

# PRELIMINARY DESIGN REPORT

**Tibbetts Bridge  
Bridge #3344**

**Loggin Road  
Over  
Marsh Stream**

**Winterport-Frankfort, Maine**

**PIN 016763.00**

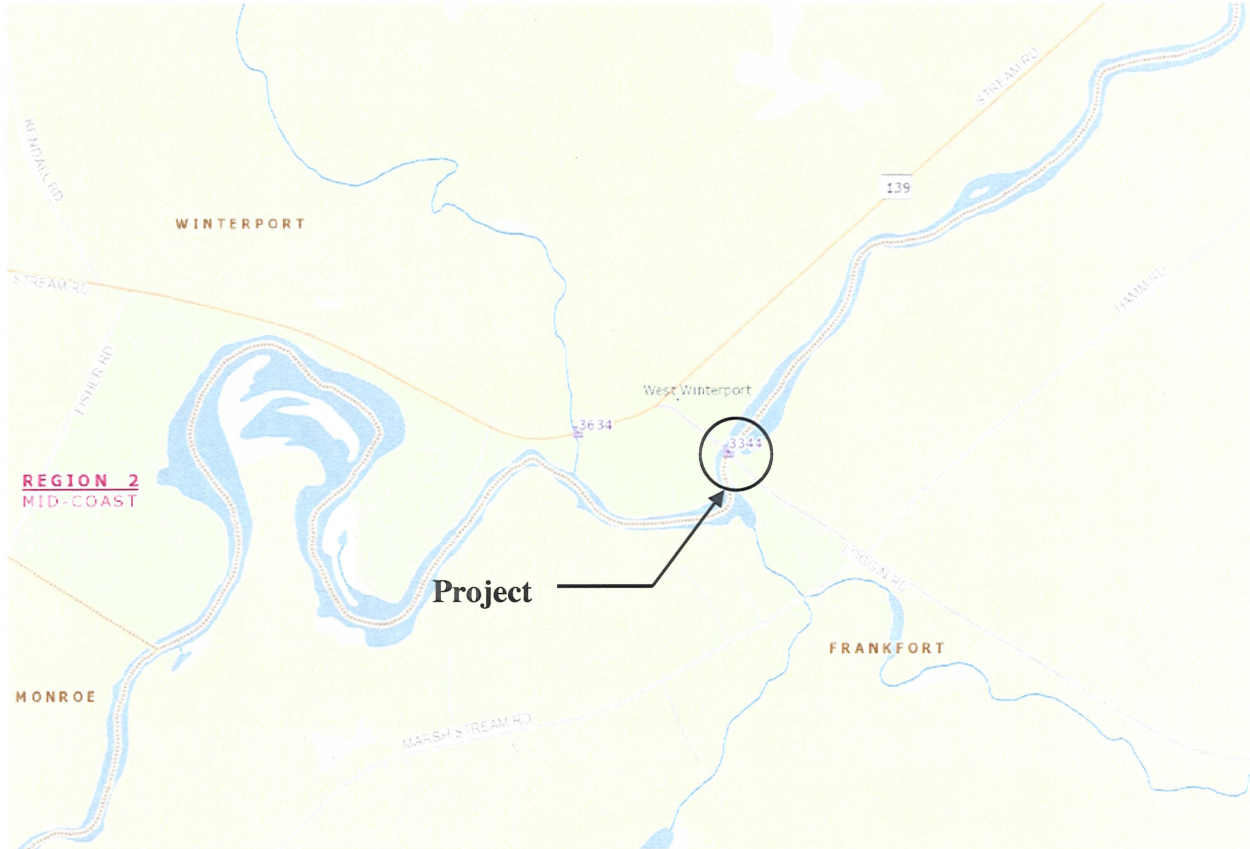


**MAINEDOT**  
Maine Department of Transportation



# LOCATION MAP

Winterport-Frankfort, Maine  
Tibbetts Bridge  
Bridge No. 3344  
PIN 016763.00



Latitude: 44°37'11.3" N

Longitude: 68°57'04.6" W

The drainage basin characteristics for Tibbetts Bridge (#3344) at the Winterport - Frankfort town line on Loggin Road over Marsh Stream were provided by the Maine Department of Transportation Environmental Office - Hydrology Section. The flows were computed using the 1999 USGS full regression equation. Additional data was also available from the Flood Insurance Study for the town of Winterport issued in 1990. The Flood Insurance Study provided drainage areas and Q100 flows on each side of the bridge as well as a profile of the stream at Q100. The drainage area and Q100 flows in the report correlate well with the data provided by the Environmental Office. Therefore, the flows calculated using the 1999 USGS full regression equation were used in design and are as follows:

**Summary**

Drainage Area = 119.9 mi<sup>2</sup>

Ordinary High Water (Q<sub>1.1</sub>) = 1,542.4 cfs

10 Year Flood (Q<sub>10</sub>) = 5,279.3 cfs

Design Discharge (Q<sub>50</sub>) = 7,576.3 cfs

Check Discharge (Q<sub>100</sub>) = 8,629.9 cfs

Q<sub>500</sub> = 11,200.0 cfs

Two sources were contacted in order to determine if there has been any ice jam problems or road overtopping at the bridge site. Bridge Maintenance Manager Mike Eldridge reported no issues. Winterport Town Council member Samuel Butler, resident of Winterport for 69 years, also reported no issues.

Reported By: Richard E. Myers

Date: June 4, 2010

Note: Relevant data and reports are provided in the appendix of this Preliminary Design Report.

The existing bridge and proposed structures were analyzed using HEC-RAS, version 4.0, the river analysis software developed by the U.S. Army Corps of Engineers. The HEC-RAS model for this project represents a 357 foot long segment of Marsh Stream, including the bridge at the stream crossing on Loggin Road. Four cross-sections upstream of the bridge and five downstream make up the geometry of the stream. The existing bridge was modeled and run with Q100 in order to calibrate the stream model based on the data from the Flood Insurance Study. Boundary conditions, Manning's "n" values, and contraction/expansion coefficients were altered in several iterations until the model correlated well with the Flood Insurance Study. Following is a discussion of each of the parameters used in the final analysis as well as other assumptions made for both the existing and proposed models.

- Steady flow
- Manning's "n"
  - Upstream channel = 0.03 to 0.04
  - Downstream channel = 0.045 to 0.05
  - Dense brush and tree areas in overbanks = 0.11
  - Light brush in overbanks = 0.08
  - Grassy areas in overbanks = 0.035

The higher numbers of the ranges listed above for the channel were used near the bridge to account for more friction due to boulder accumulation under the bridge, especially just downstream.

- Contraction/Expansion coefficients

The typical values used were 0.1 and 0.3 respectively. The constriction of the stream at the bridge is quite severe, so a higher number was warranted for contraction there. After calibration however, it was only increased to 0.2 at the cross-section just before the bridge. The stream expands rapidly throughout the second and third cross-sections just downstream of the bridge; therefore, values of 0.8 were used for expansion at those two cross-sections.

- Boundary conditions
  - Upstream: normal depth with a stream slope of 0.0048 ft/ft
  - Downstream: normal depth with a stream slope of 0.0005 ft/ft

The upstream stream slope was calculated based on the profile in the Flood Insurance Study. It is difficult to get an accurate average stream slope from just the survey data because of the short length of survey and the variability of the streambed elevations in that length. The downstream stream slope in the Flood Insurance Study is 0.0034 ft/ft; however, in order to calibrate the model and match the head difference at the bridge between upstream and downstream, the stream slope was changed to 0.0005 ft/ft after several iterations.

- Mixed flow regime

After calibration of the head difference at the bridge structure between the Flood Insurance Study and the HEC-RAS model, the average velocity in the stream calculated by HEC-RAS was compared to the velocity shown in the Flood Insurance Study for further verification. The study shows an average velocity of 3.6 fps at a cross-section about 100 feet upstream of the bridge (cross section V in study). The model shows an average velocity of 4.47 fps at cross section 1342.632 which is about 83 feet upstream; therefore, the results indicate close correlation.

Once the model was calibrated, peak flows were run through the existing structure and proposed structures for comparison. The two proposed structures represent a steel plate girder option and a NEBT girder option. The only difference between the two is the assumed girder depths which are 47.625" and 47.24" respectively. The road elevation in both proposed options is based on the preliminary profile which closely matches the existing profile. Following is a list of assumptions made for the proposed structures:

- 100'-0" single span
- Superstructure with 3" of pavement, ¼" membrane, and an 8" slab
- Full-height cantilever retaining wall abutments with no embankments in front

Headwater elevations and stream velocities are reported in the table below for peak flows for each of the three structures. The headwater elevations are taken from the cross-section directly at the upstream opening. The velocities are taken from the first cross section downstream from each structure (about 27 feet from bridge fascia). This was done because the velocities are typically higher than directly at the exit of the bridge due to a transition in flow from subcritical to supercritical. Since Q100 and Q500 have velocities greater than 15 fps for the proposed structures, heavy riprap will be used for slope protection around the wingwalls. Furthermore, since it is proposed to construct the bridge foundations directly on bedrock, no other scour countermeasures will be used.

Note that only the total open area and vertical clearance numbers are different between the two proposed structures in the table below because the water stayed under the bridge.

**SUMMARY**

Unit		Existing Structure	Proposed Bridge	
		75'-6" Span	100'-0" Span Steel	100'-0" Span NEBT
	Area of Opening (s.f.)	1,120	1,293	1,297
	Headwater El. Q1.1	131.46	131.27	131.52
	Headwater El. Q10	135.98	135.41	135.88
ft	Headwater El. Q25	137.34	136.43	136.96
	Headwater El. Q50	138.29	137.18	137.81
	Headwater El. Q100	139.25	137.99	138.67
	Headwater El. Q500	141.43	139.80	140.56
	Vertical Clearance			
	@ Q50	4.02	3.87	3.90
	@ Q100	3.06	3.06	3.09
	Discharge Vel. Q1.1	9.88	9.38	9.38
	Discharge Vel. Q10	14.03	13.22	13.22
ft/s	Discharge Vel. Q25	17.36	14.23	14.23
	Discharge Vel. Q50	18.87	14.90	14.90
	Discharge Vel. Q100	20.28	15.47	15.47
	Discharge Vel. Q500	23.22	18.89	18.89

\*Elevations based on NAVD

According to the Bridge Design Guide, for major riverine bridges, four feet minimum vertical clearance between the bottom of the superstructure and the Q50 backwater elevation is preferred. Since conditions are improving by increasing the span length and there has been no issues with ice jams or road overtopping, it was determined that a vertical clearance between three and four feet is acceptable.

Reported by: Richard E. Myers  
Date: July 20, 2010

Note: Supporting calculations for Manning's "n" and output from HEC-RAS is provided in the appendix of this Preliminary Design Report. The output from only one of the proposed structures is included since the only difference between the two is the vertical clearance.

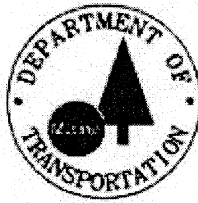
# **APPENDIX B**

## **Summary of Existing Upstream and Downstream Bridges**

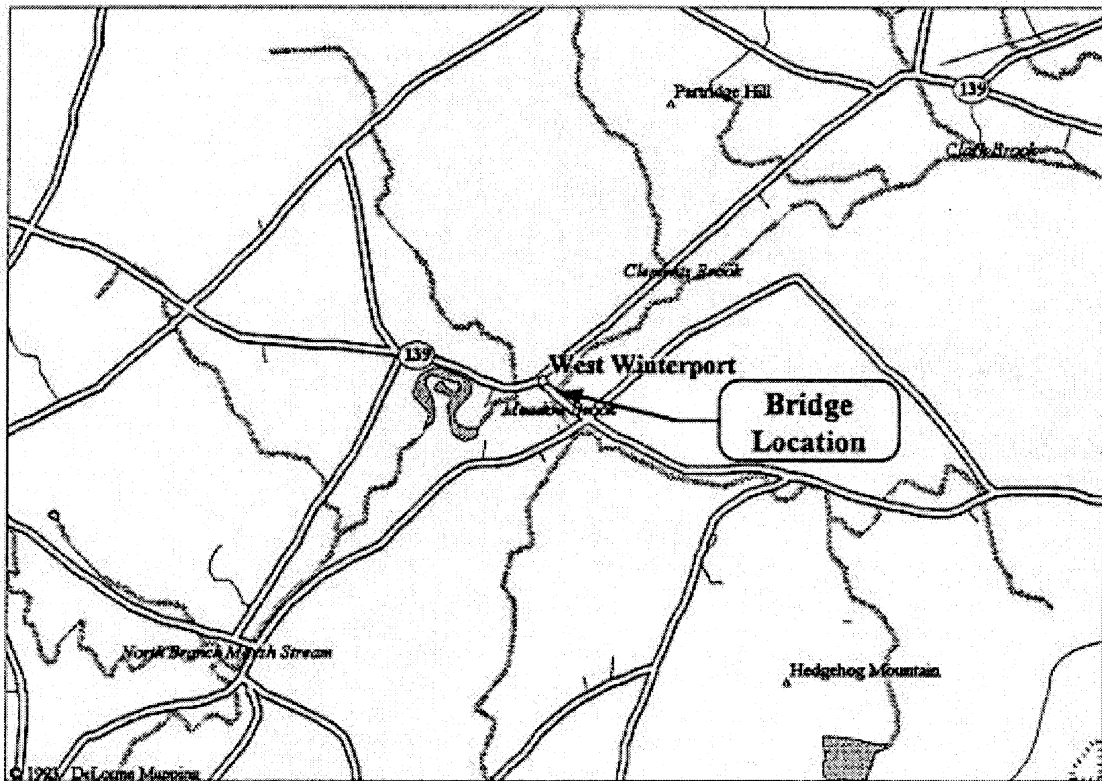
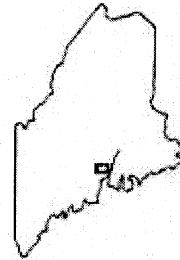
## SUMMARY OF EXISTING UPSTREAM AND DOWNSTREAM BRIDGES

<b>Upstream -</b>	<u>3.1</u> miles	<b>Town -</b>	<u>Monroe</u>		
		<b>Name -</b>	<u>Lord Bridge</u>	<b>Br. No. -</b>	<u>3348</u>
		<b>Hydraulic Opening -</b>	<u>74</u> ' Span x <u>20</u> ' Rise=	<u>1480</u>	SF
		<b>Known Ice, Flooding, Scour, and Debris Concerns:</b> <u>None known other than overtopping during 1936 flood.</u>			
<b>Upstream -</b>	<u>3.6</u> miles	<b>Town -</b>	<u>Frankfort</u>		
		<b>Name -</b>	<u>Twin Bridge</u>	<b>Br. No. -</b>	<u>2526</u>
		<b>Hydraulic Opening -</b>	<u>85</u> ' Span x <u>17</u> ' Rise=	<u>1445</u>	SF
		<b>Known Ice, Flooding, Scour, and Debris Concerns:</b> <u>None known other than scour issues.</u>			
<b>Upstream -</b>	<u>6.2</u> miles	<b>Town -</b>	<u>Monroe</u>		
		<b>Name -</b>	<u>Braley Bridge</u>	<b>Br. No. -</b>	<u>3988</u>
		<b>Hydraulic Opening -</b>	<u>60</u> ' Span x <u>13</u> ' Rise=	<u>780</u>	SF
		<b>Known Ice, Flooding, Scour, and Debris Concerns -</b> <u>None known.</u>			
<b>Downstream -</b>	<u>6.8</u> miles	<b>Town -</b>	<u>Frankfort</u>		
		<b>Name -</b>	<u>Upper Bridge</u>	<b>Br. No. -</b>	<u>2883</u>
		<b>Hydraulic Opening -</b>	<u>157</u> ' Span x <u>20</u> ' Rise=	<u>3140</u>	SF
		<b>Known Ice, Flooding, Scour, and Debris Concerns -</b> <u>None known other than ice jams.</u>			

# BRIDGE SCOUR EVALUATION REPORT



**Name:** Tibbetts Bridge  
**County:** Waldo  
**Town:** Winterport - Frankfort.  
**Route:** Loggin Road  
**Stream:** Marsh Stream  
**Bridge #:** 3344  
**Date:** December 1995



**Prepared by:** Whitman & Howard  
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**TY LIN INTERNATIONAL**

HZH 3/19/96  
GM 03/04/96

## BRIDGE SCOUR EVALUATION SUMMARY

Bridge Name: Tibbetts

Town: Winterport

Bridge Number: 3344

Route/Name: Loggin Road

Stream: Marsh Stream

River Basin: Penobscot

Review Date: 12-Oct-95

Note : See Office/Field Review Report for Additional Data.

### SUMMARY AND CONCLUSIONS

The bridge is a single-span concrete slab on steel stringers constructed in 1951. The bridge is supported by vertical wall granite masonry abutments with unknown foundations. The FEMA study for Winterport predicts that the 100-year flood will reach 3 feet below low chord. However, the high water elevation in 1936 reached about 4 feet above present low chord, indicating pressure flow potential.

The stream reach has low channel migration potential, with incised and well-vegetate banks. The channel is very constricted through the bridge opening, and then widens considerably 100 feet down stream. The flood plains are highly constricted through the bridge. No signs of contraction scour (blowholes or bed deposits) were evident. Contraction scour potential is moderate. The bed material consists of cobble and boulder.

The streambed measured by soundings shows approximately 1.5 foot degradation of the thalweg from the streambed on the 1951 design plans. Flow attacks the left abutment at a 20 degree angle. Stones from the middle of the left abutment at bed level are loose. The 1951 plans indicate "probable ledge" under the left abutment at elevation 68.8 feet (5.5 feet below streambed at the abutment face); and "very firm material through boulders and gravel" under the right abutment at elevation 65.8 feet (7.1 feet below streambed at face of abutment). MDOT inspections report settlement and tilting of both abutments: (7/18/90) "NW (left) abut: lower crses of field stone have tumbled out of abut"; "signs of settlement at NW abut"; recommended "repair base of NW abut"; "SE abutment: portion of downstream backwall cracked and moved 2 1/2" D.S.; superstructure jammed against SE abutment"; (4/29/92) "NW'ly abut (left) has stones missing @ base w. vert crack < 1/2" running up to conc cap"; and (5/4/94) "point mortar missing, scour under No. (left) abut"; SE'ly (right) abut has rotated forward est. 3" @ top"; "long, cracking @ SE'ly abut indicates settlement". Both abutments are well-protected with large riprap (2 foot diameter). Protection was also noted in MDOT inspection: "Bottom well protected with large stone with upstream concrete jacket at southerly abutment" (4/29/92).

An Item 113 rating of 3A is recommended based on cracking and settlement of left abutment; rotation of right abutment; unknown foundations; major channel contraction; 20 degree angle of flow attack on the left abutment; approximately 1.5 foot lower thalweg compared to 1951 plans; scour reported in MDOT inspections; and potential for pressure flow. Risk of scour is considered mild based on history of the bridge surviving floods since 1951 (superstructure) and 1910 (abutments); and riprap present at both abutments.

### RECOMMENDATIONS

Countermeasures: Routine Monitoring -

Recommended Repair Code:	Element:	Work:	Priority:	Effort:
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Level Two Analysis: Not Required -

### RECOMMENDED SCOUR VULNERABILITY RATING (PER FHWA)

Scour Vulnerability: Contraction - Abutment

Recommended NBI Rating	Item 61:	Item 71:	Item 113:
	7	9	3A

# BRIDGE SCOUR EVALUATION SUMMARY

## BRIDGE DESCRIPTION

Bridge Description: Single Span	Number of Spans: 1	Bridge Datum: Assumed
Date Built: 1951	Date of Widening/Major Repairs: None	
Low Chord Elev (ft): 87.3 - 86.2	Bridge Deck Elev (ft): 91.5 - 90.7	Thalweg Elev (ft): 69.6
Overtopping Elev (ft): 90.1	Overtopping Location: At Bridge	

## ABUTMENTS

	Left Abutment	Right Abutment
Type:	Vertical Wall	Vertical Wall
Support:	Fixed	Expansion
Foundation Type:	Stone Masonry	Stone Masonry
Footing Exposed:	No	Yes
Top of Footing Elev (ft):	NA	NA
Footing Height (ft):	Unknown	Unknown
Exposure (ft):	NA	NA
Piles Exposed:	NA	NA
Pile Tip Elev (ft):	NA	NA
Rock Elev (ft):	68.8	65.8
Riprap (Type/Size):	Stone, 2' diameter	Stone, 2' diameter
Riprap Condition:	Fair	Fair
Other Protection:	None	None
Condition:	NA	NA
Scour		
Tilt/Settlement:	Yes	Yes
Max Depth Undermining (ft):	0	0
Scour Holes:	No	No
Location:	NA	NA

## PIERS

**MAINE DEPARTMENT OF TRANSPORTATION  
BRIDGE SCOUR EVALUATION  
OFFICE/FIELD REVIEW REPORT**

✓ Bridge Name: <u>TIBBETTS</u>	✓ Town: <u>WINTERPORT</u>	✓ Bridge #: <u>3344</u>
✓ Route No./Name: <u>LOGGIN RD.</u>	✓ Stream: <u>MARSH STREAM</u>	✓ River Basin: <u>TENOBSCOT</u>
Reviewed By: <u>SONG GINDON</u> <i>DLG</i>	✓ Review Date: <u>10/12/95</u>	
	MDOT PIN: <u>5259.00</u>	
	TYLI Project No: <u>102220</u>	
Weather: <u>SUN, WARM</u>	✓ Division: <u>5</u>	

**NOTES**

- Observations left and right are facing downstream -
- Elevations refer to bridge plan datum unless otherwise noted -
- The information shown in this report is obtained from available MDOT bridge plans and records, supplemented by field review -

**STREAM STABILITY ASSESSMENT**

1. CHANNEL	Upstream	Downstream	At Bridge
Mannings 'n':	<u>.04</u>	<u>.04</u>	<u>.04</u>
<b>2. FLOOD PLAIN</b>			
a. Mannings 'n' (L/R):	<u>L-.03 R-.08</u>	<u>L-.05 R-.08</u>	
b. Description (Upstream L/R):	<u>L-pasture R-thick woods</u>		
(Downstream L/R):	<u>L-pasture + scattered trees R-thick woods</u>		
<b>3. CHANNEL LATERAL STABILITY</b>			
a. Bends (see sketch plan)			
1) Bridge Location	<u>NA</u> #/Upstream of Bend	<u>300</u> ft./Downstream of Bend	On Bend
2) Migration Potential (Describe):	<u>low: incised, large bank material, well-vegetated</u>		
b. Bank Condition			
	Upstream	Downstream	At Bridge
1) Vegetation (Describe)	<u>trees shrubs</u>	<u>trees shrubs</u>	<u>NA</u>
2) Material	<u>cobble boulder</u>	<u>cobble boulder</u>	<u>NA</u>
3) Eroding or Stable (See sketch-plan)	<u>stable</u>	<u>stable</u>	<u>NA</u>
4) Bank Slope	<u>1:1</u>	<u>1:1</u>	<u>NA</u>
5) Bank Protection (Describe)	<u>L-2' diameter stone in front of left embankment</u> <u>R-none</u>		<u>NA</u>
c. Islands/Bars/Deposits	ft./Upstream	<u>30</u> ft./Downstream	At Bridge

bars consisting of large cobble/boulders - either side of channel downstream (may be remnants of old abutments)

# OFFICE/FIELD REVIEW REPORT

Bridge # 3344

## 4. CHANNEL VERTICAL STABILITY

a. Channel Profile  Pool  Riffle (Upstream)  Pool  Riffle (Downstream)

b. Contraction Scour Potential (due to encroachment)

1) Evidence of Overbank Flow (Y/N) Left  Y  Right  Y (1936 Flood)

2) Relief Structure N Bridge  Culvert  Location (ft. L/R)

3) Evidence of Over Topping (Y/N): Y Unknown: 1936 Flood overtopped old bridge

4) NBI Rating: 5 Item 60 7 Item 61 9 Item 71 (Bridge records) and would have overtopped present bridge

c. Long Term Potential for: Aggradation (Y/N) N Degradation (Y/N) N

Source of Sediment: None Road  Bed Load  Other

d. Bed Material

Silty Clay  Sand  Gravel

Cobbles/Boulder  Bedrock  Other

Bed Material D50 (Visual Classification) 1'

## BRIDGE SITE CONDITIONS

5. STREAM CROSS SECTION (See sheet 11)  Upstream Face  Downstream Face

### 6. FLOW CONDITIONS

a. General Description/Estimated velocity/Avg. depth: shallow flow riffle beneath bridge  
avg. depth ~ 1 ft, 1 fps

b. Wadeable  Boat Required

c. Previous MDOT Underwater Inspection (Y/N Date): N Frequency (Months):

d. Obstructions/Beaver Dams/Etc... (Describe) N

e. Confluences (L/R, ft. upstream or downstream) Y, 300 ft upstream w/ Meadow Stream

f. High Water Mark FEMA-100 YR is 3' below lowchord

1) Date/Estimated Flood Frequency 1936 / Frequency unknown

2) Approx. Elev. (Based on bridge datum) 91.0 (over bridge deck)

3) Source/Reliability 1951 Plans

### 7. BRIDGE DESCRIPTION

a. Description of Bridge/Bridge Type (Multi span, Single span): single span concrete slab  
on steel stringers

b. Date Built: 1951 - new superstructure replaced original 1910  
pony truss - used orig. abuts

# OFFICE/FIELD REVIEW REPORT

Bridge #: 5344

- ✓ c. Widening or Other Major Repairs (description/date) NONE  
Oct 1968 - south (left) abutment built form and placed concrete to support corner.
- ✓ d. Bridge datum: (NGVD/Assumed) Elev. 87.5 Location top concrete bridge seat
- ✓ e. Low Chord Elev., ft.: 87.3 L - 86.2 R left abutment
- ✓ f. Bridge Deck Elev., ft.: 91.5 L 90.7 R
- g. Top of Bank Elevation at Bridge, ft.: 80.0
- ±87.5 → ✓ h. Overtopping Elev., ft.: 88.7 At Bridge (Y/N) Approaches (ft. L/R) R 300'
- i. Water Elev., ft.: 72.4
- ✓ j. Throat Elev., ft.: 69.2 Depth of Flow, ft.: 2.8
- k. Pressure Flow Potential (Y/N): Y (Based on 1936 Flood)

## 8. ABUTMENTS

	Left	Right
✓ a. Type (Stub abut. on slope) <u>Vertical wall</u>		
Vertical wall w/wingwalls)	X	X
✓ b. Support (Fixed, Expansion)	fixed	expansion
c. Length of Road Embankment Normal to Flow (at overtopping)	50	20
✓ d. Angle of Inclination, degrees:	70°	110°
✓ e. Foundation		
1) Spread Footings	NA	NA
✓ 2) Piles	NA	NA
✓ 3) Other	stone masonry	stone masonry
✓ 4) Footing Exposed (Y/N)	NA	Y ✓ concrete raised footing
✓ 5) Top of Footing Elev., ft.	Unk	Unk ** after original structure (1968)
✓ 6) Footing Height, ft.	NA	NA
✓ 7) Exposure, ft. (See Sounding Sheet)	NA	NA
✓ 8) Piles Exposed (Y/N)	NA	NA
✓ 9) Pile Tip Elev., ft.	NA	NA
✓ 10) Rock Elev., ft.	68.8	65.8 (reported firm material)
11) Source of Data ( <u>Field review</u> , <u>Design plans</u> , As-built drawings, Pile driving records, Inspection reports, Other)	X	X
f. Location from bank (Set back, At bank, in channel, in floodplain)	at bank	at bank
g. Protection		
✓ 1) Riprap (Type, Size)	stone 2' diam	stone 2' diam.
✓ 2) Riprap Condition (Good, Fair, Poor)	fair	fair
✓ 3) Other Protection	None	None
✓ 4) Condition (Good, Fair, Poor)	NA	NA

✓	a. Type (Solid shaft, Single Column, Multi-column, Pile bent)		
✓	b. Support (Fixed, Expansion)		
	c. Channel/Floodplain		
✓	d. Shape (square, round nose, sharp nose)		
✓	Upstream		
✓	Downstream		
✓	e. Width x Length, ft.		
✓	f. Angle of Inclination, degrees:		
✓	g. Foundation		
✓	1) Spread Footings		
✓	2) Piles		
✓	3) Other		
✓	4) Footing Exposed (Y/N)		
✓	5) Top of Footing Elev., ft.		
✓	6) Footing Height, ft.		
✓	7) Exposure, ft. (See Sounding Sheet)		
	8) Footing Width x Length, ft.		
✓	9) Piles Exposed (Y/N)		
✓	10) Pile Tip Elev., ft.		
✓	11) Rock Elev., ft.		
	12) Source of Data (Field review, Design Plans, as-built drawings, Pile driving records, Inspection reports, Other)		
	h. Protection <i>NA</i>		
✓	1) Riprap (Size, Type)		
✓	2) Riprap Condition (Good, fair, Poor)		
✓	3) Other Protection		
✓	4) Condition (Good, Fair, Poor)		
<b>10. EVIDENCE OF SCOUR</b>			
	a. Abutments	Left	Right
✓	1) Tilt / Settlement *	Y	Y
	2) Cracks * - grout loss between masonry	Y	N
	3) Slope Erosion *	N	N
	4) Adjacent Roadway Settlement *	N	N
	* Describe Cause, if not scour: <i>Cracks and loose stones from abutment at bed level. Settlement &amp; cracks reported in MPOI inspections 1988-1994</i>		
✓	5) Max. Depth Undermining, ft. (See sketch-plan)	0	0

# OFFICE/FIELD REVIEW REPORT

Bridge #: 3344

	Left	Right
✓ 6) Scour Holes Y/N (See sketch-plan)	N	N
✓ Location	NA	NA
Approximate Dimensions	NA	NA

7) Comments: *left abutment losing chinking stones and gout at base*

b. Piers	NA	Pier #	1	2	3	4	5
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- ✓ 1) Tilt / Settlement (Y/N) \_\_\_\_\_
- ✓ 2) Max. Depth Undermining, ft.  
(see sketch-plan) \_\_\_\_\_
- ✓ 3) Scour Holes Y/N (see sketch-plan) \_\_\_\_\_
- ✓ Location \_\_\_\_\_
- Approximate Dimensions \_\_\_\_\_
- 4) Comments: \_\_\_\_\_

**c. General Contraction Scour**

- 1) Bed Deposits Downstream (Y/N) N Distance, ft. \_\_\_\_\_
- 2) Blowhole (Y/N) N
- 3) Comments: *stream widens considerably (~150%) downstream high potential for contraction scour based on 1936 overtopping width of 450'*

**11. DEBRIS**

- ✓ a. Potential (qualitative) Low \_\_\_\_\_ Moderate X High \_\_\_\_\_
- b. Debris Accumulation Locations (see sketch-plan) - Describe none  
*large boulders, chunks concrete causing flow deflection*
- c. Type and Size (Brush, trees, trash, combination) none observed  
*potential brush accumulation*

# OFFICE/FIELD REVIEW REPORT

Bridge # 3314

**12. SUMMARY AND CONCLUSIONS**

- single span concrete slab on steel stringers built in 1951 over original 1910 masonry abutments
- 1986 flood W.S. elevation reached 4 ft above present low chord pressure flow is possible; FEMA indicates 100 yr flood 3' below low chord
- laterally stable, incised well-vegetated banks
- bed material: cobble, boulder
- streambed from soundings shows 1.5' degradation of thalweg from 1951 streambed
- channel is contracted through bridge  
no signs of contraction scour (pilot holes or bed deposits)
- abutment scour
  - 20° attack on left abutment
  - large riprap stone protection
  - stones have become loose at middle of abutment (left)
  - unknown foundations
- rate 6U

**13. RECOMMENDATIONS**

✓ a. Countermeasures - Describe:

- ✓ 1) Riprap NA
- ✓ 2) Scour Monitor routine monitoring
- ✓ 3) Inspection (Y/N) Frequency, Months (12/24/Other):
- ✓ 4) Other None
- ✓ 5) Recommended Repair Code (See selected codes from MDOT list 04-19-90):
- ✓ Element: \_\_\_\_\_ Work: \_\_\_\_\_ Priority: \_\_\_\_\_ Effort: \_\_\_\_\_

b. Feasibility of Adding Riprap or Other Scour Countermeasures (explain):

OK easy access

✓ c. Level Two Analysis not required

d. General Comments: NA

# OFFICE/FIELD REVIEW REPORT

Bridge #: 3344

## 14. RECOMMENDED SCOUR VULNERABILITY RATING (PER FHWA)

✓ a. Scour Vulnerability (Long term, Contraction, Abutment, Pier)

1. Scour Critical:                      3A (Low)                      3B (Medium)                      3C (High)

2. Unknown Foundations (6U)

3. Low Risk (8L)

✓ b. Recommended NBI Ratings

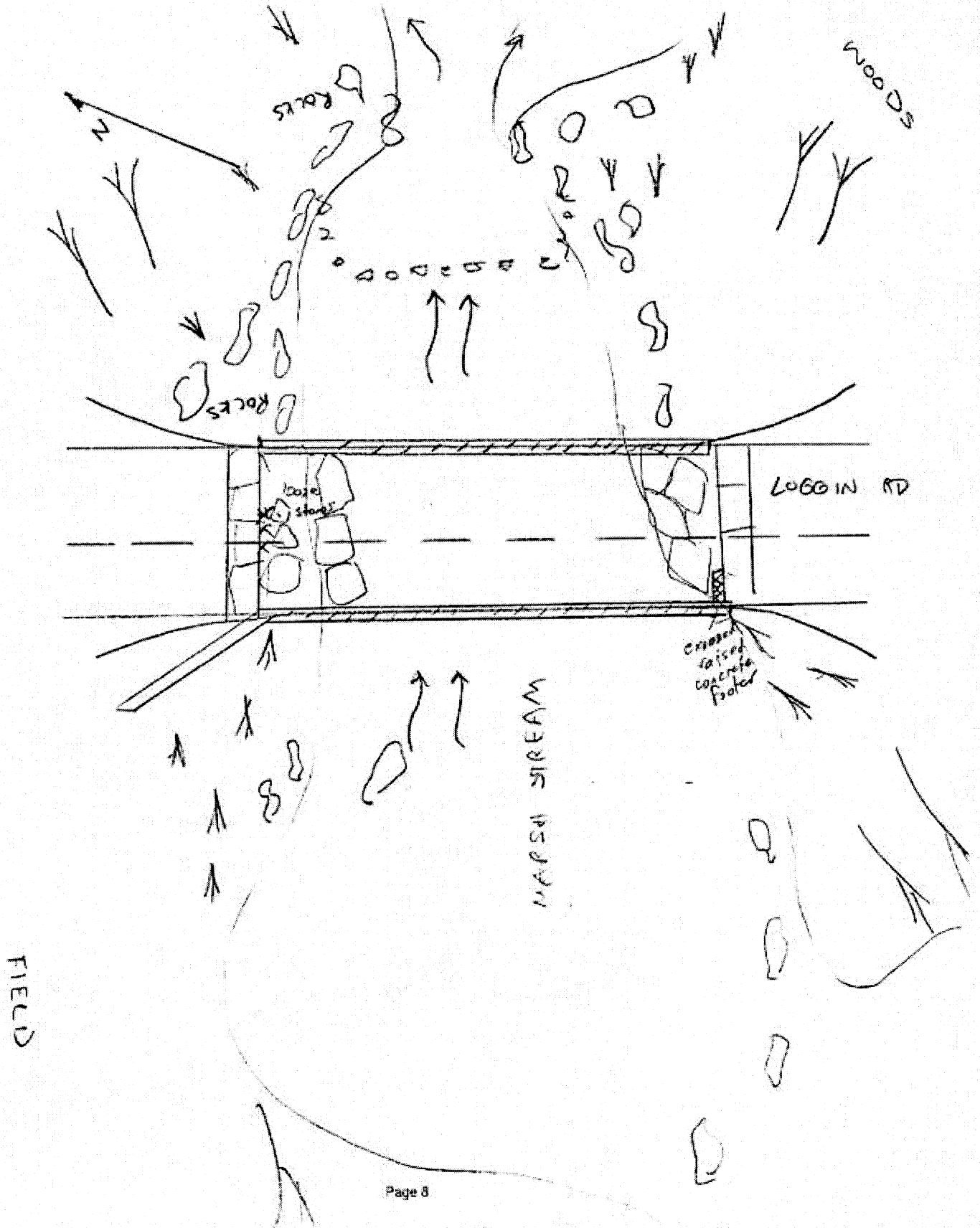
✓ Item 61 : 7                      Item 71 : 9                      Item 113 : 3A

# OFFICE/FIELD REVIEW REPORT

Bridge Name: <u>STROETS</u>	Town: <u>WINTER DORT</u>	Bridge #: <u>3344</u>
Route No./Name: <u>LOGGIN RD</u>	Stream: <u>MARSH STREAM</u>	Review Date: <u>10/12/05</u>

## Sketch (Plan view)

Bridge plans supplemented by field sketch.

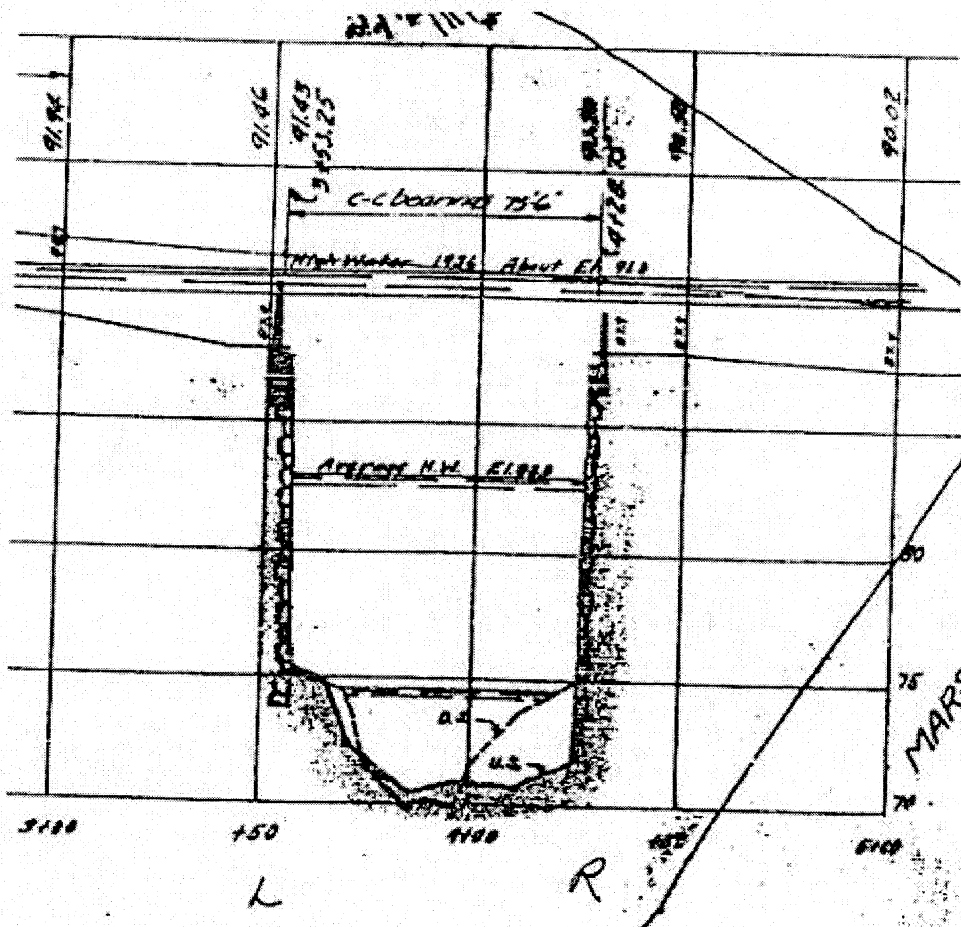


# OFFICE/FIELD REVIEW REPORT

Bridge Name: <u>T. BOETTS</u>	Town: <u>WINTERPORT</u>	Bridge #: <u>3344</u>
Route No./Name: <u>LOGAN RD.</u>	Stream: <u>MARSH STREAM</u>	Review Date: <u>10/2/95</u>

Sketch (Profile)

Bridge plans supplemented by field sketch.



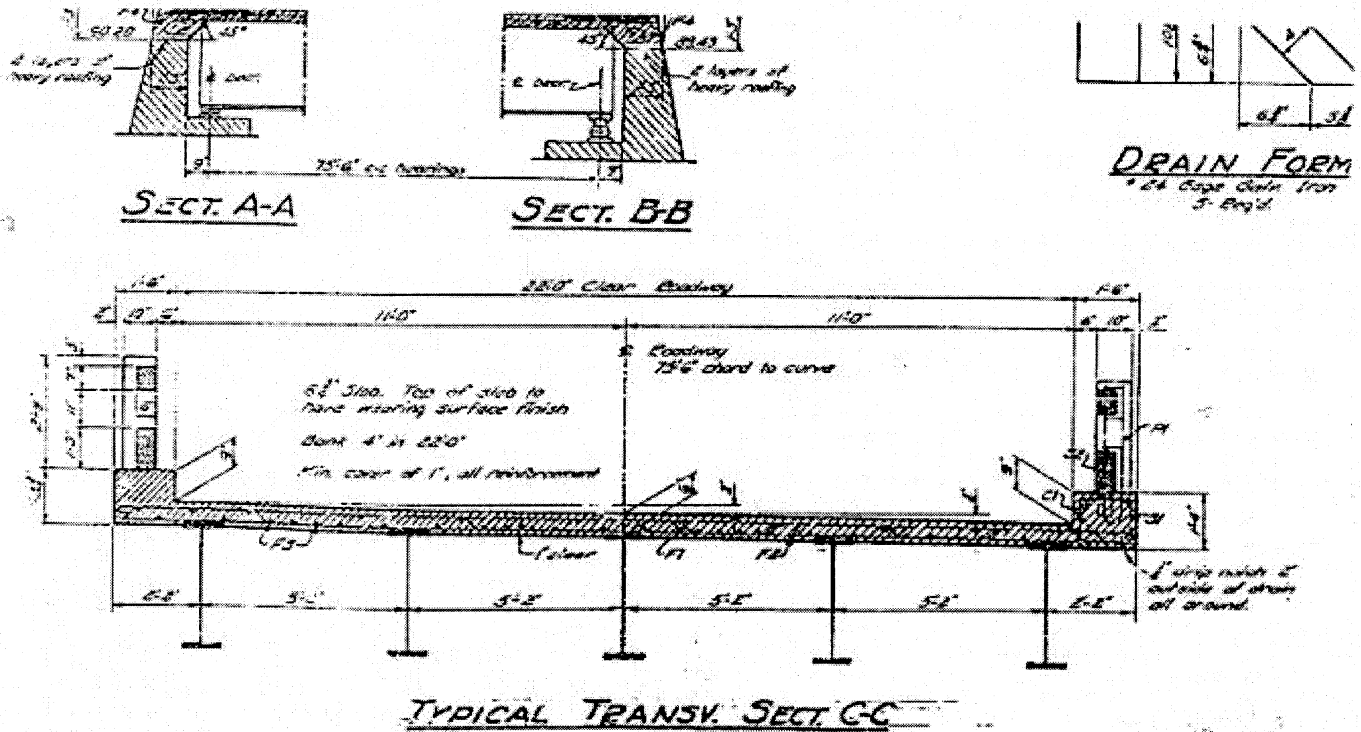
1951 Plans

# OFFICE/FIELD REVIEW REPORT

Bridge Name: <b>TIBBETS</b>	Town: <b>WINTERPORT</b>	Bridge #: <b>3744</b>
Route No./Name: <b>LOGGINS RD</b>	Stream: <b>MARSH STREAM</b>	Review Date: <b>10/12/95</b>

Sketch (Typical Section)

Transverse section, abutment, pier or other views as required.



1951 PLANS

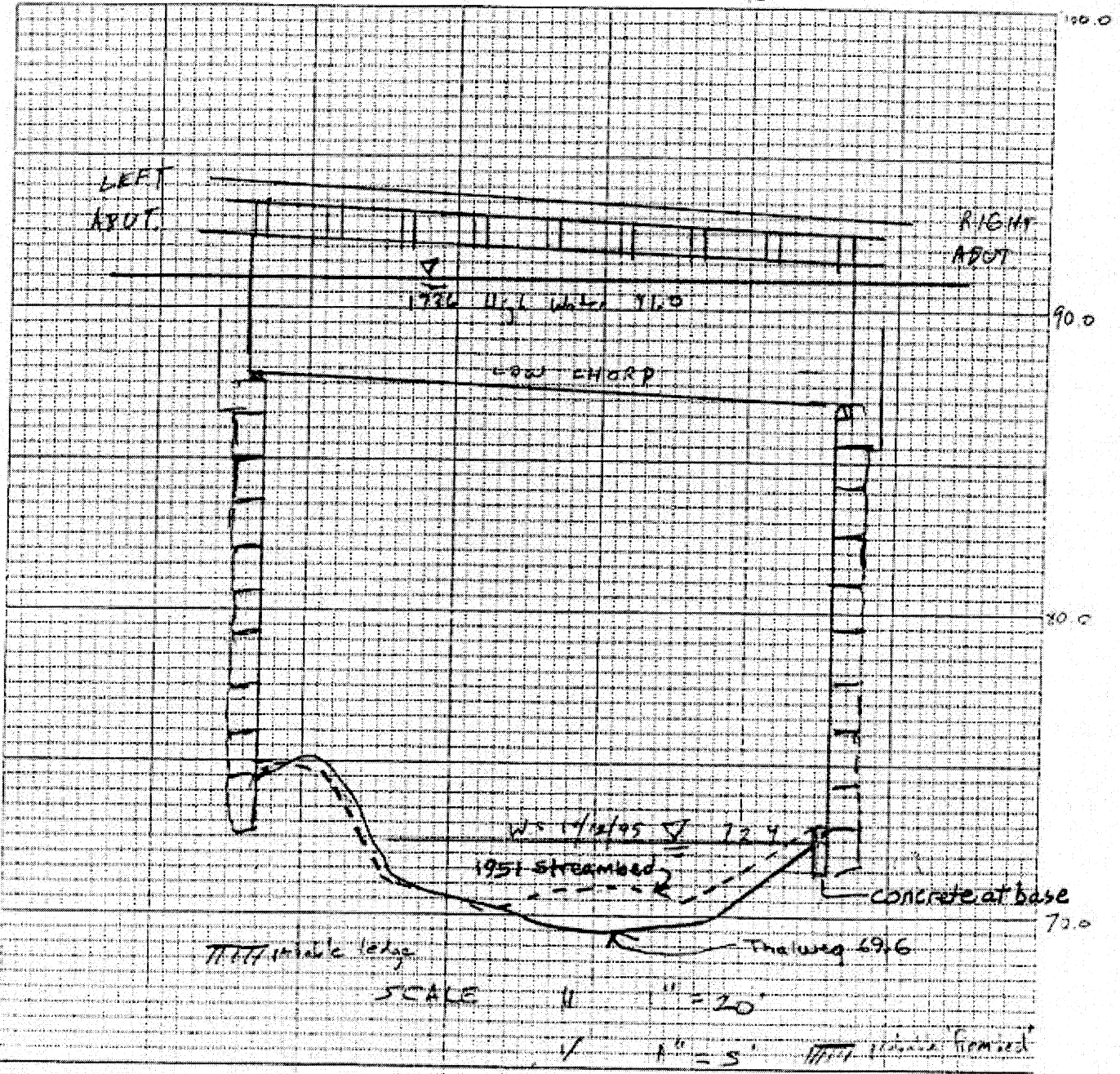
# OFFICE/FIELD REVIEW REPORT

Bridge Name: <u>TIBBETTS</u>	Town: <u>WINTERPORT</u>	Bridge #: <u>3344</u>
Route No./Name: <u>LOGGON RD</u>	Stream: <u>NARSH STREAM</u>	Review Date: <u>10/12/95</u>

## Stream Cross Section at Bridge (Facing Downstream)

Upstream Side: X      Downstream Side: \_\_\_\_\_

70.0



1951 PLANS

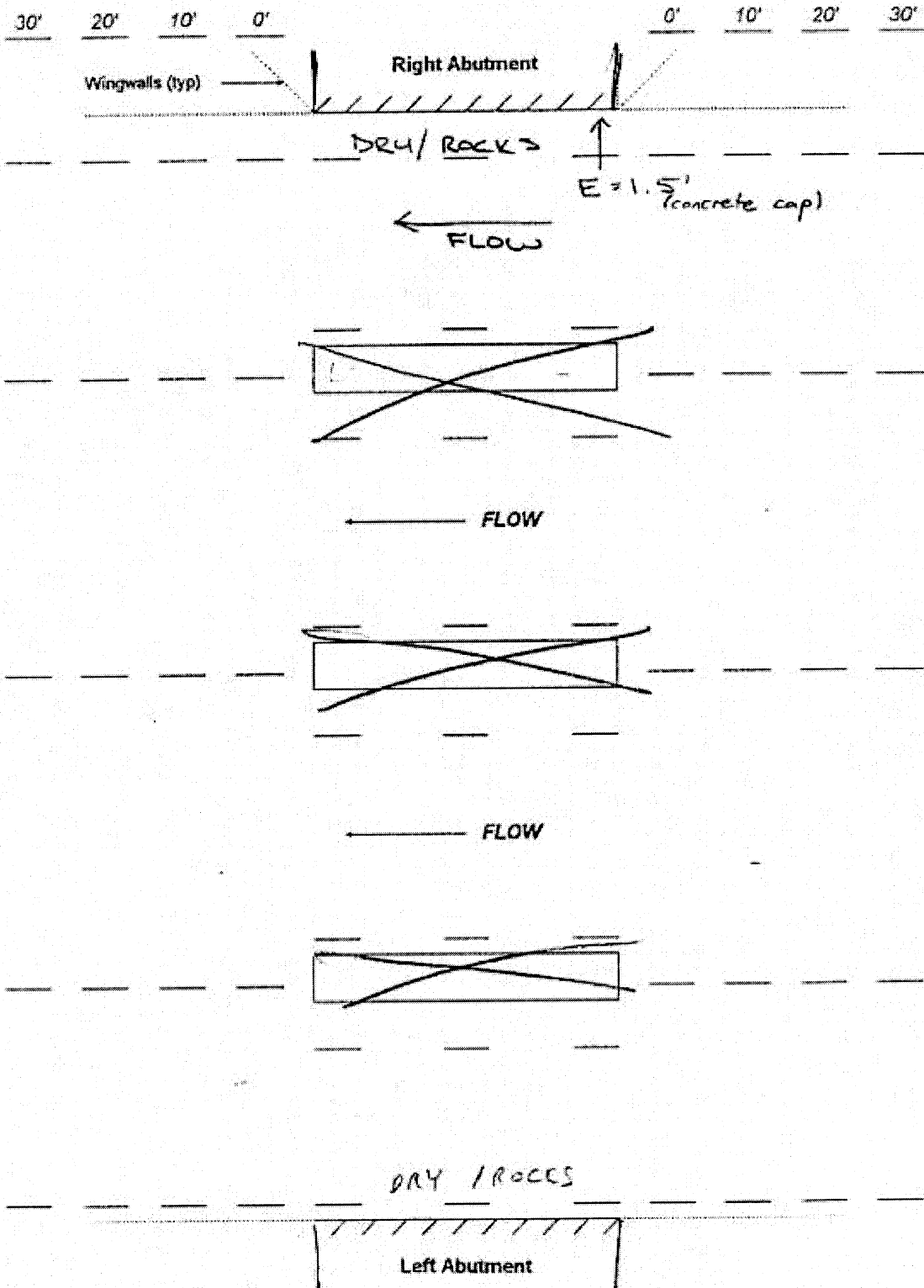


# OFFICE/FIELD REVIEW REPORT

Bridge Name: <u>TIBBETTS</u>	Town: <u>WINTER POLE</u>	Bridge #: <u>3344</u>
Route No./Name: <u>LOGGERS RD</u>	Stream: <u>MARSH STREAM</u>	Review Date: <u>10/12/95</u>

## Soundings/Probings

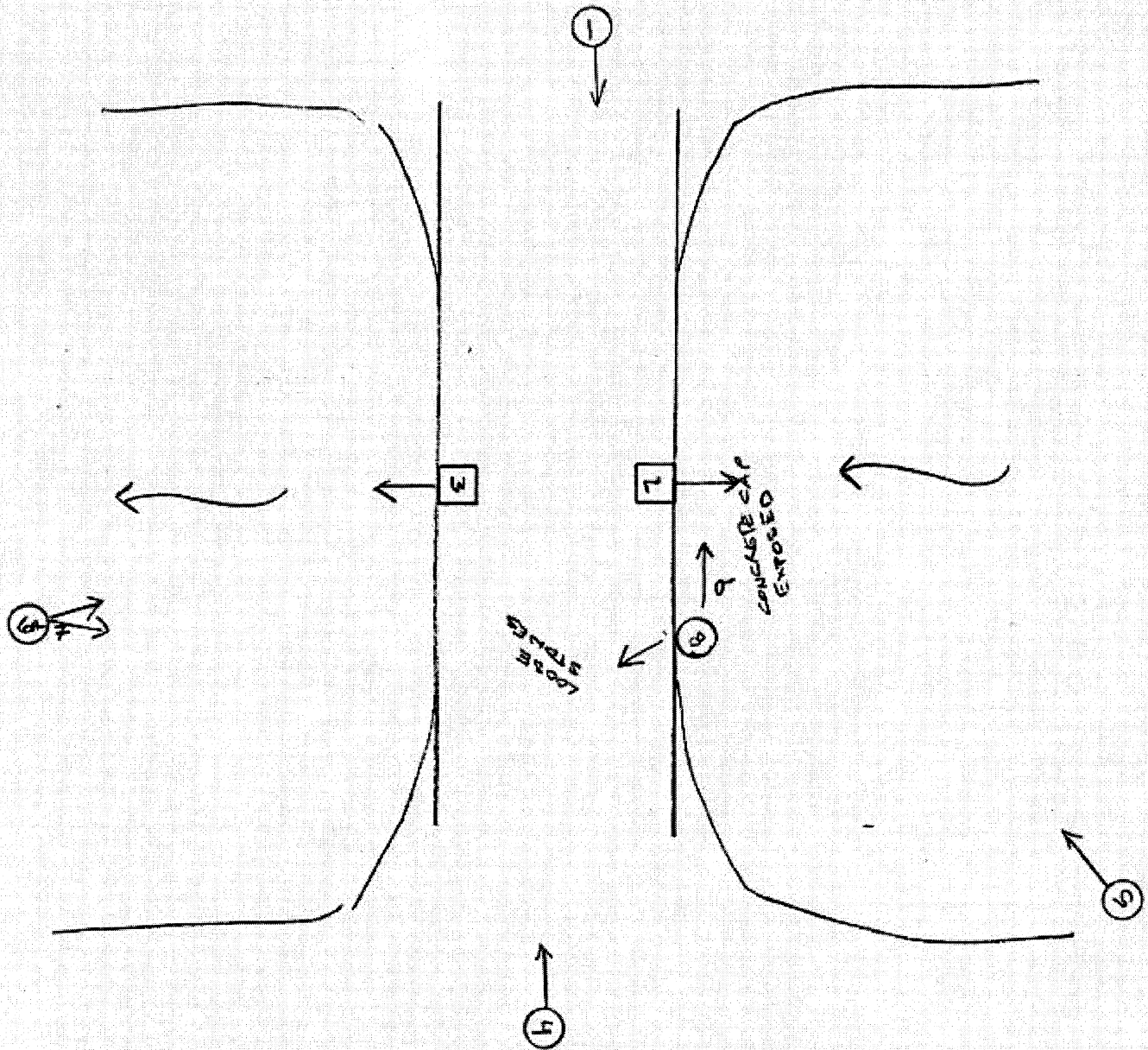
E - Footing Exposure      U - Depth of Undermining  
 P - Depth of Rod Probe      W - Water Depth



# OFFICE/FIELD REVIEW REPORT

Bridge Name: <b>DIABETTS</b>	Town: <b>WINTERPORT</b>	Bridge #: <b>3344</b>
Route No./Name: <b>LOGGIN RD.</b>	Stream: <b>MARSH STREAM</b>	Review Date: <b>10/12/95</b>

## Picture Locations



○ → From Ground

□ → From Bridge Deck

Site Investigation Pictures

Bridge Name: TIBBETS

Bridge #: 3344



② Facing Upstream



③ Facing Downstream



① Bridge Deck From Right Approach



④ Bridge Deck From Left Approach

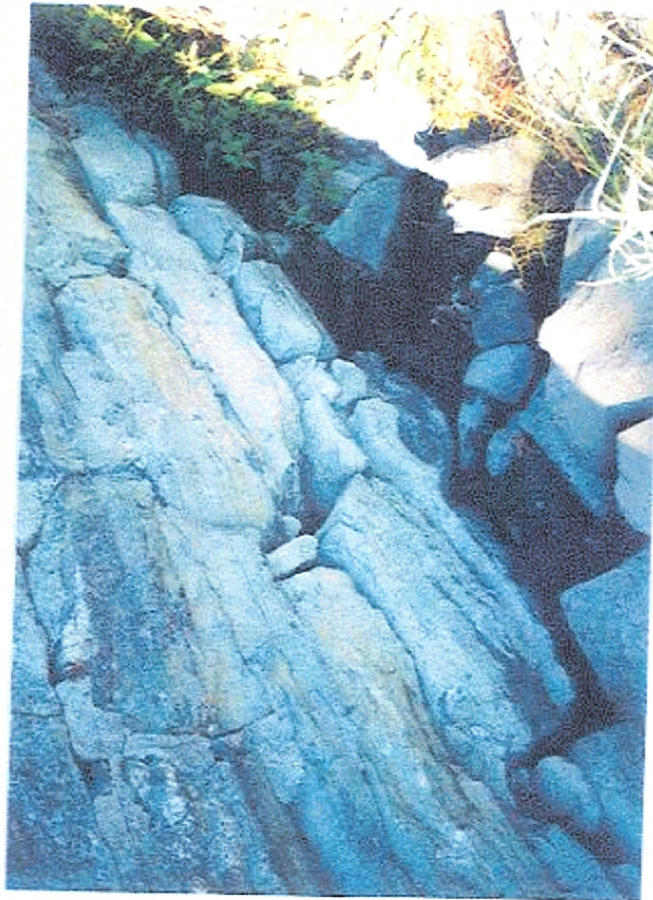
Site Investigation Pictures

Bridge Name: TIBBETS

Bridge # 3344



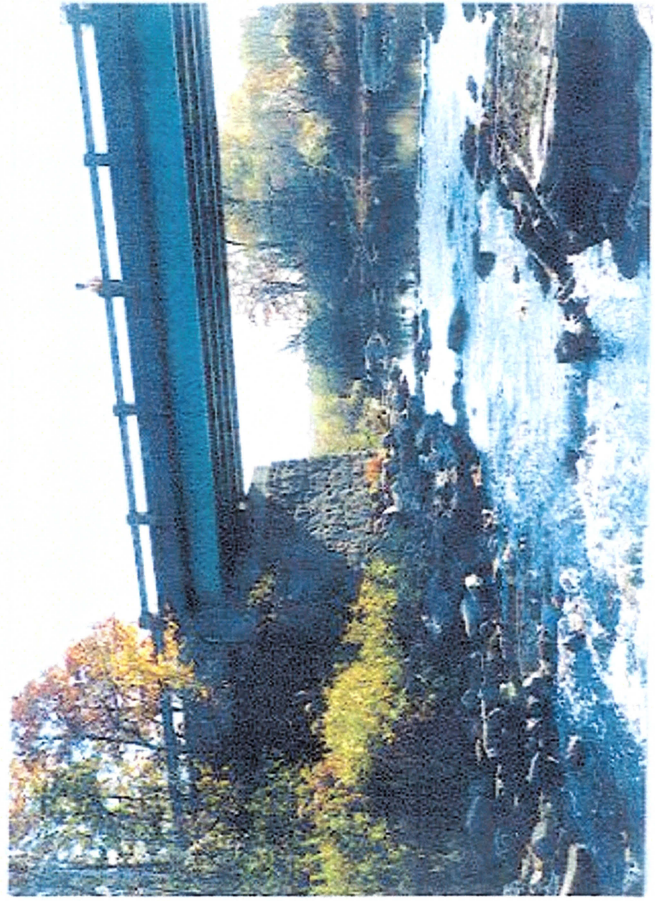
⑦ downstream face, right abutment



⑧ left abutment, showing loose stones



⑤ upshear face, looking at right abutment



⑥ downstream face, right abutment

Site Investigation Pictures

Bridge Name: TILBETTS

Bridge #: 3344



① looking at right  
abutment, note  
concrete cap, U.S.

# **APPENDIX E**

## **Hydrology & Hydraulics Data**

**Project Name:** Frankfort-Winterport  
**Stream Name:** Marsh Stream  
**Bridge Name:** Tibbetts Bridge  
**Route No.:** Loggin Rd  
**Analysis by:** AW Mann

**PIN:** 16763  
**Town:** Frankfort & Winterport  
**Bridge No.:** 3344  
**USGS Quad:**  
**Date:** 5/20/2009

## Peak Flow Calculations by USGS Regression Equations (Hodgkins, 1999)

Enter data in blue cells only!

	km <sup>2</sup>	mi <sup>2</sup>	ac
A	310.42	119.854	76706.6
W	27.01	10.427	6673.5

P <sub>c</sub>	493493	4940208
County	Waldo	
pptA	47.2	
SG	0.00	

A (km <sup>2</sup> )	310.42
W (%)	8.70

Conf Lvl

Enter data in [mi<sup>2</sup>]

Watershed Area  
Wetlands area (by NWI)

watershed centroid (E, N; UTM 19N; meters)  
choose county from drop-down menu  
mean annual precipitation (inches; by look-up)  
sand & gravel aquifer as decimal fraction of watershed A

**Worksheet prepared by:**  
 Charles S. Hebson, PE  
 Chief Hydrologist  
 Maine Dept. Transportation  
 Augusta, ME 04333-0016  
 207-287-1105  
[Charles.Hebson@maine.gov](mailto:Charles.Hebson@maine.gov)

### Ret Pd Peak Flow Estimate

T (yr)	Lower	Q <sub>T</sub> (m <sup>3</sup> /s)	Upper
1.1		43.68	
2	58.84	81.88	113.94
5	86.78	121.15	169.12
10	106.13	149.51	210.62
25	130.50	186.24	265.80
50	148.71	214.57	309.59
100	167.47	244.40	356.67
500	210.84	317.19	477.18

### Q<sub>T</sub> (ft<sup>3</sup>/s)

1542.4
2891.1
4277.8
5279.3
6576.2
7576.3
8629.9
11200.0

### Reference:

Hodgkins, G., 1999.  
 Estimating the magnitude of peak flows for streams  
 in Maine for selected recurrence intervals  
*Water-Resources Investigations Report 99-4008*  
 US Geological Survey, Augusta, Maine

$$Q_T = b \times A^a \times 10^{-ww}$$

# FLOOD INSURANCE STUDY

TOWN OF WINTERPORT

R. MYERS

5/12/10

16763.00

## • NOTES

- FROM TABLE 1 (ATTACHED), TIBBETTS BRIDGE IS BETWEEN THE POINT "UPSTREAM OF LITTLEFIELD BROOK" AND "APPROXIMATELY 1,400 FEET DOWNSTREAM OF UPPER RAILROAD BRIDGE."

	DRAINAGE AREA	Q100
POINT 1 : UPSTREAM OF LITTLEFIELD BROOK	111 mi <sup>2</sup>	8,420 cfs
TIBBETTS BRIDGE	120 mi <sup>2</sup>	8,630 cfs
POINT 2 : APPROXIMATELY 1,400 FEET DOWNSTREAM OF UPPER RAILROAD BRIDGE	133 mi <sup>2</sup>	9,850 cfs

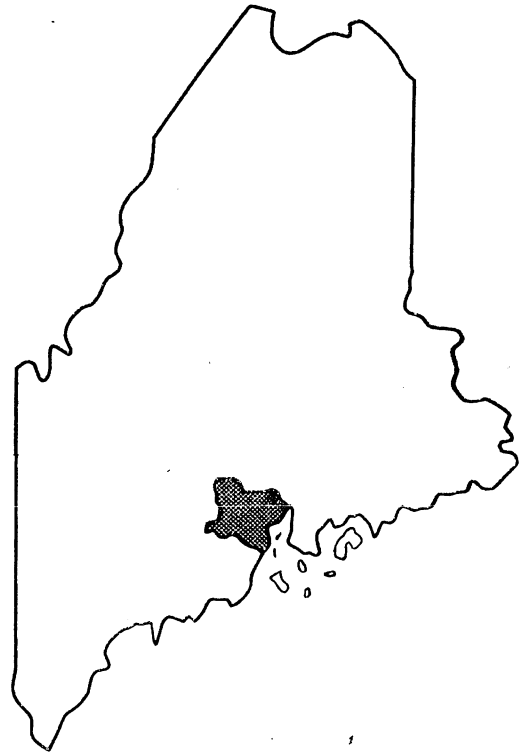
- SINCE LITTLEFIELD BROOK DRAINS INTO MARSH STREAM BETWEEN POINT 1 AND TIBBETTS BRIDGE, THE DATA CALCULATED BY OUR ENVIRONMENTAL TEAM, PARTICULARLY A DRAINAGE AREA  $\approx 120$  mi<sup>2</sup> AND A Q100  $\approx 8630$  cfs, CORRELATES WELL WITH THE DATA FROM THE FLOOD STUDY.

- MANNING'S "n" VALUES FOR MARSH STREAM IN THE STUDY WERE AS FOLLOWS: a) 0.030 - 0.060 FOR THE MAIN CHANNEL; b) 0.050 - 0.125 FOR THE FLOODPLAIN.

# FLOOD INSURANCE STUDY



**TOWN OF  
WINTERPORT,  
MAINE  
WALDO COUNTY**

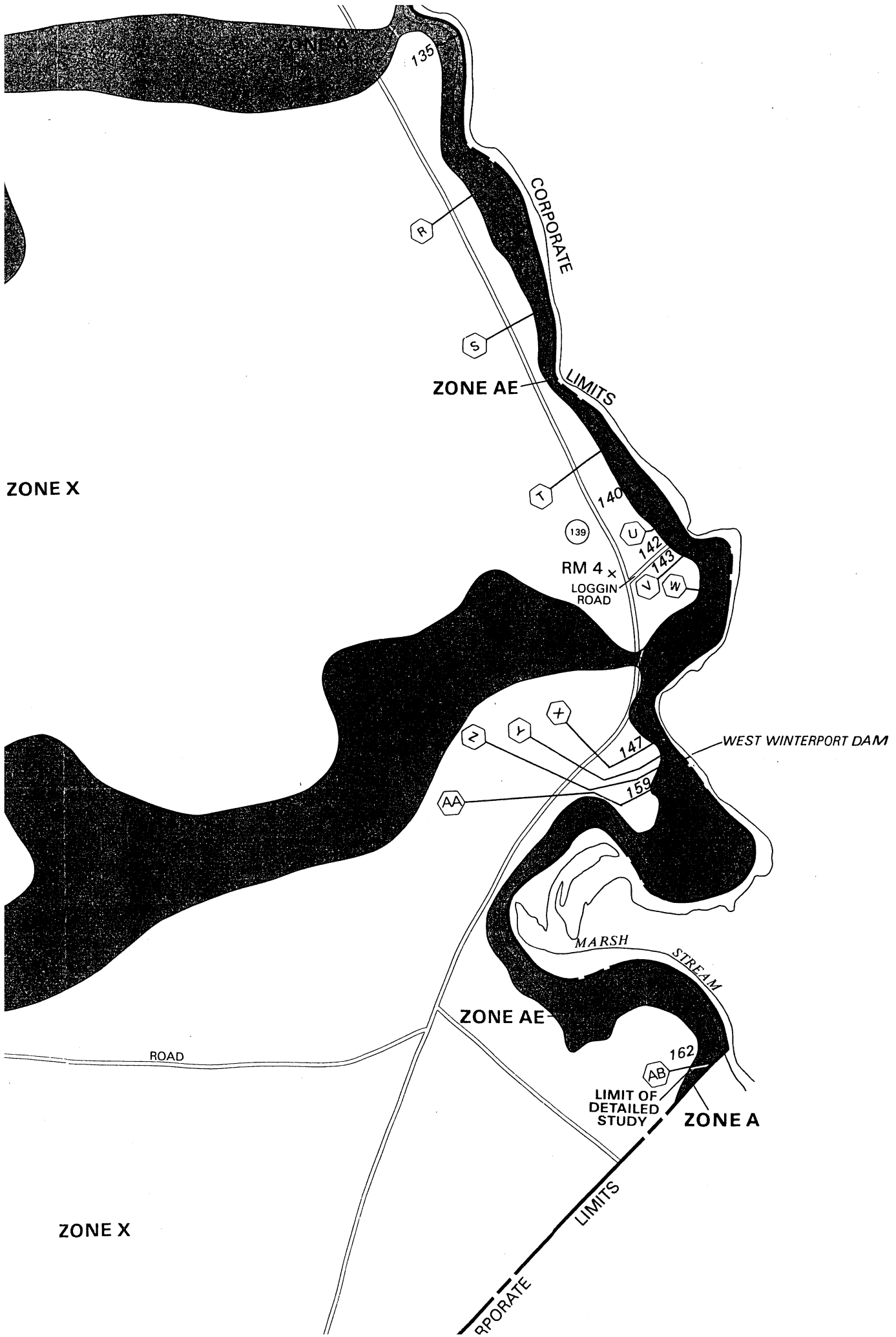


MAY 3, 1990



Federal Emergency Management Agency

COMMUNITY NUMBER - 230271



ZONE X

ZONE AE

RM 4 X

LOGGIN ROAD

WEST WINTERPORT DAM

MARSH

ZONE AE

LIMIT OF DETAILED STUDY

ZONE A

ZONE X

CORPORATE

LIMITS

### 3.1 Hydrologic Analyses

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

The 100-year flood discharge for Marsh Stream was computed using empirical equations developed by the USGS (Reference 5). These equations relate flood flows to selected basin characteristics: drainage area, main channel slope, and percent storage area. On Marsh Stream, the flow was adjusted above Littlefield Brook on the basis of drainage area ratios.

Data for the Penobscot River flooding was taken from Tidal Flood Profiles of the New England Coastline (Reference 6). The 100-year flood data is given in Table 1, "Summary of Discharges and Flood Elevations."

TABLE 1 - SUMMARY OF DISCHARGES AND FLOOD ELEVATIONS

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (sq. miles)</u>	<u>PEAK DISCHARGE (cfs) 100-YEAR</u>	<u>FLOOD ELEVATION 100-YEAR (Feet, NGVD)</u>
<b>PENOBSCOT RIVER</b>			
At downstream corporate limits	8,250	--	10.5 <sup>1</sup>
At upstream corporate limits	8,210	--	10.7 <sup>2</sup>
<b>MARSH STREAM</b>			
At head of dam in Frankfort	135	9,850	--
Approximately 1,400 feet downstream of upper railroad bridge	133	9,850	77.0
Upstream of Littlefield Brook	111	8,420	145.8
At upstream corporate limits	111	8,420	162.1

<sup>1</sup>From Bucksport Flood Study (Reference 7)

<sup>2</sup>From Hampden Flood Study (Reference 8)

### 3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

FLOODING SOURCE		RIVER CHANNEL				BASE FLOOD ELEVATION
CROSS SECTION	DISTANCE <sup>1</sup> (FT.)	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	STREAM-BED ELEVATION FT. (NGVD)	FT. (NGVD)
L	30,200	319	2,580	3.8	109.3	120.8
M	31,400	400	2,720	3.6	111.0	121.8
N	32,400	343	2,060	4.8	113.8	123.5
O	33,400	326	1,980	5.0	118.5	127.0
P	34,200	275	1,750	5.6	119.5	129.6
Q	36,200	354	3,000	3.3	121.0	134.0
R	38,300	520	3,410	2.9	125.0	136.2
S	39,400	287	1,960	5.0	126.3	137.2
T	40,700	342	2,210	4.5	127.5	139.3
U	41,500	372	2,050	4.8	130.2	140.7
V	41,800	381	2,770	3.6	129.0	143.4

<sup>1</sup> STREAM DISTANCE IN FEET UPSTREAM FROM ITS MOUTH.

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF WINTERPORT  
WALDO COUNTY, MAINE

100-YEAR FLOOD DATA

MARSH STREAM

TABLE 2

FLOODING SOURCE		RIVER CHANNEL				BASE FLOOD ELEVATION
CROSS SECTION	DISTANCE <sup>1</sup> (FT.)	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	STREAM-BED ELEVATION FT. (NGVD)	FT. (NGVD)
W	42,400	449	3,010	3.3	132.0	144.3
X	43,800	374	2,520	3.3	134.5	147.4
Y	43,990	185	1,210	7.0	138.0	147.7
Z	44,000	311	916	9.2	151.9	157.4
AA	44,100	637	3,620	2.3	136.7	159.5
AB	50,300	577	3,580	2.4	146.0	162.1

<sup>1</sup> STREAM DISTANCE IN FEET UPSTREAM FROM ITS MOUTH.

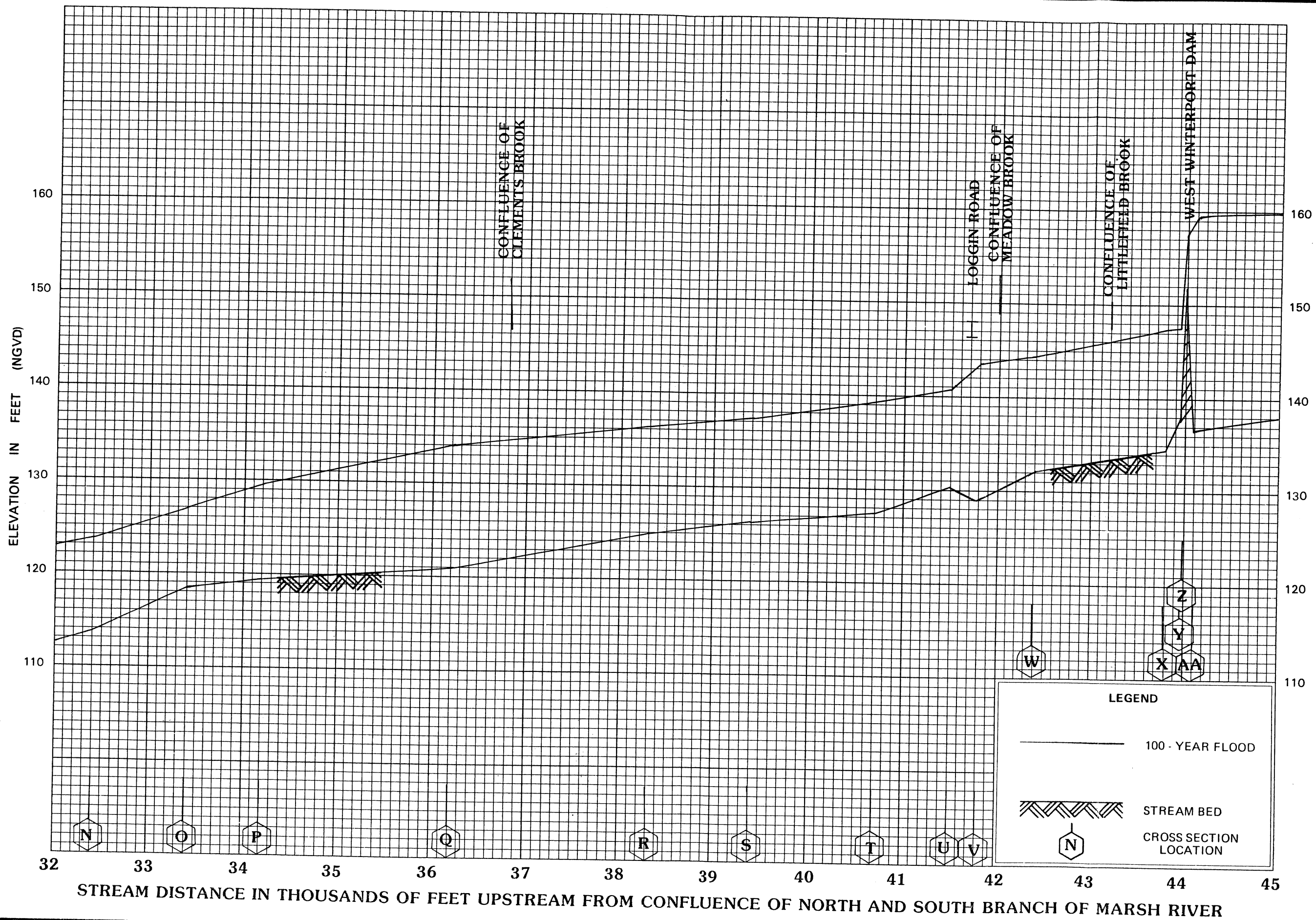
FEDERAL EMERGENCY MANAGEMENT AGENCY

100-YEAR FLOOD DATA

TOWN OF WINTERPORT  
WALDO COUNTY, MAINE

MARSH STREAM

TABLE 2



**FLOOD PROFILES**  
MARSH STREAM

FEDERAL EMERGENCY MANAGEMENT AGENCY  
TOWN OF WINTERPORT, MAINE  
WALDO COUNTY

PRELIM. BY REM  
FINAL CHK. BY \_\_\_\_\_  
ITEM NO. \_\_\_\_\_

DATE 5/26/10 PROJ. NO. 16763.00  
DATE \_\_\_\_\_ LOCATION WINTERPORT  
SUBJECT MANNING'S "n"

FILE NO. \_\_\_\_\_ OF \_\_\_\_\_  
SH. NO. \_\_\_\_\_ OF \_\_\_\_\_

MARSH STREAM & FLOODPLAIN

• CHANNEL

1) FLOOD INSURANCE STUDY USED 0.030 - 0.060

2) ACCORDING TO HYDRAULIC TEXT ASSUMING

- CLEAN, WINDING, SOME POOLS & SHOALS

- SOME WEEDS AND STONES

- SAME AS ABOVE BUT W/MORE STONES

0.045 - 0.060

OR

- MOUNTAIN STREAM, NO VEGETATION IN CHANNEL, BANKS USUALLY STEEP, TREES AND BRUSH ALONG BANKS SUBMERGED AT HIGH STAGES

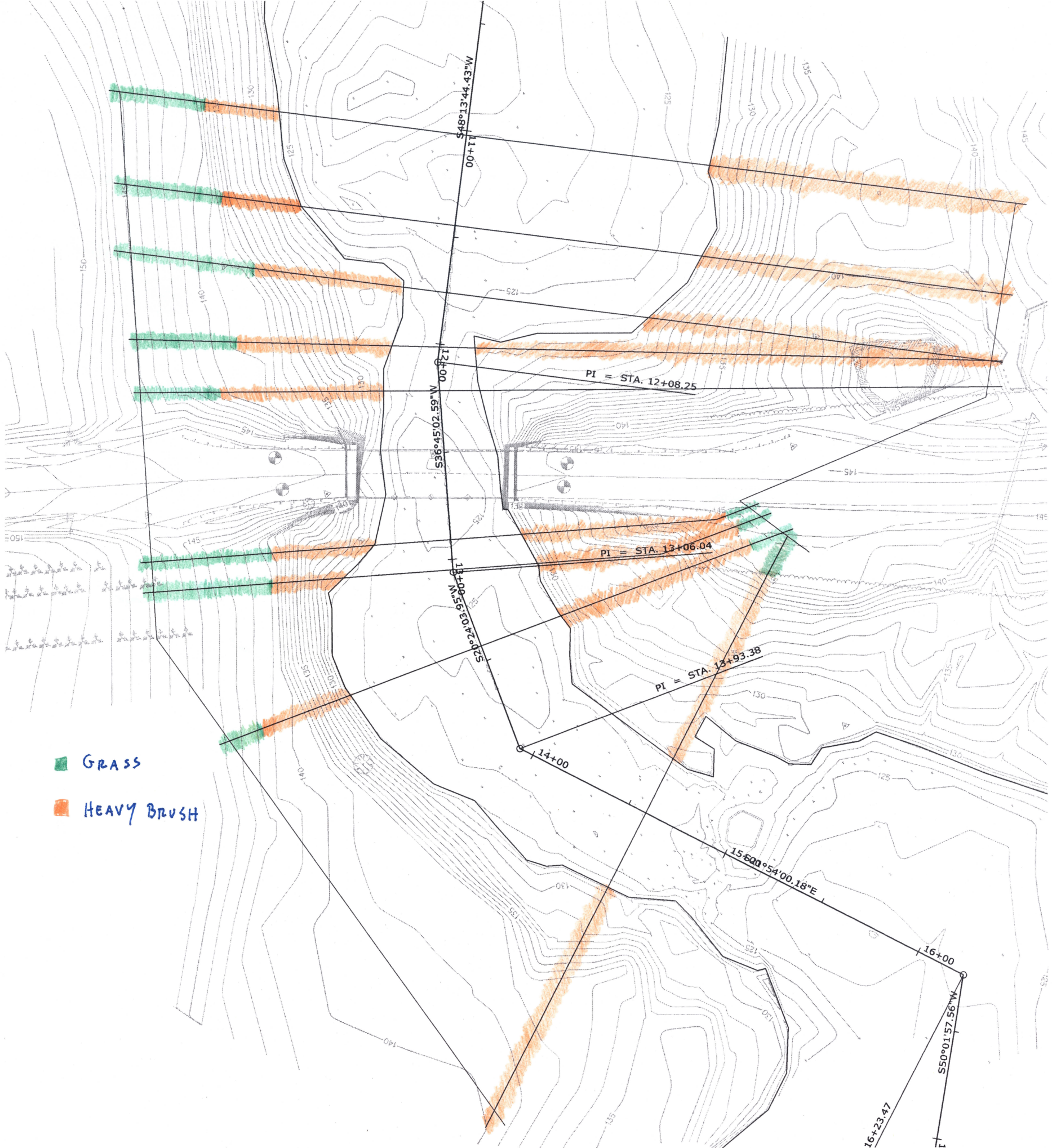
- BOTTOM: GRAVELS, COBBLES, AND FEW BOULDERS

0.030 - 0.050

∴ TWO SOURCES ARE IN AGREEMENT

- COULD DO A SENSITIVITY ANALYSIS TO COMPARE THE MAX. & MIN. OR JUST USE THE AVERAGE OF 0.045

• FLOODPLAIN
1) FLOOD INSURANCE STUDY USED 0.050 - 0.125
THERE'S BASICALLY TWO BROAD FLOODPLAIN CATEGORIES AT THE SITE
a) HEAVY BRUSH W/ TALL WEEDS, SOME TREES, A LOT OF BIG BUSHES
b) GRASS - SHORT TO MEDIUM LENGTH
2) HYDRAULIC TEXT GIVES THE FOLLOWING CATEGORIES
For a)
- MEDIUM TO DENSE BRUSH, IN WINTER 0.045 - 0.110
- " " , IN SUMMER 0.070 - 0.160
For b)
- SHORT GRASS 0.025 - 0.035
- HIGH GRASS 0.030 - 0.050
∴ THE FULL RANGE IS IN CLOSE AGREEMENT
<u>CONCLUSION</u> : For a), BEGIN W/ AN AVERAGE FOR THE TWO SEASONS; THEN, DO A SENSITIVITY ANALYSIS W/ THE MAX. & MIN. For b), USE 0.035



■ GRASS

■ HEAVY BRUSH

• PROPOSED 100' SPAN

- GEOMETRY ESTIMATED IN MICROSTATION

CROSS SECTION	STA. LT.	STA. RT.	ELEV. LT.	ELEV. RT.
1342.632	X	196.09	X	145.6
1304.845	57.13	203.22	147.2	145.8
1290.684	73.48	190.93	147.0	145.9
1221.361	86.83	209.59	146.9	145.7
1201.384	85.59	225.52	147.0	145.6
1175.934	87.99	X	147.0	X
1144.605	82.63	X	147.1	X

\* ELEV. ROUNDED DOWN TO NEAREST TENTH OF A FOOT

\* V/S, USED 1:1 CONTRACTION

\* P/S, ESTIMATED EXPANSION BASED ON CONTOURS

## Existing Bridge

HEC-RAS Plan: P2 River: Marsh Stream Reach: Tibbetts

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Tibbetts	1304.845	Q1.1	131.75	131.63	127.81	0.01	0.01	113.99	19.26	1514.50	8.64	2.85
Tibbetts	1304.845	Q10	137.00	136.59	130.45	0.01	0.02	178.55	124.34	5075.06	79.90	5.19
Tibbetts	1304.845	Q25	138.57	138.09	131.19	0.01	0.02	185.12	172.95	6289.62	113.64	5.66
Tibbetts	1304.845	Q50	139.69	139.16	131.72	0.01	0.02	189.69	213.60	7222.19	140.51	5.98
Tibbetts	1304.845	Q100	140.81	140.23	132.24	0.01	0.02	194.22	259.43	8200.86	169.61	6.29
Tibbetts	1304.845	Q500	143.37	142.67	133.51	0.01	0.03	218.94	404.10	10553.41	242.49	6.93
Tibbetts	1290.684	Q1.1	131.74	131.53	128.16	0.02	0.01	96.76	42.36	1485.97	14.07	3.68
Tibbetts	1290.684	Q10	136.97	136.36	131.30	0.03	0.06	140.64	394.01	4786.54	98.75	6.52
Tibbetts	1290.684	Q25	138.54	137.84	132.21	0.03	0.08	151.65	570.15	5873.51	132.55	7.03
Tibbetts	1290.684	Q50	139.65	138.89	132.82	0.03	0.09	159.42	710.48	6706.84	158.98	7.39
Tibbetts	1290.684	Q100	140.78	139.95	133.43	0.03	0.11	169.75	862.67	7579.99	187.24	7.74
Tibbetts	1290.684	Q500	143.34	142.35	134.86	0.03	0.15	201.75	1246.79	9695.84	257.37	8.48
Tibbetts	1260 BR U	Q1.1	131.71	131.46	128.20	0.05	0.09	69.79	36.76	1505.64		4.02
Tibbetts	1260 BR U	Q10	136.88	135.98	131.47	0.10	0.40	69.79	179.30	5100.00		7.73
Tibbetts	1260 BR U	Q25	138.43	137.34	132.38	0.10	0.50	69.79	234.15	6342.05		8.50
Tibbetts	1260 BR U	Q50	139.53	138.29	133.04	0.10	0.54	69.79	276.97	7299.33		9.05
Tibbetts	1260 BR U	Q100	140.64	139.25	133.69	0.10	0.58	69.79	322.67	8307.23		9.58
Tibbetts	1260 BR U	Q500	143.16	141.43	135.22	0.10	0.67	69.79	435.87	10764.13		10.72
Tibbetts	1260 BR D	Q1.1	131.57	130.86	129.63	0.33	0.15	70.58	37.54	1420.54	84.32	6.98
Tibbetts	1260 BR D	Q10	136.38	133.49	133.28	0.47	0.10	70.58	257.04	4627.98	394.29	14.46
Tibbetts	1260 BR D	Q25	137.83	134.26	134.26			70.58	350.27	5712.07	513.86	16.11
Tibbetts	1260 BR D	Q50	138.89	134.98	134.98	0.49	0.21	70.58	430.43	6533.92	611.95	16.91
Tibbetts	1260 BR D	Q100	139.96	135.68	135.68	0.48	0.24	70.58	516.24	7397.63	716.04	17.71
Tibbetts	1260 BR D	Q500	142.38	137.31	137.31	0.48	0.29	70.58	732.00	9494.03	973.97	19.38
Tibbetts	1221.361	Q1.1	131.09	129.64	129.64	0.44	0.13	74.96	18.99	1472.68	50.73	9.88
Tibbetts	1221.361	Q10	135.81	133.25	133.25	0.38	0.11	166.43	247.41	4341.25	690.64	14.03
Tibbetts	1221.361	Q25	137.20	133.28	134.09	0.60	0.04	166.76	310.44	5400.58	865.17	17.36
Tibbetts	1221.361	Q50	138.20	133.62	134.67	0.62	0.07	170.09	380.72	6149.05	1046.53	18.87
Tibbetts	1221.361	Q100	139.22	133.97	135.28	0.64	0.10	173.52	458.79	6925.12	1245.99	20.28
Tibbetts	1221.361	Q500	141.55	134.79	136.61	0.66	0.17	181.31	662.12	8778.95	1758.93	23.22
Tibbetts	1201.384	Q1.1	130.40	128.48	129.04	0.64	0.05	138.62	72.47	1166.26	303.66	12.62
Tibbetts	1201.384	Q10	135.00	130.20	131.64	0.58	0.22	155.55	425.27	3370.64	1483.38	21.25
Tibbetts	1201.384	Q25	136.26	130.67	132.33	0.78	0.17	159.47	579.85	4084.01	1912.35	23.16
Tibbetts	1201.384	Q50	137.20	130.99	132.84	0.84	0.16	162.18	701.47	4629.66	2245.17	24.54
Tibbetts	1201.384	Q100	138.17	131.30	133.35	0.89	0.16	164.84	831.71	5200.41	2597.78	25.91
Tibbetts	1201.384	Q500	138.39	135.84	134.50	0.11	1.32	205.59	1381.47	6094.66	3723.88	16.24

## Existing Bridge

Plan: P2 Marsh Stream Tibbetts RS 1342.632 Profile Q100

E.G. Elev (ft)	140.84	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.43	Wt. n-Val.	0.110	0.030	0.110
W.S. Elev (ft)	140.42	Reach Len. (ft)	79.71	37.79	12.39
Crit W.S. (ft)	131.42	Flow Area (sq ft)	170.82	1554.99	205.75
E.G. Slope (ft/ft)	0.000316	Area (sq ft)	170.82	1554.99	499.43
Q Total (cfs)	8629.90	Flow (cfs)	115.93	8298.96	215.01
Top Width (ft)	210.75	Top Width (ft)	32.70	103.95	74.10
Vel Total (ft/s)	4.47	Avg. Vel. (ft/s)	0.68	5.34	1.05
Max Chl Dpth (ft)	15.73	Hydr. Depth (ft)	5.22	14.96	9.54
Conv. Total (cfs)	485597.2	Conv. (cfs)	6523.5	466975.5	12098.2
Length Wtd. (ft)	38.14	Wetted Per. (ft)	35.94	104.16	22.65
Min Ch El (ft)	124.69	Shear (lb/sq ft)	0.09	0.29	0.18
Alpha	1.37	Stream Power (lb/ft s)	0.06	1.57	0.19
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	1.20	6.18	0.72
C & E Loss (ft)	0.02	Cum SA (acres)	0.22	0.56	0.16

### Errors Warnings and Notes

Note:	Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.
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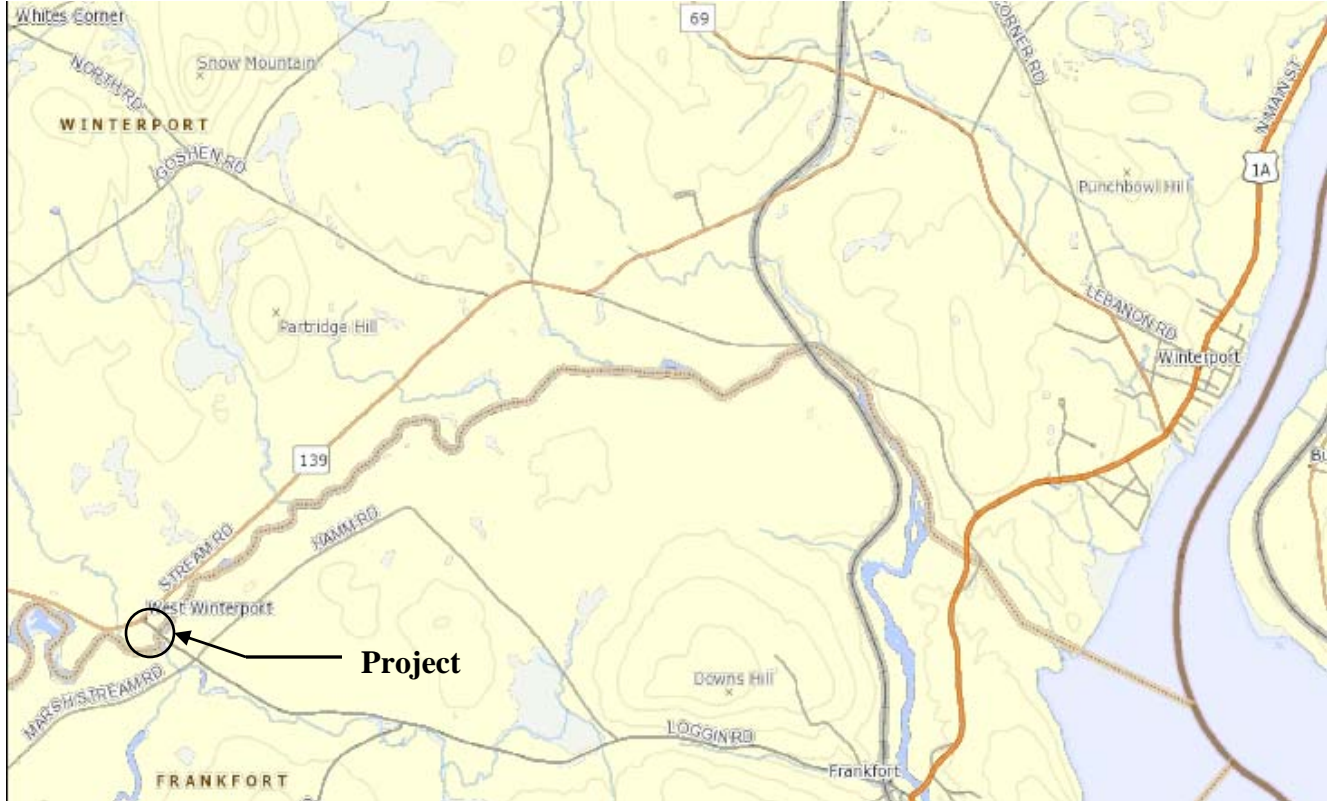
# Proposed Bridge

HEC-RAS Plan: P5 River: Marsh Stream Reach: Tibbetts

Reach	River Sta	Profile	E.G. Elev (ft)	W.S. Elev (ft)	Crit W.S. (ft)	Frctn Loss (ft)	C & E Loss (ft)	Top Width (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Vel Chnl (ft/s)
Tibbetts	1304.845	Q1.1	131.53	131.39	127.81	0.01	0.01	113.12	18.23	1516.06	8.11	2.97
Tibbetts	1304.845	Q10	136.24	135.77	130.46	0.01	0.03	174.92	115.71	5078.92	84.66	5.62
Tibbetts	1304.845	Q25	137.47	136.88	131.19	0.01	0.03	179.80	157.85	6292.82	125.53	6.28
Tibbetts	1304.845	Q50	138.37	137.70	131.73	0.01	0.03	183.41	193.09	7223.55	159.66	6.71
Tibbetts	1304.845	Q100	139.32	138.58	132.24	0.02	0.03	187.22	233.11	8198.73	198.07	7.10
Tibbetts	1304.845	Q500	141.47	140.55	133.55	0.02	0.04	195.60	340.60	10562.48	296.92	7.93
Tibbetts	1290.684	Q1.1	131.51	131.29	128.16	0.01	0.00	94.83	39.93	1490.85	11.62	3.85
Tibbetts	1290.684	Q10	136.20	135.47	131.28	0.02	0.01	134.03	341.50	4813.56	124.23	7.15
Tibbetts	1290.684	Q25	137.42	136.54	132.22	0.02	0.02	141.98	498.01	5903.38	174.81	7.91
Tibbetts	1290.684	Q50	138.32	137.34	132.88	0.02	0.02	147.88	627.48	6732.77	216.05	8.41
Tibbetts	1290.684	Q100	139.27	138.19	133.48	0.02	0.03	154.20	772.71	7595.40	261.79	8.84
Tibbetts	1290.684	Q500	141.42	140.12	134.92	0.02	0.05	171.45	1143.46	9679.10	377.44	9.77
Tibbetts	1260 BR U	Q1.1	131.50	131.27	128.16	0.07	0.08	94.73	39.80	1491.03	11.57	3.86
Tibbetts	1260 BR U	Q10	136.18	135.41	131.29	0.11	0.21	95.74	293.71	4879.11	106.48	7.30
Tibbetts	1260 BR U	Q25	137.39	136.43	132.19	0.13	0.28	95.74	395.20	6035.83	145.18	8.17
Tibbetts	1260 BR U	Q50	138.28	137.18	132.78	0.14	0.37	95.74	476.72	6923.13	176.45	8.76
Tibbetts	1260 BR U	Q100	139.22	137.99	133.37	0.15	0.43	95.74	566.09	7852.89	210.92	9.29
Tibbetts	1260 BR U	Q500	141.35	139.80	134.70	0.15	0.53	95.74	790.39	10111.79	297.82	10.43
Tibbetts	1260 BR D	Q1.1	131.35	130.74	129.51	0.34	0.15	84.60	7.55	1485.97	48.87	6.41
Tibbetts	1260 BR D	Q10	135.85	134.02	132.91	0.37	0.12	96.00	139.58	4748.63	391.09	11.39
Tibbetts	1260 BR D	Q25	136.98	134.63	133.84	0.40	0.08	96.00	210.19	5850.77	515.24	12.95
Tibbetts	1260 BR D	Q50	137.77	134.83	134.46	0.44	0.01	96.00	254.58	6718.85	602.87	14.52
Tibbetts	1260 BR D	Q100	138.64	135.25	135.07	0.45	0.06	96.00	318.37	7604.16	707.37	15.64
Tibbetts	1260 BR D	Q500	140.66	136.45	136.45			96.00	506.16	9711.19	982.66	17.53
Tibbetts	1221.361	Q1.1	130.87	129.51	129.51	0.46	0.10	73.03	0.86	1527.92	13.62	9.38
Tibbetts	1221.361	Q10	135.37	132.93	132.93	0.38	0.08	162.51	91.71	4699.43	488.16	13.22
Tibbetts	1221.361	Q25	136.50	133.74	133.74	0.37	0.10	171.32	147.83	5709.72	718.65	14.23
Tibbetts	1221.361	Q50	137.32	134.33	134.33	0.34	0.19	176.93	200.21	6472.13	903.96	14.90
Tibbetts	1221.361	Q100	138.13	134.95	134.95	0.31	0.26	182.80	264.91	7257.65	1107.34	15.47
Tibbetts	1221.361	Q500	140.08	135.37	136.19	0.54	0.05	187.48	386.28	9317.43	1496.30	18.89
Tibbetts	1201.384	Q1.1	130.22	128.62	129.04	0.62	0.03	141.39	78.34	1138.33	325.73	11.65
Tibbetts	1201.384	Q10	134.62	130.36	131.62	0.56	0.18	156.84	428.49	3316.66	1534.15	20.17
Tibbetts	1201.384	Q25	135.74	130.89	132.33	0.55	0.21	161.40	572.70	4017.13	1986.37	21.70
Tibbetts	1201.384	Q50	135.58	133.22	132.90	0.15	1.27	181.40	828.02	4267.69	2480.59	15.55
Tibbetts	1201.384	Q100	136.37	134.05	133.39	0.13	1.22	189.22	1017.57	4755.72	2856.61	15.52
Tibbetts	1201.384	Q500	138.24	135.88	134.49	0.11	1.18	205.93	1475.40	5957.11	3767.49	15.82

## LOCATION MAP

Winterport-Frankfort, Maine  
Tibbetts Bridge  
Bridge No. 3344  
PIN 016763.00



Latitude: 44°37'11.3" N

Longitude: 68°57'04.6" W

Frankfort Bridge # 3344  
Loggin Rd. Core # 1





# BRIDGE CORE TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Sample Description	Sampled	Received
<b>207595</b>	<b>BRIDGE CORE</b>	<b>12/9/2010</b>	<b>12/9/2010</b>
Sample Type: <b>OTHER</b>	Sampler: <b>GODIN, JASON G</b>	Sample Location:	
PIN: <b>016763.00</b>	Town: <b>Winterport, Frankfort</b>	Station: <b>0+01</b>	Offset, ft: <b>12, RT</b>
Contractor:		Resident:	

### TEST RESULTS

#### Shear Bond (MeDOT)

	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

#### Chloride Content (T 260)

Location, inch	Chloride Level, lb/yd <sup>3</sup>
<b>4.0-4.5</b>	<b>1.1</b>
<b>5.0-5.5</b>	<b>0.69</b>

#### Compressive Strength (T 22)

	Location, inch	Strength, psi
Specimen 1	<b>5.5-9.75</b>	<b>6490.00</b>
Specimen 2		

#### Rebar Corrosion (MeDOT)

	Location, inch	Corrosion Level
Specimen 1		
Specimen 2		
Specimen 3		
Specimen 4		

#### Comments:

**Final report. Core # 1 Bridge # 3344 Frankfort, Loggin Rd.**

### AUTHORIZATION AND DISTRIBUTION

Reported by: **HARADON, ROBERT S**

Date Reported: **1/10/2011**

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Frankfort Bridge # 3344

Loggin Rd. Core # 2





# BRIDGE CORE TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Sample Description	Sampled	Received
<b>207596</b>	<b>BRIDGE CORE</b>	<b>12/9/2010</b>	<b>12/9/2010</b>
Sample Type: <b>OTHER</b>	Sampler: <b>GODIN, JASON G</b>	Sample Location:	
PIN: <b>016763.00</b>	Town: <b>Winterport, Frankfort</b>	Station: <b>0+40</b>	Offset, ft: <b>7, RT</b>
Contractor:		Resident:	

### TEST RESULTS

#### Shear Bond (MeDOT)

	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

#### Chloride Content (T 260)

Location, inch	Chloride Level, lb/yd <sup>3</sup>
<b>5.0-5.5</b>	<b>0.77</b>
<b>6.0-6.5</b>	<b>0.59</b>
<b>8.0-8.5</b>	<b>0.27</b>

#### Compressive Strength (T 22)

	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

#### Rebar Corrosion (MeDOT)

	Location, inch	Corrosion Level
Specimen 1		
Specimen 2		
Specimen 3		
Specimen 4		

#### Comments:

**Final report. Core # 2 Bridge # 3344 Frankfort, Loggin Rd.**

### AUTHORIZATION AND DISTRIBUTION

Reported by: **HARADON, ROBERT S**

Date Reported: **1/10/2011**

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Frankfort Bridge # 3344  
Loggin Rd. Core # 3





# BRIDGE CORE TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No. <b>207597</b>	Sample Description <b>BRIDGE CORE</b>	Sampled <b>12/9/2010</b>	Received <b>12/9/2010</b>
Sample Type: <b>OTHER</b>	Sampler: <b>GODIN, JASON G</b>	Sample Location:	
PIN: <b>016763.00</b>	Town: <b>Winterport, Frankfort</b>	Station: <b>0+77</b>	Offset, ft: <b>.5, RT</b>
Contractor:		Resident:	

### TEST RESULTS

Shear Bond (MeDOT)		
	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

Chloride Content (T 260)	
Location, inch	Chloride Level, lb/yd <sup>3</sup>
<b>6.0-6.5</b>	<b>1.3</b>
<b>7.5-8.0</b>	<b>1.4</b>
<b>9.5-10.0</b>	<b>1.01</b>

Compressive Strength (T 22)		
	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

Rebar Corrosion (MeDOT)		
	Location, inch	Corrosion Level
Specimen 1		
Specimen 2		
Specimen 3		
Specimen 4		

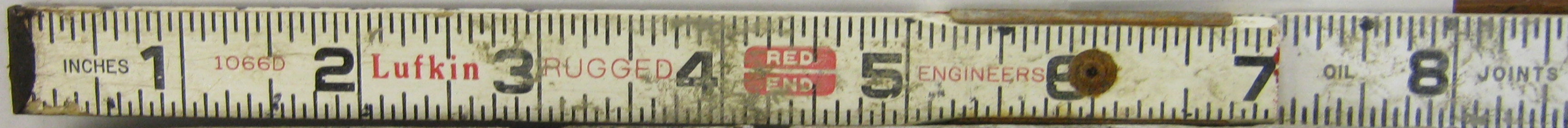
Comments:  
**Final report. Core # 3 Bridge # 3344 Frankfort, Loggin Rd.**

### AUTHORIZATION AND DISTRIBUTION

Reported by: **HARADON, ROBERT S**

Date Reported: **1/10/2011**

Frankfort Bridge # 3344  
Loggin Rd. Core # 4





# BRIDGE CORE TEST REPORT

## Central Laboratory

### S A M P L E I N F O R M A T I O N

Reference No.	Sample Description	Sampled	Received
<b>207598</b>	<b>BRIDGE CORE</b>	<b>12/9/2010</b>	<b>12/9/2010</b>
Sample Type: <b>OTHER</b>	Sampler: <b>GODIN, JASON G</b>	Sample Location:	
PIN: <b>016763.00</b>	Town: <b>Winterport, Frankfort</b>	Station: <b>0+65</b>	Offset, ft: <b>5, LT</b>
Contractor:		Resident:	

### T E S T R E S U L T S

#### Shear Bond (MeDOT)

	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

#### Chloride Content (T 260)

Location, inch	Chloride Level, lb/yd <sup>3</sup>

#### Compressive Strength (T 22)

	Location, inch	Strength, psi
Specimen 1	<b>4.5-8</b>	<b>6540.00</b>
Specimen 2		

#### Rebar Corrosion (MeDOT)

	Location, inch	Corrosion Level
Specimen 1		
Specimen 2		
Specimen 3		
Specimen 4		

#### Comments:

**Final report. Core # 4 Bridge # 3344 Frankfort, Loggin Rd.**

### A U T H O R I Z A T I O N   A N D   D I S T R I B U T I O N

Reported by: **HARADON, ROBERT S**

Date Reported: **1/10/2011**

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Frankfort Bridge # 3344  
loggin Rd. Core # 5





# BRIDGE CORE TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No. <b>207599</b>	Sample Description <b>BRIDGE CORE</b>	Sampled <b>12/9/2010</b>	Received <b>12/9/2010</b>
Sample Type: <b>OTHER</b>	Sampler: <b>GODIN, JASON G</b>	Sample Location:	
PIN: <b>016763.00</b>	Town: <b>Winterport, Frankfort</b>	Station: <b>0+47</b>	Offset, ft: <b>9.5, LT</b>
Contractor:		Resident:	

### TEST RESULTS

Shear Bond (MeDOT)		
	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

Chloride Content (T 260)	
Location, inch	Chloride Level, lb/yd <sup>3</sup>
<b>4.25-4.75</b>	<b>2.32</b>
<b>5.75-6.25</b>	<b>2.69</b>
<b>6.5-7.0</b>	<b>2.85</b>
<b>8.5-9.0</b>	<b>1.75</b>

Compressive Strength (T 22)		
	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

Rebar Corrosion (MeDOT)		
	Location, inch	Corrosion Level
Specimen 1		
Specimen 2		
Specimen 3		
Specimen 4		

Comments:

**Final report. Core # 5 Bridge # 3344 Frankfort, Loggin Rd.**

### AUTHORIZATION AND DISTRIBUTION

Reported by: **HARADON, ROBERT S**

Date Reported: **1/10/2011**

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Frankfort Bridge # 3344  
Loggin Rd. Core # 6





# BRIDGE CORE TEST REPORT

## Central Laboratory

### SAMPLE INFORMATION

Reference No.	Sample Description	Sampled	Received
<b>207600</b>	<b>BRIDGE CORE</b>	<b>12/9/2010</b>	<b>12/9/2010</b>
Sample Type: <b>OTHER</b>	Sampler: <b>GODIN, JASON G</b>	Sample Location:	
PIN: <b>016763.00</b>	Town: <b>Winterport, Frankfort</b>	Station: <b>0+09</b>	Offset, ft: <b>7, LT</b>
Contractor:		Resident:	

### TEST RESULTS

#### Shear Bond (MeDOT)

	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

#### Chloride Content (T 260)

Location, inch	Chloride Level, lb/yd <sup>3</sup>
<b>5.0-5.5</b>	<b>1.34</b>
<b>6.5-7.0</b>	<b>0.9</b>
<b>8.5-9.0</b>	<b>0.53</b>

#### Compressive Strength (T 22)

	Location, inch	Strength, psi
Specimen 1		
Specimen 2		

#### Rebar Corrosion (MeDOT)

	Location, inch	Corrosion Level
Specimen 1		
Specimen 2		
Specimen 3		
Specimen 4		

#### Comments:

**Final report. Core # 6 Bridge # 3344 Frankfort, Loggin Rd.**

### AUTHORIZATION AND DISTRIBUTION

Reported by: **HARADON, ROBERT S**

Date Reported: **1/10/2011**

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