

SKAGIT RIVER

Rough Estimate of Flood Damages from  
Sedro Woolley to Mouth of Skagit  
River.

1951 FLOOD

(Crest Feb. 10-11, 1951)

Flowage Estimate Section  
28 Feb. 1951  
H. R. Madison

For Newspaper Clippings re 1951 Flood  
see Flowage Estimate Section Files 1-6.9

P 001095

14 FEB. 1951

Comments on Flood Damages for Area 1

Area 1 has been revised. The attached summary of damages for Area 1 shows the breakdown for the various subareas.

In the estimate submitted 26 February 1951, the 1921 H.W. (210,000 cfs.) damages were taken as representing fairly close the 1951 damages. Subarea 1B was substituted for subareas 1C and 1D. Subarea 1A was flooded both in 1921 and 1951. However, the 1921 H.W. damages for subarea 1J was also included but should not have been. Deducting the item of Buildings and Contents for subarea 1J, amount \$249,800, from the total of \$436,700 for this item shown in the original notes, volume 5, page 9, the remainder, \$186,900, should be compared with the attached revised summary, \$245,200. Subarea 1J was flooded in 1921 but not in 1951.

I believe the resulting figures are about as good as can be obtained short of an actual appraisal and should stand notwithstanding Clark's comments. Many small details can easily be overlooked in attempting to obtain a damage figure by taking a distant broad view which would tend to minimize the individual component parts.

  
H. R. MADISON

P 001096

		SKAGIT RIVER								Madison
<u>1951 Prices</u>		<u>Rough Estimate of Flood Damages- 1951 H.W.</u>						<u>Area 1 - Left Bank</u>		11/3/51
Item No.	Item	Area 1A	Area 1B	Area 1C	Area 1D	Area 1E	Area 1F	Area 1H	Area 1J	Total Area 1
1.	Flood Fighting	\$ 5,200	\$ 3,000	\$ 6,000	\$ 4,200		\$ 500	\$1,000	\$ 3,600	\$ 23,500
2.	Restoration of levees	20,000	5,000	100,000	6,000		2,000		0	133,000
3.	" salt water levees	0	0	15,000						15,000
4.	Drainage Systems	8,600	1,000	6,000	1,000			500	500	17,600
5.	Buildings & Contents									
a.	Rural	81,900	0	75,000	13,400		1,800			172,100
b.	Urban-Conway	73,100	0							73,100
6.	Land & Crops									
a.	Crop damage \$23.45 per ac	121,900	0	46,500	21,500	0	16,300		100	206,300
b.	Salt water damage	0		23,100	0					23,100
c.	Fences	10,700	0	6,000	500		200			17,400
d.	Weed seeds	5,200	0	2,000	500		200			7,900
e.	Silting	10,000	0	25,600	1,000					36,600
f.	Erosion	9,500	0	27,000	500		500			37,500
g.	Clean-up	20,000	0	12,000	1,000					33,000
7.	Farm machinery and equipment	10,100	0	6,800	1,600		800			19,300
8.	Refugees	2,700	0	2,500	700		200			6,100
9.	Autos	9,000	0	8,000	1,100		300			18,400

Skagit River Flood Damages, 1951 H.W. (cont'd)

	1A		1C	1D					
10. Livestock:									
a. Lost	500	0	15,000	300		300			16,100
b. Added cost of handling	10,000	0	8,000	300					18,300
11. Loss in milk production	5,000	0	4,000	500					9,500
12. Loss to business and employees	6,500	0							6,500
a. Rural	1,000		500						1,500
b. Urban - Conway	5,600		0						5,600
13. Wirelines	4,500	0	3,000			200			7,700
14. Highways:									
a. Other than bridges	7,300	0	5,000						12,300
b. Bridges	0	0	0						0
15. Railroads:									
a. Other than bridges	0	0	0						0
b. Bridges	0	0	0						0
16. Traffic interruptions		0	0						0
a. Highways	29,900	0	10,000						39,900
b. Railroads	0	0	0						0
c. Stage and auto freight	4,300	0	2,000						6,300
17. Total	\$462,500	\$9,000	\$409,000	\$54,100	0	\$23,300	\$1,500	\$4,200	\$963,600
Acres crop damage	5,200	0	1,980	445	0	140		5	

ROUTING SLIP

DATE 15 Feb 51

DO NOT DETACH FROM CORRESPONDENCE

FILE NO.

ROUTE TO

ROUTING ORDER

REASON (For)

1 2 3 4 5 6

~~Busswell MD~~ ✓

Clark BIC ✓  
No further comment

Madison ✓

- SIGNATURE
- APPROVAL
- COMMENT
- PREPARE REPLY
- PREPARE BLOTTER
- ATTACH PREV DISTRIBUTION
- STAMP INDORSEMENT
- TYPE FINAL
- FILE ( )
- RETURN TO
- MAILING
- SUSPENSE TO DISPATCH

REMARKS:

ROUTED FROM:

Madison

PAD FORM 489  
REV 11 OCT 45

ROUTING SLIP		DATE 2, 28/51					
DO NOT DETACH FROM CORRESPONDENCE		FILE NO.					
ROUTE TO	ROUTING ORDER						REASON (For)
	1	2	3	4	5	6	
BUSWELL MB	✓						<input type="checkbox"/> SIGNATURE
<del>CLARK</del>							<input type="checkbox"/> APPROVAL
CLARK		✓					<input type="checkbox"/> COMMENT
							<input type="checkbox"/> PREPARE REPLY
							<input type="checkbox"/> PREPARE BLOTTER
							<input type="checkbox"/> ATTACH PREV
							<input type="checkbox"/> DISTRIBUTION
							<input type="checkbox"/> STAMP INDORSEMENT
							<input type="checkbox"/> TYPE FINAL
							<input type="checkbox"/> FILE ( )
							<input type="checkbox"/> RETURN TO
							<input type="checkbox"/> MAILING
							<input type="checkbox"/> SUSPENSE TO
							<input type="checkbox"/> DISPATCH
REMARKS: COPY FOR B. J. CLARK.							
ROUTED FROM: MADISON.							

PAD FORM 489  
REV 11 OCT 45

Item 5' - This evidently applies to Conway where  
bdy. damage, in spite of appx. 76 curvils,  
appeared superficial. Except for 1 or 2  
stores where locks had been moved to safety,  
1st floor levels were not reached by  
flood water.

Items 8 d, e, f. - Possibly some duplication here.  
Also I don't agree with the areas  
affected as shown. My rough estimate of  
the areas are as follows:

land lost by severe erosion : 10-20 acres

land eroded but capable of  
being reclaimed : 50-75 acres

land having appreciable amounts  
of sand and silt deposits : 1300 acres (no change)

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Suggest reduction of total damages by  
\$300,000 to \$400,000.

B J Clark

ROUTING SLIP			DATE
DO NOT DETACH FROM CORRESPONDENCE			FILE NO.
NO.	ROUTE TO	INITIAL	REASON (FOR)
	<i>Hopton H</i>		<input type="checkbox"/> ACTION <input type="checkbox"/> SIGNATURE <input type="checkbox"/> APPROVAL <input checked="" type="checkbox"/> NOTE & RETURN <input type="checkbox"/> COMMENTS <input type="checkbox"/> INFORMATION <input type="checkbox"/> PREPARE REPLY <input type="checkbox"/> MAILING <input type="checkbox"/> FILE
	<i>Brewell</i>		
	<i>Madison H.P.M.</i>		
<b>REMARKS:</b> <p><i>I'm looking over Harry's sheet flood damage estimate, several items in Area 1, left blank, seem questionable. With brief comments they are as follows:</i></p> <p><i>Item 5 a: - One group of farm buildings was entirely lost - say value \$20,000-25,000. Other farm buildings affected in Dist. 13 and 3 were flooded by quiet water generally to depths below 1st floor levels. \$100,000 rather than \$200,000 sounds more reasonable to me.</i></p> <p><i>(over)</i></p>			
<b>ROUTED FROM:</b> <i>B.G. Clark</i>			

NPS FORM 663  
14 FEB 47

Army-Sea. Dist., Wn.

SKAGIT RIVER

FEB. 1951 HW DAMAGES  
(Rough Estimate)

1951 Prices

Madison  
2/26/51

	Area 1 Left Bank	Area 1 Rt. Bank	Area 3 Clear Lk. Nookachamp	Area 4 Burlington To Bend	Sedro Woolley To Rockport	Avon By-Pass	Avon By-Pass To Riv. Mouth
1. Flood Fighting	\$ 25,000	\$ 20,000	\$	\$ 2,000	\$	\$	\$
2. Restoration of Flood Control Works	125,000						
3. " " Salt Water Levees	15,000						
4. Drainage Systems	10,000						
5. Bldgs. and Contents			25,000	10,000	20,000	10,000	6,000
a. Rural	300,000						
b. Urban	70,000						
6. City Streets & Sewers (Mt. Vernon)	0						
7. Refugees			1,000	1,000	1,000		
a. Rural	2,000						
b. Urban	1,000						
8. Land & Crops	200,000		40,000	15,000	30,000		10,000
a. Salt Water Damage	40,000						
b. Fences	15,000		2,000	1,000			
c. Weeds	60,000		12,000	3,000			2,000
d. Minor Silting	50,000						
e. Erosion	85,000		10,000	1,000			
f. Clean up	90,000		20,000	5,000	5,000		4,000
9. Farm Machinery	10,000		5,000	3,000			
10. Autos	8,000		5,000				1,000
11. Livestock	15,000		5,000		1,000		
12. Loss in Milk Production	6,000		1,000				
13. Loss to Business & Employees	25,000						

SEE REVISED SUMMARY

*additional*

P 001103

SKAGIT RIVER

FEB. 1951 HW DAMAGES  
(Rough Estimate)

1951 Prices

Madison  
2/26/51

Areal      Area 1      Area 3      Area 4  
Left Bank Rt. Bank Clear Lake Burlington  
Nookachamp Bend  
Sedro Woolley  
To Rockport Avon By-Pass  
Avon By-Pass To Riv.Mouth

14. Wirelines	<del>10,000</del>	\$	\$ 1,000	\$	\$	\$	\$
15. Highways & Roads							
a. Other than bridges	<del>20,000</del>		15,000	1,000	1,000	2,000	1,000
b. Bridges	<del>0</del>		1,000			2,000	
16. Railroads							
a. Other than bridges	<del>0</del>					4/1,000	
b. Bridges	<del>0</del>						
17. Traffic Interruption							
a. Highways	<del>40,000</del>		15,000		10,000		
b. Railroads	<del>0</del>						
c. Stage & Auto Freight	<del>6,000</del>						
18. Snagging						7,000	2,000
19. Misc. (Incl. 10 to 14)				2,000			
TOTAL	<del>\$1,228,000</del>	\$20,000	\$158,000	\$44,000	\$68,000	\$22,000	\$26,000
GRAND TOTAL	<del>963,600</del>						<del>\$1,566,000</del> <u>1,301,600</u>

1/ 1,280 AC at \$30

2/ 190 AC Erosion at \$450

3/ 80 Cows lost diking Dist. #13 at \$140 ea.

4/ G.N.Ry. Main Line North of Skagit R. Bridge

DATA OBTAINED FROM  
 Iner C. Nelson, 11 March 1951

Cost Estimate of Flood Fighting on the Skagit River  
 from Burlington to Conway, 10-11-12 February 1951

Labor estimate for Burlington:

Filling, carrying and placing filled sacks-----	400	man-days
District #17 area and vicinity-----	600	" "
Avon area west of Mount Vernon-----	400	" "
Conway area and Fir Island area-----	600	" "
Mount Vernon-----	300	" "
<hr/>		
Total volunteer labor in Skagit River area-----	2,300	" "
<hr/>		
County employees-----	100	" "
<hr/>		
Navy Air Force-----	100	" "
<hr/>		
Washington National Guard-----	400	" "
<hr/>		
U. S. Army-----	80	" "
Total military force-----	580	" "
<hr/>		
Grand total-----		2,980 man-days

Equipment:

County trucks-----	40	8-hour days
Army Dukw's (4)-----	16	8 " "
1/4-ton jeeps (4)-----	16	8 " "
3/4-ton weapons carriers (3)-----	12	8 " "
1/2-ton personnel trucks (1)-----	4	8 " "
2 1/2-ton cargo trucks (5)-----	20	8 " "
<hr/>		
Sound truck (volunteer)-----	2	8 " "

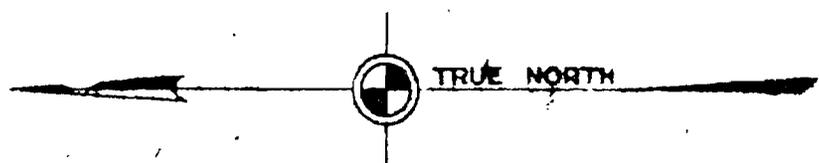
Radio station KBRC (volunteer)

Many private cars and trucks volunteered of which there is no record.

Sacks, Gov't furnished at 15¢ each-----	105,874	<i>No. sacks at cost</i>
Sacks, private, estimated at 17¢ each-----	10,000	
<hr/>		
Red Cross provided meals-----	1,860	
Elks Club and American Legion lunches-----	2,000	
<hr/>		
Beds, nights -----	400	
Sheriff's force -----		
County Engineer force -----		

SHORELINE  
ETC  
(Shoreline taken from U.S. G.S. sheets)

B  
A



### LEGEND

- Drainage Ditch -----
- Diking district boundary - - - - -
- Dike shown thus [dashed line with dots]
- Paved road [solid line]
- Other road [dashed line]
- Topography shown thus [wavy line]
- taken from U.S.G.S. Quadrangle sheets.
- Distance in miles from mouth of North Fork (4) ←

P 001106

S  
K  
A  
G  
I  
T

# SKAGIT RIVER, WASHINGTON

## RIVER TOPOGRAPHY

### 1951 FLOODED AREA

In 2 Sheets                      Sheet No. 2                      Scale  $\frac{1}{31680}$

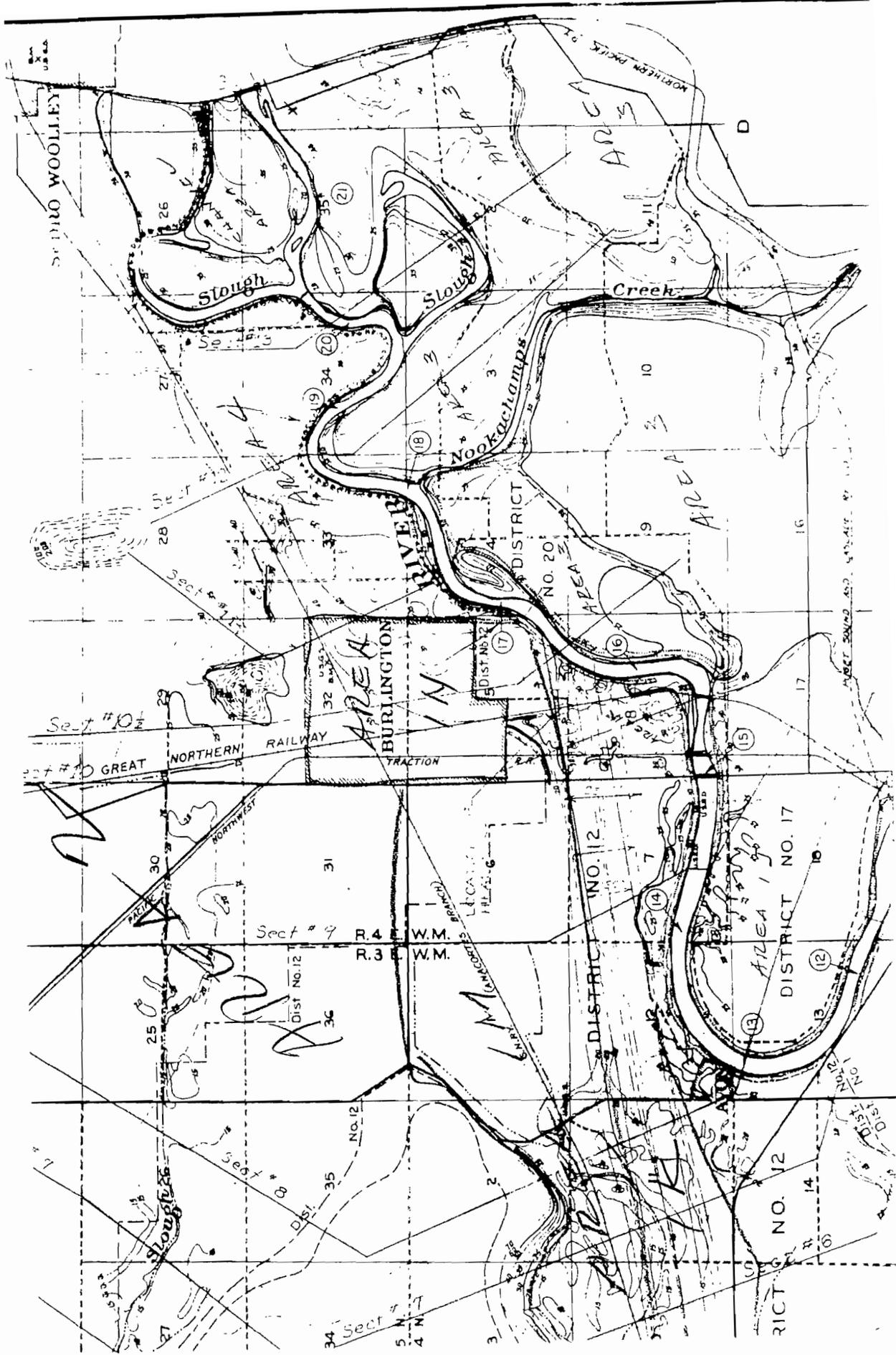
2 MILES

U.S. Engineer Office, Seattle, Wash., Oct. 1, 1949

DEP. G. PROATS  
CHECKED

RIVER BANK FLOOD PROFILES  
FILE NO. E-6-6-52

2064 m - 14 FEB. 1951



Name: *B. J. Clark*

Date:

Project:

*Skagit River Flood - February 10-11-12, 1951*

Job:



#432

*Feb 10, am. Break, Dist #13 about 1000 feet below N. Fork Bridge. This break enlarged and another one developed, completely destroying the barn shown and also an adjoining farm house and all other buildings.*

*Note: On 11 Feb a more serious break in Dist. #13 occurred on Peew Slough near its head. This break and the one above flooded the entire district causing much damage from scour, deposition of silt, and inundation.*



#431

*Feb 10, am Break, private dike on Freshwater Slough about 1 mile below S. Fork Bridge. County bridge leading to this island was later washed out.*

*Note: In Nov. 1949 flood this levee was overtopped but did not fail.*

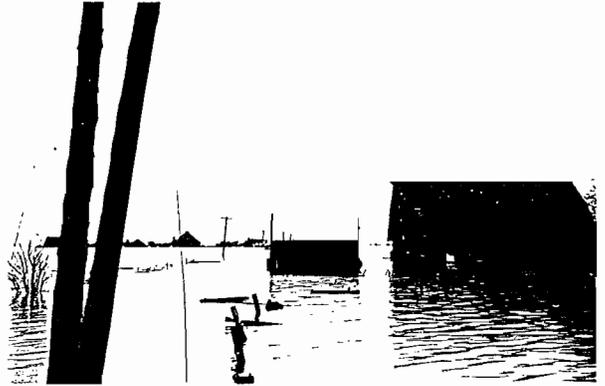
Name: *B. J. Clark*

Date:

Project:

*Skagit River Floods - Nov. 1949 and Feb. 1951*

# 307



# 305

# 306



← *Milltown Break, S. Fork. 28 Nov 1949*

*Views in 1949 flood from G.H. Ry. grade*

# 428



← *Milltown Break on 10 Feb 1951*

*Uncompleted Milltown levee repairs on 10 Feb 1951 shown below.*

P 001109



# 430

Name: *B. J. Clark*

Date:

Project:

*Stagit River Flood - February 10-12, 1951*

Job:

*Feb 11, am Break on South Fork  
just below Conway.*

*All pictures this sheet taken  
from G.H. Ry. grade, which was  
reached by wading in from  
Hwy. #99 before the water got  
too deep.*

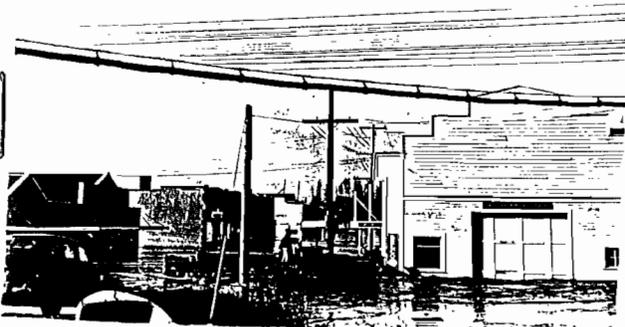
*#436*



*Feb. 11, am.*

*View of Conway*

*#435*



*#433*

*Feb. 11, am Views of Co*

*All residents were safely evacuated*



*#434*

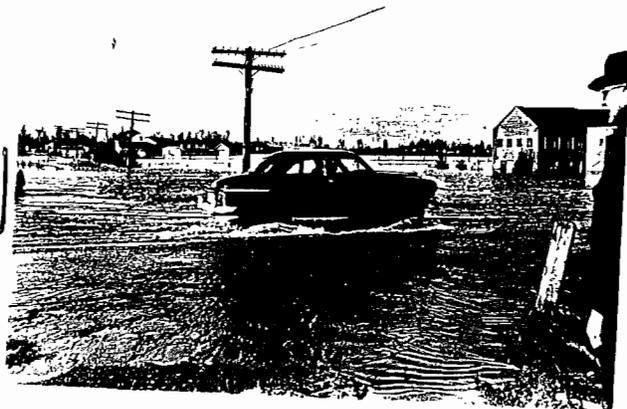
Name: *B. J. Clark*

Date:

Project:

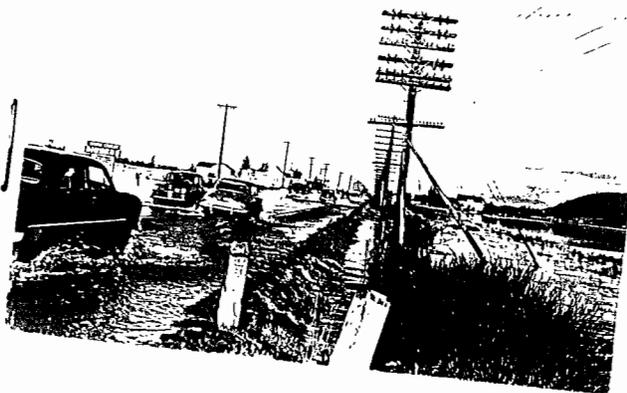
*Skagit River Flood - February 1951*

Job:



These two photos show Highway #99 just east of Conway on 11 Feb 1951 about noon. Traffic was heavy because it was Sunday.

Water was rising rapidly at this time from the Conway and Hilltown breaks. About an hour after these photos were taken the highway was closed to traffic and remained closed for more than a week.



View north toward Mt. Vernon. The water later got much deeper, but even at this time the pavement was difficult to follow in many places and the shoulders were getting badly eroded. Only luck prevented a serious traffic tie-up in the rising water.

The highway should have been closed much sooner.

P 001111

1949

STREAM	GAGE	DATE	Q	
			DAILY MEAN	PEAK
Slegit	Hope	27 Nov	6,500	
	At Newhalen	"	8,560	
	At Marblemont	"	29,000	59,300
	Nr Concrete	"	123,000	154,000
	Nr Mt. Vernon	28 Nov	91,000	114,000
Cascade	at Marblemont	27 Nov	10,200	17,800
Sank	Nr Sank	"	55,800	82,400
Baker	at Conete	"	25,100	35,200

LEVEE BREAKS

1. Fall Slough
2. District 15 (7 breaks)
3. District 21 (1 break)
4. North Fork (2 breaks), at Dodge Valley
5. South Fork, north of Hilltown (R.R. fill)

1949 [Contd.]

## AREAS FLOODED

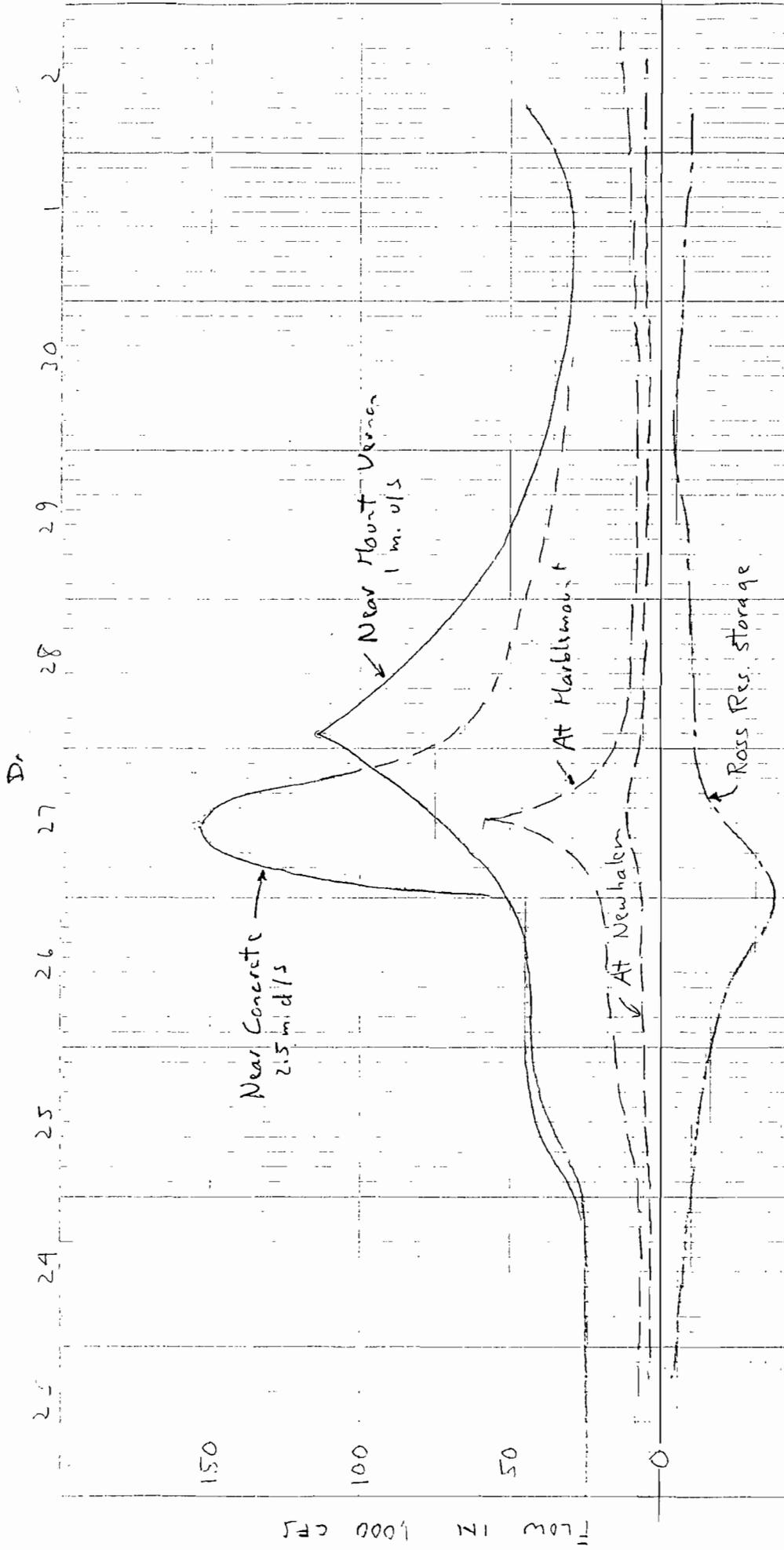
1. District 15 } 917 ares
2. District 21 }
3. Small portion of District 13 - 92 ares
4. South end of District 3 - 887 ares
5. Delta between Freshwater Slough and Ten Mile Slough - 693 ares

## DAMAGES (1950 prices)

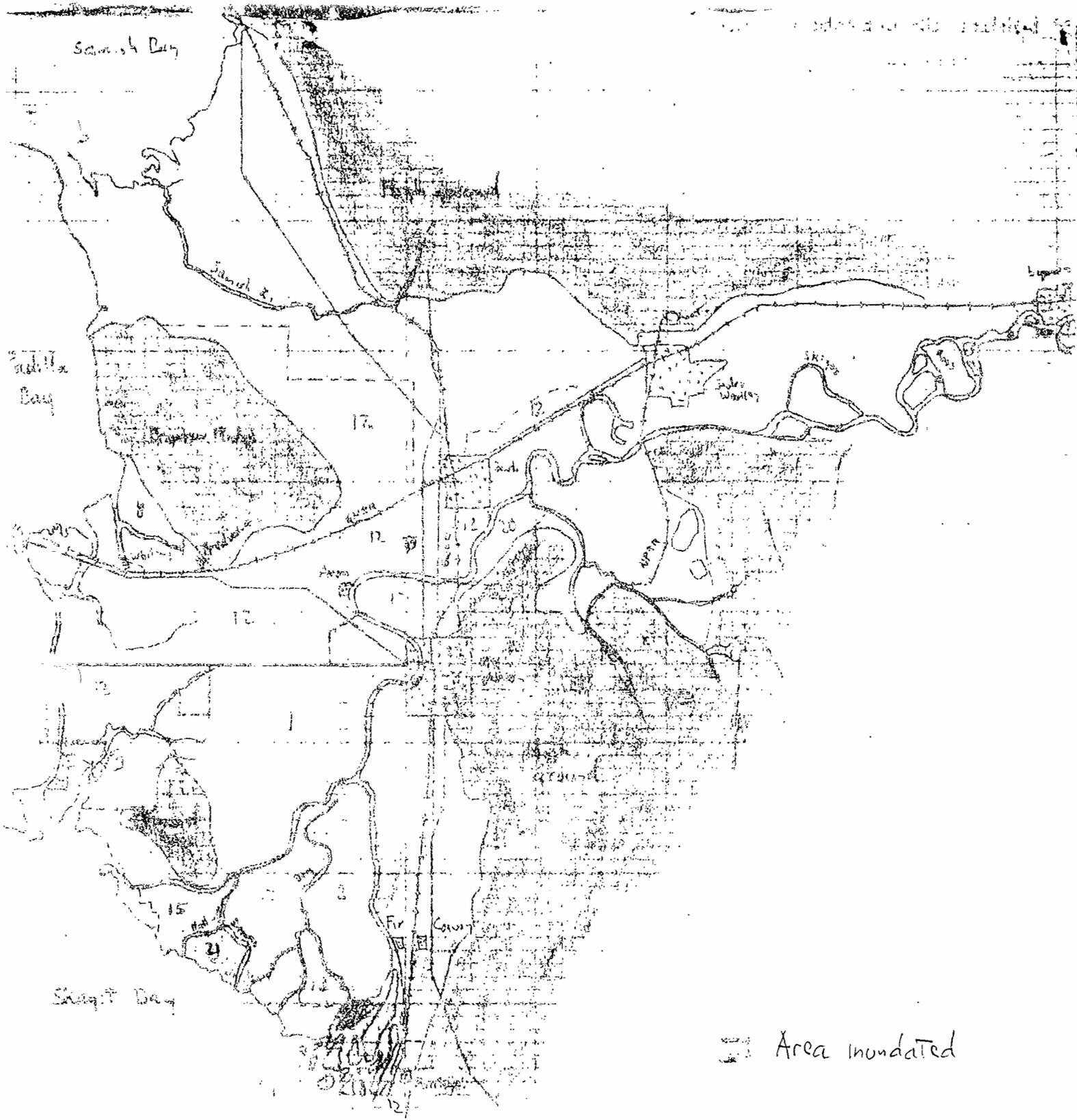
PT. bank d/s from Burlington	\$ 23,320
Int. bank d/s from Burlington and Fri Island	165,109
Saville valley	1,325
Northclamps Creek - Chen Lake	48,080
PT. bank - Burlington - Seds Woolley	22,950
Seds Woolley - Rockport	267,540

1949 [Cont'd]

ROSS RESERVOIR					
Date	Res Elev	Capacity 1000 AF	$\Delta$ 1000 AF	$\Delta$ cfs	Q at Newhalen
Nov				+ Storage	
23	549.35	885	+12	+6,000	3,500
24	50.64	895	+20	+10,000	3,320
25	2.87	915	+35	+17,000	5,220
26	6.90	950	+63	+31,500	6,260
27	62.52	1,013	+27	+13,000	8,560
28	6.03	1,040	+18	+9,000	5,760
29	7.96	1,058	+10	+5,000	4,670
30	9.06	1,068	+14	+7,000	4,330
DEC					
1	70.56	1,082	+18	+9,000	5,190
2	2.22	1,100			5,620



SKAGIT RIVER  
 WASH.  
 FLOOD HYDROGRAPH  
 NOV 1949



Area inundated

SKAGIT RIVER WASH  
 FLOOD PLAN  
 1949

File No. - 7-8  
Eng'r Data - Skagit River  
Civil Works Branch, Eng'r Div.

147.1/78

U. S. ENGINEER OFFICE  
SEATTLE, WASH.

*Negatives of photos 7-8a*

Memo on Skagit Flood of February, 1932.

On the morning of February 27, 1932, the writer was detailed to observe the impending flood on the Skagit River. The party consisted of five men besides the writer. The equipment included a Hudson sedan, a Model A Ford truck, a boat on a trailer and necessary surveying and sounding equipment.

The object of the trip was two-fold. It was desired:

- (1) To obtain general data pertaining to the flood, determine high water marks, and note breaks in the dikes, if any.
- (2) To measure the discharge at or near Sedro Woolley by the slope method (Kutter's formula) in order to study the effect of channel storage by the difference in flow between Sedro Woolley and the U.S.G.S. gage at the Dalles.

Transportation was hampered by flooded roads. The Ford truck arrived at Sedro Woolley about 5:00 p.m., with the equipment and a gage was immediately set on the left (south) bank of the Skagit at mile 22.6, about a half mile above the highway bridge. All stream mileage used in this report is as shown on drawings of river topography to scale of 2 inches to the mile. Readings at 15 minute intervals were started at once (6:00 p.m.) and were continued throughout the night and the following day.

An attempt was made to establish a gage on the right (north) bank a mile farther upstream. The low lands and the roads were so badly flooded that this was found to be practically inaccessible. Two men were then sent up along the logging railroad on the left bank of the river. A gage was established at mile 23.8 by them, and readings started at 9:30 p.m., Feb. 27, were continued throughout the night and the following day. The crest was reached at 7:00 a.m., Sunday, Feb. 28.

On Sunday morning I went down the river on an inspection trip and marked the water surface on convenient objects at a half dozen places between Sterling Bend and Mt. Vernon (9:00 to 11:00 a.m.). These marks were later proven to represent the crest of the flood.

Three principal breaks occurred in the dikes, in the following order.

The first and probably the most serious break occurred Saturday evening, Feb. 27 on the right bank of the South Fork a mile above Fir <sup>Failure</sup> ~~Failure~~ occurred by a boil. About 500 feet of dike was washed away. About five acres of good tillable land was badly eroded and strewn with snags. One residence was knocked off its foundation. About three sections of farm land were inundated. See photos Nos. 10, 11, and 12.

P 001117

*V* *E.S.P.* *11*

*all. n. 7-8*

The second break occurred Sunday morning about 5:00 a.m. on the right bank of Deer Slough, locally known as Dry Slough, about 2 miles below its confluence with the North Fork. Approximately 90 feet of dike was eroded, starting with a boil. The break occurred directly in front of a large, rather cheaply built barn, and undermined it. It was badly racked, and will have to be torn down. The ranchers intend to build a new dike out around the site of the barn, which will add about an acre to the slough channel. See photos Nos. 13, 14, and 15. At least two sections of good farm land were flooded.

The third break occurred on the right bank of the main Skagit at mile 16.2 a half mile above the Great Northern Railway bridge about noon of the 28th. It also started from a boil. About 150 feet of dike was eroded. The released water overtopped the Great Northern Railway grade and washed out the fill in two places for lengths of 130 and 360 feet, respectively. Part of the water flowed over the Pacific Highway to a depth of about 3 feet, and part went under the trestle bridge near the S.E. corner of Sec.6, T. 34 N., R. 4 E. It spread out over the farm land and finally found its way to the Sound, largely to the north of Avon, via Fredonia and Whitney. No extensive damage was sustained, outside of the erosion of the Great Northern grade. See photos Nos. 7, 16, and 17.

By Sunday evening through auto traffic was at a stand still. The Pacific Highway was closed south of Burlington, the Avon-Bellingham road was closed because of a washed out bridge, the highway was badly flooded between Lyman and Hamilton, the Sedro Woolley-Wickersham road was closed, and the fill on the Sedro Woolley-Clear Lake road was washed out at the approach to the Skagit River bridge. We were forced to use the Northern Pacific bridge to get across to our gages. The Great Northern Railway was out of commission at the break south of Burlington.

The velocity of the river was clocked at 8:30 a.m. <sup>Feb. 28</sup> between the highway and the Northern Pacific Railway bridges near Sedro Woolley as 9 miles per hour.

On Sunday afternoon a gage was established on the right bank opposite the lower gage on the left bank. It was placed on a small frame pump house on Township Avenue, about 100 feet south of Dunlop Avenue. Township Avenue follows the township line between Ranges 4 and 5 East. Readings were started at 2:45 p.m. of the 28th and were continued throughout the night.

During the ensuing week, differential levels in a closed circuit were run to the gages from the U.S.G.S. bench in Sedro Woolley. The distance between the two gages on the left bank was chained. The current in the river was found to be too swift to safely take cross sections of the river at that time.

Another section of the river was taken just below the Pacific Highway, mile 14 to 15. A profile of the high water mark was obtained and four cross sections of the stream were made. This was to be used as a check on the measurements near Sedro Woolley.

As a general rule the high water mark was only a foot below the top of the dikes from Burlington down to Conway. At the Great Northern bridge the crest was a half foot lower than that for the 1921 flood.

The high water profile for the flood was obtained from Birdsvew to Conway, and is shown in the following table.

Miles: above: mouth:	Point on river Locality	Elevation: :U.S.G.S.:	Date of occurrence	Approx.: slope : (Ft.per: mile) :	Remarks
45.5	:Birdsvew R. R.	: 127.5	: *	: :	:At mouth of Grundy Cr.
	: Station	: :	: :	: 6.1	:
40.±	:At Hamilton	: 93.6	: *	: :	:
	: :	: :	: :	: 2.8	:
35.1	:Lyman	: 79.8	: *	: :	:At mouth of Etach Cr.
	: :	: :	: :	: 4.7	:
32.3±	:Minkler Lake	: 66.7	: *	: :	:At G. N. Bridge No. 37.
	: :	: :	: :	: 2.1	:
23.8	:Near Sedro	: 49.1	: 7:00 a.m.	: :	:At Suspension Pipe Crossing.
	: Woolley	: :	: Feb. 28, 1932	: 3.1	:
22.7	: -do-	: 45.7	: -do-	: :	:
	: :	: :	: :	: 0.2	:
20.5±	:Below Sterling	: 45.3±	: 9:30 a.m.	: :	:This elevation is based
	: Bend	: :	: Feb. 28	: 2.0	:on a stadia survey.
17.4±	:E. of Burlington:	: 39.3	: 10:00 a.m.	: :	:
	: :	: :	: Feb. 28	: 1.6	:
16.0	:Above G.N.Bridge:	: 37.1	: 10:30 a.m.	: :	:
	: :	: :	: Feb. 28	: 1.0	:
15.5	:At G. N. Bridge	: 36.6	: *	: :	:
	: :	: :	: :	: 1.4	:
13.0	:At Avon	: 33.0	: 11:00 a.m.	: :	:
	: :	: :	: Feb. 28	: 2.0	:
10.5	:At Mt. Vernon	: 28.0	: 11:30 a.m.	: :	:
	: :	: :	: Feb. 28	: 1.9	:
0.4 <sup>#</sup> :2 <sup>1</sup> / <sub>2</sub>	: miles S. of	: 21.2	: *	: :	:On left bank - South Fork.
	: Mt. Vernon	: :	: :	: 2.4	:
3.1 <sup>#</sup>	:At Conway	: 14.8	: *	: :	:On left bank - South Fork.
	: :	: :	: :	: 1.8	:
3.1 <sup>#</sup>	: -do-	: 16.3	: *	: :	:On right bank - South Fork.

\* Observed high water mark - exact time unknown.

# Miles below fork which is 7.3 miles above mouth of North Fork.

The approximate slope shown in the table is rather erratic due probably to errors in the mileage, as the high water marks in some cases were taken a mile or more from the natural low water channel, on which the river mileage is measured. The average slope of the surface between Hamilton and Sedro Woolley was 2.7 feet per mile, and between Sedro Woolley and Conway was 1.6 feet per mile.

It was noticed in studying high water marks, that large quantities of silt were present in the stream at and above Sedro Woolley, but were practically

absent on the lower reaches. Apparently most of this silt was deposited at Sterling Bend and Nookachamps Creek.



No. 1. Looking southwest from the right bank of the Skagit at mile 24. Our upper gage was located on the opposite bank in this immediate vicinity. The main channel is in the background, with overflowed bank of stream in the foreground. Picture taken 10:00 a.m., Feb. 29.



No. 2. Looking south along the Clear Lake road from near the city limits of Sedro Woolley. This fill was composed of sand with some clay and flattened out like molasses when it became saturated. The fill was not overtopped. Note some water still flowing through the break. Picture taken 10:00 a.m., Feb. 29.



No. 3. Looking north along the Clear Lake road at same break shown in No. 2. Picture taken March 3d.



No. 4. Looking north along the Clear Lake road at break shown in Nos. 2 and 3. Picture taken March 2d.



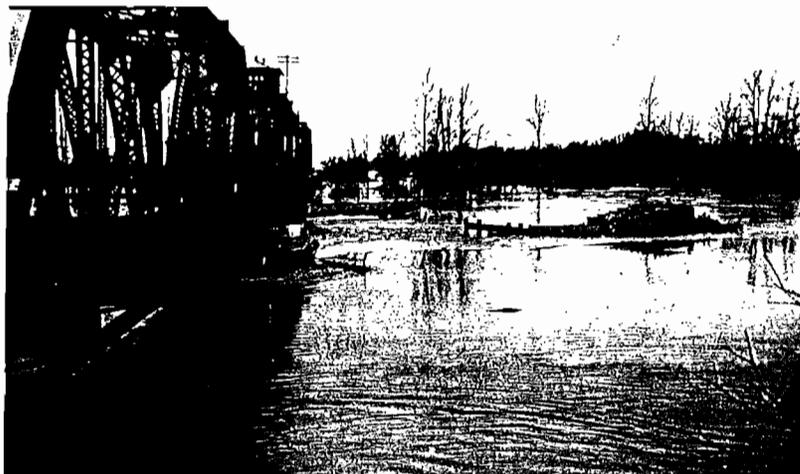
No. 5. Looking south from the Great Northern Railway near the north and south highway near the east side of section 27, T. 35 N., R. 4 E. This lake was formed immediately below Sterling Bend. Picture taken at 9:30 a.m., Feb. 28th.



No. 6. Looking east along the road that runs out of Burlington to the east. Picture taken at 10:00 a.m., Feb. 28th from the top of the dike.



No. 7. Looking upstream (north) along the broken dike above the Great Northern Railway bridge. (mile 16.2). Note the old pile trestle that was used to repair the dike after the 1921 flood. The main river channel is on the right. Picture taken 2:00 p.m., March 1st.



No. 8. Looking north along the upstream side of the Great Northern Railway bridge (mile 15.5) at the crest of the flood (10:30 a.m., Feb. 28).



No. 9. Looking downstream to the southwest, from the Great Northern Railway bridge, 10:30 a.m., Feb. 28th. The main river channel is in the background. The buildings are located on the channel side of the dike. (Invisible on the right.)



No. 10. Looking upstream along the dike at the break on the right bank of the South Fork a mile north of Conway, taken about 2:00 p.m., March 2d. The river channel to the right is not visible. The lake in the foreground is formed by the water after passing through the broken dike. Note the numerous large snags stranded in the door-yard. The white house in the left background was knocked off its foundation.



No. 11. This picture was taken from approximately the same point as No. 10, looking more to the west. An orchard is shown in the background, part of which was washed away. The snag in the left foreground is located in what was the front yard of a large farm house. The house was not damaged.



No. 12. Looking west from the dike. The farm house mentioned in No. 11 is shown in part on the extreme right. Note the flooded land in the background. This flooded area extended over to Deer Slough and covered about three sections.



No. 13. Looking north along the broken dike on the right (west) side of Deer Slough on the morning of March 3d. On the left is the barn that was undermined and badly racked.



No. 14. Another view of the barn showing the flooded farm land in the background.



No. 15. Looking southwest from the dike at the downstream end of the break on Deer Slough.



No. 16. Looking north along the Great Northern Railway washout, near Burlington. Track undermined for 360 feet at this location. A break occurred here during the 1921 flood. Note that the old trestle used in repairing the roadbed after the 1921 flood is still in place and was used to shore up the track after the present flood. Picture taken at 2:00 p.m., Feb. 29th.



No. 17. Looking southeast from the Pacific Highway, showing the water that has passed through the break in the dike near Burlington. This flow passed under the trestle at the Highway. Picture taken about 2:00 p.m., Feb. 29th.

*R. W. Lincoln*  
*assoc. H. E. Eng.*  
*Mar. 8, 1932*

P 001128

38.7 U.S.G.S.  
36.8  
34.9

H.W. 11/30/09 = 134.7 G.M.  
H.W. Jan/18 = 132.8 G.M.  
H.W. 2/24 = 150.9 G.M.

G.N. Profile G/9.19 Roll 1 shown  
GN 200 = U.S.G.S. 109

Addenda

Miscellaneous Benchmarks.  
U.S.G.S. Datum

On Great Northern Bridge over Skagit River. A chiseled square on the northwest corner of the concrete wing wall of the north approach abutment, about a foot below the base of rail. Elevation, 44.57.

Same bridge. Base of rail at the center of the swing span. Elevation, 48.2.

On Pacific Highway near south approach of Skagit River Bridge. Concrete monument a foot below a cast iron cover marked "MC" at cross roads at south end of bridge. Elevation, 33.38.

Avon - Top of concrete gate structure of Anacortes water supply, at south edge of. Elevation, 34.88. This bench run from Avon station by spirit leveling with a small transit and was not checked back.

Miscellaneous High Water Marks.

Location	Skagit River		
	1917 Flood	1921 Flood	1932 Flood (Lincoln)
Great Northern Bridge,		37.1	36.6
Avon,	31.5 <sup>a</sup>	31.2 <sup>a</sup>	33.0 <sup>b</sup>
On Anacortes branch of G. N. Railroad, 2,000 feet west of Avon station,	22.4 <sup>c</sup>	28.0 <sup>c</sup>	
Ditto, 7,000 feet west of Avon station,	17.8 <sup>c</sup>	20.0 <sup>c</sup>	
Ditto, 3,000 feet east of Whitney,	8.2 <sup>c</sup>	9.8 <sup>c</sup>	
At Fir, to the west of the South Fork,		14.1 <sup>d</sup>	11.2

From Long's topog.

<sup>a</sup> From data secured in 1930 by B. G. Long and shown on plane table sheets File K/2/93 as being on left bank of river.

<sup>b</sup> On right bank at intake of Anacortes water supply.

P 001129

<sup>c</sup> See File K/2/93.

<sup>d</sup> See page 12, Field Book 4/73, Pease, 1924.

*Rev. L.*

1935

STREAM	GAGE	DATE	9	
			DAILY MEAN	PEAK
Slogit	Nr Hope	25 Jan	5,200	
	At Newbale	26 Jan	24,800	(25 Jan) 30,200
	Nr Concrete	25 Jan	120,000	131,000
Cascade	At Marlborough	25 Jan	8,550	
Saul	Nr Saul	"	46,300	

LEVEE BREAKS

- 0.75 mi. E. of Burlington, 0.5 mi. N. of Slogit P.

Others?

AREAS FLOODED

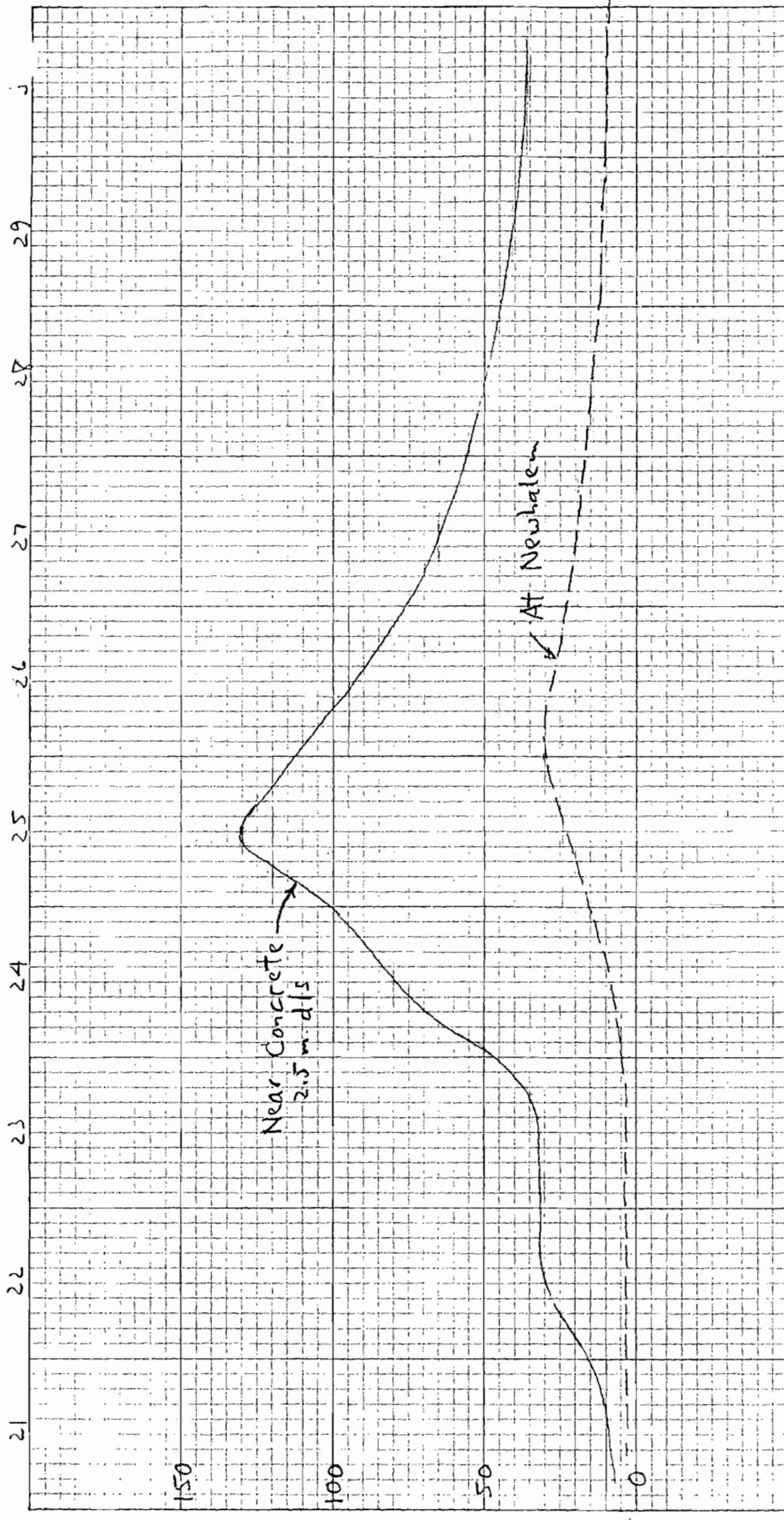
- Stealing Bend

Others?

DAMAGES

?

DAYS



SKAGIT RIVER WASH.  
FLOOD HYDROGRAPH  
JAN 1935

1932

STREAM	GAGE	DATE	Q	
			DAILY MEAN	PEAK
Shagitt	At Newhalem	28 Feb	32,100	(27 Feb) 45,000
	Nr Concrete	27 Feb	129,000	147,000
Cascade	At Marblemont	27 Feb	9,250	
Saul	Nr Saul	26 Feb	51,400	68,500

LEVEE BREAKS

1. South Fork, 1 m. above Conway, rt. bank. Boil, 500 l.f. washed out

2. Dry Slough, 2 m. below North Fork. Boil. 90 l.f.

3. Shagitt, 0.5 m. above G.N.R.R. bridge, rt. bank.  
(Borrow pit.)  
Boil. 150 l.f.

4. Note: River about 1' below top of dike

5. Left bank lower No. Fork

1932 [cont'd]

AREAS FLOODED

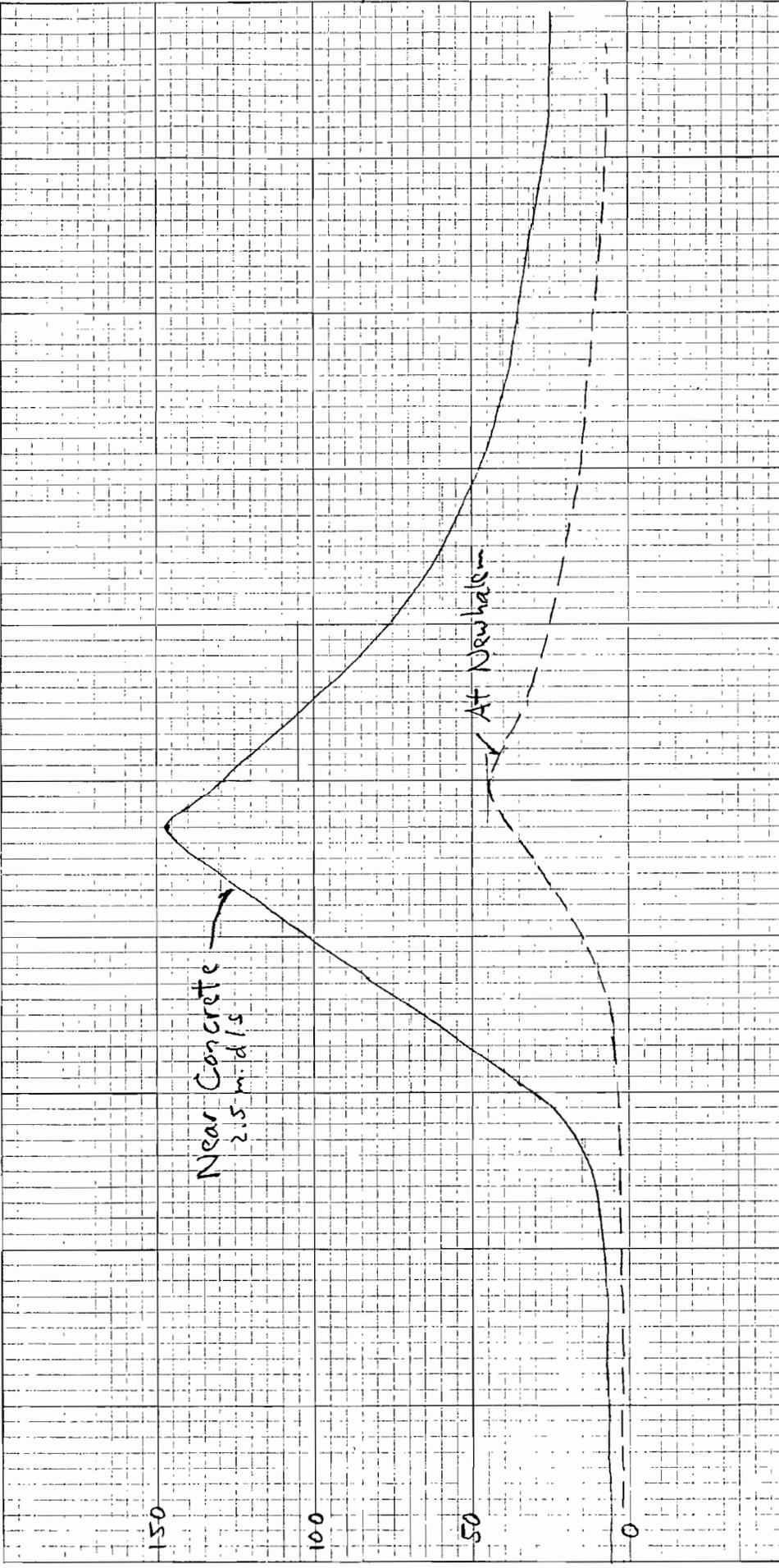
1. District 2. About 3 sects. So. Fl. to Dry Slough.
2. District 13. At least 2 sects.
3. Though GNR&P fill on rt. bal of Slough so. of Burlington, over and under old Hwy 99, to Sand - north of Avon, past Fredonia and Whitney, District 12.

DAMAGES

1. District 2. 5 acres eroded, dikes. 1 house moved. 8-10 breaks in sea dikes.
2. District 13. Barn destroyed
3. District 12. 490 dy. RR fill washed out. No other serious damage
4. Highway closures: Hwy 99 so. of Burlington, bridge washed out on Avon-Bellington road, flooding on Lynn-Hamilton road, Sids Woolley - Wickesham, Sids Woolley - Clear Lake fill collapsed no. of Slough bridge

DAY

23 24 25 26 27 28 29 30 31 32 33



Near Concrete  
2.5 m. d/s

At Newhalem

SKAGIT RIVER WASH.

FLOOD HYDROGRAPH

FEB 1932

Flow in 1,000 cfs



1921

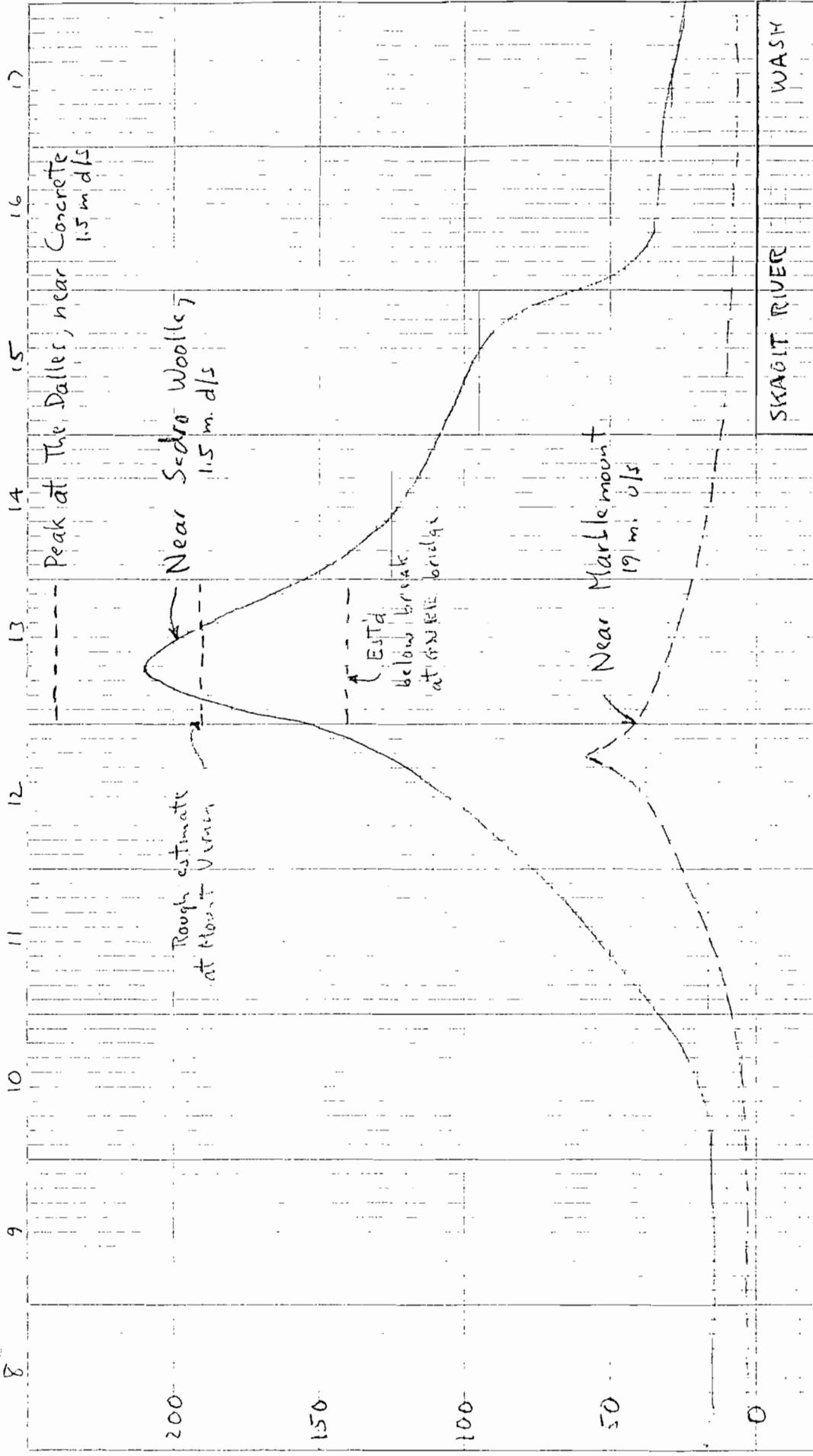
STREAM	GAGE	DATE	Q	
			DAILY MEAN	PEAK
Slagitt	[Below Ruby Cut] N. Marblemont	12 Dec	29,200	45,700
	At Reflector Bar near Marblemont	"	38,000	58,000
	at The Dalles near Concrete	13 Dec		240,000
	Near Soda Woolley	"	188,000	210,000
Saul	[Mile 23] At Darrington	12 Dec	27,000	36,000
Bales	Below Anderson Cut near Concrete	12 Dec	19,600	23,600

LEVEE BREAKS

1. Above GNR bridge near Mt. Vernon

Others?

D.



SKAGIT RIVER WASH

FLOOD HYDROGRAPH

DEC 1921

HUNT  
2 JUN 61

Flow in 1000 CFS

P 001137



# Shogit River

## PEAK FLOWS

### At Mt. Vernon

1961

60

59 92,300 - 30 Apr

58 43,900 - 17 Jan

57

56 64,000 - 20 Oct

55 107,000 - 4 Nov

54 60,800 - 20 Nov

53 57,900 - 1 Nov, 65,700 - 1 Feb

52 41,400 - 5 Jun

\* 51 144,000 - 11 Feb

50

\* 49 114,000 - 28 Nov, 56,200 - 13 May

48

47 69,400 - 19 Oct

46 64,900 - 25 Oct

45 94,300 - 26 Oct, 59,800 - 8 Feb

44

43 55,700 - 3 Dec, 47,000 - 18 Jun

42

41 65,300 - 3 Dec, 28,100 - 17 May

Nr. Courele

1940

39 48,200 - 15 Dec 79,600 - 29 May

38

37 89,600 - 28 Oct, 68,300 - 19 Jun

36 60,000 - 3 Jun

\* 35 131,000 - 25 Jan

34

33 101,000 - 22 Dec\* 32 116,000 - 13 Nov, 147,000 - 27 Feb

31 60,600 - 26 Jun

30 32,200 - 7 Jun

29

28 74,300 - 9 Oct, 95,500 - 12 Jan

27

26 88,900 - 16 Oct

25 51,600 - 23 Dec

24 92,500 - 12 Dec

Near Sedro WoolleyAt The Dalles, Nr Courele

23

22 71,000 - 24 Dec

21 210,000 - 13 Dec

240,000 - 13 Dec

At The Dalles, No. Concrete

1917	220,000	-	30 Dec
1909	260,000	-	30 Nov
1897	275,000	-	19 Nov
1856	350,000	-	?

Near Sels Worley

1917	195,000	-	30 Dec
1909	220,000	-	30 Nov
1906	180,000	-	16 Nov
1897	190,000	-	19 Nov
1896	185,000	-	16 Nov
1856	300,000	-	Dec

Slipit River  
PAST FLOODING

## REFERENCES

- ✓ 1. HD 187, 1932
- ✓ 2. P.E. Mar 1932
- ✓ 3. Report, Jun 1942
- ✓ 4. Report, Feb 1952
- ✓ 5. Flood Control folder - 1952 study
- ✓ 6. " " " " 1932, 35, 49, 51 surveys.
- ✓ 7. SCS photo report on 1951 flood
- ✓ 8. Water Control Camps 5-22
- ✓ 9. " " " " 5-22
- 10.
11. 1950 damage appraisal, Vol. 5

# Shogit River

## PAST FLOODING

### 1. 308 Report, HD 187, 1932

1815 - 480,000 cfs (est'd) at The Dalles.

1932 - 182,000 (unregulated. Reduced 39% by operation of Lower Baker & Diablo.) 147,000 recorded at The Dalles.

1915-1932 - All floods occurred in winter months. However floods have occurred in other months.

p. 59 1896 - Jan. (22'), Jun (20'), Nov (24').  
Highest flood usually Nov, Dec.

Date	Below Diablo Dam		RM 54 2 m. below Baker &		RM 25 Nr. Lewis & Woolly	
	Stage	Elev. Q	Stage	Elev. Q	Stage	Elev. Q
1815	20.5	115	56.6	480	33.5	400
1856	18.5	95	44.6	350	30.0	300
1896					24.8	185
1897	12.5	48	38.4	270	24.9	190
1906					24.7	180
1909	15.4	70	36.4	260	26.5	220
1917	12.5	43	33.0	220	24.1	195
1921	14.5	63	34.9	240	24.3	210
1932		45 (47.4)*		147 (182)*	21.1	-
[1935] 1935		30.3		131	-	-

\* Unregulated (est'd)

p 56

1921 - Dike broke just above GN bridge at Mt. Vernon.  
 140,000 cfs estimated below this point. Total  
 discharge est'd at 190,000 cfs

1932 - Dike not overtopped - with about 1' of top (average.)  
 Dike break due to bomb. Total discharge assumed less  
 than 140,000 cfs. 4 major breaks - (1) Right bank So. Fl., 1 m.  
 north of Fir, bomb, break 500' long, 5 acres eroded & covered with debris,  
 1 house lifted, 3 sections of farm land inundated.

(2) Right bank Deer (or Day)  
 Slough, 2 m. below confluence with No. Fl., bomb, 90' dike cut,  
 large barn destroyed, 2 sects farm land inundated.

(3) Right bank Shagrit, 0.5 m  
 above GN RR bridge, bomb in borrow pit, 150' break in dike, 400' of GN RR grade  
 washed out [also occurred in 1921]. Water crossed highway, spread out over  
 farms, reached Podlike <sup>Bay</sup> via Fredonia & Whitney.

(4) Left bank lower No. Fl.

8-10 breaks in sea dikes permitted escape of water west of Fir.

## 2. Shagitt River Report, June 1942

p 16	Date	Below dike, Dan	RM 54	RM 25 - Sedo Woolley
		Q	Q	Q
	1910			114
	1933		101	91
	1934		131	110
[1952 Rpt] p 18	1949	14	158	135
	1951	12	139	150

Flood  
dike 9/10

41.5  
43.1

## 3. Shagitt River Report, Feb 1952

1949, 135,000 cfs at Sedo Woolley, 114,000 at Hwy 99.

1951 145,000 cfs, Burlington to Fords, no floodboard.

p 21 1949. (1) Left bank No. Fl., DD #15, water confined by sea dikes, 8' deep. DD #21 flooded (shallow) by water over dike from DD #15.

(2) 1.5 mi so. of Conway, left bank So. Fl., 25' DD #3 up to 5' deep. Stopped at cross dike near Shagitt City line.

1951. (1) Dry Slough break, DD #12, near confluence with No. Fl.
- (2) D/S for No. Fl. bridge, DD #13, depth up to 8' standing, several hundred acres scoured, 1 group farm bldgs destroyed.
- (3) South Ford near Sway, DD #1, overtopped section being repaired from 1949, also 0.25 m. so. of Sway, 50% of DD #3 flooded.

p. 35

Method used in determining theoretical flooding

3. Flood Control folder - 1952 flood damage study

	M.T.U. Study 99 stage	Base Q <sup>5</sup>	Seals Working stage stage	Seals Working stage ①
28 Nov 49	34.3	114	41.5	135
11 Feb 51	36.8	145	43.1	150

In 1951 some water crossed Burlington Lake dam

4. Flood Control folder - 1932, 35, 49, 51 surveys

1951 study - Map showing limit of floods in 51

5. 1951 Flood Damage Appraisal

Index of reference including flood damage  
limit of flooding

E-6-6-90 (1949)

E-6-6-92 (1950)

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Additional Information

1. levee construction started 1897.
2. Date of construction of Shreve Port dams:
  - 1927 Lower Bahr
  - 1930 Diabls
  - 1940-48 Ross

FCM/cp  
28 Feb '51

NPSGP  
812 .7(Skagit River)46

1 March 1951

Mr. H. O. Walberg  
County Engineer, Skagit County  
County Courthouse  
Mount Vernon, Washington

Dear Mr. Walberg:

It is understood that hourly readings were taken by you at the staff gage in town of Mount Vernon during a major portion of the 9-12 February 1951 flood. This office would appreciate receiving a copy of these data, or a plotting of the data, if available. An additional copy of your plotting of the November 1949 flood is also desired for study.

Your cooperation in furnishing these data is appreciated.

FOR THE DISTRICT ENGINEER:

Very truly yours,

A. L. WRIGHT  
Captain, Corps of Engineers  
Executive Officer

cc: Murphy

Murphy *AM*  
Baswell *JB*  
Brown - S.S.  
Wright *AW*  
M & R

812.7(Skagit River)46

*file  
yes.*

**ACTION COPY**

H. O. WALBERG  
COUNTY ROAD ENGINEER



ENGINEER'S OFFICE

# SKAGIT COUNTY

STATE OF WASHINGTON  
MOUNT VERNON

ENGR. DIV.

*MB*  
*MIR*

March 22, 1951

NPS 812.7 (Skagit River) 46

Office of the District Engineer  
4735 E. Marginal Way  
Seattle 4, Washington.

Att: Mr. A. L. Wright  
Executive Officer

Re: NPSGP  
812.7 (Skagit River) 46

Dear Sir:

Enclosed are graphs of gage readings taken by this office of the Skagit River at Mount Vernon, and at the Dalles near Concrete, during the 9-12 February flood.

Also, enclosed are copies of a similar graph of the November 1949 flood.

As soon as more complete information is available the graph will be augmented by readings from other gages maintained by the U. S. Geological Survey.

I trust this answers your request of 1 March, 1951.

Yours very truly,

H. O. WALBERG,  
County Road Engineer

By *Wm. R. Whitnall*  
W. R. Whitnall,  
Associate Engineer

WRW:MM

*Incl. w/d Hydrology Section*

*file*