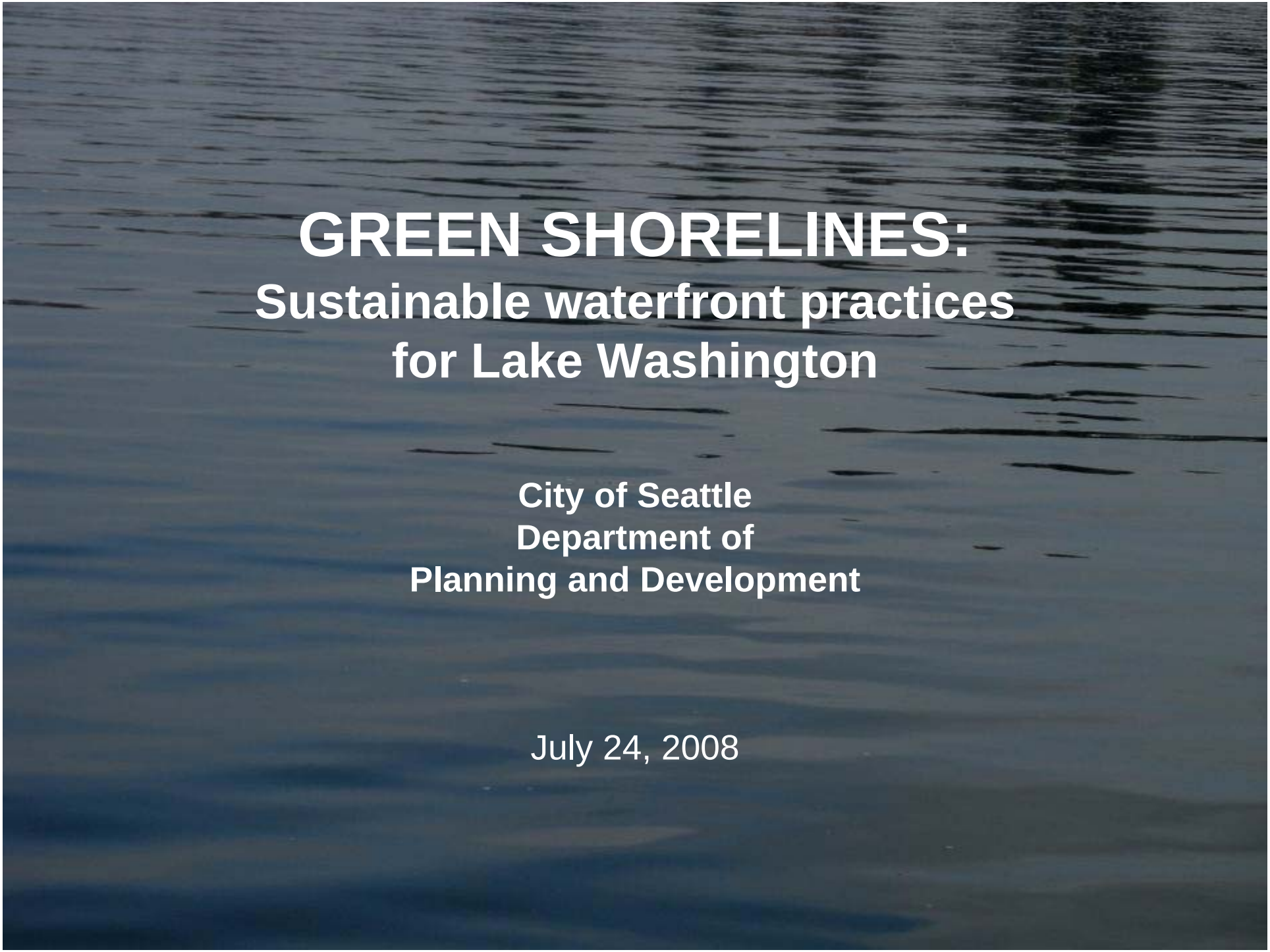


GREEN SHORELINES:
Sustainable waterfront practices for Lake Washington

City of Seattle
Department of
Planning and Development

July 24, 2008

Background

- Lake Washington's Chinook salmon population is threatened by a shortage of nearshore habitat – in 2001, 70% hardened shoreline and 2,737 docks around the lake.

- Start to address problem by encouraging voluntary improvements on residential properties.

- Grant from King Conservation District


Roger Tabor

Product

- Develop a guidebook to inform homeowners about more sustainable options and stimulate interest in these projects – compile information in one place.

- Surveys indicate that a majority of homeowners prefer the vegetated shoreline “look,” but that they have four main concerns:
  - Lack of information
  - Cost
  - Reliability
  - Permitting process

- Provide information and images to address these issues, shift preferences away from the sterile turf and bulkhead aesthetic to more diverse landscapes.

Process

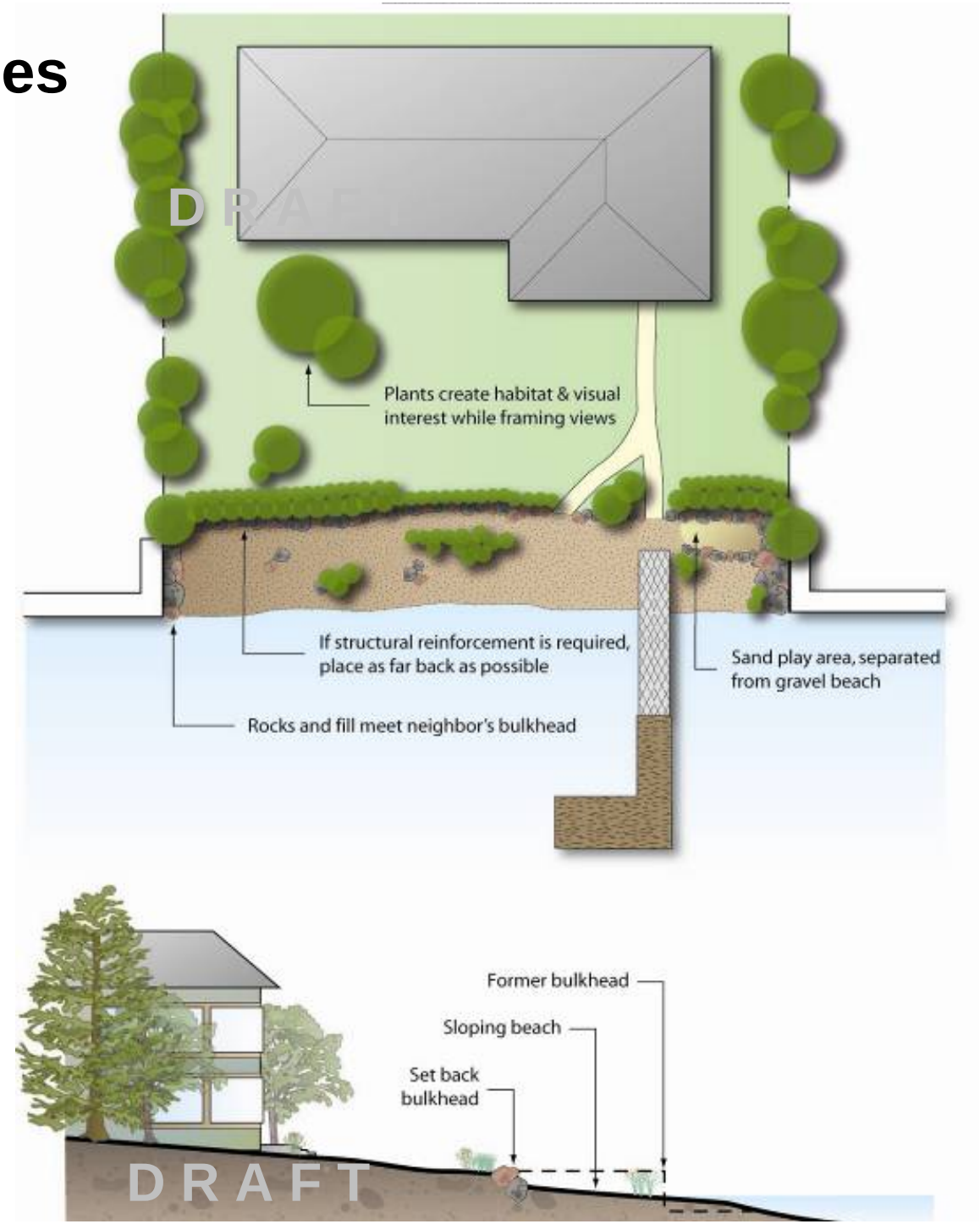
- Literature review -- WRIA 8 Chinook Salmon Conservation Plan, UW studies, various publications on shoreline stabilization practices (DNR, DOE, ACE, KC, misc. non-profits)
- Draw up draft recommended practices, look for precedent sites
- Review and revise with input Technical Advisory Committee: engineers, designers, contractors, regulators

Anchor Environmental

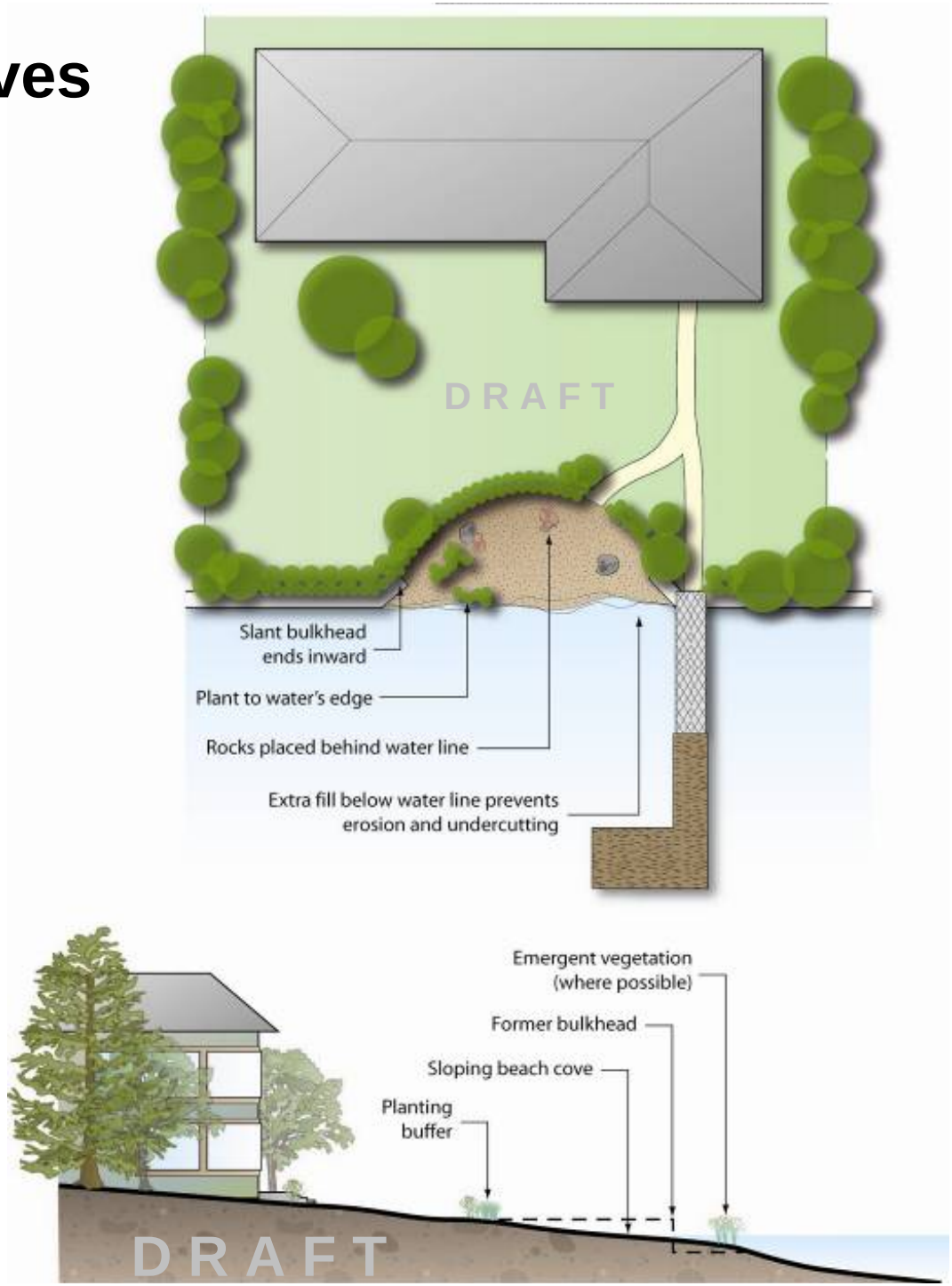
Living Shorelines practices

- Full beach installation
- Creating beach coves
- Setting back bulkheads
- Vegetated buffers
- Slope bioengineering
- Log placement

Full Beaches

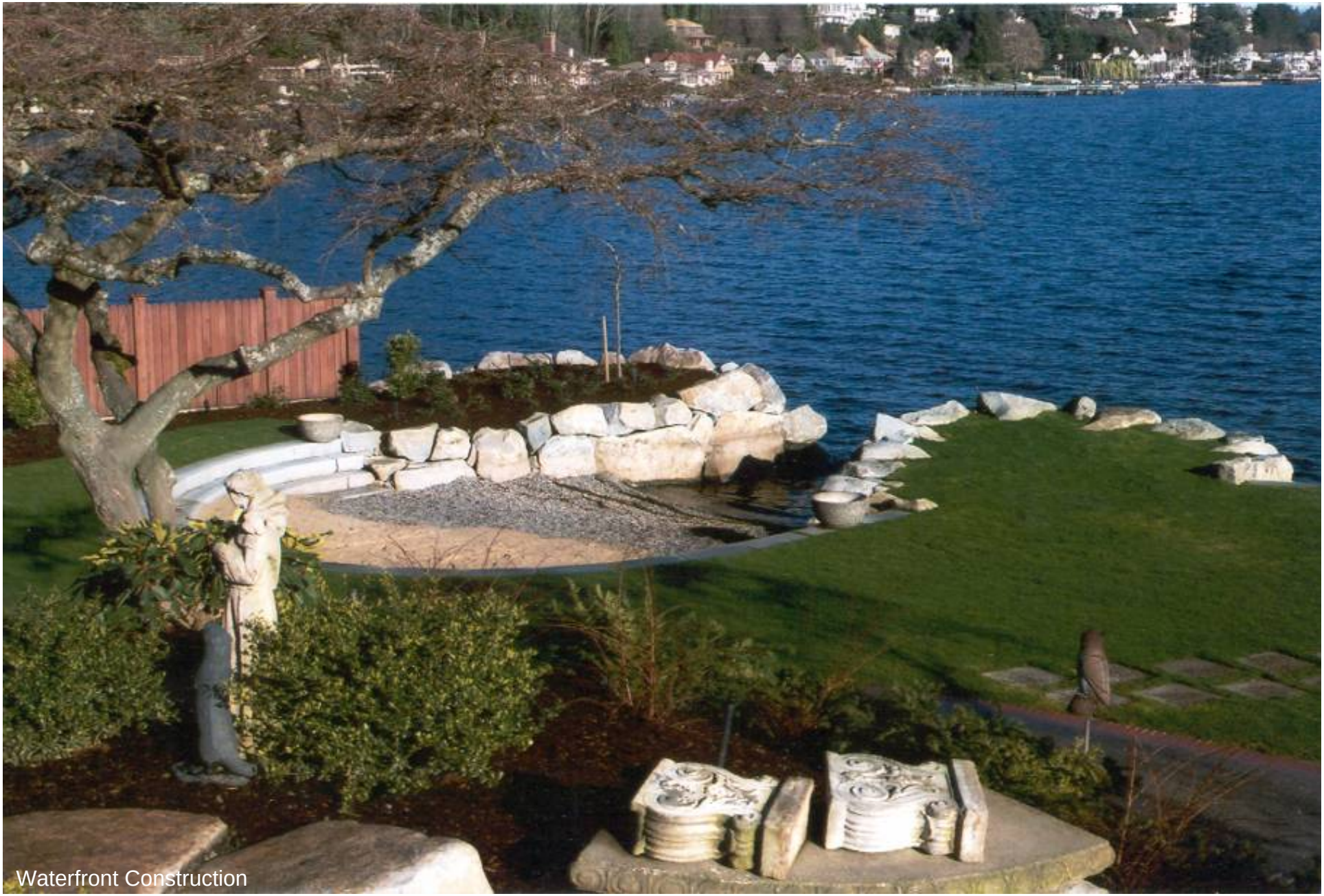


Beach Coves


DRAFT
Slant bulkhead ends inward
Plant to water's edge
Rocks placed behind water line
Extra fill below water line prevents erosion and undercutting
Emergent vegetation (where possible)
Former bulkhead
Sloping beach cove
Planting buffer
DRAFT


Watershed Company


Hendrikus Group



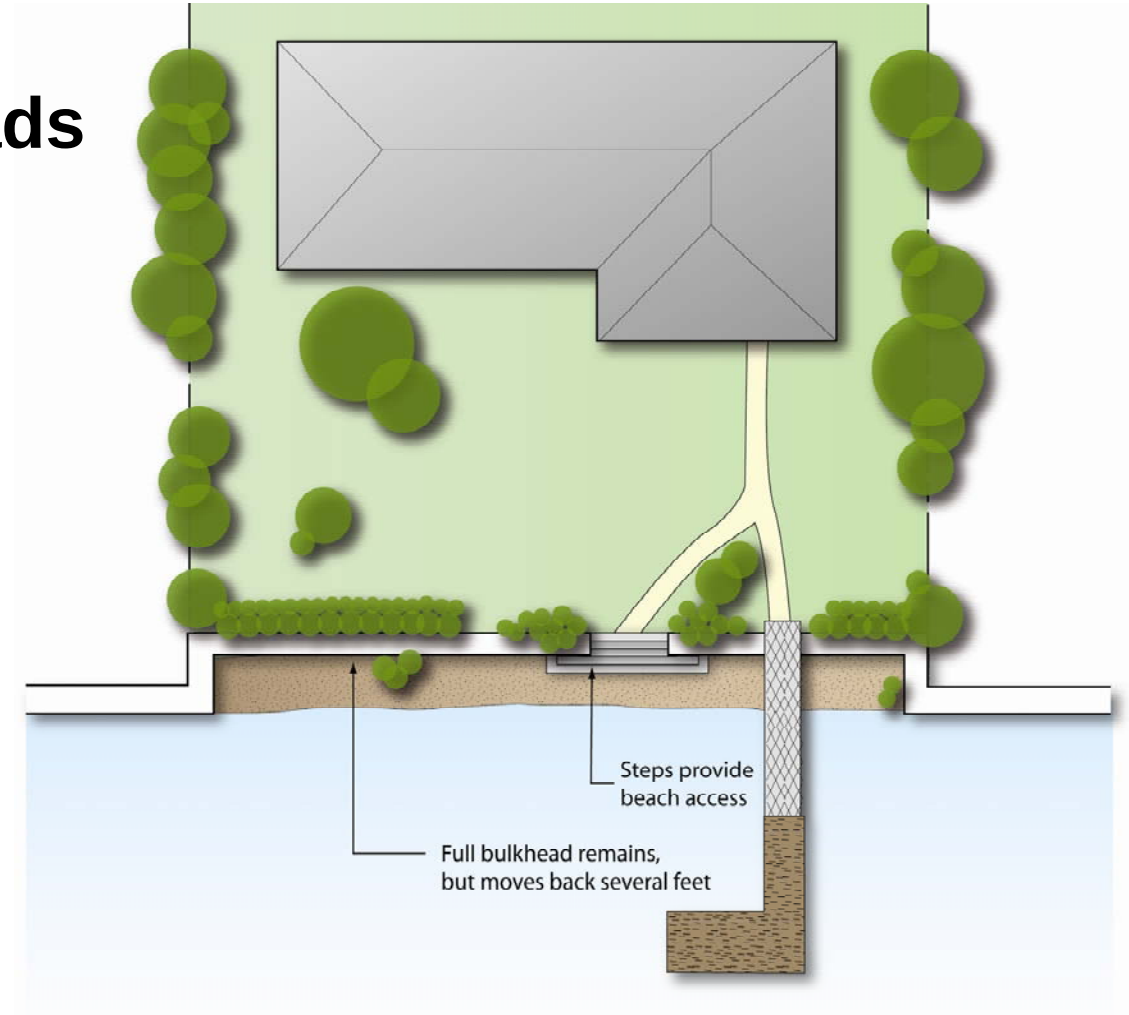
Waterfront Construction

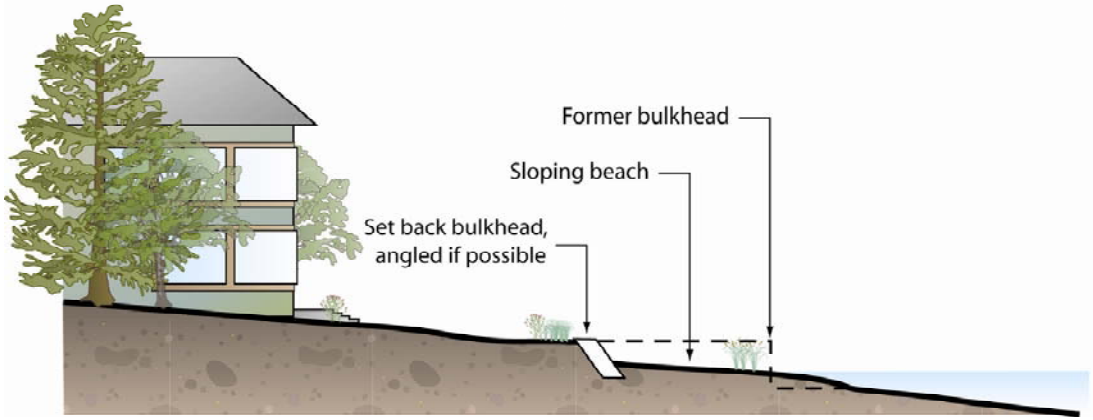
Waterfront Construction


Ecco Design

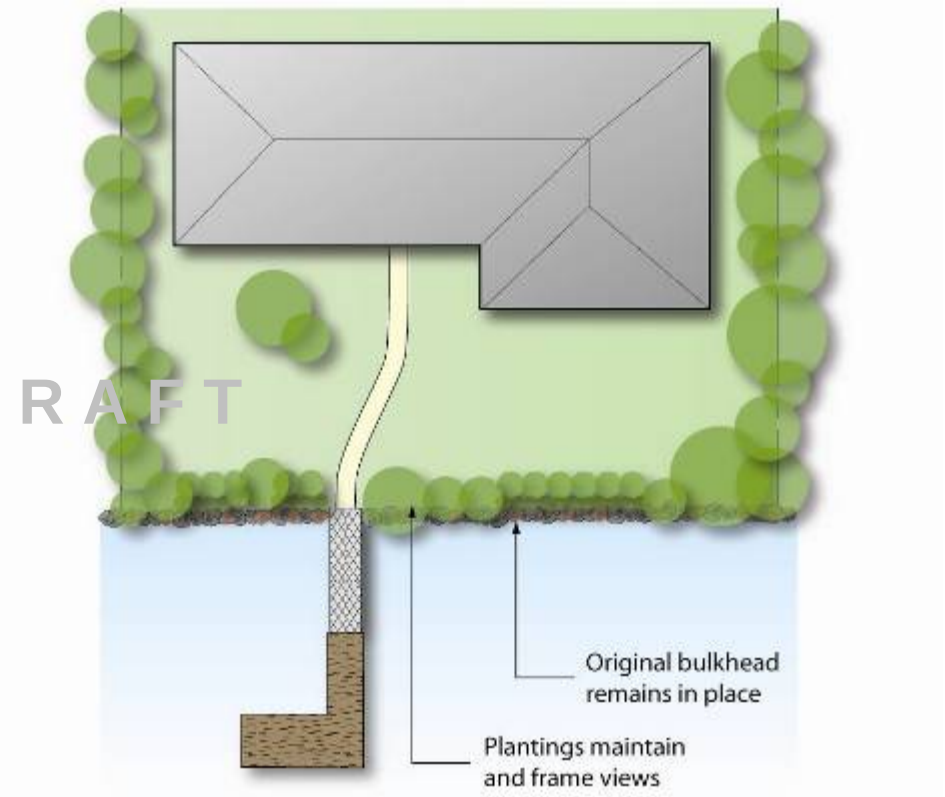

Ecco Design

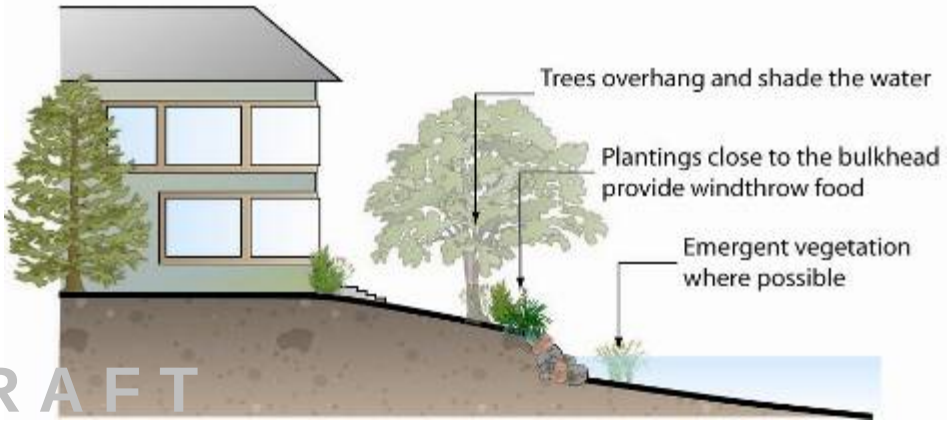
Setting Back Bulkheads





Vegetated Buffers



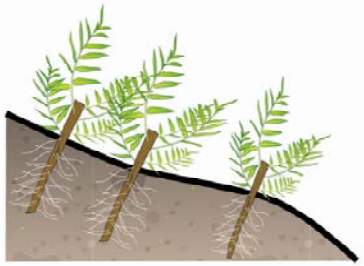



Joanna Buehler

Waterfront Construction

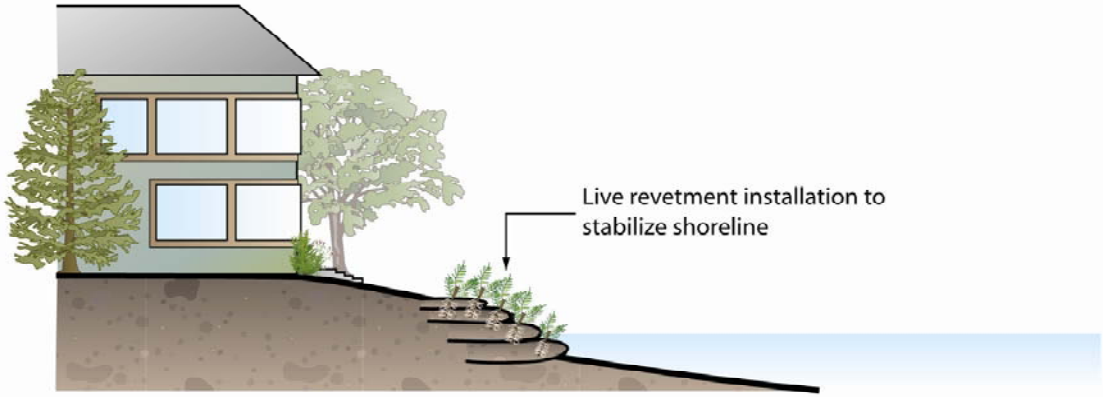

Berger Partnership

Slope Bioengineering

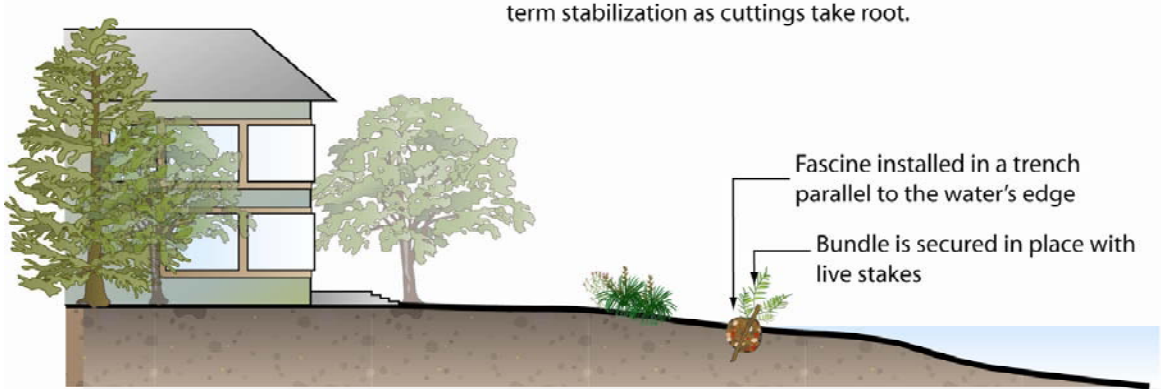


Live stakes, inserted in the ground, establish roots and hold soil in place

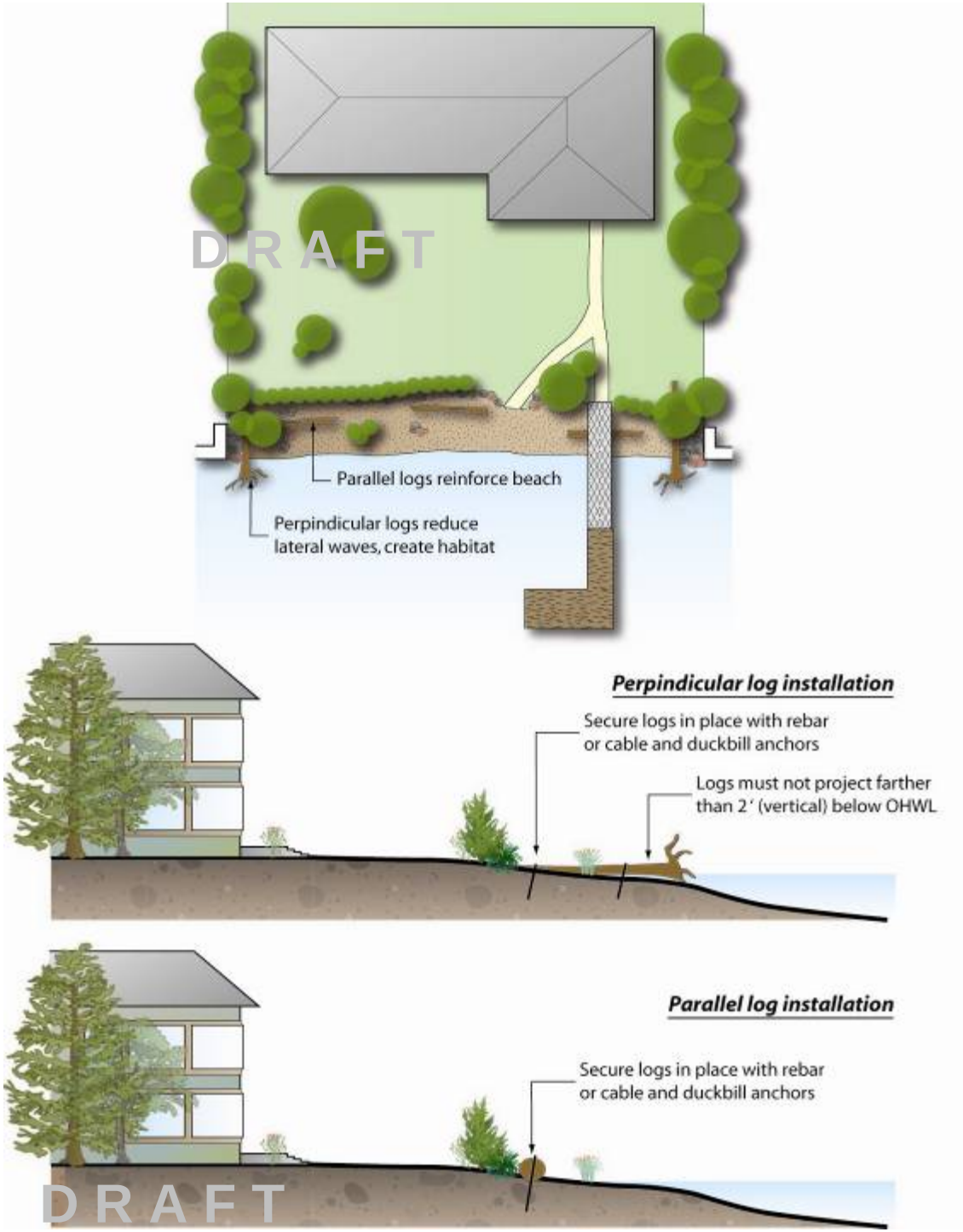
Live revetment uses live stakes and geotextile fabric to rebuild slopes



Fascines are bundles of live plant cuttings, used to provide short term erosion control as well as long-term stabilization as cuttings take root.

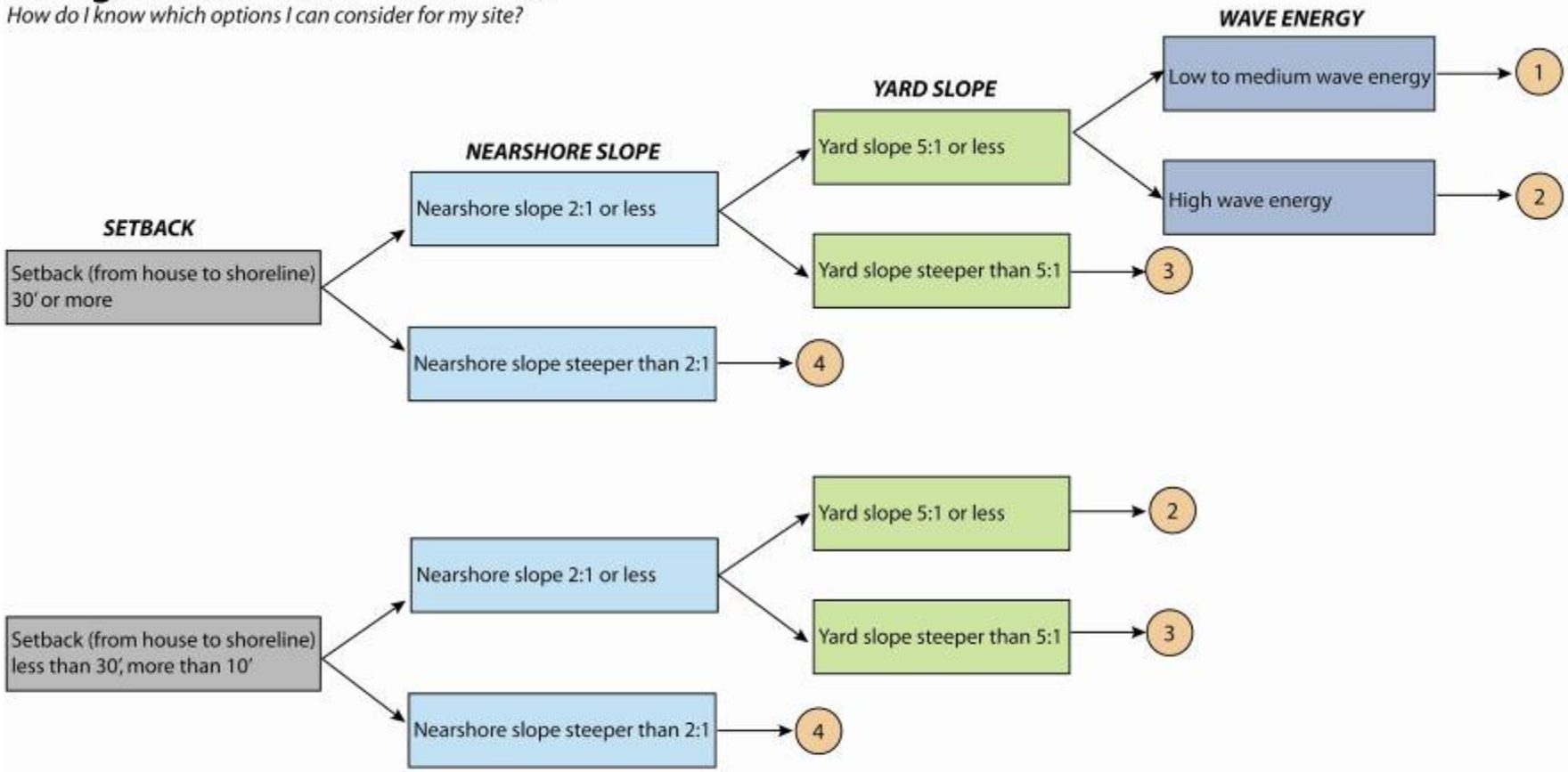


Log placement



Living Shorelines Decision Tree

How do I know which options I can consider for my site?



Notes:

-The use of plant buffers or logs is a viable option for any site, including those that employ hard engineering such as bulkheads.

-Sites with less than a 10' setback are not included on this decision tree, because in most cases they will depend on hard engineering solutions like bulkheads or riprap. As noted above, plant buffers are appropriate.

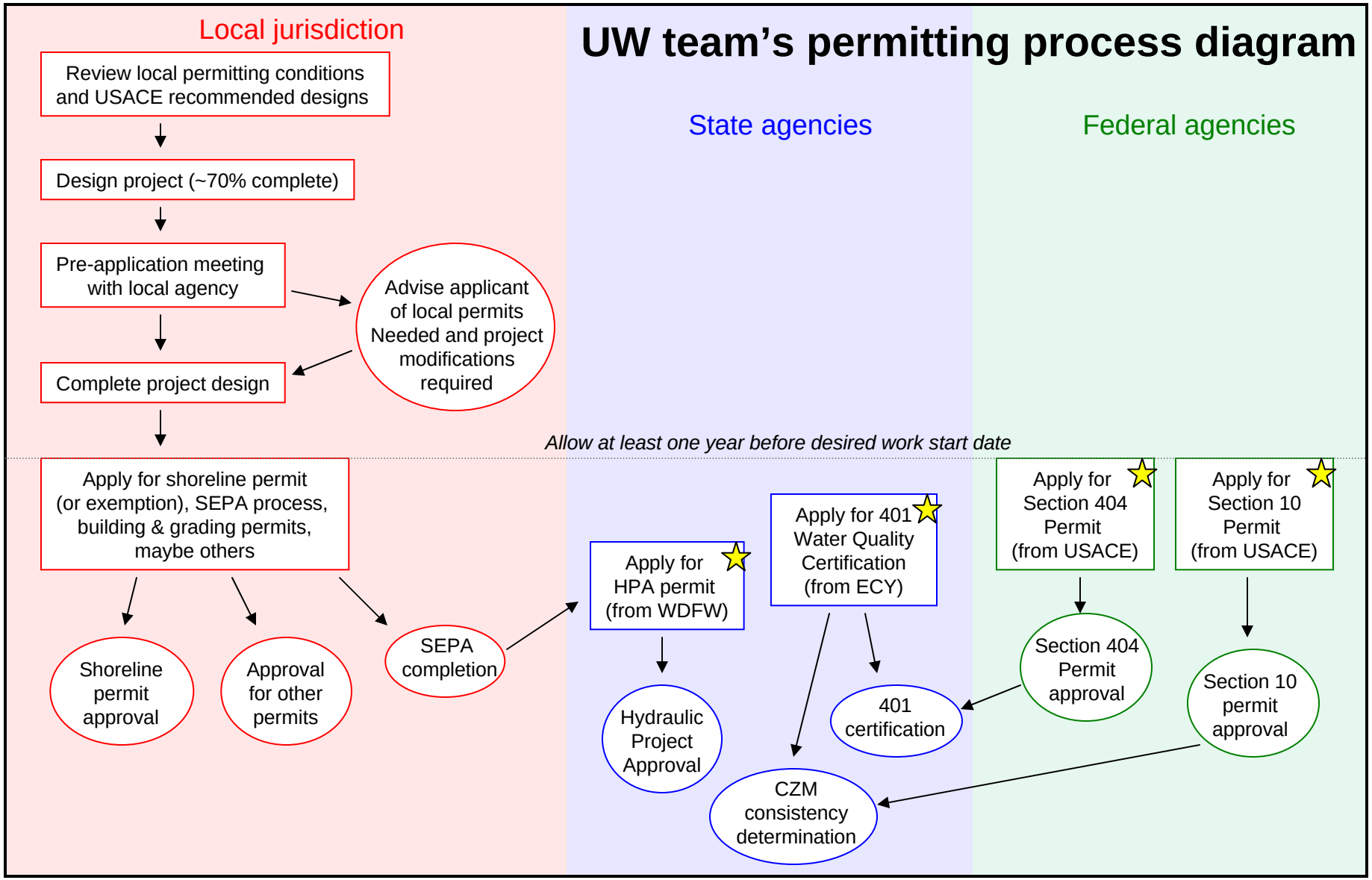
1. full beach, beach coves, setting back bulkhead, bioengineering
2. beach coves, setting back bulkhead, bioengineering
3. setting back bulkhead, bioengineering
4. bioengineering

Shoreline construction costs

	Bulkhead Removal Costs		
Site Access	**Wood**	**Riprap**	**Concrete**
Accessible from shore	$30-40/lin ft	$45-60/lin ft	$95-110/lin ft
Accessible from water only	$40-55/lin ft	$55-80/lin ft	$100-125/lin ft

	CONVENTIONAL TREATMENTS		LIVING SHORELINES		
Cost Category	**Bulkheads**	**Riprap**	**Slope bioengineering**	**Beach Establishment**	**Piers**
Capital Costs	Average rock or concrete bulkhead is $350 to $400 per linear foot, sheetpile is $800+ per linear foot	Average riprapped bank is $125 to $200 feet per linear foot	Average bioengineering project is $300 to $1000 per linear foot	Average beach establishment is $200 to $500 per linear foot	Average new pier costs $100 to $300 per square foot
Design and Permitting	10-15% of capital costs for larger projects (greater than $100K), 20-25% for smaller projects		7-12% of capital costs for larger projects (greater than $100K), 15-20% for smaller projects		Similar to bulkheads
Maintenance	No maintenance is usually required for 25-50 year life span of projects		Sand replenishment at a 1-5 year frequency, gravel at a 5-10 years, both $3 to $6 per square foot of beach		Similar to bulkheads

UW team's permitting process diagram



= Applicant's responsibility

= Permitting agency's responsibility

= use JARPA as application form

CZM – Coastal Zone Management
ECY – WA Department of Ecology
HPA – Hydraulic Project Approval
JARPA – Joint Aquatic Resource Permit Application
SEPA – WA State Environmental Policy Act
WDFW – WA Department of Fish & Wildlife
USACE – U.S. Army Corps of Engineers

For assistance or questions about permitting, visit the Washington State Office of Regulatory Assistance (ORA) website: www.ora.wa.gov

Other practices and topics…

- Salmon-friendly docks
- Sidebars to address specific concerns (views, geese, reliability…)
- The permitting process, including RGP3 and USACE Programmatic
- Choosing designers and contractors
- Plant list
- Public shoreline restoration projects

Questions for the group

- How are different jurisdictions using requirements, incentives, and/or streamlined permitting to encourage bulkhead alternatives as part of SMP update?

- Include discussion of logs projecting into the water, or does this open up too many problems? Setting back bulkheads?

- Ease of obtaining obtaining beach nourishment permits?

Next steps

- Complete edits based on technical advisory committee comments, gather additional information
- Submit to graphic designer for final layout as 35-45 page booklet
- Distribute guidebooks, launch website and outreach campaign (late spring, early summer)

Dave LaClergue
City of Seattle
Dept. of Planning and Development

dave.laclergue@seattle.gov
(206) 733-9668