

Residential Shoreline Loan Program Feasibility Study

Market Analysis Memo

The Shoreline Armoring Implementation Strategy (Habitat Strategic Initiative 2018) recommended expanding financial incentives available to property owners to motivate ecologically friendly shoreline management. Puget Sound Institute, Coastal Geologic Services (CGS), and Northern Economics are conducting a feasibility study for development of a residential shoreline loan program to advance this near-term priority.

The purpose of this memo is to document the project team’s work to estimate projected market size and homeowner interest in loans for eligible projects on their property. Results will be an input for a financial analysis to determine how much funding would be needed to create a self-sustaining revolving loan fund sized to meet projected demand.

The estimates provided here are based on available data with known limitations. The project team advises using caution in applying these projections for other purposes.

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1. TARGET ACTIVITIES

This analysis will estimate potential demand for loans to implement four activities on Puget Sound waterfront residential properties:

1. Removing shoreline armor
2. Installing soft shore protection
3. Elevating a home to protect from damage by floodwaters
4. Relocating a home to another portion of its parcel to protect from bluff recession

Activities one and two broadly include several of the techniques described in the *Marine Shoreline Design Guidelines* or “MSDG” (Johannessen et al. 2014). Local [Shore Friendly](#) programs currently help residential property owners evaluate existing conditions, select a MSDG technique or techniques appropriate for their parcel, and assist with project implementation. What we refer to as “soft shore protection” may include one or more of the following MSDG techniques: beach nourishment, large wood, and reslope-revegetation.

Activities three and four, called relocation and vertical relocation in the MSDG, are hazard mitigation measures intended to reduce potential damage to homes from bluff retreat and flooding while maintaining or restoring natural shoreline processes.

2. PROJECT SCENARIOS

Depending on parcel characteristics and homeowner objectives, one activity or a combination of activities may be suitable for a waterfront property. Since there are fixed costs associated with implementation (e.g., design, permitting, equipment mobilization), summing the cost of individual activities is not an accurate way to estimate the total cost of a project involving more than one activity. Therefore, the project team developed ten likely activity combinations called project scenarios. These scenarios will structure our evaluation of market size and the cost analysis provided in a separate memo. The project scenarios are:

- remove armor
- remove armor + install soft shore
- remove armor + install soft shore + relocate home
- remove armor + install soft shore + elevate home
- remove armor + relocate home
- remove armor + elevate home
- install soft shore
- install soft shore + relocate home
- install soft shore + elevate home
- elevate home

3. MARKET SEGMENTATION

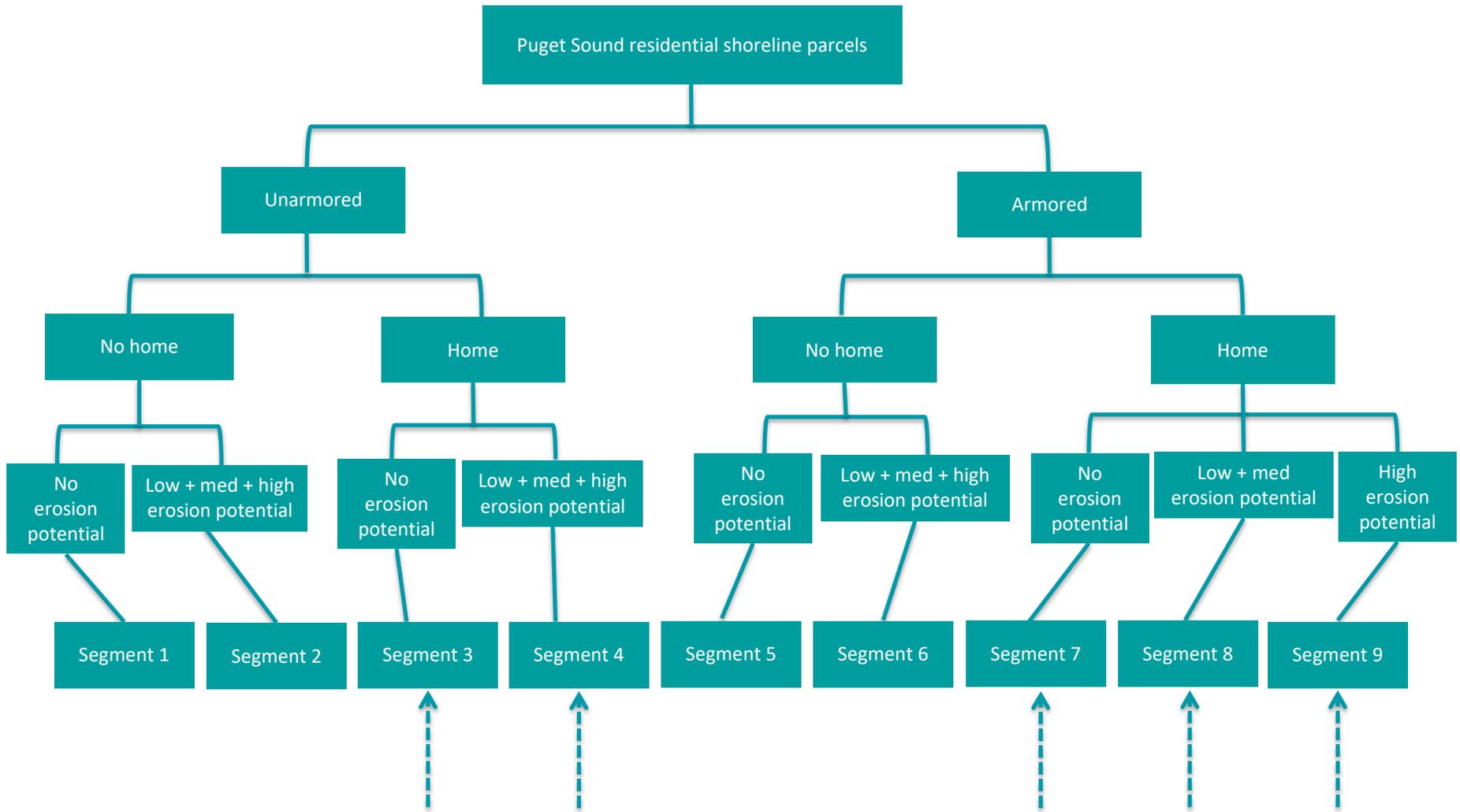
In marketing, segmentation is research to break potential customers into subgroups based on shared characteristics. Segmentation provides insights into the needs and motivations of different customer groups. This market analysis is based on segmentation conducted during Shore Friendly program development.

3.1 Shore Friendly Parcel Segmentation

Colehour + Cohen et al. (2014a) grouped Puget Sound residential waterfront parcels into nine segments based on combinations of three characteristics: presence of a home, armor status, and erosion potential. Then Colehour + Cohen et al. (2014e) identified potential behaviors relevant for each of the parcel segments.

Figure 1 illustrates how the parcels were categorized into nine distinct segments. Table 1 shows the number of parcels in each segment and specific behavior objectives assigned to each of these segments.

Figure 1. Shore Friendly market segmentation framework
Adapted from Colehour + Cohen et al. (2014a)



Dashed arrows show the Shore Friendly segments used for the loan study market segmentation.

Table 1. Shore Friendly market segmentation results
Adapted from Colehour + Cohen et al. (2014e) Potential Behaviors Grid

Parcel segment	Segment 1	Segment 2	Segment 3	Segment 4	Segment 5	Segment 6	Segment 7	Segment 8	Segment 9
Armor status	NO ARMOR				ARMOR				
Home on property	NO HOME		HOME		NO HOME		HOME		
Erosion potential	No	Low-Mod	No	Low-High	No	Low-High	No	Low-Mod	High
Number of parcels (2020)	732	3,513	2,457	14,848	119	1,738	1,128	19,778	675
Behavior objective	PRESERVE UNARMORED CONDITION				REMOVE ARMOR WITHOUT RISKING HOME/PROPERTY				
Leave shore unarmored	x	x	x	x					
Install soft shore on unarmored property	x	x	x	x					
Remove all armor					x	x	x	x	
Remove portion of armor						x		x	x
Replace armor with soft shore						x	x	x	
Build further from shore than regulations allow	x	x			x	x			
Move home further from shoreline				x				x	x
Obtain expert advice	x	x	x	x	x	x	x	x	x
Maintain or plant native vegetation	x	x	x	x	x	x	x	x	x
Address drainage reaching bluff		x	x	x		x		x	x

The datasets used for the Shore Friendly parcel segmentation have been updated since 2014. Recent improvements to the Washington Department of Fish and Wildlife Estuary and Salmon Restoration Program's (ESRP) [Beach Strategies Geodatabase](#) include addition of new high-resolution armor mapping, new measures of fetch to update erosion potential, and adjustments to the real estate parcel database (CGS 2017). These updates improved overall accuracy and added structures constructed or removed since 2011.

In 2020, the Shore Friendly parcel segmentation analysis was repeated using the updated Beach Strategies Geodatabase. This work was funded by ESRP, where Shore Friendly has been housed since 2019, and will be used to improve program implementation. The market analysis for the proposed loan program uses outputs of this 2020 parcel segmentation update.

Note that our target activities represent only a subset of behaviors encouraged by Shore Friendly programs. This is because the existing programs cover the cost of several incentives and not all management recommendations are expensive enough to warrant taking out a loan (e.g., vegetation management). A loan program would complement other existing Shore Friendly incentive tools.

3.2 Market Segmentation for the Proposed Loan Program

Figures 2 and 3 illustrate how the project team used the Shore Friendly parcel segmentation and Beach Strategies Geodatabase to estimate potential market size for the proposed loan program. The first step was to exclude all parcels without a home (Segments 1, 2, 5, 6) from the analysis. We assumed standard construction loans are a more likely source of financing for property development, and that a shoreline loan program may require presence of a home as collateral.

Next we identified shores potentially exposed to flooding and bluff retreat as a way to link parcels with project scenarios that include home elevation or relocation. For this analysis, the project team used shoretype as a proxy for hazard exposure. We associated coastal flooding risk with low elevation shoretypes (accretion shoreforms, inner lagoon, and estuarine embayment shores) and retreat risk with bluff shoretypes.

The final step was to assign each of the project scenarios to one of the remaining Shore Friendly segments. This was a logic exercise to identify the most likely project scenario given the characteristics of a group of parcels. For example, armor removal would not occur on a parcel without armor. Flooding hazard (Scenarios 1, 4, 5, 9) was linked to parcels with no to moderate erosion potential (Segments 3, 4, 7, 8) because accretion shoreforms, by definition, are not subject to high erosion. Likewise, bluffs are erosive shoreforms, so we associated bluff retreat (Scenarios 2, 5, 7, 10) with moderate to high erosion potential parcels (Segments 4, 8, 9).

Table 2 summarizes query methods and results for each of the ten project scenarios. Detailed methodology for the spatial analysis is provided in CGS (2020).

Figure 2. Segmentation framework for unarmored parcels

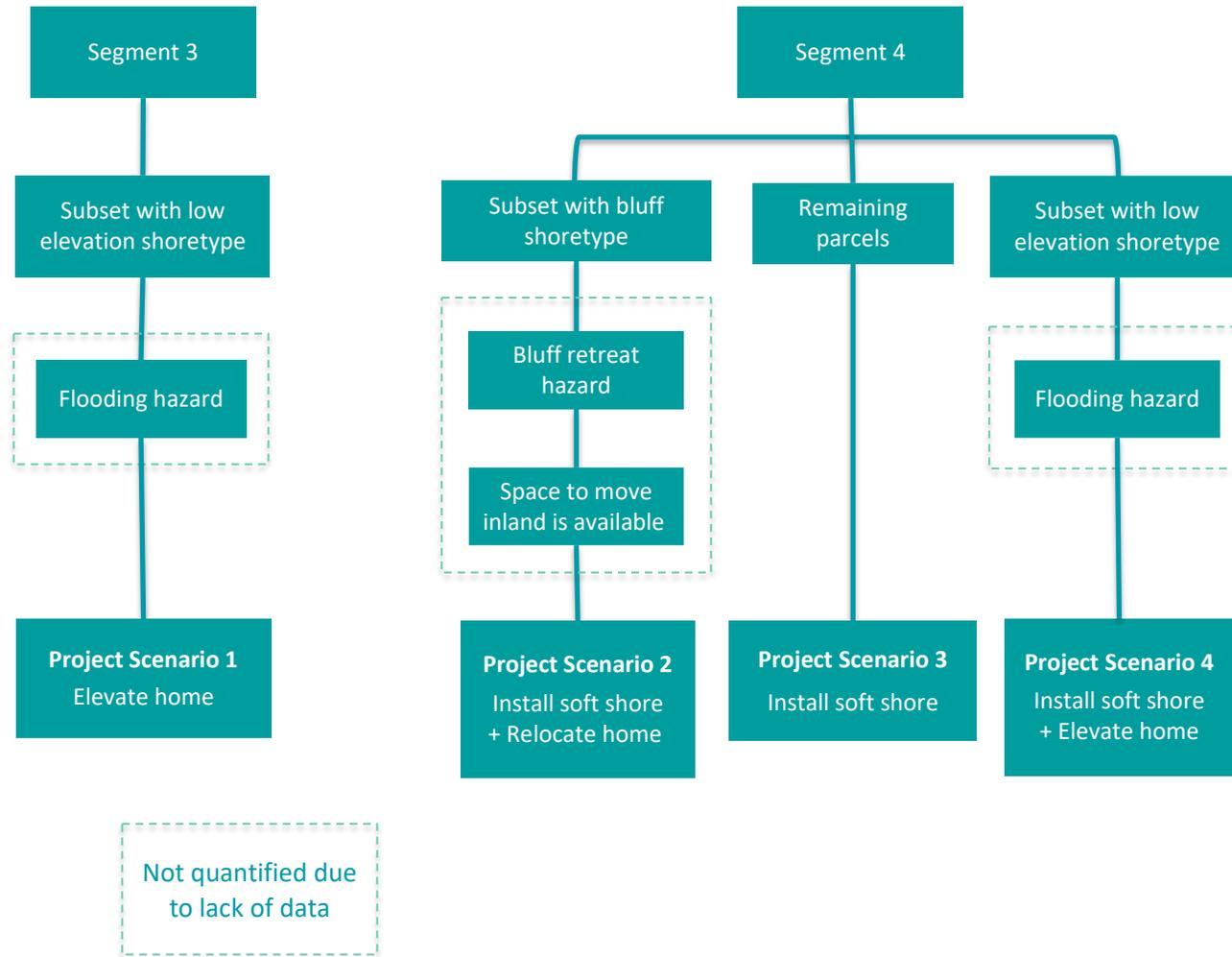


Figure 3. Segmentation framework for armored parcels

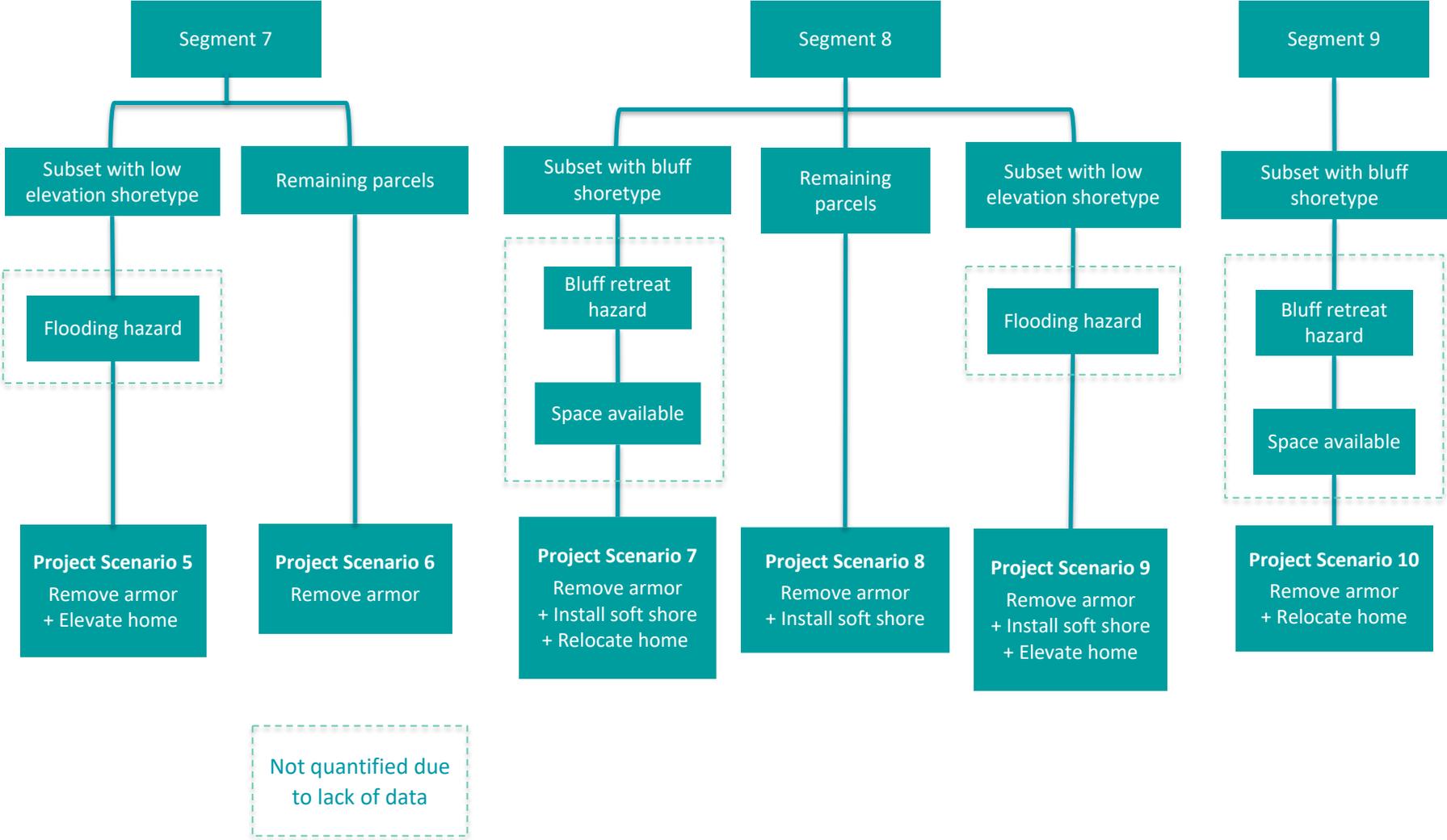


Table 2. Market segmentation for the proposed loan program

Project scenario	Activities				Query method	Number of parcels	Percent of all residential parcels	Cumulative length (feet)
	Remove	Soft	Relocate	Elevate				
1				X	Low elevation shores in Segment 3	1,787	4%	361,985
2		X	X		Bluff shoreforms in Segment 4	5,965	13%	954,756
3		X			Segment 4 excluding bluff and low elevation shores	4,924	11%	1,041,098
4		X		X	Subset of Segment 4 with low elevation shoretype	3,959	9%	680,230
5	X			X	Low elevation shores in Segment 7	1,044	2%	151,552
6	X				Segment 7 excluding low elevation shores	84	0.2%	14,013
7	X	X	X		Bluff shoreforms and medium erosion potential sites in Segment 8	4,324	10%	503,652
8	X	X			Segment 8 excluding bluffs, low elevation shores, and medium erosion potential sites	771	2%	144,225
9	X	X		X	Low elevation shores in Segment 8	4,420	10%	595,758
10	X		X		Bluff shoreforms in Segment 9	675	2%	109,323
TOTAL						27,953	62%	863 miles

NOTE: Where a site classified as both containing a bluff and low elevation shoreform, the predominant shoretypes were used to avoid assigning parcels to more than one scenario. See CGS (2020) for additional details.

The assignments made for this segmentation exercise will not affect Shore Friendly project development and loan eligibility criteria. Project team decisions to include or exclude segments were made only for the purpose of identifying the most probable project/parcel combinations in order to estimate market size. Site-specific investigations by coastal professionals are required to determine the most appropriate actions for a given parcel.

The dashed boxes in Figures 2 and 3 identify uncertainties in these estimates resulting from a lack of data to translate potential hazard exposure to actual risk of home damage. Our use of shoretype is a very coarse substitute for more rigorous analysis of actual home elevation and setback distance. The number of at-risk bluff-top homes on parcels with space available for relocation is also not known. We recommend additional data collection and analysis to better quantify risk and feasibility of mitigation opportunities. This type of research would be applicable in a number of management contexts beyond the scope of this study.

4. LANDOWNER SURVEY AND FOCUS GROUP DATA

Market research conducted during Shore Friendly program development provides insights into shoreline landowner interest in target activities and loans. This section summarizes relevant results of an online/telephone survey of 1,164 shoreline landowners (Colehour + Cohen et al. 2014b); findings from three focus groups with 23 shoreline property owners (Colehour + Cohen et al. 2014c); and an analysis of the University of Washington School of Environmental and Forest Sciences' [2012 State Parcel Database](#) and the Secretary of State's [Washington State Voter Registration Database](#) (Colehour + Cohen et al. 2014d).

These results are the basis for the demand analysis presented in Section 5. They also identify some factors that could motivate participation in a loan program.

4.1 Landowner Characteristics

The Colehour + Cohen et al. (2014b) shoreline landowners survey had 771 respondents answer the question about annual household income. Although income levels tended to be high overall, 22% reported an income of less than \$60,000 (Table 3). 56% of respondents indicated they were 65 or older, and 55% said they were retired.

This self-reported age data is consistent with the analysis conducted by Colehour + Cohen et al. (2014d). They found:

- For parcels owned by Washington State residents, 34% were owned by persons in the 60-69 age range and 24% by persons in the 70-79 age range.
- 38.5% of residential parcels were owner occupied and 39% were owned by persons living elsewhere. Parcels in San Juan and Mason counties had the lowest owner occupancy rate.
- 20.4% of parcels were owned by a trust, estate, holding or similar rather than direct ownership by individuals.

- 56.3% of parcels were smaller than 1 acre in size (not including data from King County). The smallest parcels are most likely to have armor, while parcels over 1 acre were less likely to have armor.

Table 3. Survey results on annual household income
Source: Colehour + Cohen et al. (2014b) Appendix C

Q73 What is your approximate annual household income?

	Frequency	Percent
Less than \$30,000	39	3
\$30,000-\$59,999	134	12
\$60,000-\$124,999	281	24
\$125,000-\$249,999	202	17
\$250,000 or more	115	10
Prefer not to say	381	33
Total	1152	99

4.2 Interest in Armor Removal and Soft Shore Protection

Figures 4 and 5 provide results from Colehour + Cohen et al. (2014b) survey questions gauging interest in armor removal and soft shore protection.

Homeowners with armored shorelines were asked how likely they were to undertake armor removal projects. Of 474 respondents:

- 17 (4%) said they were “very likely” and 65 (14%) said they were “somewhat likely” to remove all or a portion of the armor and replace it with engineered soft shore protection
- 15 (3%) were “very likely” and 52 (11%) were “somewhat likely” to remove a portion of hard armor and let the beach naturalize
- 5 (1%) were “very likely” and 35 (7%) were “somewhat likely” to remove all hard armor and let the beach naturalize

Homeowners with unarmored shorelines were asked how likely they were to have engineered soft shore protection installed. Of 151 respondents, 17 (11%) indicated they were “very likely” and 42 (28%) were “somewhat likely.”

Repeating the Colehour + Cohen et al. (2014b) survey could provide data to track changes in landowner knowledge and perceptions about shoreline armor over time. This could quantify the impact of Shore Friendly outreach and education efforts.

Figure 4. Survey results on likelihood of removing hard armor
 Source: Figure 10 from Colehour + Cohen et al. (2014b)

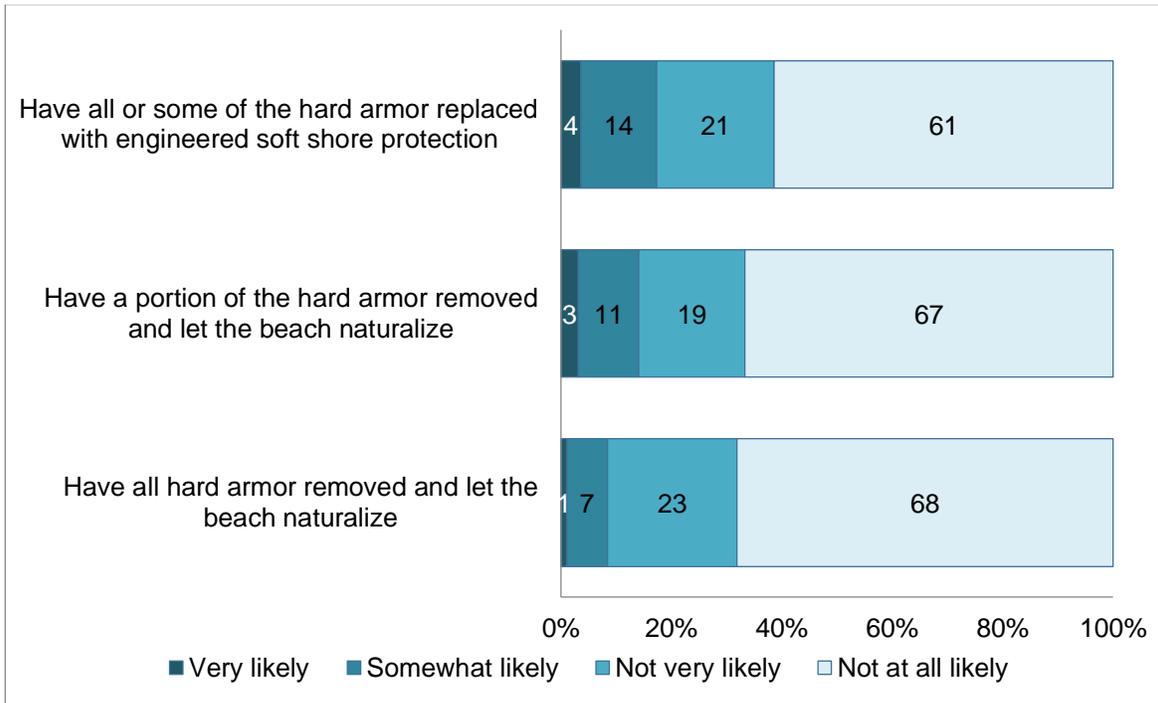
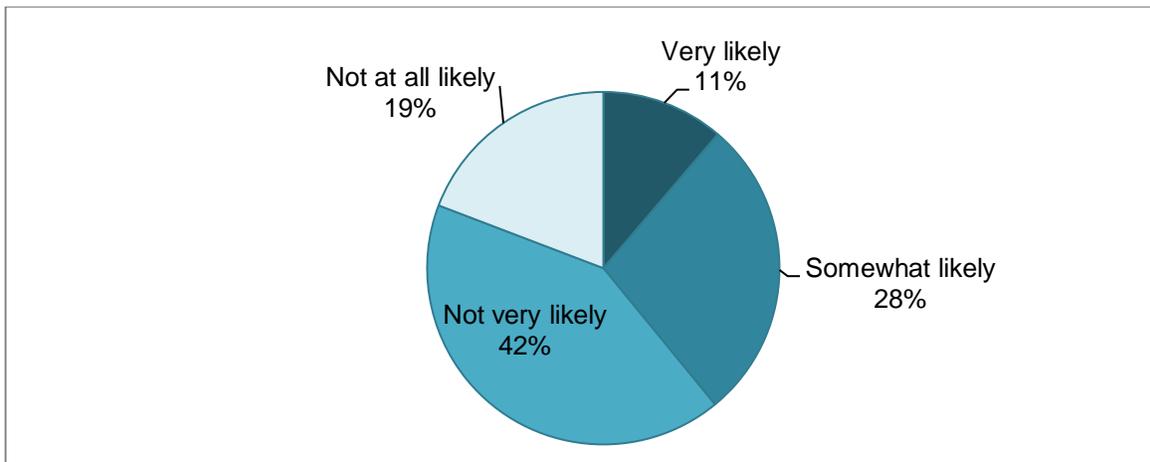


Figure 5. Likelihood of installing soft shore protection on unarmored property
 Source: Figure 11 from Colehour + Cohen et al. (2014b)

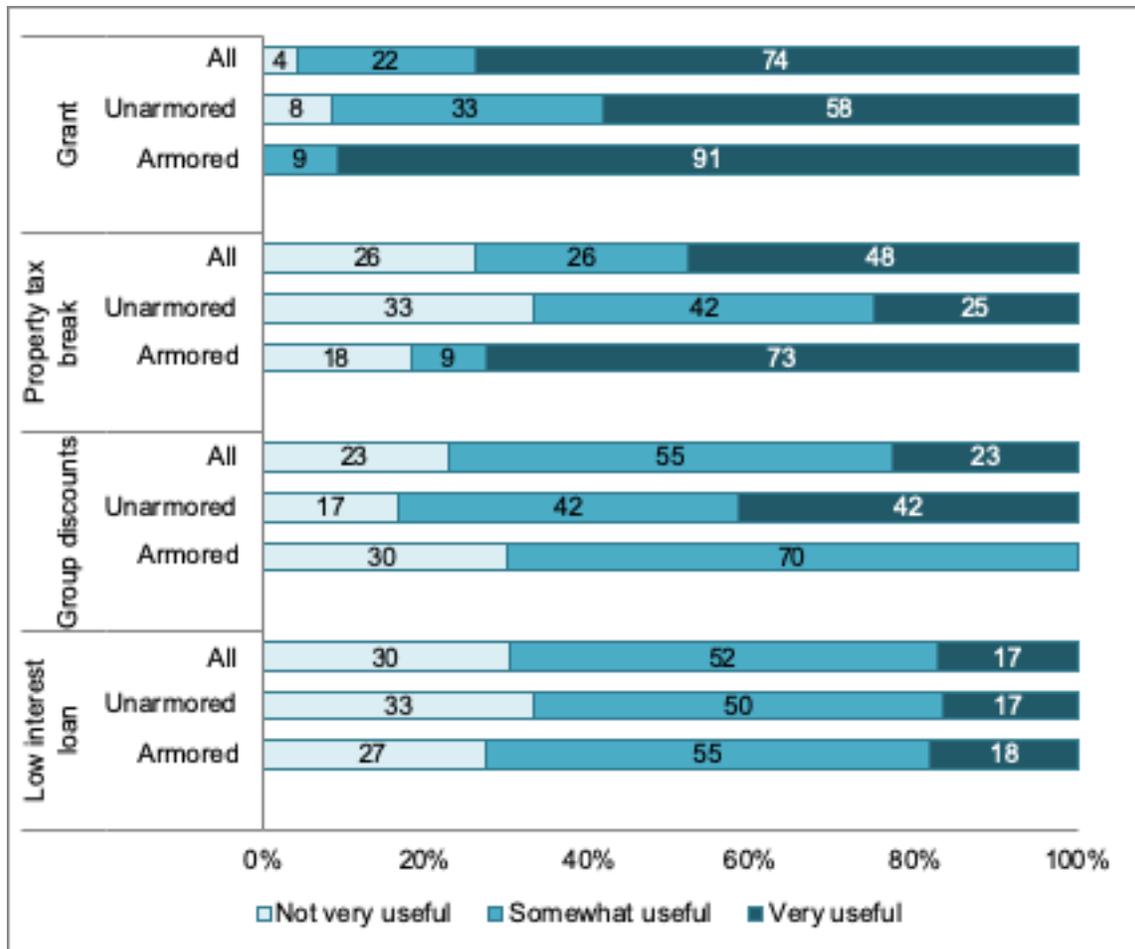


n=151

4.2 Interest in Loans

Four types of financial incentives were discussed during the Colehour + Cohen et al. (2014c) focus groups: property tax breaks, grants, low interest loans, and discounts for group projects. Participants were asked to rate how useful each type of incentive would be to them. As shown in Figure 6, 17% of respondents indicated that loans would be “very useful” and 52% rated them as “moderately useful.”

Figure 6. Focus group ratings of usefulness different financial incentives
 Source: Figure 2 from Colehour + Cohen et al. (2014c)



After individual financial incentives were rated, the facilitator asked the groups to comment on what was appealing or concerning about each type of tool. The following insights were offered about loans and other financial incentives:

- Some participants said that for loans “the draw is not as high” when interest rates are very low. One participant noted that he looked into the septic replacement loan program and was able to qualify for a lower rate than the program could provide.
- One participant said that interest rate is not as important as an easy-to-access loan. Streamlined loan processing would be a benefit as much as a low rate.

- One participant said that having a loan (or other financial incentive) could tip the balance to choose a project option he might not have otherwise considered.
- Some participants talked about how they could justify paying for armor removal if it increased the value of their property.
- Participants with “imminent” projects said they would be influenced by smaller amounts of financial support.

Timeliness was a recurring theme during the Colehour + Cohen et al. (2014c) focus groups. When there is a problem with armor, people need to have *easy* and *fast* access to assistance.

The Colehour + Cohen et al. (2014b) survey asked respondents with armored shorelines who were at all likely to remove or replace hard armor if “getting a loan or grant” would make them more likely to do so. 30% said a grant or loan would make them more likely to remove all hard armor and let the beach naturalize; 25% said it would make them more likely to remove a portion of hard armor and let the beach naturalize; and 28% said it would make them more likely to remove all or some hard armor and replace with soft shore protection.

Of 205 respondents with unarmored properties, 41 (20%) said “getting a loan or grant” would make them more likely to install engineered soft shore protection and 113 (55%) said that expense would make them less likely to install engineered soft shore protection.

If a survey of shoreline landowners is ever repeated, results would be more useful if respondents were asked about loans and grants separately.

4.4 Concern about Coastal Flooding and Sea Level Rise

The Colehour + Cohen et al. (2014b) survey did not specifically ask landowners about sea level rise and flooding. However, the survey included a question asking respondents to describe current concerns about their property. Responses were grouped by theme and tallied. 38 survey respondents (3%) said they were concerned about rising tides/global warming. Flooding, flood insurance, and winter storms were mentioned frequently in responses to other open-ended questions included in the survey. Some responses seem to indicate that homeowners believe a bulkhead will protect them from flooding.

Repeating a shoreline landowner survey with specific questions about extreme water levels and flooding would provide data to refute or support anecdotal reports that concerns about coastal flooding among Puget Sound waterfront residents has grown in recent years.

4.5 Interest in Moving Home away from Shoreline

Figure 7 and Table 4 – 5 provide results from Colehour + Cohen et al. (2014b) survey questions gauging interest in relocating homes.

A third of respondents with a home on their property said that their house is set back further from the shoreline than current regulations require. Respondents with a home not already set back further than current requirements were asked how likely they were to move their home further from the shoreline. Of the respondents:

- 48% did not think this is necessary (Table 4);
- 34% said their property isn't big enough to allow for moving the house further from shore;
- 1% would be somewhat likely or very likely; and
- 5% were not very likely.

The strongest motivators for relocating a home would include experiencing a major erosion or flood event and being confident that the property will be protected or enhanced by this step (Table 5).

Figure 7. Survey results showing reported likelihood of moving home
Source: Figure 16 from Colehour + Cohen et al. (2014b)

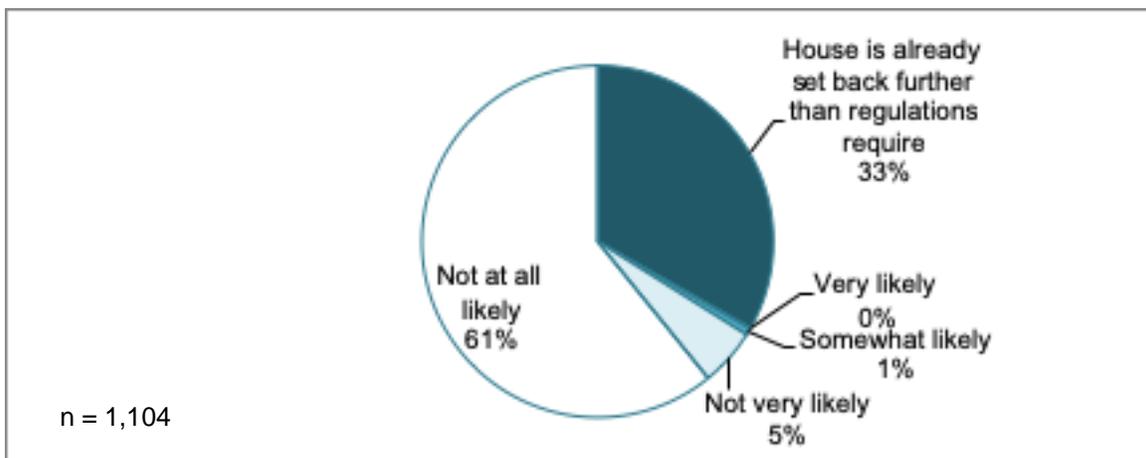


Table 4. Survey results on barriers to moving home further from the shoreline
Source: Colehour + Cohen et al. (2014b)

Table 24. Which of the following makes you less likely to move the house further from the shoreline?		
	n	%
I don't think it's necessary	31	48
My property isn't big enough to allow for moving further from the shore	22	34
If I thought it would damage my house	17	27
I don't know enough about the cost of doing it	14	22
I don't know enough about this to do it	7	11
I don't plan to live here long enough to make it worthwhile	6	9
I don't know who to talk to about how to do it	3	5
I don't want the building to be set back that far from the shoreline	3	5
I don't like the look of it	0	0
Other	10	16

n=64; Multiple responses permitted- percentages total more than 100%

Table 5. Survey results on motivators for moving home further from the shoreline
Source: Colehour + Cohen et al. (2014b)

Table 23. Which of the following would make you more likely to move the house further from the shoreline?		
	n	%
Experiencing a major erosion or flood event	21	33
Being confident that my property will be protected or enhanced by it	20	31
Knowing it's possible to move my house without damaging it	17	27
Getting a tax break or reduced fees for doing it	13	20
Knowing the house would be better protected from floods or erosion	13	20
Knowing more about the cost	11	17
If it would help provide healthy habitat for fish and wildlife	8	13
(If currently no hard armor) If it were less expensive than installing and maintaining a bulkhead to protect my house	7	11
Knowing where to get expert advice on how to do it	6	9
Streamlined permitting and processes for doing it	5	8
Being able to have a bigger yard and/or a natural beach	2	3
Other, please describe:	13	20

n=64; Multiple responses permitted- percentages total more than 100%

5. DEMAND ANALYSIS

The project team estimated potential demand for loans by adjusting the market size estimates developed in Section 3 using the market research data summarized in Section 4. Figure 8 and Table 6 describe the methods used to calculate demand; the input source for each step; and, since the quality of the inputs varies, our confidence level for the estimates. Table 7 provides the demand analysis calculations.

Figure 8. Calculation flow to estimate demand



Table 6. Sources for demand analysis inputs

Input	Source	Confidence
Market size	Shore Friendly parcel segmentation (2020 update) and Beach Strategies Geodatabase queries by Coastal Geologic Services as summarized in Table 2	High (shoreline activities): recent Beach Strategies Geodatabase updates and revised parcel segmentation analysis Very low (hazard mitigation activities): shoretype was used as proxy for hazard exposure
Space to relocate	Colehour + Cohen et al. (2014b): 34% of survey respondents said their property was not large enough to allow for moving the house further from shore	Low: data was self-reported, and respondents were not separated by shoretype
Interest in projects	Colehour + Cohen et al. (2014b): “very likely” and “somewhat likely” survey responses	Medium (shoreline activities): survey data was broken down by type of project but is several years old Low (hazard mitigation activities): survey results were not separated by shoretype; we assumed self-reported concerns about sea level rise correlate with interest in projects; and data is several years old
Interest in loans	Colehour + Cohen et al. (2014c): “very useful” focus group responses	Low (shoreline activities): very small number of focus group participants; data is several years old Very low (hazard mitigation activities): same percentage used for scenarios with hazard mitigation activities that would cost much more

Although our demand estimates would be significantly improved with newer market research data and more refined geospatial data on hazard exposure, the project team has determined that data quality is sufficient for the purpose of quantifying loan fund capitalization needs. The purpose of this exercise is to develop a hypothetical loan portfolio for which inputs and outputs can modeled over a period of 20 years. This will inform the level of funding we intend to seek to establish a revolving loan fund.

Some sources of error identified in Table 6 would overstate, and others would understate, potential demand. For example, the number of parcels exposed to coastal flooding and bluff retreat hazards is likely lower than we estimated using shoretype. But anecdotal reports from Shore Friendly staff/contractors that regularly interact with waterfront homeowners indicate that concern about hazards and interest in taking action to protect property is higher now compared to 2013 when the surveys occurred. Recent localized projections for sea level rise (Miller et al. 2018) and recurrence intervals for extreme water level events (Miller et al. 2019) that indicate that this risk will continue to grow.

Table 7. Demand analysis calculations

Project scenario	Market size	x	Space to relocate	=	Number parcels	x	Interest in project	=	Likely projects	x	Interest in loan	=	Projected demand
1	1787		—		—		0.03		54		0.17		9
2	5965		0.66		3937		0.01		9		0.17		7
3	4924		—		—		0.39		1920		0.17		326
4	3959		—		—		0.03		119		0.17		20
5	1044		—		—		0.03		31		0.17		5
6	84		—		—		0.14		12		0.17		2
7	4324		0.66		2854		0.01		29		0.17		5
8	771		—		—		0.18		139		0.17		24
9	4420		—		—		0.03		133		0.17		23
10	675		0.66		446		0.01		4		0.17		1

5.1. Input from Shore Friendly Staff

The project team presented preliminary demand analysis results to Shore Friendly program staff during a May quarterly coordination meeting. The intent was to “ground truth” our early estimates for loan demand assigned to each of the Shore Friendly segments. The number of parcels potentially exposed to hazards had not been calculated before this meeting, therefore

breakdowns by project scenarios that included hazard mitigation activities were not included in the presentation.

Meeting participants raised concerns about the very large market share of Shore Friendly Segment 4 (install soft shore on unarmored parcels). Segment 4 is not emphasized by Shore Friendly programs because of ESRP’s strategic focus on projects that incorporate armor removal to increase ecological lift. Although installing soft shore protection on an unarmored beach has lower impacts than hard armor, it does have impacts and the group indicated that such projects should not necessarily be supported with loans. We also received feedback that the loan demand projections seemed reasonable, if not a little low, for a 20-year time period.

5.2 Proposed model inputs for loan demand

Table 8 summarizes demand analysis results that will be used as inputs to the financial analysis. The project team incorporated feedback from Shore Friendly program staff by making two changes to preliminary results: (1) we included the percentage of survey respondents who were “somewhat likely” to undertake projects, rather than only “very likely” respondents, when calculating the number of likely projects; and (2) we developed five different options for Scenario 3 (Table 9). The project team will present the Scenario 3 options and solicit feedback at the August 2020 Shore Friendly quarterly coordination meeting.

Table 8. Demand analysis estimates for input into financial model

Project scenario	Activities				Estimated market size	Likely projects	Projected loan demand	Proportion of total demand
	Remove	Soft	Relocate	Elevate				
1				X	1,787	54	9	10%
2		X	X		5,965	39	7	7%
3		X			4,924	2,480	see Table 9	
4		X		X	3,959	119	20	21%
5	X			X	1,044	31	5	5%
6	X				84	12	2	2%
7	X	X	X		4,324	29	5	5%
8	X	X			771	139	24	25%
9	X	X		X	4,420	133	23	24%
10	X		X		675	4	1	1%
TOTAL					27,953	2,480	96 (no Scenario 3)	

Table 9. Alternative Scenario 3 options for partner consideration

Option	Loan demand (Scenario 3)	Loan demand (all scenarios)	Scenario 3 as proportion of total demand	Proportion of loans that include hazard mitigation activities	Average loans per year (all scenarios) over 20 years
Scenario 3 x 1	326	422	77%	17%	21
Scenario 3 x 0.5	163	259	63%	27%	13
Scenario 3 x 0.25	82	178	46%	39%	9
Scenario 3 x 0.1	33	129	26%	54%	6
Scenario 3 x 0	0	96	0%	73%	5

NOTE: The Scenario 3 x 0.25 option is very close to the loan demand estimate generated using only “very likely” survey responses to calculate interest in loans (11% versus 39% for Table 7 interest in project calculation)

6. REFERENCES

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