

DRAFT MEMORANDUM

Date: March 23, 2023
To: Project Management Team
From: Bob Stowe, Stowe Development & Strategies
Re: Memorandum #1: Revised Proposed Safe Structures Program

Introduction

The proposed Safe Structures Program (SSP) is a voluntary program designed to protect, raise (elevate), acquire, or relocate structures that are susceptible to flood damage within the 2080 100-year flood plain. Estimates of valuable structures are based on the WSE structure database that contains finished floor elevations for valuable structures only. Because updated data is not available for recent development, the dataset does not include all structures in the floodplain; estimates of valuable structures might be low or missing for certain locations. It is possible that more structures than quantified in the memorandum could qualify for Safe Structures interventions.

Proposed Safe Structures Program

Approach to Reducing Flood Damage

The proposed SSP identifies potential strategies to prioritize and protect high-value or vulnerable structures¹ on an individualized basis without the use of protective infrastructure such as a levee, floodwall, dam, or the like. Valuable structures are defined as:

“Each structure delineated in GIS was then viewed using Google Street View and the NAIP aerial photographs. Based on this visual examination, structures were classified as “valuable” (for example schools, residences, businesses, etc.) or “not valuable” (for example garages, sheds, park shelters, carports, etc.).

Source: Watershed Science & Engineering memorandum dated November 7, 2014

The SSP is proposed to be voluntary and is designed for each potentially flood prone structure in the Chehalis Basin to be evaluated, scored, and prioritized based on a set of risk assessment criteria that identifies potential flood damage reduction measures. The Office of Chehalis Basin’s Community Flood Assistance and Resilience (CFAR) Program has and is performing many of the strategies recommended by the SSP. The key differences relate to the size and scale of the SSP which is designed to protect the majority of valuable structures within the modeled 2080 100-year floodplain (based on the willingness of each property owner) in the Chehalis Basin within a reasonable time frame.

Incorporating Housing and Income Vulnerability

Households spending an inordinate share of their income on housing costs and low-income households are more vulnerable to disruptions because they are not equipped to absorb unexpected costs. The SSP should take into account incomes and the ability to take part in the SSP.

Households are considered rent or cost burdened when they spend 30% or more of their gross income on housing. Households are considered severely rent or cost burdened when they spend 50% or more of their gross income on housing (Table 1). Housing rent and cost burden are important metrics for policymakers to consider because of their consequences for the affected households. When a household spends more than 30% of their income on housing, they have less disposable income available to pay for other necessities, such as transportation, childcare, food, or medicine. In addition, rent burdening for low-income households means they may have very little cushion to absorb an unexpected cost or disruption such as a relocation.

Assuming one household resides in a single occupied housing unit and that cost and rent burden across the three counties is represented similarly across households in the floodplain, the study area has approximately 215 households experiencing cost burden or rent burden. These households may need additional support and resources to withstand additional costs generated by the SSP.

Table 1: Estimate Number of Households Facing Cost and Rent Burden, 2021

	NUMBER OF HOUSEHOLDS
Rent Burdened Paying >30% of income on housing	54
Severely Rent Burdened Paying >50% of income on housing	44
Cost Burdened Paying >30% of income on housing	70
Severely Cost Burdened Paying >50% of income on housing	46

Source: US American Community Survey 2021 5-year estimates

Furthermore, households earning less than 100% Area Median Income are more vulnerable to economic disruptions. Area Median Income (AMI) is the primary measure of income used to determine housing affordability. It is determined annually by the United States Department of Housing and Urban Development (HUD) for individual counties and Metro areas across the country. AMI represents median household income for a family of four, and then is adjusted based on the number of people in the household or the number of bedrooms in a housing unit to determine affordability.

AMI varies across the 2080 100-year floodplain because it touches three counties. 100% AMI in Grays Harbor is \$59,800, \$55,800 in Lewis County, and \$83,700 in Thurston County¹. Assuming that the income profile across the three counties is represented similarly across households in the floodplain, then approximately 450 households earn less than 100% of AMI (Table 2). Like cost and rent burdened households, those earning less than 100% AMI may be more vulnerable to disruptions and will likely require additional support.

Table 2: Household Area Median Income Brackets, 2019

	NUMBER OF HOUSEHOLDS
< 30% Area Median Income	105
30% - 50% Area Median Income	104
50% - 80% Area Median Income	153
80% - 100% Area Median Income	87

Source: Comprehensive Housing Affordability Strategy (CHAS) Data, 2019

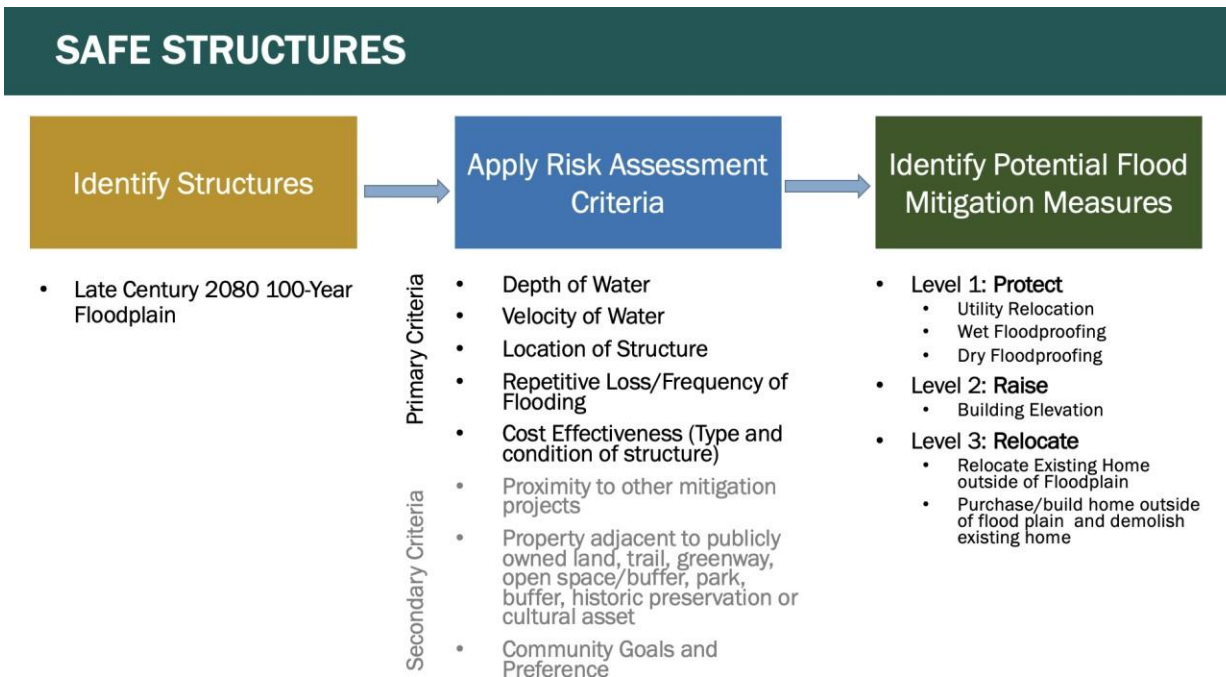
Assessing And Applying the Level of Protection

The proposed SSP establishes three levels of potential flood damage reduction options. Applicability for each structure is determined by the severity of flooding and the existing construction methods. While general determinations using two of the five available criteria (flood inundation and velocity) have been made for valuable structures in the basin to develop potential program cost estimates, each structure included in the SSP would be required to be individually evaluated to confirm what type of approaches might be feasible using all five criteria identified in Figure 1 and described in more detail on page 6.

The scale of the proposed Program begins with the identification of valuable structures within the current 100-year and projected Late Century (2080) 100-year floodplain. For this analysis, a structures database was used (the same used for the Flood Retention Facility Draft Environmental Impact Statement) that identified valuable structures and also included, for some structures, ground floor elevations that were used to determine the level of flood inundation. The resulting analysis grouped the structures by the severity of inundation. The velocity of flood water was also used to determine which mitigation measure may be viable.

¹ Comprehensive Housing Affordability Strategy (CHAS) Data, 2019
Preliminary LAND Alternative

Figure 1: Safe Structure Program



Three levels of flood reduction and mitigation approaches were applied based on the Late Century (2080) 100-year floodplain; starting first with the lowest flood risk, least burdensome and least costly approach and progressively advancing to the highest flood risk, most costly, and most burdensome approach, until appropriate mitigation is identified and selected. These measures vary within each of the three levels from protecting structures to remain within the floodplain to removing an entire structure from the floodplain. The costs associated with implementing a measure are variable, where the reduction of flood damages is proportional to the cost of the measure (i.e., removal of a structure from the floodplain will eliminate all future damages associated with flooding, while flood-proofing a home may mitigate flood damage, but does not eliminate future flood damages to that structure. Key assumptions for determining which flood reduction and mitigation measure would likely be viable for each structure is presented below – see also Applying the proposed SSP Approach section (page 10).

Flood Insurance

There are two kinds of flood insurance policies that are available for property owners, renters, or businesses, and having this coverage helps them recover faster when floodwaters recede. Flood insurance is a separate policy that can cover buildings, the contents in a building, or both. The first, and likely most well-known, are insurance policies backed by the National Flood Insurance Program (NFIP). Second are policies managed entirely by a private insurance company. Both are sold through property insurance

agents. There are over 200 companies that offer private flood insurance policiesⁱⁱ. Flood insurance is available for any property in the Chehalis Basin.

The NFIP is administered by the Federal Emergency Management Agency (FEMA). The NFIP also uses a Community Rating System (CRS) which is a voluntary incentive program that recognizes communities for implementing floodplain management practices that exceed the federal minimum requirements of the NFIP to provide protection from flooding. In exchange for a community's proactive efforts to reduce flood risk, policyholders can receive reduced flood insurance premiums for buildings in the community. There are currently 4 communities in the Chehalis Basin that participate in the CRS.

FEMA prepares Flood Insurance Rate Maps (FIRM's) to show how likely it is for an area to flood. Any place with a 1% chance or higher chance of experiencing a flood each year is considered to have a high risk. Homes and businesses in high-risk flood areas with mortgages from government-backed lenders are required to have flood insurance. Each city and county within the Chehalis Basin are required to adopt a FIRM that has been prepared by FEMA. These maps represent the current flood threat rather than a future threat such as the 2080 100-year flood event model used by the proposed SSP, although some jurisdictions have not updated their flood maps in over 20 years. Communities that adopt a floodplain map reflecting future conditions for regulatory purposes will likely receive a premium credit under the CRS. In these cases, two maps would be maintained: the FIRM map for the mandatory purchase requirement of insurance when a property receives a loan or mortgage backed by the Federal government; and, a second future threat flood map that regulates development within the floodplain.

Although not included as a specific mitigation measure with the proposed SSP, property owners and those who rent (for its contents) residential and commercial properties susceptible to flooding are encouraged to obtain flood insurance (usually paid on an annual basis) as a cost recovery approach to flood damage loss, repairs and restoration.

Mitigation Levels

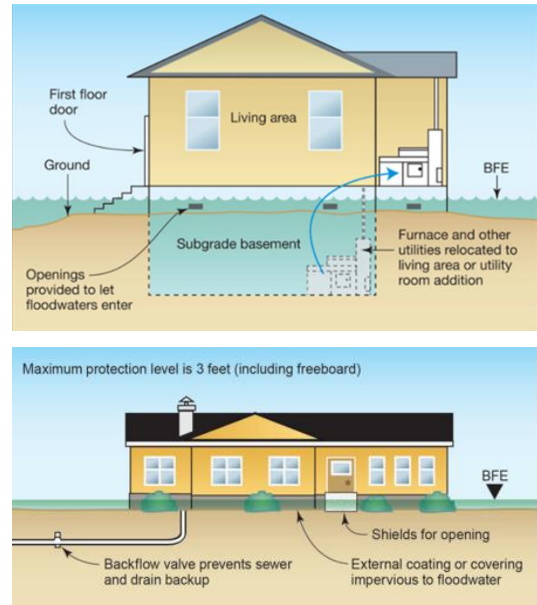
Level 1: Protect

Utility Relocation. Elevation of any furnace, air conditioner, appliances, and/or electrical and plumbing systems above the identified level.

Wet Floodproofing. Water is allowed to enter the impacted area such as a crawl space to equalize the hydrostatic pressure (e.g., the pressure of water on the building due to the force of gravity).

Dry Floodproofing. Making the walls watertight and closing all openings so water that gets to the building does not get inside. The building itself becomes the barrier.

Figure 2: Utilities/Wet & Dry Floodproofing



Level 2: Raise (Elevation)

All damage-prone parts of the building would be elevated above the flood protection level on a foundation intended to resist flood damage. Elevation can be performed using fill material, on extended foundation walls, piers, post, piles, and columns.

Figure 3: Elevated Home



Level 3: Acquire / Relocate

Figure 4: Relocation of Existing Home



Property is purchased based on a replacement value under a voluntary program and the home is demolished and debris removed from the site and placed into open space to preserve the natural function of the floodplain. These properties may represent opportunities for floodplain restoration, agricultural production, public use, and access to open spaces. In some situations, the property owner may want to retain ownership of the property but have the home relocated or demolished under the proposed SSP.

An important distinction associated with the proposed SSP is that it recommends replacement value rather than “fair market value” used by many government programs. This is an important distinction and one that is likely to encourage greater voluntary participation to sell an existing home in the floodplain and relocating outside of the floodplain. The delta between the fair market value and replacement value may need to be supported by local funds or other funding that is not restricted to only property acquisitions up to fair market values.

Existing homes in the floodplain may also be physically relocated outside of the floodplain. The decision regarding which method to use (purchase a new home or relocate an existing home), will likely be based on several considerations including property owner preference, home condition and cost associated with both approaches, if the home can be physically moved, and relocated outside of the floodplain.

Relocation/financial assistance would be needed to physically move the residential structure, purchase or construct a new home outside of the floodplain. The history of voluntary relocation in the basin is limited. Since 2011, there have been only seven identified buyouts and relocations, primarily in Centralia. The Community Flood Assistance and Resilience (CFAR) program has just started a pilot program that encompasses protecting, raising and relocating structures. In comparison, since 2011, 173 properties have been elevated in the basin since the 1996 flood; 19 of which were repetitive loss properties. Other longer-term relocation or buy-out options that have been identified include:

- Right of First Offer - Opportunity to submit first offer/bid
- Right of First Refusal - Opportunity to match a submitted offer
- Buy-Rent-Retreat - option allows for the local government or non-profit to purchase the floodplain property from a revolving loan program and then rent out the property to the homeowner (or someone else) and use that money to pay off any loan associated with the propertyⁱⁱⁱ.

Risk Assessment Criteria

A set of preliminary risk assessment criteria has been developed to identify the appropriate mitigation measure for each “valuable structure” within the Late Century 2080 100-year floodplain that may be in harm’s way and pose a risk to life and human safety. Valuable structures should be evaluated by knowledgeable and experienced inspectors and/or construction professionals who have inspected and installed floodproofing systems and have raised and relocated homes and commercial businesses.

Primary criteria include: 1) depth of water; 2) velocity of water; 3, location of the structure, 4) repetitive loss/frequency of flooding; and, 5) cost-effectiveness (type and condition of structure).

Secondary criteria include: 1) proximity to other mitigation projects; 2) property is adjacent to publicly owned lands, trails, greenways, open space/buffers, parks, historic preservation, or cultural assets; and 3) community goals/preferences. Below is a brief description of each of the criteria:

Primary Criteria

- Depth of Water: Flooding above the lowest floor of a building can cause varying levels of damage to a structure. However, even if the living space is not flooded, any depth of flooding of the crawlspace or building foundation can still cause cracking or potential damage from subsidence or shifting soil.
- Velocity of Water: Higher velocities (e.g., greater than five feet per second) can pose a serious threat to safety. Higher velocities may be found in the floodway, especially in steeper terrain and closer to the channel.
- Location of the Structure: If a structure and/or property is partially or completely surrounded by water. Flood water surrounding the property, even if it does not touch the structure, can lead to serious issues related to access. Issues may also arise due to the motion and waves striking against the structure.
- Repetitive Loss/Frequency: The structure has been identified as a repetitive loss property. Utilization of multi-return flood recurrence intervals can assist in evaluating potential risks: 100-, 50-, 10-, 5-, and 2-year events or 1-, 2-,10-, 20-, and a 50-percent chance of occurrence in any given year, respectively.
- Cost-Effectiveness: The proposed mitigation measure may exceed the estimated value of the structure, or the condition of the structure or type of foundation may not lend itself to one of the “protect in place” mitigation measures. For example, if the cost of raising (elevating) the home above the determined flood protection height may exceed the cost of a new home purchase outside of the floodplain, relocation would be the likely action.

Secondary Criteria

- Proximity to Other Mitigation Projects: Greater efficiencies and lower costs can likely be achieved by the administration of flood mitigation measures for a group of structures within an area rather than individual structures spread throughout the basin.
- Adjacency to Public Land: Property acquisition may be a community benefit if such property is adjacent to publicly owned land, trail, greenway, open space/buffer, park, buffer, historic preservation, or cultural asset.
- Community Goals and Preference: Each local government entity may have different preferences for land use locations, social vulnerability issues, and other community-wide preferences that should be factored in when evaluating various flood mitigation measures.

A risk assessment criteria score sheet can be used to give each structure a score based on the above-mentioned criteria. Risk assessments should be performed by or under the direction of knowledgeable and experienced inspectors and/or construction professionals who have inspected and installed floodproofing systems, raised and relocated homes and/or commercial businesses. Each structure can be given a recommendation based on whether it meets the minimum criteria for a particular mitigation technique. Recommendations by structure should include:

- **Highly Effective** —the mitigation technique is determined to be highly effective at reducing flood risk and provides additional community benefits.
- **Effective**—the mitigation technique is determined to be feasible and effective for reducing flood risk.
- **Further Evaluation Needed**—the minimum criteria for the mitigation technique are met but further evaluation or additional data is needed to determine if the technique is a viable option.
- **Not Recommended**—the minimum criteria for the mitigation technique are not met - therefore the technique is likely not feasible, effective, or may be cost prohibitive.

Applying the Safe Structures Approach

There are approximately 3,166 structures (homes, businesses, agricultural buildings) identified in the structures database used for the proposed Flood Retention Facility Draft SEPA and NEPA Environmental Impact Statements and for the LAND Alternative analysis that are subject to flooding under the 100-year Late Century Flood plain modelⁱⁱ. If the recommended capital projects included in the Preliminary LAND Alternative, where constructed, the number of structures still inundated would be reduced to approximately 1,640 structures. Not all structures are assumed to take part in the program. Assuming approximately 75 percent of structures would actually take part in the program, the SSP assumes that

1,231 structures would take part in the program. when including the SSP combined with and. Using the available criteria of the depth of water and velocity of water, structures have been assigned to one of the three flood mitigation levels of Protect, Raise, and Relocate. This assignment of structures is the result of a desk-top evaluation of existing data to gain an order of magnitude of the number of structures and their appropriate mitigation measure and potential costs. A field assessment of each structure should be made prior to a final determination regarding recommended flood reduction actions and costs. Structures that are inundated with water less than 1 foot above the first-floor level have been assigned to the Protect category for purposes of developing a rough order of magnitude cost estimate for the SSP. Structures that are inundated between 1 and 5 feet of water above the first-floor level are assigned to the Raise category. Structures inundated with more than five feet of water above the first floor level are assigned to the Relocate category. It is also recommended that an additional 1 to 3 feet of freeboard are added to each mitigation measure to provide an additional measure of safety.

It is possible that some structures up to three feet of inundation may be floodproofed under the Protect category rather than Raise and, structures that are inundated above 5 feet could be elevated rather than relocated. Conservative assumptions have been used for the purposes of generating a cost estimate. A maximum height of 5 feet (plus up to 3 feet of freeboard) was selected for the Raise limit because of likely zoning height limitations for a two-story home along with aesthetic considerations for a home that is raised more than 8 feet. Actual inspection of the condition of each structure or type of foundation will either confirm or eliminate a potential mitigation measure as being viable or cost- effective.

Additional refinements to the desk-top evaluation have been made to the number of structures that are assigned to each Flood Mitigation Measure category by the following:

- Structures that have initially been assigned to the Protect category based on depth of water and are subject to the velocity of water greater than five feet per second^{iv} were moved to the Raise category. There are only three structures that are impacted by this assumption.
- There are 163 single family structures that have been identified as mobile homes. Of these, 38 are identified within the Protect category; 118 within the Raise Category and 7 within the Relocate category. All mobile homes within the Protect Category have been transferred to the Raise Category as a better protective flood solution and the costs for raising all mobile homes is estimated at \$35,000 per home.
- 10 percent of the structures^v that have initially been assigned to the Raise category are assumed to have slab-on-grade foundation systems and were placed in the Relocation category. Although it is possible to raise a home on a slab-on-grade foundation, assigning these structures to the Raise category is a more conservative measure and was selected for the purposes of generating a cost estimate below.

- Structures that have been identified as commercial properties in which the business operation was not contained in a former residential structure, and were identified as structures that should be raised (elevated) or relocated, have been transferred to the Protect category. Similarly, agricultural buildings have been transferred to the Protect category.
- Final adjustments to the total structures have been made to account for the voluntary nature of the SSP. We have assumed a 75 percent participation rate across all Structures based on the professional judgment of the Project Team and reported participation rates from the Blue Acres program in New Jersey of between 70 to 80 percent.

Relocation/Rental Assistance

Homeowners that choose to raise their home will likely need temporary housing while construction is taking place. Homeowners that relocate their homes will also be provided with moving expenses that are covered or identified in the replacement value of a new home.

For those that rent their homes and are displaced due to relocation, the Project Team has assigned a budget of 2.5 percent of the total relocation expense. If the SSP is self-funded (and does not utilize any federal or likely state funding), relocation assistance for tenants displaced by voluntary acquisitions can be provided assistance based on the terms created by the agency in charge of the flood mitigation program. If Federal or State funding is used, tenant relocation assistance is still available under the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (URA) to tenants displaced from their homes.

Regardless of the source of funding, the Project Team proposes to use the regulations under the Federal Act, in which an eligible tenant (homeowner or renter) displaced from their home can receive the following advisory and financial assistance:

- Advisory Services. This includes referrals to comparable and suitable replacement homes, the inspection of replacement housing to ensure that it meets established standards, help in preparing claim forms for relocation payments, and other assistance to minimize the impact of the move.
- Payment for Moving Expenses. Selection between either a: -- Payment for the Actual Reasonable Moving and Related Expenses, or -- Fixed Moving Expenses and Dislocation Allowance.
- Replacement Housing Assistance. To enable the occupant to rent or buy a comparable or suitable replacement home (e.g., rent differential up to 42 months).

Safe Structures & Community Development Alignment

The proposed SSP is a voluntary program designed to protect residences, businesses, and other important structures that are at risk of inundation from the 2080 100-year flood event. During this event, approximately 3,166 structures would be at risk of inundation to varying degrees within the Chehalis Basin if no flood damage reduction interventions were undertaken compared to the approximately 1,640 structures at risk if the Preliminary LAND Alternative were constructed. Under a no build scenario, the SSP assumes that 75 percent of owners/renters would take part in the SSP, totaling approximately 2,380 structures. The proposed SSP estimates the cost to protect these structures to be approximately \$313 million. However, the number of structures that are at risk of flooding and the cost to protect them will continue to climb unless local governments (cities and counties) regulate how development occurs within the very same area that the SSP is trying to protect. The idiom of chasing our tails uniquely applies to this current situation.

To contain potential future costs of implementing the SSP, every local government should apply the same flood protective measure to new development as is proposed to be applied to existing structures as part of the SSP. Applying floodproofing materials or raising a home above the flood level will be significantly less expensive if done when the building is being built rather than after construction and before any damage occurs to the structure from flooding. When buildings cannot be safely protected or raised, they will need to be moved to a safer location on the property or outside the floodplain. Even without an SSP or funding for its implementation, requiring new construction to adhere to certain regulations to protect it from future flooding is the right thing to do. Building regulations or codes exist to ensure safe and resilient structures. These codes protect people from a wide range of hazards, including safe wiring, structural integrity of the building, fire prevention, earthquake, and flooding. These codes reduce casualties, costs, and damage by creating stronger and safer structures designed to withstand disasters. They are particularly important for those who do not own property and do not have insurance to protect themselves against flood risk or full information to willingly accept a particular level of risk. Codes that set a minimum level of protection that substantially reduces flood risk increase equitable outcomes by reducing public costs of response and recovery during and after flood events—allowing resources to be available to address other priorities—and by limiting the amount of risk vulnerable populations, including renters, are exposed to.

The SSP also envisions that approximately 150 +/- residential structures may not be suitable for any flood protective measure allowing the home to remain in place or moved to a safer location on the property. In these situations, local governments should ensure that adequate housing and properties are available to support the displaced residents who voluntarily decide to sell their homes as part of the SSP and desire to remain in the community. Ensuring that adequate housing will be available and affordable is an important community development goal, especially for residents that are already part of the community and want to remain in the community. It is also an opportunity to marry the local community's economic development goals with the need for replacement housing. Land use planning is the purview of local governments. Local governments that have been successful in creating successful economic development projects,

revitalization of their downtowns, creating transformative placemaking projects that focus on public spaces and their connection to private development, usually have been successful because of their leadership, vision, investment in infrastructure, and including a critical mass of housing that supports redevelopment and private investment. Although 150 +- new housing units, even if built in one location, would likely not move the needle much in terms of accomplishing a community's economic or housing goals; providing some of that housing as part of a mixed-use development (vertical or horizontal) could help jump start more redevelopment to provide an economic impact and a significant community benefit.

Commitment and Incentive

Each local government authority that is responsible for regulating development within the Chehalis Basin should consider adopting similar regulations or codes to reduce flood damage through land use and building codes. Access to any SSP funds by residents or businesses should only be awarded if their local government adopts similar flood protective regulations.

Additionally, those local governments that have adopted similar flood protective regulations, should be eligible to receive funding from the SSP for public infrastructure that may be needed to support the construction of additional housing units that are purchased or rented to displaced residents. Local governments are also encouraged to use other infrastructure funding sources such as tax increment financing, and federal and state grants in an effort to support its economic development and housing goals. It is recommended that the SSP provide a total of \$20 million that can be applied for and awarded to local governments.

Details on potential flood protective regulations that could be required to receive funding are outlined in **Memorandum #2: Draft Land Use Recommendations and Receiving Areas Memo**. Several of these recommendations build upon the work of French & Associates with input from local governments and recommendations developed by the Local Actions Program Implementation Advisory Group in 2020-2021. Potential regulations could include:

- Updated local flood maps to provide information to landowners, developers, and existing property owners.
- Identify base flood elevations (BFE). Where the FIRM does not provide a BFE, use the BFEs developed by Watershed Science & Engineering for the Chehalis Basin Strategy. Where the FIRM provides no BFE and there is no available flood study, calculate the BFE either by the permit applicant or the community prior to permit issuance.
- Join the Community Rating System (CRS), implementing various floodplain management practices that exceed the minimum requirements of the National Flood Insurance Program (NFIP).

- Update local zoning and development code regulations to adopt low density zoning or nonresidential zoning within the floodplain; adopt development regulations that minimize development in floodplains;
- Update building codes to require new structures, substantially remodeled structures, and structures damaged from previous flooding to be raised up to three feet above the BFE; and require new buildings to be protected to at least the BFE or flood of record, whichever is higher.
- Implement NFIP criteria, if not previously implemented.

Program Administration

Standing up and operating the proposed SSP will be a significant undertaking and will require in-house or contract staffing. Likely positions include and are not limited to:

- Administrative staff;
- Legal counsel;
- Property acquisition specialists;
- Assessment and building inspectors;
- Grant and funding specialists;
- Application-intake coordinators;
- Relocation assistance specialists;
- Community outreach staff; and
- Real estate appraisers.

Following the administrative fee model of the Blue Acres Buy-out program in New Jersey, a 10 percent administrative fee of total program costs is proposed to be included to operate the proposed SSP. The Blue Acres program has received over \$300 million in funding over the last 10 years. The Blue Acres selected this administrative fee limit as it is the maximum that FEMA will allow under its reimbursement regulations and providers for a significant team of staff to implement their program.

Rough Order of Magnitude Costs Determined by:

- Replacement Home Cost: \$400,000 (New construction home cost of \$375,000 + Demolition cost of \$15,000 (new) and Moving costs of \$15,000 (new) per structure included).

- Relocation/Rental Assistance: 2.5 Percent of Total Relocation Costs (New)
- Structural Elevation Costs: \$150,000 for stick-built homes & \$35,000 (New) for mobile homes (includes temporary rental)
- Utility Relocation/Flood Proofing: \$20,000 per Residential Structure (Increased from \$10,000); \$30,000 per commercial and Ag. Structure (new)
- Infrastructure Grants to Support New Housing Projects: A total of \$20 million is allocated for awards
- Contingency: 20 Percent of Total Costs (No change)
- SSP Administration Fee: 10 percent of Total Costs

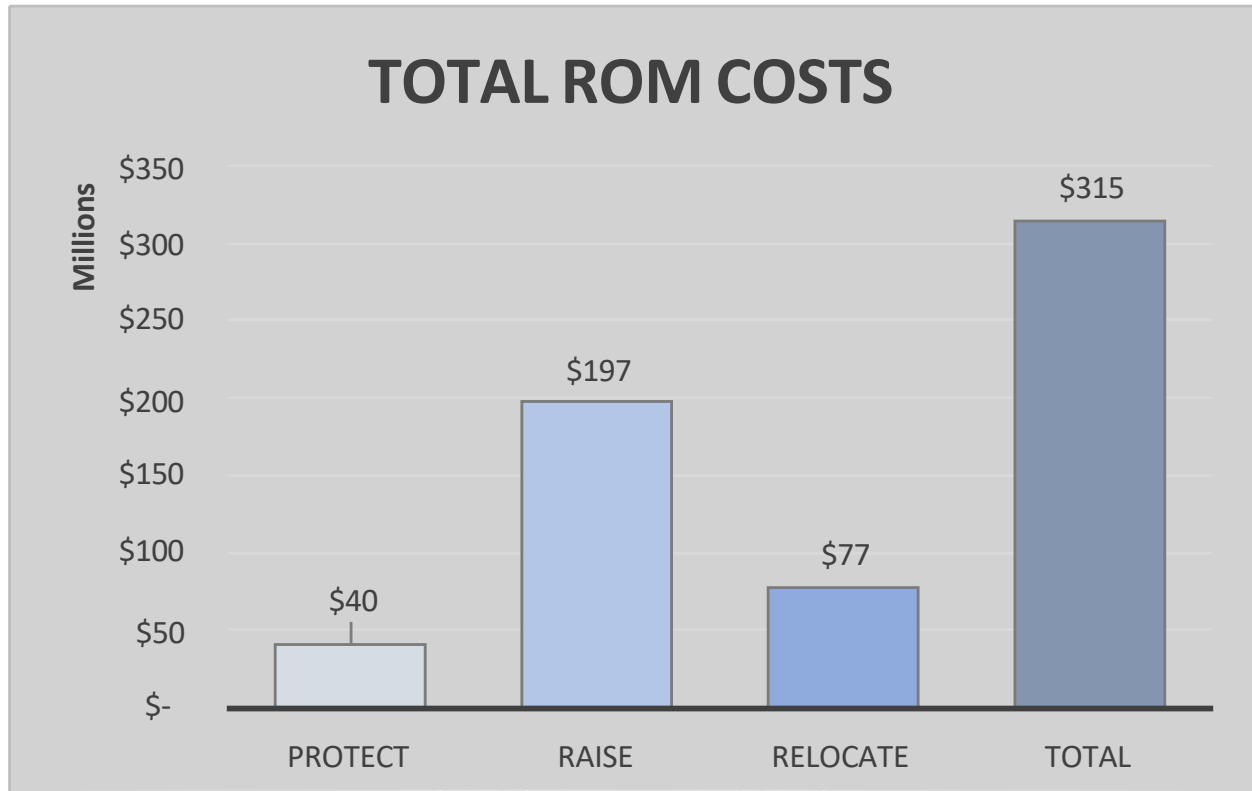
No distinction has been made at this time between those homeowners who desire, and is a viable solution, to relocate their existing home versus the purchase of a new home.

Preliminary Costs

The proposed SSP will provide a systematic and strategic approach to identifying and protecting structures that are at risk from flooding. Total costs of the SSP range from \$192 million to \$315 million depending on if the SSP is implemented with or without the proposed capital infrastructure projects.

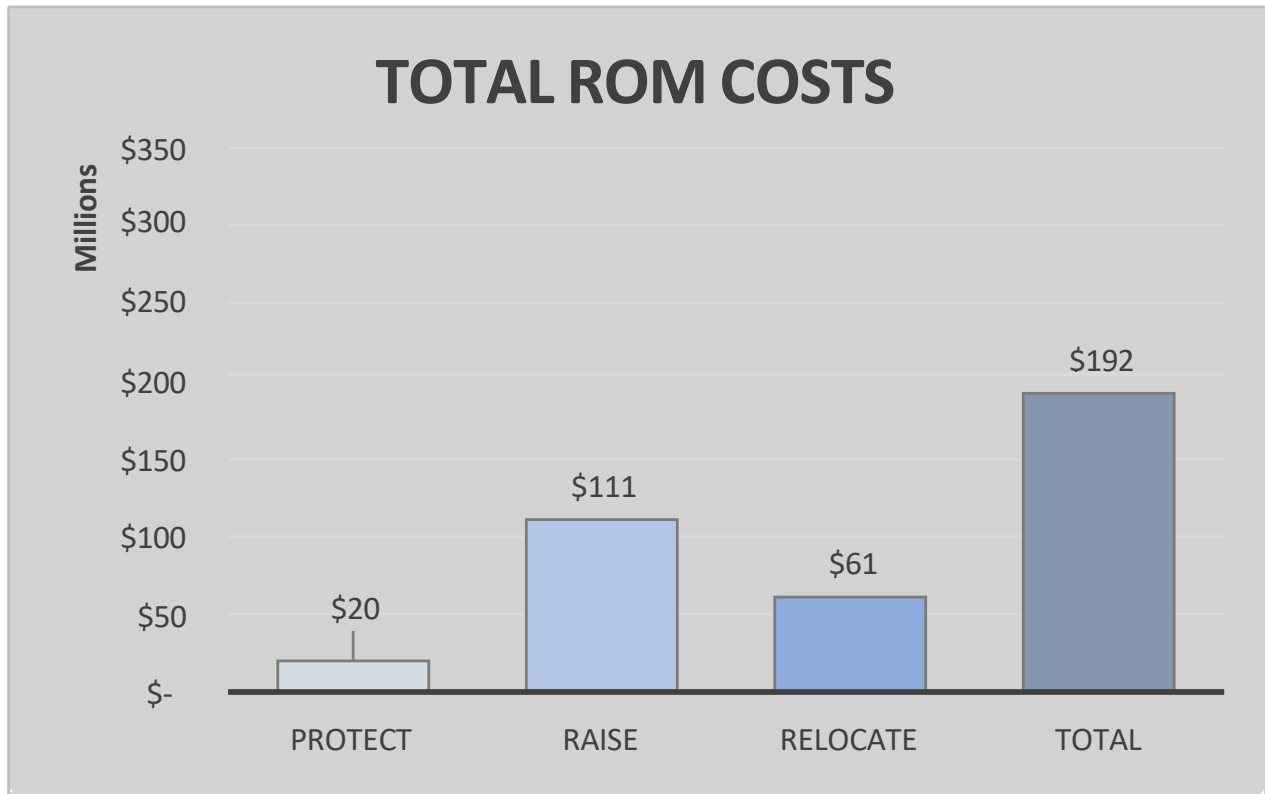
Below are rough order of magnitude (ROM) cost estimates based on the above criteria and assumptions for the SSP only and then combined with the recommended Capital Projects. Estimates of valuable structures are based on the WSE structure database which contains finished floor elevations. The finished floor elevations are estimated only for valuable structures. Given that updated data is not available for recent development, the dataset does not include all structures in the floodplain and estimates of valuable structures may be low or missing for certain locations. It is possible that more structures than quantified in this table and in additional areas could qualify for Safe Structures interventions.

Safe Structures Program Only



Location	Protect			Raise	Relocate	Relocate/Rental	Contingency	Admin. Fee	Total ROM
	Residential Cost	Commercial Cost	Agriculture Costs	Residential Cost	Residential Cost	5 % of Relocate	20 % of Total	10 % of Total	
Lewis County									
Centralia	\$ 8,940,000	\$ 8,190,000	\$ 330,000	\$ 79,350,000	\$ 31,600,000	\$ 1,580,000	\$ 25,682,000	\$ 15,567,200	\$ 171,239,200
Chehalis	\$ 700,000	\$ 3,750,000	\$ 390,000	\$ 13,200,000	\$ 5,200,000	\$ 260,000	\$ 4,648,000	\$ 2,814,800	\$ 30,962,800
Adna	\$ 220,000	\$ 240,000	\$ 600,000	\$ 8,100,000	\$ 2,800,000	\$ 140,000	\$ 2,392,000	\$ 1,449,200	\$ 15,941,200
Boistfort	\$ 340,000	\$ 30,000	\$ 330,000	\$ 6,750,000	\$ 180,000	\$ 9,000	\$ 1,526,000	\$ 916,500	\$ 10,081,500
Pe Ell	\$ 220,000	\$ 30,000	\$ 30,000	\$ 750,000	\$ 800,000	\$ 40,000	\$ 366,000	\$ 223,600	\$ 2,459,600
Thurston County						\$ -	\$ -	\$ -	\$ -
Rochester	\$ 1,040,000	\$ 60,000	\$ 990,000	\$ 12,900,000	\$ 1	\$ 0	\$ 2,998,000	\$ 1,798,800	\$ 19,786,802
Grays Harbor County						\$ -	\$ -	\$ -	\$ -
Elma	\$ 380,000	\$ 1,230,000	\$ 420,000	\$ 11,700,000	\$ 6,400,000	\$ 320,000	\$ 4,026,000	\$ 2,447,600	\$ 26,923,600
Oakville	\$ 360,000	\$ 600,000	\$ 270,000	\$ 10,800,000	\$ 4,000,000	\$ 200,000	\$ 3,206,000	\$ 1,943,600	\$ 21,379,600
Montesano	\$ 180,000	\$ 420,000	\$ 210,000	\$ 4,350,000	\$ 4,400,000	\$ 220,000	\$ 1,912,000	\$ 1,169,200	\$ 12,861,200
Satsop	\$ 20,000	\$ -	\$ 30,000	\$ 900,000	\$ 400,000	\$ 20,000	\$ 270,000	\$ 164,000	\$ 1,804,000
Aberdeen	\$ -	\$ 30,000	\$ -	\$ 450,000	\$ -	\$ -	\$ 96,000	\$ 57,600	\$ 633,600
Cosmopolis	\$ -	\$ -	\$ -	\$ 150,000	\$ -	\$ -	\$ 30,000	\$ 18,000	\$ 198,000
	\$ 12,400,000	\$ 14,580,000	\$ 3,600,000	\$ 149,400,000	\$ 55,780,001	\$ 2,789,000	\$ 47,152,000	\$ 28,570,100	\$ 314,271,102

Safe Structures Program Combined with the Preliminary LAND Alternative



Location	Protect			Raise	Relocate	Relocate/Rental	Contingency	Admin. Fee	Total ROM
	Residential Cost	Commercial Cost	Agriculture Costs	Residential Cost	Residential Cost	5 % of Relocate	20 % of Total	10 % of Total	
Lewis County									
Centralia	\$ 860,000	\$ 1,500,000	\$ 630,000	\$ 20,400,000	\$ 11,200,000	\$ 560,000	\$ 6,918,000	\$ 4,206,800	\$ 46,274,800
Chehalis	\$ 320,000	\$ 1,500,000	\$ 540,000	\$ 9,450,000	\$ 4,400,000	\$ 220,000	\$ 3,242,000	\$ 1,967,200	\$ 21,639,200
Adna	\$ 220,000	\$ 240,000	\$ 600,000	\$ 7,950,000	\$ 3,200,000	\$ 160,000	\$ 2,442,000	\$ 1,481,200	\$ 16,293,200
Boistfort	\$ 340,000	\$ 30,000	\$ 450,000	\$ 6,150,000	\$ 2,400,000	\$ 120,000	\$ 1,874,000	\$ 1,136,400	\$ 12,500,400
Pe Ell	\$ 220,000	\$ 30,000	\$ 30,000	\$ 750,000	\$ 800,000	\$ 40,000	\$ 366,000	\$ 223,600	\$ 2,459,600
Thurston County						\$ -	\$ -	\$ -	\$ -
Rochester	\$ 840,000	\$ 60,000	\$ 1,680,000	\$ 13,200,000	\$ 5,600,000	\$ 280,000	\$ 4,276,000	\$ 2,593,600	\$ 28,529,600
Grays Harbor County						\$ -	\$ -	\$ -	\$ -
Elma	\$ 160,000	\$ 1,140,000	\$ 990,000	\$ 11,100,000	\$ 8,000,000	\$ 400,000	\$ 4,278,000	\$ 2,606,800	\$ 28,674,800
Oakville	\$ 160,000	\$ 630,000	\$ 960,000	\$ 9,750,000	\$ 4,000,000	\$ 200,000	\$ 3,100,000	\$ 1,880,000	\$ 20,680,000
Montesano	\$ 160,000	\$ 390,000	\$ 300,000	\$ 4,200,000	\$ 4,400,000	\$ 220,000	\$ 1,890,000	\$ 1,156,000	\$ 12,716,000
Satsop	\$ -	\$ -	\$ 150,000	\$ 450,000	\$ -	\$ -	\$ 120,000	\$ 72,000	\$ 792,000
Aberdeen	\$ -	\$ 30,000	\$ -	\$ 450,000	\$ -	\$ -	\$ 96,000	\$ 57,600	\$ 633,600
Cosmopolis	\$ -	\$ -	\$ -	\$ 150,000	\$ -	\$ -	\$ 30,000	\$ 18,000	\$ 198,000
	\$ 3,280,000	\$ 5,550,000	\$ 6,330,000	\$ 84,000,000	\$ 44,000,000	\$ 2,200,000	\$ 28,632,000	\$ 17,399,200	\$ 191,391,200

Below are the structures by location based on the above criteria and assumptions for the Safe Structures Program Only and then combined with the recommended Capital Projects.

Safe Structures Only by Location

Location	Residential	Protect Commercial	Agriculture	Raise Residential	Relocate Residential	Total
Lewis County						
Centralia	447	273	11	529	79	1,339
Chehalis	35	125	13	88	13	274
Adna	11	8	20	54	7	100
Boistfort	17	1	11	45	6	80
Pe Ell	11	2	1	5	2	21
Thurston County						
Rochester	52	2	33	86	12	185
Grays Harbor County						
Elma	19	41	14	78	16	168
Oakville	18	20	9	72	10	129
Montesano	9	14	7	29	11	70
Satsop	1	0	1	6	1	9
Aberdeen	0	1	0	3	0	4
Cosmopolis	0	0	0	1	0	1
Total	620	487	120	996	157	2,380

Safe Structures + Recommended Capital Project by Location

Location	Residential	Protect Commercial	Agriculture	Raise Residential	Relocate Residential	Total
Lewis County						
Centralia	43	50	21	136	28	278
Chehalis	16	50	18	63	11	158
Adna	11	8	20	53	8	100
Boistfort	17	1	15	41	6	80
Pe Ell	11	2	1	5	2	21
Thurston County						
Rochester	42	2	56	88	14	202
Grays Harbor County						
Elma	8	38	33	74	20	173
Oakville	8	21	32	65	10	136
Montesano	8	13	10	28	11	70
Satsop	0	0	5	3	0	8
Aberdeen	0	1	0	3	0	4
Cosmopolis	0	0	0	1	0	1
Total	164	186	211	560	110	1,231

Next Steps

There are several immediate next steps needed to begin to implement the Safe Structures Program:

- Determine which, if any of the Preliminary LAND Alternative recommendations move forward to understand the scale of the Safe Structures Program.
- Update the existing structures database to include structures outside of the Chehalis mainstem area.
- Determine whether Safe Structures is implemented as an expansion of the CFAR program or if a new program is required.
- Create a management, staffing and grant program to establish the program or expand CFAR.
- Identify equity goals and if funds should be targeted to lower income households that could take part in a program.

Completion of these next steps will begin to answer some of the broader questions that should be considered as part of the program.

References

ⁱ 2018 Structures Data Base

ⁱⁱ Chehalis Basin Flood Insurance Questions and Answers

ⁱⁱⁱ NPA article describing California's Climate Change Idea for Coastal Homes: Buy, Rent, Retreat; March 21, 2021

^{iv} Federal Emergency Management Agency (FEMA) NFIP Technical Bulletin 3/ January 2021; limiting dry flood-proofing to water velocity less than 5 feet per second. French Wetmore, French & Associates, Ltd. Robert Stowe, Interviewer, February 2023.

^v French & Associates, Ltd., assumption of number of slab on grade homes in Chehalis Basin. Robert Stowe, Interviewer, February 2023