
(Draft) Section 2
**RECOMMENDED FLOOD HAZARD MANAGEMENT
PLAN**

This section reports the recommended Flood Hazard Management Plan (FHMP) improvements that resulted from this study. The planning process, project area background, goals and objectives, and a description of the other alternatives evaluated follow in subsequent chapters.

The recommended flood hazard reduction measures were selected by Grays Harbor County staff with extensive feedback from public meetings and limited feedback from a survey conducted in May 1997. Several criteria were defined from the goals and objectives detailed in Section 4 of this FHMP for use as a selection guide. To meet the goals and objectives, recommended alternatives must:

- Have a reasonable certainty of improving the targeted drainage issue;
- Be cost-effective and have realistic funding sources;
- Have the agreement of the interested public;
- Have approval from Grays Harbor County and other regulatory agencies;
- Maximize beneficial environmental impacts and minimize adverse environmental impacts;
- Be implementable in a timely manner;
- Provide long-term benefits; and
- Address future growth conditions in South Beach.

Specific recommendations are summarized in Table 2-1.

**Table 2-1
South Coastal Flood Hazard Management Plan
Recommendations**

	Policy and Program Recommendations	Capital Improvement Project Recommendations
Area-Wide Issues	<ul style="list-style-type: none"> • Regulate development in flood-plains and wetlands and impacts to drainage courses • Evaluate revisions to FEMA mapped floodplain boundaries • Coordinate flood hazard management activities with other County divisions and other agencies • Consider development of a conservation easement program to preserve flood storage areas • Develop flood hazard public education programs 	<ul style="list-style-type: none"> • Elevate affected homes and businesses where necessary
Winter Creek		<ul style="list-style-type: none"> • Construct berms in conjunction with selected example projects if applicable (See example solutions later in report) • Improve portions of the channel in conjunction with selected example projects if applicable (See example solutions later in report)
Local Drainage Issues		<ul style="list-style-type: none"> • Example Project ABCE • Example Project I • Example Project K1/K2 • Example Project L • Example Project Q • Example Project R • Example Project X

POLICY AND PROGRAM RECOMMENDATIONS

While structural alternatives for flood hazard management address problems already identified, non-structural alternatives seek to prevent future problems by addressing the causes of flooding. They are typically focused on the regulation of land use, which is the largest controllable factor in most flooding problems. In some cases, homes and other structures are built within an identified floodplain; in others, although structures are outside the floodplain, fill or other features of development alters natural drainage courses, creating flooding up- or downstream. Development of wetlands removes the important natural floodwater storage function they provide. Overall, the cumulative effects of development add impervious surface area within watersheds, increasing stormwater runoff, and result in additional fill that displaces water, diverts flow, and raises flood elevations. Addressing these issues through land use policies and regulations is a cost-effective way of helping to avoid future flooding problems that require costly capital solutions. Also effective are educational programs, which help maintain property owner awareness of the types of activities that can contribute to flooding and provide guidance on the regulations and permit processes related to flood hazard management.

It is important to note in any discussion of policy and regulatory solutions that Grays Harbor County, and particularly the coastal areas, are by nature exceptionally prone to flooding. Much of the South Beach study area is less than 20 feet above sea level, and many areas lie within designated floodplains or wetlands. The ocean shoreline in this area is accreting and historic drainage pathways are changing. This results in new areas of localized flooding and high groundwater that may affect the performance of septic system drainfields. Any regulations preventing development that was subject to flooding or that in some way contributed to flooding would result in unacceptably severe restrictions on development through much of South Beach. Thus, it must be recognized that—given the nature of the area—flooding will continue to occur to some degree if landowners are to exercise their property rights. This will be true even with strict enforcement of all existing regulations and implementation of the other measures described below.

This plan recommends that each of the non-structural alternatives presented here be implemented by Grays Harbor County.

Regulate Development in Floodplains and Impacts to Drainage Courses

Regulations are a means of limiting actions taken by individuals that may put them at risk or adversely affect others or the environment. As detailed in the Regulatory Overview of Section 3 and Appendix B of this FHMP, there are a number of federal, state, and local laws that pertain to flood hazard management. Any new development in the floodplain should strictly follow the guidelines specified in these regulations.

To reduce localized flooding, land use policies in the South Beach area must ensure that development does not impact drainage courses and that there is minimum runoff. Regulations that address the goal of protecting drainage pathways should be enforced. This requires that the County:

- Identify permanent drainage pathways.
- Prevent filling or blocking of natural drainage courses. Prevent alterations or relocations of drainage courses that affect their flood carrying capacity. This can be done by vigorously enforcing the Uniform Building Code and the County Zoning Ordinance.
- Limit fill materials for new development or improvements to the minimum necessary to elevate homes and septic mound systems above the designated flood level.
- Review all filling activities for adverse downstream and upstream impacts.
- Establish policies to comply with Sections 401 and 404 of the Clean Water Act. (Related to construction measures for flood hazard protection that may affect wetlands)
- Establish policies to formalize the posting of warnings of flooding hazards during events that cause closure of roadways, bridges, or facilities.

Evaluate Revisions to FEMA Floodplain Boundaries

The special permitting requirements for development within floodplains (administered under chapter 13.07 of the County's zoning ordinance, as described in Chapter 3) apply only to those areas within the 100-year floodplain mapped by FEMA. Figure 3-3 shows the 100-year floodplain mapped for South Beach. Discussions with County staff resulted in the observation that some areas adjacent to but outside the mapped floodplain appear to experience significant flooding; because of the dynamic nature of the coastal topography (such as beach accretion and

shifting of dune locations), it is likely that changes have occurred in the floodplain boundaries that are not reflected on the current maps. Computer modeling of the area using up-to-date topography and hydrologic data could establish whether additional areas should be subject to floodplain development permit requirements to protect property and safety in the floodplain area. The County could also consider adopting a policy of performing such floodplain boundary reviews on a periodic basis in coastal areas like South Beach where conditions are subject to change.

Coordinate Planning with County Divisions and Other Jurisdictions

At public meetings held during the FHMP planning process, a number of citizens noted that better coordination among divisions within the County would be helpful in identifying and managing flooding hazards. For example, they cited the issuance of permits for wetland filling that resulted in a loss of flood storage and resulting impacts on downstream properties. Some of the situations cited are the result of issues beyond the County's control, such as "grandfathered" development under permits issued in the past when regulations were less stringent, and some are the result of regulatory violations by property owners. However, opportunities may exist for a coordinated process among the County's Planning, Building, and Utilities and Development divisions to ensure that all new development with the potential to experience or exacerbate flooding is reviewed for consistency with this FHMP as well as other applicable plans and regulations. It is recommended that the County include such coordination in current permit program improvements.

Because flooding occurs on a watershed basis, without respect to city and county boundaries, interjurisdictional coordination is another important aspect of flood hazard management planning. Typically, several public agencies are affected by, or have authority over, activities that can contribute to flooding in a given watershed. In South Beach, for example, the Washington State Department of Transportation has jurisdiction over the operation and maintenance of SR 105, where much of the flooding with the greatest potential hazard occurs. The City of Westport is also a key player in flood hazard management, as it contains most of the length of the main ditch draining the northern portion of the South Beach area. Policies and processes should be established among these three entities for:

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- Notification of projects that may affect flooding in areas under the other agencies' jurisdiction.
 - Coordination of planning activities that address land use and flooding in the watershed.
 - Development of mechanisms for cost-sharing on projects of mutual benefit.

Consider Development of Flood Storage Conservation Easements

As noted elsewhere, much of the South Beach area consists of floodplains and jurisdictional wetlands. These areas serve as natural storage for floodwaters, and filling and development within them force the water elsewhere—often over roads or into already developed areas. To address similar issues, some jurisdictions—for example, in King County—have established natural resource conservation easements, whereby property owners can voluntarily agree to forego development in exchange for property tax reductions or other incentives. The areas thus protected will reduce future flood hazards by continuing to provide their natural storage functions, and can also provide other public benefits such as recreation. Though the effects of such voluntary programs cannot be quantified, they can be a cost-effective way of serving multiple public purposes without increasing regulation. It is recommended that the County investigate the development of such a program for interested property owners.

Develop Flood Hazard Public Education Programs

Educational programs are important tools to protect the public safety and health of citizens in flood-prone areas. It is recommended that a series of posters be developed for display in the lobbies of County offices and other public places to inform people of the flooding issues in South Beach; efforts could be coordinated with similar activities in other areas of the County. Pamphlets should also be distributed to educate the public. Examples of topics to be included in the educational series are as follows:

- Flood zones in South Beach: where they are and what they mean.
- Potential for damages when buying/building a structure in a floodplain.
- Likely impacts to roads and bridges in floodplains.

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- The importance of maintaining existing drainage courses, not creating any that drain wetlands, and minimizing the use of fill materials.
 - Impacts of flooding on water quality, including increased erosion and sedimentation, and the washing of pesticides and herbicides into the main channel.
 - Measures to reduce flood hazards and minimize damages.
 - Explanation of regulatory programs and permits related to improvements on private property.

While education programs of this nature will serve to inform people of the dangers of construction within floodplains and the need to maintain natural drainage courses, they do not guarantee changes in existing practices. This is a choice that must be made by individuals and the community as a whole; therefore, safety, flood hazard reduction, and environmental benefits depend upon public attitudes and actions. Without significant interest or acceptance of the goals, these benefits may not be realized.

CAPITAL IMPROVEMENT PROJECT RECOMMENDATIONS

No capital improvement projects (CIPs) are recommended for the reach of Winter Creek that runs from just south of Cohasset Lake through Westport, except where indicated for localized drainage improvements. These localized improvements are addressed in the example solutions presented below.

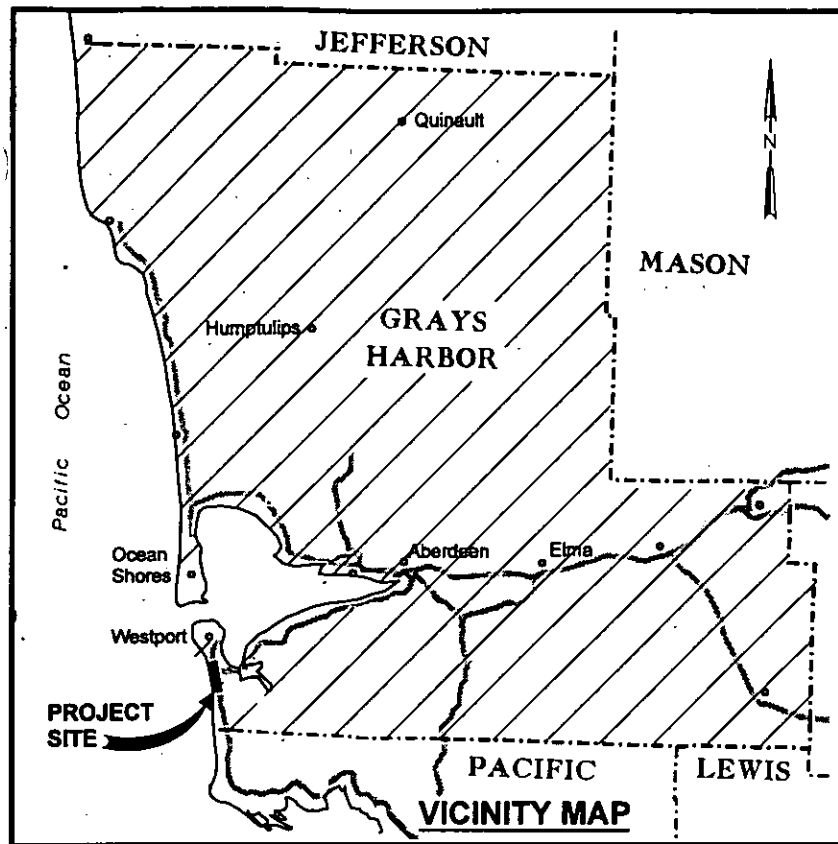
If necessary, after the other improvements have been implemented, existing homes and businesses (including basements) affected by flooding should elevate their structures. Although the Federal Emergency Management Agency (FEMA) did not perform detailed modeling to establish the base flood level, they did specify the 100-year tide elevation for the Port of Grays Harbor as elevation 10 feet. Committee members' recollections of high floodwater levels indicate that structures should be elevated to approximately 2 to 3 feet above surrounding land in the low areas on either side of SR 105. The County is currently working with FEMA to develop a flood mitigation plan that would help fund these projects; however, this plan assumes that the cost of elevating houses and businesses would be borne by the owner. Any elevation of structures would be subject to permit requirements for fill placement and, if applicable, floodplain development.

Localized Flooding Example Solutions

Seven sites were chosen as example capital improvement projects for localized drainage. These locations were selected because they are reasonable examples of the possible solution types and order-of-magnitude costs that can be expected elsewhere in the project area, they have important safety, health or property protection value, and they were identified as priorities at the community meetings. Similar projects throughout the planning area will be necessary to alleviate the local, frequent flooding.

Using the criteria set forth in Section 4, Goals and Objectives, flood hazard reduction measures were conceptualized and evaluated by the consultants for constructability and the potential to improve drainage conditions. After this initial screening, several local capital improvement and area-wide policy alternatives were identified to reduce flooding hazards associated with the frequent storm events in the area. During the advisory committee meetings, example solutions for the seven selected sites were presented and discussed. These examples included several alternatives that were later modified to reflect the committee's input and to consider the results of a follow-up survey returned by some of the participants.

The seven example project locations are shown on Figure 2-1, and the projects, with one or more alternatives to address the flooding, are highlighted in Table 2-2. This table contains a brief summary of the main elements of potential solutions, and order-of-magnitude implementation costs (please refer to the discussion of "Costs" later in this Section). The example solutions are described in more detail and depicted graphically in Section 5 of this report (see Figures 5-2 through 5-15).



LEGEND

- (X) Example Solution Provided for Flooding Area
- (A) Known Flooding Areas

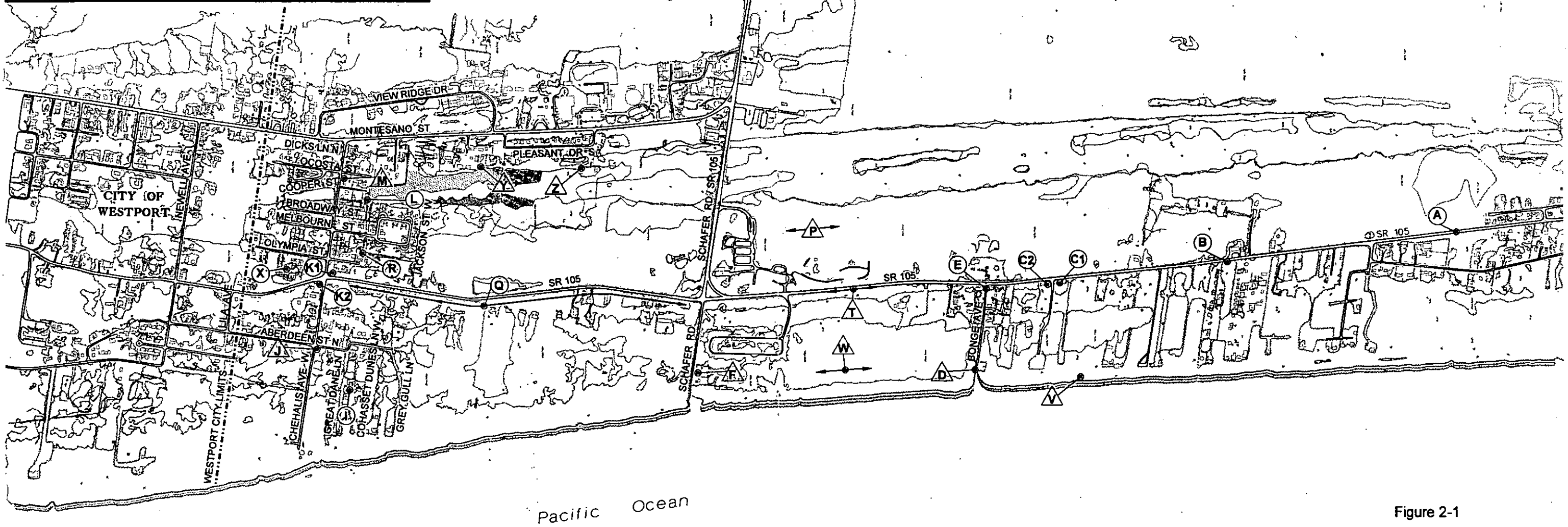
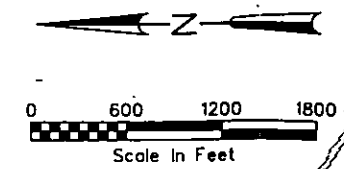


Figure 2-1
Example Project & Known Problem Areas

**Table 2-2
Project Highlights for Figure 2-1**

EXAMPLE SOLUTION SUMMARY				
Site ID & Options	Description	Total Cost	Cost per Homeowner per Year (for 10 yrs) (Notes 2 & 3)	# affected homes (4)
ABCE-1	Raise road at A, B, C1, C2, and E	\$40 - 45,000 (1)	\$10 - 13	940
ABCE-2	Clean existing ditch from A to the south. Construct new ditch/culvert system to take runoff from B, C, E north along SR105 and east along Shafter/SR105 to tide gates	\$230 - 245,000 (1)	\$40 - 45	940
I-1	Construct ditch/culvert system throughout Cohasset Dunes area, pump water to the ocean	\$75 - \$80,000	\$565 - 715	25
I-2	Raise roads and several private drives in Cohasset Dunes Area (Property flooding will still occur)	\$60 - 65,000	\$475 - 625	25
K1/K2 - 1	Improve existing intermittent ditch system and construct new channel & culverts where necessary (route water to main drainage channel)	\$12 - 17,000 (1)	\$5 - 9	940
K1/K2 - 2	Same as above, but slightly different path to main channel	\$10 - 13,000 (1)	\$5 - 8	940
L-1 (a)	Build 2.5' high berm around private property at 233 Chehalis, and install sump pump	\$18 - 22,000	\$2,600 - 3,300 (ULID costs are not applicable)	1
L-1 (b)	Same as above, but also improve channel downstream of property to Cohasset Lake	\$20 - 25,000	\$400 - 650	15
L-1 (c)	Same as (a) and (b), but also improve culverts to Cohasset Lake	\$40 - 45,000	\$600 - 850	15
L-2	Raise house at 233 Chehalis	\$20 - 25,000	\$3,000 - 3,700 (ULID costs are not applicable)	1
Q-1	Construct ditch and culvert system to convey water to main drainage channel	\$22 - 25,000 (1)	\$7 - 10	940
Q-2	Raise road at flooding areas	Similar to Alternative ABCE-1		
R-1 (a)	Build 1' high berm around both sides of channel. (Protects properties at 1814 Olympia and neighbor without moving flooding to trailer park)	\$15 - 20,000	\$1,100 - 1,500 (ULID Costs are not applicable)	2
R-1 (b)	Same as above, but also improve channel downstream of properties to Cohasset Lake	\$20 - 25,000	\$400 - 650	15
R-1 (c)	Same as (a) and (b), but also improve culverts to Cohasset Lake	\$40 - 45,000	\$600 - 850	15
R-2	Raise houses at 1814 Olympia and neighbor	\$30 - 35,000	\$2,200 - 2600 (ULID costs are not applicable)	2

**Table 2-2
Project Highlights for Figure 2-1**

EXAMPLE SOLUTION SUMMARY				
Site ID & Options	Description	Total Cost	Cost per Homeowner per Year (for 10 yrs) (Notes 2 & 3)	# affected homes (4)
X-1	Clean and re-vegetate Apple Maggot Ditch	\$8 - 10,000	\$420 - 750	10 (5)
X-2	Widen and re-vegetate Apple Maggot Ditch	\$5 - 7,000	\$375 - 700	10 (5)

NOTES:

(1) Assumes 50% of funding will be provided by State or County. Applied only to SR105 projects.

(2) Assessment/start-up costs for the Utility Local Improvement Districts (ULIDs) will be in the \$20 - \$50,000 range. The costs will vary from what is assigned here; however, a simple plan of \$20,000 on low end cost estimates and \$40,000 on high end was used here. The relatively high percentage of total cost that the assessment carries on low capital cost projects should be noted and considered.

(3) Assumes funding for the projects can be obtained at an 8% interest rate (compound) over 10 years. (A/P, 8%, 10) = 0.1490 from standard interest tables.

(4) Based on Grays Harbor county Census Block data with some refinement from observations of air photos/base map. The tract boundaries are difficult to translate to individual project areas, so these evaluations are only approximations. All SR105 Projects assumed to benefit population of entire project area (total # houses = 940).

(5) If example solutions for Sites K and/or Q are implemented, then costs for improvements at Site X could be split among 940 households, bringing the price for option X-1 down to \$8-\$11 per household annually for 10 years. Likewise, X-2 could decrease to \$5-\$8 per household annually for 10 years.

COSTS

Area-Wide Recommendations

Several program and policy recommendations address area-wide flooding and drainage concerns in South Beach. Their costs have been approximated as follows:

- **Regulate development in floodplain and impacts to drainage courses:** Regulations can be enforced under existing County regulatory programs with minimal impact to operating budgets.
- **Evaluate revisions to FEMA floodplain boundaries.**
- **Coordinate planning with County divisions and other jurisdictions.** This can be done for a minimal investment of staff time by the three jurisdictions (Grays Harbor County, the City of Westport, and WSDOT).
- **Consider the development of flood conservation storage easements.** The costs of a voluntary easement program are difficult to quantify, as participation is

unpredictable; further, costs to the County would depend upon the types of incentives offered to property owners.

- **Develop flood hazard and water quality public education programs:** These programs tend to rely heavily on volunteers and can be successfully completed for approximately \$5,000 - \$10,000 per year.

Elevating affected homes and businesses (including septic systems) will cost approximately \$10,000 to \$60,000 per structure. This cost will vary with the size of the structure, the site conditions, the elevation height required, and other factors.

Local Drainage Improvement Example Projects

Order-of-magnitude cost estimates for the example projects were developed in terms of total project costs and the annual cost per contributing homeowner, for a 10-year period. These costs were presented above in Table 2-2. The cost estimates were prepared using March/April 1997 dollars and do not include escalation, financial costs, or operation and maintenance costs. The final costs will depend on the actual labor and material costs, actual site conditions, productivity, competitive market conditions, final project scope, final project schedule, and other variable factors. It is also stressed that if these ideas are implemented by individual property owners or groups with donated labor, equipment, and little or no overhead or engineering fees, costs could be *substantially lower*. As a result, the final project costs will vary from the estimates.

The annual cost per household is an approximation developed to give members of the community an idea of the annual cost to those benefiting from the improvement. The costs were determined using a 10-year financing period, and they include the formation of a funding mechanism (such as a Utility Local Improvement District) to implement the financial details. The formation of local utility districts to fund projects with costs beyond County or State funds, are presented and discussed below.

FUNDING

Once costs are identified, there are several potential sources of funding that may be considered and evaluated. The first to be considered by most residents is property tax revenues. In Grays Harbor County, the majority of property taxes are distributed to special purposes such as

schools, roads, the Port District and the cities. Only 11 percent of total property taxes are available to the County without previous designated uses. These are used to support the basic functions of County government and are placed in the general fund or the current expense fund. They support police, fire, parks, planning, administration and other basic County services. Seventy per cent of these funds go to support the criminal justice system. Because of this, there is substantial competition for the remaining funds and there is generally little or no money left for special needs such as drainage and flood hazard reduction. Therefore, other sources must be considered.

Other potential sources may be considered in several categories as shown in Table 5-2 in Chapter 5. In the South Beach area, many of the most serious drainage problems are along and on the State Highway. These problems should be solved by both the State and County, using State highway and County funds

As illustrated above, funding for flooding solutions is limited, and local drainage problems must generally be resolved locally rather than through reliance on government agencies. This keeps local control of the solutions, assures response to local issues, and may result in more cost effective solutions. Some discussion was held regarding the formation of an LID or drainage district to address the localized problems; the survey conducted for the project indicated some support (though not universal) for this approach. The most likely source for supplemental grant funding for drainage and flood related improvements is the State's FCAAP grants.

Using the Example Solution ABCE-1 to illustrate the annual costs to property owners of forming a district and funding the improvements locally, the calculations used for each Example Solution are explained below. For evaluation purposes it was assumed that the following information is valid for Example Solution ABCE-1.

- Capital costs are \$80,000 to \$90,000.
- State Highway Funds pay for 50 percent or \$40,000 to \$45,000, reducing capital costs to \$40,000 to \$45,000, for the community (note: State funding is not assured and will depend on availability in the annual budgeting process).
- Property owners' share of the costs of forming the district are \$20,000 to \$40,000.

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- Construction costs and district formation costs are amortized over 10 years with an 8 percent interest rate.
 - Annual maintenance and administration costs are not included. For future reference these may be approximately \$5000/year.
 - There are approximately 940 properties in the planning area, each would be subject to assessment.

This results in annual costs of approximately \$8,940 to \$12,670 for the area. Dividing the total by the 940 properties would result in annual assessments of approximately \$10 to \$13 per property or \$1 per month per property.

Formation of a district would provide a funding base and a local management structure for local residents to discuss and address drainage issues. Final decisions regarding local solutions would be made locally.

SCHEDULES AND LENGTH OF TIME OF BENEFITS

If the necessary budget is available, the non-structural improvements should be implemented within the 1997 fiscal year or as soon as possible. Grant monies to help with the development of the educational program should be applied for during the next grant application period. All non-structural benefits should be ongoing efforts, and the time of benefits is expected to be indefinite. Elevating homes and businesses is an individual property owner concern. For this reason, the process will be an ongoing one that proceeds as individuals decide the process is necessary and can allocate funds accordingly. The time of benefits of elevating structures is expected to equal the life of the structure.

Final design of localized drainage improvement projects that are funded by State Road funds should be implemented as soon as funding is established. Improvements could be completed within one year of the establishment of funding. With proper maintenance, these benefits are expected to last 50 years (before the culverts and drainage structures will need to be replaced).

Improvements that require the establishment of a local drainage district and/or grant funding will take longer to implement. Because of the need for consensus building, the petition to County Commissioners, the public hearing and property-owner vote required to establish a special district, and the length of time involved in obtaining grants, the establishment of fund-

ing for improvements could take one to two years. It is expected that improvements similar to those of Example Project ABCE could be identified, designed and completed within one year of the establishment of proper funding. With proper maintenance, the length of time of benefits on road projects is expected to be limited by the need for road resurfacing after no more than 15 years. Ditch and culvert systems would have a possible life-span of up to 50 years before replacement becomes necessary.

CONFORMANCE WITH GOALS AND OBJECTIVES

Comprehensive goals and objectives were developed to provide an organized framework to guide the analysis and planning processes. The goals represent the general results and improvements desired by South Beach residents and Grays Harbor County, while the objectives are the specific action items that will deliver these results. All of the goals set forth in Section 4 of this report were met. The objectives provided a basic framework to develop methods to achieve the goals; as such, they were refined and discarded to better reach the goals as the analysis proceeded.