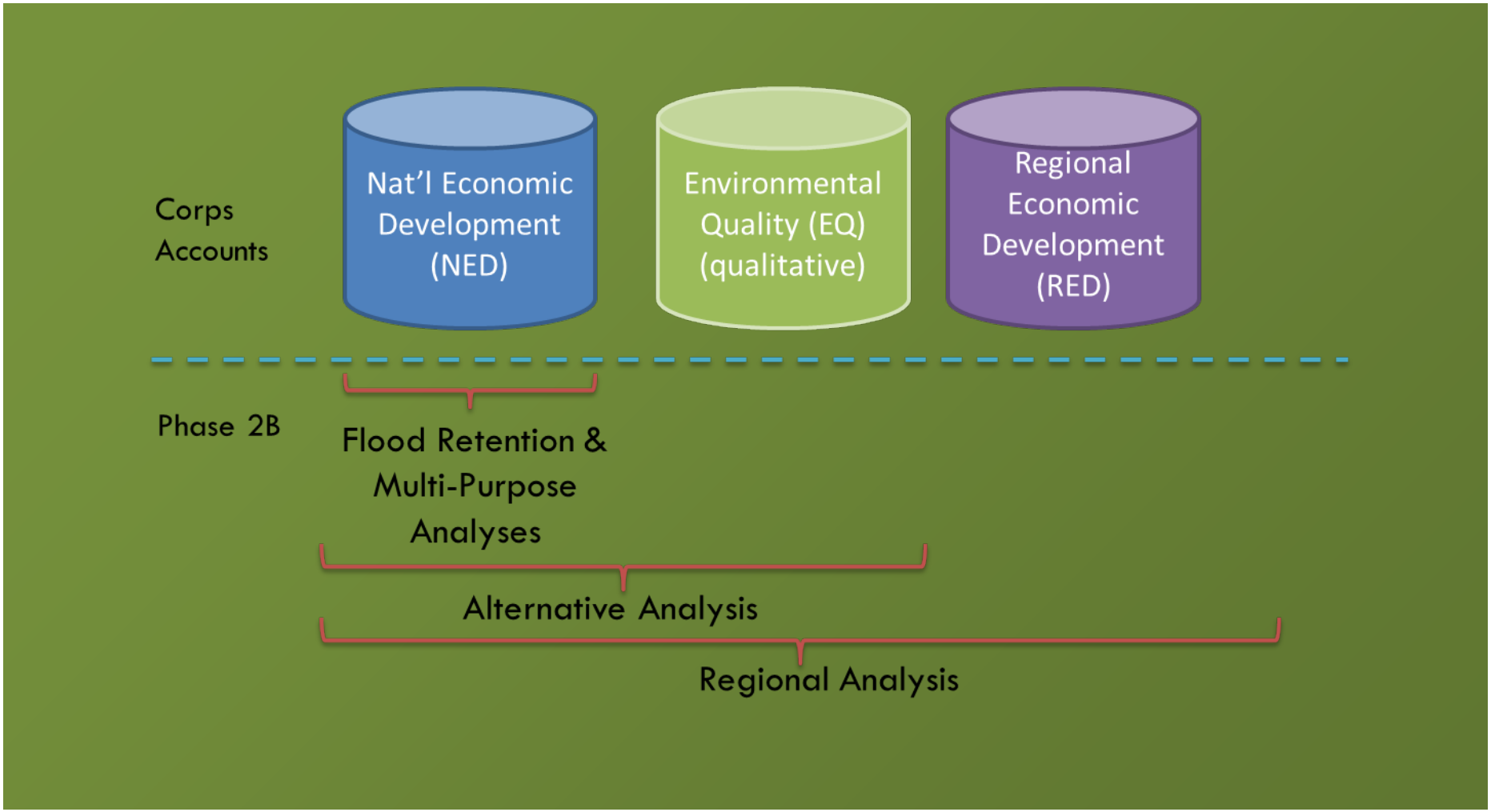
Analysis of Alternatives Project Timeline (cont'd)

- Comparison of Alternatives
  - Build model based on methodology selected
  - Receive data from other studies
  - Perform analysis
  - Perform risk analysis
- Need to Complete Draft Analysis by June 30, 2014
- Finalize by August 31, 2014
- Deliverable: Draft and Final Report

Prior Economic Analysis

- Provided Benefit/Cost Ratios
- Examined Flood Only and Multi-Purpose Retention Projects
- Flood Damage Reduction Based on Event Probabilities
  - 10 year, 25 year, 50 year, 100 year and 500 year floods
  - Examined impact with and without project
- Used HAZUS to Determine Flood Damage Impact
- Minimal Environmental Impacts Were Quantified
- 3 Perspectives: National (P&G), Alternative and Regional

Prior Economic Analysis (cont'd)



Prior Economic Analysis (cont'd)

- Critique
  - Explore alternatives other than retention facilities
  - Need to make the data sources and value assumptions transparent
  - Some impacts may have been double counted
  - Use net benefits rather than benefit-cost ratios
  - Provide a range of results, not just a single number
  - Apply probability distributions where available
  - No environmental impacts/not comprehensive
  - Disaggregate project benefits and costs by Impact
  - Discuss discount rate and provide range
  - Clearly define the without project (baseline) case

Prior Economic Analysis (cont'd)

- Throughout Address What We are Doing Different
  - Including WSDOT and Basin Wide Alternatives
  - Incorporate Aquatic Species Enhancement Plan
  - The analysis will be transparent with source data and calculation available and explainable
  - Incorporating environmental impacts based on studies underway -
  - Incorporating uncertainty measures including ranges and probability distributions where available
  - Allowing for information to be presented based on requirements from funding sources and decision makers
  - Presenting Net Present Value (NPV) of Net Benefits
  - Incorporating qualitative evaluation in addition to quantitative evaluation

Standard Methodology for Evaluating Flood Projects

1. Identify Alternatives
2. Determine the Perspective from Which the Analysis Will be Conducted
3. Develop Cost of Alternative (Capital and O&M)
4. Analyze Incremental Effects of the Alternative
   - Impact with alternative
   - Impact without alternative
5. Gather Data about Value of Impacts of Alternative
6. Develop a Deterministic Model to Calculate the Net Present Value (NPV) of Expected Net Benefits
7. Develop a Risk Profile Around the Expected Net Benefit
8. Consider Qualitative Impacts with the Quantitative Impacts to Inform Decision Makers

Methodology Selection

1) Options – Which Alternatives Do We Model?

- Recommendation
  - Flood retention facility only
  - Multi-purpose flood retention facility (with possible hydro)
  - WSDOT alternative
  - Suite of basin-wide projects
  - Aquatic species enhancement plan
- Decision point

Methodology Selection (cont'd)

- How Do We Incorporate Suite of Basin Wide/AESP Projects?
  - Magnitude of impact is not yet known
  - Do they impact results for the other alternatives (raised houses reduce flood damage impact) or do they complement other projects?
  - Model combinations or separately
    - Could be a large number of combinations

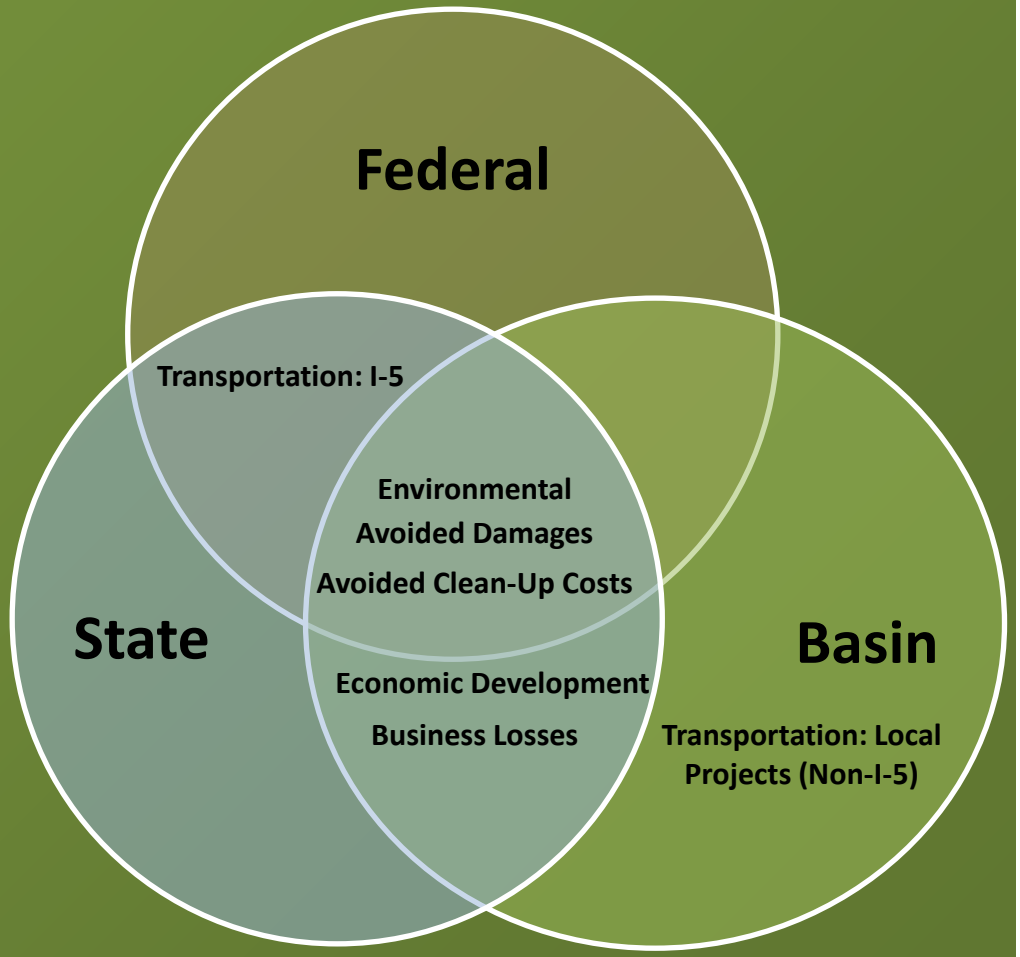
Methodology Selection (cont'd)

- **Recommendation**
  - If project does not affect the impact analysis of the retention facilities or WSDOT Alternative – add costs and impacts after the fact
  - If project does affect the impact analysis of the retention facilities or WSDOT Alternative, the analysis should explicitly ensure that no double counting of impacts occurs
- **Decision Point**

Methodology Selection (cont'd)

2) Analysis Perspective

- Whose costs and benefits are being assessed?
  - Why is this important?
  - How does it impact analysis?



Methodology Selection (cont'd)

- **Recommendation** – Show Results from Three Perspectives
  - National Perspective
    - P&G with 2013 update
    - Includes environmental impact
  - State Perspective
    - Includes environmental impact
    - Includes economic impacts
  - Basin Wide Perspective
    - Includes environmental impact
    - Includes localized impacts, but removes some state impacts
- **Decision Point**

Methodology Selection (cont'd)

3) Cost of Alternative – Developed by Other Technical Groups

- Costs
  - Include capital investments
  - Include O&M costs
  - Include permitting costs
- **Recommendation** – Costs developed for 50 years (analysis horizon) in today's dollars
- **Decision Point**

Methodology Selection (cont'd)

4) Analyze Incremental Effects of the Alternative

- Need to Develop Baseline for Comparison
  - Options
    - Forecast of future changes if no alternative is selected
    - Status quo – current situation with no changes
    - Current status with known and measurable changes
- **Recommendation** – Current status but include currently funded and approved projects
- **Decision Point**

Methodology Selection (cont'd)

- The Following Effects are Anticipated to be Evaluated
  - Impact on commercial fisheries for salmon and steelhead
  - Impact on recreational fisheries for salmon and steelhead
  - Impact on terrestrial and non-fish aquatic habitat species
  - Impact on other fish species (non-salmonids)
  - Impact on other environmental benefits such as carbon sequestration and resiliency to climate change
  - Impact on building structures, contents and equipment
  - Impact on agriculture
  - Impact on clean-up costs
  - Impact on transportation
  - Net value of hydropower and its renewable qualities
  - Impact on local employment and business income

Methodology Selection (cont'd)

- Components will be included in each perspective analysis based on the appropriate guidelines (remember Venn Diagram)
- Impacts will be based on data provided by technical studies and data collected for the Chehalis Basin
- Quantitative or qualitative based on data available
- **Decision Point**

Methodology Selection (cont'd)

5) Gather Data About Value of Impacts

- Flood damage valuation will be based on HAZUS model output with each benefit disaggregated for input into overall BCA framework
- Indirect/direct costs will be estimated based on IMPLAN county and state models
  - Business losses
  - Income effect
- WSDOT will provide analysis of value of the impact of transportation changes

Methodology Selection (cont'd)

- Environmental Valuation Recommendations
  - Will be handled using a customized model
  - Impact analysis framework matched up with output framework developed by the ASEP group
    - Quantitative outputs used to monetized ecosystem benefits
    - Qualitative outputs used in a cost-effectiveness analysis (no-monetization of impacts)
  - Keep environmental benefit results disaggregated for input into overall BCA framework

Methodology Selection (cont'd)

- Environmental Valuation Recommendations (cont'd)
  - Monetize Salmon and Steelhead benefits based on quantitative analysis from ASEP
  - Present each of the monetized benefits separately (use vs. non-use)
  - Expected assessments include:
    - Use values from commercial fisheries
    - Use values from recreational fishing
    - Non-use values for species sources: Yakima Basin Study, NRCS inventory of use/non-use values, literature review

Methodology Selection (cont'd)

- Environmental Valuation Recommendations (cont'd)
  - Evaluate impacts to other fish species and terrestrial habitat benefits in a cost-effectiveness (C-E) analysis framework
    - Takes advantage of indices provided by ASEP team
    - Measure tradeoffs/gains for each habitat type compared to costs of alternatives to rank the performance of alternatives
    - Methods utilize C-E framework similar to USACE National Ecosystem Restoration guidance and IWR-Plan models already in existence
  - Disaggregated framework
    - Keep each ASEP guild index separate

Methodology Selection (cont'd)

6) Deterministic Model Development

- Benefit Cost Model Combines the Impacts and the Value of Each Effect
- Deterministic Model Uses Expected Value of All Inputs to Determine Most Likely Result
- Net Benefit = Benefits – Costs
  - Will be developed for each alternative for each perspective
  - Possible to group benefits and costs in different manner
- **Recommendation** – Results will be presented on a Net Present Value (NPV) basis summarizing 50 years of net benefits in today's dollar; impacts will be disaggregated for each alternative so decision makers can understand the contribution to overall net benefits from each impact
- **Decision Point**

Methodology Selection (cont'd)

7) Risk/Uncertainty Evaluation

- Risk or uncertainty associated with each variables will be included based on available data
- Analysis must have a foundation so the results are believable
- **Recommendation** – Use probability distributions where data is available and use deterministic analysis (high/medium/low) and ranges where data is not available to understand the probability distribution
- **Decision Point**

Methodology Selection (cont'd)

8) Incorporate Qualitative Analysis

- Not all impacts can be measured quantitative, i.e., be assigned a dollar value
  - May conduct a tradeoff analysis between benefits which are monetized and those which are evaluated in C-E frameworks to compare the performance of alternatives and rank the tradeoffs between monetized and non-monetized benefits
- Methodology for incorporating qualitative analysis depends on how important the impact is – would it alter the decision?
- Tools available to convey qualitative impacts:
  - Descriptions
  - Ranking
  - Positive/Negative
  - Level of impact (High/Medium/Low)

Methodology Selection (cont'd)

Table 2. Qualitative benefit analysis: positive (+) and negative (–) added benefits of implementing either A1 or A2, relative to the impacts of the minimal intervention A0.

Benefit dimension	Option A1	Option A2
Environmental component:		
Time of inundation of the riverine zone	+	+
Risk of discharge obstruction due to sedimentation	+	+
Quality of surface water after a flood event	+	+
Piezometric level of aquifers	+	+
Quality of groundwater	–	–
Area of agriculture soil	–	–
Soil contamination	=A0	+
Nature conservation interest	–	–
Urban integration	+	+
Enhancement of landscape	–	+
Social component:		
Perception of flood risk	+	+
Effects on the social fabric	–	+
Effects on public health	–	–
Technical component:		
Technical complexity of the intervention	+	+
Complexity of maintenance	+	+
Level of protection	+	+

Methodology Selection (cont'd)

Table 1: Benefit-Cost Analysis Overview

	Present Value
Costs – Total Capital and Operations and Maintenance	$3,786,300
Monetizable Benefits	
Flood Control Benefits	
Avoided Downstream Flood Damage	$9,902,622
Total Monetizable Benefits	$9,902,622
Qualitative Benefit or Cost	**Qualitative Indicator***
Water Supply Benefits	
Avoided Loss of Groundwater Recharge	+
Water Quality and Other Benefits	
Maintain Protected Riparian Habitat	++
Avoided Degradation of Water Quality	+
Protect Wetland and Riparian Habitats	++
Recovery of Endangered Southern Steelhead	++
Protect Farmland from Development	++
Provide Educational and Recreational Opportunities	+
Flood Control Benefits	
Avoided Construction Cost of New Levees	++
Avoided Maintenance Costs for New Levees	++
Avoided Upgrade Costs for Existing Levees	++

Methodology Selection (cont'd)

Benefit	Rationale	Based on Building-Permit Growth	Based on Population Growth
Avoided fish losses	Some streams will experience avoided fish losses. They will have higher flows than projected now.	$3.8 million	$6.8 million
Increased certainty in development	Development will be less likely to be stopped by future closures resulting from legal challenges. Future development is at risk of this now.	$19.9 million	$62.1 million
Avoided legal costs	Legal challenge will be less likely on the grounds of instream and fish protection. Legal challenge is likely now.	$2.4 million	$4.8 million
Protecting existing restoration	Money has been invested in multiple restoration projects for salmon habitat. These investments lose value given projections of streamflow loss without the rule.	$6.0 million	$6.0 million
Potential value of avoided curtailment	Existing and future junior water users will be less likely to have use curtailed in favor of senior right holders. They are at risk of this now.	Not quantifiable	
Potential value of beneficial storage projects	Storage projects that benefit people and the environment will be possible. There is no allowance for these now.	Not quantifiable	
	Total Quantified Benefits	**$32.1 million**	**$79.7 million**

Methodology Selection (cont'd)

- Simple Example of Qualitative & Quantitative Evaluation

	College 1	College 2	College 3
Tuition	$15,000	$35,000	$55,000
Description	Local university, can live at home	Large public school, out of state	Small private liberal arts college, out of state
Number of Students	20,000	15,000	2,000
Internship Program (Scale 1 - 5, 5 best)	4	3	2
Tennis Team	-	+	+
Quality of Study Program (Scale 1 - 5, 5 best)	2	3	5
Near skiing	+	-	+

  - **Recommendation** – Provide description of qualitative measures and impact; the methodology will provide information on both qualitative and quantitative impacts separately, so the decision makers can apply their own weighting to the information
  - **Decision Point**

Questions/Comments