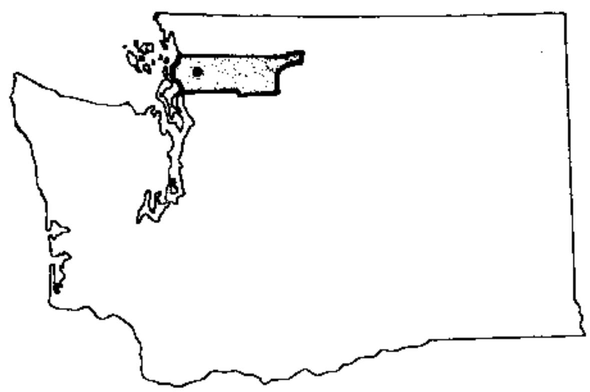
FLOOD INSURANCE STUDY

CITY OF BURLINGTON, WASHINGTON
SKAGIT COUNTY



JULY 3, 1984

Federal Emergency Management Agency

COMMUNITY NUMBER - 530153

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Burlington, Skagit County, Washington, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Burlington to the regular program of flood insurance by the Federal Emergency Management Agency. Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3. In such cases, however, it shall be understood that the State (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corps of Engineers, Seattle District, and Dames & Moore, for the Federal Emergency Management Agency, under Inter-Agency Agreement No. IAA-H-7-76, Project Order No. 2; Inter-Agency Agreement No. IAA-2-10-77, Project Order No. 1; and Contract No. EMW-C-0542. This work, which was completed in December 1982, covered all significant flooding sources affecting Burlington.

1.3 Coordination

A precontract coordination meeting was held in Mount Vernon, Washington, on November 20, 1975, and attended by representatives of the study contractor, the Federal Emergency Management Agency, the Washington State Department of Ecology, and the City of Burlington to inform the community of the nature and purpose of the Flood Insurance Study, to solicit map data, and to establish the scope of the study. Additional coordination on the scope of the study was conducted with local and Federal Emergency Management Agency representatives throughout the study period.

Intermediate coordination meetings held on March 21 and 23, 1983, were attended by representatives of the community, Skagit County, the Federal Emergency Management Agency, the study contractor, and Dames & Moore to discuss the results of the hydrologic and hydraulic analyses. All appropriate changes resulting from the meeting have been included in this report.

The final community coordination meeting was held on December 8, 1983, and was attended by representatives of the Federal Emergency Management Agency, the study contractor, and the city. No problems were raised at the meeting.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Burlington, Skagit County, Washington. The area of study is shown on the Vicinity Map (Figure 1).

Skagit River and overbank flows were studied by detailed methods.

Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1987.

2.2 Community Description

The City of Burlington is located in the west-central portion of Skagit County in northwestern Washington. It is situated immediately north of Mount Vernon, Washington, and surrounded by unincorporated Skagit County to the west, north, and east. Transportation facilities include Interstate Highway 5, State Highway 20, and the Burlington Northern Railroad.

Burlington was first settled in 1882 by John R. Millett and William McKay, who operated a logging camp at the present site of the community. Tom W. Soules, who purchased the land from McKay, named the settlement for Burlington, Vermont. Extensive logging operations in the valley and the adjacent foothills led to the construction of a large sawmill in 1890, and the Seattle and Northern Railway extended its lines to the town. For a number of years, Burlington grew due to its position at the crossroads of railway lines and proximity to timber stands. The depletion of the timber stands eventually forced a change from logging and lumbering to dairying and farming (Reference 1). Burlington is located in the heart of a rich agricultural area with a mild climate and good soils well suited to vegetable, seed, berry, and bulb production (Reference 2). According to Washington State Office of Financial Management figures, the estimated population of Burlington was 3,910 on April 1, 1980 (Reference 3).

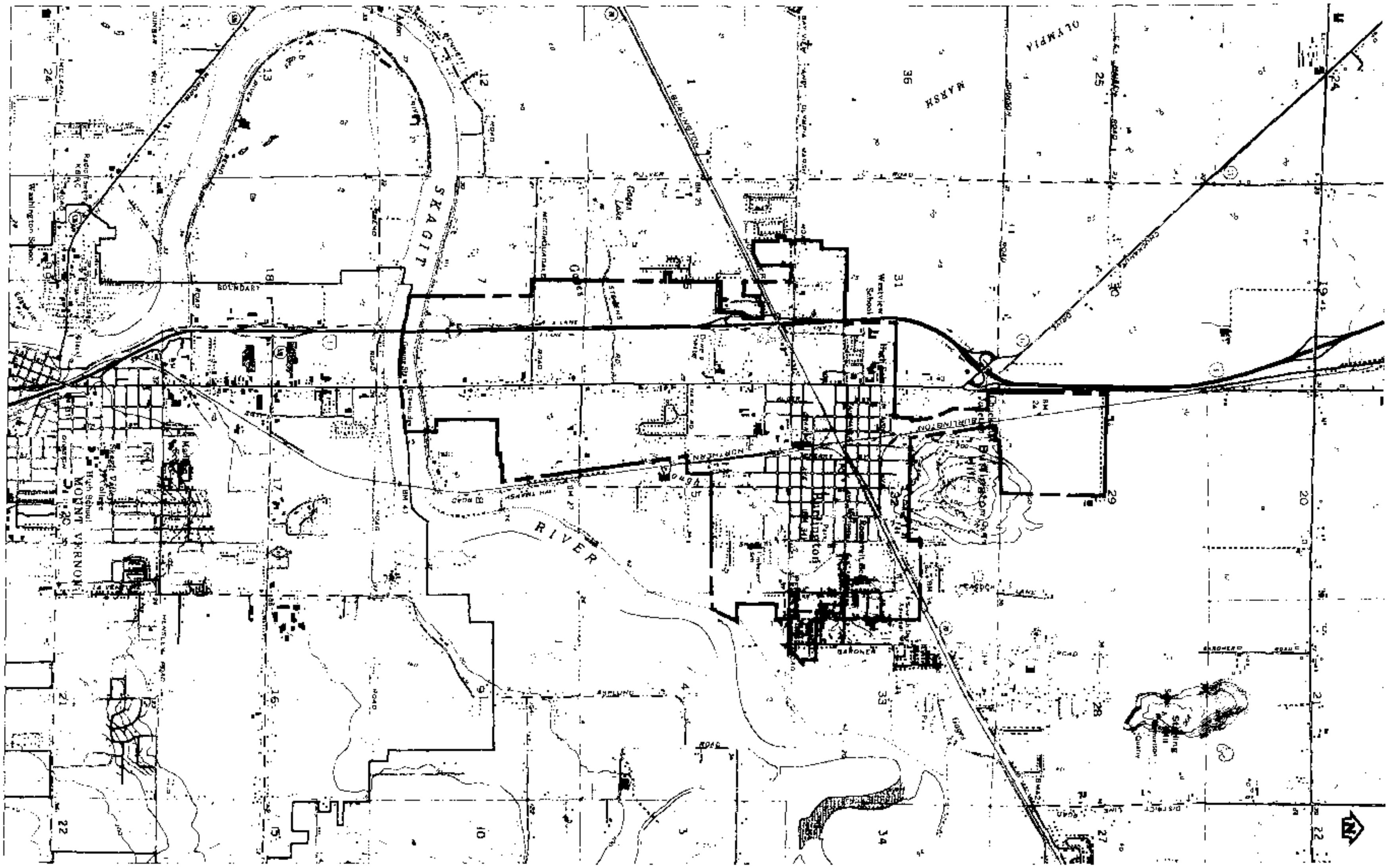


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BURLINGTON, WA
(SKAGIT CO.)

APPROXIMATE SCALE

4000 0 4000 8000 12000 FEET

VICINITY MAP

Burlington is located on the right bank of the Skagit River Valley, with elevations ranging from approximately 20 feet in the southern part of the city near the river to approximately 260 feet on Burlington Hill in the northern part of the city. Most of the land surrounding Burlington has little topographic relief because it is a part of the low-lying delta of the Skagit River. Burlington Hill, on the northern part of the city limits, has an elevation of approximately 460 feet and represents the major topographic feature in the area. Underlying Burlington are alluvial soils consisting primarily of fine sandy loam. Most of the land within the corporate limits has been cleared of native vegetation. In the few wooded areas, deciduous trees such as alder, maple, willow, and cottonwood predominate, except on Burlington Hill where Douglas fir predominates (Reference 4).

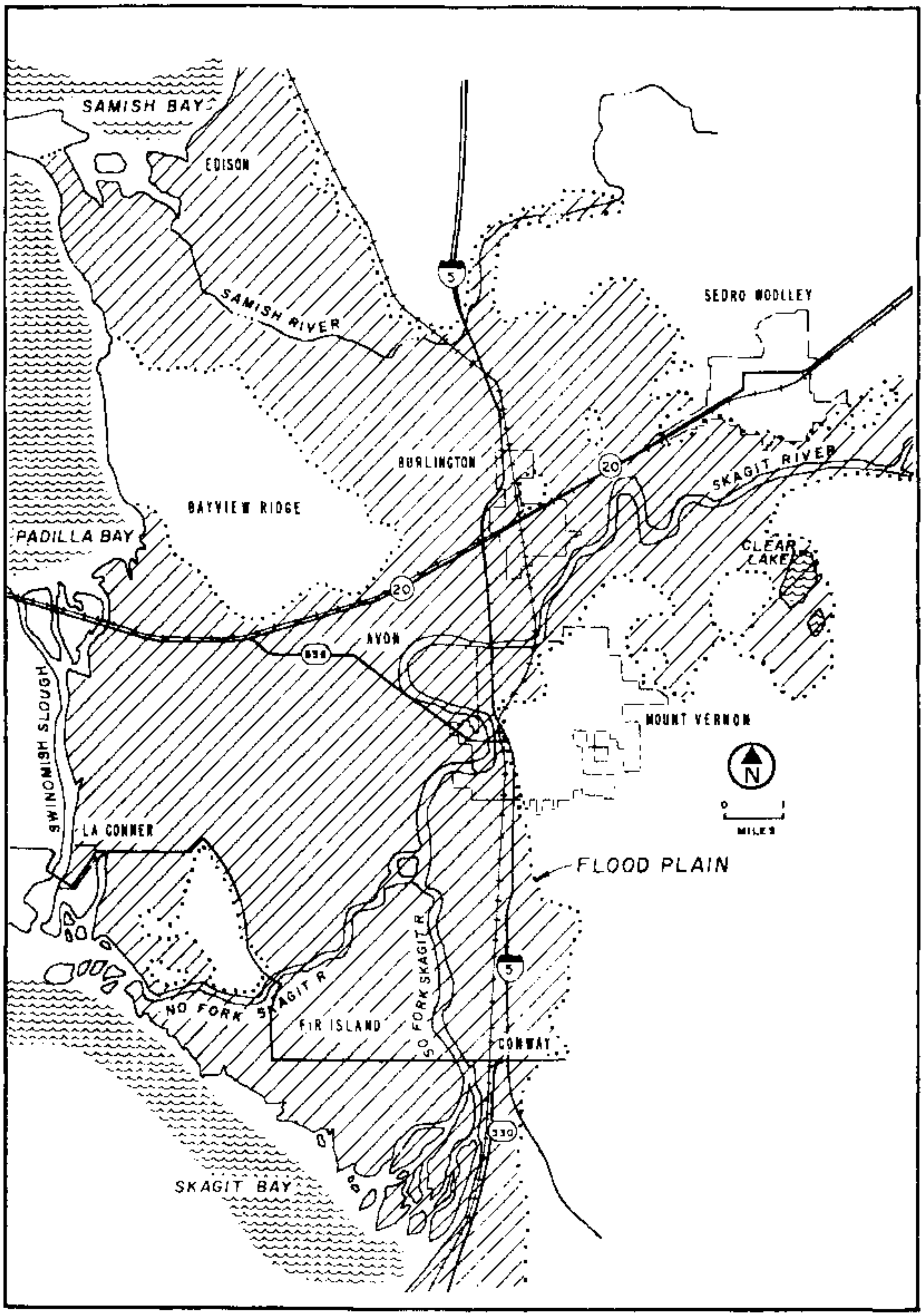
The climate is predominantly a midlatitude, west coast, marine type because most of the airmasses originate over the Pacific Ocean. In late fall and winter, these masses are moist and at approximately the same temperature as the ocean surface. Orographic lifting and cooling as airmasses are carried inland by prevailing westerly winds results in cloudiness and widespread precipitation throughout Skagit County. Burlington receives an average of approximatley 36 inches of precipitation annually, of which approximately 50 percent falls from October through January. Average annual snowfall is approximately 5 inches, and average temperatures range from 39° F in January to 69° F in August (Reference 5).

The old U.S. Highway 99 bridge (Garl Street) near the southern corporate limits of Burlington is 147 miles from the source of the Skagit River, and the drainage area above this point is 3,093 square miles.

2.3 Principal Flood Problems

Major floods of the Skagit River in the vicinity of Burlington are caused by winter rainstorms. The Skagit Basin, lying directly in the storm path of cyclonic disturbances from the Pacific Ocean, is subject to numerous storms which are frequently quite severe and may follow one another in quick succession. On the mountain slopes, storm precipitation is heavy and almost continuous as a result of combined frontal and orographic effects. The resulting runoff, while predominantly from rainfall, includes some snowmelt.

Skagit River represents the major flooding source of the community. Flooding occurs from multiple levee failures and bank and levee overtopping during a 100-year flood. Downstream of Sedro Woolley, the Skagit River flows through a large delta area that fronts Samish, Padilla, and Skagit Bays. Within this area, the flood plain forms a large alluvial fan with an east-west width of approximately 11 miles and a north-south width of 19 miles (Figure 2).



EXISTING CONDITIONS 100-YEAR FLOODING

FIGURE 2

Spring floods also occur on the Skagit River and are due primarily to snowmelt runoff. However, these events are not of sufficient magnitude to be a serious flood threat at Burlington.

Major floods have occurred in the past, and photographs of some of the effects of past floods are shown in Figures 3 through 5. The photographs show the floods of November 21, 1910; December 29 and 30, 1917; and December 12 and 13, 1921. These floods had discharges of 114,000; 195,000; and 210,000 cubic feet per second (cfs), respectively, at Sedro Woolley.

A significant flood occurred in December 1975. Heavy rain began over western Washington late on November 29 and early on November 30. It did not moderate at most precipitation stations until midnight on November 30. Snow had begun falling over the Cascades late on November 24, and the rate of fall became increasingly heavy as the warmer air arrived. By the afternoon of November 30, the snow had changed to heavy rain. Precipitation continued throughout the next 3 days, surging between moderate and heavy. The total storm period of late evening on November 29 to early morning on December 4 included three distinct storms following each other in close succession. Total storm precipitation for the period of November 29 through December 5 at Ross Dam, Upper Baker Reservoir, and Stampede Pass was 12.78, 11.90, and 18.79 inches, respectively. Maximum 24-hour precipitation was 4.10, 3.24, and 6.75 inches, respectively. The maximum recorded discharge at Mount Vernon was 129,200 cfs at 7:30 p.m. on December 4. The river was above zero damage stage for 87 hours and above major damage stage for 67 hours. The 1975 flood was essentially a bankfull flood with little or no freeboard. Only extensive flood fighting enabled the levee system to contain the 1975 flood, which had a recurrence interval of approximately 12 years.

Two floods occurred prior to the period of record that far exceeded any of the floods of record. In 1923, Mr. J.E. Stewart of the U.S. Geological Survey (USGS) collected data for and partially completed a report on floods in the Skagit River Basin. The data he collected and the conclusion he reached, together with information concerning floods of record through 1957, are published in USGS Water-Supply Paper 1527 (Reference 6). After careful study and analysis of all data available to him, Mr. Stewart reached the conclusion that two great floods occurred prior to the arrival of white settlers, and that the earlier and greater of these two floods probably was as large or nearly as large as the greatest flood that has occurred here within the last several hundred years. Flood discharges as determined by Mr. Stewart for a number of historical floods, together with the maximum floods of record, are presented in Table 1 for various stream gage locations.

Figure 3. November 1910 Flooding of Skagit River along Fairhaven Avenue in Burlington

Figure 4. December 1917 Flooding of Skagit River Along Fairhaven Avenue in Burlington.

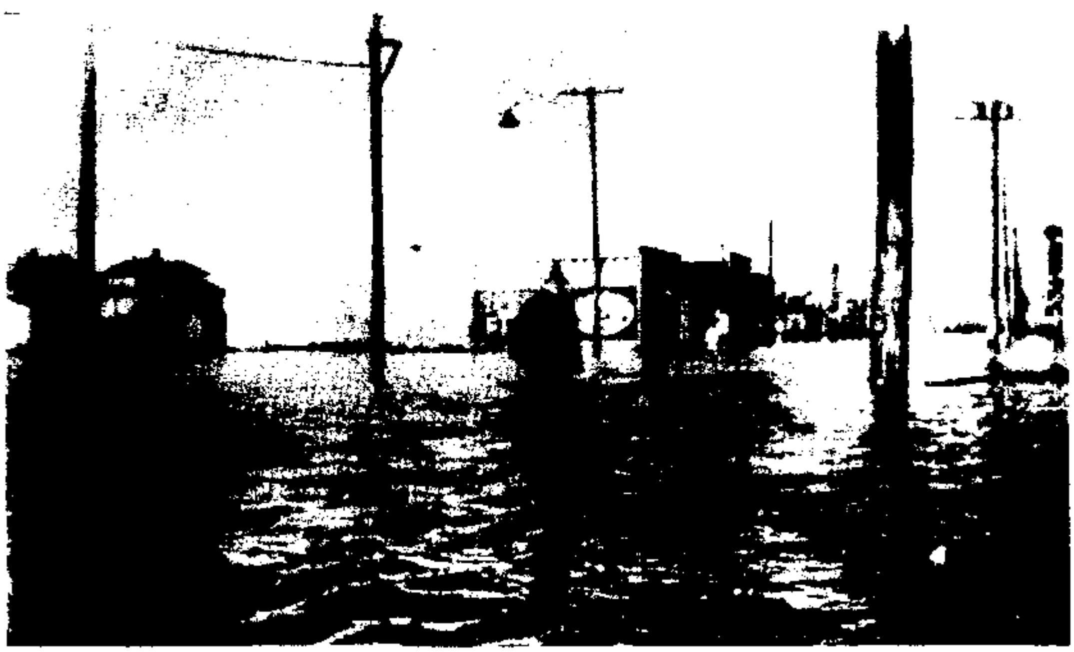


Figure 5. December 1921 Flooding of Skagit River at Intersection of Fairhaven Avenue and Anacortes Street in Burlington.

Table 1. Recorded and Historic Discharges

Flooding Source and Location	Recorded Flows Discharge (cfs)	Recorded Flows Date	Historic Flows Discharge (cfs)	Historic Flows Date
Skagit River				
Near Concrete	154,000	November 27, 1949	500,000	1815
Near Sedro Woolley	220,000	November 30, 1909	400,000	1815
Near Mount Vernon	144,000	February 11, 1951	180,000	1906

2.4 Flood Protection Measures

The City of Seattle (Seattle City Light) owns and operates Ross Reservoir on the upper Skagit River, the only project on the main stem of the Skagit River operated for flood storage. Ross Reservoir has 1,052,300 acre-feet of usable storage between elevations 1,602 and 1,475 feet, of which 120,000 acre-feet are reserved for flood control in compliance with the Federal Energy Regulatory Commission license.

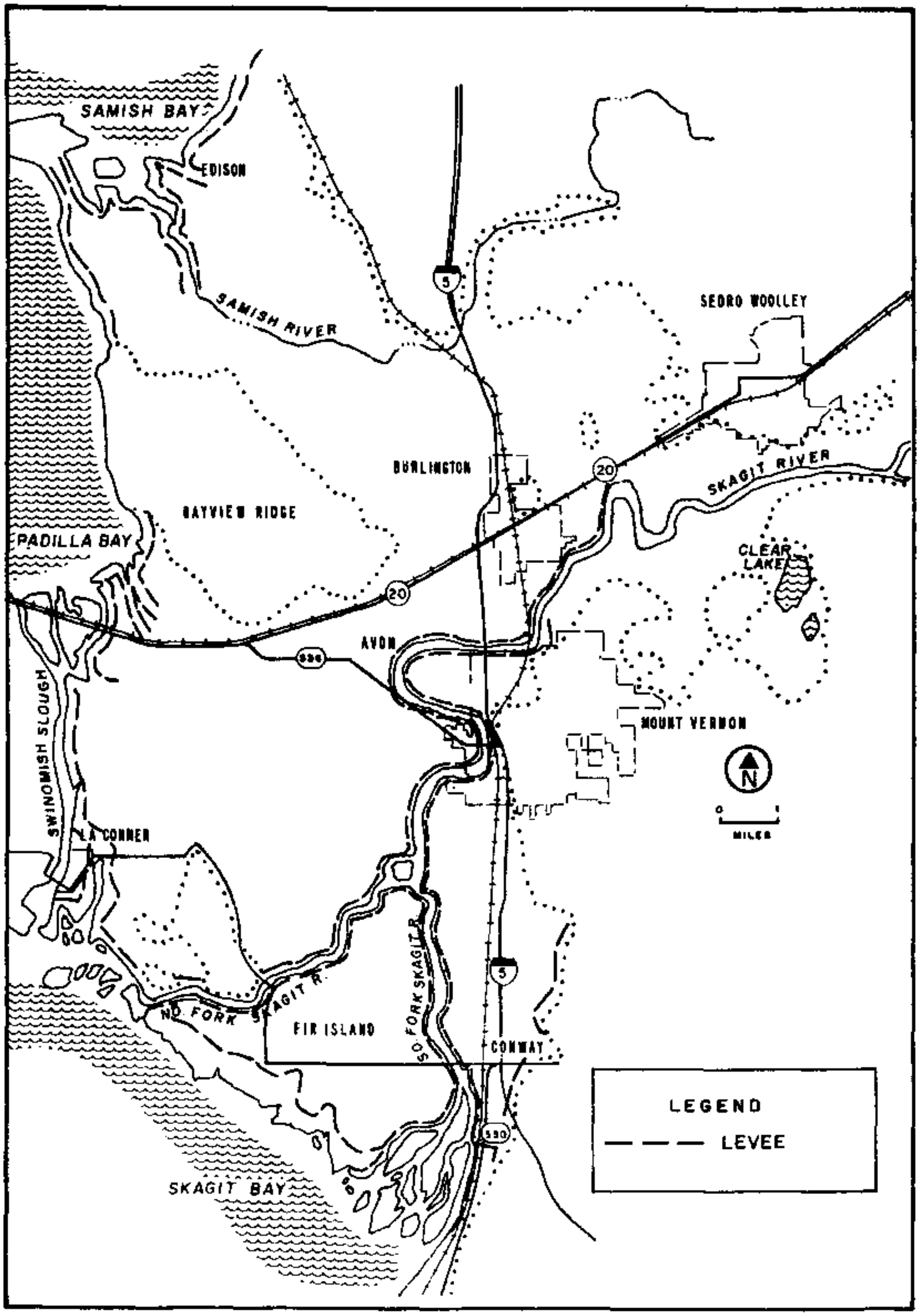
Puget Power operates two hydroelectric power projects on the Baker River: Lower and Upper Baker Dams and Reservoirs located at River Miles 1.12 and 9.29, respectively. Baker River streamflows have been subject to varying degrees of flood control regulation since completion of the Lower Baker Dam project in 1927 and the Upper Baker Dam project in 1959. Flood control storage was increased in 1977 from 16,000 to 74,000 acre-feet at the Upper Baker project to more effectively regulate Skagit River flows west of Concrete. Flood control regulation is maintained only at the Upper Baker Project. During the November through March flood season, flood control regulation commences when the flow in the Skagit River near Concrete is forecast to reach or exceed 90,000 cfs within the next 8 hours. The U.S. Army Corps of Engineers then directs operation of the Ross and Baker projects flood control operations. Project releases are selected with reference to formal operating plans which consider flow at Concrete, reservoir pool elevations, and observed and forecast reservoir inflows. Releases from both projects are regulated to minimum levels until the flood peak has passed and the Skagit River has begun to recede at Concrete. Subsequently, project discharge is increased to draft storage from the reservoirs, so that flood control storage space is regained. A list of storage data for the major dams within the basin is presented in Table 2.

Sixteen diking districts maintain approximately 56 miles of levees and 39 miles of sea dikes in the Skagit River delta, but none of the levees or dikes are adequate to protect against a 100-year tidal or riverine flood (Figure 6).

The City of Burlington is fronted by a levee that extends approximately 1 mile upstream of the corporate limits, but the levee will not protect the city from a 100-year flood on the Skagit River.

Table 2. Storage Characteristics of Existing Reservoirs

Reservoir	Flood Control Storage (Acre-Feet)	Maximum Storage (Acre-Feet)	Maximum Usable Storage (Acre-Feet)	Storage Began
Ross	120,000	1,434,800	1,052,300	March 1940
Diablo	0	90,140	76,220	October 1929
Gorge	0	8,485	6,770	June 1960
Upper Baker (Baker Lake)	74,000	285,470	220,630	July 1959
Lower Baker (Lake Shannon)	0	unknown	142,600	November 1925



EXISTING LEVEE SYSTEM

FIGURE 6

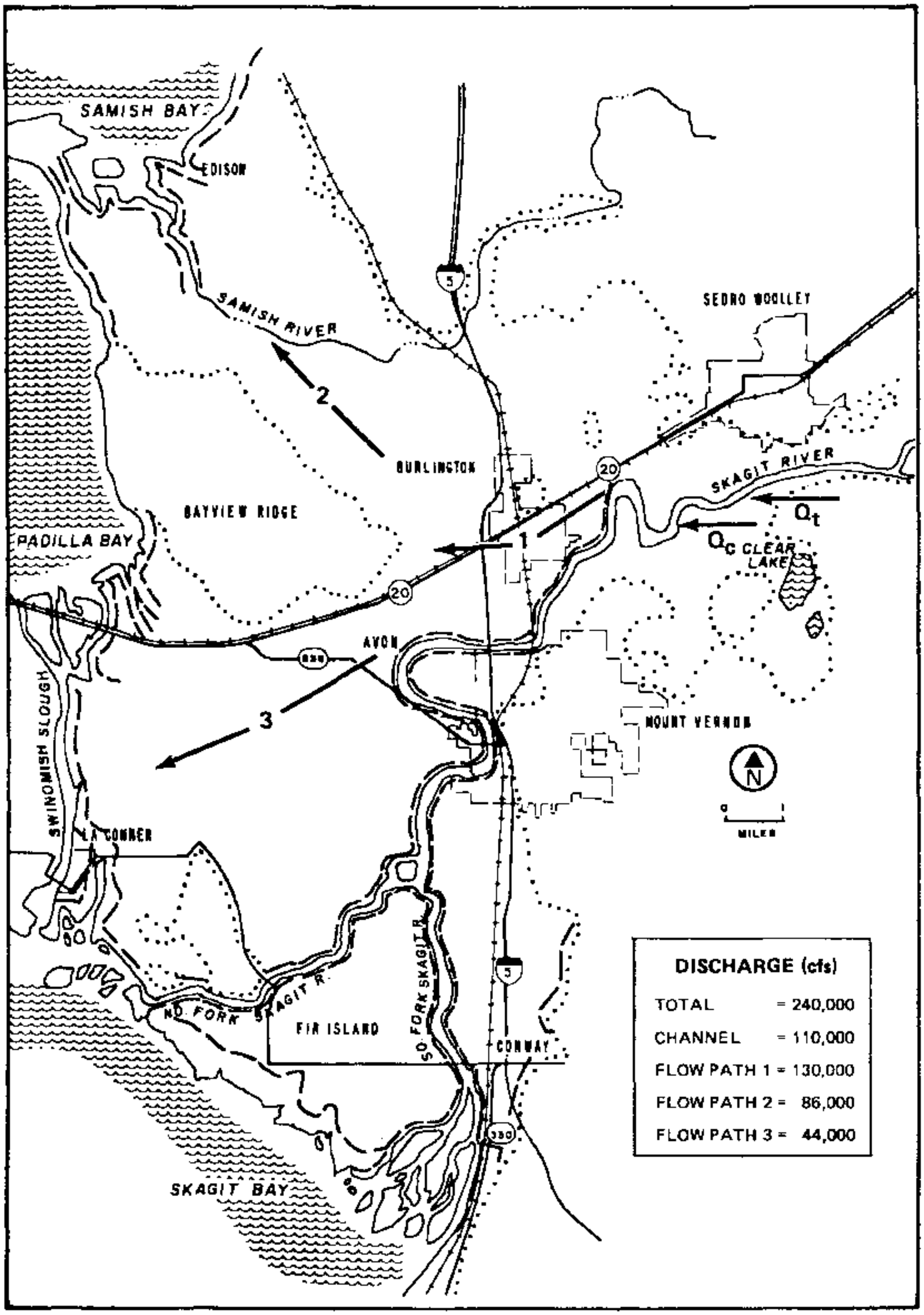
3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

The 100-year flood discharge downstream from Sedro Woolley was estimated to be 240,000 cfs by the U.S. Army Corps of Engineers. Historical flooding events have shown that discharges within the channel and existing levees will reach a maximum of 130,000 cfs before levee overtopping and failure will occur. The 1975 flood reportedly caused levee-full conditions and thus was assumed to represent maximum channel and existing levees flooding conditions during a 100-year event. For this analysis, 110,000 cfs were assumed to flow in the natural channel and the remaining 130,000 cfs were assumed to flow in the overbanks during the 100-year event. Downstream of Sedro Woolley, the flow is divided into channel and overbank flows above the upstream end of the levee system near Sterling. Figure 7 indicates the direction and distribution of the overland flow. Along Flow Path No. 1, 130,000 cfs will pass through Burlington and vicinity. After the flow crosses Interstate Highway 5, it will divide at Bayview Ridge to flow through the Samish River flood plain into Samish and Padilla Bays (Flow Path No. 2), and through the Skagit River flood plain into Swinomish Slough and Skagit Bay (Flow Path No. 3).



DISCHARGE DISTRIBUTION IN DELTA AREA

FIGURE 7

Because of the complex nature of the divided overbank floodflows, it was necessary to perform several HEC-2 analyses (Reference 7) for a range of discharges along Flow Path Nos. 2 and 3. The results were used to develop stage-discharge rating curves for each path. From these rating curves, discharges were selected for each path; the discharges produced a common elevation at the point of bifurcation of the two paths. It then was determined that 86,000 cfs will flow into Samish and Padilla Bays, and 44,000 cfs will flow into Skagit Bay.

Peak discharge-drainage area relationships for Skagit River are shown in Table 3.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of these flooding sources.

Water-surface elevations for all flow paths were computed using the HEC-2 computer program (Reference 7). Use of the computer model was replaced or supplemented with hand calculations in certain areas and situations where such methods were considered to be more suitable. It was assumed that the coastal levees would contain the riverine flooding until they were overtopped. Therefore, the average levee crest elevation of 8 feet was used as the starting water-surface elevation for overbank Flow Path Nos. 2 and 3. The common upstream elevation of the two flow paths was used as the starting water-surface elevation for Flow Path No. 1. The analysis indicates that the elevated portions of Interstate Highway 5 west of Burlington will obstruct this flow to some extent, but the highway ultimately will be overtopped.

Water-surface elevations for the Skagit River channel were taken from the flood profiles of the 1975 flood (Reference 5).

Flood profiles for the overbank flow paths were drawn showing computed 100-year flood water-surface elevations (Exhibit 1). The overbank flow path distances shown on the profiles were measured along the base lines indicated on the maps in Exhibit 2.

Cross section data for the delta area were obtained from aerial mapping (Reference 8), U.S. Geological Survey topographic maps (Reference 9), other topographic maps (References 10 and 11), and as-built drawings of Interstate Highway 5 (Reference 12). Terrain features such as roads, railroads, and levees that would have a hydraulic effect were considered by selecting the cross section locations to include and reflect the controlling effects of such features.

Table 3. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Skagit River					
Near Sedro Woolley	3,015	132,000	200,000	240,000	321,000

Field observations were made to supplement available topographic data.

The Manning's "n" values used in the computation of flood profiles for the overbank flows were estimated based on review of aerial photographs (Reference 5) and a county land use map (Reference 13). Values for roughness coefficients ranged from 0.045 to 0.060.

Some areas within the flood plain lie above the 100-year flood **elevations and, therefore,** are not subject to flooding; due to **the wide expanse** and sheetflow conditions that exist throughout **the delta area, such areas are shown as Zone B.**

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Emergency Management Agency as the base flood for purposes of flood plain management measures. The 100-year flood boundaries were delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at scales of 1:24,000, with a contour interval of 20 feet (Reference 9); 1:2,400, with a contour interval of 2 feet (Reference 11); and 1:2,400, with a contour interval of 5 feet (Reference 10). Aerial mapping at a scale of 1:24,000, with a contour interval of 100 feet (Reference 8), and construction as-built drawings (Reference 12) were also used in the interpolation.

Flood boundaries are indicated on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year flood boundary corresponds to the boundary of the areas of special flood hazards (Zones A1 and A7). Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment in river valley flood plain areas, such as artificial fill, reduces the flood-carrying capacity and increases the flood heights and hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, a flood plain area is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the Federal Emergency Management Agency limit such increases in flood heights to 1.0 foot.

For the study area downstream of Sedro Woolley, flood plain encroachment must be restricted in certain definitive areas. For the Skagit River proper, the levees confining the channel and adjacent areas have been designated as floodways. In the vicinity of Whitmarsh Road and the old U.S. Highway 99 Bridge (Garl Street), the most landward levees were used to establish the floodway boundary. The purpose of these floodway designations is to preclude any encroachment which would reduce the capacity of the river channel or jeopardize the integrity of the levee system.

Conventional floodways are not appropriate for the Skagit River delta area for a number of reasons. Although flood elevation and depth criteria can be established for the delta based upon general flood risk assessments which consider possible modes and locations of levee failure in flow path computations, such analyses are not appropriate for establishing floodways on the delta. Unlike typical valley situations, the exact location of flow paths during any particular flood event on the delta cannot be known in advance due to the uncertainty of where levee failures will occur, the relative sequence of levee failures, and the volumes of flow that will result. Likewise, because of the topographic nature of the delta, flooding occurs in sheetflow patterns and no one particular flow path is inherently more efficient than other possible alternatives, making the selection of a floodway location highly arbitrary.

Therefore, it is recommended that all communities with land use jurisdiction on the delta assume a responsibility to maintain flow paths for floodwaters in order to minimize backwater effects which may increase flood levels. Suggested measures include design of new roads and streets to be at grade in order that obstructive fills not be placed perpendicular to local flow paths, preservation of swale areas and existing drainage channels such as Gages Slough, and a minimization of development density in currently zoned agricultural areas.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Emergency Management Agency has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting Burlington.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The U.S. Army Corps of Engineers has estimated that the 10-year discharge of the Skagit River would be contained in the channel; therefore, the Flood Hazard Factors for the overland flows were determined by the average difference between the ground elevations and the 100-year flood elevations.

The locations of the reaches determined for the flooding sources of Burlington are shown on the Flood Profiles (Exhibit 1) and summarized in Table 4.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Emergency Management Agency device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND 10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)	FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (FEET NGVD)
Overbank Flow Path No.1 Reach 1	0001	-3.73[4]	N/A	N/A	035	A7	Varies - See Map
Main Stem Skagit River Reach 1	0001	N/A	N/A	N/A	005	A1	Varies - See Map

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

[4]Elevation Difference Between 100-Year Elevation and Average Ground Elevation

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BURLINGTON, WA
(SKAGIT CO.)

FLOOD INSURANCE ZONE DATA

OVERBANK FLOW PATH NO. 1-MAIN STEM SKAGIT RIVER

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of Burlington was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A1 and A7:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water-control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

The flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 4.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Burlington is, for insurance purposes, the principal result of the Flood Insurance Study. This map (Exhibit 2) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Emergency Management Agency.

6.0 OTHER STUDIES

In June 1972, the U.S. Army Corps of Engineers, Seattle District, under contract to the Federal Emergency Management Agency, completed a Flood Insurance Study for the unincorporated portions of Skagit County, Washington (Reference 14). This study was not formally released by the Federal Emergency Management Agency, but limited distribution was made to cognizant state and local officials for interim use in flood plain management. This study supersedes the 1972 Flood Insurance Study.

The U.S. Army Corps of Engineers, Seattle District, has published several reports and studies on the Skagit River Basin, including Flood Control and Other Improvements in March 1965 (Reference 15); Flood Plain Information Studies in July 1966, and April 1967 (References 16 and 17); Sauk River Suggested Hydraulic Floodway in June 1976 (Reference 18); Authorization Report for Additional Flood Control at Upper Baker Project in June 1976 (Reference 19) and accompanying draft environmental impact statement dated September 1976; and Skagit River, Washington, General Design Memorandum for Levee Improvements in July 1979 (Reference 5). These studies are in agreement with this study.

Additional studies of the Skagit River Basin include the "Puget Sound and Adjacent Waters" study by the Puget Sound Task Force of the Pacific Northwest River Basins Commission in 1970, and Comprehensive Land Use Planning Alternatives for the Skagit River Floodplain and Related Uplands by the Skagit Regional Planning Council in April 1973 (References 20 and 21).

On November 10, 1978, under Public Law 95-625, portions of the Skagit River and some tributaries, Cascade, Suiattle, and Sauk Rivers, were incorporated into the the National Wild and Scenic River System. Studies are underway by the U.S. Forest Service to detail boundaries of the river areas and prepare a management plan to protect and enhance those scenic, scientific, geological, historical, cultural, recreational, and fish and wildlife values for which the river was designated as a component of the National Wild and Scenic River system.

This study supersedes the Flood Hazard Boundary Map prepared for the City of Burlington (Reference 22).

This study is in agreement with the Flood Insurance Study for Sedro Woolley (Reference 23).

Flood Insurance Studies are being prepared the City of Mount Vernon and the unincorporated areas of Skagit County (References 24 and 25, respectively). These studies are in agreement with this Flood Insurance Study.

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, Federal Regional Center, 130 228th Street, SW, Bothell, Washington 98011.

8.0 BIBLIOGRAPHY AND REFERENCES

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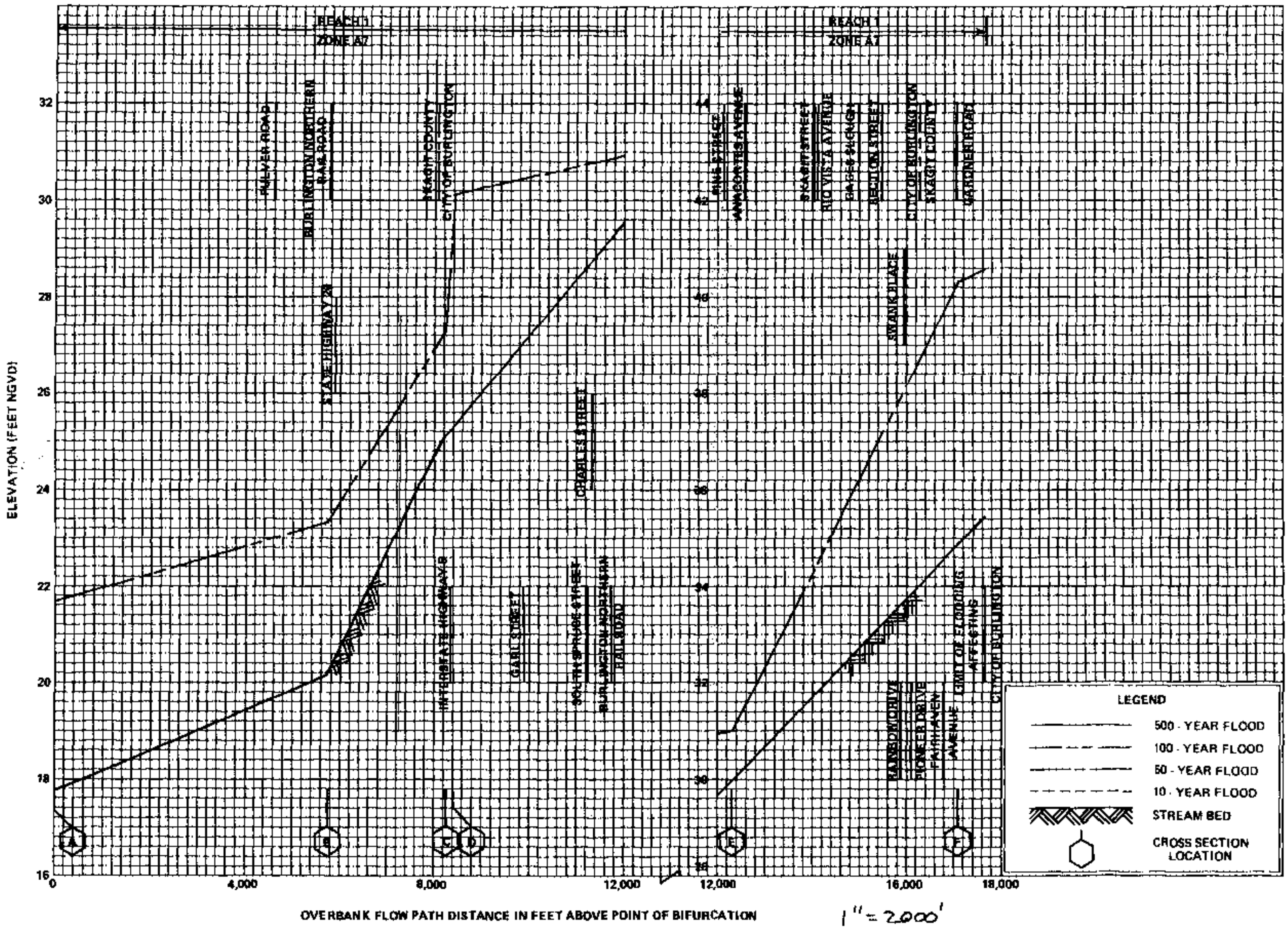

FLOOD PROFILES

OVERBANK FLOW PATH NO. 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF BURLINGTON, WA
(SKAGIT CO.)

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