SKAGIT RIVER LEVEE & CHANNEL IMPROVEMENTS

PUBLIC BROCHURE
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FOREST BROOKS, STUDY MANAGER (206) 764-3621
SEATTLE DISTRICT, CORPS. OF ENGINEERS
POST OFFICE BOX C-3755, SEATTLE WASHINGTON 98124

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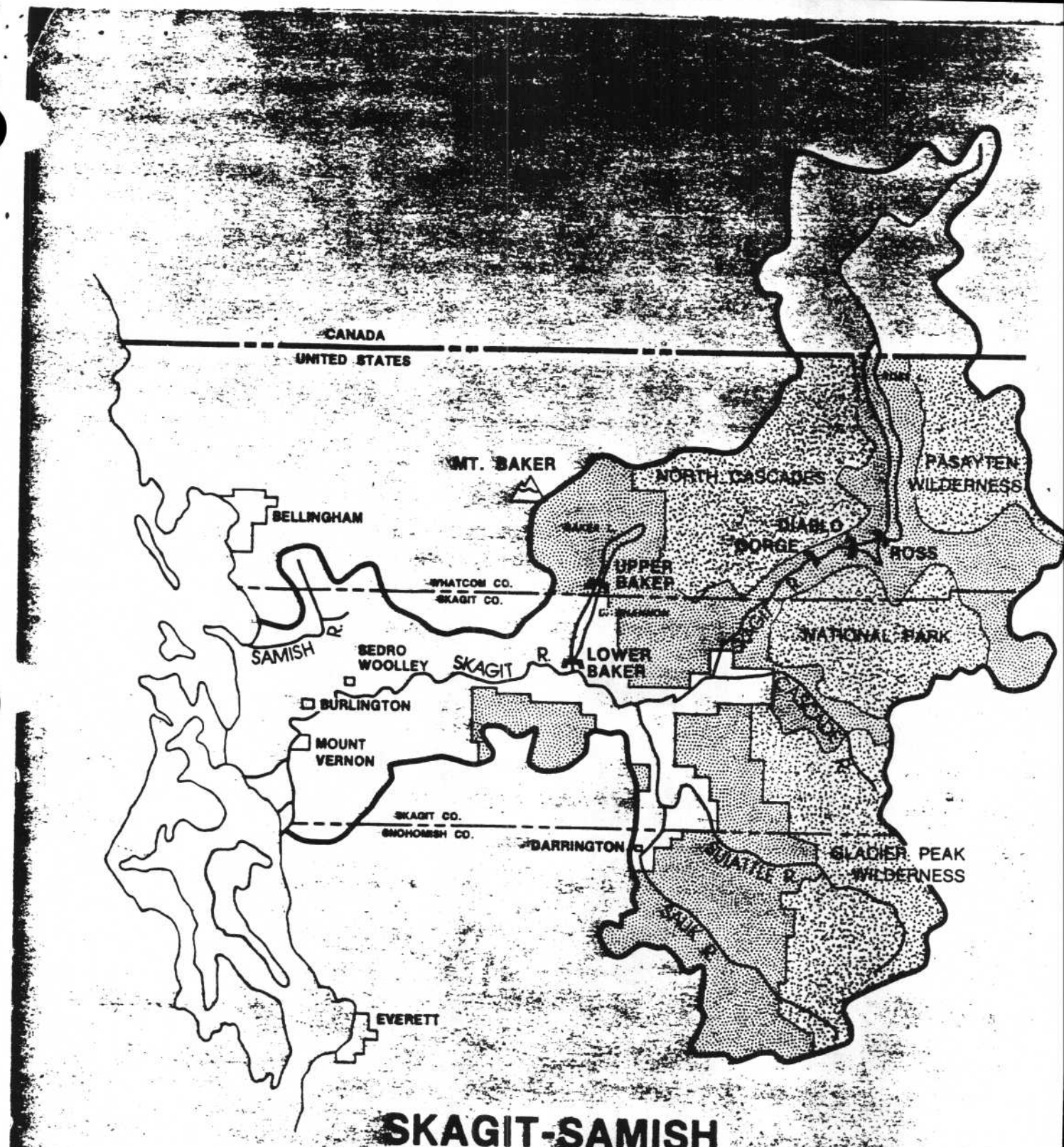

SKAGIT-SAMISH RIVER BASIN

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WHY THIS STUDY?

Following the flooding that occurred in the Skagit River basin in November, 1959, Congress, in 1960, directed the Corps of Engineers to review the flood control needs in the basin. A study on flood control and associated improvements was begun in 1960 and completed in 1965. The report recommended construction of a levee and channel improvement project as part of comprehensive flood control which also included upstream storage and the Avon Bypass. The report also recommended modification of the authorized Avon Bypass project to include recreation facilities. This recommendation was approved by Congress in the Flood Control Act of 1966. Congress funded further work on the Levee and Channel Improvement Project late in 1976. The purpose of our present study is to review the authorized project and determine whether any modifications should be made to it before project design is completed and plans and specifications are prepared.

WHY THIS MEETING?

The Seattle District, Corps of Engineers is holding a public meeting in Mount Vernon at 7:30 p.m. on Wednesday, March 22, 1978 at the New County Administration Building. At this meeting we will inform the public about the status and progress of our studies on the Skagit River Levee and Channel Improvement Project and provide a means for public input. We will discuss the background of previous flood control planning for the basin, the currently authorized project, and alternative flood damage reduction measures which are being considered. Some conditions have changed since the project was originally authorized. We want to determine what the changes are and the present desires of the local people.

WHAT DOES THIS BROCHURE DO?

This brochure describes the background of previous flood control planning for the Skagit River basin, the authorized Levee and Channel Improvement Project, information on our present study effort, and alternative flood control measures under consideration. Future brochures will be distributed as needed to reflect new information developed by our study and to provide you and other interested parties a means for public comment on our study, the authorized plan, and possible modifications or alternatives. You may use the sheet in the back of the brochure for this. Then cut it out, fold, staple, and mail it back to us. We pay the postage. Your comments are important! Please share them with us. Comments can also be turned in at the public meeting or you may write or telephone (see cover) the Skagit Basin Study Manager, Mr. Forest Brooks, with comments or questions.

WHAT IS THE FLOODING PROBLEM?

The Skagit River valley has a long history of flooding. Floodflows have been recorded intermittently since 1908. Flood damage begins when the flow measured at the Concrete gage exceeds 60,000 cubic feet per second (c.f.s.). In the leveed areas below Sedro Woolley, the maximum safe channel capacity (with 2 feet of freeboard) is 84,000 c.f.s. Freeboard is a factor of safety in the design of a levee. It is the height of the top of the levee above the water surface of the design river flow. Since 1908, during the winter flood season (October-March), 84,000 c.f.s. has been exceeded 19 times. The most recent flood causing major damage occurred in February 1951 with a peak discharge of 139,000 c.f.s. at Concrete; 150,000 c.f.s at Sedro Woolley; and 144,000 c.f.s. at Mount Vernon. The flood remained near its peak for 6 hours at Mount Vernon, a fact which contributed significantly to the severity of the flood damages. During this flood, many dikes failed because they lacked sufficient height and width to withstand saturation. The December 1975 flood had a peak discharge of 122,000 c.f.s. at Concrete and 130,000 c.f.s. at Mount Vernon. The flood discharge was above 120,000 c.f.s. at Mount Vernon for about a day. During floods, the Nookachamps Creek area on the left bank between Mount Vernon and Sedro Woolley is a major source of valley storage and can reduce major floods peaks downstream from Sedro Woolley. However, if the peak flow continues for an extended time the discharge downstream can be greater due to downstream inflows and the reduced effectiveness of valley storage. The following table lists major historic Skagit River flood discharges.

FLOOD		NEAR CONCRETE	NEAR SEDRO WOOLLEY	NEAR MOUNT VERNON
	1815	500,000 cfs	400,000 cfs	N/A
	1856	350,000 cfs	300,000 cfs	N/A
November	1896	N/A	195,000 cfs	N/A
November	1897	275,000 cfs	190,000 cfs	N/A
November	1906	N/A	180,000 cfs	180,000 cfs
November	1908	N/A	97,000 cfs	N/A
November	1909	260,000 cfs	220,000 cfs	N/A
November	1910	N/A	114,000 cfs	N/A
January	1914	N/A	104,000 cfs	N/A
December	1917	220,000 cfs	195,000 cfs	N/A
December	1921	240,000 cfs	210,000 cfs	N/A
February	1932	147,000 cfs	N/A	N/A
November	1932	116,000 cfs	N/A	N/A
December	1933	101,000 cfs	N/A	N/A
January	1935	131,000 cfs	N/A	N/A
October	1945	102,000 cfs	N/A	94,300 cfs
November	1949	154,000 cfs	140,000 cfs	114,000 cfs
February	1951	139,000 cfs	150,000 cfs	144,000 cfs
November	1955	106,000 cfs	113,000 cfs	107,000 cfs
April	1959	90,700	92,000 cfs	
November	1959	89,300 cfs	91,000 cfs	91,600 cfs
November	1962	114,000 cfs	N/A	83,200 cfs
December	1975	122,000 cfs	121,000 cfs	130,000 cfs

A 100-year flood is that flood which is expected to occur an average of once every 100 years or in other words, the flood which has a 1 percent chance of occurring in any given year. The 100-year flood at Sedro Woolley is estimated at about 215,000 c.f.s., but, due to overflow into the Samish basin, the 100-year discharge at Mount Vernon would be much less.

WHAT HAS BEEN DONE IN THE PAST?

Existing flood damage reduction measures in affect in the Skagit River basin include flood forecasting and warning, flood plain zoning, flood control storage, and flood control levees.

- Estimates of impending peak flood flows and expected time of occurrence are prepared by the River Forecast Center in the Portland, Oregon office of the National Weather Service. That office then issues emergency and public service teletype bulletins to the National Weather Service office in Mount Vernon which in turn alerts the county and city officials, newspapers, and transmitting news media. The Skagit County Department of Emergency Preparedness is responsible for emergency operations during a flood.

- Skagit County has enacted zoning regulations based on data contained in the flood plain information report for the Skagit River which the Corps of Engineers produced in April 1967 and the flood insurance study done by the Corps of Engineers for the Federal Insurance Administration in 1972. We are currently involved in revising that study for the Federal Insurance Administration and expect to complete the revision by July 1979. Skagit County will make appropriate modifications to their regulations based on the detailed study. The Skagit River has been designated as flood control zone #7 by the Washington Department of Ecology. Therefore, flood control zone permits from the Department of Ecology are also required for structures in the flood plain.

- Five major dams have been constructed in the Skagit River basin. These include: Ross, Diablo, and Gorge Dams built by Seattle City Light on the Skagit River and Lower Baker and Upper Baker Dams built by Puget Sound Power and Light on the Baker River. Of these five dams only Ross and Upper Baker provide flood control storage. Ross reservoir has a usable storage capacity of 1,280,000 acre feet. Since 1953, 120,000 acre feet of storage has been reserved for flood control from 1 December to 15 March. In May 1977, Congress authorized 74,000 acre feet of flood control storage in Upper Baker Lake. This storage is available from 15 November to 1 March.

- Farmland and cities in the delta flood plain west of Sedro Woolley are afforded a low degree protection by locally constructed levees which prevent flooding from the river and in the lower river and along Skagit, Padilla and Samish Bays from tidal salt water. About 43 miles of river levees have been constructed. Sixteen diking districts have inclosed a total of 45,000 acres of land within levees and individual owners have inclosed an additional 1,000 acres. The existing levees below Burlington vary in level of protection and will safely withstand river flows from 84,000 c.f.s. to 130,000 c.f.s. with a minimum 2 foot levee freeboard.

- No major Federal flood control works have been constructed in the Skagit River basin, although the Corps of Engineers has made several studies for Congress on flood control needs in the basin.

  - In the Flood Control Act of 1936, Congress authorized the Avon Bypass channel which would divert excess Skagit River flood flows from the main river near Burlington through a bypass channel to Padilla Bay. The Avon Bypass Project also included the extension and the improvement of the right bank levee from Burlington to Sedro Woolley. The Flood Control Act of 1966 added recreation as a project purpose. In 1977, as provided by Section 12 of the Water Resources Development Act of 1974, the Avon Bypass was considered for deauthorization. However, Skagit County opposed the deauthorization at that time since the project would provide a substantial amount of flood protection. However, the Avon Bypass would involve substantial cost because of the relocation of transportation facilities and the acquisition of right-of-way disrupting the farm community.

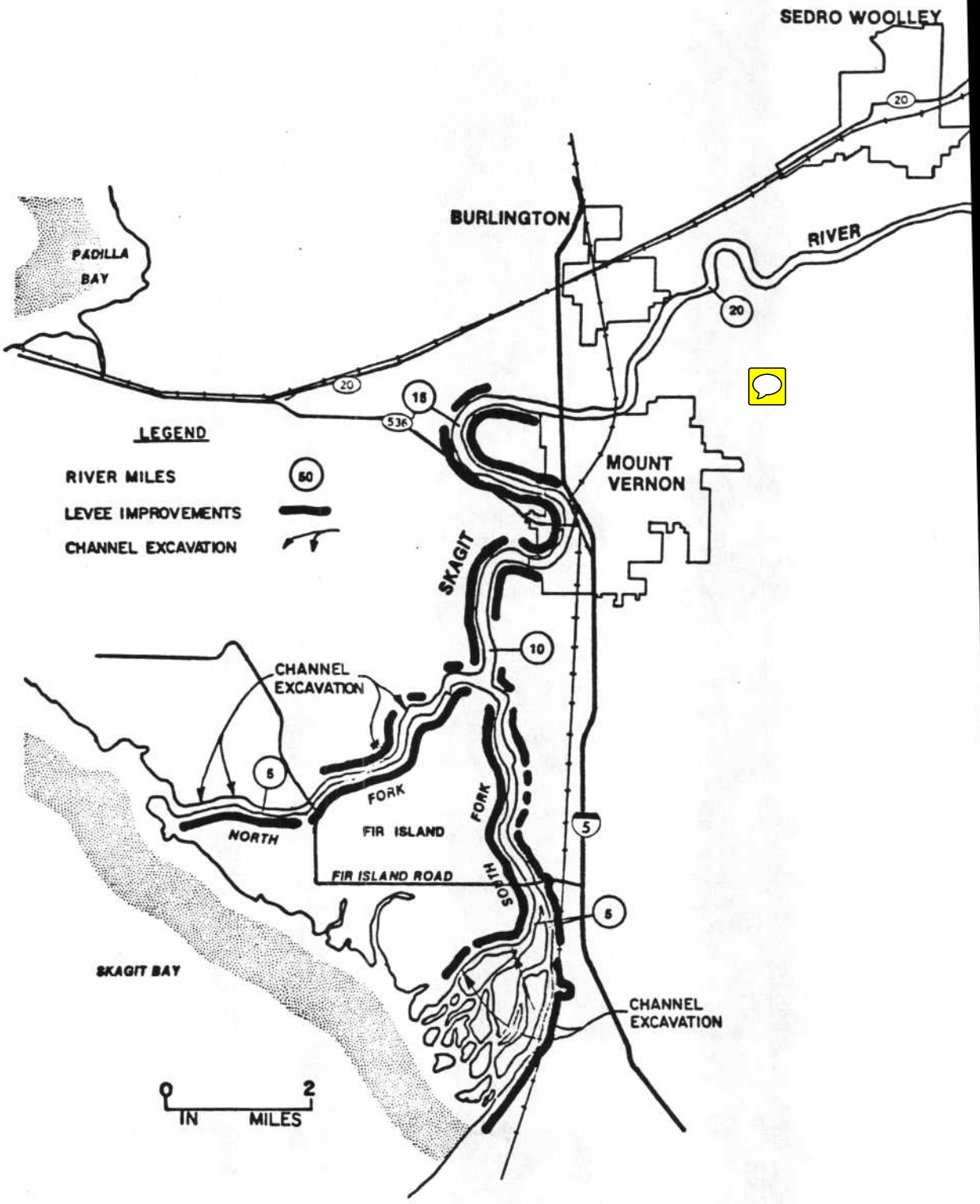
  - The Flood Control Act of 1966 authorized construction of a Levee and Channel Improvement Project along the lower Skagit River that would provide a uniform minimum safe channel capacity of 120,000 cubic feet per second from just upstream of Interstate Highway 5, downstream through the delta. The combination of the Avon Bypass and the Levee and Channel Improvement projects would provide a minimum safe channel capacity downstream of Sedro Woolley of 180,000 c.f.s. The Levee and Channel Improvement Project is the one which we are currently reviewing to determine whether any modifications should be made to the authorized project.

WHAT SPECIFICALLY DID CONGRESS AUTHORIZE?

The authorized project includes raising and strengthening the existing levee system from the mouths of the North and the South Forks upstream to the Burlington Northern railroad crossing and improving the hydraulic capacity of the North and the South Fork channels.

- West side of the Main River and the North Fork. Levee improvements on the west side of the river would involve increasing top widths and flattening side slopes between river miles 8.7 and 9.5, 10.2 and 11.2, and 12.8 to 14.7. (The bridge at Mount Vernon is at river mile 12.5.) Levee raising is required to provide freeboard at river miles 6.3, 6.5, 6.8, 11.4, and 13.1. A sandbag closure would be provided during flood periods at the approach to the west end of the State Highway 536 bridge at Mount Vernon.

- East side of the Main River and the South Fork. Levee improvements on the east side of the river would consist of increasing the top width and widening levee side slopes for 3.1 miles at the Mount Vernon bend, for 2.5 miles between Mount Vernon and Conway, and for 1.5 miles south of Milltown. Sandbagging would be required during flows of 120,000 c.f.s. to provide 2 to 3 feet of freeboard for a 1,000 foot section south of the State Highway 536 bridge in Mount Vernon. The levee along the tributary stream near river mile 4.5 would also have to be raised.



LEVEE & CHANNEL IMPROVEMENT PROJECT

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- Fir Island Side of the North and South Fork. The levee along the North Fork requires widening throughout most of its length below the junction of the North Fork and the main river. Minor raising to provide two feet of freeboard is required at many locations along four miles of levee between river miles 5 and 9. (The North Fork bridge is near river mile 5.5.) The levee along the South Fork requires widening for 6 miles from the head of the North Fork to the head of Freshwater Slough. Intermittent raising of 2.5 miles of levee is required to provide freeboard.

- Channel Improvements. Channel improvements would be undertaken on the North Fork and the Freshwater Slough Channels. Between river miles 3.8 and 4.7 on the North Fork, the channel would be widened along the left bank and the levee relocation to the bank of the improved channel. Between river miles 7.0 and 8.1 on the North Fork, excavation would straighten and enlarge the channel. Levees would be built next to both banks of the new channel. Between river miles 4.0 and 4.7 on Freshwater Slough the channel would be widened adjacent to the left bank to retain the existing channel for low flows and provide an overbank area to pass flood flows. The existing levee along the south bank would be relocated along the new channel.

At the time of the authorization in 1966, the cost of the levee and channel improvements was estimated at $6,007,000, of which $5,770,000 would have been Federal and $237,000 would have been non-Federal costs. Due to inflation, the current estimate for the authorized project, based on October 1977 prices, is $15,660,000, of which $15,100,000 would be Federal and $560,000 would be non-Federal costs.

The Washington Congressional delegation is currently proposing legislation that would amend the authority for the Skagit River Levee and Channel Improvements Project. The legislation would, in effect, provide authority for the Corps of Engineers to extend the levee system upstream to the vicinity of Sedro Woolley. This authorization change would permit the Corps to construct the downstream levee project and levees above Interstate 5 which were authorized as part of the Avon Bypass project in 1936. Any construction would be contingent on the recommended plan being engineeringly feasible, economically viable, and environmentally acceptable.

WITH FIVE DAMS IN THE BASIN, IS THERE STILL A PROBLEM?

Although the Skagit River basin has 5 hydroelectric dams, only two of them provide flood control storage, and the possibility of severe flooding in the basin remains. The three Seattle City Light dams on the Skagit River regulate river flows from about 31 percent of the Skagit drainage basin. Ross reservoir has a significant effect on flooding, but Gorge and Diablo have little storage and are used only for

power generation. The two Puget Sound Power and Light dams on the Baker river provide flood control for the Baker River basin which amounts to approximately 10 percent of the Skagit River drainage. This approximately 41 percent of the drainage basin is regulated by flood control dams. During the 1975 flood, the discharges from Ross and Upper Baker contributing to the flood peak of 122,000 c.f.s. at Concrete were 5,000 c.f.s. and 10,000 c.f.s., respectively. The Sauk River peaked at 65,300 c.f.s. and the inflow on the Skagit River below Ross and above Concrete was 42,000 c.f.s Thus approximately 46 percent of the basin area (44% of the basin above Concrete) contributed 88 percent of the flood discharge at Concrete. Skagit River flood damages in December 1975 totaled $3,247,000. These damages would have been much greater without the successful flood fighting effort on the diking system along the lower Skagit River. Damages which were prevented by this flood fighting were estimated at $8.7 million and this flood has a recurrence interval of only about 10 years. This flood has a recurrence interval of about 10 years. The 100 year flood is estimated to be approximately 215,000 c.f.s. when measured at Sedro Woolley. Thus, even with the existing flood control dams substantial amounts of flooding can and will occur in the future.

WHAT HAS BEEN THE BASIN FLOOD CONTROL PLAN?

Skagit County has considered a comprehensive flood control plan to guide future planning and has formed a county-wide flood control district to enable the county to sponsor flood control improvement projects.

- The first part of the comprehensive plan involves obtaining additional flood control storage at the existing Upper Baker Project. This was authorized by Congress last year and is currently available for use.

- The second part of the plan involves construction of the Levees and Channel Improvement Project.

- The third part of the plan contemplates additional flood control storage on the Sauk River and/or construction of the Avon Bypass Project. The county has consistently maintained that flood control improvements in addition to the Levee and Channel Improvements Project are needed. If upstream storage and diversion are not possible they have indicated that other measures should be used to obtain substantial increase in the amount of flood protection provided to the urban areas in the Skagit River delta including Mount Vernon, Burlington, and Sedro Woolley.

HOW DOES THE CORPS OF ENGINEERS BUILD PROJECTS?

The process by which the Corps of Engineers plans, designs and builds water resource projects is very complicated. It can, however, be broken down into three phases. These are; general investigations studies, advance engineering and design studies, and construction.

- In the first phase, called general investigation studies, Congress directs the Corps of Engineers to investigate a certain problem or problems and make recommendations as to the Federal interest in implementing any possible measures which could alleviate these problems. For the Skagit River Levee and Channel Improvement Project, Congress authorized a study by the Corps in 1960. The study was completed in 1965 and the Corps recommended that the Levee and Channel Improvement Project be constructed. In the Flood Control Act of 1966, Congress then authorized the Corps to proceed with the project. However, Congress did not fund for the second phase, the project until Fiscal Year 1977.

- The second phase of a Corps of Engineers project involves advance engineering and design studies. During this phase, the Corps reviews the authorized project to determine whether there are changes in the needs of the area of the desires of the people and the local officials since the first phase of studies. Either the formulation of the project which was authorized is affirmed or it is reformulated to meet new or greater needs. This part of the Corps of Engineers study usually involves three years and during this phase of the Corps planning process, detailed design is begun and plans and specifications are prepared for the first construction contract. On the Skagit Levee and Channel Improvement Project, Congress funded this phase first in Fiscal Year 1977. We are currently in the second year of this phase. Presently we are scheduled to submit a report in the spring of 1979 that will either reaffirm the authorized project or propose modifications that are desirable and justified.

- The third phase of a Corps of Engineers project is construction. This can take one or several years depending on the scope of the project. We expect that the first construction will occur, probably on the downstream end of the project, in the summer of 1980. Future construction on upper portions of the project will probably continue through 1981 and 1982. At that time the completed project would be turned over to Skagit County to operate and maintain.

WHAT CAN BE DONE ABOUT FUTURE FLOODING?

There are five basic methods of handling flooding. These include: do nothing, instutute flood plain regulations to restrict development and thus reduce flood damages, create additional flood control storage on tributaries of the Skagit River, divert flood flows away from the developed areas, or protect selected areas with high levee systems.

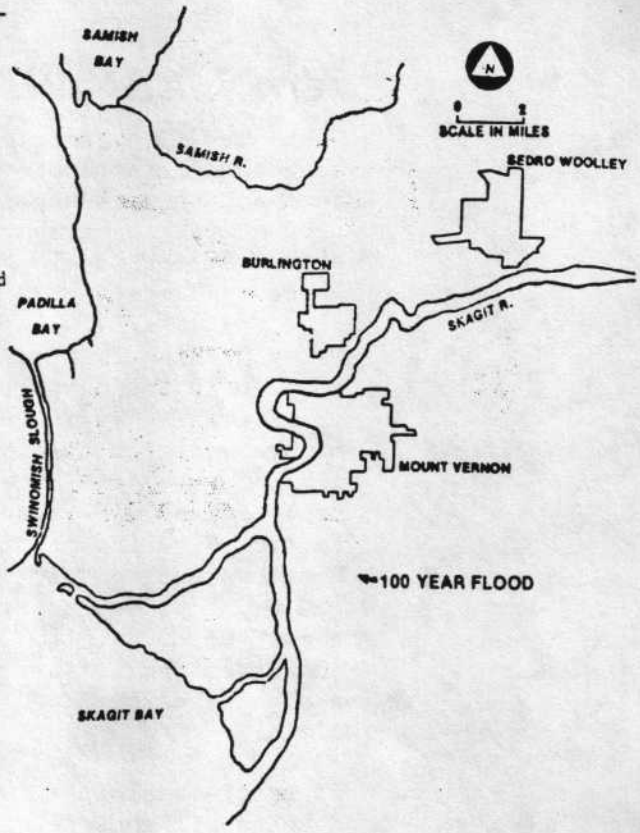
Doing nothing to prevent future flood damages is and has been completely unacceptable to county, city officials and the public in general. Skagit County already has implemented flood plain management regulations which should greatly reduce flood susceptible future development in the flood plain and the consequent damages that will result from it. However, this does nothing to control flooding or damages to existing structures. In 1977, Congress authorized flood control storage of 74,000 acre feet in the Upper Baker reservoir which was first available during the winter of 1977-1978. However, this is not enough and substantial amounts of additional upstream storage are necessary to provide a high level of flood protection to the entire Skagit River flood plain.

If upstream storage is not possible due to environmental or other concerns, then some other means must be employed to provide the desired flood damage reduction. The diversion of flood flows below Sedro Woolley could provide increased protection to the urban and delta farming areas. However, this by itself will not provide high level protection to the urban areas of Burlington, Mount Vernon,and Sedro Woolley. The only apparent way to do that is to build a levee system at the cities. Different degrees of protection can be provided by different conbinations of storage, diversion, and levees. To provide a basis for a decision, various combinations of storage, diversion, and levees are being studied in addition to the authorized levee and channel improvement project. The Corps is now evaluating these measures to determine whether any appear to be feasible and should be recommended in lieu of the authorized Levee and Channel Improvement Project. Also we want to assure that work accomplished now will not prevent future options from being effective.

The following section of this brochure describes the authorized levee and channel improvement project, alternative flood control measures which can be combined to provide higher levels of protection for both the urban area around the cities and the agricultural land in the delta. One alternative would be to do nothing about the flooding problem. Each alternative is presented on a separate page and details concerning the cost and effects of each alternative are listed. The cost estimates are not based on detailed studies but are preliminary engineering estimates of the range of costs that could be involved. These only give an indication of the cost that would be involved in implementing a particular alternative. As our study progresses some alternatives may be dropped due to engineering, economic, or environmental reasons, suggestions of city or county officials or the general public.

ALTERNATIVE 1 - CONTINUE EXISTING CONDITIONS (DO NOTHING)

DESCRIPTION: No new action would be taken for flood damage reduction through either structural or non-structural means. Development on the flood plain would be restricted through existing zoning. Flood proofing of future structures would be required as part of a flood insurance program that would indemnify property owners against losses. Undeveloped lands in the flood plain could be preserved for parks and open space. No new dams, levees, channel modifications, diversion structures, or other structural controls would be built for flood damage reduction purposes. Existing levee system and upstream flood control storage (120,000 ac. ft. at Ross, 74,000 ac. ft. at Upper Baker) would be maintained The existing flood warning system would provide forecasts of floods and give emergency information to flood plain residents.



Implementation costs.

Federal	Flood plain information studies Flood insurance studies	
Washington State Skagit County Cities		- Zoning, land purchase, and park development
Individuals		- Floodproofing

Annual management costs.

Federal	insurance premiums subsidy, emergency operations
Local	administration and maintenance of parks and zoning, emergency operations
Individuals	floodproofing maintenance, insurance premiums

EFFECTS:

Flood Damage Reduction: Rivers would remain partially controlled by existing structural flood prevention measures. Existing average annual damages of about $4.5 million based on 1977 prices and conditions would continue. Some flood damage would be eliminated through floodproofing by individuals. Limiting flood plain development through zoning would reduce flood damage growth.

People. Flood plain residents would continue to be exposed to life and health threats and social disruption during flooding.

Land. Development on the flood plain would continue to be restricted by zoning, land use ordinances, and building codes.

Recreation. Increased recreational opportunities are possible with future park development on flood prone land.

Transportation. Road, highway, and rail traffic would continue to be disrupted during floods.

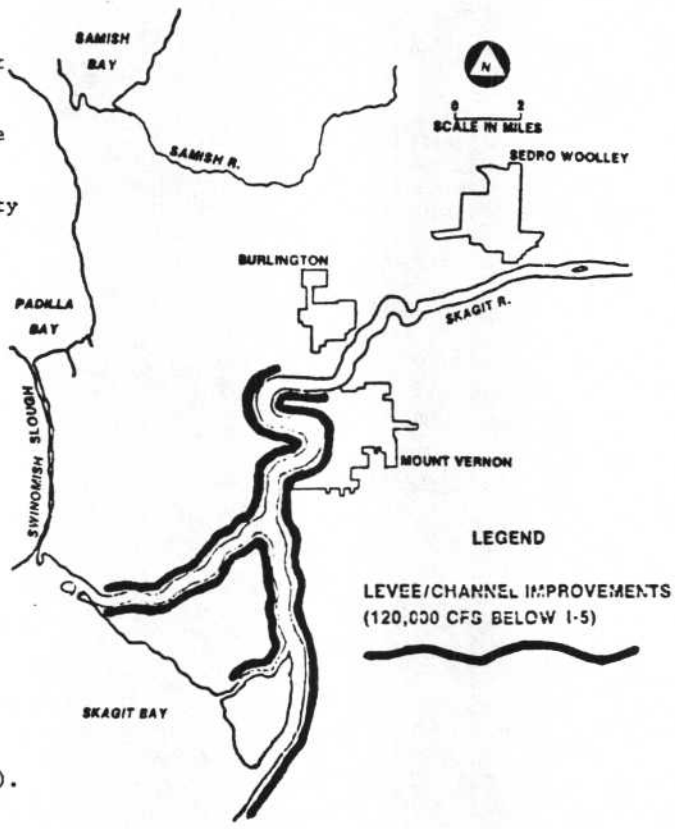
Water Quality. Water supplies located near or on ground surface would continue to be vulnerable to contamination during flooding. Ponded water and overloaded storm and sanitary sewers would continue to effect Skagit River water quality during flooding. The potential for long term degradation due to more intensive use of floodplain would be avoided.

Fish and Wildlife. Existing trends would continue.

Cultural Resources. No effect on historic or archeologic sites.

ALTERNATIVE 2 - LEVEE AND CHANNEL IMPROVEMENTS

DESCRIPTION. This alternative would involve raising and strengthening the existing levee system from the mouths of the North and South Forks upstream to the Burlington Northern railroad crossing and improving the hydraulic capacity of the North Fork and Freshwater Slough so that the safe channel capacity downstream from the railroad bridge is 120,000 cfs. Two feet of freeboard would be provided. Development on the flood plain would continue to be restricted through existing zoning. Floodproofing of future structures would be required as part of the flood insurance program that would indemnify property owners against losses. Undeveloped lands could be used for parks and open space. The existing flood warning system would provide flood forecasts and emergency information to flood plain residents.



Implementation costs.

Federal	$15,100,000	(1966 report updated to
Local	$ 560,000	1977 prices)

Annual management cost.

Federal	None
Local	$15,000 (in addition to present costs)

EFFECTS:

Flood Damage Reduction: The safe channel capacity would be increased from 84,000 cfs to 120,000 cfs with 2 feet of freeboard (recurrence interval about 11 years).

People. Residents of the Skagit delta downstream of the railroad bridge would experience a reduction in annual flood damages and hazards to life and property.

Land. No change in existing land uses is expected.

Recreation. Increased recreational opportunities are possible with future park development on flood prone land by local interests.

Transportation. Road, highway, and rail traffic would continue to be disrupted during floods.

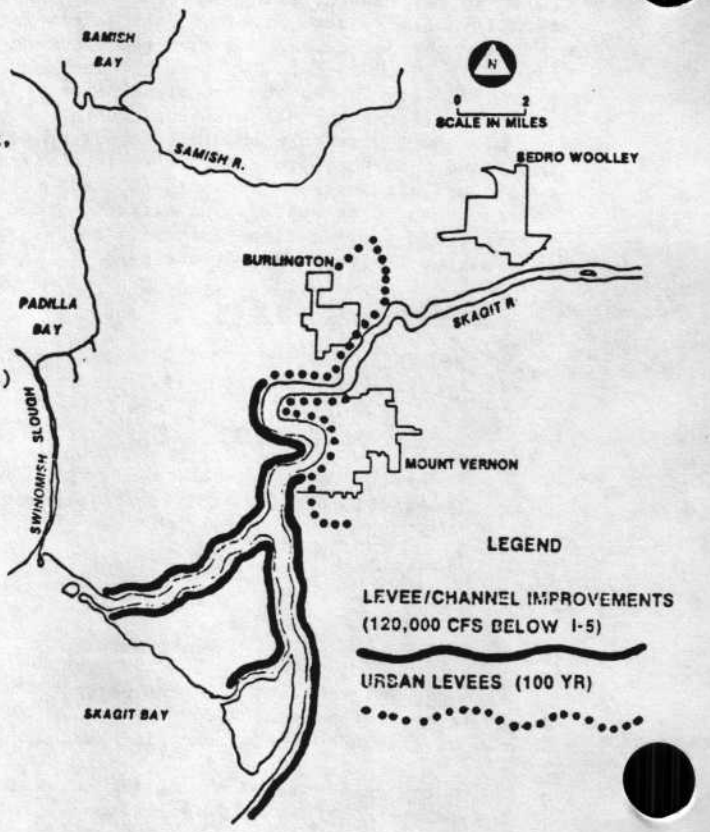
Water Quality. Construction activities such as removal of river bank vegetation and channel modifications would cause temporary increases in turbidity and could affect other parameters. Pressure for more intensive development in flood protected area would increase. Impact to water quality during flood would be reduced.

Fish and Wildlife. Habitat would be reduced due to streambank vegetation clearing and channel modifications including loss of cover, shade, and food resources. Secondary impacts may occur as a result of increased development pressure. Temporary effects would be associated with construction activities. Project could affect the State Game farm and the bald eagle which occurs in the area and has recently been added to the National endangered and threatened species list.

Cultural Resources. Historic or archaeologic sites may be adversely affected.

ALTERNATIVE 3 - LEVEE AND CHANNEL IMPROVEMENTS AND URBAN LEVEES

DESCRIPTION: This alternative would include the improvements described by alternative 2 and in addition would provide a high degree (100-year) of flood protection to the urban area of Burlington and Mount Vernon by a high levee system. Three feet of freeboard would be used on the high levees. Drainage outlets and pumping stations would be provided as required. Flood plain management would continue to be required for those areas lying outside the high levees. This would include zoning, flood proofing of future structures, the flood warning system, etc. Undeveloped lands could be used for parks and open space.



Implementation costs.

Federal	$27,000,000 - 53,000,000	(preliminary
Local	$ 3,000,000 - 7,000,000	estimate-not based on detailed studies)

Annual management costs

Federal	None
Local	$50,000 - 70,000

EFFECTS:

Flood Damage Reduction: The 5,200 acres of urban land protected by the high levees would receive a high degree (100 years) of flood protection. The rest of the flood plain would be provided a lower degree of protection (about 11 years).

People. Residents of the Skagit delta would experience a reduction in annual flood damages and hazards to life and property with those in Burlington and Mount Vernon receiving a significant reduction.

Land. Flood plain lands with a high degree of protection could be more intensively developed.

Recreation. Increased recreational opportunities are possible with future park development by local interests on flood prone lands or land adjacent to the high levee.

Transportation. Road, highway, and rail traffic outside the high levee would continue to be disrupted during floods.

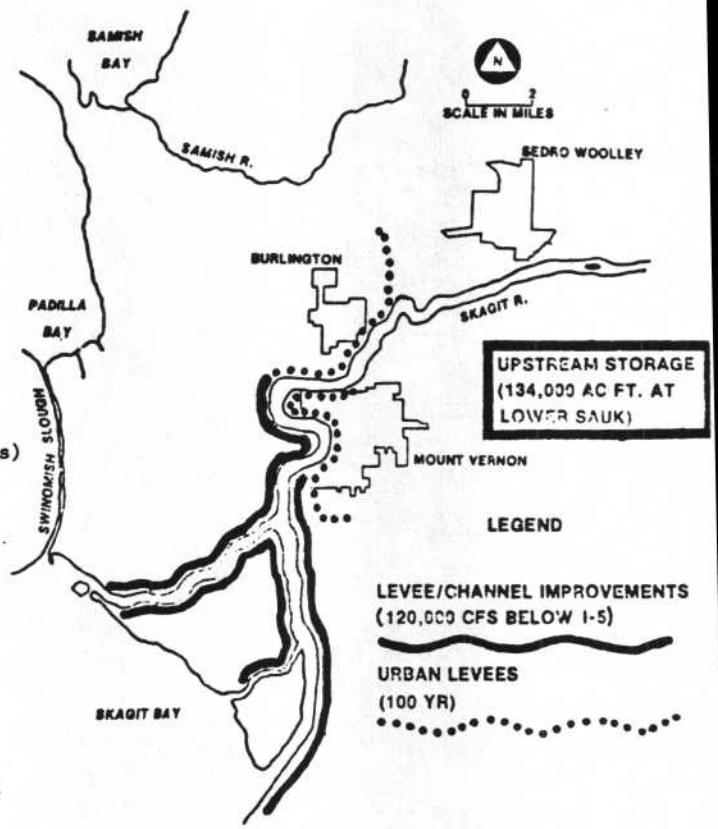
Water Quality. Construction activities such as removal of river bank vegetation and channel modifications would cause temporary increases in turbidity and could affect other parameters. Development could increase in flood protected area. Impact to water quality during flooding would be reduced.

Fish and Wildlife. Habitat would be reduced due to streambank vegetation clearing and channel modifications including loss of cover, shade, and food resources. The high levees could cause increased encroachment on near shore instream habitat. Secondary impacts may occur as a result of increased development. Temporary effects would be associated with construction activities. Project could affect the State Game and the bald eagle which occurs in the area and has recently been added to the National endangered and threatened species list.

Cultural Resources. Historic or achaeologic sites might be adversely affected.

ALTERNATIVE 4 - LEVEE AND CHANNEL IMPROVEMENTS, URBAN LEVEES, AND UPSTREAM STORAGE.

DESCRIPTION: This alternative would include the improvements described by alternative 2 and, in addition, upstream storage of 134,000 acre feet would be provided by a dam on the Sauk River and a high levee system would provide a high degree of flood protection (100-year) to the urban areas of Burlington and Mount Vernon. The high levee would have a three foot freeboard and would be about 2 feet lower than the alternative 3 high levee. Drainage outlets and pumping stations would be provided as required. Flood plain management would continue to be required for those areas lying outside the high levees. This would include zoning, flood proofing of future structures, the flood warning system, etc. Undeveloped lands could be used for parks and open space.



Implementation costs.

Federal	$175,000,000 - 225,000,000	(preliminary
Local	$ 3,000,000 - 6,000,000	estimate-not based on detailed studies)

Annual management costs

Federal	$500,000
Local	$ 50,000 - 70,000

EFFECTS:

Flood Damage Reduction: The 5,200 acres of urban land protected by the high levees would receive a high degree (100 years) of flood protection. The rest of the flood plain would be provided a lower degree of protection.

People. Residents of the Skagit delta would experience a reduction in annual flood damages and hazards to life and property with those in Burlington and Mount Vernon receiving a significant reduction.

Land. Flood plain lands with a high degree of protection could be more intensively developed. About 11,000 acres would be required for the dam and reservoir which are not compatible with Forest Service Wild and Scenic river proposal.

Recreation. Increased recreational opportunities are possible with future park development by local interests on flood prone lands or land adjacent to the high levee. Existing recreational opportunities along about 10 miles of the Sauk River and 4 miles of the Suiattle River would be greatly reduced.

Transportation. Road, highway, and rail traffic outside the high levee would continue to be disrupted during floods.

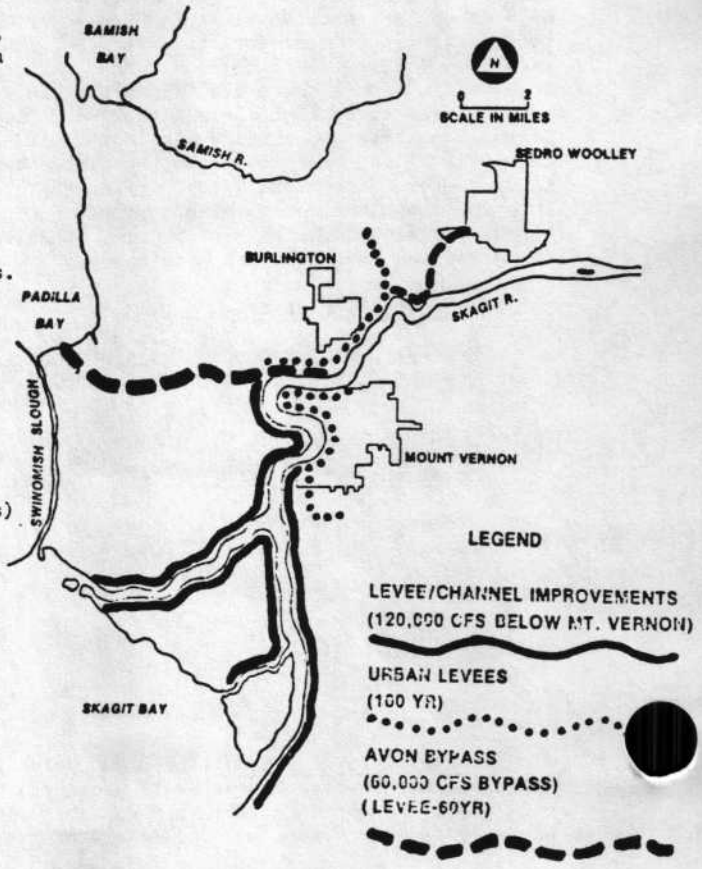
Water Quality. Construction activities such as removal of river bank vegetation and channel modifications would cause temporary increases in turbidity and could affect other parameters. Dam construction would affect the downstream flow regime. Development could increase in flood protected area. Impact to water quality during flooding would be reduced.

Fish and Wildlife. Habitat would be reduced due to streambank vegetation clearing and channel modifications including loss of cover, shade, and food resources. An upstream storage dam would disrupt anadromous fish spawning, rearing, and migration. The high levees could cause increased encroachment on near shore instream habitat. Secondary impacts may occur as a result of increased development. Temporary effects would be associated with construction activities. Project could affect the State Game Farm and the bald eagle which occurs in the area and has recently been added to the National endangered and threatened species list.

Cultural Resources. Historic or archaeologic sites might be adversely affected.

ALTERNATIVE 5 - LEVEE AND CHANNEL IMPROVEMENTS, URBAN LEVEES, AND AVON BYPASS

DESCRIPTION: This alternative would include the improvements described by alternative 2 and, in addition, the Avon Bypass and a high levee system to provide a high degree of flood protection (100-year) to the urban areas of Burlington and Mount Vernon. The existing levee system would be extended to Sedro Woolley and the bypass channel would have a capacity of 60,000 cfs. The high levee would have a three foot freeboard and would be 3.5 to 5.5 feet lower than alternative 3 high levee. Drainage outlets and pumping stations would be provided as required. Flood plain management would continue to be required for those areas lying outside the high levees. This would include zoning, flood proofing of future structures, the flood warning system, etc. Undeveloped lands could be used for parks and open space.



Implementation Costs.

Federal	$70,000,000 - 90,000,000	(preliminary
Local	$15,000,000 - 20,000,000	estimate-not based on detailed studies)

Annual management cost

Federal	None
Local	$150,000 - 200,000

EFFECTS:

Flood Damage Reduction: The 5,200 acres of urban land protected by the high levees would receive a high degree (100 years) of flood protection. The rest of the flood plain, about 63,000 acres would be provided a lower degree of protection (about 60 years).

People. Residents of the Skagit delta would experience a significant reduction in annual flood damages and hazards to life and property with those in Burlington and Mount Vernon receiving an even greater reduction.

Land. Flood plain lands with a high degree of protection could be more intensively developed. About 1,000 acres of land would be taken out of farming for channel and disposal areas.

Recreation. Increased recreational opportunities are possible along the bypass channel and in Padilla Bay, including a resident fishery. Local interests could develop additional parks on flood prone land or land adjacent to the high levee.

Transportation. Road, highway, and rail traffic outside the high levee would not be disrupted during floods with recurrence intervals of 60 years or less.

Water Quality. Construction activities such as removal of river bank vegetation and channel modifications would cause temporary increases in turbidity and could affect other parameters. Padilla Bay could be affected by flood water releases about once in every four years. Development would increase in flood protected area. Impact to water quality during flooding would be reduced.

Fish and Wildlife. Habitat would be reduced due to streambank vegetation clearing and channel modificat including loss of cover, shade, and food resources. The high levees could cause increased encroachment on ne shore instream habitat. Construction of the bypass channel could impact the resources of Padilla Bay possibl affecting migratory waterfowl. Resident fishery could be provided in channel. Secondary impacts may occur a result of increased development. Temporary effects would be associated with construction activities. Projec d affect the State Game Farm and the bald eagle which occurs in the area and has recently been added to the National endangered and threatened species list.

Cultural Resources. Historic or archaeologic sites might be adversely affected.

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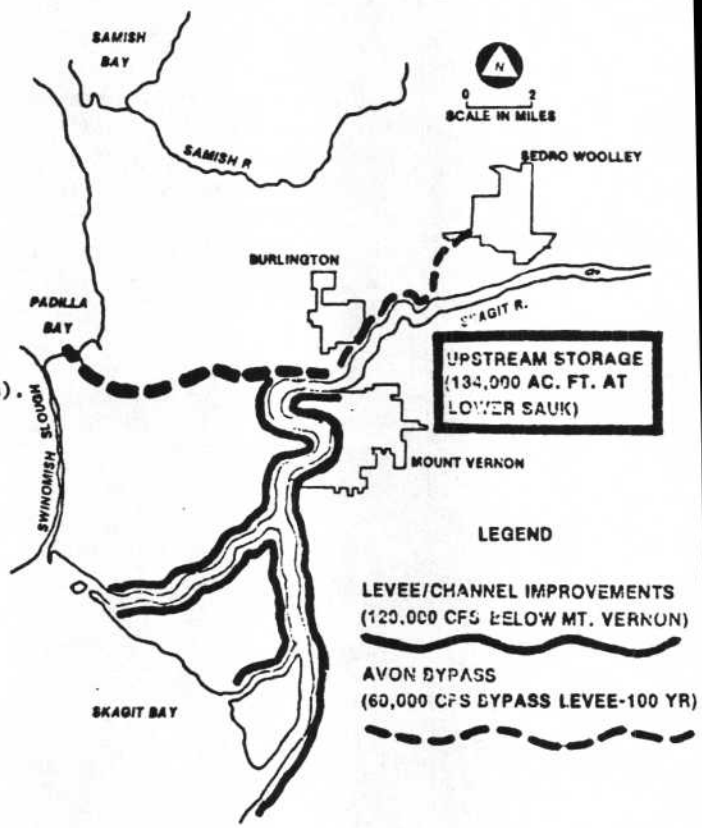
ALTERNATIVE 6 - LEVEE AND CHANNEL IMPROVEMENTS, AVON BYPASS, AND UPSTREAM STORAGE

DESCRIPTION: This alternative would include the improvements described by alternative 2 and, in addition, the Avon Bypass and upstream storage of 134,000 acre feet on the Sauk River. The existing levee system would be extended to Sedro Woolley and the bypass channel would have a capacity of 60,000 cfs. Since about 100 year flood protection would be provided to the entire flood plain downstream of Sedro Woolley most of the restrictions would no longer be required. Undeveloped lands could be used for parks and open space.



Implementation Costs:

Federal	$200,000,000 - 250,000,000	(preliminary
Local	$ 14,000,000 - 18,000,000	estimate-not based on detailed studies).

Annual management costs

Federal	$500,000
Local	$120,000 - 160,000

EFFECTS:

Flood Damage Reduction: The 68,000 acres of urban and agricultural land downstream of Sedro Woolley would be provided a high degree of protection (about 100 year.)

People. Residents of the Skagit delta would experience a significant reduction in annual flood damages and hazards to life and property.

Land. Protected flood plain lands could be more intensicely developed. About 1,000 acres of land would be taken out of farming for the bypass channel and disposal areas. About 11,000 acres would be required for the dam and reservoir which are not compatible with the Forest Service wild and scenic river proposal.

Recreation. Increased recreational opportunities are possible along the bypass channel and in Padilla Bay, including a resident fishery. Local interests could develop additional parks on flood prone land. Existing recreational opportunities along about 10 miles of the Sauk River and 4 miles of the Suiattle River would be greatly reduced.

Transportation. Road, highway, and rail traffic outside the high levee would not be disrupted during floods with recurrence intervals of 100 years or less.

Water Quality. Construction activities such as removal of river bank vegetation and channel modifications would cause temporary increases in turbidity and could affect other parameters. Padilla Bay could be affected by flood water releases about once in every four years. Dam construction would affect the downstream flow regime.

Fish and Wildlife. Habitat would be reduced due to streambank vegetation clearing and channel modifications including loss of cover, shade, and food resources. Construction of the bypass channel could impact the resources of Padilla Bay possibly affecting migratory waterfowl. A resident fishery could be provided in channel. An upstream storage dam would disrupt anadromous fish spawning, rearing, and migration. Secondary impacts may occur as a result of increased development. Temporary effects would be associated with construction activities. Project could affect the State Game Farm and the bald eagle which occurs in the area and has recently been added to the National endangered and threatened species list.

Cultural Resources. Historic or archaeologic sites might be adversely affected.

WHAT ARE THE ENVIRONMENTAL RESOURCES OF THE STUDY AREA?

The Skagit floodplain includes the entire floor of the Skagit River valley, the deltas of the Samish and Skagit Rivers, and reclaimed tidelands. The almost 100,000 acres of floodplain below Concrete includes a broad delta downstream of Sedro Woolley. The valley upstream from Sedro Woolley is narrow and relatively undeveloped in the upper reach, about two-thirds of the bottomland is uncleared or occupied by river channels and sloughs. The valley varies in width from less than 1 mile in the upper reaches to about 2 miles at Sedro Woolley. It then opens into a broad delta outwash plain more than 15 miles wide.

Within the floodplain, the Skagit River and surrounding environment possess outstanding fish and wildlife and cultural values. The shorelines of the Skagit River and Skagit and Padilla Bays have been declared shorelines of statewide significance. The waters of the Skagit and its tributaries are generally considered to be of excellent quality and provide habitat for a diverse fishery, including five species of salmon, three species of searun trout, and a wide range of resident fish. The Skagit River is nationally renowned for its sport steelhead fishery.

A variety of wildlife inhabit the area, including the northern race of bald eagle, which gathers along the Skagit during the winter to feed on migrating salmon. This species has recently been added to the National list of endangered and threatened species. The Skagit River delta, located in the Pacific Flyway, is a major Pacific coast wildlife area, primarily outstanding for waterfowl. Here the Washington State Department of Game owns and manages the Skagit Wildlife Recreation area, which provides a significant wintering habitat for a variety of waterfowl species.

The rich farmlands of the low, flat fertile delta of the Skagit River produce 90 percent of the nation's supply of cabbage seed and a large portion of beet, turnip, and rutabaga seed. Other extractive resources of the study area include forests, and vast "potential future sources" of minerals. The potential for significant archeological resources lying within the study area is considered high based on knowledge of Indian habitation of the Skagit valley.

Recreational opportunities within the study area are numerous and include fishing, hunting, and various forms of appreciate use. Fishing is excellent in the North Fork and South Fork of the Skagit River and steelheading occurs from the mouth of the North Fork upstream to Marblemount. The Department of Game operates a large steelhead rearing pond at Barnaby Slough. The lower Skagit Valley, including the Wildlife Recreation Area, is a heavily hunted waterfowl area. The Upper Skagit Valley and adjacent hills and mountains are productive deer and grouse areas. The Lower Skagit River provides recreation and profit for fur trappers. Some appreciative uses of the study area include hiking, photography, birdwatching and canoeing.

WHAT IS THE WILD AND SCENIC RIVER PROPOSAL?

Congress is currently considering legislation that would provide for the classification of portions of the Skagit River and its tributaries under the Wild and Scenic Rivers Act. The legislation proposed by the U.S. Forest Service was sent to President Carter on 6 May 1977, and he forwarded it to Congress, along with his environmental message, on 23 May 1977. The U.S. Forest Service proposal includes the following additions to the National System: the Skagit River from the pipeline crossing at Sedro Woolley upstream to the mouth of Bacon Creek; the Cascade River from its mouth upstream to the junction of its north and south forks and up the South Fork to the Glacier Peak Wilderness; the Sauk River from its mouth upstream to Elliott Creek and up its North Fork from its mouth to the Glacier Peak Wilderness; and the Suiattle River from its mouth upstream to the Glacier Peak Wilderness. The Skagit River would be included in the National System under the recreational classification. The Cascade, Sauk, and Suiattle would be included under the scenic classification. The proposal if enacted by Congress would effectively preclude consideration of additional significant flood control storage on tributaries of the Skagit River. There is some interest in removing the reach of the Skagit River from Hamilton to Sedro Woolley from the classification because of the recent decision by the Secretary of Agriculture that the Skagit Nuclear Plant would impair the values of this reach of the Skagit River. Other modifications that have been suggested would provide that future riprapping be permitted to protect farm land along the Skagit River and that upstream storage on the Sauk be permitted if it is found that upstream storage is the most cost effective alternative for flood damage prevention. The final form of the legislation is not known at this time.

WHAT IS SEATTLE CITY LIGHT PLANNING?

The Federal Energy Regulatory Commission (the former Federal Power Commission) issued a license to Seattle City Light on 5 July 1977, to raise Ross Dam 122 feet. However, due to objections from Indian tribes and the Department of Interior, the license is under review indefinitely. If Ross Dam is raised 122 feet, the reservoir will total 3.456.000 acre feet of which 1,052,000 acre feet is usable by 120,000 acre feet of storage, would be maintained.

Seattle City Light is currently conducting an environmental study of Copper Creek Dam on the Skagit River. The primary site under consideration is about one mile below Copper Creek on the Skagit River. The dam would be about 190 feet high and span 2,000 feet across its crest. It could provide 55,000 to 60,000 kilowatts of additional hydroelectric generation and would permit a more even flow of water downstream. The project would also allow future installation of additional generating units at Gorge, Diablo, and Ross Powerhouses. The study should be completed early in 1979, and a recommendation made to the Seattle City Council on whether or not to proceed with the project.

WHAT ARE THE COST SHARING REQUIREMENTS?

All proposed plans are potentially eligible, either directly or indirectly, for Federal financing assistance through the Corps of Engineers. However, Federal participation in implementing any plan would be contingent upon the following conditions:

- The plan must provide sufficient benefits, including economic, environmental, and social considerations, to offset the costs.

- For local flood damage reduction measures, a local governmental agency must:

  - o Provide all lands, easements, and rights-of-way necessary for the construction of the project.

  - o Provide all alterations and relocations of buildings, transportation facilities, and utilities.

  - o Hold the United States free from damages due to the construction work (not including damages due to the fault of the United States or contractors).

  - o Maintain and operate the project after completion.

  - o Prevent obstruction or encroachment upon the project right-of-way levees, floodwalls, channels, or ponding areas, that would be detrimental to flood damage reduction. Restore the capability of the project, if ponding area or drainage channel capacities become impaired.

  - o Provide one-half the costs for specific recreation features.

  - o Provide one-quarter the costs for fish and wildlife enhancement features.

- Where a combination of structural and nonstructural measures comprise the recommended plan, Federal participation may be contingent upon completion of zoning or other nonstructural activities by local authorities.

GLOSSARY

Acre Feet (ac.ft.) - A unit for measuring the volume of water or sediment. It is equal to the amount of water needed to cover one acre of land with water one foot deep. One acre foot equals 43,560 cubic feet or 325,851 gallons.

Cubic Feet Per Second (c.f.s.) - A unit of measure for the rate of discharge of water. One cubic foot per second is the rate of flow of a stream with a cross section of one square foot which is flowing at one foot per second. It is equal to 448.8 gallons per minute.

Drainage Basin - That portion of the surface of the earth which is drainaged by a river and its tributaries, or which is occupied by a permanent body of water (lake, pond, reservoir, etc.) and all of its tributaries.

Flood - Any relatively high streamflow or overflow that comes from a river or other body of water.

Flood Plain - The area adjoining a watercourse (river, stream, lake, etc.) which has been or may be covered by floodwaters. Flood plains are often defined for a flood of a particular megnitude, e.g., "100-year flood.:

100-year Flood - A flood which is expected to recur on an acreage of once every 100 years. or a flood which has a 1 percent chance of occurring in any given year. It is based on statistical analysis of rainfall and runoff characteristics in the watershed. At Sedro Woolley, the 100-year flood on the Skagit River is estimated to be equal to a streamflow of 215,000 c.f.s.

Floodway - Ordinarily means those portions of the flood plain adjoining the watercourse which are reasonably required to carry and discharge floodwaters.

Freeboard - The height of the top of the levee above the water surface of the design river flow is called freeboard. It is a factor of safety in levee design.

Runoff - That part of precipitation that appears in surface streams. This is the streamflow before it is affected by artificial diversion, reservoirs, or other man-made changes in or on stream channels.

Storage - Water naturally or artificially stored in surface or underground reservoirs.

Usable Storage Capacity - The volume of the reservoir which can be used to store flood waters, generate hydroelectirc power, provide irrigation or water supply. Usually the volume of the reservoir above the intake to the powerhouse.

Valley Storage - Natural storage of floodwater in adjacent areas when a river overflows its banks.

WHAT WILL HAPPEN NEXT?

We have already completed most of the field surveys needed for the study and much of the foundation exploration. We are currently reviewing the basin hydrology and hydraulics and hope to complete these segments of our studies this spring. We are preparing: flood damage appraisals which will be used to determine the monetary benefits which would result from a project, engineering analyses of various measures, and environmental assessments of the project area and the effects that the alternatives would have.

After the public meeting, we will evaluate the public input, modify the alternatives as appropriate and continue our studies on the alternatives which appear to be most beneficial. We plan to have public workshops and/or public meetings this summer and fall to explain the progress of our studies and ask for further public input. We expect that the final plan, that will be recommended for construction, should be developed by the end of 1978. Our final report is currently scheduled for submission to our higher authority in the Spring of 1979.

WHAT CAN I DO?

Part of the reason for preparing this brochure is to provide you a means to comment on this Corps of Engineers study and to suggest changes or modifications to the authorized flood control project. Your comments can be written on the following page which can be cut out and mailed to us. If you need more space, attach additional sheets of paper, making sure as you staple them together that our address appears on the outside. We are not soliciting votes for or against any of the alternatives, but we do invite you to present comments or information that could have a bearing on the outcome of our study. Your input is essential so that our evaluation will be complete. If you wish to discuss the study at any time you may write the study manager at the address or telephone him at the number noted on the cover of this brochure. Also, to help us update our mailing list, please fill in the information at the top of the comment sheet. Thank you.