FINAL CONSTRUCTION REPORT

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT

DAMID: 0470121
Water Division 6, Water District 47
Jackson County, Colorado
C-1291A

Prepared for:

Office of the State Engineer
Division of Water Resources
Dam Safety Branch
1313 Sherman Street
Denver, Colorado 80203

Prepared by:

W. W. WHEELER
& ASSOCIATES, INC.
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405

DECEMBER 2018

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
FINAL CONSTRUCTION REPORT

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INTRODUCTION

Coyte Reservoir Dam is classified as a small size, Low Hazard dam that is privately owned and operated. Coyte Reservoir is located on the Spicer Ranch Property next to Highway 14 approximately 27 miles southwest of Walden CO. The general location of the dam and reservoir is in Section 29 Township 7N, Range 79 W of the 6th P.M. The reservoir has a surface area of about 5 acres and a storage capacity of about 39 acre-feet. Appurtenant discharge structures in Coyte Reservoir dam consist of an emergency spillway, a 12-inch-diameter CMP outlet, the 10-inch-diameter low-level outlet, and an 18-inch-diameter mid-level outlet. The reservoir is off-channel and derives its water supply from the surrounding runoff. The dam is used for irrigation and recreational purposes.

In 2017, the State Engineer placed a storage restriction on the reservoir due to the observed deteriorating condition of the 18-inch-diameter mid-level outlet. The 18-inch-dimater outlet was operated with a downstream control gate, thus resulting in a pressurized pipe condition through the dam. Water had been observed flowing from the embankment beside the pipe indicating that there are holes within the existing CMP conduit.

Purpose

The purpose of this project was to improve the overall safety of the dam by addressing the current deficiencies associated with the 18-inch-diameter mid-level outlet, and thus eliminating any potential concerns for dam safety and future storage restrictions. The existing dam was rehabilitated by removing the existing 18-inch-diameter CMP conduit and gate, and installing a new upstream concrete intake structure with a new 12-inch-dimater canal gate and 12-inch-diameter SDR 35 PVC conduit pipe. Additional modifications completed during the outlet replacement include, a new downstream outlet headwall for the mid-level outlet, removal of the vegetation along the downstream slope, installation of a trashrack for the mid-level outlet, and widening and straightening the dam crest.

Project Team

Dam Owner: Spicer Ranches
Coy Meyring

Project Engineer: W. W. Wheeler and Associates, Inc.
John Treacy, P.E., Engineer of Record

Geotechnical Engineer: Kumar and Associates, Inc.
Barrett Sullivan, Field Inspector

Construction Contractor: RLW Enterprises
Rick Wamsley, Project Manager

Concrete Contractor: Jordan Concrete, LLC
BJ Jordan, Project Manager

Dam Safety Engineer: State Engineer's Office (SEO)
Dana Miller, P.E.

SUMMARY OF CONSTRUCTION

RLW Enterprises and Coy Meyring were the primary contractors for the project. The concrete structures installed for this repair were constructed by Jordan Concrete. The reservoir was drained throughout the summer by use of the low-level outlet. The following is a summary of the weekly construction progress throughout the project duration.

- October 2– October 5, 2018:
  RLW Enterprises mobilized to the site and began construction by clearing and grubbing the vegetation along the downstream slope and toe. RLW excavated and removed the existing 18-inch-diameter CMP outlet pipe and downstream outlet structure. RLW then began preparing the foundation for the concrete intake structure. John Treacy was on-site Friday October 5, 2018 to perform an inspection of the foundation and to collect a soil sample to be tested for embankment backfilling and compaction. As the excavation approached the final grade, it was evident that the embankment material had a significant amount of moisture. It was discussed by John Treacy and RLW to excavate the wetter material 6-inches below the final grade and replace with the dryer embankment material prior to prepping the foundation for the intake structure. The 12-inch-diameter SDR 35 PVC pipe was delivered to the site.

- October 8-12, 2018:
  Jordan Concrete was on-site setting the forms and reinforcing steel for the footings of both the Intake structure and the outlet structure. Jordan Concrete placed 8 yards of concrete in the intake and outlet structure footings. Kumar and Associates were on-site to perform concrete testing and provide quality control. Following completion of the concrete placement, Jordan Concrete covered the concrete placements with concrete blankets for the weekend.

- October 15-19, 2018:
  Jordan Concrete removed the forms from the footings of both the intake and outlet structures. Jordan concrete installed the formwork and reinforcing steel for the intake and outlet structure walls. Concrete placement for the intake structure and outlet structure walls was conducted on Thursday October 18, 2018. Andrea Fasen, with W. W. Wheeler and Associates was on-site to inspect the rebar prior to concrete placement and Kumar and Associates was on-site to perform concrete testing. Following completion of the concrete placement, the concrete was covered with concrete blankets for the weekend.

- October 22-26, 2018:
  Jordan Concrete removed the forms from the intake and outlet structures. Following removal of the forms, the 12-inch diameter SDR 35 outlet pipe was installed. The 12-inch diameter canal gate and stem were installed on the intake structure. Jordan Concrete grouted around the pipe and gate entrance to ensure a tight seal between the gate and pipe. The downstream sand filter diaphragm was installed approximately 8 feet upstream of the outlet structure and 2.5 feet below the pipe invert prior to the concrete saddle placement. The concrete pipe cradle was installed to the spring line of the pipe on Monday October 22. On Wednesday, October 24, RLW began some initial backfill and embankment lifts to bring the embankment up to the spring line of the pipe. On Thursday October 25, 2018, John Treacy was on-site for the pressure testing of the SDR outlet pipe. The 12-inch diameter pipe was pressure tested using two plugs installed at both the upstream and downstream end. Water was pumped into the system up to 5 psi. The pressure test began at 9:00 AM at 5 PSI and completed at 10:00 AM with a pressure reading maintained at 5 psi. Following the completion of the pressure testing, RLW began backfilling and compacting the embankment material. Kumar and Associates was on-site to perform compaction testing in accordance with the specifications. The sand filter installation was being completed in conjunction with the embankment installation. Embankment lifts were being installed and, and the sand filter diaphragm was excavated out following compaction. Embankment fill was completed on Friday October 26, 2018.

- October 29 – November 16, 2018:
  Weather delays and other project demands extended the remaining cleanup and additional work to be completed over this 3-week span. During this time, RLW completed the grading of the upstream and downstream slope around the mid-level outlet to match the existing slopes. The dam crest was widened to the designed 15-feet and road base material was installed with drainage now draining into the reservoir. Riprap and bedding material were installed in the channel below the mid-level outlet. The trashrack was installed around the mid-level outlet intake gate.

- November 19, 2018:
  Dana Miller with the SEO, and John Treacy were on-site to perform a substantial completion inspection of the dam. In addition to the inspection, Guildner Pipeline was on-site to perform a video inspection of the 3 outlets

CONSTRUCTION ISSUES AND RESOLUTIONS

The Coyte Reservoir Dam mid-level outlet repair was completed without any major problems. A few noteworthy issues are described in the following paragraphs.

Upstream Slope Repair

One potential item that the SEO wanted this repair to address was the wave erosion and scraping along the upstream slope. To repair this area, it was recommended that the slope be re-constructed to match the intended grade and riprap bedding and riprap be installed in this area between elevations 8249 and 8257. This item was not completed during the 2018 construction window due to timing and funding. It was agreed upon by the SEO and the Owner, that the upstream slope repair will be delayed until after irrigation season sometime in 2019.

Staff Gage Installation

It was discussed and approved by the Engineer that the reservoir staff gage will be installed by the Owner on the existing low-level outlet air vent pipe. The Owner will weld or attach some metal marking at every foot increment corresponding to the water surface elevation.

CONSTRUCTION PHOTOGRAPHS

Photographs of the construction process were taken regularly during construction from the excavation of the existing pipe through the project completion. Key construction photographs are provided in Appendix A. Numerous additional photographs are on file at Wheeler.

SAMPLING AND TESTING

Kumar and Associates conducted gradations, Standard Proctor tests, and in-place density and moisture tests of the backfill. Test results are provided in Appendix B.

VIDEO INSPECTIONS

On November 19, 2018, a final post-construction video inspection was performed by Guildner Pipeline. No problems with the new outlet were observed. In addition, the low-level outlet and the left outlet discharge pipes were inspected. There were no major issues observed with the condition of either outlet. All video inspections were provided to the SEO by Wheeler.

RECORD DRAWINGS

11x17 size As-Built drawings are enclosed in Appendix C.

APPENDIX A

CONSTRUCTION PHOTOGRAPHS

1. View of RLW beginning the excavation of the mid-level outlet

2. View of the mid-level outlet excavation.

3. View of the exposed existing 18-inch diameter CMP mid-level outlet prior to removal.

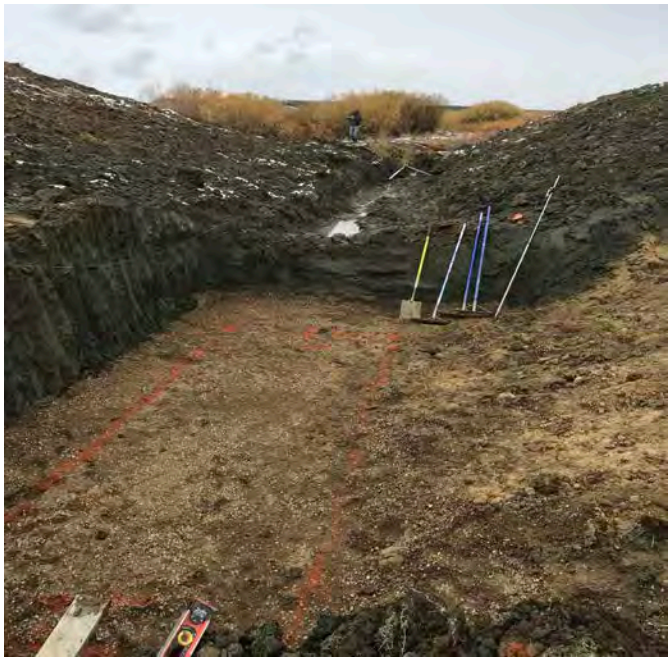
4. View of the of the exposed foundation looking downstream from the dam.

5. View of the exposed foundation preparation of the mid-level outlet.

6. View looking upstream of the exposed foundation preparation for the mid-level intake structure.

7. View looking left across the downstream slope at the clearing and grubbing work done to remove vegetation along the slope.

8. View looking at the 12-inch diameter SDR 35 PVC pipe that will be installed as the mid-level outlet conduit.



9. View of the final subgrade preparation for the new mid-level intake structure.

10. View of the intake structure footing steel and formwork

11. Close up view of the intake structure cutoff wall steel prior to concrete installation.

12. View looking upstream at the intake structure footing prior to concrete installation.

13. General view of the footing reinforcement for the mid-level outlet downstream discharge structure.

14. Close up view of the footing reinforcement for the downstream discharge structure.

15. View of the finished concrete placement for the intake structure footing concrete.

16. View of the finished concrete placement for the downstream discharge structure.

17. View looking left of the formwork for the right wingwall of the intake structure.

18. View looking right of the formwork for the left wingwall of the intake structure.

19. View of formwork and reinforcing steel for the intake structure.

20. View of the formwork for the outlet discharge structure headwall.

21. View of concrete placement of the outlet discharge headwall.

22. View of the concrete placement of the intake structure headwall and wingwalls.

23. View of the completed intake structure following removal of the forms.

24. View looking upstream at the final grade and filter diaphragm trench prior to installation of the outlet pipe.

25. Close up view of the filter diaphragm trench below the pipe.

26. View of installed filter diaphragm below the outlet conduit pipe and cradle.

27. View of the 12-inch diameter SDR 35 PVC outlet pipe being installed.

28. View of the new outlet pipe installed through the intake structure.

29. View of the mid-level outlet conduit installation.

30. View of RLW forming the concrete cradle for the outlet pipe.

31. View of the concrete cradle reinforcement and formwork.

32. View of the concrete placement for the outlet conduit pipe cradle.

33. View of the completed concrete cradle for the mid-level outlet conduit.

34. View of the backfilling and compaction of the embankment material around the pipe cradle.

35. View of the embankment compaction up to the spring line of the outlet conduit.

36. View of filter diaphragm installed to the spring line of the outlet conduit.

37. View of the pressure test of the outlet conduit completed on Oct. 25, 2018.

38. Close up view of the pressure test. Note pressure was held at 5 psi.

39. View of the pressure test setup at the intake structure.

40. View of the intake structure and new installed canal gate.

41. View of the filter diaphragm and embankment backfill looking upstream from the outlet.

42. General view of the embankment backfill process around the mid-level outlet.

43. View of the embankment material spreading and compaction process.

44. View of the embankment lift compaction process.

45. General panoramic view of the backfill and compaction for the mid-level outlet.

46. View of a typical compaction test being completed on an embankment lift.

47. View of the filter diaphragm installation process after embankment lifts have been installed.

48. View of the filter diaphragm installation prior to ASTM C33 sand being installed.

49. View of the completed filter diaphragm installed 2-feet above the outlet conduit.

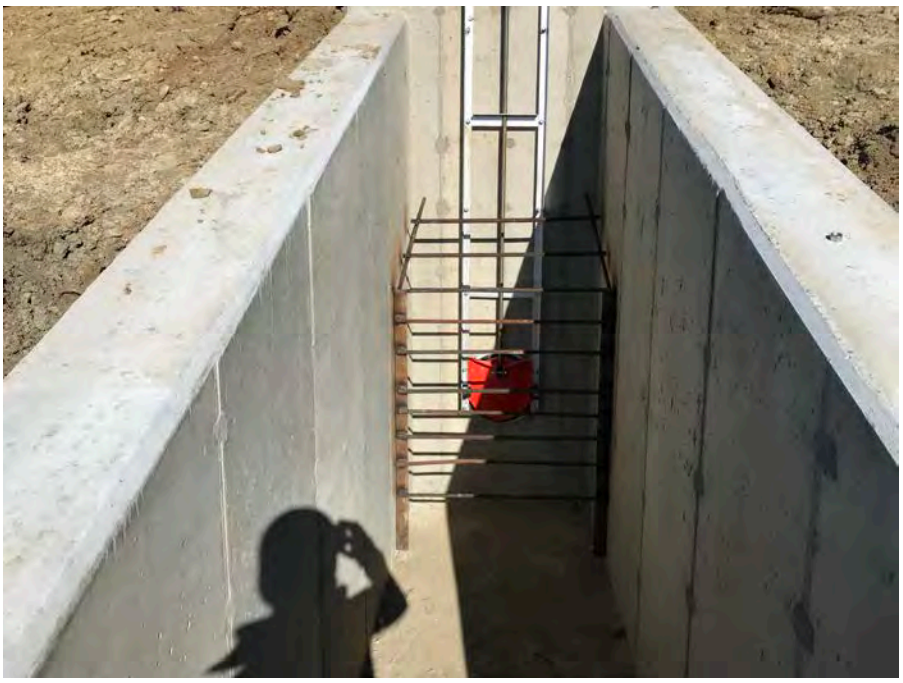
50. View of completed mid-level discharge outlet, Note riprap installed in the channel.

51. View looking downstream at the mid-level outlet discharge channel and downstream slope.

52. View looking upstream at the completed slope and intake structure.

53. View looking left across the completed upstream slope and at the intake structure

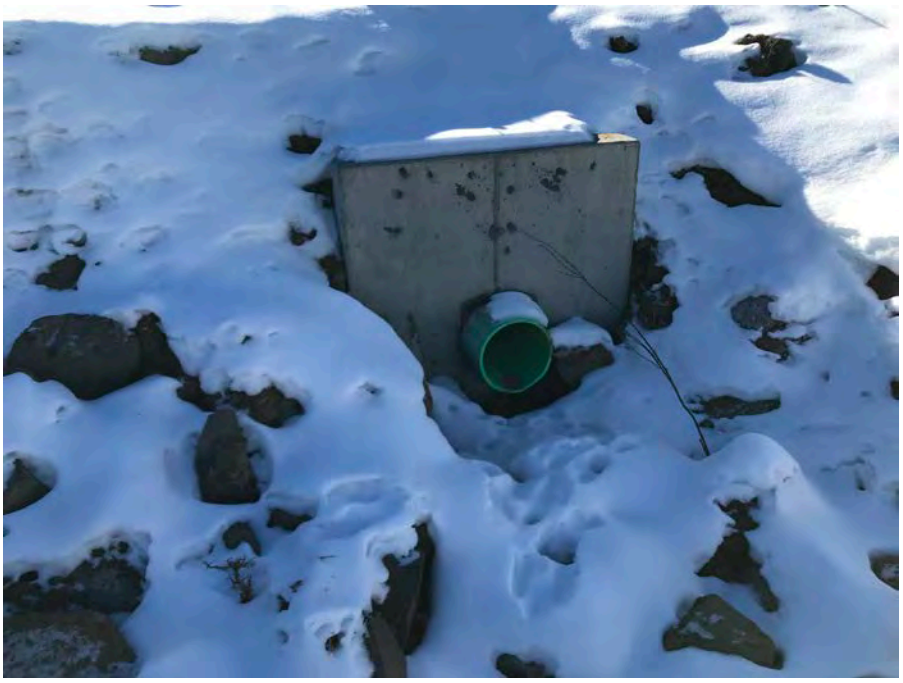
54. View of the completed intake structure with gate and trashrack installed.



55. Close up view of the intake structure gate and trashrack.

56. Close up view of the new 12-inch canal gate.

57. View looking left across the completed upstream slope.



58. View of the new mid-level outlet headwall and discharge pipe.

59. View looking left across the downstream slope. Note the vegetation has been removed.

60. View looking right across the downstream slope.

61. View looking right across the dam crest. Note the new road base added.

62. View looking right across the completed upstream slope.

63. View of the air vent pipe near the low-level outlet where the staff gauge will be installed.

APPENDIX B

MATERIAL TEST RESULTS

Kumar & Associates, Inc.

Geotechnical and Materials Engineers and Environmental Scientists

240 Annie Road
P.O. Drawer 1887
Silverthorne, CO 80498
phone: (970) 468-1989
fax: (970) 468-5891
www.kumarusa.com

Office Locations: Denver (HQ), Colorado Springs, Fort Collins, Glenwood Springs, Parker, and Silverthorne, Colorado

John Treacy
W. W. Wheeler & Associates
3700 South Inca Street
Englewood, CO 80110

PROJECT NO. 18-6-223
Coyte Reservoir Dam
Highway 41
Walden, CO

Supplier: Wyatt Redi-Mix CO, Inc.

CONCRETE FIELD REPORT (ASTM C172)
Report Date 12/4/2018

Placement Location Outlet Works Pipe Footings

Date Sampled 10/12/2018	**Time Sampled** 12:30 PM	**Time Tested** 12:30 PM	**Sampled/Tested By** TJH
Mix Number	**Ticket Number**	**Batch Size** 8 CY	**Batch Time** 4:50 PM
Truck Number	**No. of Specimens** 5	**Initial Curing Method** Standard	**Min/Max Temp.** NA
Slump 4.0 in.	**Slump Specification** 0 - 4 in.	**Air Content** 4.9 %	**Air Content Specification** 4 - 7 %
Unit Weight 143.7 pcf	**Volume of Density Measure** 0.25 CF	**Yield** NA	
Air Temperature 40ºF	**Concrete Temperature** 53ºF	**Water Added** 0 gals	

STRENGTH TESTING REPORT (ASTM C39/C39M-12)

Date Received in Lab 10/15/2018 **Lab Curing Method** Moist Cure
Length 8 in. **Design Strength** 4500 psi

Specimen	Test Date	Age (days)	Load (lbs)	Daily Diam (in)	Daily Area (sq in)	Strength (psi)	Percent of Design	Type of Fracture	Tech.
C4294-1	10/15/2018	3	37141	4.00	12.57	2960	66	3	CH
C4294-2	10/19/2018	7	48832	4.00	12.57	3890	86	2	BWS
C4294-3	11/9/2018	28	65123	4.00	12.57	5180	115	2	BWS
C4294-4	11/9/2018	28	67895	4.00	12.57	5400	120	2	BWS
C4294-5	11/9/2018	28	66159	4.00	12.57	5260	117	2	BWS

Average 28-Day Strength: 5280 psi

Defects in Specimen or Cap: NO **If YES, explain:**
Comments: Material sampled from the point of discharge. Contractor notified of results.

Reported By
Barrett Sullivan, Construction Services Manager

cc: book, file, Wyatt Redi-Mix CO, Inc., john.treacy@wwwheeler.com

Kumar & Associates, Inc.

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PROJECT NO. 18-6-223
Coyte Reservoir Dam
Highway 41
Walden, CO

Supplier: Wyatt Redi-Mix CO, Inc.

CONCRETE FIELD REPORT (ASTM C172)

Report Date 12/4/2018

Placement Location Upstream Inlet Structure and Downstream Head Wall

Date Sampled 10/18/2018	**Time Sampled** 2:20 PM	**Time Tested** 2:20 PM	**Sampled/Tested By** CH
Mix Number Class D	**Ticket Number** 0290	**Batch Size** 9 CY	**Batch Time** 1:50 PM
Truck Number NA	**No. of Specimens** 4	**Initial Curing Method** Standard	**Min/Max Temp.** NA
Slump 4.5 in.	**Slump Specification** 0 - 4 in.	**Air Content** 6.5 %	**Air Content Specification** 4 - 7 %
Unit Weight 142.11 pcf	**Volume of Density Measure** 0.25 CF	**Yield** NA	
Air Temperature 50ºF	**Concrete Temperature** 48ºF	**Water Added** 0 gals	

STRENGTH TESTING REPORT (ASTM C39/C39M-12)

Date Received in Lab 10/19/2018 **Lab Curing Method** Moist Cure
Length 8 in. **Design Strength** 4500 psi

Specimen	Test Date	Age (days)	Load (lbs)	Daily Diam (in)	Daily Area (sq in)	Strength (psi)	Percent of Design	Type of Fracture	Tech.
C4306-1	10/25/2018	7	42081	4.00	12.57	3350	74	3	CH
C4306-2	11/15/2018	28	57231	4.00	12.57	4550	101	2	BWS
C4306-3	11/15/2018	28	57562	4.00	12.57	4580	102	2	BWS
C4306-4	11/15/2018	28	58987	4.00	12.57	4690	104	2	BWS

Average 28-Day Strength: 4610 psi

Defects in Specimen or Cap: NO **If YES, explain:**
Comments: Sampled at point of discharge. Contractor was notified of results.

Reported By
Barrett Sullivan, Construction Services Manager

cc: book, file, Wyatt Redi-Mix CO, Inc., john.treacy@wwwheeler.com

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FILL OBSERVATION AND TESTING RESULTS

John Treacy
W. W. Wheeler & Associates
3700 South Inca Street
Englewood, CO 80110

PROJECT NO. 18-6-223 **Date:** 10/25/2018
DAILY REPORT NO. 1
Coyte Reservoir Dam
Highway 41
Walden, CO

			LABORATORY		FIELD				
Test No.	Location	Depth/ Elev.	Maximum Dry Density (pcf)	Optimum Moisture Content (%)	Probe Depth (in)	Dry Density (pcf)	Moisture Content (%)	Compaction (%)	Soil Type
1	Right Side, 10 Feet Downstream	TOP	110.6	13.4	6	106.9	17.7	97	Onsite Borrow
2	Right Side, 30 Feet Downstream	TOP	110.6	13.4	6	105.5	16.8	95	Onsite Borrow
3	Left Side, 15 Feet Downstream	8" ATOP	110.6	13.4	6	105.5	17.8	95	Onsite Borrow
4	Left Side, 50 Feet Downstream	8" ATOP	110.6	13.4	6	103.1	19.1	93	Onsite Borrow
5	Right Side, 15 Feet Downstream	16" ATOP	110.6	13.4	6	110.1	13.0	100	Onsite Borrow
6	Left Side, 40 Feet Downstream	16" ATOP	110.6	13.4	6	104.2	12.5	94	Onsite Borrow
7	Left Side, Middle 20' Downstream	24" ATOP	110.6	13.4	6	105.2	15.3	95	Onsite Borrow
8	Right Side, 30 Feet Downstream	32" ATOP	110.6	13.4	6	105.9	12.3	96	Onsite Borrow
9	Left Side, 15 Feet Downstream	32" ATOP	110.6	13.4	6	106.1	10.1	96	Onsite Borrow

COMPACTION SPECIFICATION:
95% ASTM D698, ±2% OMC
DAILY STANDARD COUNT:NA
CONSTRUCTION EQUIPMENT-TYPE/NUMBER:
NA
METHOD OF ADDING MOISTURE: Natural
GAUGE-MAKE/MODEL/SN:

FILL TESTED MEETS SPECIFICATIONS.

CONTRACTOR ADVISED: _X_ YES ___ NO
___ FULL-TIME OBSERVATION _X_ PART-TIME OBSERVATION

Field Observer: BWS
Reviewed By: Barrett Sullivan, Construction Services Manager

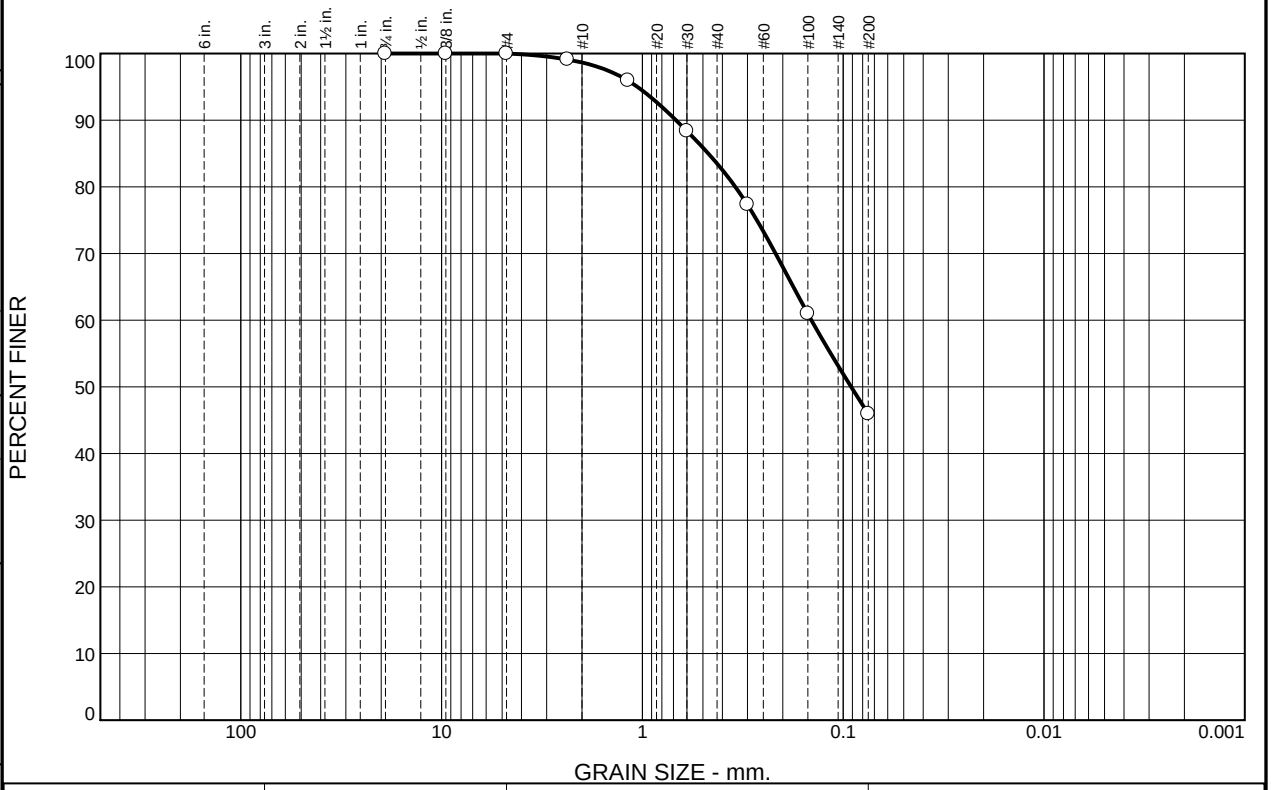
Gauge calibration data on file with the testing agency.
Tests are "Direct Transmission" (Method A) unless probe depth is noted as "Backscatter".

PROGRESS REPORT: TOP = Top of Pipe, ATOP = Above Top of Pipe

Cc: book, file, john.treacy@wwwheeler.com

This report presents opinions formed as a result of our observations of fill placement. We have relied on the contractor to continue applying the recommended compactive effort and moisture to the fill during times

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	16	37	46	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
3/8"	100		
#4	100		
#8	99		
#16	96		
#30	88		
#50	77		
#100	61		
#200	46		

* (no specification provided)

Material Description

clayey sand

Atterberg Limits

PL= 15 LL= 32 PI= 17

Classification

USCS= SC AASHTO= A-6(4)

Remarks

Location: On-Site
Sample Number: 8959

Date: 10-5-18

Kumar & Associates, Inc.

Denver, Colorado

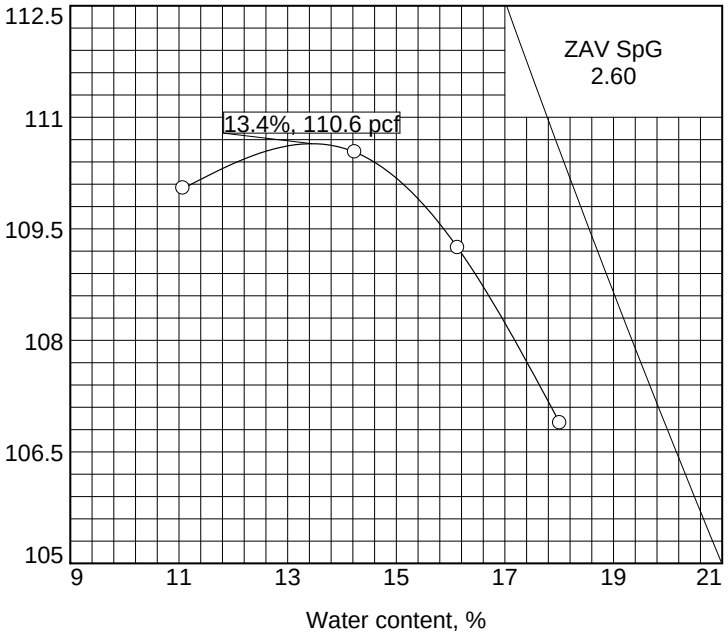
Client: W.W. Wheeler
Project: Coyote Reservoir

Project No: 18-1-341.4 **Figure**

Tested By: AS **Checked By:** JP

COMPACTION TEST REPORT

Curve No. 8959



Preparation Method

Rammer: Wt. 5.5 lb. Drop 12 in.

Type Manual

Layers: No. three Blows per 25

Mold Size 0.03333 cu. ft.

Test Performed on Material Passing #4 Sieve

%>#4 0 %<No.200 46

Atterberg (D 4318): LL 32 PI 17

NM (D 2216) Sp.G. (D 854) 2.6

USCS (D 2487) SC

AASHTO (M 145) A-6(4)

Date: Sampled 10-5-18

Received 10-5-18

Tested 10-9-18

Tested By AS

COMPACTION TESTING DATA
ASTM D 698-12 Method A Standard

	1	2	3	4	5	6
WM + WS	4012.0	4073.0	4082.0	4071.0		
WM	2164.0	2164.0	2164.0	2164.0		
WW + T #1	411.0	473.3	516.2	472.8		
WD + T #1	384.3	433.0	467.8	423.3		
TARE #1	143.3	150.0	167.8	148.5		
WW + T #2						
WD + T #2						
TARE #2						
MOIST.	11.1	14.2	16.1	18.0		
DRY DENS.	110.0	110.5	109.2	106.9		

SIEVE TEST RESULTS
ASTM D-422 ASTM D-1140

Opening Size	% Passing	Specs.
3/4"	100	
3/8"	100	
#4	100	
#8	99	
#16	96	
#30	88	
#50	77	
#100	61	
#200	46	

TEST RESULTS

Maximum dry density = 110.6 pcf

Optimum moisture = 13.4 %

Material Description

clayey sand

Remarks:

Project No. 18-1-341.4 **Client:** W.W. Wheeler

Project: Coyote Reservoir

○ **Location:** On-Site **Sample Number:** 8959

Checked by: DS

Title: Lab Manager

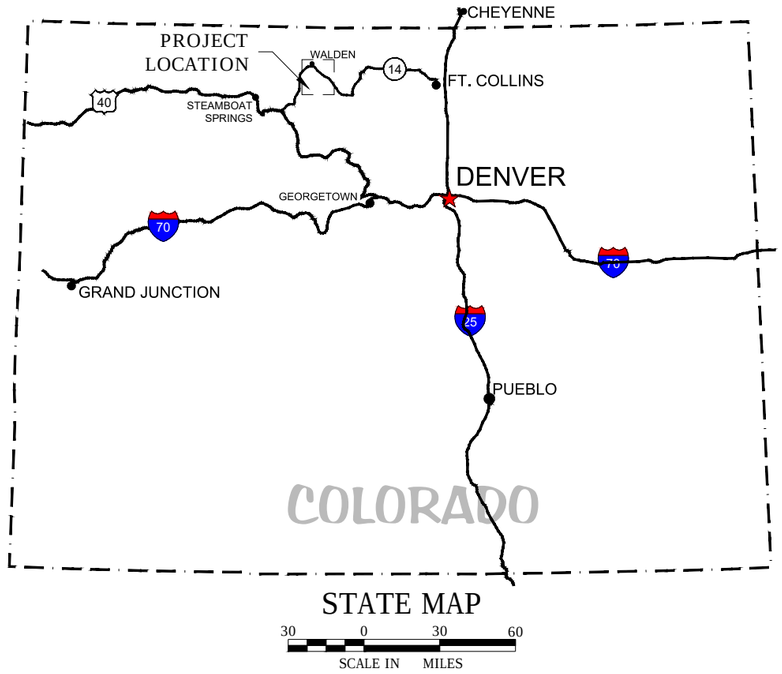
Kumar & Associates, Inc.

Denver, Colorado

Figure

APPENDIX C

RECORD DRAWINGS
(ONE-HALF SCALE)



STATE MAP

30 0 30 60

SCALE IN MILES

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT

CONSTRUCTION FILE: C-1291A
DAMID: 470121

WATER DIVISION 6, WATER DISTRICT 47
SECTION 29, T7N, R79W, 6TH P.M.
JACKSON COUNTY, COLORADO

PREPARED FOR:
SPICER RANCHES LTD.

PREPARED BY:
W. W. WHEELER AND ASSOCIATES, INC.

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
COLORADO DAM ID 470121
C-1291A
Water Division 6, Water District 47

I hereby declare these plans for the construction of the COYTE RESERVOIR DAM MID-LEVEL OUTLET REPLACEMENT were prepared under my direct supervision.

RESPONSIBLE DESIGN ENGINEER:
W. W. Wheeler & Associates, Inc.

John Treacy III Colo. PE No. 48387

COLORADO LICENSED JOSEPH TREACY III 47781 PROFESSIONAL ENGINEER 10/1/18

STATE ENGINEER APPROVAL:
Approved on the 2nd day of October, 2018.

Kevin G. Rein
State Engineer

By: _____
William T. McCormick, III
CO PE 29127
Chief-Dam Safety Branch

STATE ENGINEER OF COLORADO

These plans represent the AS-CONSTRUCTED conditions of the COYTE RESERVOIR DAM MID-LEVEL OUTLET REPLACEMENT to the best of our knowledge and judgment, based in part on information furnished by others as of the 14TH day of DECEMBER, 2018.

John Treacy III Colo. PE No. 48387

COLORADO LICENSED JOSEPH TREACY III 47781 PROFESSIONAL ENGINEER

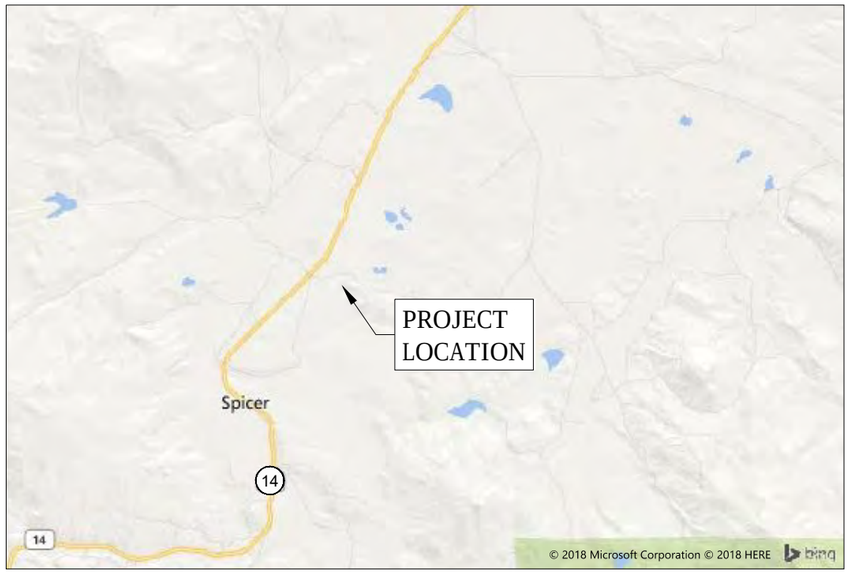
GENERAL NOTES:

1. A PRE-CONSTRUCTION MEETING SHALL BE HELD WITH THE OWNER, ENGINEER, CONTRACTOR AND A REPRESENTATIVE OF THE STATE ENGINEER'S OFFICE PRIOR TO CONSTRUCTION.
2. ALL BEST MANAGEMENT PRACTICES SHALL BE INSTALLED IN PLACE PRIOR TO START OF CONSTRUCTION.
3. THIS PROJECT CANNOT BE CONSIDERED AS HAVING BEEN COMPLETED UNTIL THE STATE ENGINEER HAS APPROVED THE SAME IN WRITING.

PROJECT VICINITY MAP

2 0 2 4

SCALE IN MILES



PROJECT LOCATION MAP

1 0 1 2

SCALE IN MILES

REVISIONS No.	Date	Made	Checked	Remarks
1	09/18	SAA	JJT	FOR SEO APPROVAL
2	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION
3	12/18	SAA	JJT	RECORD DRAWING
4				
5				

REFERENCE Sheet No.	Drawing No.	Title

RECORD DRAWING

W. W. WHEELER & ASSOCIATES, INC
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
COVER SHEET
AND LOCATION MAPS

Client	SPICER RANCHES LTD.	
Design	JJT	Wheeler No. 1883.00
Drawn	SAA	Sheet No. 1 of 5
Check	SLJ	
Plot Date	12/14/2018	Drawing No. 2 G1

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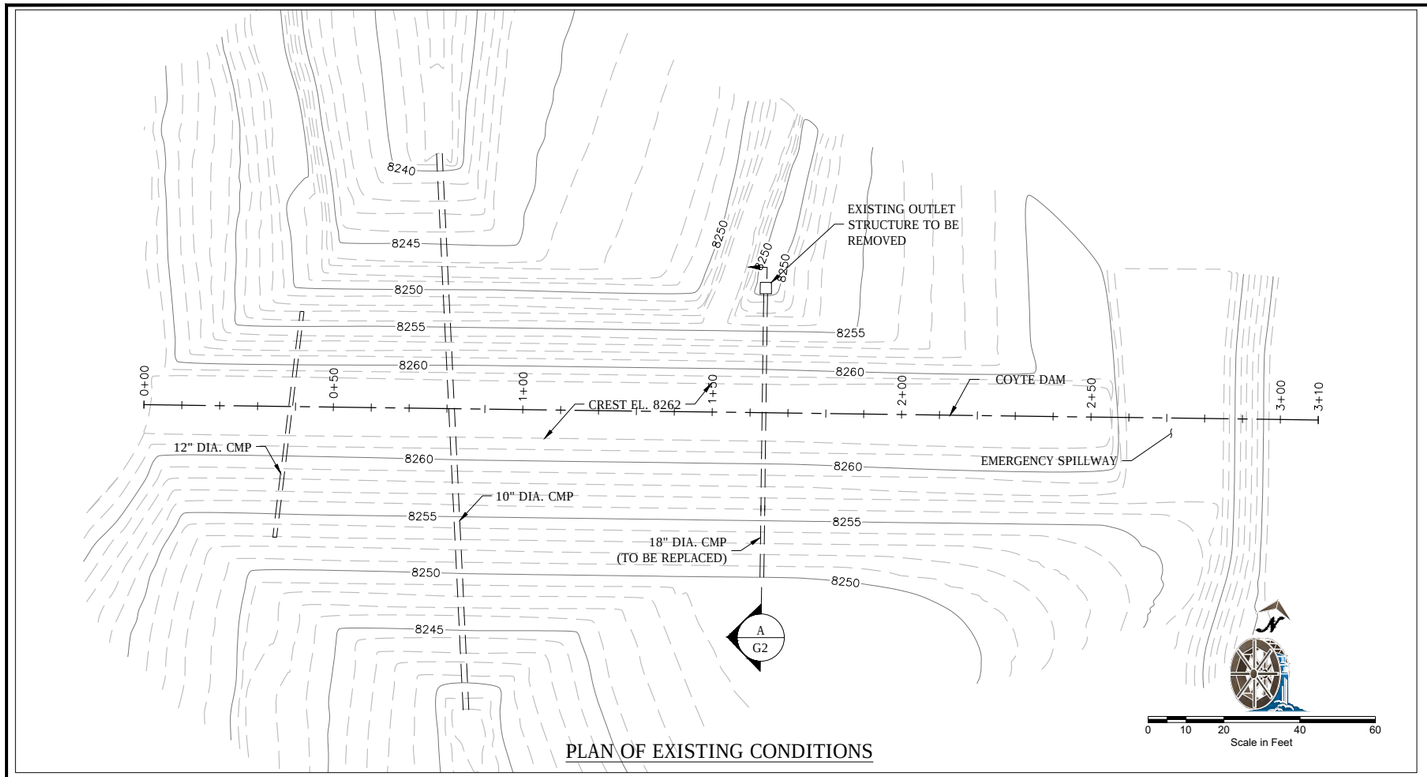
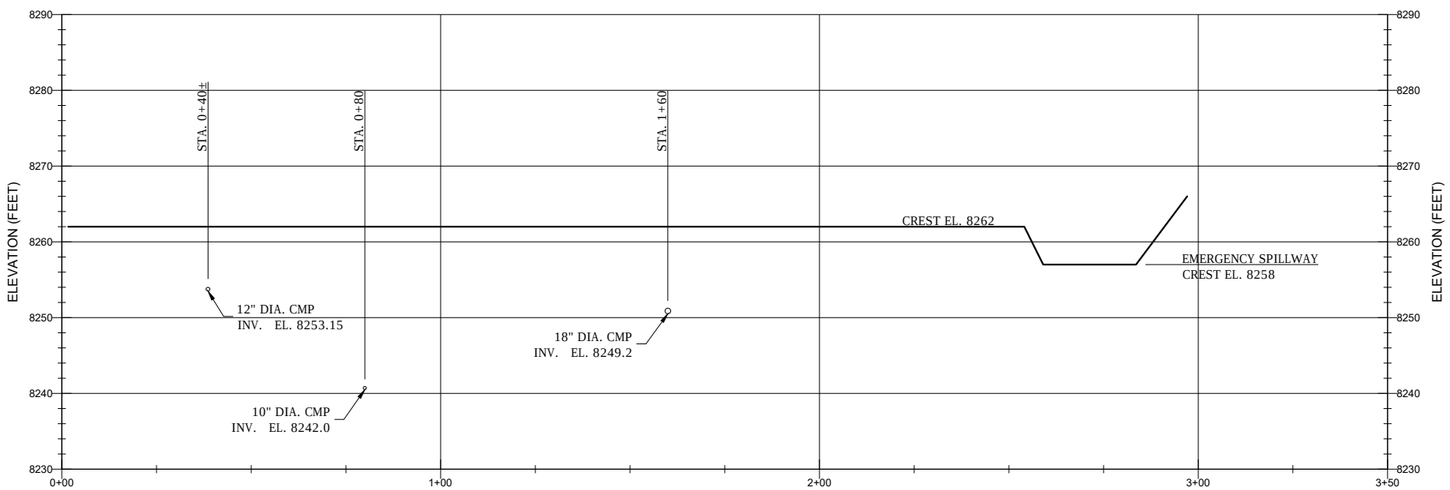


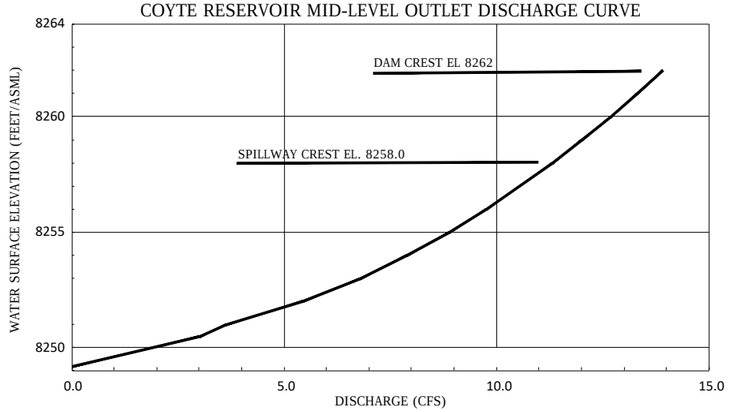
PLAN OF EXISTING CONDITIONS



PROFILE VIEW OF COYTE DAM ALIGNMENT

DRAWING INDEX		
SHEET NO.	DRAWING NO.	DESCRIPTION
1	G1	COVER SHEET - VICINITY & PROJECT LOCATION MAPS
2	G2	DRAWING INDEX AND EXISTING CONDITIONS
3	C1	OUTLET WORKS PLAN AND PROFILE
4	C2	OUTLET WORKS SECTIONS AND DETAILS
5	C3	MISCELLANEOUS DETAILS

COYTE RESERVOIR MID-LEVEL OUTLET DISCHARGE CURVE



OUTLET WORKS DISCHARGE CAPACITY TABLE			
RESERVOIR ELEVATION (FT)	GAGE HEIGHT (FT)	CULVERT DISCHARGE (CFS)	
8262.0	20.0	13.9	TOP OF DAM
8261.0	19.0	13.3	
8260.0	18.0	12.7	
8259.0	17.0	12.0	
8258.0	16.0	11.3	SPILLWAY CREST ELEVATION
8257.0	15.0	10.6	
8256.0	14.0	9.7	
8255.0	13.0	8.9	
8254.0	12.0	7.9	
8253.0	11.0	6.8	
8252.0	10.0	5.4	
8251.0	9.0	3.6	
8250.5	8.5	3.0	
8249.2	7.7	0.0	INVERT ELEVATION

NOTES:

1) DAM CREST ELEVATION BASED ON 1970 DRAWING. INVERTS AND CREST ELEVATIONS ARE BASED ON FIELD MEASUREMENTS TAKEN DURING CONSTRUCTION.
2) RESERVOIR TO BE DRAINED BY OWNER PRIOR TO CONSTRUCTION.
3) ENGINEER WILL PERFORM A VIDEO INSPECTION ASSESSMENT OF THE 10-INCH OUTLET AND 12-INCH OUTLET DURING CONSTRUCTION.
4) REMOVE TREES, SHRUBS, UNDERGROWTH , TOPSOIL AND ALL OTHER ORGANICS FROM EXCAVATION FOOTPRINT PRIOR TO EXCAVATION. HAUL TO DESIGNATED OWNER DISPOSAL AREA AS NECESSARY. REMOVE AND STOCKPILE RIPRAP FOR REUSE.
5) EXCAVATE TO REMOVE THE EXISTING 18" DIA. CMP PIPE AND DOWNSTREAM CONTROL STRUCTURE, REPLACE WITH SDR 35 PVC PIPE AND UPSTREAM CONTROL STRUCTURE. MATCH EXISTING PIPE ELEVATION (WITH ALLOWANCE FOR THE CONCRETE CRADLE)
6) SUPPORT NEW PIPE IN TRENCH WITH A BRICKS OR CEMENT BLOCKS AND TIE DOWN USING REBAR AND WIRE EVERY 8'-10' TO PREVENT FLOATATION DURING PLACEMENT OF CONCRETE PIPE CRADLE. CRADLE SIZE SHALL BE AT LEAST MINIMUM DIMENSIONS SHOWN IN SECTION AND SHALL CONSIST OF MIN. 4,000 PSI STRENGTH CONCRETE. CLEAR TRENCH BOTTOM OF ALL LOOSE SOILS BEFORE CONCRETE PLACEMENT.
7) BACKFILL AROUND PIPE WITH EXCAVATED SOILS OR APPROVED SUBSTITUTE (ORGANICS REMOVED). COMPACT TO 95% STD PROCTOR DENSITY WITH 6" MAXIMUM LIFT THICKNESS. COMPACT MATERIAL AROUND AND IN THE HAUNCHES OF THE PIPE.
8) SAND FILTER DIAPHRAGM SHALL CONSIST OF ASTM C33 SAND. COMPACT WITH WITH PLATE COMPACTOR (2 PASSES).
9) GRADE BACKFILL TO MATCH EXISTING ADJACENT SLOPES AND DIKE CREST. REPLACE RIPRAP.
10) STAFF GAGE OR WATER LEVEL MARKINGS TO BE INSTALLED ON DISCHARGE INTAKE STRUCTURE BY OWNER AND APPROVED BY ENGINEER.

C-1291A

REVISIONS					
NO.	DATE	MADE	CHECKED	REMARKS
3	09/18	SAA	JJT	FOR SEO APPROVAL
2	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION
1	12/18	SAA	JJT	RECORD DRAWING

REFERENCE		
SHEET NO.	DRAWING NO.	TITLE

RECORD DRAWING

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Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | Fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
PLAN OF EXISTING
CONDITIONS

CLIENT	SPICER RANCHES LTD.		
DESIGN	JJT	WHEELER NO.	1883.00
DRAWN	SAA	SHEET NO.	2 of 5
CHECK	SLJ		
PLOT DATE	12/14/2018	DRAWING NO.	G2

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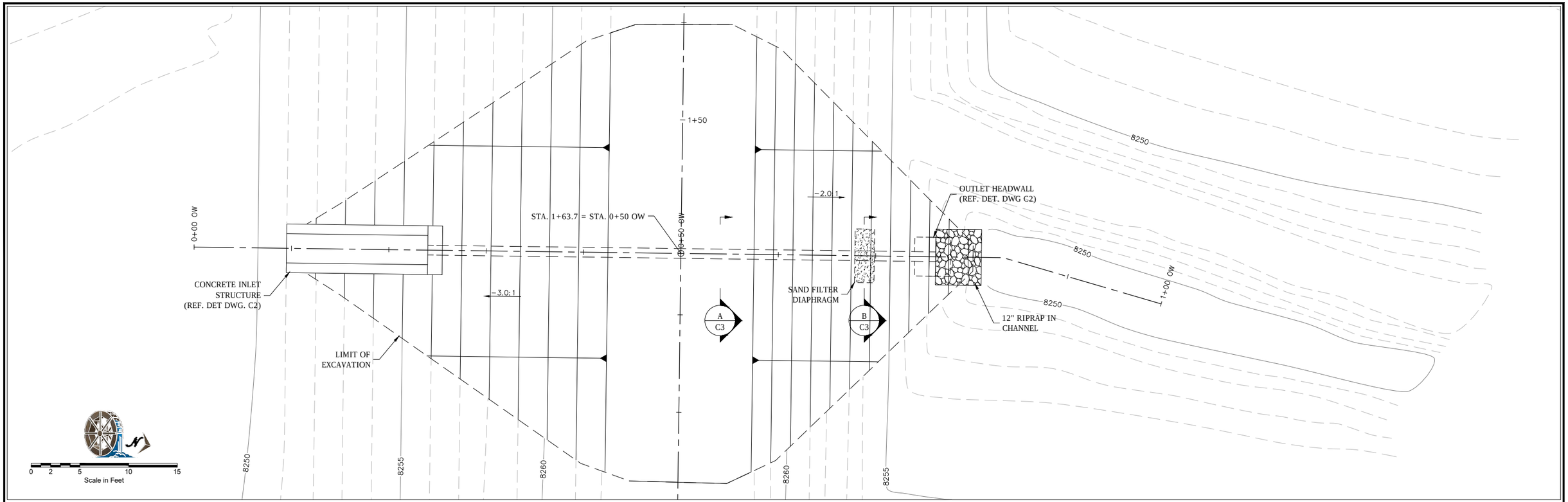

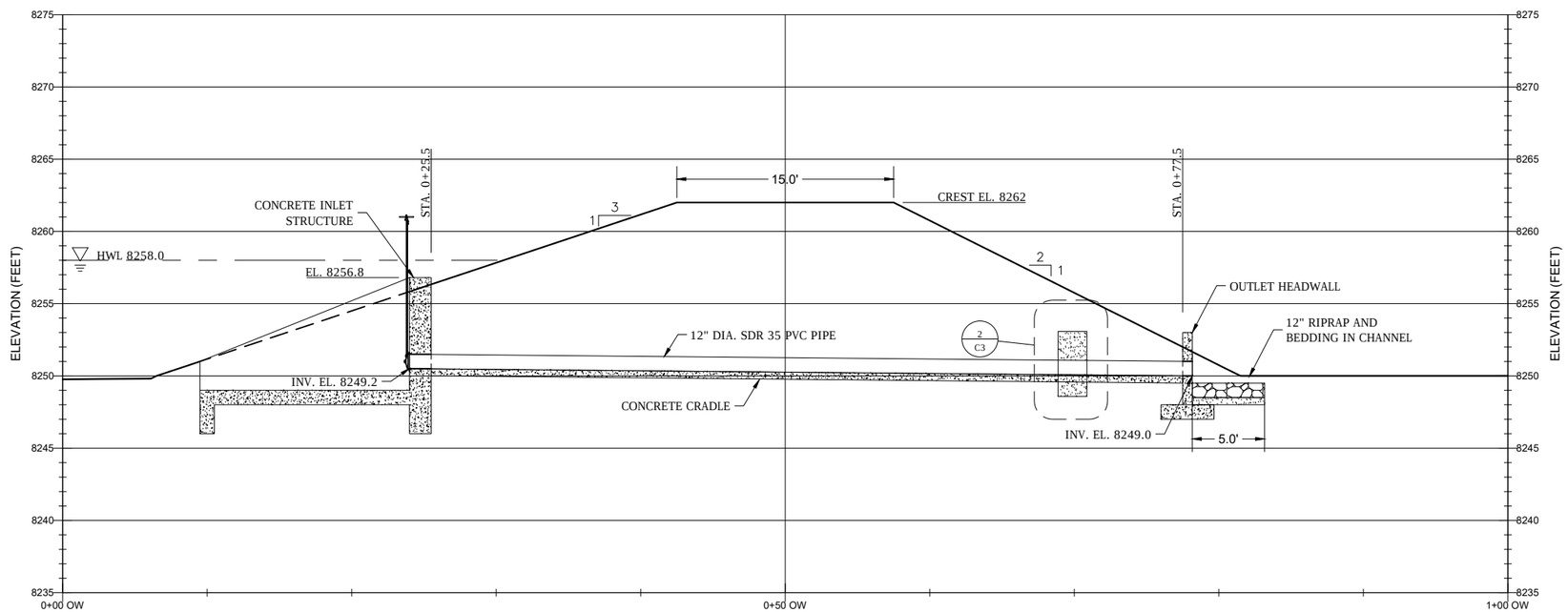

NOTES:
1) CONCRETE SADDLE TO BE INSTALLED FROM CONCRETE HEADWALL TO FILTER DIAPHRAGM.
2) ENGINEER WILL OBSERVE THE SUBGRADE PRIOR TO INSTALLATION OF HEADWALL.
3) CATWALK ACCESS TO BE DESIGNED AND INSTALLED BY OWNER.
4) PVC PIPE JOINTS TO BE WRAPPED WITH POLYURETHANE WRAP AFTER CONNECTION.

C-1291A

Revisions	No.	Date	Made	Checked	Remarks
	1	09/18	SAA	JJT	FOR SEO APPROVAL
	2	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION
	3	12/18	SAA	JJT	RECORD DRAWING
	4				
	5				

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COYTE RESERVOIR DAM

MID-LEVEL OUTLET REPLACEMENT

OUTLET WORKS

PLAN AND PROFILE

Client	SPICER RANCHES LTD.
Design	JJT
Drawn	SAA
Check	SLJ
Plot Date	12/14/2018
Wheeler No.	1883.00
Sheet No.	3 of 5
Drawing No.	C1

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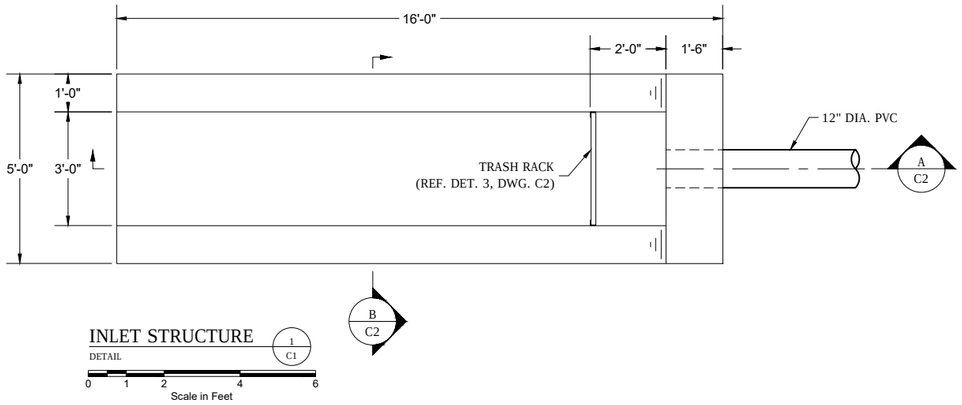

INLET STRUCTURE DETAIL 1 C1

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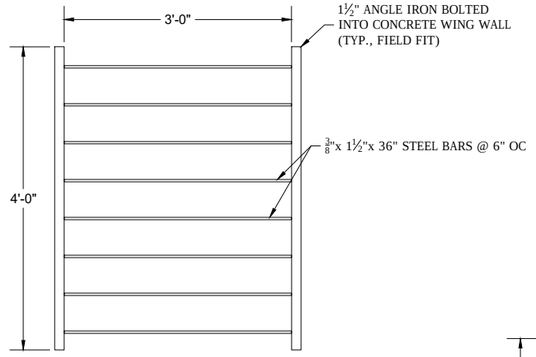

TRASHRACK DETAIL 3 C2

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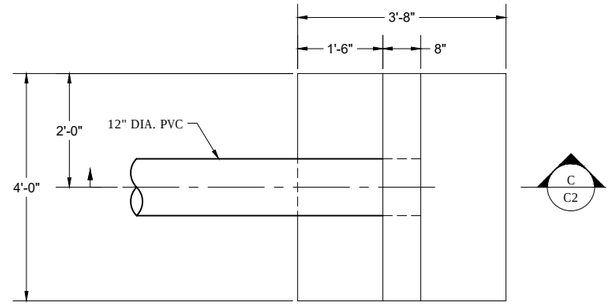
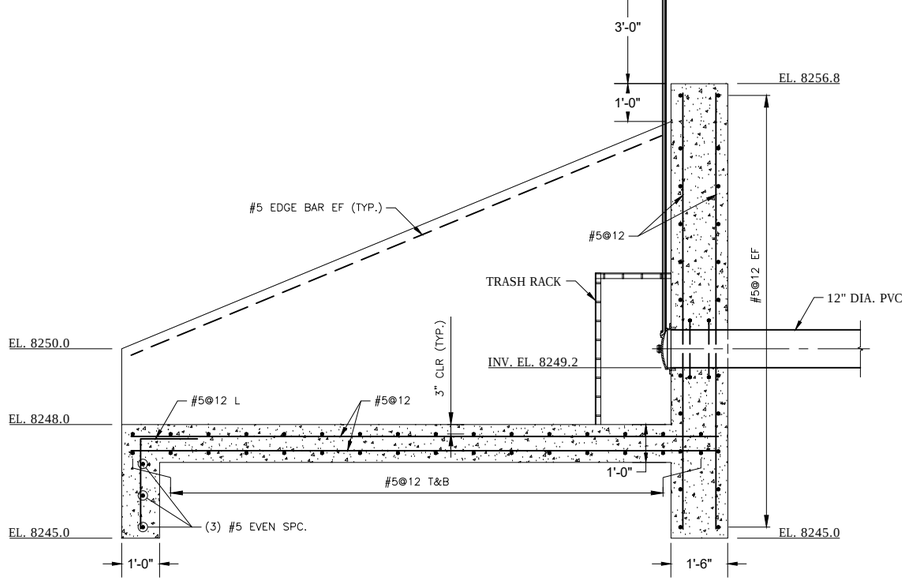


OUTLET HEADWALL DETAIL 2 C1

Scale in Feet: 0 1 2 3 4



INLET STRUCTURE SECTION A C2

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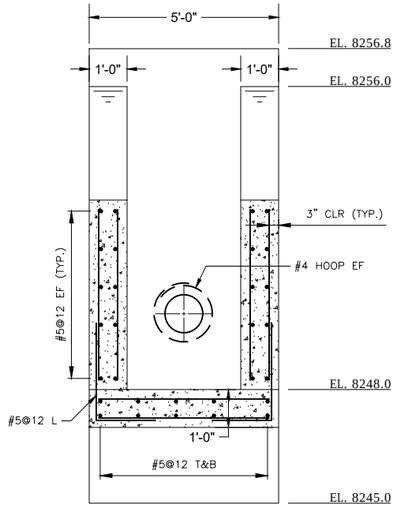

INLET STRUCTURE SECTION B C2

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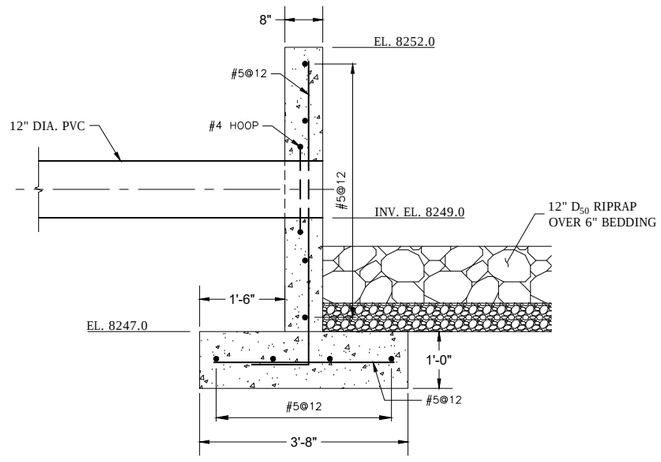

OUTLET HEADWALL SECTION C C2

Scale in Feet: 0 1 2 3 4

C-1291A

REVISIONS	No.	Date	Made	Checked	Remarks
	1	09/18	SAA	JJT	FOR SEO APPROVAL
	1	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION
	1	12/18	SAA	JJT	RECORD DRAWING

REFERENCE	Sheet No.	Drawing No.	Title

RECORD DRAWING

W. W. WHEELER & ASSOCIATES, INC
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | Fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
OUTLET WORKS
SECTIONS AND DETAILS

Client	SPICER RANCHES LTD.
Design	JJT
Drawn	SAA
Check	SLJ
Plot Date	12/14/2018
Wheeler No.	1883.00
Sheet No.	4 of 5
Drawing No.	C2

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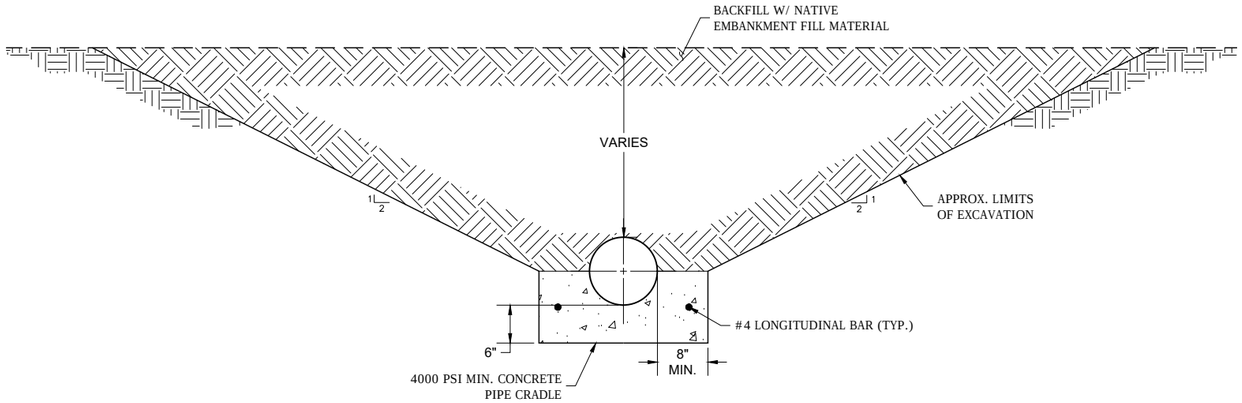
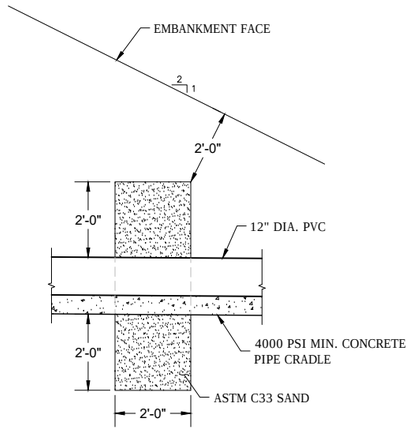
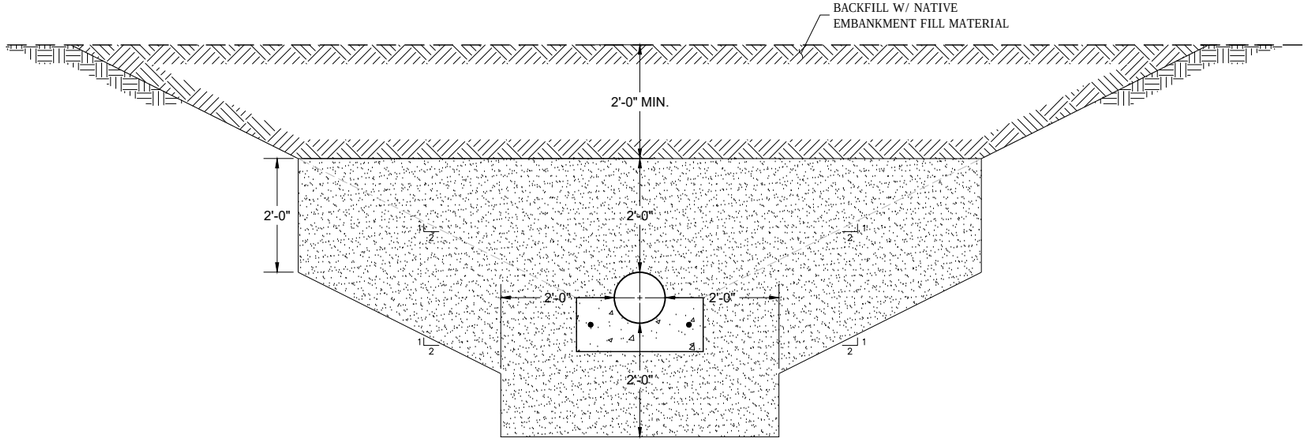


PIPE TRENCH
TYPICAL SECTION (N.T.S.) A C1

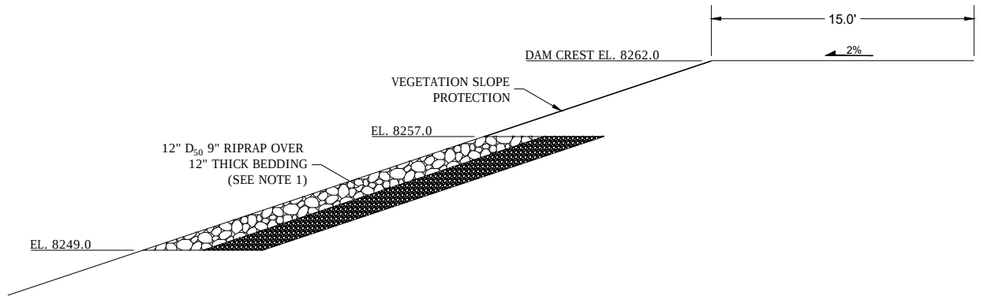


SAND FILTER DIAPHRAGM
DETAIL 2 C1

0 1 2 4 6
Scale in Feet



SAND FILTER DIAPHRAGM
TYPICAL SECTION (N.T.S.) B C1



UPSTREAM SLOPE REPAIR
TYPICAL SECTION (N.T.S.) 1 C1

NOTES:
1. UPSTREAM SLOPE ARMORING IS AN OPTIONAL ITEM AT THE DISCRETION OF THE OWNER. AT A MINIMUM, THE UPSTREAM SLOPES SHOULD BE FILLED WITH STRUCTURAL FILL AND COMPACTED TO MATCH EXISTING SLOPES. WORK SHOULD BE PERFORMED IN PRESENCE OF ENGINEER.
2. DAM CREST SHOULD BE LEVELED AND GRADED WITH 15-FOOT MINIMUM CREST WIDTH AND SLOPING FROM DOWNSTREAM TO UPSTREAM WITH A 2% SLOPE.

C-1291A

REVISIONS NO.	DATE	MADE	CHECKED	REMARKS
1	09/18	SAA	JJT	FOR SEO APPROVAL
2	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION
3	12/18	SAA	JJT	RECORD DRAWING

REFERENCE SHEET NO.	DRAWING NO.	TITLE

RECORD DRAWING

W. W. WHEELER & ASSOCIATES, INC
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
MISCELLANEOUS DETAILS

CLIENT	SPICER RANCHES LTD.
DESIGN	JJT
DRAWN	SAA
CHECK	SLJ
PLOT DATE	12/14/2018
WHEELER NO.	1883.00
SHEET NO.	5 of 5
DRAWING NO.	C3

COYTE RESERVOIR DAM
MID-LEVEL OUTLET
REPLACEMENT

DAMID 470121
C-1291A

TECHNICAL SPECIFICATIONS
Approved For Construction

PREPARED FOR:

Spicer Ranches LTD
13241 Highway 14
Walden, CO 80480

W. W. WHEELER
& ASSOCIATES, INC.
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405

September 28, 2018

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT

DAMID 470121
C-1291A
WATER DIVISION No. 6, DISTRICT No. 47
JACKSON COUNTY, COLORADO

SPECIFICATION CERTIFICATION

I hereby certify that these Specifications for the Coyte Reservoir Dam Repair were prepared under my direct supervision for the owners thereof.

COLORADO LICENSED JOSEPH TREACY III 47781 PROFESSIONAL ENGINEER

John J. Treacy III, P.E.
Registered Professional Engineer, Colorado #48387

STATE ENGINEER APPROVAL

Approved on the 2nd day of October, 2018.

STATE ENGINEER OF COLORADO

Kevin G. Rein
State Engineer

by: _____
William T. McCormick, III
Chief, Dam Safety Branch CO PE #29127

These Specifications and associated Drawings shall not be materially changed without the prior written approval of the State Engineer in accordance with Rule 9.1.8.

The project cannot be considered as having been completed until the State Engineer has approved the same in writing.

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT

TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

OTHER DIVISIONS NOT USED

R:\1800\1883\DOCUMENTS\Specifications\Coyte_Technical Specifications.Docx

SECTION 00001
GENERAL PROJECT INFORMATION

1. CONTRACTOR USE OF SITE

1.1. Contractor shall access the construction site off of Highway 14 at the Spicer Ranch Property. Site access and construction areas are shown on the drawings. Staging and borrow areas will be determined by the Owner and approved by the Engineer prior to construction.

2. APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

2.1. Unless stated otherwise, the Contractor shall comply with codes and standards applicable to each type of work and as listed in individual Specification sections. Conflicts shall be resolved as follows:

2.1.1. Where a conflict occurs between referenced documents and the Specifications, the Specifications govern.

2.1.2. Where a conflict occurs between the Specifications and the Drawings, the Specifications govern.

2.1.3. Where a conflict occurs between different reference documents, the document containing the more stringent requirements governs.

2.1.4. Where referenced documents are not specified by date, the latest published, applicable version as of the date of Notice-to-Proceed for the project shall govern.

3. MANUFACTURER'S SPECIFICATIONS

3.1. Materials, applications, and tests specified by reference to published standards of a society, association, code, or other published standards are included in these specifications as if written in their entirety.

3.2. Products and processes included in the Specifications shall conform to the manufacturer's latest published specifications.

3.3. The Contractor shall provide sworn affidavits from manufacturers certifying that materials, products, and/or processes delivered and used on the project meet the specified requirements. Affidavits shall not relieve the Contractor from the responsibility for full compliance with the requirements of the Specifications.

4. SUBSTITUTIONS

4.1. The Contactor shall provide all equipment, materials, and services as specified or noted on the Drawings, unless a written approval for substitution is obtained from the Company. The Company's decision regarding the acceptability of substitutions shall be final.

4.2. Where multiple manufacturers' names are noted, the first named manufacturer shall be the basis for equipment design and drawing layout for the project.

5. MEANS AND METHODS

5.1. Means and methods of construction shall be at the Contractor's sole discretion subject to the Company's right to reject proposed means and methods which:

5.1.1. Constitute a haz ard to the work, persons, dam safety or property; and/or

5.1.2. Will not produce finished work in accordance with the terms of the contract; and/or

5.1.3. Are contrary to specified means and methods required in the contract.

5.2. The right to reject means and methods of the Contractor shall not be construed or interpreted as acceptance of control of means and methods by the Company.

5.3. The Company's approval or failure to exercise the right to reject means and methods shall not relieve the Contractor of the obligation to complete the work required by the contract.

5.4. The Contractor shall be responsible for control of all means and methods for all work.

6. LIMITS OF SITE DISTURBANCE

6.1. The Contractor shall use care to minimize site disturbance. Site disturbance shall not extend beyond the areas designated on the drawings without approval from the Owner. Contractor shall be solely responsible for damages, fines and repairs required to repair unauthorized disturbed areas.

7. ENGINEER'S CONSTRUCTION OBSERVATION

7.1. The Owner's Engineer will monitor the quality of the construction as specified in Rule 9 of the Rules and Regulations for Dam Safety and Dam Construction, dated January 1, 2007.

- END OF SECTION 00001 -

SECTION 01000
SCOPE OF WORK

PART 1 - GENERAL

1-1 REQUIRED WORK ITEMS

Except as otherwise specifically provided, the Contractor shall supply all the materials, equipment, supplies, tools, labor, layout, and supervision necessary to perform the Work covered by the Drawings and Technical Specifications including, but not necessarily limited to the following items

A. GENERAL

1. Mobilize equipment, tool trailers, office trailers, supplies, stores, and other facilities as required for the support of construction activities and the Work.

2. Provide temporary heat, electrical power and water as necessary for the performance of the Work.

3. Demobilize all temporary equipment and facilities at the completion of the Work.

4. Provide dewatering of work areas as required.

5. Clean up all construction materials and debris from the site at the completion of the Work.

6. A pre-construction meeting shall be held with the owner, engineer, contractor and a representative of the SEO prior to construction.

7. Dispose of waste excavations, not otherwise incorporated in the Work, offsite, unless otherwise directed by the Owner. To the extent practical, Contractor shall minimize generation of waste excavation materials to be hauled off-site.

8. Prepare and provide to the Owner a set of Project Drawings with As-Built mark-ups and survey information at the completion of the Project.

9. Other work required to complete the Work not specifically identified in this Scope of Work.

B. WATER CONTROL STRUCTURE INSTALLATION

1. Clear and strip excavation areas.
2. Excavate and remove earth materials directly in the construction footprint to allow proper access and constructability of the project. Separate topsoil and riprap designated to be saved.
3. Remove approximately eighty feet (80') of existing eighteen inch (18") diameter corrugated metal pipe and existing downstream structure.
4. Furnish and install discharge pipe, slide gate, pipe bedding materials and other work and materials required in accordance with the Drawings and Specifications.
5. Backfill all excavations to existing grade and/or restore excavations as designated in the Contract Documents and as shown on the Drawings.
6. Collect and properly dispose of all exposed trash, debris, rubbish, waster grout and concrete materials, and excess fill material from within the project area.

C. EMBANKMENT REPAIR

1. Refill dam and pipe excavations with approved materials in accordance with the Drawings and Specifications/
2. Grade finished surface to generally blend with pre-existing contours.
3. Dispose of surplus excavated materials at alternate borrow material site as necessary, and grade to match existing contours.
4. Replace topsoil and revegetate disturbed areas including work areas, stockpile areas, and the alternate materials site if utilized, at completion of this task in accordance with the Technical Specification.

PART 2 - MATERIALS

Not used.

PART 3 - EXECUTION

Not used.

- END OF SECTION 01000 -

SECTION 01400
QUALITY CONTROL AND TESTING

PART 1 - GENERAL

1-1 SECTION INCLUDES

A. Requirements of the State Engineer

B. Quality control testing performed by the Engineer

C. Quality control testing performed by the Contractor

1-2 REFERENCED SECTIONS

A. Section 02300: Earthwork

B. Section 03300: Concrete

1-3 REFERENCES AND STANDARDS

A. ASTM C31: Standard Method of Making and Curing Concrete Test Specimens in the Field

B. ASTM C39: Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [55-mm] Cube Specimens).

D. ASTM C138: Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.

E. ASTM C143: Standard Test Method for Slump of Hydraulic Cement Concrete

F. ASTM C172: Standard Method of Sampling Fresh Concrete

G. ASTM C173: Standard Method of Test for Air Content of Freshly Mixed Concrete by the Volumetric Method

H. ASTM C231: Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

J. ASTM C1064: Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete

K. ASTM D422: Standard Test Method for Particle-Size Analysis of Soils

L. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))

M. ASTM D2922: Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

N. ASTM D3017: Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

O. American Concrete Institute (ACI) - ACI 318, Building Code Requirements for Reinforced Concrete

P. The latest issue or revision of the References and Standards shall apply. Where more than one code or standard applies or where local codes or standards have been adopted, the more stringent standard shall govern.

1-4 SUBMITTALS

A. Quality control testing results shall be submitted to the Engineer within one day of completing each test.

1-5 COOPERATION

A. The Contractor shall cooperate with the Engineer to provide access to the work areas as needed for sampling and testing and to insure that only acceptable materials will be incorporated into the completed work. Contractor shall conduct his operation and scheduling in a manner to allow sampling of materials and products, testing, and observation of the Work. The Contractor shall assist the Engineer and testing laboratory in obtaining samples for testing if requested.

1-6 STATE ENGINEER REQUIREMENTS

A. Construction activities shall be observed by the Engineer to verify compliance with the intent of the Plans and these Technical Specifications. The Engineer shall monitor the quality of construction as specified in Rule No. 9 of the "Rules and Regulations for Dam Safety and Dam Construction" (Rules), January 1, 2007.

B. Approved Drawings and Technical Specifications may not be materially changed except with the prior written consent of the Engineer and the State Engineer in accordance with Rule 9.1.8 of the Rules.

C. State Engineer has the authority to require the material used and the work of construction to be accomplished according to the Rules and Regulations and that construction shall not be considered complete until the State Engineer has accepted the same in writing.

D. The State Engineer shall visually inspect the foundation prior to the placement of fill.

1-7 ENGINEER QUALITY CONTROL AND TESTING

A. GENERAL

1. The Engineer, or designated representative, shall perform quality control and quality assurance testing as required by these Specifications.

2. Construction activities shall be observed by the Engineer, or designated representative, to verify general conformance with the intent of the Drawings and Specifications.

3. The Engineer shall have the authority to reject defective material or workmanship, and require the Contractor to either correct any defective work or remove it from the site and replace it with non-defective work.

B. EARTHWORK

1. The Engineer, or designated representative, shall take samples from the borrow sources, stockpile sources, and/or in-place materials, and shall perform tests to evaluate whether the materials conform to the specified requirements. The Contractor shall provide access to all stockpiles, borrow and fill areas, and assist the Engineer in obtaining adequate, representative samples for testing, and in preparing the surfaces of fill for in-place density and moisture testing.

2. The Engineer reserves the right to conduct more frequent earthwork testing or additional tests not described herein at the Engineer's discretion.

3. MATERIAL CONFORMANCE TESTS – Material conformance tests shall be performed on all fill materials every 300 cubic yards or a minimum of 3 tests of Structural Fill material placed, or at each substantive change of fill material in accordance with ASTM D 422 (grain size analysis) and ASTM D 4318 (Atterberg Limits).

At least one grain size analysis shall be per formed for each aggregate material specified in Section 02300: Earthwork, including Structural Fill.

4. IN-PLACE DENSITY AND MOISTURE TESTS – Common Fill and Structural Fill shall be tested by conducting in-place density tests in accordance with ASTM D 2922 and in-place moisture content tests in accordance with ASTM D 3017. Testing shall be performed: a) for every 500 cubic yards of each Fill placed; b) for every five foot of vertical lift of fill placed on average; c) once every day when fill is being placed, on av erage; or d) whenever, in the opinion of the Engineer, testing is necessary, or whichever is more frequent. Moisture density relationships (i.e., Proctor curves) for each fill material shall be performed in accordance with ASTM D 698.

C **CONCRETE**

1. COMPRESSIVE STRENGTH TESTS - During the course of construction, tests shall be conducted by the Engineer to determine whether the concrete, as being produced, complies with the standards of quality specified in this Specification. The Contractor is not relieved of the responsibility of proper placing and curing even though test reports indicate adequate strengths.

2. PREPARATION OF TEST SPECIMENS - Concrete for test specimens (cylinders) will be sampled and prepared in accordance with ASTM C 172 each time concrete is placed. The specimen will be cast and cured in accordance with ASTM C 31 and will be tested in accordance with ASTM C 39. Each test specimen will be tagged with the location of the sampled batch in the structure, the mix proportions or designation, the slump, and the date of placement.

3. NUMBER OF TEST SPECIMENS - Not less than five (5) compressive strength test specimens will be m ade for each 50 cubic yards of concrete placed or for each day when concrete is being placed, whichever is more frequent. Concrete cylinders shall be cast for the pipe cradle material only.

4. AGE OF SPECIMENS AT TESTING - One (1) test specimens will be broken at three (3) days, one (1) test specimens will be broken at seven (7) days, two (2) will be broken at twenty-eight (28) days, and the remainder held in reserve.

5. SLUMP TESTS - Slump tests will be made from each truckload of concrete delivered to the site in accordance with ASTM C 143.

6. TESTS FOR ENTRAINED AIR – The entrained air content and temperature of fresh concrete will be determined for each truckload of concrete delivered to the site in accordance with ASTM C 138, ASTM C 173, or ASTM C 231.

7. CONCRETE REINFORCEMENT INSPECTION - The Contractor shall give the Engineer a minimum of 24 hour notice prior to concrete placement, to allow sufficient time for inspection of foundation, formwork, and reinforcement placement. All rebar placement and formwork shall be completed prior to the inspection by the Engineer, and at least eight (8) working hours prior to scheduled concrete placement.

PART 2 - MATERIALS

Not used.

PART 3 - EXECUTION

3-1 GENERAL

A. The Contractor shall give the Engineer a minimum of 24 hours timely notice of readiness of the earthwork for all required inspections, tests, or approvals.

A. Unless otherwise required by Engineer or provided for in these Specifications, all defective materials, equipment, and work shall be promptly reworked, repaired, removed, or replaced as required by Engineer. The defective materials, equipment, or work shall be re-tested to the satisfaction of the Engineer. The Contractor shall perform all such actions necessary to correct defective materials, equipment, or work at no additional cost to the Owner. Actions required by Contractor shall be as outlined below or as described elsewhere in these Specifications.

C. The Contractor shall be responsible for and shall pay all costs in connection with any inspection or testing required in connection with the Engineer's acceptance of a manufacturer, fabricator, supplier, or distributor of materials or equipment.

D. If the Engineer considers it necessary or advisable that covered Work be observed by the Engineer or inspected or tested by others, the Contractor, at the Engineer's request, shall uncover, expose or otherwise make available for observation, inspection, or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and e quipment. If it is found that such Work is defective,

Contractor shall bear all the expenses of such uncovering, exposure, observation, inspection, and testing, and of satisfactory reconstruction, including compensation for additional professional services. If, however, such Work is not found to be defective, Contractor shall be allowed an increase in the Agreement price or an extension of the Agreement time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, and reconstruction.

3-2 FAILED QUALITY CONTROL TESTING

A. Unless otherwise required by the Engineer or provided for in these Specifications, all defective materials, equipment, and work shall be promptly reworked, repaired, removed, or replaced. The defective materials, equipment, or work shall be re-tested to the satisfaction of the Engineer. The Contractor shall perform all such actions necessary to correct defective materials, equipment, or work at no additional cost to the Owner. Actions required by Contractor shall be as outlined below or as described elsewhere in these Specifications.

B. All retesting of material previously failed, and all actions necessary for concrete coring, additional concrete curing, and correction of defective materials, equipment or work shall be performed at the Contractor's expense with no additional cost to the Owner.

3-3 EARTHWORK ACCEPTANCE CRITERIA

A. The Engineer shall inform the Contractor when the product quality, in-place density, or moisture content test results of earthwork materials do not meet the specified requirements.

B. Earthwork materials not meeting the requirements of Section 02300: Earthwork shall be removed and replaced with acceptable materials.

C. Earthwork materials not meeting the specified compaction or moisture requirements shall be reworked to achieve acceptable test results. Reworking may include removal, rehandling, reconditioning, moisture conditioning, drying, compacting, or combinations of these procedures.

3-4 CONCRETE ACCEPTANCE CRITERIA

When test specimens made, cured, and tested in accordance with this Specification fail as above defined, the Engineer may request the following action be taken:

A. ADDITIONAL WET CURING - The Contractor shall wet cure the structure in accordance with a plan acceptable to the Engineer.

B. Correct and replace concrete work judged inadequate by structural analysis or by results of core tests or load tests with additional construction, as directed by Engineer, at Contractor's expense.

C. Evaluate the design based on the actual concrete strengths and actual structural and operational loads imposed to determine if the structure will be acceptable for service. This evaluation will be done by the Engineer and the cost of the evaluation will be paid by the Contractor.

- END OF SECTION 1400 –

SECTION 02200
EXCAVATION

PART 1 - GENERAL

1-1 SECTION INCLUDES

A. This specification defines the requirements for excavation of soil materials required to construct the project features as shown on the Drawings.

1-2 DEFINITIONS

A. Unclassified Excavations - Unclassified excavations includes excavation of all site earth materials.

1-3 PROTECTION

A. Locate all site utilities prior to initiating excavations and protect utilities during excavation work.

B. Damage to structures, utilities, survey control markers, other facilities, and instrumentation designated as protected shall be repaired by the Contractor at no cost to the Owner and to the satisfaction of the Engineer.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3-1 PREPARATION

A. The Contractor shall confirm required excavation lines, levels, contours, and datum, as shown on the Drawings and determined by initial field investigations with the Engineer prior to initiating any excavation work

B. Contractor shall strip and stockpile the riprap bedding and riprap from the upstream slope prior to excavation of the outlet. Stockpile riprap bedding and riprap for replacement during reclamation.

C. Contractor shall strip a minimum of 6 inches of topsoil from all vegetated excavation and stockpile areas. Stockpile topsoil in a separate stockpile for replacement during final grading and reclamation.

3-2 EXCAVATION

A. The Contractor shall excavate to the limits of excavation shown on the Drawings and will not be entitled to payment for excavations made beyond the required limits of excavation without prior approval.

B. The Contractor shall assume all responsibility for interpretations and conclusions as to the nature of the materials to be excavated, appropriate excavation slopes, and the difficulties of making and maintaining the required excavations. In all cases, excavations shall conform to all safety requirements of OSHA. The Contractor is wholly responsible for maintaining excavation slope stability, regardless of excavation slopes shown on the Drawings.

C. The Engineer reserves the right, during the progress of the work, to vary the slopes, grades, or the dimensions of the excavations from those specified herein.

D. The Contractor shall take all necessary precautions to preserve the material below and beyond the established lines of all excavation. Any damage to the work or the foundations due to the Contractor's operations shall be repaired as directed by the Engineer at the expense of and by the Contractor.

3-3 EXCAVATED MATERIAL SUITABLE FOR BACKFILL

A. The Contractor shall stockpile and/or directly reuse excavated soils in the project work area Earthwork. Excavated material that is suitable for backfill shall be reused directly or stockpiled separately in areas to be designated by the Engineer and acceptable to the Owner.

3-4 DISPOSAL

A. Excavated materials that are not suitable or are surplus shall be removed and disposed of by the Contractor in an area approved by the Owner.

3-5 FIELD QUALITY CONTROL

A. The Engineer or his designated representative will conduct visual inspections of the bottom of all excavations. All excavations and foundations shall be approved by the Engineer prior to placement of any structure or fill material. Excessively soft, wet, or yielding areas, as determined by the Engineer shall be over excavated and replaced with structural fill as directed by the Engineer.

- END OF SECTION 02200 -

SECTION 02300
EARTHWORK

PART 1 - GENERAL

1-1 SECTION INCLUDES

A. Preparing foundation under structures and pipe.

B. Borrowing and/or furnishing and placing Backfill Material.

C. Furnishing and Installing Riprap Bedding and Riprap Material.

1-2 REFERENCES AND STANDARDS

A. ASTM C535: Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

B. ASTM D 4318-05: Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

C. ASTM D698: Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3)

1-3 SUBMITTALS

A. Earthwork Materials Data including the source/supplier, gradation, material properties, and v erification that materials meet the requirements of these Specifications for all imported earth materials including riprap and riprap bedding, pipe bedding, and imported fill shall be submitted for approval by the Engineer 14 days prior to commencing applicable earthwork.

1-4 DEFINITIONS

A. Optimum Water Content - The moisture content which will result in a maximum dry unit weight of the soil when subjected to the ASTM D698 compaction test.

B. Percent Compaction - The percentage of compaction relative to the maximum dry unit weight of the soil when subjected to the ASTM D698 compaction test.

C. Structural Backfill - Backfill placed for support of concrete structures, embankment backfill, roads, pipes, other engineered features, or as otherwise noted on the Drawings. Also called Structural Fill.

D. Common Fill – shall include surplus material, over wet material, and material excavated from the embankment that is not suitable for embankment backfill. This material shall be excavated from for the project area and disposed and compacted in the designated borrow area.

E. Bedding Sand - Bedding sand shall include the sand material for placement around the new PVC pipe at the downstream filter collar.

PART 2 - PRODUCTS

2-1 STRUCTURAL FILL

A. Structural Fill shall be generally free of topsoil, organics and other deleterious material, however minor amounts will be permitted. The maximum size of cobbles and rocks permitted in Structural Fill shall be two-inch (2”), and shall have a minimum of 20% passing the # 200 sieve.

B. Structural Fill shall generally be the native soil excavated for the construction unless the moisture content is significantly higher than optimum. In such cases, the Engineer may require that Structural Fill be excavated and hauled from the designated borrow areas.

2-2 RIPRAP BEDDING

A. Riprap Bedding shall be obtained from an approved supplier

B. Riprap bedding shall be a mixture of gravels and sands shall be graded within the following limits:

U.S. Standard Sieve	Percent Passing by Weight
3-inch	90-100
¾- inch	20-90
No. 4	0-20
No. 200	0-3

2-3 RIPRAP

A. Riprap shall be used to provide erosion protection at designated slopes as shown on the Drawings.

B. Riprap shall be obtained from an approved supplier. The riprap shall be UCFCD Type L, D_{50}= 9-inch.

C. Riprap shall consist of reasonably well graded, hard and durable, semi-angular to angular rock. Excessively flat, slabby, or overly elongated pieces will not be acceptable.

D. The median riprap size (D_{50}) shall be as designated on the Drawings. The minimum rock fragment size shall be two-inch (4"), and the maximum size shall be approximately 1.75 times the D_{50} size. The following table lists the approximate riprap gradation limits.

Riprap – 9" D_{50} Size Gradation

	Percent Smaller by Weight
Rock Size	9-inch D_{50}
15-inch	70-100
12-inch	50-70
09-inch	35-50
03-inch	2-10

E. Minimum riprap layer thickness shall be approximately 2.0 times the D_{50} rock size, 18-inches for the 9-inch rock size.

F. The riprap material shall be new or that salvaged from the excavation of the dam face, as needed.

2-4 FILTER SAND

A. Filter Sand shall be used for the filter collar and for drainage and leveling around the concrete headwall as necessary.

B. Filter Sand shall be obtained from local sources acceptable to the Engineer.

C. Filter sand shall be a processed sand material in conformance with ASTM C33 and graded within the following limits:

U.S. Standard Sieve	Percent Passing by Weight
3/8"	100
No. 4	80-100
No. 8	60-100
No. 16	40-82
No. 30	20-65
No. 50	2-45
No. 100	0-20
No. 200	0-3

PART 3 - EXECUTION

3-1 GENERAL

A. Prior to initiating any work covered by this section, the Contractor shall become thoroughly familiar with all site features, the site conditions, and all portions of the work in this section.

B. The Contractor shall not perform any earthwork as specified in this section in any specific work area until all clearing, grubbing, and stripping work have been completed in that area.

C. The Contractor shall be responsible for any damage to structures caused by earthwork operations. Damage to structures shall be repaired by and at the expense of the Contractor.

D. Earthwork shall be finished to within an allowable tolerance of plus or minus 0.20 foot from the original grades as shown on the Drawings.

3-2 FOUNDATION PREPARATION

A. The Contractor shall not place materials until the foundation has been suitably prepared, dewatered, and approved by the Engineer.

B. Do not prepare foundation or place fill when temperatures could result in frozen ground conditions. Any frozen fill materials shall be removed and replaced or reworked to the satisfaction of the Engineer.

C. The site for the PVC pipe installation shall be excavated as shown in accordance with the design Drawings.

D. If the foundation soils at the base of the bedding layer are unsuitable because of over-wet condition, presence of peat, muck, or apparent lack of consolidation for significant depth, the site shall be over-excavated by at least 12 inches and the over-excavation shall be filled with Structural Fill, or with filter sand as directed by the Engineer.

E. For concrete and bedding sand foundations, proof roll or tamp material to a firm surface for concrete and sand placement.

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3-3 PLACING STRUCTURAL BACKFILL

A. Structural backfill shall be placed and compacted to the lines and grades as shown on the Drawings or as otherwise specified in these Specifications.

B. Structural Fill shall be compacted in place to at least ninety-five percent (95%) of the maximum dry density within two percent (2%) and plus two percent (2%) of the optimum moisture content, when tested in accordance with ASTM D 698.

C. Cut slopes shall be lightly moisture conditioned at the direction of the Engineer prior to backfilling.

D. Structural backfill shall be placed in horizontal lifts not exceeding a thickness of 6 inches before compaction.

E. Prior to placing structural backfill on or against the surfaces of previously placed earthfill materials, all previously placed materials which have become frozen, soft or loose, which contain erosion channels or cracks, or are excessively dry shall be reworked by removing, replacing, or recompacting as directed by the Engineer. No separate payment will be made for placing, reworking, removing, replacing, or recompacting previously placed soft or loose embankment material.

F. Distribute structural backfill such that it is free from lenses, pockets, streaks, lumps, or layers of material differing substantially in texture, gradation, or moisture content from the surrounding material so as to form as homogeneous layer of material as practical. The Engineer reserves the right to designate the locations for placement of each load of material in the fill.

G. Structural backfill quality control shall conform to the requirements of Section 01400: Quality Control and Testing.

H. Structural backfill shall not be placed around, behind, or adjacent to concrete structures until a minimum of 7 days has elapsed from the concrete placement or until the concrete strength, as determined by laboratory testing of test specimens, exceeds 75 percent of the nominal 28 day compressive strength.

I. Heavy equipment shall not be permitted to operate closer than 5 feet from any concrete structure.

J. Where structural backfill is to be placed against steeply sloping existing ground surfaces or against previously placed fill, the new fill shall be benched horizontally with bench heights ranging from 2 to 3 feet. Structural backfill shall be placed up to the top of each bench within 24 hours of excavating the bench.

3-4 PLACING RIPRAP BEDDING

A. Bedding shall be placed and spread in such a manner as to avoid segregation and assure a uniform layer.

B. Riprap bedding thickness shall be six inches or as shown on the design Drawings.

3-5 PLACING RIPRAP

A. Riprap shall be placed over bedded areas to conform to the Drawings.

B. Riprap shall be placed to ensure a relatively uniform distribution of rock sizes.

C. Placing riprap by end dumping from the top of the slope will not be permitted.

3-6 PLACING FILTER SAND

A. Filter Sand material shall be placed in maximum six-inch (6") loose layers and compacted by two passes of an impact-type compaction equipment.

B. Compaction equipment for Filter Sand and shall consist of small self-propelled vibratory rollers and vibratory plate compactors. Vibratory rollers shall be approved by the Engineer and shall have a minimum static weight 270 pounds and a minimum dynamic force of 1,000 pounds.

C. Filter Sand shall be compacted with four (4) coverages of an approved compactor. There are no moisture requirements for filter sand, but the Engineer may require moisture conditioning at the Engineers discretion.

3-7 COMMON FILL

A. Common Fill shall be the over-wet material from the embankment excavation or other unusable fill obtained from the project site, to be disposed of in the designated borrow area.

B. Common Fill shall be placed in horizontal loose lifts and compacted to a minimum of 90 percent of the maximum Standard Proctor density as determined in accordance with ASTM D 698. The loose lift thickness before compaction shall not exceed eight inches when compacted by heavy equipment and six inches when compacted by a hand-operated tamper.

SITE CLEANUP

A. Surplus excavated native soils shall be disposed of in the designated borrow area.

B. Excavations, borrow areas, and backfill shall be graded to a smooth slope configuration and blended into the adjacent slope surfaces.

C. Backfill along the pipe alignment shall match adjacent grades and slopes.

D. The top six inches (6”) of the fill and backfill areas to be revegetated shall be left in a loose condition or scarified upon completion of compaction.

E. Access roads and staging areas shall be scarified for revegetation.

3-7 FIELD QUALITY CONTROL

A. The Engineer or his designated representative will conduct visual inspections of the bottom of all excavations. All excavations and foundations shall be approved by the Engineer or his designated representative prior to placement of any structure or fill material. Soft, excessively wet, or yielding areas, as determined by the Engineer shall be excavated as directed by the Engineer, and replaced with structural backfill.

- END OF SECTION 02300 -

SECTION 02510
PIPING

PART 1 – GENERAL

1-1 SCOPE

The work covered by this specification consists of furnishing all materials and performing all operations required for the installation of the piping as shown on the Drawings, including, but not necessarily limited to the following work.

1-2 GENERAL

A. Project is to replace the outlet conduit to provide long-term operational reliability and safety.

B. All piping shall be constructed at the locations indicated on the Drawings or at such alternative locations dictated by field conditions and acceptable to the Engineer.

C. All materials shall be installed in strict accordance with the manufacturer's recommendations, as applicable, or the applicable standard.

D. Product information submittals to the Engineer shall be required for any material item that is supplied by the Contractor as an “or equal” to the material specification on the Drawings or specified herein, and items for which a specific manufacturer and model have not been specified. The Engineer will have the authority to reject any proposed substitution without justification.

E. The Contractor shall furnish the Owner/Engineer with a copy of all product installation, operation, and maintenance documentation provided to the Contractor by the manufacturer.

1-3 SUBMITTALS

Submit the PVC Pipe, flanges, and couplings manufacturer’s information. The submittal shall include:

A. PVC Pipe and Fittings

i. Material Data

a. Physical and chemical test reports demonstrating compliance with Specification requirements.

b. Fabricator name and location.

PART 2 – PRODUCTS

2-1 MATERIALS

A. The materials for the outlet works shall conform to the following Standard or Manufacturer's Specification.

B. Gasketed PS46 PVC Pipe – The twelve-inch (12") diameter PVC pipe and couplings shall have a minimum wall thickness of 0.360-inch.

C. Polywrap tubing – shall consist of a tubular polyethylene protection wrap manufactured by Mountain States Plastics or approved equivalent.

PART 3 – EXECUTION

3-1 GENERAL

A. Installation shall conform to approved PVC Pipe Submittal.

B. Handle and install in accordance with the pipe manufacturer's written recommendations, using methods and equipment that will not damage the pipe. Immediately remove from the Site any pipe segment or fitting that, in the opinion of Engineer, is or becomes damaged.

C. Engineer shall be on-site during pipe installation and backfill to ensure pipe is not damaged during backfill. Each gasketed joint shall be wrapped with polyurethane tubing prior to backfill.

D. Pipe damage includes, but is not limited to, scrapes, cuts, gouges, or other defects having a depth in excess of ten percent (10%) of the nominal pipe wall thickness.

E. Remove debris of any kind from inside the pipe and keep it clean during and after installation.

F. The PVC Pipe alignment will conform to the existing pipe alignment. Pipe invert elevations will match those of the existing pipe.

G. The pipe and fittings shall be supported in the prepared trench bottom section by oven fired brick, concrete block, or with bedding sand as otherwise shown on the Drawings.

H. Estimated pipe lengths are shown on the Drawings or in this specification. Contractor shall field verify required pipe lengths.

I. Do not permit water, animals or foreign objects of any kind to enter the existing conduit or PVC pipe. Keep open ends of all conduits covered or closed, except when workers are present and it is necessary to have the pipe end open to permit progress of the Work.

J. The Contractor shall provide adequate notice and opportunity to the Engineer for a visual inspection of all pipe joints, and all other pipe connections. If necessary for complete inspection, the Contractor shall provide equipment and/or manpower that may be required by the Engineer to perform the inspection. Any and all joints that are deemed unsatisfactory by the Engineer shall be removed and replaced.

K. The Contractor shall perform hydrostatic leak testing on the entire system or in segments. Test shall be performed for the mid-level outlet piping. The Contractor shall provide equipment, materials, setup and personnel required for testing. The internal test pressure shall be 5 psi at the lowest point in the system (approximate maximum operating pressure with the water surface at the dam crest). The hydrostatic test shall last a minimum of 1 hour. The Contractor shall prepare a detailed Plan or Procedure to be followed to perform the hydrostatic leak testing, and submit this Plan or Procedure to the Engineer for approval. The preferred testing medium is clean water. The Engineer must be present during the test for the results to be accepted.

L. The Contractor shall perform a video inspection following the completion of construction to ensure that there is no pipe damage or debris remaining within the pipe.

- END OF SECTION 02510 -

SECTION 02935
RECLAMATION

PART 1 - GENERAL

1-1 SECTION INCLUDES

A. Reclaiming requirements within the limits of site disturbance.

1-2 PROTECTION

A. Areas outside the limits of Site disturbance shall be protected from damage by the Contractor. Any disturbance of vegetation or native ground outside of the limits of Site disturbance shown on the Approved Construction Drawings shall be reclaimed by the Contractor at no additional expense to the Company.

1-3 REVEGETATION

A. The Contractor will be responsible for all reseeding and re-vegetation following construction.

PART 2 - PRODUCTS

2-1 TOPSOIL

A. Topsoil shall be the stockpiled material obtained from the stripping of the excavation areas.

2-2 SEED

A. Seed shall be an approved commercially available seed, free from noxious seeds and weeds. Seed, which has become wet, moldy, or otherwise, contaminated or damaged in transit or storage will not be accepted.

B. A seed mix specified by the Owner is acceptable.

2-3 REVEGETATION

B. The Contractor will be responsible for all reseeding and re-vegetation following construction.

PART 3 - EXECUTION

3-1 EXECUTION

A. Prior to reclaiming any disturbed areas, remove all Contractor's equipment, debris and construction materials,

B. Repair and contour all disturbed roads, trails and paths to original ground contour condition.

C. Replace topsoil.

D. Final grade all disturbed areas with a smooth blade grader, bulldozer, or other approved equipment, to the lines and grades shown on the Approved Construction Drawings, or as directed by the Engineer.

- END OF SECTION 02935 –

SECTION 03100
CONCRETE FORMWORK

PART 1 – GENERAL

1.1 SECTION INCLUDES

B. Summary of the Work.

C. Applicable Standards.

D. Form Materials and Formwork Accessories.

E. Requirements for the inspection, preparation, erection, removal and cleaning of formwork.

1.2 SUMMARY OF THE WORK

F. Formwork for cast-in-place structural concrete, with shoring, bracing, and anchorage.

G. Openings for other affected Work.

H. Form accessories.

I. Stripping forms.

1.3 APPLICABLE STANDARDS

B. American Concrete Institute (ACI)

1. ACI 301-2005: Specifications for Structural Concrete for Buildings

2. ACI 347R-2004: Guide to Formwork for Concrete.

C. PS 1: Construction and Industrial Plywood.

D. Where these Specifications differ from the requirements of ACI, the more stringent requirements shall apply.

1.4 SYSTEM DESCRIPTION

A. Design, engineer, and construct formwork, shoring, and bracing to meet design and code requirements so that resultant concrete conforms to required shapes, lines and dimensions.

1.5 QUALITY ASSURANCE

A. Construct and erect concrete formwork in accordance with ACI 301 and the recommendations of ACI 347R.

1.6 REGULATORY REQUIREMENTS

A. Conform to all applicable local, municipal, state and federal building code regulations.

PART 2 – PRODUCTS

2.1 FORM MATERIALS

A. Plywood: Douglas fir species; solid one side grade; sound, undamaged sheets with straight edges.

B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to withstand the pressure resulting from placement and vibration of concrete without deflection detrimental to structural tolerances and appearance of finished concrete surface.

C. Lumber: Fir species; No. 2 grade or better; with grade stamp clearly visible.

D. Steel: Minimum sixteen (16) gage sheet, well matched, tight fitting, stiffened to withstand the pressure resulting from placement and vibration of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.2 FORMWORK ACCESSORIES

A. Form Ties: Shall be steel with conical or spherical inserts. Form ties shall be designed to maintain positive contact with forming material. Furnish units that will leave no metal closer than one (1") inch to concrete surfaces when forms, inserts, and tie ends are removed. Wire tires ties are not permitted. Use flat bar ties for panel forms. Furnish plastic or rubber inserts with minimum one-inch depth and sufficient dimensions to permit patching of tie holes. Provide ties with an integral neoprene water stop three-sixteenths (3/16") inch-thick by three-fourths (3/4") inch-diameter whose center hole is one-half (1/2") inch-diameter of tie.

B. Form Release Agent: General purpose form release agents shall be nonstaining products such as Formshield as manufactured by A. C. Horn Inc. Duogard by W. R. Meadows, Inc., Noxcrete by The Noxcrete Company, Magic Kote by Symons Manufacturing Company, or equal, as approved by the Contracting Agents Representative.

C. Fillet for Chamfered Corners and All Exposed Edges: Shall be wood strips or rigid plastic, three-fourths (3/4") inch by three-fourths (3/4") inch, unless otherwise shown on the Drawings.

D. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required; strength and character to maintain formwork in place while placing concrete.

PART 3 – EXECUTION

3.1 INSPECTION

E. Verify lines, levels, and measurements before proceeding with formwork.

3.2 PREPARATION

A. No concrete shall be placed until all formwork, installation of items to be embedded, and preparation of surfaces involved in the placement have been approved by the Government Inspector.

B. All surfaces of forms and embedded materials shall be free from curing compound, dried mortar from previous placements, and other foreign substances before the adjacent or surround concrete placement is begun.

C. All surfaces upon or against which concrete is to be placed shall be free from frost, ice, water, mud and debris. All ponded water shall be removed from the excavations prior to and during concrete placing operations.

D. Hand-trim sides and bottoms of earth forms; remove loose dirt prior to placing concrete.

E. Minimize form joints. Symmetrically align joints and make watertight to prevent leakage of mortar.

F. Arrange and assemble formwork to permit stripping so that concrete is not damaged during the removal.

G. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

3.3 ERECTION

A. Provide bracing to ensure stability or formwork. Strengthen formwork liable to be overstressed by construction loads.

B. Provide temporary ports in formwork to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain. Close ports with tight fitting panels, flush with inside face of forms, neatly fitted so that joints will not be apparent in exposed concrete surfaces.

C. Provide ¾-inch by ¾-inch chamfer strips on all external corners.

D. Construct formwork to maintain tolerances in accordance with ACI 117-06, Manual of Concrete Practice.

3.4 APPLICATION OF FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's instructions. Apply prior to placing reinforcing steel anchoring devices, and embedded items.

B. Do not apply form release agent where concrete surfaces are schedule to receive special finishes which may be affected by the agent. Soak contact surfaces of untreated form with clean water. Keep surfaces wet prior to placing concrete.

C. After form release agent is applied to form, the concrete shall be placed within fourteen (14) days. If concrete is not placed within fourteen (14) days, the forms shall be removed and form release agent reapplied.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for Work embedded in or passing through concrete.

B. Coordinate Work of other Sections informing and setting openings, slots, recesses, chases, sleeves, bolts, anchors, and other inserts.

C. Install accessories in accordance with manufacturer's instructions, level and plumb. Ensure items are not disturbed during concrete placement.

3.6 FORM REMOVAL

A. Notify Contracting Officer's Representative prior to removing formwork.

B. Do not remove forms until concrete has sufficient strength to support its own weight. Forms shall be left in place for a minimum of twenty-four (24) hours after placement.

C. Do not damage concrete surfaces during form removal.

D. Finish all concrete surfaces prior to applying curing compound in accordance with the requirements of Section 03300: Cast-in-Place Concrete; and Section 03370: Concrete Curing.

3.7 CLEANING

A. Clean forms to remove foreign matter as erection proceeds.

B. Ensure that water and debris drain to exterior through cleanout ports.

C. During cold weather, remove ice and snow from forms. Do not use de-icing salts. Do not use water to clear out completed forms unless formwork and construction proceed within heated enclosure. Use compressed air to remove foreign matter

- END OF SECTION 03100 –

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Summary of the Work.

B. Applicable Standards.

C. Submittals.

D. Requirements for materials, fabrication and installation of reinforcing materials and accessory materials.

1.2 SUMMARY OF THE WORK

A. Reinforcing steel bars for structural concrete shall be cut, bent, and placed in concrete where shown on the Drawings.

B. Support chairs, bolsters, bar supports, spacers, and tie wire for supporting reinforcement.

C. Plain dowels shall be provided in the diameters and lengths specified on the Drawings.

1.2 APPLICABLE STANDARDS

E. American Concrete Institute (ACI)

1. ACI 301-2005: Specifications for Structural Concrete for Buildings.
2. ACI 315: Details and Detailing of Concrete Reinforcement.
3. ACI 318: Building Code Requirements for Reinforced Concrete.
4. ACI 305R: Hot Weather Concreting.
5. ACI 306R-88 (02): Standard Specification for Cold Weather Concreting.

F. American National Standards Institute (ANSI) and American Society for Testing and Materials (ASTM)

1. ANSI/ASTM A 82-97ae1: Wire, Plain Steel, for Concrete Reinforcement.
2. ANSI/ASTM A 185-06e1: Wire Fabric, Plain, Welded Steel for Concrete Reinforcement.

3. ANSI/AWS D1.4 – Structural Welding Code Reinforcing Steel.

4. ASTM A36-05: Structural Steel.

5. ASTM A 615: Bars, Deformed and Plain, Billet-Steel, for Concrete Reinforcement

6. ASTM A 706: Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

G. Concrete Reinforcing Steel Institute (CRSI)

1. CRSI – Manual of Practice.

2. CRSI 63 – Recommended Practice for Placing Reinforcing Bars.

3. CRSI 65 – Recommended Practice for Placing Bar Supports, Specifications, and Nomenclature.

H. Where these Specifications differ from the requirements of ACI, the more stringent requirements shall apply.

1.3 QUALITY ASSURANCE

B. Physical and chemical test shall be performed for deformed bars for each heat of reinforcing in accordance with ASTM A 615. Copies of certified mill test reports (CMTR's) for the chemical ladle analyses and mill physical tests shall be furnished for each heat.

1.4 SUBMITTALS

B. Submit Shop Drawings for Contracting Officers Representative review prior to fabrication in accordance with Section 01300: Submittals.

C. Shop Drawings shall indicate sizes, spacings, locations, and quantities of reinforcing steel, wire fabric, bending and cutting schedules, splicing, stirrup spacing, supporting, and spacing devices.

D. Test Reports: Submit mill test reports as required in Paragraph 1.3.

PART 2 – PRODUCTS

2.1 MATERIALS

E. Reinforcing Steel: ASTM A 615, billet-steel bars, minimum yield strength of sixty-thousand (60,000 psi) pounds-per-square-inch, uncoated finish, grade sixty (60). Tie strings shall be grade forty (40).

F. Welded Steel Wire Fabric: ANSI/ASTM A one-hundred-eighty-five (185) plain type; in flat sheets; a coiled roll; uncoated finish.

G. Plain dowels: Dowel bars shall be plain steel bars of the size shown on the Drawings conforming to ASTM A 615 and shall be free from burring or other deformation restricting slippage in the concrete.

H. Expansion caps: Shall be metal, PVC, or other type of an approved design to cover two (2") to three (3") inches of the dowel, with a closed end and with a suitable stop to hold the end of the cap at least the width of the joint plus one-fourth (1/4") inch away from the end of the dowel bar. Caps shall be of such design that they will not collapse during construction. The cap shall be fitted on the trailing end of the dowel bar as shown on the Drawings.

2.2 ACCESSORY MATERIALS

E. Tie Wire: Minimum sixteen (16) gage annealed type or as noted on Drawings.

F. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during installation and placement of concrete. All supports against forms shall be plastic or plastic coated per CRSI.

2.2 FABRICATION

A. Fabricate in accordance with ACI 315, providing concrete cover specified in Section 03300: Cast-in-Place Concrete.

B. Locate reinforcing splices not indicated on the Drawings at points of minimum stress. Indicate location of splices on Shop Drawings.

C. Welding of reinforcing bars shall not be allowed.

PART 3 – EXECUTION

3.1 INSTALLATION

F. Before placing concrete, clean reinforcement of foreign particles or coatings.

G. Place, support, and secure reinforcement against displacement. Do not deviate from alignment or measurement.

H. Plain dowels shall be properly positioned and held in place in the form work to prevent displacement during concrete placement. Dowels shall be placed so that one-half of the dowel is embedded on each side of the joint. Dowels shall be set parallel with the concrete slab surface. Dowels placed and left protruding for any length of time shall be cleaned prior to placing the adjacent concrete. On end of each dowel shall be epox y-coated and greased to prevent bond to concrete.

- END OF SECTION 03200 –

SECTION 03300
CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This specification defines the requirements for cast-in-place structural concrete and miscellaneous grouting.

1.2 REFERENCE SECTIONS

A. Section 01330: Submittals

B. Section 01400: Quality Control and Testing

C. Section 02330: Earthwork

D. Section 03110: Concrete Formwork.

E. Section 03200: Concrete Reinforcement

1.3 REFERENCES AND STANDARDS

A. ACI 301: Specification for Structural Concrete

B. ACI 304R: Guide for Measuring, Mixing, Transporting, and Placing Concrete

C. ACI 305R: Hot Weather Concreting

D. ACI 306R: Cold Weather Concreting

E. ACI 308R: Guide to Curing Concrete

F. ACI 309R: Guide for Consolidation of Concrete

G. ACI 318: Building Code Requirements for Structural Concrete

H. ASTM C33: Standard Specifications for Concrete Aggregates

I. ASTM C94: Standard Specifications for Ready-Mixed Concrete

J. ASTM C150: Standard Specifications for Portland Cement

K. ASTM C171: Standard Specification for Sheet Materials for Curing Concrete

L. ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete

M. ASTM C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

N. ASTM C494: Standard Specification for Chemical Admixtures for Concrete

O. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

1.4 SUBMITTALS

A. Concrete mix designs shall be submitted to the Engineer prior to concrete placement. Certification tests of cement, water, admixtures, and aggregates shall be performed and submitted with the proposed mix design to ensure conformance with the requirement specified herein.

B. Hot and cold weather concreting procedures shall be submitted when such conditions are anticipated or if requested by the Engineer.

C. Concrete materials samples, concrete batching equipment data, and ready-mix plant certifications shall be submitted if requested by the Engineer.

D. Quality control testing results shall be submitted to the Engineer within 1 day of completing each test.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement shall be Portland Cement Type II or Type I/II meeting the requirements of ASTM C150 and s hall have a m aximum tricalcium aluminate (C3A) content of 8.0 percent.

B. Aggregates shall consist of clean, hard, dense, durable, uncoated rock fragments that are free from injurious amounts of soft dirt, organic matter, and other deleterious substances. Aggregates shall meet the requirements of ASTM C33 and shall not be of a carbonate-based rock, unless approved by the Engineer.

C. Coarse aggregate shall conform to the requirements of ASTM C33, Size No. 57, No. 6, or No. 67, with a maximum one-inch (1”) particle size.

D. Fine aggregate shall conform to the requirements of ASTM C33, Sand.

E. Water shall be clean and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or reinforcement and shall conform ASTM C94.

F. Grouts shall consist of one (1) part cement to three (3) parts fine aggregate, mixed with the minimum quantity of water to obtain a suitable consistency, designed for 28-day compressive strength of 3,000 psi.

2.2 ADMIXTURES

A. Air entrainment admixture shall conform to ASTM C260.

B. Chemical admixtures including Type A (water reducing), Type B (retarding), and Type D (water reducing and retarding) shall conform to ASTM C494.

C. The use of calcium chloride is prohibited.

D. Fly ash shall be Class F, conforming to ASTM C618. Fly ash shall not exceed twenty-five (25) percent by weight of cement.

2.3 ACCESSORIES

A. Bonding agent shall be two (2) component modified epoxy resin.

B. Curing Materials:

1. Liquid membrane-forming curing material shall comply with the requirements of ASTM C309, Type 1, Class A or B.

2. Curing paper, polyethylene film, or burlap shall comply with the requirements of ASTM C171.

3. Burlap cloth shall be absorptive and made from jute or Kenat, approximately nine (9) ounces per square yard, and shall comply with the requirements of ASSHTO M182, Class 3 or 4.

2.4 CONCRETE MIX

A. Concrete shall be mixed in accordance with ASTM C94 and shall meet the following requirements, unless specified otherwise:

1. 28-Day Compressive Strength: ≥ 4,000 psi

2. Slump: 3.0 inches ± one-inch (1”)

3. Entrained Air: six percent (6%) ± one percent (1%) at point of placement

4. Temperature during placement: fifty-five degrees Fahrenheit to eighty degrees Fahrenheit (55°F - 80°F)

5. Water Cement Ratio: ≤ 0.45 (including fly ash)

6. The concrete mix design shall include a cement/fly ash mixture with twenty-five percent (25%) fly ash by weight.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall perform work in accordance with ACI 301, ACI 304R, ACI 318, and all applicable local, municipal, county, state, and federal building code requirements.

B. Quality Control of concrete will be performed under provisions of Section 01400: Quality Control and Testing.

C. Tolerances are defined as allowable variations from specified lines and grades, and dimensions and as the allowable magnitude of the surface irregularities. Allowable variations from specified lines, grades, and dimension shall be in accordance with ACI 301.

D. The Contractor shall maintain records of all placed concrete items. The Contractor shall record the date, location of pour, quantity, air temperature, concrete placement temperature, slump, air content, and test samples taken.

E. The Contractor shall notify the Engineer at least forty-eight (48) hours prior to commencing concrete placement to allow for formwork and reinforcement observation.

F. The placement setup shall be completed including forms, reinforcement, bracing, embedments, etc., a minimum of 8 working hours prior to the concrete placement to allow for formwork and reinforcement observation.

G. Prior to placement of concrete for the intake structure, gate stem supports, and the gate operator control structure, contractor shall verify alignment of all components.

3.2 INSPECTION

A. The Contractor shall verify that anchors, seats, plates, reinforcement, and other items to be cast into concrete are accurately placed, held securely, and will not cause hardship in placing concrete.

B. The Contractor shall verify the requirements for concrete cover over reinforcement.

C. The Contractor shall verify the appropriate mix design for designated placement.

D. The Contractor shall verify lines, levels, and measurements before proceeding with concrete placement.

3.3 PREPARATION

A. Water, ice, debris, dirt, and mud shall be removed from forms, trenches, and excavations. Any flow of water into an excavation shall be diverted through proper side drains to a sump or removed by other approved methods that will avoid the washing of freshly deposited concrete.

B. Foundations shall be prepared in accordance with Section 02300: Earthwork.

C. Concrete reinforcement shall be fabricated in accordance with Section 03200: Concrete Reinforcement.

D. Concrete forms shall be constructed in accordance with Section 03110: Concrete Formwork.

E. Remove hardened concrete, wood chips, ice, dirt, free water, and other debris from the interior of forms.

F. Place form release agent or wet forms just prior to placing concrete. Form release agents or any other deleterious materials are not acceptable on concrete surfaces, reinforcement, or embedments, except as specifically called out on the Drawings or Specifications.

3.4 MIXING AND DELIVERY

A. Concrete shall be mixed and transported in approved equipment in a manner that will deliver uniform and homogeneous concrete to the forms as recommended in ACI 304R.

B. Job-mixed concrete shall be mixed and transported in accordance with ASTM C94.

C. The concrete shall be discharged into forms or other placements at the site within ninety minutes (90 min) from the time water is added into the concrete mix. If the air temperature is eighty-five degrees Fahrenheit (85°F) or higher, the time limit shall be reduced to sixty minutes (60 min).

D. The Contractor shall verify the delivery time from the batched tickets. Delivered concrete exceeding the time limit shall be rejected and shall not be paid for.

E. Temperature of concrete at the time it is discharged into the forms shall not exceed 80 degrees F.

F. The Contractor shall provide concrete delivery tickets that include actual material batch weights.

G. The Contractor shall not be allowed to add water to the batched concrete after quality control testing has been performed in accordance with Section 01400: Quality Control and Testing.

H. The Contractor shall not add water to the batched concrete that would cause the allowable water–cement ratio to be exceeded.

I. Do not use concrete that has been subjected to more than 250 total revolutions of any combination of mixing and agitating equipment following the first introduction of water to the mixer.

3.5 PLACING CONCRETE

A. Acceptable placing practices to obtain durable and watertight concrete are given in ACI 304R. Concrete shall be conveyed and placed as rapidly as practicable, either by manual or mechanical means that will prevent the segregation and/or loss of ingredients.

B. Concrete shall be deposited continuously in horizontal layers, not exceeding twenty-four inches (24”), in a manner that will prevent the displacing of reinforcement and the accumulation of concrete on the forms or reinforcement.

C. Ensure reinforcement, inserts, embedded parts, and waterstops are not disturbed during concrete placement.

D. Deposit concrete as close as practicable to its final position.

E. The concrete shall not be allowed to drop freely more than three feet (3’). Drops greater than three feet (3’) shall be accomplished by a confining device acceptable to the Engineer.

F. Chuting of concrete shall be permitted only upon acceptance of the methods by the Engineer. Chutes shall be of rounded cross-section to avoid the accumulation of concrete in corners. The slope shall be steep enough to permit flow without requiring a slump greater than that specified or required for placement. All chutes and hoppers shall be thoroughly cleaned before and after each run. All wash water and debris shall be discharged outside of forms.

G. Where concrete is conveyed and placed by mechanically or pneumatically applied pressure, the equipment shall be suitable in kind and adequate in capacity for the work. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. Slump loss in the concrete should not exceed 1.5 inches from the pump hopper to the point of placement. When pumping is completed, the concrete remaining in the pipeline shall be ejected in such a manner that there will be no contamination of the concrete in place. After this operation, the entire equipment shall be thoroughly cleaned.

H. Placement methods using buckets, conveyors, drop chutes, elephant trucks, tremies, and portholes should follow the guidelines set forth in ACI 304R.

I. Provide sufficient concrete placing capacity and equipment to deliver and place concrete without undue delay; do not permit cold joints to occur.

J. Care should be taken in placing and consolidating concrete at the base of walls to prevent segregation and voids.

K. Wet concrete for the outlet conduit encasement shall be placed on one side of the conduit and worked under the conduit to minimize voids under the conduit.

3.6 CONSOLIDATION

A. During and immediately after placement, all concrete shall be consolidated and worked to provide thorough placement around all reinforcement, embedded fixtures, and into corners of forms. Unless otherwise approved by the Engineer, the Contractor shall accomplish consolidation by the use of high-frequency internal vibrators with a minimum frequency of 7,000 revolutions per minute. The type and operation of vibrators is subject to the Engineer's acceptance. Concrete should be vibrated in accordance with the recommendations contained in ACI 309R.

B. Vibration shall extend through the entire depth of each new layer and several inches into the preceding layer, at no time penetrating more than two feet (2') into the underlying layer. Vibration shall be applied at the point of deposit and uniformly throughout the freshly placed concrete.

C. Usually, vibration should secure the desired results within five to fifteen seconds (5 – 15 sec) at points eighteen to thirty inches (18" – 30") apart rather than for longer periods at wider intervals. In general, to prevent segregation of ingredients, vibration shall continue only long enough to accomplish thorough consolidation and complete embedment of the reinforcement and fixtures.

D. Vibrators shall not be used as a means of moving concrete to a desired placement area. This action shall be accomplished by correct initial placement. The Contractor shall provide a sufficient number of vibrators and operators so that consolidation is started immediately after the first concrete has been deposited in the forms.

3.7 HOT AND COLD WEATHER CONCRETING

A. The Contractor shall provide adequate equipment for heating materials and protecting the concrete during freezing or near freezing weather. Unless the temperature is at least forty degrees Fahrenheit (40°F), concrete materials shall be heated so that the temperature of the concrete at time of placement is not less than fifty-five degrees Fahrenheit (55°F). Said equipment shall be available at all times and shall be used for the period specified in this specification. All work during cold weather shall be executed in accordance with ACI 306R.

B. When concrete must be placed during hot weather, ninety degrees Fahrenheit (90°F) or above, the Contractor shall follow the procedures outlined in ACI 305R.

3.8 FINISHING CONCRETE

A. All slab surfaces of unformed concrete that are not to be permanently concealed by fill material or concrete shall be sloped a minimum of 1/8-inch

in one-foot (1') and have a floated and broomed finish as defined in ACI 301.

B. All other surfaces of unformed concrete that are not to be permanently concealed by fill material or concrete shall have a floated finish as defined in ACI 301.

C. All unformed concrete surfaces that are to be permanently concealed by fill material or concrete shall have a screeded finish as defined in ACI 301.

D. All surfaces of formed concrete that are not to be permanently concealed by fill material or concrete shall have a smooth rubbed finish as defined in ACI 301.

E. All surfaces of formed concrete that are to be permanently concealed by fill material or concrete shall have a smooth form finish as defined in ACI 301.

F. All exposed concrete edges and corners shall receive a ¾-inch chamfer.

3.9 CURING CONCRETE

A. Concrete surfaces shall be adequately protected, following the guidelines of ACI 308R, against early evaporation of water, injurious action by the sun, rain, flowing water, frost, freezing, and/or mechanical injury.

B. Cure fresh unformed concrete surfaces immediately, and formed surfaces following the removal of forms, for a minimum of seven (7) days.

C. Concrete placed shall be cured by following the recommendations of ACI 308R or by one (1) of the following methods as approved by the Engineer:

1. Moist Curing - All exposed surfaces shall be maintained in a continuously moist condition for the required curing period.

2. Membrane Curing - Pressure-spray tinted curing compounds shall be one of the types specified in ASTM C309. All compounds shall be applied according to the manufacturer's directions immediately after finishing operations are completed. No curing compound shall be permitted on surfaced where future bonding with concrete or painting is specified. Such surfaces shall be cured by the moist curing process. The use of any membrane material that tends to impart a slippery surface to the concrete or alter its natural color shall not be permitted. The compound, however, shall contain a dye of color strength sufficient to render the film distinctly visible on the concrete surface for a period of at least four hours (4 hours) after application. The compound shall be of such character that it will harden with thirty minutes (30 min). A second application of curing compound shall be made one-hour (1 hr) after the initial application. Curing materials visible on the surface of the concrete after the curing period is complete shall be removed.

3. Polyethylene film for curing concrete should conform to ASTM C171.

D. When the mean daily temperature of the atmosphere is less than forty degrees Fahrenheit (40°F), the temperature of the concrete shall be maintained between fifty degrees Fahrenheit and s eventy degrees Fahrenheit (50°F and 70°F) for the required curing period. When necessary, arrangements for heating, covering, insulating, or housing shall be made in advance of placement and shall be adequate to maintain the required temperature and moisture conditions without injury due to the concentration of heat. Detailed recommendations are given in ACE 306R.

E. When the air temperature is expected to exceed ninety degrees Fahrenheit (90°F) within forty-eight hours (48 hrs) after placement, all surfaces shall be protected from direct sunlight and maintained in a moist condition for a minimum period of forty-eight hours (48 hrs). Detailed recommendations are given in ACI 305R.

3.10 DEFECTIVE CONCRETE

A. The Engineer shall be allowed to perform an i mmediate inspection of concrete surfaces upon removal of forms

B. Concrete surfaces shall be r epaired immediately after form removal in accordance ACI 301 and ACI 309R.

C. The Contractor shall notify the Engineer upon discovery of any honeycombing, foreign-embedded items, and defective concrete.

D. Hardened concrete not within specified tolerances shall be repaired to bring it within those tolerances. Such repair shall be accomplished in a manner approved by the Engineer. The Engineer shall be notified as to the time when repair will be performed.

E. Holes left by tie rods shall be hammer packed with stiff, dry mortar using the same materials as those in the concrete except with a somewhat leaner mix.

F. Honeycombed areas shall be cut out to a depth at which sound concrete is exposed and filled with concrete. The color shall match that of the structure.

G. Spalled and pitted areas caused by concrete sticking to the forms during removal shall be chipped back to obtain a good mechanical bond, undercut at the edges, and repaired with mortar matching the color of the concrete.

H. Throughout the operations of repairing defects and finishing, the surface shall not be allowed to become dry nor shall the underlying concrete be damaged by the operations.

I. Grinding of concrete surfaces exposed to view shall be limited in depth such that no aggregate particles are exposed by more than 1/8-inch in cross-section at the finished surface.

J. When hardened concrete does not meet specified tolerances, the Contractor shall, upon request, submit to the Engineer an outline of all preventative actions to be implemented to avoid repeated failures. The Owner reserves the right to delay concrete placements until the Contractor implements such preventative actions that are approved by the Engineer.

K. The Contractor shall modify, repair, or replace concrete not conforming to required levels and lines, details, and elevations; not properly placed; or not of the specified type.

L. Within the first seven (7) days after concrete placement, repairs may be made with dry pack concrete. After seven (7) days from concrete placement, repairs shall be made with an epoxy mortar mix.

- END OF SECTION 03300-

- END OF DIVISION 3-

SECTION 11290
GATES AND VALVES

PART 1 - GENERAL

1.1 WORK INCLUDES:

A. Contractor shall furnish and install the following:

1. Furnish and Install one (1), twelve-inch (12”) diameter C-20 Canal gate, rising stem, with machined iron seats installed on the outlet works headwall as shown on the Drawings.

1.2 RELATED SECTIONS

A. Section 01300: Submittals

1.3 REFERENCES

A. AWWA C560 – Standard for Cast Iron Slide Gates

B. ASTM A320 - Standard Specification for Alloy-Steel and Stainless Steel Bolting for Low-Temperature Service.

1.4 SUBMITTALS

A. The Contractor shall submit the following to the Engineer for review and approval in accordance with Section 01300: Submittals:

1) 1. Manufacturer and product data for the slide gate and shop drawings, including materials of construction, anchor details, stem construction and guidance, and installation details.

PART 2 - PRODUCTS

2.1 CAST IRON GATE

A. Gate shall be twelve inch (12”) C-20 Cast Iron Canal Gate, AWWA C-560, or approved equivalent.

B. The slide gate cover, frame ring, adjustable wedges, arch, and handwheel shall be made of cast iron.

C. The lift nut shall be made of cast bronze and utilize rugged acme type threads.

D . The lift assembly shall be stainless steel rising stem.

2.2 FASTENERS

A. Fasteners, including nuts, bolts and washers for fittings and couplings shall be ASTM A320, stainless steel, Grade B8 or approved equivalent.

PART 3 - EXECUTION

3.1 Handle and install gate in accordance with manufacturer's installation recommendations.

3.2 Contractor shall verify compatibility with existing and all new connections.

3.4 Excavation, where required, shall be in accordance with the requirements of Section 02200: Excavation.

3.5 Backfill, where required, shall be in accordance with the requirements of Section 02300: Earthwork.

- END OF SECTION 11290 –

- END OF DIVISION-

Coyte Reservoir Outlet Repair

Task 1

WW Wheeler	$ 27,991.97	Engineering, construction engineering services, video inspectior
	$ (11,391.97)	Spicer Ranches Matching
	$ (16,600.00)	WSRF Fund
	$ (27,991.97)	

Task 2

Alpine Insurance	$ 3,308.36	Commercial Liability Insurance
Ferguson Water Works	$ 1,731.59	SDR 26 PVC 12" pipe
Timberline	$ 1,123.24	12" Headgate with 10' frame
Indian Peaks Rental	$ 1,844.69	Trench roller and sheepsfoot roller rental
Peterson Products Co.	$ 509.20	12" mechanical test plugs
Timberline	$ 59.39	plumbing hardware for pressure testing
High Country Hard Rock	$ 114.38	Masonary sand for sand filter
Jordon Concrete LLC	$ 24,000.00	Concrete footings, headwalls and pipe cradle
RLW Enterpises	$ 10,000.00	Excavation and backfill, concrete placement
Spicer Ranches	$ 12,415.00	Outlet repair construction (inkind)
	$ 55,105.85	Total Task 2
	$ 42,690.85	WSRF amount Task 2
	$ 83,097.82	Total Task 1 & 2
	$ 90,600.00	Total Budget
	$ 7,502.18	under/(over) budget

Budget

	Match	WSRF	Total
Task 1	$ 10,000.00	$ 16,600.00	$ 26,600.00
Task 2	$ 13,000.00	$ 51,000.00	$ 64,000.00
	$ 23,000.00	$ 67,600.00	$ 90,600.00

Actual

	Match	WSRF	Total
Task 1	$ 11,391.97	$ 16,600.00	$ 27,991.97
Task 2	$ 12,415.00	$ 42,690.85	$ 55,105.85
	$ 23,806.97	$ 59,290.85	$ 83,097.82
over/(under) budget	$ 806.97	$ (8,309.15)	$ (7,502.18)

$	27,991.97	actual paid
$	(16,600.00)	WRSF Funds
$	11,391.97	Spicer Matching

Spicer Ranches, Ltd In-Kind Matching

Equipment	Unit	Rate	Qty		Total
2" water pump	Hr	50	3	$	150
Cat 259D CTL	Hr	130	20	$	2,600
IH TD-8 Dozer	Hr	120	10	$	1,200
Cat 416B Backhoe	Hr	90	22	$	1,980
Ford Dumptruck	Hr	110	12	$	1,320
GMC w/ 24ft flatbed	Mile	2.50	554	$	1,385
				$	8,635

Labor	Unit	Rate	Qty		Total
Labor/Equipment Operator	Hr	20	50	$	1,000
General Contractor	Hr	80	30	$	2,400
				$	3,400

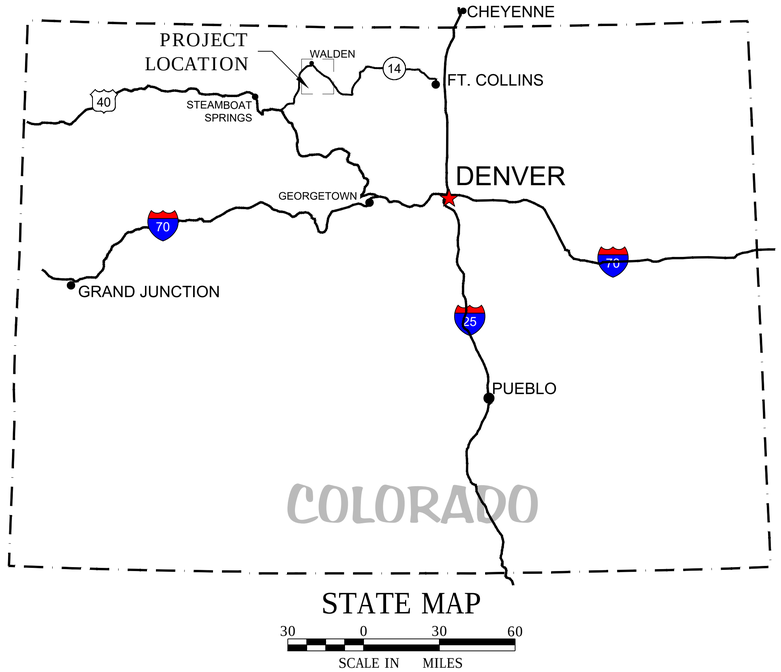
Materials	Unit	Rate	Qty		Total
Class 6 Road Base	Load	110	1	$	110
1.5 Road Base	Load	90	3	$	270
				$	380

TOTAL	$	12,415

United Rentals Rates

Daily	Weekly	Monthly	40
$ 58	$ 184	$ 436	$ 10.90
$ 575	$ 1,498	$ 3,190	$ 79.75
$ 611	$ 2,003	$ 4,486	$ 112.15
$ 428	$ 1,129	$ 3,046	$ 76.15
$ 686	$ 1,853	$ 5,183	$ 129.58

Miles	Location
314	Aurora for 12" pipe
240	2 trips to Indian Peaks Rental



STATE MAP

30 0 30 60

SCALE IN MILES

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT

CONSTRUCTION FILE: C-1291A
DAMID: 470121

WATER DIVISION 6, WATER DISTRICT 47
SECTION 29, T7N, R79W, 6TH P.M.
JACKSON COUNTY, COLORADO

PREPARED FOR:
SPICER RANCHES LTD.

PREPARED BY:
W. W. WHEELER AND ASSOCIATES, INC.

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
COLORADO DAM ID 470121
C-1291A
Water Division 6, Water District 47

I hereby declare these plans for the construction of the COYTE RESERVOIR DAM MID-LEVEL OUTLET REPLACEMENT were prepared under my direct supervision.

RESPONSIBLE DESIGN ENGINEER:
W. W. Wheeler & Associates, Inc.

_____ Colo. PE No. 48387
John Treacy III

COLORADO LICENSED JOSEPH TREACY 47781 10/1/18 PROFESSIONAL ENGINEER

STATE ENGINEER APPROVAL:
Approved on the 2nd day of October, 2018.

Kevin G. Rein
State Engineer

By: _____
William T. McCormick, III
CO PE 29127
Chief-Dam Safety Branch

STATE ENGINEER OF COLORADO

These plans represent the AS-CONSTRUCTED conditions of the COYTE RESERVOIR DAM MID-LEVEL OUTLET REPLACEMENT to the best of our knowledge and judgment, based in part on information furnished by others as of the ____ day of ____, 2019.

_____ Colo. PE No. 48387
John Treacy III

GENERAL NOTES:
1. A PRE-CONSTRUCTION MEETING SHALL BE HELD WITH THE OWNER, ENGINEER, CONTRACTOR AND A REPRESENTATIVE OF THE STATE ENGINEER'S OFFICE PRIOR TO CONSTRUCTION.
2. ALL BEST MANAGEMENT PRACTICES SHALL BE INSTALLED IN PLACE PRIOR TO START OF CONSTRUCTION.
3. THIS PROJECT CANNOT BE CONSIDERED AS HAVING BEEN COMPLETED UNTIL THE STATE ENGINEER HAS APPROVED THE SAME IN WRITING.

PROJECT VICINITY MAP

2 0 2 4

SCALE IN MILES

PROJECT LOCATION MAP

1 0 1 2

SCALE IN MILES

REVISIONS No.	Date	Made	Checked	Remarks
0	09/18	SAA	JJT	FOR SEO APPROVAL
1	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION

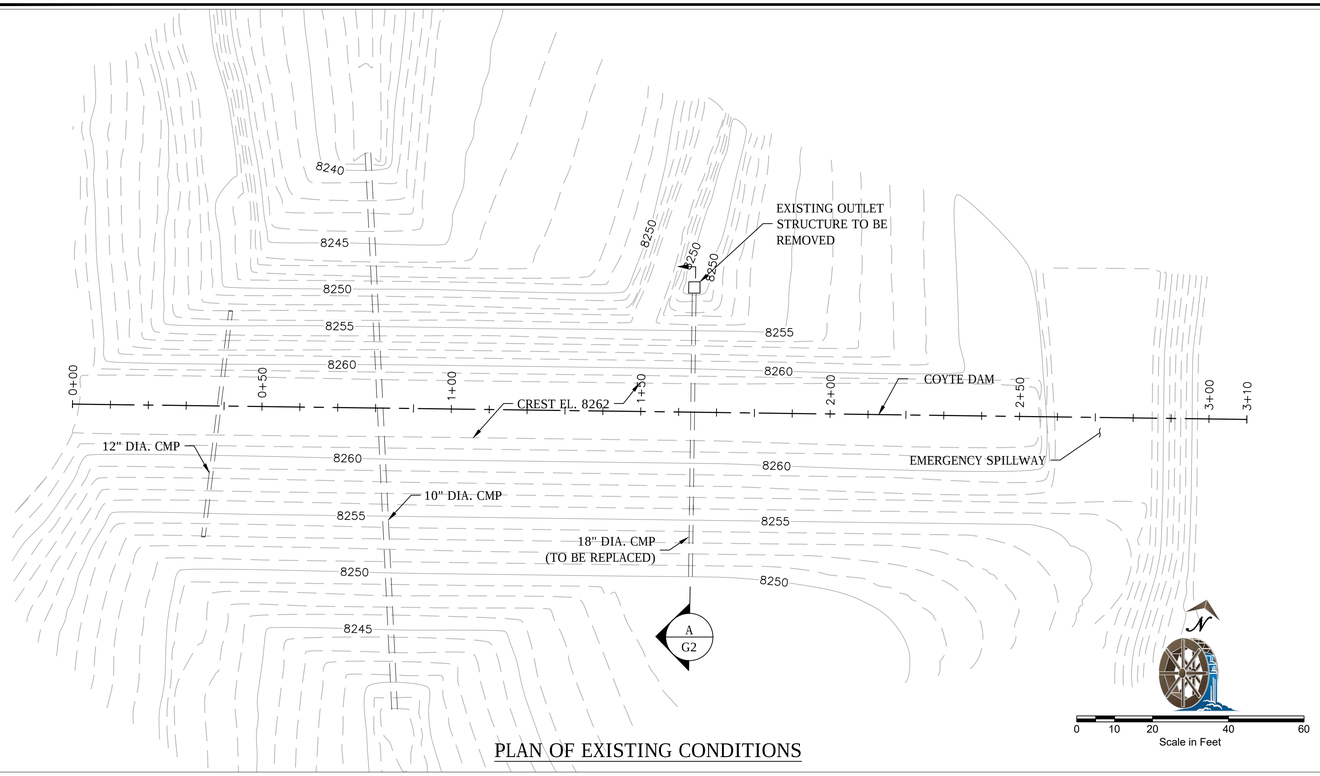
REFERENCE Sheet No.	Drawing No.	Title

APPROVED FOR CONSTRUCTION

W. W. WHEELER & ASSOCIATES, INC
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | Fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
COVER SHEET
AND LOCATION MAPS

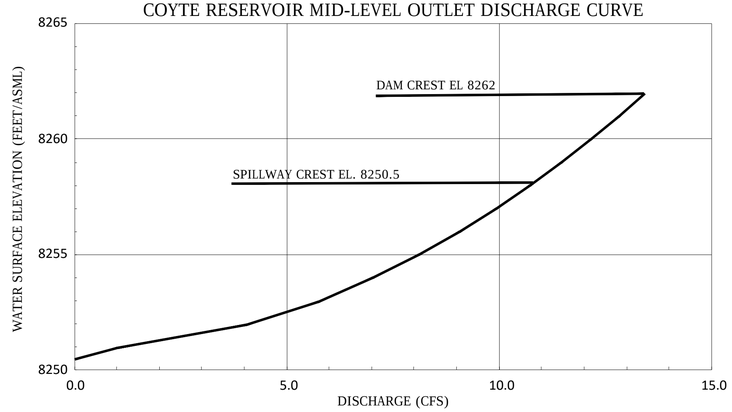
Client	SPICER RANCHES LTD.		
Design	JJT	Wheeler No.	1883.00
Drawn	SAA	Sheet No.	1 of 5
Check	SLJ		
Plot Date	10/01/2018	Drawing No.	G1



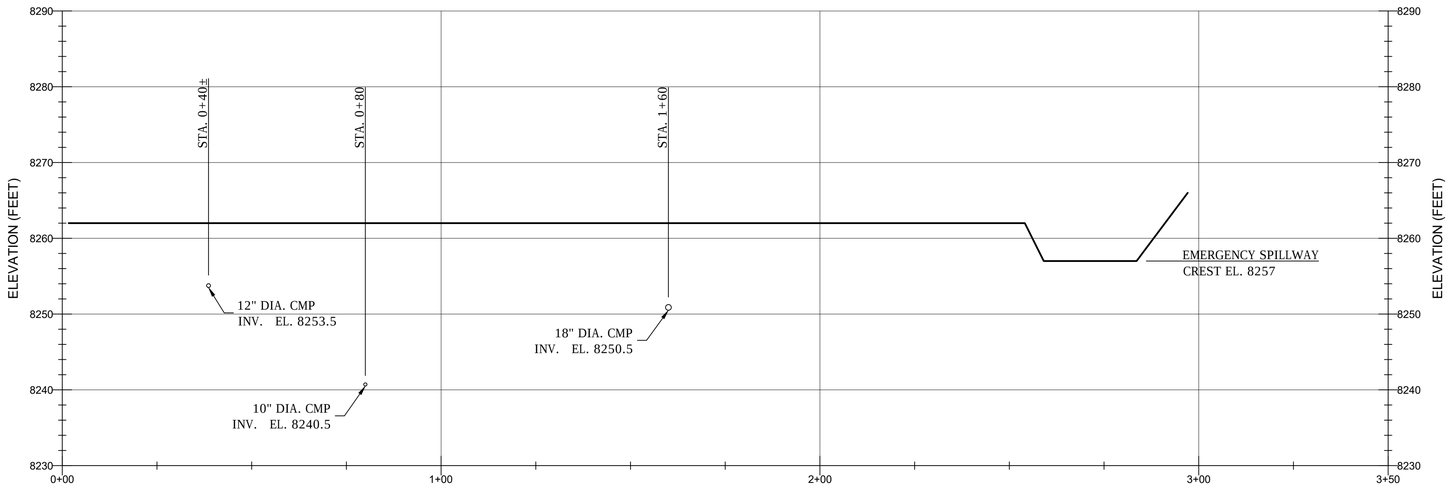
PLAN OF EXISTING CONDITIONS

DRAWING INDEX		
SHEET NO.	DRAWING NO.	DESCRIPTION
1	G1	COVER SHEET - VICINITY & PROJECT LOCATION MAPS
2	G2	DRAWING INDEX AND EXISTING CONDITIONS
3	C1	OUTLET WORKS PLAN AND PROFILE
4	C2	OUTLET WORKS SECTIONS AND DETAILS
5	C3	MISCELLANEOUS DETAILS

COYTE RESERVOIR MID-LEVEL OUTLET DISCHARGE CURVE



OUTLET WORKS DISCHARGE CAPACITY TABLE			
RESERVOIR ELEVATION (FT)	GAGE HEIGHT (FT)	CULVERT DISCHARGE (CFS)	
8262.0	21.5	13.4	TOP OF DAM
8261.0	20.5	12.8	
8260.0	19.5	12.1	
8259.0	18.5	11.4	
8258.0	17.5	10.7	
8257.0	16.5	9.9	SPILLWAY CREST ELEVATION
8256.0	15.5	9.0	
8255.0	14.5	8.1	
8254.0	13.5	7.0	
8253.0	12.5	5.7	
8252.0	11.5	4.0	
8251.0	10.5	1.0	
8250.5	10.0	0.0	INVERT ELEVATION



PROFILE VIEW OF COYTE DAM ALIGNMENT

NOTES:

1) ELEVATIONS ARE BASED ON 1970 DRAWING AND MAY NOT REPRESENT ACTUAL FIELD ELEVATIONS
2) RESERVOIR TO BE DRAINED BY OWNER PRIOR TO CONSTRUCTION.
3) ENGINEER WILL PERFORM A VIDEO INSPECTION ASSESSMENT OF THE 10-INCH OUTLET AND 12-INCH OUTLET DURING CONSTRUCTION.
4) REMOVE TREES, SHRUBS, UNDERGROWTH , TOPSOIL AND ALL OTHER ORGANICS FROM EXCAVATION FOOTPRINT PRIOR TO EXCAVATION. HAUL TO DESIGNATED OWNER DISPOSAL AREA AS NECESSARY. REMOVE AND STOCKPILE RIPRAP FOR REUSE.
5) EXCAVATE TO REMOVE THE EXISTING 18" DIA. CMP PIPE AND DOWNSTREAM CONTROL STRUCTURE, REPLACE WITH SDR 35 PVC PIPE AND UPSTREAM CONTROL STRUCTURE. MATCH EXISTING PIPE ELEVATION (WITH ALLOWANCE FOR THE CONCRETE CRADLE)
6) SUPPORT NEW PIPE IN TRENCH WITH A BRICKS OR CEMENT BLOCKS AND TIE DOWN USING REBAR AND WIRE EVERY 8'-10' TO PREVENT FLOATATION DURING PLACEMENT OF CONCRETE PIPE CRADLE. CRADLE SIZE SHALL BE AT LEAST MINIMUM DIMENSIONS SHOWN IN SECTION AND SHALL CONSIST OF MIN. 4,000 PSI STRENGTH CONCRETE. CLEAR TRENCH BOTTOM OF ALL LOOSE SOILS BEFORE CONCRETE PLACEMENT.
7) BACKFILL AROUND PIPE WITH EXCAVATED SOILS OR APPROVED SUBSTITUTE (ORGANICS REMOVED). COMPACT TO 95% STD PROCTOR DENSITY WITH 6" MAXIMUM LIFT THICKNESS. COMPACT MATERIAL AROUND AND IN THE HAUNCHES OF THE PIPE.
8) SAND FILTER DIAPHRAGM SHALL CONSIST OF ASTM C33 SAND. COMPACT WITH WITH PLATE COMPACTOR (2 PASSES).
9) GRADE BACKFILL TO MATCH EXISTING ADJACENT SLOPES AND DIKE CREST. REPLACE RIPRAP.
10) STAFF GAGE OR WATER LEVEL MARKINGS TO BE INSTALLED ON DISCHARGE INTAKE STRUCTURE BY OWNER AND APPROVED BY ENGINEER.

C-1291A

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REVISIONS				
NO.	DATE	MADE	CHECKED	REMARKS
1	09/18	SAA	JJT	FOR SEO APPROVAL
2	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION
3				
4				
5				

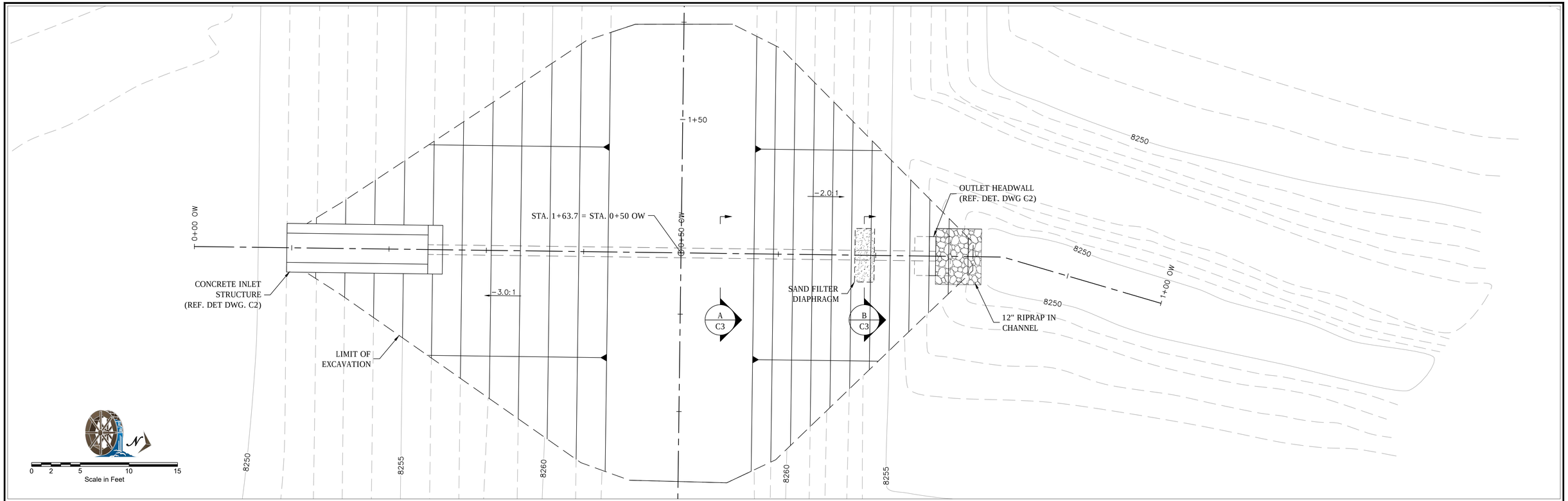
REFERENCE		
SHEET NO.	DRAWING NO.	TITLE

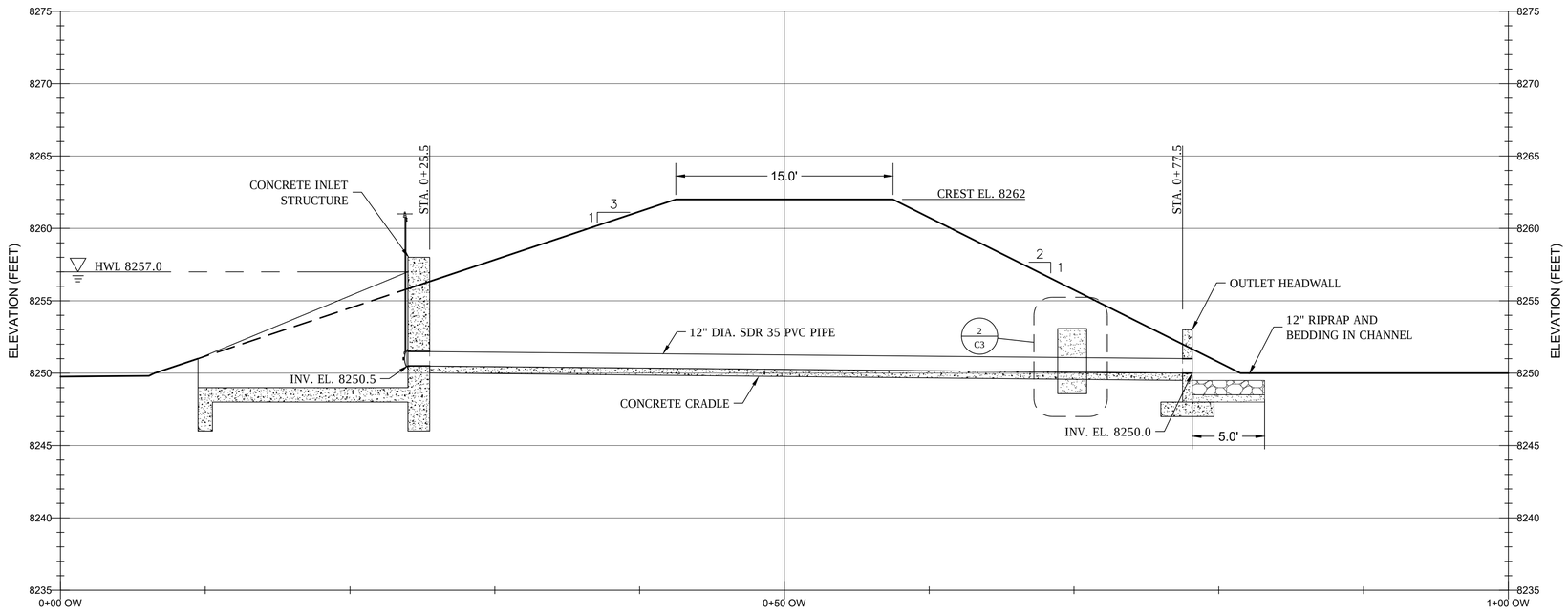
APPROVED FOR CONSTRUCTION

W. W. WHEELER & ASSOCIATES, INC
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
PLAN OF EXISTING
CONDITIONS

CLIENT	SPICER RANCHES LTD.
DESIGN	JJT
DRAWN	SAA
CHECK	SLJ
PLOT DATE	10/01/2018
WHEELER NO.	1883.00
SHEET NO.	2 of 5
DRAWING NO.	G2





NOTES:
1) CONCRETE SADDLE TO BE INSTALLED FROM CONCRETE HEADWALL TO FILTER DIAPHRAGM.
2) ENGINEER WILL OBSERVE THE SUBGRADE PRIOR TO INSTALLATION OF HEADWALL.
3) CATWALK ACCESS TO BE DESIGNED AND INSTALLED BY OWNER.
4) PVC PIPE JOINTS TO BE WRAPPED WITH POLYURETHANE WRAP AFTER CONNECTION.

C-1291A

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Revisions No.	Date	Made	Checked	Remarks
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1	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION

Reference Sheet No.	Drawing No.	Title

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3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | Fax 303-761-2802

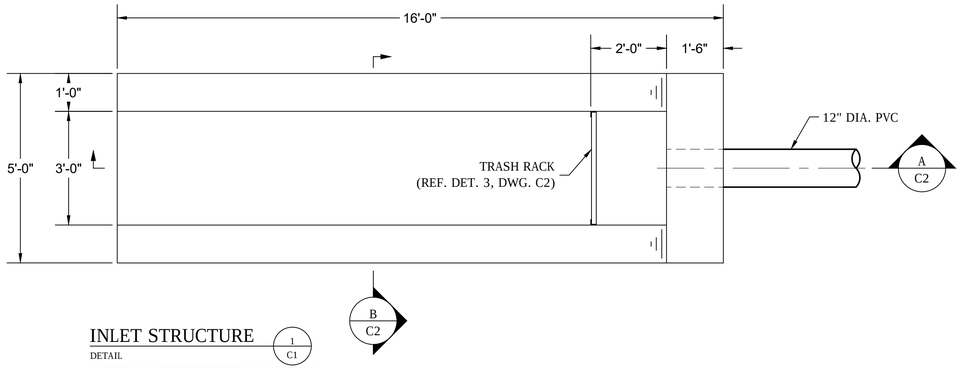
COYTE RESERVOIR DAM

MID-LEVEL OUTLET REPLACEMENT

OUTLET WORKS

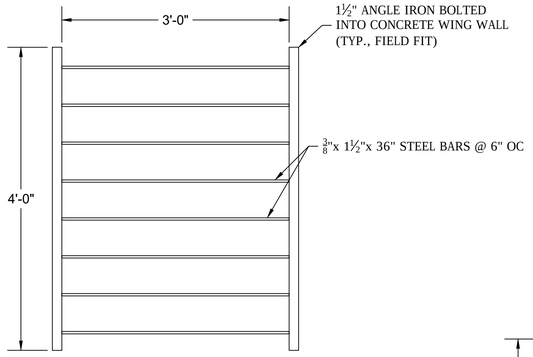
PLAN AND PROFILE

Client	SPICER RANCHES LTD.		
Design	JJT	Wheeler No.	1883.00
Drawn	SAA	Sheet No.	3 of 5
Check	SLJ		
Plot Date	10/01/2018	Drawing No.	C1



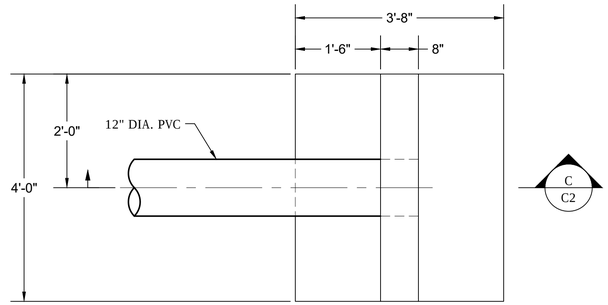
INLET STRUCTURE — DETAIL 1 / C1

Scale in Feet: 0 1 2 4 6



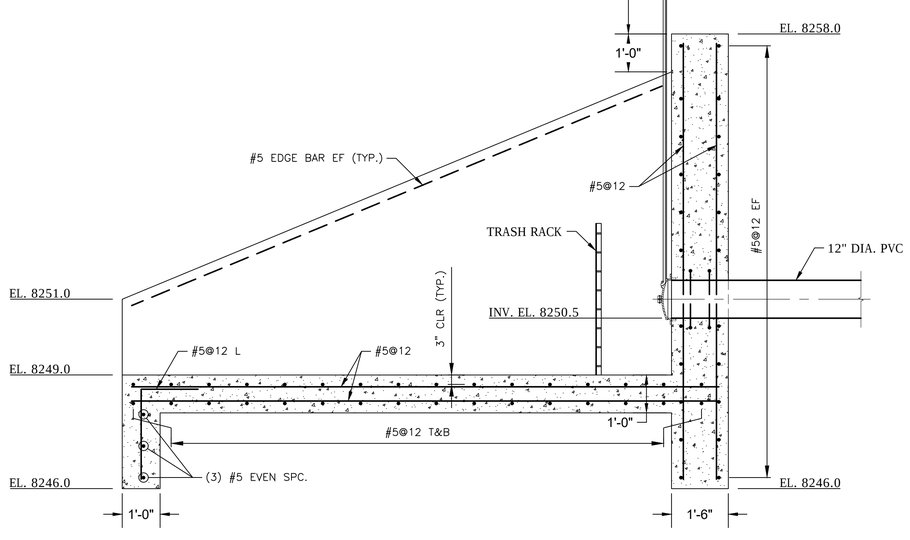
TRASHRACK — DETAIL 3 / C2

Scale in Feet: 0 ½ 1 2 3



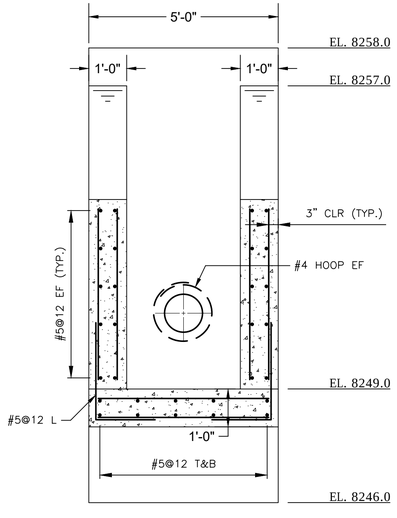
OUTLET HEADWALL — DETAIL 2 / C1

Scale in Feet: 0 1 2 3 4



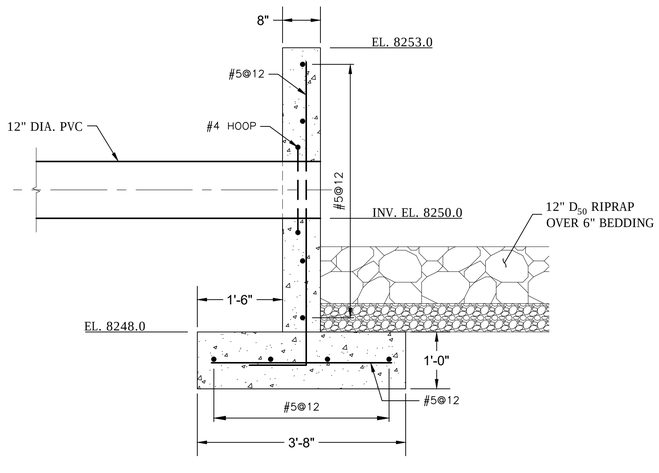
INLET STRUCTURE — SECTION A / C2

Scale in Feet: 0 1 2 4 6



INLET STRUCTURE — SECTION B / C2

Scale in Feet: 0 1 2 4 6



OUTLET HEADWALL — SECTION C / C2

Scale in Feet: 0 1 2 3 4

C-1291A

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Revisions	No.	Date	Made	Checked	Remarks
	0	09/18	SAA	JJT	FOR SEO APPROVAL
	1	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION

Reference	Sheet No.	Drawing No.	Title

APPROVED FOR CONSTRUCTION

W. W. WHEELER & ASSOCIATES, INC
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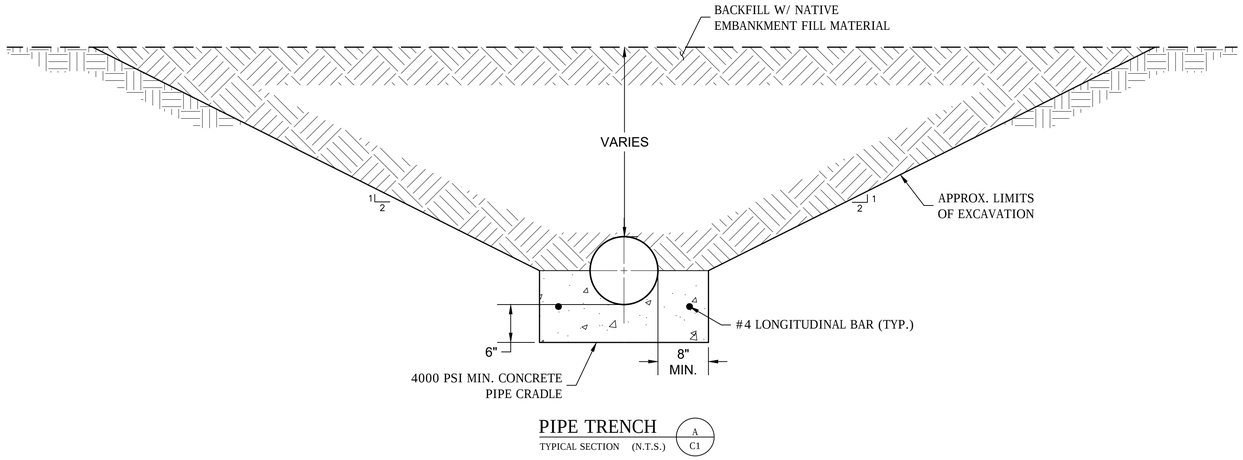
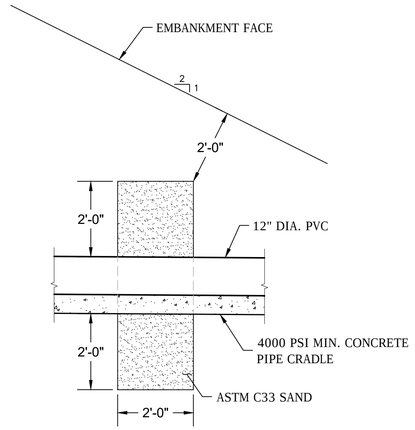
303-761-4130 | fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
OUTLET WORKS
SECTIONS AND DETAILS

Client	SPICER RANCHES LTD.		
Design	JJT	Wheeler No.	1883.00
Drawn	SAA	Sheet No.	4 of 5
Check	SLJ		
Plot Date	10/01/2018	Drawing No.	C2

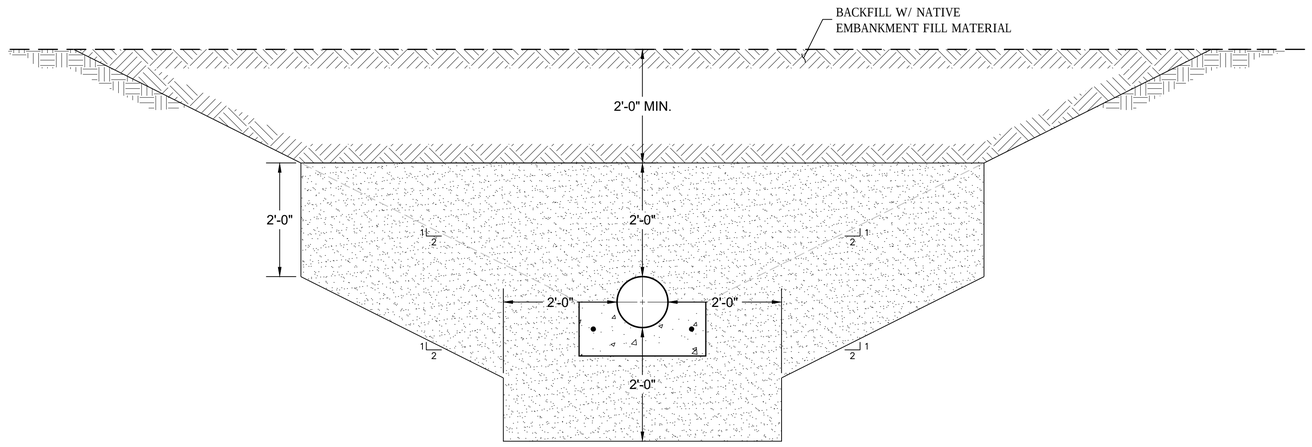


PIPE TRENCH
TYPICAL SECTION (N.T.S.) A C1

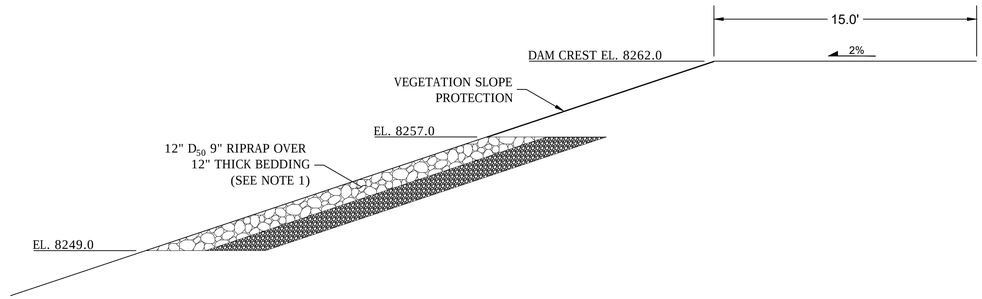


SAND FILTER DIAPHRAGM
DETAIL 2 C1

0 1 2 4 6
Scale in Feet



SAND FILTER DIAPHRAGM
TYPICAL SECTION (N.T.S.) B C1



UPSTREAM SLOPE REPAIR
TYPICAL SECTION (N.T.S.) 1 C1

NOTES:
1. UPSTREAM SLOPE ARMORING IS AN OPTIONAL ITEM AT THE DISCRETION OF THE OWNER. AT A MINIMUM, THE UPSTREAM SLOPES SHOULD BE FILLED WITH STRUCTURAL FILL AND COMPACTED TO MATCH EXISTING SLOPES. WORK SHOULD BE PERFORMED IN PRESENCE OF ENGINEER.
2. DAM CREST SHOULD BE LEVELED AND GRADED WITH 15-FOOT MINIMUM CREST WIDTH AND SLOPING FROM DOWNSTREAM TO UPSTREAM WITH A 2% SLOPE.

C-1291A

REVISIONS No.	Date	Made	Checked	Remarks
1	09/18	SAA	JJT	FOR SEO APPROVAL
0	10/18	SAA	JJT	APPROVED FOR CONSTRUCTION

REFERENCE Sheet No.	Drawing No.	Title

APPROVED FOR CONSTRUCTION

W. W. WHEELER & ASSOCIATES, INC
Water Resources Engineers
3700 S. Inca Street | Englewood, CO 80110-3405
303-761-4130 | fax 303-761-2802

COYTE RESERVOIR DAM
MID-LEVEL OUTLET REPLACEMENT
MISCELLANEOUS DETAILS

Client	SPICER RANCHES LTD.	
Design	JJT	Wheeler No. 1883.00
Drawn	SAA	Sheet No. 5 of 5
Check	SLJ	
Plot Date	10/01/2018	Drawing No. 1 C3

COLORADO
Division of Water Resources
Department of Natural Resources

Dam Safety

CONSTRUCTION INSPECTION REPORT

PROJECT INFORMATION			
Dam Name:	Coyte	Inspector:	DSM
DAMID:	470121	Date:	November 19, 2018
C-#:	C-1291A	Time on Site:	10:00 pm – 12:00 pm
Dam Owner:	Spicer Ranches, LTD	Contact:	Coy Meyring
Engineer:	W. W. Wheeler	Contact:	John Treacy
Contractor:	RLW Enterprises	Contact:	Rick Wamsley
Approved Plans & Specifications On-site? ☑ Yes ☐ No		Engineer Following Const. Obs. Plan? ☑ Yes ☐ No	

INSPECTION PARTICIPANTS	
Inspection Participants:	Dana Miller (SEO), John Treacy (Wheeler), Coy Meyring (Spicer Ranches), Rick Wamsley (RLW Enterprises), Guildner Pipeline (pipe inspection)

CONDITIONS	
Reservoir:	Empty
Weather:	Clear, cold, mid 20s F
Equipment:	Camera inspection van

CONSTRUCTION STATUS	
Work Completed to Date:	Project substantially complete.
Work in Progress:	Outlet conduit inspection, final survey.
Work Planned and est. Timeframe:	

OBSERVATIONS AND DISCUSSION	
Purpose of Inspection:	Substantial completion, outlet inspection.
Items Inspected:	1. New outlet construction. Headwall concrete looks good. Vertical canal gate and trash rack in place. Waste concrete pad poured just downstream of gate operator to provide a place to stand for operation. This design negates the need for a cat walk. High water reported to reach just over the top of the concrete headwall. Downstream basin contains rock with concrete. 2. Finished grade. Crest appears flat end to end with an upstream cross slope. The final layer is reported to be of a more gravelly nature, which will be good for future wear. 3. Upstream slope. Still requires some repair. The owner plans to do this in the spring when the temperatures warm and he is able to mine some local rock. Discussed a process for completing the repair with removal of vegetation, preparation of the slope, placement of fill in horizontal lifts, and a gravel filter material under the riprap. 4. Pipe. All three conduits were video inspected by Guildner Pipeline. The two older conduits appeared to be in relatively sound condition with no immediate concerns. Video of the inspections will be provided.
Items not in compliance with	

OBSERVATIONS AND DISCUSSION	
approved plans/specs:	
Problems/Concerns:	
Action Items:	1. Provide video documentation of the conduit inspections, as well as a brief written summary in the final construction report for the project. 2. Submit as-constructed documentation in compliance with Rule 10. 3. Repair the upstream slope
Change Orders:	
Minor Changes:	
Issues Discussed:	1. Material in the spillway channel. Unclear whether this has accumulated from hillside erosion over time, or if it was placed intentionally at some point. The depth appears to be approximately a foot or less. A check of the database shows the tributary area for Coyte Dam is 2921 acres, or 4.6 square miles. The approved 1970 construction plans for the dam show a spillway with a bottom width of 25 feet and 5 feet of freeboard to the dam crest. It appears the designed difference in elevation between the standpipe service spillway and the emergency spillway was only 0.25 feet. It is possible a small amount of material was placed in the emergency spillway at some point to keep it from running more frequently when the reservoir elevation exceeded this quarter of a foot over the standpipe entrance. Lacking any new hydrology information, the original design freeboard of 5 feet should be maintained in order to preserve the original spillway capacity. Final relative elevations will be provided by the contractor so the current freeboard can be evaluated. If it needs to be increased, material can be added to the top of the dam to accomplish this rather than removing material from the spillway, if desired. 2. Removed conduit. Most of the removed outlet conduit appeared to be in surprisingly good condition upstream of the corroded headwall section. Damage to the surface by construction equipment during removal, revealed shiny, silver CMP underneath. It is unknown whether the buried segment of conduit remained in that much better condition upstream of the exposed segment, or if a portion was perhaps replaced at one time. There does not appear to be a joint between the corroded and non-corroded sections. In any case, the current project included replacement of the entire mid-level outlet works based on the observed condition prior to design.
Resolution of Deficiencies:	
Conclusions & Recommendations:	1. Project substantially complete. Awaiting as-constructed documentation for final project acceptance and approval to store water.
Next Inspection:	Regular dam safety.

PHOTOGRAPHS

Photo 1 New gate and trash rack

Photo 2 Notch for easy trash rack removal

Photo 3 Waste concrete pad to facilitate gate access at high water levels

Photo 4 Downstream end of the new outlet

Photo 5 Small berm in the emergency spillway channel

Photo 6 Removed downstream outlet gate

Photo 7 Corroded pipe segment just upstream of the old headwall; note silver appearance of CMP just upstream (right side of photo)

Photo 8 Heating the pipe to remove ice jam for inspection of the low level outlet

Photo 9 Crest