NPSEN-PL-RP

9 FEB 78

MEMO FOR: RECORD

SUBJECT: Skagit Levee and Channel Improvement - Formulation of Alternatives

1. On 9 February 1978 Lance Meyer and I discussed the hydrology study Lance was performing for the Skagit project. He has reviewed the hydrology for the basin and has revised the frequency data as shown below. This work has not been checked yet and may be further changed in the future. For the purpose of creating cost estimates of alternatives for the March public meeting, Bill McKinley will use the data from the Upper Baker Report.

Frequency of Occurrance	Skagit River near Concrete		Skagit River near Sedro Woolley	
	Upper Baker Rpt	Revision	Upper Baker Rpt	Revision
10 yr	125,000 cfs	145,000 cfs	125,000 cfs	147,000 cfs
15 yr	144,000 cfs	161,000 cfs	140,000 cfs	161,000 cfs
25 yr	165,000 cfs	180,000 cfs	160,000 cfs	178,000 cfs
50 yr	200,000 cfs	210,000 cfs	185,000 cfs	204,000 cfs
60 yr	210,000 cfs	218,000 cfs	192,000 cfs	210,000 cfs
100 yr	237,000 cfs	241,000 cfs	215,000 cfs	228,000 cfs
200 yr	295,000 cfs	276,000 cfs	255,000 cfs	258,000 cfs

2. I also discussed with Lance Meyer and Larry Merkle, the effect the construction of a dam on the Sauk River (135,000 to 250,000 acre feet of flood control storage) would have. Larry said that, based on the 1965 Levee and Channel Improvement Report, a dam with 250,000 acre feet of storage could reduce the 100 year flood peak at Concrete by about 70,000 cfs. Also, most of the value of the storage would be in the initial half of the reservoir. Thus a flood control storage of about 135,000 acre feet could provide a reduction in the 100 year flow of about 35,000 to 50,000 cfs.

3. I discussed the distribution of high flows downstream of Sedro Woolley with Les Soule. We agreed the following would be reasonable distribution of flow for use in preparing our cost estimates for the public brochure.

a. For Alternative 3 (Levee and Channel Improvements and High Urban Levees), 45,000 cfs of the 215,000 cfs 100 year flow would go to the Samish Valley. This would leave 170,000 cfs in the river channel. Bill McKinley will design the urban levees with a profile 2 feet above the 180,000 cfs in-channel profile (from the Avon Bypass Site Selection DM).

b. For Alternative 4 (Levee and Channel Improvements,high urban levees and Upstream storage). Bill will use a Sauk dam with about 135,000 acre feet of flood storage. This would reduce the 100 year flood peak at Sedro Woolley

by about 35,000 cfs to 180,000 cfs. Of this 20,000 cfs would go to the Samish and 160,000 cfs would go down the channel. The urban levees for this proposal can be 2 feet lower than for Alternative 3.

c. For Alternative 5 (Levee and Channel Improvements High Urban Levees and Avon Bypass), the modified channel capacity past Burlington would be 180,000 cfs. Of the 35,000 cfs excess in a 100 year flood 25,000 cfs will go to the Samish and 10,000 cfs down the channel. The total flow down the channel would be 190,000 cfs and the urban levees would have to be 4 feet higher than the water surface profile from the Avon Bypass Design Memo for the with Avon Bypass condition (180,000/120,000 cfs).

d. For Alternative 6 (Levee and Channel Improvements, Avon Bypass and Upstream Storage), the same storage as alternative 4 will be used (135,000 acre feet). This reduces the 100 year flow to 180,000 cfs, which is the channel capacity provided by a combined Avon Bypass Levee and Channel Improvement Project.

4. Attached as inclosures 1 to 6 are sets of information sheets on each alternative. Each set covers the respective alternative and contains the following; an alternative description, a sketch of the proposed alternative and a diagram showing the approximate distribution of flow discussed in paragraph 3.

Brooks

BROOKS

6 Incl
As

cc w/incl:
Brooks
Cook
ERS
ECON
F&M
Civil Design
FPMS
McKinley
Water Control

w/o incl:
RP file

SKAGIT RIVER LEVEE AND CHANNEL IMPROVEMENT PROJECT

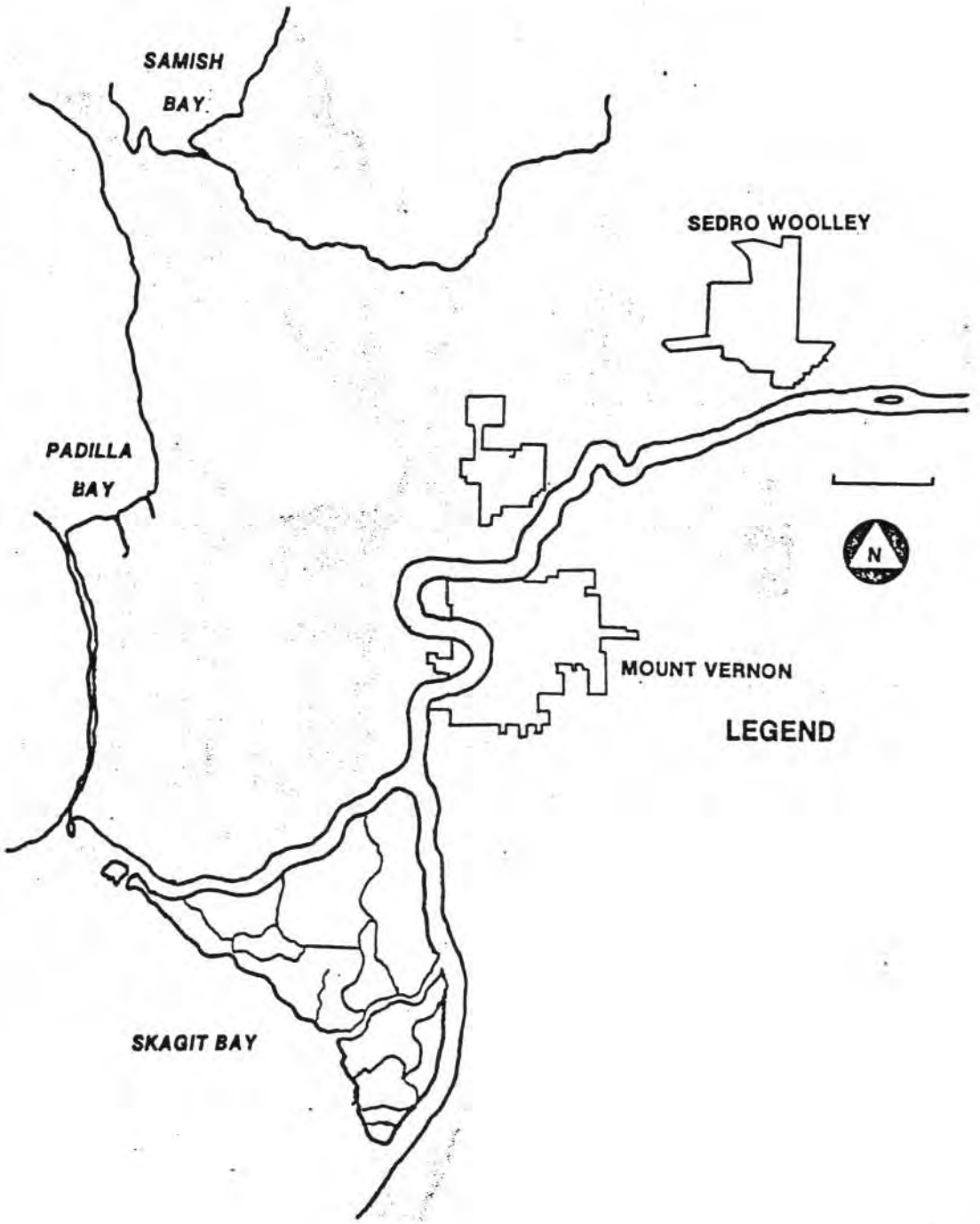
Alternative 1 - Maintain Existing Programs and Measures (Do Nothing New)

This assumes: flood control storage of 120,000 acre feet at Ross and 74,000 acre feet at Upper Baker, existing levee system which provides protection from flows of 84,000 cubic feet per second (cfs) to 130,000 cfs (3 to 15 year recurrance interval), and overflow to the Samish delta begins at 150,000 cfs. (20 year recurrance interval).

Enclosure 1

ALTERNATIVE #1

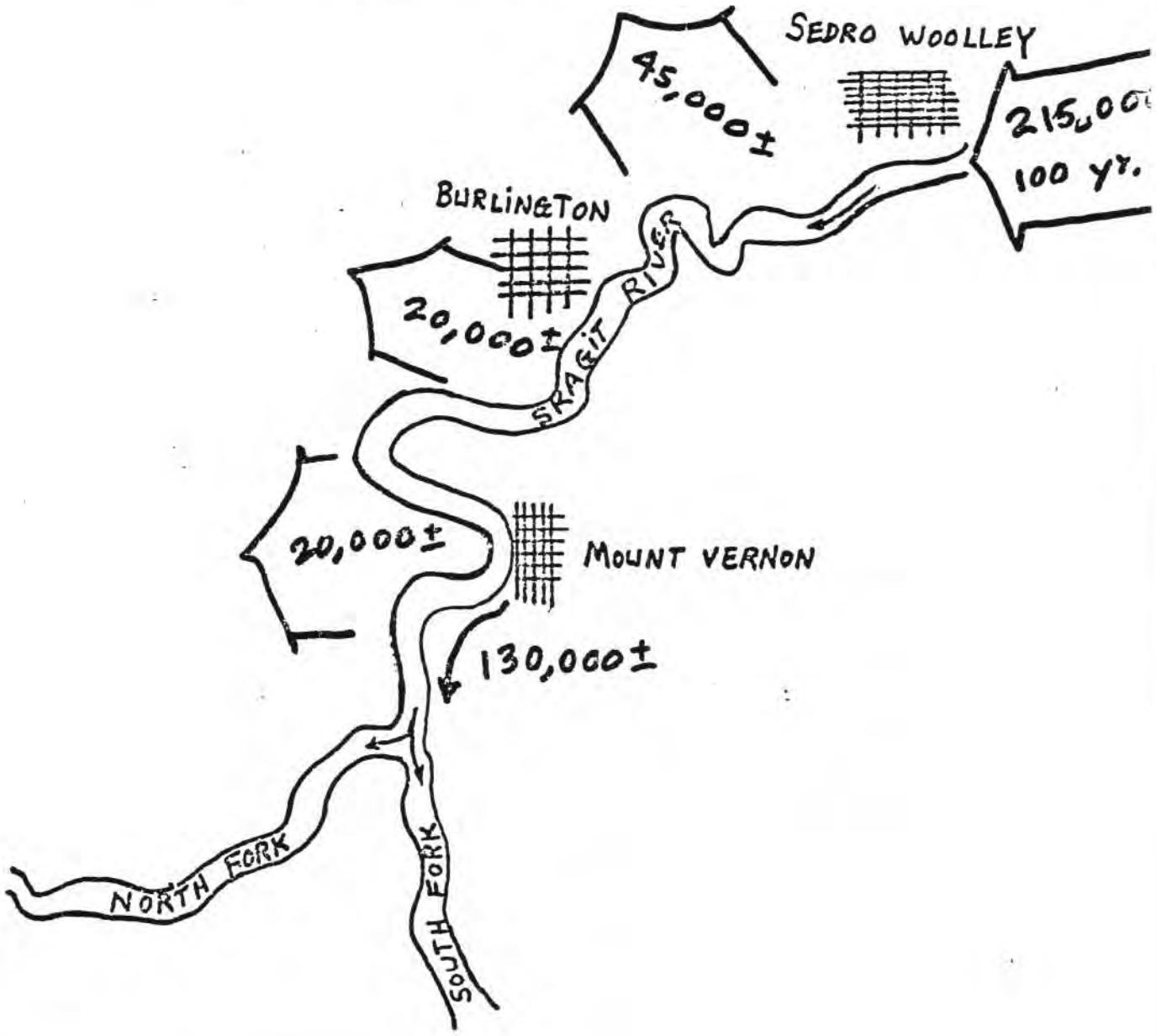
DO NOTHING



SKAGIT LEVEE & CHANNEL IMPROVEMENT - PROJECT

SCHEMATIC FLOW DIAGRAM

ALTERNATIVE 1



SKAGIT RIVER LEVEE AND CHANNEL IMPROVEMENT PROJECT

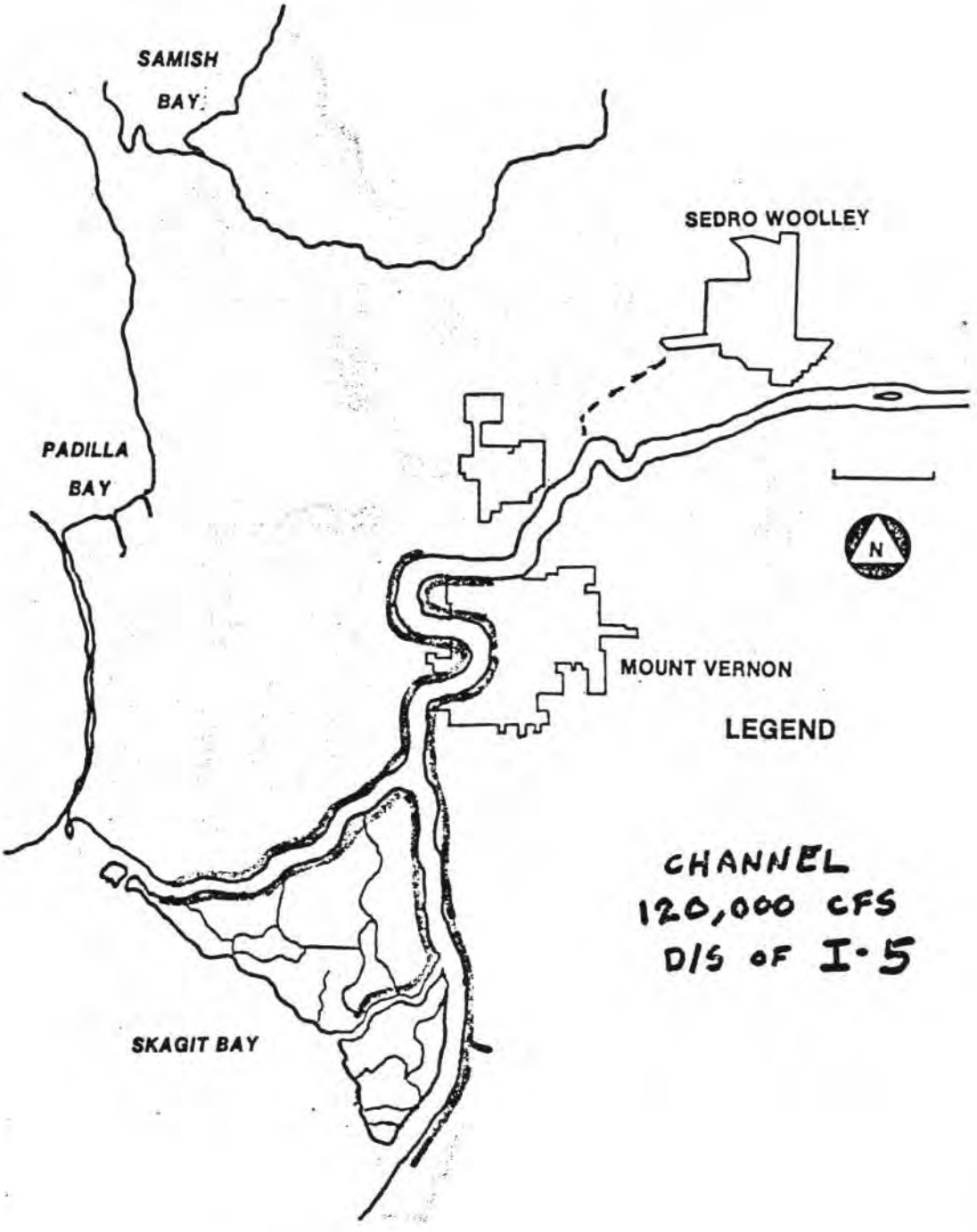
Alternative 2 - Authorized Project

This would improve the levee system and enlarge restrictive parts of the channel from Interstate 5 to the mouths of the Forks to provide a minimum channel capacity of 120,000 cubic feet per second (11 year recurrance interval) with 2 feet of freeboard. Overflow to the Samish delta begins at 150,000 cfs (25 year recurrance interval)

Enclosure 2

ALTERNATIVE # 2

LEVEE/CHANNEL IMPROVEMENTS

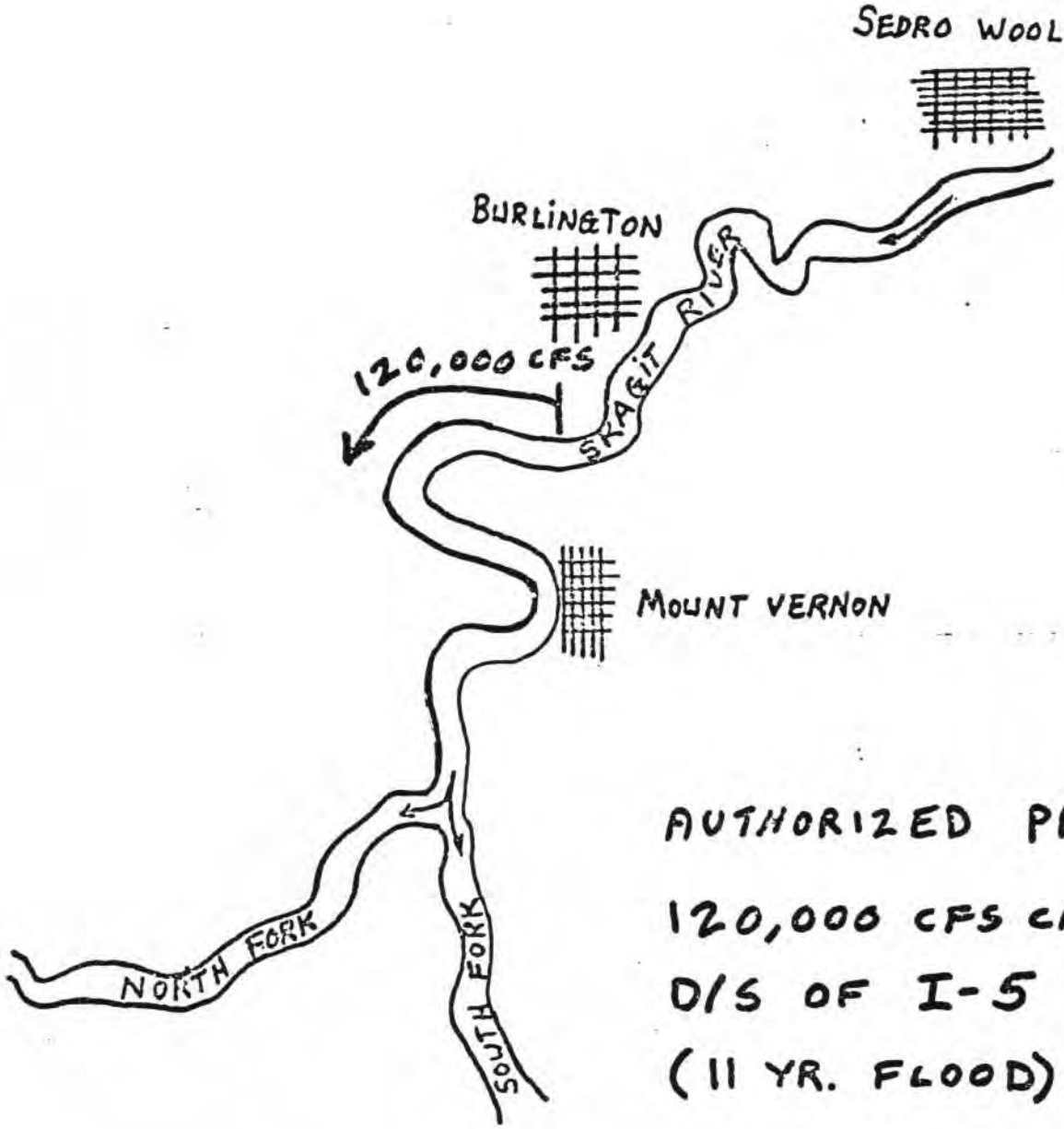


CHANNEL
120,000 CFS
D/S OF I-5

SKAGIT LEVEE & CHANNEL IMPROVEMENT · PROJECT

SCHEMATIC FLOW DIAGRAM

ALTERNATNE 2



AUTHORIZED PROJECT

120,000 CFS CHANNEL

D/S OF I-5

(11 YR. FLOOD)

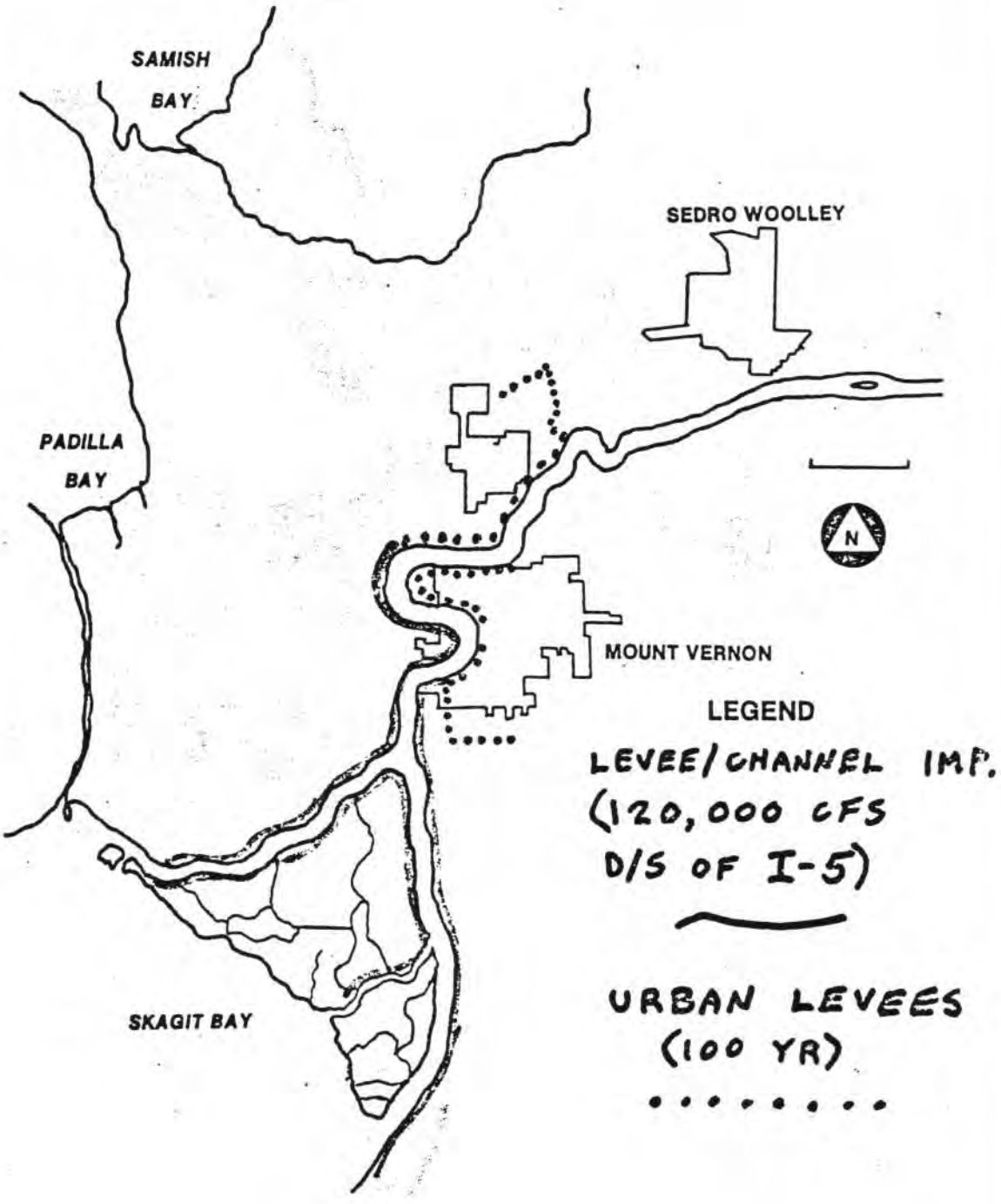
SKAGIT RIVER LEVEE AND CHANNEL IMPROVEMENT PROJECT

Alternative 3 - Authorized Project and Urban Levees

In addition to the authorized project downstream of Interstate 5, this would provide higher levees for protection from a flood with a recurrance interval of 100-years for the urban areas of Mount Vernon on the left bank and Burlington on the right bank. The existing levee system would be tied to Sterling Hill and back to Burlington Hill (if necessary). The Samish delta would be provided the same level of protection as at present (a low levee would be built if necessary from the end of the present levee along the railroad to Sedro Woolley)

Enclosure 3

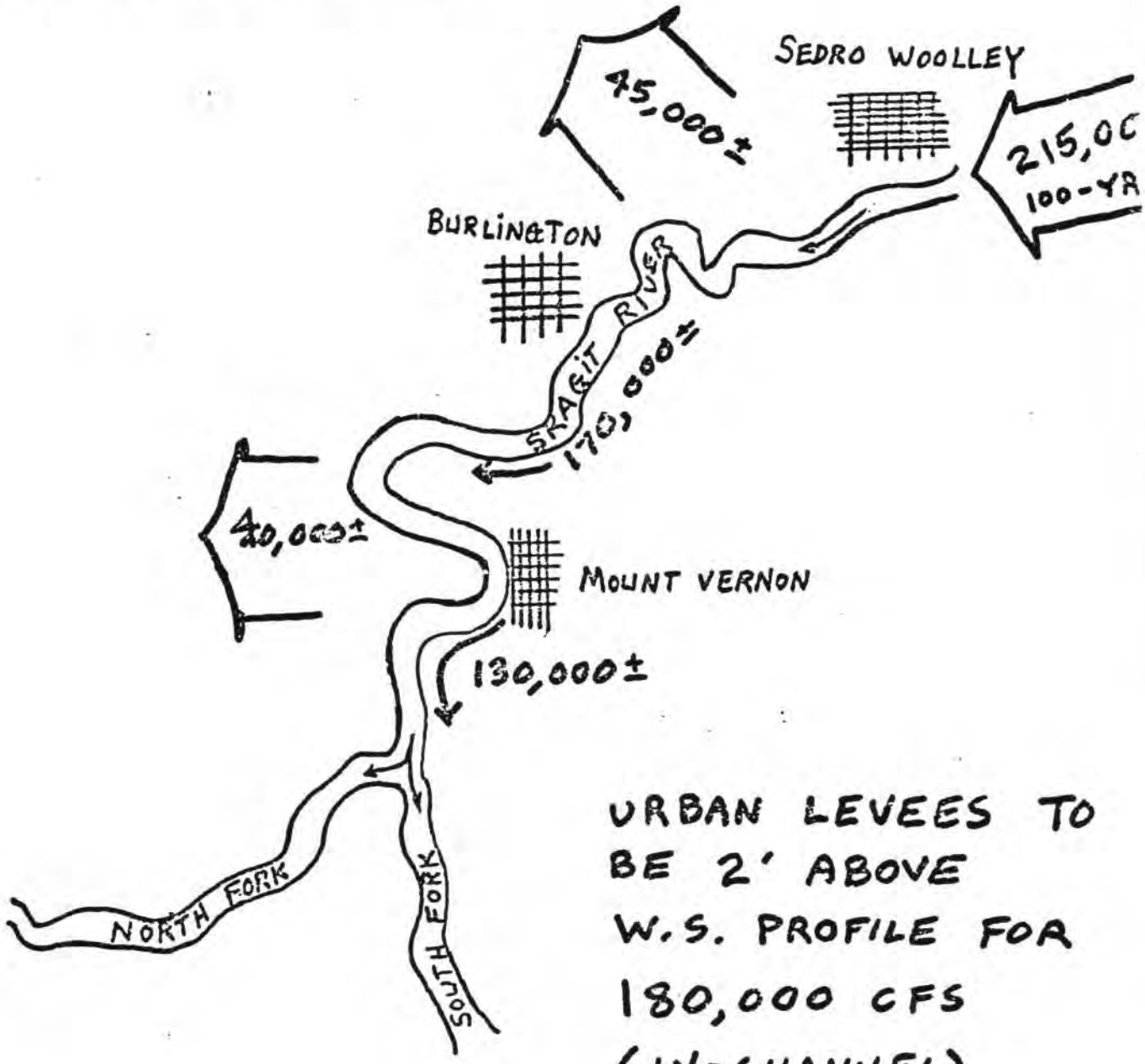
LEVEE / CHANNEL IMPROVEMENTS
URBAN LEVEES



SKAGIT LEVEE & CHANNEL IMPROVEMENT PROJECT

SCHEMATIC FLOW DIAGRAM

ALTERNATIVE 3



URBAN LEVEES TO BE 2' ABOVE W.S. PROFILE FOR 180,000 CFS (IN-CHANNEL)

SKAGIT RIVER LEVEE AND CHANNEL IMPROVEMENT PROJECT

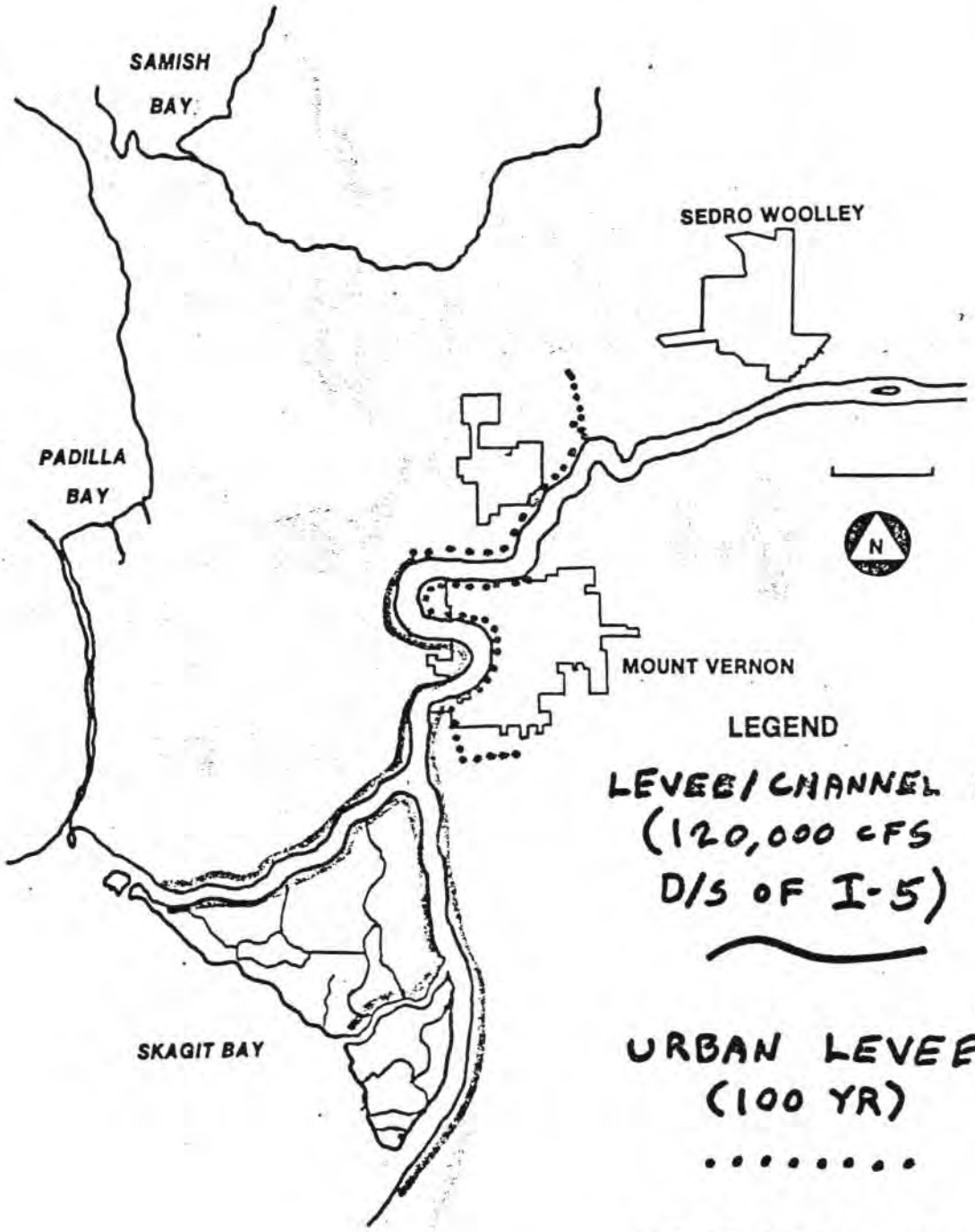
Alternative 4 - Authorized Project, Urban Levees, and Upstream Storage

In addition to the Authorized Project downstream of Interstate 5, this would provide for higher levees for Mount Vernon on the left bank and Burlington on the right bank (100-year protection) and upstream flood storage of 134,000 acre feet on the Sauk River. The Samish delta would be provided the same level of protection as at present.

Enclosure 4

ALTERNATIVE # 4

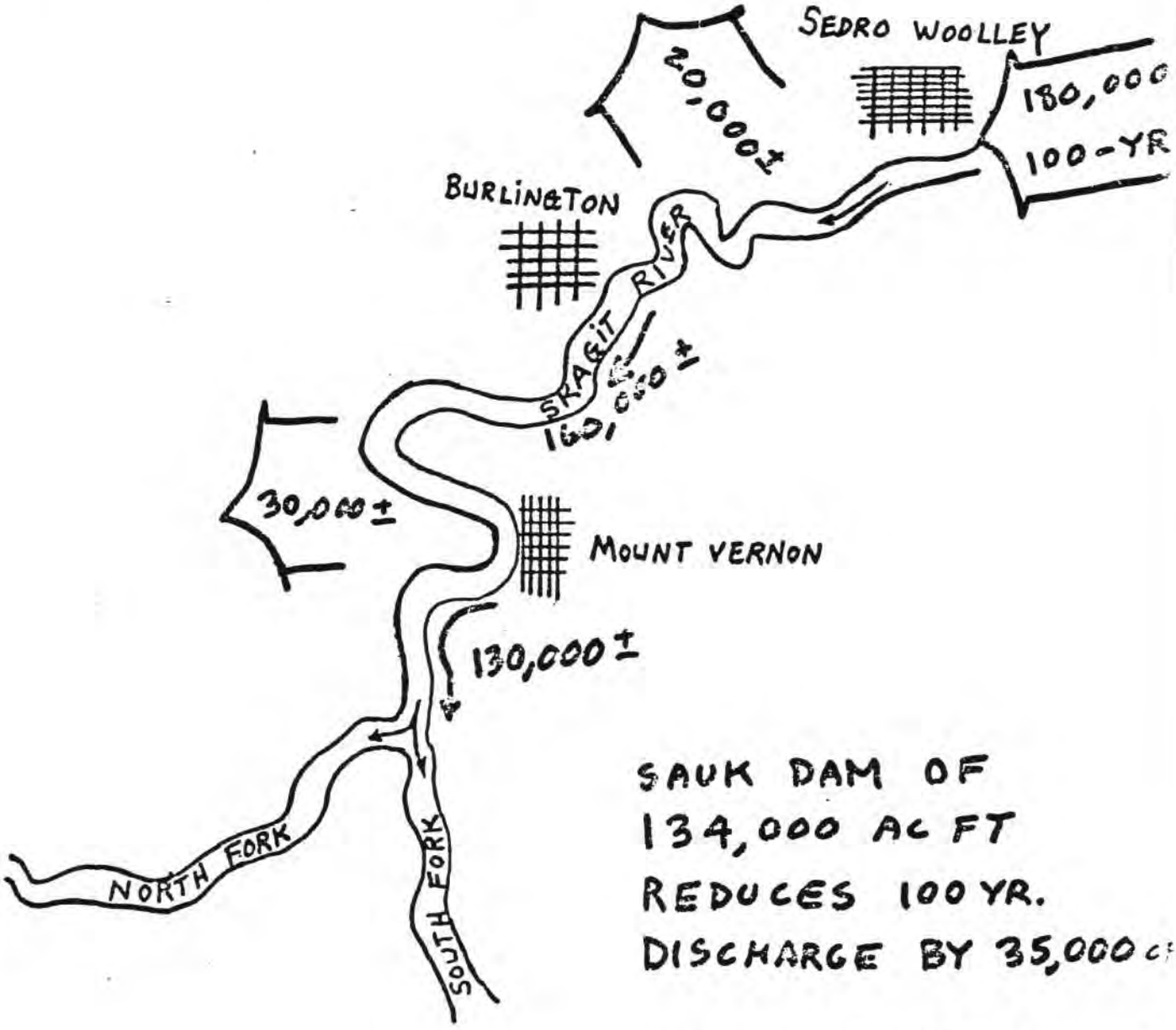
LEVEE/CHANNEL IMPROVEMENTS
URBAN LEVEES
UPSTREAM STORAGE



SKAGIT LEVEE & CHANNEL IMPROVEMENT PROJECT

SCHEMATIC FLOW DIAGRAM

ALTERNATIVE 4



SAUK DAM OF
134,000 AC FT
REDUCES 100 YR.
DISCHARGE BY 35,000 CF

URBAN LEVEES TO BE
EQUAL TO 180,000 CFS
IN-CHANNEL FLOW PRO
FILE.

SKAGIT RIVER LEVEE AND CHANNEL IMPROVEMENT PROJECT

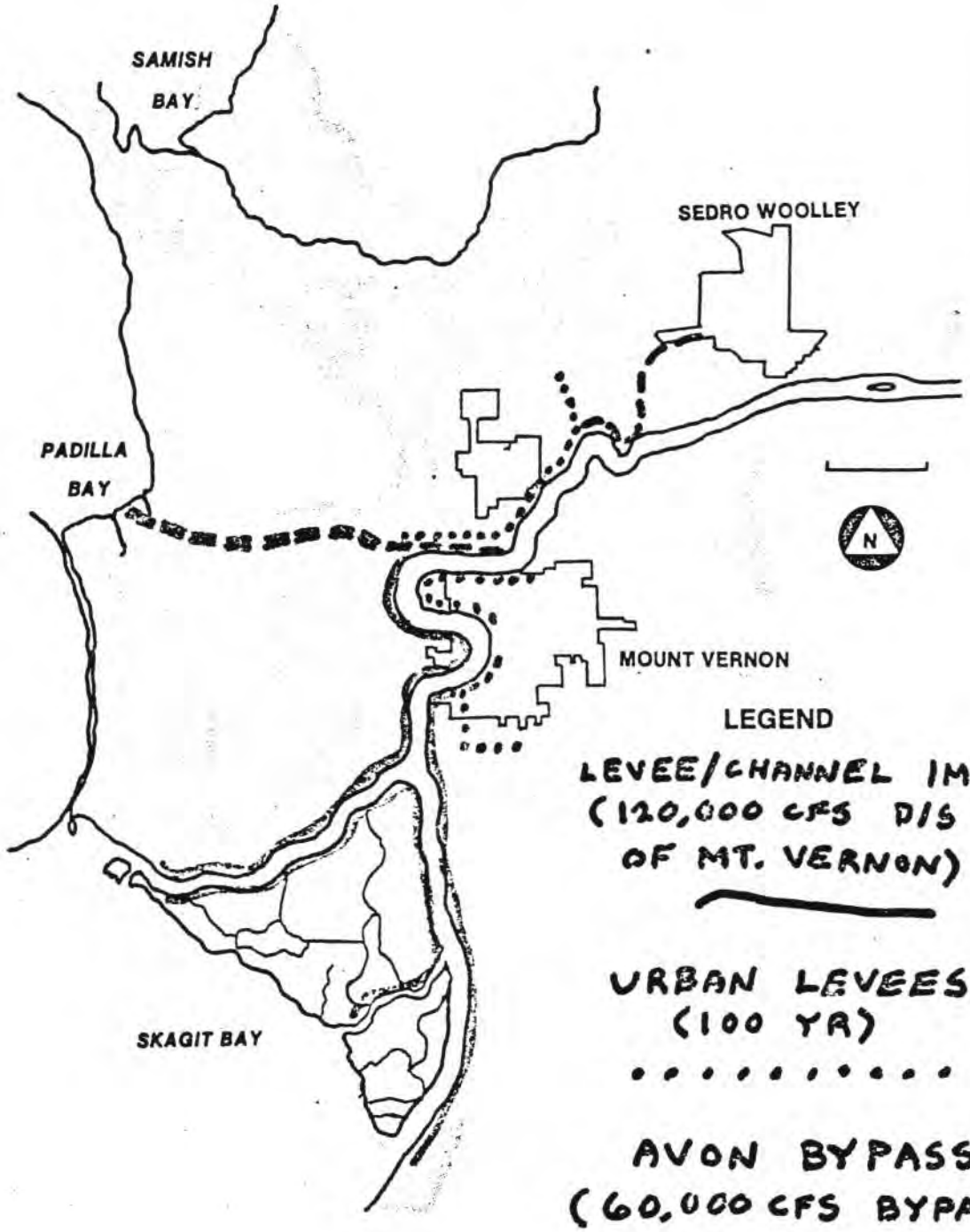
Alternative 5 - Authorized Project, Urban Levees, and Avon Bypass

In addition to the Authorized Levee and Channel Improvement Project downstream of Interstate 5, this would provide higher levees for Mount Vernon on the left bank and Burlington on the right bank (100-year protection) and the authorized Avon Bypass Project for a minimum flow capacity of 180,000 cfs (120,000 cfs in channel and 60,000 cfs in bypass) - approximately 60 year recurrance interval.. The levee system would be extended from Burlington to Sedro Woolley and the Samish delta would be provided protection from the 180,000 cfs flow.

Enclosure 5

ALTERNATIVE # 5

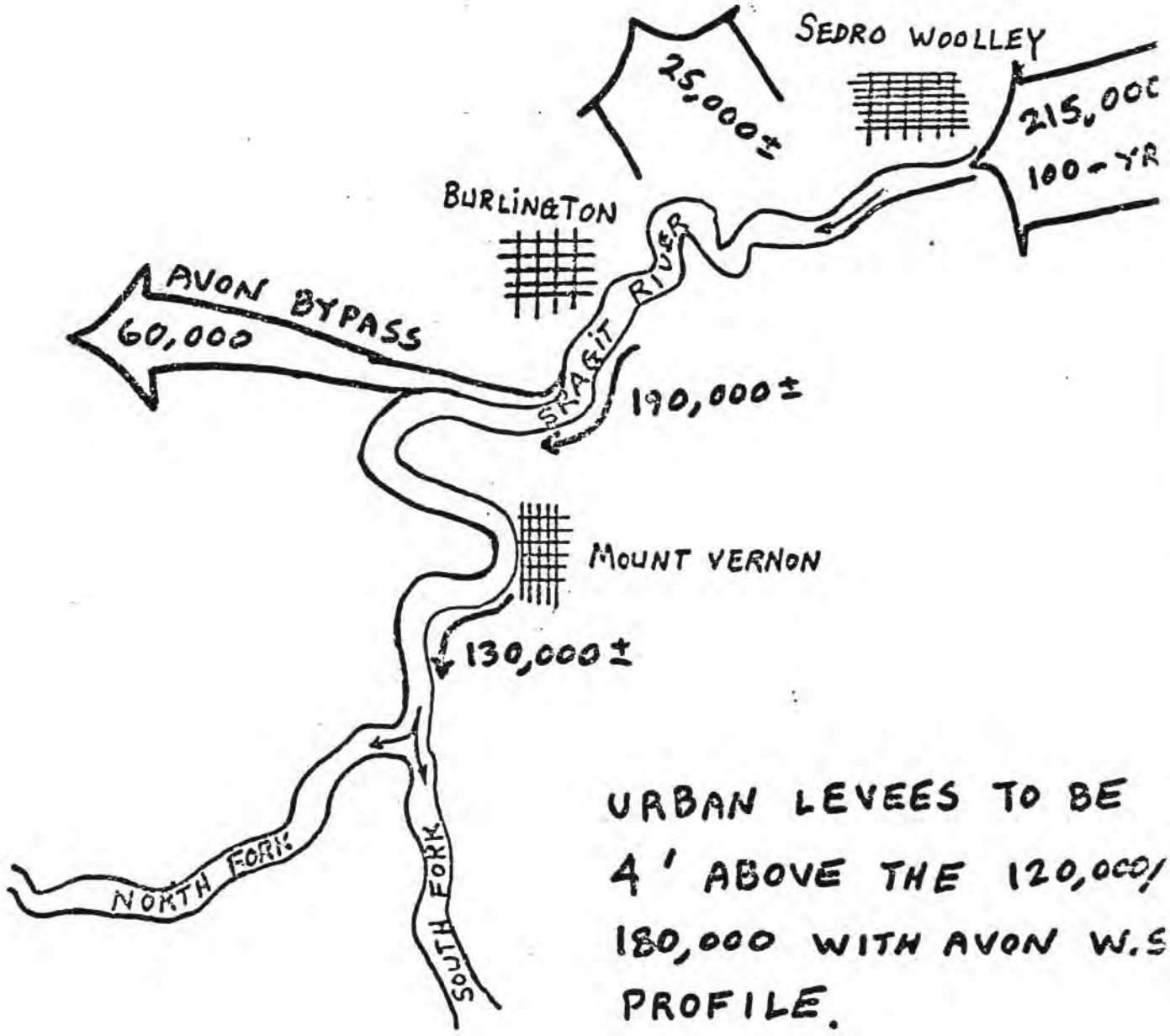
LEVEE/CHANNEL IMPROVEMENTS
URBAN LEVEES
AVON BYPASS



SKAGIT LEVEE & CHANNEL IMPROVEMENT PROJECT

SCHEMATIC FLOW DIAGRAM

ALTERNATIVE 5



URBAN LEVEES TO BE 4' ABOVE THE 120,000/ 180,000 WITH AVON W.S PROFILE.

SKAGIT RIVER LEVEE AND CHANNEL IMPROVEMENT PROJECT

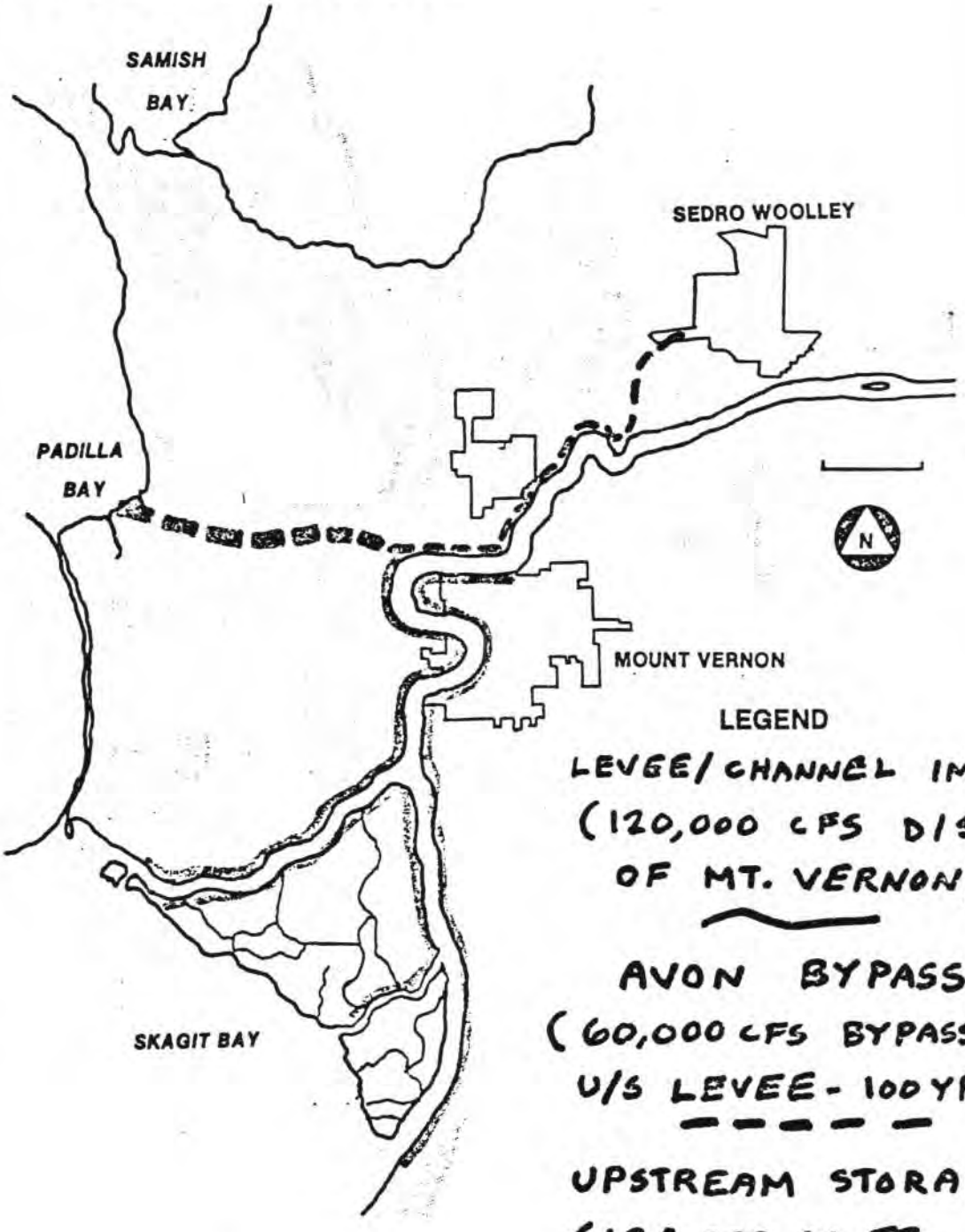
Alternative 6 - Authorized Project, Avon Bypass and Upstream Storage

In addition to the Authorized Levee and Channel Improvement project downstream of Interstate 5, this would provide for the authorized Avon Bypass Project and upstream flood storage of 134,000 acre-feet in the Sauk River. The levee system would be extended from Burlington to Sedro Woolley. The entire Skagit and Samish flood plains would be provided protection from floods on the Skagit River with a recurrance interval of 100+ years.

Enclosure 6

ALTERNATIVE # 6

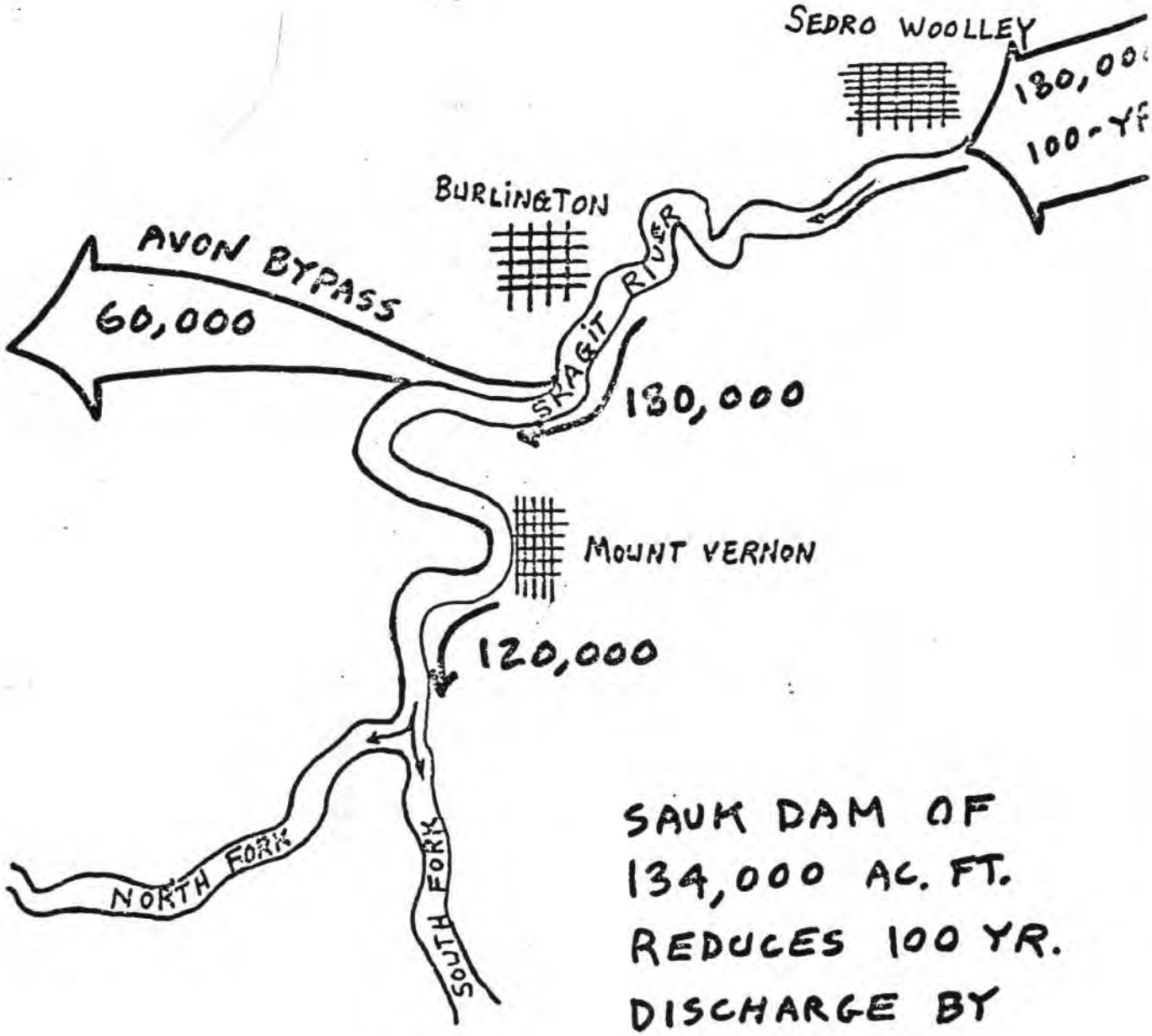
LEVEE/CHANNEL IMPROVEMENTS
AVON BYPASS
UPSTREAM STORAGE



SKAGIT LEVEE & CHANNEL IMPROVEMENT PROJECT

SCHEMATIC FLOW DIAGRAM

ALTERNATIVE 6



SAUK DAM OF
134,000 AC. FT.
REDUCES 100 YR.
DISCHARGE BY
35,000 CFS