SECTION 2

RECOMMENDED FLOOD HAZARD REDUCTION PLAN

- Policy and Program Recommendations
- Capital Improvement Programs Recommendations
- Costs
- Funding
- Schedules and Length of Time of Benefits
- Conformance with Goals and Objectives

(Draft) Section 2 RECOMMENDED FLOOD HAZARD REDUCTION PLAN

This section reports the recommended Flood Hazard Reduction Plan (FHRP) 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 advisory committee consensus. Several criteria were defined from the goals and objectives detailed in Section 4 of this FHRP, Goals and Objectives, and were defined and used as a selection guide. A summary of how these recommendations meet the goals and objectives is presented here (with no emphasis or import placed on their order of presentation). Recommended alternatives:

- Have a reasonable certainty of improving the targeted drainage issue;
- Are cost effective and have realistic funding sources;
- Have the agreement of the advisory committee and the interested public;
- Have approval from Grays Harbor County and other regulatory agencies;
- Maximize beneficial environmental impacts and minimize adverse environmental impacts;
- Can be implemented in a timely manner;
- Will provide long-term benefits; and
- Address future growth conditions in Grayland.

Specific recommendations are summarized in Table 2-1.

Table 2-1 Grayland Flood Hazard Reduction Plan Recommendations		
	Policy and Program Recommendations	Capital Improvement Project Recommendations
Area-Wide Issues	 Regulate development in flood- plains and impacts to drainage course Develop flood hazard and water 	Elevate affected homes and businesses where the other CIPs cannot alleviate flooding
	quality public education programs	
· :	Elevate affected homes and busi- nesses that are still subject to flooding after improvement projects	
Main Drainage Ditch	Develop water quality monitor- ing program/protect agricultural and natural resources	None
Local Drainage Issues	Create local drainage district for areas west of SR 105; maintain drainage courses to the ocean	Example Project No. 1 - Tingstrom Lane Area: Convey runoff to ocean outfall along private property
		Example Project No. 2 - Post Office Site: Elevate road to 10- year event level/improve con- veyance to main channel
	· .	Example Project No. 3 - Mutiny Lane/Lamplighter Site: Con- vey runoff to main drainage channel

POLICY AND PROGRAM RECOMMENDATIONS

Policy and program recommendations were developed for both the main drainage channel flooding issues and the local drainage improvement projects.



Results of the hydrologic and hydraulic analysis of conveyance through Drainage District No. 1's main channel and reports of historic flooding in Grayland showed that small, frequent events do not pose a significant threat to public health and safety or environmental interests. Frequent flooding at the south end of the channel and near the Post Office site has been reported and shown to occur in the models. Larger (10-year, 25-year and 100-year events) cause overbank flows; however, the main concerns of citizens in Grayland relate to frequent localized drainage problems that are mostly west of SR 105 and not impacted by water levels in the main drainage channel. Improvement projects proposed to alleviate flood hazards were evaluated within this context, and it was agreed that large capital projects to improve the main drainage channel would provide little if any benefit, and citizens would rather have monies spent to reduce the more frequent localized flooding.

Using the criteria set forth in Section 4, Goals and Objectives, flood hazard reduction measures were conceptualized and evaluated by the consultants for the potential to improve drainage conditions, constructability, and costs. After this initial screening, several capital improvement and policy alternatives were identified to reduce flooding hazards associated with the main drainage channel. Local drainage issues were addressed by selecting three frequently flooded sites as examples, developing capital improvement and policy solutions for these sites, and providing cost estimates for the implementation of the capital improvement projects. Proposed drainage improvement projects were then presented to the advisory committee and the interested community members, where they were evaluated and discarded or refined.

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 FHRP, there are several federal, state and local laws that pertain to flood hazard management. Any new development in the floodplain should follow the guidelines specified in these regulations.

To reduce localized flooding, land use policies in the Grayland area must ensure that development does not impact drainage courses and that increases in runoff are kept to a minimum. Regulations that address the goal to protect drainage pathways should be enforced. This requires that the County follow the guidelines listed below.

- 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.

Develop Water Quality Monitoring Program / Protect Agricultural and Natural Resources

While a water quality monitoring program will not reduce flooding, it can have significant environmental and economic benefits. Grays Harbor County has initiated a program through their health department to sample water in Grayland's main drainage ditch. Samples are analyzed for fecal coliform counts, which determines the presence of fecal matter from warmblooded animals (in itself not necessarily harmful, but useful as an indication of contamination from leaking septic systems and the potential presence of other harmful bacteria).

This program should be continued, and if any problem areas are located, further testing in other sites may be warranted. If funding can be obtained, perhaps through a Centennial Clean Water



Grant, further water quality testing is recommended. To perform a more comprehensive analysis of water quality to protect natural resources, this program could be expanded to monitor more parameters and more locations. The additional parameters for analysis would be limited to those with the potential to occur in Grayland and cause damage to natural resources such as cranberry bogs, wildlife, and vegetation. Parameters may include heavy metals, nutrients from fertilizers, compounds used in pesticides, and oil and grease.

Additional sampling locations would include significant lateral connecting ditches and main channel locations near the cranberry bogs. Periodic monitoring of waters near the tide gates would give an indication of the suitability of stormwater runoff released to Grays Harbor. The watershed divide at the southern end of the channel could also be monitored periodically to ascertain the incoming water quality and identify pollution from outside of the Grayland watershed. This is also an important monitoring point because of the potential for directional shifts in flow that occasionally cause drainage from the Grayland area to flow south (a water quality concern voiced by the Shoalwater Tribe in Tokeland).

Develop Flood Hazard and Water Quality 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 Grayland. Pamphlets should also be distributed to educate the public. Following are several examples of topics to be included in the educational series.

- Flood zones in Grayland—where they are and what they mean
- Potential for damages when buying/building a structure or farming in a floodplain
- Likely impacts to roads and bridges in floodplains
- The importance of maintaining existing drainage courses, not creating courses that drain wetlands, and minimizing the use of fill materials

- Impacts of flooding on water quality, including increased erosion and sedimentation, "washing" of pesticides and herbicides into the main channel (and possibly contaminating the cranberry bogs)
- 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; that is a choice that must be made by individuals and the community as a whole. Therefore, the safety, flood hazard reduction, and environmental benefits depend upon public attitudes and actions.

Create Local Drainage District for Areas West of SR 105; Maintain Drainage Courses to the Ocean

Drainage in the Grayland area can and should follow traditional pathways. This means that drainage from west of SR 105 should discharge to the ocean, not to the main drainage channel (with the exception of drainage at the Mutiny Lane/Lamplighter Site). Several existing drainage pathways have been identified to convey stormwater runoff from the area west of the highway to ocean outfalls. Without regular maintenance, they can become blocked by sedimentation, debris, and deliberate filling. The following local drainage actions are needed.

- Identify pathways
- Prevent filling by enforcing regulations
- Establish a stable funding mechanism for capital improvements and maintenance
- Obtain permanent easements
- Obtain permits
- Maintain pathways

Through the public education programs and regulations discussed earlier, public understanding of the need for these drainage courses can be broadened. A program will be needed to iden-



tify and maintain existing drainage courses. By forming a local drainage district, residents can obtain a reasonable interest rate for the capital improvement project costs, and ensure that funding will be available for regular maintenance.

The advisory committee reached a consensus to not rely on "big government" (county, state or federal) to solve local drainage problems. The community needs to solve problems locally. Therefore, it is recommended that local residents should organize their neighbors to pursue solutions, and technical assistance for legal and engineering issues will be necessary from the County.

CAPITAL IMPROVEMENT PROJECT RECOMMENDATIONS

No capital improvement projects (CIPs) are recommended for the main drainage ditch. An area-wide CIP is recommended only for those locations where the local drainage improvements (discussed below) cannot resolve the flooding and drainage problems.

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. Modeling performed for this study indicates that structures should be elevated to approximately 13 to 14 feet east of SR 105 and 2 to 3 feet above surrounding land in the low areas west of SR 105. The cost of elevating houses and businesses would be borne by the owner.

The following three sites, shown in Figure 2-1, were chosen as example capital improvement projects for localized drainage.

- Tingstom Lane area
- Post Office site
- Mutiny Lane/Lamplighter site

Similar projects throughout the area west of SR 105 (such as along Rockney Place) will be necessary to alleviate the local, frequent flooding. The three example projects are described in more detail below.

Example Project No. 1 - Tingstrom Lane Area: Convey Runoff to Ocean Outfall along Private Property

A conceptual diagram of example project No. 1 is shown in Figure 2-2. Drainage ditches along Cranberry Beach Road, Tingstrom Lane, and Tingstrom Lane East have not been maintained, and they are inadequately sized to handle stormwater runoff in the area. Many driveway culverts are partially or fully blocked. The historic area outfall has not been maintained.

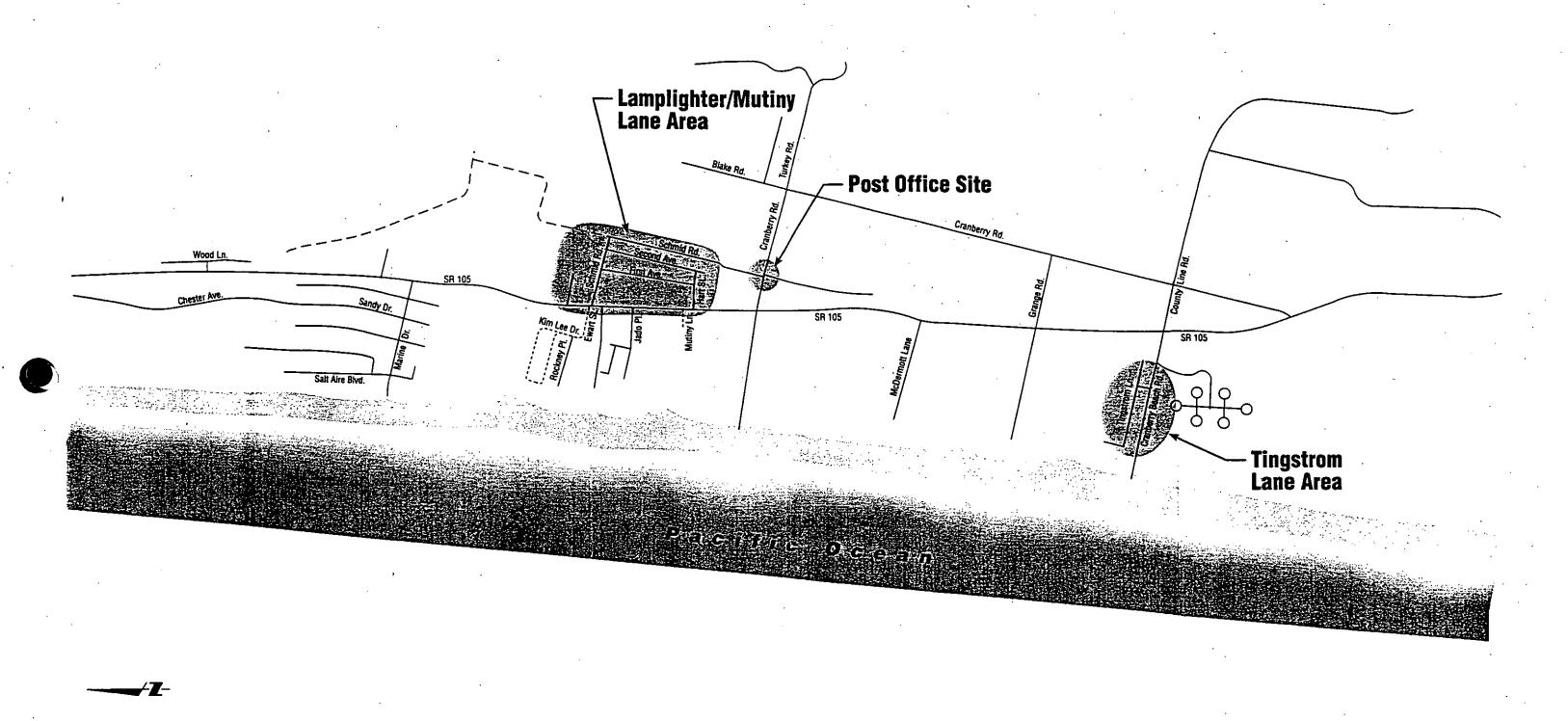
The recommendation proposed at Tingstrom Lane would resolve only the frequent minor drainage problems. The area would still be subject to occasional flooding from extreme high tides and/or storm events (the design storm used to size the ditches and culverts was the 25-year event). Under more extreme conditions, the proposed improvements would not be capable of conveying the entire runoff volume; however, following extreme events, these improvements would remove the water more quickly, allowing a faster recovery.

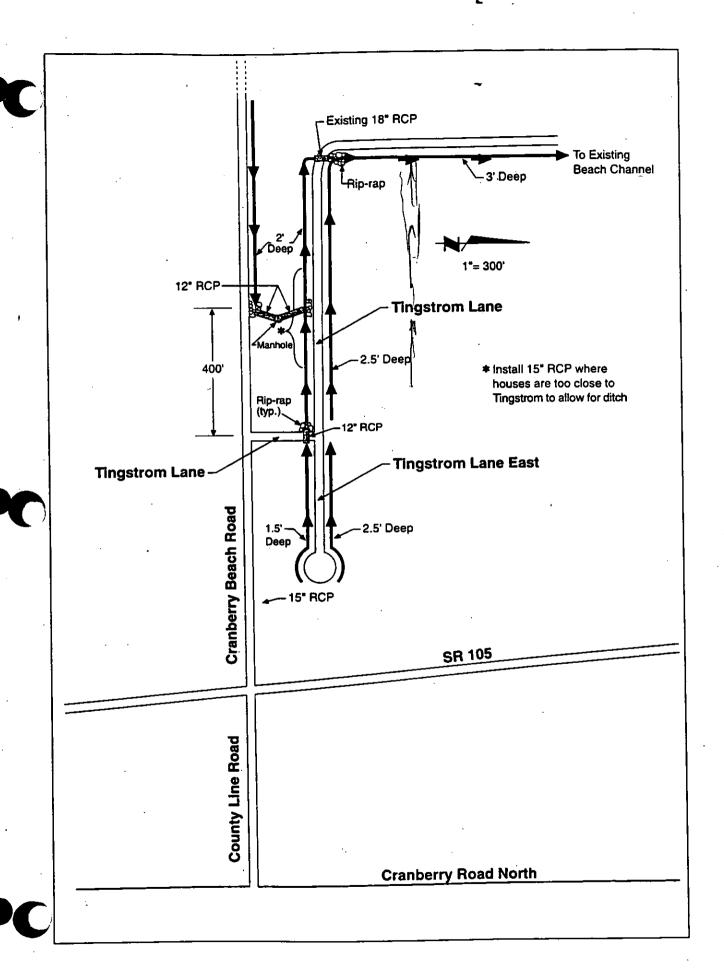
The potential obstacles to implementation of this plan include the possibility of one or more homeowners objecting to improvements and effectively blocking the movement of water by not allowing improvements to their ditch section or by not "buying into" the Local Improvement District. Permitting for the ocean outfall is not anticipated to be an obstacle.

The following specific drainage improvements are proposed for this example project.

- Install ditches along both sides of Tingstrom Lane to carry runoff west to the existing channel leading to the beach. Install a culvert beneath Tingstrom Lane and maintain the existing culvert running north/south at the end of the street.
- Install a ditch along a portion of Cranberry Beach Road, west of Tingstrom Lane.
 Route discharge through a culvert to the ditch along Tingstrom Lane leading to the beach drainage.







DRAINAGE ISSUES

- Ponding of stormwater along Tingstrom Lane East, Tingstrom Lane, and Cranberry Beach Road
- Flooding and property damage to homeowners

PRELIMINARY SOLUTIONS

- Install ditches along both sides of Tingstrom Lane to convey runoff west to the channel leading to the beach. Install a culvert beneath Tingstrom Lane and maintain the existing culvert running north/south at the end of the street
- Install ditch along portion of Cranberry Beach Road, west of Tingstrom Lane. Route discharge through culvert to ditch along Tingstrom Lane leading to beach drainage
- Place rip-rap at culvert outlets for erosion control
- Obtain easement for outfall

COSTS

- \$110,000 (Capital Improvement Project Cost)
- \$20,000 to \$50,000 (Utility Local Improvement District or Drainage District Assessment Fee/Start-up Costs)

Total Annual Cost per Household: \$450 (Ten Years)

- Place rip-rap at culvert outlets for erosion control.
- Obtain an easement for the beach drainage/outfall.

Example Project No. 2 - Post Office Site: Elevate Road to 10-Year Event Level / Improve conveyance to Main Channel

The Post Office project site, shown in Figure 2-3, is located along Cranberry Road, near the intersection with Schmid Road. There is an existing stormwater conveyance system in place at this site, but portions of it are blocked. Frequently, during storm events, runoff pools to the east of the post office driveway and crosses the center-line crest of Cranberry Road, inundating the intersection at Schmid Road and compounding the drainage issues on the north side of the road. Water in the main drainage channel occasionally backs-up the culvert installed to drain this area. The main drainage channel also overtops its west bank during some storm events, causing the intersection to flood. The limited availability of data at this site preclude sizing of the conveyance system; however, general recommendations were made.

The following measures are proposed for this example project.

- Unblock and maintain the post office driveway culvert.
- Install a drop inlet and culvert across Cranberry Road from the pooled area to the drainage ditch on the north side of the road.
- Regrade the existing channel on the north side of Cranberry Road. Install a drop
 inlet and replace the culvert to the main channel. Install a flap gate at the culvert
 outlet to the main channel.
- Place rip-rap at the culvert outlet for erosion control.
- Maintain drainage ditches on the east side of the bridge.

Because water levels in the main channel often will prevent the discharge of local stormwater from this site, it is also proposed that Cranberry Road west of the bridge be elevated.

Elevate Cranberry Road to 10-year event level. A 300-foot stretch of roadway would be raised by approximately 1.75 feet to a road elevation of approximately 12.5 feet. This would raise the road above the modeled main channel floodplain water elevation for a 10-year storm with a concurrent high tide. With this improvement, the inundation of the intersection during frequent, small storm events and larger events, including the 10-year storm, would be eliminated.

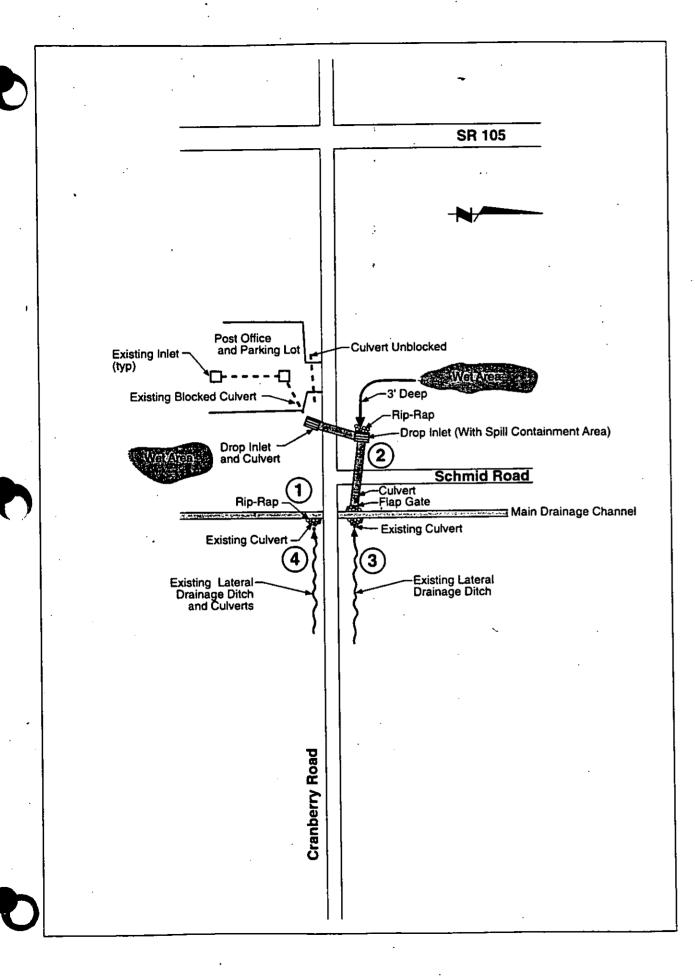
An actual roadway design would be needed because of the vertical curves involved in reaching the proper approach slope for the bridge. Further hydraulic modeling should be undertaken during the design of an actual solution at this site. There may be upstream and/or downstream impacts related to raising the road.

Example Project No. 3 - Mutiny Lane/Lamplighter Site: Convey Runoff to Main Drainage Channel

The Mutiny Lane/Lamplighter project site, shown in Figure 2-4, is located at the north end of the Grayland Drainage study area, along SR 105. It encompasses several arterial streets and private drives, but the main flooding issues are along the state highway. Flooding has been reported on the west side of SR 105, south of Ewart Street/Schmid Road, at the intersection with Mutiny Lane and at the intersection with Jado Place. On both sides of the highway, flooding occurs in front of the Lamplighter Restaurant. There is no stormwater conveyance system in the project area north of Schmid Road. An intermittent swale/ditch runs along the south side of Hart Street. Another lateral ditch runs along the north side of Schmid Road; however, it does not appear to be adequately maintained. All of these ditches are undersized for adequate conveyance of large storm events.

The following proposed recommendations for example project no. 3 are made under the assumption that the main drainage channel is adequately sized for stormwater conveyance from the project basin.

- Install ditch and culvert systems along both sides of SR 105 leading into a culvert and ditch system running to the east along Schmid Road.
- Connect system to the existing main drainage channel.



DRAINAGE ISSUES

• Area 1 Blocked culvert beneath post office driveway

Ponding stormwater encroaching on Cranberry Road and

intersection with Schmid Road

Area 2 Ponding stormwater causing property and home damage

• Areas 3 & 4 Potential flooding - Further discussion with residents required

PRELIMINARY SOLUTIONS

• Raise road elevation from Schmid Road, west to the post office

Area 1 Unblock and maintain post office driveway culvert

Install drop inlet and culvert across Cranberry Road from pooled area

to north drainage ditch

• Area 2 Regrade existing channel

Install drop inlet and replace culvert to main channel

Install flap gate at culvert outlet to main channel

Place rip-rap at culvert outlet for erosion control

• Areas 3 & 4 Maintenance, no futher action unless flooding is an issue

COSTS Funding for all cases: County Road Funds

Case I: Road elevation raised to eliminate sag

\$34,000

• Case II: Road elevation raised to water level of 10-year event

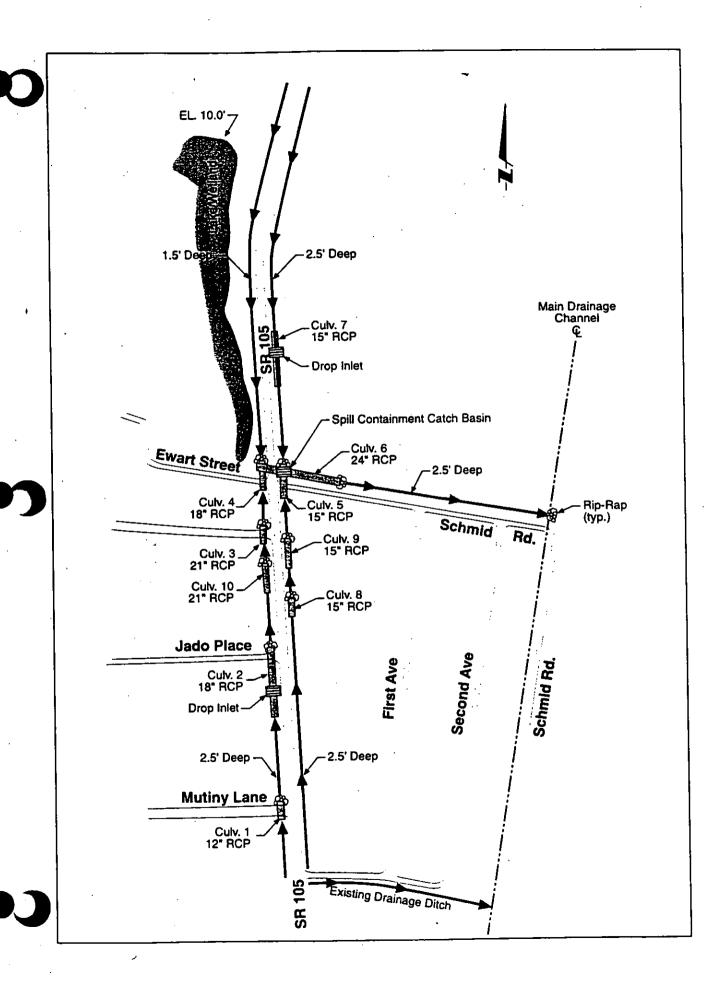
\$38,000

• Case III: Road elevation raised to water level of 100-year event

\$45,000

Figure 2-3

Example Project No. 2: Post Office Site



DRAINAGE ISSUES

- Ponding of stormwater along and on SR 105 approximately 200' south of Schmid Road
- Ponding of stormwater along and on SR 105 in front of the Lamplighter Restaurant

PRELIMINARY SOLUTIONS

- Install ditch and culvert systems along both sides of SR 105 leading into a culvert and ditch system running to the east along Schmid Road
- Connect system to existing main channel
- Require that properties south of Schmid Road join the Drainage District

COSTS

- \$203,000 (WSDOT and County Road Funds)
- District Drainage Fees (properties south of Schmid Road)
- Rights-of-way Dedicated by Adjacent Property Owners

Require that properties served by these improvements either belong or join
 Drainage District No. 1.

COSTS

Area-Wide Recommendations

Several program and policy recommendations address area-wide flooding and drainage concerns in Grayland. 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.
- 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.

Main Drainage Channel

The recommended non-structural alternatives for the main drainage channel is a program and policy recommendation. The cost for this alternative has been approximated as follows:

 Develop Water Quality Monitoring Program/Protect Agricultural and Natural Resources: This program has already been initiated through the County Health Department, but its expansion will require approximately \$10,000 - \$20,000 in additional funding per year.

Local Drainage Improvement Example Projects

Order-of-magnitude cost estimates for the example projects were developed for the alternative that remained after the preliminary screening processes. These costs, in February 1995 dollars, 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. As a result, the final project costs will vary from the following estimates.

- Example Project No. 1: \$110,000
- Example Project No. 2: \$38,000
- Example Project No. 3: \$203,000

The formation of local utility districts to fund projects that will not receive County or State road funds, as well as operation and maintenance costs, 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 for 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 funds are used to support the basic functions of County government and are placed in the current expense fund. Seventy percent of these funds go to support the criminal justice system. Because of this, there is substantial competition for the remaining funds and generally little or no money left for special needs such as drainage and flood hazard reduction. Therefore, other funding sources must be considered, in several categories, as presented in Table 6-2 in Section 6, Alternative Flood Hazard Reduction Measures.

These sources were reviewed in the advisory committee. In the Grayland area, many of the most serious drainage problems are along and on the SR 105 and local roads. These problems should be solved by both the State and County, using State highway and County road funds.

The committee agreed that the remaining drainage problems should be resolved locally rather than relying on other government agencies. This keeps local control of the solutions, ensures response to local issues, and may result in more cost-effective solutions. The Grayland area has a history of successful response from the existing drainage district. However, the purpose of the district is limited to maintaining the main drainage channel, not the lateral ditch system. Many areas that are tributary to the district are not included in the district and do not contribute financially to the district. Therefore, it is not appropriate to expect the district to accept additional water from those areas. In addition, areas tributary to the district should be required to join the district before drainage improvements are made that will deliver more runoff to the district's system. This includes, for example, the area along SR 105 south of Schmid Road.

West of SR 105, substantial capital improvements and reliable ongoing maintenance of drainage systems is necessary to reduce drainage problems. For these reasons, formation of a local special district is recommended. Funding generated by the district can be supplemented by funding from the County, grants, and other sources. The majority of the funding is likely to have to come from locally generated taxes. The most likely source for supplemental grant funding for drainage and flood related improvements is the State's FCAAP grants.

Because of the expense of creating a district, a single additional district should be formed. The steps for forming the district are described in Washington State law. Formation of the district will include a petition to the County commissioners, a public hearing, and a vote of the property owners affected. Thereafter, operation of the district would be controlled by a 3-person, locally elected board.

Using the Tingstrom Lane area as an example, the annual costs to property owners can be estimated. For evaluation purposes it was assumed that:

- Construction costs are \$110,000.
- The County pays for 30 percent or \$33,000, reducing capital costs to \$77,000 for the community (note: County funding is not assured and will depend on availability in the annual budgeting process).



- Tingstrom Lane area property owners' share of the costs of forming the district are \$20,000.
- Construction costs and district formation costs are amortized over ten years with a 6 percent interest rate.
- Annual maintenance and administration costs are \$5,000.
- There are approximately 40 properties in the Tingstrom area that would be subject to assessment.

This results in annual costs of approximately \$18,000 for the area. Dividing the total by the 40 properties would result in annual assessments of approximately \$450 per property or \$37.50 per month per property. If 50 percent funding from FCAAP for the capital projects is obtained, the annual costs would be reduced to \$320 per property.

Although the capital needs of other areas west of SR 105 are not the same as Tingstrom Lane, the potential costs to Tingstrom Lane property owners can serve as an example. There are similar needs in each of the areas.

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.

As discussed above, there are not adequate County funds for the County to provide solutions. With the large percentage of absentee owners and the level of effort needed to maintain ocean outfalls, it is unlikely that volunteer efforts will be successful in providing the necessary improvements in the short term or the necessary maintenance over any long period of time.

SCHEDULES AND LENGTH OF TIME OF BENEFITS

If the necessary budget is available, the non-structural improvements for the main drainage channel should be implemented within the 1995 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 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 County and/or State road funds (Post Office Site and Mutiny Lane/Lamplighter Area) 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 needed 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 funding for improvements could take one to two years. It is expected that improvements similar to those of the Tingstrom Lane area could be identified, designed, and completed within one year of the establishment of proper funding. With proper maintenance, the length of time of benefits of such improvements are expected to be on the order of 50 years (before the culverts and drainage structures will need to be replaced).

CONFORMANCE WITH GOALS AND OBJECTIVES

Comprehensive goals and objectives, as discussed in Section 3, were developed to provide an organized framework to guide the analysis and planning processes. The goals represent the general results and improvements desired by Grayland 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 3 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. For example, to achieve Goal No. 3 (to provide practical, cost-effective solutions that will result in measurable reductions in flooding frequency, duration, and frequently flooded area damages), Objective 3a (identify drainage

channel improvements) included "enhance performance of tide gates." After completing the hydrologic and hydraulic analysis of the main drainage channel, it was determined that enhancing the performance of the tide gates would provide no significant benefits to flood hazard reduction. Therefore, efforts were put into other objectives that would help to meet Goal No. 3.

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