STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION

Region 5 - Engineering
3803 N. Main Ave., Suite 200
Durango, Colorado 81301

(970) 385-1413 or (970) 385-1400
FAX (970) 385-1410

September 30, 2009

Mr. Amanullah Mommandi, M.S., P.E.
State Serior Hydraulics Engineer
4201 E. Arkansas Ave. Room 290
Denver, CO 80222
Ph # (303) 757-9044

Re: Plan of Action for Scour Critical Bridge K-01-A
SH 141: Dolores River at Gateway, CO

Dear Mr. Mommandi,

Region 5 Inter-Disciplinary Team submits this Plan of Action for the K-01-A, SH 141 Bridge over the Dolores River at Gateway Colorado. Included is a chart of Inter-disciplinary Team members and List of Region 5 bridges that have been identified as scour critical and unknown foundations. This plan is in accordance with the criteria set forth in the February 5, 2009 Memorandum from Rick Gabel, Director of Staff Branches, with the subject: Plan of Action (POA) for Scour Critical Bridges and Bridges with Unknown Foundations.

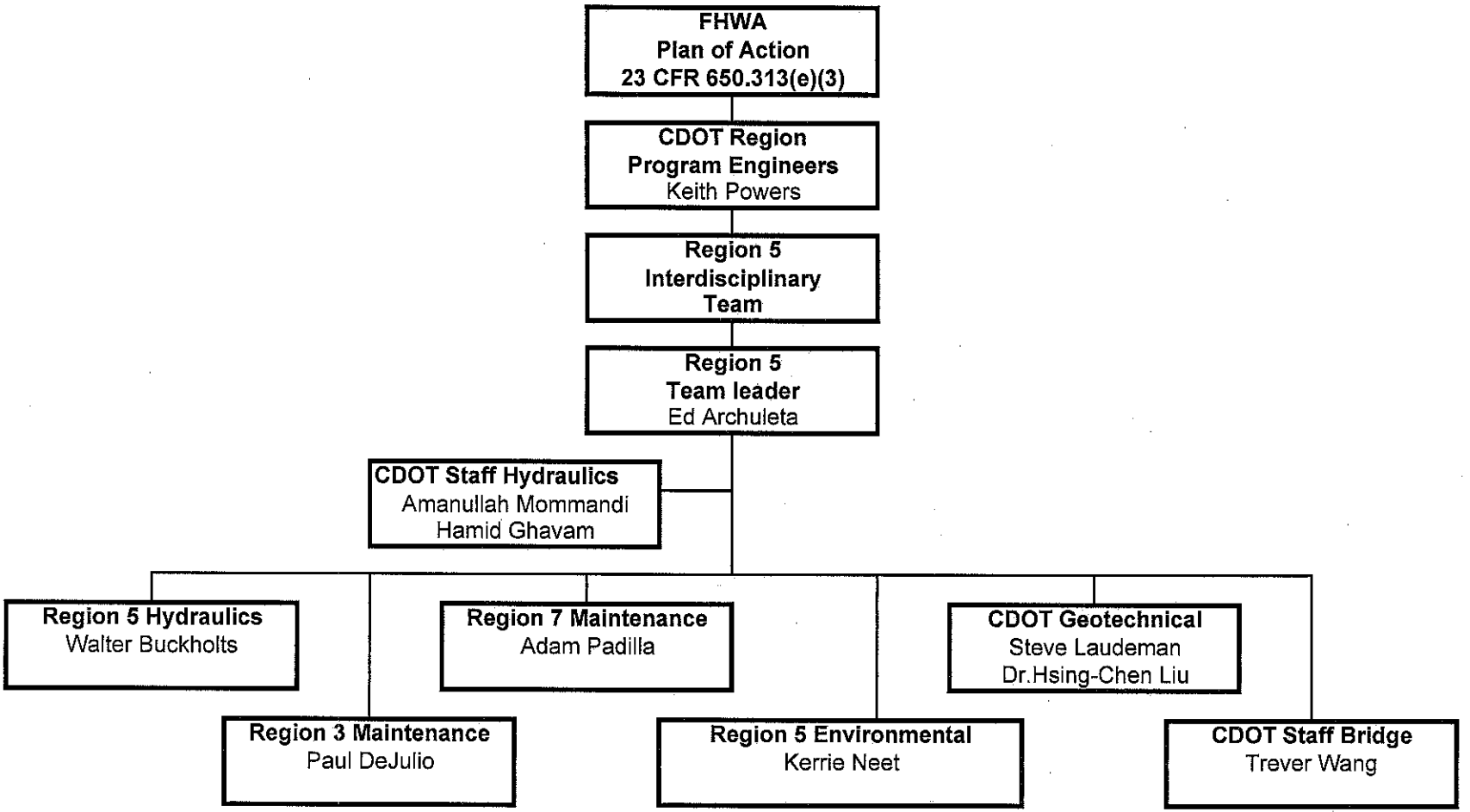
Please Contact the undersigned if you have any questions or need additional information.

Sincerely,

W. H. Buckholts III, P.E.
Region 5 Hydraulic Engineer, CDOT

Enclosures: Interdisciplinary Team Organization Chart
Priority Listing of Region 5 Scour Critical Bridges
POA for K-01-A

Colorado Department of Transportation
Interdisciplinary Team Organization Chart



Colorado Department of Transportation
Scour Critical Bridges Region 5

Structure Number	Classification		Average Daily Traffic		Detour Length Miles		Year Built		Substructure Condition		Waterway Adequacy		Replacement Schedule	
O-05-AQ	SD	O-05-AQ	35,100	O-05-AQ	124	K-01-C	1929	P-12-A	5	L-05-B	6	K-01-A	O-05-AQ	Unknown
L-05-B	FO	L-05-B	7,700	L-05-B	**124**	**K-01-A**	1929	P-12-B	6	J-12-AK	7	P-02-A	L-05-B	Unknown
P-02-A	NO	P-02-A	7,700	P-05-G	62	P-02-A	1936	P-15-D	6	O-12-AD	7	P-12-B	P-02-A	Unknown
J-12-AK	NO	J-12-AK	6,900	J-12-B	62	P-02-B	1940	P-13-D	6	P-05-G	7	P-12-A	J-12-AK	Unknown
P-02-B	NO	P-02-B	5,600	P-05-R	62	P-01-A	1948	L-05-B	6	K-01-C	8	O-05-AQ	P-02-B	Unknown
O-12-AD	NO	O-12-AD	5,300	N-10-V	62	P-07-D	1952	K-01-C	6	P-12-B	8	L-05-B	O-12-AD	Unknown
P-07-B	NO	P-07-B	5,100	J-12-AK	22	P-07-B	1954	O-12-AD	6	P-12-A	8	P-02-B	P-07-B	Unknown
P-05-G	NO	P-05-G	4,500	P-12-B	16	P-14-P	1955	P-07-B	6	P-13-D	8	O-12-AD	P-05-G	Unknown
K-01-C	NO	K-01-C	4,500	P-12-A	13	N-11-V	1957	P-05-G	7	O-05-AQ	8	P-07-B	K-01-C	Unknown
P-12-B	NO	P-12-B	4,000	P-07-B	11	P-13-D	**1958**	**K-01-A**	7	P-02-A	8	P-05-G	P-12-B	Unknown
K-01-A	**NO**	**K-01-A**	3,300	P-02-A	9	P-05-G	1959	J-12-AK	7	P-02-B	8	K-01-C	**K-01-A**	**Unknown**
P-01-A	NO	P-01-A	3,300	P-02-B	7	P-05-R	1959	P-02-A	7	P-07-B	**8**	**P-01-A**	P-01-A	Unknown
P-12-A	NO	P-12-A	2,300	P-01-A	6	L-05-B	1959	P-02-B	7	**K-01-A**	8	P-07-D	P-12-A	Unknown
P-07-D	NO	P-07-D	1,900	N-11-V	6	P-15-D	1961	P-01-A	7	P-01-A	8	P-13-D	P-07-D	Unknown
P-13-D	NO	P-13-D	1,400	P-13-D	3	P-12-B	1961	P-07-D	7	P-07-D	8	J-12-B	P-13-D	Unknown
J-12-B	NO	J-12-B	1,400	P-14-P	3	P-12-A	1965	J-12-B	7	P-05-R	8	P-05-R	J-12-B	Unknown
P-05-R	NO	P-05-R	850	O-12-AD	2	O-12-AD	1971	P-05-R	8	N-11-V	8	P-15-D	P-05-R	Unknown
P-15-D	NO	P-15-D	830	P-07-D	2	N-10-V	1974	O-05-AQ	8	P-14-P	8	N-11-V	P-15-D	Unknown
N-11-V	NO	N-11-V	430	P-15-D	1	O-05-AQ	1980	N-11-V	8	N-10-V	8	P-14-P	N-11-V	Unknown
P-14-P	NO	P-14-P	400	K-01-C	1	J-12-AK	1981	N-10-V	N	J-12-B	8	N-10-V	P-14-P	Unknown
N-10-V	NO	N-10-V	**370**	**K-01-A**	1	J-12-B	1984	P-14-P	N	P-15-D	9	J-12-AK	N-10-V	Unknown
21														
Bridge in Region 2														
K-13-V	FO	K-13-V	3,000	K-13-V	1	K-13-V	1936	K-13-V	6	K-13-V	8	K-13-V	K-13-V	Unknown
K-13-P	NO	K-13-P	3,000	K-13-P	62	K-13-P	1934	K-13-P	7	K-13-P	8	K-13-P	K-13-P	Unknown
Unknown Foundation Identified														
N-09-D	NO	N-09-D	2,500	N-09-D	124	N-09-D	1977	N-09-D	N	N-09-D	8	N-09-D	N-09-D	Unknown
L-02-F	NO	L-02-F	430	L-02-F	4	L-02-F	1972	L-02-F	7	L-02-F	7	L-02-F	L-02-F	Unknown

SCOUR CRITICAL BRIDGE - PLAN OF ACTION

1. GENERAL INFORMATION

Structure number: K-01-A	**City, County, State:** N/A, Montrose, Colorado	**Waterway:** Dolores River
Structure name: N/A	**State highway or facility carried:** SH 141	**Owner:** CDOT
Year built: 1958	**Year rebuilt:** N/A	**Bridge replacement plans (if scheduled):** N/A **Anticipated opening date:** N/A

Structure type: [X] Bridge [ ] Culvert

Structure size and description: 30 If Wide, 240 If Long 4-bay bridge crossing

Foundations: X Known, type: Spread Footings Depth: 4.25-ft [ ] Unknown

Subsurface soil information (*check all that apply*): [X] Non-cohesive [ ] Cohesive [X] Rock

Bridge ADT: 460	**Year/ADT:** 2008	**% Trucks:** 19.7

Does the bridge provide service to emergency facilities and/or an evacuation route (Y/N)? Y
If so, describe: Emergency service from Naturita and Paradox valley to Grand Junction, CO

2. RESPONSIBILITY FOR POA

Author(s) of POA (name, title, agency/organization, telephone, pager, email):
Walter Buckholts, Region 5 Hydraulics Engineer, CDOT, Durango 970-385-1445 (970-759-5321)
walter.buckholts@dot.state.co.us
Date: 30 Sept09
Concurrences on POA (name, title, agency/organization, telephone, pager, email):
Amanullch Mommandi, State Senior hydraulic engineer, CDOT-Denver 303-757-9044

POA updated by (name, title, agency, organization): Walter Buckholts, R5 Hydraulics Engineer, CDOT-Durango **Date of update: 30 Sept 09**
Items update: POA

POA to be updated every 24 **months by (name, title, agency/organization):** Walter Buckholts, R5 Hydraulics Engineer, CDOT-Durango

Date of next update: 30 Sept 09

3. SCOUR VULNERABILITY

a. Current Item 113 Code: [X] 3 [ ] 2 [ ] 1 Other: _____

b. Source of Scour Critical Code: [X] Observed [ ] Assessment [X] Calculated Other: _____

c. Scour Evaluation Summary: Total scour has an expected depth of 4.5 ft below the footing. <500yr> at piers 3 & 4 north side of the bridge as the greatest scour.

Scour History: Inspection history begins in 1967 and shows continued deepening of the channel from pier 3 through pier 4 to abutment 5. From Abutment 1 through Piers 2 to pier 3 shows deposition in the riverbed. The footer at pier 4 was exposed to a depth of 2.5 ft. It was verified stable in 2007 with the installation of rip rap. Rip Rap at the nose of Pier 3 is being monitored

4. RECOMMENDED ACTION(S) (see Sections 6 and 7)

	Recommended		Implemented	
a. Increased Inspection Frequency	[X] Yes	[ ] No	[ ] Yes	[X] No
b. Fixed Monitoring Device(s)	[ ] Yes	[X] No	[ ] Yes	[X] No
c. Flood Monitoring Program	[X] Yes	[ ] No	[ ] Yes	[X] No
d. Hydraulic/Structural Countermeasures	[X] Yes	[ ] No	[ ] Yes	[X] No

5. NBI CODING INFORMATION

		Current	Previous
Inspection date		October 2007	October 2005
Item 113	Scour Critical	3	3
Item 60	Substructure	7	7
Item 61	Channel & Channel Protection	5	5
Item 71	Waterway Adequacy	6	6
Comments: (drift, scour holes, etc. - depict in sketches in Section 10)			

6. MONITORING PROGRAM

[X] **Regular Inspection Program** [ ] w/surveyed cross sections
Items to Watch: Piers and abutments

[X] **Increased Inspection Frequency of 12 mo.** [ ] w/surveyed cross sections
Items to Watch: Piers and Abutments

[X] **Underwater Inspection Required**
Items to Watch: Stability of Rip Rap placed at Piers

[ ] **Increased Underwater Inspection Frequency of __ mo.**
Items to Watch: _____

[ ] **Fixed Monitoring Device(s)**
Type of Instrument: _____
Installation location(s): _____
Sample Interval: [ ] 30 min. [ ] 1 hr. [ ] 6 hrs. [ ] 12 hrs. [ ] Other: _____
Frequency of data download and review: [ ] Daily [ ] Weekly [ ] Monthly [ ] Other _____
Scour alert elevation(s) for each pier/abutment: 2 feet below top of footing
Scour critical elevations(s) for each pier/abutment: _____
Survey ties: _____
Criteria of termination for fixed monitoring: Approval from Staff hydraulics

[ ] **Flood Monitoring Program**
Type: [X] Visual inspection
[ ] Instrument (*check all that apply*):

☐ Portable ☐ Geophysical ☐ Sonar ☐ Other: _____

Flood monitoring required: [X] Yes ☐ No

Flood monitoring event defined by (*check all that apply*):

[X] Discharge 4000cfs ☐ Stage _____

[X] Elev. measured from Water Surface of EL 4738.4

☐ Rainfall _____ (in/mm) per _____ (hour)

☐ Flood forecasting information: _____

☐ Flood warning system: _____

Frequency of flood monitoring: ☐1 hr. [X]3 hrs. ☐6 hrs. ☐ Other: _____

Post-flood monitoring required: ☐ No [X]Yes, within _____ days

Frequency of post-flood monitoring: [X] Daily ☐Weekly ☐Monthly ☐Other: _____

Criteria for termination of flood monitoring: Approval from Staff Hydraulics

Criteria for termination of post-flood monitoring: Approval from Staff Hydraulics

Scour alert elevation(s) for each pier/abutment: 2 feet below top of footing

Scour critical elevation(s) for each pier/abutment: _____

Note: Additional details for action(s) required may be included in Section 8.

Action(s) required if scour alert elevation detected (*include notification and closure procedures*): _____

Action(s) required if scour critical elevation detected (*include notification and closure procedures*): _____

Agency and department responsible for monitoring: Colorado Department ofTransportation, Region 5 Maintenance

Contact person (*include name, title, telephone, pager, e-mail*): Paul Dejulio, Maintenance, CDOT Region 5-970-385-1651 pauldejulio@dot.state.co.us

7. COUNTERMEASURE RECOMMENDATIONS

Prioritize alternatives below. Include information on any hydraulic, structural or monitoring countermeasures.

☐ **Only monitoring required (see Section 6 and Section 10 – Attachment F)**

Estimated cost $_____

[X] **Structural/hydraulic countermeasures considered (see Section 10, Attachment F):**

Priority Ranking	Estimated cost
(1) Redirection of the Dolores River at Structure K-01-A	$ 564,300
(2) _____	$ _____
(3) _____	$ _____
(4) _____	$ _____
(5) _____	$ _____

Basis for the selection of the preferred scour countermeasure: Hydraulic Analysis

Countermeasure implementation project type:

[X] Proposed Construction Project [X] Maintenance Project

☐ Programmed Construction - Project Lead Agency:

☐ Bridge Bureau ☐ Road Design ☐ Other _____

Agency and department responsible for countermeasure program (if different from Section 6 contact for monitoring): Same

Contact person (*include name, title, telephone, pager, e-mail*): Same

Target design completion date: May 15, 2010

Target construction completion date: November 15, 2010

Countermeasures already completed: _____

8. BRIDGE CLOSURE PLAN

Scour monitoring criteria for consideration of bridge closure:

- [X] Water surface elevation reaches EL 4738.4 at 4000 cfs
- [X] Overtopping road or structure
- [ ] Scour measurement results / Monitoring device (See Section 6)
- [X] Observed structure movement / Settlement
- [X] Discharge: 4000 cfs/cms
- [ ] Flood forecast: _____
- [ ] Other: [ ] Debris accumulation [X] Movement of riprap/other armor protection
  [ ] Loss of road embankment

Emergency repair plans (*include source(s), contact(s), cost, installation directions*): Dependent on site conditions and repairs required.

Agency and department responsible for closure: CDOT

Contact persons (name, title, agency/organization, telephone, pager, email): Greg Stacy, CDOT (970) 626-4378

Criteria for re-opening the bridge: Approval from Staff Bridge

Agency and person responsible for re-opening the bridge after inspection: Greg Stacy, CDOT (970) 626-4378

9. DETOUR ROUTE

Detour route description (route number, from/to, distance from bridge, etc.) - Include map in Section 10, Attachment E.

Bridges on Detour Route:

Bridge Number	Waterway	Sufficiency Rating/ Load Limitations	Item 113 Code
See Section 10 Attachment E			

Traffic control equipment (detour signing and barriers) and location(s): _____

See Section 10 Attachment E

Additional considerations or critical issues (susceptibility to overtopping, limited waterway adequacy, lane restrictions, etc.) : Remote Location

News release, other public notice (include authorized person(s), information to be provided and limitations): Nancy Shanks, CDOT-Durango, CO (970) 385-1428

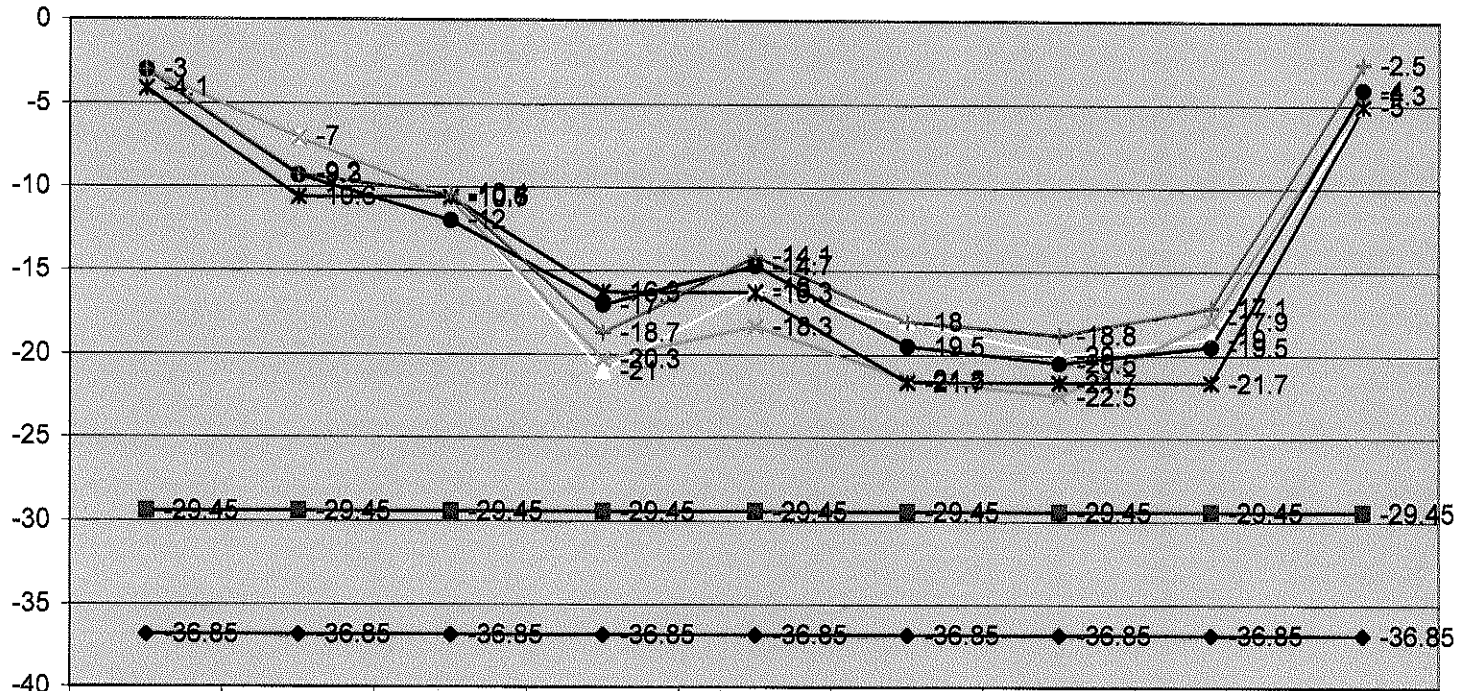
10. ATTACHMENTS

Please indicate which materials are being submitted with this POA:

- ☐ **Attachment A: Boring logs and/or other subsurface information**
- ☒ **Attachment B: Cross sections from current and previous inspection reports**
- ☒ **Attachment C: Bridge elevation showing existing streambed, foundation depth(s) and observed and/or calculated scour depths**
- ☒ **Attachment D: Plan view showing location of scour holes, debris, etc.**
- ☒ **Attachment E: Description and Map showing detour route(s)**
- ☒ **Attachment F: Supporting documentation, calculations, estimates and conceptual designs for scour countermeasures.**
- ☒ **Attachment G: Photos**
- ☐ **Attachment H: Other information: _____**

ATTACHMENT B: CROSS SECTIONS FROM CURRENT AND PREVIOUS INSPECTION REPORTS

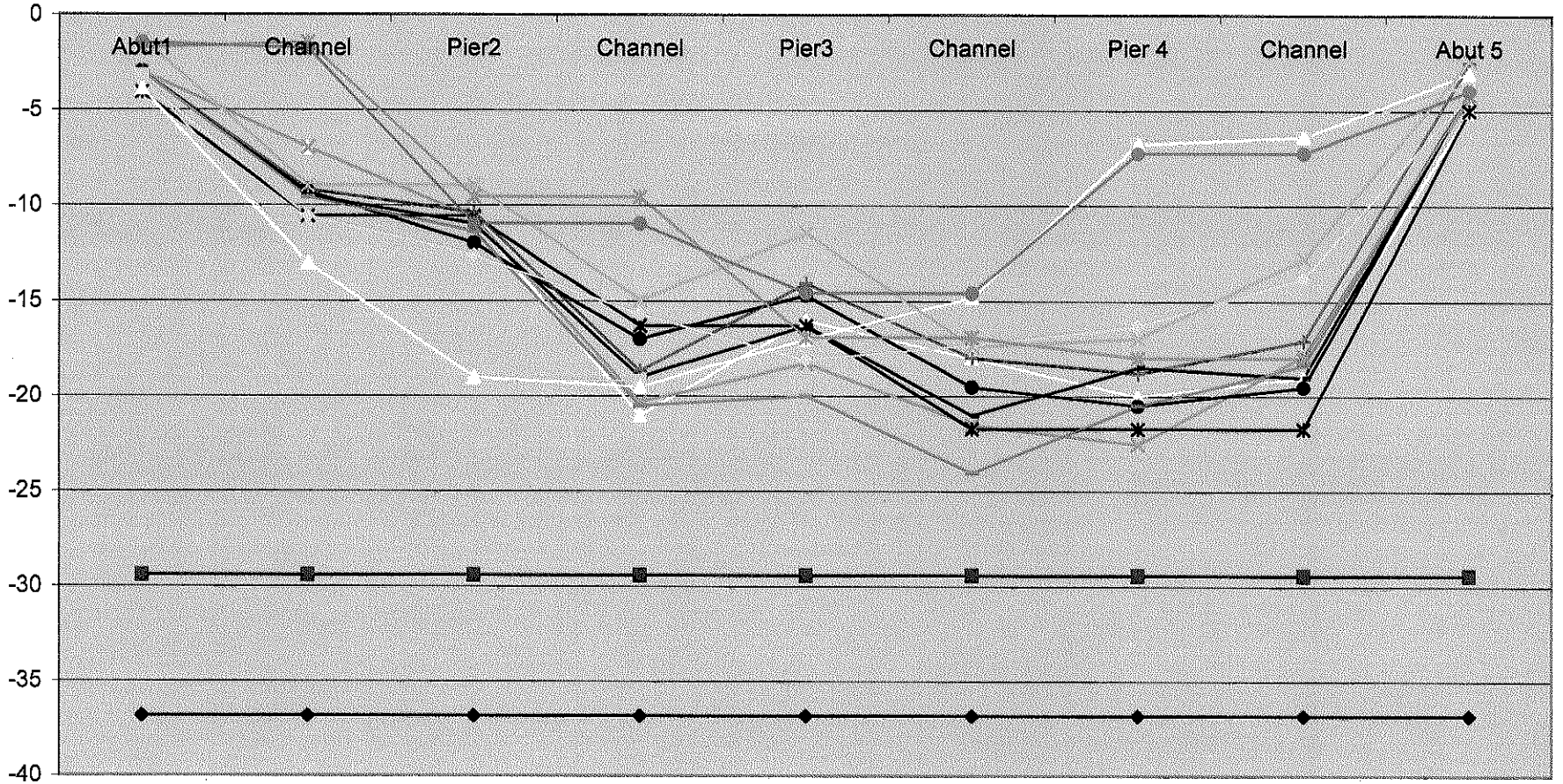
K-01-A



	Abut1	Channel	Pier2	Channel	Pier3	Channel	Pier 4	Channel	Abut 5
1958 FOOTING BOTTOM	-36.85	-36.85	-36.85	-36.85	-36.85	-36.85	-36.85	-36.85	-36.85
500 YR SCOUR	-29.45	-29.45	-29.45	-29.45	-29.45	-29.45	-29.45	-29.45	-29.45
2003	-3	-7	-10.7	-21	-16	-18	-20	-19	-5
2001	-3	-7	-10.7	-20.3	-18.3	-21.5	-22.5	-17.9	-4.3
1999	-4.1	-10.6	-10.6	-16.3	-16.3	-21.7	-21.7	-21.7	-5
1997	-3	-9.3	-12	-17	-14.7	-19.5	-20.5	-19.5	-4
1995	-3	-9.2	-10.4	-18.7	-14.1	-18	-18.8	-17.1	-2.5

1958 FOOTING BOTTOM — 500 YR SCOUR — 2003 — 2001 — 1999 — 1997 — 1995

K-01-A


0
-5
-10
-15
-20
-25
-30
-35
-40
Abut1
Channel
Pier2
Channel
Pier3
Channel
Pier 4
Channel
Abut 5
1958 FOOTING BOTTOM
500 YR SCOUR
2003
2001
1999
1997
1995
1993
1992
1990
1988
1983
1977
1971
1967

Bridge Number **K-01-A**

Highway **141** Drainage area **3,755 Sq. Miles**
Span/type **4 CIC** Stream **DOLORES RIVER**

		Abut1	Channel	Pier2	Channel	Pier3	Channel	Pier 4	Channel
1958 FOOTING BOTTOM		-36.85	-36.85	-36.85	-36.85	-36.85	-36.85	-36.85	-36.85
500 YR SCOUR		-29.45	-29.45	-29.45	-29.45	-29.45	-29.45	-29.45	-29.45
	2003	-3	-7	-10.7	-21	-16	-18	-20	-19
	2001	-3	-7	-10.7	-20.3	-18.3	-21.5	-22.5	-17.9
	1999	-4.1	-10.6	-10.6	-16.3	-16.3	-21.7	-21.7	-21.7
	1997	-3	-9.3	-12	-17	-14.7	-19.5	-20.5	-19.5
	1995	-3	-9.2	-10.4	-18.7	-14.1	-18	-18.8	-17.1
	1993	-3	-9.5	-11	-19	-16.3	-21	-18.5	-19
	1992	-3	-9.6	-11.4	-20.5	-20	-24	-20.5	-18.4
	1990	-3.5	-10.6	-12.6	-15.7	-18.1	-17.3	-16.3	-13.8
	1988	-3.2	-13	-19.2	-19.2	-17.3	-14.9	-6.7	-6.4
	1983	-3.9	-13	-19	-19.5	-17	-14.8	-6.8	-6.4
	1977	-1.3	-9	-9	-15	-11.5	-17.4	-17	-12.8
	1971	-1.8	-1.5	-9.6	-9.6	-16.9	-16.9	-18	-18
	1967	-1.5	-1.8	-11	-11	-14.6	-14.6	-7.3	-7.3

ATTACHMENT C-1

ELEVATION OF EXISTING AND PROPOSED STREAMBED, FOUNDATION DEPTHS, AND CALCULATED SCOUR DEPTHS FOR 100 AND 500 YEARS

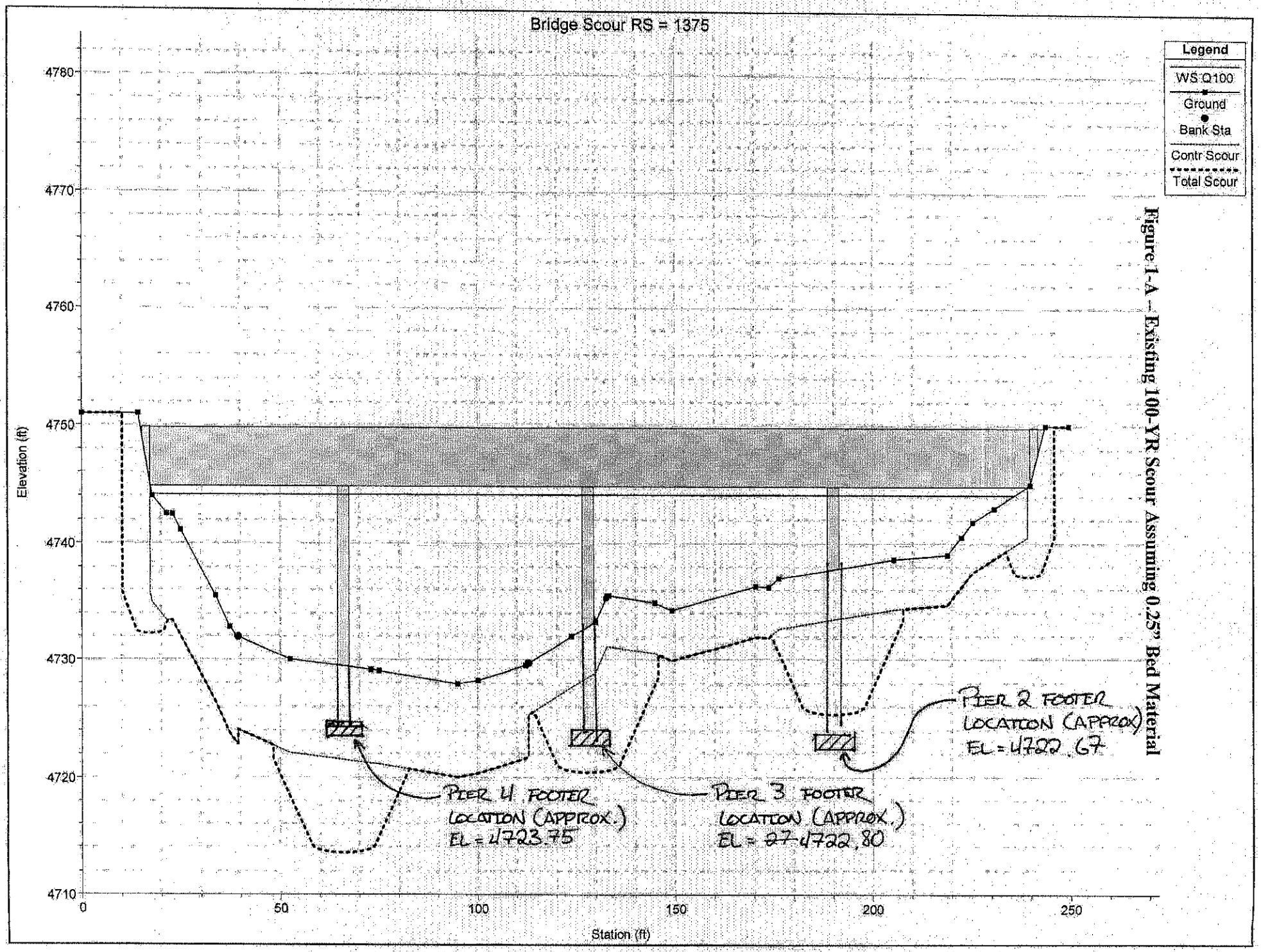


Figure 1-A – Existing 100-YR Scour Assuming 0.25" Bed Material

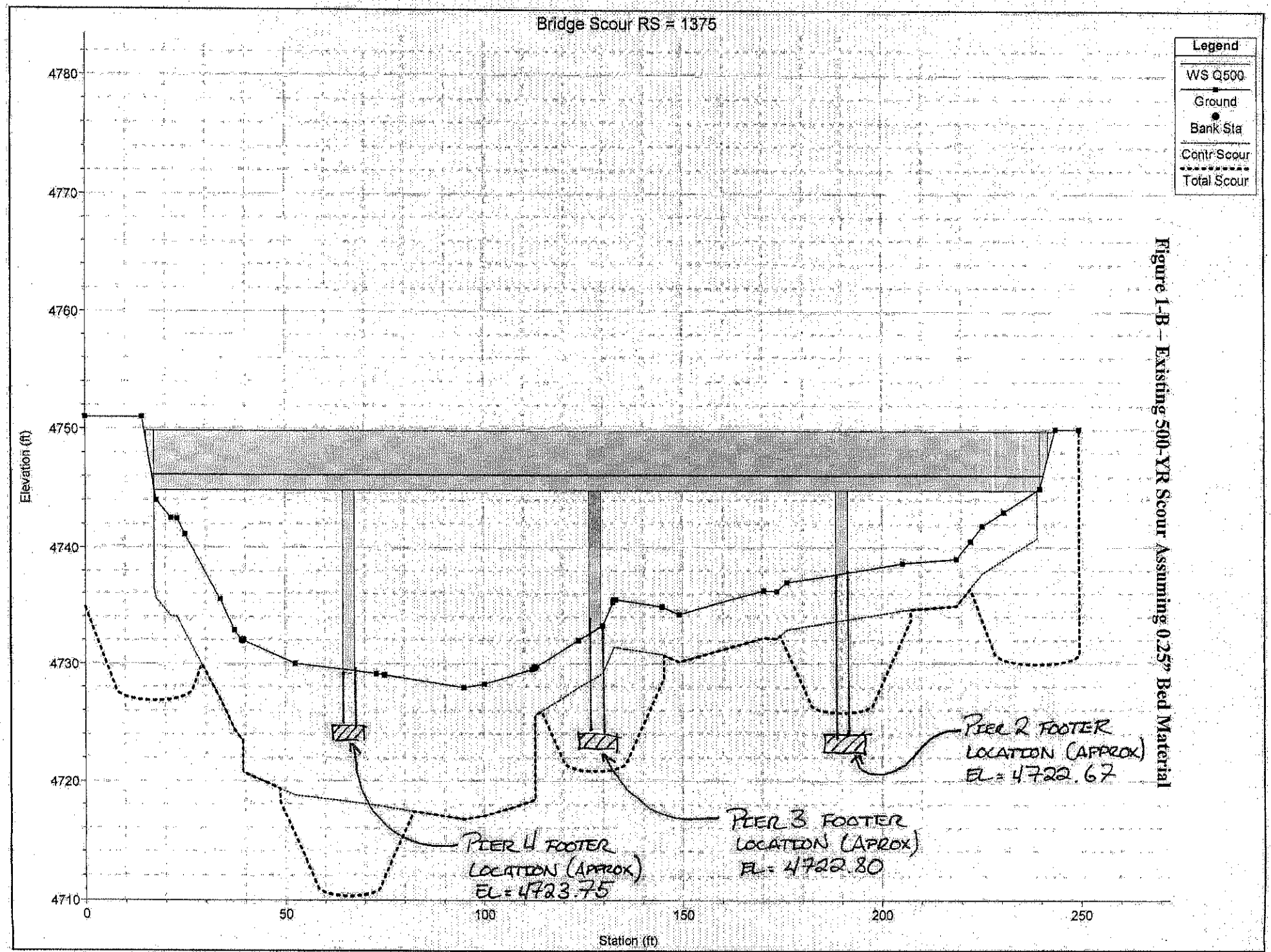


Figure 1-B – Existing 500-YR Scour Assuming 0.25" Bed Material

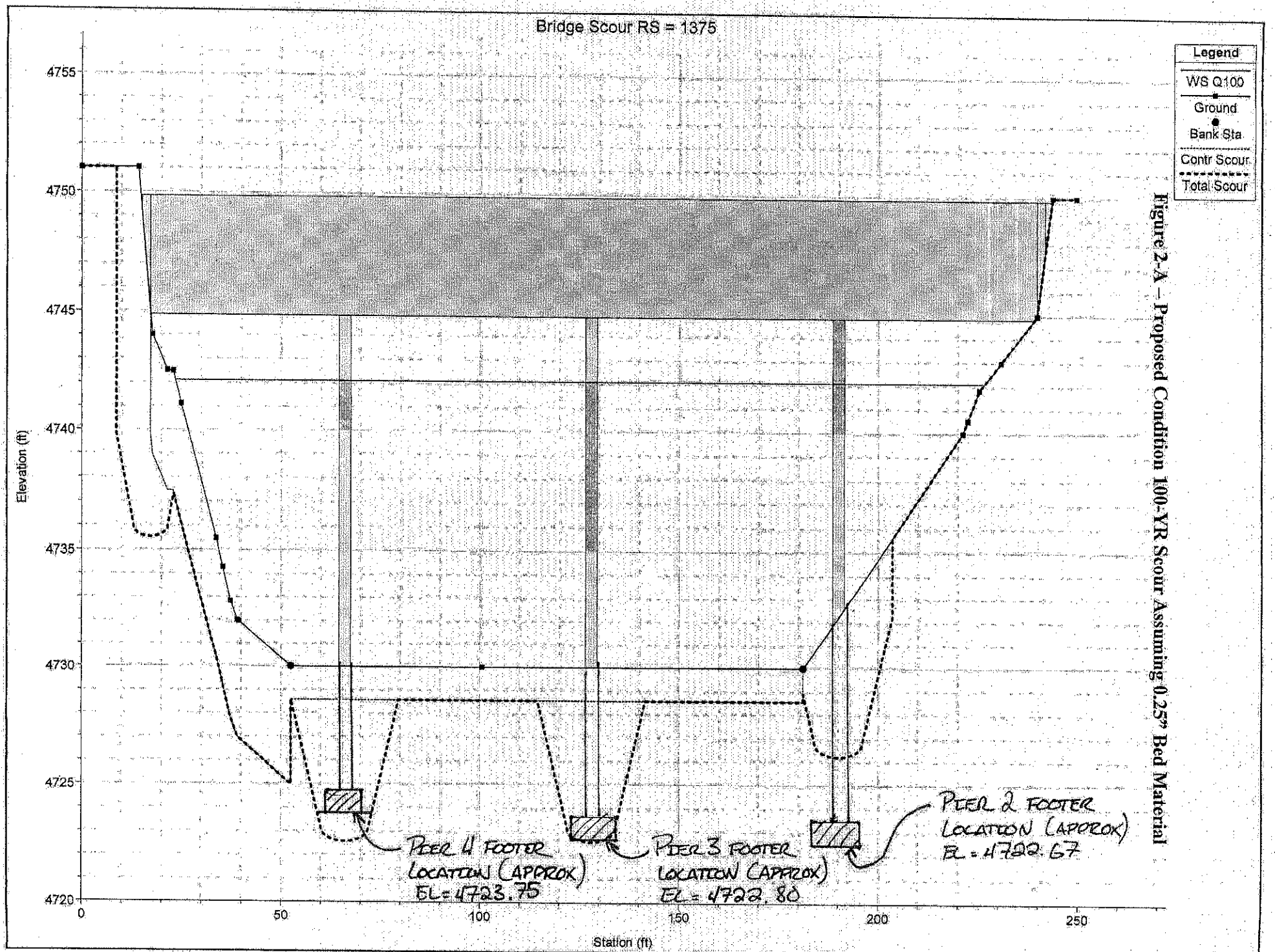


Figure 2-A – Proposed Condition 100-YR Scour Assuming 0.25" Bed Material

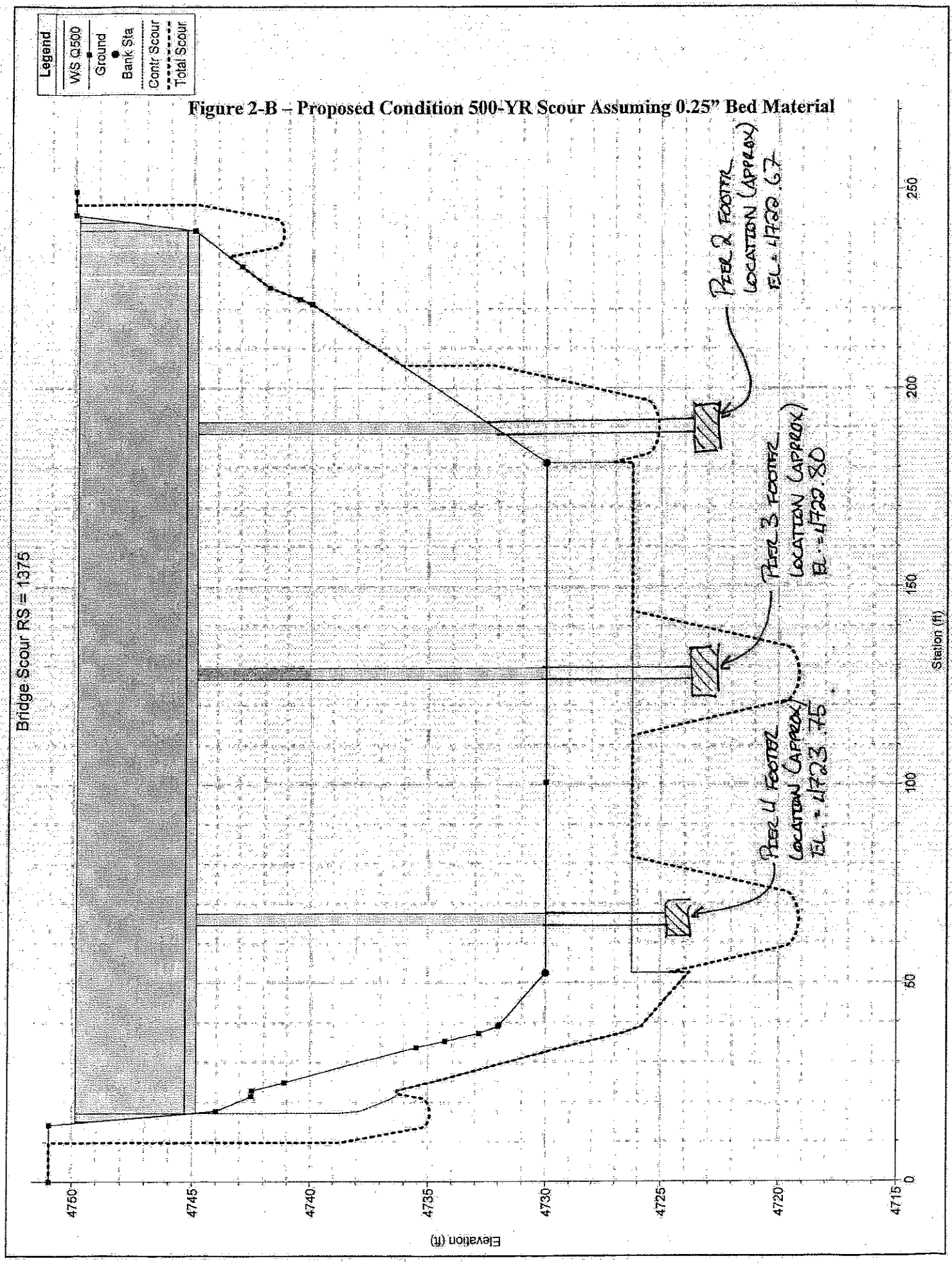
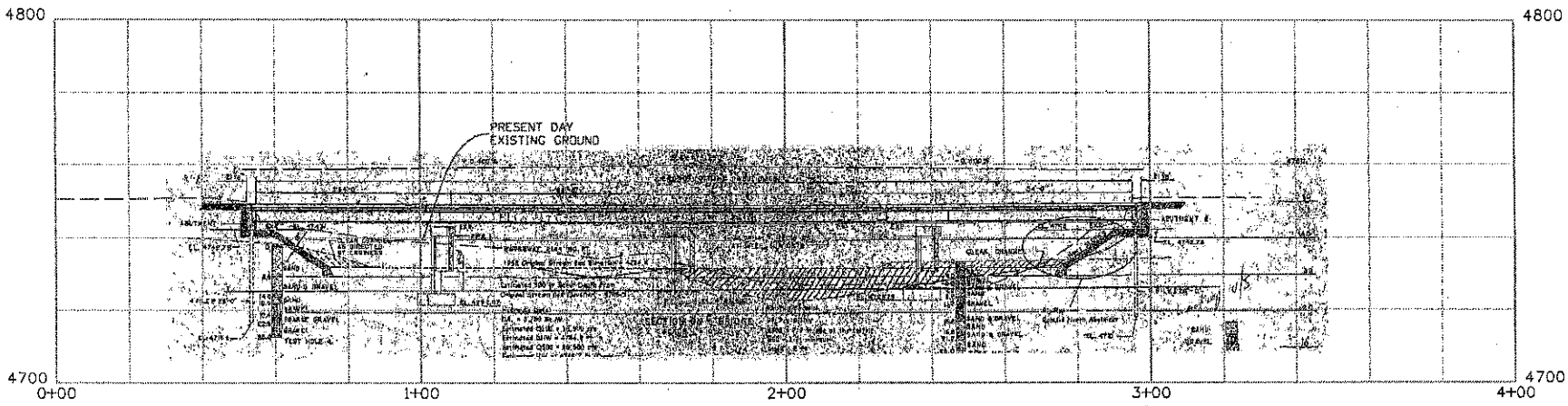


Figure 2-B – Proposed Condition 500-YR Scour Assuming 0.25" Bed Material

ATTACHMENT C-2

ELEVATION OF ORIGINAL (1952) AND PRESENT-DAY STREAMBED



BRIDGE LOOKING UPSTREAM

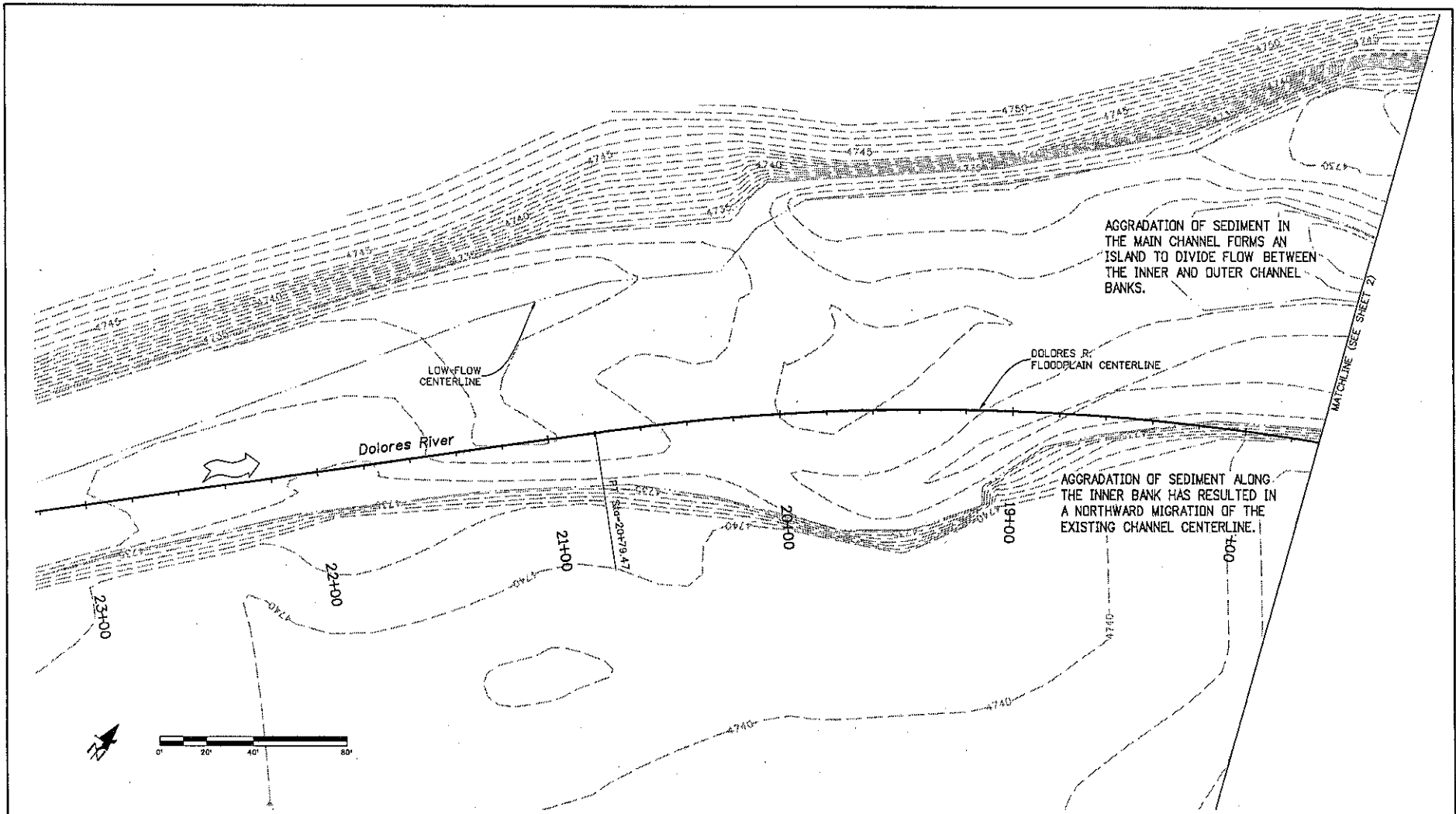
NOT FOR CONSTRUCTION - PRELIMINARY PLANS - 07-20-09

Print Date: 9/21/2009		Sheet Revisions			Colorado Department of Transportation
File Name: 16270Prof-01.dgn		Date:	Comments	Init.	3803 North Main Avenue, Suite 200, Durango, CO 81301
Horiz. Scale: As Noted Vert. Scale: As Noted					Phone: 970-385-1440 FAX: 970-385-8365
MULLER ENGINEERING CO. INC. CONSULTING ENGINEERS 777 S. Wadsworth Blvd. Suite 4-100 Lakewood, CO 80226 303-988-4939	R-X 0000				Region 5 EJA

As Constructed	DOLORES R. AT SH-141 ATTACHMENT C		Project No./Code
No Revisions:			IM ??
Revised:	Designer: XXXXXXXX	Structure Numbers	16270
Void:	Detailer: XXXXXXXX		Sheet Number
	Sheet Subset: XXXXXXX	Subset Sheets:	

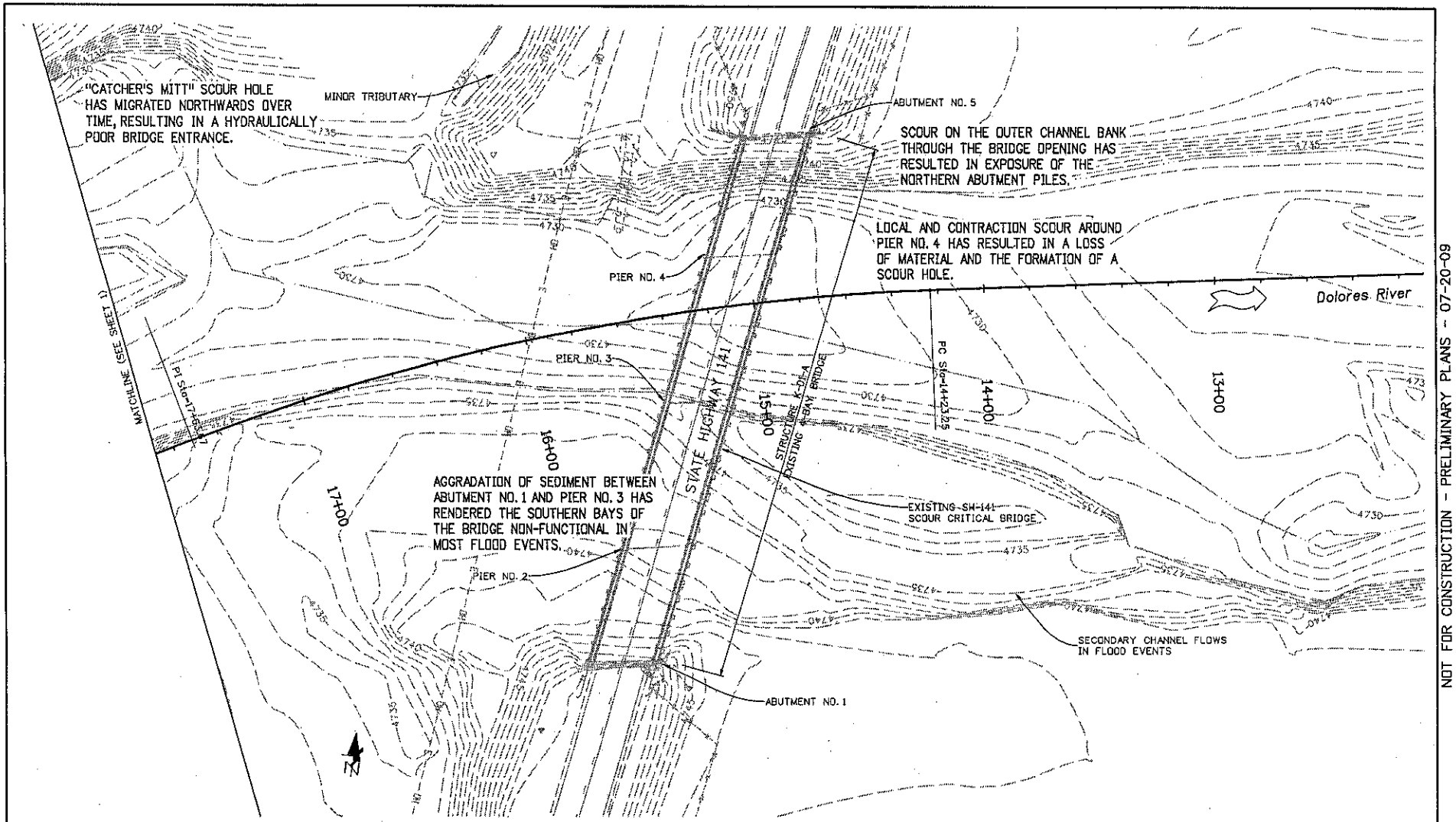
ATTACHMENT D

EXISTING PLAN VIEW



NOT FOR CONSTRUCTION - PRELIMINARY PLANS - 07-20-09

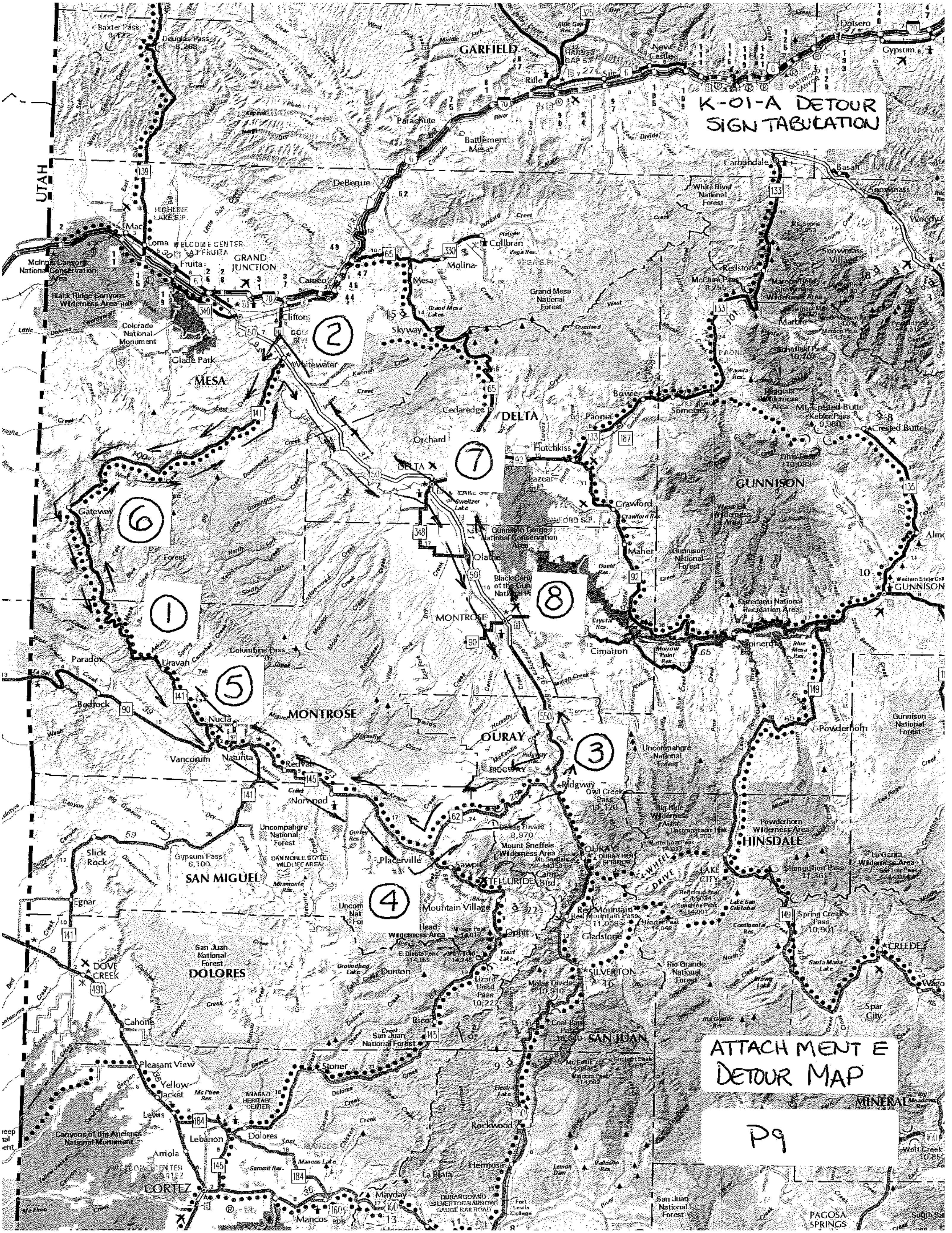
Print Date: 9/22/2009 File Name: 16270Plan-PDA.dgn Horiz. Scale: As Noted Vert. Scale: As Noted MULLER ENGINEERING CO. INC. 777 S. Wadsworth Blvd. Suite 4-100 Lakewood, CO 80226 303-988-4939	REV 0000	Sheet Revisions Date: / Comments / Init.	Colorado Department of Transportation 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5 EJA	As Constructed No Revisions: Revised: Void:	SH-141 AT DOLORES R. ATTACHMENT D Designer: Detailer: Sheet Subset: / Structure Numbers / Subset Sheets:	Project No./Code IM ?? 16270 Sheet Number



NOT FOR CONSTRUCTION - PRELIMINARY PLANS - 07-20-09

Print Date: 9/22/2009		Sheet Revisions			Colorado Department of Transportation	As Constructed	SH-141 AT DOLORES R. ATTACHMENT D	Project No./Code
File Name: 16270Plan-PDA.dgn		Date:	Comments	Init.	3803 North Main Avenue, Suite 200, Durango, CO 81301, Phone: 970-385-1440 FAX: 970-385-8365	No Revisions:		IM ??
Horiz. Scale: As Noted Vert. Scale: As Noted	R-X				Region 5 EJA	Revised:	Designer: / Structure Numbers:	16270
MULLER ENGINEERING CO. INC. 777 S. Wadsworth Blvd. Suite 4-100, Lakewood, CO 80226, 303-988-6950						Void:	Detailer: / Sheet Subset: / Subset Sheets:	Sheet Number

ATTACHMENT E: DESCRIPTION MAP SHOWING DETOUR ROUTES, SIGNAGE AND BRIDGE LISTING ON DETOUR ROUTE


K-01-A DETOUR
SIGN TABULATION
ATTACHMENT E
DETOUR MAP
P9
1
2
3
4
5
6
7
8
UTAH
GARFIELD
MESA
DELTA
MONTROSE
OURAY
GUNNISON
SAN MIGUEL
DOLORES
SAN JUAN
HINSDALE
MINERAL
GRAND JUNCTION
Fruita
Loma
Mack
Clifton
Whitewater
Gateway
Uravan
Paradox
Bedrock
Nucla
Naturita
Redvale
Norwood
Placerville
Sawpit
TELLURIDE
Mountain Village
Ophir
Ridgway
OURAY
Silverton
Montrose
Olathe
Delta
Orchard
Cedaredge
Hotchkiss
Paonia
Crawford
Cimarron
GUNNISON
Lake City
Creede
Dove Creek
Cahone
Pleasant View
Yellow Jacket
Lewis
Lebanon
Arriola
CORTEZ
Dolores
Mancos
Rico
Stoner
Rifle
Silt
New Castle
Parachute
DeBeque
Cameo
Mesa
Molina
Collbran
Skyway
Carbondale
Redstone
Marble
Crested Butte
Slick Rock
Egnar
Gypsum
Dotsero

Colorado Department of trasportation
K-01-A Detour Sign List

Map Ref. Point	Intersection Location		Signage
1	SH 141 at bridge	MP 88.421	Type 3 baricade (North and South of Bridge) Road Closed/Bridge Out (North and South of Bridge)
2	SH141 Whitewater, CO	US 50	Portable VMS (warning bridge out and Detour) Detour Arrow (Right from SH 141 on to Hwy 50) Detour Arrow (Left from Hwy 50 on to SH 141)
3	Hwy 550 Ridgeway, CO	SH 62	Detour Arrow (Right from Hwy 550 on to SH 62) Detour Arrow (Left from Hwy 62 on to Hwy 550)
4	SH 62 Placerville, CO	SH 145	Detour Arrow (Right from SH 62 on to SH 145) Detour Arrow (Left from SH 145 on to SH 62) Portable VMS (warning bridge out and Detour)
5	SH 145 Vancorum, CO	SH 90	Portable VMS (warning bridge out and Detour) Detour Arrow (Right SH 90 on to SH 145) Detour Arrow (Straight through intersection)
6	SH 145 Gateway, CO		Portable VMS (warning bridge out and Detour) Detour Arrow (towards Whitewater)
7	Hwy 50 Delta, CO		Detour Arrow (north bound traffic) Detour Arrow (sorth bound traffic)
8	Hwy 50 Montrose, CO		Detour Arrow (north bound traffic) Detour Arrow (sorth bound traffic)

Colorado Department of Transportation
Bridges on Detour Route

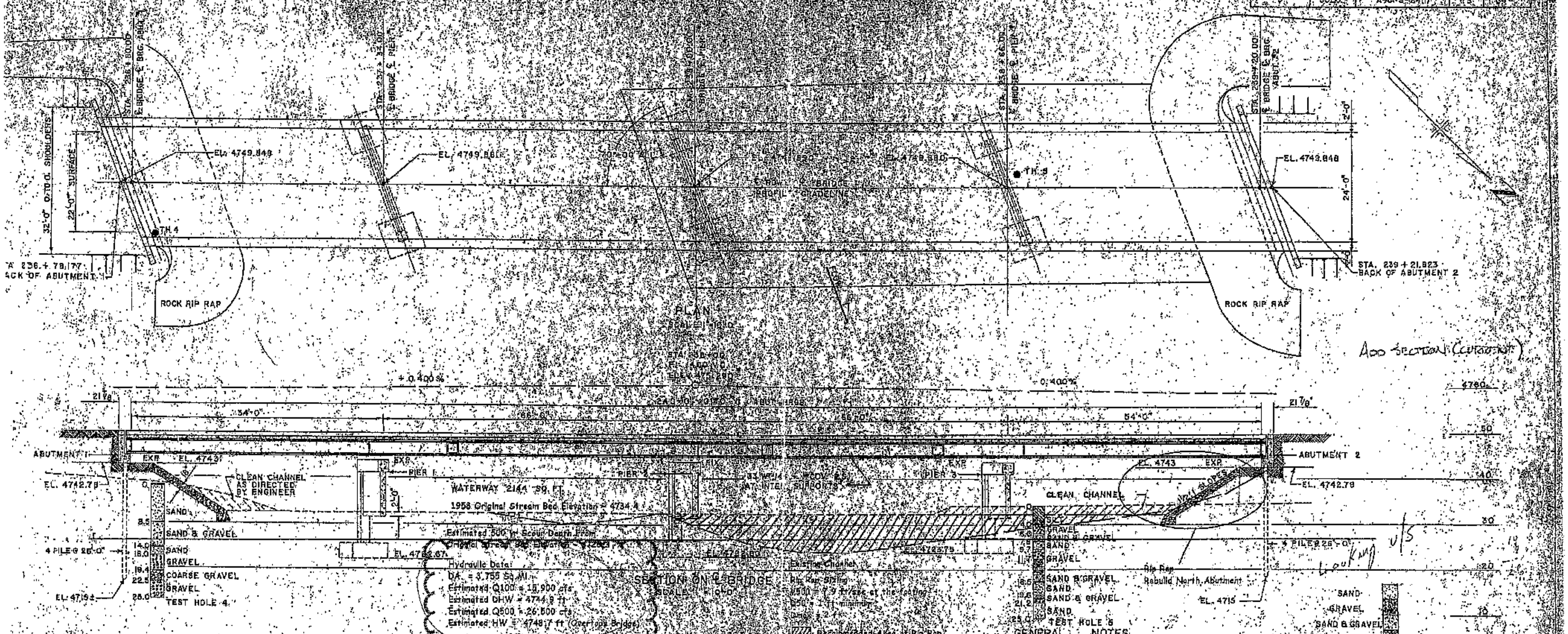
Highway: Route (Mile Post)	Bridge Number	Waterway	Sufficiency Rating	Item 113 Code	**Total Miles**
88.42	**K-01_A**	**Dolores River**	**70.4**	**3**	
SH 141: K-01-A (Bridge) to Jct US 50Whitewater					**65.58** Miles
95.58	K-01-H	Draw	88.5	8	
101.31	J-01-E	Salt Canyon	79.7	5	
104.30	J-01-F	Draw	88.5	8	
110.47	J-01-D	John Brown Creek	90.5	U	
110.85	J-01-C	Dolores River	52.3	3	
115.92	J-01-A	West Creek	85.6	8	
119.95	I-01-C	West Creek	74.8	8	
126.08	I-01-M	North Lobe Creek	75.6	5	
139.87	I-02-D	East Creek	85.5	8	
143.03	I-02-K	East Creek	61.2	5	
144.67	I -02-B	Gibble Gulch	61.2	3	
152.67	I-03-K	East Creek	58.1	8	
153.65	I-03-A	Gunnison River	75.2	3	
US 50 Whitewater to Delta					**33.19** Miles
45.55	I-03-N	Kannah Creek	69.2	8	
51.24	I-03-F	King Creek	92.6	8	
51.29	I-03-C	Deer Creek	69.2	8	
56.58	I-03-T	Wells gulch	69.2	8	
63.03	I-04-L	Point Creek	69.2	8	
70.52	I-04-N	Gunnison River	93.7	8	
70.52	I-04-K	Gunnison River	78.9	3	
US 50 Delta to Montrose					**22.33** Miles
78.72	J-05-AX	Loutzenheizer Wash	84.3	8	
US 500 Montrose to Ridgeway					**23.55** Miles
127.22	K-05-N	Cedar Wash	77.4	8	
126.06	K-05-BP	Uncomphagre River	96.6	8	
126.05	K-05-Bq	Uncomphagre River	98.7	8	
125.00	K-05-BV	Horsefly Creek	98.5	8	
123.11	K-05-BT	Montrose Delta Canal	96.1	8	
120.80	K-05-C	West Canal (Minor)	98	8	
117.17	K-05-BU	Wildcat Creek	63	8	
112.17	K-05-BS	Uncomphagre River	60	8	
112.40	K-05-AC	Chaffee Gulch	74.1	8	

Colorado Department of Transportation
Bridges on Detour Route

Highway: Route (Mile Post)	Bridge Number	Waterway	Sufficiency Rating	Item 113 Code	**Total Miles**
111.97	L-05-K	Cow Creek	69	8	
111.97	L-05-G	Cow Creek	57.6	5	
SH 62- Ridgeway to Placerville					**23.4** Miles
23.20	L-05-B	Uncomphagre River	48.8	3	
18.51	L-05-L	Dallas Creek	99.1	5	
SH 145- Placerville to Naturita					**32.59** Miles
93.86	L-04-U	Good enough Gulch	49.9	5	
96.07	L-04-A	San miguel River	72.3	5	
SH 141: Natrurita to K-01-A (Bridge)					**31.72** Miles
59.07	L-02-B	Naturita Creek	75.9	8	
62.37	L-02-F	Dry creek	93.6	U	
74.13	K-02-C	San Miguel River	71	5	
75.62	K-02-H	Draw	88.5	8	
77.50	K-01-F	Atkinson Creek	54.2	8	
85.82	K-01-B	Mesa Creek	64.6	5	

ATTACHMENT F-1

HYDROLOGY REFERENCE



FED ROAD DIV. NO.	DISTRICT	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLO.	A-AA-5-34(1)	[illegible]	[illegible]

SUMMARY OF QUANTITIES

ITEM	DESCRIPTION	UNIT	QUANTITY
14a	STR. EXCAVATION, COMMON	CU. YD.	165
15a	STRUCTURAL BACKFILL	CU. YD.	263
16b	MECHANICAL TAMPING	HOUR	56
44b	MISC. TREATED TIMBER	M.B.F.	502
45a	CLASS "A" CONCRETE	CU. YD.	318
47	REINFORCING STEEL	LB.	46549
48	STRUCTURAL STEEL	LB.	177,375
18b	STATION YARD OVERHAUL	STA. YD.	1,841
61by	CONC. FILLED STEEL PILING	LIN. FT.	208
67a	ROCK RIP RAP	CU. YD.	250
75cx	METAL PLATE GUARDRAIL	LIN. FT.	325
89a 7	FLOOR DRAINS 4"X1'-6"	EA.	12

INDEX

SHT. NO.	DESCRIPTION
1	GENERAL PLAN & ELEVATION
2	ABUTMENTS 1 & 2
3	PIERS 1, 2 & 3
4	DECK, REAR & SECTION
5	STEEL FRAMING, GIRDER SECTIONS AND BEARING DEVICES

DESIGN DATA

1953 AASHO AND SUBSEQUENT REVISIONS
LIVE LOAD H20-S16-44
fc = 1,200 PSI, fs = 20,000 PSI
WT. EARTH = 120 PCF, EQUIV. FLUID PRESS. = 30 PCF
MAX. LOAD PER 10 3/4" 0.D. STEEL PIPE PILING = 56 TONS

GENERAL NOTES

1. ALL WORK SHALL BE DONE ACCORDING TO STANDARD SPECIFICATIONS OF COLORADO DEPARTMENT OF HIGHWAYS ADOPTED JUNE 1, 1952.
2. SOUNDINGS AND DEPTHS FOOTINGS SHOWN IN ACCORD WITH BEST AVAILABLE DATA. IF ESSENTIALLY DIFFERENT CONDITIONS ARE ENCOUNTERED, BRIDGE ENGINEER WILL INSPECT AND DETERMINE IF REDESIGN IS NECESSARY.
3. ALL CONCRETE SHALL BE CLASS "A" AND AIR ENTRAINED, AS SPECIFIED.
4. CHAMFER ALL EXPOSED CORNERS 3/4", EXCEPT AS NOTED.
5. ALL REINFORCING STEEL SHALL BE INTERMEDIATE GRADE DEFORMED BARS CONFORMING TO AASHO SPECIFICATIONS M31 & M137 (ASTM A15 & A305).
6. ALL REINFORCING BARS SHALL BE TAGGED WITH STRUCTURE Nº AND MARK.
7. ALL DIMENSIONS ON BAR DETAILS ARE OUT TO OUT.
8. ALL HOOKS AND BENDS IN BARS SHALL CONFORM TO ACI STANDARD 315A-55.
9. MAIN BARS SHALL NOT BE SPLICED EXCEPT WHERE SPECIFIED ON PLANS.
10. REINFORCING STEEL CLEARANCE 1" CLEAR IN DECK, 3" CLEAR IN SUBSTRUCTURE, EXCEPT AS NOTED.
11. SPECIFICATIONS, DESIGN, MATERIALS AND WORKMANSHIP SHALL BE DONE ACCORDING TO AASHO SPECIFICATIONS FOR 1953 AND SUBSEQUENT REVISIONS.
12. PAINT ALL STRUCTURAL STEEL EXCEPT STEEL PILES, SHALL RECEIVE ONE SHOP COAT ZINC CHROMATE AND TWO FIELD COATS ALUMINUM ACCORDING TO COLORADO DEPT. HIGHWAYS SPECIFICATIONS.
13. ROADWAY, CURB SURFACES AND TOP 2' OF WINGWALLS SHALL RECEIVE CLASS I SURFACE FINISH.
14. FORMS FOR CONCRETE SURFACES EXPOSED IN FINISHED WORK SHALL BE CONSTRUCTED OF SHIPLAP OR TONGUE AND GROOVE LUMBER S3S UNLESS FACED WITH PANEL BOARD.
15. WHEN EXCAVATING FOR FOOTINGS THE FINAL ONE FOOT OF DEPTH SHALL BE DONE BY HAND LABOUR.
16. 10BP42 MAY BE SUBSTITUTED FOR THE PILING SHOWN, BUT AT NO ADDITIONAL EXPENSE TO THE COLORADO DEPT. OF HIGHWAYS. ALL PILING IN ANY ONE SUBSTRUCTURE UNIT SHALL BE THE SAME.
17. ALL RIVETS 3/4", EXCEPT AS NOTED. H.S. BOLTS MAY BE SUBSTITUTED FOR FIELD RIVETS AT THE CONTRACTOR'S EXPENSE.

COLORADO DEPARTMENT OF HIGHWAYS
GRAND JUNCTION, COLORADO

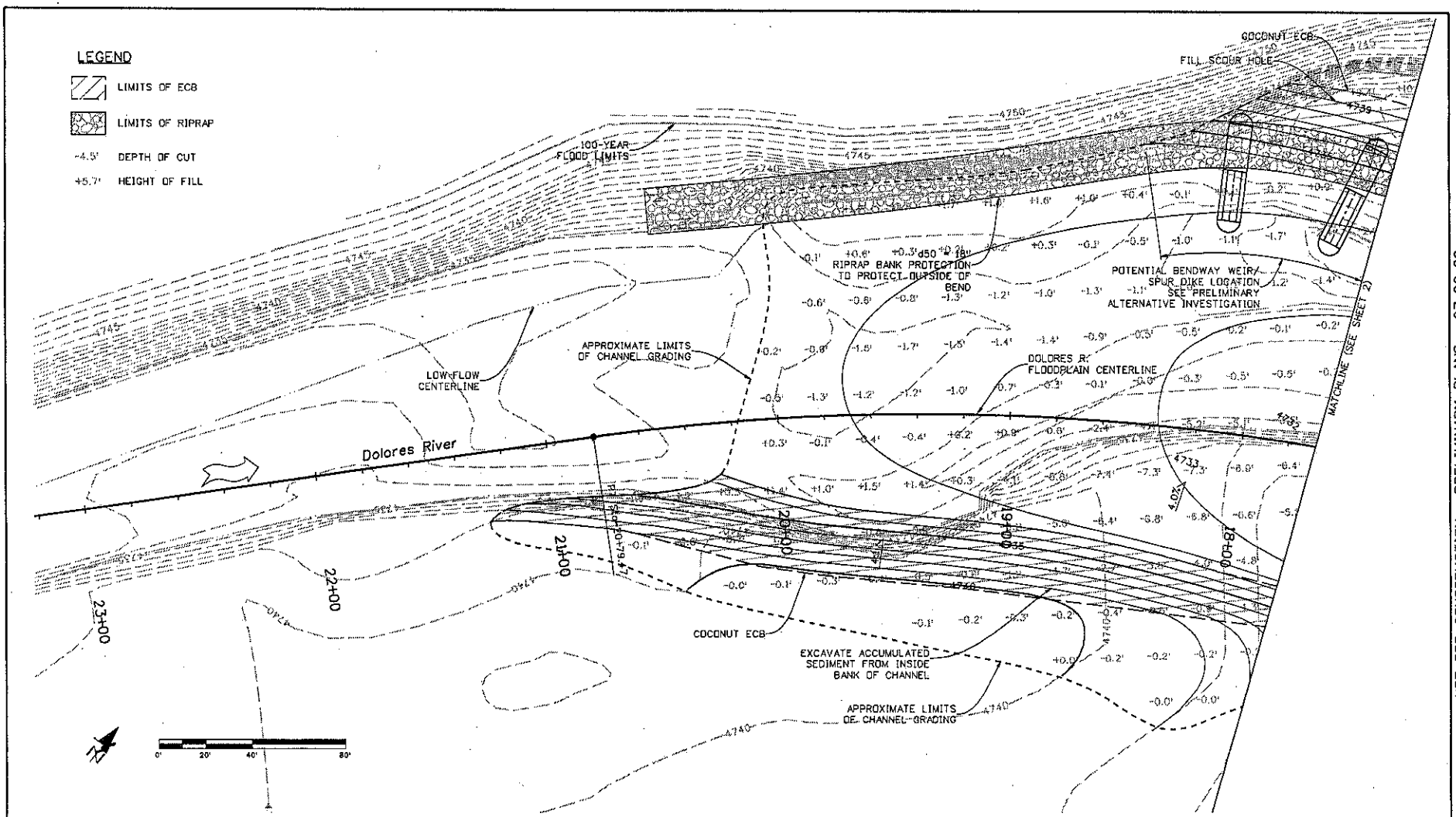
DOLORES RIVER BRIDGE
GENERAL PLAN AND ELEVATION
STRUCTURE NO. K-1-A

KEN R. WHITE
CONSULTING ENGINEERS
DENVER, COLORADO

SHEET 1 OF 5 SHEETS

ATTACHMENT F-2

PROPOSED PRELIMINARY GRADING PLAN AND SECTIONS



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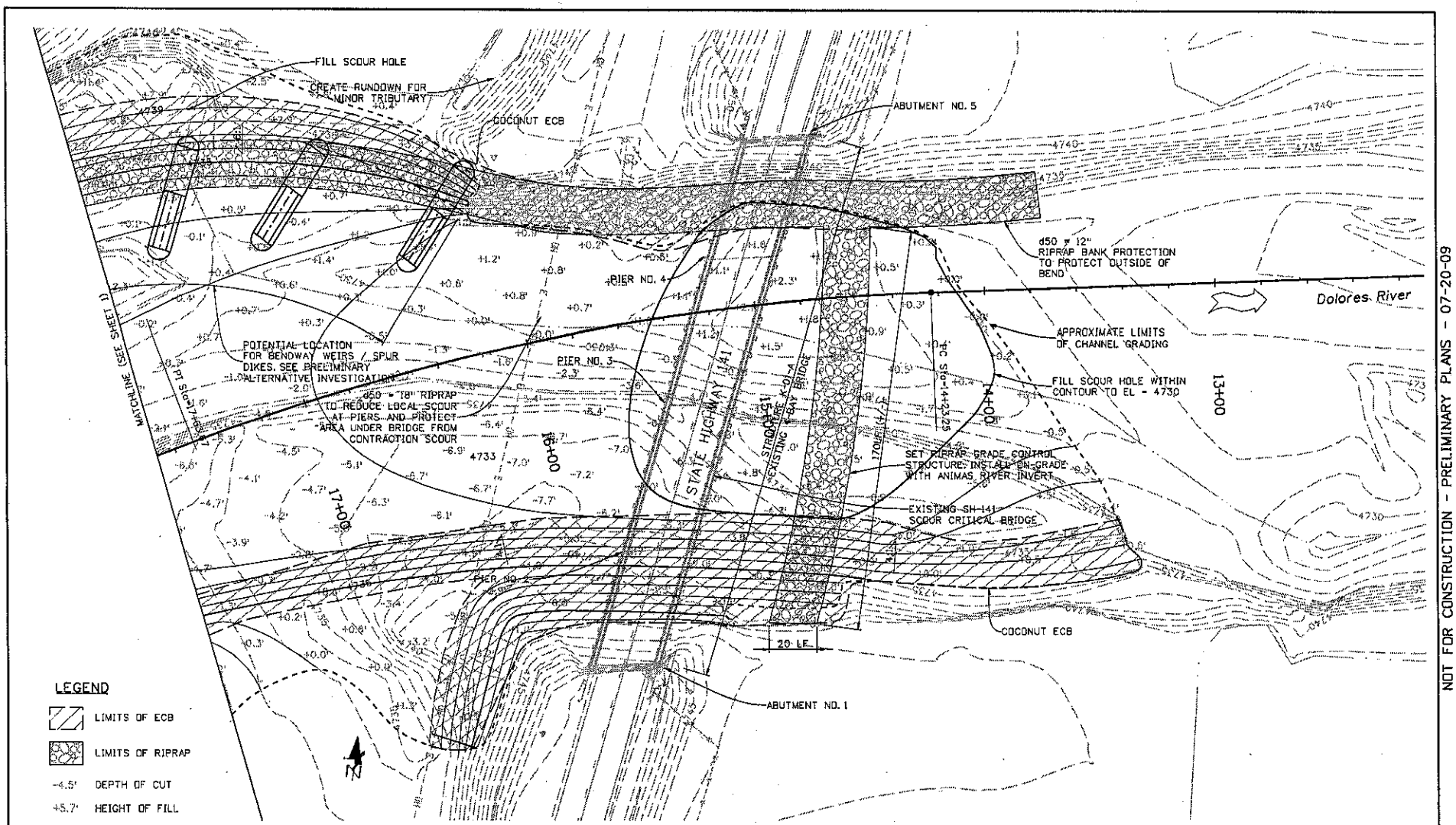
MULLER ENGINEERING CO. INC. 777 S. Wadsworth Blvd. Suite 4-100 Lakewood, CO 80226 303-988-4939	R-X 0000				Void:	Detailer: / Sheet Subset: / Subset Sheets:	Sheet Number
					Colorado Department of Transportation DOT 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5 EJA		



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SH-141 AT DOLORES R.
PRELIMINARY GRADING PLAN

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Detailer:			16270
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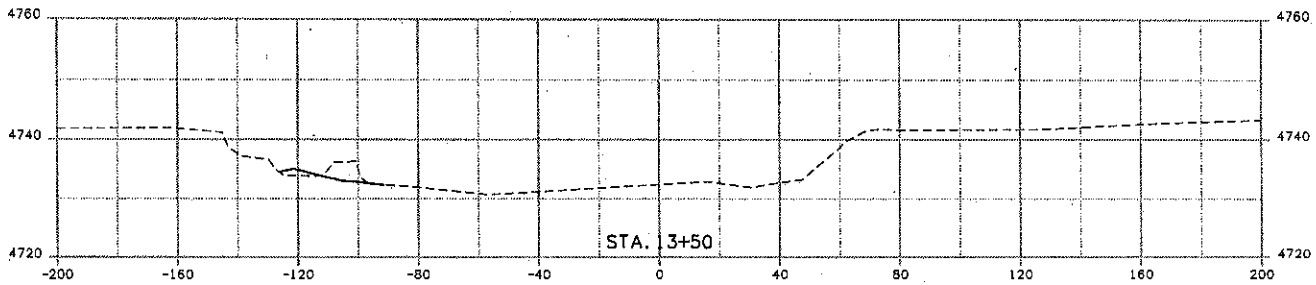

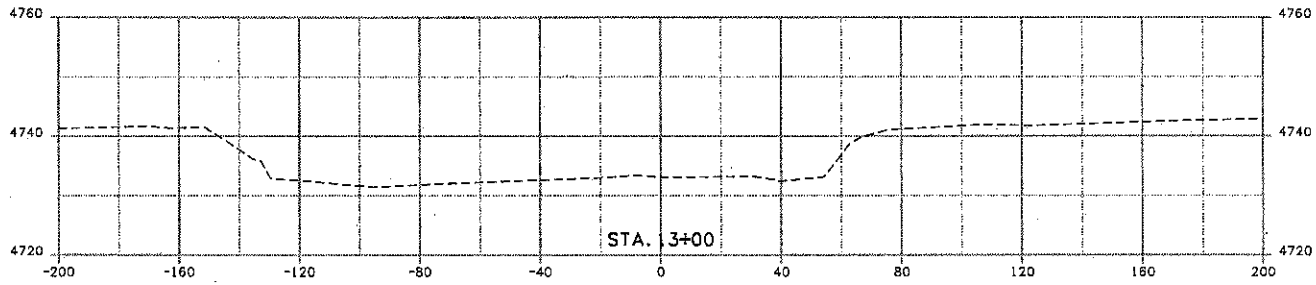

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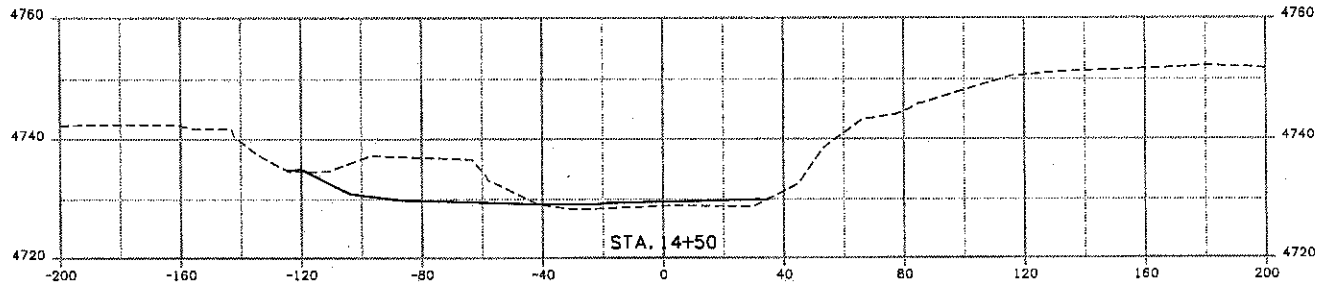

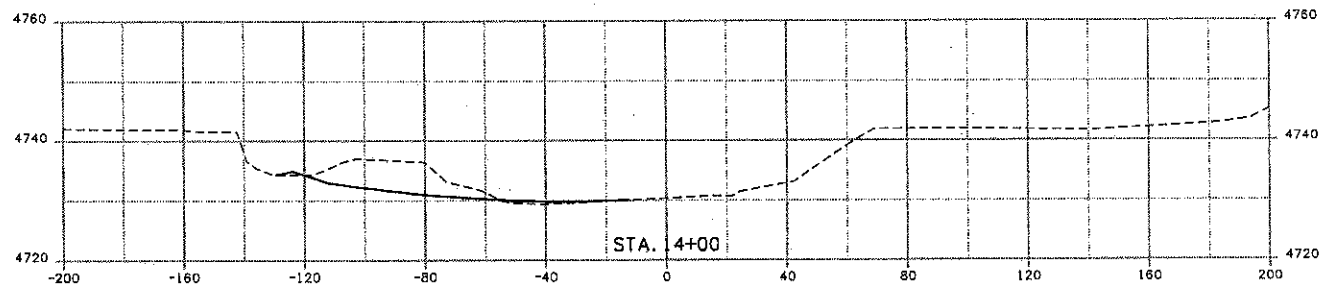

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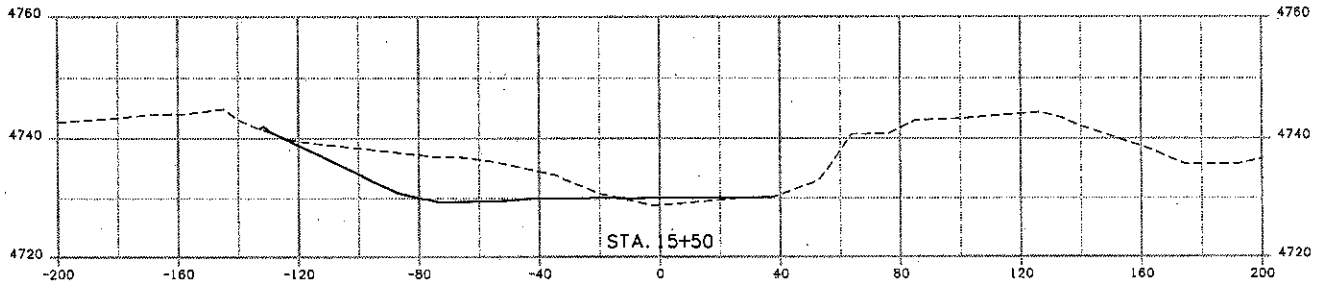

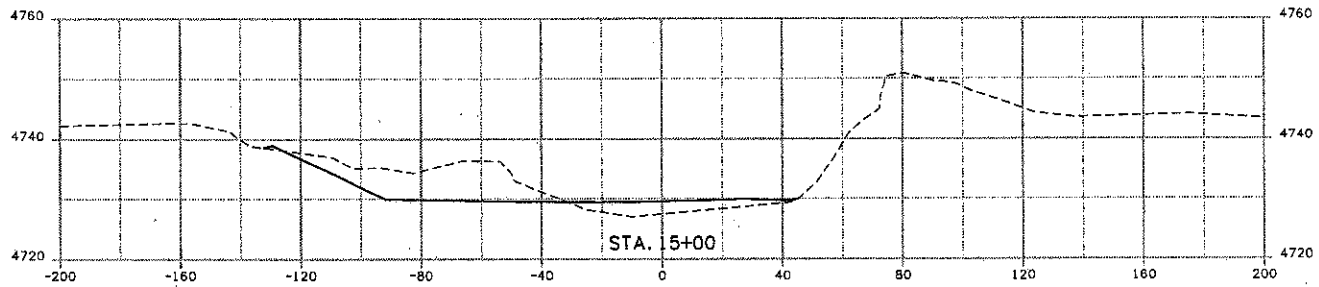

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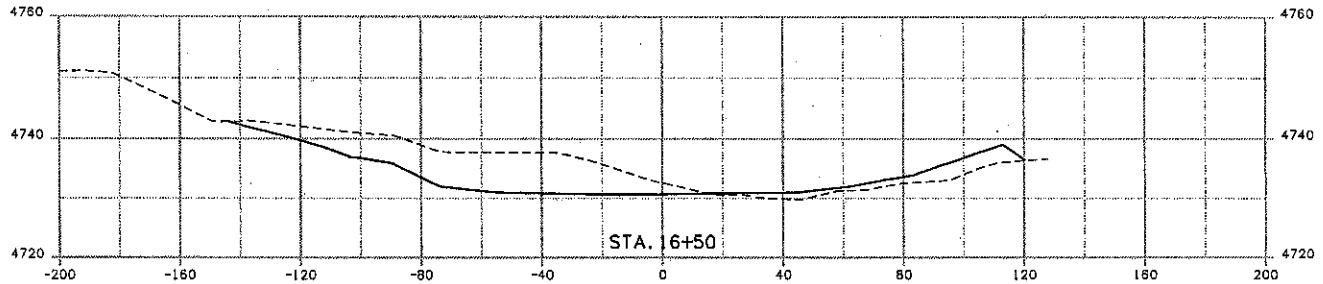

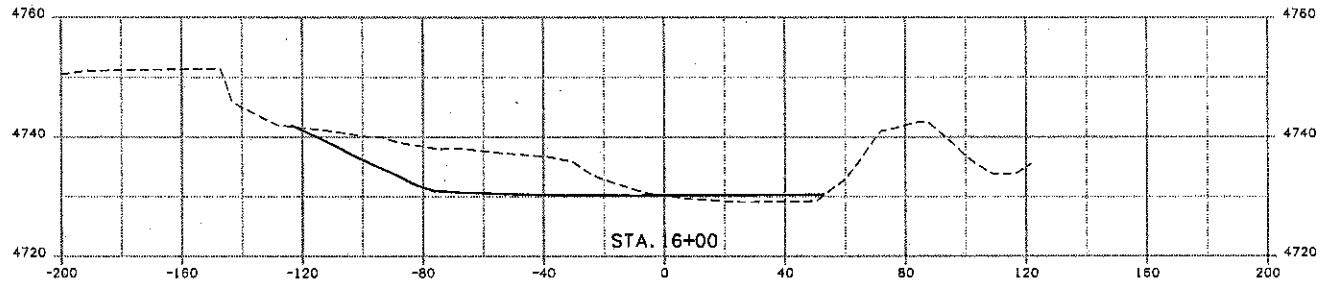

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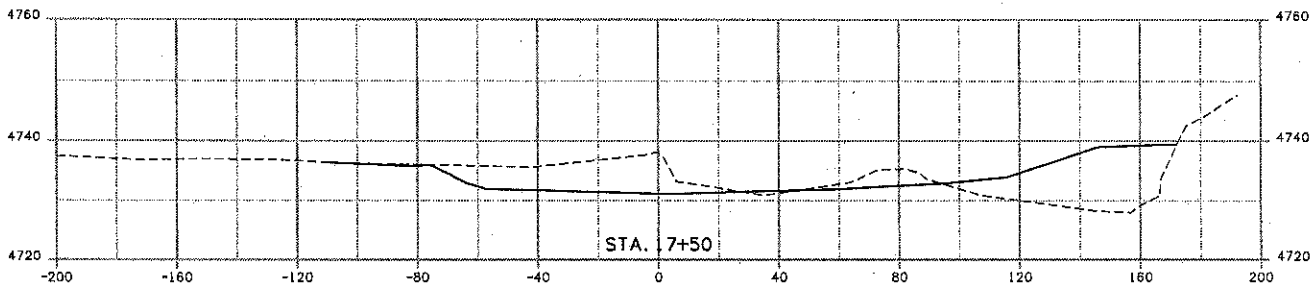

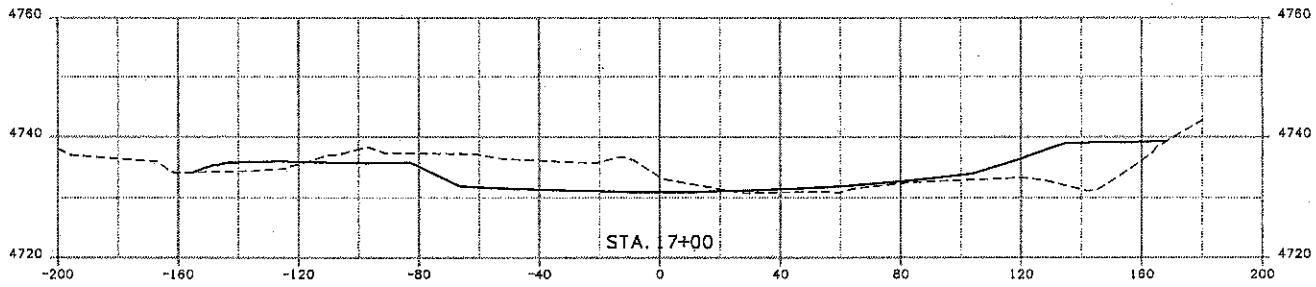

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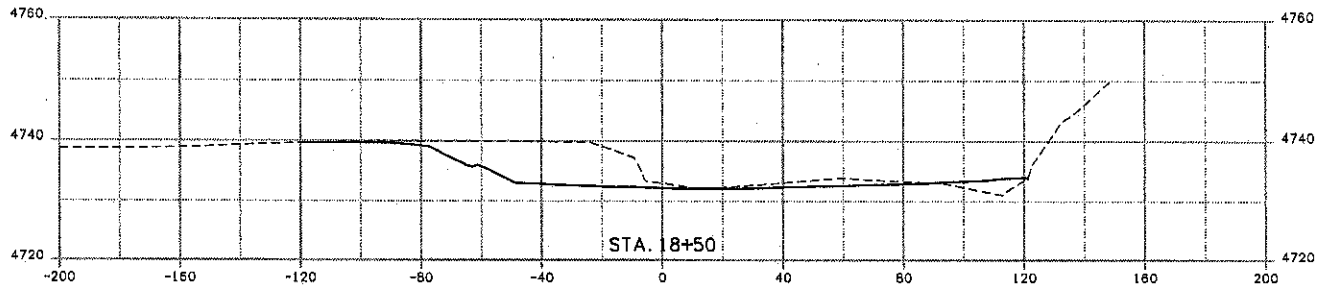

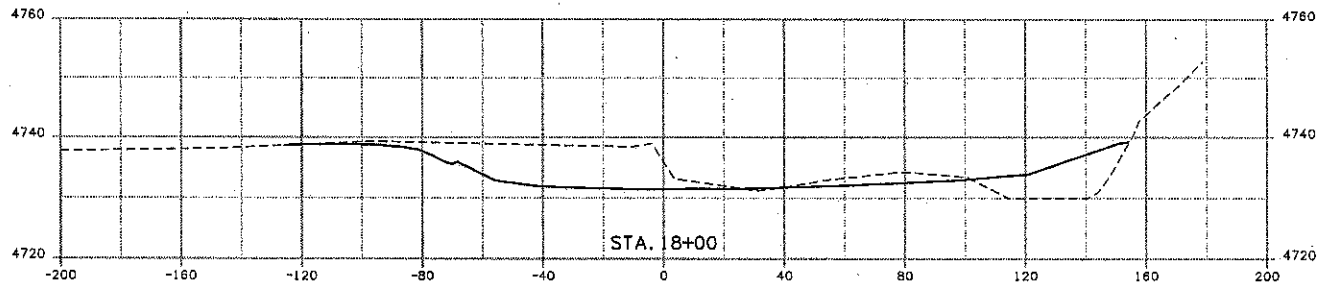

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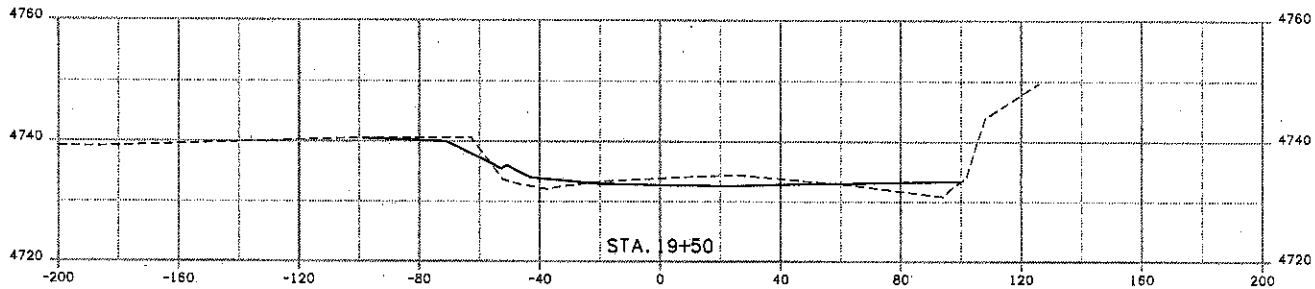

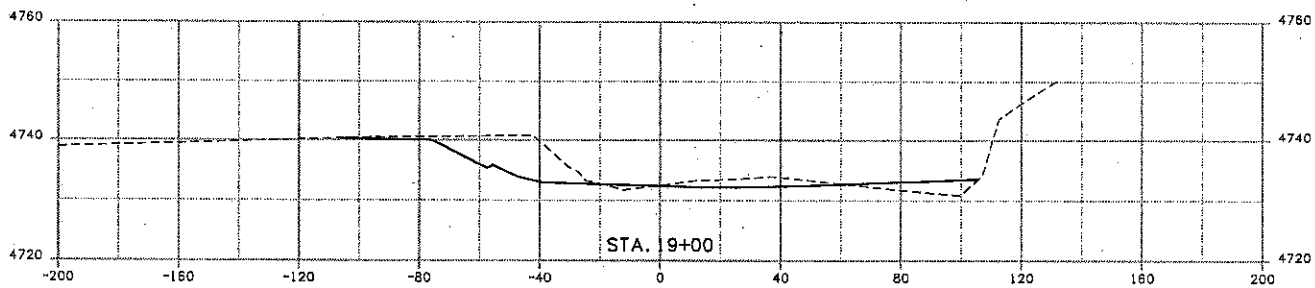

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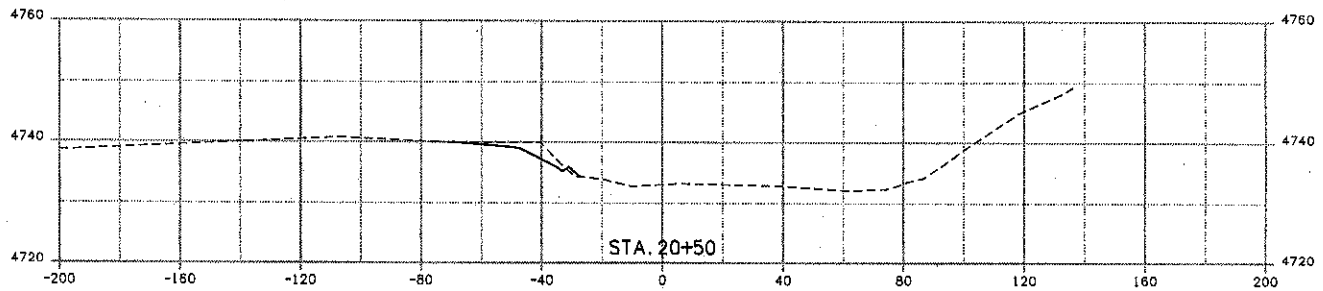
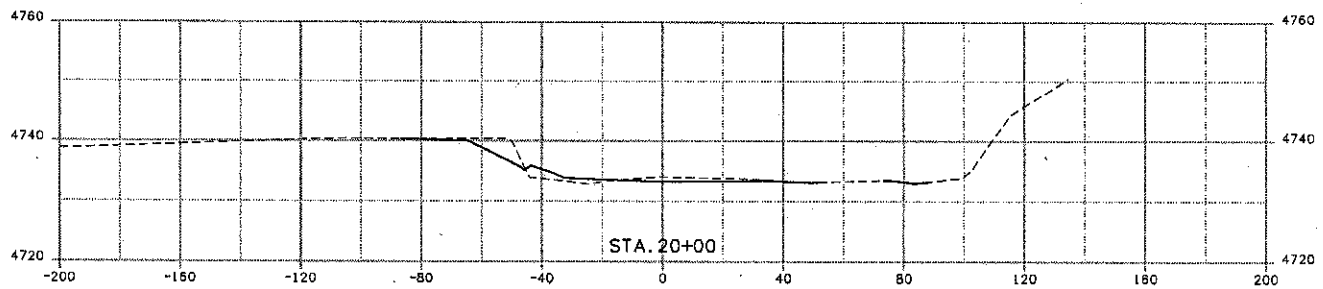
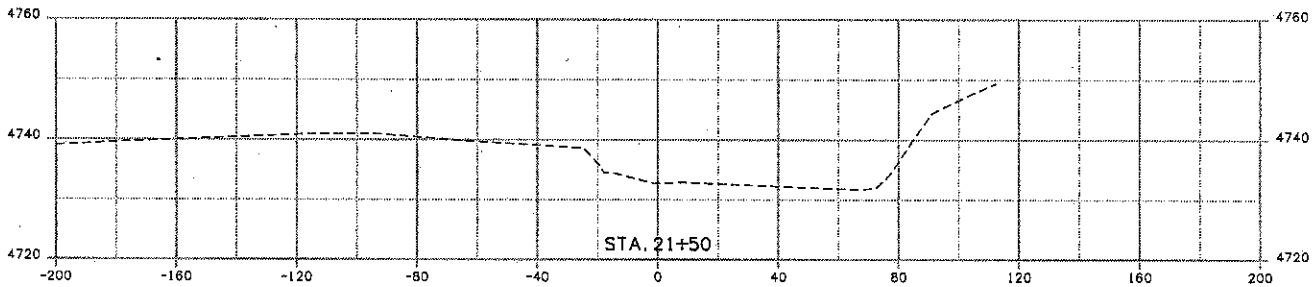
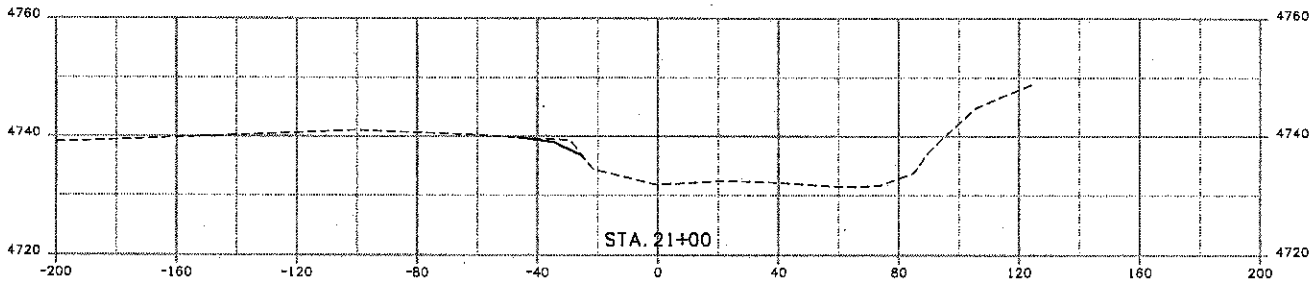




NOT FOR CONSTRUCTION - PRELIMINARY PLANS - 01-07-09

Print Date: 7/20/2009 File Name: 16270HYDR_Model_Realign.dgn Horiz. Scale: As Noted Vert. Scale: As Noted MULLER ENGINEERING CO. INC. 777 S. Wadsworth Blvd. Suite 4-100 Lakewood, CO 80226 303-986-4939	REV	Sheet Revisions Date: / Comments / Init.	Colorado Department of Transportation DOT 3803 North Main Avenue Suite 200 Durango, CO 81301 Phone: 970-385-1440 FAX: 970-385-8365 Region 5 EJA	As Constructed No Revisions: Revised: Void:	DOLORES R. CROSS-SECTIONS Designer: Detailer: Sheet Subset:	Project No./Code IM 16270 Sheet Number Structure Numbers Subset Sheets:





NOT FOR CONSTRUCTION - PRELIMINARY PLANS - 01-07-09

Print Date: 7/20/2009
File Name: 16270HYDR_Model_Realign.dgn
Horiz. Scale: As Noted Vert. Scale: As Noted

MULLER ENGINEERING CO. INC
CONSULTING ENGINEERS
Pr 08-007.01 Solares R/16270/Design/Drawings
777 S. Wadsworth Blvd.
Suite 4-100
Lakewood, CO 80226
303-988-4939

R-X

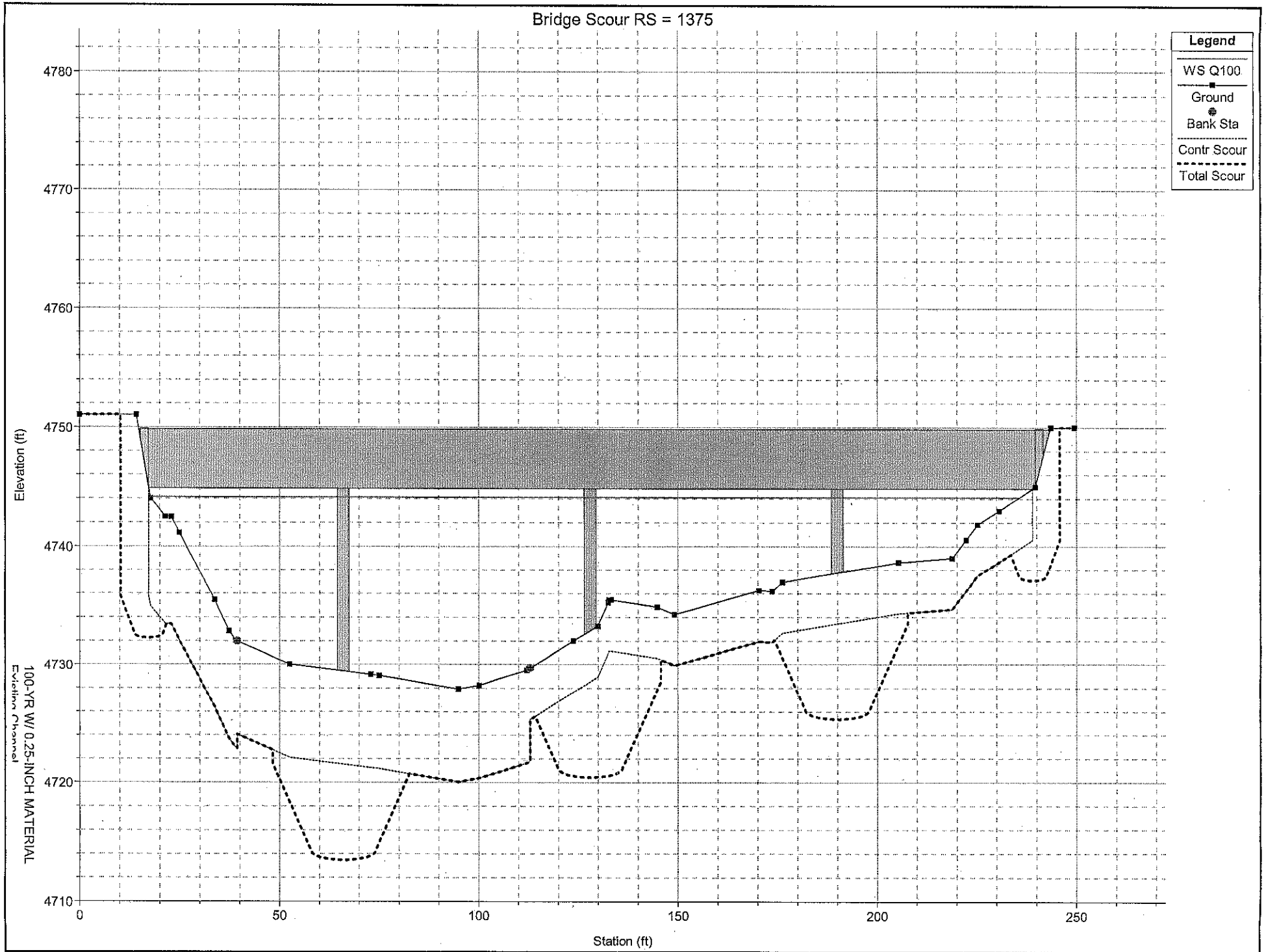
Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation
CDOT
DEPARTMENT OF TRANSPORTATION
3803 North Main Avenue
Suite 200
Durango, CO 81301
Phone: 970-385-1440 FAX: 970-385-8365
Region 5 EJA

As Constructed	DOLORES R. CROSS-SECTIONS		Project No./Code
No Revisions:			IM
Revised:	Designer:	Structure Numbers	16270
Void:	Detailer:		Sheet Number
	Sheet Subset:	Subset Sheets:	

ATTACHMENT F-3

100 AND 500 YEAR SCOUR CALCULATIONS FOR EXISTING STREAMBED


Bridge Scour RS = 1375
Legend
WS Q100
Ground
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
4780
4770
4760
4750
4740
4730
4720
4710
0
50
100
150
200
250
Station (ft)
100-YR W/ 0.25-INCH MATERIAL
1 in Horiz. = 30
1 in Vert. = 10

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	4.98	14.69	8.33
	Approach Velocity (ft/s):	0.95	5.84	1.60
	Br Average Depth (ft):	5.62	14.84	7.39
	BR Opening Flow (cfs):	356.55	12688.74	2854.71
	BR Top WD (ft):	21.83	70.52	116.77
	Grain Size D50 (mm):	6.35	6.35	6.35
	Approach Flow (cfs):	95.26	12750.24	3054.50
	Approach Top WD (ft):	20.10	148.72	229.70
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):	9.08	7.88	4.33
	Critical Velocity (ft/s):			
	Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Square nose
	Pier Width (ft):	3.00
	Grain Size D50 (mm):	6.35000
	Depth Upstream (ft):	15.72
	Velocity Upstream (ft/s):	12.09
	K1 Nose Shape:	1.10
	Pier Angle:	5.00
	Pier Length (ft):	27.00
	K2 Angle Coef:	1.38
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	25.40000
	K4 Armouring Coef:	0.59
Results		
	Scour Depth Ys (ft):	8.08
	Froude #:	0.54
	Equation:	CSU equation

Abutment Scour

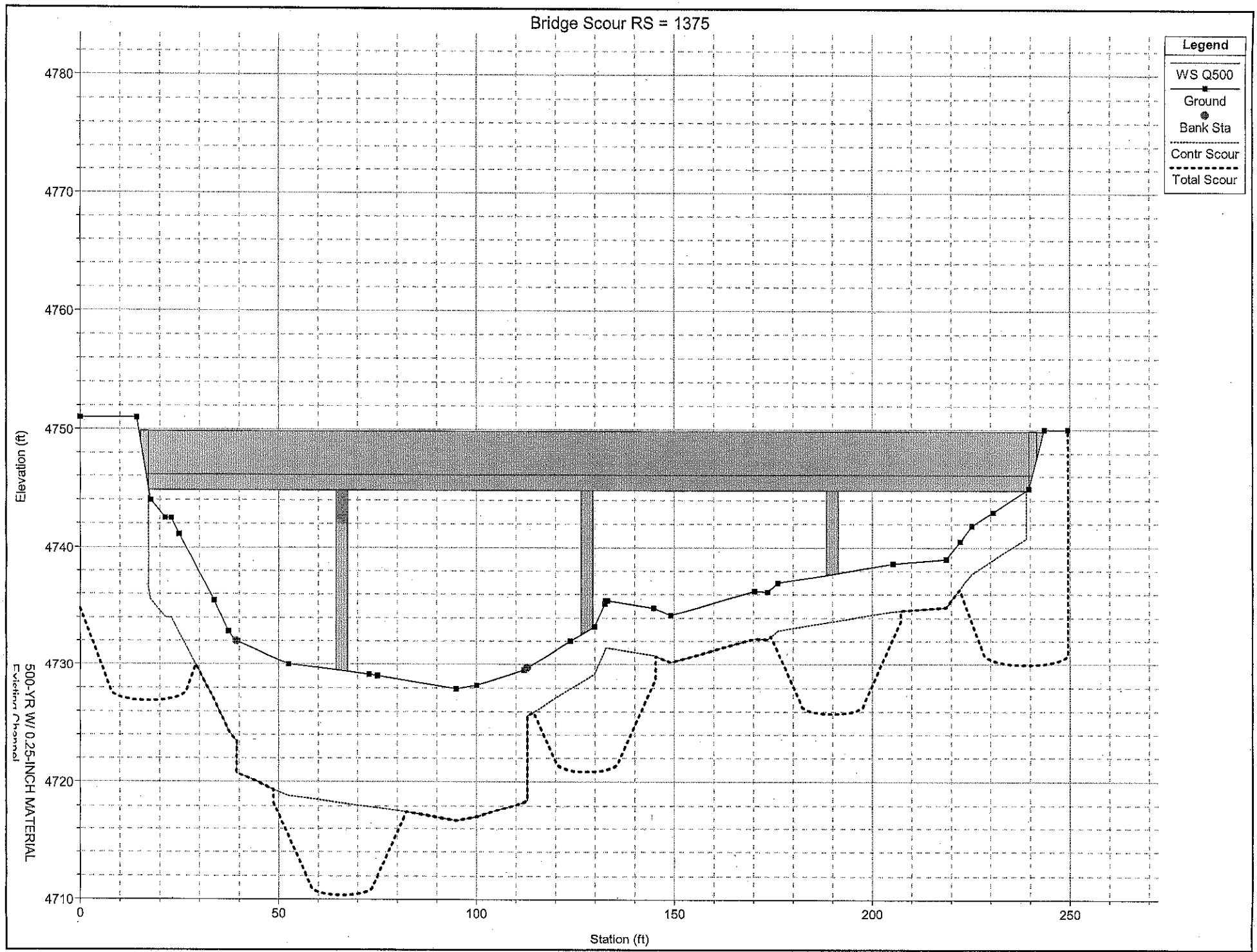
		Left	Right
Input Data			
	Station at Toe (ft):	17.24	239.01
	Toe Sta at appr (ft):	-6.07	220.64
	Abutment Length (ft):	0.00	329.97
	Depth at Toe (ft):	1.00	1.00
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	5.00	5.00
	K2 Skew Coef:	0.69	0.69
	Projected Length L' (ft):	52.00	52.00
	Avg Depth Obstructed Ya (ft):		7.93
	Flow Obstructed Qe (cfs):	115.70	2414.14
	Area Obstructed Ae (sq ft):		2617.57
Results			
	Scour Depth Ys (ft):	3.52	3.42
	Froude #:	0.34	0.31
	Equation:	HIRE	HIRE

Combined Scour Depths

Pier Scour + Contraction Scour (ft):		
	Channel:	15.96
	Right Bank:	12.41
Left abutment scour + contraction scour (ft):	12.60	

100-YR W/ 0.25-INCH MATERIAL
Existing Channel

Right abutment scour + contraction scour (ft):	7.74


Bridge Scour RS = 1375
Legend
WS Q500
Ground
Bank Sta
Contr Scour
Total Scour
Elevation (ft)
4780
4770
4760
4750
4740
4730
4720
4710
0
50
100
150
200
250
Station (ft)
500-YR W/ 0.25-INCH MATERIAL
Existing Channel
1 in Horiz. = 30
1 in Vert. = 10

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	8.87	18.69	12.34
	Approach Velocity (ft/s):	1.25	6.66	2.01
	Br Average Depth (ft):	9.64	17.7	10.15
	BR Opening Flow (cfs):	562.74	18960.05	4495.40
	BR Top WD (ft):	22.86	73.52	127.66
	Grain Size D50 (mm):	6.35	6.35	6.35
	Approach Flow (cfs):	227.66	18525.20	5711.56
	Approach Top WD (ft):	20.58	148.72	229.70
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):	8.47	11.19	4.06
	Critical Velocity (ft/s):			
	Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	3.00
	Grain Size D50 (mm):	6.35000
	Depth Upstream (ft):	19.85
	Velocity Upstream (ft/s):	13.29
	K1 Nose Shape:	1.00
	Pier Angle:	5.00
	Pier Length (ft):	27.00
	K2 Angle Coef:	1.38
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	25.40000
	K4 Armouring Coef:	0.59
Results		
	Scour Depth Ys (ft):	7.90
	Froude #:	0.53
	Equation:	CSU equation

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	17.24	239.01
	Toe Sta at appr (ft):	-6	220.64
	Abutment Length (ft):	52	52
	Depth at Toe (ft):	3.53	3.52
	K1 Shape Coef:	1.00 - Vertical abutment	
	Degree of Skew (degrees):	5	5
	K2 Skew Coef:	0.69	0.69
	Projected Length L' (ft):	4.53	4.53
	Avg Depth Obstructed Ya (ft):		11.48
	Flow Obstructed Qe (cfs):		4491.04
	Area Obstructed Ae (sq ft):		3974.82
Results			
	Scour Depth Ys (ft):	9.51	10.86
	Froude #:	0.15	0.23
	Equation:	HIRE	HIRE

Combined Scour Depths

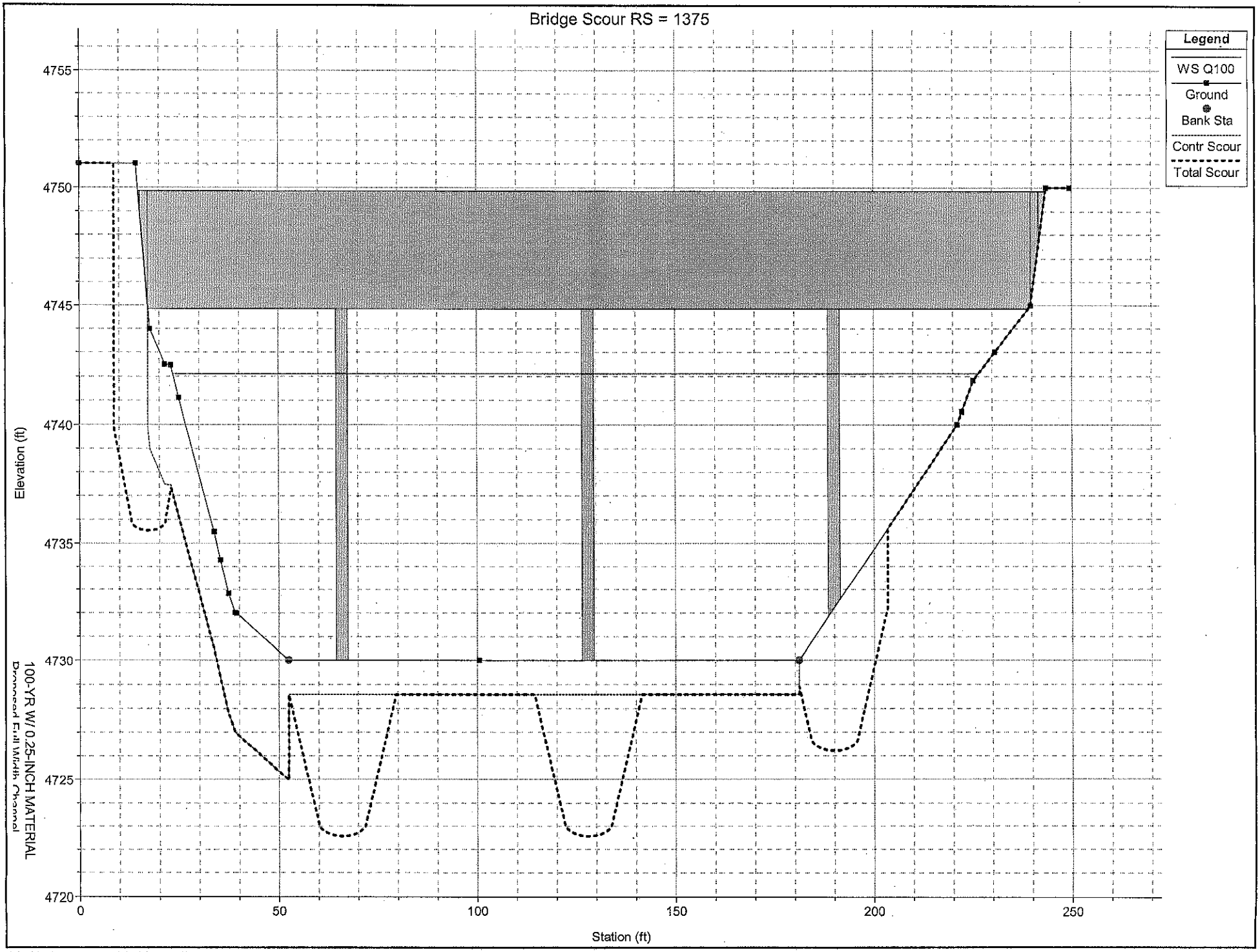
Pier Scour + Contraction Scour (ft):		
	Channel:	19.09
	Right Bank:	11.96
Left abutment scour + contraction scour (ft):	17.98	

500-YR W/ 0.25-INCH MATERIAL
Existing Channel

Right abutment scour + contraction scour (ft):	14.93

ATTACHMENT F-4

100 AND 500 YEAR SCOUR CALCULATIONS FOR PROPOSED STREAMBED



1 in Horiz. = 30 1 in Vert. = 5

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	6.44	10.34	5.37
	Approach Velocity (ft/s):	2.08	7.19	1.86
	Br Average Depth (ft):	7.89	12.12	6.14
	BR Opening Flow (cfs):	784.14	14499.66	616.19
	BR Top WD (ft):	29.07	122.62	42.36
	Grain Size D50 (mm):	6.35	6.35	6.35
	Approach Flow (cfs):	271.21	14677.04	951.75
	Approach Top WD (ft):	20.23	197.32	95.45
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):	5.03	1.43	0.00
	Critical Velocity (ft/s):			
	Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	3.00
	Grain Size D50 (mm):	6.35000
	Depth Upstream (ft):	12.30
	Velocity Upstream (ft/s):	9.22
	K1 Nose Shape:	1.00
	Pier Angle:	5.00
	Pier Length (ft):	27.00
	K2 Angle Coef:	1.38
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	25.40000
	K4 Armouring Coef:	0.56
Results		
	Scour Depth Ys (ft):	6.00
	Froude #:	0.46
	Equation:	CSU equation

Abutment Scour

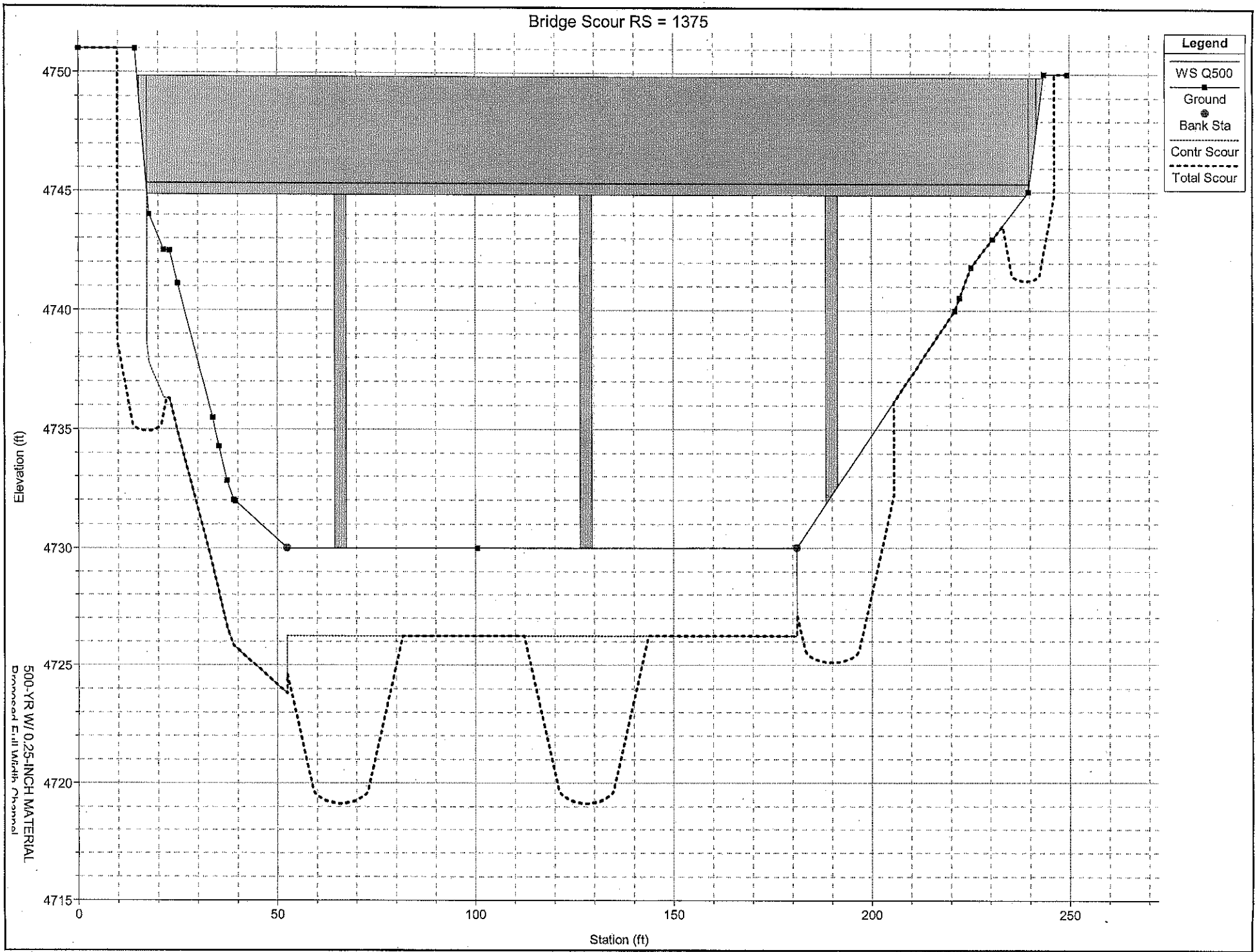
		Left	Right
Input Data			
	Station at Toe (ft):	17.24	239.01
	Toe Sta at appr (ft):	10.69	249.40
	Abutment Length (ft):	50.00	50.00
	Depth at Toe (ft):	1.00	0.00
	K1 Shape Coef:	0.82 - Vert. with wing walls	
	Degree of Skew (degrees):	90.00	90.00
	K2 Skew Coef:	1.00	1.00
	Projected Length L' (ft):	1.17	246.83
	Avg Depth Obstructed Ya (ft):	0.38	5.77
	Flow Obstructed Qe (cfs):	271.21	933.30
	Area Obstructed Ae (sq ft):	0.44	1423.06
Results			
	Scour Depth Ys (ft):	4.28	
	Froude #:	0.37	
	Equation:	HIRE	Default

Combined Scour Depths

Pier Scour + Contraction Scour (ft):

	Channel:	7.43
	Right Bank:	6.00

Left abutment scour + contraction scour (ft): 9.31



1 in Horiz. = 30 1 in Vert. = 5

Contraction Scour

		Left	Channel	Right
Input Data				
	Average Depth (ft):	10.80	14.70	9.73
	Approach Velocity (ft/s):	2.63	8.14	2.47
	Br Average Depth (ft):	9.86	15.34	8.97
	BR Opening Flow (cfs):	1344.41	23877.22	1278.38
	BR Top WD (ft):	35.48	128.62	58.86
	Grain Size D50 (mm):	6.35	6.35	6.35
	Approach Flow (cfs):	574.94	23629.70	2295.36
	Approach Top WD (ft):	20.23	197.32	95.45
	K1 Coefficient:	0.590	0.590	0.590
Results				
	Scour Depth Ys (ft):	6.20	3.75	0.00
	Critical Velocity (ft/s):			
	Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data		
	Pier Shape:	Round nose
	Pier Width (ft):	3.00
	Grain Size D50 (mm):	6.35000
	Depth Upstream (ft):	16.04
	Velocity Upstream (ft/s):	11.59
	K1 Nose Shape:	1.00
	Pier Angle:	5.00
	Pier Length (ft):	27.00
	K2 Angle Coef:	1.38
	K3 Bed Cond Coef:	1.10
	Grain Size D90 (mm):	25.40000
	K4 Armouring Coef:	0.58
Results		
	Scour Depth Ys (ft):	7.11
	Froude #:	0.51
	Equation:	CSU equation

Abutment Scour

		Left	Right
Input Data			
	Station at Toe (ft):	17.24	239.01
	Toe Sta at appr (ft):	-6.00	249.40
	Abutment Length (ft):	52.00	52.00
	Depth at Toe (ft):	1.19	1.19
	K1 Shape Coef:	0.82 - Vert. with wing walls	
	Degree of Skew (degrees):	5.00	5.00
	K2 Skew Coef:	0.69	0.69
	Projected Length L' (ft):	4.53	4.53
	Avg Depth Obstructed Ya (ft):	2.62	9.71
	Flow Obstructed Qe (cfs):		2250.87
	Area Obstructed Ae (sq ft):	20.07	2531.89
Results			
	Scour Depth Ys (ft):	3.72	3.62
	Froude #:	0.43	0.40
	Equation:	HIRE	HIRE

Combined Scour Depths

Pier Scour + Contraction Scour (ft):		
	Channel:	10.86
	Right Bank:	7.11
Left abutment scour + contraction scour (ft):	9.91	

500-YR W/ 0.25-INCH MATERIAL
Proposed Full Width Channel

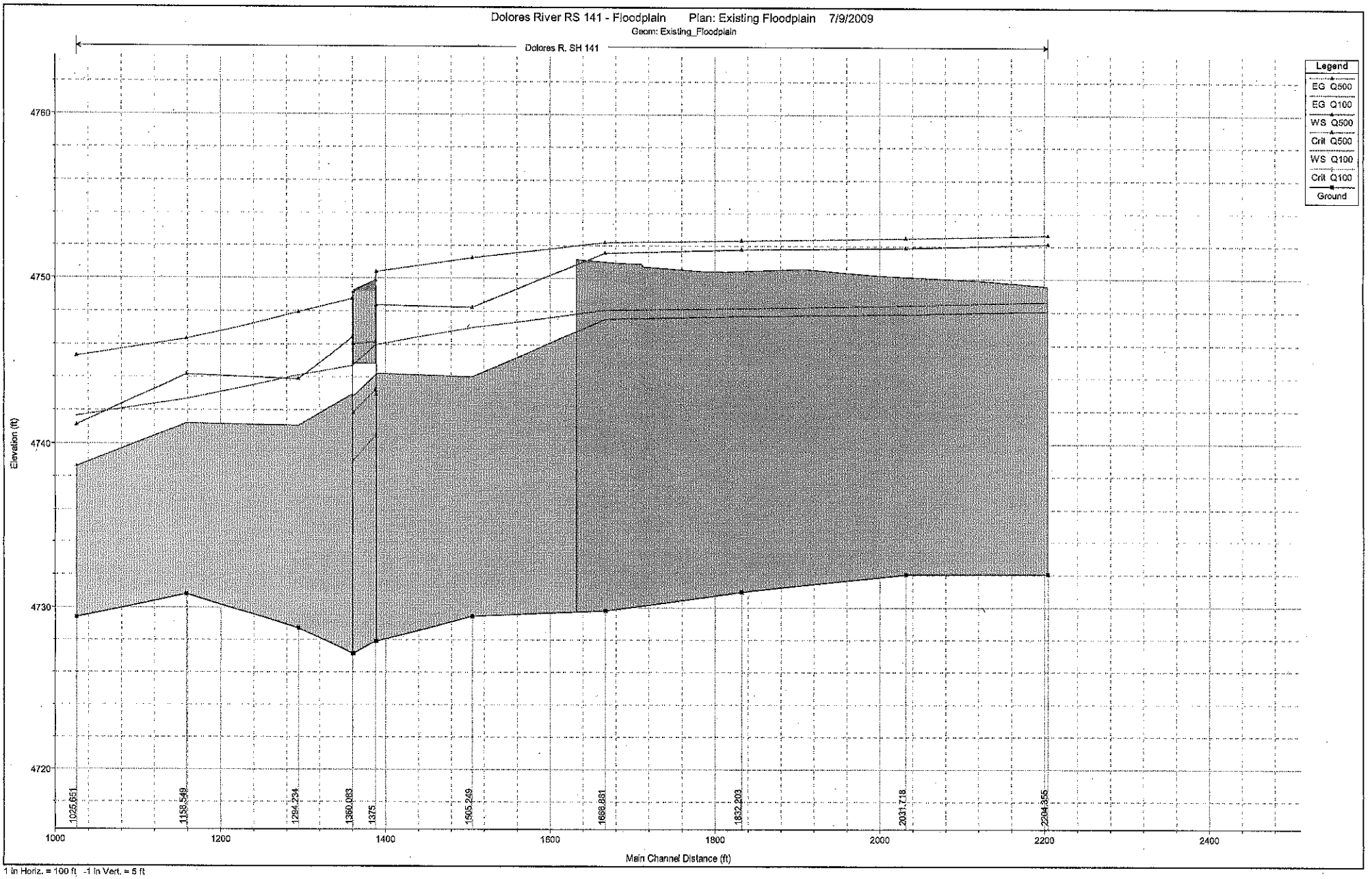
Right abutment scour + contraction scour (ft): 3.62

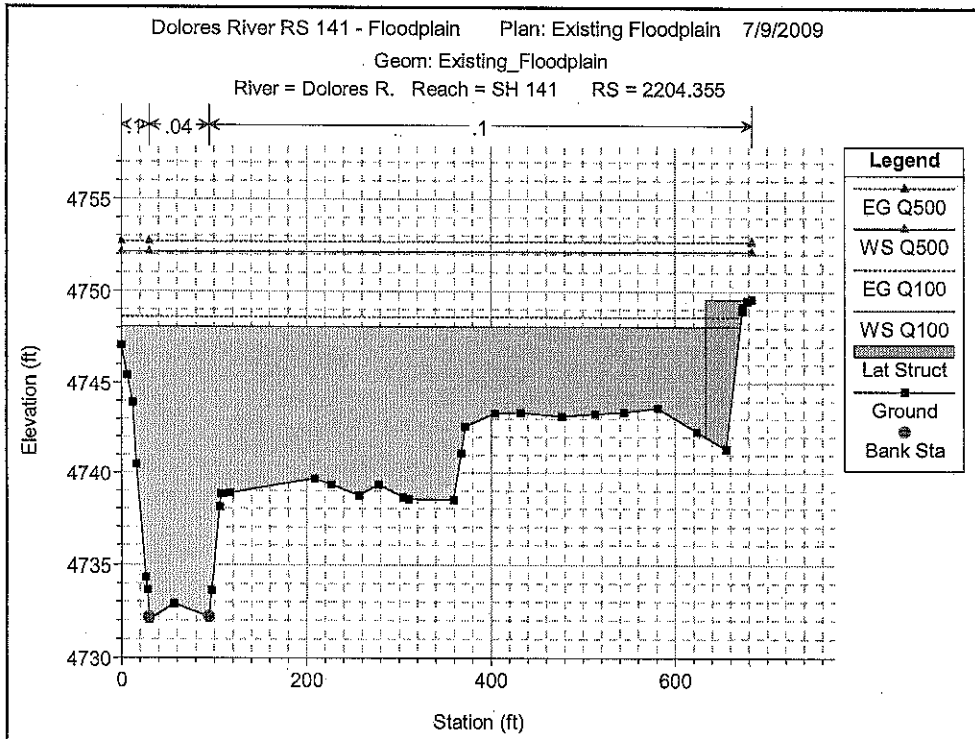
ATTACHMENT F-5

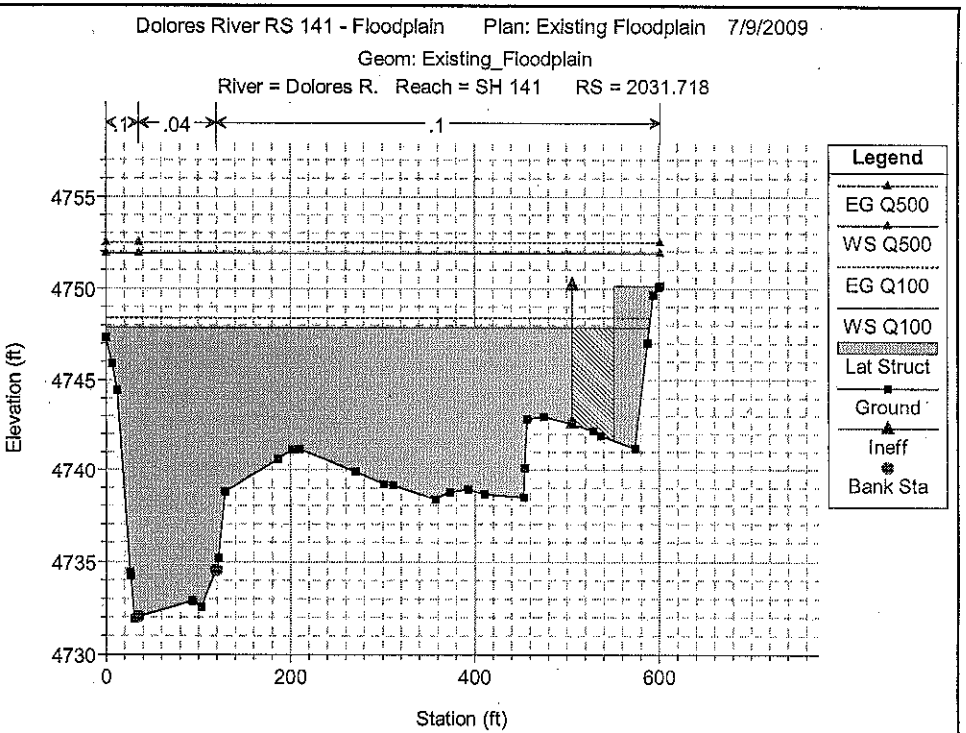
EXISTING CONDITION HEC-RAS HYDRAULICS

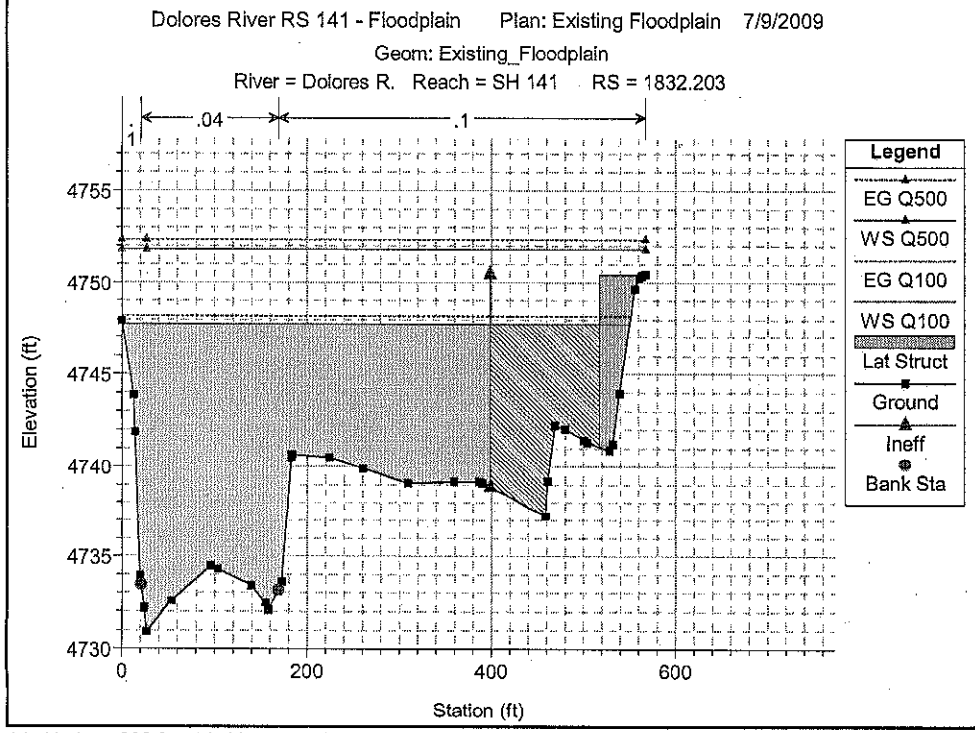
HEC-RAS Plan: EX-FL River: Dolores R. Reach: SH 141

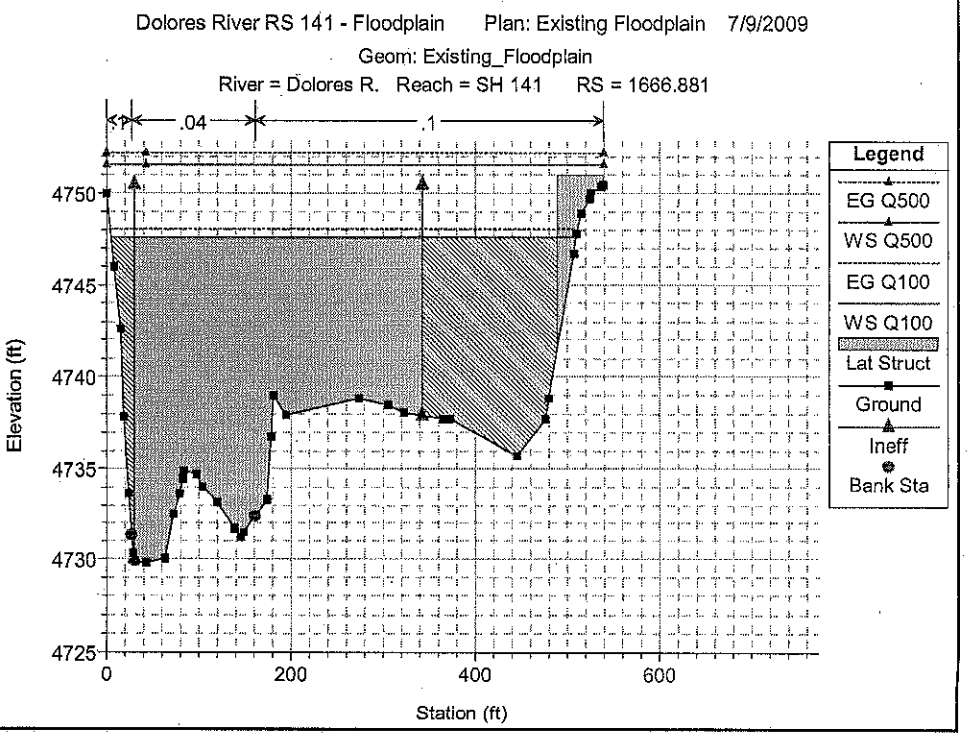
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SH 141	2204.355	Q100	15900.00	4732.05	4748.07		4748.60	0.001200	8.01	5233.28	671.18	0.36
SH 141	2204.355	Q500	26500.00	4732.05	4752.14		4752.67	0.001032	8.67	7997.75	683.41	0.35
SH 141	2200		Lat Struct									
SH 141	2031.718	Q100	15900.00	4732.04	4747.88		4748.40	0.001054	7.38	4672.02	590.19	0.33
SH 141	2031.718	Q500	25242.60	4732.04	4751.91		4752.49	0.000947	8.19	6709.61	601.18	0.33
SH 141	1832.203	Q100	15900.00	4730.93	4747.78		4748.21	0.000691	5.84	4198.29	550.13	0.27
SH 141	1832.203	Q500	24464.42	4730.93	4751.79		4752.32	0.000652	6.66	5797.96	567.01	0.27
SH 141	1666.881	Q100	15900.00	4729.80	4747.59		4748.08	0.000747	6.27	3785.42	504.96	0.28
SH 141	1666.881	Q500	24028.34	4729.80	4751.56		4752.20	0.000731	7.22	5029.16	539.66	0.29
SH 141	1505.249	Q100	15900.00	4729.45	4744.04		4747.06	0.005404	15.49	1698.89	248.66	0.74
SH 141	1505.249	Q500	24018.19	4729.45	4748.23		4751.25	0.004099	16.14	2563.13	268.00	0.67
SH 141	1388.957	Q100	15900.00	4727.92	4744.24	4740.37	4745.99	0.002714	11.72	2155.49	218.72	0.53
SH 141	1388.957	Q500	24018.19	4727.92	4748.37	4742.97	4750.39	0.002402	12.97	3079.86	226.81	0.52
SH 141	1375		Bridge									
SH 141	1360.083	Q100	15900.00	4727.19	4742.97		4744.73	0.002582	11.41	2035.10	206.20	0.52
SH 141	1360.083	Q500	24018.19	4727.19	4746.44		4748.74	0.002667	13.33	2800.06	226.21	0.55
SH 141	1294.234	Q100	15900.00	4728.74	4741.11		4744.11	0.006082	14.63	1417.54	318.66	0.76
SH 141	1294.234	Q500	24018.19	4728.74	4743.89		4747.96	0.006321	17.25	1861.91	442.60	0.81
SH 141	1158.549	Q100	15900.00	4730.81	4741.25		4742.68	0.003805	9.74	1784.49	254.20	0.58
SH 141	1158.549	Q500	26500.00	4730.81	4744.17		4746.33	0.003954	12.03	2495.73	462.41	0.62
SH 141	1025.651	Q100	15900.00	4729.39	4738.63	4738.63	4741.68	0.012355	14.25	1258.85	234.72	0.99
SH 141	1025.651	Q500	26500.00	4729.39	4741.14	4741.14	4745.31	0.011084	16.81	1911.49	312.93	0.99


Dolores River RS 141 - Floodplain Plan: Existing Floodplain 7/9/2009
Geom: Existing_Floodplain
Dolores R. SH 141
Legend
EG Q500
EG Q100
WS Q500
Crit Q500
WS Q100
Crit Q100
Ground
Elevation (ft)
4760
4750
4740
4730
4720
1025.651
1158.549
1294.234
1360.083
1375
1505.249
1666.881
1832.203
2031.718
2204.355
1000
1200
1400
1600
1800
2000
2200
2400
Main Channel Distance (ft)
1 in Horiz. = 100 ft 1 in Vert. = 5 ft

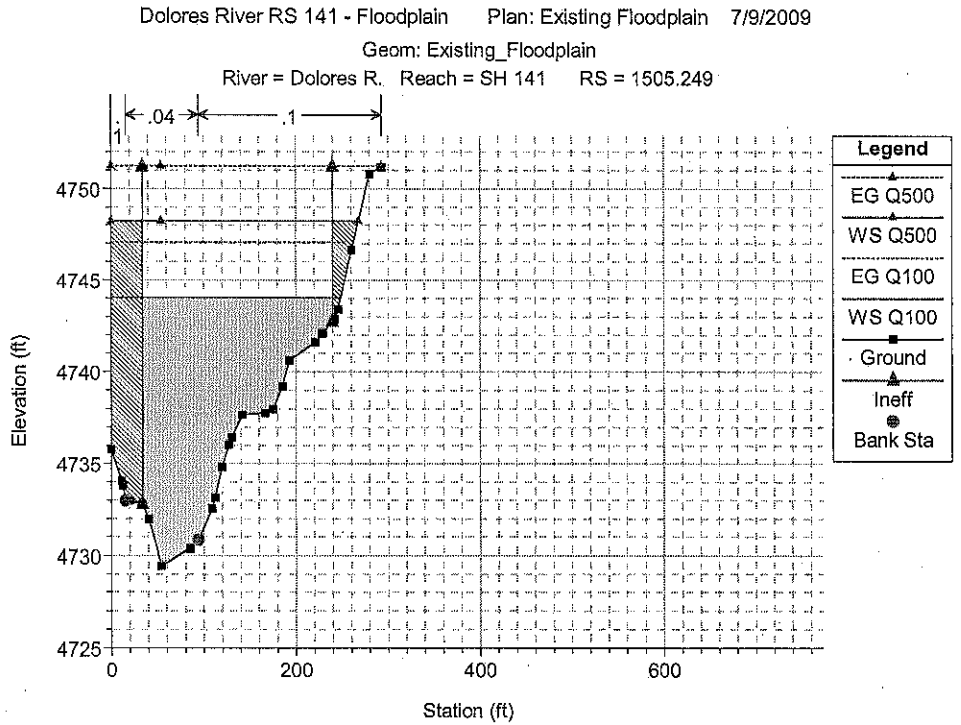


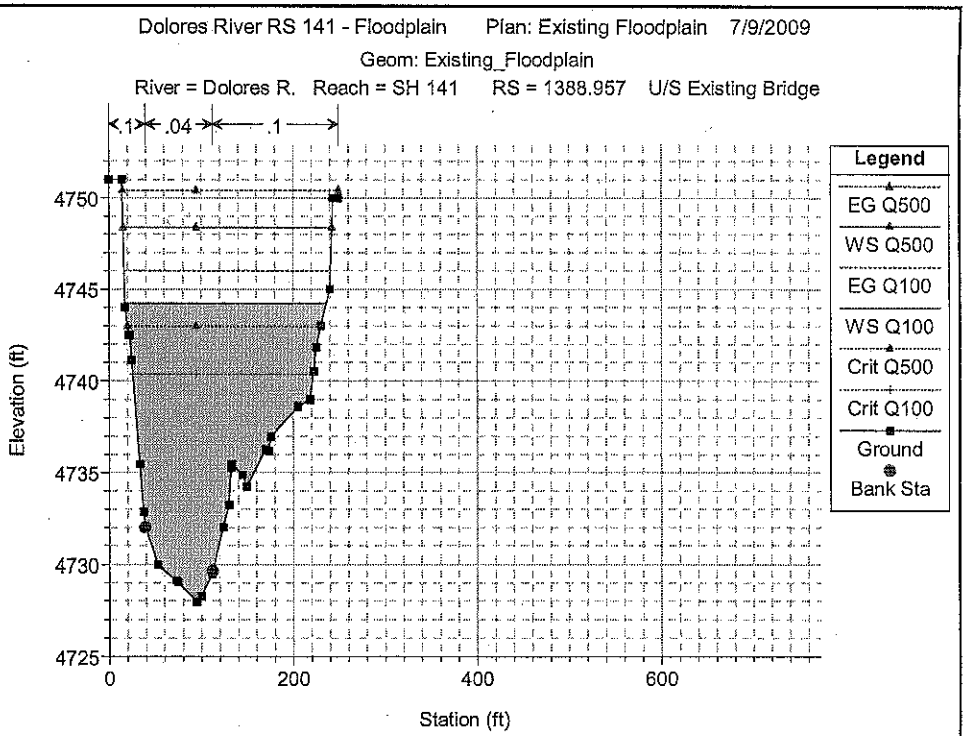


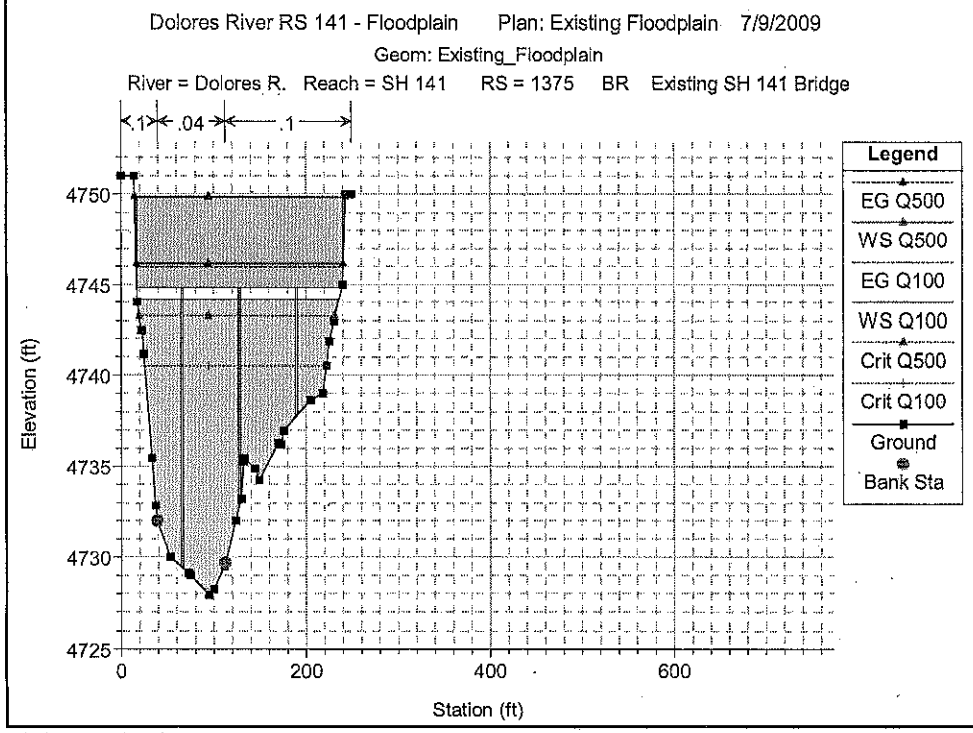


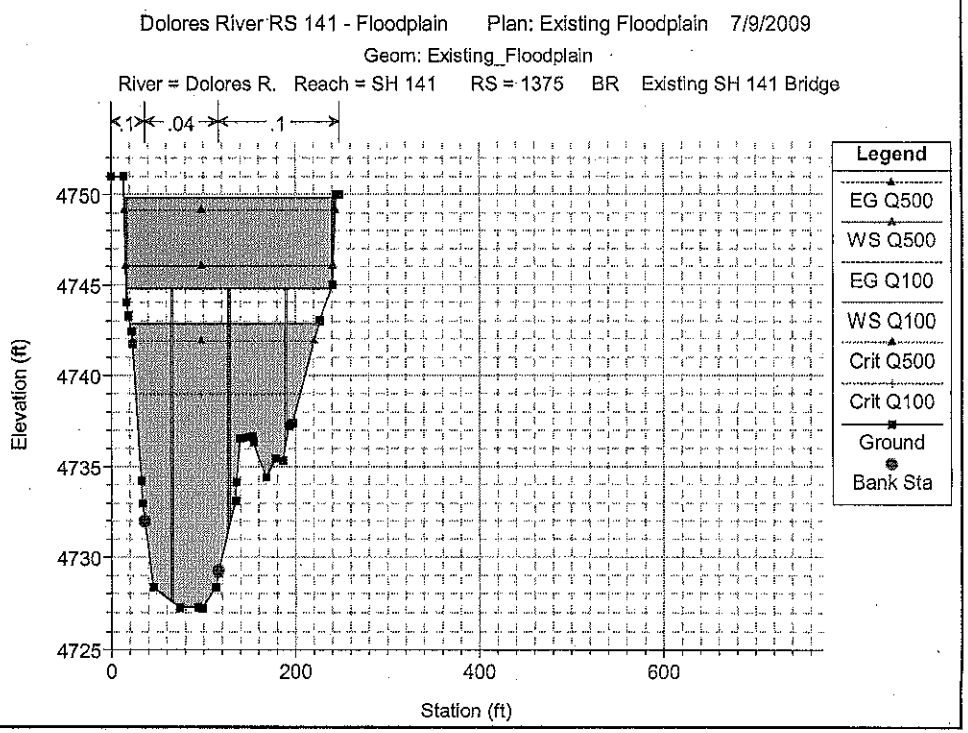


1 in Horiz. = 200 ft 1 in Vert. = 10 ft

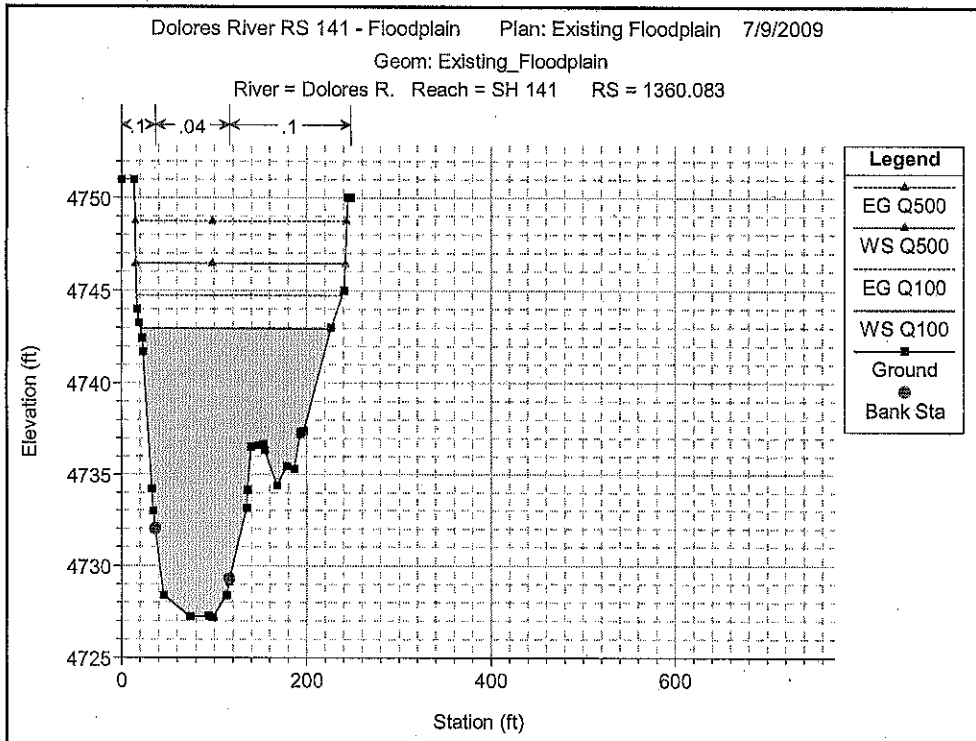


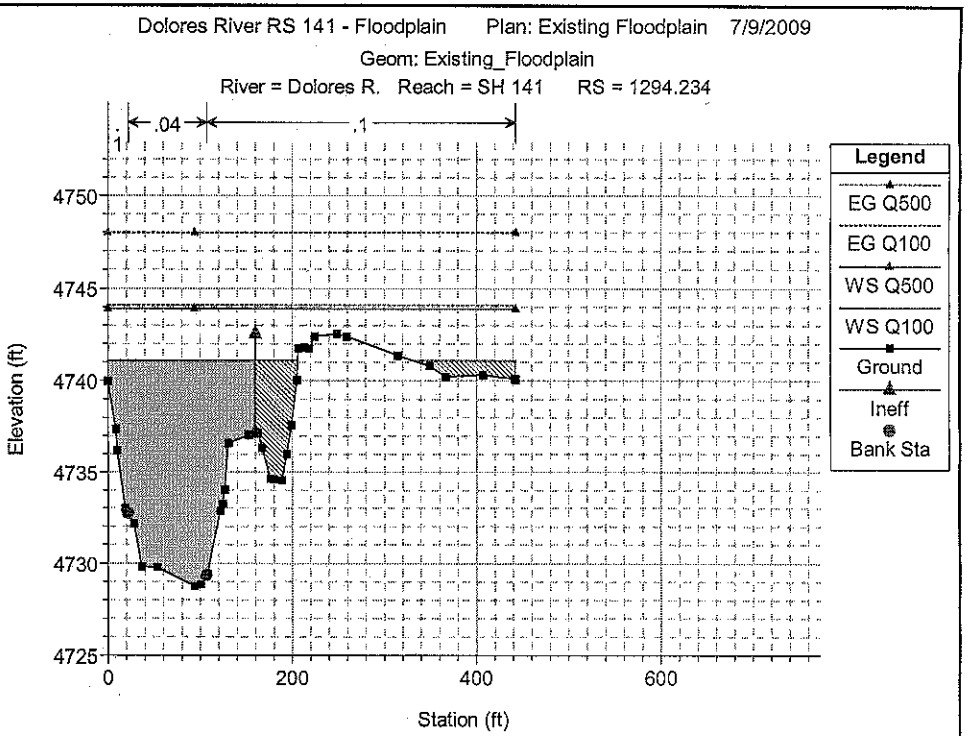


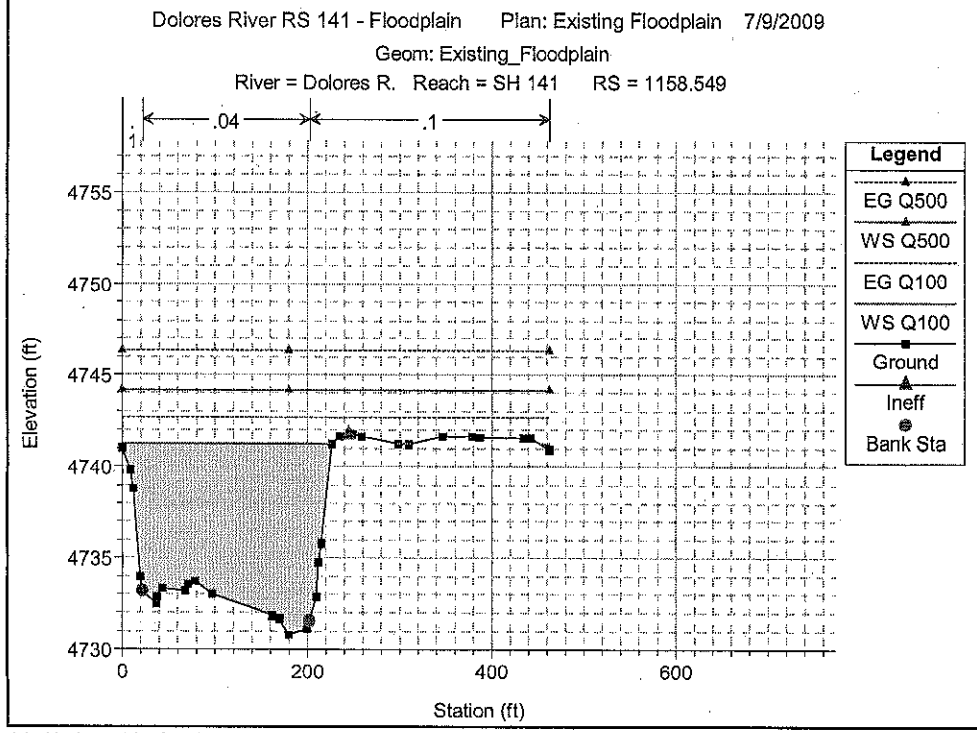


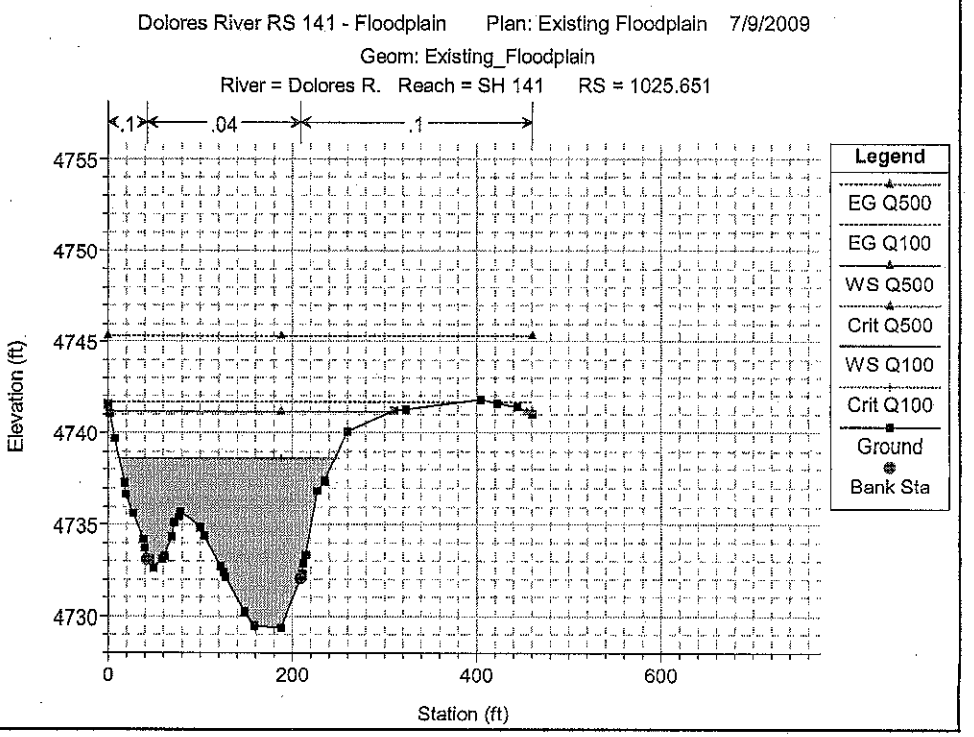


1 in Horiz. = 200 ft 1 in Vert. = 10 ft









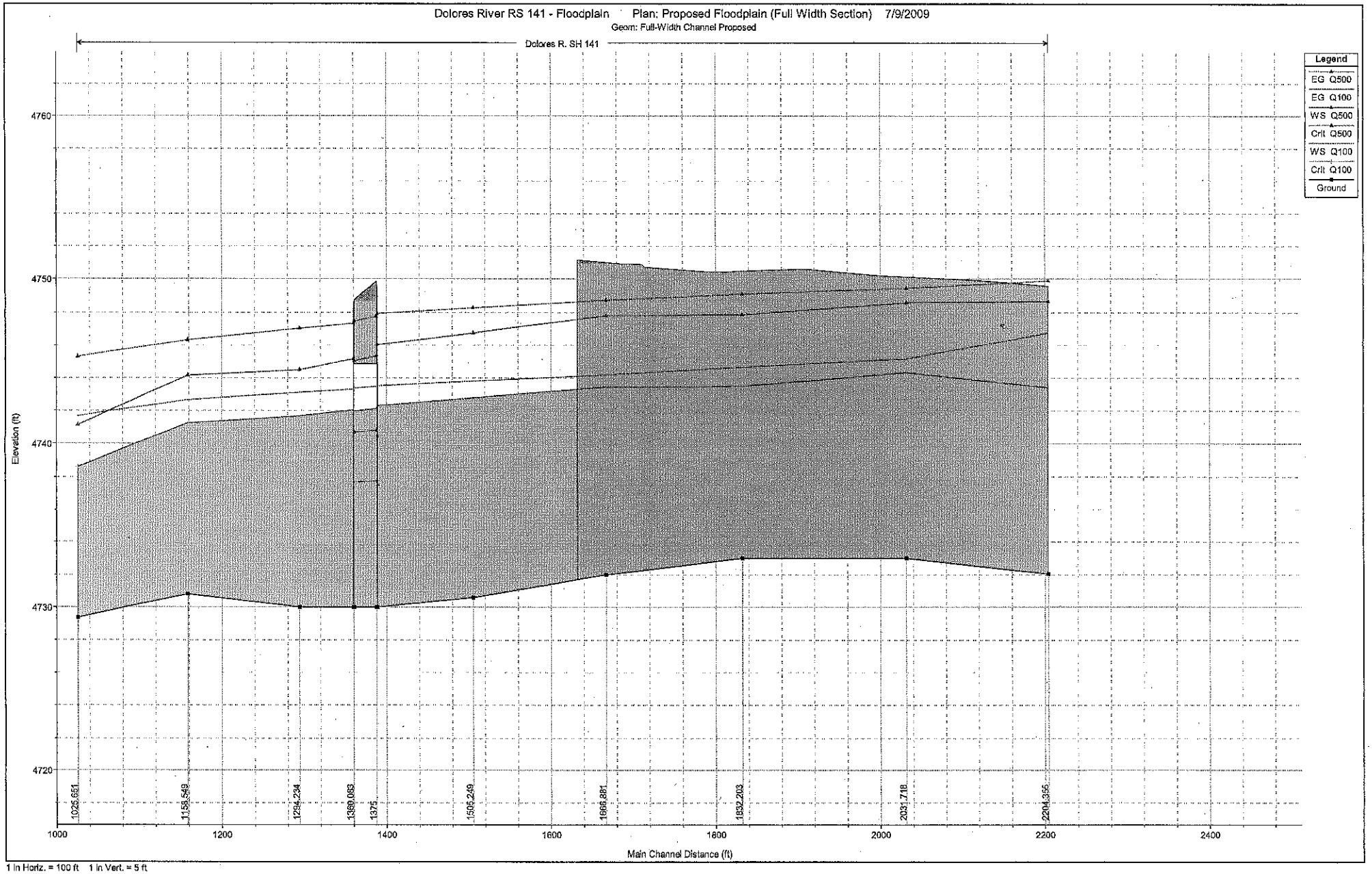
1 in Horiz. = 200 ft 1 in Vert. = 10 ft

ATTACHMENT F-6

PROPOSED CONDITION HEC-RAS HYDRAULICS

HEC-RAS Plan: Full Width River: Dolores R. Reach: SH 141

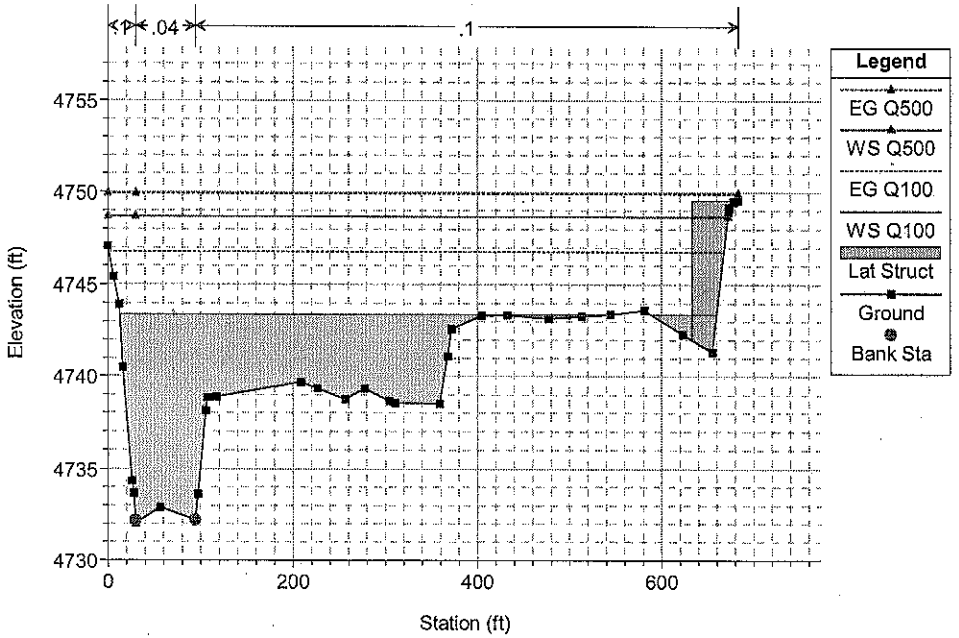
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
SH 141	2204.355	Q100	15900.00	4732.05	4743.40		4746.76	0.008638	16.94	2153.02	604.07	0.91
SH 141	2204.355	Q500	26500.00	4732.05	4748.65		4749.89	0.002745	12.42	5625.31	672.54	0.54
SH 141	2200		Lat Struct									
SH 141	2031.718	Q100	15900.00	4733.00	4744.33		4745.17	0.001952	8.11	3210.99	569.38	0.43
SH 141	2031.718	Q500	26500.00	4733.00	4748.59		4749.44	0.001420	8.61	5346.86	591.84	0.39
SH 141	1832.203	Q100	15900.00	4733.00	4743.49		4744.67	0.002873	9.33	2492.27	525.08	0.52
SH 141	1832.203	Q500	26500.00	4733.00	4747.88		4749.08	0.001972	9.83	4211.97	550.72	0.45
SH 141	1666.881	Q100	15900.00	4732.00	4743.44		4744.18	0.001666	7.19	2683.75	482.87	0.39
SH 141	1666.881	Q500	26500.00	4732.00	4747.80		4748.73	0.001336	8.14	4048.85	505.87	0.37
SH 141	1505.249	Q100	15900.00	4730.60	4742.78		4743.81	0.001821	8.39	2200.09	240.22	0.42
SH 141	1505.249	Q500	26500.00	4730.60	4746.73		4748.28	0.001914	10.38	3013.52	260.93	0.46
SH 141	1388.957	Q100	15900.00	4730.00	4742.30	4737.48	4743.52	0.002170	9.22	2115.65	204.21	0.46
SH 141	1388.957	Q500	26500.00	4730.00	4746.04	4740.46	4747.93	0.002405	11.59	2925.32	223.85	0.51
SH 141	1375		Bridge									
SH 141	1360.083	Q100	15900.00	4730.00	4742.03		4743.31	0.002296	9.34	2015.72	199.58	0.47
SH 141	1360.083	Q500	26500.00	4730.00	4745.16		4747.32	0.002874	12.20	2682.08	224.64	0.55
SH 141	1294.234	Q100	15900.00	4730.00	4741.69		4743.11	0.002602	9.76	1833.72	351.93	0.50
SH 141	1294.234	Q500	26500.00	4730.00	4744.50		4747.01	0.003480	13.03	2312.16	442.60	0.60
SH 141	1158.549	Q100	15900.00	4730.81	4741.25		4742.68	0.003805	9.74	1784.49	254.20	0.58
SH 141	1158.549	Q500	26500.00	4730.81	4744.17		4746.33	0.003954	12.03	2495.73	462.41	0.62
SH 141	1025.651	Q100	15900.00	4729.39	4738.63	4738.63	4741.68	0.012355	14.25	1258.85	234.72	0.99
SH 141	1025.651	Q500	26500.00	4729.39	4741.14	4741.14	4745.31	0.011084	16.81	1911.49	312.93	0.99


Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009
Geom: Full-Width Channel Proposed
Dolores R. SH 141
Legend
EG Q500
EG Q100
WS Q500
Crit Q500
WS Q100
Crit Q100
Ground
Elevation (ft)
4760
4750
4740
4730
4720
1025.651
1158.549
1294.234
1369.083
1375
1505.249
1666.881
1832.203
2031.718
2204.355
1000
1200
1400
1600
1800
2000
2200
2400
Main Channel Distance (ft)
1 in Horiz. = 100 ft 1 in Vert. = 5 ft

Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

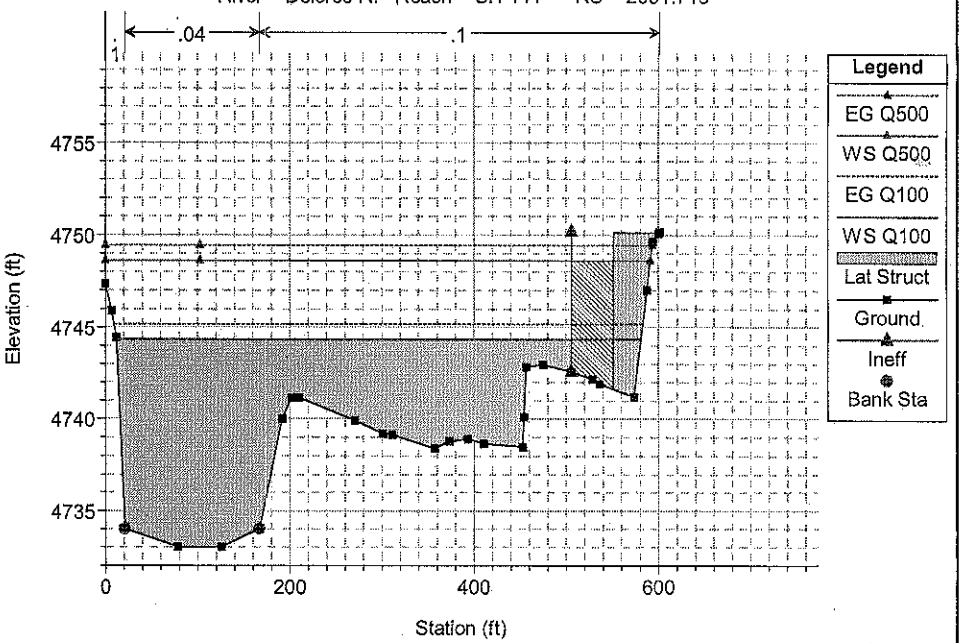
River = Dolores R. Reach = SH 141 RS = 2204.355



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

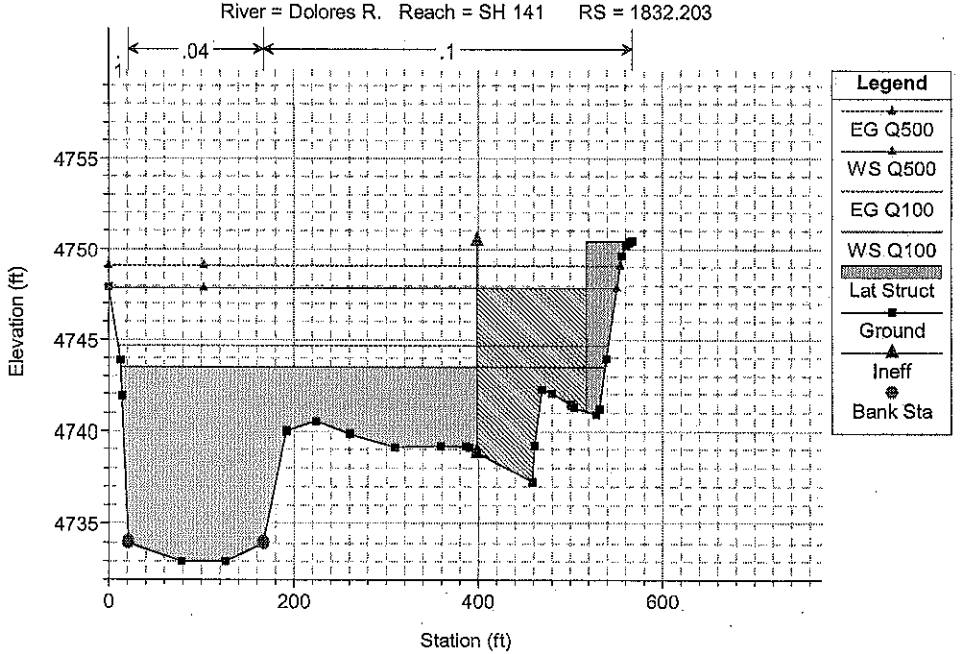
River = Dolores R. Reach = SH 141 RS = 2031.718



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

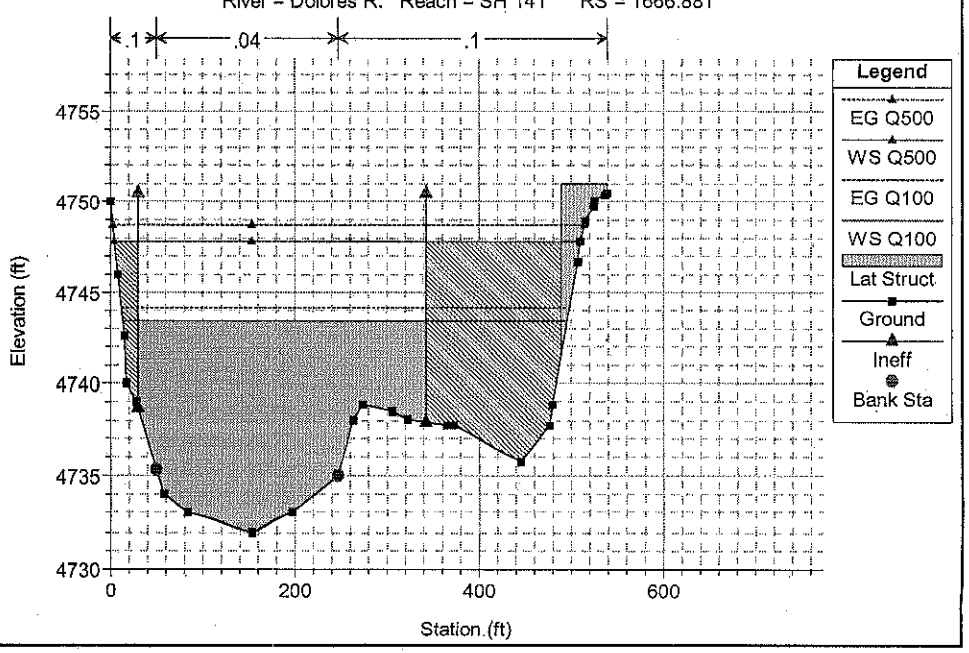
River = Dolores R. Reach = SH 141 RS = 1832.203



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

River = Dolores R. Reach = SH 141 RS = 1666.881

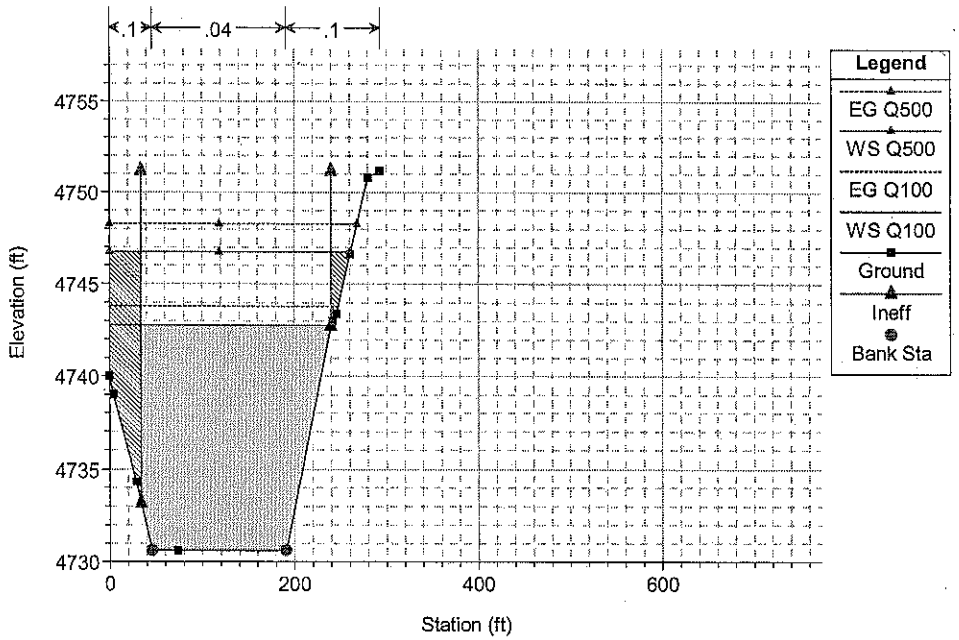


1 in Horiz. = 200 ft 1 in Vert. = 10 ft

Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

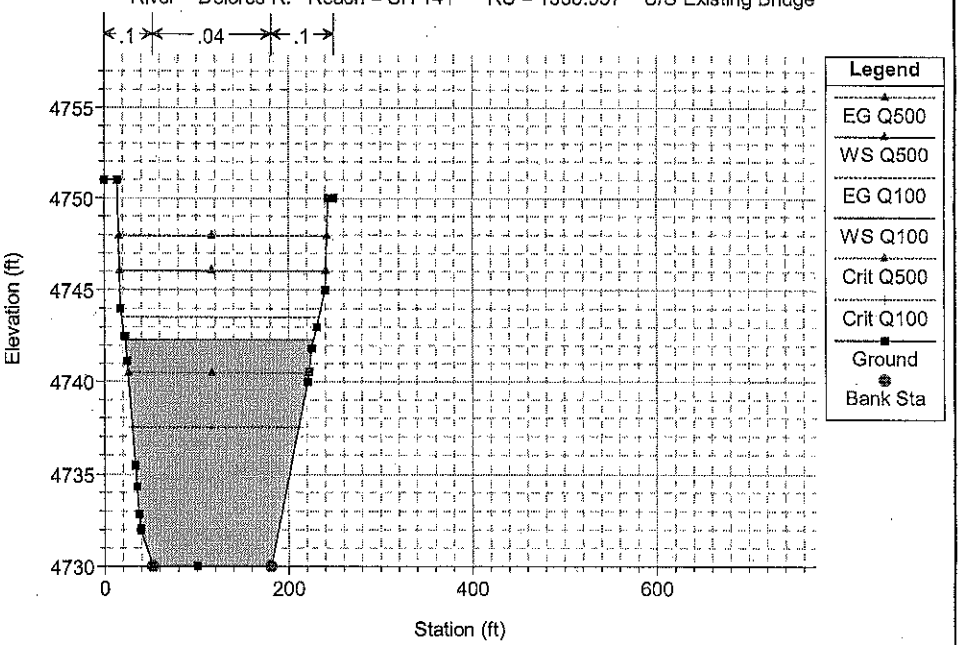
River = Dolores R. Reach = SH 141 RS = 1505.249



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

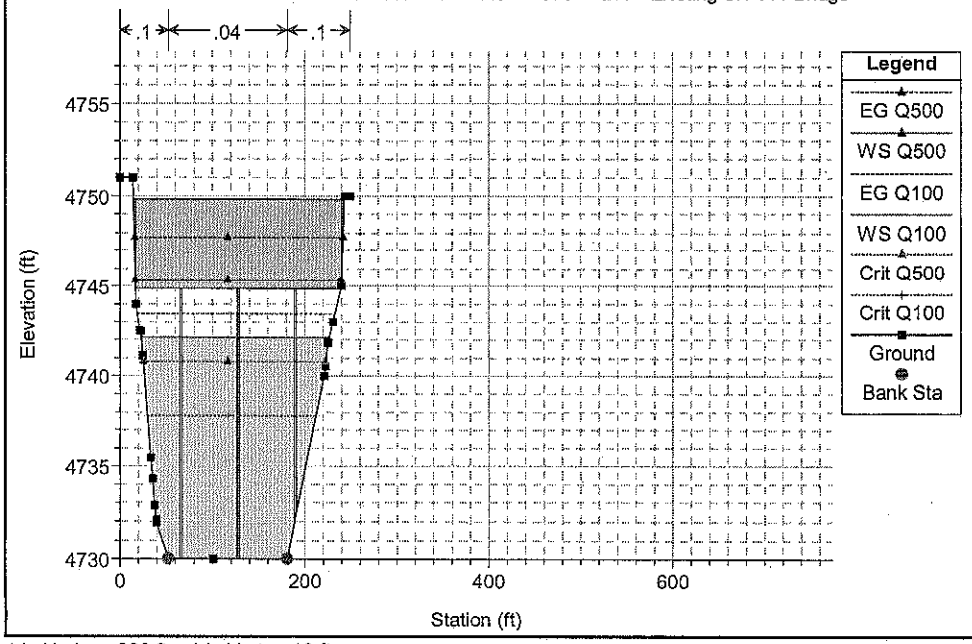
River = Dolores R. Reach = SH 141 RS = 1388.957 U/S Existing Bridge



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

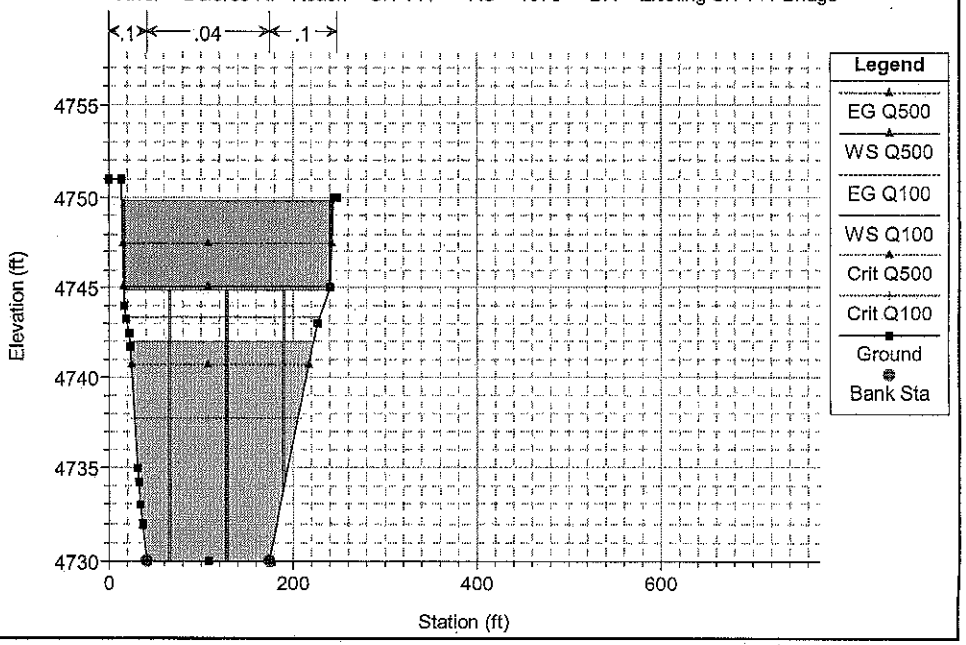
River = Dolores R. Reach = SH 141 RS = 1375 BR Existing SH 141 Bridge



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

River = Dolores R. Reach = SH 141 RS = 1375 BR Existing SH 141 Bridge

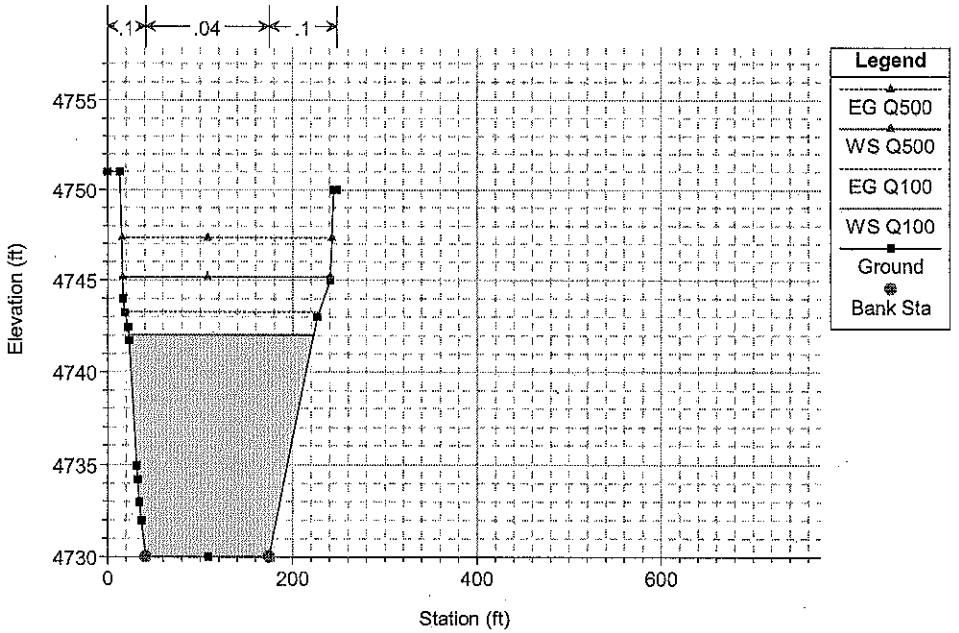


1 in Horiz. = 200 ft 1 in Vert. = 10 ft

Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

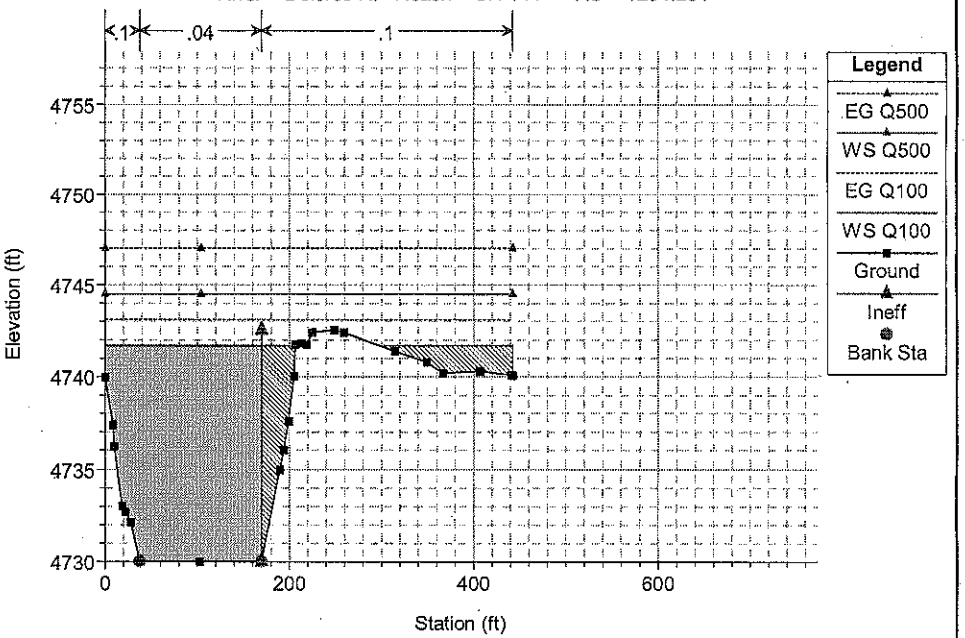
River = Dolores R. Reach = SH 141 RS = 1360.083



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

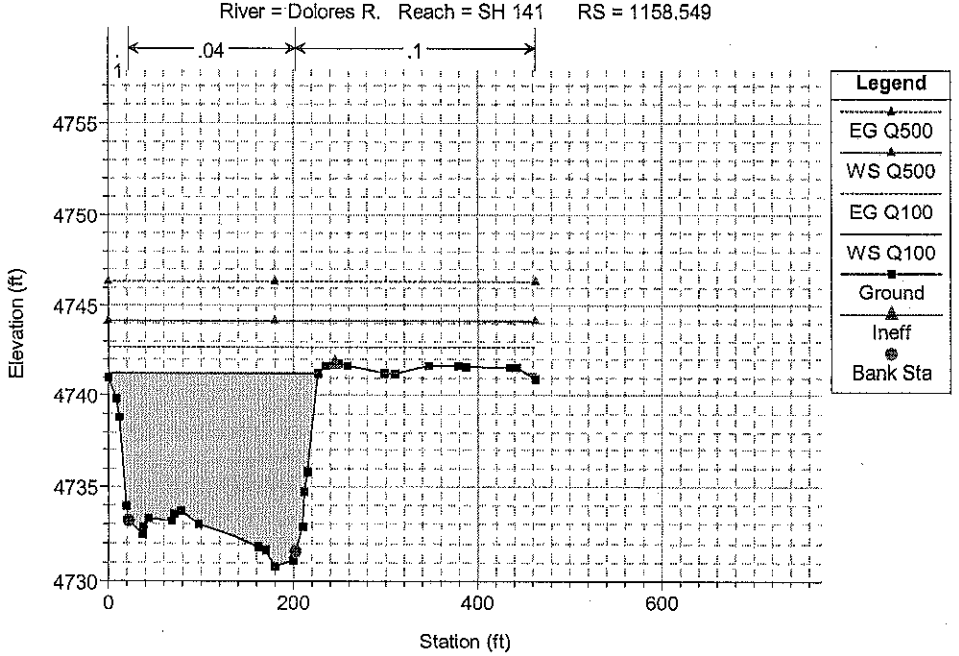
River = Dolores R. Reach = SH 141 RS = 1294.234



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

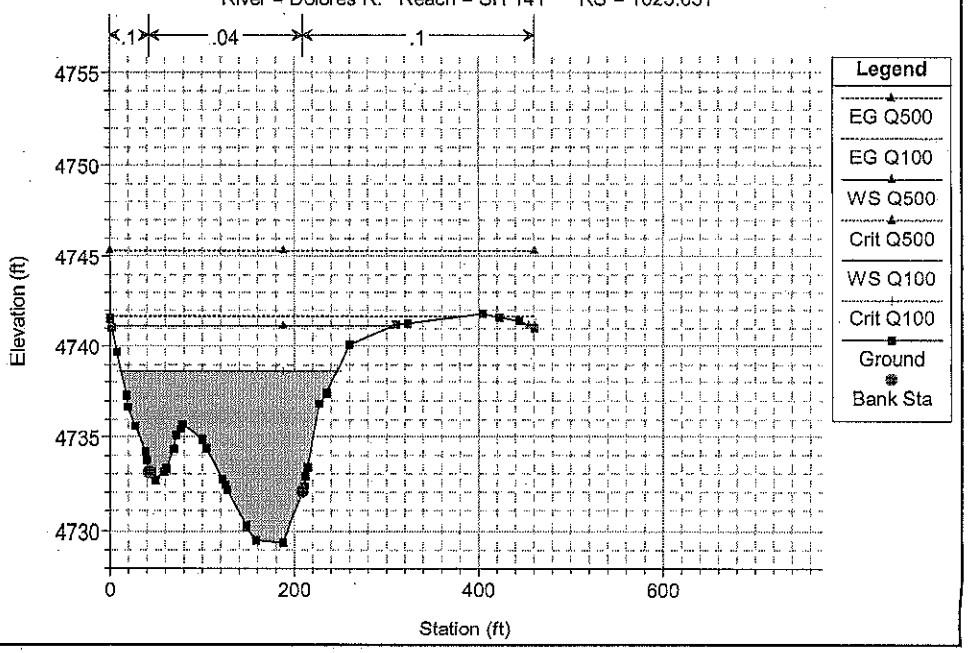
River = Dolores R. Reach = SH 141 RS = 1158.549



Dolores River RS 141 - Floodplain Plan: Proposed Floodplain (Full Width Section) 7/9/2009

Geom: Full-Width Channel Proposed

River = Dolores R. Reach = SH 141 RS = 1025.651



1 in Horiz. = 200 ft 1 in Vert. = 10 ft

ATTACHMENT F-7

PRELIMINARY COST ESTIMATE

EXHIBIT D - OPINION OF PROBABLE COST (PRELIMINARY)

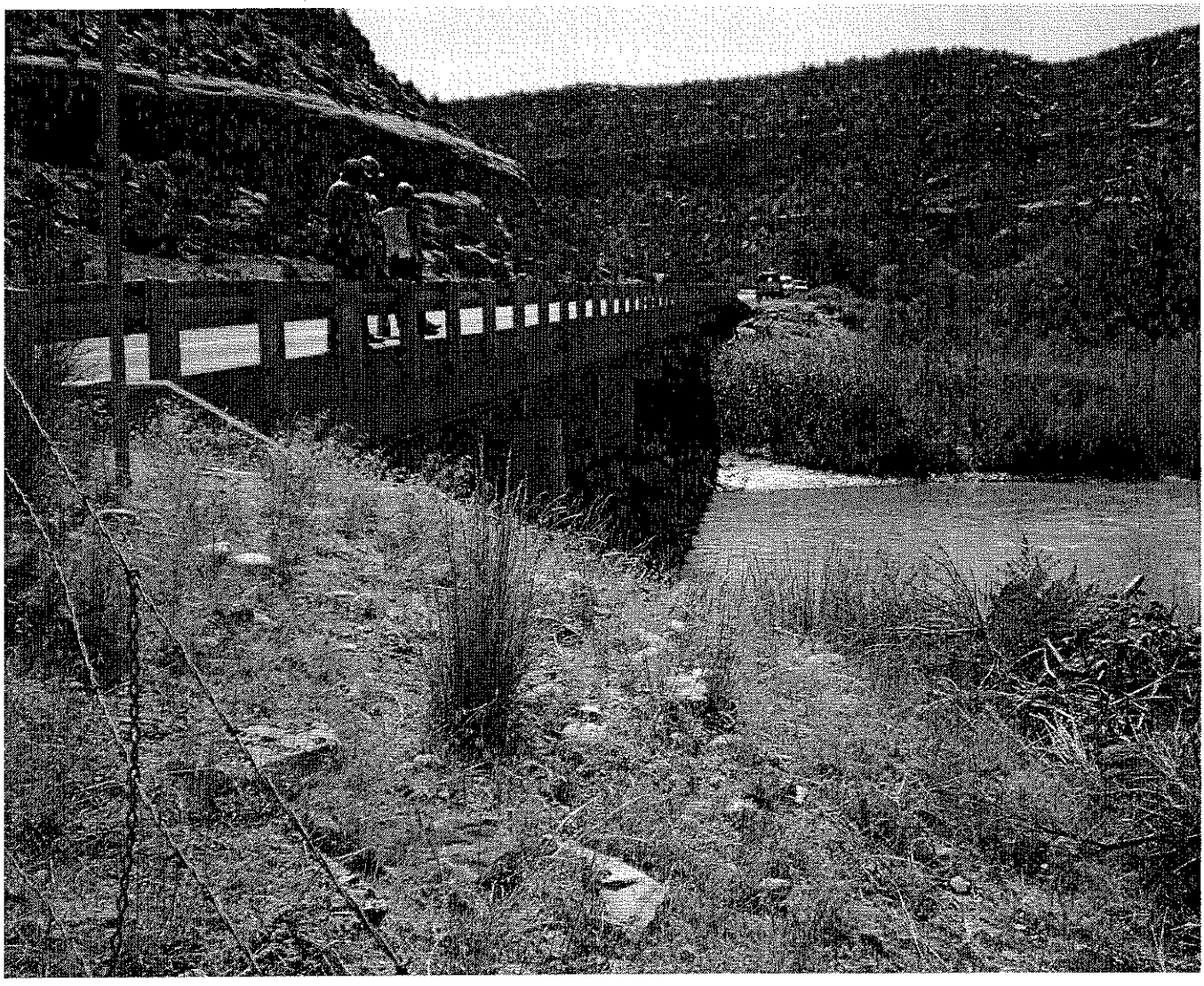
DOLORES R. AT SH-141 - Regrading Alternative

BID ITEM NO.	DESCRIPTION OF BID ITEM	QUANTITY	PAY UNIT	UNIT PRICE	TOTAL COST OF BID ITEM
1	Clearing and Grubbing	1	LS	$1,000.00	$1,000
2	Topsoil Stripping and Replacement (6" Layer)	650	CY	$8.00	$5,200
3	Earthwork (unclassified excavation and embankment)	9200	CY	$8.00	$73,600
4	Construction Fence	100	LF	$2.50	$250
5	Silt Fence	1200	LF	$2.50	$3,000
6	Vehicle Tracking Control Pad	2	EA	$1,500.00	$3,000
7	Coconut Blanket	3700	SY	$3.50	$12,950
8	D_{50}=12" Soil Riprap (Embankment Protection)	2200	CY	$70.00	$154,000
9	D_{50}=12" Soil Riprap (Weir Structures)	400	CY	$70.00	$28,000
10	D50=18" Soil Riprap (Pier Protection)	1000	CY	$80.00	$80,000
11	Seeding and Mulching (to Limits of Construction)	1	AC	$2,500.00	$2,500
12	Construction Sign	1	EA	$400.00	$400
13	Permit Fees	1	LS	$2,500.00	$2,500
14	Mobilization, Bonds, Insurance, Obtaining Permits, Traffic Control, Miscellaneous Job Costs, Final Cleanup, and Demobilization	1	LS	$10,000.00	$10,000
15	Water Control and Dewatering	1	LS	$75,000.00	$75,000

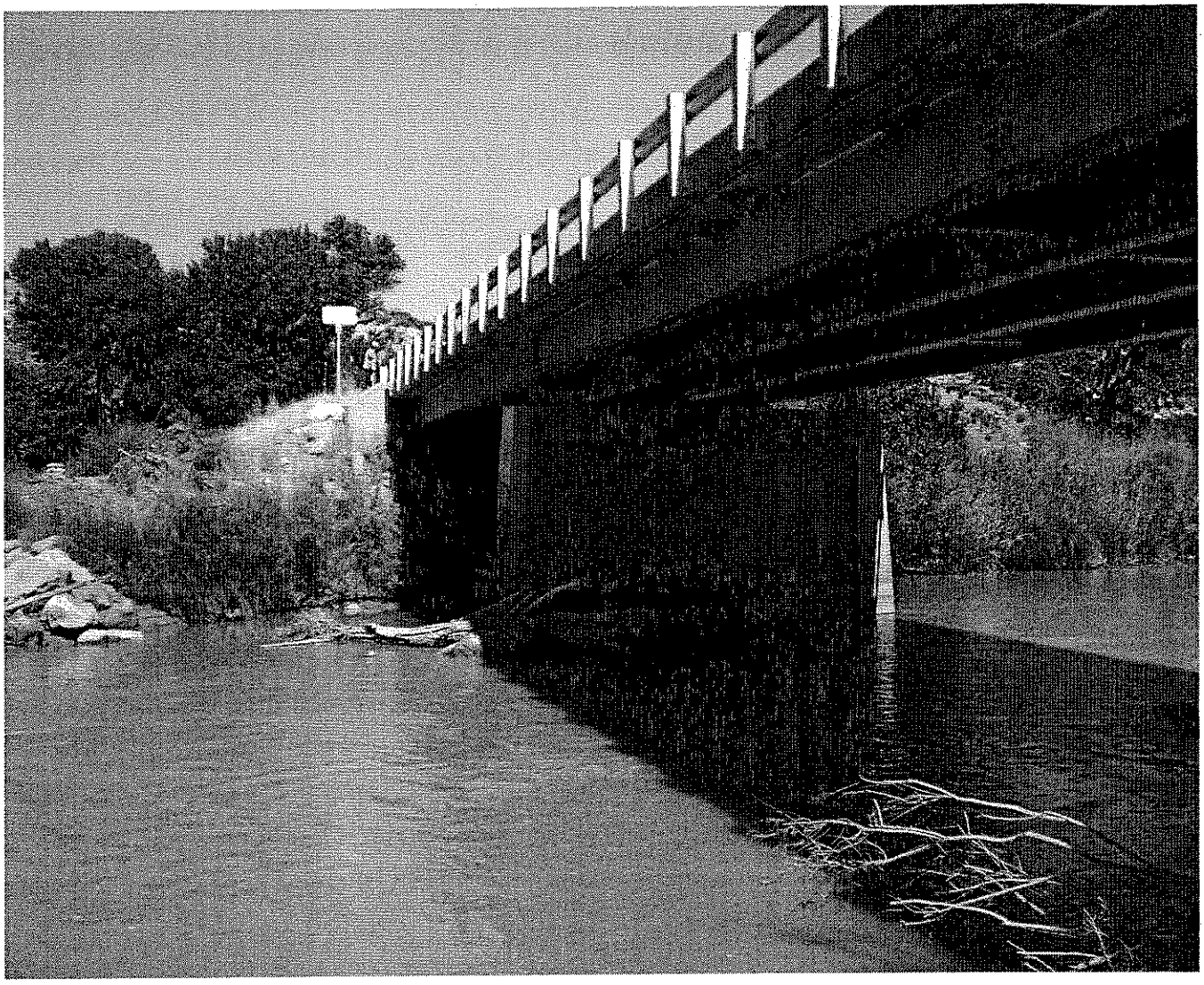
Subtotal	$451,400
Contingency (25%)	$112,900
TOTAL PROJECT COST	**$564,300**

ATTACHMENT G: PHOTOS

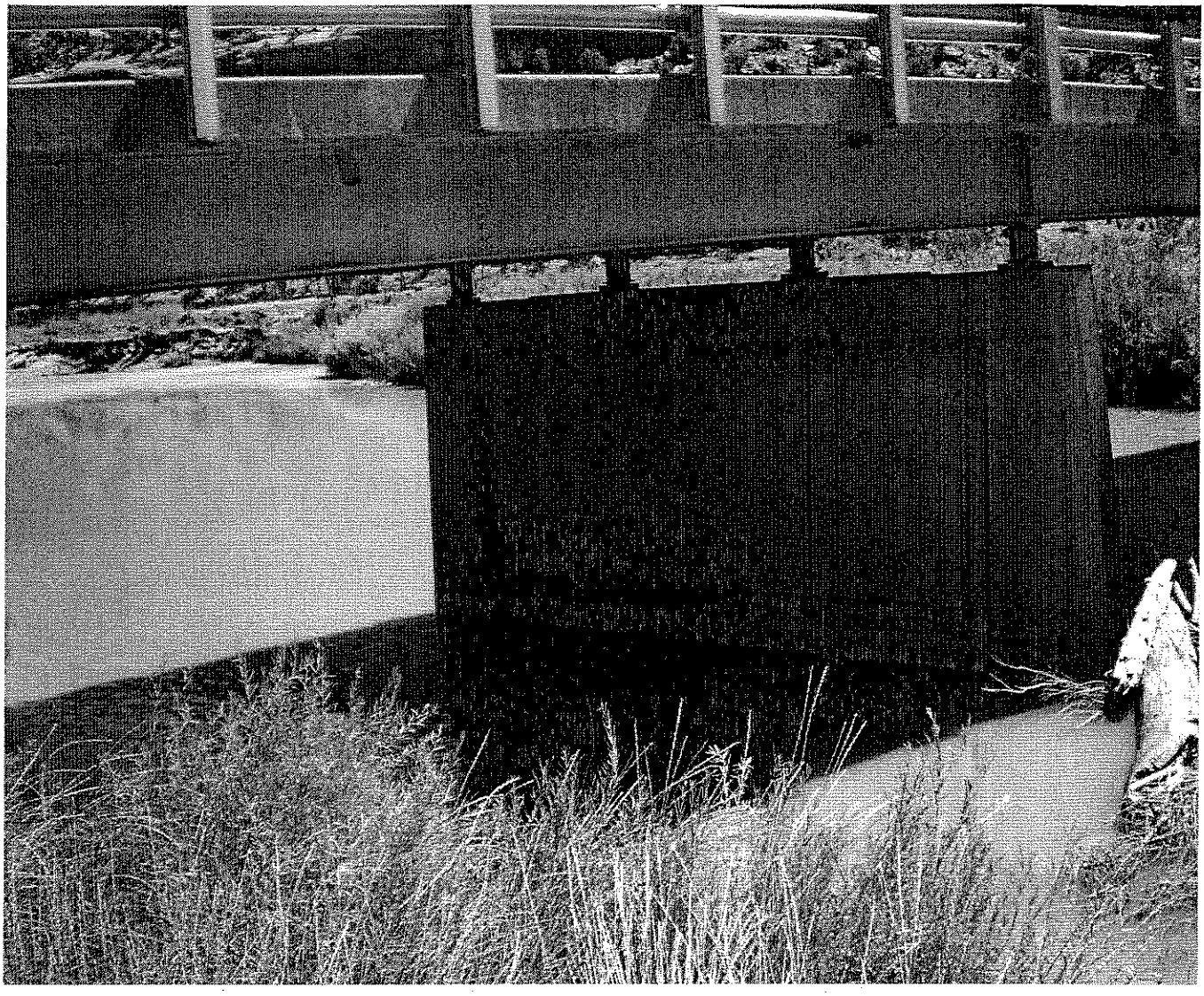
K-01-A Bridge Photo's



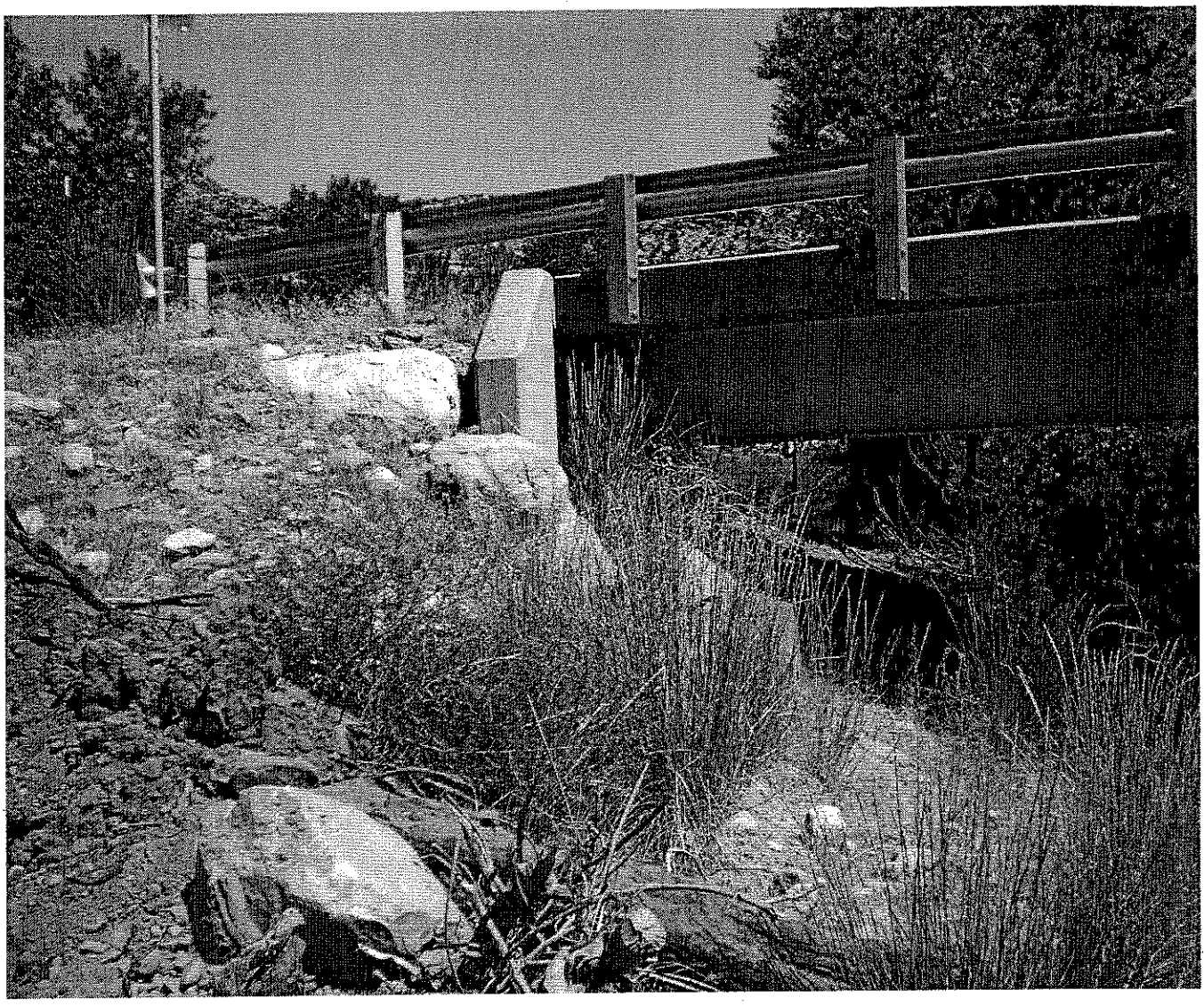
19Aug08 – K-01-A at North bank looking South



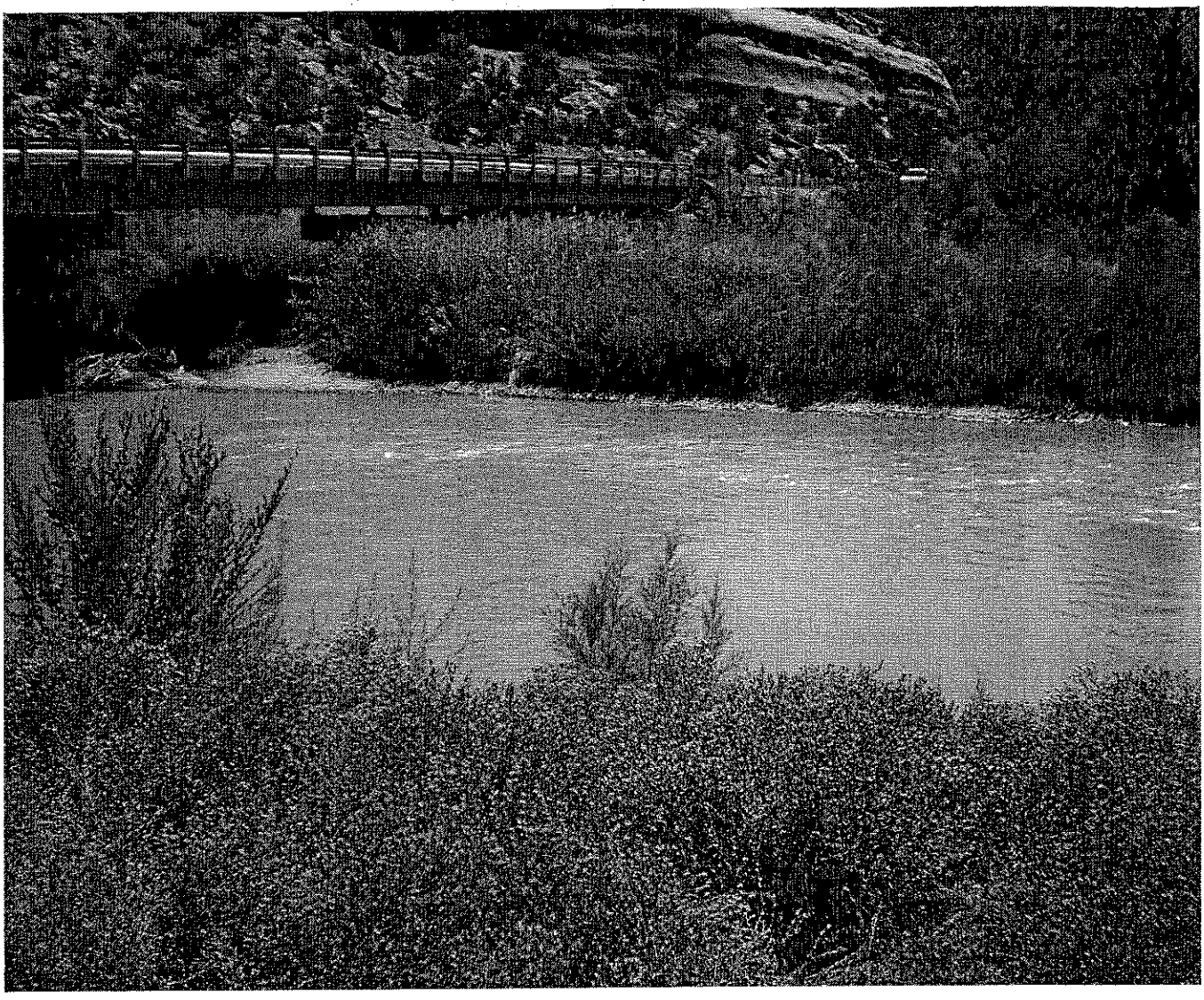
19 Aug 08 K-01-A Looking north, Pier #4 and Abutment #5



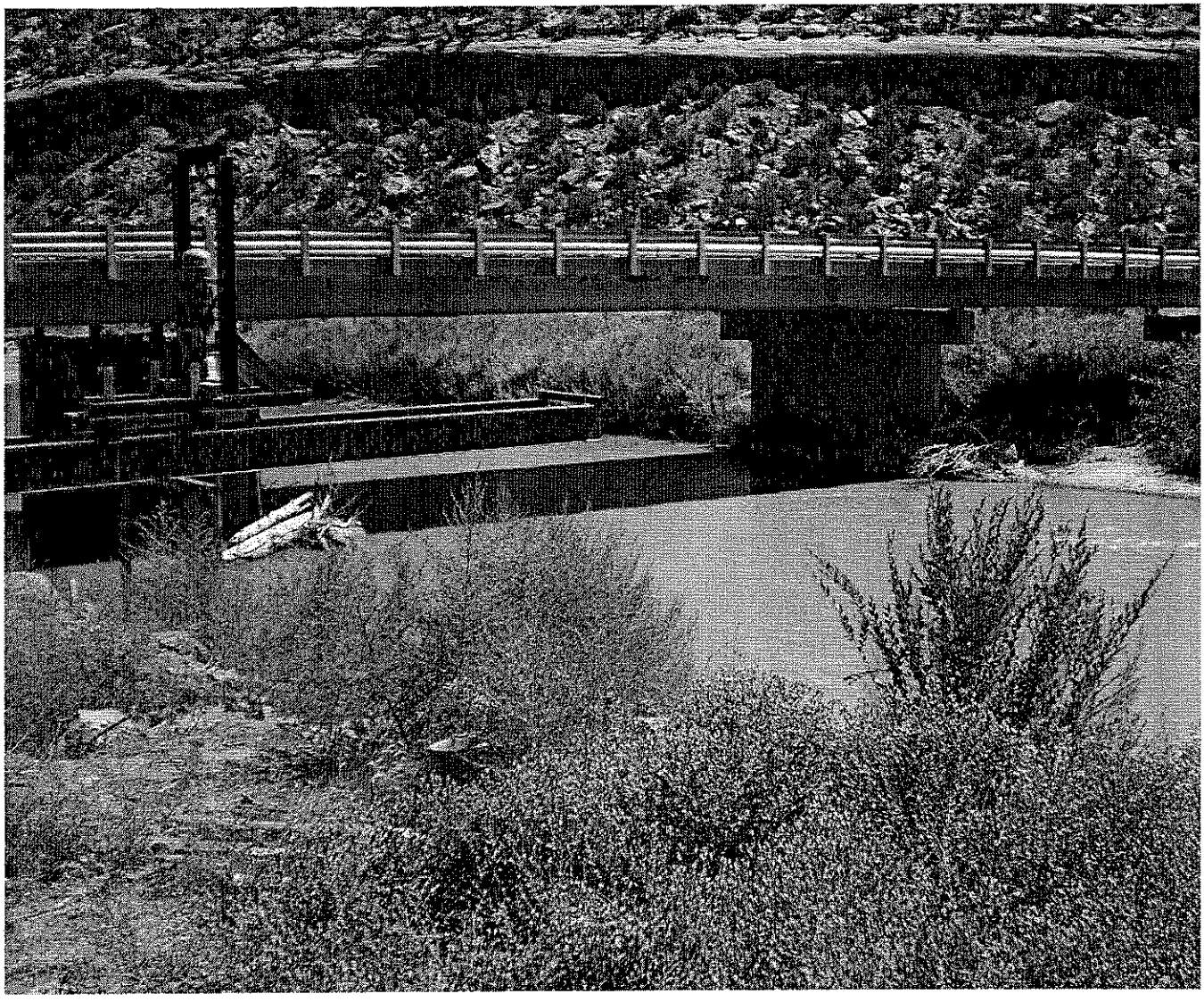
19 Aug 08 K-01-A Looking East Pier #3



19 Aug 08 K-01-A North end of bridge at Abutment #5



19 Aug 08 K-01-A South end of bridge Pier # 3 to Abutment #1 at bank.



19 Aug 08 K-01-A North end of Bridge Pier #4 Right, Pier #3 on Left