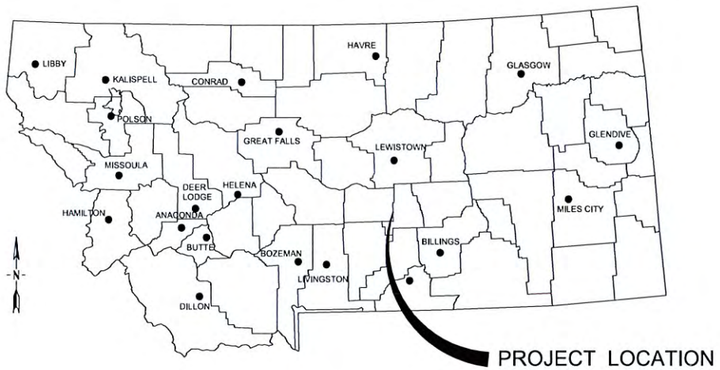
CONSTRUCTION DRAWINGS FOR

DEADMAN'S BASIN DIVERSION DAM AND HEADGATE REPLACEMENT PROJECT
DEADMAN'S BASIN WATER USERS ASSOCIATION
WHEATLAND COUNTY, MONTANA

JUNE 2014



LOCATION MAP

NO SCALE

PREPARED FOR:

MONTANA DNRC

PREPARED BY:

MORRISON MAIERLE, INC.
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

3011 Palmer Street, Missoula, MT 59801
Phone: (406) 542-8880 Fax: (406) 542-4801

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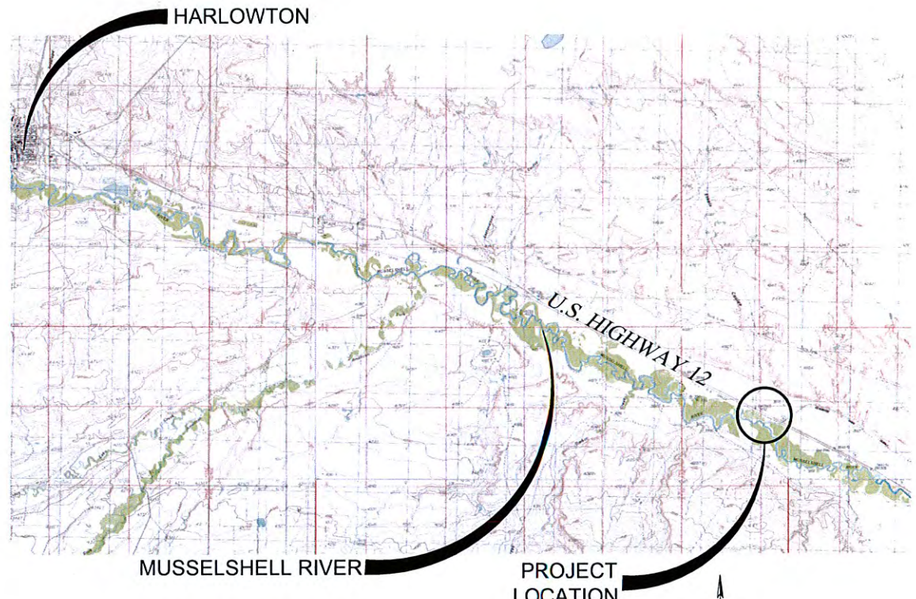

VICINITY MAP

MONTANA
JOSEPH T. SMITH
26795 PE
REGISTERED PROFESSIONAL ENGINEER
6-27-2014

APPROVED BY: _____
JOSEPH SMITH, P.E., CFM, LSIT
Project Manager

APPROVED BY: _____
KEVIN SMITH, P.E.
DNRC STATE WATER PROJECTS BUREAU

MORRISON MAIERLE, INC.
QUALITY ASSURANCE

Project Manager

Office Manager or QA Coordinator

Peer Reviewer

6-27-2014
Q.A. Approval Date

1447,035,088
Q.A. Project No.

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SET NO. _____

MMI PROJECT NO. 1447.035

M:\1447\035\ACAD\SHEETS\COVER.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON 6/27/2014

SHEET INDEX		
SHEET No.	DRW-NO	SHEET TITLE
		COVER
1	C-1	SITE PLAN
2	C-2	DEMOLITION PLAN
3	C-3	DIVERSION DAM PLAN
4	C-4	DIVERSION DAM DETAILS AND SECTIONS
5	C-5	FISHWAY DETAILS
6	C-6	HEADGATE PLAN AND SECTIONS
7	C-7	ROCK RAMP SUBGRADE GRADING PLAN
8	S-1	STRUCTURAL NOTES
9	S-2	STRUCTURAL PLAN
10	S-3	STRUCTURAL SECTIONS
11	S-4	STRUCTURAL SECTIONS AND DETAILS
12	S-5	STRUCTURAL SECTIONS AND DETAILS
13	S-6	STRUCTURAL DETAILS

LOCATION DESCRIPTION

FROM THE INTERSECTION OF U.S. HIGHWAY 12 AND U.S. HIGHWAY 191, HEAD EAST ON U.S. HIGHWAY 12. TRAVEL APPROXIMATELY 9 MILES. FROM SHAWMUT, HEAD NORTHWEST ON U.S. HIGHWAY 12 FOR APPROXIMATELY 6 MILES. THE DIVERSION DAM IS LOCATED JUST SOUTH OF THE HIGHWAY.

LATITUDE: 46° 13' 06.33" N
LONGITUDE: 109° 37' 55.34" W

GENERAL ABBREVIATIONS

CONC.	- CONCRETE
CP	- CONTROL POINT
CPP	- CORRUGATED PLASTIC PIPE
DIA.	- DIAMETER
ELEV.	- ELEVATION
IE	- INVERT ELEVATION
IN.	- INCH
LF	- LINEAR FOOT
MIN	- MINIMUM
NIC	- NOT IN CONTRACT
NTS	- NOT TO SCALE
OPC	- ORANGE PLASTIC CAP
SCH	- SCHEDULE
STA	- STATION
TYP.	- TYPICAL
TOW	- TOP OF WALL

CONTROL POINT TABLE				
POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
22	778418.4640	1935220.4460	3970.71	CP22
23	778539.1490	1936594.0470	3963.41	CP23

N

SCALE
100 50 0 100 200
IN FEET

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\C-1 SITE PLAN.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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MONTANA
JOSEPH T. SMITH
No. 20156 PE
LICENSED PROFESSIONAL ENGINEER

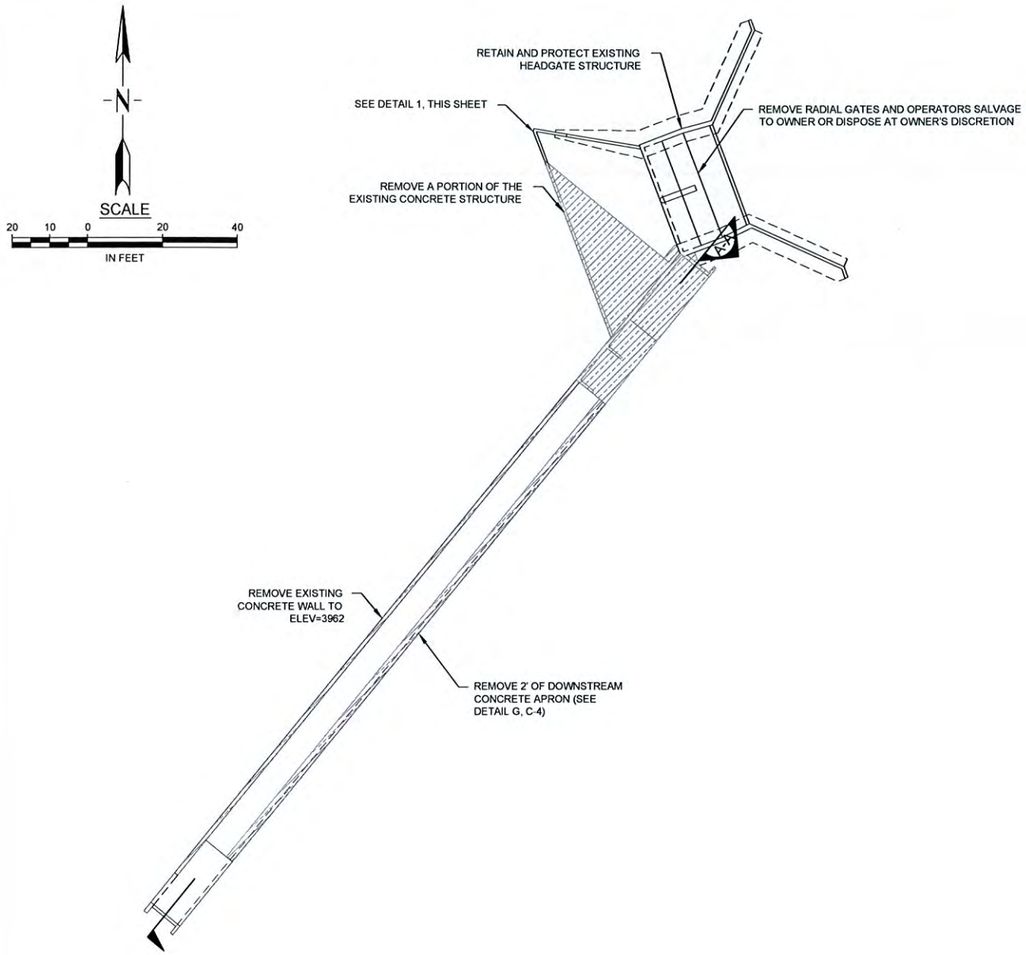
DRAWN BY: CRH
DSGN BY: NK
CHKD BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

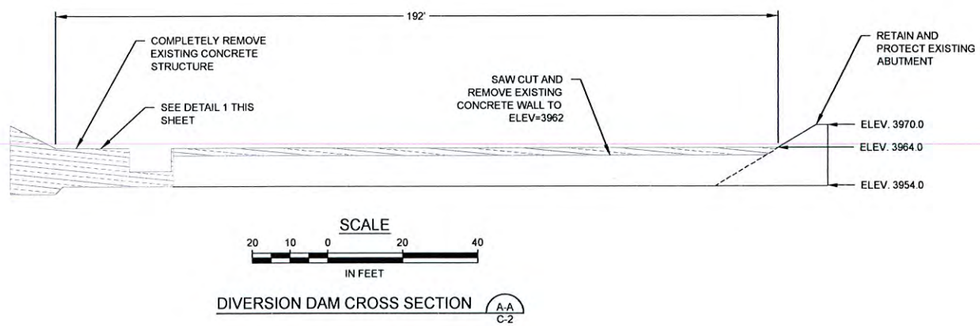
DEADMAN'S BASIN DIVERSION DAM

WHEATLAND COUNTY MONTANA

SITE PLAN

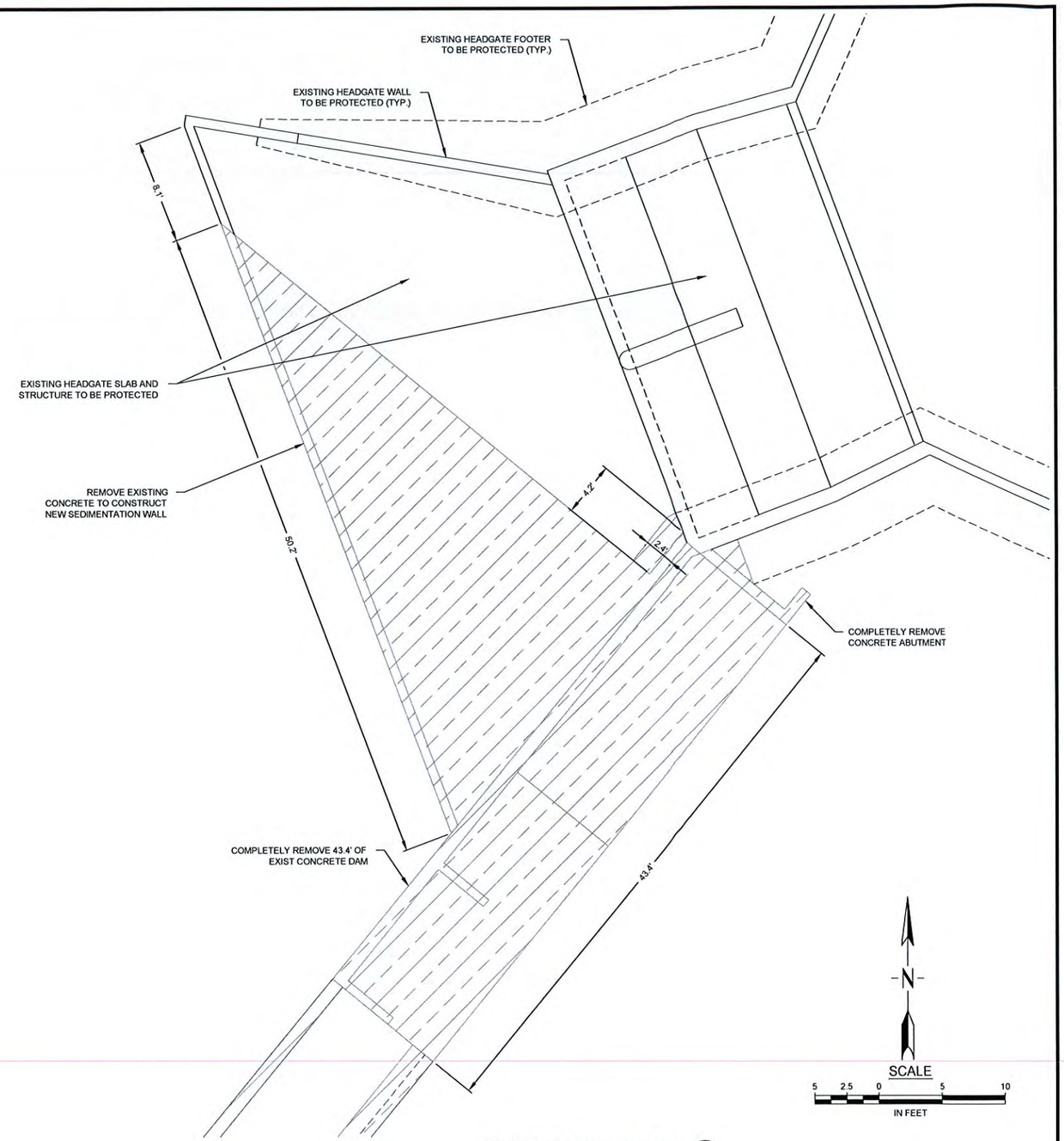
PROJECT NUMBER 1447.035
SHEET NUMBER 1
DRAWING NUMBER C-1





SCALE
20 10 0 20 40
IN FEET

DIVERSION DAM CROSS SECTION A-A C-2



EXPANDED DEMOLITION PLAN 1 C-2

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REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\C-2 DEMO PLAN.DWG PLOTTED BY: CHRISTOPHER HAWKINS ON Jun/27/2014

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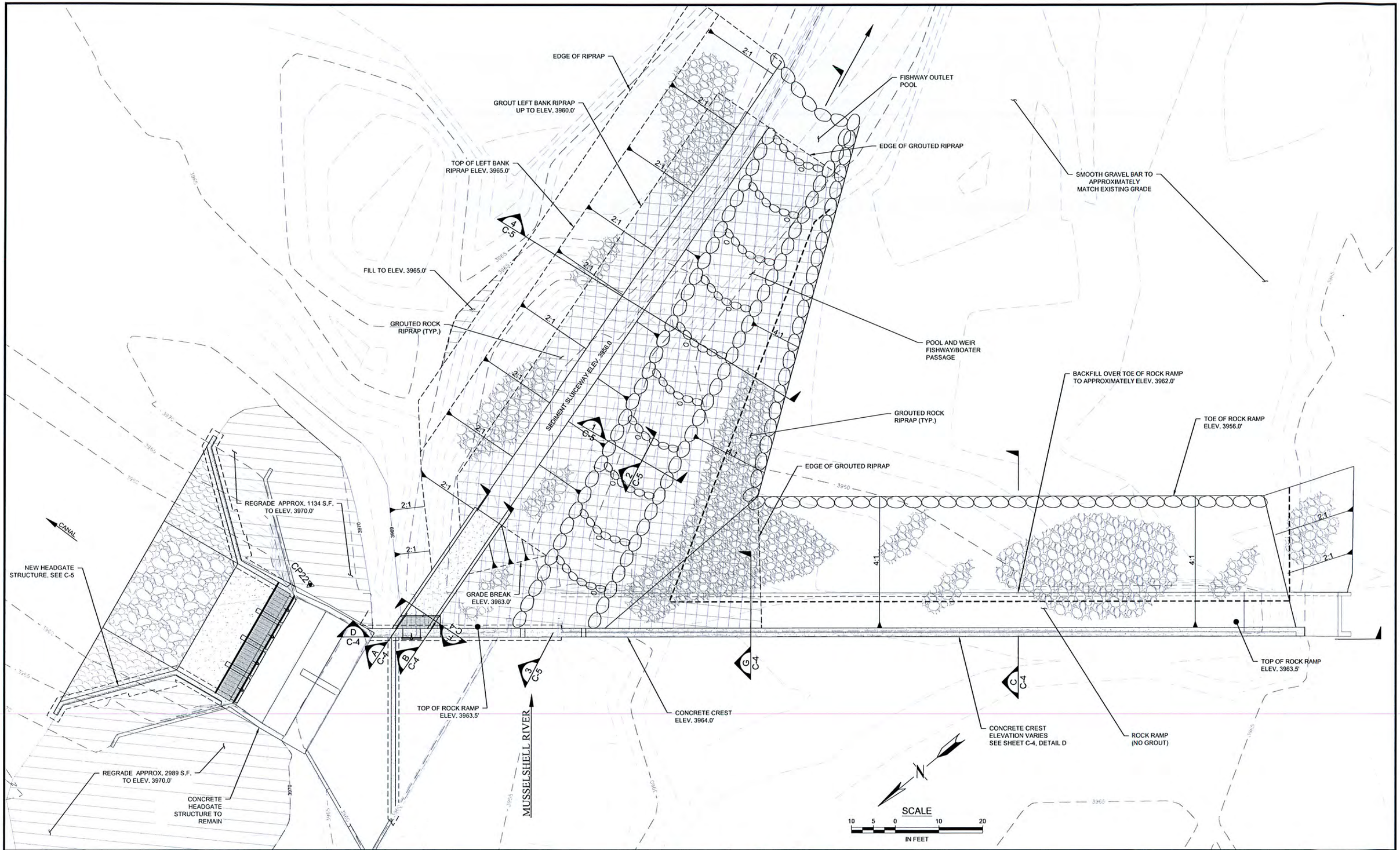
STATE OF MONTANA JOSEPH T. SMITH No. 20156 PE LICENSED PROFESSIONAL ENGINEER

DRAWN BY: CRH
DSGN BY: NK
APPR BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA
DEMOLITION PLAN

PROJECT NUMBER 1447.035
SHEET NUMBER 2
DRAWING NUMBER C-2



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REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\C-3 DIVERSION PLAN.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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MONTANA
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DRAWN BY: CRH
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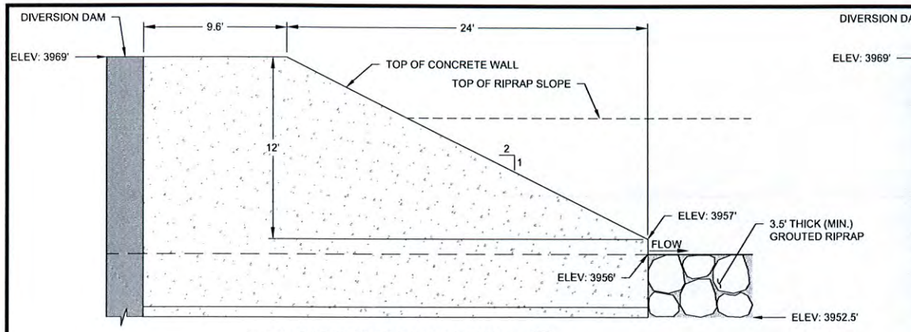
APVD. BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM

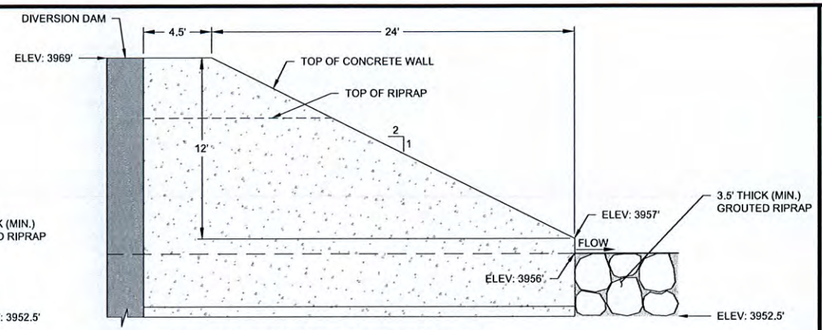
WHEATLAND COUNTY — MONTANA

DIVERSION DAM PLAN

PROJECT NUMBER 1447.035
SHEET NUMBER 3
DRAWING NUMBER C-3



SEDIMENT SLUICEWAY EAST WALL (A, C-3)

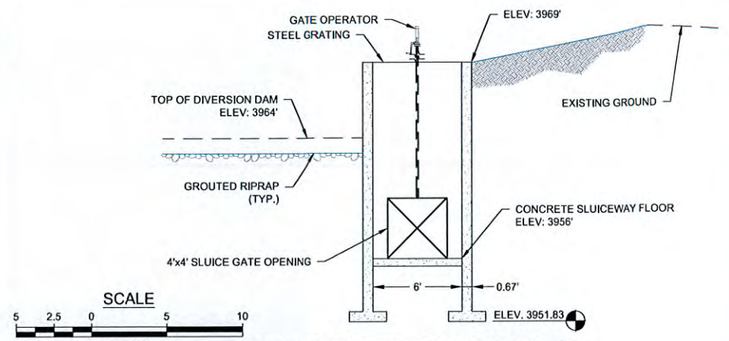


SEDIMENT SLUICEWAY WEST WALL (B, C-3)

SCALE

5 2.5 0 5 10

IN FEET



SCALE

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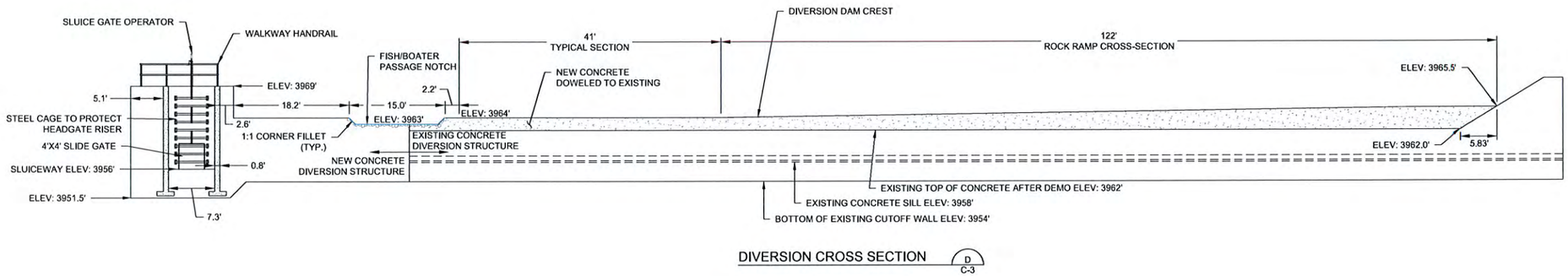
IN FEET

SEDIMENT SLUICEWAY CROSS SECTION (F, C-3)

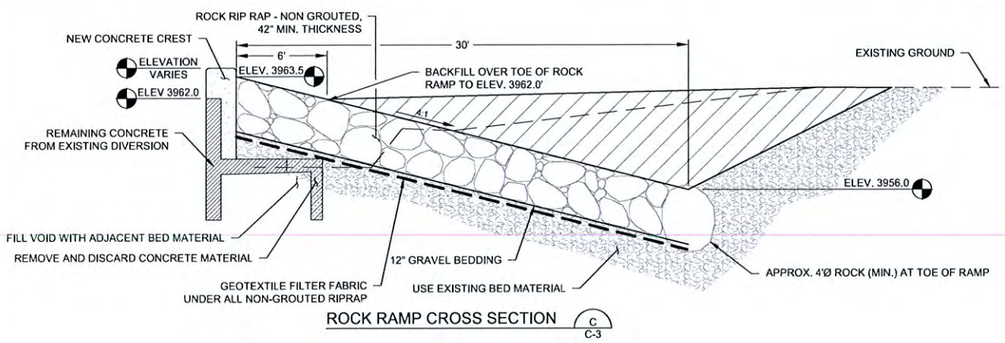


DIVERSION CROSS SECTION (D, C-3)

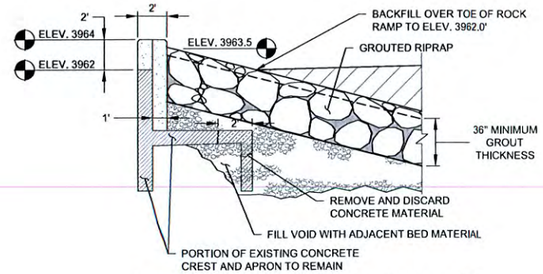
SCALE

10 5 0 10 20

IN FEET



ROCK RAMP CROSS SECTION (C, C-3)



DIVERSION CREST TYPICAL SECTION (G, C-3)

SCALE

5 2.5 0 5 10

IN FEET

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REVISIONS

NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\C-4 DIVERSION DETAILS.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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DSGN BY: NK
APVD. BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM

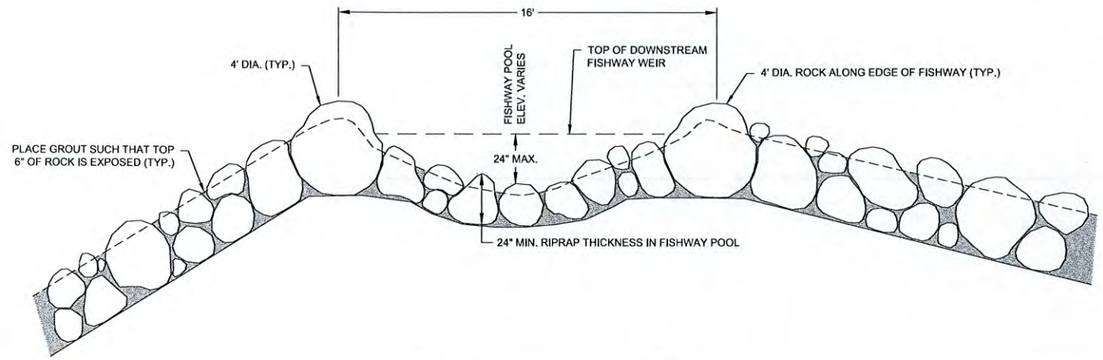
WHEATLAND COUNTY MONTANA

DIVERSION DAM DETAILS AND SECTIONS

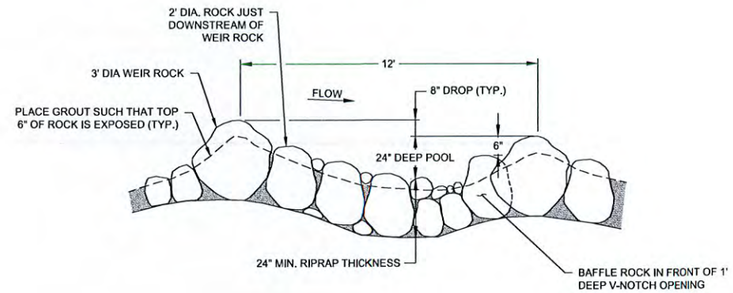
PROJECT NUMBER 1447.035

SHEET NUMBER 4

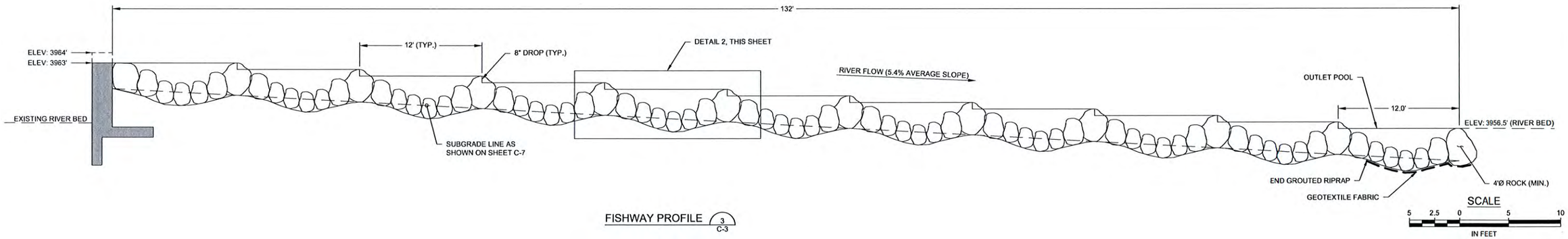
DRAWING NUMBER C-4



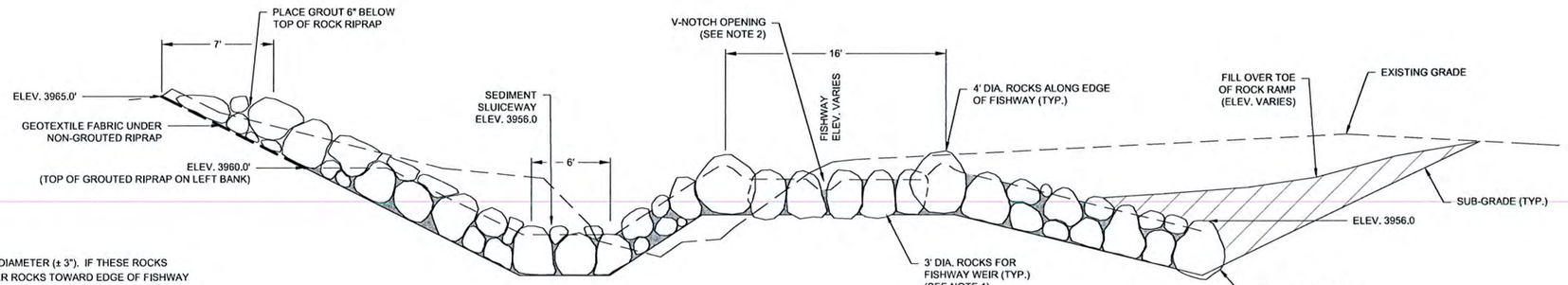
FISHWAY SECTION 1 C-3
SCALE: NTS



FISHWAY SECTION 2 C-3
SCALE: NTS



FISHWAY PROFILE 3 C-3



NOTES:

1. FISHWAY WEIR ROCKS SHALL BE 3' IN DIAMETER (± 3"). IF THESE ROCKS VARY SLIGHTLY IN SIZE, PLACE LARGER ROCKS TOWARD EDGE OF FISHWAY AND SMALLER ROCKS NEAR CENTER, TO DIRECT FLOW TOWARDS CENTER OF FISHWAY.
2. CREATE V-NOTCH OPENING IN EACH FISHWAY WEIR BY PLACING GROUT 1-FOOT FROM TOP OF WEIR ROCKS. V-NOTCH MEANDERS AND IS NOT IN THE CENTER OF FISHWAY. PLACE BAFFLE ROCK JUST UPSTREAM OF V-NOTCH OPENING SUCH THAT TOP OF BAFFLE ROCK IS 6" BELOW TOP OF WEIR ROCKS, AND AS SHOWN IN FISHWAY DETAIL 2 ON THIS SHEET. .

SCALE
5 2.5 0 5 10
IN FEET

FISHWAY SECTION 4 C-3

VERIFY SCALE!
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REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\C-5 FISHWAY DETAILS.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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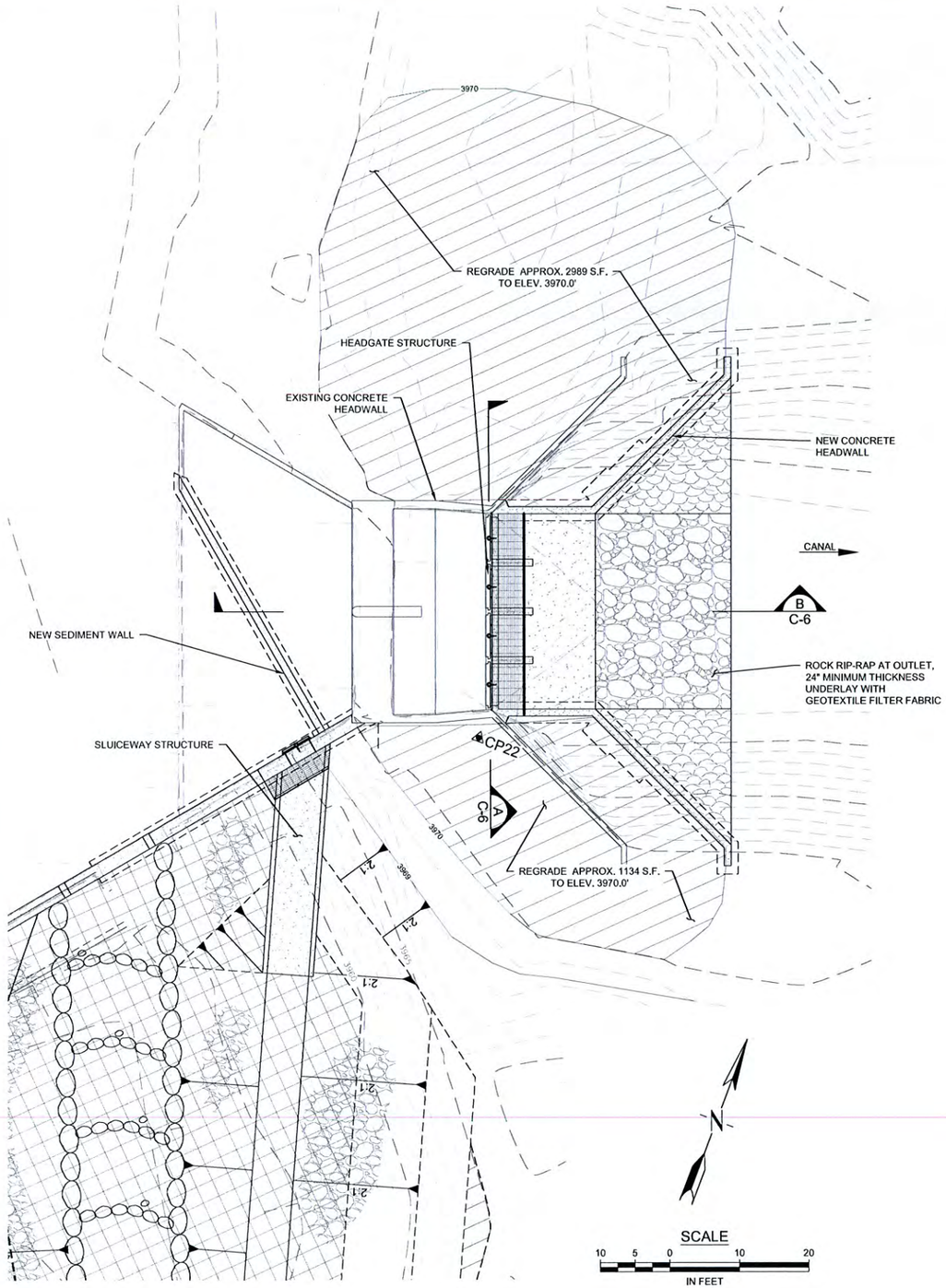
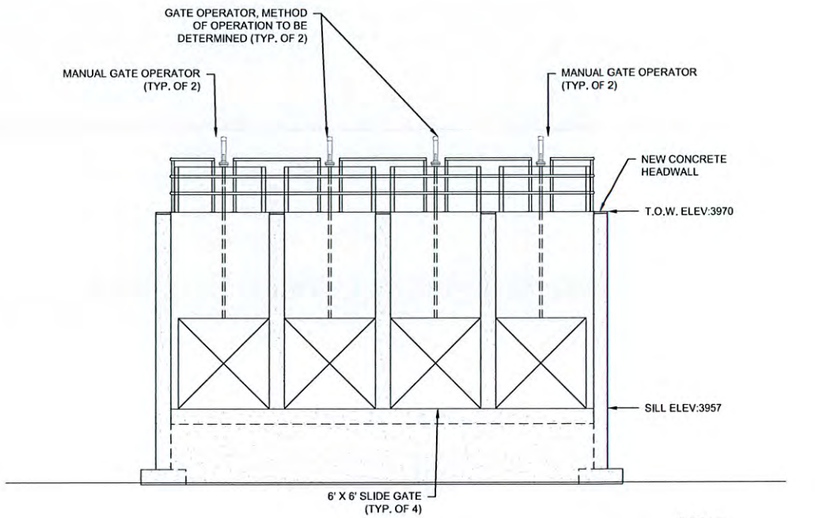
DRAWN BY: CRH
DSGN BY: NK
APPR. BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA
FISHWAY DETAILS

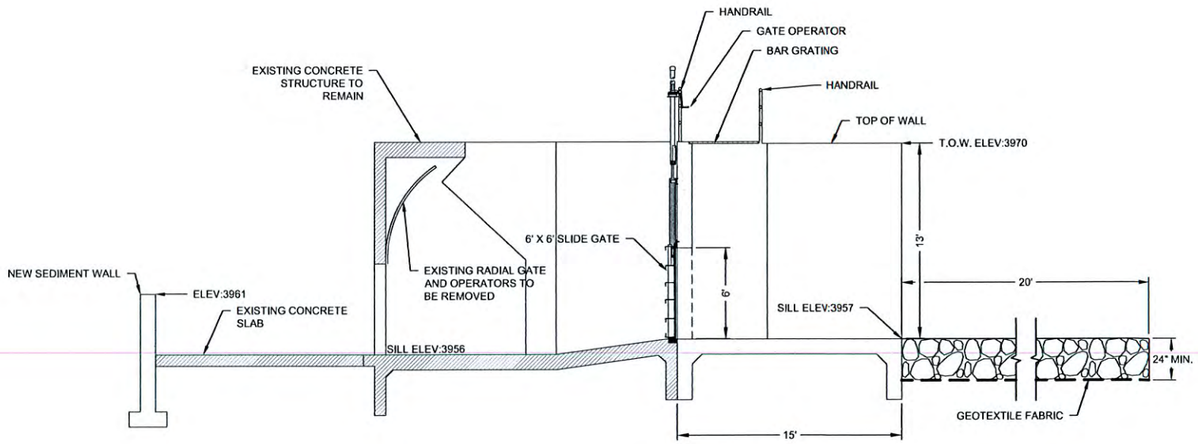
PROJECT NUMBER 1447.035
SHEET NUMBER 5
DRAWING NUMBER C-5





SCALE
5 2.5 0 5 10
IN FEET

GATE CROSS SECTION A C-6



SCALE
5 2.5 0 5 10
IN FEET

STRUCTURE CROSS SECTION B C-6

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REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\C-6 HEADGATE PLAN AND SECTIONS.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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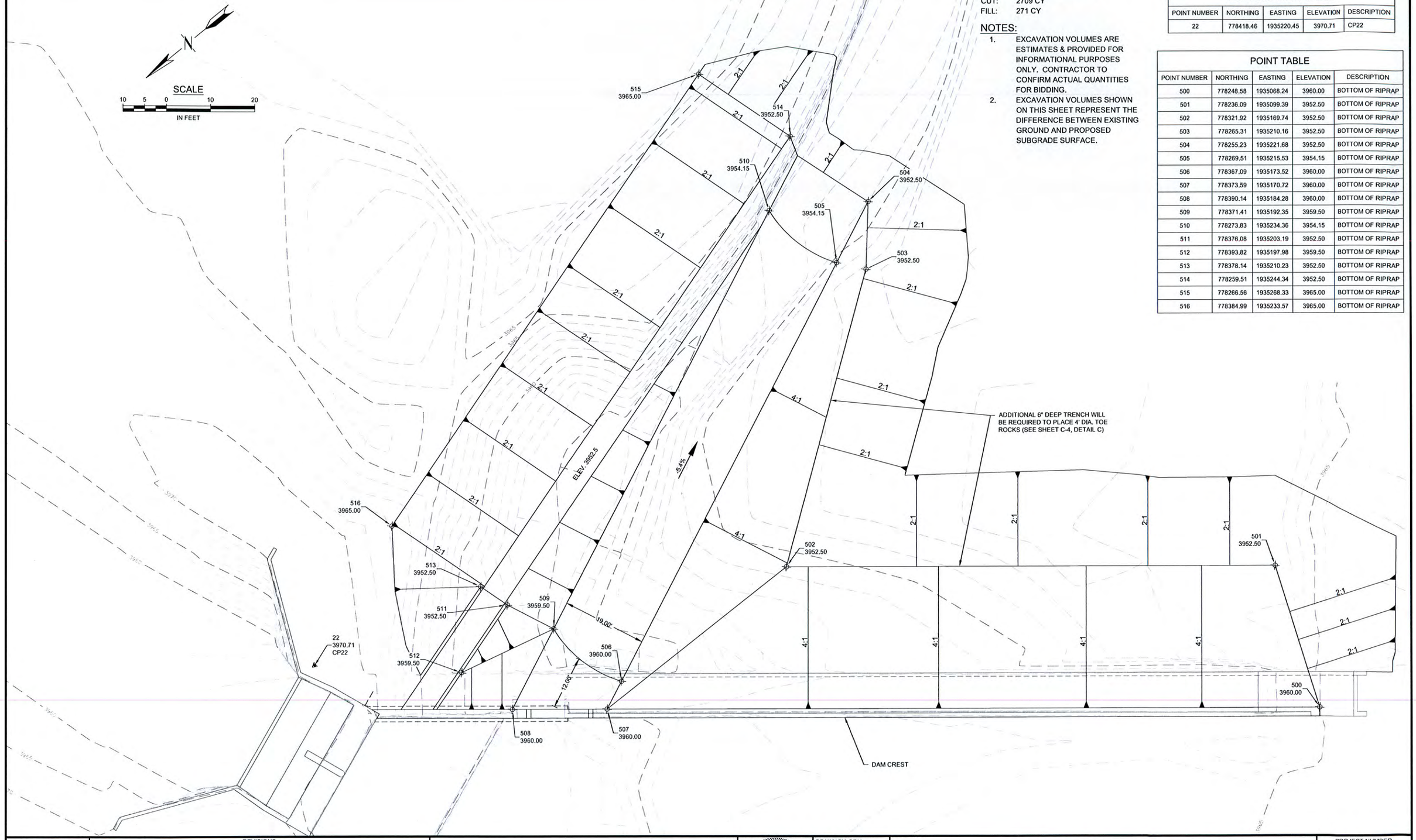
DRAWN BY: CRH
DSGN BY: NK
CHKD BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA
HEADGATE PLAN AND SECTIONS

PROJECT NUMBER 1447.035
SHEET NUMBER 6
DRAWING NUMBER C-6



EXCAVATION VOLUMES:

CUT: 2709 CY
FILL: 271 CY

NOTES:

1. EXCAVATION VOLUMES ARE ESTIMATES & PROVIDED FOR INFORMATIONAL PURPOSES ONLY. CONTRACTOR TO CONFIRM ACTUAL QUANTITIES FOR BIDDING.
2. EXCAVATION VOLUMES SHOWN ON THIS SHEET REPRESENT THE DIFFERENCE BETWEEN EXISTING GROUND AND PROPOSED SUBGRADE SURFACE.

CONTROL POINT TABLE

POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
22	778418.46	1935220.45	3970.71	CP22

POINT TABLE

POINT NUMBER	NORTHING	EASTING	ELEVATION	DESCRIPTION
500	778248.58	1935068.24	3960.00	BOTTOM OF RIPRAP
501	778236.09	1935099.39	3952.50	BOTTOM OF RIPRAP
502	778321.92	1935169.74	3952.50	BOTTOM OF RIPRAP
503	778265.31	1935210.16	3952.50	BOTTOM OF RIPRAP
504	778255.23	1935221.68	3952.50	BOTTOM OF RIPRAP
505	778269.51	1935215.53	3954.15	BOTTOM OF RIPRAP
506	778367.09	1935173.52	3960.00	BOTTOM OF RIPRAP
507	778373.59	1935170.72	3960.00	BOTTOM OF RIPRAP
508	778390.14	1935184.28	3960.00	BOTTOM OF RIPRAP
509	778371.41	1935192.35	3959.50	BOTTOM OF RIPRAP
510	778273.83	1935234.36	3954.15	BOTTOM OF RIPRAP
511	778376.08	1935203.19	3952.50	BOTTOM OF RIPRAP
512	778393.82	1935197.98	3959.50	BOTTOM OF RIPRAP
513	778378.14	1935210.23	3952.50	BOTTOM OF RIPRAP
514	778259.51	1935244.34	3952.50	BOTTOM OF RIPRAP
515	778266.56	1935268.33	3965.00	BOTTOM OF RIPRAP
516	778384.99	1935233.57	3965.00	BOTTOM OF RIPRAP

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M:\1447\035\ACAD\SHEETS\C-7 GRADING PLAN.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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MONTANA REGISTERED PROFESSIONAL ENGINEER
JOSEPH T. SMITH
No. 20156 PE

DRAWN BY: CRH
DSGN BY: NK
CHKD BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM

WHEATLAND COUNTY — MONTANA

ROCK RAMP SUBGRADE GRADING PLAN

PROJECT NUMBER 1447.035
SHEET NUMBER 7
DRAWING NUMBER C-7

GENERAL STRUCTURAL NOTES:

DESIGN CODES AND STANDARDS:

1. 2009 INTERNATIONAL BUILDING CODE (IBC)
2. ASCE 7-05 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
3. ACI 318-08 BUILDING CODE REQUIREMENTS FOR CONCRETE STRUCTURES
4. AMERICAN WELDING SOCIETY (AWS) D1.1-04 "STRUCTURAL WELDING CODE"

DESIGN LOADS:

1. DEAD LOADS: CONCRETE = 150 PCF

2. LIVE LOADS/WATER = 62.4 pcf

3. WIND LOADS: BASIC WIND SPEED (3-SECOND GUST) = 90 MPH
   WIND IMPORTANCE FACTOR = 1.0
   WIND EXPOSURE = C

4. SEISMIC LOADS: SEISMIC DESIGN CATEGORY = B
   - OCCUPANCY CATEGORY = I
   - MAPPED ACCELERATION PARAMETER: S_S = 0.301, S_1 = 0.101
   - SOIL SITE CLASS = C
   - DESIGN SPECTRAL ACCELERATION PARAMETER, S_{DS} = 0.241, S_{D1} = 0.114

5. EARTH PRESSURES:
   ABOVE GROUND WATER
   LATERAL ACTIVE EARTH PRESSURE (EQUIV. FLUID WT.) = 36PCF

   BELOW GROUND WATER
   LATERAL ACTIVE EARTH PRESSURE (EQUIV. FLUID WT.) = 82 PCF

   FRICTION COEFFICIENT BETWEEN FOOTING BASE AND SUPPORTING SOIL = 0.5

   LATERAL EARTH BEARING RESISTANCE (PASSIVE) = 300 PSF/FT.

MISCELLANEOUS:

1. STRUCTURAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH SITE CIVIL FOR BIDDING AND CONSTRUCTION. CONTRACTOR SHALL NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO BIDDING AND CONSTRUCTION.

2. SEE CIVIL DRAWINGS FOR NON-STRUCTURAL ELEMENTS. STRUCTURAL DRAWINGS SHOW THIS INFORMATION FOR COORDINATION PURPOSES ONLY.

3. DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY INDICATED BUT ARE OF SIMILAR CHARACTER TO DETAILS SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED, SUBJECT TO REVIEW AND APPROVAL BY THE ENGINEER.

4. ENGINEER SHALL REVIEW SHOP DRAWINGS ONLY FOR THE CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND FOR COMPLIANCE WITH THE INFORMATION GIVEN IN THE CONTRACT DOCUMENTS. DIMENSIONS AND QUANTITIES NOTED ON THE SHOP DRAWINGS ARE NOT GUARANTEED BY THE ENGINEER, AND THEREFORE, MUST BE VERIFIED BY THE GENERAL CONTRACTOR. CONTRACTOR IS RESPONSIBLE FOR INFORMATION THAT PERTAINS TO THE FABRICATION PROCESSES OR TO TECHNIQUES OF CONSTRUCTION, AND FOR COORDINATION OF THE WORK OF ALL TRADES. SHOP DRAWINGS MUST BE REVIEWED, STAMPED, AND SIGNED BY THE CONTRACTORPRIOR TO THE REVIEW BY THE ENGINEER.

5. THE STRUCTURE SHALL BE ADEQUATELY BRACED FOR SOIL, WIND, EARTHQUAKE AND CONSTRUCTION LOADS UNTIL ALL FLOOR, ROOF, AND WALL UNITS HAVE BEEN PERMANENTLY ATTACHED THERETO.

REQUIRED SPECIAL INSPECTIONS AND TESTING:

1. IN ADDITION TO REGULAR INSPECTIONS, THE FOLLOWING ITEMS WILL ALSO REQUIRE SPECIAL INSPECTIONS AND TESTING IN ACCORDANCE WITH SECTION 1704, 1707, AND 1708 OF THE 2009 INTERNATIONAL BUILDING CODE.

   a) SPECIAL INSPECTIONS (1704):
      - INSPECTION OF FABRICATORS (1704.2)
      - CONCRETE CONSTRUCTION (1704.4)
      - SOILS (1704.7)

   b) STRUCTURAL TESTING FOR SEISMIC RESISTANCE (1708):
      - REINFORCING STEEL (1708.3)

2. THE CONTRACTOR OR ITS AUTHORIZED AGENT SHALL EMPLOY A QUALIFIED TESTING AGENCY TO PROVIDE INSPECTION AND TESTING OF REQUIRED STRUCTURAL ITEMS IN ACCORDANCE WITH THE STATEMENT OF SPECIAL INSPECTIONS PREPARED BY THE STRUCTURAL ENGINEER OF RECORD.

3. IN ACCORDANCE WITH SECTION 1706.1 OF THE IBC, THE CONTRACTOR IS REQUIRED TO ACKNOWLEDGE THEIR AWARENESS OF AND THIER PLANS FOR OBTAINING CONFORMANCE WITHIN THEIR OWN ORGANIZATION TO THE STATEMENT OF SPECIAL INSPECTIONS. A FORM OUTLINING THE CONTRACTOR'S RESPONSIBILITIES WILL BE PROVIDED BY THE STRUCTURAL ENGINEER OF RECORD FOR THE CONTRACTOR'S USE IN MEETING THE REQUIREMENTS OF IBC SECTION 1706.1.

EARTHWORK:

1. FOUNDATIONS HAVE BEEN BASED ON AN ALLOWABLE BEARING PRESSURE PER IBC TABLE 1804.2. ALLOWABLE SOIL BEARING CAPACITY OF WALL FOOTINGS SUPPORTED ON NATIVE SOIL MATERIAL WITH 1'-0" OF STRUCTURAL FILL IS 3000 PSF.

2. ALLOWABLE SOIL BEARING CAPACITY OF SPREAD FOOTINGS SUPPORTED ON NATIVE COLLUVIUM, ALLUVIUM, BEDROCK, OR PLACED AND COMPACTED STRUCTURAL FILL IS 3000 PSF.

3. DATA ON INDICATED SUBSURFACE CONDITIONS ARE NOT INTENDED AS REPRESENTATIONS OR WARRANTIES OF CONTINUITY OF SUCH CONDITIONS. IT IS EXPRESSLY UNDERSTOOD THAT OWNER AND ENGINEER WILL NOT BE RESPONSIBLE FOR INTERPRETATIONS OR CONCLUSIONS DRAWN THEREFROM BY THE CONTRACTOR. THE DATA ARE MADE AVAILABLE FOR CONVENIENCE OF THE CONTRACTOR.

4. STABILITY OF CONSTRUCTION EXCAVATION AND WORKER SAFETY ARE THE RESPONSIBILITY OF THE CONTRACTOR. TEMPORARY CONSTRUCTION EXCAVATIONS, ABOVE GROUNDWATER, TO BE PLANNED IN ACCORDANCE WITH OSHA PROVISIONS SHOULD ASSUME TYPE B MATERIAL FOR STIFF CLAY, AND TYPE C MATERIAL FOR SAND.

5. GROUNDWATER MAY BE PRESENT DURING CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL DEWATERING.

6. KEEP EXCAVATIONS FREE OF STANDING WATER. REMOVE AND REPLACE MATERIAL THAT IS NOT WITHIN 3% OF OPTIMUM MOISTURE PRIOR TO PLACING ADDITIONAL FILL OR CONCRETE.

7. PROPER DRAINAGE SHALL BE MAINTAINED DURING CONSTRUCTION TO KEEP SURFACE RUNOFF FROM ENTERING THE EXCAVATIONS AND DIRECTED AWAY FROM THE STRUCTURE.

8. ALL EXCAVATION IS UNCLASSIFIED, REGARDLESS OF THE MATERIAL ENCOUNTERED.

9. SUB-EXCAVATE ALL EXISTING FILL TO BOTTOM OF FOOTING OR SLAB ELEVATION AS INDICATED IN THE DRAWINGS. ONCE EXCAVATION HAS REACHED BOTTOM OF FOOTING OR SLAB ELEVATION SUB-EXCAVATE ADDITIONAL 1'-0" AND REPLACE WITH STRUCTURAL FILL TO BOTTOM OF FOOTING OR BOTTOM OF SLAB ELEVATION AS INDICATED IN DRAWINGS. OVER-EXCAVATE ½ FOOT IN THE HORIZONTAL DIRECTION FOR EVERY VERTICAL FOOT EXCAVATED BELOW BOTTOM OF SLAB OR FOOTING.

10. STRUCTURAL FILL AND BACKFILL MATERIAL SHALL BE IMPORTED CLEAN SANDY GRAVEL MEETING THE GRADATION REQUIREMENTS: 100 PERCENT PASSING 3", 26-60 PERCENT PASSING THE #4 SIEVE, AND 5 PERCENT (MAX.) PASSING THE #200 SIEVE.

11. STRUCTURAL FILL AND BACKFILL SHALL BE PLACED IN MAXIMUM LOOSE LIFTS OF 8" AND COMPACTED TO 95% OF ASTM D698.

12. USE ONLY HAND OPERATED COMPACTION EQUIPMENT WITHIN 5 FT. OF STRUCTURES.

13. DO NOT PLACE BACKFILL UNTIL ALL SUPPORTING STRUCTURES ARE IN PLACE AND CONCRETE WALLS AND SLABS HAVE ACHIEVED THE SPECIFIED 28-DAY COMPRESSIVE STRENGTH UNLESS OTHERWISE NOTED ON DRAWINGS.

14. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

CONCRETE:

1. CONCRETE PROPERTIES (SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS):

CAST-IN-PLACE CONCRETE	FOOTINGS/ FOUNDATION WALLS
MINIMUM 28 DAY COMPRESSIVE STRENGTH	4000 PSI
MAXIMUM WATER-CEMENT RATIO (BY WT.)	0.43
MAXIMUM AGGREGATE SIZE	¾"
PERCENT RANGE OF AIR CONTENT	6.5% ± 1.5%**
MAXIMUM SLUMP	4" ***

*** MAXIMUM SLUMP MAY BE INCREASED TO 8" W/ THE USE OF WATER-REDUCING ADMIXTURES TO MAINTAIN THE SPECIFIED W/C RATIO.

2. ALL CONCRETE REINFORCING SHALL CONFORM TO ASTM A615, GRADE 60, EXCEPT FOR REINFORCING INDICATED AS REQUIRING WELDING, WHICH SHALL CONFORM TO ASTM A706, GR.60.

3. CLEARANCE FOR REINFORCEMENT BARS, UNLESS SHOWN OTHERWISE, SHALL BE:
   WHEN PLACED ON GROUND: --- 3"
   EXPOSED TO WATER, WEATHER,
   BACKFILL OR CONDENSATION:
   #5 BAR OR SMALLER --------2"
   #6 BAR OR LARGER ---------2"

4. ALL BENDS, UNLESS OTHERWISE SHOWN, SHALL BE A 90 DEGREE STANDARD HOOK AS DEFINED IN THE LATEST EDITION OF ACI 318. DETAIL ALL REINFORCEMENT IN ACCORDANCE WITH ACI 315.

5. ALL REINFORCEMENT LAPS, UNLESS OTHERWISE NOTED, SHALL BE AS FOLLOWS:

DETAIL OF REINFORCEMENT - LAP LENGTHS **

BAR SIZE		#3	#4	#5	#6	#7	#8	#9	#10	#11
CONCRETE DESIGN STRENGTH		4000 PSI								
GR 60	TOP BAR *	1'-9"	2'-5"	3'-0"	3'-7"	5'-3"	6'-0"	6'-9"	7'-7"	8'-6"
	OTHER BAR	1'-5"	1'-9"	2'-4"	2'-6"	4'-0"	4'-7"	5'-2"	5'-10"	6'-7"

* TOP BARS SHALL BE DEFINED AS ANY HORIZONTAL BARS PLACED SUCH THAT MORE THAN 12" OF FRESH CONCRETE IS CAST IN THE MEMBER BELOW THE BAR, IN ANY SINGLE POUR. HORIZONTAL WALL BARS ARE CONSIDERED TOP BARS.

** INCREASE LAP LENGTHS SHOWN ABOVE BY 25% WHERE BARS ARE SPACED CLOSER THAN 6" O.C. OR WHERE EDGE OF BAR MEASURED IN DIRECTION OF SPACING IS LESS THAN 3" FROM FACE OF MEMBER.

6. TOLERANCES IN PLACING REINFORCEMENT SHALL BE: +/- 3/8 IN. FOR MEMBERS WITH D LESS THAN 8 IN. +/- 1/2 IN. FOR MEMBERS WITH D GREATER THAN 8 IN. WHERE D IS THE DISTANCE FROM THE OPPOSITE FACE OF CONCRETE TO THE CENTER OF THE REINFORCING.

7. METAL CLIPS OR SUPPORTS SHALL NOT BE PLACED IN CONTACT WITH THE FORMS OR THE SUBGRADE. CONCRETE BLOCKS OR DOBBIES SUPPORTING BARS ON SUBGRADE SHALL BE IN SUFFICIENT NUMBERS TO SUPPORT THE BARS WITHOUT SETTLEMENT, BUT IN NO CASE SHALL SUCH SUPPORT BE CONTINUOUS.

8. DOWELS SHALL BE THE LENGTH INDICATED. DOWELS SHALL BE WIRED IN POSITION PRIOR TO POURING CONCRETE.

9. AT ALL FOUNDATION/CONCRETE WALL AND FOOTING CORNERS AND WALL INTERSECTIONS, CORNER BARS SHALL BE PROVIDED TO MATCH THE HORIZONTAL BARS. SEE FOUNDATION DETAILS(1/S-4 & 2/S-4)

10. UNLESS INDICATED OTHERWISE, ALL ANCHOR BOLTS, HOLDOWNS AND OTHER REQUIRED ACCESSORIES SHALL BE WIRED IN PLACE PRIOR TO FOUNDATION INSPECTION AND CONCRETE PLACEMENT. DO NOT STAB THE ABOVE LISTED ITEMS INTO FRESH CONCRETE AFTER PLACEMENT. PROPERLY VIBRATE AROUND INSTALLED ITEMS TO ENSURE PROPER CONSOLIDATION OF CONCRETE.

11. WHERE SLAB OR WALL CONSTRUCTION REQUIRES CONSTRUCTION JOINTS PROVIDE A ROUGHENED BONDED SURFACE WITH LAPPED REINFORCEMENT AS INDICATED IN DETAIL 3/S-4.

12. PROVIDE VERTICAL CONSTRUCTION JOINT AT END OF POUR PER DETAIL 6/S-4. LENGTH OF WALL POUR SHALL BE 60'-0" OR LESS BETWEEN CONSTRUCTION JOINTS.

13. WHERE "DRILLING & EPOXYING" OF REINFORCING STEEL OR THREADED ANCHOR RODS (ASTM A36, U.N.O.) IS INDICATED, UNLESS NOTED OTHERWISE, PROVIDE THE FOLLOWING SYSTEM OR APPROVED EQUIVALENT:

APPLICATION	EPOXY SYSTEM
NEW OR EXISTING CONCRETE.	HILTI HIT HY200

14. SEE SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

STRUCTURAL ABBREVIATIONS

ABUT.	- ABUTMENT
A.C.I.	- AMERICAN CONCRETE INSTITUTE
A.F.F.	- ABOVE FINISHED FLOOR
A.I.S.C.	- AMERICAN INSTITUTE OF STEEL CONSTRUCTION
A.N.S.I.	- AMERICAN NATIONAL STANDARDS INSTITUTE
A.W.S.	- AMERICAN WELDING SOCIETY
B.B.	- BACK TO BACK
BLKG.	- BLOCKING
BOT.	- BOTTOM
BSMT.	- BASEMENT
B.U.	- BUILT-UP
CCJ	- CONCRETE CONTROL JOINT
CEJ	- CONCRETE EXPANSION JOINT
CRJ	- CONCRETE CONSTRUCTION JOINT
CIJ	- CONCRETE ISOLATION JOINT
CH.FL.PL.	- CHECKERED FLOOR PLATE
CTRD.	- CENTERED
°	- DEGREE
DWL	- DOWEL
D.O.	- DOOR OPENING
E.	- EAST
EA.	- EACH
FTG.	- FOOTING
GL.	- GLUE LAMINATED
G.L.B.	- GLUE LAMINATED BEAM
GR.	- GRADE
G.W.	- GROUND WATER
H.C.M.	- HOLLOW CLAY MASONRY
HORIZ.	- HORIZONTAL
I.B.C.	- INTERNATIONAL BUILDING CODE
I.C.B.O.	- INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS
INV.	- INVERT
KIP	- 1000 POUNDS
LAM.	- LAMINATED
L.L.V.	- LONG LEG VERTICAL
L.L.H.	- LONG LEG HORIZONTAL
LONG.	- LONGITUDINAL REINFORCEMENT
L.V.L.	- LAMINATED VENEER LUMBER
MK.	- MARK
M.O.	- MASONRY OPENING
MTD.	- MOUNTED
MTL.	- METAL
N.	- NORTH
O.C.	- ON CENTER
OPP.	- OPPOSITE
O.W.J.	- OPEN WEB JOIST
P.A.F.	- POWDER ACTUATED FASTENERS
PCS.	- PIECES
PSF	- POUNDS PER SQ. FT
PSI	- POUNDS PER SQ. INCH
P.T.	- PRESSURE TREATED
R.	- RISER
RD.	- ROUND
REINF.	- REINFORCEMENT BARS
RM.	- ROOM
S.	- SOUTH
S.F.	- SQUARE FEET
SFC.	- SURFACE
S.G.T.	- STRUCTURAL GLAZED TILE
SHT'G.	- SHEATHING
S.I.	- SQUARE INCHES
S.I.P.	- STRUCTURAL INSULATED PANEL
S.L.V.	- SHORT LEG VERTICAL
SPA.	- SPACES
SST	- STAINLESS STEEL
STIRR.	- STIRRUP
STR.	- STRAIGHT
S.Y.	- SQUARE YARD
T.	- TREAD OR TON
THD.	- THREAD
TJI	- TRUSS JOIST
TMBR.	- TIMBER
T.O.D.	- TOP OF DECK/SHEATHING
T.O.F.	- TOP OF FOOTING
T.O.SL.	- TOP OF SLAB
T.O.W.	- TOP OF WALL
TRANS.	- TRANSVERSE REINFORCEMENT
U.N.O.	- UNLESS NOTED OTHERWISE
VERS.	- VERTICAL REINFORCEMENT
VERT.	- VERTICAL
W	- WEST
W.I	- WROUGHT IRON
W.P.	- WORKING POINT

VERIFY SCALE!
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REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447-035\ACAD\SHEETS\S-1 STRUCTURAL NOTES.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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MONTANA — JAY B. FISCHER — No. 16836 PE — LICENSED PROFESSIONAL ENGINEER

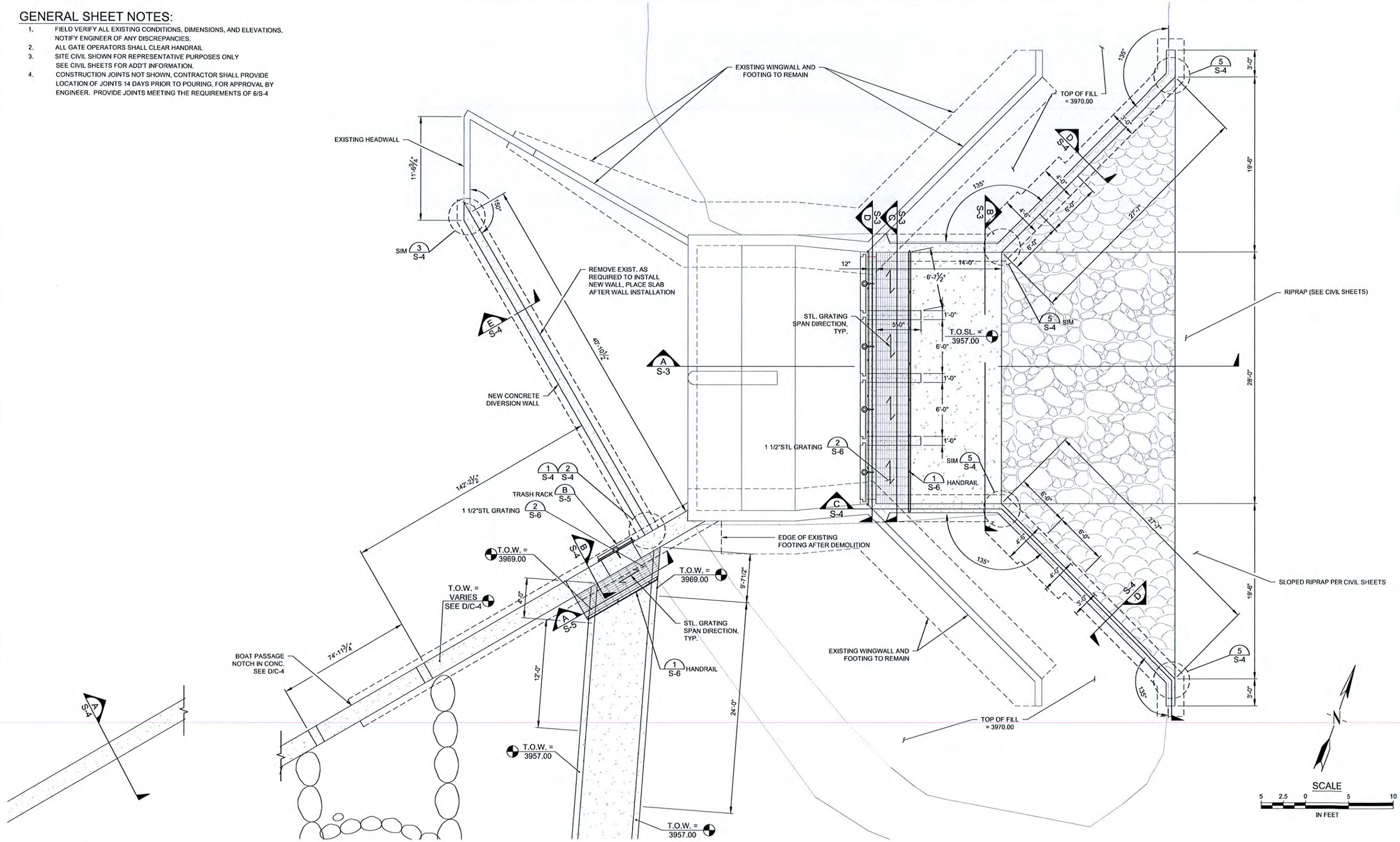
DRAWN BY: CRH
DSGN. BY: JBF
APPR. BY: ---
DATE: 3/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA
STRUCTURAL NOTES

PROJECT NUMBER 1447.035
SHEET NUMBER 8
DRAWING NUMBER S-1

GENERAL SHEET NOTES:

1. FIELD VERIFY ALL EXISTING CONDITIONS, DIMENSIONS, AND ELEVATIONS. NOTIFY ENGINEER OF ANY DISCREPANCIES.
2. ALL GATE OPERATORS SHALL CLEAR HANDRAIL
3. SITE CIVIL SHOWN FOR REPRESENTATIVE PURPOSES ONLY SEE CIVIL SHEETS FOR ADD'T INFORMATION.
4. CONSTRUCTION JOINTS NOT SHOWN, CONTRACTOR SHALL PROVIDE LOCATION OF JOINTS 14 DAYS PRIOR TO POURING, FOR APPROVAL BY ENGINEER. PROVIDE JOINTS MEETING THE REQUIREMENTS OF 6/S-4



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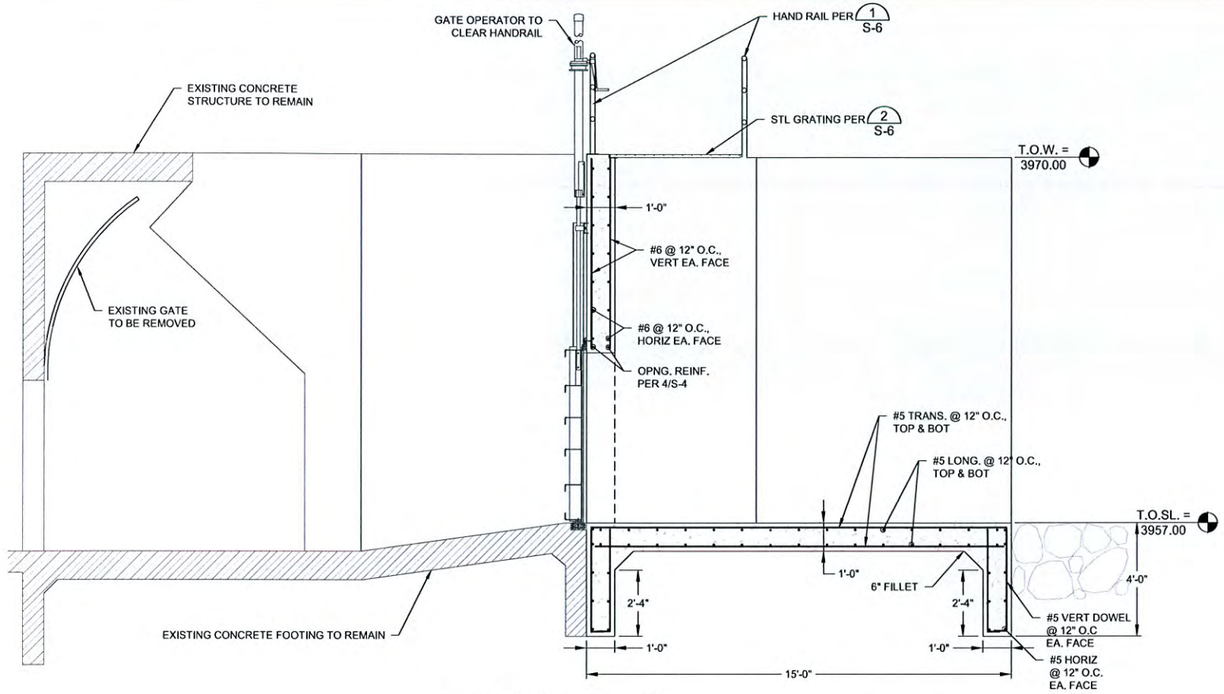
MONTANA REGISTERED PROFESSIONAL ENGINEER JAY B. FISCHER No.18836 PE LICENSED

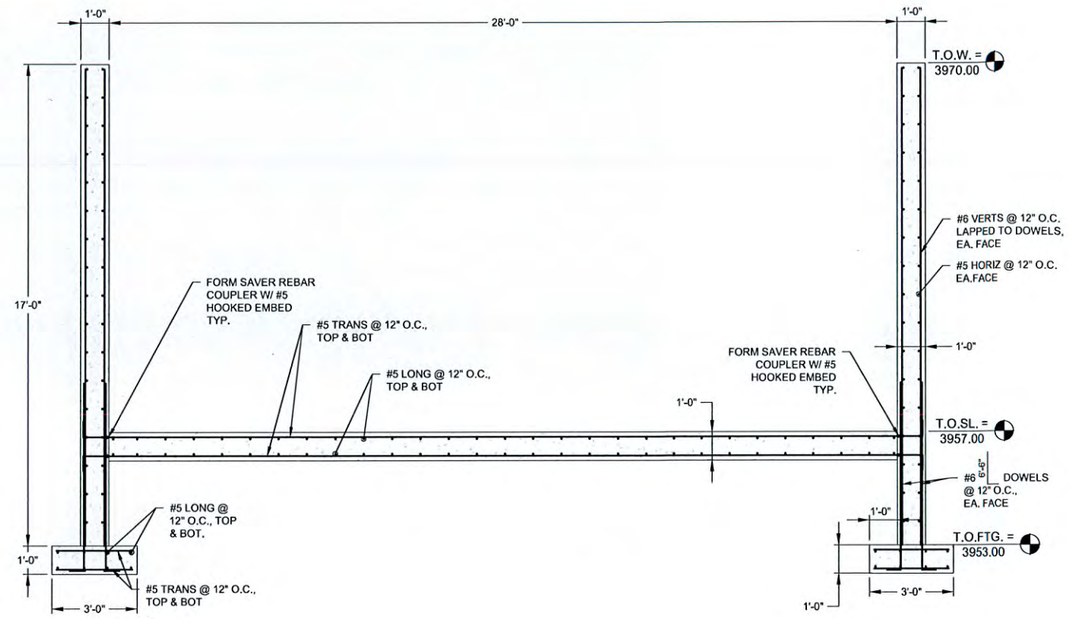
DRAWN BY: CRH
DSGN. BY: JBF
APPR. BY: —
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA
STRUCTURAL PLAN

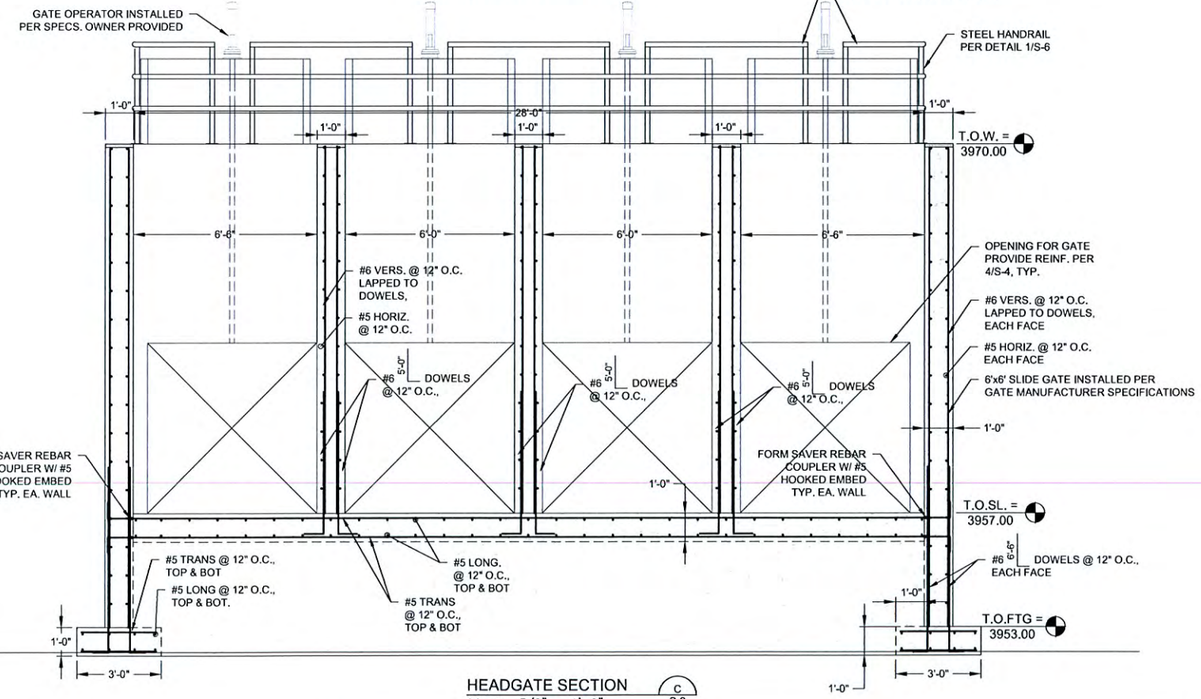
PROJECT NUMBER 1447.035
SHEET NUMBER 9
DRAWING NUMBER S-2



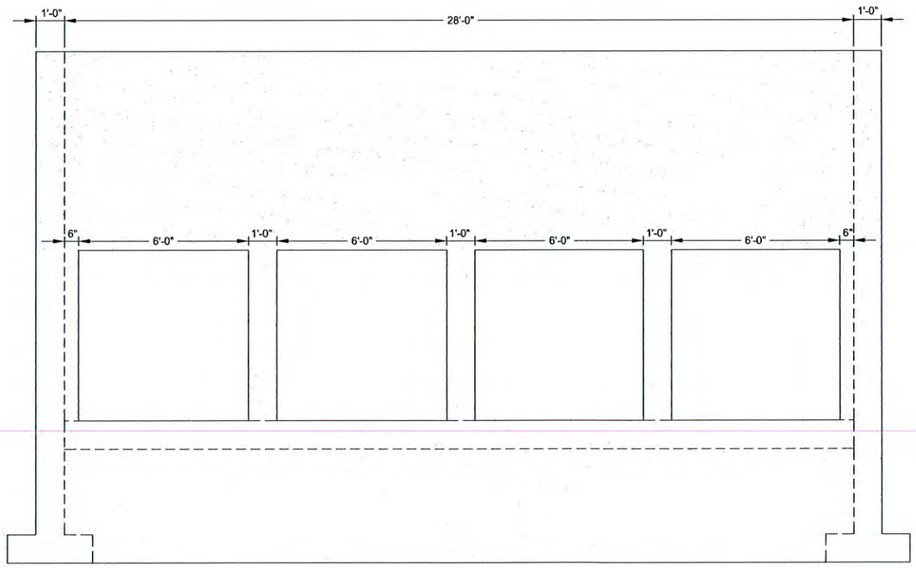
HEADGATE SECTION (A) S-2
SCALE: 3/8" = 1'-0"



HEADGATE SECTION (B) S-2
SCALE: 3/8" = 1'-0"



HEADGATE SECTION (C) S-2
SCALE: 3/8" = 1'-0"



HEADGATE SECTION (D) S-2
SCALE: 3/8" = 1'-0"

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REVISIONS			
NO.	DESCRIPTION	DATE	BY

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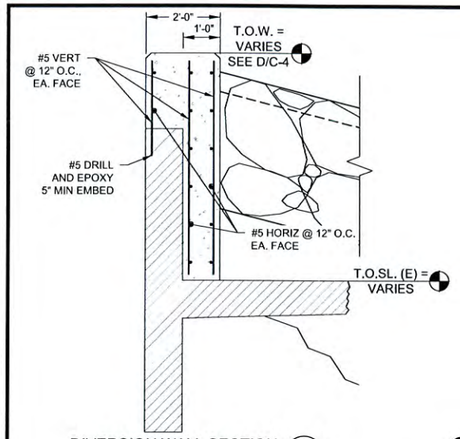
MONTANA — JAY B. FISCHER No. 18836 PE — LICENSED PROFESSIONAL ENGINEER

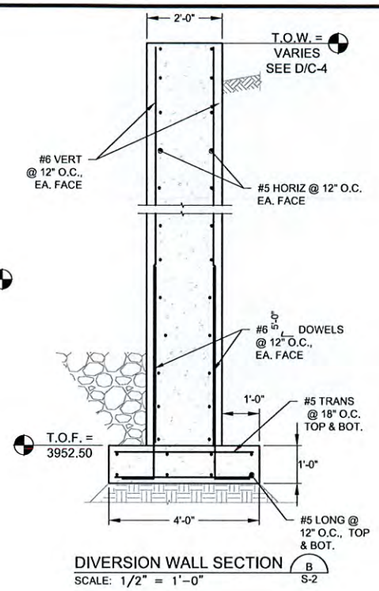
DRAWN BY: CRH
DSGN. BY: JBF
APPR. BY: ---
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY — MONTANA
STRUCTURAL SECTIONS

PROJECT NUMBER 1447.035
SHEET NUMBER 10
DRAWING NUMBER S-3



DIVERSION WALL SECTION (A)
SCALE: 1/2" = 1'-0" S-2



DIVERSION WALL SECTION (B)
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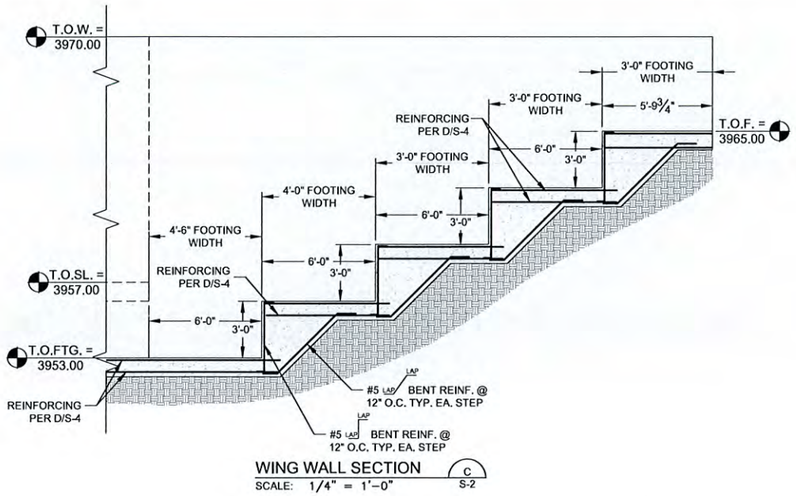

WING WALL SECTION (C)
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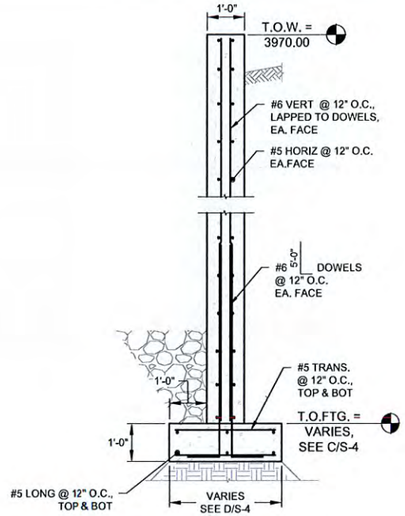

WING WALL SECTION (D)
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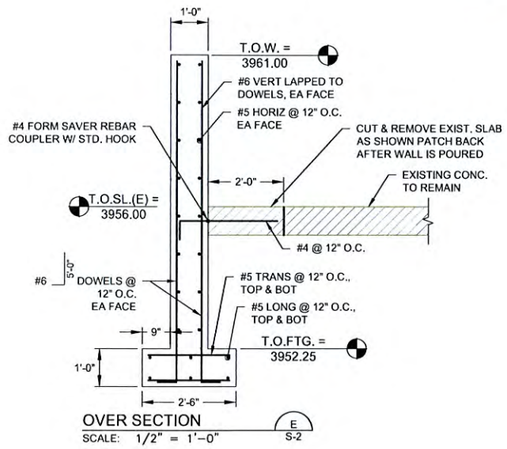
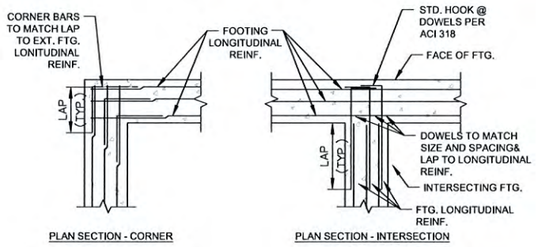


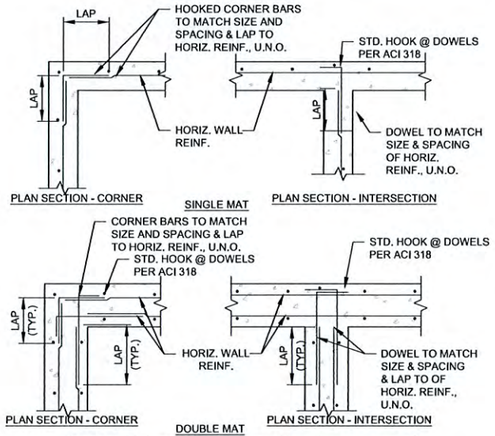
OVER SECTION (E)
SCALE: 1/2" = 1'-0" S-2



PLAN SECTION - CORNER
PLAN SECTION - INTERSECTION

NOTES:
1. TRANSVERSE & DOWEL REINF. NOT SHOWN, PROVIDE PER FDN. DETAILS.
2. SEE GENERAL STRUCTURAL NOTES FOR LAP LENGTHS.

FOUNDATION DETAIL (1)
SCALE: NTS S-1 S-2



PLAN SECTION - CORNER
PLAN SECTION - INTERSECTION

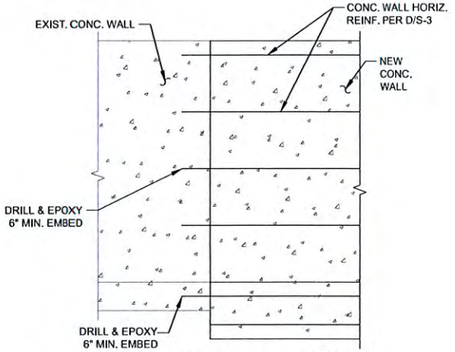
SINGLE MAT

PLAN SECTION - CORNER
PLAN SECTION - INTERSECTION

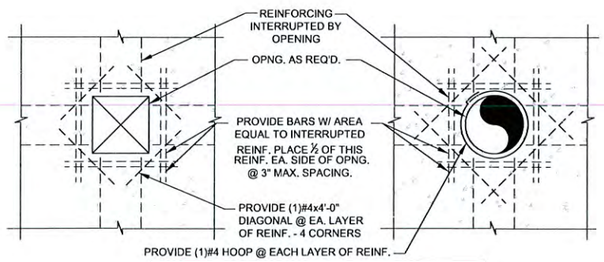
DOUBLE MAT

NOTES:
1. SEE GENERAL STRUCTURAL NOTES FOR LAP LENGTHS.

FOUNDATION DETAIL (2)
SCALE: NTS S-1 S-2

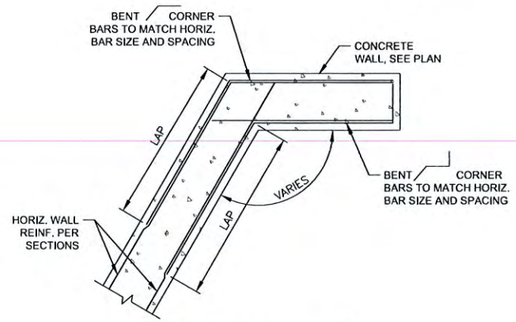


FOUNDATION DETAIL (3)
SCALE: 3/4" = 1'-0" S-2

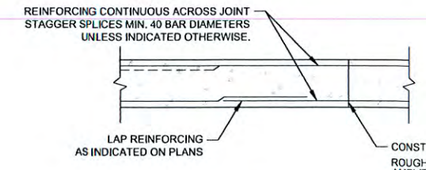


NOTE:
OMIT ADDITIONAL REINF. FOR OPENING DIAMETER < 12"

OPENING DETAIL (4)
SCALE: 3/4" = 1'-0" S-2



FOUNDATION DETAIL (5)
SCALE: NTS S-2



PLAN

VERTICAL CONSTRUCTION JOINT (6)
SCALE: NTS S-1

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MODIFY SCALE ACCORDINGLY!

REVISIONS

NO.	DESCRIPTION	DATE	BY

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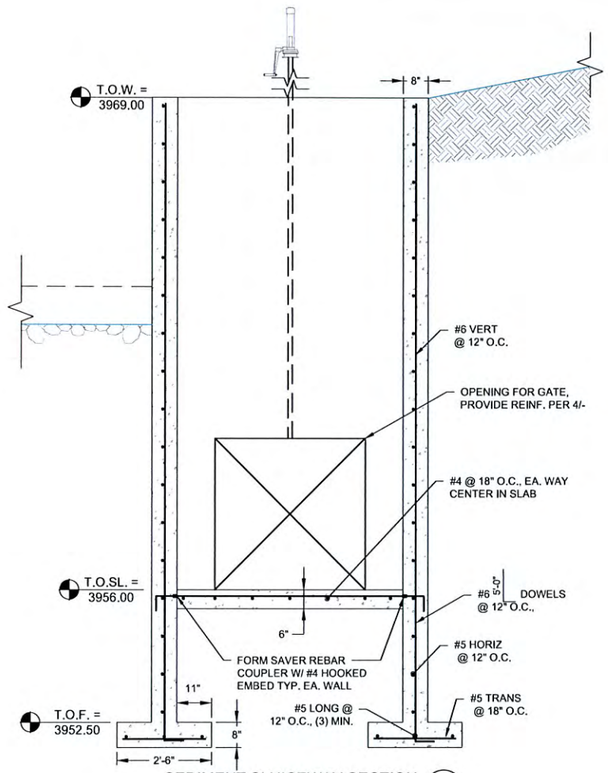
MONTANA REGISTERED PROFESSIONAL ENGINEER
JAY B. FISCHER
No. 18836 PE

DRAWN BY: CRH
DSGN. BY: JBF
APPR. BY: * * *
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

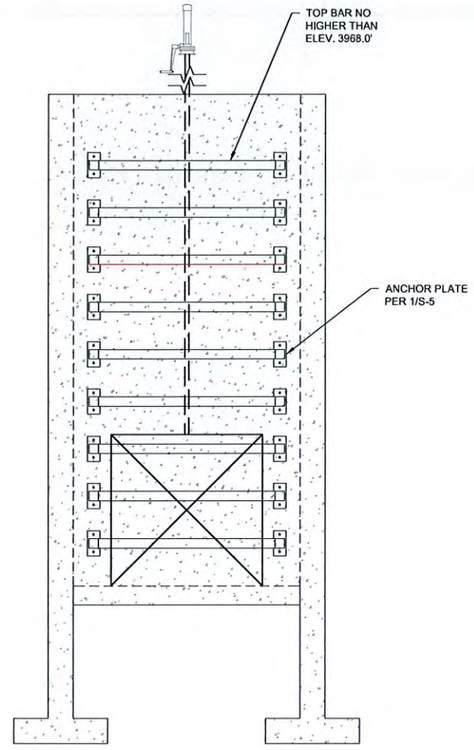
DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA

STRUCTURAL SECTIONS AND DETAILS

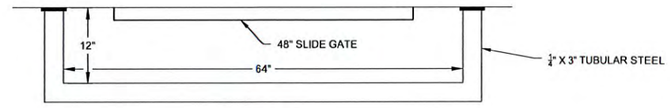
PROJECT NUMBER 1447.035
SHEET NUMBER 11
DRAWING NUMBER S-4



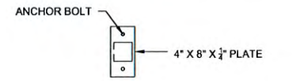
SEDIMENT SLUICEWAY SECTION (A, S-2)
SCALE: 1/2" = 1'-0"



TRASH RACK SECTION (B, S-2)
SCALE: 1/2" = 1'-0"



PLAN VIEW



TRASH RACK DETAILS (1, S-5)
SCALE: 1" = 1'-0"

VERIFY SCALE!
THESE PRINTS MAY BE REDUCED. LINE BELOW MEASURES ONE INCH ON ORIGINAL DRAWING.
MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\S-5 STRUCTURAL SECTIONS AND DETAILS.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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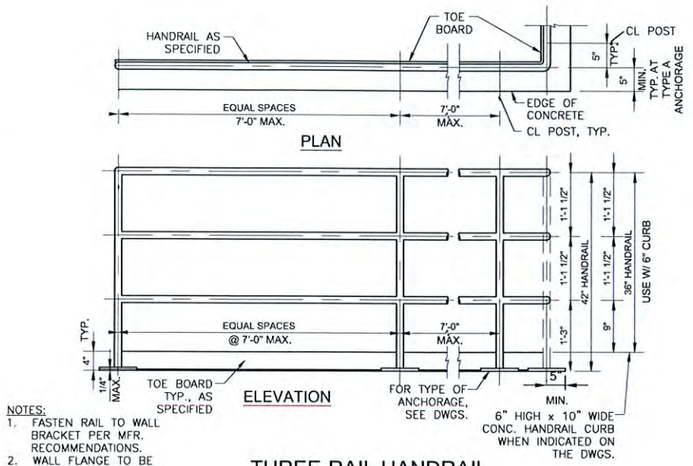
MONTANA JAY B. FISCHER No. 16836 PE LICENSED PROFESSIONAL ENGINEER

DRAWN BY: CRH
DSGN. BY: NK
APPR. BY: JTS
DATE: 06/2014
Q.C. REVIEW BY: TDM
DATE: 06/27/14

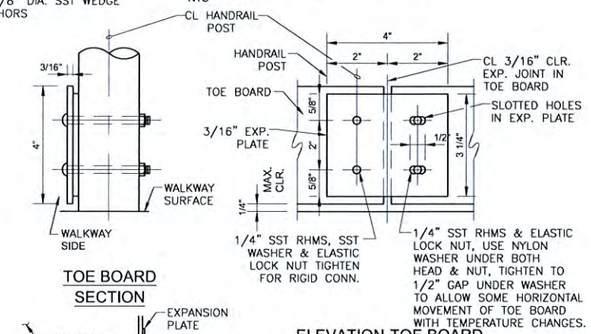
DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY MONTANA
STRUCTURAL SECTIONS AND DETAILS

PROJECT NUMBER 1447.035
SHEET NUMBER 12
DRAWING NUMBER S-5

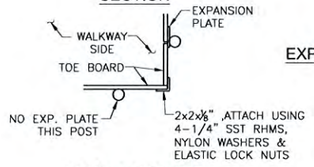


NOTES:
1. FASTEN RAIL TO WALL BRACKET PER MFR. RECOMMENDATIONS.
2. WALL FLANGE TO BE MOUNTED TO WALL W/ 2-3/8" DIA. SST WEDGE ANCHORS

THREE-RAIL HANDRAIL
NTS



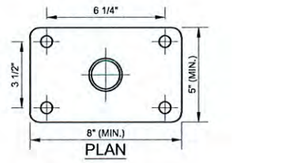
ELEVATION-TOE BOARD EXPANSION PLATE CONNECTION



PLAN-TOE BOARD INSIDE CORNER
(OUTSIDE CORNER SIMILAR)

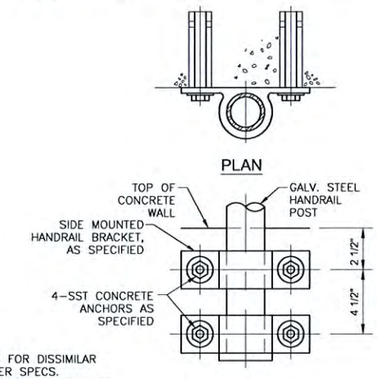
NOTES:
1. WHERE BOLTED BASE PLATE EXTENDS ABOVE WALKWAY SURFACE, NOTCH TOE BOARD TO FIT ROUND BASE PLATE WITH MAX. OF 1/4" GAP.
2. TOE BOARD TO BE MOUNTED ON WALKWAY SIDE OF HANDRAIL.
3. RHMS = ROUND HEAD MACHINE SCREW AS SPECIFIED, SST.

HANDRAIL TOE BOARD
NTS



NOTE:
PROVIDE PROTECTION FOR DISSIMILAR METALS & CONCRETE PER SPECS.

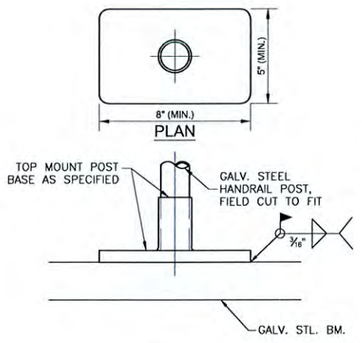
HANDRAIL POST ANCHORAGE
NTS



NOTES:
1. PROVIDE PROTECTION FOR DISSIMILAR METAL AND CONC. PER SPECS.
2. USE SIDE MOUNTED HANDRAIL BRACKET AS A TEMPLATE FOR THE ANCHOR BOLTS.
3. MAINTAIN THE CLEARANCES BETWEEN THE TOE BOARD & THE CONCRETE SURFACES REQUIRED BY ALL STATE & FEDERAL SAFETY REQUIREMENTS.

TYPE "D"

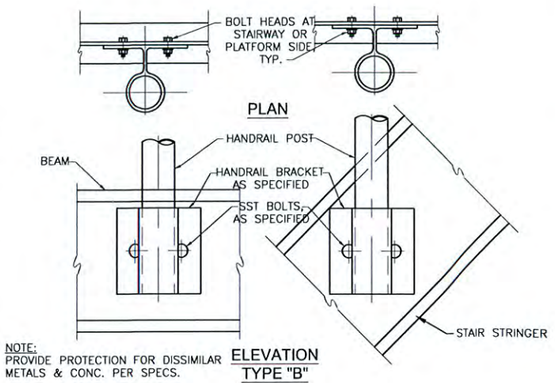
HANDRAIL POST ANCHORAGE
NTS



TYPE "C"

NOTE:
PROVIDE PROTECTION FOR DISSIMILAR METALS & CONC. PER SPECS.

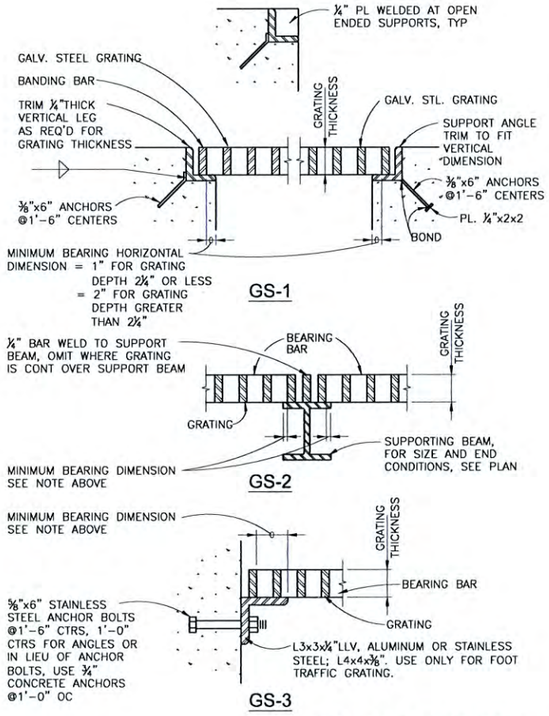
HANDRAIL POST ANCHORAGE
NTS



NOTE:
PROVIDE PROTECTION FOR DISSIMILAR METALS & CONC. PER SPECS.

ELEVATION
TYPE "B"

HANDRAIL POST ANCHORAGE
NTS



GRATING NOTES

1. GRATING SPAN ⟷ SEE PLAN.
2. WIDTH OF GRATING SECTIONS SHALL NOT EXCEED 3'-0".
3. SHOP DRAWINGS BASED ON FIELD DIMENSIONS SHALL BE SUBMITTED TO THE ENGINEER PRIOR TO FABRICATION.
4. MATERIAL FOR SUPPORTS OF STEEL AND ALUMINUM GRATING TO BE SAME AS GRATING, EXCEPT METAL SUPPORTS THAT ARE TO BE EMBEDDED IN CONCRETE SHALL BE TYPE 316 STAINLESS STEEL.
5. UNLESS NOTED OTHERWISE ON PLANS, GRATING THICKNESS SHALL BE AS TABULATED IN "GRATING THICKNESS TABLE" FOR APPLICABLE TRAFFIC.
6. BEARING BAR THICKNESS FOR GRATING TO BE 3/16" MINIMUM.
7. BAND ALL EDGES WITH 3/16" x DEPTH OF BEARING BAR.
8. PROVIDE MISCELLANEOUS GRATING FASTENERS AS REQUIRED.
9. TYPE OF MATERIAL USED SHALL BE AS SHOWN ON PLANS OR AS SPECIFIED. THIS STANDARD DETAIL INCLUDES 3 TYPES, ALTHOUGH ALL 3 MAY NOT BE INCLUDED IN PROJECT.
10. THE HORIZONTAL CLEARANCE BETWEEN THE GRATING AND GRATING SUPPORTS SHALL NOT BE LESS THAN 1/4"NOR GREATER THAN 1/2" AND AS SPECIFIED.
11. ALL GRATING SECTIONS, WHEN IN PLACE, SHALL ALWAYS BE FIRMLY ANCHORED TO THEIR SUPPORTS AS SPECIFIED.

FOOT TRAFFIC
GRATING THICKNESS TABLE

MAXIMUM SPAN	STEEL (IN.)
3'-6"	1"
4'-0"	1"
4'-6"	1"
5'-0"	1¼"
5'-6"	1¼"
6'-0"	1½"
6'-6"	1½"
7'-0"	1¾"

HAND RAIL STANDARD DETAIL — 1 / S-2
SCALE: NTS

GRATING SUPPORT DETAIL — 2 / S-2
SCALE: NTS

VERIFY SCALE!
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MODIFY SCALE ACCORDINGLY!

REVISIONS			
NO.	DESCRIPTION	DATE	BY

M:\1447\035\ACAD\SHEETS\S-6 STRUCTURAL DETAILS.DWG PLOTTED BY:CHRISTOPHER HAWKINS ON Jun/27/2014

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MONTANA — JAY B. FISCHER — No. 18836 PE — REGISTERED PROFESSIONAL ENGINEER

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DEADMAN'S BASIN DIVERSION DAM
WHEATLAND COUNTY — MONTANA
STRUCTURAL DETAILS

PROJECT NUMBER 1447.035
SHEET NUMBER 13
DRAWING NUMBER S-6