

<b>AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT</b>				1. CONTRACT ID CODE J	PAGE OF PAGES 1   3
2. AMENDMENT/MODIFICATION NO. 0009		3. EFFECTIVE DATE 24-Nov-2003	4. REQUISITION/PURCHASE REQ. NO. W68MD9-2183-1410		5. PROJECT NO.(If applicable)
6. ISSUED BY USA ENGINEER DISTRICT, SEATTLE ATTN: CENWS-CT 4735 EAST MARGINAL WAY SOUTH SEATTLE WA 98134-2329		CODE W912DW	7. ADMINISTERED BY (If other than item 6) <b>See Item 6</b>		CODE
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)				X	9A. AMENDMENT OF SOLICITATION NO. DACW67-03-R-0001
				X	9B. DATED (SEE ITEM 11) 19-Sep-2003
					10A. MOD. OF CONTRACT/ORDER NO.
					10B. DATED (SEE ITEM 13)
CODE		FACILITY CODE			
<b>11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS</b>					
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input checked="" type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required)					
<b>13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.</b>					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) DACW67-03-R-0001 FISH PASSAGE COFFERDAM AND EXCAVATION, HOWARD HANSON DAM, KING COUNTY, WASHINGTON  The purpose of this amendment (R0009) is to incorporate the following:					
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print)			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
			TEL: _____ EMAIL: _____		
15B. CONTRACTOR/OFFEROR		15C. DATE SIGNED	16B. UNITED STATES OF AMERICA		16C. DATE SIGNED
_____ (Signature of person authorized to sign)			BY _____ (Signature of Contracting Officer)		24-Nov-2003

EXCEPTION TO SF 30  
APPROVED BY OIRM 11-84

30-105-04

STANDARD FORM 30 (Rev. 10-83)  
Prescribed by GSA  
FAR (48 CFR) 53.243

## SECTION SF 30 BLOCK 14 CONTINUATION PAGE

## AMENDMENT NO. NINE

A. This amendment provides for the following changes:

- (1) Revisions to SF1442, Solicitation, Offer and Award.
- (1) Revisions to Section 00800, Special Clauses, Revisions to Drawings Sheets GT3.2, GT3.6, GT3.7, GT4.4, GT4.6, EP2.1, C1.2, S2.3, S3.9, S5.1, S5.4, S8.1 and S8.2;
- (2) Revisions to the Bid Schedule, and corresponding revisions to Section 01025, Measurement and Payment;
- (3) Revisions to Section 01005, Site Specific Supplementary Requirements, Paragraph 1.3, and attached Hydrologic and Precipitation Data for Howard Hanson Reservoir Information Sheet
- (4) Miscellaneous revisions throughout Section 01060, Water Quality Standards;
- (5) Miscellaneous revisions throughout Section 01061, Environmental Protection;
- (6) Miscellaneous revisions throughout Section 01100, Environmental Management;
- (7) Revisions to Section 01501, Construction Facilities and Temporary Controls, Paragraph 1.14;
- (8) Revisions to Section 01560, Diversion and Care of Water, Paragraph 1.6.1;
- (9) Miscellaneous revisions throughout Section 01563, Pollution Control;
- (10) Revisions to Section 02212, Controlled Blasting, Paragraph 1.4.2;
- (11) Revisions to Section 02214, Geotechnical Instrumentation, Paragraph 2.5;
- (12) Miscellaneous revisions throughout Section 02251, Foundation Drilling and Grouting;
- (13) Revisions to Section 02521, Water Wells, Paragraph 1.6(i).
- (14) Project/Dr. Checks Bidder Inquires and Answers added. "The questions/responses provided below are for your information and for clarification purposes only. The responses provided do not constitute a change to the plans or specifications. Only amended specifications or drawings provided in amendments will change the solicitation requirements."

B. The attached revised pages supersede and replace the corresponding pages. The attached revised specification sections supersede and replace the corresponding specification sections. Specification changes are generally identified for convenience, by strikeout for deletions and underlining of text for additions. All portions of the revised or new pages shall apply whether or not changes have been indicated.

C. The proposal submittal time and date is extended to December 8, 2003 at 2:00 p.m. LOCAL TIME.

D. NOTICE TO OFFERORS: Offerors must acknowledge receipt of this amendment by number and date on offer or by telegram. Please mark outside of envelope in which your offer is enclosed to show amendments received.

Encl:

SF1442, (revised)

Bid Schedule (revised)

Section 00800 (revised)

Drawings as listed (revised)

Section 01005 (revised)

Hydrologic and Precipitation Data for Howard Hanson Reservoir (new)

Section 01025 (revised)

Section 01060 (revised)

Section 01100 (revised)

Section 01510 (revised)

Section 01560 (revised)

Section 01563 (revised)

Section 02202 (revised)

Section 02214 (revised)

Section 02251 (revised)

Section 02521 (revised)

Dr. Checks Bidder Inquiries and Answers (new)

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<b>SOLICITATION, OFFER, AND AWARD</b> <i>(Construction, Alteration, or Repair)</i>	1. SOLICITATION NUMBER <b>DACW67-03-R-0001</b>	2. TYPE OF SOLICITATION <input type="checkbox"/> SEALED BID (IFB) <input checked="" type="checkbox"/> NEGOTIATED (RFP)	3. DATE ISSUED <b>Sept 19, 2003</b>	PAGE OF PAGES <b>1</b>
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**IMPORTANT - The "offer" section on the reverse must be fully completed by the offeror.**

4. CONTRACT NUMBER	5. REQUISITION/PURCHASE REQUEST NUMBER <b>W68MD9-2183-1410</b>	6. PROJECT NUMBER
7. ISSUED BY Seattle District, Corps of Engineers ATTN: CENWS-CT-CB-CU PO Box 3755 Seattle, WA 98124-3755	CODE <b>W68MD9</b>	8. ADDRESS OFFER TO Seattle District, Corps of Engineers PO Box 3755 ATTN: CENWS-CT-CB-CU Seattle, WA 98124-3755  HAND CARRY: Preston Conference Room 4735 East Marginal Way South Seattle, WA 98134-2385  BID OPENING ROOM: Preston Conference Room
9. FOR INFORMATION CALL	A. NAME See Information Page inside Front Cover	B. TELEPHONE NUMBER (Include area code) (NO COLLECT CALLS) See Information Page inside Front Cover

**SOLICITATION**

**NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".**

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying number, date):

Furnish all labor, materials and equipment and perform all work for Fish Passage Facility Cofferdam and Excavation, Howard Hanson Dam, King County, Washington in accordance with the attached Contract Clauses, Special Clauses, Technical Specifications and Drawings.

NOTE: Award will be made pursuant to the Small Business Competitive Demonstration Program.

11. The Contractor shall begin performance within 10 calendar days and complete it within \_\_\_\_\_ calendar days after receiving

award,  notice to proceed. This performance period is  mandatory,  negotiable. (See \* Paragraph SC-1, 00800 .)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE PAYMENT BONDS?  
(If "YES," indicate within how many calendar days after award in Item 12B.)

YES  NO

12B. CALENDAR DAYS

10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and \_\_\_\_\_ copies to perform the work required are due at the place specified in Item 8 by 2:00 p.m. (hour) local time December 8, 2003 (date). If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelope containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee  is,  is not required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

D. Offers providing less than 90 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

**OFFER (Must be fully completed by offeror)**

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)   Tax ID No: _____ DUNS No: _____ eMail: _____  CODE _____ FACILITY CODE _____	15. TELEPHONE NUMBER (Include area code) <span style="float:right">FAX: _____</span>  16. REMITTANCE ADDRESS (Include only if different than Item 14)
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17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within \_\_\_\_\_ calendar days after the date offers are due. (Insert any number equal or greater than the minimum requirement stated in 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

AMOUNTS See page 00010-5 thru 00010-10

18. The offeror agrees to furnish any required performance and payment bonds.

**19. ACKNOWLEDGEMENT OF AMENDMENTS**  
 (The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)	20B. SIGNATURE	20C. OFFER DATE
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**AWARD (To be completed by Government)**

21. ITEMS ACCEPTED

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA
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24. SUBMIT INVOICES TO ADDRESS SHOWN IN  (4 copies unless otherwise specified)	ITEM 26	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO <input type="checkbox"/> 10 U.S.C. 2304(c) ( ) <input type="checkbox"/> 41 U.S.C. 253(c) ( )
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26. ADMINISTERED BY CODE _____ United States Army Corps of Engineers Seattle District Northwest Area Office PO Box 92146 Tillicum, WA 98492-0146	27. PAYMENT WILL BE MADE BY US Army Corps of Engineers Finance Center CEFC-AO-P 5722 Integrity Drive Millington, TN 38054-5005
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**CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE**

<input type="checkbox"/> 28. NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to the issuing office.) Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.	<input type="checkbox"/> 29. AWARD. (Contractor is not required to sign this document.) Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.
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30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)	31A. NAME OF CONTRACTING OFFICER (Type or print) <b>CONTRACTING OFFICER</b>	
30B. SIGNATURE	30C. DATE	31B. UNITED STATES OF AMERICA BY _____
		31C. AWARD DATE

## SCHEDULE

<u>Item No.</u>	<u>Description of Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
0001	All Work for Fish Passage Facility Cofferdam and Excavation, Except for Items 0002 Through <span style="color: red;">0039_0046</span>	1	JOB	L.S.	\$ _____
0002	Mobilization And Demobilization	1	JOB	L.S.	\$ _____
0003	All Work for Reservoir Excavation & Debris Removal From Trash Racks				
0003AA	First 600 Cubic Yards	600	CY	\$ _____	\$ _____
0003AB	All Over 600 Cubic Yards	400	CY	\$ _____	\$ _____
0004	All Work for Multi-Point Borehole Extensometers	1	JOB	L.S.	\$ _____
0005	All Work for Piezometers	1	JOB	L.S.	\$ _____
0006	All Work for Inclinometers	1	JOB	L.S.	\$ _____
0007	All Work for Load Cells	1	JOB	L.S.	\$ _____
0008	All Work for Passive Relief Wells	2,260	LF	\$ _____	\$ _____
0009	All Work for Dewatering Wells	3,000	LF	\$ _____	\$ _____
0010	All Overburden Drilling for Grout Curtain Holes, (1, 2 & 4 Stage Holes)				
0010AA	First 10 Linear Foot	10	LF	\$ _____	\$ _____
0010AB	All Over 10 Linear Foot	400	LF	\$ _____	\$ _____
0011	All Rock Drilling for Grout Holes (1,2 & 4 Stage Holes)				
0011AA	First 5,000 Linear Foot	5,000	LF	\$ _____	\$ _____
0011AB	All Over 5,000 Linear Foot	5,600	LF	\$ _____	\$ _____

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<u>Item No.</u>	<u>Description of Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
0012	All Work for Redrilling Grout Curtain Holes (2 Stage Grout Curtains only)				
0012AA	First 600 Linear Foot	600	LF	\$_____	\$_____
0012AB	All Over 600 Linear Foot	1,000	LF	\$_____	\$_____
0013	All Hookups To Grout Holes used in Placement of Cement Grout Curtains				
0013AA	First 150 Each	150	EACH	\$_____	\$_____
0013AB	All Over 150 Each	160	EACH	\$_____	\$_____
0014	All Portland Cement used in Grout Curtains				
0014AA	First <u>1,000</u> 94-lb Bags	1,000	BAGS	\$_____	\$_____
0014AB	All Over <u>1,000</u> 94-lb Bags	1000	BAGS	\$_____	\$_____
0015	All Bentonite used in Grout Curtains				
0015AA	First 10 <u>50</u> -lb Bags	10	BAGS	\$_____	\$_____
0015AB	All Over 10 <u>50</u> -lb Bags	75	BAGS	\$_____	\$_____
0016	All HRWR Water Reducing Admixture (Anti-Washout Admixture) used in Grout Curtains				
0016AA	First 50 Gallons	50	GAL	\$_____	\$_____
0016AB	All Over 50 Gallons	100	GAL	\$_____	\$_____
0017	All New Intake Tower Addition Tremie Concrete Below Elevation 1085				
0017AA	First 200 Cubic Yards	200	CY	\$_____	\$_____
0017AB	All Over 200 Cubic Yards	100	CY	\$_____	\$_____
0018	All 37 Each Vertical 1-3/4" Diameter Bars for New Intake Tower Addition (Plate S8.3)				
0018AA	First 740 Linear Foot	740	LF	\$_____	\$_____
0018AB	All Over 740 Linear Foot	2,200	LF	\$_____	\$_____
0019	All Soldier H-Piles Tie Back for Permanent Retaining Wall				
0019AA	First 1,800 Linear Foot of H piles	1,800	LF	\$_____	\$_____

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<u>Item No.</u>	<u>Description of Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
0019AB	All Over 1,800 Linear Foot of H piles	1,000	LF	\$ _____	\$ _____
0020	All Tie Back Anchors for Permanent Retaining Wall				
0020AA	First 3,600 Linear Foot	3,600	LF	\$ _____	\$ _____
0020AB	All Over 3,600 Linear Foot	1,000	LF	\$ _____	\$ _____
0021	All Common Excavation Above Elevation 1074				
0021AA	First 10,000 Cubic Yard	10,000	CY	\$ _____	\$ _____
0021AB	All Over 10,000 Cubic Yard	5,500	CY	\$ _____	\$ _____
0022	All Rock and Concrete Excavation Above Elevation 1074				
0022AA	First 23,000 Cubic Yard	23,000	CY	\$ _____	\$ _____
0022AB	All Over 23,000 Cubic Yard	12,100	CY	\$ _____	\$ _____
0023	All 30' Long Rock Bolts #11, Threaded Bar Grade 150 Above Elevation 1074				
0023AA	First 90 Each	90	EACH	\$ _____	\$ _____
0023AB	All Over 90 Each	85	EACH	\$ _____	\$ _____
0024	All 30' Long Rock Bolts, #8 Threaded Bar Grade 75 Above Elevation 1074				
0024AA	First 100 Each	100	EACH	\$ _____	\$ _____
0024AB	All Over 100 Each	185	EACH	\$ _____	\$ _____
0025	All 20' Long Rock Bolts, #8 Threaded Bar Grade 75 Above Elevation 1074				
0025AA	First 600 Each	600	EACH	\$ _____	\$ _____
0025AB	All Over 600 Each	215	EACH	\$ _____	\$ _____
0026	All 30' Long Weep Holes Above Elevation 1074				
0026AA	First 200 Each	200	EACH	\$ _____	\$ _____

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<u>Item No.</u>	<u>Description of Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
0026AB	All Over 200 Each	70	EACH	\$ _____	\$ _____
0027	All 6" Thick Shotcrete				
0027AA	First 25,000 Square Foot	25,000	SF	\$ _____	\$ _____
0027AB	All Over 25,000 Square Foot	14,000	SF	\$ _____	\$ _____
0028	All Welded Wire Fabric Above Elevation 1074				
0028AA	First 1,000 Square Foot	1,000	SF	\$ _____	\$ _____
0028AB	All Over 1,000 Square Foot	3,600	SF	\$ _____	\$ _____
0029	All Rock and Concrete Excavation Below Elevation 1074				
0029AA	First 1,500 Cubic Yard	1,500	CY	\$ _____	\$ _____
0029AB	All Over 1,500 Cubic Yard	800	CY	\$ _____	\$ _____
0030	All 30' Long Rock Bolts #11, Threaded Bar Grade 150 Below Elevation 1074				
0030AA	First 5 Each	5	EACH	\$ _____	\$ _____
0030AB	All Over 5 Each	5	EACH	\$ _____	\$ _____
0031	All 30' Long Rock Bolts, #8 Threaded Bar Grade 75 Below Elevation 1074				
0031AA	First 12 Each	12	EACH	\$ _____	\$ _____
0031AB	All Over 12 Each	12	EACH	\$ _____	\$ _____
0032	All 20' Long Rock Bolts, #8 Threaded Bar Grade 75 Below Elevation 1074				
0032AA	First 16 Each	16	EACH	\$ _____	\$ _____
0032AB	All Over 16 Each	16	EACH	\$ _____	\$ _____
0033	All 30' Long Weep Holes Below Elevation 1074				

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<u>Item No.</u>	<u>Description of Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
0033AA	First 4 Each	4	EACH	\$ _____	\$ _____
0033AB	All Over 4 Each	5	EACH	\$ _____	\$ _____
0034	All Welded Wire Fabric Below Elevation 1074				
0034AA	First 700 Square Foot	700	SF	\$ _____	\$ _____
0034AB	All Over 700 Square Foot	300	SF	\$ _____	\$ _____
0035	All Work for Cut-Off-Wall (South Shore) 5' into Rock to Elevation 1170', <u>and the Earth Berm Embankment South of the Cofferdam as shown in Section A/C2.5, Sheet 100</u>	1	JOB	LS	\$ _____
0036	Emergency Mobilization & Demobilization For When Water Elevation Is Above Elevation 1150	2	EACH	\$ _____	\$ _____
0037	Emergency Mobilization & Demobilization For When Water Elevation Is Above Elevation 1165	2	EACH	\$ _____	\$ _____
0038	Emergency Mobilization & Demobilization For When Water Elevation Is Above Cofferdam Elevation 1169	2	EACH	\$ _____	\$ _____
0039	All Work for As-Built Drawings as specified in Section 01702 from preparation to final approval	1	JOB	LS	\$25,000.00
<u>0040</u>	<u>All Grout Curtain Drill Rig Setups (1,2 &amp; 4 Stage Holes)</u>				
<u>0040AA</u>	<u>First 100 Each</u>	<u>100</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0040AB</u>	<u>All Over 100 Each</u>	<u>115</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0041</u>	<u>All Grout Curtain Exploratory Hole Drilling</u>				
<u>0041AA</u>	<u>First 60 Linear Foot</u>	<u>60</u>	<u>LF</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0041AB</u>	<u>All Over 130 Linear Foot</u>	<u>130</u>	<u>LF</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0042</u>	<u>All Microfine Cement used in Grout Curtains</u>				
<u>0042AA</u>	<u>First 20 100 -lb Bags</u>	<u>20</u>	<u>BAGS</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0042AB</u>	<u>All Over 20 100 -lb Bags</u>	<u>100</u>	<u>BAGS</u>	<u>\$ _____</u>	<u>\$ _____</u>

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<u>Item No.</u>	<u>Description of Item</u>	<u>Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Amount</u>
<u>0043</u>	<u>All At South Wall 1-3/4" Diameter Rock Anchors (Shown on S3.9)</u>				
<u>0043AA</u>	<u>First 30 Each</u>	<u>30</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0043AB</u>	<u>All Over 30 Each</u>	<u>36</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0044</u>	<u>All Extra Cost to increase #11, 30' Long Cement-Grouted Untensioned Rock Bolts Holes into a #11, 40' Long Cement-Grouted Untension Rock Bolts</u>				
<u>0044AA</u>	<u>First 10 Each</u>	<u>10</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0044AB</u>	<u>All Over 30 Each</u>	<u>30</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0045</u>	<u>All Unsatisfactory Watertightness Rock Anchor and Cement-Grouted Untensioned Rock Bolts Holes</u>				
<u>0045AA</u>	<u>First 200 Each</u>	<u>200</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0045AB</u>	<u>All Over 310 Each</u>	<u>310</u>	<u>EACH</u>	<u>\$ _____</u>	<u>\$ _____</u>
<u>0046</u>	<u>All Work for the Northwest Flood/Retaining Wall Adjacent to the Existing Intake Tower as shown on Plates S6.1 and S6.2</u>	<u>1</u>	<u>JOB</u>	<u>LS</u>	<u>\$ _____</u>
	<u>TOTAL ALL ITEMS</u>				<u>\$ _____</u>

**NOTES:**

1. The dollar amount established in Item No. 0039 shall not be revised by bidder.
2. Contract Clause "Variation in Estimated Quantity" in Section 00700 does not apply to Bid Items 0036, 0037, and 0038. If Emergency Demobilization and Remobilization and Standby of Equipment and Crew is used, the Contractor will be paid the unit price for the actual number of moves out of the work demobilization and remobilization and for number of standby days of equipment and crew as described in Section 01025 of the specifications. If Emergency Demobilization, Remobilization, Standby of Equipment, and Crew do not occur, the Bid Items will not be used and the government will issue a credit modification for each unused bid item in its entirety.

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SC-1.1	<u>DELETED</u> – OPTION FOR INCREASED QUANTITY
SC-2	LIQUIDATED DAMAGES - CONSTRUCTION
SC-3	<u>DELETED</u> – TIME EXTENSIONS
SC-4	VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS
SC-5	INSURANCE - WORK ON A GOVERNMENT INSTALLATION
SC-6	CONTINUING CONTRACTS
SC-7	PERFORMANCE OF WORK BY THE CONTRACTOR
SC-8	PHYSICAL DATA
SC-9	<u>DELETED</u> – QUANTITY SURVEYS
SC-10	LAYOUT OF WORK
SC-11	PAYMENT FOR MOBILIZATION AND DEMOBILIZATION
SC-12	<u>DELETED</u> – AIRFIELD SAFETY PRECAUTIONS
SC-13	<u>DELETED</u> – IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY
SC-14	EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE
SC-15	PAYMENT FOR MATERIALS DELIVERED OFF-SITE
SC-16	<u>DELETED</u> – ORDER OF PRECEDENCE
SC-17	<u>DELETED</u> – LIMITATION OF PAYMENT FOR DESIGN
SC-18	CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS
SC-19.	<u>DELETED</u> – TECHNICAL PROPOSAL - COPIES TO BE FURNISHED UPON AWARD
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SC-21.	<u>DELETED</u> – VALUE ENGINEERING
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SC-23	RECOVERED MATERIALS

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## SPECIAL CLAUSES

SC-1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984) (FAR 52.211-10).

The Contractor shall be required to (a) commence work under this Contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 685 calendar days after date of receipt by Contractor of notice to proceed. The time stated for completion shall include final cleanup of the premises.

SC-2. LIQUIDATED DAMAGES - CONSTRUCTION (SEP 2000) (FAR 52.211-12)

(a) If the Contractor fails to complete the work within the time specified in the Contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of \$2,415.00 for each day of delay.

(b) If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

SC-3 DELETED.

SC-4. VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS (MAR 1995) (EFARS 52.212-5001): This variation in estimated quantities clause is applicable only to Item Nos. 0003, 0010, 0011, 0012, 0013, 0014, 0015, 0016, 0017, 0018, 0019, 0020, 0021, 0022, 0023, 0024, 0025, 0026, 0027, 0028, 0029, 0030, 0031, 0032, 0033 and 0034.

(a) Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

(b) Where the actual quantity of work performed for Items Nos. 0003, 0010, 0011, 0012, 0013 and 0014 is less than 85 % of the quantity of the first sub-item listed under such item, the Contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

(c) If the actual quantity of work performed under Items Nos. 0003, 0010, 0011, 0012, 0013 and 0014 exceeds 115 percent or is less than 85 percent of the total estimated quantity of the sub-item under that item and/or if the quantity of the work performed under the second sub-item or any subsequent sub-item under Items Nos. 0003, 0010, 0011, 0012, 0013 and 0014 exceeds 115 % or is less than 85 % of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

SC-5. INSURANCE - WORK ON A GOVERNMENT INSTALLATION (JAN 1997) (FAR 52.228-5)

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance period of this Contract at least the kinds and minimum amounts of insurance required in the Insurance Liability Schedule or elsewhere in the Contract.

(b) Before commencing work under this Contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective:

(1) for such period as the laws of the State in which this Contract is to be performed prescribe;  
or

(2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this Contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the Contract. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

(d) Insurance Liability Schedule (FAR 28.307-2)

(1) Workers' compensation and employer's liability. Contractors are required to comply with applicable Federal and State workers' compensation and occupational disease statutes. If occupational diseases are not compensable under those statutes, they shall be covered under the employer's liability section of the insurance policy, except when Contract operations are so commingled with a Contractor's commercial operation that it would not be practical to require this coverage. Employer's liability coverage of at least \$100,000 shall be required, except in states with exclusive or monopolistic funds that do not permit workers' compensation to be written by private carriers.

(2) General Liability.

(a) The Contracting Officer shall require bodily injury liability insurance coverage written on the comprehensive form of policy of at least \$500,000 per occurrence.

(b) Property damage liability insurance shall be required only in special circumstances as determined by the agency.

(3) Automobile liability. The Contracting Officer shall require automobile liability insurance written on the comprehensive form of policy. The policy shall provide for bodily injury and property damage liability covering the operation of all automobiles used in connection with performing the Contract. Policies covering automobiles operated in the United States shall provide coverage of at least \$200,000 per person and \$500,000 per occurrence for bodily injury and \$20,000 per occurrence for property damage. The amount of liability coverage on other policies shall be commensurate with any legal requirements of the locality and sufficient to meet normal and customary claims.

(4) Aircraft public and passenger liability. When aircraft are used in connection with performing the Contract, the Contracting Officer shall require aircraft public and passenger liability insurance. Coverage shall be at least \$200,000 per person and \$500,000 per occurrence for bodily injury, other than passenger liability, and \$200,000 per occurrence for property damage. Coverage for passenger liability bodily injury shall be at least \$200,000 multiplied by the number of seats or passengers, whichever is greater.

(5) Environmental Liability. If this contract includes the transport, treatment, storage, or disposal of hazardous material waste the following coverage is required.

The Contractor shall ensure the transporter and disposal facility have liability insurance in effect for claims arising out of the death or bodily injury and property damage from hazardous material/waste transport, treatment, storage and disposal, including vehicle liability and legal defense costs in the amount of \$1,000,000.00 as evidenced by a certificate of insurance for General, Automobile, and Environmental Liability Coverage. Proof of this insurance shall be provided to the Contracting Officer.

SC-6. CONTINUING CONTRACTS (EFARS 52.232-5001) (MAR 1995):

(a) This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the "Payments to Contractor" clause or any other clause of this contract.

(b) The sum of \$7,000,000.00 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.

(c) Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment under the terms of this contract, except as specifically provided in paragraphs (f) and (i) below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefore.

(d) The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.

(e) If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due, or to become due, under the contract during that fiscal year. This notice shall be given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.

(f) No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the contracting officer determines was actually earned under the terms of the contract and would have been

made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.

(g) Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the contractor to any price adjustment under the "Suspension of Work" clause or in any other manner under this contract.

(h) An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

(i) If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

(j) If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the contractor, to reduce said reservation by the amount of such excess.

SC-7. PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984) (FAR 52.236-1): The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen percent (15%) of the total amount of work to be performed under the Contract. The percentage may be reduced by a supplemental agreement to this Contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

SC-8. PHYSICAL DATA (APR 1984) (FAR 52.236-4): Data and information furnished or referred to below is for the Contractor's information. The Government will not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) Physical Conditions: The indications of physical conditions on the drawings and in the specifications are the result of site investigations by test holes shown on the drawings.

(b) Weather Conditions: Each bidder shall be satisfied before submitting his bid as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any National Weather Service Office.

(c) Transportation Facilities: Each bidder, before submitting his bid, shall make an investigation of the conditions of existing public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress at the jobsite. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of the work.

(d) Right-of-Way: The right-of-way for the work covered by these specifications will be furnished by the Government, except that the Contractor shall provide right-of-way for ingress and egress across

private property where necessary to gain access to the jobsite. The Contractor may use such portions of the land within the right-of-way not otherwise occupied as may be designated by the Contracting Officer. The Contractor shall, without expense to the Government, and at any time during the progress of the work when space is needed within the right-of-way for any other purposes, promptly vacate and clean up any part of the grounds that have been allotted to, or have been in use by, him when directed to do so by the Contracting Officer. The Contractor shall keep the buildings and grounds in use by him at the site of the work in an orderly and sanitary condition. Should the Contractor require additional working space or lands for material yards, job offices, or other purposes, he shall obtain such additional lands or easements at his expense.

(e) Condition of Area: The condition of the area when last surveyed is shown on the drawings. Topography is in feet and represents elevation with reference to National Geodetic Vertical Datum (N.G.V.D.).

(f) Datum and Bench Marks: The plane of reference of N.G.V.D. as used in these specifications is that determined by the bench marks, as shown on the drawings.

(g) Howard Hanson Dam and Reservoir Hydraulics and Hydrology: More information on conditions at the reservoir that will directly effect construction and the scheduling of construction is available attached to the end of Section 01005.

(h) Geotechnical Baseline Report. This report is attached to the end of this section. It provides available information on the Geotechnical properties of the site.

SC-9. DELETED.

SC-10. LAYOUT OF WORK (APR 1984) (FAR 52.236-17): The Contractor shall lay out its work from Government-established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due, or to become due, to the Contractor.

SC-11. PAYMENT FOR MOBILIZATION AND DEMOBILIZATION. Payment No. 0002 (DEC 1991) (FAR 52.236-7004):

(a) The Government will pay all costs for the mobilization and demobilization of all of the Contractor's plant and equipment at the contract lump sum price for this item.

(1) Fifty percent (50%) of the lump sum price upon completion of the Contractor's mobilization at the work site.

(2) The remaining fifty percent (50%) upon completion of the demobilization.

(b) The Contracting Officer may require the Contractor to furnish cost data to justify this portion of the bid if the Contracting Officer believes that the percentages in paragraphs (a)(1) and (2) of this clause do not bear a reasonable relation to the cost of the work in this contract.

(1) Failure to justify such price to the satisfaction of the Contracting Officer will result in payment, as determined by the Contracting Officer, of --

- (i) Actual mobilization costs at completion of mobilization;
- (ii) Actual demobilization costs at completion of demobilization; and
- (iii) The remainder of this item in the final payment under this contract.

(2) The Contracting Officer's determination of the actual costs in paragraph (b)(1) of this clause is not subject to appeal.

(c) This item is not to be confused with Emergency De-mobilization and Re-mobilization due to floods. See Specifications Section 01050 for more information.

SC-12 AND SC-13 DELETED.

SC-14. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAY 1999)-  
(EFARS 52.231-5000)

(a) This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals and FAR Part 49.

(b) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region VIII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost

or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

(e) Copies of EP1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" Volumes 1 through 12 are available in Portable Document Format (PDF) and can be viewed or downloaded at <http://www.usace.army.mil/inet/usace-docs/eng-pamphlets/cecw.htm>. A CD-ROM containing (Volumes 1-12) is available through either the Superintendent of Documents or Government bookstores. For additional information telephone 202-512-2250, or access on the Internet at [http://www.access.gpo.gov/su\\_docs](http://www.access.gpo.gov/su_docs).

SC-15. PAYMENT FOR MATERIALS DELIVERED OFF-SITE (MAY 1999)-(EFARS 52.232-5000)

(a) Pursuant to FAR clause 52.232-5, Payments Under Fixed Priced Construction Contracts, materials delivered to the contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the General Provisions are fulfilled. Payment for items delivered to locations other than the work site will be limited to:

(1) materials required by the technical provisions; or (2) materials that have been fabricated to the point where they are identifiable to an item of work required under this contract.

(b) Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contractor and including the value of material and labor incorporated into the item.

SC-16 AND SC-17 DELETED.

SC-18. CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (OCT 1996) (52.0236-4001 EBS)

(a) The Government--

(1) Will provide the Contractor, without charge, one set of contract drawings and one set of specifications in electronic format on a compact disk. The Government will not give the Contractor any hard copy paper drawings or specifications for any contract resulting from this solicitation.

(b) The Contractor shall--

(1) check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies; and

(4) Be responsible for any errors which might have been avoided by complying with this paragraph (b).

(c) Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified in the index of drawings attached at the end of the Special Clauses.

SC-19 THROUGH SC-21 DELETED.

SC-22. EPA ENERGY STAR: The Government requires that certain equipment be Energy Star compliant. Initially, the sole Energy Star requirement shall be the self certification by the bidder that the specified equipment is Energy Star compliant. Within 3 months of the availability of an EPA sanctioned test for Energy Star compliance, the Contractor shall submit all equipment upgrades and additions for testing and provide proof of compliance to the Government upon completion of testing. Testing shall be at the Contractor's expense.

SC-23. RECOVERED MATERIALS: The Corps of Engineers encourages all bidders to utilize recovered materials to the maximum extent practicable. The attached APPENDIX R contains procurement guidelines for products containing recovered materials.

APPENDIX R

PART 247 - COMPREHENSIVE PROCUREMENT GUIDELINE FOR PRODUCTS CONTAINING RECOVERED MATERIALS

40 CFR Ch. 1 (9-1-99 Edition)

Subpart B-Item Designations

§ 247.10 Paper and paper products.

Paper and paper products, excluding building and construction paper grades.

§ 247.11 Vehicular products.

(a) Lubricating oils containing re-refined oil, including engine lubricating oils, hydraulic fluids, and gear oils, excluding marine and aviation oils.

(b) Tires, excluding airplane tire

(e) Reclaimed engine coolants, excluding coolants used in non-vehicular applications.

247.12 Construction products.

(a) Building insulation product including the following items:

(1) Loose-fill insulation, including but not limited to cellulose fiber, mineral fibers (fiberglass and rock vermiculite, and perlite;

(2) Blanket and batt insulation, including but not limited to mineral fibers (fiberglass and rock wool).

(3) Board (sheathing, roof decking wall panel) insulation, including but not limited to structural fiberboard and laminated paperboard products perlite composite board, polyurethane, polyisocyanurate, polystyrene, phenolics, and composites; and

(4) Spray-in-place insulation, including but not limited to foam-in-place polyurethane and polyisocyanurate and spray-on cellulose.

(b) Structural fiberboard and laminated paperboard products for applications other than building insulation, including building board, sheathing shingle backer, sound deadening board, roof insulating board, insulating wallboard, acoustical and non-acoustical ceiling tile, acoustical and non-acoustical lay-in panels, floor underlayments, and roof overlay (cover board).

(c) Cement and concrete, including concrete products such as pipe and block, containing coal fly as ground granulated blast furnace (GGBF) slag.

(d) Carpet made of polyester fiber use in low- and medium-wear applications.

(e) Floor tiles and patio block containing recovered rubber or plastic.

(f) Shower and restroom dividers/partitions containing recovered plastic or steel.

(g) (1) Consolidated latex paint used for covering graffiti; and

(2) Reprocessed latex paint used for interior and exterior architectural applications such as wallboard, ceilings, and trim; gutter boards; and concrete, stucco, masonry, wood and metal surfaces.

§247.13 Transportation products.

(a) Traffic barricades and traffic cones used in controlling or restricting vehicular traffic.

(b) Parking stops made from concrete or containing recovered plastic or rubber.

(c) Channelizers containing recovered plastic or rubber.

(d) Delineators containing recovered plastic, rubber, or steel.

- (e) Flexible delineators containing recovered plastic.

§ 247.14 Park and recreation products

- (a) Playground surfaces and running tracks containing recovered rubber or plastic.
- (b) Plastic fencing containing recovered plastic for use in controlling snow or sand drifting and as a warning/safety barrier in construction or other applications.

247.15 Landscaping products.

- (a) Hydraulic mulch products containing recovered paper or recovered wood used for hydroseeding and as an over-spray for straw mulch in landscaping, erosion control, and soil reclamation.
- (b) Compost made from yard trimmings, leaves, and/or grass clippings for use in landscaping, seeding of grass or other plants on roadsides and embankments, as a nutritious mulch under trees and shrubs, and in erosion control and soil reclamation.
- (c) Garden and soaker hoses containing recovered plastic or rubber.
- (d) Lawn and garden edging containing recovered plastic or rubber.

§ 247.16 Non-paper office product.

- (a) Office recycling containers and office waste receptacles.
- (b) Plastic desktop accessories.
- (c) Toner cartridges.
- (d) Binders.
- (e) Plastic trash bags.
- (f) Printer ribbons.
- (g) Plastic envelopes.

§ 247.17 Miscellaneous products.

Pallets containing recovered wood, plastic, or paperboard.

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COFFERDAM AND EXCAVATION  
HOWARD HANSON DAM, GREEN RIVER, WASHINGTON

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72	GT-3.5	Instrumentation Section, Sheet 3		27 JUN 03
73	GT-3.6	Instrumentation Section, Sheet 4	<u>B</u>	<u>21 NOV 03</u>
74	GT-3.7	Instrumentation Details, Sheet 1	<u>B</u>	<u>20 NOV 03</u>
75	GT- 4.1	Cofferdam Grouting Plan		27 JUN 03
76	GT-4.2	Cofferdam Grouting Sections	A	13 OCT 03
77	GT-4.3	Cofferdam Grouting Schedules, Sheet 1		27 JUN 03
78	GT-4.4	Cofferdam Grouting Schedules, Sheet 2	<u>B</u>	<u>20 NOV 03</u>
79	GT-4.5	Dewatering Plan		27 JUN 03
80	GT-4.6	Seismic Retrofit Grout Curtain Plan And Profiles	<u>B</u>	<u>20 NOV 03</u>
81	EP-1.1	Environmental Site Control General Site Layout And Keyplan Features	A	13 OCT 03
82	EP-1.2	Environmental Site Control Collection Basin Layout And Notes	A	13 OCT 03
83	EP-1.3	Environmental Site Controls Layout And Features-1	A	13 OCT 03
84	EP-1.4	Environmental Site Controls Layout And Features-2	A	13 OCT 03
85	EP-1.5	Environmental Site Controls Sedimentation Pond Layout		27 JUN 03
86	EP-2.1	Environmental Site Control Details	<u>B</u>	<u>20 NOV 03</u>
87	EP-2.3	Environmental Site Controls Details-1		27 JUN 03
88	EP-2.4	Environmental Site Controls Details-2	A	13 OCT 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
89	S2.17	Environmental Site Control Sedimentation Pond Details		27 JUN 03
90	C1.1	General Site Plan		27 JUN 03
91	C1.2	Disposal Sites	<u>B</u>	<u>20 NOV 03</u>
92	C1.3	Demolition Plan		27 JUN 03
93	C1.4	Excavation Plan - Phase <u>IA</u> & <u>IB</u>	A	13 OCT 03
94	C1.5	Excavation Plan - Phase <u>IC</u>	A	13 OCT 03
95	C1.6	Excavation Sections & Details I	A	13 OCT 03
95A	C1.7	Excavation Cross Sections	A	13 OCT 03
96	C2.1	Temporary Access Road Plan And Profile I	A	13 OCT 03
97	C2.2	Temporary Access Road Plan And Profile Ii	A	13 OCT 03
98	C2.3	Temporary Access Road - Cross Sections I		27 JUN 03
99	C2.4	Temporary Access Road - Cross Sections Ii		27 JUN 03
100	C2.5	Tremie Concrete Infill And Miscellaneous Details		27 JUN 03
101	S1.1	Plans	A	13 OCT 03
102	S1.2	Elevation And Sections	A	13 OCT 03
103	S2.1	Precast Concrete Structure Layout, Sheet 1	A	13 OCT 03
104	S2.2	Precast Concrete Structure Layout, Sheet 2	A	13 OCT 03
105	S2.3	Precast Concrete Structure Segment A, Detail Sheet 1	<u>B</u>	<u>20 NOV 03</u>
106	S2.4	Precast Concrete Structure Segment A, Detail Sheet 2	A	13 OCT 03
107	S2.5	Precast Concrete Structure Segment B, Detail Sheet 1	A	13 OCT 03
108	S2.6	Precast Concrete Structure Segment B, Detail Sheet 2	A	13 OCT 03
109	S2.7	Precast Concrete Structure Segment C, Detail Sheet 1	A	13 OCT 03
110	S2.8	Precast Concrete Structure Segment C, Detail Sheet 2	A	13 OCT 03
111	S2.9	Precast Concrete Structure Segments D & E, Sheet 1		27 JUN 03
112	S2.10	Precast Concrete Structure Segments D & E, Sheet 2		27 JUN 03
113	S2.11	Precast Concrete Structure Segments F & G	A	13 OCT 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
114	S2.12	Precast Concrete Structure Segment H		27 JUN 03
115	S2.13	Precast Concrete Structure Segment J & K		27 JUN 03
116	S2.14	Precast Concr. Structure Segments L, M, N, & P, Sheet 1		27 JUN 03
117	S2.15	Precast Concr. Structure Segments L, M, N, & P, Sheet 2		27 JUN 03
118	S2.16	Precast Concrete Structure Backflood Pipe		27 JUN 03
119	S2.17	Precast Concrete Structure Segment Anchor Details		27 JUN 03
120	S2.18	Typical Stoplog Bearing & Seal Surface And Segment Joint Details	A	13 OCT 03
121	S2.19	Precast Concrete Segment Support Frame Sheet 1		27 JUN 03
122	S2.20	Precast Concrete Segment Support Frame Sheet 2	A	13 OCT 03
123	S3.1	Cast-In-Place Concrete South Wall Detail Sheet 1	A	13 OCT 03
124	S3.2	Cast-In-Place Concrete South Wall Detail Sheet 2	A	13 OCT 03
125	S3.3	Cast-In-Place Concrete North Wall Detail Sheet 1		27 JUN 03
126	S3.4	Cast-In-Place Concrete North Wall Detail Sheet 2	A	13 OCT 03
127	S3.5	Cast-In-Place Concrete North Wall Detail Sheet 3		27 JUN 03
128	S3.6	Cast-In-Place Concrete Crane Rail Support Beams Sht. 1	A	13 OCT 03
129	S3.7	Cast-In-Place Concrete Crane Rail Support Beams Sht. 2		27 JUN 03
130	S3.8	South Wall Rock Anchors	A	13 OCT 03
131	S3.9	South Wall Rock Anchor Details	<b>B</b>	<b>20 NOV 03</b>
132	S3.10	South Counterfort Walls Elevations And Sections		27 JUN 03
133	S3.11	Waterproof Wall Joint Between Phase 1 And Phase 2	A	13 OCT 03
134	S4.1	Trash Rack Detail Sheet 1		27 JUN 03
135	S4.2	Trash Rack Detail Sheet 2	A	13 OCT 03
136	S4.3	Trash Rack Detail Sheet 3	A	13 OCT 03

<b>SHEET NUMBER</b>	<b>PLATE NUMBER</b>	<b>TITLE</b>	<b>REVISION NUMBER</b>	<b>DATE</b>
137	S5.1	Stoplog Details Sheet 1	<u>B</u>	<u>20 NOV 03</u>
138	S5.2	Stoplog Details Sheet 2	A	13 OCT 03
139	S5.3	Stoplog Details Sheet 3		27 JUN 03
140	S5.4	Stoplog Details Sheet 4	<u>B</u>	<u>20 NOV 03</u>
141	S5.5	Lifting Beam Plan & Elevation	A	13 OCT 03
142	S5.6	Lifting Beam Detail Sheet 1	A	13 OCT 03
143	S5.7	Lifting Beam Detail Sheet 2	A	13 OCT 03
144	S6.1	Flood / Retaining Walls, Sheet 1	A	13 OCT 03
145	S6.2	Flood / Retaining Walls, Sheet 2	A	13 OCT 03
146	S6.3	Personnel Stair Plan And Sections	A	13 OCT 03
147	S6.4	Personnel Stair Details	A	13 OCT 03
148	S7.1	Access Road Permanent Retaining Wall, Plan And Elevation		27 JUN 03
149	S7.2	Access Road Permanent Retaining Wall, Details	A	13 OCT 03
150	S8.1	Existing Intake Tower Seismic Retrofit Trashrack Beams	<u>B</u>	<u>20 NOV 03</u>
151	S8.2	Existing Intake Tower Seismic Retrofit Wingwalls	<u>B</u>	<u>20 NOV 03</u>
152	S8.3	Existing Intake Tower Seismic Retrofit Plan & Elevation	A	13 OCT 03
153	S8.4	Existing Intake Tower Seismic Retrofit Section And Detail 1		27 JUN 03
154	S8.5	Existing Intake Tower Seismic Retrofit Section And Detail 2		27 JUN 03
155	S8.6	Existing Intake Tower Seismic Retrofit Tremie Concrete	A	13 OCT 03

REFERENCE DRAWINGS

Reference drawings provided show conditions at time of construction. These drawings are furnished for information only and the Government does not warrant that conditions will be exactly as shown. Minor deviations can be anticipated and shall not be the basis for a claim for extra compensation.

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
	156	25	Spillway General Layout		23 AUG 59
	157	27	Spillway Intermediate Pier Plan, Elevations & Sections		12 SEP 58
	158	28	Spillway Intermediate Pier Reinforcement		12 SEP 58
	159	29	Spillway Left Abutment Pier Plan, Elevations & Sections		12 SEP 58
	160	33	Spillway Right Abutment		10 OCT 60
	161	42	Spillway Crest Gate Elevations & Sections		12 SEP 58
	162	43	Spillway Crest Gate Details		12 SEP 58
	163	44	Spillway Crest Gate Details		12 SEP 58
	164	48	General Layout		12 SEP 58
	165	49	Substructure Sectional Plans I		12 SEP 58
	166	50	Substructure Sectional Plans II	B	21 APR 65
	167	51	Substructure Sectional Elevations I	B	22 SEP 59
	168	52	Substructure Sectional Elevations II	B	22 SEP 59
	169	53	Substructure Elevations	C	22 SEP 59
	170	54	Substructure Plans & Sections	B	28 AUG 59
	171	55	Reinforcement I	B	27 OCT 58
	172	56A	Reinforcement IIA		28 AUG 58
	173	56B	Reinforcement IIB	A	21 APR 65

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
	174	57	Reinforcement III	B	21 APR 65
	175	58	Reinforcement IV	A	3 OCT 58
	176	59	Trash Rack Bars		12 SEP 58
	177	65	Equipment General Arrangement I		12 SEP 58
	178	66	Equipment General Arrangement II	A	21 APR 65
	179	67	Regulating Gate Plans & Sections	A	21 APR 65
	180	68	Regulating Gate Elevations & Sections	A	21 APR 65
	181	69	Regulating Gate Details		12 SEP 58
	182	70	Regulating Gate Details	A	21 APR 65
	183	71	Regulating Gate Seals	A	21 APR 65
	184	72	Regulating Gate Hoist Assembly	A	21 APR 65
	185	87	Tunnel Upstream Transition		12 SEP 58
	186	88A	Tunnel Sections & Details	A	27 OCT 58
	187	88B	Tunnel Downstream Transition	A	27 OCT 58
	188	89	Stilling Basin Plan & Section I	B	10 APR 61
	189	90	Stilling Basin Plan & Section II	C	21 APR 65
	190	91	Stilling Basin Sections	C	10 APR 61
	191	92	Stilling Basin Details	B	2 FEB 60
	192	93	Stilling Basin Bypass Outlet Gate	A	10 APR 61
	193	94	Bridge Plan, Elevation & Sections	D	10 APR 61
	194	95	Bridge Detail Plan, Elevation & Sections	B	10 OCT 60
	195	96	Bridge Details	A	3 OCT 58
	196	97	Bridge Piers	A	3 OCT 58

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
	197	G-1	Seismic Upgrade – Cover Sheet		1 NOV 96
	198	G-2	Seismic Upgrade – Index		1 NOV 96
	199	G-3	Seismic Upgrade – Site Map		1 NOV 96
	200	G-4	Existing Surface Topography		1 NOV 96
	201	S-1	Structural Notes And Rock Anchor Detail		1 NOV 96
	202	S-2	Modifications To The Existing Bridge And Tower		20 NOV 95
	203	S-3	Foundation		1 NOV 96
	204	S-4	Elevation & Section		1 NOV 96
	205	S-5	Details I		1 NOV 96
	206	S-6	Details II		1 NOV 96
	207	S-7	Footing Caps		1 NOV 96
	208	S-8	Shear Panels for Pier I		1 NOV 96
	209	S-9	Shear Panels For Piers 2 And 3		1 NOV 96
	210	S-10	Shear Panel Sections		1 NOV 96
	211	S-11	Deck Restraint Cable Details		1 NOV 96
	212	S-12	Deck Lateral Restraint		1 NOV 96
	213	M-1	Hoist Carriage Restraint		1 NOV 96
	214	GT-1A	Instrumentation On Existing Structures, Site Plan		3 JUL 03
	215	GT-1B	Instrumentation On Existing Structures, Outlet Tunnel Plan		3 JUL 03
	216	GT-2	Instrumentation On Existing Structures, Instrumentation Schedule		3 JUL 03
	217	GT-3	Instrumentation On Existing		3 JUL 03

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
			Structures, Structure Elevation		
	218	Gt-4	Instrumentation On Existing Structures, Liquid Level Gages		3 JUL 03
	219	GT-5	Instrumentation On Existing Structures, Intake Tower Instruments, Seismic Retrofit		3 JUL 03
	220	GT-6	Instrumentation On Existing Structures, North Wall Cofferdam Instruments		3 JUL 03
	221	P-1	Existing Intake Tower Photograph		26 JUN 03

STANDARD DETAILS BOUND IN THE SPECIFICATIONS

DRAWING NUMBER	SHEET NUMBER	TITLE	DATE
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SECTION 01501 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1, 2	Civil Works Project Identification Sign	REV 07APR88
1	Hard Hat Sign	10SEP90

END OF SECTION

## SECTION 01005

## SITE SPECIFIC SUPPLEMENTARY REQUIREMENTS

## PART 1 GENERAL

## 1.1 COORDINATION AND WORK HOURS

1.1.1 Coordination with using agencies, to include Howard Hanson Dam Operations and Tacoma Public Utilities (TPU), shall be made through the Contracting Officer to assist the Contractor in completing the work with a minimum of interference and inconvenience.

1.1.2 Work hours in the construction area will not be restricted, but will be according to the Contractor's accepted proposal as required in Section 00110 PROPOSAL SUBMISSION AND EVALUATION of this document. Work hours other than as specified in the original Contractor's proposal shall be coordinated with and approved by the Contracting Officer.

## 1.2 GENERAL ACCESS REQUIREMENTS

This section describes controls and restrictions regarding site access and Green River watershed activities. The watershed provides drinking water for over 300,000 people and must necessarily be protected during construction. Only authorized personnel (Government personnel or Contractor personnel participating in Government business) may enter the restricted watershed.

1.2.1 Access to Howard Hanson Dam structures will be controlled at an entrance guard station operated by TPU. TPU will issue permits for the Contractor's vehicles on the first occasion they come to the guard station. Access can be expedited by notifying the Tacoma control station, at (206) 502-8346, and the Corps of Engineers Project Office at (206) 886-2911, in advance. Incoming traffic will be restricted from entering the controlled area until proper identification is provided. Access on a regular basis and during other than established working hours will require prior coordination and approval by the Contracting Officer.

1.2.2 Access to the Green River Watershed will be permitted only to those persons actually engaged in operations authorized by the Contractor by permit from (TPU). Access to the watershed is permitted only at such times as personnel are on direct work assignment. Wandering from the work area or engaging in any activity other than that authorized is not permitted. If there is probable cause to believe that there has been a violation of the regulations, then any such vehicle or vehicles as may appear to be involved in such violations maybe stopped and inspected by TPU or the Contracting Officer's Representatives. The refusal by the operator of any such designated vehicle to permit such inspection may be deemed sufficient reason to deny that operator further access to the watershed.

1.2.3 The Contractor shall submit a complete listing of Contractor personnel, including job title and identification credential number, who will be working on the project. This listing shall be updated as needed to ensure that the Government has been notified of any changes of Contractor Personnel in advance of new personnel engaging in work on the project. The Government will allow access to the controlled areas of only the Contractor Personnel authorized in advance and included on the employee listing. The

list will be submitted the week prior to personnel arrival on-site. The list shall be revised on each occasion of change of employees and the revised list provided to the Contracting Officer during weekly meetings.

#### 1.2.3.1 Identification Credentials

Contractor personnel shall either be issued a photo identification card (ID) by the Contractor or agree to provide their individual vehicle driver's license as appropriate identification credential. In either case, the identification number shall be included on the listing required above. If the Contractor determines to issue ID cards to its employees, the following information shall be included:

##### Contractor Identification and Card Number Indicating Employees:

- |                     |              |
|---------------------|--------------|
| o Full Name         | o Height     |
| o Current Address   | o Weight     |
| o Birth Date        | o Hair Color |
| o Recent Photograph | o Eye Color  |

Contractor personnel shall be instructed to present identification credential upon request by proper authority as established by the Contracting Officer.

#### 1.2.3.2 Employee Termination

If a Contractor employee resigns or is terminated the Contracting Officer, or designated representative shall be so notified at the earliest opportunity, but in no case later than the start of the succeeding workday.

1.2.4 Contractor employee parking shall be in the designated areas at the TPU Watershed Office. The Contractor is responsible for providing shuttle transportation from the designated parking areas to the work at the dam (approx. 4 miles). Contractor trade vehicles (e.g., pipefitting, electrical truck, etc.) shall be permitted on the worksite as needed to perform construction activities. Contractor's vehicles will not be allowed to park at the base of the intake tower or under the access bridge. All vehicles entering the site shall be permitted and insured to the Contracting Officer's requirements and shall be properly maintained to be free of drips and leaks of oil and other fluids.

1.2.5 The Contractor shall instruct all persons who enter the watershed on its behalf the nature of the watershed and to the serious consequences arising from failure to comply with access guidelines. The Contractor shall provide a copy of these guidelines to all employees and agents who enter the watershed. A copy of these guidelines shall also be posted in a conspicuous place at each worksite. All gates at the worksite are provided to control access and shall be kept locked at all times, except as otherwise specifically approved by the Contracting Officer.

### 1.3 ACCESS ROADS

The Contractor is required to pay to TPU the rate of \$21.40/trip for hauling ~~to Disposal Site #1 and heavy equipment (vehicles over 14,000 lbs.)~~ on the Tacoma Headworks Access road from Kanasket-Cumberland Road (Access Road "A") to the dam. In addition, the Contractor shall pay to TPU the rate of \$3.40/trip for hauling to the Project Disposal Site #2 for all construction vehicles over 14,000 lbs. The fees are to reimburse TPU for required road repair. The Contractor is required to maintain the road from

the dam to the staging and stockpile area in the same condition as that prior to construction throughout the contract period. The road shall be maintained at least once per week during periods of heavy use. The Contractor shall keep records of road use in the watershed and to provide 3 copies of road use trip and mileage records to the Contracting Officer. The Contractor is required to coordinate with TPU's Watershed Manager, Brian King, (360) 886-2018 for forms and frequency of payment. Costs for the road repair in this paragraph shall be included in Bid Item No.1.

#### 1.3.1 Access Road "A"

The Government and its contractors have the right to use the one-lane access road (Access Road "A" - see Reference Drawings) to the dam site. However, usage of the road by the Government or its contractors is neither superior nor inferior to the rights of any other party. All parties authorized to use the road (including the Forest Service, the Department of Health and Human Services, and the City of Tacoma) do so on an equal basis. The speed limit is 35 mph on lengths of paved road, and 25 mph on gravel lengths. Original constructed widths vary from 18' to 22', as shown on the reference drawings. Approximately one mile from the guard station toward the damsite is a one-lane bridge (originally a railroad bridge); all vehicles are required to come to a complete stop before proceeding onto this bridge.

#### 1.3.2 Access Road "C"

See reference drawings for grade, usable width, etc. Access across the face of the dam and through the Construction site shall be maintained by the Contractor for other authorized parties as described herein.

#### 1.3.3 Spillway and Outlet Works Bridges

These bridges were designed according to the 1957 AASHO Standard Specifications for Highway bridges for H 20-S16-44 loading, which is currently designated by AASHTO as HS 20-44 loading. See reference drawings for usable width. Contractor may use spillway and outlet works bridges for access to his work areas, but in no case shall the Contractor exceed design loadings, as furnished herein, for either of these structures.

#### 1.3.4 Gate Tower Foundation (Trash Removal Deck)

The trash removal deck (the top of the base portion of the intake tower) was designed to carry a 25-ton truck crane handling 15-ton loads at a 17-foot radius. See reference drawings for usable area.. Contractor may use the trash removal deck for access to his work areas, but in no case shall the total weight of Contractor's equipment exceed 40 (short) tons.

#### 1.3.5 Control Gates

In addition to the gate at the entrance guard station, control gates stand at either end of the dam embankment.

#### 1.4 CONTRACTOR'S VEHICLES

Contractor's vehicles shall carry proof of insurance at all times and shall be equipped with CB radios (to be tuned to Channel 10). Contractor's lowboys with equipment extending on the sides of the trailer shall be preceded by pilot cars while traveling along the access road to the dam site.

## 1.5 ACCESS KEYS

1.5.1 Keys are required for access beyond the gate at the guard station and will be provided by the Contracting Officer.

1.5.2 The Contractor shall be responsible for Government-owned keys issued for this contract.

1.5.3 Upon completion of the work at the damsite, or upon request of the Contracting Officer, the key or keys relevant to the completed areas shall be returned.

1.5.4 Should the Contractor lose a key:

a. the Contracting Officer shall be notified, in writing, within three (3) working days after the loss is discovered and

b. should the key not be found before final acceptance, the final contract payment shall be reduced by \$100 for each key not returned.

## 1.6 CONTRACTOR SECURITY

The Corps of Engineers will not be responsible for providing security for Contractor-owned/controlled equipment, supplies, or materials. The Contractor shall provide those necessary security measures.

## 1.7 SANITARY FACILITIES AND LITTER CONTAINERS

1.7.1 Human excrement or urine shall not be voided or deposited on the watershed, nor shall any garbage, food waste, or other form of decaying, foul, noxious or putrescible matter, either liquid or solid, be thrown, spread or otherwise deposited on, or beneath the surface of the ground.

1.7.2 The Contractor shall provide approved sanitary facilities and litter containers at all work sites. Sanitary facilities and litter containers shall be placed on flat surfaces at convenient locations and adequately protected against upset. Location of sanitary facilities and litter containers shall be subject to approval of the Contracting Officer. Sanitary facilities and litter containers shall be maintained in a satisfactory condition and the contents disposed of in a manner approved by the Contracting Officer.

## 1.8 CAMPS, HOUSING FACILITIES, AND ANIMALS

No camps or housing facilities may be constructed or maintained within the watershed area. Camping is not allowed. No domestic animals, such as dogs, cats, ferrets, or other are allowed in the watershed or on the worksite.

## 1.9 EROSION CONTROL

All construction activities shall be conducted in a manner to prevent erosion or siltation. Where culverts, ditches or drainage are necessary for protection of surface water quality, such facilities shall be constructed by the Contractor per the plans and specifications.

## 1.10 PESTICIDES AND PLANT NUTRIENTS

Pesticides or plant nutrients shall not be applied to the watershed without

prior approval of the Contracting Officer. Approval shall be required for each specific activity.

#### 1.11 REGULATORY REQUIREMENTS

1.11.1 All activities in the Green River Watershed shall be conducted in compliance with all other applicable federal, state, and local laws, rules and regulations for the protection of domestic water supplies.

1.11.2 The project site lies within a forested area. The Contractor shall comply with all forest fire laws, rules and regulations of the State of Washington and such additional Department of Natural Resources and City of Tacoma Public Utilities guidelines as are deemed necessary. A copy of all pertinent fire regulations shall be posted at all work sites. All Contractor tools and equipment shall be kept in serviceable condition, and shall at all times be readily available for fighting fires. Failure to comply with the fire control regulations will be a material breach of contract.

#### 1.12 CONSTRUCTION SEQUENCING AND SCHEDULING

The Contractor shall be required to complete certain critical items of work by a specified date or within a specified period of time after notice to proceed in order to minimize the potential effects on the environment, and to minimize the potential that construction activities could interfere with the functional use of the existing outlet structures to meet project flood control and flow augmentation requirements. See also Attachment "HOWARD HANSON DAM AND RESERVOIR HYDRAULICS AND HYDROLOGY BASELINE REPORT -- WORK IN THE RESERVOIR DURING FLOOD CONTROL SEASON" for key information on construction sequencing and scheduling in the Flood Control Reservoir.

#### 1.13 UTILITY OUTAGES

Contractor shall coordinate utility outages with the Contracting Officer at least 7 days in advance. Outages shall be kept to a minimum and any one outage shall not last more than 2 hours.

#### 1.14 CONSTRUCTION PHASING FOR MAINTAINING NORMAL OUTLET WORKS OPERATIONAL CAPABILITY

The Contractor shall schedule and execute all construction activities such that clear access through the personnel doors of the existing outlet works intake tower is maintained for Howard Hanson Dam project personnel. In addition, clear access for project personnel and equipment shall be provided to and on the existing trash clearing deck upon any advance notice of 24 hours. Outages of any existing utility (including mechanical and electrical utilities of the existing intake tower) shall be coordinated at least 48 hours in advance and in writing, and shall be approved by the Contracting Officer before any such outage shall occur.

#### 1.15 PROTECTION OF GOVERNMENT PROPERTY

In addition to requirements of the CONTRACT CLAUSES, Contractor shall protect all Government property within the buildings in which he is working, except for such property as is required to be demolished. Property which is to be demolished shall be protected until its scheduled demolition time. Protection shall include, but not be limited to, protection from construction generated dust, debris, water, and vibration.

PART 2 NOT USED

PART 3 NOT USED

## **HOWARD HANSON DAM AND RESERVOIR HYDRAULICS AND HYDROLOGY BASELINE REPORT**

### **WORK IN THE RESERVOIR DURING FLOOD CONTROL SEASON**

#### **1. Summary of Howard Hanson Dam Reservoir Operations**

- A. Flood control is the primary mission of Howard Hanson Dam. The secondary mission of HHD is storage of water during spring runoff for use in low flow augmentation of the Green River. These two missions occur in complimentary seasons. Flood control season occurs annually from late fall to early spring. Storage and release of low flow augmentation waters occurs annually from early spring to late fall.
- B. The reservoir will be operated throughout the year in the same manner during construction activities, as it would be if construction were not occurring. As such, special operation requests from the contractor cannot be accommodated.
- C. The maximum pool elevation attained in the reservoir to date was 1,183 feet in February 1996.
- D. Flood control operations typically occur between mid-October through early to mid-March, annually.
- E. Under most circumstances the reservoir elevation during flood control season is maintained at approximately elev. 1,073 to elev. 1,075 feet awaiting floodwaters.
- F. Significantly higher pool elevations occur on a regular basis when water is stored in the reservoir for flood control (a more detailed summary of flood control operations is provided below).
- G. The pool is raised gradually in spring to elev. 1,147 feet for low flow augmentation.
- H. The augmentation pool is slowly drafted from elev. 1,147 through late summer until the flood control low pool elevation of 1,073 to 1,075 feet is attained in November.

#### **2. Discussion of Normal Howard Hanson Dam Flood Control Operations**

- A. The reservoir will be operated during flood control operations in the same manner during construction activities, as it would be if the construction were not occurring. As such, special operation requests from the contractor cannot be accommodated. Water is stored in the reservoir during periods of high runoff (i.e., during periods of significant rainfall) to prevent downstream flooding. Reservoir levels often change rapidly during flood storage operations, especially within the lower elevations of the reservoir (e.g., between elevation 1,073 and 1,110 feet). For example, pool increases of several feet per hour and 10 to 20 feet per day are not uncommon during a flood storage operation. Given the often unpredictable and rapid onset of winter storm systems, flood storage operations at the project often occur with relatively little advance notice. It is not unusual to have only one day or less of advance notice of an approaching storm system that requires a flood control operation at the project. It is also common for conditions to change

during a flood event that require short-term changes to flood control operations. Drawing the reservoir below elevation 1,073 feet is avoided to prevent flushing reservoir sediment deposits and associated turbidity downstream.

- B. In early to mid-March annually, conservation storage begins. The pool elevation rises until a seasonal maximum pool elevation of about 1,147 feet is reached sometime in May or June depending on the conditions of the given year. Relatively rapid increases in pool elevation sometimes occur during this period due to high inflows from snowmelt or rainfall. Once the seasonal maximum pool elevation is reached, the reservoir is typically held at the seasonal maximum elevation for a period of several weeks. A slow drawdown of the pool commences generally in late June or early July. The pool is drawn down at a relatively gradual rate (typically less than one foot per day) until the minimum flood control pool of about elevation 1,073 feet is reached sometime in November or early December. For the construction associated with this contract the conservation seasonal maximum pool elevation will be 1,147 feet. However, commencing in early 2006, the conservation seasonal maximum pool elevation will be increased to 1,167 feet.

### **3. Historical HHD Pool Elevation Information**

- A. Figure H&HBR-1 summarizes the operating range of the Howard Hanson reservoir on an annual basis since 1995. This figure shows the minimum, maximum, and median daily reservoir elevations since 1995. As the figure indicates, reservoir elevations can be well above elevation 1,073 feet during the flood control season.
- B. A series of graphs is presented in this section for the purpose of summarizing maximum historical pool elevations in Howard Hanson reservoir. Figure H&HBR-2 shows the maximum reservoir elevation during the October through March period for all years since 1963. The maximum pool elevations from each year (October through March period) are plotted based on exceedance frequency, which represents the approximate probability that the given elevation will be equaled or exceeded in a given year.
- C. Subsequent figures in this section (Figures H&HBR-3 through H&HBR-8) show the maximum historical pool elevation in Howard Hanson reservoir on a monthly basis for the months of October through March (approximate flood control season). The maximum pool elevations for each year are plotted based on exceedance frequency. It should be noted that these figures are based in part on historical operation of the project and are included to provide an indication of the probability distribution of maximum pool elevations on a monthly basis throughout the flood control season.

### **4. Reservoir Regulation during the Cofferdam Construction Period**

- A. Regulation of the Howard Hanson reservoir during cofferdam construction activities will be performed in a manner similar to typical flood control reservoir regulation to accomplish the mission of flood control. As such, special operation requests from the contractor cannot be accommodated. The objective of reservoir regulation will be to maintain a low pool during periods when there is not an imminent flood threat. During these periods, the pool will be maintained between elevation 1,073 and 1,075 feet to the extent possible. However, rapid and

often unpredictable changes in inflow can make this task difficult. As a result, relatively small increases in reservoir inflow can lead to fairly rapid pool rises (i.e., several feet in less than a day).

- B. Although it won't be feasible to staff the Howard Hanson project office and the Reservoir Control Center (RCC) full time under most periods during the construction season, RCC staff will monitor the project to the extent possible outside of normal business hours to help meet the needs of construction activities. Staff at the RCC will be in close communication with the Contracting Officer in the event that the reservoir elevation is expected to exceed a pre-determined threshold. In addition, the Contractor will have access to daily forecasts specific to Howard Hanson Dam as needed.
- C. If the Contractor confines many of the activities related to cofferdam construction, especially construction of the lower elevation sections, to the flood control season to take advantage of low reservoir elevations, the Contractor is advised that certain activities are subject to flooding during this period. As noted in the previous section, reservoir levels often rise significantly above elevation 1,073 feet during flood control operations generally triggered by high rainfall and related high runoff in the Green River basin. Reservoir levels often change rapidly during flood storage operations. It is not uncommon to have pool increases of several feet per hour and 10 to 20 feet per day during flood control operations.
- D. The following table (Table H&HBR-1) provides information as to how often given threshold elevations in the reservoir may be exceeded during construction activities during the flood control season based on historical records. Determination of the expected number of days that given reservoir elevations may be exceeded during the flood control season was based on the expected frequency and duration of flood control operations and the expected frequency and duration of reservoir inflows during non-flood control operations that would cause given reservoir elevations to be unavoidably exceeded. This information is summarized in the following table for the mid-October through mid-March flood control season.

Table H&HBR-1  
 Estimated Average Number Of Days During The Flood Control Season (Oct. 15 – Mar. 15) That  
 Selected Reservoir Elevations May Be Exceeded In Howard Hanson Reservoir

Column 1	Column 2	Column 3	Column 4	Column 5
Reservoir Elevation (feet)	Expected Average Number of Days Given Reservoir Elevation Will be Exceeded Between Oct. 15 and Mar. 15	Expected Average Percentage of Time that Given Reservoir Elevation Will be Exceeded Between Oct. 15 and Mar. 15	Expected Range of Number of Days that Given Reservoir Elevation Will be Exceeded Between Oct. 15 and Mar. 15 <sup>1</sup>	Expected Average Number of Consecutive Days that Given Reservoir Elevation Will be Exceeded per Occurrence <sup>2</sup>
1,075	58 Days	38%	44 to 80 Days	2 to 7 days
1,080	18 Days	12%	1 to 49 Days	2 to 6 days
1,085	13 Days	9%	zero to 41 Days	2 to 5 days
1,090	10 Days	7%	zero to 38 Days	3 to 4 days
1,095	8 Days	5%	zero to 33 Days	3 to 4 days

1 - Range of number of days was determined based on a review of historical flood control operations and reservoir inflows from 1975 to 2003.

2 - Ranges represent typical durations that given reservoir elevations would likely be exceeded. Durations could be longer during some flood control operations.

- E. The above table (Table H&HBR-1) summarizes the expected average number of days during the mid-October through mid-March flood control season that given elevations in the reservoir may unavoidably be exceeded (Column 2). Column 3 shows the expected average percentage of days during the flood control season that the given elevations in the reservoir may unavoidably be exceeded. The values given in Column 3 represent the number of days given in Column 2 divided by the total number of days during the October 15 to March 15 flood control season (152 days) expressed as a percentage. This table also provides a range of the number of days that a given elevation could be exceeded during the flood control season (Column 4) to indicate the variability from year to year regarding the number of times that a given reservoir elevation could be unavoidably exceeded. The values in Column 5 represent the approximate average number of consecutive days that a given reservoir elevation may be exceeded per occurrence. A comparison of Columns 2 and 5 provides some indication of the typical number of occurrences that the given reservoir elevations will be exceeded during a single flood control season. Estimated number of days of exceedance for elevations greater than 1,095 feet are not provided in the table, however, the probability of unavoidably exceeding a reservoir elevation of 1,100 feet or greater decreases accordingly for increasingly higher reservoir elevations.

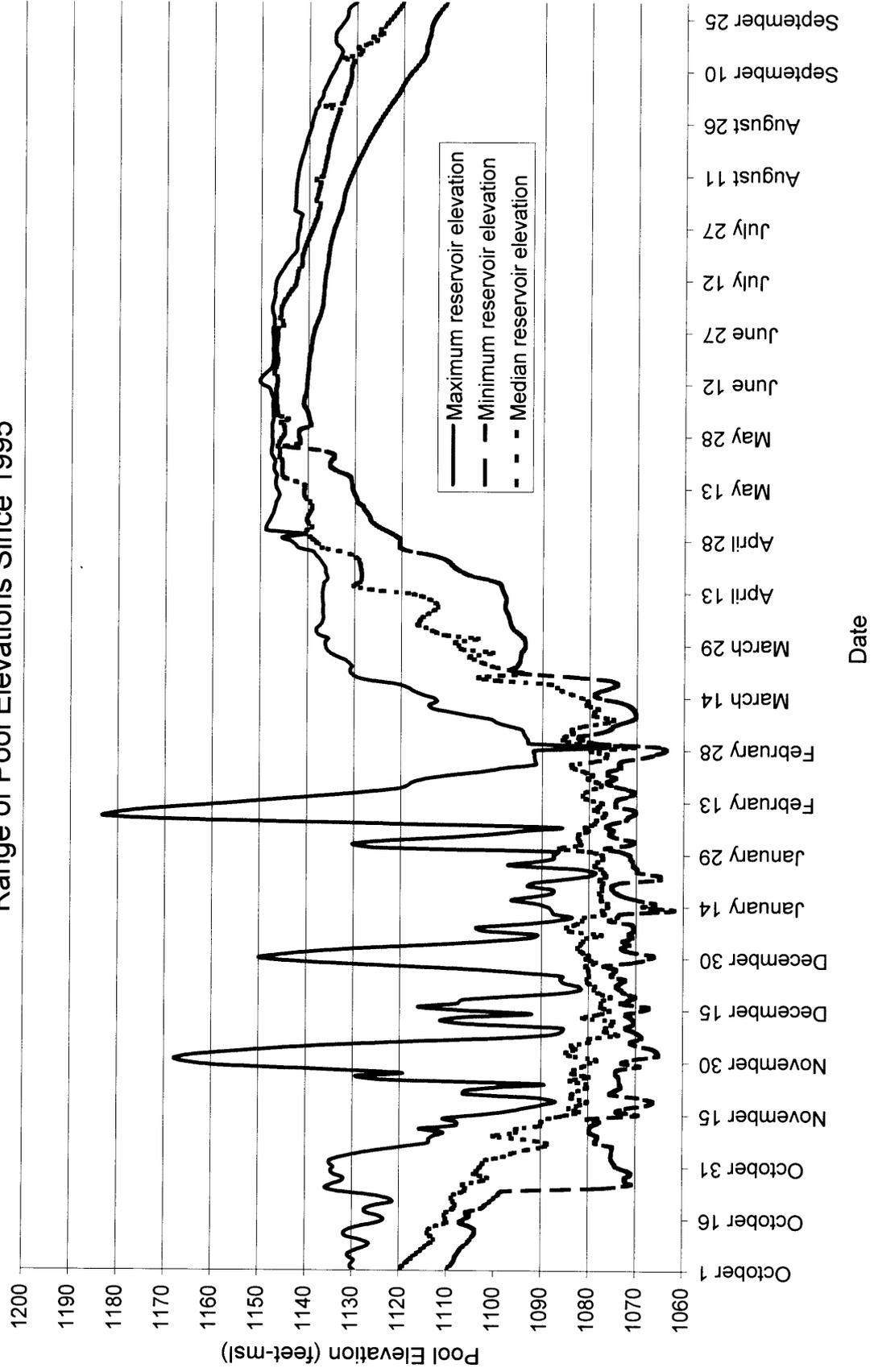
### 5. Probability of Flooding During Construction

Table H&HBR-2 characterizes the probability of the pool exceeding certain elevations during the flood control season (mid-October through mid-March) in terms of percent chance of occurrence (exceedance frequency). Flood occurrences are random and can happen at anytime throughout the winter. There is an approximately 10 percent chance that the reservoir could exceed elevation 1165 feet during the flood control season, which is the existing ground elevation approaching the spillway crest. The probability of opening the spillway gates for flood control purposes is less than 0.2 percent annually.

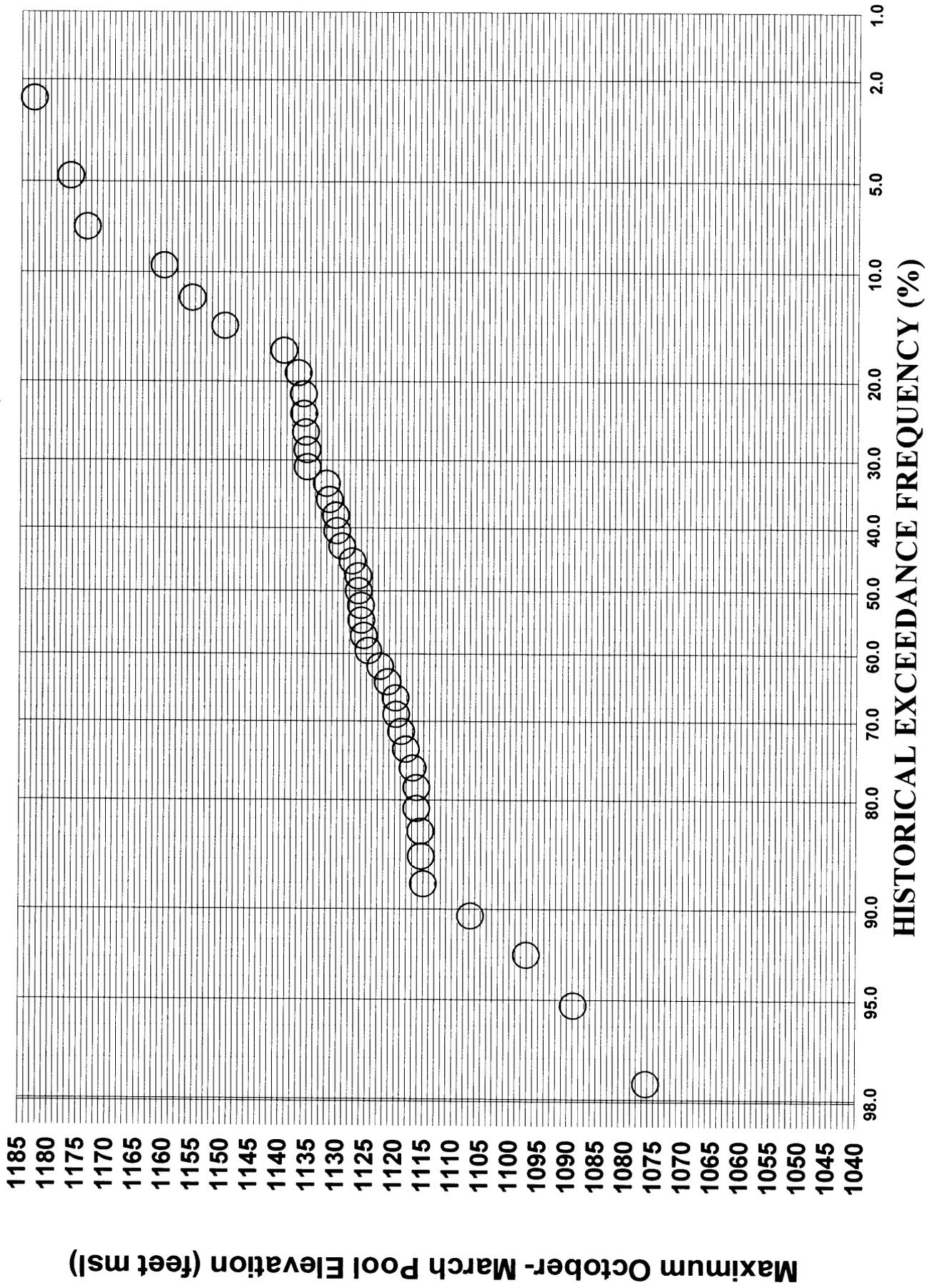
Table H&HBR-2  
Hanson Reservoir Elevation Frequencies due to Flood Control Operations

<u>Reservoir Elevation</u>	<u>Exceedance Frequency</u>
1073 feet	100%
1100 feet	70%
1120 feet	45%
1140 feet	18%
1150 feet	15%
1160 feet	13%
1170 feet	8%
1180 feet	2.5%
1190 feet	1.2%
1200 feet	0.4%

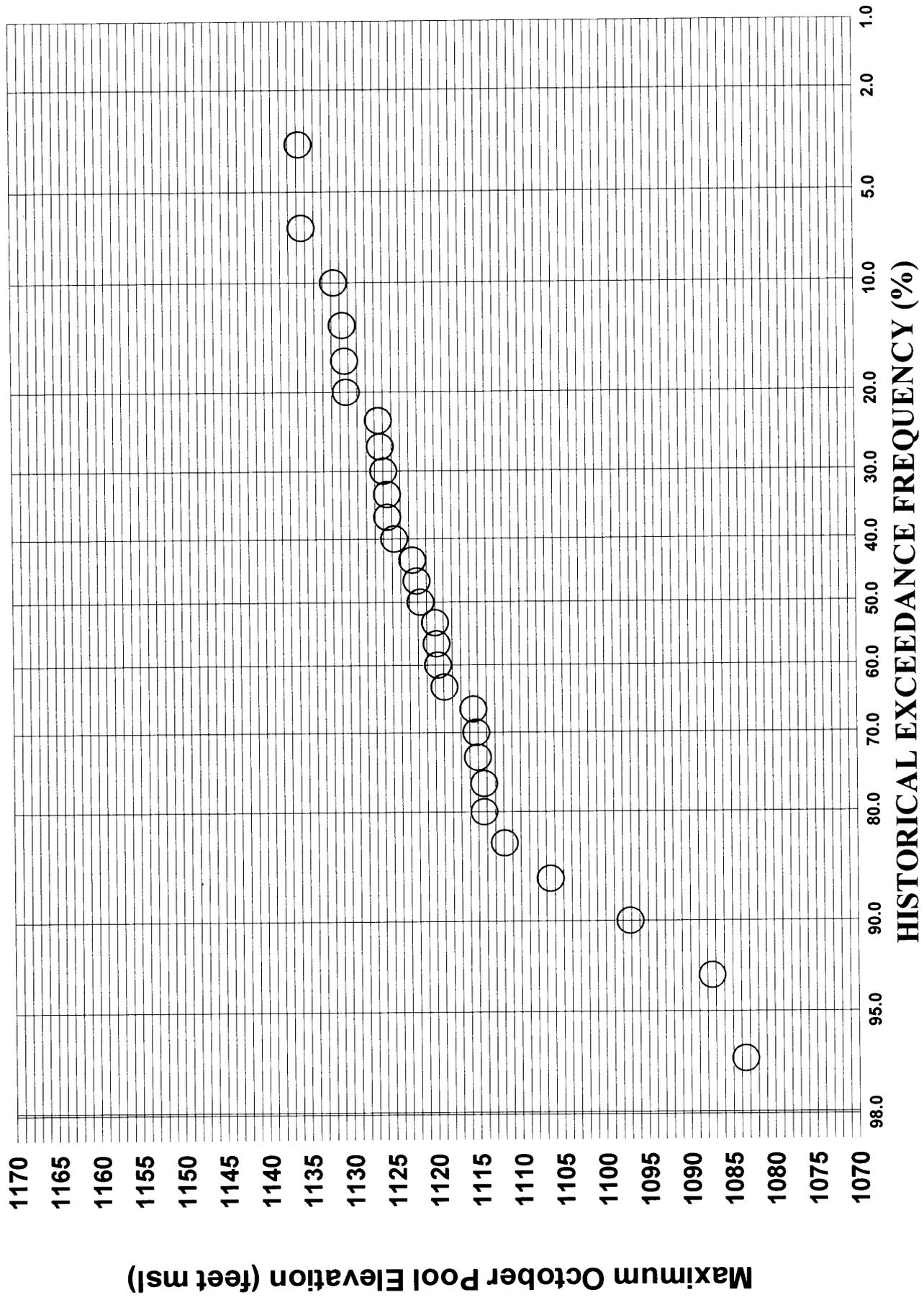
Figure H&HBR-1  
 Summary of Howard Hanson Reservoir Elevations in Recent Years  
 Range of Pool Elevations Since 1995



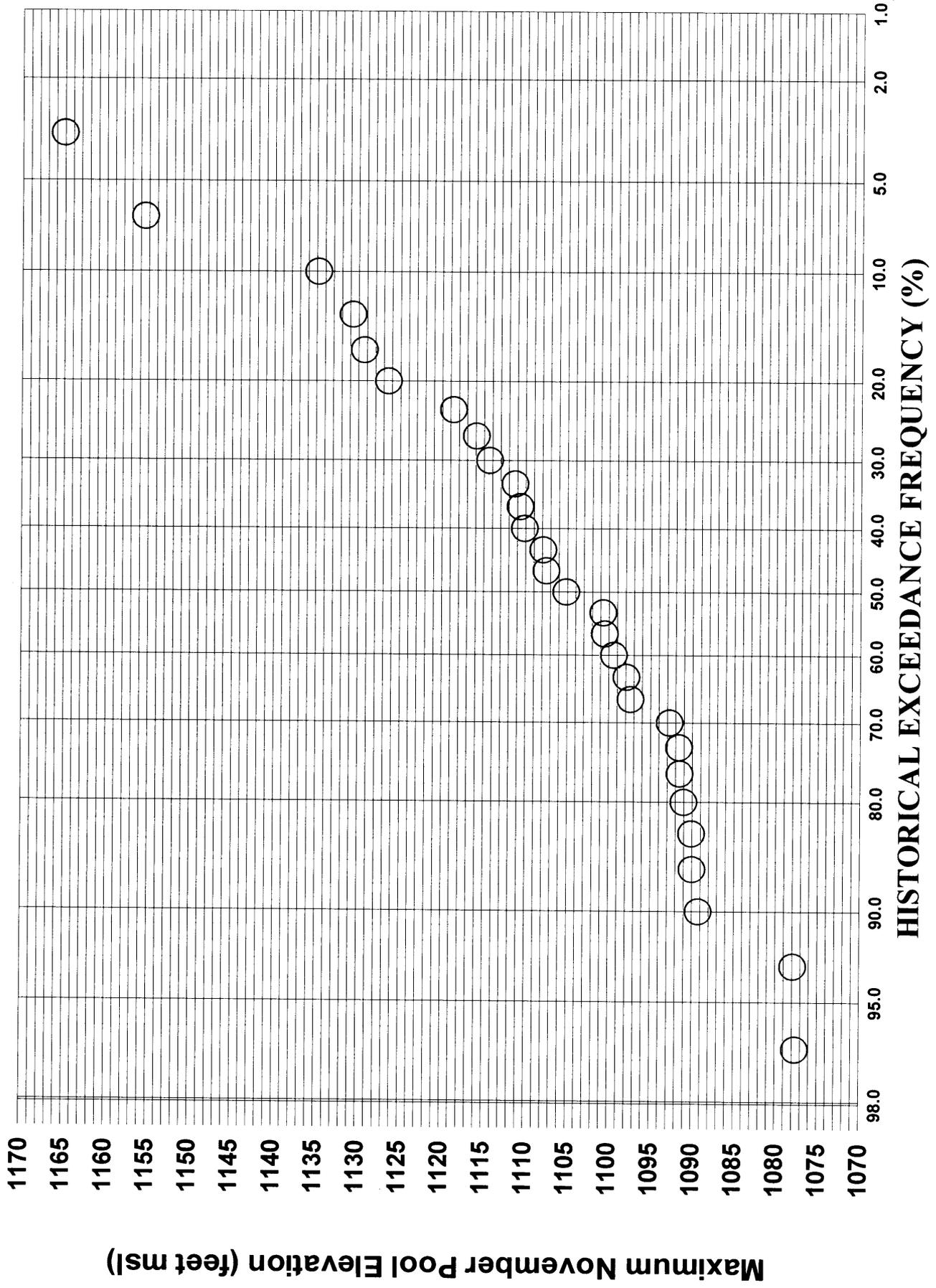
**Figure H&HBR-2  
Howard Hanson Reservoir  
Historical Maximum October-March Reservoir Elevations  
(Water Years 1963-2003)**



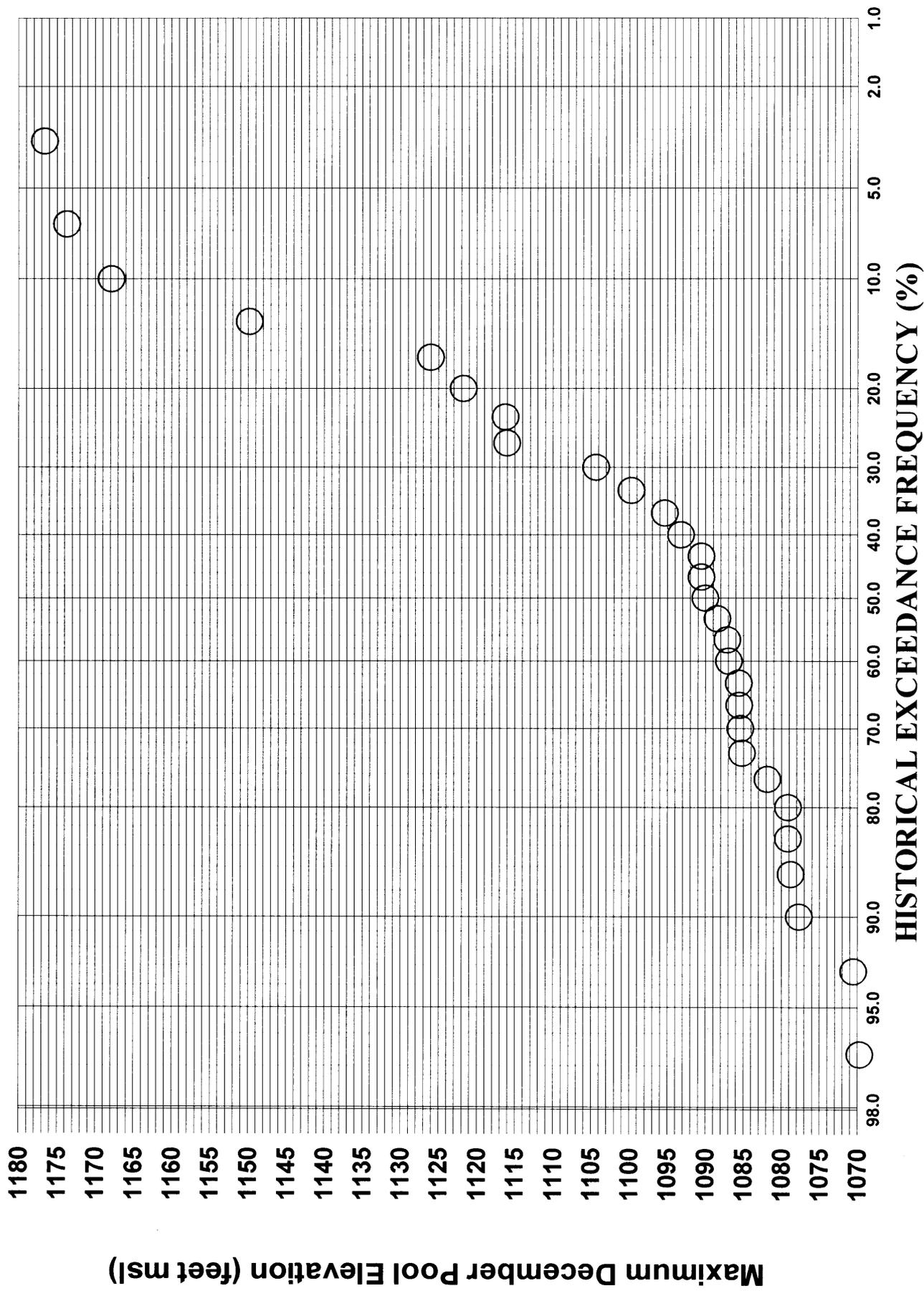
**Figure H&HBR-3  
Howard Hanson Reservoir  
Historical Maximum October Reservoir Elevations**



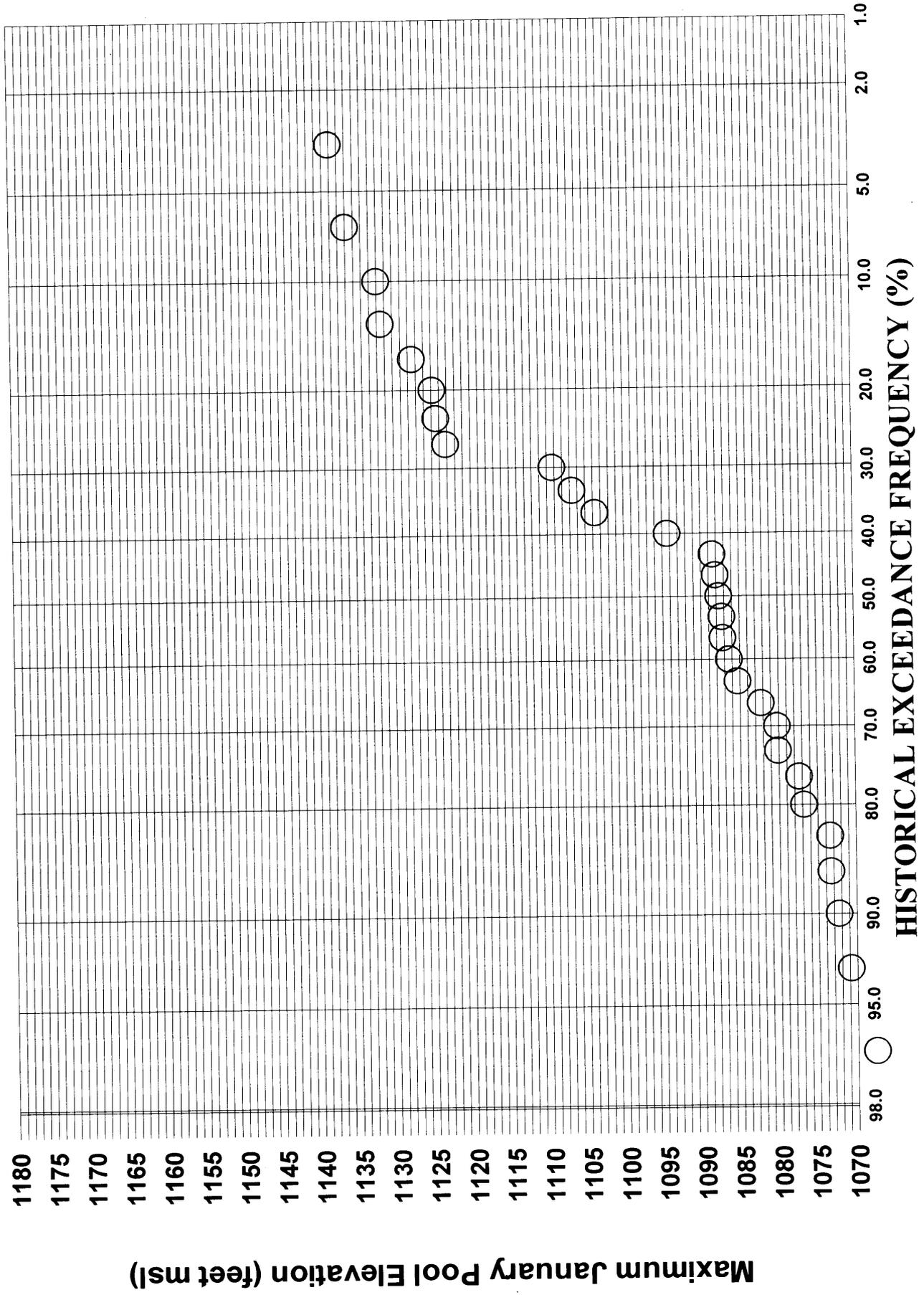
**Figure H&HBR-4  
Howard Hanson Reservoir  
Historical Maximum November Reservoir Elevations**



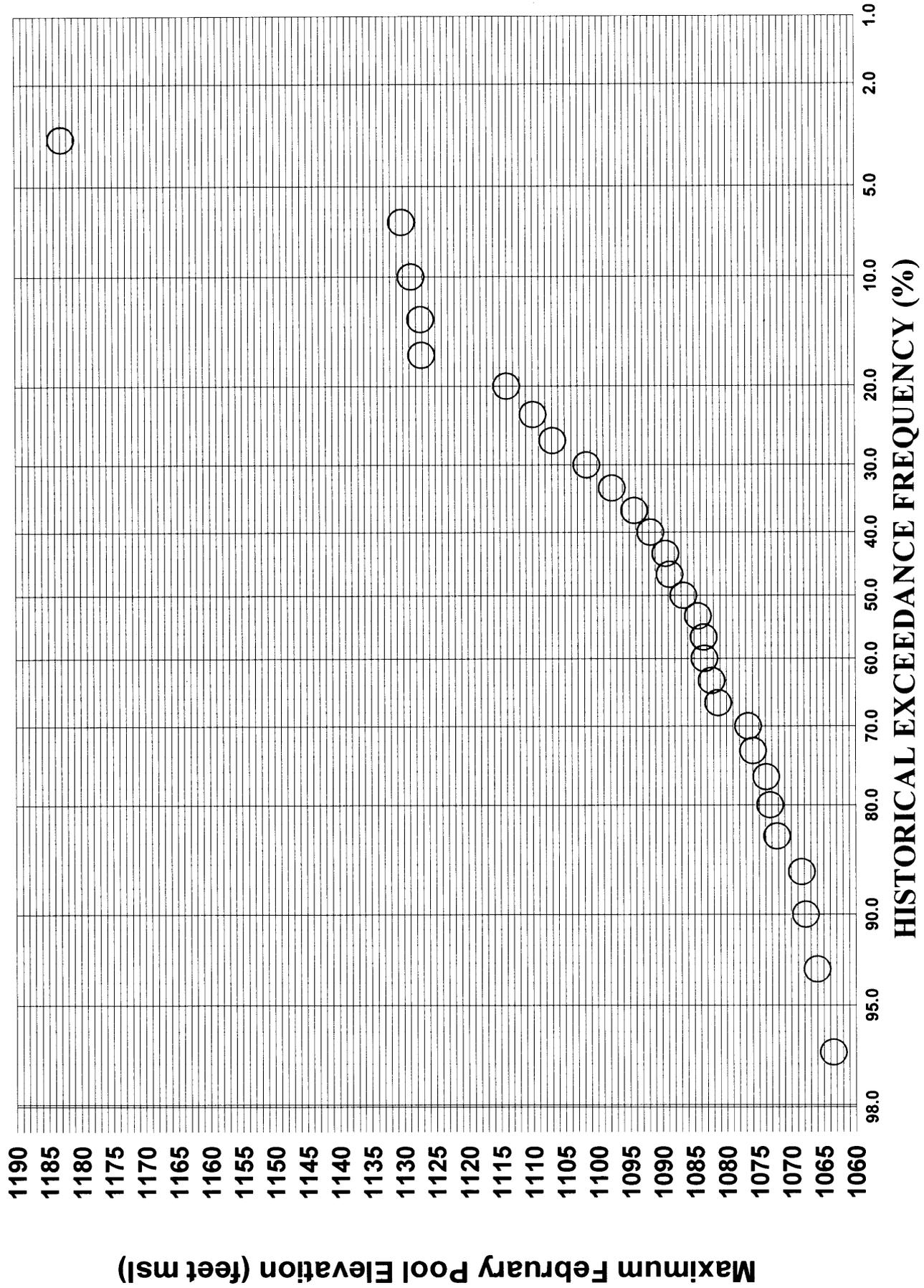
**Figure H&HBR-5  
Howard Hanson Reservoir  
Historical Maximum December Reservoir Elevations**



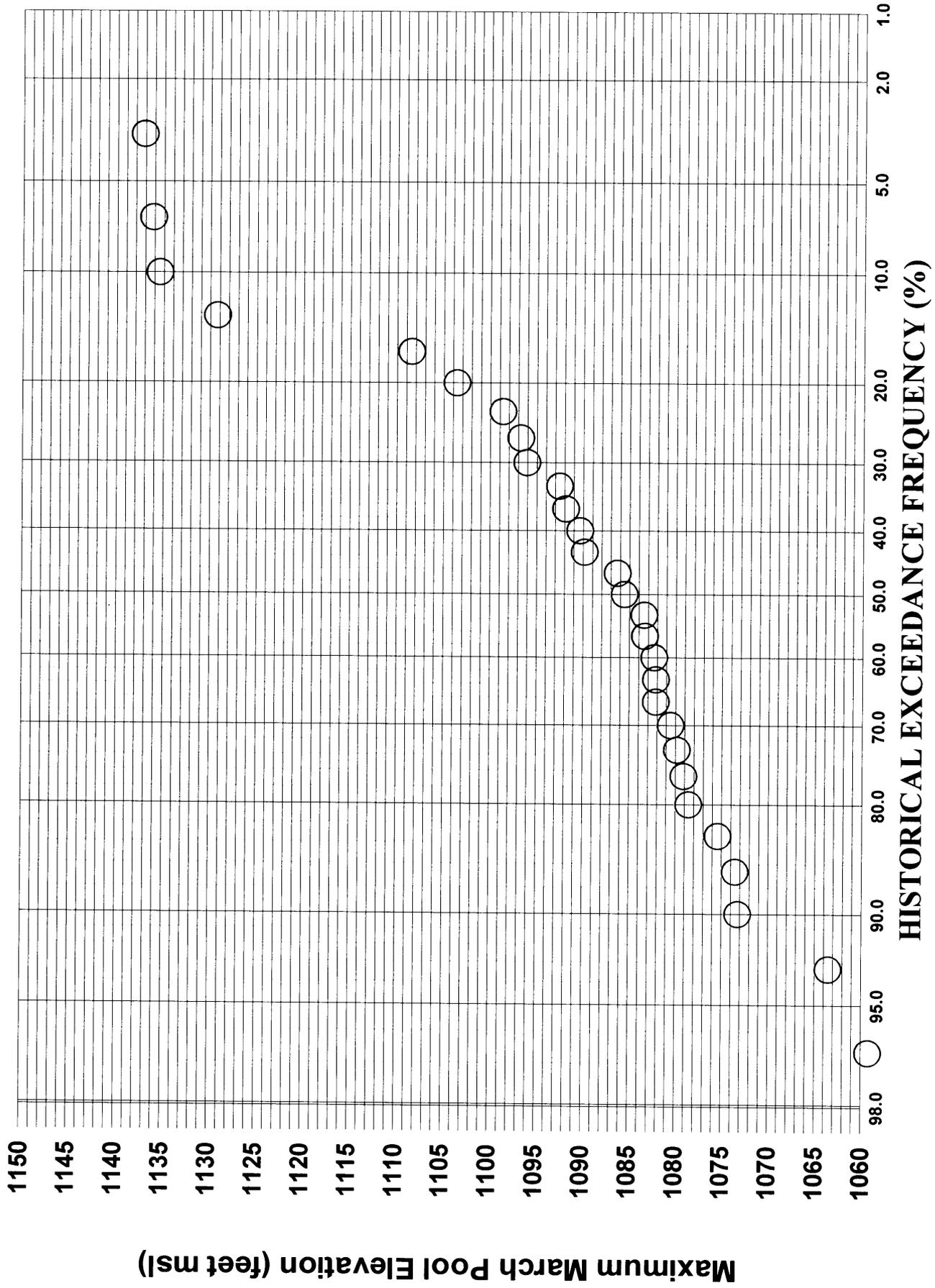
**Figure H&HBR-6  
Howard Hanson Reservoir  
Historical Maximum January Reservoir Elevations**



**Figure H&HBR-7  
Howard Hanson Reservoir  
Historical Maximum February Reservoir Elevations**



**Figure H&HBR-8  
Howard Hanson Reservoir  
Historical Maximum March Reservoir Elevations**



**Hydrologic and Precipitation Data for Howard Hanson Reservoir**  
**Source: US Army Corps - All data are considered provisional**

**Hourly Howard Hanson Reservoir Elevation**

Date	Time	Reservoir Elev. (feet)
17-Oct-03	100	1104.21
17-Oct-03	200	1104.1
17-Oct-03	300	1104.05
17-Oct-03	400	1103.93
17-Oct-03	500	1103.82
17-Oct-03	600	1103.7
17-Oct-03	700	1103.58
17-Oct-03	800	1103.46
17-Oct-03	900	1103.29
17-Oct-03	1000	1103.11
17-Oct-03	1100	1103.11
17-Oct-03	1200	1102.87
17-Oct-03	1300	1102.8
17-Oct-03	1400	1102.63
17-Oct-03	1500	1102.58
17-Oct-03	1600	1102.45
17-Oct-03	1700	1102.37
17-Oct-03	1800	1102.3
17-Oct-03	1900	1102.23
17-Oct-03	2000	1102.17
17-Oct-03	2100	1102.11
17-Oct-03	2200	1102.04
17-Oct-03	2300	1101.98
17-Oct-03	2400	1101.9
18-Oct-03	100	1101.83
18-Oct-03	200	1101.75
18-Oct-03	300	1101.67
18-Oct-03	400	1101.59
18-Oct-03	500	1101.5
18-Oct-03	600	1101.42
18-Oct-03	700	1101.33
18-Oct-03	800	1101.24
18-Oct-03	900	1101.15
18-Oct-03	1000	1101.04
18-Oct-03	1100	1100.95
18-Oct-03	1200	1100.86
18-Oct-03	1300	1100.75
18-Oct-03	1400	1100.65
18-Oct-03	1500	1100.55
18-Oct-03	1600	1100.45
18-Oct-03	1700	1100.34
18-Oct-03	1800	1100.23
18-Oct-03	1900	1100.12

18-Oct-03	2000	1100.02
18-Oct-03	2100	1099.91
18-Oct-03	2200	1099.79
18-Oct-03	2300	1099.68
18-Oct-03	2400	1099.57
19-Oct-03	100	1099.44
19-Oct-03	200	1099.34
19-Oct-03	300	1099.21
19-Oct-03	400	1099.1
19-Oct-03	500	1098.99
19-Oct-03	600	1098.87
19-Oct-03	700	1098.75
19-Oct-03	800	1098.65
19-Oct-03	900	1098.54
19-Oct-03	1000	1098.42
19-Oct-03	1100	1098.3
19-Oct-03	1200	1098.18
19-Oct-03	1300	1098.06
19-Oct-03	1400	1097.95
19-Oct-03	1500	1097.82
19-Oct-03	1600	1097.7
19-Oct-03	1700	1097.58
19-Oct-03	1800	1097.45
19-Oct-03	1900	1097.32
19-Oct-03	2000	1097.2
19-Oct-03	2100	1097.07
19-Oct-03	2200	1096.95
19-Oct-03	2300	1096.81
19-Oct-03	2400	1096.67
20-Oct-03	100	1096.55
20-Oct-03	200	1096.41
20-Oct-03	300	1096.28
20-Oct-03	400	1096.17
20-Oct-03	500	1096.04
20-Oct-03	600	1095.93
20-Oct-03	700	1095.8
20-Oct-03	800	1095.69
20-Oct-03	900	1095.55
20-Oct-03	1000	1095.47
20-Oct-03	1100	1095.33
20-Oct-03	1200	1095.24
20-Oct-03	1300	1095.17
20-Oct-03	1400	1095.13
20-Oct-03	1500	1095.03
20-Oct-03	1600	1095.01
20-Oct-03	1700	1094.96
20-Oct-03	1800	1094.97
20-Oct-03	1900	1095.03
20-Oct-03	2000	1095.13
20-Oct-03	2100	1095.29
20-Oct-03	2200	1095.58
20-Oct-03	2300	1095.94

20-Oct-03	2400	1096.4
21-Oct-03	100	1096.96
21-Oct-03	200	1097.61
21-Oct-03	300	1098.28
21-Oct-03	400	1098.94
21-Oct-03	500	1099.58
21-Oct-03	600	1100.18
21-Oct-03	700	1100.73
21-Oct-03	800	1101.18
21-Oct-03	900	1101.5
21-Oct-03	1000	1101.67
21-Oct-03	1100	1101.73
21-Oct-03	1200	1101.75
21-Oct-03	1300	1101.75
21-Oct-03	1400	1101.73
21-Oct-03	1500	1101.69
21-Oct-03	1600	1101.62
21-Oct-03	1700	1101.53
21-Oct-03	1800	1101.44
21-Oct-03	1900	1101.33
21-Oct-03	2000	1101.2
21-Oct-03	2100	1101.05
21-Oct-03	2200	1100.89
21-Oct-03	2300	1100.72
21-Oct-03	2400	1100.52
22-Oct-03	100	1100.34
22-Oct-03	200	1100.13
22-Oct-03	300	1099.93
22-Oct-03	400	1099.69
22-Oct-03	500	1099.45
22-Oct-03	600	1099.21
22-Oct-03	700	1098.95
22-Oct-03	800	1098.68
22-Oct-03	900	1098.42
22-Oct-03	1000	1098.13
22-Oct-03	1100	1097.85
22-Oct-03	1200	1097.55
22-Oct-03	1300	1097.25
22-Oct-03	1400	1096.94
22-Oct-03	1500	1096.62
22-Oct-03	1600	1096.45
22-Oct-03	1700	1096.29
22-Oct-03	1800	1096.13
22-Oct-03	1900	1095.95
22-Oct-03	2000	1095.8
22-Oct-03	2100	1095.71
22-Oct-03	2200	1095.55
22-Oct-03	2300	1095.42
22-Oct-03	2400	1095.26
23-Oct-03	100	1095.11
23-Oct-03	200	1094.96
23-Oct-03	300	1094.81

23-Oct-03	400	1094.64
23-Oct-03	500	1094.5
23-Oct-03	600	1094.3
23-Oct-03	700	1094.09
23-Oct-03	800	1093.98
23-Oct-03	900	1093.82
23-Oct-03	1000	1093.69
23-Oct-03	1100	1093.58
23-Oct-03	1200	1093.47
23-Oct-03	1300	1093.37
23-Oct-03	1400	1093.29
23-Oct-03	1500	1093.21
23-Oct-03	1600	1093.13
23-Oct-03	1700	1093.05
23-Oct-03	1800	1092.97
23-Oct-03	1900	1092.88
23-Oct-03	2000	1092.78
23-Oct-03	2100	1092.68
23-Oct-03	2200	1092.58
23-Oct-03	2300	1092.49
23-Oct-03	2400	1092.38
24-Oct-03	100	1092.27
24-Oct-03	200	1092.17
24-Oct-03	300	1092.05
24-Oct-03	400	1091.94
24-Oct-03	500	1091.81
24-Oct-03	600	1091.69
24-Oct-03	700	1091.57
24-Oct-03	800	1091.46
24-Oct-03	900	1091.36
24-Oct-03	1000	1091.29
24-Oct-03	1100	1091.26
24-Oct-03	1200	1091.24
24-Oct-03	1300	1091.23
24-Oct-03	1400	1091.23
24-Oct-03	1500	1091.24
24-Oct-03	1600	1091.25
24-Oct-03	1700	1091.26
24-Oct-03	1800	1091.28
24-Oct-03	1900	1091.29
24-Oct-03	2000	1091.31
24-Oct-03	2100	1091.31
24-Oct-03	2200	1091.32
24-Oct-03	2300	1091.33
24-Oct-03	2400	1091.33
25-Oct-03	100	1091.33
25-Oct-03	200	1091.33
25-Oct-03	300	1091.33
25-Oct-03	400	1091.33
25-Oct-03	500	1091.33
25-Oct-03	600	1091.33
25-Oct-03	700	1091.33

25-Oct-03	800	1091.31
25-Oct-03	900	1091.3
25-Oct-03	1000	1091.29
25-Oct-03	1100	1091.27
25-Oct-03	1200	1091.26
25-Oct-03	1300	1091.24
25-Oct-03	1400	1091.22
25-Oct-03	1500	1091.2
25-Oct-03	1600	1091.18
25-Oct-03	1700	1091.16
25-Oct-03	1800	1091.14
25-Oct-03	1900	1091.11
25-Oct-03	2000	1091.09
25-Oct-03	2100	1091.06
25-Oct-03	2200	1091.02
25-Oct-03	2300	1090.99
25-Oct-03	2400	1090.96
26-Oct-03	100	1090.93
26-Oct-03	200	1090.9
26-Oct-03	300	1090.86
26-Oct-03	400	1090.83
26-Oct-03	500	1090.79
26-Oct-03	600	1090.75
26-Oct-03	700	1090.71
26-Oct-03	800	1090.67
26-Oct-03	900	1090.63
26-Oct-03	1000	1090.58
26-Oct-03	1100	1090.54
26-Oct-03	1200	1090.5
26-Oct-03	1300	1090.45
26-Oct-03	1400	1090.39
26-Oct-03	1500	1090.35
26-Oct-03	1600	1090.29
26-Oct-03	1700	1090.25
26-Oct-03	1800	1090.21
26-Oct-03	1900	1090.16
26-Oct-03	2000	1090.11
26-Oct-03	2100	1090.05
26-Oct-03	2200	1090
26-Oct-03	2300	1089.94
26-Oct-03	2400	1089.89

### Hourly Inflow to Howard Hanson Reservoir

Date	Time	Reservoir Inflow (cfs)
17-Oct-03	100	1034
17-Oct-03	200	971
17-Oct-03	300	928
17-Oct-03	400	886

17-Oct-03	500	872
17-Oct-03	600	843
17-Oct-03	700	773
17-Oct-03	800	821
17-Oct-03	900	742
17-Oct-03	1000	742
17-Oct-03	1100	694
17-Oct-03	1200	699
17-Oct-03	1300	682
17-Oct-03	1400	688
17-Oct-03	1500	610
17-Oct-03	1600	650
17-Oct-03	1700	616
17-Oct-03	1800	631
17-Oct-03	1900	588
17-Oct-03	2000	596
17-Oct-03	2100	583
17-Oct-03	2200	575
17-Oct-03	2300	567
17-Oct-03	2400	558
18-Oct-03	100	549
18-Oct-03	200	541
18-Oct-03	300	531
18-Oct-03	400	526
18-Oct-03	500	516
18-Oct-03	600	511
18-Oct-03	700	497
18-Oct-03	800	492
18-Oct-03	900	492
18-Oct-03	1000	479
18-Oct-03	1100	475
18-Oct-03	1200	471
18-Oct-03	1300	467
18-Oct-03	1400	468
18-Oct-03	1500	459
18-Oct-03	1600	448
18-Oct-03	1700	452
18-Oct-03	1800	448
18-Oct-03	1900	440
18-Oct-03	2000	436
18-Oct-03	2100	437
18-Oct-03	2200	429
18-Oct-03	2300	434
18-Oct-03	2400	421
19-Oct-03	100	421
19-Oct-03	200	425
19-Oct-03	300	421
19-Oct-03	400	418
19-Oct-03	500	431
19-Oct-03	600	428
19-Oct-03	700	433
19-Oct-03	800	429

19-Oct-03	900	426
19-Oct-03	1000	424
19-Oct-03	1100	428
19-Oct-03	1200	416
19-Oct-03	1300	412
19-Oct-03	1400	413
19-Oct-03	1500	409
19-Oct-03	1600	406
19-Oct-03	1700	406
19-Oct-03	1800	397
19-Oct-03	1900	401
19-Oct-03	2000	394
19-Oct-03	2100	387
19-Oct-03	2200	392
19-Oct-03	2300	388
19-Oct-03	2400	385
20-Oct-03	100	395
20-Oct-03	200	391
20-Oct-03	300	405
20-Oct-03	400	411
20-Oct-03	500	416
20-Oct-03	600	418
20-Oct-03	700	441
20-Oct-03	800	427
20-Oct-03	900	438
20-Oct-03	1000	454
20-Oct-03	1100	489
20-Oct-03	1200	493
20-Oct-03	1300	539
20-Oct-03	1400	552
20-Oct-03	1500	611
20-Oct-03	1600	670
20-Oct-03	1700	737
20-Oct-03	1800	817
20-Oct-03	1900	972
20-Oct-03	2000	1123
20-Oct-03	2100	1328
20-Oct-03	2200	1551
20-Oct-03	2300	1799
20-Oct-03	2400	2042
21-Oct-03	100	2261
21-Oct-03	200	2428
21-Oct-03	300	2554
21-Oct-03	400	2648
21-Oct-03	500	2703
21-Oct-03	600	2690
21-Oct-03	700	2634
21-Oct-03	800	2570
21-Oct-03	900	2490
21-Oct-03	1000	2416
21-Oct-03	1100	2319
21-Oct-03	1200	2211

21-Oct-03	1300	2113
21-Oct-03	1400	2037
21-Oct-03	1500	1967
21-Oct-03	1600	1906
21-Oct-03	1700	1844
21-Oct-03	1800	1782
21-Oct-03	1900	1726
21-Oct-03	2000	1679
21-Oct-03	2100	1627
21-Oct-03	2200	1586
21-Oct-03	2300	1539
21-Oct-03	2400	1507
22-Oct-03	100	1468
22-Oct-03	200	1432
22-Oct-03	300	1400
22-Oct-03	400	1374
22-Oct-03	500	1336
22-Oct-03	600	1315
22-Oct-03	700	1276
22-Oct-03	800	1259
22-Oct-03	900	1234
22-Oct-03	1000	1210
22-Oct-03	1100	1190
22-Oct-03	1200	1171
22-Oct-03	1300	1134
22-Oct-03	1400	1115
22-Oct-03	1500	1090
22-Oct-03	1600	1067
22-Oct-03	1700	1057
22-Oct-03	1800	1074
22-Oct-03	1900	1065
22-Oct-03	2000	1082
22-Oct-03	2100	1081
22-Oct-03	2200	1085
22-Oct-03	2300	1097
22-Oct-03	2400	1095
23-Oct-03	100	1061
23-Oct-03	200	1068
23-Oct-03	300	1040
23-Oct-03	400	1020
23-Oct-03	500	1022
23-Oct-03	600	998
23-Oct-03	700	975
23-Oct-03	800	957
23-Oct-03	900	922
23-Oct-03	1000	909
23-Oct-03	1100	903
23-Oct-03	1200	864
23-Oct-03	1300	851
23-Oct-03	1400	837
23-Oct-03	1500	827
23-Oct-03	1600	818

23-Oct-03	1700	807
23-Oct-03	1800	794
23-Oct-03	1900	787
23-Oct-03	2000	783
23-Oct-03	2100	772
23-Oct-03	2200	760
23-Oct-03	2300	756
23-Oct-03	2400	747
24-Oct-03	100	743
24-Oct-03	200	732
24-Oct-03	300	721
24-Oct-03	400	718
24-Oct-03	500	709
24-Oct-03	600	689
24-Oct-03	700	678
24-Oct-03	800	666
24-Oct-03	900	659
24-Oct-03	1000	646
24-Oct-03	1100	632
24-Oct-03	1200	623
24-Oct-03	1300	619
24-Oct-03	1400	617
24-Oct-03	1500	613
24-Oct-03	1600	608
24-Oct-03	1700	609
24-Oct-03	1800	604
24-Oct-03	1900	604
24-Oct-03	2000	604
24-Oct-03	2100	601
24-Oct-03	2200	594
24-Oct-03	2300	590
24-Oct-03	2400	583
25-Oct-03	100	583
25-Oct-03	200	580
25-Oct-03	300	576
25-Oct-03	400	576
25-Oct-03	500	568
25-Oct-03	600	564
25-Oct-03	700	560
25-Oct-03	800	553
25-Oct-03	900	549
25-Oct-03	1000	541
25-Oct-03	1100	534
25-Oct-03	1200	534
25-Oct-03	1300	531
25-Oct-03	1400	527
25-Oct-03	1500	527
25-Oct-03	1600	520
25-Oct-03	1700	520
25-Oct-03	1800	517
25-Oct-03	1900	510
25-Oct-03	2000	507

25-Oct-03	2100	503
25-Oct-03	2200	500
25-Oct-03	2300	500
25-Oct-03	2400	494
26-Oct-03	100	494
26-Oct-03	200	494
26-Oct-03	300	491
26-Oct-03	400	488
26-Oct-03	500	484
26-Oct-03	600	480
26-Oct-03	700	476
26-Oct-03	800	473
26-Oct-03	900	472
26-Oct-03	1000	468
26-Oct-03	1100	461
26-Oct-03	1200	460
26-Oct-03	1300	453
26-Oct-03	1400	457
26-Oct-03	1500	457
26-Oct-03	1600	453
26-Oct-03	1700	453
26-Oct-03	1800	453
26-Oct-03	1900	450
26-Oct-03	2000	451
26-Oct-03	2100	447
26-Oct-03	2200	440
26-Oct-03	2300	437
26-Oct-03	2400	437

**Observed Hourly Incremental Precipitation at Howard Hanson Dam**

Date	Time	Hourly Incremental Precipitation (inches)
17-Oct-03	100	0
17-Oct-03	200	0
17-Oct-03	300	0
17-Oct-03	400	0.01
17-Oct-03	500	0.01
17-Oct-03	600	0
17-Oct-03	700	0
17-Oct-03	800	0
17-Oct-03	900	0
17-Oct-03	1000	0
17-Oct-03	1100	0
17-Oct-03	1200	0
17-Oct-03	1300	0
17-Oct-03	1400	0
17-Oct-03	1500	0
17-Oct-03	1600	0
17-Oct-03	1700	0

17-Oct-03	1800	0
17-Oct-03	1900	0
17-Oct-03	2000	0
17-Oct-03	2100	0
17-Oct-03	2200	0
17-Oct-03	2300	0
17-Oct-03	2400	0
18-Oct-03	100	0
18-Oct-03	200	0
18-Oct-03	300	0
18-Oct-03	400	0
18-Oct-03	500	0
18-Oct-03	600	0
18-Oct-03	700	0
18-Oct-03	800	0
18-Oct-03	900	0
18-Oct-03	1000	0
18-Oct-03	1100	0
18-Oct-03	1200	0
18-Oct-03	1300	0
18-Oct-03	1400	0
18-Oct-03	1500	0
18-Oct-03	1600	0
18-Oct-03	1700	0
18-Oct-03	1800	0
18-Oct-03	1900	0
18-Oct-03	2000	0
18-Oct-03	2100	0
18-Oct-03	2200	0
18-Oct-03	2300	0
18-Oct-03	2400	0
19-Oct-03	100	0
19-Oct-03	200	0
19-Oct-03	300	0
19-Oct-03	400	0.03
19-Oct-03	500	0.03
19-Oct-03	600	0.08
19-Oct-03	700	0.08
19-Oct-03	800	0.02
19-Oct-03	900	0
19-Oct-03	1000	0.02
19-Oct-03	1100	0.01
19-Oct-03	1200	0
19-Oct-03	1300	0
19-Oct-03	1400	0
19-Oct-03	1500	0
19-Oct-03	1600	0
19-Oct-03	1700	0
19-Oct-03	1800	0
19-Oct-03	1900	0
19-Oct-03	2000	0
19-Oct-03	2100	0

19-Oct-03	2200	0
19-Oct-03	2300	0
19-Oct-03	2400	0
20-Oct-03	100	0.02
20-Oct-03	200	0.03
20-Oct-03	300	0.01
20-Oct-03	400	0.17
20-Oct-03	500	0.07
20-Oct-03	600	0.08
20-Oct-03	700	0.03
20-Oct-03	800	0
20-Oct-03	900	0.01
20-Oct-03	1000	0.01
20-Oct-03	1100	0.01
20-Oct-03	1200	0.13
20-Oct-03	1300	0.17
20-Oct-03	1400	0.21
20-Oct-03	1500	0.1
20-Oct-03	1600	0.09
20-Oct-03	1700	0.13
20-Oct-03	1800	0.26
20-Oct-03	1900	0.33
20-Oct-03	2000	0.26
20-Oct-03	2100	0.29
20-Oct-03	2200	0.43
20-Oct-03	2300	0.28
20-Oct-03	2400	0.23
21-Oct-03	100	0.19
21-Oct-03	200	0.23
21-Oct-03	300	0.21
21-Oct-03	400	0.11
21-Oct-03	500	0.02
21-Oct-03	600	0.08
21-Oct-03	700	0.03
21-Oct-03	800	0.03
21-Oct-03	900	0.06
21-Oct-03	1000	0
21-Oct-03	1100	0
21-Oct-03	1200	0
21-Oct-03	1300	0
21-Oct-03	1400	0
21-Oct-03	1500	0
21-Oct-03	1600	0
21-Oct-03	1700	0
21-Oct-03	1800	0
21-Oct-03	1900	0
21-Oct-03	2000	0
21-Oct-03	2100	0
21-Oct-03	2200	0
21-Oct-03	2300	0
21-Oct-03	2400	0
22-Oct-03	100	0

22-Oct-03	200	0
22-Oct-03	300	0
22-Oct-03	400	0
22-Oct-03	500	0
22-Oct-03	600	0
22-Oct-03	700	0
22-Oct-03	800	0
22-Oct-03	900	0
22-Oct-03	1000	0
22-Oct-03	1100	0
22-Oct-03	1200	0
22-Oct-03	1300	0
22-Oct-03	1400	0
22-Oct-03	1500	0
22-Oct-03	1600	0
22-Oct-03	1700	0
22-Oct-03	1800	0.01
22-Oct-03	1900	0.07
22-Oct-03	2000	0.34
22-Oct-03	2100	0.3
22-Oct-03	2200	0
22-Oct-03	2300	0
22-Oct-03	2400	0
23-Oct-03	100	0
23-Oct-03	200	0
23-Oct-03	300	0
23-Oct-03	400	0
23-Oct-03	500	0
23-Oct-03	600	0
23-Oct-03	700	0
23-Oct-03	800	0
23-Oct-03	900	0
23-Oct-03	1000	0
23-Oct-03	1100	0
23-Oct-03	1200	0
23-Oct-03	1300	0
23-Oct-03	1400	0
23-Oct-03	1500	0
23-Oct-03	1600	0
23-Oct-03	1700	0
23-Oct-03	1800	0
23-Oct-03	1900	0
23-Oct-03	2000	0
23-Oct-03	2100	0
23-Oct-03	2200	0
23-Oct-03	2300	0
23-Oct-03	2400	0
24-Oct-03	100	0
24-Oct-03	200	0
24-Oct-03	300	0
24-Oct-03	400	0
24-Oct-03	500	0

24-Oct-03	600	0
24-Oct-03	700	0
24-Oct-03	800	0
24-Oct-03	900	0
24-Oct-03	1000	0
24-Oct-03	1100	0
24-Oct-03	1200	0
24-Oct-03	1300	0
24-Oct-03	1400	0
24-Oct-03	1500	0
24-Oct-03	1600	0
24-Oct-03	1700	0
24-Oct-03	1800	0
24-Oct-03	1900	0
24-Oct-03	2000	0
24-Oct-03	2100	0
24-Oct-03	2200	0
24-Oct-03	2300	0
24-Oct-03	2400	0
25-Oct-03	100	0
25-Oct-03	200	0
25-Oct-03	300	0
25-Oct-03	400	0
25-Oct-03	500	0
25-Oct-03	600	0
25-Oct-03	700	0
25-Oct-03	800	0
25-Oct-03	900	0
25-Oct-03	1000	0
25-Oct-03	1100	0
25-Oct-03	1200	0
25-Oct-03	1300	0
25-Oct-03	1400	0
25-Oct-03	1500	0
25-Oct-03	1600	0
25-Oct-03	1700	0
25-Oct-03	1800	0
25-Oct-03	1900	0
25-Oct-03	2000	0
25-Oct-03	2100	0
25-Oct-03	2200	0
25-Oct-03	2300	0
25-Oct-03	2400	0
26-Oct-03	100	0
26-Oct-03	200	0
26-Oct-03	300	0
26-Oct-03	400	0
26-Oct-03	500	0
26-Oct-03	600	0
26-Oct-03	700	0
26-Oct-03	800	0
26-Oct-03	900	0

26-Oct-03	1000	0
26-Oct-03	1100	0
26-Oct-03	1200	0
26-Oct-03	1300	0
26-Oct-03	1400	0
26-Oct-03	1500	0
26-Oct-03	1600	0
26-Oct-03	1700	0
26-Oct-03	1800	0
26-Oct-03	1900	0
26-Oct-03	2000	0
26-Oct-03	2100	0
26-Oct-03	2200	0
26-Oct-03	2300	0
26-Oct-03	2400	0

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## SECTION 01025

## MEASUREMENT AND PAYMENT

## PART 1 GENERAL

## 1.1 GENERAL

The contract price for each item shall constitute full compensation for furnishing all plant, labor, materials, appurtenances, and incidentals and performing all operations necessary to construct and complete the items in accordance with these specifications and the applicable drawings, including surveying performed by the Contractor. Payment for each item shall be considered as full compensation, notwithstanding that minor features may not be mentioned herein. Work paid for under one item will not be paid for under any other item. No separate payment will be made for the work, services, or operations required by the Contractor, as specified in DIVISION 1, GENERAL REQUIREMENTS, to complete the project in accordance with these specifications; all costs thereof shall be considered as incidental to the work.

## 1.2 MEASUREMENT

## 1.2.1 Measurement of Hookups to Grout Curtain Holes

The quantity of hookups for hydraulic pressure tests and placement of cement grout curtains will be measured for payment as the number of hookups performed as required.

## 1.2.2 Measurement of Portland Cement and Bentonite by 94-Pound Bag

Portland cement and bentonite used in grout curtains will be measured for payment as the number of bags of portland cement (94 pounds of cement per bag) mixed into grout and satisfactorily pumped into the grout holes.

## 1.2.3 Measurement of HRWRA Water Reducing Admixture by Gallon

Cement Grout HRWRA (High Range Water Reducing Admixture) water reducing Admixture use in grout curtains will be measured for payment as the number of gallons of admixture used for the cement grouting, unless wasted or used for the convenience of the Contractor.

## 1.2.4 Cubic Yard Excavation Measurement

1.2.3.1 A survey of the site shall be made by the Contractor just after commencement of the work under this contract and prior to the initiations of any excavation. All measurements for payment for excavation will be based on that survey and additional surveys as specified hereinafter without regard to any changes that may occur during the prosecution of the work. Quantities for payment for excavation will be determined in cubic yards based on cross-section measurements. The Contracting Officer will make all decisions concerning classification of the excavated materials. Payment for excavation will be made only for the volume of materials actually removed by the Contractor, and only for the materials excavated within the limits shown on the drawings or established in the field by the Contracting Officer. Payment for any given volume of excavation will not

be made under more than one classification of excavation. Payment for excavation will constitute full compensation for all cost associated with blasting, ripping, excavating, removal hauling, stockpiling, and disposal of the excavated materials.

1.2.3.2 The total quantity of excavated common material for which payment will be made will be the computed volume between two ground surfaces as determined by surveys performed prior to and immediately after the common excavation is complete. No allowance will be made for overdepth excavation or for the removal of any material outside the required slope lines unless authorized.

1.2.3.3 The total quantity of excavated material from rock and concrete excavation for which payment will be made will be the computed volume between two surfaces as determined by the second survey performed for calculating the common excavation and a subsequent survey performed after completion of rock and concrete excavation.

### 1.3 PAYMENT

#### 1.3.1 ITEM 0001 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0001, All Work for Fish Passage Facility Cofferdam and Excavation, Except for Items 0002 Through ~~0039~~ 0046, payment of which shall constitute full compensation for Item No. 0001, complete.

#### 1.3.2 ITEM 0002 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0002, Mobilization and Demobilization, payment of which shall constitute full compensation for Item No. 0002, complete, including costs for assembling all plant and equipment at the site preparatory to initiating the work and for removing it when all work has been completed, in accordance with Special Clause SC-11. This also shall include payment for any interim Demobilization and Remobilization that may be necessary. It is not, however, to be confused with Item No. 0018 below.

#### 1.3.3 ITEM 0003 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0003, All Work for Reservoir Excavation & Debris Removal From Trash Racks, payment of which shall constitute full compensation for Item No. 0003, complete.

#### 1.3.4 ITEM 0004 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0004, All Work for Multi-Point Borehole Extensometers, payment of which shall constitute full compensation for Item No. 0004, complete, including costs for drilling, groutable anchors, stainless steel rods, pvc tubes, vibrating wire displacement transducers of the appropriate range, the appropriate lengths of transducer cable and conduit, vibrating wire head assembly, grout, surface completion, installation of all components, and for furnishing all labor and supplies incidental to the work.

#### 1.3.5 ITEM 0005 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0005, All Work for Piezometers, payment of which shall constitute full compensation

for Item No. 0005, complete, including costs for core drilling, vibrating wire pressure transducers of the appropriate range, the appropriate lengths of transducer cable and conduit, bentonite seals, sand, grout, surface completion, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.6 ITEM 0006 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0006, All Work for Inclinometers, payment of which shall constitute full compensation for Item No. 0006, complete, including costs for core drilling, inclinometer casing, grout, the appropriate lengths of inclinometer cable and conduit, surface completion, one portable inclinometer probe and readout box used for reading all inclinometers, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.7 ITEM 0007 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0007, All Work for Load Cells, payment of which shall constitute full compensation for Item No. 0007, complete, including costs for vibrating wire load cells, test bolts, grout, the appropriate lengths of cable and conduit, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.8 ITEM 0008 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0008, All Work for Passive Relief Wells, payment of which shall constitute full compensation for Item No. 0008, complete.

1.3.9 ITEM 0009 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0009, All Work for Dewatering Wells, payment of which shall constitute full compensation for Item No. 0009, complete.

1.3.10 ITEM 0010 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0010, All Overburden Drilling for Grout Curtain Holes, (1, 2 & 4 Stage Holes), payment of which shall constitute full compensation for Item No. 0010, complete.

1.3.11 ITEM 0011 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0011, All Drilling for Grout Holes (1,2 & 4 Stage Holes) payment of which shall constitute full compensation for Item No. 0011, complete.

1.3.12 ITEM 0012 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0012, All Work for Redrilling Grout Curtain Holes (2 Stage Grout Curtains only) payment of which shall constitute full compensation for Item No. 0012, complete.

1.3.13 ITEM 0013 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0013, All Hookups To Grout Holes used in Placement of Cement Grout Curtains, payment of which shall constitute full compensation for Item No. 0013, complete.

1.3.14 ITEM 0014 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0014, All Portland Cement used in Grout Curtains, payment of which shall constitute full compensation for Item No. 0014, complete.

1.3.15 ITEM 0015 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0015, All Bentonite used in Grout Curtains, payment of which shall constitute full compensation for Item No. 0015, complete.

1.3.16 ITEM 0016 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0016, All HRWR Water Reducing Admixture (Anti-Washout Admixture) in Grout Curtains, payment of which shall constitute full compensation for Item No. 0016, complete.

1.3.17 ITEM 0017 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0017, All New Intake Tower Addition Tremie Concrete Below Elevation 1085, payment of which shall constitute full compensation for Item No. 0017, complete.

1.3.18 ITEM 0018 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0018, All 37 Each Vertical 1-3/4" Diameter Bars for New Intake Tower Addition (Plate S8.3), payment of which shall constitute full compensation for Item No. 0018, complete.

1.3.19 ITEM 0019 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0019, All Soldier H-Piles Tie Back for Permanent Retaining Wall, payment of which shall constitute full compensation for Item No. 0019, complete.

1.3.20 ITEM 0020 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0020, All Tie Back Anchors for Permanent Retaining Wall, payment of which shall constitute full compensation for Item No. 0020, complete, including furnishing, installing, grouting, tensioning, and tie off of all permanent tie back anchors, as specified and as approved.

1.3.21 ITEM 0021 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0021, All Common Excavation, Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0021, complete.

1.3.22 ITEM 0022 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0022, All

Rock and Concrete Excavation, Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0022, complete.

1.3.23 ITEM 0023 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0023, All 30' Long Rock Bolts #11, Threaded Bar Grade 150 Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0023, complete.

1.3.24 ITEM 0024 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0024, All 30' Long Rock Bolts, #8 Threaded Bar Grade 75 Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0024, complete.

1.3.25 ITEM 0025 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0025, All 20' Long Rock Bolts, #8 Threaded Bar Grade 75 Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0025, complete.

1.3.26 ITEM 0026 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0026, All 30' Long Weep Holes Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0026, complete.

1.3.27 ITEM 0027 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0027, All 6" Thick Shotcrete, payment of which shall constitute full compensation for Item No. 0027, complete.

1.3.28 ITEM 0028 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0028, All Welded Wire Fabric, Above Elevation 1074, payment of which shall constitute full compensation for Item No. 0028, complete.

1.3.29 ITEM 0029 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0029, All Rock and Concrete Excavation, Below Elevation 1074, payment of which shall constitute full compensation for Item No. 0029, complete.

1.3.30 ITEM 0030 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0030, All 30' Long Rock Bolts #11, Threaded Bar Grade 150 Below Elevation 1074, payment of which shall constitute full compensation for Item No. 0030, complete.

1.3.31 ITEM 0031 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0031, All 30' Long Rock Bolts, #8 Threaded Bar Grade 75 Below Elevation 1074, payment of which shall constitute full compensation for Item No. 0031, complete.

## 1.3.32 ITEM 0032 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0032, All 20' Long Rock Bolts, #8 Threaded Bar Grade 75 Below Elevation 1074, payment of which shall constitute full compensation for Item No. 0032, complete.

## 1.3.33 ITEM 0033 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0033, All 30' Long Weep Holes, Below Elevation 1074, payment of which shall constitute full compensation for Item No. 0033, complete.

## 1.3.34 ITEM 0034 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0034, All Welded Wire Fabric, Below Elevation 1074, payment of which shall constitute full compensation for Item No. 0034, complete.

## 1.3.35 ITEM 0035 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0035, All Work for Cut-Off-Wall (South Shore) 5' into Rock to Elevation 1170', and the Earth Berm Embankment South of the Cofferdam as shown in Section A/C2.5, Sheet 100, payment of which shall constitute full compensation for Item No. 0035, complete.

## 1.3.36 ITEM 0036 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0036, Emergency Mobilization & Demobilization For When Water Elevation Is Above Elevation 1150, payment of which shall constitute full compensation for Item No. 0036, complete.

## 1.3.37 ITEM 0037 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0037, Emergency Mobilization & Demobilization For When Water Elevation Is Above Cofferdam Elevation 1165, payment of which shall constitute full compensation for Item No. 0037, complete.

## 1.3.38 ITEM 0038 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0038, Emergency Mobilization & Demobilization For When Water Elevation Is Above Cofferdam Elevation 1169, payment of which shall constitute full compensation for Item No. 0038, complete.

## 1.3.39 ITEM 0039 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0039, All Work for As-Built Drawings as specified in Section 01702 from preparation to final approval, payment of which shall constitute full compensation for Item No. 0039, complete.

1.3.40 ITEM 0040 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0040, All Grout Curtain Drill Rig Setups (1,2 & 4 Stage Holes), payment of which shall constitute full compensation for Item No. 0040, complete.

1.3.41 ITEM 0041 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0041, All Grout Curtain Exploratory Hole Drilling, payment of which shall constitute full compensation for Item No. 0041, complete.

1.3.42 ITEM 0042 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0042, All Microfine Cement used in Grout Curtains, payment of which shall constitute full compensation for Item No. 0042, complete.

1.3.43 ITEM 0043 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0043, All At South Wall 1-3/4" Diameter Rock Anchors (Shown on S3.9), payment of which shall constitute full compensation for Item No. 0043, complete.

1.3.44 ITEM 0044 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0044, All Extra Cost to increase #11, 30' Long Cement-Grouted Untensioned Rock Bolts Holes into a #11, 40' Long Cement-Grouted Untension Rock Bolts , payment of which shall constitute full compensation for Item No. 0044, complete.

1.3.45 ITEM 0045 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0045, All Unsatisfactory Watertightness Rock Anchor and Cement-Grouted Untensioned Rock Bolts Holes, payment of which shall constitute full compensation for Item No. 0045, complete.

1.3.46 ITEM 0046 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0046, All Work for the Northwest Flood/Retaining Wall Adjacent to the Existing Intake Tower as shown on Plates S6.1 and S6.2, payment of which shall constitute full compensation for Item No. 0046, complete.

1.4 PROGRESS PAYMENT INVOICE

Requests for payment shall be submitted in accordance with Federal Acquisition Regulations (FAR) Subpart 32.9, entitled "PROMPT PAYMENT", and Paragraphs 52.232-5 and 52.232-27, entitled "Payments Under Fixed-Price Construction Contracts", and "Prompt Payment for Construction Contracts", respectively. In addition each request shall be submitted in the number of copies and to the designated billing office as shown in the Contract.

1.3.1 When submitting payment requests, the Contractor shall complete Blocks 1 through 12 of the "PROGRESS PAYMENT INVOICE" Form as directed by the Contracting Officer. (A sample form is attached at the end of this Technical Specification Section.) The completed form shall then become the cover document to which all other support data shall be attached.

1.3.2 One additional copy of the entire request for payment, to include the "PROGRESS PAYMENT INVOICE" cover document, shall be forwarded to a separate address as designated by the Contracting Officer.

1.3.3 The Contractor shall submit with each pay request, a list of subcontractors that have worked during that pay period. The listing shall be broken down into weeks, identifying each subcontractor that has worked during a particular week, and indicate the total number of employees that have worked on site for each subcontractor for each week. The prime Contractor shall also indicate the total number of employees for its on site staff for each week.

PART 2 NOT USED

PART 3 NOT USED

## SECTION 01060

## WATER QUALITY STANDARDS

## PART 1 GENERAL

## 1.1 SCOPE

A. This section summarizes the pertinent surface water and drinking water quality standards relating to public water supply and to surface waters of the State of Washington. The Howard Hanson Dam Reservoir and Green River provide drinking water for the Tacoma Public Utilities and surrounding communities. The regulations and requirements regarding water quality will be strictly enforced.

B. This section also explains the water quality monitoring and management measures which the Contracting Officer uses and which require Contractor's cooperation and compliance.

## 1.2 REFERENCE SPECIFICATIONS

- A. Section 01561, DUST CONTROL.
- B. Section 01563, POLLUTION CONTROL.
- C. Section 01565, CONSTRUCTION SPOILS HANDLING.

## 1.3 WATER QUALITY STANDARDS

## A. Public Water Supply

1. Water from Howard Hanson Dam Reservoir and Green River is used for municipal water supply for over 300,000 people in Pierce County. The source is unfiltered. Extreme care shall be taken by the Contractor to protect water quality during the construction period.

The documents that contain the relevant criteria for Howard Hanson Dam Reservoir and Green River surface water and public water supply quality are:

- a. National Primary Drinking Water Regulations plus amendments promulgated as part of the Safe Drinking Water Act, PL 93-523.
- b. Rules and Regulations of the State Department of Health Regarding Public Water Systems, Revised July 1999, WAC 246-290 Public Water Systems and amendments.
- c. State of Washington Department of Ecology Surface Water Quality Regulations.
- d. Howard Hanson Dam Additional Water Storage Project Phase I - Construction, Water Quality and Supply Protection Plan, June 2002.
- e. Howard Hanson Dam Additional Water Storage Project Phase I -

Construction, Water Quality and Supply Emergency Response Plan for Construction Related Activities, June 2002.

2. The ~~Contracting Officer~~ Contractor shall measure a number of water quality parameters at a variety of locations on an ongoing basis to verify that water quality is maintained. The Contractor shall not cause monitored water quality parameters to exceed acceptable levels. Violation of water quality action limits due to construction activity may result in a shut down of construction until water quality is restored and the source of contamination identified and rectified. The Contractor may be required to take additional measures to protect water quality or mitigate certain construction activities that threaten water quality standards.

3. The standards for which the ~~Contracting Officer~~ Contractor measures, reports, and to which the Contractor must adhere in the Howard Hanson Dam Reservoir and Green River are:

a. A "scheduled window of disturbing activity" will be defined as predetermined construction periods, verified by the Contracting Officer, during which reservoir sediments may be disturbed as a result of construction activity. Such windows shall be limited to 72 hours maximum. During these predetermined "windows" turbidity levels may be exceeded. Outside of "scheduled windows of disturbing activity" turbidity shall not exceed 5 NTU over background when turbidity is <50 NTU. When background turbidity is >50 NTU, turbidity may not exceed 10% greater than background. This applies to all locations in the reservoir impacted by construction or related activities. The Contractor shall take all precautions to limit turbidity to as low as possible regardless of scheduled activities.

b. Fecal coliform shall be less than the geometric average of 50 colonies/100 ml. No more than 10% of samples shall exceed 100 colonies/ml.

c. Temperature shall not exceed 16°C due to construction activities. If natural temperature exceeds 16°C, no temperature increase shall raise receiving water temperature by more than 0.3°C. Incremental increases from point sources shall not exceed  $t = 23/(T + 5)$ ; where t = maximum allowable temperature at mixing zone and T = background temperature.

d. No visible construction related sheens shall be allowed.

e. pH shall remain within the 6.5 to 8.5 range and construction related variation shall be less than 0.2 units.

f. Total dissolved oxygen shall exceed 9.5 mg/L at all times.

g. Aesthetic values must not be impaired by the presence of construction related material that offends sight, smell, touch or taste.

#### 1.4 POINTS OF MEASUREMENT FOR WATER QUALITY COMPLIANCE

A. Seven monitoring locations upstream and downstream of construction have been established by the Contracting Officer to monitor changes caused by construction activity.

B. Surface Water: The point of measurement for surface water quality criteria shall be within an identified mixing zone approximately 200 feet from the point of construction related activity.

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

### 3.1 WATER QUALITY VIOLATIONS RESPONSE MEASURES

A. Ambient water quality levels shall be determined by results of monitoring in upstream areas unaffected by Contractor operations. Actions will be taken by the Contractor and Contracting Officer in response to spills or to any actions that violate water quality standards as described in Sections 01100, ENVIRONMENTAL MANAGEMENT and 01563, POLLUTION CONTROL. If the Contractor's activities result in a violation of the water quality standards, action to stop the violation, including a shutdown of the activity causing the violation, may be taken by the Contracting Officer in accordance with Section 01100, ENVIRONMENTAL MANAGEMENT. The Contracting Officer and Environmental Monitor will ~~make~~ evaluate water quality measurements and review Contractor activity based on those measurements. Contractor shall bear all costs associated with a stop work order due to a water quality violation related to construction activity.

B. In event of any spill, the Contractor shall follow the procedures noted in the Emergency Planning and Response Submittal.

1. The Contractor is expected to respond immediately to notification of potential construction related water quality degradation as directed by the Contracting Officer, Contractor's Environmental Coordinator (see Section 1100) or ~~representative designated by the Contracting Officer~~ Government Environmental Monitor (see Section 1100). Response shall be immediate and the Contractor shall follow the provisions of the Emergency Planning and Response Submittal.

2. In event of a detrimental impact to water quality as defined by the water quality criteria the Contractor shall help determine whether the source of degradation is directly or indirectly construction related. If there is evidence that the failure is construction related, the Contractor shall immediately rectify the problems that caused the failure. The Contractor shall provide immediate response, access to work areas, labor, materials and equipment, and any other items necessary to meet these requirements at no additional cost to the Contracting Officer.

### 3.2 SURFACE WATER TURBIDITY AND pH MEASURES

A. Routine turbidity and pH monitoring ~~will~~ shall be conducted by the ~~Contracting Officer~~ Contractor at upstream, construction zone, and downstream locations. pH monitoring may be increased during tremie concrete activities. Additional turbidity and pH monitoring may be performed by the Contracting Officer or Corps' Environmental Monitor at any time.

B. The Contractor's goal shall be to keep the turbidity of the water entering the Green River from exceeding background turbidity level (i.e.,

no contribution from construction activities). The overall goal shall be to keep turbidity as low as possible at all times.

C. Turbidity levels in the Howard Hanson Dam Reservoir and Green River will be impacted by sources outside of construction. At all times the Contractor shall use best management practices and operational control strategies to minimize turbidity contributions from construction activities. The Contractor shall be subject to shutdown in the event of best management practice failure or construction related turbidity generation outside of approved and scheduled disturbing activity construction windows. These shutdowns will continue until sources of turbidity are located and corrected at no cost to the Contracting Officer.

D. The Government's Environmental Monitor (see Section 01100) shall ~~monitor~~ review turbidity at several locations to determine if in-lake and river turbidity is rising as a result of construction activities.

1. Turbidity shall remain below the specified levels at any location 200 feet from the construction activity or in the Green River. Turbidity may be measured at any depth within the water column.

2. If the turbidity in the Howard Hanson Dam Reservoir continues to increase even after appropriate actions have been taken to eliminate the source of the increase, the Contractor shall stop work on all construction activity causing the violation of standards until the turbidity level is reduced to specified acceptable levels.

### 3.3 WATER QUALITY MONITORING LOCATIONS AND PROCEDURES

A. Water quality monitoring ~~will shall be performed by the Government's Environmental Monitor~~ Contractor's Environmental Coordinator (see Section 01100). Contractor shall cooperate with monitoring activities and shall provide a boat appropriate for, and dedicated to, environmental protection activity and water quality monitoring.

B. Monitoring will consist of a set of parameters that compares water quality upstream, within, and downstream of the construction site. Monitoring locations and frequency will vary depending on the construction activities.

C. If any monitoring indicates an exceedance of any water quality action level, the Contracting Officer may arrange for additional monitoring. Additional monitoring may be performed during critical operations such as clam shelling, excavation, blasting, and cofferdam construction. Contractor shall cooperate with monitoring activities and provide access to necessary construction areas for the Contracting Officer and Environmental Monitor.

D. In event of a petroleum, chemical, or sanitary waste spill, the emergency procedures in the approved Emergency Planning and Response Submittal shall be followed. The Contracting Officer will work with the Environmental Monitor and Contractor's Environmental Coordinator to implement appropriate monitoring.

E. Water from the construction site shall not be discharged or allowed to directly enter the Howard Hanson Dam Reservoir, except as necessary to perform the in-lake construction portions of the project. All water from construction activities must pass through the oil/water separators and enhanced turbid water sedimentation pond facilities as identified on the CONSTRUCTION DRAWINGS.

### 3.4 POTABLE WATER BACTERIOLOGICAL QUALITY PROTECTION MEASURES

- A. Use of temporary sanitation facilities will be required at all work areas. Such facilities must be maintained on a regular basis.
- B. All materials and equipment planned to come in contact with the water supply shall first be cleaned and disinfected by the Contractor.

### 3.5 PETROLEUM AND CHEMICAL CONTROL MEASURES

The Contractor shall implement all measures to prevent introduction of petroleum and chemicals to Howard Hanson Dam Reservoir and the Green River.

### 3.6 WATER SUPPLY OPERATIONS

- A. Construction operations shall be staged and scheduled so that the Tacoma Public Utilities water supply operations are not impacted.
- B. The Contractor shall coordinate with the Contracting Officer and Environmental Monitor to properly schedule and sequence construction activities for no impact on water supply and availability. The Contractor shall work with the Contracting Officer to identify all activities requiring temporary shutdowns of Tacoma Public Utilities water supply facilities and to schedule such events. Such Shutdown, bypass, and/or drawdown operations will require 10 construction days notification for Tacoma Public Utilities to arrange, shall be limited to 72 hours maximum, and will not be possible during certain periods when water supply is critical. Contractor requests for shutdown "windows" shall be limited to 2 per month throughout the contract period. The Contractor shall work within the available times to perform tasks requiring shutdown or bypass of water supply operations.

### 3.7 SURFACE WATER QUALITY MEASURES

- A. The Contractor shall plan and conduct the work in a manner that minimizes the possibility of discharging pollution to surface waters.
- B. The Contracting Officer will coordinate water quality, water releases, fishery, and other environmental concerns and activities during construction. Contractor and Contracting Officer will comply with local, state, and federal permit, reporting, and monitoring requirements.
- C. The Contracting Officer may conduct meetings with interested agencies and parties. These meetings may include site visits. Contractor shall provide access for such site visits and shall participate in meetings as requested by the Contracting Officer.
- D. Clearing for work access and staging areas shall be minimized, and disposal sites shown on the plans shall be utilized. Additional permits and approvals will be required if Contractor proposes use or clearing of areas not shown in the Contract Documents. Contractor shall assume all responsibility for obtaining such permits and approvals, and for any time delays associated with the permitting process.

-- End of Section --

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## SECTION 01061

## ENVIRONMENTAL PROTECTION

## PART 1 GENERAL

## 1.1 SCOPE

This Section covers prevention of environmental pollution and damage as the result of construction operations under this contract. For the purpose of this specification, environmental pollution, and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for esthetic, cultural, and/or historical purposes. The control of environment pollution and damage requires consideration of air, water, and land, and includes management of visual esthetics, noise, and solid waste, as well as other pollutants.

## 1.2 REFERENCE SPECIFICATIONS

Section No.	Section Title
01060	Water Quality Standards
01100	Environmental Management
01560	Diversion and Care of Water
01561	Dust Control
01563	Pollution Control
01565	Construction Spoils Handling

## 1.3 QUALITY CONTROL

The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record any problems in complying with laws, regulations, and ordinances, and corrective action taken.

## 1.3.1 Subcontractors

Assurance of compliance with this Section by subcontractors will be the responsibility of the Contractor.

## 1.4 NOTIFICATION

When the Contracting Officer notifies the Contractor in writing of any observed noncompliance with Federal, state, or local laws, regulations, or permits, the Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or costs or damage allowed to the Contractor for any such suspension.

## 1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications.

Environmental protection shall be as stated in the following subparagraphs:

#### 1.5.1 Protection of Land Resources

The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer except as otherwise specified or indicated. See Paragraph 1.6 for additional requirements relating to protection of trees during excavation in the vicinity of a tree.

#### 1.5.2 Disposal of Garbage

Garbage shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination.

#### 1.5.3 Refuse Disposal and Cleanup

Refuse shall be defined as debris other than such organic materials as brush or tree stumps.

##### 1.5.3.1 Refuse Disposal

The cost of refuse disposal, such as transportation, handling, dumping fees as applicable, and similar cost, shall be included in the contract price. Refuse shall be disposed of off site, in accordance with all local, state, and Federal rules and regulations, at the Contractor's expense.

##### 1.5.3.2 Fire Hazard

Cloths, cotton waste, and other combustible materials that might constitute a fire hazard shall be placed in closed metal containers and placed outside or destroyed at the end of each day. The Contractor shall comply with all Washington Department of Natural Resources (WDNR) industrial fire restrictions, and shall modify or cease work in accordance with changes in fire restriction levels.

#### 1.5.4 Restrictions

The Contractor will not be permitted to deposit refuse in existing garbage cans or refuse dumpsters. Cleaners shall not be poured, drained, or washed into plumbing fixtures or sanitary or storm sewers. Debris, dirt, dust, and stains attributable to or resulting from the work effort shall be removed, cleaned, or effaced by the Contractor to the satisfaction of the Contracting Officer prior to acceptance of the job. Refuse shall not be burned. Burning of vegetation or tree stumps will not be allowed unless the worksite is in an area approved for burning.

#### 1.5.5 Disposal of Chemical or Hazardous Waste

Chemical or hazardous waste shall be stored in corrosion-resistant containers, removed from the work area, and disposed of in accordance with Federal, State, and local regulations.

#### 1.5.6 Disposal of Discarded Materials

Discarded materials, other than those which can be included in the solid waste category, shall be handled as directed.

#### 1.5.7 Protection of Water Resources

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. The Contractor shall perform routine water quality monitoring as designated in section 01060.

#### 1.5.8 Particulates

Dust particles, aerosols, and gaseous byproducts from construction activities, processing, and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and state allowable limits at all times.

#### 1.6 PROTECTION OF TREES DURING EXCAVATION

Care shall be exercised by the contractor when excavating trenches in the vicinity of trees. Where roots are 2 inches in diameter or greater, the trench shall be excavated by hand and tunneled. When large roots are exposed, they shall be wrapped with a heavy burlap for protection and to prevent drying. Trenches dug by machines adjacent to trees having roots less than 2 inches in diameter shall have the sides hand trimmed making a clean cut of the roots. Trenches having exposed tree roots shall be backfilled within 24 hours unless adequately protected by moist burlap or canvas.

#### 1.7 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

#### 1.8 RESTORATION OF LANDSCAPE ~~(VEGETATION SUCH AS TREES, PLANTS, AND GRASS) DAMAGE~~

~~All landscape features (vegetation such as trees, plants, and grass) damaged or destroyed during Contractor operations outside and within the work areas shall be restored to a condition similar to that which existed prior to construction activities unless otherwise indicated on the drawings or in the specifications. This restoration shall be done at no additional cost to the Government. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.~~

~~Trees shall be replaced in kind with a minimum 4 inch caliper nursery stock. Shrubs, vines, and ground cover shall be replaced in kind; size to be approved by the Contracting Officer.~~

~~All plant material shall meet specifications outlined in ANSI Z60.1 current publication, "American Standard for Nursery Stock."~~

Grass areas disturbed near the new retaining wall and the new sedimentation pond shall be replaced in kind by sodding or seeding. Sod shall be required in all regularly maintained lawn areas and shall be installed

~~according to American Sod Producers Association Guideline Specifications to Sodding.~~

Grass seeding shall be installed on a minimum 2-inch topsoil and according to Section 02921 SEEDING. Restoration of landscape such as trees and plants in the staging and stockpile area or the disposal area will not be required.

#### 1.9 STORMWATER PERMIT

1.9.1 The Washington State Department of Ecology requires a storm water discharge permit for construction that involves any soil disturbing activities, such as clearing, grading, excavating and/or demolition that will disturb 1 acre or more of land area AND that will have a discharge of stormwater from the site into surface water(s), or into storm drainage systems that discharge to surface waters. Surface waters include wetlands, ditches, rivers, unnamed creeks, lakes, estuaries, rivers, reservoirs, and marine waters. As required, based on the above, the Contractor shall apply for a construction stormwater general permit from the Department of Ecology. Necessary information for permit requirements and application procedures can be obtained at:

[http://www.ecy.wa.gov/programs/wq/stormwater/construction/cnst\\_prmt\\_fin.pdf](http://www.ecy.wa.gov/programs/wq/stormwater/construction/cnst_prmt_fin.pdf)

1.9.2 If applicable, the Contractor shall provide the Contracting Officer with a copy of the construction stormwater general permit and all necessary supporting documentation required by the permit. This includes a Construction Stormwater Pollution Prevention Plan (SWPPP) designed by qualified personnel. The SWPPP must be approved by Washington State Department of Ecology and by the Contracting Officer prior to construction activities. The objective of the plan is to minimize erosion of disturbed areas during the construction and post construction phases of a project. The Contractor will be required to control all construction operations in strict compliance with the approved SWPPP.

PART 2 NOT USED.

PART 3 NOT USED.

-- End of Section --

## SECTION 01100

## ENVIRONMENTAL MANAGEMENT

## PART 1 GENERAL

## 1.1 SCOPE

This section describes the project on-site management structure relative to environmental protection. The section describes the role, responsibilities, and authority of the Government's Environmental Monitor. Described are environmental submittal requirements, environmental coordination, reporting, and documentation of environmental protection activity. This Section describes requirements for environmental management, which may supplement such provisions of federal, state and local statutes, ordinances and regulations.

## 1.2 GENERAL REQUIREMENTS

The Contractor shall comply with all provisions of federal, state and local statutes, ordinances and regulations pertaining to the prevention of environmental pollution and the preservation of public natural resources.

## 1.3 REFERENCE SPECIFICATIONS

- A. Section 01060, WATER QUALITY STANDARDS
- B. Section 01561, DUST CONTROL
- C. Section 01563, POLLUTION CONTROL
- D. Section 01565, CONSTRUCTION SPOILS HANDLING

## 1.4 SUBMITTALS

## 1.4.1 ENVIRONMENTAL MANAGEMENT SUBMITTALS

The Contractor shall plan and conduct all work in a manner that will prevent environmental pollution and preserve public natural resources within the Green River Watershed. The Contractor shall submit to the Contracting Officer for review and approval an Environmental Management Plan that shall include detailed submittals for:

- Water quality monitoring and water quality maintenance;
- erosion and sediment control;
- diversion and care of water;
- emergency demobilization;
- spill prevention, containment and response;
- pollution control;
- emergency planning and response;
- watercraft preparation and operation;

Descriptions, sketches, and calculations shall be included as appropriate in all submittals. The Contracting Officer will review and return the Environmental Management Plan submittals to the Contractor. Supplements to the Environmental Management Plan addressing new construction activities not included in the initial Environmental Management Plan shall be prepared and submitted to the Contracting Officer for approval. The Contractor will not be permitted to perform any work or conduct any activity within the

Green River Watershed until the Contractor's initial Environmental Management Plan and subsequent supplements have been approved by the Contracting Officer.

#### 1.4.2 ENVIRONMENTAL MANAGEMENT PLAN CONTENTS

1.4.2.1 The contractor shall submit a water quality monitoring and maintenance plan addressing, at a minimum, the following:

- The qualifications of the Contractor's Environmental Coordinator
- Daily schedule for sampling of Fecal coliform bacteria, pH, temperature, Total Dissolved Oxygen, and turbidity at seven sites above and below Howard Hanson Dam, and within 200 feet of the work area. Sampling shall be subject to Howard Hanson Dam intake safety protocols.
- Sampling procedures for the parameters outlined above, including references to standards and practices.
- Data collection, storage, transmission and archiving procedures. These shall, at a minimum, consist of field notes taken on water proof paper, pictures of each sampling location and any unusual conditions observed through out the project, data recording in a computer spreadsheet, weekly transmission of spreadsheets in both hard copy and digital form to the Corps' Environmental Monitor, and transmission of final spreadsheets, sampling logs or books, and pictures to the Contracting Officer.
- The Water Quality submittal shall comply with all directions in section 01060 Water Quality Standards.

1.4.2.2 The Contractor shall submit an Erosion and Sediment Control Submittal addressing, at a minimum, the following:

- How the Contractor intends to construct, inspect, operate, and maintain sediment and erosion control elements.
- Show that all erosion control work is to be completed before any construction disturbance begins in any given area. The Contractor may schedule the erosion control work in phases, providing no construction activity, including truck traffic, occurs in a segment with incomplete erosion control work.
- Methods for sediment and erosion control measures for all work not shown on the Drawings, including:
  - § Additional earthwork proposed by Contractor.
  - § Temporary access or haul roads.
  - § Staging, Contractor's field office, and Contracting Officer's field office.
  - § Material storage areas.
  - § Spoils areas.
- Methods and schedules for operating, inspecting, and maintaining erosion control facilities and equipment.
- The name and 24-hour-a-day phone number and alternate contacts for contractor personnel responsible for operating and maintaining erosion and sediment control facilities.
- Methods for site restoration of the following areas:

- § Work areas.
- § Spoils areas.
- § Office area.
- § Staging and storage areas.

- Shop drawings, samples, and product data.
- Samples of all fabrics.
- Manufacturer's data on all products.
- Include in the submittal facilities not shown on the Drawings that the Contractor requires to accomplish the work. Such facilities include, but are not limited to, staging areas, parking areas, and a cleaning/disinfection area.

1.4.2.2- The Contractor shall submit a Diversion and Care of Water Submittal addressing, at a minimum, the following:

- Drawings showing the location, size, and construction details of water diversion and handling features such as sedimentation ponds, ditches, and sumps.
- Manufacturers' literature on each of the elements described in the submittal showing the equipment.
- Drawings of the designated decontamination and wash down sites indicating the location and size of the facilities and means of water conveyance to the holding tank.
- Description of turbid water conveyance treatment and disposal systems to be used on the project. The system shall meet the criteria noted in this and other sections of the Specifications. The overall goal of these systems is to prevent release of turbid or contaminated water into surface waters. These systems shall include:

- § Source of waters and disposal locations for water and solids;
- § Plans showing method of pumping and system control.
- § Plans showing storage, treatment, and disposal features (tanks and valves).
- § Calculations showing all items meet design criteria.
- § Information on pumps, piping, and fittings showing they meet the design criteria.
- § Description of the activities that will potentially generate turbid water.
- § Proposed methods and details of collection and transmission of turbid water to the settling ponds and dispersal facility.
- § Description of procedures for operating and maintaining turbid water treatment facilities.
- § Procedure for pressure and leak testing of pipe transporting turbid waters.
- § Action Plan for activities in case of turbid water facility damage/failure.

1.4.2.3- The Contractor shall submit an Emergency Demobilization Submittal addressing, at a minimum, the following:

- § Criteria for demobilization.

- § Communication structure of Contracting Officer and Contractor emergency demobilization status.
- § Decision responsibility to demobilize.
- § Sequence of performing demobilization, indicating demobilization activities with high priorities.
- § Handling of construction site water following re-mobilization.
- § Contingency for incomplete demobilization.
- § Interim staging and storage for demobilized equipment.
- § Estimates on the amount of time needed to demobilize based on activities being carried out.
- § Schedule and format of desktop and field demobilization drills.
- § Plans for handling fixed equipment such as crane that may not be able to be removed in an 8-hour period.

1.4.2.4- The Contractor shall submit a Spill Prevention, Containment, and Response Submittal addressing, at a minimum, the following:

- § Location of chemical and petroleum storage and refueling area.
- § List and use of chemicals stored on-site.
- § Drawings of chemical and petroleum storage and refueling area detail.
- § Fueling and chemical/petroleum station layout and construction features.
- § Description of spill prevention best management practices to be implemented by the Contractor.
- § Spill Response Decision Tree for spills on land and in water.
- § Prioritized Notification List for spills on land and in water.
- § Spill Containment Kit contents and locations.
- § Description of Spill Containment Procedures.
- § Land Spill
- § Water Spill
- § Personnel Responsibilities
- § Spill reporting protocol following containment.
- § Spill clean-up product details.

1.4.2.5- The Contractor shall submit a Pollution Control Submittal addressing, at a minimum, the following:

- § Personnel access controls.
- § Vehicle access controls
- § Signage.
- § Mobilization and demobilization controls.
- § Controlling equipment and materials to be in contact with the reservoir.
- § Stationary equipment containment.
- § Disinfection and cleaning procedures.
- § Methods to minimize and preclude tremie concrete from entering the water column.
- § Chemical and petroleum housekeeping measures.
- § Construction rubbish and garbage controls.
- § Sanitary waste controls.
- § Equipment maintenance and refueling controls.
- § Personnel training.
- § Dust control.
- § A list of products and quantities of petroleum/chemical products proposed for use during the work.
- § Material Data Safety Sheets and other relevant environmental documentation for all proposed petroleum/chemical products.
- § Documentation of environmentally acceptable petroleum/chemical

products in processes and equipment wherever possible.

§ List of hydraulic equipment on-site and type of hydraulic fluid used.

§ Method for tracking and monitoring the type and amounts of chemicals stored and used on site.

1.4.2.6- The Contractor shall submit an Emergency Planning and Response Submittal addressing, at a minimum, the following:

§ Description of circumstances under which emergency response will be needed.

§ Signed agreement with the Emergency Response Firm for 24-hour services to address spills or other environmental emergencies.

§ Verification that the contracted firm can address all substances to be used on-site and firm credentials.

§ Description of roles and responsibilities of entities affected by an emergency situation, including the Contractor, emergency response firm, Corps, and TPU.

§ Timing of emergency response firm site visit.

§ Prioritized notification list.

§ Specific responsibilities of on-site personnel during emergency situations.

§ Emergency response decision tree.

§ Schedule of periods critical to TPU's drinking water supply.

1.4.2.7- The Contractor shall submit a Watercraft Preparation and Operation Submittal addressing, at a minimum, the following:

§ Detailed information about proposed watercraft including a photo and prior uses. Watercraft shall not have been previously used in polluted water or sewage.

§ Methods for inspecting, cleaning, and disinfecting watercraft and immersed materials and equipment. Cleaning and disinfection shall be done in the presence of the Environmental Monitor or his representative.

§ Plans for containment on watercraft.

§ Method for removing bilge and other accumulated water on watercraft.

§ Containment trays or methods for all equipment, chemicals, and petroleum on watercraft.

§ List of all motors and equipment to be used on watercraft. Motors for propulsion and equipment on watercraft shall not release any fluids to the water.

§ Methods for launching, loading and landing of all watercraft. The launching and landing methods must minimize disturbance of bottom sediments in order to reduce turbidity.

§ Methods for mooring, anchoring and docking methods and location of oil containment booms.

#### 1.4.3 ENVIRONMENTAL MANAGEMENT PLAN

1.4.3.1 The separate submittal elements of the approved Environmental Management Plan shall be assembled into a working document that shall be readily available for reference during project construction. The approved submittals shall be bound in loose-leaf style in 1-1/2-inch 3-ring notebooks with each submittal clearly indexed. The notebook shall be clearly labeled on the cover and the side as Howard Hanson Dam Fish Passage Facility Project - Environmental Management Plan Volume (volume number required only if more than 1 volume). The Contractor shall provide the Contracting Officer with four copies of the approved Environmental

Management Plan. The Environmental Management Plan working document shall be kept current by inserting supplements including, but not limited to, approved submittals addressing new construction activities, minutes and records of attendance at environmental meetings, reports issued by the Environmental Monitor, and any reports issued by regulatory or permitting agencies.

1.4.3.2 Upon completion of the work the Contractor shall submit four copies of the project final Environmental Management Plan to the Contracting Officer.

#### 1.5 Environmental Monitor

The Contracting Officer will provide an Environmental Monitor tasked with ~~monitoring~~ reviewing environmental management activities and water quality for the Green River Watershed. The Environmental Monitor will ~~monitor~~ review construction activities to verify that the Contractor complies with the environmental management requirements of these Specifications and project submittals. The Environmental Monitor will ~~monitor~~ review Howard Hanson Dam Reservoir and Green River turbidity and other water quality parameters measured by the Contractor to verify that the requirements of these specifications are being met. Monitoring shall also be conducted by the ~~Environmental Monitor~~ Contractor at borrow sites, waste sites, and staging areas to verify environmental protection. The Contractor shall provide access to all areas of its operations and cooperate with the Environmental Monitor in the execution of monitoring operations. The Environmental Monitor is not authorized to direct the Contractor to perform work functions or work site clean up. Presence or absence of the Environmental Monitor shall not relieve the Contractor of its responsibility to maintain environmental protection controls and practices and all provisions of federal, state, and local statutes, ordinances and regulations pertaining to the prevention of environmental pollution and preservation of public natural resources.

#### 1.6 CONTRACTOR'S ENVIRONMENTAL COORDINATOR

The Contractor shall appoint an Environmental Coordinator from the supervisory level of its staff to coordinate environmental matters. This person shall work directly with the Contracting Officer concerning water quality permits and other environmental matters.

#### 1.7 ENVIRONMENTAL COORDINATION

The Contracting Officer, Environmental Monitor, and Contractor's Environmental Coordinator shall attend weekly environmental meetings with personnel responsible for the environmental management at the jobsite. Subcontractors shall also be in attendance at the discretion of the Contracting Officer. Meetings shall be scheduled and conducted by the Contracting Officer. The discussions at such meetings shall include, but not be limited to, the requirements of the Environmental Management Submittals. Records of meeting attendance and meeting minutes shall be kept by the Contractor and submitted to the Contracting Officer within five days following the meeting. Attendance records and minutes shall also be inserted into the Environmental Management Plan working document. The frequency of the environmental meetings may be reduced at the discretion of the Contracting Officer.

#### 1.8 ENVIRONMENTAL EDUCATION

The Contractor shall conduct weekly environmental education meetings with its personnel and subcontractors on the subjects in the Environmental Management Plan. The subjects shall emphasize proper handling of sanitary waste, petroleum products and chemicals and control of turbid waters and pollution. Records of the meetings shall be kept and submitted to the Contracting Officer. All new personnel on the project shall be informed as to the contents of the ENVIRONMENTAL MANAGEMENT PLAN before coming on-site.

The Environmental Monitor may attend the meeting at Monitor's discretion.

#### 1.9 ENVIRONMENTAL REPORTING AND DOCUMENTATION

A. Records will be kept by the Environmental Monitor on Contract compliance and compliance with environmental permits and regulations. These records and reports will be submitted to the agencies issuing permits and other health and resource management agencies. A copy of all reports will be given to the Contractor for insertion into the Environmental Management Plan working document.

B. There will be periodic visits to the jobsite by regulating agencies including, but not limited to, King County Department of Public Health, Washington State Department of Ecology, Department of Fish and Wildlife, and Department of Health. The purpose of these visits is to enable the representatives of these agencies to review jobsite conditions and ensure that applicable regulations are being followed and permit conditions are being fulfilled. The Contracting Officer, Environmental Monitor and, if requested, the Contractor shall participate in these periodic visits. The Environmental Monitor will prepare minutes of visits and provide copies to the Contracting Officer.

PART 2 PRODUCTS Not used.

#### PART 3 EXECUTION

The Contractor shall submit the Environmental Management Plan in its entirety according to the submittal scheduling and timeline requirements of Section 01330 SUBMITTAL PROCEDURES. The Contractor shall execute the Environmental Management Plan.

-- End of Section --

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## SECTION 01501

## CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

## PART 1 GENERAL

## 1.1 AVAILABILITY OF UTILITY SERVICES

1.1.1 The Contractor shall be responsible for providing his or her own water and electricity. Water may be drawn from the reservoir but such water is not regarded as potable. If the contractor intends to use reservoir water for concrete, the ACI provisions on the use of non-potable water shall govern. To ensure water quality, the Contractor shall provide a backflow prevention device, approved by the Contracting Officer, for use in drawing water from the reservoir.

1.1.2 Water can also be obtained from the well shown on the drawings.

## 1.2 SANITARY PROVISIONS

Contractor shall provide sanitary accommodations for the use of employees as may be necessary and shall maintain accommodations approved by the Contracting Officer and shall comply with the requirements and regulations of the State Health Department, County Sanitarian, or other authorities having jurisdiction.

## 1.3 TEMPORARY ELECTRIC WIRING

## 1.3.1 Temporary Power and Lighting

The Contractor shall provide construction power facilities in accordance with the safety requirements of the National Electric Code NFPA No. 70 and the SAFETY AND HEALTH REQUIREMENTS MANUAL EM 385-1-1. The Contractor, or its delegated subcontractor, shall enforce the safety requirements of electrical extensions for the work of subcontractors. Work shall be accomplished by journeyman electricians.

## 1.3.2 Construction Equipment

In addition to the requirements of SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, temporary wiring conductors installed for operation of construction tools and equipment shall be either Type TW or THW contained in metal raceways, or shall be hard usage or extra hard usage multiconductor cord. Temporary wiring shall be secured above the ground or floor in a workmanlike manner and shall not present an obstacle to persons or equipment. Open wiring may only be used outside of buildings, and then only in accordance with the provisions of the National Electric Code.

## 1.3.3 Submittals

Submit detailed drawings of temporary power connections. Drawings shall include, but not be limited to, main disconnect, grounding, service drops, service entrance conductors, feeders, GFCI'S, and all site trailer connections.

## 1.3.4 Phone Facilities

The Government will provide telephone service for the project. The service

will include 3 separate lines for the sole use of the contractor.

#### 1.4 FIRE PROTECTION

During the construction period, the Contractor shall provide fire extinguishers in accordance with the safety requirements of the SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1. The Contractor shall remove the fire extinguishers at the completion of construction.

#### 1.5 STAGING AREA

Contractor will be provided adequate open staging area as directed by the Contracting Officer. Area is unsecured, and Contractor shall make provisions for its own security.

Contractor shall be responsible for keeping staging area, and office area clean and free of weeds and uncontrolled vegetation growth. Weeds shall be removed by pulling or cutting to within 1-inch of ground level. Lawn areas shall be mown to keep growth to less than 2-inches. All loose debris and material subject to being moved by prevailing winds in the area shall be picked up or secured at all times.

If the area is not maintained in a safe and clean condition as defined above the Contracting Officer may have the area cleaned by others with the costs being deducted from the Contractor's payment.

The Contractor may use the area in front of the spillway for staging subject to the following:

A. The Contractor's equipment located in that area must be removed within 8 hours upon forecast of a flood that has the potential to inundate the area. The Contractor's equipment shall be moved to areas above elevation 1,220 ft. and must remain until the Contracting Officer allows re-mobilization to that area as specified in Section 01050 of this document.

B. The Contractor's use of the area allows for unimpeded access for normal operations by the Dam operations personnel.

#### 1.6 HOUSEKEEPING AND CLEANUP

Pursuant to the requirements of Clause CLEANING UP and Clause ACCIDENT PREVENTION, of the CONTRACT CLAUSES, the Contractor shall assign sufficient personnel to ensure compliance. The Contractor shall submit a detailed written plan for implementation of this requirement. The plan will be presented as part of the preconstruction safety plan and will provide for keeping the total construction site, structures, and accessways free of debris and obstructions at all times. Work will not be allowed in those areas that, in the opinion of the Contracting Officer, have unsatisfactory cleanup and housekeeping at the end of the preceding day's normal work shift. At least once each day all areas shall be checked by the Quality Control person of the Contractor and the findings recorded on the Quality Control Daily Report. In addition, the Quality Control person shall take immediate action to ensure compliance with this requirement. Housekeeping and cleanup shall be assigned by the Contractor to specific personnel. The name(s) of the personnel shall be available at the project site.

#### 1.7 PROJECT SIGN

Contractor shall furnish and install one project identification sign and one safety performance sign in accordance with conditions hereinafter specified and layout shown on drawings attached at end of this section, except Corps communication mark will be Government furnished. Corps communication mark shall be secured with galvanized screws. All lettering shall be block type, upper case. Letters shall be painted black on white background using exterior-type paint. Sign shall be maintained in excellent condition throughout life of job. Project sign shall be located as directed. Upon completion of project, sign shall be removed and shall remain the property of Contractor except Corps communication mark will remain property of the Government.

#### 1.8 ELEVATED WORK AREAS

Workers in elevated work areas in excess of 6 feet above an adjoining surface require special safety attention. In addition to the provisions of SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, the following safety measures are required to be submitted to the Contracting Officer's Representative. Prior to commencement of work in elevated work areas, the Contractor shall submit drawings depicting all provisions of his positive fall protection system including, but not limited to, all details of guardrails. If safety belts and harnesses are used, the positive fall protection plan will address fall restraint versus fall arrest. Body belts will ONLY be used for fall restraint, they will not be used for fall arrest.

#### 1.9 CONSTRUCTION COORDINATION MEETINGS

Contractor shall attend a weekly coordination meeting with the Contracting Officer's Representative and representatives of the using service. During the meeting, the Contractor shall be required to present in writing, and discuss his specific construction plans for, the following 2-week period. The first week's schedule shall be firm and the second weeks' schedule may be tentative and subject to change as conditions warrant. The schedule shall be detailed describing planned work activities, crew sizes and locations, and any utility and access restrictions to base activity which may be caused by planned construction. Any scheduling of outages will be performed at this meeting. Any Contractor activity affecting base security needs, such as scattered crews and number of workers per crew, will be detailed in the written schedule and discussed during the meeting. This weekly meeting is in addition to the construction progress charts or network analysis submission requirements.

#### 1.10 TRAFFIC CONTROL

##### 1.10.1 Traffic Control Plan

The Contractor shall submit a Traffic Control Plan for moving traffic through and around the construction zone in a manner that is conducive to the safety of motorists, pedestrians, and workers. This plan shall indicate scheduling, placement, and maintenance of traffic control devices in accordance with the U.S. Department of Transportation, Federal Highway Administration publication, Manual on Uniform Traffic Control Devices. The Contractor shall obtain, in writing from the Contracting Officer, approval of the Traffic Control Plan. The Contractor shall submit his Traffic Control Plan at least 15 working days prior to commencement of street or road work. Excavations shall not remain open for more than 1 working day without approval. The Contractor shall identify by site inspection and indicate on the plan all roads and trails used by military or civilian wheeled and tracked vehicular traffic and, by traffic control devices,

prevent this traffic from entering the construction zone.

#### 1.10.2 Contractor's Vehicles

Contractor's vehicles shall carry proof of insurance at all times and shall be equipped with CB radios (to be tuned to Channel 10). Contractor employee parking will be provided in the designated areas at the TPU Watershed Office. The Contractor is responsible for providing shuttle transportation from the designated parking areas to the work at the dam (approx. 4 miles). Trade vehicles (e.g., pipefitting, electrical truck, etc.) will be permitted on the worksite as needed to perform construction activities. Contractor's trucks shall be preceded by pilot cars while traveling along the access road to the dam site. Pilot cars for lowboys shall be coordinated in advance with the Contracting Officer. Drivers shall report their positions at every mile marker (spaced at approximately half-mile intervals). When two trucks approach one another, the driver of the truck moving toward the project shall pull over, state where he has pulled over, and wait for the other truck to pass until the other truck has passed. Contractor's vehicles shall only park in approved areas in accordance with the parking plan provided by the Contracting Officer.

#### 1.10.3 Bridge and tunnel limitations are as follows:

Access Bridge #79: 4-axle at 160 tons. Width - 16 feet, height - 22 feet.  
Spillway and Tower Bridge: 20-ton, single axle.  
Weyco RR Tunnel: Width - 16 feet, height - 22 feet.

#### 1.11 UTILITIES NOT SHOWN

The Contractor can expect to encounter, within the construction limits of the entire project, utilities not shown on the drawings and not visible as to the date of this contract. If such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer verbally and then in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are removed or relocated as directed, the Contractor shall be entitled to equitable adjustment for any additional work or delay. The types of utilities the Contractor may encounter are waterlines, sewerlines (storm and sanitary), gaslines, fueling lines, steamlines, buried fuel tanks, septic tanks, other buried tanks, communication lines, and powerlines. These utilities may be active or abandoned utilities.

#### 1.12 GOVERNMENT WITNESSING AND SCHEDULING OF TESTING

The Contractor shall notify the Contracting Officer, by serial letter, of dates and agenda of all performance testing of the following systems: mechanical (including fire protection and EMCS), electrical (including fire protection) medical and food service systems a minimum of 10 calendar days prior to start of such testing. In this notification, the Contractor shall certify that all equipment, materials, and personnel necessary to conduct such testing will be available on the scheduled date and that the systems have been prechecked by him and are ready for performance and/or acceptance testing. Contractor shall also confirm that all operations and maintenance manuals have been submitted and approved. NO PERFORMANCE AND/OR ACCEPTANCE TESTING WILL BE PERMITTED UNTIL THE OPERATIONS AND MAINTENANCE MANUALS HAVE BEEN APPROVED.

Government personnel, at the option of the Government, will travel to the site to witness testing. If the testing must be postponed or canceled for

whatever reason not the fault of the government, the Contractor shall provide the Government not less than 3 working days advance notice (notice may be faxed) of this postponement or cancellation. Should this 3 working day notice not be given, the Contractor shall reimburse the Government for any and all out of pocket expenses incurred for making arrangements to witness such testing including, but not limited to airline, rental car, meal, and lodging expenses. Should testing be conducted, but fail and have to be rescheduled for any reason not the fault of the Government, the Contractor shall similarly reimburse the Government for all expenses incurred.

#### 1.13 HARD HAT SIGNS

The Contractor shall provide 24 by 24 inch square Hard Hat Area signs at each entry to the project or work area as directed by the Contracting Officer. A minimum of two signs will be required. Signs shall be in accordance with the sketch at the end of this section.

#### 1.14 CONTRACTOR'S FIELD OFFICE TRAILERFIELD OFFICE TRAILER

~~The Contractor will be allowed to use the area adjacent to and on the north and west of the existing administration building (referred to as the "Project Office" on plate C1.2 of the contract drawings) to locate a field office trailer or trailers. The Contractor is required to coordinate the location with the Contracting Officer and provide for safety of the trailers in the required contract traffic control plan. The Contractor shall furnish a trailer, containing not less than 600 square feet, in a location designated by and for the use of the Contracting Officer. The trailer shall be furnished with two desks. One desk shall be 5 feet long by 3 feet wide, with a side drawer and a center drawer that can be locked. The second desk shall be 3 feet by 4 feet minimum, suitable for laying out full scale contract plans. Two chairs and one stool shall be furnished. A wall locker shall be furnished which is suitable for hanging coats and rain gear and as general storage. It shall be 60 inches to 72 inches high, 18 inches to 24 inches wide, and 18 inches deep (minimum). The building shall have two windows and shall have a door with a lock set with two keys. Each window shall have not less than 6 square feet of glass area, and the door shall be 2 feet, 8 inches wide by 6 feet, 8 inches high. Contractor shall provide a ten pound, multipurpose, dry chemical fire extinguisher, rated for type A, B, and C fires. Extinguisher shall be mounted at a strategic location, coordinated with the Contracting Officer. The Contractor shall furnish and maintain adequate electric lights and wall outlets, heat, air conditioning, and drinking water for the building, and shall perform any necessary maintenance and disposal of waste to the building. Drinking water shall be either supplied and maintained daily in insulated water can or be provided via piping to an indoor sink. Suitable enclosed sanitary toilet and lavatory facilities shall be furnished in the immediate vicinity of the building and kept clean by the Contractor. Contractor shall be responsible for installing all utility hookups, tie downs, skirting, slabs, foundations, steps and landings as necessary to meet all local, county, state and federal codes and regulations. The trailer will remain property of the Contractor and shall be removed from the site upon completion of the project.~~

#### 1.15 WATER QUALITY TRAILER

The Contractor shall furnish a smaller trailer, containing not less than 600 square feet, in a location designated by and for the use of the Contracting Officer for Water Quality verification work. The trailer shall

be furnished a desk 5 feet long by 3 feet wide, with a side drawer and a center drawer that can be locked. A work table with two chairs and one stool shall also be furnished. A wall locker shall be furnished which is suitable for hanging coats and rain gear and as general storage. It shall be 60 inches to 72 inches high, 18 inches to 24 inches wide, and 18 inches deep (minimum). The building shall have a door with a lock set with two keys. The building shall feature at least one window with not less than 6 square feet of glass area. The door shall be 2 feet, 8 inches wide by 6 feet, 8 inches high. Contractor shall provide a ten pound, multipurpose, dry chemical fire extinguisher, rated for type A, B, and C fires. Extinguisher shall be mounted at a strategic location, coordinated with the Contracting Officer. The Contractor shall furnish and maintain adequate electric lights and wall outlets, heat, air-conditioning, and drinking water for the building, and shall perform any necessary maintenance and disposal of waste to the building. Drinking water shall be either supplied and maintained daily in insulated water can or be provided via piping to an indoor sink. Suitable enclosed sanitary toilet and lavatory facilities shall be furnished in the immediate vicinity of the building and kept clean by the Contractor. Contractor shall be responsible for installing all utility hookups, tie downs, skirting, slabs, foundations, steps and landings as necessary to meet all local, county, state and federal codes and regulations. The trailer will remain property of the Contractor and shall be removed from the site upon completion of the project.

PART 2 (NOT APPLICABLE)

PART 3 (NOT APPLICABLE)

## SECTION 01560

## DIVERSION AND CARE OF WATER

## PART 1 GENERAL

## 1.1 SCOPE

The Howard Hanson Dam Reservoir stores water for use by over 300,000 people in the south Puget Sound region. It is of vital importance to protect the reservoir from contamination. This section describes the requirements for the diversion, collection, and conveyance of waters generated by construction processes, seepage, dewatering, precipitation or any other controllable waters falling onto or diverted around the construction site or waste and spoils area.

## 1.2 GENERAL REQUIREMENTS

1.2.1 The Contractor shall be responsible to supply, install, operate, maintain, and relocate or move as construction progresses, all equipment (including all portable pumps, generators, piping, valves, supports and appurtenances as required) for the complete conveyance and handling of all water from dewatering wells, seepage wells, static wells, surface water runoff from disturbed and non-disturbed areas as indicated in the construction Drawings in accordance with these Specifications.

1.2.2 The Contractor shall provide on-going maintenance and operation of water diversion systems until such time that construction of the Fish Passage Facility in the excavated areas of this contract begins (Phase 2 construction). Phase 2 construction will commence within 60 days of the scheduled completion date of the contract associated with this document.

## 1.3 SUBMITTALS

1.3.1 Prior to performing any work, the Contractor shall submit a Diversion and Care of Water Submittal as specified in Section 01061, ENVIRONMENTAL PROTECTION.

1.3.2 Any diversion systems the Contractor may add that are not shown on the drawings shall be designed, submitted for approval, installed, and tested using the criteria noted in this section. The Contractor shall obtain approval from the Contracting Officer of plans, installation tests, and ongoing performance.

## 1.4 CLEAN WATER SYSTEMS

The Contractor shall, when possible, capture and divert stormwater prior to contact with a disturbed construction area. Stormwater from undisturbed areas and dewatering water from dewatering wells shall be collected and discharged to the Green River and the reservoir at locations identified on the drawings. If at any time the Contractor is unable to control stormwater and dewatering water prior to contact with a disturbed area that water shall be treated as turbid water and conveyed to the sedimentation pond until such time that Contracting Officer approved diversion can be installed.

## 1.5 TURBID WATER SYSTEMS

1.5.1 Turbid water shall be defined as any water that through rain, snow, or seepage comes in contact with a disturbed construction area.

1.5.2 All stormwater and seepage water that cannot be diverted around the construction site shall be captured and conveyed to the sedimentation pond prior to discharge to the reservoir per the drawings.

1.5.3 A Civil Engineer licensed in the State of Washington shall design the turbid water conveyance, settling, and discharge systems. Sedimentation ponds shall conform to design criteria listed in this section. Submittals of sedimentation pond design shall include stamped calculations and drawings. The Contracting Officer shall review and approve all submittals from the Contractor.

1.5.4 All materials used in the portions of the turbid water systems that will or may reasonably come in contact with water draining to the reservoir shall be new and approved by the NSF, FDA, and/or UL for contact with potable water. All equipment and construction materials coming in contact with the reservoir shall be disinfected in accordance with Section 01061, ENVIRONMENTAL PROTECTION.

### 1.5.5 Design Criteria:

1.5.5.1 All turbid water systems shall be designed to protect water quality. All systems shall be subject to approval by the Contracting Officer.

1.5.5.2 Dispersion and erosion control shall be provided at water release points sufficient to ensure the force and velocity of flow does not cause erosion.

1.5.5.3 The conceptual design of the sedimentation pond is shown on the Drawings. Final design will be provided by the Contractor and included in the Diversion and Care of Water Submittal as described in Section 01061 - ENVIRONMENTAL PROTECTION for approval by the Contracting Officer. The Contractor's final design shall be stamped by a State of Washington licensed professional engineer and meet, at a minimum, the following design criteria:

- a. Parallel oil water separators at the inlet.
- b. Inlet energy dissipation.
- c. Surface oil absorbent booms.
- d. Primary outlets and emergency spillways per the King County Surface Water Manual.
- e. Capability to handle storm flows for a 6-year return storm per the Drawings.
- f. A minimum surface area of 7,500 ft<sup>2</sup> measured at outlet riser.
- g. A minimum total depth of seven feet.
- h. A minimum length:width ratio of 3:1 and a maximum of 6:1.
- i. The spillways shall convey, at a minimum twice the maximum pumped flow rate with 1 foot of freeboard.
- j. The Pond #1 spillway shall discharge to Pond #2; no external discharge from Pond #1 shall be allowed.
- k. A minimum riser pipe diameter of 42 inches.
- l. Maximum discharge velocity measured at the diffuser pipe outfall shall not exceed 2.0 ft/sec.

1.5.5.4 The conveyance system shall have sufficient capacity, to carry all identified turbid flows to the disposal area(s). The pump(s) shall be capable of running with flows much less than its design capacity for long periods of time.

1.5.5.5 The conveyance system shall be installed as an element of mobilization and shall be activated prior to any disturbing activity.

#### 1.5.6 Testing and Maintenance of Systems:

The Contracting Officer shall observe initial testing of all turbid water systems with non-turbid water. Water may be obtained from the reservoir for this purpose. The Contractor shall not be allowed to proceed until these systems operate to the satisfaction of the Contracting Officer. In the event of system failure or malfunction, the Contracting Officer may issue a stop work order for all work that depends on proper functioning of the failed system. Repairs shall be made at no additional cost to the Contracting Officer.

### 1.6 PROCESS WATER HANDLING OUTSIDE OF CONSTRUCTION AREA

1.6.1 Equipment washdown and decontamination operations ~~will~~ shall take place at a location downstream of the of the water supply intake pipe near the Headworks gate as identified in the drawings by the Contracting Officer.

Coordinate with Tacoma Public Utilities (TPU) for a TPU representative to be present for all such decontamination operations. Wastewater from these processes shall be collected at the washdown and decontamination areas and conveyed to the appropriate temporary holding tanks for eventual off-site disposal.

1.6.2 The Contractor may conduct equipment washdown at an off-site location. Inspection and disinfection of all equipment shall occur immediately prior to entrance to the watershed.

## PART 2 PRODUCTS

### 2.1 PORTABLE PUMPS, HOSE, AND PIPING

Portable pumps shall be of sufficient capacity and head to meet anticipated flows and pressure requirements. All hose, piping and appurtenances shall meet pressure requirements and be sized to allow for flow velocity within its capability. Hoses shall be free from leaks. Engine driven pumps shall meet the containment and fueling requirements of Section 01061, ENVIRONMENTAL PROTECTION. Submersible pumps, hose, pipe, and fittings immersed in water leading to or in the reservoir shall meet the requirements of Section 01061, ENVIRONMENTAL PROTECTION, regarding prior use, cleaning, and disinfection.

## PART 3 EXECUTION

### 3.1 WATER HANDLING COLLECTION

The Contractor shall install, maintain and operate the facilities required to collect and convey stormwater, process water, dewatering discharge, seepage and all other dewatering systems within the work limits to the sediment treatment facilities or direct discharge locations as shown on the project drawings.

### 3.1.1 Dewatering Water

Systems for dewatering shall have the capability of operating continuously without interruption at their full discharge capacity for required periods to fully protect the work from flooding and to prevent discharge of turbid or polluted water.

### 3.1.2 Stormwater and Seepage

Ditches, swales, berms, sand bag walls, sumps, pumps and other means shall be employed to collect all stormwater and seepage and convey it from the construction area as shown on the Drawings. All stormwater and seepage water in contact with disturbed areas shall be piped to the sedimentation pond per the Drawings. Silt fences and straw bale check dams shall be used in conjunction with ditches, swales and berms. Alternate methods designed by the Contractor and approved by the Contracting Officer may be used to direct runoff if soil conditions, topography or other physical constraint prevents the use of methods shown on the Drawings.

### 3.1.3 Process Water

All waters originating from sources other than precipitation, snowmelt, or seepage and used for purposes including, but not limited to, disinfection, washdown, bilge, etc. shall be properly contained in a temporary storage tank and transported off-site for proper legal disposal.

## 3.2 SEDIMENTATION TREATMENT FACILITIES

All stormwater and seepage water in contact with disturbed construction areas shall be collected, conveyed to, and treated in, a sedimentation pond before discharge to the reservoir.

## 3.3 DISPERSAL SYSTEMS

The Contractor shall install, operate, and maintain the sediment pond dispersal system according to design criteria.

## 3.4 TURBID WATER TREATMENT FACILITY OPERATIONS

The Contractor will be responsible for constructing, operating and maintaining the turbid water sedimentation pond treatment facility as required to meet water quality regulations until such time that operation is taken over by the Contracting Officer. The facility shall include all piping, vaults, excavations, structures, etc. to convey, treat, and provide detention for all turbid water generated by the construction activities of the project.

## 3.5 CATCH BASINS

Catch basins shall be installed as indicated in the project drawings and shall be a Type 1, 1L, or 1P catch basin as required per Standard Plan B-1, B-1a, or B-1b, as noted in WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition).

## 3.6 PRESSURE PIPE

Piping to be used for conveying the turbid water to the sedimentation pond shall be designed by the Contractor and approved by the Contracting Officer.

### 3.7 NONPRESSURE PIPE

Piping layouts and details shall be submitted to Engineer for review and approval. The pipe shall be adequately restrained to prevent movement or damage due to pressure surges, water hammer or any other force on or in the pipe. The pipe shall be protected from damage by the construction equipment.

### 3.8 PIPING DEMOBILIZATION

All pressure and non-pressure piping will be flushed to remove sediment and drained to sediment pond prior to demobilization.

### 3.9 ELECTRICAL POWER

The Contractor shall supply a reliable source of electrical power for all facilities requiring such power. Backup power supply is required for the turbid water conveyance and treatment facilities. Distribution of power will be in accordance with all applicable codes.

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## SECTION 01563

## POLLUTION CONTROL

## PART 1 GENERAL

## 1.1 SCOPE

This section describes the work required to control water pollution caused by construction activities.

## 1.2 REFERENCE SPECIFICATIONS

- A. Section 01050, EMERGENCY DEMOBILIZATION
- B. Section 01100, ENVIRONMENTAL MANAGEMENT
- C. Section 01561, DUST CONTROL
- D. Section 01565, CONSTRUCTION SPOILS HANDLING
- E. Section 13202, FUEL STORAGE SYSTEMS

## 1.3 SUBMITTALS

The Contractor will submit, for approval by the Contracting Officer, submittals addressing:

- Pollution Control
- Spill Prevention, Containment, and Response
- Emergency Planning and Response
- Watercraft Preparation and Use

The minimum requirements for these submittals are outlined in Section 01100 - ENVIRONMENTAL MANAGEMENT.

## 1.4 PROJECT CONDITIONS

The Contractor shall maintain pollution control systems throughout the life of the contract including during periods when construction activities are reduced or shutdown. During the life of the contract the Contractor shall comply with all provisions of federal, state and local statutes, ordinances and regulations pertaining to the prevention of environmental pollution and the preservation of public natural resources.

## PART 2 PRODUCTS

## 2.1 OIL SPILL CLEANUP KIT

The Contractor shall at all times maintain two emergency spill clean-up kits on site. The kits shall be secured and identified as "emergency use" only. Each oil spill cleanup kit shall contain the following items as a minimum:

- a. Twelve medium weight metal fence posts, 6 feet long

- b. 100 Feet of 1/4-inch rope for anchoring booms
- c. Two axes
- d. Two hammers
- e. Two shovels
- f. Two screened pitchforks
- g. Two 6-Volt flashlights including extra batteries
- h. 200 Feet of portable oil containment boom
- i. 200 Feet of oil absorbent boom
- j. Five 5-Gallon empty containers with lids
- k. Two pair of cotton work gloves
- l. 40 Feet of 1/4-inch mesh screen, minimum 3 feet high
- m. A minimum of 100 oil absorbent pads
- n. 25 Plastic garbage bags
- o. A map of the drainage area
- p. A copy of the Emergency Response Plan with notification procedures and telephone

## 2.2 OIL ABSORBING MATERIALS

### 2.2.1 GENERAL

Oil absorbing products shall be oleophilic and hydrophobic, constructed of blown polypropylene fibrous material meeting the requirements described below and shall be 3M Brand Oil Sorbent as manufactured by Occupational Health and Safety Products Division/3M, St. Paul, Minnesota or equal.

### 2.2.2 PHYSICAL PROPERTIES

Property	Test Method	Value
Mildew	MIL-I-631 Section 3.5.7	Mildew and rot resistant
Temperature Range		Performance unaffected between 20° F and 150° F
Humidity		Performance unaffected by 100% relative humidity at 100° F for 25 days
Flammability	ASTM D2859 ASTM D1929	Resistant to flammability. Shall not autoignite at temperature below 650° F
Oil Absorption	MIL-S-28600 Section 4.4.3	Absorb 20-30 times its weight in oil depending on the grade and time exposed
Water Repellency	MIL-S-28600 Section 4.4.3	Less than 0.5 grams water /gram Absorbent

### 2.2.3 OTHER PROPERTIES

Oil absorbing materials shall have sufficient strength to allow them to be secured and remain in position for the applications shown. The materials shall be reusable and shall not have any irritating or toxic effects on personnel which handle the material. The Contractor shall supply oil absorbing materials in the form of sheets, rolls, sweeps, pillows or booms as required for effective control of spilled oil at the various project

locations.

#### 2.2.4 TYPES OF OIL ABSORBING MATERIALS

##### 2.2.4.1 Oil Absorbent Pads

The oil absorbent pads shall be sorbent sheets approximately 18 inches by 18 inches by 3/8-inch thick. Pads shall be easy to apply, retrieve, and shall be reusable. They shall be new 3M Brand, Model No. T-1 56 or equal.

##### 2.2.4.2 Oil Absorbent Booms

The oil absorbent boom shall come in minimum 10-foot sections and be at least 5 inches in diameter. Boom shall be constructed of oil absorbing material contained in an open mesh skin. The ends shall be constructed to allow easy attachment of one boom to another to form longer booms or for anchoring. The boom shall be 3M Brand Model T-270 Sorbent Booms or equal.

#### 2.3 BOAT AND MOTOR

The Contractor shall provide a boat dedicated for use on environmental actions and monitoring. Minimum boat length shall be 14 feet. The boat shall be washed down, decontaminated, and inspected by a representative of Tacoma Public Utilities prior to use in the reservoir. The boat shall be equipped with a minimum 9-hp, 4-cycle gasoline powered motor, oars, and Coast Guard approved life jackets and other safety equipment as required by the appropriate regulatory agencies. The boat shall be rigid hull, fiberglass or aluminum, and shall be stored in the reservoir within an oil containment boom. The motor well shall be plugged such that it does not drain outside the boat and shall always contain oil-absorbing pads while operating in water. Bilge pumps shall not discharge into reservoir.

#### 2.4 RESERVOIR OIL CONTAINMENT BOOM

The oil containment booms shall be used to contain oil slicks on surface waters as shown in the project Drawings. The boom shall be high visibility yellow, heavy-duty, vinyl or plastic coated polyester or nylon fabric (minimum weight 22 oz/sq. yd.) and be resistant to ripping, tearing, abrasion, weather, oils, and chemicals. It shall be designed for use in water. It shall have 12-inch flotation with a minimum 24-inch skirt. Minimum length per section shall be 50 feet. Boom sections shall be provided with connections to allow quick, secure, coupling which will not allow oil to pass through. Ballast shall be provided and shall be secured to the bottom edge of the boom. The fabric shall have a minimum tongue tear strength of 150 pounds per inch and a minimum grab tensile strength of 500 pounds per inch. The reservoir oil containment boom shall meet the requirements specified and shall be Action Petroleum Standard Oil Boom Model AP3601 or equal.

#### 2.5 EMERGENCY SPILL KIT OIL CONTAINMENT BOOM

The emergency spill kit oil containment boom shall meet the requirements specified below and shall be Action Petroleum Spill Recovery Standard Oil Boom Model AP10 or equal. Minimum requirements include:

Boom Tensile Strength	5,000 pounds
Fabric Weight	22 ounces
Fabric Tensile Strength	5,000 pounds
Fabric Tongue Tear Strength	150 pounds

Buoy Ratio	3.25
Flotation	Air or Foam
Height	10 inches
Float diameter	4 inches
Skirt Length	6 inches
Ballast Chain	¼ inch

## 2.6 SPECIAL MESSAGE SIGNS

Special message signs shall be constructed as shown on the Drawings. The signs shall be of medium or high-density plywood with exterior glue, and shall conform to Section 9-28.5 of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) (latest edition). Paint shall be enamel compatible with the environment and the length of the project and shall conform to the requirements of Section 9-28.5 of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) (latest edition). Wood support posts shall conform to Section 9-28.15(2) of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) (latest edition).

## 2.7 REFUELING AND CHEMICAL/PETROLEUM STORAGE AREAS

A. The refueling and chemical/petroleum storage area shall be sized, designed, constructed, and maintained by the Contractor in accordance with those minimum requirements, dimensions, and design elements as indicated in the project Drawings.

B. Refueling and chemical/petroleum storage area shall be located as indicated on the project Drawings proposed within the general project area by the Contractor subject to approval of the Contracting Officer. If the Contractor proposes to use areas not shown as work limits in this contract, he shall provide documentation of the rights acquired to use the property from pertinent landowners, including the City of Tacoma. Liner materials shall be installed as indicated on the project Drawings. All edges shall be keyed into the earth and containment berms shall be continuous around the complete perimeter of the containment portion of the storage area.

## 2.8 LINER MATERIALS

### 2.8.1 Impermeable Liner

Impermeable liners for containment areas shall be a material meeting the minimum physical properties listed below and rated by the manufacturer and supplier for containing all chemical or petroleum products being contained. Liner shall also be suitable for exposed use with weathering and UV resistance provided. For containment of only petroleum products the liner material shall be 36-mil Coolguard HR, Tripolymer Alloy/Elvaloy, or other approved equal impermeable material. Contractor may wish to provide a heavier material and provide cover to protect the liner from weathering and UV exposure to limit required maintenance during the project. The liner shall not be degradable by the petroleum/chemical substances used by the Contractor and that will maintain its integrity due to abrasion.

### 2.8.2 Liner Protection

1. Liners placed in truck or equipment access pathways of the refueling and chemical/petroleum storage areas shall be protected above and below as follows:

- a. Roll smooth and compact subgrade to 95% maximum density per WSDOT

Standard Plans for Road, Bridge and Municipal Construction, (latest edition), Section 2-03.3(14)D. Remove all sharp objects, sticks, debris. Install a single layer need punched GCL "Bentomat DN" by CETCO or equal. Install single layer of 30 mil PVC liner, "Enviro Liner", by Layfield or approved equal followed above by 16 oz non-woven geotextile, "MIRIFY 1600" by TC Nicolon or approved equal. Cover geotextile with an 8" layer of 2" minus angular rock.

2. Liners not in truck or equipment access pathway shall be 2 layers of 30mil PVC liner, "Enviro Liner", by Layfield or approved equal. All penetrations shall be sealed and all pipe openings shall be made with a boot sized for the pipe opening and sealed to the liner material. Sand bag hold downs may used as ballast to hold liner in place.

3. Foot traffic or container storage areas shall be constructed with a minimum 4" layer of 5/8" minus crushed rock with a wood planking walkway or 3/4" plywood covering constructed over the crushed rock to protect liner integrity

2.8.3 Contractor shall immediately repair all punctures, abrasions, tears, or any other damage due to use or aging of the liner to the satisfaction of the Contracting Officer at no additional cost to the Contracting Officer throughout the life of the construction contract. PVC Liner Minimum Physical properties:

Typical Property	Test Method	30 mil
Gauge (nominal)	-----	30
Thickness (mils)	ASTM D1593	28.5
Specific Gravity	ASTM D792	1.2
Tensile Properties	ASTM D882	
Break Strength, lbs/in.	Method A (MD & TD)	73
Elongation at Break %	Method A (MD & TD)	350
Modulus at 100%	Method A (MD & TD)	34
Tear Resistance, lbs/in.	ASTM D1004, Die C	8.5
Low Temp, pass	ASTM D1790	-29C
Dimensional Stability	ASTM D1204 (MD&TD)	3
Water Extraction	ASTM D3083	0.15
Volatile Loss	ASTM D1203 (A)	0.7
Resistance to Soil Burial	ASTM D3083	
Breaking Factor		5%
Elongation at Break		20%
100% Modulus		20%
Water Vapor Transmission	ASTM D814, max	5.0 X 10 <sup>-9</sup> cm/sec
Hydrostatic Resistance, lbs/in <sup>2</sup>	ASTM D751 (A)	100

Minimum Specifications for Factory Fabricated Seams:

Peel Strength, lbs/in.	15
Shear Strength, lbs/in.	58.4

## 2.9 CATCH BASINS

Catch basins shall be installed as indicated in the project drawings and shall be a Type 1, 1L, or 1P catch basin as required per Standard Plan B-1, B-1a, or B-1b, as noted in WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition).

## 2.10 BACKFLOW PREVENTERS

Backflow preventers assemblies shall be approved by the Washington State Department of Health.

## 2.11 DISINFECTION AND CLEANING AREA

The Contractor shall build the Disinfection and cleaning area at the location shown on the drawings.

A. The construction of the truck and equipment access pathway through the disinfection wash-down area shall be similar to the refueling and chemical/petroleum storage area access.

B. Liners placed in truck or equipment access pathways of the refueling and chemical/petroleum storage areas shall be protected above and below as follows:

1. Roll smooth and compact subgrade to 95% maximum density per WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition), Section 2-03.3(14)D. Remove all sharp objects, sticks, debris. Install a single layer needle punched GCL "Bentomat DN" by CETCO or equal. Install single layer of 30mil PVC liner, "Enviro Liner", by Layfield or approved equal followed above by 16oz non-woven geotextile, "Mirify 1600" by TC Nicolon or approved equal. Cover geotextile with an 8" layer of 2" minus angular rock.
2. Liners not in truck or equipment access pathway shall be 2 layers of 30mil PVC liner, "Enviro Liner", by Layfield or approved equal. All penetrations shall be sealed and all pipe openings shall be made with a boot sized for the pipe opening and sealed to the liner material. Sand bag hold downs may used as ballast to hold liner in place.
3. Catch basins shall be installed as indicated in the project drawings and shall be a Type 1, 1L, or 1P catch basin as required per Standard Plan B-1, B-1a, or B-1b, as noted in WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition).

## 2.12 DECONTAMINATION EQUIPMENT AND SUPPLIES

~~Equipment cleaning may be conducted off site at the Contractor's discretion. Off site cleaning will be subject to verification prior to entering the watershed. All disinfection of equipment shall be conducted at a nearby location as identified by the Contracting Officer.~~

Decontamination of construction materials, boats, and equipment entering the reservoir shall require the following items:

1. Pressure washer having a minimum pressure of 2,000 pounds per square inch.
2. Steam cleaner.
3. Pressurized tank sprayer or spray bottle suitable for chlorine application.
4. Chlorine bleach.
5. Biodegradable soap (for equipment and materials that would be

damaged by chlorine).

6. Rubber boots.
7. Splash suit or full waterproof rain gear.
8. Rubber gloves and duct tape.
9. Goggles.
10. Chlorine dip tank (for small equipment and materials).
11. Washdown pad with drain to wastewater holding tank (for large equipment and materials as shown on the Drawings).
12. Sodium thiosulfate or ascorbic acid or other dechlorinating chemical (for chlorine neutralization).
13. Field test kit for total residual chlorine.
14. Process water source

### 2.13 SMALL EQUIPMENT CONTAINMENT

All motorized, portable, stand alone, or stationary equipment shall have completely liquid tight, self supporting, containment pans placed under the equipment. The containment pan shall be sized to hold 110% of the volume of all fuels, oils, and liquids contained within the equipment. The equipment pan shall be accessible for easy monitoring and shall have a low point to facilitate the pumping or removal of contaminated liquids. All leaks, spills, accumulated storm water, or liquids shall be immediately removed from the containment pan and transferred off-site for proper disposal by the contractor.

## PART 3 EXECUTION

### 3.1 GENERAL

A. The Contractor shall take all necessary precautions to assure that sediment, debris, petroleum products, chemicals or other contaminants will not enter the Eagle Gorge Reservoir or the Green River which is Tacoma Public Utilities public water supply and a valuable fishery resource. Acceptable levels of contaminants for the work shall be as specified under the rules and regulations of the State of Washington Administrative Code (WAC), the Water Quality Standards specified in Section 01060, or as required by the permits or agreements with all federal, state, and local agencies for this project.

B. Construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris and other objectionable pollutants and wastes into streams, rivers, lakes, and flowing or dry watercourses. Such pollutants and wastes include, but are not restricted to, refuse, earth and earth products, garbage, cement, concrete, sewage effluent, & industrial waste, radioactive substances, mercury, oil and other petroleum products, aggregate processing tailings, mulching products, mineral salts, and thermal pollution. In addition to the Water Quality Standards specified herein, the Contractor shall comply with the requirement and water quality criteria of WAC Chapter 173-201 for Class A water use. All pollutants and all waste and sludge from the sedimentation and treatment facilities shall be disposed of in an approved manner and at legal disposal sites. The Contractor shall secure legal disposal sites.

C. Chemical emulsifiers, dispersants, coagulants or other cleanup compounds shall not be used without prior written approval. Contaminated soil and vegetation resulting from accidental spills shall be excavated and removed immediately to a legal disposal site.

D. Concrete preparation and placement activities shall not cause the pH of surface waters to violate water quality standards. Runoff from concrete preparation areas shall be controlled and routed to the wastewater treatment system or other approved system. The pH levels of wastewater discharge to the forest floor shall be within the range of 6.0 to 9.0. Treatment shall be provided as needed to maintain these levels.

E. Petroleum and chemical containment areas shall be designed consistent with design criteria in General Notes as shown on the Project Drawing. The Contractor may design such facilities for more adverse conditions at its discretion and expense. Damage to such facilities, which results from acts of nature beyond the reference criteria, shall be immediately repaired. The cost of such repairs shall be by Force Account as specified in Division 1 - General Terms and Conditions.

F. Domestic animals will not be allowed on the project site or in vehicles in the watershed.

G. Fishing or swimming will not be allowed in the Green River or the Eagle Gorge Reservoir or other surface waters. The Contractor shall dismiss any worker violating this rule.

H. Workboats and barges shall be operated in a manner to minimize wake and waves washing against the shoreline. Care in shallow areas shall be exercised to minimize disturbances of bottom sediments with prop wash or boat maneuvers.

I. The Contractor shall take all necessary precautions to assure that all equipment and materials (permanent or temporary) used in the reservoir are decontaminated according to the procedures outlined in this Specification.

J. Washing or flushing concrete delivery trucks or other equipment within the Green River Watershed area shall not be permitted.

K. The Contractor shall respond immediately to emergency situations as directed by the Contracting Officer, where the quality of the water is threatened and shall take corrective action to eliminate or at least temporarily contain the contaminants until a more permanent solution to the problem can be determined. Sheens and rainbows on surface waters shall be contained and mopped immediately.

### 3.2 OIL SPILL CLEANUP KITS

Use approved oil absorbing materials to remove oil. The Contractor shall provide and maintain two kits as specified in this Section with new spill cleanup and containment equipment. One kit shall be stored at the lower staging area and one kit at the upper maintenance facility area. Small, loose items of equipment shall be stored in secure boxes that can be easily carried by two workers, and transported in the bed of a pickup truck. Boxes shall be painted yellow and labeled OIL SPILL KIT - EMERGENCY USE ONLY. The contents of each kit shall be used only for emergency purposes and not in the routine execution of the work.

### 3.3 OIL ABSORBING

The materials shall be secured so as to effectively accomplish the task and shall not be disturbed by effects of wind, rain and other environmental factors, or construction activities. Oil absorbing material shall be reused according to the manufacturer's recommendations and shall be disposed of in

a manner, which is approved by the regulatory agencies and is in accordance with the manufacturer's recommendations.

#### 3.4 BOAT AND MOTOR

The Contractor shall provide a dedicated boat and motor as specified for Contractor and ENVIRONMENTAL MONITOR environmental protection and monitoring activities. The boat and motor shall not be used in the routine prosecution of the work.

#### 3.5 OIL CONTAINMENT BOOMS

Oil containment booms shall be moored to maintain a minimum 20-foot distance between barges or other work equipment located in the water and the boom unless otherwise shown or specified. The boom shall be placed around areas and activities where equipment is working at the water's edge or in the water. The boom shall be adequately anchored and secured. At the intersection of the boom and the shoreline, absorbent pillows shall be used to fill in any gaps to prevent leakage of floating debris or oil around the boom. Placement and anchoring of the boom shall be according to the manufacturer's approved methods. The boom shall be designed to accommodate changes in water level and rapid demobilization (< 8 hours). Boom shall be adjusted as other contaminants reach the water in the reservoir. The Contractor shall protect the water quality and shall not rely solely on the oil containment boom to provide that protection. Sheens and rainbows contained within booms shall be cleaned up immediately.

#### 3.6 EMERGENCY SPILL KIT OIL CONTAINMENT BOOM

The emergency spill kit oil containment boom shall remain in the secured emergency spill kits until needed. The boom shall be constructed and designed to provide for full deployment within 30 minutes. Once a spill has been adequately contained and cleaned up, the boom shall be demobilized and returned to storage.

#### 3.7 SPECIAL MESSAGE SIGNS

Provide one Type 1, Type 2 and one Type 3 signs. Provide a barricade with every Type 3 sign. The signs shall be installed as shown on the Drawings, in accordance with Standard Plan G-4a of the Standard Plans for Road, Bridge and Municipal Construction (WSDOT/APWA).

#### 3.8 REFUELING AND CHEMICAL/PETROLEUM STORAGE AREA

The refueling and chemical/petroleum storage area shall function to store and dispense the anticipated Contractor's fueling and chemical needs throughout the course of the construction. The Contractor shall be responsible to supply and install all safety and operational equipment as may be necessary to support the use and operations of the facility consistent with these specifications, project Drawings, Washington State OSHA and WISHA regulations and codes for the Contractor's operations.

1. All spills shall be immediately contained and all contaminated water, fuels, or other liquids shall be pumped from the containment basin sump and removed from the site for disposal by the Contractor.
2. Contractor shall be responsible to maintain the refueling and chemical/petroleum storage area in a neat, clean and safe manner.

3. The refueling and chemical/petroleum containment area shall be subject to inspection by the Contracting Officer at the Contracting Officer's discretion. The Contractor shall immediately remedy any and all noted potential problems or conditions that may adversely affect water or environmental quality.

### 3.9 BACKFLOW PREVENTERS

Backflow preventers shall be installed on water systems which use water obtained from the reservoir, or any surface or ground water. The backflow preventer shall be as close to the water source as practical and shall be installed in accordance with, and approved by, the Washington State Department of Health.

### 3.10 PESTICIDES AND HERBICIDES AND INSECTICIDES

The Contractor shall not store, transport or apply pesticides, herbicides, insecticides or agents containing these materials in the Green River Watershed.

### 3.11 AGREEMENT WITH SPILL CLEANUP FIRM

The Contractor shall enter into an agreement with a commercial agency for spill containment and cleanup assistance at the reservoir in the event that a major spill occurs. The cleanup firm shall be regularly engaged in the business of prevention, containment, and removal of oil pollution; and shall be willing to maintain equipment and work force in a state of readiness to provide prompt response to oil pollution situations on a 24-hour basis. The agreement shall indicate that credit checks have been made and that all up front information has been collected and verified, so that the clean up firm is immediately available to respond. The agreement time period shall begin prior to work on or near the Eagle Gorge Reservoir and shall extend until all work is complete, including demobilization. A site visit prior to construction by a representative from the cleanup firm shall be conducted to review the situation and anticipate any unusual or special conditions at the reservoir. The agreement shall become part of the Environmental Management Plan.

### 3.12 DISINFECTION AND CLEANING OF EQUIPMENT

Equipment disinfection and cleaning that conforms to these specifications may be conducted off-site at the Contractor's discretion but must be done in the presence of a representative of Tacoma Public Utilities. Otherwise, all disinfection of equipment shall be conducted at the facility required to be built by the Contractor according to these specifications at the location shown on the contract drawings.

A. Before boats, barges, floating platforms or other equipment that will come into contact with reservoir waters enter the reservoir, they shall be thoroughly steam cleaned and washed to remove dirt, oil, and chemical deposits, and sprayed or swabbed with a solution containing 200 mg/l of chlorine. Diving equipment shall be cleaned and disinfected prior to entering the reservoir. Cleaning and washing shall be performed before such equipment enters the watershed (defined by the TPU security gate), and shall be verified by the Contracting Officer and the ENVIRONMENTAL MONITOR.

B. The disinfection and cleaning site shall be sized, designed, constructed, and maintained by the Contractor in accordance with those minimum requirements, dimensions, ~~and~~ design elements and location as

indicated in these specifications and project Drawings. ~~Location shall be determined by the Contracting Officer.~~ The site shall be restored to its original condition at the end of the contract period. The Contractor shall provide and operate and maintain all pumping and washing equipment as required to clean and disinfect all equipment.

C. The Contractor shall comply with the following activities associated with disinfection and cleaning of equipment and construction materials to be in contact with the reservoir.

1. Use machinery, equipment, and materials that have not previously been used in other aquatic systems whenever possible.
2. Follow the decontamination procedures outlined in this Section before beginning work in the reservoir. The terms "machinery" and "equipment" include, but are not limited to, boats, barges, trailers, cables on heavy equipment, drilling rigs, silt curtains, hoses, pumps, shovels, waders, nets, scuba equipment, scientific equipment, and any other personal equipment that will come into contact with the waters of the reservoir. The term "materials" includes all permanent and temporary construction materials including, but not limited to, concrete, metal, plastics, pipes, hardware, cables, ropes, valves, or other items used for the construction.
3. Provide all of the decontamination equipment and supplies.
4. Document other sites where machinery, equipment, and materials were used or stored during the previous 12 months.
5. Schedule decontamination and inspection of machinery, equipment and materials with the Contracting Officer.
6. Reschedule decontamination and inspection if machinery, equipment, or materials have been temporarily taken offsite.

D. Equipment and Materials Decontamination Procedure:

1. The decontamination requirement covers all aquatic vessels, machinery, equipment, and materials that are new or have been previously used outside the Green River watershed and that will be exposed to the waters of the reservoir or River. Any use of vessels or equipment in surface waters during the previous year must be documented with dates and location on an equipment decontamination log. Equipment and materials decontamination on-site must be conducted at the decontamination area designated by the Contracting Officer. The decontamination and cleaning procedure has four steps:
  - a. Visual inspection and physical removal and disposal of obvious plant fragments and mussel shell.
  - b. Steam clean and/or pressure wash to remove all oil, grease and debris.
  - c. Wash with chlorine solution.
  - d. Final visual inspection by Contracting Officer or ENVIRONMENTAL MONITOR.
2. The detailed procedure shall be:
  - a. Examine all parts of the equipment, looking for any plant fragments, mussel shells, or any foreign matter.
    - 1) If material is green or looks like a clamshell, remove it. Pay special attention to the following areas where small plant pieces or mussel shells can easily be hidden or lodged:
      - a) Storage wells and the floors of boats.
      - b) Motor, propeller, and motor well.
      - c) Hitch and bumper area.
      - d) Trailer frame, inside and outside.
      - e) Vehicle and trailer axles and fender wells.

f) Gears and axles on mechanized equipment (remove metal grating to inspect these areas).

2) Properly dispose of removed materials in a refuse facility (e.g., garbage can). Complete the remaining steps in the decontamination process, even if no biological material is visible.  
b. Pressure wash surfaces with hot water.

1) Slowly direct the pressure washer stream at all surface, especially the areas listed in Step a.1 above. The pressure washer shall provide a minimum temperature of 180 degrees F (82 degrees C) and a minimum pressure of 2,000 pounds per square inch. Pressure washing technique may vary for materials having different sensitivity to pressure and temperature. The nozzle type, spray distance and application rate shall be adjusted to thoroughly remove all foreign substances without damaging the equipment being decontaminated. Boat motors and other equipment with internal surfaces that contact water shall be flushed with at least three volumes of hot water.

2) For new equipment or fragile materials that could be damaged by the pressure washer stream (e.g., fabrics and scientific instruments), surfaces may be washed with a brush during the next step instead of a pressure washer. Temperature-sensitive equipment may be stored completely dry for at least 10 days at the decontamination site as an alternative to pressure washing with hot water. Machinery and equipment exhibiting petroleum or chemical contamination shall be washed off-site.

c. Wash surfaces with chlorine solution, following safety and environmental precautions outlined below:

1) Follow pressure wash with chlorine solution (see below) applied with a coarse spray using a pressurized tank sprayer or spray bottle. Concentrate spray especially toward tight spaces and crannies where plant pieces or shells might collect. Allow bleach solution to remain on the equipment for a minimum of 10 minutes. Rinse beach solution off with fresh water.

2) For cleaning equipment that can be damaged by bleach, instead scrub with liquid biodegradable soap. For repetitive decontamination of small equipment, a dip tank filled with chlorine solution may be used instead of a coarse spray. For large equipment and vessels, the coarse spray of chlorine solution must be collected on a wash pad that drains to a wastewater holding tank. Spent chlorine solution in dip tanks or holding tanks must be neutralized before disposal onsite (see environmental precautions below).

3) Chlorine solution is not stable and must be made fresh daily. It readily decomposes to salt and water when exposed to sunlight. An effective chlorine solution must contain approximately 200 milligrams per liter (mg/L) free available chlorine. This concentration can be obtained by diluting fresh household bleach (off-the-shelf Clorox contains approximately 5 percent chlorine), according to the following table:

Household Bleach	Water
4 milliliters	1 liter
40 milliliters	10 liters
1 tablespoon	1 gallon
1 cup	16 gallons
3-1/4 cups	50 gallons

4) Personal safety precautions shall be taken at all times

when handling and applying chlorine solution.

5) Environmental Precautions for Use of Chlorine Solution:

a) To protect the environment, take care to prevent the chlorine solution from entering or being washed directly into surface waters. The Contractor shall use a coarse spray for chlorine applications, and rinse the equipment where the rinse water will puddle to allow time for the photo-decomposition process. Spent chlorine solution in dip tanks or wastewater holding tanks shall not be discharged onsite.

b) Sodium ascorbate will neutralize chlorine at ratios between 1.6 and 3 by weight, depending on pH of the solution. Based on a ratio of 2.5 for a pH of 7.8, 500 mg per Liter of sodium ascorbate is needed to neutralize 200 mg per liter of free available chlorine. Therefore, 0.21 pounds (95 grams) of sodium thiosulfate is needed to neutralize 50 gallons (189 liters) of chlorine solution wastewater. Adjust the amount of sodium ascorbate in proportion to the amount of chlorine solution. Test the neutralized chlorine solution for total residual chlorine using a field test kit.

c) Inspect all surfaces again for plant fragments or mussel shells. A final inspection and approval of vessels, machinery, and equipment must be conducted by the Contracting Officer or authorized representative and documented in an equipment decontamination log.

3. This decontamination procedure must be repeated if the machinery or equipment is removed from the work site.

### 3.13 PETROLEUM/CHEMICAL STORAGE

#### 3.13.1 GENERAL

1. Petroleum or chemical products shall be stored at the designated refueling/storage area ~~shown on the Drawings~~ proposed by the Contractor. Petroleum and chemical products shall be contained in OSHA-approved containers and secured against spillage.

2. The Contractor shall track the type, location and amount of petroleum/chemicals on site including that in storage, in use, and used. Tracking methods and forms shall be approved by the Contracting Officer. Completed forms shall be submitted by the Contractor to the Contracting Officer twice each month.

3. Handling and storage of oil and chemicals shall not take place adjacent to waterways. Shut off and lock valves shall be provided on tanks. Shutoff nozzles shall be provided on hoses. Locks shall be provided on valves, pumps, and tanks. The fuel storage tanks shall meet the requirements of Section 13202A - FUEL STORAGE SYSTEMS.

#### 3.13.2 BULK STORAGE

Bulk storage shall be defined as storage of 55 gallons or more of petroleum/chemical product in one location. The petroleum/chemical storage area shall be provided with an adequate containment dike surrounding the area as shown on the Drawings to ensure minimum soil contamination in the event of a spill. The volume of the impoundment above the finished grade and below the freeboard level, as shown on the Drawings, shall be equal to the volume of all fluids stored in the area plus 10 percent minimum. The calculated impoundment volume shall not include the catch basin, storm drainage culvert or the void space within the aggregate base. The bulk storage area may be constructed entirely above existing grade by

construction berms, below existing grade by excavating the impoundment or some combination depending on topography. Subgrade shall be smoothed to the normally accepted limits of a smooth bladed dozer. Debris larger than 1/2 inch shall be removed prior to placing the impermeable liner. Vehicle traffic shall be minimized within the storage facility. The integrity of the impermeable liner shall be maintained throughout the life of the facility. Penetrations of the liner shall be limited to those required for drainage piping. All penetrations shall be sealed watertight. All fuel and other piping and hoses shall be above the containment basin and shall be continuously visible and shall be properly protected to prevent damage. The impermeable liner shall be as specified in this Section. The liner shall extend beyond the limits of the impoundment and be anchored as shown. Two layers of non-woven geotextile (minimum thickness 30 mils for each layer) shall be placed under the impermeable liner.

### 3.13.3 NONBULK STORAGE

1. Storage of small volumes, defined as less than 55 gallons of petroleum or chemicals is allowed outside of the bulk storage areas if those materials are being actively used in the construction process. Petroleum and chemical materials not being actively used in the construction process shall be stored in the bulk storage area.
2. All non-bulk petroleum/chemical containers shall be kept within a watertight basin sized to hold 110% of the total stored contents. Storage in non-bulk storage areas will not be allowed during non-work hours.
3. All non-bulk storage areas shall be covered to prevent the collection of stormwater. The collection of stormwater shall be monitored daily or more often as needed.

### 3.13.4 SPILL PREVENTION AND CLEANUP

1. Adequate petroleum and chemical product containment, recovery, cleanup, restoration, and disposal supplies and equipment shall be maintained at the project site at all times in the event of an accidental spill emergency. The name and location of the spill cleanup firm as specified shall be posted in a conspicuous location on-site, at all times. State-of-the-art methods and procedures of using such spill emergency control supplies and equipment shall be implemented in an expeditious and effective manner, to minimize the adverse impacts of any such spill emergency.
2. Electrically operated petroleum or chemical pumping or transfer devices shall be manned by knowledgeable personnel at all times of operation.

### 3.13.5 CONTAINMENT AREA USE AND MAINTENANCE:

1. All containment areas shall be inspected by the Contractor daily, and in the event of rain, inspection frequency shall be twice a day. Inspection will ensure that stormwater facilities are appropriately functioning. In event of significant petroleum or chemical leakage or spillage, all contaminated water shall be diverted to a temporary tank for transport and disposal off-site. Fluids in any containment area that contain significant amounts of oil or any spilled chemicals shall be cleaned up immediately by the Contractor or the Contractor's spill response firm and disposed of at a legal disposal facility. The source of leakage or spillage shall be identified and repaired immediately or the equipment or

containers shall be immediately removed by the Contractor from the watershed area in a way that prevents further leakage. Cleanup work shall be performed at no additional cost to the Contracting Officer. Contractor shall follow all applicable federal, state, and local laws in clean-up and disposal efforts.

2. The oil/water separators shall be inspected daily or in event of a spill. Trapped oil shall not exceed one-half of the designed oil containment volume.

3. All containment areas not specifically designated by the Contracting Officer to remain as a permanent structure shall be removed by the Contractor immediately upon completion of use. Facilities designated to remain by the Contracting Officer shall be thoroughly cleaned of any accumulated oil or chemicals by the Contractor upon completion of use. Facilities to be removed shall first be cleaned of any accumulated oil or chemicals by the Contractor. Debris from the removal shall be hauled off-site for disposal. Disturbed areas shall be restored and provided ground cover in accordance with Section 02272, EROSION AND SEDIMENT CONTROL, and Section 02935, HYDROSEEDING.

### 3.14 STATIONARY EQUIPMENT CONTAINMENT

All stationary equipment, operating or idle, in a location for more than one hour shall have oil absorbent pads placed beneath it. This includes, but is not limited to, backhoes, cranes, loaders, dozers, engine driven pumps, compressors, generators, and trucks. Soiled pads shall be replaced as often as necessary to preclude runoff of water containing petroleum sheens. Pads need to be picked up immediately when equipment is moved. Each piece of heavy equipment shall carry one empty 5-gallon bucket with lid, 5 absorbent pads, and a shovel for use in a petroleum spill. Stationary equipment which is not self-propelled such as compressors, and generators, which contain or use petroleum products or chemicals, shall be placed inside a containment basin as shown on the Drawings. Self-contained mechanisms are preferred.

### 3.15 PETROLEUM/CHEMICAL STORAGE ON VESSELS

A. Fuel storage on boats, barges, and other vessels shall be limited to the smallest quantities needed for daily operation. Bulk fuel storage will not be permitted on vessels. Chemicals shall be permitted on vessels only with the specific approval of the Contracting Officer, and shall be limited to approved quantities. Stormwater from on-board watercraft shall not be discharged to the reservoir or any other surface water. Bilge water must be held on-board vessels and collected and disposed of off-site. Bilge water shall not be discharged to the sedimentation ponds. All vessels shall be maintained in a clean condition to prevent discharge of deleterious materials during storm events.

B. Each vessel shall be equipped with a minimum of 100 oil absorbent pads and one empty five-gallon bucket with lid. Sheens and rainbows shall be mopped up immediately. Rubbish, litter, or garbage shall not be stored or left on deck. An inspection at the end of each shift will be conducted to pick up and dispose of rubbish.

C. Empty or extraneous containers of petroleum or chemical products shall be removed from watercraft containment areas and transported ashore for removal or disposal daily.

D. All petroleum and chemicals on water vessels shall be stored in

watertight containment pans designed to hold 110% for the stored volume.

E. In the event of any spillage, the Contractor shall cease all work that contributed to the spillage or that may interfere directly or indirectly with speedy containment. All suitable personnel shall be devoted to containing and cleaning up the spillage in accordance with the Emergency Response Submittal. Normal work involving the vessel shall not be resumed until all the conditions that resulted in the spill have been fully corrected and the spill has been fully cleaned up.

### 3.16 EQUIPMENT REFUELING

The approximate location for the refueling and chemical/petroleum storage area is shown on the Drawings. Refueling of all mobile equipment shall be conducted at that location. Fueling of water vessels shall be performed at the moorage location and within containment booms. A mobile fueling truck may be employed to fuel construction equipment that can not be transported to the refueling site.

### 3.17 TRANSFER OF PETROLEUM PRODUCTS

During transfer of fluid from one container to another, a competent operator shall be on-site to oversee the operation. Oil and petroleum products shall be dispensed during daylight hours unless the dispensing area is lighted. Dispensing devices shall automatically shutoff when the container is full. Overflows or spillage will not be allowed. Condensation siphoned from fuel tanks shall not be discharged onto the ground or to surface waters. Storage tanks and fuel trucks shall be structurally capable of holding the full contents without leakage. Excessive rust, perforations, holes, splits, etc. on tanks will not be permitted. Fuel trucks shall be labeled or marked as such, and shall carry a minimum of one 20-gallon bucket with lid, one shovel, and 5 oil absorbent pads for use at a spill. Reference Section 13202A - FUEL STORAGE SYSTEMS.

### 3.18 SANITARY AND RUBBISH WASTES

The Contractor shall provide and maintain any accommodations for the Contractor and Contracting Officer employees that are necessary to comply with the requirements and regulations of the State Department of Health and other agencies. Sanitary facilities and rubbish containers shall be located at all work sites and all locations where workers gather prior to start of work or shift changes. Sanitary facilities shall be maintained in a clean and sanitary condition, and shall be serviced regularly to prevent spillage and undue odors. Rubbish containers will not be allowed to overflow or spill liquids or solids onto the ground or into the reservoir, or other surface waters. Sanitary facilities shall not be located on footbridges, work platforms, barges, or below the high water mark or river. The Contractor shall not discharge waste or litter of any type to the reservoir. This includes fecal material, urine, chewing tobacco, sputum, cigarettes, cigars, food material, and garbage. Gray and black water from sinks and drinking fountains and black water (sanitary wastes) shall not be discharged to surface or ground waters. Gray and black water shall be collected in holding tanks and shall be trucked out of the watershed for legal disposal.

### 3.19 DIVERS AND DIVING APPARATUS

Divers shall not discharge any waste products to the water during diving operations. Diving gear including breathing apparatus, wet suits, dry

suits, masks and fins shall be thoroughly washed and disinfected before entering the reservoir. Gear previously used in sewage lagoons, outfall inspections, or other potentially polluted areas shall not be used on this project.

### 3.20 PROCESS WATER

#### 3.20.1 SOURCE

The Contractor will be allowed to withdraw process water from the clean water collection vault. Pumps and other mechanical components shall be designed and maintained so as to not impart grease or oils to the source or to the process water during withdrawal.

#### 3.20.2 RECYCLING

Wherever construction operations require the continuing use of water for performing repetitive functions such as washing and rewashing aggregates, construction joint cleanup, curing concrete, washing of concrete batching and mixing equipment, recycling of the water will be required, unless this requirement is specifically waived. Appropriate holding tanks, storage facilities, pumping and treatment equipment shall be provided as required for the recycling process.

#### 3.20.3 DISCHARGE OF PROCESS WATER

All process water released from recycling operations shall be stored and transported off-site for disposal unless conveyance to the sedimentation pond is approved by the Contracting Officer.

### 3.21 TREMIE PLACEMENT

Control placement of tremie concrete such that minimal loss of material occurs and enters the reservoir waters. This can be accomplished by minimizing the openings at joints and separations to preclude loss to the water.

### 3.22 LAYOUT OF FACILITIES

General concepts for the pollution control facilities are shown on the Drawings. These general concepts shall be adhered to in the execution of this contract and prosecution of the work.

### 3.23 CHLORINE RESIDUAL

Water containing chlorine residual shall not be discharged directly into, streams or state waters. Chlorinated water may be treated to remove chlorine residual and disposed on land for percolation if approved by the Contracting Officer. Chlorine residual may be reduced chemically with a reducing agent such as sodium thiosulfate, sodium ascorbate or other suitable chemical. Water shall be tested for chlorine residual prior to discharge.

### 3.24 NOTIFICATION

In the event of a sanitary sewage spill, notification shall also be made to the following: Tacoma Public Utilities, King County Health Department, Department of Health, and Department of Ecology. The Contractor shall immediately notify the Contracting Officer and the Department of Ecology of

all incidents of chemical, oil, or other contaminated spills or discharges in excess of 1 gallon into State waters which become known to the Contractor.

### 3.25 NONCOMPLIANCE WITH WATER AND AIR POLLUTION CONTROL

The Contractor will be notified of noncompliance with the provisions specified herein and of necessary corrective action to be taken. Ambient water quality levels will be determined by results of samples collected from those areas unaffected by Contractor operations. Dilution zones will be as defined by DOE regulations. The Contractor shall take immediate corrective action when such notice is given. If the Contractor fails to comply or if water quality of potable water is threatened, the Contracting Officer may issue a stop work order until effective remedial measures have been taken by the Contractor. Time lost due to any such stop work order shall not entitle the Contractor to an extension of time or costs or damages, unless it is later determined by the Contracting Officer that the Contractor was in compliance.

-- End of Section --

## SECTION 02212

## CONTROLLED BLASTING

## PART 1 GENERAL

## 1.1 APPLICATION

This section covers the use of explosives in drill-and-blast operations for all work involving the excavation of rock for the construction of the Juvenile Fish Passage Facility and Cofferdam at the Howard Hanson Dam operated by United States Army Corps of Engineers - Seattle District.

The work covered in this section includes pre-blast inspections, blast design which includes evaluating the existing nearby structures, blast limitations, materials, equipment, labor and supervision for the transportation and storage of explosives, drilling and loading of blast holes, protection of existing facilities, test blasts, blast-effects monitoring, post-blast inspections and damage repairs.

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## BUREAU OF ALCOHOL TOBACCO AND FIREARMS (BATF)

BATF 27 CFR Part 555	Title XI, Regulation of Explosives (18 U.S.C. Chapter 40; 84 Statute 952), of the Organized Crime Control Act of 1970 (84 Statute 922) and the Safe Explosives Act, Title XI, Subtitle C of Public Law 107-296, the Homeland Security Act of 2002
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## U.S. DEPARTMENT OF TRANSPORTATION (DOT)

DOT 49 CFR	Title 49, Parts 106, 107, 171-179, 383 and 390-399
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## WASHINGTON DEPARTMENT OF LABOR AND INDUSTRY (WAC)

WAC296-52	Safety Standards for the Possession and Handling of Explosives
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## U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) Safety and Health Requirements Manual (Section 29)
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## 1.3 DEFINITIONS

Air Overpressure: Fluctuating changes in ambient air pressure caused by blasting. Airblast is expressed in units of psi or decibels (dBL).

**Buffer Holes:** Holes with reduced energy charges drilled adjacent to smoothwall, trim or open line-drilled holes at the perimeter of the excavation. The explosive charge in buffer holes is generally between 50 and 75% of the charge used in normal production blast holes. Buffer holes are usually drilled parallel to adjacent holes at the excavation perimeter.

**Channel Drilling:** A method of preventing overbreak by using special drilling equipment to create a series of drilled holes that are connected to create a continuous open slot within the plane of the desired excavation limits. This method is often used in conjunction with lightly loaded buffer charges that are placed within the rock mass at a set distance that will break it back to the channel slot but not beyond it. Mechanical excavation methods such as hoe-rams, rock saws, or narrow cutter trenching machines can also be used to break rock within the boundaries of drilled channel slots.

**Close-in Blasting:** Refers to drilling and rock excavation activities to existing structures within a distance that is equal to or less than the final excavation depth.

**Line Drilling:** A method of controlling overbreak, in which a series of very closely spaced holes are drilled at the perimeter of the excavation. Line holes are generally not loaded with explosives; however, in some applications alternating holes may be loaded with light charges using detonating cord.

**Lookout -** A term used to define the practice of aligning perimeter blast holes such that the toe of the hole arrives 6 to 12 inches outside the ideal envelope limits of the cut. The planned overbreak in the toe area, created by lookout-holes angles several degrees outward, creates adequate space so drills can establish perimeter holes for the next bench or round at desired collar locations just outside the planned minimum cut or round break limits.

**Maximum Charge Weight per Delay-**For purposes of vibration control, any charges firing within any 8-millisecond time period are considered to have a cumulative effect on vibration and airblast effects. Therefore, the maximum charge per delay equals the sum of the weight of all charges firing within any 8-millisecond time period. For instance, if two 10-lb charges fire at 100 ms and one 15-lb charge fires at 105 ms, the maximum charge per delay would be 35 lbs.

**Occupied Building:** Structure on or off construction limits that are occupied by humans or livestock.

**Peak Particle Velocity (PPV):** The maximum of the three ground vibration velocities measured in the vertical, longitudinal and transverse directions. Velocity units are expressed in inches per second (ips).

**Pre-splitting:** A blasting technique in which the perimeter charges are detonated first in the firing sequence or as a separate blast ahead of production blasting. This technique is designed to generate a fracture in the plane of the pre-split holes drilled along the perimeter of the excavation.

**Primary Initiation:** The method whereby the blaster initiates the blast(s) from a remote and safe location. Primary initiation systems use pneumatic tubing or shock-tubes to convey firing energy from blasters to blast locations.

Production Holes: Blast holes in the main body of the rock mass being removed by drilling and blasting.

Residential Building: Includes single and multi-family dwellings, hotels, motels, and any other structure containing sleeping quarters.

Scaled Distance: The distance from a blast measured in feet, divided by the square root of the charge per delay period measured in pounds. These "square root" scaled distance values are used in calculations regarding ground vibration prediction and control. For airblast calculations, cube root scaling is used whereby distance is divided by the cube root of the maximum charge per delay.

Smoothwall Blasting (trim blasting): A form of controlled blasting used in tunnel, shaft, trench and other surface blasting excavations. With this method, lightly loaded charges are placed in relatively close-spaced holes and timed to fire such that a well-formed open face provides excellent relief when removing the final burden of rock in front of trim holes drilled at the excavation limits. Smoothwall trim blasts can be fired as separate blasts after mass rock has been blasted and removed or the trim blast can be integrated with adjacent mass blasts if delay timing and other blast design factors ensure that adequate free-face relief is provided for the final rock burden against perimeter charges.

Stemming: Crushed stone, tamped clay or some other inert earth material placed in the unloaded collar area of blast holes for the purpose of confining explosive charges and limiting rock movement and airblast.

Sub-drilling: The portion of a blast hole that is drilled below or beyond the desired excavation depth or limit. Subdrilling is generally required to prevent the occurrence of high or tight areas of unfractured rock between blast holes.

USBM RI 8507 PPV Frequency Plot: A plot of measured peak particle velocity vs. measured frequency on a logarithmic horizontal and vertical scales, examples of which are shown in Appendix A of "Structure Response and Damage Produced from Surface Mine Blasting", U.S. Bureau of Mines, Report of Investigation 8507, by D. E., Suskind, et. al, dated 1980.

#### 1.4 SYSTEM DESIGN

Unless approved by the Contracting Officer, test and full-scale production blasts shall conform to the requirements for Excavation Bench Blasting provided in paragraph EXCAVATION BENCH BLASTING of these specifications. The Contractor, with the assistance of the Contractor's blasting consultant, shall evaluate the results of the Test Blasts (paragraph TEST BLASTS) and shall evaluate the impacts of the test blasts on nearby existing structures. With supporting documentation, the Contractor shall then propose in a revised blasting plan that includes additional blast design requirements, including maximum charge-weight-per-delay based on scaled distance, to accomplish the work in a satisfactory manner and to protect nearby existing structures, and to limit peak particle velocities at nearby structures to the values presented in paragraph PERFORMANCE REQUIREMENTS of these specifications. The Contracting Officer may approve the Contractor's proposed revisions to the blasting plan, which shall be used to design subsequent blasts. As an alternative, the Contracting Officer may require that all subsequent blasting shall conform to the requirements listed in paragraph DESIGN CRITERIA through PERFORMANCE

REQUIREMENTS. The contracting Officer reserves the right to not allow any blasting method, product, or practice proposed by the Contractor that does not conform to the requirements listed in paragraph DESIGN CRITERIA through PERFORMANCE REQUIREMENTS for any reason.

Additional requirements and limitations on blasting methods may be necessary to accomplish the work in a satisfactory manner, and protect existing and newly constructed facilities. Adoption of the requirements in this section, including the maximum charge weight-per-delay provided in paragraph EXCAVATION BENCH BLASTING, of these specifications does not relieve the Contractor, with the assistance of the Contractor's Blasting Consultant, of developing a plan for preventing damage to nearby facilities as required in the General Blasting Plan (paragraph PREPARATION AND PROTECTION (B)) of these specifications.

#### 1.4.1 Design Criteria

The firing systems for the general blast holes shall be controlled by the use of delay detonators. Explosives used for a single period of delay shall be the minimum required.

Blast designs shall include measures that prevent all forms of misfires and ensure complete detonation of all explosives. If any products or methods are causing excessive cutoffs or other forms of misfires, the Contracting Officer can require the Contractor to suspend the use of problematic products or methods. All associated costs of redesigned blasts or delays caused by this action will be at the Contractor's expense.

#### 1.4.2 Excavation Bench Blasting

Excavation to final rock surfaces shall be carried out using, channel drilling, line drilling or approved smoothwall blasting methods. Pre-split blasting will not be allowed.

The diameter of all holes charged with explosives shall not exceed 2.5 inches.

Only fixed-cartridge or packaged explosives with diameters not exceeding 1.5 inches shall be used. Flowable explosives like ANFO or pumped slurries will not be allowed.

#### **\*Amend R0009\***

In excavation area 1B, the north perimeter walls adjacent to the existing outlet works tower shall be channel drilled to control overbreak and limit blast impacts to remaining rock and the nearby structures beyond it. The depth of the channel drilling shall not be less than the depth of the excavation drill benches. Channel drilling shall be required between approximate Station 3+25 and 3+65 in Excavation Area 1B where excavation is adjacent to the existing outlet works tower. Channel drilling shall also be required in Excavation Area 1C where excavation is adjacent to the existing outlet works tower (approximate Station 3+56 to 3+68). Lookout drilling practice will be allowed for channel drilling, but the holes must not be drilled into the existing outlet works tower. Rock remaining between the channel drilling and the existing outlet works tower may have to be removed by mechanical methods.

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The depth of excavation drill benches, not including subdrilling, shall not exceed 10 feet, except in those areas specified in Section 02300a, EARTHWORK, paragraph EXCAVATION BENCH HEIGHT RESTRICTIONS where a bench height of 8 feet is specified.

Subdrilling shall not exceed 2 feet and the total depth of blast holes shall not exceed 12 feet.

Perimeter holes along the final excavation limits may be drilled to a maximum depth of 42 feet, backfilled with a sand and partially reopened with blow pipes to allow their integrated use with adjacent 10-foot production bench blasts.

All explosive charges shall be stemmed with clean washed crushed stone sized between 3/8 and 1/2 inches. The minimum height of stemming shall be at least 20 charge diameters; i.e. if a 1.5-inch diameter charge is used, minimum stemming shall be at least 30 inches or 2.5 feet.

Maximum charge weights per delay shall meet the following criteria:

In Areas 1B and 1C, minimum scaled distance of  $5 \text{ ft/lb}^{0.5}$  (feet per square root of the charge weight in pounds) shall be used to determine maximum charge-weight-per-delay, based on the distance of charges to the nearest point of the existing outlet works tower, tunnel, and bridge piers; i.e. if the distance is 10 feet, the maximum-charge-weight-per-delay shall not exceed 4 pounds  $(10/5)^2$ . To conform to this limit, contractors are encouraged to use 200 or 400-grain detonating cord in charges used very close to the existing outlet works tower and tunnel.

When smoothwall blasting methods are used, the design and implementation shall conform to the following requirements:

- (1) Hole spacing shall not exceed 18 inches unless the Contracting Officer approves a variance. Justification to increase hole spacing shall be based on the Contracting Officer's opinion that test blasts have produced satisfactory results.
- (2) The main explosive charge, not including the primer stick, shall be distributed evenly and de-coupled from wall of the hole. The maximum charge weight per unit length of hole (loading factor) shall not exceed 0.34 lb/ft. The weight of the primer stick or cast booster shall not exceed 0.5 pounds.
- (3) Burden/spacing ratio for perimeter holes shall be between 1.2 and 1.4. The burden is the distance between the borehole and the nearest free-face, and spacing is the distance between boreholes and approximately perpendicular to the burden.
- (4) Lookout of perimeter holes: Lookout shall be limited to the minimum necessary to collar holes for the the next bench.

#### 1.4.3 Performance Requirements

A. Blasting shall be performed only within the period of time occurring 30 minutes after dawn and 30 minutes before sunset. No nighttime blasting will be allowed, unless it is authorized under special circumstances with the express approval of the Contracting Officer.

B. In no case shall blasting noise (air-overpressure), measured near the

nearest on-site building, exceed 133 dBL.

C. Peak particle velocity measured at reinforced concrete structures, including but not limited to the spillway, outlet works tower, outlet works tunnel lining, bridge piers, shall not exceed a Limiting Value equal to 20 inches per second (ips). The Threshold Value at these structures shall be equal to 16 ips. If either the Limiting or the Threshold Values of peak particle velocity as measured by instrumentation, installed by either the Contracting Officer or the Contractor, is exceeded the Contractor shall take the actions specified in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS.

Peak particle velocity measured at the trunnions of the existing spillway and outlet works regulating gates shall not exceed a Limiting Value equal to 8 ips. The Threshold Value at these structures shall be equal to 6 ips. If either the Limiting or the Threshold Values of peak particle velocity as measured by instrumentation, installed by either the Contracting Officer or the Contractor, is exceeded the Contractor shall take the actions specified in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS.

#### 1.4.4 Alternative Excavation Bench Blasting Criteria

The Contractor may propose and submit in a revised blast plan an Alternative Excavation Bench Blasting Criteria for the Contracting Officer's approval. If approved by the Contracting Officer, the Contractor's proposed criteria shall only apply to the following areas:

1. Area 1C above an elevation of 1120 feet and not included in those areas where the height of excavation benches are limited to 8 feet as specified in Section 02300a, EARTHWORK, paragraph EXCAVATION BENCH HEIGHT RESTRICTIONS.
2. Those portions of Area 1B that are located at a distance greater than 40 feet from the existing outlet works tower, tunnel, and regulating gates.

In all other areas, the requirements of paragraph EXCAVATION BENCH BLASTING of this Section shall apply.

Prior to implementation of Alternative Excavation Bench Blasting Criteria in any production blast, the Contractor shall demonstrate by the means of Test Blasts (paragraph TEST BLASTS) that the proposed revisions will neither damage existing structures nor exceed the Limiting Values of peak particle velocities listed in paragraph PERFORMANCE REQUIREMENTS of this Section. The Contractor's proposed Alternative Excavation Bench Blasting Criteria shall be implemented only with the approval of the Contracting Officer, and the Contracting Officer may require that the Contractor use the Excavation Bench Blasting Criteria provided in paragraph EXCAVATION BENCH BLASTING if the Contractor's proposed methods are resulting in damage to existing structures.

The Contractor's proposed Alternative Bench Blasting Requirements shall conform to the following requirements:

- (1) The depth of excavation benches shall not be greater than 20 feet.
- (2) The diameter of holes charged with explosive shall not exceed 3.5 inches.

(3) Only fixed cartridge explosives with diameters not exceeding 2.5-inches shall be used, and flowable explosives like ANFO or pumped slurries shall not be allowed.

4) Subdrilling shall not exceed 4 feet, and the total depth of blast holes shall not exceed 24 feet.

(5) Excavation to final rock surfaces shall be carried out using channel drilling, line drilling, or approved smoothwall blasting methods, Pre-split blasting shall not be allowed.

(6) Stemming, approved stemming materials, smoothwall blasting methods, and maximum charge weight per delay shall meet the requirements listed in paragraph EXCAVATION BENCH BLASTING of this Section.

#### 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

##### SD-01 Preconstruction Submittals

General Blasting Plan: G  
Individual Blast Plans: G  
Blasting Safety Plan: G

The Contractor shall prepare a blasting safety plan. Unless otherwise indicated, make required submittals at least 30 days prior to conducting any blasting operations, and before any explosives, blasting agents, primers, or initiators are delivered to the job site.

Emergency Response Plan: G

An Emergency Response Plan indicating types of explosive materials, storage locations and quantities shall be submitted to and approved by the local emergency response agency. The approved emergency response plan will be submitted to the Contracting Officer before explosives are allowed on site. The emergency Response Plan shall contain points of contact and telephone numbers for local emergency response agency(ies).

##### Pre-Blast Inspection Survey

Prepare and deliver to the Contracting Officer, prior to the start of test blasting, two bound copies of the pre-blast inspection reports containing field notes, sketches, diagrams, photos and videos. Reports must be signed and witnessed by all involved parties. The blasting consultant shall be included in the pre-blast survey and inspection, as well as the post-blast survey, if the post-blast survey is required as directed by the Contracting Officer.

Data obtained from pre-inspections shall be delivered to the Contracting Officer within 7 days of the date of inspection.

Submit copies of all after-blast inspection reports to the Contracting Officer within 30 calendar days of the receipt of a complaint.

#### SD-03 Product Data

Material Safety Data Sheets; G

Manufacturer's product information sheets and Material Safety Data Sheets (MSDS) for all explosives, blasting agents, primers and initiator products, blasting devices, lightning detectors, blasting mats, and all other blasting equipment.

Vibration Monitoring Software; G

Submit original installation-disks, manuals and other documentation for IBM-PC-based software used to report and interpret blast-induced motion.

#### SD-07 Certificates

Quality Control Submittals; G

A detailed description of the education, training, and experience of all proposed persons that will be immediately in charge of drilling and blasting operations. Separate qualifications shall be submitted for each supervising blaster-in-charge. The qualifications of each blaster-in-charge shall meet or exceed the requirements given in paragraph QUALIFICATIONS of the specifications. The Contractor's' submittal shall include names, addresses and telephone numbers of at least three persons who can verify such prior successful experience for each supervising blaster-in-charge. Copies of valid Washington State blasting licenses shall also be submitted for all blasting supervisors. Blasting licenses shall indicate that the blasters are certified for blasting using non-electric initiation systems.

The name and qualifications of a recognized blasting consultant(s) whom the Contractor plans to retain to facilitate the development or review of all blasting designs and blast-effect control measures. The qualifications of the blasting consultant(s) shall meet or exceed the requirements given in paragraph QUALIFICATIONS of these specifications. The blasting consultant shall be retained for the duration of the project. Contractor shall anticipate a minimum of 60 hours of blasting consultant effort to prepare the General Blasting Plan and Individual Blast Plans for test and full-scale production blasts. The retained blasting consultant shall also be on site during test blasting. Also, if requested by the Contracting Officer, the Contractor shall provide two additional one-week duration on-site visits for the blasting consultant.

The name and qualifications of a qualified specialist who will perform the pre-blast condition inspection of all structures, utilities and facilities located within 500 feet of the blast areas. The qualifications of the specialist shall meet or exceed

the requirements given in paragraph QUALIFICATIONS of these specifications.

After each blast, a post-blast report including printed seismograph monitoring reports, including all data specified in paragraph BLAST MONITORING EQUIPMENT, shall be submitted to the Contracting Officer prior to loading any subsequent blast holes. After each blast, a copy of the video tape recording, specified in paragraph MONITORING shall be submitted to the Contracting Officer prior to the loading of any subsequent blast holes.

Copies of required Washington State Explosive Purchase and Storage licenses.

Copies of any required regulatory variances.

## 1.6 SCHEDULING AND SEQUENCING

A. Schedule blasting operations, including the initial test blasts, to minimize disturbance of the public ongoing dam operations, Burlington Northern Santa Fe (BNSF) railroad traffic, and users of the access road through the project.

B. Perform pre-blast inspections of adjacent private and public property as specified herein, including but not limited to the BNSF Railway before conducting test blasts.

## 1.7 QUALITY ASSURANCE

### 1.7.1 Qualifications

All blasters and supervising shift foremen shall be properly qualified and licensed in accordance with applicable federal, state, and local government regulations. The Contractor shall not allow prohibited persons as defined (BATF 27 CFR Part 555) by the BATF to transport, handle, possess or use explosive materials.

The blasting supervisors (blasters-in-charge) shall have a minimum of 10 years of experience, directly related to controlled blasting, in-water blasting, and close-in blasting near critical above and below ground structures or other demonstrated experience of satisfactory performance on previous jobs, as demonstrated to the Contracting Officer. All blasting supervisors shall be able to document the completion of at least three projects with satisfactory results of similar scope and complexity.

The Contractor shall retain the services of an experienced blasting consultant with at least 10 years experience in monitoring blasting operations and interpreting blast-induced effects including vibration in complex structures and air overpressure impacts for similar construction projects.

The Contractor shall retain the services of an experienced blasting consultant(s) with at least 10 years experience in preparing controlled blasting designs. This experience shall include specific experience with close-in blasting near critical above and below ground structures. Blasting plans, test-blasting-plans and revisions to any of these plans will be reviewed by and covered with a signed review letter by the blasting consultant(s). The blasting consultant shall not be required to sign the individual blast plans provided they are signed by an on-site licensed

blaster.

The Contractor shall retain the services of an experienced specialist who will conduct a detailed pre-blast inspection of the condition of the BNSF Railway line and critical structures and openings within the Howard Hanson Dam including but not limited to the existing spillway outlet works tower, access bridge, outlet tunnel, and associated mechanical works of the facilities. The specialist shall have performed similar pre-construction survey services on at least three projects of similar scope and complexity and have at least five years of experience in conducting pre-blast inspections. The experienced specialist shall have a college degree in science or engineering from a 4-year college or university.

#### 1.7.2 Monitoring

Monitor each blast using approved personnel and equipment conforming to the requirements outlined in paragraph BLAST MONITORING EQUIPMENT as follows:

1. Seismographs to measure ground motion and air overpressure:
  - a. At two on-site structures as designated by the Contracting Officer.
2. One instrument using either tri-axial accelerometers or high-range velocity geophones with 1,000 Hz frequency range and PPV range up to 100 ips to measure blast-induced vibration at identified locations where frequency of motion exceeds 250-Hz:
  - a. At locations identified by the Contractor's blasting consultant or the Contracting Officer.

The Contractor shall make a video tape recording on VHS format of each blast. The video shall include coverage before, during, and after initiation of the shot that clearly depicts the layout of the shot, the behavior of the shot, and the resulting muck pile. Each shot record shall be cued in tape to identify the project, date, and shot number.

#### 1.8 DELIVERY, STORAGE AND HANDLING

A. Comply with federal, state, and local regulations, applying to the purchase, transportation, storage, handling, and use of explosives, blasting agents, primers, initiators, and ancillary equipment and materials.

##### B. Transportation

1. Where explosives are transported on public roads, the carriage shall be in accordance with DOT 49 CFR.
2. If explosives are to be transported in interstate or foreign commerce, a license or users permit shall be secured from the (BATF) Bureau of Alcohol, Tobacco, and Firearms (BATF 27 CFR Part 555).

##### C. On Site Storage

1. The location, access, and construction of explosive storage magazines and day-use magazines shall meet all requirements outlined in WAC296-52 and be in accordance with BATF 27 CFR Part 555 and all other applicable regulations.

2. The location of the on site storage facility shall be no less than 100 feet away from the shoreline of the high water level.
3. Storage of explosives on site shall be in accordance to Section 01005, SITE SPECIFIC SUPPLEMENTARY REQUIREMENTS, paragraph PROHIBITION OF STORAGE OF EXPLOSIVES AT DAM SITE.
4. All second class magazines used for day storage shall be located at least 150 feet from active work areas.
5. Maintain inventory control of all blasting equipment and supplies. Copies of inventory logs shall be kept as required by BATF rules and be made available for review at the request of the Contracting Officer.
6. Storage places shall be identified with signs stating clearly and boldly, DANGEROUS EXPLOSIVES. Signs shall be attached to poles in plain sight from all approaches to the magazine sites. Signs must not be attached directly to magazines. Signs shall also include the warning "Never Fight Explosive Fires."

D. The aforementioned review of specific regulations shall not relieve the Contractor from his/her responsibility of knowing about and complying with all applicable regulations.

E. Explosive Losses to Ground or Water

Contractor shall use great care to ensure that all possible measures are used to prevent explosive losses to ground by spillage, misfires or any other cause. If poor handling practices or blasting malfunctions cause excessive losses of explosives -based on the Contracting Officer's judgment-all blasting in affected excavations shall cease until the Contractor submits a revised explosive loss prevention plan that is approved by the Contracting Officer.

## 1.9 WORKSITE CONDITIONS

This Statement of Concern is expressly written to alert the Contractor (or prospective bidders) to the fact that ordinary practices that are customarily considered as standard for the blasting industry will not be acceptable on this project. Extra caution and skill will be required to accomplish this work in a satisfactory manner. Blasting must be safely accomplished in close proximity to the existing outlet works tower, outlet works tunnel, access bridge, regulating gates, foundations and other critical facilities. Because of these concerns, the Contracting Officer will exercise his prerogative to examine carefully the qualifications of any persons whose knowledge and skills may impact the outcome of the work. In addition, the Contracting Officer will reject any persons who are deemed unqualified for any tasks that may be required.

The Contractor shall anticipate that ground containing existing rock bolts will be encountered in the excavation, including the excavation next to the existing outlet works tower and tunnel. The Contractor shall be prepared to perform both channel drilling and production hole drilling through existing rock bolts.

## PART 2 PRODUCTS

### 2.1 EXPLOSIVE MATERIALS

Only fully non-electric blasting systems shall be used. Cap and fuse method shall not be allowed.

Only explosives designed and manufactured for smoothwall (trim) blasting shall be used in perimeter holes for blasting in the bench excavations. Such products include detonating cord as well as cartridge configurations. Loading density of charges in perimeter holes shall not exceed 0.34 pounds per lineal foot unless approved by the Contracting Officer.

Explosives, blasting agents, primers, initiators, and ancillary blasting materials shall be kept in original packaging with clearly marked date codes. All explosives and initiating devices used shall be less than one year old.

If the Contracting Officer determines that a blasting product appears to be in a damaged or deteriorated condition, the suspect product shall not be used until its condition can be determined. Products found to be damaged or in a deteriorated condition shall be immediately returned to the supplier for safe disposal.

## 2.2 BLAST MONITORING EQUIPMENT

Equipment for on-site and off-site particle velocity and air overpressure monitoring shall be 4-channel (1 overpressure and 3 seismic channels) units capable of digitally storing collected data. Equipment must be capable of printing ground motion time histories and summaries of peak motion intensities, frequencies and USBM RI8507 PPV--frequency plots. Printed report records must also include date, time of recording, operator name, instrument-number and date of last calibration.

1. Instruments shall have a flat frequency response between 2 and 250 Hz for particle velocity and from 2 to 200 Hz for air overpressure.
2. The digitizing sampling rate for peak particle velocity and air overpressure measurements shall be least 1,024 samples per second.
3. Seismographs shall be capable of performing a self-test of velocity transducers and printed event records shall indicate whether or not the sensor test was successful.
4. Seismographs used for off-site compliance monitoring shall be capable of recording overpressure from 88 to 148 decibels (dB-L), and particle velocity from 0.005 to 5.0 in/sec.
5. At locations where the intensity of expected ground motion (PPV) exceeds the accurate-recording range of standard velocity transducers (5 to 10 in/s), either high-range velocity transducers or accelerometers shall be used to record motion. The minimum flat-response frequency range of velocity transducers shall be 20 to 1,000 Hz, and the upper range of measurable PPV shall be at least 50 in/s. when high-range sensors are used, the minimum digitizing rate of recording equipment shall be at least 10,000 samples per second. Acceleration data shall be integrated to determine peak particle velocities.
6. Systems shall be capable of providing printed event reports that include all peak measurements, frequencies and complete waveform plots.
7. Seismographs shall have adequate memory to record events, on all

measurement channels for a time period equal to maximum planned blast duration plus one second.

8. All seismograph/software systems shall be capable of saving back-up copies of all event files on floppy or Zip disks in file formats supported by software that the Contractor has submitted to the Contracting Officer as specified in paragraph SUBMITTALS SD-03.

### PART 3 EXECUTION

#### 3.1 GENERAL

Monitoring and recording of all blast effects, as required by these specifications, shall be performed by the Contractor. The Contractor shall monitor each blast at specified locations and other locations determined by the Contracting Officer. Printed reports of all monitoring results-including motion and air-overpressure time-histories shall be submitted to the Contracting Officer before subsequent blasting occurs. The Contractor shall save all digital monitoring record files to at least two separate disk locations-of which one location is either an IBM-compatible 3-1/2 inch floppy disk or a Zip disk. Upon request, the Contractor shall submit copies of digitally recorded blast monitoring files to the Contracting Officer. The Contracting Officer may or may not perform independent blast monitoring. When both the Contracting Officer and the Contractor perform blast monitoring, the monitoring performed by the Contracting Officer shall be used to evaluate and determine the Contractor's compliance with the peak particle velocity (PPV) limitations specified in paragraph PERFORMANCE REQUIREMENTS of these specifications.

#### 3.2 PREPARATION AND PROTECTION

A. The following warning systems, procedures and protection devices shall be established prior to blasting.

1. A system of audible signals to warn of impending blasts. The signal shall correspond to those described in EM 385-1-1, Section 29.

2. Signboards and flags indicating areas where blasting operations are occurring. These signs shall be clearly visible and legible from all points of access to the area. The signs shall clearly describe the audible signal system for warning of impending blasts. Blast area signs shall clearly indicate the length and nature of audible blast warning and all clear signals. All warning systems shall comply with the most stringent requirements of regulating local, state, and federal agencies.

3. The blaster-in-charge shall determine when to sound the five-minute warning signal. Blasting will be performed only after ensuring that all people and equipment have been removed to a safe location.

4. Blasting shall occur only when a representative of the Contracting Officer is present to witness each blast.

5. A "tag out" procedure will be utilized to ensure that all persons are out of the blasting area prior to a blast.

#### B. Blasting Plans

The Contractor shall prepare a Blasting Safety Plan. Generic plans simply

stating that "all regulations will be followed" shall not be acceptable. Plans shall include:

1. A complete description of the warning, clearing and guarding procedures that will be employed to ensure personnel, staff, visitors, and all other persons are at safe locations during blasting. This information will include details regarding visible warning signs or flags, audible warning signals, method of determining blast areas (all areas affected by any potentially harmful blast effects), access blocking methods, guard placement and guard release procedures, primary initiation method, and the system by which the blaster-in-charge will communicate with site security guards.
2. Detailed description of how explosives will be safely stored, transported and used at the various project work sites. Plans will explain how storage magazines and explosive transport vehicles will satisfy all applicable BATF, OSHA, DOT, Federal, and State of Washington regulations. This plan will also indicate how explosives will be inventoried secured and guarded to prevent theft or unauthorized use of explosives. This plan shall include a detailed description of how the Contractor shall provide 24-hour security for any explosive magazines located on site.
3. Include Material Safety Data Sheets (MSDS) and specific details about hazard communication programs for employees.
4. Equipment that will be used to monitor the approach of lightning storms and in the event of such, evacuation and site security plans.
5. Detailed contingency plans for handling of misfires caused by cutoffs or other causes.
6. Fire prevention plan details, including, smoking policies, procedures and limitations for work involving any open flames or sparks, description and location of all fire fighting equipment, and fire fighting and evacuation plans.
7. Initial and ongoing blasting and fire safety training programs.
8. Description of the personal protective equipment that will be used by the Contractor's personnel, including but not limited to safety glasses, hard-toe footwear, hard hats, and gloves.
9. Description of blast monitoring equipment and listing of individuals that will operate such equipment. Submittal shall indicate that all equipment meets the standards defined in paragraph BLAST MONITORING EQUIPMENT of these specifications.

Obtain copies of all applicable codes, regulations, and ordinances, keep a copy in project files at all times, and shall provide the Contracting Officer with a copy. The Contractor's Safety Manager shall ensure that ongoing blasting work complies with all applicable regulations.

Submit a General Blasting Plan to the Contracting Officer not less than 30 days prior to commencing the test blasting, or at any time the Contractor proposes to change the drilling and blasting methods. The Contractor's blasting consultant shall spend at least 20 hours of time on the development and review of this plan-submitted under a signed letter from the blasting consultant. Review of the blasting plan by the Contracting

Officer shall not relieve the Contractor of his responsibility for the accuracy and adequacy of the plan when implemented in the field. The blasting plan shall include:

1. Details of controlled blasting techniques. Include plan and vertical section drawings showing hole locations, spacing, diameter and loading details for typical blast holes, buffer holes and smoothwall or perimeter trim holes.
2. All blast plan drawings shall indicate explosive types, amounts, priming method, initiator types, delay periods, and locations, charge firing times, stemming type and quantities, and typical charge weights.
3. Plans for preventing damage to nearby facilities, including but not limited to the existing outlet works tower, tunnel, access bridge, and regulating gate structures. The Contractor's blasting consultant shall establish limits for each structure, based on estimated intensities of PPV, strain, acceleration or other appropriate measures, and frequency of motion.
4. Methods of drilling, including equipment descriptions, hole alignment techniques and measures that will be used to prevent excessive blast hole deviation.
5. Method of Channel Drilling including equipment descriptions of the method to create a continuous open slot to a depth not less than the excavation drill benches: This method should include a description of the method used to cut or break existing rock bolts encountered in the slot excavation prior to blasting.
6. Hole Charging Methods: Primer make-up, placement of charges and inert stemming and method of securing detonators until tie-in.
7. Initiation system hook-up methods and primary initiation.
8. Methods for preventing spills or losses of explosives, drilling fluids, oil, or any other pollutants to ground or water of the Green River and/or Howard Hanson Reservoir during all handling and hole charging operations. Include details of all containment and contingency plans for quickly and effectively cleaning up any spilled materials.
9. Methods of safe and approved disposal of all explosive packaging materials.
10. Method of informing the BNSF Railroad and users of the access road(s) of the Contractor blasting schedule and frequency and duration of road(s) closure.

Individual Blast Plans shall be submitted for each blast at least 24 hours prior to drilling any blast holes. No loading of explosives will be permitted until the Contracting Officer has approved the Individual Blast Plan. Individual Blast Plans shall include the following information:

1. Scaled plan-view and cross-section drawings showing the location, orientation, number, diameter, and length of blast holes relative to specified stations, slopes and elevations.
2. The amount, type, diameter, weight and linear loading density of

explosives in all blast holes.

3. Maximum weight of explosive per hole or decked charge, total weight of explosives used, maximum charge weight per delay and powder factor.
4. Drawings or plan text shall clearly show detonator types, delays, quantities and charge firing times.
5. The proposed date and time of the blast.
6. Proposed location(s) of seismograph transducers and/or water-pressure measurement equipment for monitored blast effects.
7. The Contractor shall also submit other information deemed pertinent by the Contracting Officer such as measures to control flyrock, vibration, air-overpressure or other blast effects.

If the Contractor intends to blast within 100 feet of concrete aged less than 28 days, a plan indicating details of controlled blasting techniques that will be used to prevent damage to the concrete shall be submitted to the Contracting Officer. These plans shall indicate the age of the concrete-at the time of blasting, and include calculations indicating levels of expected strain in the concrete. Plans shall also indicate how concrete strain levels for such blasting will be monitored and reported to the Contracting Officer.

An emergency response plan indicating types of explosive materials, storage locations and quantities shall be submitted to and approved by the local emergency response agency. The approved emergency response plan will be submitted to the Contracting Officer before explosives are allowed on site.

Prior to any blasting on site, the Contractor shall meet with representatives of the BNSF Railroad and users of the existing access road to coordinate the Contractor's blasting operations and answer any questions they may have dealing with vibration, air-blast overpressure, flyrock, and access road closures expected to impact their operations.

#### C. Flyrock Control

Commercially manufactured steel wire rope and/or rubber tire blasting mats shall be placed over faces or breakouts to be blasted as required to protect instrumentation, utilities, personnel, and equipment from flyrock.

### 3.3 TEST BLASTS

Before any full-scale blasting occurs a series of test blasts designed to collect data concerning blast effects on critical facilities will be performed. The Contractor's Blasting Consultant(s) shall be on site to facilitate test-blasting activities. Test blasts shall accomplish the following:

1. Initially, maximum charge weights per 8-millisecond delay shall be significantly smaller than those expected for full-scale production work and shall require the approval of the Contracting Officer. Subsequent charges will be gradually increased such that blast effect data can be measured at a variety of scaled distances. For each new excavation in area 1B and 1C, the Contractor shall execute a minimum of three test blasts using gradually increased charge weights to enable the Contractor's Blasting Consultant and the Contracting Officer to

establish criteria for limiting charge weights.

2. The Contracting Officer will install instrumentation, including instrumentation to measure blast vibrations, on critical structures adjacent to the project site. A description of this instrumentation is provided in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph EXISTING STRUCTURES INSTRUMENTATION. If there is a discrepancy between the Contractor's measurements of ground vibration (PPV) and the Contracting Officer's measurement of vibration, the measurements made by the Contracting Officer shall be used to establish limiting charge weights.

3. Whenever practical, test blasts shall also be designed to evaluate the results of smoothwall blasting measures intended to minimize overbreak. The effectiveness of tested control measures should be reported in test blast reports. Measures proposed for controlling the adverse effects of full-scale production blasts should also be included in the test blast reports.

4. The Contractor shall allow adequate time for executing test blasts. The Contractor shall coordinate the test blasting firing times to accommodate structural response monitoring that might be performed by the Contracting Officer. The Contracting Officer's review of the test blasting plans does not relieve the Contractor's responsibility for any damages that might result from blasting.

5. The Contracting Officer will review the test blast results and monitoring data and evaluate proposed blasting controls provided by the Contractor's Blasting Consultant before allowing full-scale blasting.

### 3.4 BLASTING

Perform blasting operations in a manner to minimize air-overpressure and ground motion near critical on-site structures and private structures. If blast-induced air overpressure or particle velocity exceeds the performance requirements specified herein, blasting shall be suspended in the affected excavation(s) until a re-designed blasting plan is submitted to and approved by the Contracting Officer.

The Contractor may need to employ special measures to meet the specified air-overpressure limit. These measures might include, but are not limited to, the use of: blasting mats or other practical measures deemed necessary by the Contracting Officer.

The Contractor shall use extreme care to prevent spillage or loss of any explosives, oils or other pollutants to the ground or lake water. If any explosives or other pollutants are spilled, immediately clean up the spilled explosives and dispose of them by approved means. Spills of any amount shall be immediately reported to the Contracting Officer.

#### Limitations:

1. Blasting shall not be permitted when in the opinion of the Contracting Officer it may be detrimental to existing installations. The Contracting Officer's decision will be final.

2. Controlled blasting techniques shall be used to prevent overbreak and minimize rock damage in all excavations. Blast patterns shall be

designed so that the explosive energy is not directed into the back and sidewalls of the excavation but, instead, towards the developed free face.

3. Whenever, in the opinion of the Contracting Officer, proposed blasting may cause harm to persons, cause damage to structures, or create unacceptable rock instability, cease blasting immediately and review the blast design. The Contractor can resume excavation of the rock with an approved re-designed blast plan or by mechanical means.

#### Misfires and Dangerous Conditions:

After a blast has been fired, the blaster-in-charge and one assistant under his or her direct supervision shall make a careful inspection of the blast area. The Contracting Officer's representative may be present for this inspection. Inspections shall determine whether there are any indications that misfires might have occurred or whether the blast created any other imminent dangers like unstable ground conditions. If misfires or other dangerous conditions are found, the blaster-in-charge will secure the area and properly correct all hazards before any other work is allowed in the affected area. The all clear signal, allowing other work to resume in the area, shall not be given until affected blast sites are clear of all hazards.

#### Post Blast Report:

After each blast, submit a Post Blast Report, including printed seismograph reports, to the Contracting officer prior to the loading of any subsequent blast holes. The Post Blast Report will include a written description of any deviations between the information contained in the corresponding Individual Blast Plan and the blast as it was drilled, loaded, initiated delayed and fired.

#### Video Tape Recording:

After each blast, submit a copy of the video tape recording of the blast to the Contracting Officer prior to the loading of any subsequent blast holes.

#### Rock Reinforcement:

Rock reinforcement consisting of rock bolts and rock and soil anchors, welded wire fabric, and shotcrete shall be installed commensurate with excavation, drilling, blasting and excavation of subsequent lifts shall not be allowed until rock reinforcement is installed in the slope above the preceding lift.

### 3.5 SUSPENSION OF BLASTING

Blasting operations may be suspended by the Contracting Officer for any of the following reasons:

1. The Contractor's safety precautions are inadequate.
2. Air overpressure at occupied building exceed 133 decibels.
3. The peak particle velocity measured at the reinforced concrete structures, including the spillway, intake tower, outlet works tower, tunnel lining, and bridge piers exceed 20 ips.

4. The peak particle velocity measured at the trunnions of the existing spillway and outlet regulating gates exceed 8 ips.
5. Existing structural conditions are aggravated or adjacent improvements are damaged by blasting and result in instrumentation measurements that exceed the Limiting Values specified in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS.
6. Blasting endangers the stability of or causes damage to facilities outside the prescribed limits of excavation.
7. The results of the blasting, in the opinion of the Contracting Officer, are not satisfactory.
8. Contractor or Subcontractor Personnel are acting unsafely around the blast area immediately, before, during or after blasting operations.

Blasting operations shall not resume until the Contracting Officer has approved the Contractor's revised blasting plan with modifications correcting the conditions causing the suspension.

Delays or suspensions of blasting operations, as a result of improper Contractor actions or inactions, shall not be compensated, or the basis of a claim.

### 3.6 PRE-BLAST/POST-BLAST INSPECTIONS

Prior to blasting, a thorough inspection shall be made of accessible portions of BNSF rail line and of all structures and openings within the Howard Hanson Dam, including but not limited to the existing outlet works tower, tunnel, access bridge and spillway, located within 500 feet of blast areas. Qualified specialists, approved by the Contracting Officer and the Contractor's insurance carrier, shall perform all inspections. The Contractor shall notify the Contracting Officer at least 7 days prior to the inspections so a representative of the Contracting Officer may be present. Inspections shall meet the following conditions:

1. Existing crack damage, other structural problems or defects occurring inside and outside of structures or internal openings within Howard Hanson Dam shall be thoroughly documented.
2. The condition of all portions of structures shall be documented by diagrams, transcribed notes and photographs to show the extent and location of any existing damage, deterioration and cracks.
3. Close-up detailed 35-mm photographs (with print film and negatives) will be taken of all cracks, deterioration or cracks observed in the exterior portions of structures and other property improvements.
4. Minimum size of all color photographic prints shall be 5" x 7" and based on standard 35-mm negative film format. The Contractor may also provide a HI-8 or equivalent quality video of the structures and features noted above.
5. Photographs and HI-8 or digital videos shall include imprints of the survey date.

As construction progresses, re-inspect, as often as necessary or at the intervals prescribed by the Contracting Officer, to verify that controlled

blasting methods are not causing any new damage.

After-blasting, inspections shall be required for any and all property at the Contracting Officer's request. All inspections shall be done at the Contractor's expense.

### 3.7 DAMAGE REPAIR

When blasting operations damage existing facilities, offsite properties, or a portion of the work, or material surrounding or supporting the work, promptly repair or replace damaged items to the condition that existed prior to the damage, to the satisfaction of the Contracting Officer.

Nothing contained herein shall relieve the Contractor of his responsibility for claims arising from his construction operations. Failure to inspect any structure required by these contract documents, or inadequacy of the inspections shall not relieve the Contractor of his responsibility. The Contractor shall indemnify the Contracting Officer from such claims.

-- End of Section --

## SECTION 02214

## GEOTECHNICAL INSTRUMENTATION

## PART 1 GENERAL

## 1.1 DESCRIPTION OF WORK

The work of this section includes furnishing, installing and maintaining the geotechnical instrumentation; and protecting the instrumentation (both that installed by the Contractor and the Contracting Officer) from damage. It also includes additional instrumentation that the Contractor deems necessary to ensure the safety of personnel and the Work. The Contractor shall implement required remedial and precautionary measures based on the instrumentation data.

## 1.2 PURPOSE OF GEOTECHNICAL INSTRUMENTATION PROGRAM

The purposes of the geotechnical instrumentation program include, but are not limited to providing:

- a. Pre-construction baseline data for comparison with construction and post-construction data.
- b. Monitoring of ground movement, groundwater conditions and existing structure's integrity during and after construction, to determine whether they have been adversely affected by construction activities.
- c. A forewarning of unforeseen conditions that may require remedial or precautionary measures.

The Contracting Officer is not responsible for the safety of the work based on geotechnical instrumentation data.

## 1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 778 (2000) Standard Sand

## 1.4 DEFINITIONS

Work Station - Computer established to receive/download data from Measurement Control Units on site.

## 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the

Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Installation Plan; G  
Instrumentation Site Plan; G

At least 30 calendar days prior to commencing installation of the first of each type of instrument, submit to the Contracting Officer for review the following items pertaining to that instrument type:

a. Detailed step-by-step procedure for installation, together with a sample installation record sheet. The procedures shall be bound and indexed. The installation procedures shall include:

1. The method to be used for cleaning the inside of the casing or borehole.

2. Specifications for proposed grout mixes, including commercial names, proportions of admixtures and water, mixing sequence, mixing methods and durations, pumping methods and tremie pipe type, size and quantity.

3. Drill casing, type and size, if used.

4. Depth increments for backfilling boreholes with sand and bentonite grout.

5. Method for overcoming buoyancy of instrumentation casings and components during grouting.

6. Method of sealing joints in pipes and inclinometer casings to prevent ingress of grout.

7. Method for assembly of instrumentation components.

8. Method for conducting post-installation acceptance test.

9. Routing plan for instrument leads to Automatic Data Acquisition System (ADAS).

10. Method for protecting instruments and cable leads from damage.

b. Proposed layout of site ADAS, including locations of data logger(s), multiplexers, telephone and power connections, and instrument cable/conduit routing.

c. A bar chart indicating the proposed time sequence of instrument installation in relation to the proposed excavation activities.

d. A review and acceptance of proposed instrument locations and quantities by the Contractor's Geotechnical Instrumentation Engineer relative to the Contractor's proposed construction method, schedule, and safety considerations.

## Implementation of Action Plans; G

Prior to implementation of instrumentation program, the Contractor shall submit to the Contracting Officer for review, generalized plans of action to be implemented in the event any response value, as specified in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS, is reached. The generalized plans of action shall be positive measures by the Contractor to do any or all of the following, as applicable:

- a. Limit further excavation-induced structure and ground movement.
- b. Limit vibrations to adjacent structures.
- c. Maintain the structural integrity of adjacent structures in accordance with response values (see Table 1).

## SD-02 Shop Drawings

## As-Built Location Plan; G

On every Monday, during instrument installation, submit to the Contracting Officer updated as-built location plans, including location of instruments, terminal units, conduits, and ADAS components, for work completed the previous week. Also included shall be updated instrument wiring schematics and schedule of instrument leads.

## SD-03 Product Data

## Manufacturer's Product Data; G

Within 21 work days of the Notice to Proceed, submit manufacturers' product data describing all specified instruments to the Contracting Officer for review, including requests for consideration of substitutions, if any, together with product data and instruction manuals for requested substitutions.

## SD-06 Test Reports

## Pre-Installation Test Record Report

Within 2 weeks of receipt of each instrument at the site, submit to the Contracting Officer completed pre-installation acceptance test record for that instrument in accordance with manufacturer recommendations.

## Instrument Test Report

Within 5 workdays of receipt of each instrument at the site, submit to the Contracting Officer a copy of factory calibration, manufacturer's test equipment certification, completed copy of quality assurance checklist, and warranty for each instrument and portable readout unit.

## Installation Record Sheet

Within 5 days of installation of each instrument, submit to the

Contracting Officer the installation record sheet for that instrument, including as-built location as specified.

#### Instrument Reading Report

Within 2 days of performing initial readings, as specified in paragraph: SCHEDULE OF WORK, submit to the Contracting Officer an initial reading agreement form for each instrument that has been signed by both the Contracting Officer and the Contractor.

The Contractor shall submit to the Contracting Officer a description of the work performed during that week for the following items. See DATA REDUCTION, PROCESSING, PLOTTING AND REPORTING for more details.

#### Groundwater Control

Summary of Support System Construction Activities  
Summary of Excavation and Filling Activities  
Summary of Construction Activities other than Excavation  
Summary Report of Unusual Events  
Inclinometer/Multi-point borehole Extensometer Cross Section

#### SD-07 Certificates

##### Personnel Qualifications; G

Within 3 weeks after the Notice to Proceed, submit to the Contracting Officer for review:

- a. Resume of Contractor's Geotechnical Instrumentation Engineer, sufficient to define details of relevant site experience.
- b. Resumes of other field and office geotechnical instrumentation personnel to be assigned to the project, other than clerical staff.

#### 1.6 RESPONSIBILITIES OF CONTRACTOR

Contractor's responsibilities shall include, but not be limited to the following:

- a. Furnish components of instrumentation that are to be installed during construction by the Contractor. Instruments installed by the Contracting Officer will be supplied by the Government.
- b. Provide routing and protection of cables from instruments to terminal boxes and/or multiplexers of Automatic Data Acquisition System (ADAS).
- c. Furnish portable readout units for the Contracting Officer's use.
- d. Install instruments and ADAS hardware.
- e. Protect from damage and maintain instruments installed by the Contractor, and existing and future instruments installed by the Contracting Officer for the Project. Repair or replace damaged or inoperative instruments at no additional cost to the Government.
- f. Install additional instrumentation that the Contractor deems necessary to ensure the safety of personnel and the work.

g. Provide safe access to the Contracting Officer for instrument installation and data collection.

h. Implement response actions.

## 1.7 QUALIFICATIONS OF CONTRACTOR'S INSTRUMENTATION PERSONNEL

### 1.7.1 General

Geotechnical instrumentation work involves highly specialized tasks. The Contractor's instrumentation personnel who are responsible for furnishing, installing, and maintaining all geotechnical instrumentation shall have the qualifications specified herein. These personnel may be on the staff of the Contractor or may be on the staff of a specialist instrumentation subcontractor.

The Contractor's instrumentation personnel including the Geotechnical Instrumentation Engineer, and all other field and office personnel shall be subject to the review of the Contracting Officer.

### 1.7.2 Geotechnical Instrumentation Engineer

The Contractor's instrumentation personnel shall include a qualified Geotechnical Instrumentation Engineer who is a registered Professional Engineer or Licensed Geologist, and who has at least 8 years of experience in installation and monitoring of the types of instruments specified herein, including installation and management of ADAS. The Geotechnical Instrumentation Engineer shall:

a. Review all proposed instrument locations and quantities and confirm that they are appropriate relative to the Contractor's proposed construction method, schedule, and safety considerations.

b. Prepare detailed step-by-step procedures and bar chart specified for submittal SD-01, "Installation Plan", for all instruments specified herein.

c. Be on site and supervise all installations of each type of instrument.

d. Conduct the pre-installation and post-installation acceptance tests for all types of instruments specified herein.

e. Be on site until the completion and acceptance by the Contracting Officer of the tasks identified in paragraphs 1.7.2.a through c, and subsequently be available for consultation at all times for the duration of the Contract.

f. Supervise data collection, reduction, plotting, interpreting, and reporting of instrumentation data.

## 1.8 QUALITY ASSURANCE

Factory calibrations of the input/output signals and temperature corrections shall be conducted on all instruments prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where

applicable, calibrations are traceable to the National Institute of Standards and Technology. Factory calibration shall have at least 5 points within the range of instruments and shall have three loading and three unloading cycles. This data shall be provided by the manufacturer.

A final quality assurance inspection shall be made by the manufacturer of the instrument prior to shipment. During the inspection, a checklist shall be completed to indicate all materials were included and inspected. A completed copy of the checklist shall be supplied with each instrument, and furnished to the Contracting Officer prior to installation.

Contractor shall provide the manufacturer's warranty for each portable readout unit and for the electrical components of the ADAS.

#### 1.9 SCHEDULE OF WORK

Install instruments and agree on formal initial readings in accordance with paragraph: DATA COLLECTION, and the following schedule:

- a. ADAS shall be installed 15 days prior to any dewatering or pumping tests, and/or start of foundation grouting, or excavation activities, with exception of the road cut along the south side of the project site.
- b. Vibrating wire piezometers shall be installed and formal initial readings agreed on at least 15 days prior to start of any dewatering or pumping tests, start of foundation grouting, or excavation activities, with exception of the road cut along the south side of the project site.
- c. Inclinator casings shall be installed and formal initial readings agreed on at least 7 days prior to start of foundation grouting, or excavation activities, with exception of the road cut along the south side of the project site.
- d. Horizontal MPBX shall be installed as excavation for facility continues. The excavation shall not proceed to depths greater than 5 feet below a proposed MPBX location. Initial readings shall be agreed on at least 3 days after installation of instrument.
- e. Load cells shall be installed on test anchors as excavation for structure progresses. Initial readings shall be agreed upon at least 3 days after installation of the instrument.

Variations in the schedule require the review and acceptance of the Contracting Officer.

#### 1.10 STORAGE OF INSTRUMENTS

All instrumentation materials, after receipt at the site and prior to installation, shall be handled and stored in an indoor space, as per manufacturer's requirements. Instruments shall not be exposed to temperatures exceeding the manufacturer's stated working temperature range.

#### 1.11 SITE CONDITIONS

Contractor shall provide access necessary for installation of instrumentation and ADAS. The Howard Hanson Dam project has existing instrumentation for Dam Safety that is monitored with Geomation 2380 series ADAS. Numerous Measurement Control Units (MCU) are located around the site, and are linked to a main control unit on the right abutment via radio

transmitters that are operating in the 400 to 500 Mhz range. Power is provided to existing MCUs by solar panels.

#### 1.12 EXISTING STRUCTURES INSTRUMENTS

Instrumentation is, or will be, installed, on, within, and around the existing adjacent structures, under separate contract by the Contracting Officer. These instruments include, and are not limited to, vibrating wire crackmeters, strain gages, sister bars, multipoint borehole extensometers, in-place inclinometers, liquid level system, and blast monitoring geophones.

The instrument leads from these instruments, excluding the blast monitoring devices, will be connected to an ADAS provided and installed at the existing Gate Tower by the Contracting Officer. Conduits will be used to route instrument leads from the designated instrument locations to the ADAS. These conduits will be located along the existing ground surface. The Contractor shall be responsible for maintaining and protecting these instruments, conduits, and cable from damage at all times.

#### 1.13 INSTRUMENT MONITORING

The instruments specified herein shall be monitored by an Automated Data Acquisition System (ADAS). The Contractor shall procure and install the necessary components of the ADAS. The Contractor shall connect the instrument leads to the ADAS, program the ADAS to monitor the instruments, and develop database for collection and presentation of data. The Contractor shall share recorded data with the Contracting Officer.

### PART 2 PRODUCTS

#### 2.1 GENERAL

All materials shall be new.

Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. The term "acceptable equivalent" shall be understood to indicate that the "acceptable equivalent" product is the same or better than the product named in the specifications in function, performance, reliability, quality, and general configuration. This procedure is not to be construed as eliminating from competition other suitable products of equal quality by other manufacturers. The Contractor may, in such cases, submit complete comparative data to the Contracting Officer for consideration of another product. Substitute products shall not be ordered, delivered to the site, or used for this project unless accepted by the Contracting Officer in writing. The Contracting Officer will be the sole judge of the suitability and equivalency of the proposed substitution.

Any request from the Contractor for consideration of a substitution shall clearly state the nature of the deviation from the product specified.

The Contractor shall furnish all installation tools, materials, and miscellaneous instrumentation components necessary for installation.

Specified readout units, together with associated calibration devices and software, shall be furnished to the Contracting Officer no later than one week before commencing installation of the first of each type of

instrument. In addition to specified readout units for the Contracting Officer's use when collecting data, the Contractor shall provide Contractor's own readout units as needed for making pre-installation and post-installation acceptance tests, and for taking any required readings during installation. Such readout units shall be identical to the specified readout units.

Surface protection shall be provided for instruments specified herein, including protection from damage from blasting, lightning, and construction activities. Surface protection, flush with the ground surface, shall be required for instruments installed in Contractor's staging areas. Instrument leads and cabling shall also be protected from blasting and construction activities, by installation in conduits and/or burial in ground.

For each instrument type, provide an instruction manual which shall include the following:

- a. A description of the purpose of the instrument.
- b. Theory of operation.
- c. Step-by-step procedures for:
  1. Pre-installation acceptance test when instruments are received on site, to ensure the instruments are functioning correctly prior to installation.
  2. Calibration of readout units.
- d. A list of calibration equipment required and recommended frequency of calibration for the readout units.
- e. Step-by-step installation procedure including any borehole requirements, materials, tools, spare parts, and post-installation acceptance tests.
- f. Maintenance procedures.
- g. Step-by-step data collection procedure.
- h. Data reduction, processing, and plotting procedures.

All graduations shall be in U.S. Customary Units; for example, feet, inches, pounds, temperature °F.

## 2.2 INCLINOMETERS

Provide 2.75-inch O.D. ABS inclinometer casing with machine-broached internal grooves, precision-alignment couplings, and twist tolerance better than one degree per 10-foot length, as manufactured by Slope Indicator Co, Mukilteo, WA, or acceptable equivalent. Couplings shall be of the non-telescoping type.

Provide installation accessories including end caps and coupling connection tools necessary for installation and grouting of inclinometer casing.

Cement grout backfill shall be a cement/bentonite mixture having a weight ratio of 1 / 2.5 / 0.3 (cement/water/bentonite).

Provide 1/4- to 3/8-inch diameter, stranded copper wire for use as

grounding system for ADAS. The wire shall be installed on at least one inclinometer casing, secured vertically along the exterior full length of the casing.

Surface protection shall have a diameter adequate to allow attachment of cable support assembly, or shall allow for an inclinometer casing extension while readings are being taken. The length of the casing extension shall be 12 inches, with a tolerance of 0.05-inches.

Provide inclinometer probe, cable, readout unit, attachment accessories, and data reduction software, manufactured by Slope Indicator Co., Mukilteo, WA. These portable units will be used to complete pre-construction surveys of inclinometer casings, and subsequent surveys, as needed.

Inclinometer equipment shall be as follows:

- a. Probe shall be model 50302500, manufactured by Slope Indicator Co. Probe shall be biaxial, consisting of two force balance accelerometers mounted at 90 degrees to each other, with a 2-foot wheelbase. Probe shall be supplied in a carrying case.
- b. Cable shall be model 50601000, with necessary connectors, manufactured by Slope Indicator Co. The cable shall be supplied in a continuous 200-foot length with vulcanized depth marks at 1-foot intervals, with an internal steel core wire, and a neoprene cable jacket.
- c. The readout unit shall be Digitilt Datamate, model 50310900, manufactured by Slope Indicator Co. Readout unit shall include a battery charger, and Datamate Manager (DMM) Software.
- d. Pulley assembly shall be model 51104606, manufactured by Slope Indicator Co.
- e. Inclinometer data reduction software shall be Digipro for Windows, model 50310001, manufactured by Slope Indicator Co.

### 2.3 MULTIPPOINT BOREHOLE EXTENSOMETERS (MPBX)

Provide borehole rod extensometer system manufactured by Geokon Inc, Lebanon, NH, conforming to the requirements specified herein.

Anchors for MPBX shall be groutable anchors, made from lengths of steel reinforcing bars, capable of being installed within a 3-inch diameter borehole.

Extensometer rods shall be 0.25-inch diameter stainless steel rods, in lengths of 10-foot and shorter, with ends threaded and tapped for assembly encased in PVC pipes, or continuous fiberglass rods encased in plastic tubing.

Rod completion kits shall be necessary to complete connections at bottom and top of extensometer rods.

Rod displacement monitoring shall be performed using a reference head with vibrating wire displacement sensors at the top of the installation. The reference head shall be a flangeless type of head that can be recessed into the borehole.

Displacement sensors shall be as follows:

- a. Displacement sensors in the reference head shall be Model 4450 VW Displacement Transducer, manufactured by Geokon Inc., Lebanon, NH.
- b. Displacement sensors shall have a 1-inch range, with a stated laboratory accuracy of  $\pm 0.1\%$  of full scale and a sensitivity of  $0.02\%$  of full scale.
- c. Displacement sensor and attached instrument cable shall be pressure tested to 100 psi at manufacturer's prior to delivery.
- d. Reference head shall be complete with seals capable of long-term submersion up to 100 psi.

Provide 12-conductor cable (six shielded twisted pairs), 22 gage, with a common drain wire, and a sheath of 0.11- inch thick pressure-extruded vinyl with an outside diameter of 0.5-inch. Cable shall be from the same commercial source as the displacement transducers. Cable shall be impermeable to long-term submersion of up to 100 psi. Lengths of cable shall be sufficient for routing from each reference head to the ADAS, or terminal unit located at top of excavation, with a minimum of 5 percent additional length. Additional length of similar cable routing from terminal units to ADAS will be necessary if terminal boxes are used.

Provide portable vibrating wire readout box (Geokon model GK-403) and terminal units. Terminal units shall be clearly marked with each MPBX and gage number. Readout and terminal units shall be as follows:

- a. Provide portable readout unit, jumper cable and interface so that each gage can be read separately by automatic switching, and readings stored in memory in the portable readout unit. The portable readout unit shall have a minimum of 64K RAM memory, and shall be programmed to display each sensor reading in engineering units.
- b. If a terminal box is used, it shall be a fiberglass or stainless steel watertight terminal box.
- c. Cable leads shall be routed from terminal unit into ADAS.

Cement grout backfill shall be in accordance with paragraph: INCLINOMETERS.

Surface protection shall be provided such that the recessed reference head of the instrument is protected from blasting and construction activities, and is accessible for maintenance, as necessary.

#### 2.4 VIBRATING WIRE PIEZOMETERS (VWP)

Provide vibrating wire piezometers, model 4500S or 4500MLP, manufactured by Geokon Inc., Lebanon, NH. Piezometers shall have a range of 50 psi, an over-range rating of twice the rated pressure,  $\pm 0.2$  percent full scale laboratory accuracy, and 0.025 percent full scale resolution, and shall be fitted with a low air entry filter.

Provide cable. Cable shall be attached to the piezometers through an integral bulkhead seal, consisting of an interior waterstop seal and a cable entry seal. Cable shall be 4-conductor, 22 gage, with two shielded twisted pairs, a common drain wire, and a sheath of 0.065 inch thick pressure-extruded vinyl with an outside diameter of 0.25 inch. Seals shall

be either O-rings or hermetic seals. The piezometer and attached cable shall have been tested and certified for water-tightness up to 100 psi. The cable shall be of sufficient length so that it can be extended from the top of the borehole to the ADAS.

Backfill grout shall consist of uniform sized fine ground or powdered non-drilling mud grade bentonite, for use in sealing and grouting well casings. A polymer-based thixotropic additive may also be added to the mix if recommended by the manufacturer. Special grout Type A shall have a mixed specific gravity, prior to placement within the instrument borehole, of between 1.03 and 1.10.

Filter sand shall conform to ASTM C 778, for No. 20-40 sand.

Granular bentonite shall be Enviropug Medium, manufactured by Wyo-Ben, Inc., Billings, MT, or Holeplug, manufactured by Baroid Division, Petroleum Services, Inc., Houston, TX, or acceptable equivalent.

## 2.5 VIBRATING WIRE LOAD CELLS

### **\*Amend R0009\***

Provide vibrating wire load cells , model 4900 manufactured by Geokon Inc., Lebanon, NH, for installation on selected rock bolts. Each load cell shall consist of a cylinder of high-strength heat-treated steel with three vibrating wire strain gages located at 120 degrees around the circumference of the cylinder, and at the mid-point of the cylinder height and wall thickness. Load cell capacity shall be ~~300~~ 100 kips as indicated on the schedule included in the plans with an over-range capacity of not less than ~~three times the rated capacity~~ 150 percent full scale. The height of the load cell shall exceed four times the cylinder wall thickness. All load cells shall be equipped with thermistors for measuring ambient temperatures. The housing and cable connector shall be permanently sealed for field conditions and shall be plated for corrosion protection. The cell and attached cable shall be proof tested by submersion in water for 72 hours at 100 psi.

\*\*\*\*

Provide cable of sufficient length, attached to the load cells through an integral bulkhead seal, consisting of an interior waterstop seal and a cable entry seal. Cable shall be eight-conductor, 22 gage, with four shielded twisted pairs, a common drain wire, and a sheath of 0.1-inch thick pressure extruded vinyl with an outside diameter of 0.375 inch. Seals shall be either O-rings or hermetic seals.

Installation locations will be determined by the Geotechnical Instrumentation Engineer and reviewed by the Contracting Officer as the excavation for the Facility progresses. The Contractor shall supply 8 gages of the type specified above, with attached cable lengths sufficient to reach the ADAS, or terminal units.

Provide terminal units from Geokon, necessary to accommodate the number and location of load cells. Terminal units shall be clearly marked with each load cell and gage number. Cable leads shall be routed from terminal unit into ADAS . Terminal units shall be as follows:

A fiberglass or stainless steel watertight terminal box with 4 deck switch shall be provided at each load cell station.

Provide protective enclosure or device sufficient in size to protect load cell, bearing plates, and anchor head assemblies from potential damage from blasting activities.

Each load cell shall be provided with top and bottom bearing plates with a minimum thickness of 1 inch, or as recommended by the manufacturer. Bearing plates shall be ground flat, smooth and parallel.

## 2.6 AUTOMATIC DATA ACQUISITION SYSTEMS (ADAS)

Provide components of ADAS necessary to monitor VW Piezometers, VW load cells, and VW displacement sensors in MPBX. ADAS consists of, but is not limited to, data logger, multiplexers, protective enclosures, transient protection devices, rechargeable external battery, battery charger, modem, flash memory card, software, and system documentation. All ADAS components shall be manufactured and/or provided by Geomation Inc., Golden CO.as follows:

- a. ADAS shall have the same excitation signal configuration as instrument manufacturer readouts to assure that VW gages will be read in accordance with manufacturer's specifications.
- b. Data logger(s) shall consist of Model 2380/80 and/or 2380/20 Measurement Control Units (MCU) manufactured by Geomation Inc.
- c. Multiplexers shall be 10-channel Analog Signal Multiplexers (Geomation Model ASM), pre-installed by manufacturer.
- d. Protective enclosures shall consist of lockable NEMA-4 cross-connect termination enclosures for the 2380 MCUs, with DIN rails, external battery brackets, and blank gland panels (Geomation Model EN80-XC or EN20-XC). The DIN rails, external battery brackets, and MCU shall be pre-mounted into the enclosure by the manufacturer. The blank gland panels, supplied by the manufacturer, shall be drilled or punched by the Contractor to accommodate the Contractor selected conduit configuration.
- e. Transient Protection Modules shall consist of a 20-pole multi-stage transient protection modules for each multiplexer, and shall be mounted and pre-wired to each multiplexer within the protective enclosure, by the manufacturer.
- f. Rechargeable battery shall be Geomation Model ERB-EN external rechargeable battery kit for the XC type enclosure, which includes 7.2 Amp Hour external rechargeable battery and wiring harness with a DIN-rail mounted battery-disconnect switch and fuse assembly. The external battery and wiring harness shall be installed and pre-wired in the enclosure by the manufacturer.
- g. External battery charger shall be Geomation model XBC.
- h. PCMCIA Modem card shall be Geomation model TNM. The main MCU on site shall have a modem card.
- i. Memory card shall consist of one 8 MB Industrial Flashdisk Mass Storage Card (Geomation model FMS-8).
- j. Three copies of Geonet Suite software and supporting documentation.

Power for the ADAS shall conform to the manufacturer's recommendation for the external battery charger. Contractor shall provide power to each data logger. Alternative charging power can be provided by use of solar panels.

The Contractor shall provide telephone connection to the main MCU on site.

Grounding shall consist of connecting ADAS ground leads to ground wire installed in inclinometer borehole as described in paragraph: INSTALLATION OF INCLINOMETER CASING.

Provide protection of ADAS components from damage from blast debris and construction activities.

For multiple MCU locations, Contractor shall establish communication between MCUs by either hard wire or radio-link connections. Hard wire connections shall be placed in conduit protected from damage. Radio-link connections shall not be in the 400 - 500 Mhz range.

The Contractor's Work Station for accessing and downloading data from the ADAS shall consist of the following computer hardware and software:

- a. 1.3 GHz (minimum) personal computer, with 40 GB of hard drive disk space, 128 MB RAM, 3.5-inch floppy disk drive, CD-RW disk drive, and a 56.6 kbps modem.
- b. The latest version of the following software for each desktop computer: MS Windows, MS Excel, MS Access, Grapher, and Slope Indicator's Digipro.
- c. In addition, the Contractor shall provide to Contracting Officer two (2) sets of the software Grapher and Slope Indicator's Digipro.

## 2.7 EXISTING STRUCTURES INSTRUMENTATION

The Contracting Officer will install instrumentation on critical structures adjacent to the project site. Most instrumentation will be installed prior to the Contractor's mobilization to the site; however, certain instruments, due to construction sequence will be installed during construction, as outlined in paragraph: CONTRACTING OFFICER INSTRUMENT INSTALLATION. These instruments will be utilized to monitor performance of existing adjacent structures during the construction of the Fish Passage Facility. Structures to be monitored include the Intake Entrance Structure, the Gate Tower, the Outlet Works Tunnel, the Gate Tower Bridge, the Spillway, the rock pillar between excavation and the Outlet Tunnel, and the rock formation above the Outlet Tunnel. Instrumentation includes liquid level systems, in-place inclinometers, multi-point borehole extensometers, piezometers, strain gages, sister bars, crackmeters, and blast monitoring instruments. Locations and designations of instruments installed by the Contracting Officer are presented in the As-built Reference Drawings (Plate Nos. GT-1 through GT-6).

During blasting events, the Contracting Officer will monitor some of the piezometers, crackmeters, sister bars, and strain gages dynamically. Double coil vibrating wire assemblies are installed in these gages to provide continuous output signal at a frequency of approximately 100 times per second. The output from these gages will provide a full waveform response to each of the blast events.

Response values for these instruments are provided in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS. The Contractor shall interpret the data collected by these instruments and shall implement plans of action as outlined in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS, in the event these response values are exceeded.

Formal initial readings for these instruments shall be provided to the Contractor prior to major construction activities.

#### 2.7.1 Liquid Level Systems

Liquid level systems are installed around the perimeter of the first bridge pier footing near the Gate Tower, and around the perimeter of the Gate Tower. Liquid level systems consist of the following components:

##### 2.7.1.1 Liquid Level Gage

The liquid level gage consists of a Model 4675-LLG vibrating wire liquid level gage manufactured by Geokon, Inc., Lebanon, NH. Gage includes vibrating wire transducer, weight, chamber, locking mechanism, thermistor, air and liquid fittings, and tubing. The liquid level gage is sealed for long-term immersion of up to 100 psi.

##### 2.7.1.2 Carrier Pipe

The carrier pipe consists of a 3-inch nominal schedule 40 stainless steel pipe, installed between the liquid level gages. The carrier pipe is joined to the liquid level gage or subsequent sections of pipe by rubber slip couplings, and supported along the structure at approximate 4-foot intervals.

##### 2.7.1.3 Cable

The cable is 4-conductor, 22 gage, with two shielded twisted pairs, a common drain wire, and a sheath of 0.065-inch thick pressure-extruded vinyl with an outside diameter of 0.25 inch. The cable is routed through rigid metal conduit that runs adjacent to the carrier pipe, and then is routed to the ADAS in the Gate Tower.

##### 2.7.1.4 Protective Enclosure

A 1/8-inch thick sheet metal cover is used to provide additional protection of the gages against damage from blasting and construction activities. The covers enclose the gage and are secured to the structure being monitored.

#### 2.7.2 Inclinometers

Two inclinometer casings are installed in the rock pillar between the Juvenile Fish Passage Facility excavation and the Outlet Tunnel, and one is installed between the Outlet Tunnel and the bridge pier footing. In-place inclinometer sensors are installed at selected depths in these casings. Each system is designed to be removed from the casing, when necessary, to allow manual inclinometer surveys of the casing. The in-place inclinometer system consists of the following components:

##### 2.7.2.1 Casing

ABS plastic casing as described in paragraph: INCLINOMETERS.

#### 2.7.2.2 Sensors

Uniaxial in-place inclinometer sensors manufactured by Slope Indicator Co., Mukilteo, WA. The gage is composed of 3-foot long tube, with upper and lower wheel assemblies, individual signal cables for each gage, and a cable suspension device secured at the top of the casing.

#### 2.7.2.3 Cables

The cable is 7-conductor, 22-gauge, with common drain wire, and a sheath of 0.1-inch thick pressure extruded vinyl with an outside diameter of 0.385 inches. A watertight connector is attached to the cable at the top of the casing, for quick disconnect when making manual casing surveys.

#### 2.7.2.4 Protective Covers

A flush-mount monument is attached to the top of each casing. Centered and secured to the monument is a 16-inch square, 8-inch deep metal junction box. The cable suspension device and cable connections are located within this box. The cables are routed from this box and through conduit to the ADAS in the Gate Tower.

#### 2.7.3 MPBX

Three vertical MPBXs are installed over the Outlet Tunnel alignment, with the lowest anchor embedded into the top liner of the tunnel. Each MPBX has three anchors at various depths. These instruments are manufactured by Geokon, Inc., Lebanon, NH. Details of the instruments are presented in paragraph: MULTI-POINT BOREHOLE EXTENSOMETER. The instruments are installed flush to the ground surface, with instrument leads being routed through conduits located along the ground surface to the ADAS in the Gate Tower.

#### 2.7.4 Vibrating Wire Piezometers

Two boreholes were completed within the rock pillar between the Juvenile Fish Passage Facility excavation and the Outlet Tunnel in which vibrating wire piezometers were installed. Each borehole has three piezometers at various depths. These instruments are manufactured by Geokon, Inc., Lebanon, NH. Details of the instruments are presented in paragraph: VIBRATING WIRE PIEZOMETERS. The instrument monuments are installed flush to the ground surface, with instrument leads being routed through conduits located along the ground surface to the ADAS in the Gate Tower. One vibrating wire piezometer will be installed in the north cast-in-place wall of the cofferdam during construction.

#### 2.7.5 Vibrating Wire Strain Gages

Vibrating wire strain gages are affixed to steel components of the trunnion gate support, and the concrete surface of the Intake Tower Structure. The strain gage installations include a strain gage sensor with plucking coil, anchors, cable, and protective housing, as described below:

##### 2.7.5.1 Strain Gage Sensor

Model VSM 4000-6" vibrating wire strain gage sensor with double plucking coils manufactured by Geokon, Inc., Lebanon, NH. All gages are equipped with thermistors for measuring ambient temperatures.

#### 2.7.5.2 Anchors

Weldable type anchors were used for bonding the gages to concrete or steel surface on the trunnion gate support. Groutable anchors were used on the Intake Entrance Structure. Groutable anchors are 3-inch long, 3/8-inch diameter reinforcement steel bars with a threaded hole to fit the ball coupling of the strain gage.

#### 2.7.5.3 Cable

Same type as Liquid Level System for the trunnion gages. Cables for the Intake Structure are 8-conductor, 22 gage, with four shielded pairs, a common drain and a sheath of 0.1-inch thick pressure-extruded vinyl with an outside diameter of 0.385 inches. The cables are routed through rigid conduit that is routed to the ADAS in the Gate Tower.

#### 2.7.5.4 Protective Covers

The strain gages are protected with stainless steel covers, formed to fit over the gages and protect from floating debris in the water.

#### 2.7.6 Vibrating Wire Sister Bars

Vibrating wire sister bars will be installed along anchors in the Intake Entrance seismic retrofit and on reinforcing steel in the cast-in-place north wall of the cofferdam. The gages will be permanently encased in grout or concrete. The sister bar installations include the gage and cable.

##### 2.7.6.1 Sister Bar Gage

Model 4911AR vibrating wire sister bar sensor with double plucking coils, manufactured by Geokon, Inc., Lebanon, NH. The coil assembly is secured to the middle of a 54-inch long, 1/2-inch diameter rebar. All gages are equipped with thermistors for measuring ambient temperature.

##### 2.7.6.2 Cable

Same type as strain gage cable used on the Intake Structure. The cables will be routed through conduit that is routed to the ADAS in the Gate Tower.

#### 2.7.7 Vibrating Wire Crackmeters

Vibrating wire crackmeters are installed across existing cracks and joints in concrete surfaces of the Outlet Tunnel liner, on the bridge pier footing, and bridge deck. The crackmeter installations include a crackmeter sensor, anchors, cable, and protective housing, as described below:

##### 2.7.7.1 Crackmeter Sensor

Model 4420-0.5" vibrating wire crackmeter sensor with double plucking coils manufactured by Geokon, Inc., Lebanon, NH. Some gages are equipped with thermistors for measuring ambient temperatures.

##### 2.7.7.2 Anchors

Groutable anchors are 3-inch long, 3/8-inch diameter reinforcement steel bars with a threaded hole to fit the ball coupling of the crackmeter.

### 2.7.7.3 Cable

Same type as Liquid Level System for the Tunnel Crackmeters. Cables for the other crackmeters are the same as the strain gage cables for the Intake Structure. The cables are routed through rigid conduit that is routed to the ADAS in the Gate Tower.

### 2.7.7.4 Protective Covers

Some of the crackmeters in the tunnel are recessed into the concrete liner and then patched to result in a flush surface. The remaining crackmeters are protected with stainless steel covers, formed to fit over the gages and protect from floating debris in the water.

### 2.7.8 Seismographs and Geophones

Seismographs and geophones will be installed at selected locations on the Intake Entrance Structure, Gate Tower, Outlet Tunnel, bridge pier, and the Spillway. The installations will include seismographs, geophones, cables, and accessories as described below:

#### 2.7.8.1 Seismograph

MiniMate Plus manufactured by InstanTEL, Ogdensburg, NY. Each seismograph (4 channel and 8 channel) includes an internal triaxial sensor, external microphone, AC power charger, and PC connecting cable.

#### 2.7.8.2 Geophone

High frequency uniaxial and triaxial geophones, manufactured by InstanTEL, Ogdensburg, NY, will be used for close proximity monitoring. These geophones have measurement ranges of up to 100 in/s in the frequency range of 28 Hz to 2000 Hz. Standard geophones with ranges of up to 10 in/s will generally be utilized on structures 50 feet or more from blast.

#### 2.7.8.3 Cable

Extension signal cables of up to 250 feet will be used to transmit signal from geophones to seismograph. Splitter cables will be used to connect multiple geophones into the seismographs. Cables are manufactured by InstanTEL, Ogdensburg, NY.

#### 2.7.8.4 Mounting Plate

Fastening plate for securing seismograph to floor, ceiling, and walls. Uniaxial geophones are recessed into concrete liner, attached to mounting bolt. Triaxial geophones are mounted directly to surface using mounting bolt, or attached to fastening plate and secured to surface. Fastening plates are manufactured by InstanTEL, Ogdensburg, NY.

#### 2.7.8.5 Software

Advanced Module software provided by InstanTEL, Ogdensburg, NY., is necessary for analysis of high frequency geophones.

### 2.7.9 ADAS

ADAS components will be installed at the Gate Tower (El. 1230) to monitor

the existing structures' instrumentation. This ADAS will be capable of dynamic and static monitoring of the strain gages, VWP's, and crackmeters. In addition, static monitoring of MPBX displacement transducers, liquid level gages, and thermistors, will be performed through ADAS. Data received through this ADAS will herein be known as Contracting Officer's Data.

#### 2.7.10 Access Platforms

Four of the instrument locations within the rock pillar, along the north side of the FPF, may require periodic access by the Contracting Officer. Permanent platforms were constructed and secured to the steep slope surface to provide this access from the staging area above. The Contractor shall be responsible for repair or replacement should damage occur as a result of blasting and/or construction activities.

### 2.8 FACTORY CALIBRATION

A factory calibration shall be conducted on all instruments at the place of manufacture prior to shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number. Quality assurance procedures during factory calibration shall be as specified in paragraph: QUALITY ASSURANCE.

Factory calibrations of vibrating wire piezometers shall be made against a pressure gage traceable to the National Institute of Standards and Technology. The accuracy of the pressure gage shall not be less than twice the specified accuracy of the piezometers. Calibrations shall be made to full scale in three complete cycles, recording the reading in 5 equal increments during three loading and three unloading cycles. The thermal factor of each piezometer shall be determined in a precision test chamber, at 0, 10, and 20 degrees C. The calibration record shall include gage factor, thermal factor, and zero reading with corresponding temperature and barometric pressure.

Factory calibrations of the inclinometer probe shall include comprehensive calibrations of the force balance accelerometers prior to assembly in the gage. A final calibration shall include measurements made at 2.5 degree intervals from -10 degrees to +10 degrees with respect to vertical, and a comprehensive repeatability check over a smaller zone near vertical.

Factory calibrations of vibrating wire displacement transducers shall be made against a dial gage traceable to the National Institute of Standards and Technology. The accuracy of the dial gage shall not be less than twice the specified accuracy of the displacement transducers. Calibrations shall be made to full scale in three complete cycles, recording the reading in 5 equal increments during three loading cycles. The thermal factor of each transducer shall be determined in a precision test chamber, at 0, 10, and 20 degrees C. The calibration record shall include gage factor, thermal factor, and zero reading with corresponding temperature and barometric pressure.

Factory calibrations of load cells shall be made in a testing machine with an accuracy traceable to the National Institute of Standards and Technology. Calibrations shall be made to full scale in three complete cycles, recording the reading in 5 equal increments during three loading and three unloading cycles.

## PART 3 EXECUTION

## 3.1 PRE-INSTALLATION ACCEPTANCE TESTS

When the Contractor's instruments are received at the site, the Contractor's instrumentation personnel shall perform pre-installation acceptance tests to ensure that the instruments and readout units are functioning correctly prior to installation. Pre-installation acceptance tests shall include relevant items from the following list:

- a. Examine factory documentation: suggested installation methods and calibration data to verify completeness.
- b. Examine manufacturer's final quality assurance inspection check list, to verify completeness.
- c. Check cable length and cable label.
- d. Check tag numbers on instrument and cable.
- e. Check, by comparing with procurement document that model, dimensions, and materials are correct.
- f. Perform resistance and insulation testing, in accordance with criteria provided by the instrument manufacturer, using a gage insulation or circuit tester that applies 2 volts or less for resistance testing and 15 volts or less for insulation testing.
- g. Verify that all components fit together in the correct configuration.
- h. Check all components for signs of damage in transit.
- i. Check that quantities received correspond to quantities ordered.
- j. For vibrating wire piezometers, check that the pre-installation reading agrees with the manufacturer's zero reading, as specified in paragraph:FACTORY CALIBRATION. During the pre-installation reading, barometric pressure and piezometer temperature shall be measured, and corrections applied in accordance with factory calibration data. Prior to making the pre-installation reading, the piezometer shall be maintained in a constant temperature environment for sufficient time, as stated by the manufacturer, to achieve thermal equilibrium. The pre-installation reading shall be made with the piezometer filter dry, and the piezometer shall not be placed in a sand-filled bag.

During pre-installation acceptance testing of each instrument the Contractor's instrumentation personnel shall complete a pre-installation acceptance test record form.

An instrument that fails the specified pre-installation acceptance test shall be repaired by manufacturer such that it passes a subsequent pre-installation acceptance test, or shall be replaced by an identical instrument at no additional cost to the Government.

## 3.2 INSTALLATION - GENERAL

The Contractor's instrumentation personnel shall install instruments in accordance with the Contractor's detailed step-by-step procedures that were

submitted as specified in the Installation Plan, and reviewed by the Contracting Officer.

Installation procedures for instruments in boreholes shall be such that all steps in the procedure can be quality assured.

Drilling, core retrieval, core logging, and core storage shall be in accordance with Section 02251a, FOUNDATION DRILLING AND GROUTING.

The Contractor may elect to use drill casings in the upper 20 feet (soil/weathered rock) of the vertical instrumentation boreholes. Prior to installing any instrument through drill casing, all material adhering to the inside of the casing, and all cuttings, shall be removed thoroughly.

Whenever withdrawing drill casing, during instrument installation in a borehole, care shall be taken to minimize disturbance to the borehole. Backfill material shall not be allowed to build up inside the casing such that the instrument is lifted as the casing is withdrawn. The casing shall be withdrawn without rotation. The casing may be omitted, if allowed by the Geotechnical Instrumentation Engineer, only where it can be shown that instrument installation without the casing will not cause collapse of the borehole or in any way adversely affect instrument installation.

Grout shall be placed using a tremie method with side discharge ports on the tremie pipe.

The Contractor shall notify the Contracting Officer at least 24 hours prior to installing each instrument.

As excavation of the Facility progresses, the Contractor shall use the profile information from the installed inclinometer casings to mark the sidewalls of the excavation. The vertical marks will assist the Contractor in placement of the rock bolts, seep holes, and multi-point borehole extensometers, in an effort to reduce possible damage to inclinometer casing.

For instruments which do not have factory-connected cable leads that can be routed directly to the ADAS or terminal units, the Contractor shall perform connections of instrument leads to multiconductor cables. These connections shall have a water-tight seal impermeable to submersion of up to 100 psi.

The Contractor shall provide and facilitate safe access to the Work at all times for the Geotechnical Instrumentation Engineer to complete instrument lead connections, perform manual readings, perform cable lead checks, and inspect instrument boreholes. Safe access shall include, but not be limited to, cessation of work activities, temporary relocation of obstructing materials and equipment, provision of ladders, provision of crane-operated man-baskets, and any other needs that, in the opinion of the Engineer, are necessary to ensure safety.

The Contractor shall install instrumentation, in addition to that specified herein, that the Contractor deems necessary to ensure the safety of personnel and the Work. The Contractor shall notify the Contracting Officer at least 24 hours prior to installing any such additional instrumentation. Data resulting from such instrumentation are referred to herein as Contractor's data, together with data specified in paragraph: DATA COLLECTION. Such Contractor's data will be accepted by the Contracting Officer only if the data are obtained from instrumentation furnished,

calibrated, tested, installed, and maintained as specified herein, if the data are collected and plotted as specified herein, and if submitted/provided to the Contracting Officer as specified herein.

The Contractor shall extend installed instrumentation and reinstall protective covers as necessary as grade changes occur, and revise instrument reference elevations as necessary.

As each instrument is installed, an installation record sheet shall be prepared, including appropriate items from the following list:

- a. Project name.
- b. Contract name and number.
- c. Instrument type and number, including readout unit.
- d. Planned location in horizontal position and elevation.
- e. Planned orientation.
- f. Planned lengths and volumes of backfill.
- g. Personnel responsible for installation.
- h. Drill equipment used, including diameter and depth of any drill casing used.
- i. Date and time of start and completion.
- j. Spaces on record sheet for necessary measurements or readings required at hold points during installation to ensure that all previous steps have been followed correctly, including instrument readings made during installation.
- k. A log of subsurface data indicating the elevations of strata changes encountered in the borehole. Strata nomenclature shall be based on profiles and boring logs contained in the Geotechnical Data Report.
- l. Type, length, and volume of backfill used.
- m. As-built location in horizontal position and elevation including:
  1. Elevation referenced to the vertical datum N.G.V.D. (1929) to an accuracy of  $\pm 0.01$  foot, together with the location of the point used for the elevation measurement.
  2. Horizontal position referenced to the North American Datum of 1983 (NAD 83) to an accuracy of  $\pm 0.1$  foot, together with the location of the point used for horizontal position measurement.
  3. A location sketch showing the instrument number, taped horizontal distances to the instrument, measured to an accuracy of  $\pm 1$  foot from permanent physical features in the field. A sufficient number of taped measurements shall be included on the sketch to establish a unique horizontal position for the instrument. If such features are removed, the Contractor shall provide a new sketch, prior to removal, with taped measurements to

other features.

- n. As-built orientation.
- o. Result of post-installation acceptance test.
- p. Weather conditions at the time of installation.
- q. A space on record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior.
- r. Instrument lead colors and each lead's function or code.

An instrument that fails the specified post-installation acceptance test shall be replaced by an identical instrument at no additional cost to the Government.

After installation, protective covers shall be free-draining. Protective covers that are not free draining shall be repaired or replaced at no additional cost to the Government.

The Contractor shall ensure that surface components of instrumentation, including, but not limited to, terminal units, cables, and conduits, will be protected and secured from possible inundation from flood events.

The Contractor shall submit updated as-built instrument location plans to the Contracting Officer. The location plans shall be reproducible composite plans of all installed instruments plotted on 11 inch x 17 inch or 24 inch x 36 inch sheets at a scale of 1 inch = 20 feet. The first plans shall be submitted within one week after completion of the first instrument installation, regardless of instrument type. Updated plans shall be submitted every subsequent week. Updated plans need not be submitted for periods during which no instruments have been installed.

### 3.3 INSTALLATION OF INCLINOMETER CASINGS

Inclinometer casings shall be installed at the locations and depths shown on the Instrument Schedules within the Plans, or as directed by the Geotechnical Instrumentation Engineer.

At least one inclinometer casing shall have a ground wire attached and installed to the full depth of the borehole, as described in paragraph: INCLINOMETERS.

Prior to drilling, the drill rig shall be plumbed to the designated plunge listed in the Instrument Schedule.

The Contractor shall retrieve continuous core samples throughout depth of borehole.

The inclinometer casings shall be oriented such that one axis of the internal grooves are within 5 degrees of being perpendicular to the excavation. Casing groove orientation shall be maintained throughout installation. During and after installation, the casing groove spiral shall not exceed one degree per 10 feet of length.

No part of the inclinometer casing shall deviate from designed inclination by more than 2 percent of the depth to that part.

After completion of installation, a post-installation acceptance test shall be performed to verify that there is no grout in the inclinometer casing, that groove orientation and verticality satisfy the specifications, and that the inclinometer probe tracks correctly in all four orientations. A vertical survey of the installed inclinometer casing shall be performed at 2-foot depth intervals using the standard probe, to determine the vertical profile of the casing, and develop an initial data set. The Contractor shall use the vertical profile of the casing to mark the location of the casing along the sidewalls of the excavation to prevent damage from installation of rock bolts, weep holes, and other instrumentation.

#### 3.4 INSTALLATION OF MULTI-POINT BOREHOLE EXTENSOMETERS

Multi-point borehole extensometers (MPBX) shall be installed at the locations and depths shown on the Instrument Schedules within the Plans, or as directed by the Geotechnical Instrumentation Engineer. Contractor shall locate MPBXs such that they do not intersect or damage existing instruments or pumping well location.

Horizontal MPBX shall be installed at the bench designated by the Geotechnical Instrumentation Engineer and reviewed by the Contracting Officer as the excavation progresses. Excavation greater than 5 feet below the designated MPBX location shall not occur until the instrument is installed and initial readings have been completed.

Assemble reference head, anchor rods, anchors, and grout tube as recommended by manufacturer of instruments. Upper tips of anchor rods shall be assembled such that they are less than 1/2-inch below the fixed readout head surface.

Tremie place grout at the bottom of the borehole and ensure that grout has been placed up to the bottom of the reference head. A seal shall be created at the bottom of the reference head with the grout tube and a short section of tubing passing through the top portion of the seal. Grout shall be placed until return is observed through the short section of tubing.

After completion of installation, but before grout has set, wash the reference head clean of debris and grout so that there are no obstructions to the smooth movement of the anchor rods within their protective sleeves.

Prior to installation of the displacement transducers, a pre-installation acceptance test shall be performed with a gage block.

Install and firmly secure the protective cover to reference head. Install surface protection over instrument assembly.

Route the multiconductor cable, for each MPBX borehole, through conduit up to top of excavation and into ADAS or terminal units. The Geotechnical Instrumentation Engineer will complete connections of the multiconductor cable to the respective displacement transducers.

#### 3.5 INSTALLATION OF VIBRATING WIRE PIEZOMETERS

Vibrating wire piezometers shall be installed at the locations and depths shown on the Instrument Schedules within the Plans, or as directed by the Geotechnical Instrumentation Engineer. Piezometers shall be located around the perimeter of excavation, approximately midway between the pumping well locations. At locations where piezometers are to be installed in closely

spaced groups or in the vicinity of other instruments installed in boreholes, piezometers shall be installed no closer than 10 feet from the adjacent borehole instruments.

At least one piezometer borehole shall be located immediately downstream of the cofferdam excavation (PZ-7300). The piezometer(s) will monitor ground water levels on the west side of the Phase 1B excavation, and will likely be destroyed during Phase 1C excavation.

Contractor shall retrieve continuous core samples from instrument borehole.

The vibrating wire piezometer shall be inverted and secured to the instrument cable, resulting in a looped end of cable less than 1 foot in length.

Prior to insertion of the piezometer in the borehole, a reading shall be taken of the vibrating wire transducer and thermistor, at ground surface.

After insertion of the piezometer a check shall be made to ensure that the piezometer reading agrees with the water head, and the elevation of the diaphragm shall be recorded.

Depth to the top of each increment of sand and granular bentonite shall be checked using a cylindrical sounding hammer. The granular bentonite shall not be tamped.

After completion of installation, a post-installation acceptance test shall be performed to verify that the piezometer functions correctly.

### 3.6 INSTALLATION OF LOAD CELLS

Rock bolt load cells shall be installed at locations within the excavation as directed by the Geotechnical Instrumentation Engineer and reviewed by the Contracting Officer.

Load cells shall be installed on test bolts, located in the middle of the design bolt pattern. The test bolts shall be similar in dimensions and installed in similar manner as production bolts, however only the bottom four (4) feet of the bolt shall be anchored to the rock formation. Anchorage can be completed with a grout plug, or epoxy capsules. The remaining ungrouted length of drill hole shall be cased with PVC pipe.

A 1-inch thick cement-grout pad shall be placed on the rock surface around the head of the test bolt, for placement of the lower bearing plate of the load cell assembly. The bolt shall be tensioned and locked off at 10 kips after the load cell is installed.

During installation of load cells, bearing plates and cell shall be in alignment within 0.125 inch, using centralizer bushings as necessary.

After load cell installation, perform post-installation acceptance test, by reading the gages, to ensure correct functioning.

Extend cables, within protective conduit to top of excavation and route into terminal boxes or ADAS.

### 3.7 INSTALLATION OF ADAS

Based on the quantity of instruments to be measured, multiple MCUs may be

utilized throughout the site. A main MCU shall be established to link with the designated Work Station for downloading data.

Multiconductor cables, capable of accommodating the quantity of leads necessary, may be used to reduce overall cabling routed from terminal units to MCUs. The Contractor shall be responsible for routing and protecting cables, and for performing connections of instrument leads to multiconductor leads within the terminal units. The Geotechnical Instrumentation Engineer shall perform the connection of cable leads within the ADAS. Individual instrument leads shall be labeled and easily identifiable at either end of the cable.

Installation of the ADAS equipment shall be in accordance with the manufacturer's recommendations for installation. Install the protective enclosure containing main MCU at the location shown on the Instrumentation Site Plan, or at Contractor's field trailer. Placement of additional MCUs shall be based on Contractor's submittal. Installation of all MCU enclosures shall be as follows:

- a. The enclosures shall be permanently mounted at elevations above 1,170 feet.
- b. MCUs shall be mounted by existing structures, or within constructed enclosures, such that MCUs will be protected from blasting debris.
- c. Each MCU shall be grounded in accordance with the manufacturer's recommendations, and as described in paragraph: AUTOMATIC DATA ACQUISITION SYSTEMS.
- d. The bottom blank gland panel, supplied by the manufacturer, shall be drilled or punched by the Contractor to accommodate the Contractor's selected conduit configuration.

Contractor shall route cable leads from instrumentation, or terminal units, into MCU enclosure allowing a minimum of 5 feet of cable for connection to the ADAS. Each instrument cable shall be clearly labeled with the instrument designation.

The Geotechnical Instrumentation Engineer shall perform the final connection of the instrument cables to the ADAS and programming of ADAS. The Contractor shall provide and facilitate safe access to the location(s) of the ADAS at all times for the Geotechnical Instrumentation Engineer, and Contracting Officer.

Power shall be provided to location of each MCU as indicated in paragraph: AUTOMATIC DATA ACQUISITION SYSTEMS.

### 3.8 CONTRACTING OFFICER INSTRUMENT INSTALLATION

The contracting Officer will install instrumentation, including vibrating wire sister bars, vibrating wire piezometers, and seismographs/geophones, during construction. Instrument installations will be performed at the intake entrance structure during the seismic retrofit work, and at the north cast-in-place wall of the cofferdam. Contractor shall provide assistance to the Contracting Officer to facilitate the instrument installations.

#### 3.8.1 Intake Entrance Structure Seismic Retrofit

In conjunction with the Contractor, the Contracting Officer shall install up to 16 vibrating wire sister bars on four vertical anchor rods and one downhole seismic geophone, as shown on Plate S8.2 of the plans. The Contracting Officer will attach instrumentation and associated instrument cables to rods prior to insertion in drilled holes. The Contractor shall provide a staging area for the anchor rods to be placed horizontally and prepared for instruments.

The Contractor will remove existing rigid metal instrument conduits from the Intake Entrance Structure deck (El. 1140). The Contractor shall provide replacement conduits, with similar cable capacity, from the top of the instrumented anchor holes to the existing rigid metal instrumentation conduits located at the south exterior corner of the Gate Tower. The Contracting Officer, with assistance of Contractor, will route instrument cables from the top of the instrumented anchor holes to the Contracting Officer's ADAS.

### 3.8.2 Cofferdam North Cast-In-Place Wall

In conjunction with the Contractor, the Contracting Officer shall install up to 5 vibrating wire sister bars and one vibrating wire piezometer on the reinforcement steel as shown on Plate S3.3 of the plans. The Contracting Officer, with the Contractor's assistance, will attach instrumentation and associated instrument cables to reinforcement steel prior to placement, if reinforcement is assembled in sections and lowered into position. If the Contractor assembles reinforcement steel in place, then the Contractor shall install instruments with the assistance of the Contracting Officer. The Contracting Officer, with assistance of the Contractor, will route instrument cables from the top of the drilled hole to the Contracting Officer's ADAS.

### 3.9 FIELD MAINTENANCE AND CALIBRATION

The Contractor's instrumentation personnel shall conduct regular maintenance of field terminals and accessible instrument components during construction. Maintenance shall include instruments installed by the Contractor.

The Contractor shall have the survey level peg-tested and adjusted, if necessary, once a week to check for collimation error.

### 3.10 DATA COLLECTION

#### 3.10.1 Initial Readings

The Geotechnical Instrumentation Engineer shall perform the manual initial readings of each instrument, and both the Geotechnical Instrumentation Engineer and the Contracting Officer shall check the validity of formal initial readings, and shall sign agreement to such readings as specified in the Instrument Reading Report, SD-05 Test Reports of paragraph: SUBMITTALS. No instrument will be accepted or paid for until formal initial readings are agreed upon as specified herein.

Data for initial readings shall be recorded on field data records, which shall include at least the following:

- a. project name
- b. contract name and number
- c. instrument type

- d. date and time
- e. observer
- f. readout unit number
- g. instrument number
- h. readings
- i. remarks
- j. visual observations
- k. other causal data including weather, temperature, and construction activities

Instrumentation data shall be recorded in U.S. Customary Units, such as feet, inches, pounds.

The Contractor shall provide and facilitate safe access to the Work at all times for the Geotechnical Instrumentation Engineer to collect data from specified instruments, and also from any additional instruments installed by the Contractor as specified in paragraph:INSTALLATION-GENERAL. Safe access shall include, but not be limited to, cessation of work activities, temporary relocation of obstructing materials and equipment, provision of ladders, working platforms and hoisting services, and any other needs that, in the opinion of the Geotechnical Instrumentation Engineer, are necessary to ensure the safety of data collection personnel. The Contractor shall furnish two sets of safety equipment for use by the Geotechnical Instrumentation Engineer when collecting data or accessing instrument locations, which shall include, but not be limited to respirators and harnesses.

For the Contractor's information, the following subparagraphs define formal initial readings, which will be collected by the Geotechnical Instrumentation Engineer and shall be agreed on by the Contracting Officer. The following definitions of readings other than formal initial readings shall apply to Contractor's data only.

A. A set of formal initial inclinometer readings for each inclinometer casing shall be performed. An inclinometer reading is defined as a set of readings at 2 foot intervals throughout the casing, and a second set at 180 degrees to the first set. The formal initial inclinometer reading will be selected from three reading sets as defined above, involving six complete traverses along the casing. Each reading other than the formal initial reading shall be a single reading. Check-sums (sum of two readings at the same depth but 180 degrees apart) shall be examined in the field. Except where obvious imperfections in the casing have affected the check-sums, the standard deviation of A- and B-axis check-sums over a 2 foot interval shall not exceed 0.0005 foot and 0.0010 foot, respectively.

B. A formal initial set of multi-point borehole extensometer readings will consist of the average of three readings with repeatability  $\pm 0.0005$  inches per 1 inch range gage, with the electronic readout, for each displacement transducer located at the reference head of the MPBX borehole. Each reading other than the formal initial reading shall consist of a single reading taken with the electronic readout unit or ADAS.

C. A formal initial vibrating wire piezometer reading will consist of the average of three readings with repeatability of  $\pm 0.25$  psi per 50 psi gage range. Each reading other than the formal initial reading shall be a single reading.

D. A formal initial load cell reading will be made with approximately 10 kips load on the load cell, and will consist of a set of readings of all strain gages, determining the average of the set, followed by repeating the set of readings two more times and averaging all three sets with repeatability  $\pm 150$ lb for 300 kips gage range. Each reading other than the formal initial reading shall be the average of a single set.

E. It is the Contractor's responsibility to maintain and periodically calibrate all portable readout boxes and probes in accordance with the schedule of such maintenance provided by the manufacturers of this equipment.

### 3.10.2 Reading Schedule

Instrumentation data shall be collected by the ADAS at least twice per day during active construction, and at higher frequencies during blasting events, with a minimum of once before and after the blast event. The reading schedule shall continue 24 hours per day, 7 days per week through the end of construction, and/or the end of the contract. Instrumentation collected through the ADAS will not include inclinometer casing surveys.

Manual inclinometer casing surveys shall be performed 1 to 2 hours after each blast event, for casings located within 75 feet of the nearest drilled blast hole.

Data recorded by the ADAS will be available to the Contractor and the Contracting Officer as specified in paragraph:DATA REDUCTION, PROCESSING, PLOTTING, AND REPORTING. This data will herein be known as the Contractor's Data.

The Contractor shall collect data from instrumentation specified herein, in addition to the data regularly collected by the ADAS, which the Contractor believes are required to ensure the safety of personnel and the Work.

### 3.11 DATA REDUCTION, PROCESSING, PLOTTING, AND REPORTING

#### 3.11.1 Data Reduction and Processing

The Contractor's Geotechnical Instrumentation Engineer shall program the ADAS to perform the functions specified below.

The ADAS will record measurements on a predetermined schedule, as specified in paragraph:DATA COLLECTION, and at an accelerated schedule during blasting events. The data will be stored within the main multiplexer until an ADAS Work Station downloads it. The multiplexer will automatically download data to the Work Station when a communication line is established between the two units. This shall be performed after each blasting event, or once per day (whichever is greater), with the main multiplexer automatically calling the Work Station, or by calling the multiplexer directly from the Work Station.

The ADAS shall be programmed to convert the raw data into engineering units. Both the raw data and the engineering units shall be downloaded from the multiplexer to the Work Station. The Contractor's Data shall be sent from the ADAS to both the Contractor's Work Station and the Contracting Officer's Work Station. A database, integral with the ADAS, will automatically be updated, after additional data is downloaded, on both the Contractor's and Contracting Officer's Work Stations. Plots of data

will be available within this database.

The ADAS shall be programmed to trigger an alarm when measurements occur that meet or exceed the threshold values, as established in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS. The triggered alarms shall alert the Contractor either by audible means and/or pager.

### 3.11.2 Plotting

Plots of the Contractor's Data shall be available through the database, updated every time measurements are downloaded from the ADAS. The ADAS shall be programmed by the Geotechnical Instrumentation Engineer to develop the following types of plots for each instrument type:

- a. Plots of vibrating wire piezometer data shall show piezometric elevation versus time.
- b. Plots of multi-point borehole extensometers shall show deformation of each anchor in borehole versus time.
- c. Plots of load cell data shall show load versus time. A plot of temperature versus time shall be on the same axis.

Additional plots of instrumentation, not recorded by the ADAS shall include:

- a. Plots of inclinometer casing vertical surveys. Plots of inclinometer data shall be "cumulative change" data, showing absolute horizontal deformation versus depth, and "change" data showing incremental deflection versus depth, and shall be prepared on 8-1/2 inch x 11-inch sheets using Digitilt software. The top of the inclinometer casing (excluding any extension length added during data collection) shall be used as a datum for depth measurement. Multiple plots shall be on the same sheet to provide a time history, each labeled with the date. Each plot shall include the instrument numbers, station, and offset. Electronic copies of the raw data shall also be provided in Digitilt (PCslin) format.

### 3.11.3 Reporting

Each week the Contractor shall submit to the Contracting Officer an updated set of instrumentation data plots as described in the subparagraphs above for both the Contractor's Data and the Contracting Officer's Data.

- a. A description of groundwater control and temporary pressure relief operations. This description shall include the pump locations (plan location and depth), times and duration of operation, and estimated quantity of flow from dewatering operations as well as metered quantity of flow from each well.
- b. A summary of the support system construction activities. This installation shall include a location plan and narrative indicating rock bolt installation, in addition to other excavation support systems.
- c. A summary of excavation activities. This summary shall include a location plan and a description of where excavation has occurred during the week, together with plots of the elevation of the bottom of the excavation or top versus station, showing a plot for the current date and one each for the three previous weeks.

- d. A description and location of any construction activities other than excavation support system, excavation, including any surcharge caused by temporary construction loads.
- e. A report of any unusual events that may have affected the instrumentation readings. This report shall include a description of any remedial or precautionary measures that were implemented during the week in response to geotechnical instrumentation or other data, including when they were implemented and for what reason. The report shall also include a description of any future remedial or precautionary measures that are planned in response to existing geotechnical instrumentation or other data.
- f. An evaluation of Contractor's instrumentation data, and recommendations to ensure safety for work site and personnel.
- g. A list and proposed layout of additional recommended instrumentation.

Each week the Contractor shall also submit to the Contracting Officer a cross section, at each inclinometer / multi-point borehole extensometer location, using a vertical scale of 1 inch = 20 feet, showing the key construction activities and other events that could influence changes in the data. These key construction activities and other events shall include at a minimum: current elevation of the bottom of the excavation at the same station as the inclinometer / multi-point borehole extensometer; support system construction including current depth of walls; elevation, installation angle, and number for each bolt; stratigraphy to final bottom of excavation; profile and number of each inclinometer / multi-point borehole extensometer; and contract stationing.

### 3.12 ELECTRONIC ACCESS TO DATA

The Contracting Officer shall have access to the Contractor's Data during the construction contract. Similarly, the Contractor will have access to the Contracting Officer's Data during the construction contract. Some of the new data in the database may be unchecked. The Contractor can retrieve and use the unchecked data at their own risk.

The Contractor access to the Contracting Officer's data will be accomplished by two data transmission methods. The first data transmission method will provide the Contractor with real-time data views and alarms which are based on thresholds and limits set for data measurements. The Contracting Officer's data will be directly transmitted from the data logging facilities to a contractor supplied computer at the construction site. To accomplish this method of data transmission, the Contractor will be required to obtain hardware and software compatible with the Contracting Officer's instrumentation monitoring systems. The second data transmission method will provide comprehensive instrumentation data via a common web site that will be accessible to the Contractor, the Contracting Officer, and other team members. It is anticipated that data on the Contracting Officer web site will be available 5 to 10 minutes after the actual measurement time. It is also anticipated that access to the web site will only require a typical personal computer with Internet access.

### 3.13 DAMAGE TO INSTRUMENTATION

The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from

damage due to construction operations, weather, lightning, traffic, and vandalism.

If an instrument, including an existing instrument installed by others, is damaged or inoperative, the Contractor's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours at no additional cost to the Government. The Contractor shall notify the Contracting Officer at least 24 hours prior to repairing or replacing a damaged or inoperative instrument. The Contracting Officer will be the sole judge of whether repair or replacement is required.

### 3.14 DISCLOSURE OF DATA

The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent from the Contracting Officer.

### 3.15 INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS

The Contractor shall interpret the Contractor's Data and the Contracting Officer's Data. Interpretation shall include making correlations between instrumentation data and specific construction activities. Instrumentation data shall be evaluated to determine whether the response to construction activities is reasonable.

Table 1 indicates Threshold and Limiting Values for selected instruments. These values shall be defined collectively as Response Values. The actions associated with these Response Values are defined below. Plans for such actions are referred to herein as plans of action, and actual actions to be implemented are referred to herein as response actions. Response Values are subject to adjustment by the Contracting Officer as indicated by prevailing conditions or circumstances.

TABLE 1. RESPONSE VALUES

<u>Instrument</u>	<u>Threshold Value</u>	<u>Limiting Value</u>
A. Vibrating Wire Piezometers		
During Excavation	Groundwater elevation less than 5 ft below adjacent subgrade elevation	Groundwater elevation equal to adjacent subgrade elevation
During Dewatering of the Excavation Following a Flood Event	Groundwater elevation more than 3 ft above water elevation in the adjacent flooded excavation	Groundwater elevation more than 5 ft above water elevation in the adjacent flooded excavation
B. Inclinator Casings (See Notes 1 & 2)		
1. In-Place Sensors (See Note 5)	Change in Slope = 30 seconds	Change in Slope = 45 seconds
2. Inclinator Casing Surveys	0.0005H	0.001H
C. Multi-Point Borehole Extensometers		
1. Above Existing Tunnel - Vertical (See Notes 3 & 5)	0.01 ft	0.04 ft
2. Excavation Sidewalls - Horizontal (See Note 2)	0.01 ft	0.04 ft
D. Liquid Level Gages (See Notes 3 & 5)		
1. On Structures	0.01 in	0.02 in
E. Outlet Works Tunnel Liner (see Note 5)		
1. Crack Meters	0.05 in.	0.1 in.
2. Static Strain Gages	100 microstrain	250 microstrain
F. Load Cells	5 kip increase in load	10 kip increase in load
G. Seismographs (see Note 5 & 6)		

TABLE 1. RESPONSE VALUES

1. Reinforced Concrete Spillway, Outlet Works Tower, Outlet Works Tunnel Lining, and Bridge Piers	16 in/s	20 in/s
2. Trunnions of Existing Spillway and Outlet Works Regulating Gate	6 in/s	8 in/s

*NOTES:*

1. *H is equal to the current excavation depth.*
2. *Instrument Response Values refer to horizontal displacement.*
3. *Instrument Response Values refer to vertical displacement.*
4. *Contractor monitored instruments, not in ADAS.*
5. *Data for existing structures supplied by Contracting Officer.*
6. *Instrument response values given are peak particle velocities.*

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If a Threshold Value is reached the Contractor shall:

- a. Meet with the Geotechnical Instrumentation Engineer and Contracting Officer to discuss the need for response action(s).
- b. If directed by the Geotechnical Instrumentation Engineer or the Contracting Officer, during the above meeting, that a response action is needed, within 24 hours of receiving instrumentation data from the ADAS or Contractor, indicating that a Threshold Value has been reached, submit a detailed specific plan of action, based as appropriate on the generalized plan of action submitted previously in accordance with the Sections 02212, CONTROLLED BLASTING, 02521a, WATER WELLS, and 02525a, RELIEF WELLS.
- c. If directed by the Geotechnical Instrumentation Engineer or Contracting Officer, implement response action(s) within 24 hours of submitting a detailed specific plan of action, so that the Threshold Value is not exceeded.
- d. Install additional instruments if directed by the Geotechnical Instrumentation Engineer.

The Contractor shall take all necessary steps so that the Limiting Value is not exceeded. Contractor may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid exceeding the Limiting Value.

If a Limiting Value is reached, the Contractor shall:

- a. Meet with the Geotechnical Instrumentation Engineer and Contracting Officer to discuss the need for response action(s).
- b. If directed by the Geotechnical Instrumentation Engineer or Contracting Officer, during the above meeting, that a response action is needed, within 24 hours of receiving instrumentation data from the ADAS or Contractor indicating that a Limiting Value has been reached, submit a detailed specific plan of action, based as appropriate on the

generalized plan of action submitted previously in accordance with the Sections 02212, CONTROLLED BLASTING, 02521a, WATER WELLS, and 02525a, RELIEF WELLS.

c. If directed by the Geotechnical Instrumentation Engineer, implement response action(s) within 24 hours of submitting a detailed specific plan of action, so that the Limiting Value is not exceeded.

### 3.16 DISPOSITION OF INSTRUMENTS

Remove salvageable instruments only when directed by the Contracting Officer. All salvaged instruments shall become the property of the Contracting Officer.

Portable readout units and computers furnished to the Contracting Officer for data collection shall become the property of the Contracting Officer. Portable readout units used by the Contractor during installation, during pre- and post-installation acceptance testing, and for collecting Contractor's data shall remain the property of the Contractor.

It is the responsibility of the Contractor to ensure that all instruments installed by the Contractor shall be operational upon completion of the Work for possible later monitoring by the Contracting Officer. If directed by the Contracting Officer, the Contractor shall remove any or all instruments at no additional cost to the Government. The Contracting Officer will be the sole judge of whether or not removal is required. If directed by the Contracting Officer to remove piezometers, multi-point borehole extensometers, or inclinometers, the upper two feet of the instrument shall be removed, together with the surface protection. The remaining open portions of the instrument and casing shall be backfilled with cement grout up to a level two feet below the ground surface, and with lean concrete in the upper two feet. Disturbed or damaged surfaces shall be restored to the condition existing before installation of the instrument.

-- End of Section --

## SECTION 02251

## FOUNDATION DRILLING AND GROUTING

## PART 1 GENERAL

## 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 70	(1994) Surface Moisture in Fine Aggregate
ASTM C 91	(1998) Masonry Cement
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	(1999a) Portland Cement
ASTM C 618	(1999) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 937	(1997) Grout Fluidifier for Preplaced-Aggregate Concrete

## ASME INTERNATIONAL (ASME)

ASME B16.3	(1992) Malleable Iron Threaded Fittings
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## U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 100	(1975) Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
EM 385-1-1	(1996) Safety and Health Requirements Manual

## 1.2 GOVERNMENT SAMPLING AND TESTING

## 1.2.1 Preconstruction Sampling and Testing

## 1.2.1.1 Sand, Cementitious Materials, and Admixtures

Sampling and testing of these materials shall be in accordance with Section 03301a CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

### 1.2.1.2 Grout Materials

Sampling and testing of grout materials shall be in accordance with Section 03301a CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

### 1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

#### SD-03 Product Data

Drilling Equipment  
Grouting Equipment  
Grout Material; G

Details and data on the drilling and grouting equipment shall be submitted for conformance with the requirements of paragraph EQUIPMENT.

Grout Plant; G

A detailed plan shall be submitted showing equipment and grout plant layout proposed for mixing and placing grout.

#### SD-06 Test Reports

Grouting Operations

Contractor shall furnish grouting records to the Government within 24 hours of grouting operations

#### SD-07 Certificates

Contractor Qualifications

Grouting Contractor shall have and provide evidence to the Government of at least 10 years of successful grouting experience on similar projects with adjacent critical structures.

### 1.4 MATERIALS DELIVERY, STORAGE, AND HANDLING

Transportation and storage of materials shall be in accordance with Section 03301a CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

#### 1.4.1 Cement

A sufficient quantity of cement shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of cement. In the event the cement is found to contain lumps or foreign matter of a nature and in amounts which, in the opinion of the Contracting Officer, may be deleterious to the grouting operations, screening through a standard 100 mesh screen, or rejection of the cement, may be required as determined by the Contracting Officer. No payment will be made for such screening or rejected cement.

## 1.5 PROJECT/SITE CONDITIONS

The project grouting will consist of installation of a grout curtain in four areas of the upstream side of the project site: 1) left abutment; 2) intake structure foundation; 3) intake structure seismic retrofit backfill and 4) cofferdam foundation; the approximate locations, limits and details which are indicated. The intent of the grout curtain is to reduce seepage into the excavation. To maintain adequate overburden pressures and reduce potential for grout leaks, the left abutment and intake structure grouting will be conducted prior to Phase 1B blasting and excavation. The cofferdam foundation grouting will be conducted at an intermediate period of Phase 1B blasting and excavation when the excavation reaches elevation 1075.

The program shown and described is based on currently available information. Conditions encountered during construction may require additions or deletions. The grouting program shall not be modified or curtailed as a construction expediency. It is a required part of design and shall not become secondary to any time or scheduling restrictions. Final determination of grouting mixes, pressures, injection rate and the sequence in which the holes are drilled and grouted will be made in the field and shall be as directed by the Contracting Officer.

## PART 2 PRODUCTS

### 2.1 GROUT MATERIAL

Grout shall be composed of water and cement, pozzolans, admixtures, and fillers, as needed and approved by the Contracting Officer. The grout mixes will be approved by the Contracting Officer and will be varied to meet the characteristics of each hole as determined by conditions encountered. The various materials to be furnished by the Contractor shall conform to the specifications listed in the paragraphs below.

#### 2.1.1 Water

Water suitable for use in the work can be obtained from a well at the left dam abutment just upstream from the spillway gates. It shall be the responsibility of the Contractor to provide a pump and any necessary supply line connections and extensions.

#### 2.1.2 Cement

Cement used in grout shall conform to the requirements of ASTM C 91 and ASTM C 150. The use of bulk cement will not be allowed. Only cement furnished in moisture-resistant cloth or paper bags will be accepted to use in the work. Storage of cement shall be in accordance with paragraph MATERIALS DELIVERY, STORAGE, AND HANDLING.

#### 2.1.3 Pozzolans

Pozzolans, if required, shall be fly ash or other raw or calcined natural pozzolans conforming to ASTM C 618. Sampling will be done by an authorized representative of the Government. All tests will be made by and at the expense of the Government. Pozzolans are to be furnished in moisture resistant paper sacks. It shall be transported, handled, and stored so as to avoid damage, waste, or absorption of moisture. Material which has become caked due to moisture absorption will be rejected.

#### 2.1.4 Microfine Cement

Microfine cement, if required, shall consist of a blend of ultrafine Portland cement and ultrafine blast furnace slag with 95 percent of the particles finer than 10 microns and 50 percent of the particles finer than 3 microns. The ultrafine cement shall include a high range water reducer supplied as a powder preblended into the ultrafine cement or as a liquid to be added by the grouting contractor. Use only liquid superplasticizers supplied by or approved by the ultrafine cement supplier as being compatible with their ultrafine cement. Sampling shall be done by an authorized representative of the Government. All tests shall be made by and at the expense of the Government. Ultrafine cement is to be furnished in moisture resistant sacks. It shall be transported, handled and stored so as to avoid damage, waste, or absorption of moisture. Material that has become caked due to moisture absorption will be rejected.

#### 2.1.5 Admixtures

Admixtures, if required, shall be added to the grout immediately before or during its mixing and will consist of accelerators, retarders, water reducers, aluminum powder, and/or fluidifiers.

#### 2.1.6 Fluidifier

Fluidifier shall be a compound possessing characteristics which will increase the flowability of the mixture, assist in dispersal of the cement grains, and neutralize the setting shrinkage of the grout. The quality of the material shall meet the requirements specified in ASTM C 937. Sampling of fluidifier shall be done by an authorized representative of the Government. Trial mixtures should be tested prior to using the materials in field work. All tests will be made by and at the expense of the Government. Fluidifier shall be furnished in moisture-resistant paper sacks shipped in sealed containers and shall be handled and stored so as to avoid absorption of moisture, damage or waste. Material which has become caked due to moisture absorption will be rejected.

#### 2.1.7 Bentonite

Bentonite shall be sodium (Na) cation, powdered montmorillonite. It shall be added to the cement grout 2 percent to 5 percent by weight of cement. The percentage shall be adjusted as directed by the Contracting Officer. A separate colloidal bentonite mixer is required to mix the bentonite and water to ensure fully dispersing and hydrating the bentonite before adding to the grout mixer. The bentonite shall be handled and stored so as to avoid absorption of moisture, damage, or waste. Bentonite which has become caked due to moisture absorption will be rejected. A sufficient quantity of bentonite shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of bentonite.

#### 2.1.8 Sand

a. Sand for grout shall be clean and consist of hard, tough, durable, uncoated particles with no more than 2 percent passing the #200 sieve. The shape of the particles shall be generally rounded or cubical and shall not contain more than 5 percent of flat or elongated pieces having a maximum dimension in excess of five times the minimum dimension. The sand shall be generally well graded from fine to medium in accordance with ASTM C 136 with 100 percent passing the No. 30 sieve.

b. The sand shall be subjected to such tests as are necessary to

determine its acceptability. All sampling of sand shall be in accordance with the applicable sampling provisions contained in COE CRD-C 100 or as directed. Unless otherwise directed, all test samples shall be taken under the supervision of the Contracting Officer and shall be delivered to a designated point, at the expense of the Contractor, at least 10 working days in advance of the time when sand will be required at the site of work. All tests will be made by the Government at its expense. The tests to which the sand will be subjected will include specific gravity, absorption, soundness in magnesium sulfate, petrographic analyses, and any other tests that are necessary to demonstrate that grout of adequate durability can be produced.

c. The percentage of surface moisture in terms of the saturated surface-dried sand will be determined in accordance with ASTM C 70, or other method giving comparable results.

d. Sand shall be stored in such a manner as to avoid the inclusion of any foreign materials in the grout. All sand shall remain in free draining storage for at least 72 hours prior to use.

## 2.2 METAL PIPE AND FITTINGS

Metal pipe and fittings, if required, for constructing grout and exploratory holes, shall be furnished, cut, threaded, and fabricated by the Contractor.

### 2.2.1 Pipe

Pipe will be black steel. The pipe shall conform to ASTM A 53/A 53M.

### 2.2.2 Fittings

The fittings shall be black, malleable iron in accordance with ASME B16.3.

## PART 3 EXECUTION

### 3.1 EQUIPMENT

#### 3.1.1 General

All drilling, including exploratory hole drilling, and grouting equipment used shall be of a type, capacity and mechanical condition suitable for performing the work, as determined by the Contracting Officer. The power and equipment and the layout thereof shall meet all applicable requirements of local, State, and Federal regulations and codes, both safety and otherwise.

#### 3.1.2 Drilling Equipment

Standard drilling equipment of the rotary or percussion type shall be used to perform the drilling as specified in paragraphs GROUT HOLE DRILLING and EXPLORATORY HOLE DRILLING. Water or air shall be used to remove cuttings from the hole during drilling operations. Supplies shall include all bits, drill rods, tools, casing, piping, pumps, water, and power to accomplish the required drilling. All drilling rigs and pumps will be equipped with pressure gages. A borehole deviation survey, using a method proposed by the Contractor and approved by the Contracting Officer, shall be employed at each stage of the first three primary grout holes in the intake

structure grout curtain. The survey is intended to verify angle and location of grout holes, and reduce potential for damage to the intake structure. If location of grout holes are inaccurate, additional grout holes and deviation surveys may be required, as determined by the Contracting Officer and at no cost to the Government. Water suitable for use in the work will be supplied by the Contractor, as described in paragraph: WATER.

### 3.1.2.1 Core Boxes

Longitudinal partitioned wooden core boxes shall be furnished for rock cores. Core boxes shall be fabricated from dressed lumber. Core boxes shall be completely equipped with all necessary partitions, covers, hinges and hasps for holding down the cover. White painted wooden spacer blocks used to partition the core to provide marking space to identify core runs shall be furnished with the core boxes. Contractor shall furnish three spacer blocks per core box, painted with non-glass red paint for marking voids and core losses. Staples will not be allowed in core box construction. Core boxes shall be identified with stenciled labels on the inside and outside of the cover. Labels shall show: Project, Boring No. Depth, and Box No. Core boxes shall be placed on wooden pallets. All cores shall be arranged neatly in the partitioned boxes in the same sequence in which they occurred before removal from the boring. Facing the open box with the hinged cover above and the open box below, cores shall be arranged in descending sequence beginning at the left end of the trough nearest the hinges and continuing in the other troughs from left to right. The highest part of the core shall be placed in box no. 1 and the lower portions of the core shall be placed in the other boxes in consecutive order. A waterproof, black, wide-tip felt tip marker shall be used for labeling the core boxes. The individual white blocks shall be placed at the end of a core run and labeled in tenths of feet. White blocks shall contain the following information: Run ID (ie run A); D (length of run, ie 4.8 ft; C (length recovered; ie 4.8 ft); L (loss, ie 0.0); and D (ending depth of run; ie 47.5 ft).

### 3.1.3 Grouting Equipment

The grout plant shall be capable of supplying, mixing, stirring and pumping the grout and additives, to the satisfaction of the Contracting Officer. The plant shall have a minimum capacity of 30 gpm of grout injected at a combined pressure (static head and pumped pressure) not greater than 150 psi.

The grout plant shall be properly maintained at all times and any grout hole that is lost or damaged due to mechanical failure of equipment or inadequacy of grout supply shall be replaced by another hole, drilled by the Contractor at his expense. The amount of grouting equipment shall be as necessary to perform the work specified herein. The type to be furnished shall include the following:

- a. A progressive cavity pump capable of passing particles up to a top size of No. 16, generating pressures up to 50 psi and pumping a maximum of 30 gpm. In no case will the pump be separated by more than 200 feet of grout line from the header of a hole being grouted.
- b. A colloidal type grout mixer having a minimum drum capacity of approximately 10 to 15 cubic feet with a mix batch of 15 cubic feet. Mixing time shall be as required to mix thoroughly. A No. 30 sieve filter screen shall be placed over the mixer to remove agglomerated grout from the return line.

- c. A separate colloidal mixer for mixing and hydrating bentonite.
- d. A mechanically agitated sump having a minimum capacity of 20 to 30 cubic feet or as required.
- e. A circulating grout header with control valves and a pressure gage with protector. Control valves shall be connected to the return line and header. The header shall be joined directly to the riser pipe at the hole by means of a quick connector union.
- f. A water storage tank or suitable source of clean auxiliary water for use in washing, pressure testing and flushing operations.
- g. A water meter graduated in cubic feet and tenths having a direct reading totalizer and capable of conveniently being set back to zero.
- h. Such valves, packers, pressure gages, pressure hose, supply lines, and small tools as may be necessary to provide a continuous supply of grout at accurately controlled pressures as specified. All valves shall be of the ball type and shall have lever-type handles so that it can be easily determined if the valves are open or closed. The inside diameter of the pressure hose and grout supply line shall be not less than 1 inch. Pressure gages shall be at least 3 inches in diameter and capable of measuring no higher than 50 percent beyond the maximum anticipated grout pressures. An accurately calibrated, high precision pressure gage shall be used to check the accuracy of all gages used in the grouting. Certificates indicating such gage calibration shall be submitted for approval within 10 working days prior to beginning grouting operations. Gages shall be checked at least every 24 hours, or more frequently if the Contracting Officer so determines. When defects are found, grouting operations will be stopped until calibration of gages has been obtained. A sufficient number of additional calibrated gages shall be maintained on site at all times for use as replacements.
- i. A computer system to monitor grouting operations, including grout pressures and rates. Grouting data is to be recorded electronically and displayed in real time. Copies of the grouting data are to be supplied to the Contracting Officer within 24 hours of grout operations.
- j. Equipment to light the work area so that grouting can be conducted during hours of darkness in a safe manner. Lighting must also be directed into the reservoir area adjacent to the work area so that underwater grout leakage can be observed during hours of darkness.

#### 3.1.4 Safety

Cement, lime and bentonite clay are respiratory and skin irritants. Section No. 6 of EM 385-1-1 shall be strictly adhered to and workers shall be equipped with respirators and skin protection during mixing of the dry cement and bentonite products. The manufacturer's recommended safety equipment and instructions shall be used.

#### 3.2 GROUT AND EXPLORATORY HOLES

##### **\*Amend R0009\***

All holes for grouting or exploration shall be drilled at the locations, in the direction, angle, and to the depths indicated or as directed by the

Contracting Officer. A maximum tolerance for deviation in angle and direction shall be ~~1/2~~ one degree. The first series of holes to be drilled and grouted shall be as shown on the plans and hereinafter are referred to as primary holes. The location of secondary and succeeding series (intermediate) holes shall be determined by the split spacing method as defined in paragraph SPLIT SPACING and as shown on the plans. The number of grout holes shall be increased, progressively, by the split spacing method as deemed necessary by the Contracting Officer until the amount of grout take at each hole is less than 0.1 cubic foot grout over a 10 minute period. Each hole drilled shall be protected from becoming clogged or obstructed by means of a cap or other suitable device on the collar and any hole that becomes clogged or obstructed due to fault of the Contractor before completion of operations shall be cleaned out in a manner satisfactory to the Contracting Officer or another hole provided by and at the expense of the Contractor.

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### 3.2.1 Pipe for Foundation Grouting

All metal pipe and fittings required for constructing grout and exploratory holes shall be embedded. The pipe and fittings shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embedment. All joints shall be made up snug and the assembly held firmly in position and protected from damage or displacement while the concrete is being placed. The Contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the Contractor's expense. The presence of tramp metal such as nails, wire, bolts, nuts and other foreign material in the pipes through which diamond drilled holes are to be drilled shall be considered as obstructions. The Contractor may, if he so elects, substitute percussion or diamond drilled holes through the concrete in lieu of pipe, provided that the method proposed meets with the approval of the Contracting Officer and provided further that such substitution does not result in any increased cost to the Government.

### 3.2.2 Grout Hole Drilling

a. Grout holes shall be drilled with standard rotary or percussion drilling equipment. No core recovery will be required and the type bit used shall be optional with the Contractor. The hole shall be of sufficient diameter to allow use of an expansion plug or packer with an effective inside diameter of not less than 1/2 inch. The minimum diameter of hole shall be 2 inches at the point of maximum penetration.

Drill casing may be needed where grout holes extend through soil. No grout hole will be drilled at an angle less than 60 degrees measured from the horizontal nor to a depth greater than 200 feet measured along the hole from the collar of the hole. If, as the work progresses, it is determined that holes to depths greater than indicated are necessary, drilling to such greater depth will be ordered in writing, and the drilling to depths in excess of 200 feet will be paid for at a negotiated unit price.

b. Drilling will be done in accordance with the applicable grouting method hereinafter described. Upon completion of drilling of any grout hole and prior to pressure testing, all drill cuttings and slurry shall be removed by applying water to the bottom of the hole through open end rods and returning the wash water through the hole to the surface until

the return water is clear. No separate payment will be made for this washing.

### 3.2.3 Completion of Grouting

All grouting operations shall be completed and in proper working condition prior to the time of impounding water. At that time, all work in the area shall be completed and the area shall be free of all construction debris. Nipples, if required for grout hole drilling, will be removed.

### 3.2.4 Exploratory Hole Drilling

#### **\*Amend R0009\***

a. The Contractor shall perform such exploratory drilling as may be required to determine the condition of the rock prior to grouting or the effectiveness of the grouting operations during or after grouting. All exploratory drilling shall be performed with rotary drilling equipment using HQ size coring type bits. Since the maximum recovery of unpredictable soft or friable materials is of prime importance, the Contractor shall make every effort to recover 100 percent of the core by use of the appropriate equipment and drilling procedures.

b. The holes may be required to be drilled to varying depths, with a maximum depth of 200 feet as measured along the hole from the collar of the hole. No exploratory hole will be drilled at an angle ~~greater~~ less than 50 degrees measured from the horizontal.

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c. Special care should be exercised to obtain cores in as good condition as possible. The Contractor shall keep, in a manner satisfactory to the Contracting Officer, an accurate Driller's Log of all exploratory holes drilled. The log shall include a nontechnical description of all materials encountered in the drilling, their location in the holes and the location of special features such as seams, open cracks, soft or broken rock, points where abnormal loss or gain of drill water occurred, and any other items of interest in connection with the purpose for which the exploratory drilling is required.

d. Wooden or other approved core boxes will be furnished by the Contractor, and the Contractor shall place the cores in the boxes in the correct sequence and separated accurately by wooden blocks, according to the measured distances in the hole. No box shall contain cores from more than one hole. The covers shall be fastened securely to the core boxes and the secured boxes shall be delivered in the vicinity of the work as directed.

e. Exploratory holes shall be grouted under pressure, if conditions so indicate, by grouting to full depth in one operation and backfilled in accordance with paragraph BACKFILLING OF HOLES.

## 3.3 DEFINITIONS AND PROCEDURES FOR DRILLING AND GROUTING

### 3.3.1 General

The drilling and grouting shall be accomplished in single or multiple lines as shown. The drilling and the grouting shall be done using the split

spacing, stage grouting method and by the split spacing, stop grouting method as described herein.

#### 3.3.1.1 Zone

A zone is a predetermined partial depth of curtain. Zones are shown on the plans.

#### 3.3.1.2 Section

A section is a reach along the grout curtain, not more than 100 feet in length, in which grouting operations will not be permitted at the same time that drilling is in progress. Insofar as practicable, the grout curtain will be subdivided into sections in a manner which will facilitate the Contractor's operations.

#### 3.3.1.3 Stage

A stage is one complete operational cycle of drilling, cleaning, pressure washing, pressure testing, and pressure grouting within a zone. The actual depth of a stage depends upon geologic conditions encountered in drilling. It may vary from a fraction to the full depth of the zone.

#### 3.3.1.4 Stop

A stop is a predetermined depth at which the expanding plug or packer is positioned.

#### 3.3.1.5 Split Spacing

Split spacing is the procedure of locating an additional grout hole midway between two previously drilled and grouted holes.

### 3.3.2 Stage Grouting

Stage grouting is the grouting of progressively deeper zones in stages. It involves the placement of a grout curtain by drilling and grouting in successive operations in accordance with the following general procedure.

#### 3.3.2.1 Primary Holes

Primary holes for foundation grouting shall be drilled to their first stage of depth within the first zone. The depths will be governed by the foundation conditions.

a. The holes thus drilled shall be washed and pressure tested, and then grouted, except that when pressure testing indicates a relatively tight hole, the Contracting Officer may direct that the grouting of that hole be omitted for that stage and the hole be left open for drilling and grouting of the next stage.

b. After the grouting of any hole, the grout within the hole shall be allowed to set and subsequently the hole shall be redrilled.

c. After the interval of time as specified in paragraph SECOND STAGE, the primary holes not already drilled to the limit of the first zone shall be drilled as directed to additional depths not exceeding the zone limit.

d. The primary holes thus deepened shall again be washed and pressure tested and then grouted at higher pressures as directed. Again, the grout within the hole shall be removed as described above.

e. The process of successively drilling primary holes to additional depths and grouting at higher and higher pressures in stages, as directed, shall be repeated until all of the primary holes on the maximum spacing (see paragraph GROUT AND EXPLORATORY HOLES) have been completely drilled and grouted to the depth of the first zone in that section of the grout curtain.

#### 3.3.2.2 Successive Holes

After the primary holes in the first zone have been completed in any section as specified above, the second and succeeding series of holes, as determined by the "split spacing method," shall be drilled and grouted to the depth of the first zone in like manner until the first zone of that section is completely grouted as directed.

#### 3.3.2.3 Completion of Section

The process of successively drilling to additional depths and grouting at higher and higher pressures in stages for the first series of holes and then for succeeding series of holes shall be repeated for the second and subsequent zones of that section. Other sections along the grout curtain shall be grouted in like manner until grouting of the foundation is completed to the satisfaction of the Contracting Officer. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting.

In such event, the equipment shall be returned and additional holes shall be drilled and grouted as directed.

#### 3.3.3 Stop Grouting

Stop grouting is a method whereby each hole is drilled to a final depth and grouted by stops through an expansion plug or packer which is set at successively shallower depths. It involves the placement of a grout curtain by drilling and grouting in accordance with the following general procedure:

a. Drill hole to the full depth and wash as specified in paragraph GROUT HOLE DRILLING.

b. The holes thus drilled and washed shall be pressure washed and tested as specified in paragraph PRESSURE WASHING AND PRESSURE TESTING.

c. The expansion plug, or packer, shall be placed in the hole at the top of the interval to be grouted blocking off the higher portion of the hole, and the interval is grouted. The lowest zone is grouted first. In no case will the Contractor be required to set the packer deeper than 175 feet, as measured along the hole from the collar of the hole.

d. After placing the grout at the pressure and mix directed by the Contracting Officer, the expansion plug, or packer, shall be left in place until the grout pressure drops to that pressure required for the next higher stop or as directed by the Contracting Officer.

e. The expansion plug, or packer, shall then be moved to the next

higher stop and grout placed at the lower pressure as directed by the Contracting Officer.

f. The procedures described in subparagraphs "d" and "e" above shall be repeated until grouting of the hole is complete.

g. After the primary holes in the first zone have been completed in any section as specified above, the second and succeeding series of holes, as determined by the "split spacing method" shall be drilled and grouted in like manner until all zones of that section are completely grouted as directed.

h. Other sections along the grout curtain shall be grouted in like manner until grouting of the foundation is completed to the satisfaction of the Contracting Officer.

i. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting. In such event, the equipment shall be returned and additional holes for grouting shall be drilled and grouted as directed. No allowance above contract unit prices will be made for drilling and grouting such holes. Expense for movement of equipment necessary to the performance of such work shall be compensated for at agreed upon rates.

#### 3.3.4 Pressure Washing and Pressure Testing

##### **\*Amend R0009\***

Immediately before the pressure grouting operation, the hole shall be thoroughly washed under pressure and pressure tested. All intersected rock seams and crevices containing clay or other washable materials shall be washed with water and air under pressure to remove as much of these materials as possible. If practicable, as determined by the Contracting Officer, such material shall be ejected from one or more holes by introducing water and air under pressure into an adjacent hole. In no case shall such pressure exceed the maximum grouting pressure, as directed by the Contracting Officer. All grout holes shall be tested with clean water under continuous pressure up to the maximum grouting pressure and held for 15 minutes as directed. All holes sufficiently tight to build up the maximum required pressure shall be washed at such pressure and the washing shall continue as long as there is any increase in the rate at which water is taken, such increase indicating the fractures are being opened by the washing operation. Grout holes with water takes of less than 3 Lugeon units shall be considered tight and will not require grouting. Lugeon unit = (cubic feet per foot per minute/0.01076)\*(142 psi/actual test pressure in psi). Open holes in which no pressure can be built up shall be washed for a period of 5 minutes, with the pump operating at full capacity, or for such period of time as fracture-filling is being removed, as evidenced by the escape of muddy water through surface openings or other grout holes.

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#### 3.3.5 Stage Grouting Procedures

##### 3.3.5.1 First Stage

The Contractor shall perform the first stage of curtain grouting by washing and grouting holes at locations indicated or as directed, using the "split

spacing" method described in paragraph SPLIT SPACING. Similar stages of drilling and grouting are repeated as necessary to reach the bottom of the first zone. Before grouting is begun in any hole of a given series in any section, at least the nearest two holes in advance of each such hole in that series shall be completely drilled for the same stage and the adjacent hole completely washed to facilitate washing and flushing out of any intervening clay-filled seams, fractures, or solution channels.

#### 3.3.5.2 Second Stage

After all primary holes in the first stage grouting in any section has been completed, as specified above, the Contractor shall proceed, when so directed, with second stage drilling and grouting in accordance with the procedure outlined herein but in no case shall the deepening of any hole preparatory to grouting be commenced before the previously placed grout has set. Second stage grouting shall not be conducted within a distance of approximately 100 feet of any hole in which a previous stage of grouting has been completed until the grout in such previous stage hole has taken its set. Grouting at subsequent stages shall conform to the same requirements as to minimum time and distance. Upon completion of all primary holes to the bottom of the first zone, and after the waiting period, secondary and tertiary holes are drilled and grouted in the first zone. The process of drilling, washing, pressure washing, pressure testing, and grouting at progressively higher pressures is continued until the ground is satisfactorily tight to the required depth.

#### 3.3.6 Stop Grouting Procedures

##### 3.3.6.1 Stop Grouting of Grout Holes

The Contractor shall perform the grouting by washing and grouting holes at locations indicated or as directed. Before grouting is begun in any hole of a given series in any section, at least the nearest two holes in the advance of each such hole in that series shall be completely drilled and the adjacent hole completely washed to facilitate washing and flushing out of any intervening clay-filled seams, fractures, or solution channels.

##### 3.3.6.2 Grouting of Existing Exploratory Holes

Existing exploratory holes or portions of holes more than five feet deep after excavation shall be cleaned and pressure grouted as specified for grout holes. Holes less than 5 feet deep shall be back-filled with grout mixed in proportions directed by the Contracting Officer. Gravity grouting or backfilling shall be done in accordance with paragraph BACKFILLING OF HOLES.

#### 3.3.7 Grouting Pressures

Grouting pressures to be used in the work will vary with conditions encountered in the respective holes and pressures used shall be as directed. It is anticipated that pressures, as measured at a gauge at the surface, will range from 0 psi to 30 psi but in no event will gauge pressures in excess of 50 psi be required or allowed.

#### 3.3.8 Grouting

All pressure grouting operations shall be performed in the presence of the Contracting Officer, and shall be in accordance with the following general procedures.

### 3.3.8.1 Grout Mixes

Mixes shall be in the proportions approved by the Contracting Officer who will, from time to time, direct changes to suit the conditions found to exist in the particular grout hole. The cement grout will include 2 percent to 5 percent (by weight of cement) of sodium bentonite. The water/cement ratio by volume will be varied to meet the characteristics of each hole as revealed by the grouting operation and will range between 4:1 and 0.8:1. The Contractor shall conduct periodic tests on the grout mix using funnel and mud balance tests to insure consistency of grout mixes. The types of grout shall be as follows:

- a. Cement Grout shall consist of cement, bentonite and water.
- b. Mortar Grout shall consist of cement, bentonite, sand, and water.

### 3.3.8.2 Grout Injection

a. In general, if pressure tests indicate a tight hole, grouting shall be started with a thin mix or may not be required. If an open hole condition exists, as determined by loss of drill water or inability to build up pressure during washing operations, then grouting shall be started with a thicker mix and with a grout pump operating as nearly as practicable at constant speed at all times; the water/cement ratio will be decreased, if necessary, until the required pressure has been reached. If this procedure does not produce the desired pressure, mortar grout can be used and the mix varied as necessary to produce the desired results, as directed by the Contracting Officer.

b. When the pressure tends to rise too high, the water/cement ratio shall be increased and/or the mix of mortar grout changed or discontinued as may be required to produce the desired results. If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly as either may produce a water-hammer effect which may promote stoppage.

c. The grouting of any hole shall not be considered complete until that hole takes grout at the rate of one cubic foot of grout or less in ten minutes measured over at least a five minute period at the pressure required for that portion of the hole being grouted.

d. Should grout leaks develop on the ground surface from the formation, the Contractor shall caulk such leaks when and as directed, the cost thereof being included in the contract price for unit price pay item "Placing Grout", in accordance with Section 01025 MEASUREMENT AND PAYMENT. If grout leaks develop underwater from the formation, the mix will be thickened in an attempt to stop the leak and/or grouting will be terminated, as directed by the Contracting Officer.

e. If, due to size and continuity of fracture, it is found impossible to reach the required pressure after pumping a reasonable volume of grout at the minimum workable water/cement ratio or mortar grout with the maximum volume of sand at the minimum workable water/cement ratio, the speed of the pumping shall be reduced or pumping shall be stopped temporarily and intermittent grouting shall be performed, allowing sufficient time between grout injections for the grout to stiffen. Following such reduction in pumping speed, if the desired result is not

obtained, grouting in the hole shall be discontinued when directed. In such event, the hole shall be cleaned, the grout allowed to set, and additional drilling and grouting shall then be done in this hole or in the adjacent areas as directed, until the desired resistance is built up.

f. After the grouting of any stage or stop of a hole is finished, the pressure shall be maintained by means of a stop-cock or other suitable device until the grout has set to the extent that it will be retained in the hole.

g. Grout that cannot be placed, for any reason, within two hours after mixing shall be wasted. If such grout is mixed at the direction of the Contracting Officer or with his knowledge and consent, such wasted grout, except as specified in Section 01025 MEASUREMENT AND PAYMENT, shall be paid for at the contract unit prices for the materials contained therein.

#### 3.3.8.3 Backfilling of Holes

Where directed by the Contracting Officer, holes shall be backfilled with grout proportioned as directed by the Contracting Officer and generally having a water/cement ratio less than 1.0. The backfilling shall be accomplished by injection of grout through a tremie pipe or hose inserted to full depth of hole. When grout vents at the surface, the tremie shall be gradually withdrawn, maintaining grout in pipe or hose until completely removed. Holes containing freshly injected grout shall not be backfilled until the injected grout has set. No separate payment will be made for backfilling holes; however, grout will be paid for at the contract unit price for the Portland cement therein.

#### 3.3.8.4 Equipment Arrangement and Operation

The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout take may be. The equipment and lines shall be prevented from becoming fouled by the constant circulation of grout and by the periodic flushing out of the system with water. Flushing shall be done with the grout intake valve closed, the water supply valve open, and the pump running at full speed.

#### 3.3.8.5 Protection to Work and Cleanup

During grouting operations the Contractor shall take such precautions as may be necessary to prevent drill cuttings, equipment exhaust oil, wash water, and grout, from defacing or damaging the permanent structure. Daily maintenance may be required along grout lines, in order to offer better inspection of interconnected holes and breakouts. The Contractor will be required to furnish such pumps as may be necessary to care for waste water and grout from his operations. The Contractor shall, upon completion of his operations, clean up all waste resulting from his operations that is unsightly or would interfere with the efficient operation of the project as anticipated by the original design.

#### 3.3.9 Records

The Contractor will keep records of all grouting operations, such as a log of the grout holes, results of washing and pressure testing operations,

time of each change of grouting operation, pressure, rate of pumping, amount of cement for each change in water/cement ratio, and other data as deemed by him to be necessary. The Contractor shall furnish these records to the Contracting Officer within 24 hours of grouting operations.

#### 3.3.10 Communications

When, for his own convenience, the Contractor has the individual elements of his plant so located that communication by normal voice between these elements is not satisfactory, the Contracting Officer may require him to install a satisfactory mechanical means of communications, such as a telephone or other suitable device.

-- End of Section --

## SECTION 02521

## WATER WELLS

## PART 1 GENERAL

## 1.1 SUMMARY

This Section applies to the construction of water wells at the Howard Hanson Dam Fish Passage Facility located near Palmer, Washington.

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 150	(1999a) Portland Cement
ASTM D 4750	(1987; R 1993e1) Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)
ASTM D 5299	(1992e1; R 1997) Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities
ASTM D 5521	(1994e1) Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers

## AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA EWW	(1999) Standard Methods for the Examination of Water and Wastewater
AWWA A100	(1997) Water Wells
AWWA C206	(1997) Field Welding of Steel Water Pipe

## STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (WAC)

WAC 173-160	(1998) State of Washington, Department of Ecology, Minimum Standards for Construction and Operators
WAC 173-162	(1998) State of Washington, Department of Ecology, Regulations and Licensing of Well Contractors and Operators

## STATE OF WASHINGTON DEPARTMENT OF LICENSING (WAC)

WAC 308-15

(2002) The law relating to Geologists

## 1.3 GENERAL REQUIREMENTS

Each well shall be located and constructed in accordance with these specifications and WAC 173-160. Each well shall be installed to prevent aquifer contamination by the drilling operation and equipment, intra- and inter-aquifer contamination, and vertical seepage of surface water adjacent to the well into the subsurface, especially the well intake zone.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

## SD-02 Shop Drawings

## Installation Diagrams.

As-built installation diagram for each well installed, prepared by the hydrogeologist present during well installation operations, within 5 working days of the completion of the well installation procedure. Diagrams shall include rock and hydrogeologic conditions.

## SD-03 Product Data

## Well Installation Plan; G.

A plan as specified in paragraph WELL INSTALLATION PLAN describing the drilling methods, sampling, and well construction and well development 30 calendar days prior to beginning drilling operations. Mobilization activities may start prior to submittal of the plan. The plan shall be approved and signed by a licensed hydrogeologist as specified in paragraph QUALIFICATIONS.

## Dewatering Plan; G.

A plan as specified in paragraph DEWATERING PLAN describing the method. Installation, operation, and maintenance details shall be submitted for approval by the Contracting Officer prior to dewatering.

## Catalog Data.

Catalog data, and name of supplier, for well screens (to include the screen slot size), casing, riser pipe, filter pack material, bentonite, cement, centralizers, surface protective covers, well vaults, locking caps, airline oil filters for pneumatic drilling, dedicated sampling equipment, pumps, and chemical specifications on drill lubricants, tracers, disinfecting agents, and drill fluid additives, if used. Catalog data shall include any information, written or otherwise, supplied by the manufacturers or suppliers of the above listed items.

#### Qualifications.

Personnel qualification documentation.

#### Permits.

A copy of all permits, licenses, or other legal requirements necessary for execution of the work shall be furnished 30 working days before commencement of the work.

#### SD-06 Test Reports

##### Survey Maps and Notes.

Survey maps and notes, including a tabulated list of all wells and monuments, copies of all field books, maps showing the locations, and elevations of all wells, datum used (e.g. state plane NAD27, NAD83, UTM, etc.), elevation datum, units of measurement, and all computation sheets shall be submitted within 10 working days after completion of the survey. Also, a diagram showing where on the top of the well the elevation was determined by the surveyor.

##### Well Development Records.

A well development record, for each well, within 5 working days of the completion of development.

##### Decommissioning/Abandonment Records.

A well decommissioning record, for each well, or test hole abandoned, within 5 working days of the completion of the abandonment procedure.

##### Filter Pack.

Filter pack material test results; sieve and chemical analyses, shall be submitted within 15 working days after completion of the borehole.

##### Tests.

Test Reports within 24 hours following the conclusion of each test.

##### Well Capacity Test

Record of the test shall be delivered to the Contracting Officer.

##### Water Source; G

The Contractor shall, prior to its use at the site, sample and test the water source, and obtain approval from the Contracting Officer

##### Weekly Monitoring Report

A weekly report shall include a description of all dewatering

activities including daily monitoring records of flows from all wells and sumps, and the results instrumentation (vibrating wire piezometer) monitoring.

#### 1.5 WELL INSTALLATION PLAN

The following requirements shall be incorporated into the Contractor's Well Installation Plan and followed in the field. The plan shall include, but shall not be limited to, a discussion of the following:

- a. Plans showing all wells, piping layout, flow meters, discharge points, generators and tanks.
- b. Description of well drilling methods, and installation procedures, including any temporary casing used, placement of filter pack and seal materials, drill cuttings and fluids disposal, and soil/rock sample disposition.
- c. Description of well construction materials, including well screen, riser pipe, centralizers, tailpiece (if used), filter pack and filter pack gradation, bentonite, drilling fluid additives (if used), drilling water, cement, and well protective measures.
- d. Description of quality control procedures to be used for placement of filter pack and seals in the boring, including depth measurements.
- e. Forms to be used for installation diagrams of wells, well development records, well sampling data records, state well registration forms, and well abandonment records.
- f. Description of contamination prevention and well materials and equipment decontamination procedures.
- g. Description of protective cover surface completion procedures, including any special design criteria/features relating to frost heave prevention. The maximum frost penetration for the site shall be included in this description. Description of surface protection required to protect the wells from flood inundation.
- h. Description of well development methods to be used.
- i. List of applicable publications, including state and local regulations and standards.
- j. List of personnel assignments for this project, and personnel qualifications.
- k. Description of well decommissioning/abandonment procedures.
- l. Description of well capacity testing techniques.
- m. Description of sumps and permanent pumps to be installed, and discussion of pump operating tests to be employed at the site.
- n. Description of specific methods to be employed to control potential contamination or pollution arising from well installation activities.

- o. Schedule and timing of all activities.

#### 1.6 DEWATERING PLAN

- a. This Section specifies the definition, responsibilities, and execution for dewatering. Monitoring well/instrumentation specifications are defined in Section 02214, GEOTECHNICAL INSTRUMENTATION.
- b. Dewatering shall consist of the furnishing, installation, testing, operation and maintenance of dewatering systems to achieve proper completion of all work performed under this Contract. The systems shall consist of a deep well dewatering system and a passive pressure relief well system (see Section 02525, RELIEF WELLS) and sumps within the excavation. The dewatering systems shall conform to the design and schedule requirements given in this specification. The Contractor shall measure existing monitoring wells and pool levels prior to drilling for a minimum 2-week period in order to gain an understanding of groundwater conditions. The measurements shall be collected on an hourly basis.
- c. The dewatering system shall be installed after grouting activities (Section 02251, FOUNDATION DRILLING AND GROUTING) are complete. A minimum of eight deep dewatering wells will initially be installed prior to excavation. Passive pressure relief wells and two additional deep dewatering wells will later be installed during excavation within the excavation footprint (see Section 02525, RELIEF WELLS). These wells within the excavation footprint could be installed prior to excavation provided that they are protected from damage from all construction activities including blasting. They shall be installed prior to excavation below elevation 1,074 feet. If the completed system does not satisfy the dewatering system acceptance requirement in paragraph, DEWATERING SYSTEM ACCEPTANCE, additional dewatering wells shall be installed.
- d. The Contractor shall collect, route and/or pump water including relief well discharge and precipitation, from work areas and from within excavations, and shall dispose of all water in a manner that is compliant with all pertinent permitting and regulatory requirements. The Contractor shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all emergencies, including power outage and flooding, and shall have available at all times competent workers for the continuous and successful operation of the dewatering and monitoring systems. These systems shall not be shut down between shifts, on holidays, or weekends, or during work stoppage without written permission from the Contracting Officer. The Contractor shall be responsible for maintaining all electric power service connections to the dewatering system components.
- e. The Contractor shall control groundwater such that basal instability of the excavation shall not occur. Dewatering systems shall be designed and operated so as to prevent damage to existing structures or interruption of site work. The Contractor shall maintain water levels at or below the bottom of all excavations at all times and under all conditions except when a flood event overtops the cofferdam.

- f. During excavation below the water table, construction of structures, installing of pipelines, placing working base, structure and trench backfill, the placing and setting of concrete, and prior to the acceptance of the work or any portion of the work, the Contractor shall keep the excavation free of water. The Contractor shall control surface runoff so as to prevent entry or collection of water in excavations or in other isolated areas of the site.
- g. Before dewatering is started, submit to the Contracting Officer for approval the method, installation and details of the dewatering system the Contractor proposes to use. Review by the Contracting Officer of the method, installation and operation and maintenance details submitted by the Contractor shall not in any way be considered to relieve the Contractor from full responsibility of errors therein or from the entire responsibility for complete and adequate performance of the system in controlling the water level in the excavated areas. The Contractor shall be solely responsible for proper installation, operation, maintenance, and any failure of any component of the dewatering system for this Contract.
- h. The flow for the baseline deep dewatering system (all installed wells) is anticipated to range from 10 to 300 gallons per minute (gpm) per well. The total flow for the passive pressure relief well system (all installed passive relief wells, Section 02525, RELIEF WELLS) is anticipated to be less than 600 gpm. The actual rates may vary according to bedrock and hydrogeologic conditions.
- i. The Contractor shall leave the deep dewatering well system ~~(including pumps, wells, header pipe, tanks, materials, etc.)~~ except generators, the pumps, and any appurtenant pump controls, in place after the end of this contract. This includes the wells, header pipe, tanks, materials, etc. The system shall become the property of the Government. Prior to the turnover of the system, it shall be inspected by the Contractor and the Contracting Officer. Any defects or non-working components shall be replaced with new equipment at no additional cost to the Government.
- j. Water generated during development, well tests, and dewatering system tests must be disposed of in accordance with local, state and federal standards. See also Section 01060, WATER QUALITY STANDARDS in Division 1

## 1.7 QUALIFICATIONS

A Washington State licensed hydrogeologist (WAC 308-15) shall provide supervision and observe all borehole logging, drilling, well installation, developing and testing activities. The driller shall be licensed in the State of Washington, according to the state requirements. The Contractor shall have a minimum of 10 years of well installation and dewatering experience WAC 173-162.

## 1.8 BOREHOLES AND DEWATERING WELLS

Before starting construction of the well, a borehole of at least 12 inches in diameter shall be drilled at the location of the well into the target water bearing stratum extending to a minimum of 100 feet and a maximum of 200 feet below elevation 1021. The actual depth shall be determined based

on the well production and the response of the adjacent vibrating wire piezometers during drilling. Mud rotary drilling shall not be permitted. Boreholes should be drilled in a manner to protect the subsurface from surface contamination. The borehole shall be used to determine the expected yield from the well and the water quality. The borehole shall be cased, and screened in accordance with these specifications. This well may be considered as the permanent well, if it is in accordance with these specifications. If this well is not used for the permanent well, it shall be abandoned as specified in paragraph WELL DECOMMISSIONING/ABANDONMENT. A minimum of ten (10) dewatering wells are required, four (4) along the south edge of the excavation on approximately 50-foot centers; three (3) along the north edge on 50 to 25-foot centers; one on the west edge of the excavation (see Plate GT4.5 for approximate well locations) and two within the excavation, along the east side adjacent to the cofferdam.

#### 1.9 ABANDONMENT OF WELLS

If the Contractor fails to construct a well of the required capacity, or if the well is abandoned because of loss of tools, or for any other cause, the Contractor shall abandon the hole as specified in paragraph WELL DECOMMISSIONING/ABANDONMENT.

#### 1.10 NOTIFICATION

The Contracting Officer shall be notified 30 days prior to drilling. The Contractor shall be responsible for contacting the State of Washington in accordance with the applicable reporting requirements. Before beginning work, the local United States Geological Survey office (USGS) and the Washington State Department of Ecology shall be notified of the type and location of wells to be constructed, the method of construction and anticipated schedule for construction of the wells. The Contractor shall provide a copy of each start card for the Contracting Officer.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

Well materials shall be stored and maintained in a clean, uncontaminated condition throughout the course of the project. Filter pack material shall not be allowed to freeze before installation.

#### 1.12 SITE CONDITIONS

Access to each well site, including any utility clearance, permits, licenses, or other requirements and the payment thereof necessary for execution of the work, is the responsibility of the Contractor. The Contractor shall visit each proposed well location to observe any condition that may hamper transporting equipment or personnel to the site. If clearing, or relocation is necessary, the Contractor, and the Contracting Officer shall agree on a suitable clearing, or relocation plan, and the location of any required access road.

### PART 2 PRODUCTS

#### 2.1 CASING

Casing and well screen shall be installed within each borehole to prevent the collapse of formation material. All casing, screen, and other well material shall be of compatible materials to prevent galvanic reaction between components of the completed well. Casing shall be of sufficient strength to prevent casing collapse or breakage due to installation,

formation slough, or filter pack placement. Metal or Schedule 80 PVC will be accepted. Centralizers shall be used to maintain the casing in the center of the borehole.

#### 2.1.1 Casing and Couplings

Casing shall be new 8 inch diameter, minimum. Metal or Schedule 80 PVC will be accepted. Joints shall be either threaded and coupled, or field welded in accordance with AWWA C206.

#### 2.2 WELL SCREENS

Well Screens shall prevent the collapse of formation material into the well and shall be a minimum of 8 inches nominal diameter, and shall be directly connected to the bottom of the inner casing by an approved method. The length of the screen shall be sufficient to provide an intake area capable of passing not less than the minimum required yield of the well, at an entrance velocity not exceeding 0.1 fps and shall generally extend from about 3 feet below the bottom of the seal to the well bottom. The opening, or slot size of the screen, shall be determined by the Contractor, be compatible with the material surrounding the screen, and shall be submitted for approval as part of the well installation plan. The well screen shall be of sufficient size and design to hold back and support the gravel used in the filter pack envelope, if required, and in-situ material surrounding the screen. The screen and all accessories required for satisfactory operation shall be essentially standard products of manufacturers regularly engaged in the production of such equipment. The screen shall be of sufficient strength to prevent screen collapse or breakage. Metal or Schedule 80 PVC will be accepted. Field constructed screen is not acceptable. "Blanks" in the well screen may be utilized in nonproductive zones, or where centering devices are needed in the screened area, and shall be considered "casing." The bottom section, below the screen, shall be sealed watertight by means of a welded end cap of the same material as the well screen. Centralizers shall be used to maintain the well screen in the center of the borehole.

#### 2.2.1 Metal Screen

If metal screens are used then the screen shall be of an approved wire-wound type and shall be type 304 or type 316 stainless steel, conforming to the applicable requirements of AWWA A100. A wire-wound screen manufactured with supporting bars or core of material different from the wire will not be acceptable. Joints shall be made of threaded couplings of the same material as the screens or by brazing or welding in accordance with AWWA C206.

#### 2.3 FILTER PACK

Filter pack material (if required by state standards or for formation and/or well stabilization) shall be a product of a commercial sand and gravel supplier, shall be properly sized and graded for the surrounding soil/rock encountered, and shall be composed of clean, round, hard, waterworn siliceous material, free of flat or elongated pieces, organic matter, or other foreign matter. The filter material shall be of a size which will allow the maximum flow of water into the well and must prevent the infiltration of native sand and silt. The filter material must be graded to prevent entry through screen openings. The gradation of the filter material shall be such that the uniformity coefficient is not more than 2.5. The filter material shall be placed as directed.

## 2.4 BENTONITE SEAL

The bentonite seal, intended to keep grout from entering the filter pack, shall consist of hydrated granular, or pelletized, sodium montmorillonite furnished in sacks or buckets from a commercial source and shall be free of impurities which adversely impact the water quality. If the bentonite seal is located above any borehole fluid levels, a layer of fine sand shall be placed at the top of the bentonite seal, to provide an additional barrier to any downward migration of grout.

## 2.5 CEMENT AND BENTONITE GROUT

### 2.5.1 Cement Grout

Cement grout shall consist of Portland cement conforming to ASTM C 150, Type I or II, sand and water. Cement grout shall be proportioned not to exceed 2 parts, by weight, of sand to 1 part of cement with not more than 6 gallons of water per 94 lb bag of Portland cement, with a mixture of such consistency that the well can be properly grouted. No more than 5 percent by weight of bentonite powder may be added to reduce shrinkage.

### 2.5.2 Bentonite Grout

High-solids bentonite grout shall be made from sodium bentonite powder and/or granules. Water from an approved source shall be mixed with these powders or granules to form a thick bentonite slurry. The slurry shall consist of a mixture of bentonite and the manufacturer's recommended volume of water to achieve an optimal seal. The slurry shall contain at least 20 percent solids by weight and have a density of 9.4 lb/gallon of water or greater.

## 2.6 PUMP

Pump shall be an approved submersible type with a capacity sufficient to deliver 10 to 300 gpm. The pump shall be connected to the pump controls by a three-wire drop line or equivalent. Piping for the well drop line shall be galvanized steel pipe conforming to ASTM A 53/A 53M. The pump motor shall be of sufficient size to operate the pump under the maximum operating conditions without exceeding its rating. Pump shall be equipped with necessary controls to provide for automatic operation of the pump.

## 2.7 POWER SUPPLY AND BACKUP GENERATORS

The electrical service used for dewatering shall be separate from all other Contractor electrical requirements and dedicated solely to the operation of the dewatering system. A backup generator shall be supplied to provide electrical service in case of a system breakdown.

## PART 3 EXECUTION

### 3.1 PROTECTION OF EXISTING CONDITIONS

The Contractor shall maintain existing survey and instrument monuments, instrumentation conduits, and wells and protect them from damage from equipment and vehicular traffic. Any items damaged by the Contractor shall be repaired by the Contractor. Wells requiring replacement due to Contractor negligence shall be re-installed according to these specifications. Wells scheduled for abandonment shall be protected from

damage so that abandonment may be performed according to these specifications. Prior to excavation, the Contractor shall locate the existing outlet tunnel and position all wells a minimum of 3 feet away from the existing tunnel. Dewatering wells are approximately located on Plate GT4.5. The actual location shall be determined by the Contractor and shall also be a minimum of 3 feet away from any proposed structures or tunnels.

### 3.2 PREPARATION

#### 3.2.1 Water Source

If well drilling/installation requires the use of water the Contractor shall use water from the reservoir or Well 219. If the Contractor chooses to use a water source other than the reservoir or Well 219, the Contractor shall, prior to its use at the site, sample and test the water source, and obtain approval from the Contracting Officer. The Contractor shall be responsible for locating the source, obtaining the water from the source, transporting it to, and storing it at the site.

#### 3.2.2 Observation Well Monitoring

The Contractor shall monitor observation wells and instrumentation on an hourly frequency prior to well drilling/installation activities for a minimum of two weeks. The Contractor shall also monitor these during drilling activities, including well development, to assess dewatering well productivity and radius of influence.

### 3.3 WELL CONSTRUCTION

The drilling method shall be as approved by the Contracting Officer and shall conform to all state and local standards for water well construction.

Mud rotary drilling shall not be permitted. The execution of the work shall be by competent workers and shall be performed under the direct supervision of a licensed well driller. The drilling method shall prevent the collapse of formation material against the well screen and casing during installation of the well. The inside diameter of any casing used shall be sufficient to allow accurate placement of the screen, riser, centralizer(s), filter pack (if required), seal and grout. Casing pipe, well screens, and joint couplings shall be of compatible materials throughout each well. The well shall be a filter pack well or a naturally developed well. The hole below the outer casing shall penetrate the water bearing stratum a sufficient depth to produce the required amount of water and required drawdown at observation points without causing excessive velocities through the aquifer. During construction of the wells, precautions shall be used to prevent tampering with the well or entrance of foreign material. Runoff shall be prevented from entering the well during construction. If there is an interruption in work, such as flooding, overnight shutdown or inclement weather, the well opening shall be closed with a watertight uncontaminated cover. Surface protection is required to protect the well from flood inundation. The cover shall be secured in place or weighted down so that it cannot be removed except with the aid of the drilling equipment or through the use of drill tools. Typical well details are provided on Plate GT4.5.

### 3.4 WELL DEVELOPMENT

Within 7 days of completion of each well, but no sooner than 48 hours after cement grouting is completed, the well shall be developed. Predevelopment, or development after the filter pack has been installed, but before the

annular seal is installed, may be initiated before this minimum 48 hour period. The well shall be developed in accordance with the Well Installation Plan, by approved methods until the water pumped from the well is substantially free from sand, and until the turbidity is less than 5 on the Jackson Turbidity Scale specified in AWWA EWW. Developing equipment shall be of an approved type and of sufficient capacity to remove all cutting fluids, sand, rock cuttings, and any other foreign material. The well shall be thoroughly cleaned from top to bottom before beginning the well tests. Development shall be performed using only mechanical surging, over pumping, or a combination thereof per ASTM D 5521. Details of the proposed development method shall be included in the Well Installation Plan. At the time of development of any well, the well shall be free of drawdown or surcharge effects due to pump testing, developing or drilling at another location. The Contractor shall be responsible for maintaining at the well site the needed access and work area and clearance, necessary to accomplish development. The Contractor shall furnish, install, or construct the necessary discharge line and troughs to conduct and dispose of the discharge. Development shall be conducted to achieve a stable well of maximum efficiency. During predevelopment of the well, filter pack material shall be added to the annular space around the screen to maintain the top elevation of the filter pack to the specified elevation. The Contractor shall provide an open tube or other approved means for accurately determining the water level in the well under all conditions. If, at any time during the development process it becomes apparent in the opinion of the Contracting Officer that the well may be damaged, development operations shall be immediately terminated. The Contracting Officer may require a change in method if the method selected does not accomplish the desired results. The Contracting Officer may order that wells which continue to produce excessive amounts of fines after development for 6 hours be abandoned, plugged, and backfilled, and may require the Contractor to construct new wells nearby at no additional cost to the Government. All materials pulled into the well by the development process shall be removed prior to performing the well test.

#### 3.4.1 Intermittent Pumping

Intermittent pumping shall be performed by pumping the well at a capacity sufficient to produce a rapid drawdown, stopping the pump (backflow through pump will not be permitted) to permit the water surface to rise to its former elevation, and repeating this procedure. Cycle time for this procedure will vary as directed but will not be more than 3 cycles per minute. A deep well turbine pump, or electric submersible pump with check valve, shall be used with any attachment necessary to accomplish rapid starting and stopping for intermittent pumping. The intake shall be set at least 10 feet below the maximum expected drawdown in the well. Prior to commencing intermittent pumping, and periodically during development by this method, all sand and/or other materials shall be removed from inside the screen. The amount of drawdown may be decreased if, in the opinion of the Contracting Officer, the efficiency of the well might otherwise be impaired.

#### 3.4.2 Surging

Surging of the well shall require use of a circular block, or multiple blocks, which are approximately 1 inch smaller in diameter than the inside diameter of the well and are constructed of a material which will not damage the screen if the block comes in contact with the screen, and a bailer or pump to remove materials drawn into the well. The surging shall be continued for a period until little or no additional material from the

foundation or filter pack can be pulled through the screen. The surge block shall be moved by a steady motion up and down the full length of the well screen. Prior to commencing surging, and periodically during development by this method, all sand and/or other materials shall be removed from inside the screen. All materials pulled into the well by the surging process shall be removed by the Contractor.

### 3.4.3 Well Development Criteria

A well development record shall be maintained in accordance with paragraph Well Development Records. Development is complete when all of the following criteria are met:

- a. Well water is clear to the unaided eye and tested turbidity is less than 5 NTU,
- b. Sediment thickness in the well is less than 1 percent of the screen length,
- c. A minimum of three times the standing water volume in the well is removed plus three times the volume of all added water and drilling fluid lost during drilling and installation of the well is removed, and
- d. The length of time to achieve full water level recovery in the well has stabilized.

### 3.5 DEWATERING WELL ACCEPTANCE CRITERIA

After well development and during testing (paragraph WELL CAPACITY TEST), the well efficiency shall be determined for each well. For individual well acceptance, a well efficiency of 60% is required.

### 3.6 DEWATERING

- a. The Contractor shall drill and install deep dewatering wells, and passive pressure relief wells (Section 02525, RELIEF WELLS) consistent with the requirements of this specification. The Contractor shall perform a dewatering system test for system acceptance and shall install additional wells as directed by the Contracting Officer.
- b. The Contractor shall, in the following order:
  - 1) install, develop, step-test (see paragraph WELL CAPACITY TEST) and operate a minimum of eight deep dewatering wells, after grouting activities but prior to excavation activities;
  - 2) perform a dewatering system test (see paragraph DEWATERING SYSTEM ACCEPTANCE) and possibly install additional deep dewatering wells, prior to excavation activities;
  - 3) continue to monitor dewatering activities and site groundwater levels, during excavation activities;
  - 4) install two additional deep dewatering wells (DW-9 and DW-10) and passive relief wells according to Section 02525, RELIEF WELLS, and Plate GT4.5;

- 5) assess groundwater conditions. If required, additional deep dewatering wells should be installed. The need for these additional wells will be dependent on the effectiveness of the dewatering system.
- c. Provide sufficient number of pumps (one pump for each well) with adequate capacity at the site. Provide appropriate sumps and ditches.
  - d. Provide backup power generation and minimum 20% dewatering system components, including valves, flowmeters, pumps and piping, and devise emergency procedures for maintaining continuous uninterrupted groundwater control operations. The recovery of water levels in the rock may be rapid if pumping is interrupted. Stand-by equipment shall be installed and ready to operate to assure continuous pumping in the event that any or all of the dewatering system becomes inadequate.
  - e. Maintain the dewatering system during all phases of construction.
  - f. Provide adequate protection and warning signs where construction equipment crosses over, or is in the vicinity of discharge piping.
  - g. The Contractor shall provide separate flowmeters and totalizers at each of the main line headers for the deep wells, and seepage collection distribution piping so that flow rates can be monitored and recorded on a daily basis.
  - h. The Contractor shall be responsible for testing, operating, maintaining, and daily monitoring the dewatering system. System maintenance shall include, but not be limited to, at least daily supervision by some responsible person skilled in the operation, maintenance, and monitoring of flow rates from wells and sumps, replacement of system components, and any other work required to maintain the performance of the system. The system operation shall be continuous, and interruptions shall not be permitted.
  - i. Sufficient personnel skilled in the operation, maintenance, and replacement of the dewatering system components shall be on site 24 hours per day, seven days a week, including holidays, at all times when the system is in operation.
  - j. The Contractor shall maintain records and submit a weekly monitoring report of the Groundwater Control System installation and performance data. The records shall include geologic and hydrogeologic conditions, well depths, elevations, dates of installation, approximate rates of flow, total volume of water removed, daily water levels, and sump and piping locations. Daily flow rates shall be recorded during operation of the dewatering system.

### 3.7 Well Capacity Test

The Contractor shall furnish and install an approved temporary test pump, near the well bottom with discharge piping of sufficient size and length to conduct the water being pumped to point of discharge, and equipment necessary for measuring the rate of flow and water level in the well. Four (4) to eight (8) hour step-drawdown capacity tests shall be performed while measuring the pumping rate, drawdown at the pump well, drawdown at the

observation wells and the reservoir pool level. Measurements shall be recorded every 1/2 minute during the first 5 minutes after starting the pump; then every 5 minutes for the duration of the step. Readings shall be taken until the water level stabilizes or one hour minimum. This measurement schedule shall be repeated for each step. Observation wells (piezometers) shall be read on the same schedule as the pump well. During the step-drawdown test, the pumping rate shall be increased in steps. Drawdown at the end of the final step should be within 5 feet of the pump intake. Specific capacity shall be measured for each step. The well efficiency shall be determined for each well using water level measurements made at the pump well and nearby observation wells. If the specific capacity cannot be maintained, the well efficiency is less than 60% or the drawdown is not observed at observation wells for the test period, the capacity tests shall be terminated and the dewatering well re-installed at no additional cost to the Government. When the pump is shut off, water level readings shall be taken during the rebound period for the same intervals of time as the drawdown test. The record of the test, in triplicate, shall be delivered to the Contracting Officer.

### 3.8 INSTALLATION OF PUMP

The well pump shall be installed within 5 feet of the bottom of the well. The pump shall be secured at the required depth as recommended by the pump manufacturer. After installation of the pumping units and appurtenances is complete, operating tests shall be carried out to assure that the pumping installation operates properly. Tests shall assure that the pumping units and appurtenances have been installed correctly, that there is no objectionable heating, vibration, or noise from any parts, and that all manual and automatic controls function properly.

### 3.9 DEWATERING SYSTEM ACCEPTANCE

The dewatering system shall be designed, installed, and successfully tested prior to excavation. The system shall be operated for a minimum of 14 days to simulate dewatering requirements necessary when the excavation is at final subgrade, determine if the system will lower water levels below the excavation, and determine the required pumping rates to do so. If the system does not meet the requirements of the dewatering plan (paragraph DEWATERING PLAN), the Contractor shall install additional dewatering wells. System testing shall continue until the requirements are satisfied, and as directed by the Contracting Officer.

### 3.10 SITE CLEAN-UP

After completion of the work, tools, appliances, surplus materials, temporary drainage, rubbish, and debris incidental to work shall be removed. Excavation and vehicular ruts shall be backfilled and dressed to conform with the existing landscape. Utilities, structures, roads, fences, or any other pre-existing item which must be repaired or replaced due to the Contractor's negligence shall be the Contractor's responsibility; repair or replacement shall be accomplished prior to completion of this contract.

### 3.11 DRILLING WASTE DISPOSAL

Slurry, drill cuttings, rock core; other solid or liquid material bailed, pumped, or otherwise removed from the borehole during drilling, installation, completion, and well development procedures; and fluids from material/equipment decontamination activities shall be properly and legally

disposed of by the Contractor.

### 3.12 SURVEYS

As-built location for each well/borehole in horizontal position and elevation including:

1. Elevation referenced to the vertical datum N.G.V.D. (1929) to an accuracy of  $\pm 0.01$  foot, together with the location of the point used for the elevation measurement for both the ground surface adjacent to the well borehole and the highest point on the top of the riser pipe.
2. Horizontal position referenced to the North American Datum of 1983 (NAD 83) to an accuracy of  $\pm 0.1$  foot, together with the location of the point used for horizontal position measurement.
3. A location sketch showing the instrument number, taped horizontal distances to the instrument, measured to an accuracy of  $\pm 1$  foot from permanent physical features in the field. A sufficient number of taped measurements shall be included on the sketch to establish a unique horizontal position for the instrument. If such features are removed, the Contractor shall provide a new sketch, prior to removal, with taped measurements to other features.

### 3.13 WELL DECOMMISSIONING/ABANDONMENT

Any well disapproved by the Contracting Officer, or any well decommissioned/abandoned by the Contractor for any reason shall be decommissioned/abandoned according to the requirements of the State of Washington (WAC 173-160), ASTM D 5299, and the requirements of these specifications. Well decommissioning/abandonment includes the removal of all materials left in the borehole/well, excluding the filter pack, and including backfill materials, casing, screen, and any other material placed into the hole before the decision was made to abandon the borehole/well. The Contractor shall maintain a well decommissioning/abandonment record as specified in paragraph Well Decommissioning/Abandonment Records. Groundwater levels, if encountered before the decision is made for decommissioning/abandonment, shall be measured in all borings prior to backfilling. These water levels shall be included in the well decommissioning/abandonment records. No well shall be decommissioned/abandoned without the approval of the Contracting Officer.

### 3.14 DOCUMENTATION AND QUALITY CONTROL REPORTS

The Contractor shall establish and maintain documentation and quality control reports for well construction and development to record the desired information and to assure compliance with contract requirements, including, but not limited to, the following:

#### 3.14.1 Installation Diagrams

The well will not be accepted before the geologic logs and installation diagrams are received. The diagram shall illustrate the as-built condition of the well and include, but not be limited to, the following items:

- a. Name of the project and site.
- b. Well identification number.

- c. Name of driller and name and signature of the geologist preparing diagram.
- d. Date of well installation.
- e. Description of material from which the well is constructed, including well casing/riser pipe and screen material, centralizer composition, diameter and schedule of casing and screen, gradation of filter pack, lithologic description, brand name (if any), source, and processing method, and method of placement of the filter pack, bentonite seal type (pellets, granules, chips, or slurry), grout type (cement or high-solids bentonite) and type of protective cover (protective casing or flush-to-ground), if used.
- f. Total depth of well.
- g. Nominal hole diameter.
- h. Depth to top and bottom of screen, and filter pack.
- i. Depth to top and bottom of any seals installed in the well boring (grout or bentonite).
- j. Type of cement and/or bentonite used, mix ratios of grout, method of placement and quantities used.
- k. Elevations/depths/heights of key features of the well, such as top of well casing/riser pipe, top and bottom of protective casing (if used), ground surface, the depth of maximum frost penetration (frost line), bottom of well screen, top and bottom of filter pack, and top and bottom of seal.
- l. Other pertinent construction details, such as slot size and percent open area of screen, type of screen, and manufacturer of screen.
- m. Well location by coordinates. A plan sheet shall also be included showing the coordinate system used and the location of each well. A plan sheet is not required for each well installation diagram; multiple wells may be shown on the same sheet.
- n. Static water level in the well and the reservoir pool level upon completion of the well.
- o. Special problems and their resolutions; e.g., grout in wells, lost casing, or screens, bridging, etc.
- p. Description of surface completion.
- q. Geologic log describing rock and hydrogeologic conditions.

#### 3.14.2 Well Development Records

A well development record shall be prepared for each well installed under the supervision of the geologist present during well installation operations. Information provided on the well development record shall include, but not be limited to, the following:

- a. Date, time, and elevation of water level in the well, before

development.

- b. Depth to bottom of well, name of project and site, well identification number, and date of development.
- c. Method used for development, to include size, type and make of equipment, bailer, and/or pump used during development.
- d. Time spent developing the well by each method, to include typical pumping rate, if pump is used in development.
- e. Volume and physical character of water removed, to include changes during development in clarity, color, particulates, and odor.
- f. Volume of water added to the well, if any.
- g. Volume and physical character of sediment removed, to include changes during development in color, and odor.
- h. Source of any water added to the well.
- i. Clarity of water before, during, and after development. Nephelometric turbidity unit (NTU) measurements.
- j. Total depth of well and the static water level as per ASTM D 4750 from top of the casing, and the reservoir pool level immediately after pumping/development, and 24 hours after development.
- k. Time for recovery of water levels to the static water level.
- l. Name and job title of individual developing well.
- m. Name and/or description of the disposal facility/area, for the waters removed during development.

### 3.14.3 Well Decommissioning/Abandonment Records

Decommissioning/abandonment records shall include, as a minimum, the following:

- a. Project name.
- b. Well or borehole number.
- c. Well/boring location, depth and diameter.
- d. Date of decommissioning/abandonment.
- e. Method of decommissioning/abandonment.
- f. All materials used in the decommissioning/abandonment procedure and the interval in which test materials were placed.
- g. Casing, and or other items left in hole by depth, description, and composition.
- h. Description and total quantity of grout used initially.
- i. Description and daily quantities of grout used to compensate for

settlement.

j. Water or mud level (specify) prior to grouting and date measured.

k. The reason for decommissioning/abandonment of the well/test hole.

#### 3.14.4 Survey Maps and Notes

A tabulated list of all wells and monuments, copies of all field books, maps showing the locations, and elevations of all wells, datum used (e.g. state plane NAD27, NAD83, UTM, etc.), elevation datum, units of measurement, and all computation sheets shall be prepared as a submittal. The tabulation shall consist of the designated number of the well or monument, the X and Y coordinates, and all the required elevations. Also, a diagram showing where on the top of the well the elevation was determined by the surveyor shall be prepared.

-- End of Section --

Comment Report: All Comments

For the **Bidder Inquiry** phase of project **NWS Howard Hanson Dam, Cofferdam Excavation**(sorted by CommentID )

403402	n/a	n/a	n/a
<p><b>Plan sheet C2.1 shows the proposed 14 foot wide access ramp to the elevation 1150 work pad. Although the cranes required to set the precast sections can be delivered on a 14 foot road, after setup in the configuration required they are 24 to 27 feet wide. The time required to tear down and move the crane is more than allowed by the evacuation notice specification. It is possible to move a crane up a the ramp at the grades indicated without tearing the crane down. Can the access ramp be constructed 28 feet wide? What are the requirements to widen the access ramp?</b></p>			
2-1	<p><b>The grade of the access ramp is about 8%. Crane set up and movement will be subject to the Corps' safety requirements. Presumably the crane manufacturer will have information on what grades the crane can safely transit in various conditions. If the access ramp is widened to 28 feet, an additional retaining wall would be required to the south of the access road. In addition, the intersection with the temporary access road would have to be revised. It is up to what the contractor requires, if he requires a bigger and higher ramp, he may elect to build it to any size and height that works. But he must remove it during Phase 1C excavation (a unit priced bid item).</b></p>		
403409	n/a	GT4.6	n/a
<p><b>The Chart on Plate GT4.6 with Hole Numbers and other data shows Packer Depth in column 9 and Drill Depth in column 14. In several instances packer depth is greater than drill depth. Please revise or explain the intent for these cases.</b></p>			
2-1	<p><b>This will be corrected by amendment.</b></p>		
403415	n/a	C1.4	n/a
<p><b>Note 5 on Plate C1.4 states, "Contractor shall continuously provide a vehicle / personal fall protection barrier surrounding the perimeter of the rock excavation below elevation 1150. Does this refer to barrier at elevation 1150. above the</b></p>			

<b>excavation only?</b>			
<b>1-1</b>	<b>The barrier should be situated along the edge of the rock excavation at the 1150 elevation bench. The existing access road in this area currently does not have barriers, therefore it is assumed that the barrier would only be required in the immediate vicinity of the work and would not extend to the east beyond the extend of the rock excavation.</b>		
<b>403423</b>	n/a	n/a	n/a
<b>What if any surface preparation is required for vertical contact surfaces to the existing structure at the tremmie concrete (below elevation 1085) for the seismic retrofit? What preparation is required for contact surfaces at the the seismic structure above elevation 1085 and for the cofferdam structure from elevation 1055 to elevation 1140?</b>			
<b>3-1</b>	<b>Surface preparation for hardened concrete surfaces to be in contact with freshly mixed concrete is specified in Specification Section 03730. As is stated in 03730, 2.1.(10), "The contact surface shall be prepared and primed with an epoxy resin system in accordance with ACI 503.2." ACI 503.2, 2.3.1 specifies the preparation of the concrete surfaces. Also, see Specification Section 03730, paragraph 3.2 Bonding of Concrete. The Contractor will be allowed to omit the surface application of the epoxy bonding agent to the hardened concrete surfaces below Elevation 1080. All other surface preparation and cleaning requirements still apply. I don t know if this comment is directed at concrete surface preparation or rock surface preparation, or both. However, as it pertains to rock surface preparation, all rock surfaces against which concrete is placed shall be prepared in accordance with Specification 02217a.</b>		
<b>403757</b>	n/a	n/a	n/a
<b>On sheet 137 in the plan view the dimension shows 1'-11 9/16" from the Bearing shoe to the centerline of the guide shoe and on sheet 139 shows 1'-11 11/16". Which number is correct?Steve Waite</b>			

1-1	The enlarged Section E on sheet 139 correctly shows the dimension from the bearing shoe face to the centerline of the shoe guide attached to the stoplog as 1'-11 11/16". The distance from the embedded plate and guide tab centerline to the bearing and seal surface is 1'-11 9/16" as shown in Section E/S5.3 and as shown in the Cofferdam Segment Alignment Tolerances as shown on plate S2.18.		
404672	02490	131	n/a
Sheet 131 of 155 of the drawings shows the Rock Anchor details. (Plate S-3.9)The left section "At Segment "A" base slab" shows a 3 1/2" diameter hole for the stressing length, and a 4" diameter hole for the anchor length. Is this an error or does the engineer want the holes under reamed? Under reaming is costly! The other 2 sections on this page show only 4" as the hole size . Please clarify intent.			
1-1	This will be corrected by amendment.		
404757	3301	page 7 & 24	3.7
Specifications Section 3301, Page 7, Section 1.3.2.3 notes Compressive Strength Tests will be made by the Government. Specifications Section 3301, Page 24, Section 3.7, notes the Contractor is to perform the following tests in which Compressive Strength Test is listed under 3.7.2.6.f. Please clarify whether the Contractor is to include the costs for testing in the bid			
1-1	The Contractor is responsible for the costs of the tests and inspections that he is required to perform. See Specification Section 03301, subsection 3.7. The Government will also be doing some independent testing verifying quality.		
404820	00010 & 01025	n/a	n/a
Specification Section 00010, Pricing Schedule, Item 0019 and section 01025, paragraph 1.3.19, item 0019, appears to have a typographical error in the description of the item. Should the word Shoulder be changed to Soldier ? Please clarify.			
1-1	Yes, this will be corrected by amendment.		

404826	00010	n/a	n/a
<b>Specification Section 00010, Pricing Schedule, Item 0032, the description of item states each , the unit is listed as LF . Please clarify.</b>			
1-1	<b>This will be corrected by amendment.</b>		
404834	n/a	C1.5/C1.6	n/a
<b>Drawing C1.5 shows the highest bench on the north side as elevation 1134. Drawing C1.6, Section A, shows the highest bench at elevation 1150. Please clarify.</b>			
2-1	<b>The existing grade is lower than elevation 1150 on the north side/corner of the rock excavation. This is why there is no bench at elevation 1150 along the north side of the excavation on plate C1.5. The line defining the section on plate C1.6 (the stationed centerline) is in a location where the existing grade is higher than elevation 1150. There will be a temporary bench at elevation 1150 at the centerline of the excavation, but not at the NE corner of the excavation.</b>		
404845	n/a	n/a	n/a
<b>Amendment 0004 deleted Optional Item 0019, Horizontal Trash Rack Seismic Reinforcement. Drawing S8.1 that shows the Horizontal Trash Rack Seismic Reinforcement work was not deleted. Will the Horizontal Trash Rack Seismic Reinforcement work now be included in Item 0001, All Work for Fish Passage Facility Cofferdam and Excavation, Except for Items 0002 Through 0039?</b>			
1-1	<b>The Horizontal Trash Rack Seismic Reinforcement work is part of the Base Contract.</b>		
404999	n/a	140	n/a
<b>Bottom seal plan shows 1/2" seal bolts and detail 3 shows 5/8" seal bolts. Are the 5/8" bolts correct?</b>			
1-1	<b>The 5/8" diameter bolts are correct for the seal bolts. The 5/8" diameter seal bolts are also called out in Section A on sheet 137. The</b>		

	<b>Bottom Seal Plan on sheet 140 should call out the bolts as 5/8" diameter. This will be corrected by amendment.</b>		
<b>405000</b>	n/a	140	3
<b>What is the abbreviation CRES stand for?</b>			
<b>1-1</b>	<b>CRES stands for corrosion resisting steel, which is stainless steel (S.S.).</b>		
<b>405564</b>	n/a	140	3
<b>Detail 3 references a PTFE coated fibreglass bar. Do you have the names and phone number of vendors that supply these bars?Steve Waite</b>			
<b>1-1</b>	<b>Additional information on the stoplog bearing shoes is contained in a new revision to Specification Section 05616, which will be shown in an amendment.</b>		
<b>405930</b>	n/a	n/a	n/a
<b>Reference the Geotechnical Baseline Report, Paragraph 3.2.1 Rock Mass Reinforcement subparagraph (3) Rock Bolts:The third sentence reads "The government estimates that 40% of the rock bolt borings will require grouting and redrilling prior to the installation of the rock bolts."Question: If up to 40% of the rock bolts require grouting and redrilling this will have a major impact on schedule and the cost of the work. Since additional grouting and drilling will delay the progress of rock excavation, shouldn t there be a mechanism for the contractor to get paid for this additional work especially when the extent of this grout and redrill quantity is unknown?</b>			
<b>2-1</b>	<b>The contractor should include costs for redrilling in the pay items for drilling rock bolts given in the schedule.</b>		
<b>405993</b>	02217	n/a	n/a
<b>Page 3 Paragraph 3.31 Preliminary Cleanup:1st sentence. When the excavation</b>			

has reached the approximate limits shown or when the Contracting Officer determines that a satisfactory foundation may have been reached, &&What is the definition of satisfactory foundation ? Is it merely meeting the line, grade and elevations shown on the contract plans? Or is it also based on the competency of the rock excavated.?

2-1	A satisfactory foundation is based upon the plan excavation limits and the types of materials encountered. Paragraph 3.4.2 provides more detail on the types of objectionable foundation conditions that must be corrected by the contractor. The contractor is directed to the Geotechnical Baseline Report for information on the types of rocks likely to be encountered and their anticipated properties. This information should be used to estimate the potential for foundation conditions requiring correction.

405994	02217	n/a	n/a
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Page 3 Paragraph 3.31 Preliminary Cleanup: This paragraph states that This cleanup shall consist of removing all debris, loose rock, sand, silt, and other objectionable material by hand tools or any combination of additional methods approved or directed. The Contracting Officer may require that the excavation be continued and the preliminary cleanup procedure repeated until a satisfactory foundation surface is reached. If the Contractor encounters seams of objectionable material or drummy material, shouldn't this activity be paid on an hourly basis for the effort required by the Contracting Officer?

2-1	Additional excavation will be paid by line item for rock excavation. Foundation preparation work is incidental. The contractor is directed to the Geotechnical Baseline Report for information on the types of rock likely to be encountered and their anticipated properties. This information should be used to estimate the potential for foundation conditions requiring correction.

405995	02217	n/a	n/a
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Paragraph 3.3.2 Final Cleanup and Foundation Preparation This paragraph states that This cleanup shall consist of removing all debris, loose rock, sand, silt, and

**other objectionable material by hand tools or any combination of additional methods approved or directed. The Contracting Officer may require that the excavation be continued and the preliminary cleanup procedure repeated until a satisfactory foundation surface is reached.If the Contractor encounters seams of objectionable material or drummy material, shouldn t this activity be paid on an hourly basis for the effort required by the Contracting Officer?**

<b>2-1</b>	<b>Duplicate of comment 405994.</b>

<b>405998</b>	02217	n/a	n/a
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**Page 3 Paragraph 3.31 Preliminary Cleanup and Paragraph 3.3.2 Final Cleanup and Foundation PreparationThe last sentence in both of these paragraphs states, At the direction of the Contracting Officer, the Contractor shall provide a protective treatment of 3 inches of concrete to cover exposed rock that is susceptible to slaking.Drawing Plate GT2.10 Sheet 63 of 155 indicates which slopes will have 6 inches of Shotcrete. Is the 3 inches of concrete actually shotcrete? If so, is this in addition to the 6 inches of shotcrete the Contractor is required to apply as the rock excavation progresses?**

<b>2-1</b>	<b>The protective treatment of 3 inches of concrete applies to horizontal or near horizontal rock surfaces only, in areas where shotcrete would not be applied. There are no situations where both would be used.</b>

<b>405999</b>	02217	n/a	n/a
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**Page 3 Paragraph 3.31 Preliminary Cleanup and Paragraph 3.3.2 Final Cleanup and Foundation PreparationThe last sentence in both of these paragraphs states, At the direction of the Contracting Officer, the Contractor shall provide a protective treatment of 3 inches of concrete to cover exposed rock that is susceptible to slaking.If the 3 inches is required, shouldn t there be a bid item for it also?**

<b>1-1</b>	<b>Duplicate of comment 405999.</b>

<b>406001</b>	01060	n/a	n/a
<b>Paragraph 1.3 Water Quality StandardsA. Public Water SupplyThis paragraph lists several documents that contain relevant criteria for the Howard Hanson Dam Reservoir. They are listed under subparagraphs a through e. May we have copies of these documents?</b>			
<b>1-1</b>	<b>The documents a, b, and c are available from State and Federal Agencies. The information in the documents d and e are built into the 1060 spec and others in the document.</b>		
<b>406385</b>	n/a	n/a	n/a
<b>My question in section 05120 SD-07 Certification Fabrication for a AISC certificate does this apply to section 05616 Stoplogs and Lifting Beam ?</b>			
<b>2-1</b>	<b>This will be clarified by amendment.</b>		
<b>406722</b>	02212	n/a	n/a
<b>Specification Section 02212, 1.4.2, paragraph 4 requires channel drilling in excavation area 1B adjacent to the existing outlet works tower. Drawing C1.4, Phase 1B, does not show where channel drilling will be required. Drawing C1.5, Phase 1C, has a note that states Remove rock as required to expose existing concrete of outlet structure . Is this the area where channel drilling is required? Please define which phase and the exact locations where channel drilling is required. Will the lookou drilling practice be allowed for channel drilling?</b>			
<b>2-1</b>	<b>This will be clarified by amendment.</b>		
<b>406724</b>	n/a	n/a	n/a
<b>We request a copy of all of the questions asked by other General Contractors, Subcontractors and material Suppliers as well as the USACE's answers to these</b>			

<b>questions.</b>			
<b>1-1</b>	<b>It is the government's intent to post all answers to bidder inquiries by amendment. The first set of bidder inquiries were added to Amendment 5. The government will post bidder inquiries that came after that by amendment soon.</b>		
<b>407087</b>	03730	125	n/a
<b>Reference NORTH WALL PLAN AT ELEVATION 1080: Is it intended that the specified epoxy adhesive for the drilled #9 dowels be used as an underwater application? Section E shows these dowels all the way down to Elev. 1060 -- well below minimum pool.</b>			
<b>1-1</b>	<b>Yes, the drilled-in dowels with epoxy adhesive do extend below water to the elevations shown.</b>		
<b>407461</b>	05120	n/a	n/a
<b>Reference Section 05120 - 3.1, second paragraph. Please confirm that the non-stainless steel items to be painted include those shown on sheets 114 and 117.</b>			
<b>1-1</b>	<b>The brace angles and connection plates inside the precast segments on sheets 114 and 117 will be embedded in concrete or grout in the final condition as shown on the cast-in-place concrete sheets. In conformance to the specifications since they are not exposed in the final condition, they do not need to be painted.</b>		
<b>407463</b>	05120	n/a	n/a
<b>Reference Section 05120 - 3.1, second paragraph. Please confirm that the steel items to be painted are not to be galvanized.</b>			
<b>1-1</b>	<b>Galvanized steel surfaces do not need to be painted, unless otherwise noted.</b>		
<b>407464</b>	05120	n/a	n/a
<b>Reference Section 05120 - 3.1. second paragraph. Please confirm the precast</b>			

<b>concrete segment support frame shown on sheets 121 and 122 is not to be galvanized or painted.</b>			
<b>1-1</b>	<b>Since the precast concrete segment support frame is embedded in concrete and grout in its final condition, it is considered not exposed, and therefore it requires no painting or galvanizing.</b>		
<b>407465</b>	05120	n/a	n/a
<b>Reference Section 05120 - 3.1, second paragraph. Please confirm the steel soldier piles shown on sheets 148 and 149 are not to be galvanized or painted.</b>			
<b>1-1</b>	<b>The soldier pile steel is exposed over the height that the lagging is installed. Therefore in conformance to the specifications, each soldier pile shall be painted from slightly below the bottom of lagging elevation to the top of each soldier pile to ensure that all exposed steel is painted.</b>		
<b>407500</b>	n/a	128	n/a
<b>Reference Plate S3.6, CRANE RAIL SUPORT BEAM PLAN. Grating support angles are shown but grating is not called out. Is it intended that grating for the two openings is not part of this contract?</b>			
<b>1-1</b>	<b>The grating is not shown or called out because it is NOT part of this contract.</b>		
<b>408145</b>	00110	n/a	n/a
<b>Is it possible to use and name a consultant in the RFP writeup that participated on this projects design review team for the USACE? It appears that this person(s) would have inside information and pose an unfair advantage to other bidders.</b>			
<b>1-1</b>	<b>This must be considered on a case by case basis by our legal department. Who is the consultant, and in what capacity do you plan to use this consultant?</b>		
<b>408968</b>	n/a	n/a	n/a

Please provide contact information for arranging to view the rock cores. We are unable to attend the Nov. 4 site visit.

1-1	Please contact Rich Smith at 206-764-3309 or Tom Danielson at 206-764-3562 to view the cores at the Corps District Office in Seattle.

408972	n/a	S3.9	n/a
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On Plate S3.9 of the contract plans, the detail "At South Wall" shows a rock anchor with a smooth sheath bond breaker drawn in. It also shows this area a Bond Length. Do the south wall anchors require a smooth sheath? If so, what is the stressing length?

1-1	The "At South Wall" bond length stated (full length) in the detail is correct. There is no bond breaker length. There is double corrosion protection as stated.

408975	02491/02490	n/a	n/a
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Paragraph 3.5.1 of specification section 02491 calls for 30 sacrificial rockbolts. Section 02490 has a similar requirement for demonstration anchors. Will these anchors be paid for by the applicable bid items?

1-1	This will be clarified by amendment.

408979	01005	2	n/a
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Paragraph 1.3 defines the fee required for road use to Disposal Site #1 and Disposal Site #2 for vehicles over 14000 lbs. Plate C1.2 of the plans shows a disposal site, a debris storage area and a storage and stockpile area. Where do the documents indicated which site is Disposal Site #1 and which is Disposal Site #2?

1-1	Disposal site 1 is that referred to on the drawings as "disposal site". Disposal Site 2 is that shown on the drawings as the "storage and stockpiling area". This will be changed by amendment.

408980	n/a	n/a	n/a
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Plate S8.2. Note #3 states "Non shrink grout shall have a strength of 5000 ksi at 7

days. The other plan notes read 6000 psi at 28 days. Should this note also read 6000 psi at 28 days?

<b>1-1</b>	<b>The 7-day strength is 5000 psi. The 28-day strength is 6000 psi as specified.</b>

<b>408982</b>	Addenda 5	n/a	n/a
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The answer to question #399276 state "in amendment #4, a split bid item #11 for drilling will be added. The amount for the A item of the split item should include costs for exploratory holes." Exploratory holes require core recovery. Grout curtain holes can be drilled with other equipment. The cost difference for providing core recovery is substantial. Please designate the quantity of drilling in this item that will require core recovery.

<b>1-1</b>	<b>This will be corrected by amendment.</b>

<b>408984</b>	Addenda 5	n/a	n/a
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The answer to question #399276 state "in amendment #4, a split bid item #11 for drilling will be added. The amount for the A item of the split item should include costs for exploratory holes." Exploratory holes require core recovery. Grout curtain holes can be drilled with other equipment. The cost difference for providing core recovery is substantial. Please designate the quantity of drilling in this item that will require core recovery.

<b>1-1</b>	<b>This is a duplicate of comment 408982.</b>

<b>408985</b>	n/a	n/a	n/a
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At the Site Visit it was stated that the contract range listed was low and should be revised. What is the Contract Range?

<b>1-1</b>	<b>The contract range is \$10 Million to \$25 Million. This info was added to Amendment 4.</b>

<b>409022</b>	n/a	n/a	n/a
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Is there any information that can be made available concerning the storm event that

<b>took place October 19 and 20? We would like to get rainfall, lake water elevation and stream flow volume information for the period of October 18 to 25 if possible.</b>			
<b>1-1</b>	<b>Information is available. A spreadsheet will be e-mailed to you separately. This will also be added by amendment.</b>		
<b>409764</b>	00010	n/a	n/a
<b>Some of the text at the right-hand margin of the "The Solicitation, Offer, and Award" form, pages 00010-1 and 00010-2, is not visible. In addition, this form has not been revised by Amendment to reflect the new bid date. Does the USACE intend to reissue this form by Amendment?</b>			
<b>1-1</b>	<b>This will be reissued by amendment.</b>		
<b>409822</b>	02490, 3.3.4.3	n/a	n/a
<b>The specification indicates that all soil and rock anchors of this specification section will be pressure grouted and that gravity grouting is not allowed. Please clarify if the intent is to use tremie pipe pumped grout or do we have to close off the hole with a grouting head and induce pump pressure into the grout within the closed system.</b>			
<b>1-1</b>	<b>Pressure grouting by pumping through a tremie grout tube placed at the bottom of the drilled hole should provide the intended grouted anchorage for most rock and soil cases. However, for soil anchors in loose granular soil, grouting in a fully pressurized closed hole system may be necessary to avoid loss of grout in the hole through excessive seepage into the soil. Note that the anchors must pass the required performance and proof load tests regardless of the grouting procedures used.</b>		
<b>409877</b>	n/a	n/a	n/a
<b>Due to the magnitude of information that was presented in amendments #04 &amp; 05 and the difficulty in disseminating it to the pertinent subcontractors and suppliers, we request a bid date extension. An extension is also necessary so that the technical information can properly be prepared and submitted back to the Prime and then incorporated with the Prime's bid submittal. Thank You.</b>			

<b>1-1</b>	<b>Bid date has been extended to December 2nd by amendment 7.</b>		
<b>410225</b>	n/a	n/a	n/a
<b>Balfour Beatty will be submitting a bid as a Prime Contractor on the Howard Hanson Dam Proejct. Due to the complex nature of this Project we request a 3 week time extension to the existing Bid Date of November 18,2002.Thank You for your consideration in regards to our request.Balfour Beatty Construction</b>			
<b>1-1</b>	<b>Bid date has been extended to December 2nd by amendment 7.</b>		
<b>410262</b>	Addendum #4, 05055, 2.2	n/a	n/a
<b>Specification indicates all exposed steel other than stainless steel shall be painted as specified in Section 09965A. This specfication refers to field painting of steel. Please clarify if the steel soldier pile beams for the permanent retaining wall recieve painting and if a shop application will be acceptable if required. Also, does the entire pile require painting, the total exposed height or the partial exposed height below the concrete facia wall.</b>			
<b>1-1</b>	<b>The soldier pile steel is exposed over the height that the lagging is installed. Therefore in conformance to the specifications, each soldier pile shall be painted from slightly below the bottom of lagging elevation to the top of each soldier pile to ensure that all exposed steel is painted. Shop application is acceptable.</b>		
<b>410735</b>	n/a	n/a	n/a
<b>I have a technical question regarding the load cells specified for this project. As we understand it the load cells are to be placed over rockbolts that are #8 to #11 size as shown on drawing E-56-14-17. If the yield stress of these rockbolts is 150 ksi then the maximum load that these rockbolts can accommodate is only 118 kips for the #8 bar and 222 kips for the #11 bar. Please confirm what is meant by "three times the rated capacity". Is it 300 kips or 3 x 300 kips = 900 kips? In light of the maximum capacity of the rockbolts indicated above it would seem excessive to have load cells with a 900 kip required capacity.</b>			

3-1	<p>Specification 02214, Part 2, paragraph 2.5 states: "Load cell capacity shall be 300 kips as indicated on the schedule included in the plans with an over-range capacity of not less than three times the rated capacity." This sentence will be changed by amendment to read as follows: "Load cell capacity shall be 100 kips as indicated on the schedule included in the plans with an over-range capacity of 150 percent Full Scale (F.S.). The over-range capacity of 150 percent F.S. allows measurements up to 150 kips with no calibration shift. The "Load Cell Capacity" in Vibrating Wire Load Cell Schedule on Plate GT3.2 will be revised to reflect this change. The load cells would go on No. 8 bolts 20 feet long.</p>		
410740	n/a	n/a	n/a
<p>The Customer Satisfaction Survey which was included in admendment #05 states a return date, to the Seattle District Office, of 11/03/03. Should this document return date be the same as the proposal due date of 11/18/03?</p>			
1-1	<p>Yes. This will be changed by amendment.</p>		
410853	Addendum #4, 02490, 3.3.4.2	n/a	n/a
<p>Specification indicates that anchors that terminate in soil do not require the watertightness test. What will be the requirements for anchors which have rock in the bottom of the hole but have also penetrated soil in the upper portion of the hole. We are uncertain how to watertightness test holes which are not fully within rock.</p>			
2-1	<p>The watertightness test will not be required for holes where there is significant soil along the hole length.</p>		
410875	n/a	n/a	n/a
<p>I submitted a question on 10-30-03 here it is 11-6-03 and still on responds good system</p>			

1-1	<b>Bid period has been extended by amendment 7. See also Amendment 6 Section 05616.</b>		
<b>411313</b>	n/a	n/a	n/a
<b>I have a question regarding the water quality monitoring requirements of the contractor for the Fish passage facility project, DACW67-03-R-001. Please clarify and confirm that the Corp of Engineers will perform the water quality monitoring. As we interpret the specs, the contractor need only assure that standards are achieved. Your reply is very much appreciated. Joe Eckhoff Sanders &amp; Associates, Inc. 13256 Northup Way, Ste. 15 Bellevue, WA 98005 Phone: 425.401.1611 Fax: 425.401.1619</b>			
1-1	<b>It was the government's intent for the contractor to perform the Water Quality monitoring. The contract does not state this but the requirement will be added by amendment.</b>		
<b>411559</b>	01005	n/a	n/a
<b>Specification 01005, 1.3 gives rates per load to Disposal Site #1 and #2. Drawing C1.2 does not identify Disposal Site #1 and #2. Please clarify.</b>			
1-1	<b>Site 1 is shown on drawings as "Disposal Site". Site 2 is shown on drawings as "Storage and Stockpiling Area". This will be changed by amendment.</b>		
<b>411560</b>	01005	n/a	n/a
<b>Specification 01005, 1.3.1 and 1.3.2 both say to see the reference drawings for details of Access Road A and C . Please specify which reference drawing this information is shown on.</b>			
1-1	<b>Access road A is the main road from the Tacoma security gate to the dam and beyond to the disposal site. Access road C is the road on the dam vicinity grounds. It starts at the administration building parking leads down to the Cofferdam and excavation site. It also goes beyond to the dam maintenance building and the storage and stockpiling area.</b>		
<b>411561</b>	01501	n/a	n/a

**Specification 01501 1.10.3 refers to Access Bridge #79 and Weyco RR Tunnel. Please identify where these structures are located and do we have access to them?**

<b>1-1</b>	<b>Bridge #79 is the bridge upstream of the Tacoma Headworks compound on the main access road to the dam. The Weyco railroad tunnel is on the road that parallels the river to the south of the main road. This information was added to the contract because they represent possible constraints to accessing the site from either the north or the south.</b>

<b>411562</b>	n/a	n/a	n/a
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**Drawing C1.2 shows a 7 mile haul to the McDonald s Field Debris Storage Area. Since the contractors were not given a chance to look at this haul route or disposal site at either site visit, please provide a detailed description of this haul route and if there is any required work at this site for woody debris disposal**

<b>1-1</b>	<b>An amendment will delete the requirement to haul debris. Instead the contractor will be required to stockpile debris near the bend in the existing road a few hundred yards east of the east end of the temporary ramp shown on Plate C1.1. This will be shown by amendment.</b>

<b>411564</b>	n/a	n/a	n/a
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**Drawing C2.1 shows a dashed/dot line for the centerline of the cut-off wall. The centerline starts at the south end of the counterfort walls. Please confirm that the cutoff wall does not extend under the counterfort walls.**

<b>1-1</b>	<b>As shown on Plate C2.1 the cut-off wall does not extend under the counterfort walls.</b>

<b>411565</b>	n/a	n/a	n/a
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**Drawing C2.5, Rock Excavation Upstream From Cofferdam Detail 1. Will line drilling or smoothwall blasting methods be required from elevation 1075 to elevation 1060?**

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1-1	Refer to Specification 01212, 1.4.2 and 3.4, fifth paragraph of the specifications. Line drilling is not specifically required in the area; however controlled blasting techniques to prevent over break and minimizing rock damage in all excavations is required. Controlled blasting methods include smoothwall blasting.		
411567	02212	n/a	n/a
Specification 02212, 1.4.3 is there any limiting values for blast generated hydrostatic pressure and/or impulse on the existing structure and outlet gates?			
2-1	There is no limiting value for blast generated hydrostatic pressure at specific structures contained in the specifications. Section 01212, 3.2.B. (Item 3 of the General Blasting Plan) requires a plan for preventing damage to facilities, including regulating gate structures, and that the Contractor's Blasting consultant establish limits for each structure. These limits may include blast generated hydrostatic pressure.		
411635	n/a	n/a	n/a
I sent this question on 10/30/03 I will resend it. In section 05120 SD-07 Certification Fabrication for a AISC certifiante dose this apply to section 05616 Stoplogs and Lifting Beam ?			
1-1	Yes, the stoplogs and lifting beam are required to be fabricated in an AISC certified category Cbr fabrication facility (for major steel bridges). A copy of the AISC certificate indicating that the fabrication facility meets this specified structural steelwork category is required to be submitted. See the Amendment 6 revised specification Section 05616.		
411789	02251-2.1.8	n/a	n/a

**2. Where is the pay item for sand? What is the quantity estimate? The quantity of sand can have significant impacts on the grouting operation and is more expensive to place than neat grout.**

2-1	We anticipate sand will not be used because fractures are generally tight. Sand will likely not be needed or only rarely and thus should be considered an incidental item.

411792	02251-2.14	n/a	n/a
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**1. Where is the pay item for microfine cement? What is the estimated quantity? It costs several times as much as regular Portland and may require a different set of placement equipment.**

1-1	It is our intent to add a pay item for this by amendment.

411798	02251-2.2,3.2.1	n/a	n/a
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**3. Since a pay item has not been included for casing or grout nipples, who will decide if these are necessary? Will any casing be required to be left in place?**

1-1	Casing is required for drilling through soil overburden as described in specification 02251 section 3.2.2. Casing is not required to be left in place.

411861	02251-3.1.3i	n/a	n/a
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**4. The computer system to monitor grouting must display in "real time". As this has been a controversial issue in the past, please define "real time".**

1-1	"Real time" means that data from sensors is recorded and immediately transferred electronically to a computer on site.

411950	02251-3.2	n/a	n/a
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**5. The maximum deviation tolerance for grout holes shall be 1/2 degree. Typical**

deviation specification for grout holes is around 2 degrees. The required tolerance, in general, will not be achieved with unassisted standard drilling methods. Does the COE realize the cost multiple required to maintain specification requirements? How will the deviation be measured? Measurement methods, to my knowledge, are not commercially available with a guarantee of accuracy; especially to the tolerances required. I suggest that the drill tolerance be relaxed (at least on some holes) to match the task to be achieved. Additional holes would probably be a much cheaper and more effective solution.

1-1	A deviation of one degree along the grout hole alignments will be acceptable. However, if a possible deviation of one degree is assumed, then, without compromising the performance of the intended grout curtain, the grout holes for the intake structure grout curtain will have to be repositioned so that the grout holes will not intercept the existing intake structure. A plan for repositioning the intake structure grout curtain grout holes shall be submitted to the Contracting Officer for approval prior to start of the intake structure grout curtain drilling. This will be changed by amendment.

411958	02251-3.2.4	n/a	n/a
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6. Where is the pay item for exploratory drilling? What size is required? What will be done with the core?

1-1	A payment item for exploratory drilling will be added by amendment. Core will be HQ size. Core will be placed in wooden core boxes as per spec 02251-3.1.2.1.

411970	02251-	n/a	n/a
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7. Where are the pay items for drill setups? Exploratory and grout hole drill setups are normally separate items especially on most COE projects. Please clarify. Downstage grouting requires numerous additional drill setups. In order to standardize the bids, quantities should be offered for this work.

1-1	Items 13AA and 13AB of the bid schedule in Amendment 6 cover grout hookups. The number of drill setups will be the same so costs should be incorporated into these pay items. Exploratory drilling will be covered by a separate item by amendment and will be paid by the LF with no drill set up item.

411982	02251-GBR-3.2.4	n/a	n/a
<p><b>8. The geotechnical baseline report estimated grout takes of 0.10 saks per foot for the foundation based on a 4 inch hole. Considering the backfill volume for a 4 inch hole, does this mean that the formation will take virtually no grout?</b></p>			
1-1	<p><b>Grout takes in the GBR we re based upon measured grout takes during dam construction tunnel grouting and left abutment foundation grouting. A range of 0.1 to 0.2 sacks per foot of 4-inch diameter hole was given in the GBR. For 1-94 lbs sack of cement mixed 1:1 by volume with water yields a volume of approximately 1.5 cubic feet of grout. A 10 foot hole of 4-inch diameter has a volume of approximately 0.9 cubic feet. Thus, grout takes are anticipated to be approximately 60% to over 200% above that required to fill the grout hole.</b></p>		
412011	02251-3.3.1.2	n/a	n/a
<p><b>9. How will the length of a grout reach be determined? Who will determine this length? The 100 foot distance requirement for successive stage grouting seems very restrictive for small work areas and with very little grout take. The effects on the sequence of work will increase time and costs. Please reconsider the limitations.</b></p>			
1-1	<p><b>The contracting officer will determine the reach lengths. It is intended that drilling and grouting will be conducted at separate times within each grouted area, such as within the left abutment or the intake structure. However, drilling could be conducted at one area while grouting is being conducted at another. However, the last sentence in Specification 02251 - 3.3.1.2 states the reach length shall be subdivided into sections that will facilitate Contractor's operations.</b></p>		
412025	02251-3.3.4	n/a	n/a
<p><b>10. The closure criteria is stated as 0.1 cf per hole in ten minutes. The stage will be grouted if the pressure test shows over 3 lugeons. What is the time length for the pressure tests? How will these be paid for? Typically, unless a three minute test is specified, there is a separate bid item with units being 'hours' or 'each'.</b></p>			
1-1	<p><b>Test is minimum of 15 minutes long with a reading of water taken</b></p>		

	each 5-minute interval. Test may require extra steps if water take is declining indicating water filling dead end cracks. Water tightness testing is incidental to the grout hookup bid item.		
<b>412130</b>	01501	4	n/a
	Paragraph 1.10.2 requires all contractor vehicles to be equipped with a CB radio and all "trucks" to be predated by pilot cars while traveling along the access road to the dam site. It also says "Pilot cars for lowboys shall be coordinated in advance with the Contracting Officer." Do "trucks" which are not overwidth and are equipped with CB radios require pilot car escorts? If concrete is delivered via the access road will each truck require and escort even if the truck driver is issued a project identification and the truck has a CB radio? Will all contractor maintenance "trucks" require and escort?		
	1-1	Only trucks with lowboys that have equipment extending out the sides will be required to have a pilot car as stated in 01005-1.4. This will be clarified by amendment.	
<b>412632</b>	n/a	n/a	n/a
	In the Addenda No. 6 Bid Schedule, Bid Items 0015AA and 0015AB quantities and/or descriptions should be revised. The quantity for the AA item is "10 Bags", the description for the AB item is "All Over 75 94-lb Bags", therefore there would be no payment for bags 11 through 75.		
	1-0	The bid schedule will be corrected by amendment.	
<b>412817</b>	00010-10	n/a	n/a
	Note 2 indicates that standby days of equipment and crew will be paid for per Section 01025. Bid items 0036, 0037 and 0038 pay by the each. How will you pay for standby when the durations of shutdowns are unknown?		
	1-1	It is the intent of the government to have the bidder review the data in the H&H Baseline report regarding historical flooding at the dam. Floods above 1150 are rare. From this data a contractor should be able to estimate days of standby for the events given for the three elevations.	

412822	01563	n/a	n/a
<b>Where are the refueling and chemical/petroleum storage areas to be located, per 01563 page 4, paragraph 2.7?</b>			
1-1	<b>The requirement for a designated area for refueling will be omitted from the contract by amendment. However, the contractor must follow all other requirements regarding protection of water quality in any fueling scenario.</b>		
412840	01560	n/a	n/a
<b>Section 01560, page 3, paragraph 1.6.1 indicates that the equipment washdown and decontamination facility will be located downstream of the water supply intake pipe as identified in the drawings. Which drawing identifies the location?</b>			
1-1	<b>Location is at the headworks compound in the vicinity of the headworks security gate. Location will be added by amendment.</b>		
412860	01005	n/a	n/a
<b>Section 01005, page 2, paragraph 1.3 identifies TPU trip charges for disposal sites 1 and 2. Which site is disposal site #1?</b>			
1-1	<b>Site 1 is referred to on the drawings as "Disposal Site". Site 2 is referred to on the drawings as "Storage and Stockpiling area".</b>		
412876	n/a	GT3.2	n/a
<b>Should the thermistors associated with the deleted MPBX's also be deleted?</b>			
1-1	<b>The thermistors associated with the deleted MPBX s should be deleted. The thermistors that should be deleted are TM-0064, TM-0065, TM-0066, TM-0067, and TM-0068. This will be changed by amendment.</b>		

<b>412880</b>	n/a	n/a	n/a
<b>Due to conflicts with other bids and difficulty in disseminating addenda information to subcontractors and suppliers, and the subsequent receipt of their technical data as well as pricing, we request a 2 week delay beyond the current proposal submittal date of November 18.</b>			
<b>1-1</b>	<b>Bid date has been extended to December 2nd by amendment 7.</b>		
<b>413112</b>	00010-6 #0015	n/a	n/a
<b>11. Bentonite is normally available in 50lb or 100lb bags, not 94lb as per bid items. Please clarify.</b>			
<b>1-1</b>	<b>The bid schedule will be adjusted by amendment to the standard size bags.</b>		
<b>413280</b>	02491	n/a	n/a
<b>Reference Section 02491, paragraph 3.5.1 Will the 30 each sacrificial rock bolts be paid for under the applicable rock bolt bid item?</b>			
<b>2-1</b>	<b>These bolts will be paid for under an item to be included by amendment.</b>		
<b>413364</b>	00010	n/a	n/a
<b>In reference to SF1442, sheet 00010-4 is not labeled. Is this the Corporate Certificate of Authority to Bind sheet?</b>			
<b>413372</b>	00010	n/a	n/a
<b>Form SF1442 back (00010-2) lists #17 the price proposal information as 00010-5 thru 00010-6, should this read thru 00010-10?</b>			

413994	01563	n/a	n/a
<p><b>Paragraphs 2.11, 2.12 and 3.12 deal with disinfection of equipment to be used on the project. We interpret these sections to apply to equipment that comes in contact with the water, and not all equipment that enters the the work site. Is this correct?</b></p>			
1-1	<p><b>Disinfection only refers to equipment that will contact the water. This will be clarified by amendment.</b></p>		
<hr/>			
414357	00110	n/a	n/a
<p><b>Reference Section 00110, Paragraph 5.H.1.cIs "Underwater Grouting" here intended to mean the grouting under Segments A, B, and C described in Step 11 of the Construction Sequence shown on Plate G1.4?</b></p>			
1-1	<p><b>Yes</b></p>		
<hr/>			
414428	2251-GBR-3.2.4	n/a	n/a
<p><b>8a. The Geotechnical Baseline Report specifically states that the foundation grout takes were 0.10 saks per foot. Since the volume of the referenced 4 inch hole is 0.09 cf per foot, then the formation grout take is only about 0.05 bags per foot. (assuming 1:1 backfill used). If water tested according to the current specification, it is doubtful that any stage would be grouted. Please confirm if these assumptions correct?</b></p>			
1-1	<p><b>Grout takes in the GBR ranged from 0.1 to 0.2 sacks per foot of 4-inch diameter hole. This is an average that will include both zones of very little grout take and zones of relatively higher grout take. Bidders should anticipate that there will be zones that fail water testing and require grouting.</b></p>		
<hr/>			
414437	02251	n/a	n/a
<p><b>7a. I disagree that the number of drill setups will match the number of hookups. Both upstage and downstage methods will be used. If upstage grouting is used, the number of drill setups will be one, and the number of hookups will be the number of grout stages in that hole. Secondly, if downstage grouting is used, the number of setups will match the number of stages except when the water tests measure less than three lugeons, in which case the stage will not be grouted. I believe that a pay item for drill setups is essential in a grout program in order to keep the bid estimate</b></p>			

<b>bases similar and to reduce risk to the contractor and thereby costs to the Owner.</b>			
<b>1-1</b>	<b>Pay items for drill setups that are separate from grout hookups will be added by amendment.</b>		
<b>418375</b>	n/a	n/a	n/a
<b>Plates GT3.1 and GT3.5 show extensometer series 5400, 5500 and 5600 near station 3+40 in the Phase 1B excavation. The table titled "Multi-Point Borehole Extensometer Schedule" on Plate GT3.2 indicates these units will be installed in the Phase 1C excavation. Is the table correct.</b>			
<b>418383</b>	n/a	n/a	n/a
<b>On Plate GT3.7 the detail entitled Rock Bolt Load Cell indicates "grout/epoxy in lower 4" only". Should this read "lower 4 feet only"?</b>			

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{Report Complete}