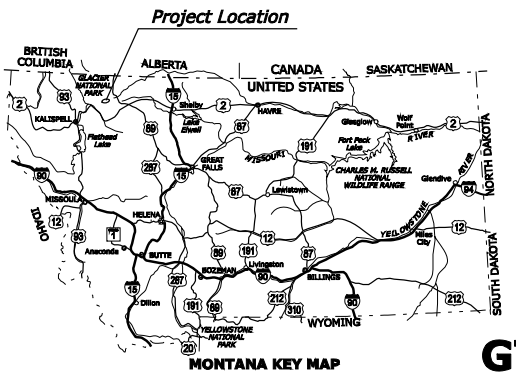
STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	A.1



MONTANA KEY MAP

U. S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
GLACIER NATIONAL PARK

PLANS FOR PROPOSED PROJECT

MT NPS ERFO 2007(1)-45(3)
PMIS PKG. NO. 129927

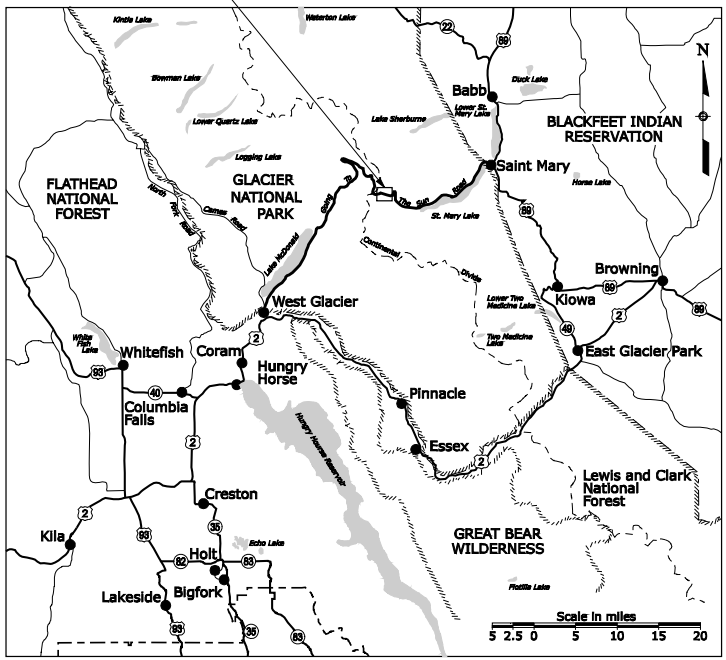
GTSR MP 33 PERMANENT ERFO REPAIRS

(MP 33.44, MP 33.57, AND MP 33.62 DAMAGED SITES)

FLATHEAD COUNTY
MONTANA

See Sheet A.4 for Vicinity Map

LENGTH 0.398 MILES



Preliminary

TYPE OF CONSTRUCTION:

Grading, pavement, base, drainage, and structures.

DESIGN DESIGNATION:

ADT 2026	*3300*
SADT 2026	*4900*
V	*35 MPH*
e (max)	*6%*

SPECIFICATION:

Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 US Customary Units

FEDERAL LANDS HIGHWAY
COMMITMENT TO EXCELLENCE

PLANS PREPARED BY
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION
VANCOUVER, WASHINGTON

WORLD HERITAGE SITE

See Sheet A.2 for Index to Sheets.

RECOMMENDED:

_____ *DATE* _____
Project Manager,
Western Federal Lands Highway Division

APPROVED:

_____ *DATE* _____
Superintendent,
Glacier National Park

PMIS Pkg. No. 129927

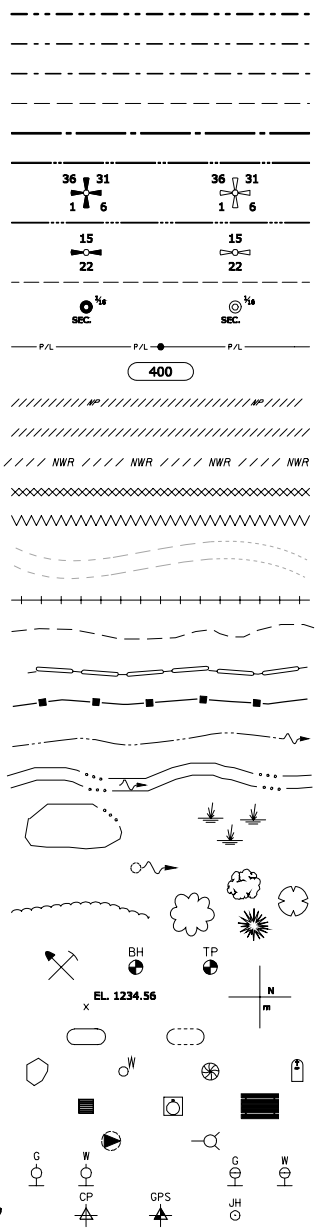
F:\WFS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\V30_Drawings\Sheets_A-General Information\GenerralMap.dgn Date/Time: 08/2007 Designed by: W. McQUISTON Checked by: --/---- A. AHOLA 08/2007

Δ	total central angle
Δc	curve central angle
Ø	diameter
θs	spiral central angle
abut.	abutment
ADT	average daily traffic
AH	ahead
appr.	approach
BK	back
BM	bench mark
BP	balance point
br.	bridge
brg.	bearing
cc or c. to c.	center to center
℄	centerline
clr.	clear
CMP	corrugated metal pipe
col.	column
conc.	concrete
conn.	connection
constr. jt.	construction joint
cont.	continuous
CS	point of curve to spiral
ctrs.	centers
CUFT	cubic foot (feet)
culv.	culvert
CUYD	cubic yard(s)
D	diameter
DHV	design hourly volume
dia.	diameter
diag.	diagonal
diaph.	diaphragm
dist.	distance
drwg(s).	drawing(s)
E	east
e	superelevation rate
El. 94.16 ft	elevation with number
elev.	elevation
emb.	embankment
EP	edge of pavement
EQ or eq.	equation
ER	edge of road
EW	edge of water
exc.	excavation
exp. jt.	expansion joint
fin.	finish
flg.	flange
ft2	square foot
ft3	cubic foot (feet)
ftg.	footing
ga.	gage (gauge)
galv.	galvanized
hdwl.	headwall
hex.	hexagon
HW	high water
ID	inside diameter
jt.	joint
L	length of curve
lam.	lamination
lat.	latitude
LNFT	linear foot (feet)
long.	longitudinal
LPSM	lump sum
Ls	length of spiral
lt. or LT	left
LW	low water
M.L.	main line
M.P.	mile post
matl.	material
max.	maximum
MGAL	thousand gallon
min.	minimum
mon.	monument
N	north
NC	normal crown
o. c.	on center
o. to o.	out to out
OD	outside diameter
OG	original ground
PC	point of curve
PCC	point of compound curve
PCS	point of curve to spiral
PI	point of intersection
pl.	plate
POC	point on curve
POS	point on spiral
POT	point on tangent
PS	point of tangent to spiral
PSC	point of spiral to curve
PST	point of spiral to tangent
PT	point of tangent
pvmt.	pavement
R	radius
R.	range
R/W	right-of-way
rdwy.	roadway
reinf.	reinforcement
reqd.	required
rt. or RT	right
rte.	route
S	south
SADT	seasonal average daily traffic
SC	point of spiral to curve
sec.	section
shldr.	shoulder
SLRY	slurry unit
spa.	spacing, spaces or spaced
SQFT	square foot
SQYD	square yard
SRS	point of spiral to reverse spiral
SS	point of spiral to spiral (no curve)
ST	point of spiral to tangent
STA, Sta.	station
std.	standard
stgr.	stringer
stiff.	stiffener
struc.	structural
STS	point of spiral to tangent spiral
sym.	symmetrical
T	tangent distance
T.	township
TBM	temporary bench mark
thd.	thread
TS	point of tangent to spiral
Ts	tangent distance (spiraled curve)
typ.	typical
V	design speed
vph	vehicles per hour
VPI	vertical point of intersection
W	west
yd2	square yard
yd3	cubic yard(s)

NOTE:

1. Other symbols used in the plans will be shown in a legend on the appropriate plan sheet.

National Boundary
State Boundary
County Boundary
City Boundary
Township or Range Line
Section Line
Section Corner (Found, Projected)
¼ Section Line
¼ Section Corner (Found, Projected)
1/16 Section Line
1/16 Section Corner (Found, Projected)
Property Line w/Found Property Corner
Parcel Number
National Park Boundary
National Forest Boundary
National Wildlife Refuge Boundary
BLM Lands Boundary
Indian Reservation Boundary
Existing Roadway (Road, Paved, Gravel)
Railroad
Trail
Wattle
Silt Fence
Intermittent Drainage or Small Creek
Large Creek or River
Lake, Pond or Reservoir; Marshland
Spring or Seep
Treeline; Individual Trees
Material Source; Bore Hole; Test Pit
Spot Elevation; Coordinate Grid Tick
Above Ground Tank; Underground Tank
Boulder; Well; Satellite Dish; Grave
Cooking Grate; Garbage Can; Picnic Table
Flagpole; Fire Hydrant
Gas & Water Meter; Gas & Water Valve
Control Point (Terestrial and GPS); Jump Hub



STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	A.3

North Arrow

	EXISTING	PROPOSED
Slope Stake Limits: Top of Cut		
Toe of Fill		
Transition		
Fence		
Gate with Fence		
Cattleguard		
Guardrail		
Concrete Barrier		
Retaining Wall		wall face
Signs (Single, double post; portable)		
Delineators		
Pipe Culvert (arrow shows flow)		
Pipe Culvert with End Section		
Pipe Culvert with Headwall		
Pipe Culvert with Drop Inlet	DI	DI
Box Culvert		
Underdrain	UD	UD
Overhead/Above Ground Utilities	P	P
Underground Utilities	W	W

FM = force main, FO = fiber optic, G = gas, IRR = irrigation, O = oil, P = power, SA= sanitary sewer, SD = storm drain, SS = storm sewer, STEAM = steam, T = telephone, TV = CATV, W = water

Poles (Power, Telephone, Joint Use, Light, Support w/Anchor)

Miscellaneous Utility Features

EM = electric meter, T = telephone pedestal, TV = CATV pedestal, UP = transformer or junction box, WF = water fountain

Building

Right-of-Way Line with Monument	R/W	R/W
Permanent Easement	P/E	P/E
Construction Easement	- no symbol -	C/E

Riprap

NO SCALE

PMIS Pkg. No. 129927

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
WESTERN FEDERAL LANDS HIGHWAY DIVISION

U.S. CUSTOMARY DETAIL

PLAN SYMBOLS AND ABBREVIATIONS

DETAIL APPROVED FOR USE 11/2001
REVISED: 9/2005
DRAFT: 1/2007

DETAIL W101-1

Preliminary

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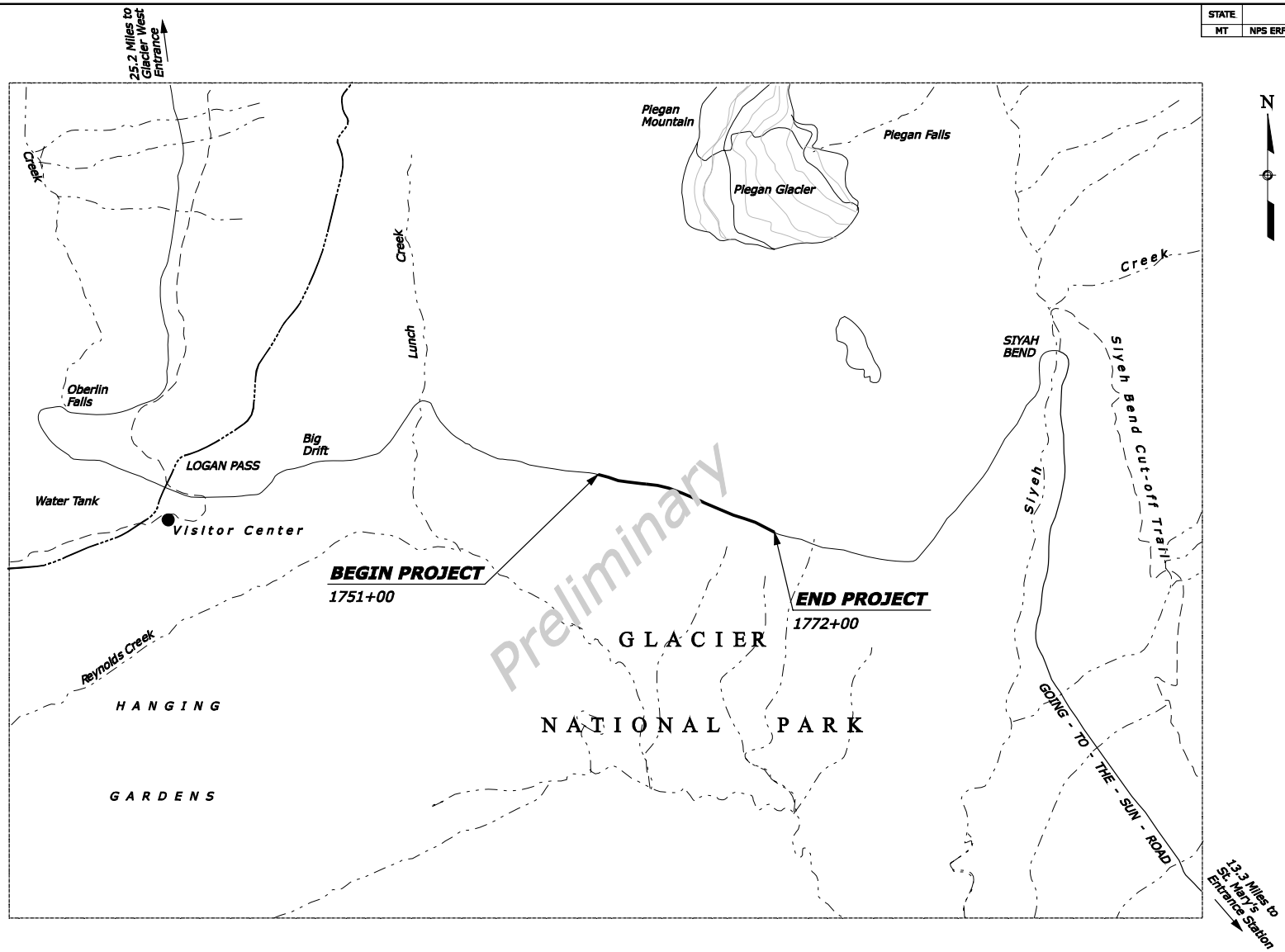
MT	NPS ERFO 2007(1)-45(3)	A.4



SCALE IN MILES

0 0.25 0.5 0.75 1.0

PMIS Pkg. No. 129927

VICINITY MAP

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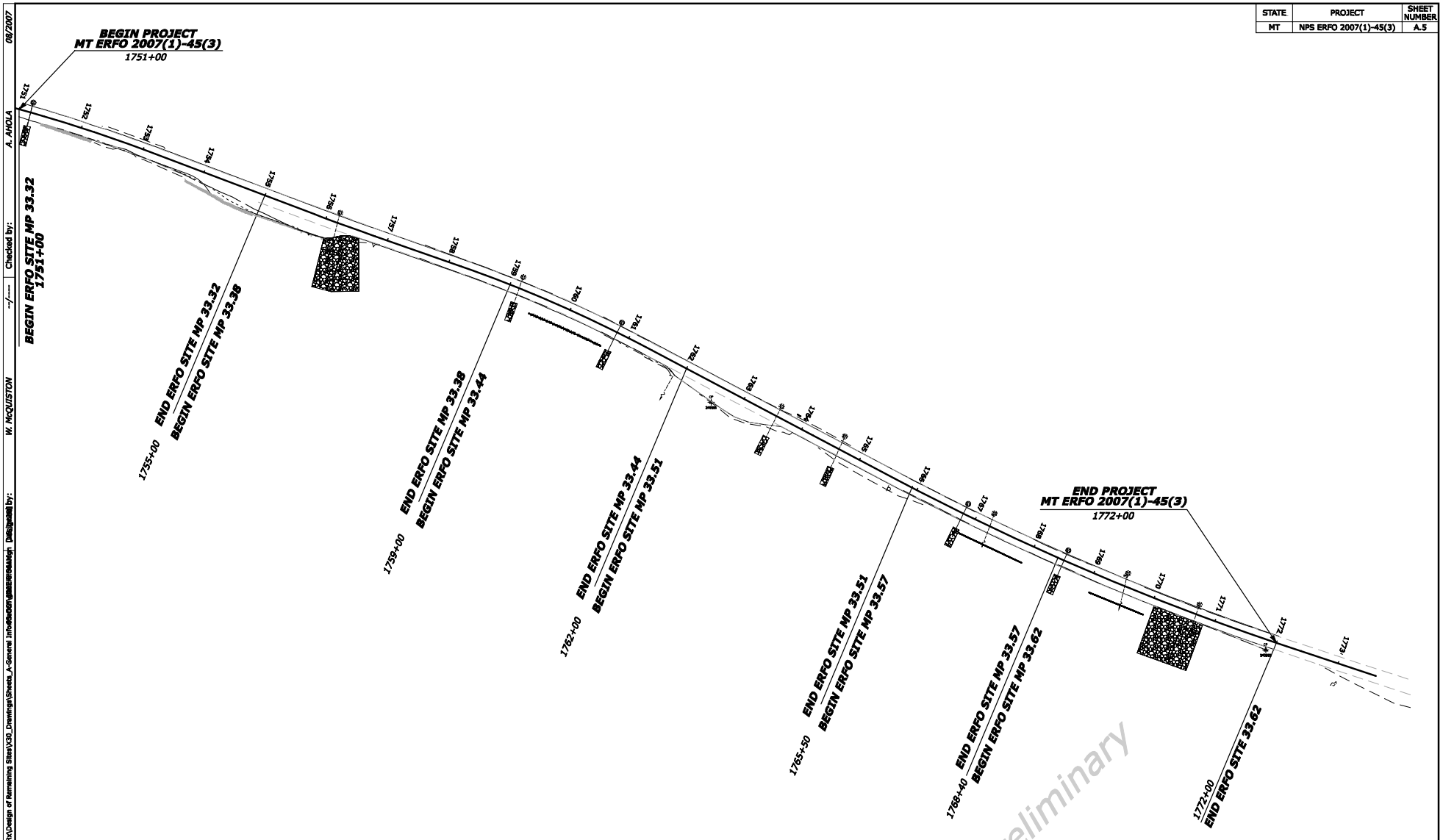
STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	A.5



PMIS Pkg. No. 129927

SITE MAP

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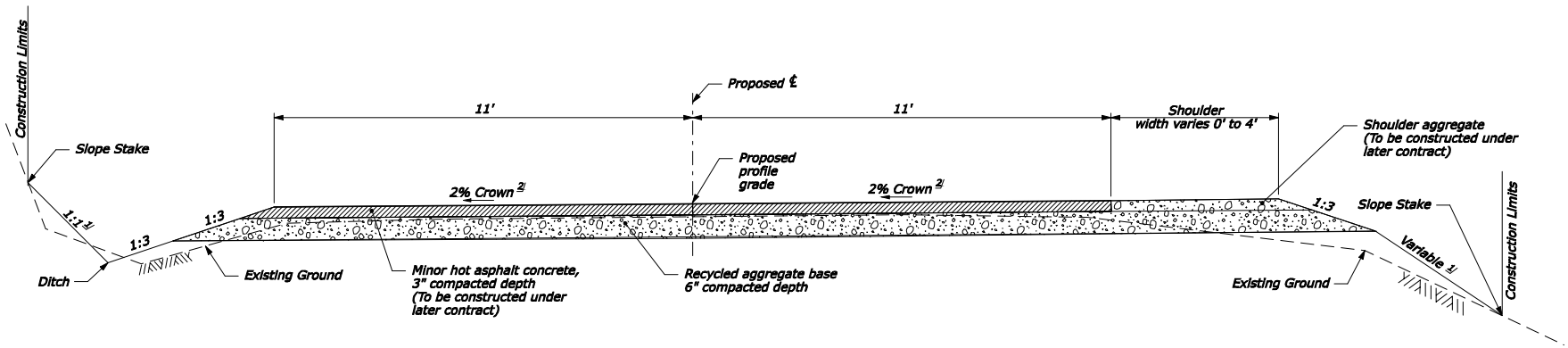
STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	C.1



PAVEMENT REPAIR TYPICAL SECTION
1751+00 to 1772+00

Preliminary

PAVEMENT STRUCTURE QUANTITIES

ITEM	DESCRIPTION	LOCATION	QUANTITY	ESTIMATING VALUE	SUPPLEMENTAL AGGREGATE (see section 310)
20401-0000	Roadway Excavation	1751+00 to 1762+00	1644.5 cuyd	-	-
30802-1000	Roadway Aggregate Method 1	1751+00 to 1762+00	410 ton	-	-
31001-0000	Recycled Aggregate Base	1751+00 to 1762+00	5884 sqyd	-	588 ton

NOTE:

1. No slope rounding required.

FOOTNOTE:

1/ Construct as shown in the Staking Report Data Listing (See FAR 52.236-4).

2/ Maximum super on curves are at the rate "e" as indicated on plan, profile curve data.

PMIS Pkg. No. 129927

ROADWAY TYPICAL SECTION AND TABULATION OF QUANTITIES

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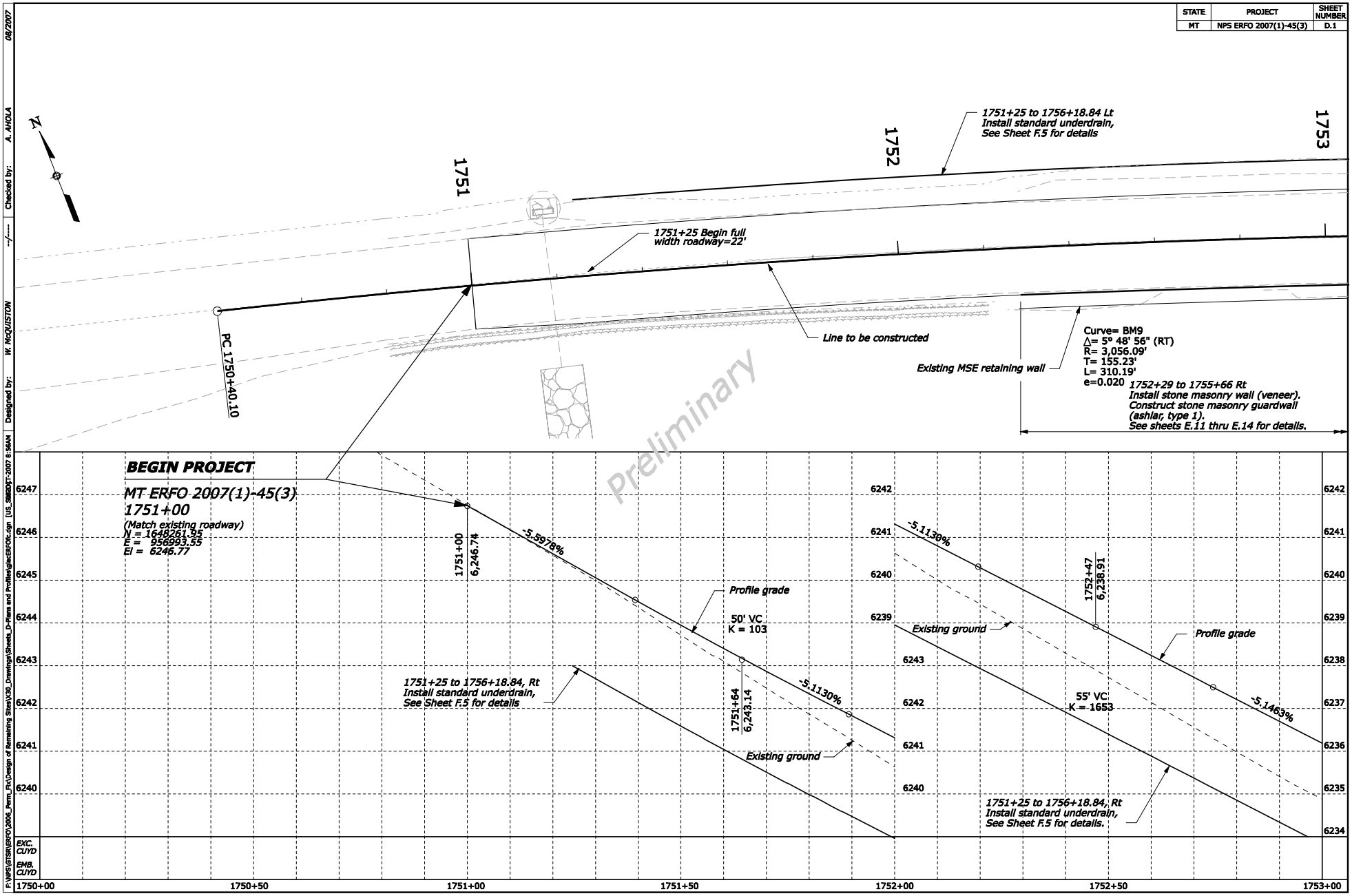
STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	D.1



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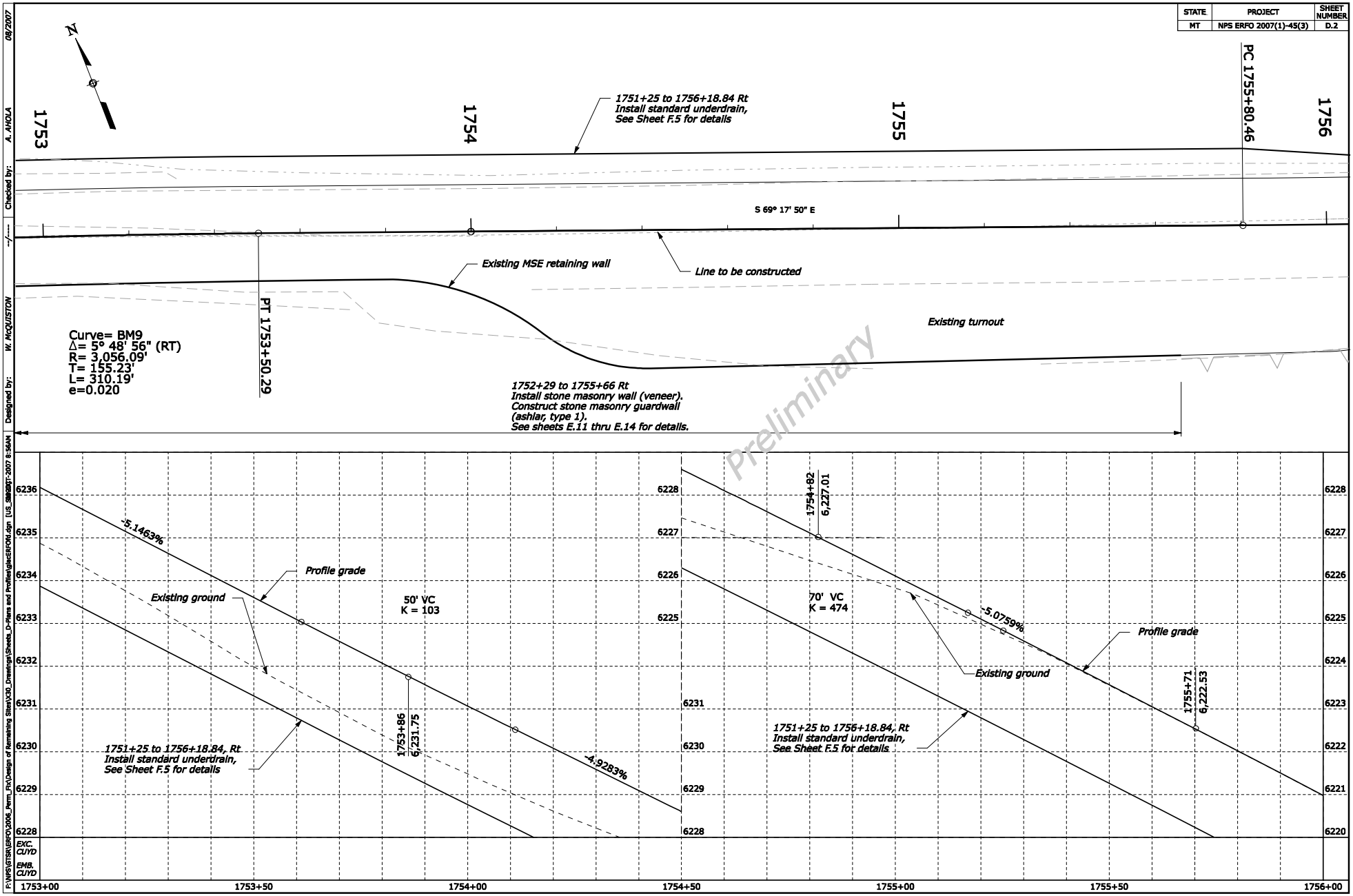
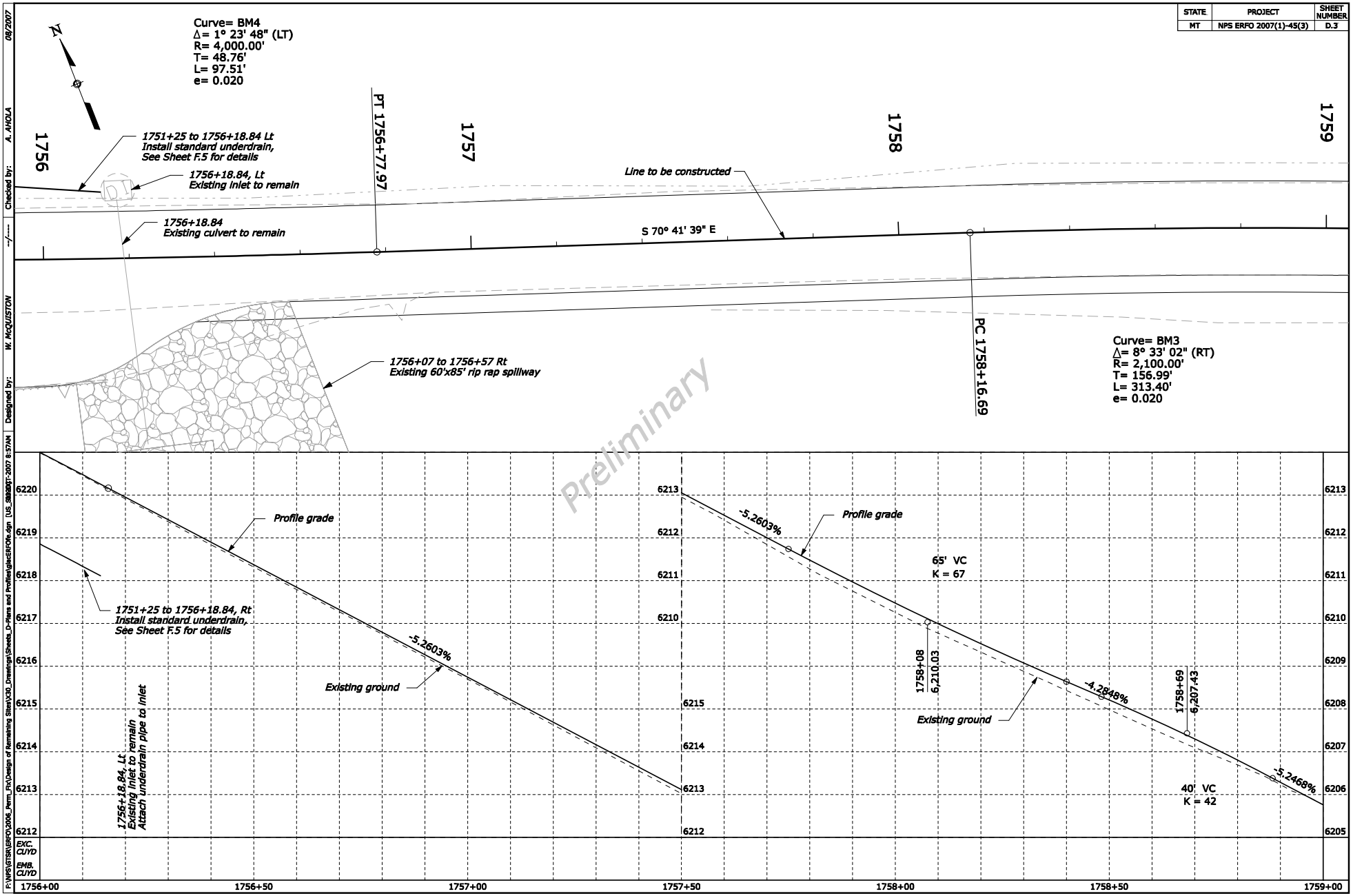
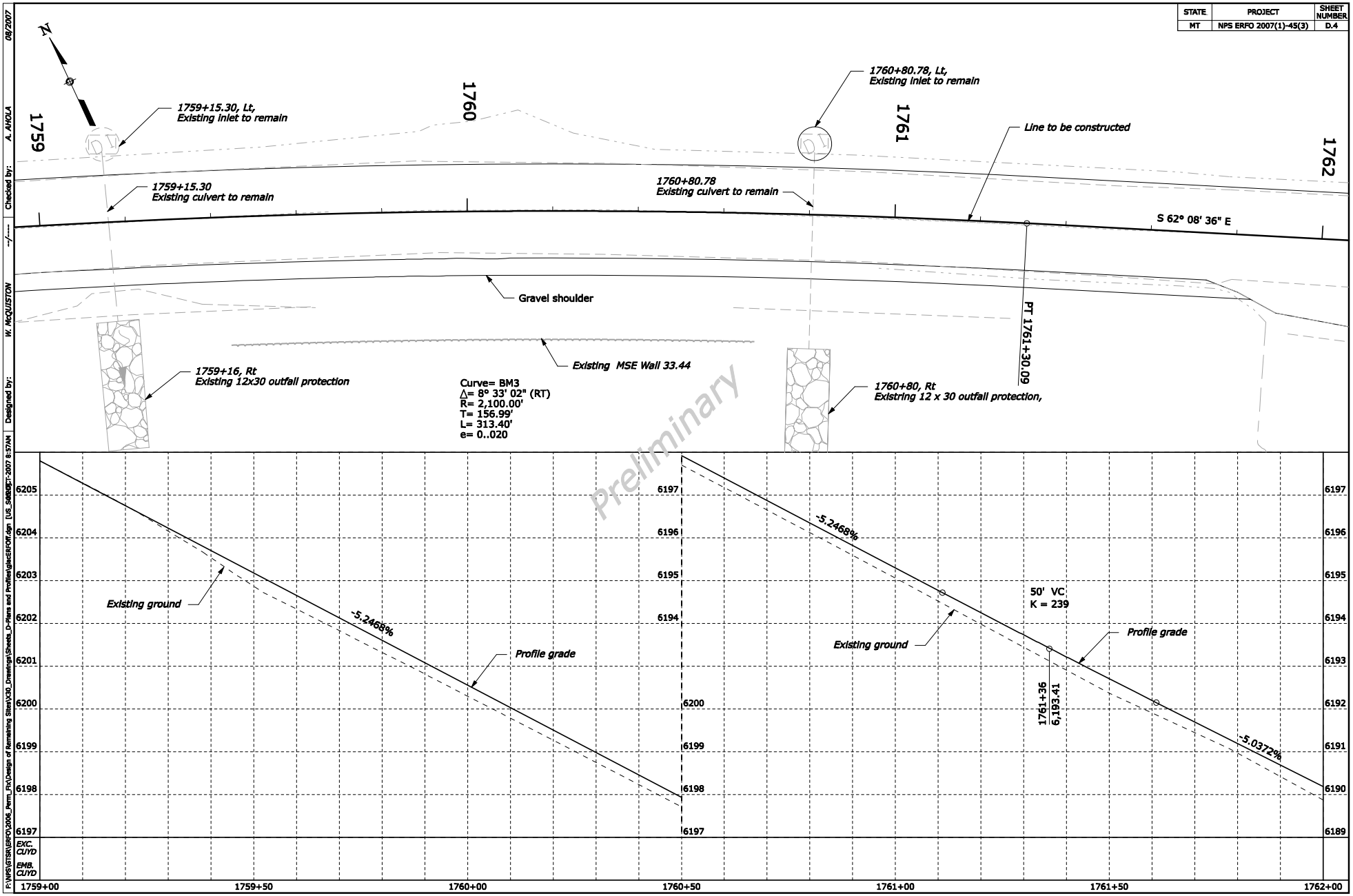


STATE
PROJECT
SHEET NUMBER
MT
NPS ERFO 2007(1)-45(3)
D.2
N
1753
1754
1755
1756
PC 1755+80.46
1751+25 to 1756+18.84 Rt
Install standard underdrain,
See Sheet F.5 for details
S 69° 17' 50" E
Existing MSE retaining wall
Line to be constructed
Existing turnout
PT 1753+50.29
Curve= BM9
Δ= 5° 48' 56" (RT)
R= 3,056.09'
T= 155.23'
L= 310.19'
e=0.020
1752+29 to 1755+66 Rt
Install stone masonry wall (veneer).
Construct stone masonry guardwall
(ashlar, type 1).
See sheets E.11 thru E.14 for details.
Preliminary
-5.1463%
Profile grade
Existing ground
50' VC
K = 103
1753+86
6,231.75
-4.9283%
1751+25 to 1756+18.84, Rt
Install standard underdrain,
See Sheet F.5 for details
1754+82
6,227.01
70' VC
K = 474
-5.0759%
Profile grade
Existing ground
1755+71
6,222.53
1751+25 to 1756+18.84, Rt
Install standard underdrain,
See Sheet F.5 for details
6236
6235
6234
6233
6232
6231
6230
6229
6228
6227
6226
6225
6224
6223
6222
6221
6220
EXC. CUYD
EMB. CUYD
1753+00
1753+50
1754+00
1754+50
1755+00
1755+50
1756+00



STATE
PROJECT
SHEET NUMBER
MT
NPS ERFO 2007(1)-45(3)
D.3
Curve= BM4
Δ= 1° 23' 48" (LT)
R= 4,000.00'
T= 48.76'
L= 97.51'
e= 0.020
N
1756
1757
1758
1759
PT 1756+77.97
PC 1758+16.69
1751+25 to 1756+18.84 Lt
Install standard underdrain,
See Sheet F.5 for details
1756+18.84, Lt
Existing inlet to remain
1756+18.84
Existing culvert to remain
Line to be constructed
S 70° 41' 39" E
1756+07 to 1756+57 Rt
Existing 60'x85' rip rap spillway
Curve= BM3
Δ= 8° 33' 02" (RT)
R= 2,100.00'
T= 156.99'
L= 313.40'
e= 0.020
Preliminary
Profile grade
1751+25 to 1756+18.84, Rt
Install standard underdrain,
See Sheet F.5 for details
-5.2603%
Existing ground
1756+18.84, Lt
Existing inlet to remain
Attach underdrain pipe to inlet
65' VC
K = 67
1758+08
6,210.03
-4.2848%
1758+69
6,207.43
-5.2468%
40' VC
K = 42
6220
6219
6218
6217
6216
6215
6214
6213
6212
6211
6210
6209
6208
6207
6206
6205
EXC. CUYD
EMB. CUYD
1756+00
1756+50
1757+00
1757+50
1758+00
1758+50
1759+00



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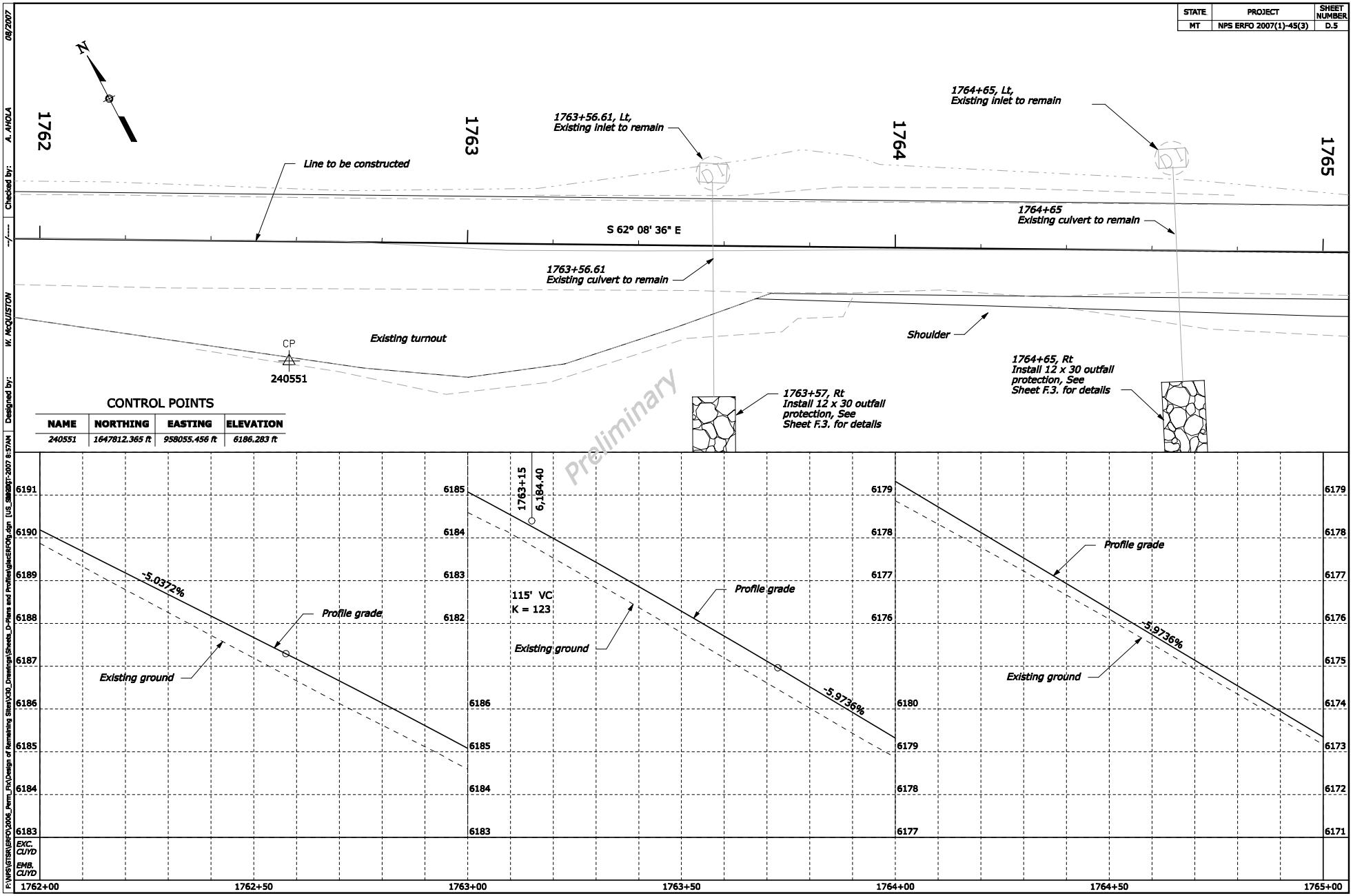
Checked by: A. AHOLA
08/2007

STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	D.5



CONTROL POINTS

NAME	NORTHING	EASTING	ELEVATION
240551	1647812.365 ft	958055.456 ft	6186.283 ft

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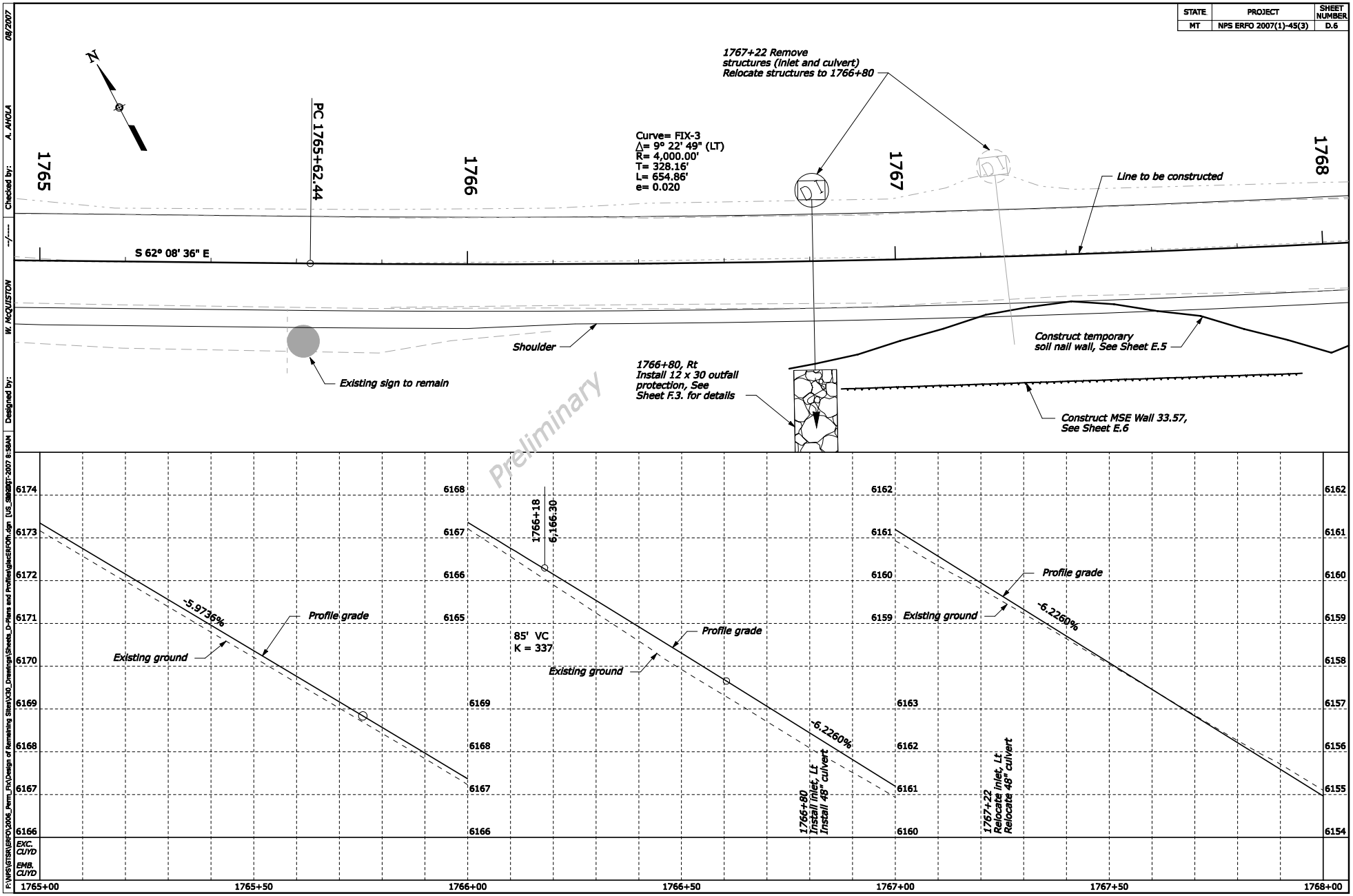
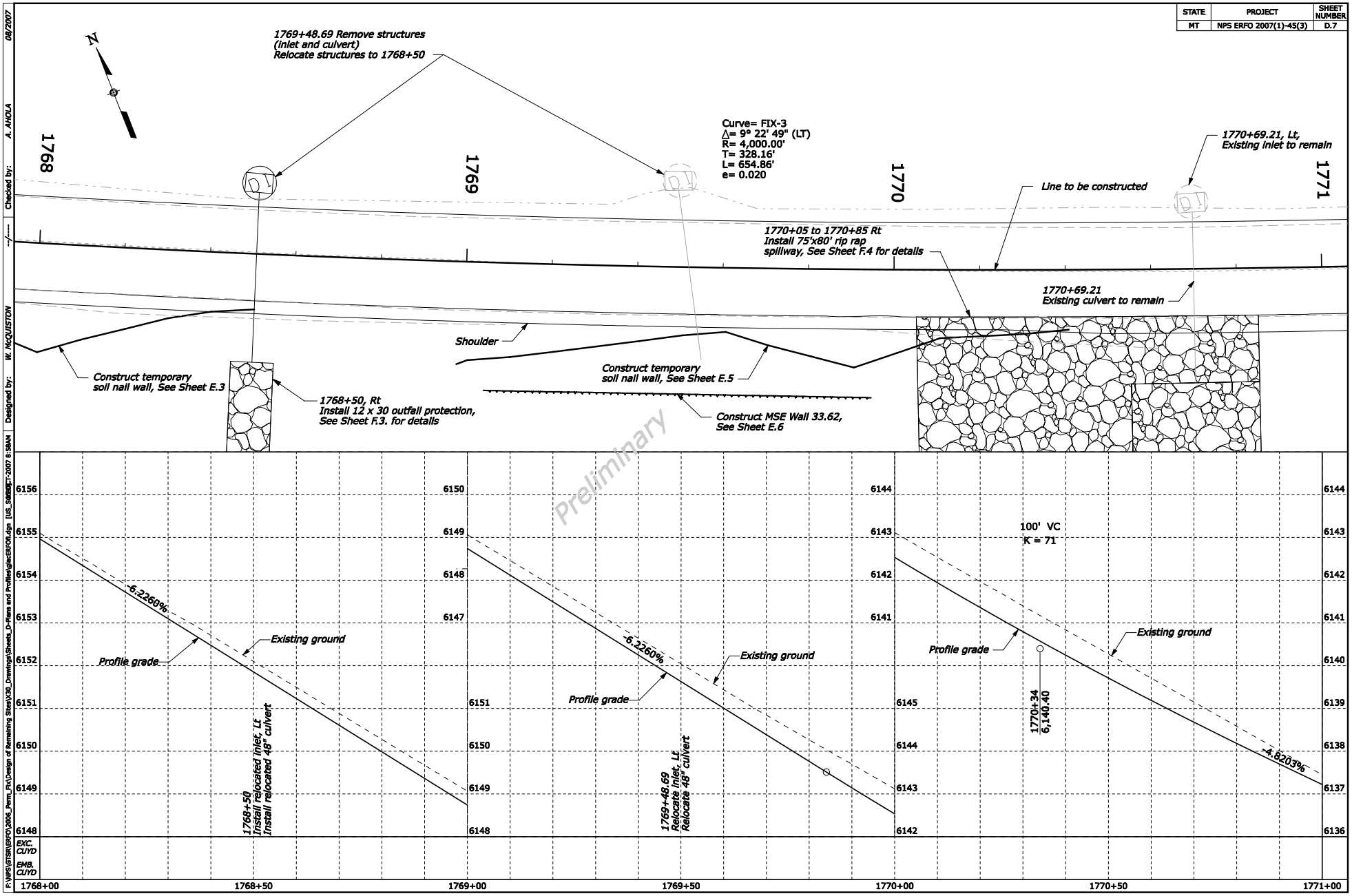
Checked by: A. AHOLA
08/2007



STATE
PROJECT
SHEET NUMBER
MT
NPS ERFO 2007(1)-45(3)
D.6
N
1765
PC 1765+62.44
1766
1767
1768
Curve= FIX-3
Δ= 9° 22' 49" (LT)
R= 4,000.00'
T= 328.16'
L= 654.86'
e= 0.020
1767+22 Remove structures (inlet and culvert) Relocate structures to 1766+80
Line to be constructed
S 62° 08' 36" E
Shoulder
Existing sign to remain
1766+80, Rt Install 12 x 30 outfall protection, See Sheet F.3. for details
Construct temporary soil nail wall, See Sheet E.5
Construct MSE Wall 33.57, See Sheet E.6
Preliminary
-5.9736%
Profile grade
Existing ground
1766+18
6,166.30
85' VC
K = 337
-6.2260%
1766+80 Install inlet, Lt Install 48" culvert
1767+22 Relocate inlet, Lt Relocate 48" culvert
EXC. CUYD
EMB. CUYD
1765+00
1765+50
1766+00
1766+50
1767+00
1767+50
1768+00



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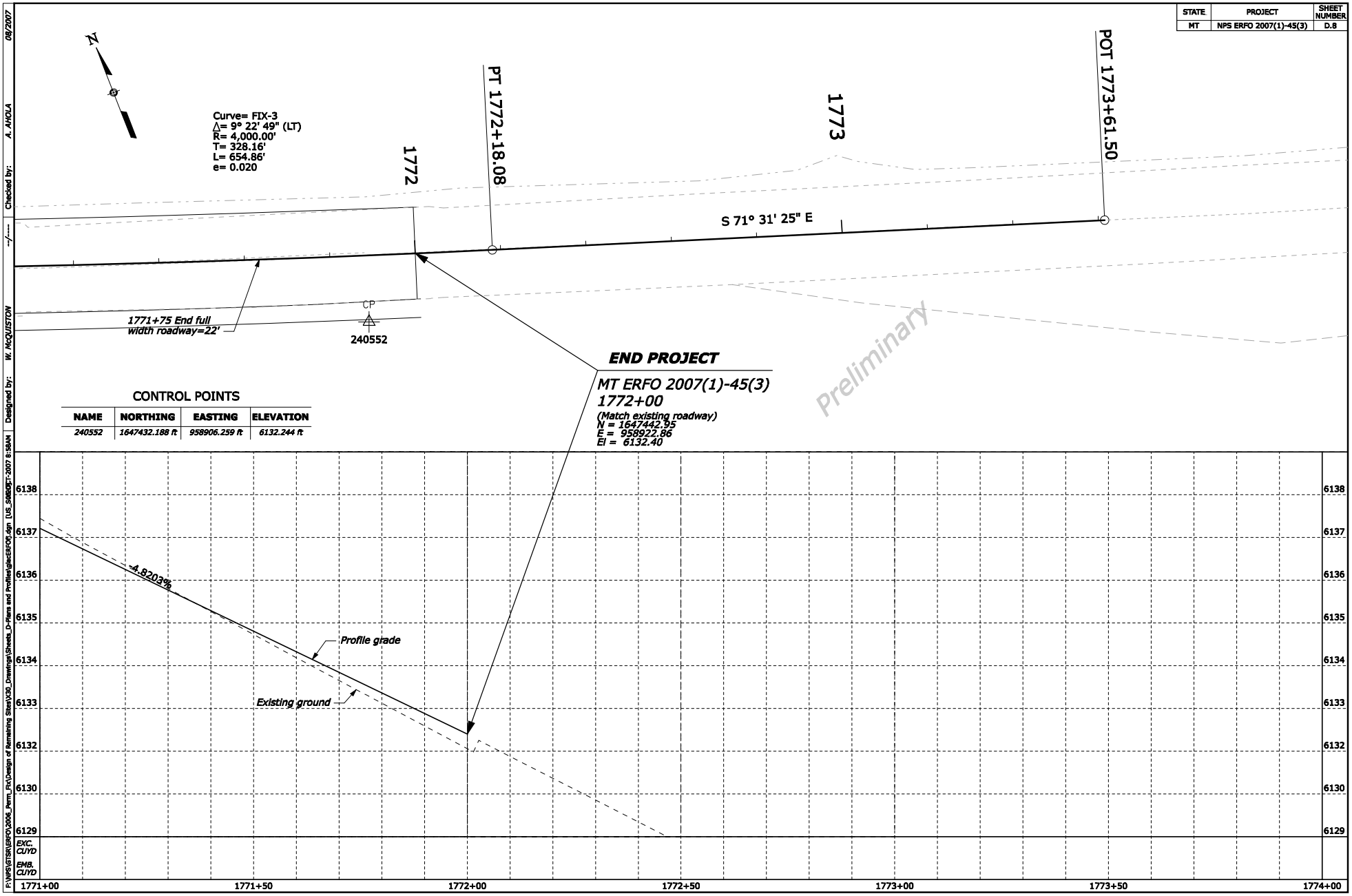
Designed by: W. McQUISTON
Checked by: A. AHOLA

STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	D.8



CONTROL POINTS

NAME	NORTHING	EASTING	ELEVATION
240552	1647432.188 ft	958906.259 ft	6132.244 ft

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STATE	PROJECT	SHEET NUMBER
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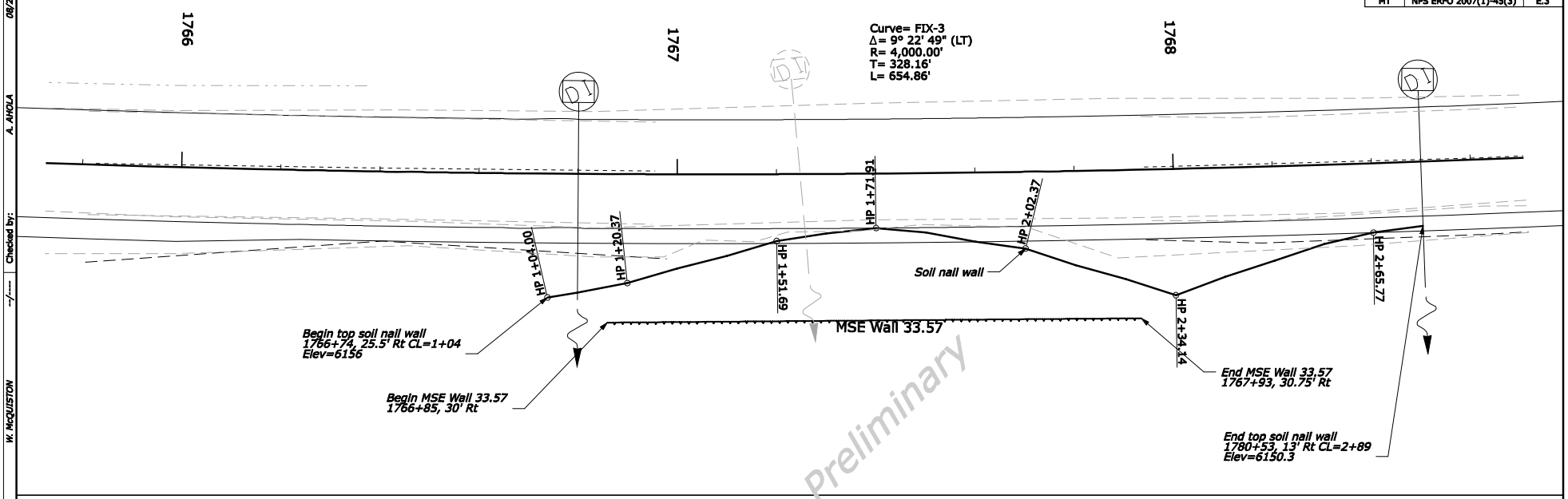
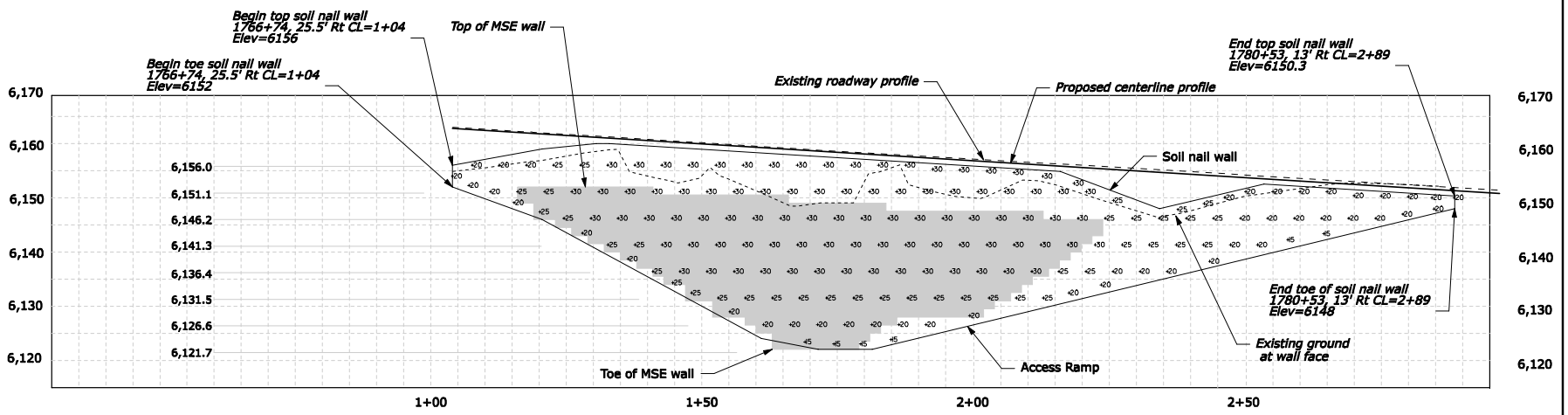




NOTE:

1. All nails #8 grade 75 ksi, 79 kip ultimate
2. All nails 15 degrees below horizontal
3. Design bond stress 2 kip/ft for 5 1/2" diameter, gravity grouted nail
4. Design live load 250 psf traffic surcharge
5. 2 verification test nails to be located by the C.O.

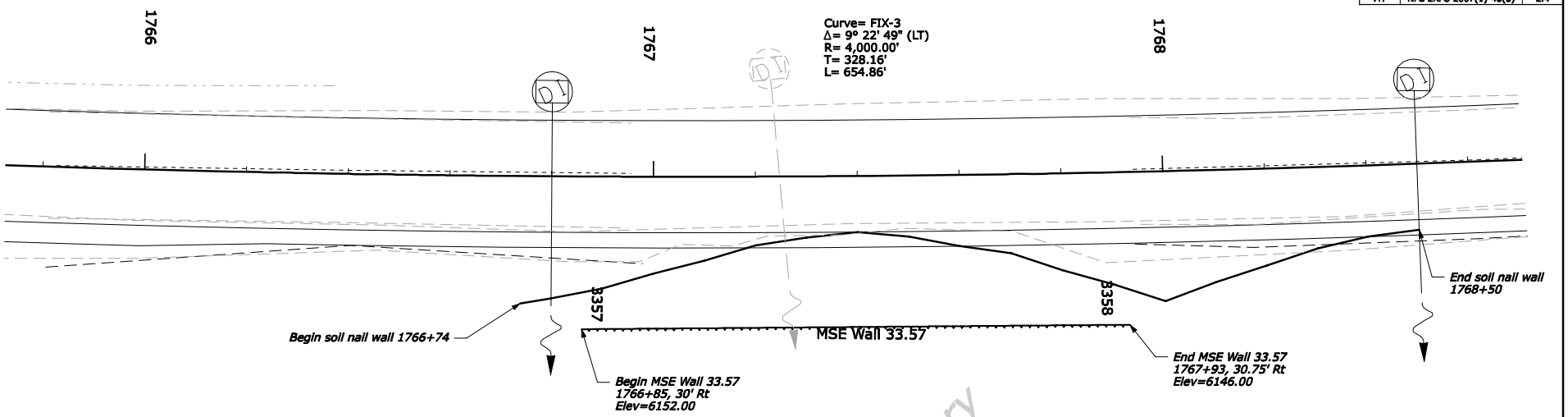
LEGEND

+24 Soil nail location and length
HP Hinge point

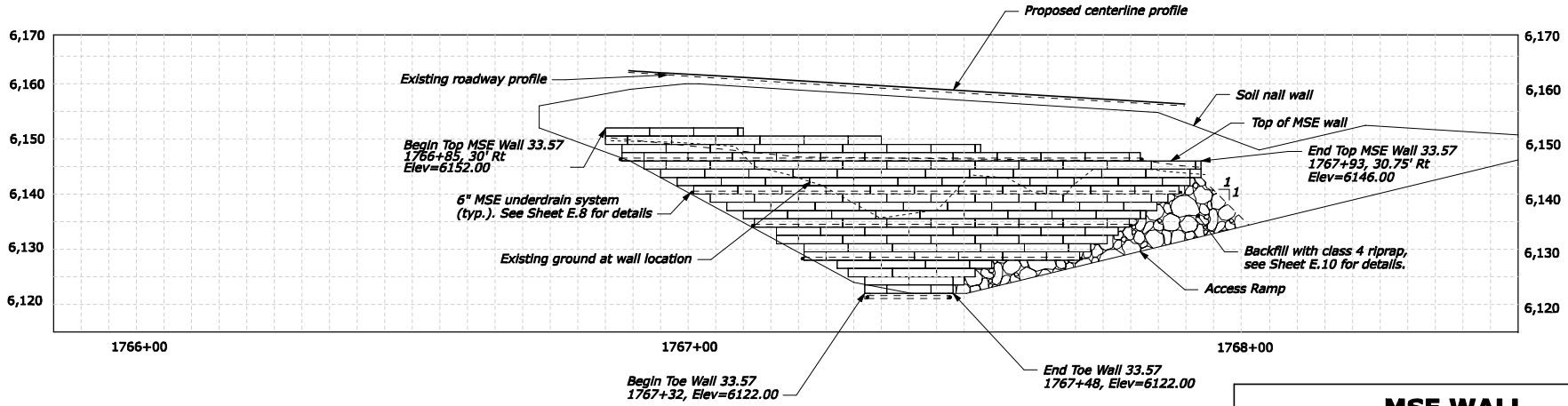
SOIL NAIL WALL PLAN AND PROFILE SITE 33.57

08/2007 | A. AHOLA | Checked by: --/--- | W. McQUISTON

STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	E.4



Preliminary



MSE WALL
PLAN AND PROFILE
SITE 33.57

08/2007 A. AHOLA Checked by: --/--- W. McQUISTON

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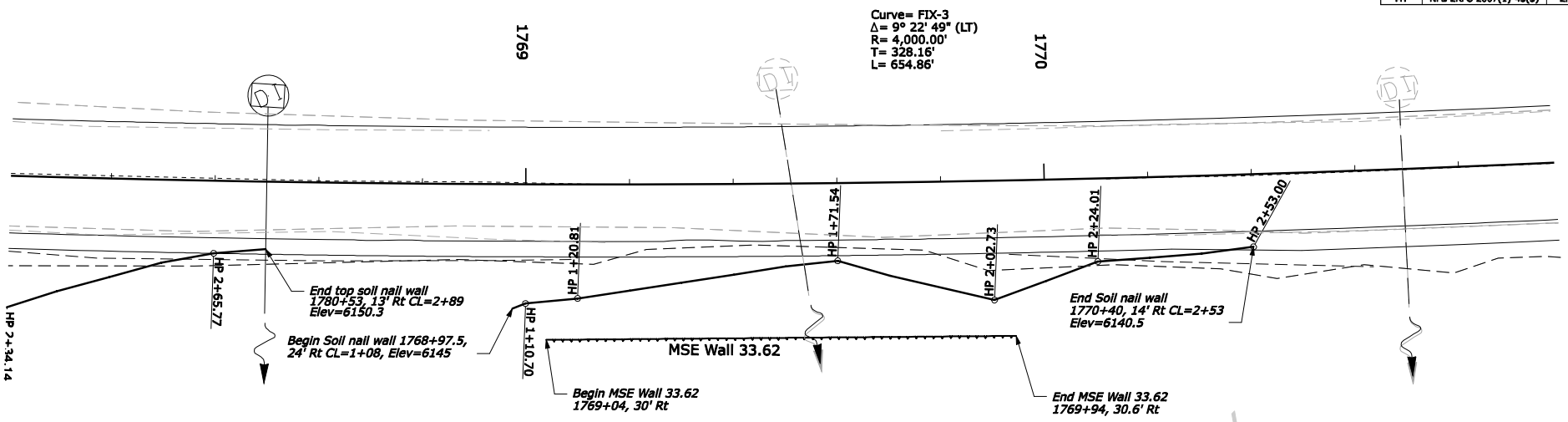
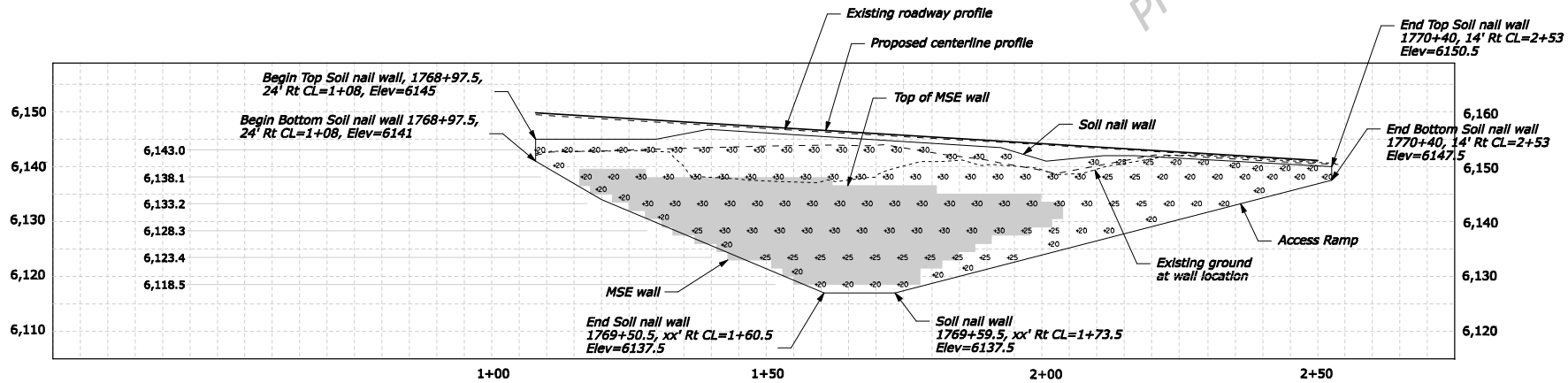
STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	E.5



Preliminary



NOTE:

1. All nails #8 grade 75 ksi, 79 kip ultimate
2. All nails 15 degrees below horizontal
3. Design bond stress 2 kip/ft for 5 1/2" diameter, gravity grouted nail
4. Design live load 250 psf traffic surcharge
5. 2 verification test nails to be located by the C.O.

LEGEND

+24 Soil nail location and length
HP Hinge point

SOIL NAIL WALL PLAN AND PROFILE SITE 33.62

F:\WPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\V30_Drawings\Sheets_E-MSE and Soil Nail Wall\E-MSE and Soil Nail Wall.dgn 08/2007 A. AHOLA Checked by: --/--/-- W. McQUISTON

STATE	PROJECT	SHEET NUMBER
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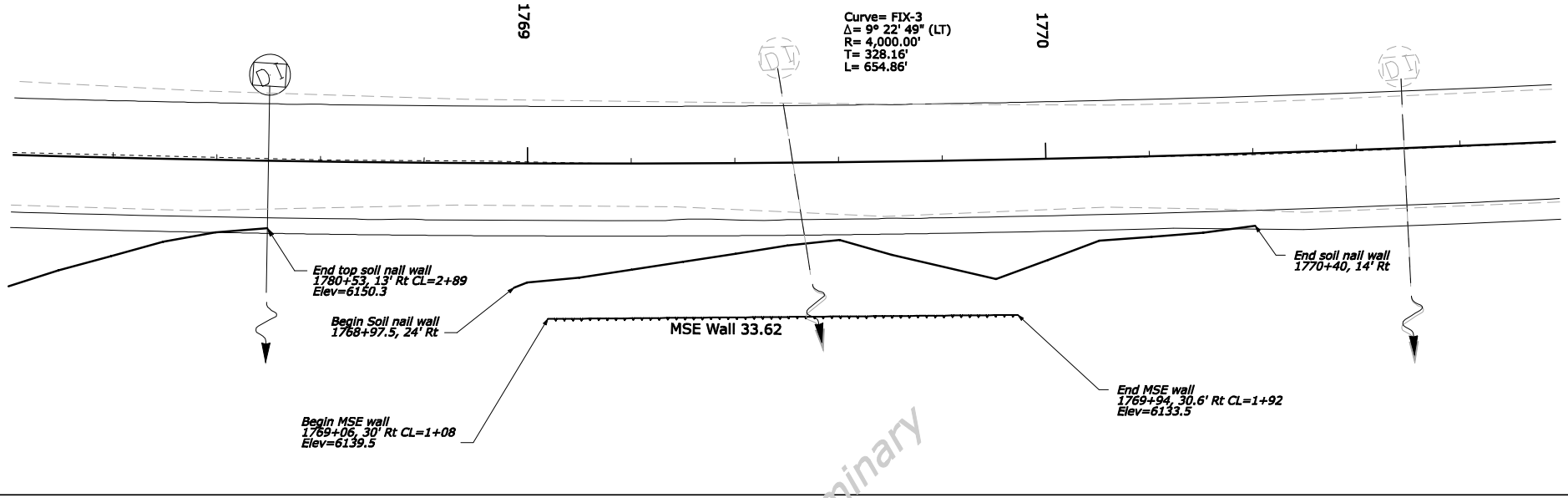
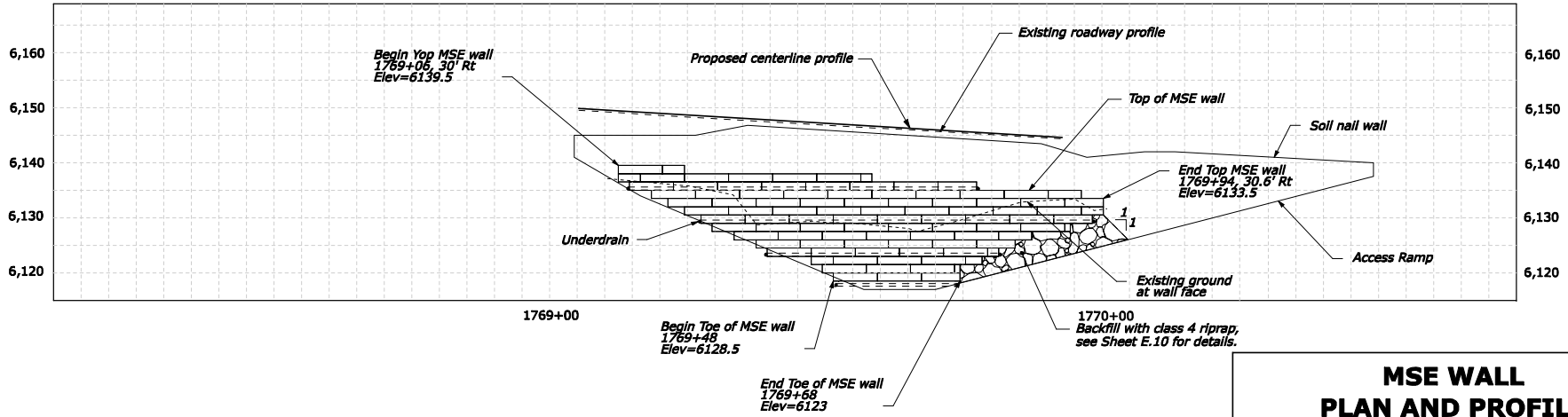


Preliminary



MSE WALL
PLAN AND PROFILE
SITE 33.62

08/2007 A. AHOLA Checked by: --/---- W. McQUISTON F:\NPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\X30_Drawings\Sheets_E-MSE and Soil

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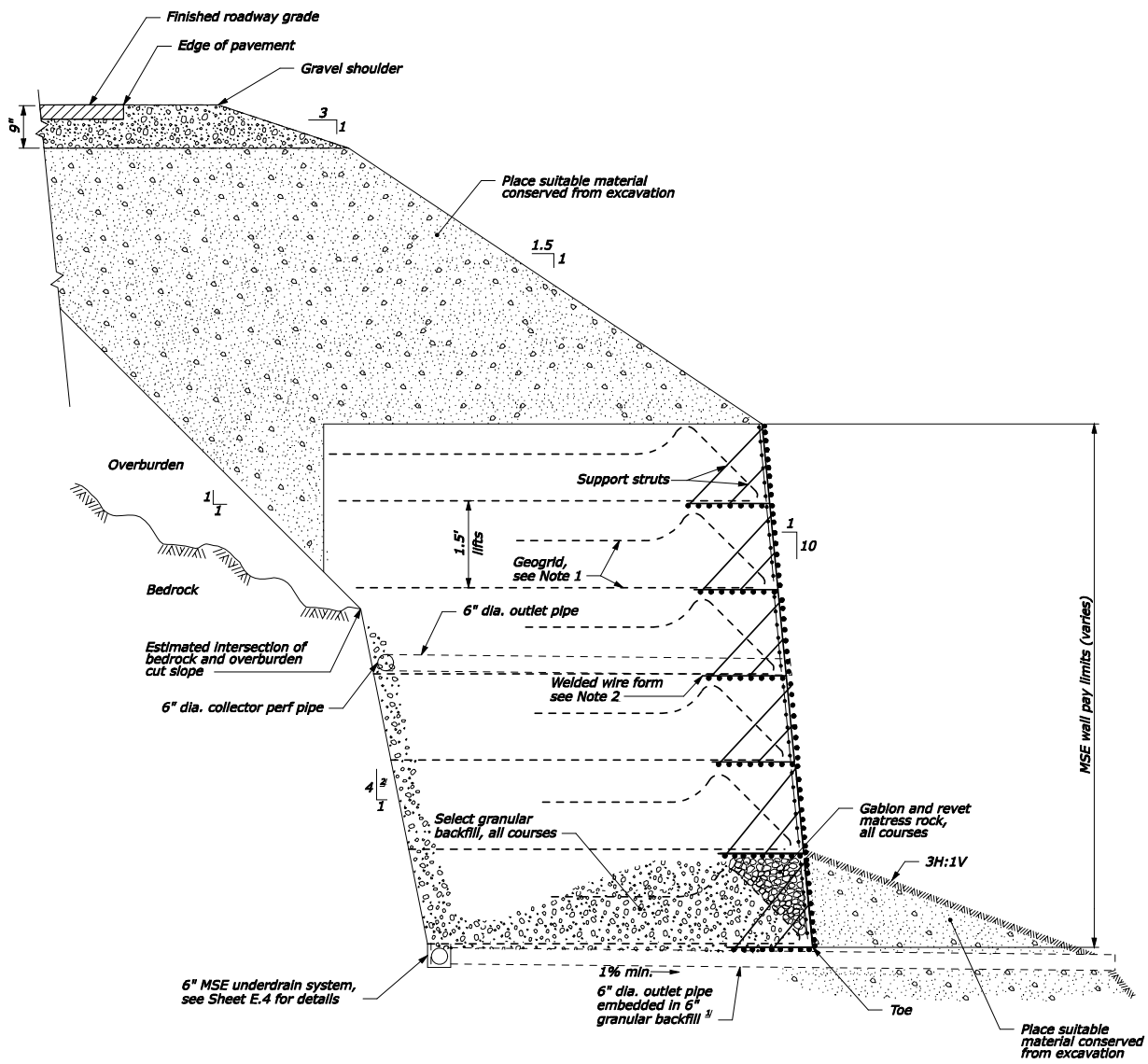

MSE GEOGRID WALL

Preliminary

NOTE:

1. See Sheet E.8 for MSE wall (geogrid) details.
2. See Sheet E.8 for forming details.
3. 6" collector and outlet pipe quantities are included with 6" MSE underdrain system quantities. See Sheet E.1.

FOOTNOTE:

1/ See Sheet E.1 for outlet pipe stationing and estimated length.

2/ Slope bedrock at 4:1 or as directed by C.O.

PMIS Pkg. No. 129927

MSE WALL (GEOGRID) TYPICAL SECTION

F:\NPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\X30_Drawings\Sheets_E-MSE and Soil Nail Wall Design.dgn Design by: W. McQUISTON --/---- Checked by: A. AHOLA 08/2007

STATE	PROJECT	SHEET NUMBER
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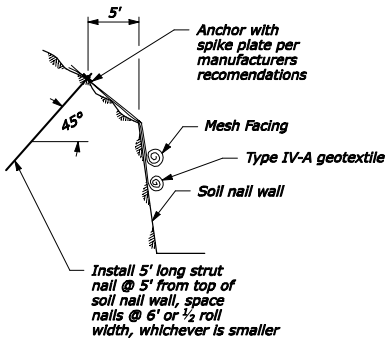
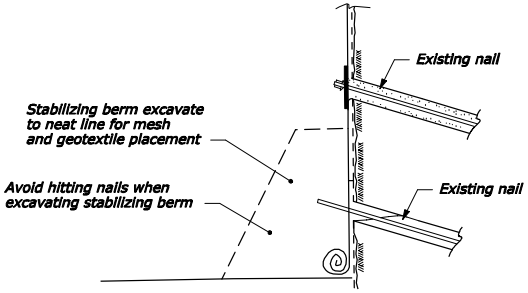
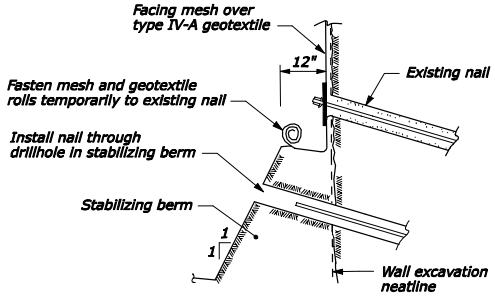


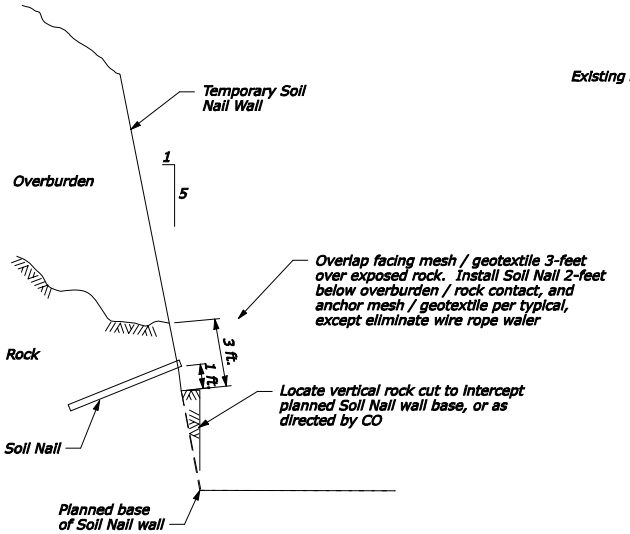
TOP OF SLOPE DETAIL



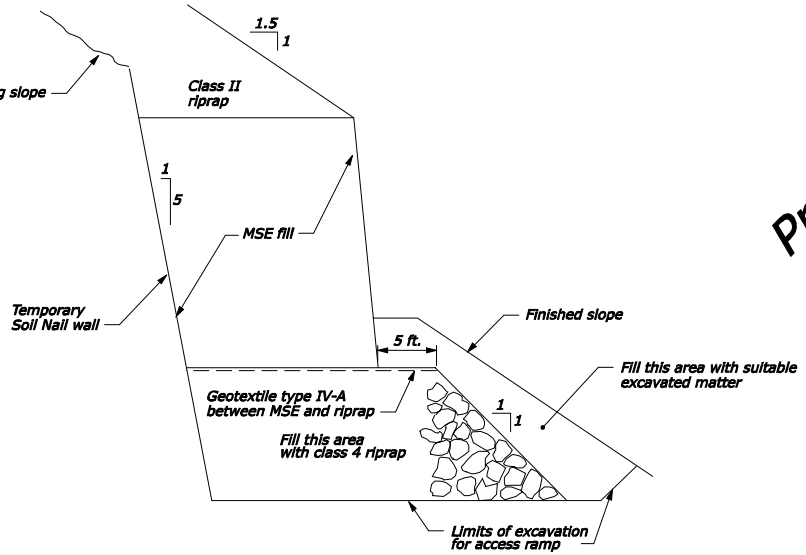
EXCAVATION OF STABILIZING BERM FOR MESH PLACEMENT



NAIL INSTALLATION THROUGH STABILIZATION BERM



TRANSITION SOIL NAIL WALL TO ROCK CUT



DETAIL FOR ACCESS RAMP BACKFILL
1767+48 to 1768+02
1769+68 to 1769+98

NO SCALE

Preliminary

PMIS Pkg. No. 129927

SOIL NAIL WALL DETAILS

F:\WPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\V30_Drawings\Sheets_E-MSE and Soil Nail Wall\E-10 Soil Nail Wall Details.dgn Date/Time: 08/2007 Checked by: A AHOLA --/--- W. McQUISTON

STATE	PROJECT	SHEET NUMBER
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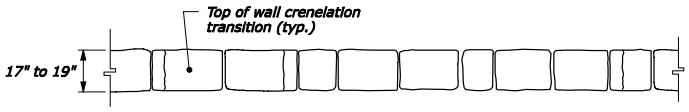
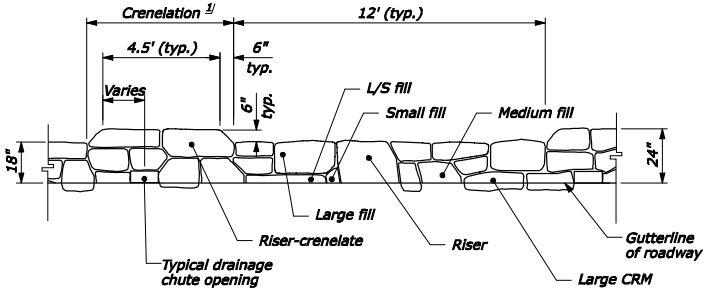
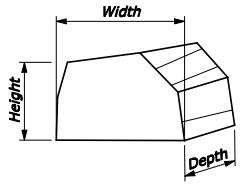


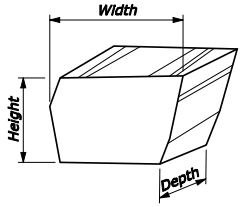
PLAN VIEW



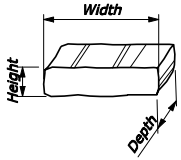
ELEVATION VIEW



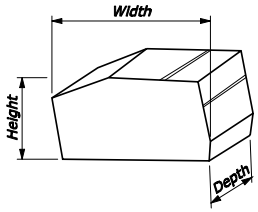
RISER - CRENELATE



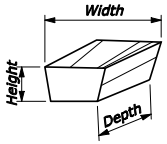
LARGE FILL



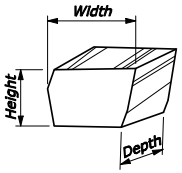
L/S FILL



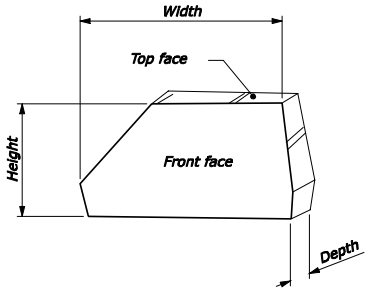
RISER

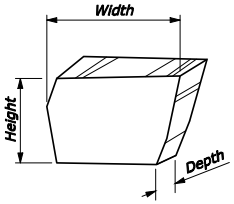


SMALL FILL

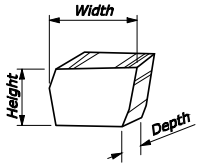


MEDIUM FILL





LARGE CRM 2/



M/B FILL 2/

DIMENSION CONVENTION DETAILS

STONE SIZE REQUIREMENTS			
STONE NAME DESCRIPTION	HEIGHT (Inches)	WIDTH (Inches)	DEPTH (Inches)
Riser crenelate	8-18	20-36	17-19
Large fill	14-18	18-36	17-19
L/S fill	6-8	10-24	6-19
Riser	17-19	20-36	17-19
Small fill	6-8	6-10	6-19
Medium fill	8-18	10-18	17-19
Large CRM 2/	14-18	18-36	4-7
M/B Fill 2/	8-18	10-18	9-12

Preliminary

NOTE:

1. General shape and character requirements of stone:
   -Shapes are angular (square or rectangular). Edges are rounded.
   -Generally uniform thickness. Do not use round cobbly shapes.
   -Do not use stones that have indentations greater than 2 inches at deepest point on any face.
   -All stones exposed on top of wall, must be full depth of wall.
2. Stone pattern shown is subject to the requirements of Section 620.
3. Create irregular joint where new or reset stone masonry joins existing wall. When removing existing stone masonry wall, remove whole stones only, creating an irregular seam. Do not cut existing stones.
4. Construct drainage chutes at locations shown in the plans. See Sheet X.x for details.
5. See Sheet E.11 for typical sections.

FOOTNOTE:

1/ Locate crenelation to be 12 feet from adjacent crenelation of wall to remain in place.

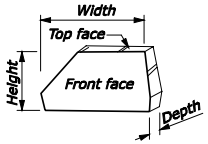
2/ See Sheet E.11.

PMIS Pkg. No. 90958 NPS Drwg. No. 117/41957

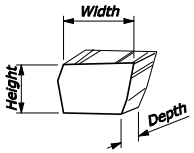
STONE MASONRY GUARDWALL (ASHLAR) STONE DETAILS

F:\WPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\V30_Drawings\Sheets_E-MSE and Soldier\Stone Masonry Wall\E-12 Stone Details.dgn 12/2006 Greg Kwock --/--- Checked by: GTSR Team

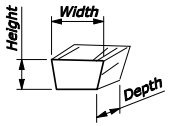
STATE	PROJECT	SHEET NUMBER
MT	NPS ERFO 2007(1)-45(3)	E.14



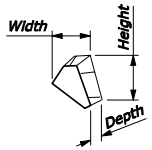
DIMENSION CONVENTION DETAILS



LARGE FILL

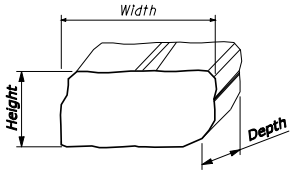


SMALL FILL

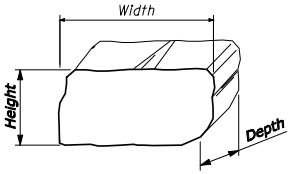


ANGULAR FILL [1/]

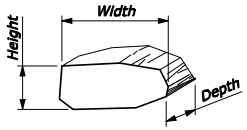
STONE SIZE REQUIREMENTS			
STONE NAME DESCRIPTION	HEIGHT (inches)	WIDTH (inches)	DEPTH (inches)
Large retainers	18 - 24	20 - 42	4 - 7
Large CRM	14 - 18	18 - 36	4 - 7
Small retainers	6 - 10	10 - 24	4 - 7
Large fill	8 - 18	10 - 18	4 - 7
Small fill	4 - 8	6 - 10	4 - 7
Angular fill [1/]	3 - 9	3 - 9	2 - 6



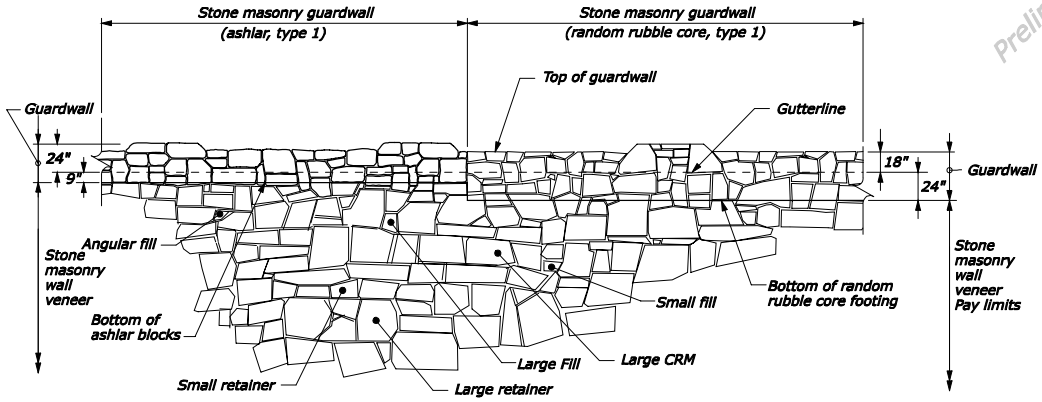
LARGE CRM (SPLIT)



LARGE RETAINER



SMALL RETAINER



TYPICAL STONE ARRANGEMENT ELEVATION VIEW

Preliminary

NOTE:

1. General shape and character requirements of stone:
   - Shapes are angular (square or rectangular). Edges are sharp. Corners where the bed and joint lines meet may have a maximum 1 1/2 inches radius.
   - Generally uniform thickness. Do not use round cobbly shapes.
   - Do not use stones that have indentations greater than 2 inches at deepest point on any face.
2. Stone pattern shown is subject to the requirements of Section 620. Modify as needed to create an irregular joint where stone masonry veneer joins a random rubble core guardwall.
3. Dimensions of individual stones may vary through the size range shown.

FOOTNOTE:

1/ Angular fill stone:
- Smaller stone required to fill gaps between larger stone.

PMIS Pkg. No. 90958 NPS Drwg. No. 117/41957

STONE MASONRY WALL (VENEER) DETAILS SHEET 2 OF 2

F:\WPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\V30_Drawings\Sheets_E-MSE and Soldier Pile Wall\Stone Masonry Wall Details.dgn 12/2006 Greg Kwock Checked by: --/--- GTSR Team

STATE	PROJECT	SHEET NUMBER
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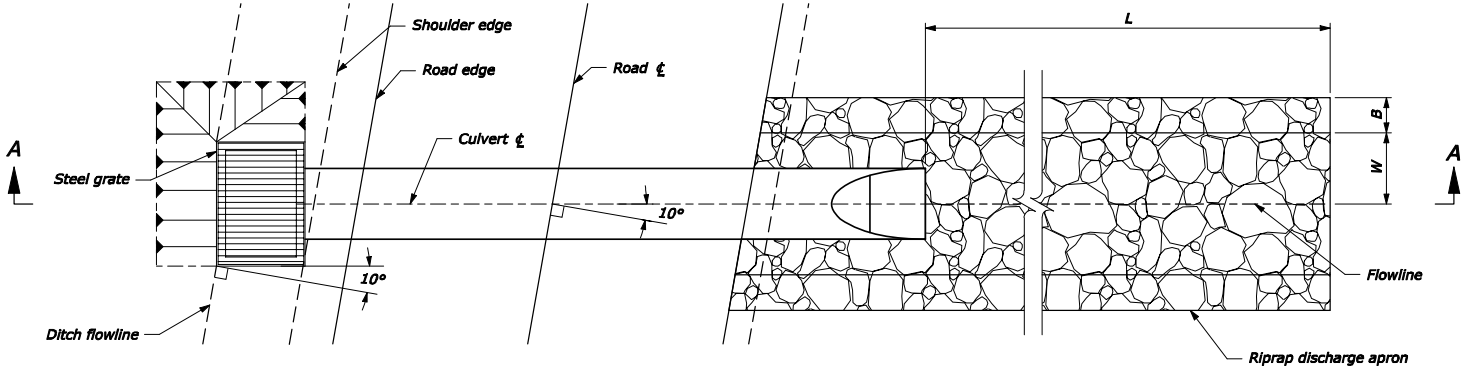
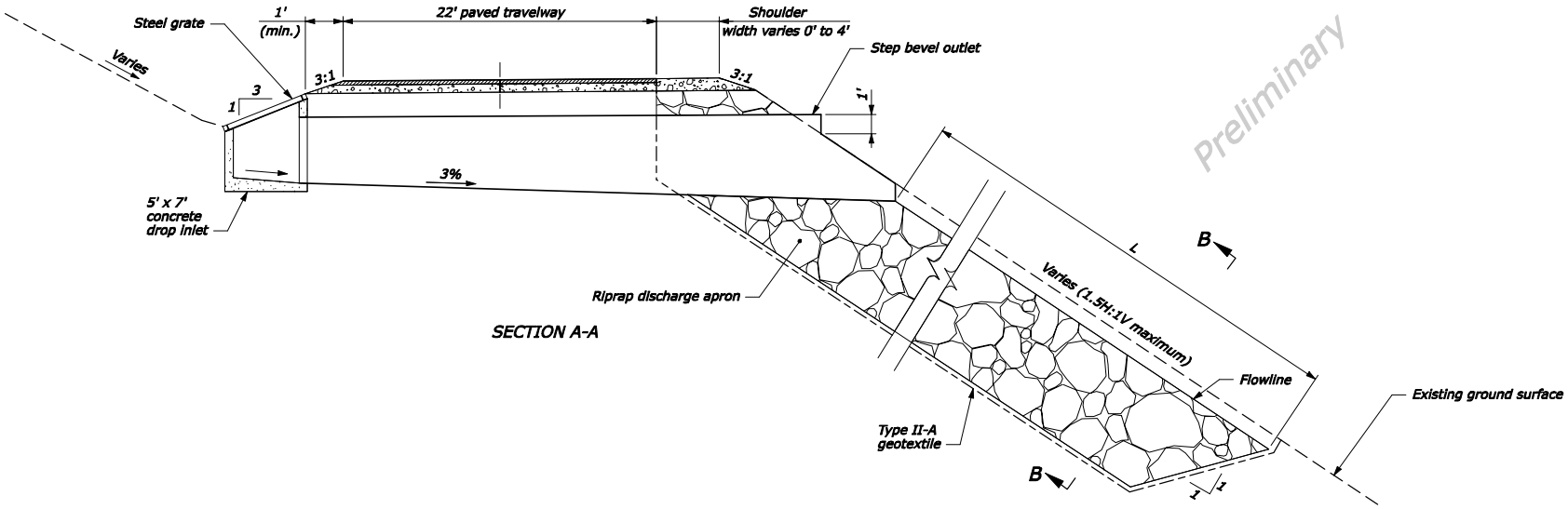
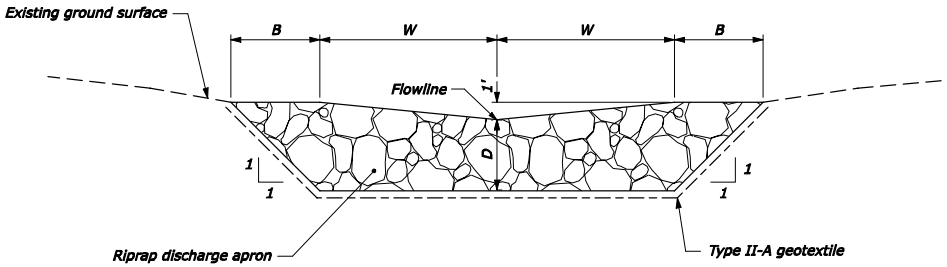


PLAN



SECTION A-A



SECTION B-B

MINIMUM DIMENSIONS

SITE	D (ft)	L (ft)	B (ft)	W (ft)
1763+57	4	30	0	6
1764+65	4	30	0	6
1766+80	4	30	0	6
1768+50	4	30	0	6

NO SCALE

NOTE:

1. Set long dimension of drop inlet level. Grade surrounding ditch area to maximize drainage to drop inlet.
2. Orientate riprap discharge apron parallel to slope fall direction.

PMIS Pkg. No. 129927

CULVERT OUTFALL PROTECTION DETAILS

Preliminary

F:\NPS\GTSR\ERFO\2006_Perm_Fix\Design of Remaining Sites\X30_Drawings\Sheets_F-Drainage\gis\ERFO2007 Design Plan.dgn Designed by: W. McQUISTON --/---- Checked by: A. AHOLA 08/2007

STATE	PROJECT	SHEET NUMBER
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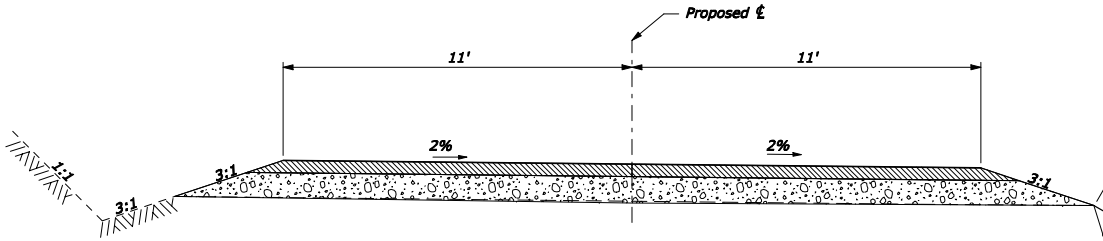
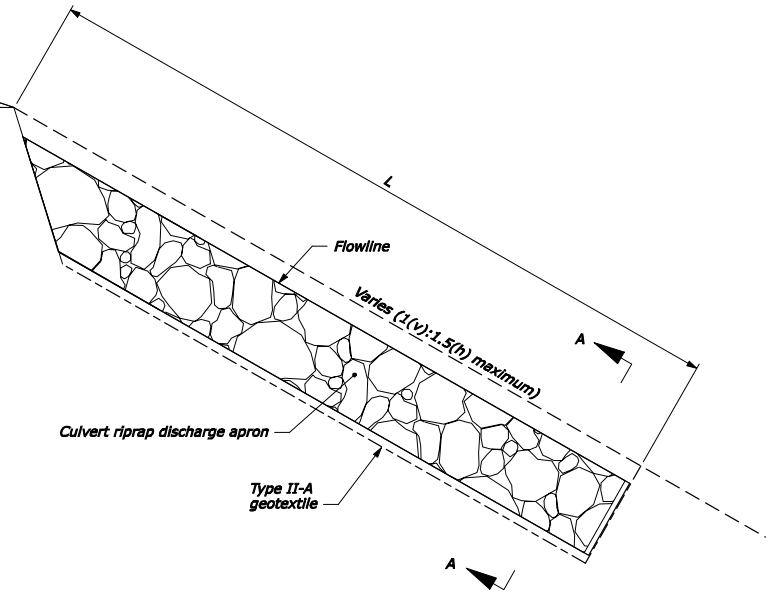
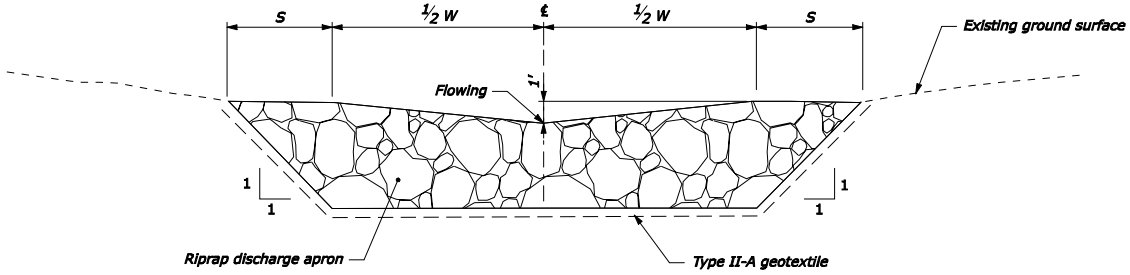


SPILLWAY DETAIL



MINIMUM DIMENSIONS					
LOCATION	Lt/Rt	D (ft)	L (ft)	S (ft)	W (ft)
1770+05 to 1770+85	Rt	6	80	7	70

Preliminary



SECTION A-A

PMIS Pkg. No. 129927

SPILLWAY PROTECTION DETAILS

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