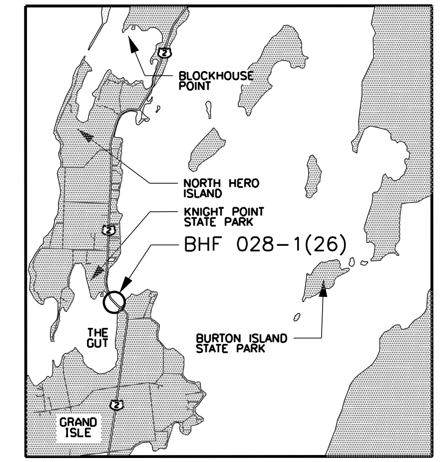
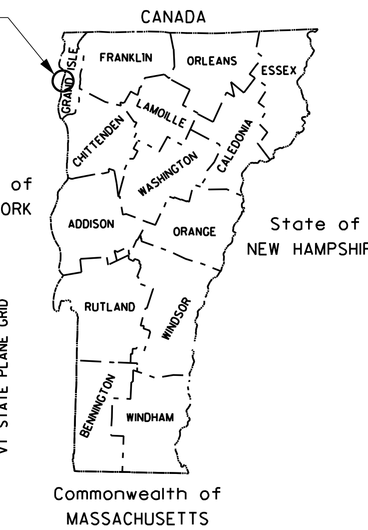
STATE OF VERMONT
AGENCY OF TRANSPORTATION





PROPOSED IMPROVEMENT
BRIDGE PROJECT

TOWN OF NORTH HERO - GRAND ISLE

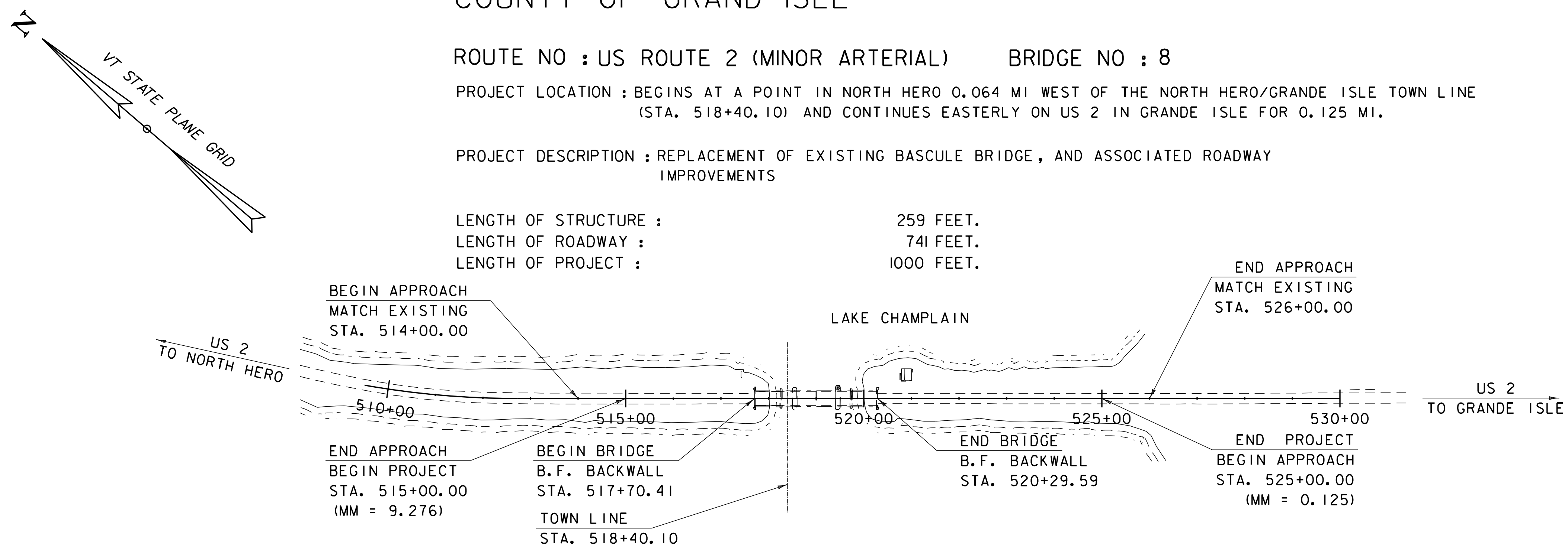
COUNTY OF GRAND ISLE

ROUTE NO : US ROUTE 2 (MINOR ARTERIAL) BRIDGE NO : 8

PROJECT LOCATION : BEGINS AT A POINT IN NORTH HERO 0.064 MI WEST OF THE NORTH HERO/GRANDE ISLE TOWN LINE (STA. 518+40.10) AND CONTINUES EASTERLY ON US 2 IN GRANDE ISLE FOR 0.125 MI.

PROJECT DESCRIPTION : REPLACEMENT OF EXISTING BASCULE BRIDGE, AND ASSOCIATED ROADWAY IMPROVEMENTS

LENGTH OF STRUCTURE :	259 FEET.
LENGTH OF ROADWAY :	741 FEET.
LENGTH OF PROJECT :	1000 FEET.



SCALE 1" = 150'-0"
150 0 150'

THESE PLANS ARE SUBJECT TO SUCH ENGINEERING CHANGES AS MAY BE REQUIRED BY THE FEDERAL HIGHWAY ADMINISTRATION OR THE DIRECTOR OF PROGRAM DEVELOPMENT.

CONSTRUCTION IS TO BE CARRIED ON IN ACCORDANCE WITH THESE PLANS AND THE STANDARD SPECIFICATIONS FOR CONSTRUCTION DATED 2011, AS APPROVED BY THE FEDERAL HIGHWAY ADMINISTRATION ON JULY 20, 2011 FOR USE ON THIS PROJECT, INCLUDING ALL SUBSEQUENT REVISIONS AND SUCH REVISED SPECIFICATIONS AND SPECIAL PROVISIONS AS ARE INCORPORATED IN THESE PLANS.

QUALITY ASSURANCE PROGRAM : LEVEL 1

SURVEYED BY : VT SURVEY AND ENG., INC.
SURVEYED DATE : JUNE 17, 2014

DATUM

VERTICAL	NAVD88 (GEOID12A)
HORIZONTAL	NAD 83 (2011)

REV2 DATE: 8/4/2017

SEMI-FINAL PLANS

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATOR
APPROVED ______ DATE ______

DIRECTOR OF PROGRAM DEVELOPMENT
APPROVED ______ DATE ______

PROJECT MANAGER : T. SUMNER

PROJECT NAME : NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER : BHF 028-1(26)

SHEET 1 OF 340 SHEETS

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PROJECT NAME:	NORTH HERO GRAND ISLE BRIDGE		
PROJECT NUMBER:	BHF 028-1(26)		
FILE NAME:	z12b142index.xls	PLOT DATE:	8/4/20[illegible]
PROJECT LEADER:	T. FRENCH	DRAWN BY:	P. LEFEBVRE
DESIGNED BY:	P. LEFEBVRE	CHECKED BY:	M. MOZER
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PRELIMINARY INFORMATION SHEET (BRIDGE)

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SD-502.00	CONCRETE DETAILS AND NOTES	10-10-2012
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SD-602.00	STRUCTURAL STEEL PLATE GIRDER DETAILS AND NOTES	05-02-2011

AS BUILT "REBAR" DETAIL

LEVEL I	LEVEL II	LEVEL III
TYPE	TYPE	TYPE
GRADE	GRADE	GRADE

TRAFFIC DATA

YEAR	ADT	DHV	% D	% T	ADTT	
2018	3000	460	55	2.6	150	20 year ESAL for flexible pavement from 2018 to 2038 : 1065000
2028	3200	490	55	3.4	210	40 year ESAL for flexible pavement from 2018 to 2058 : 0
						Design Speed 50 mph

FINAL HYDRAULIC REPORT

HYDROLOGIC DATA

Date: July 2016

DRAINAGE AREA : -
CHARACTER OF TERRAIN : -
STREAM CHARACTERISTICS : -
NATURE OF STREAMBED : -

PEAK FLOW DATA - ANNUAL EXCEEDANCE PROBABILITY (AEP)

43% = - 2% = -
10% = - 1% = -
4% = - 0.2% = -

DATE OF FLOOD OF RECORD : May 6, 2011
ESTIMATED DISCHARGE: -
WATER SURFACE ELEV : 103.27' @ Burlington USGS Gage
NATURAL STREAM VELOCITY : -
ICE CONDITIONS : -
DEBRIS: -
DOES THE STREAM REACH MAXIMUM HIGHWATER ELEV. RAPIDLY? -
IS ORDINARY RISE RAPID? -
IS STAGE AFFECTED BY UPSTREAM OR DOWNSTREAM CONDITIONS? -
IF YES, DESCRIBE -

WATERSHED STORAGE 0% HEADWATERS:
UNIFORM:
IMMEDIATELY ABOVE SITE:

EXISTING STRUCTURE INFORMATION

STRUCTURE TYPE: Twin Leaf Bascule Bridge
YEAR BUILT: 1953
CLEAR SPAN(NORMAL TO STREAM): 80.3'
VERTICAL CLEARANCE ABOVE STREAMBED: 33.3'
WATERWAY OF FULL OPENING: ~4980'
DISPOSITION OF STRUCTURE: Remove and Replace
TYPE OF MATERIAL UNDER SUBSTRUCTURE: See boring logs

WATER SURFACE ELEVATIONS AT:

43% AEP = - VELOCITY = -
10% AEP = - " -
4% AEP = - " -
2% AEP = - " -
1% AEP = 101.5' ** " -

LONG TERM STREAMBED CHANGES: -

IS THE ROADWAY OVERTOPPED BELOW 1% AEP:
FREQUENCY:
RELIEF ELEVATION:
DISCHARGE OVER ROAD @ 1% AEP:

UPSTREAM STRUCTURE

TOWN: - DISTANCE: -
HIGHWAY #: - STRUCTURE #: -
CLEAR SPAN: - CLEAR HEIGHT: -
YEAR BUILT: - FULL WATERWAY: -
STRUCTURE TYPE: -

DOWNSTREAM STRUCTURE

TOWN: - DISTANCE: -
HIGHWAY #: - STRUCTURE #: -
CLEAR SPAN: - CLEAR HEIGHT: -
YEAR BUILT: - FULL WATERWAY: -
STRUCTURE TYPE: -

LRFR LOAD RATING FACTORS

LOADING LEVELS	TRUCK						
	H 20	HL 93	3S2	5 AXLE	3A STR	4A STR	5A SEM
TONNAGE	20	36	36	66	30	34.5	38
INVENTORY	2.24	1.31					
POSTING							
OPERATING	2.91	1.71	2.35	1.59	1.63	1.5	2.02
COMMENTS:	APPROACH SPAN EXTERIOR GIRDER CONTROLS, SERVICE II LIMIT STATE						

PROPOSED STRUCTURE

STRUCTURE TYPE: TWIN LEAF BASCULE BRIDGE

CLEAR SPAN(NORMAL TO STREAM): 81.0'
VERTICAL CLEARANCE ABOVE STREAMBED: 30.4'
WATERWAY OF FULL OPENING: ~ 4100 sq ft

WATER SURFACE ELEVATIONS AT:

43% AEP = - VELOCITY= -
10% AEP = - " -
4% AEP = - " -
2% AEP = - " -
1% AEP = 101.5' ** " -

IS THE ROADWAY OVERTOPPED BELOW 1% AEP: No
FREQUENCY: Above 1% AEP
RELIEF ELEVATION: ~ 118'
DISCHARGE OVER ROAD @ 1% AEP: None

BRIDGE LOW CHORD ELEVATION: 112.4'
FREEBOARD: @ 1% AEP = 10.9'

SCOUR:

REQUIRED CHANNEL PROTECTION: Stone Fill, Type IV

PERMIT INFORMATION

AVERAGE DAILY FLOW: - DEPTH OR ELEVATION:
ORDINARY LOW WATER: -
ORDINARY HIGH WATER: - 97.6'
MEAN WATER LEVEL: - 95.1'

TEMPORARY BRIDGE REQUIREMENTS

STRUCTURE TYPE: Single Leaf Bascule Bridge
CLEAR SPAN (NORMAL TO STREAM): 40.0'
VERTICAL CLEARANCE ABOVE STREAMBED: 10' (low chord to OHW)
WATERWAY AREA OF FULL OPENING:

ADDITIONAL INFORMATION

Mean Lake Level at Rouses Point = 94.88' based on "The State Discharge Relationship of Lake Champlain - Richelieu River"
** = Taken from Grand Isle FIS

TRAFFIC MAINTENANCE NOTES

1. MAINTAIN TWO-WAY TRAFFIC ON A TEMPORARY BRIDGE
2. INSTALL AND MAINTAIN TRAFFIC SIGNALS
3. SIDEWALKS ARE NOT NECESSARY
4. THE APPROACHES FOR THE TEMPORARY BRIDGE SHALL BE PAVED.

DESIGN VALUES

1	DESIGN LIVE LOAD		HL-93
2	FUTURE PAVEMENT	d_D:	0.0 INCH
3	ABUTMENT BEARING TO BEARING LENGTH (SIX SPANS) (48.00 - 26.50 - 53.10 - 53.10 - 26.50 - 48.00) FT	L:	255.2 FT
4	MIN. MID-SPAN POS. CAMBER @ RELEASE (PRESTRESSED UNITS)	Δ:	- - -
5	PRESTRESSING STRAND	f_y:	- - -
6	PRESTRESSED CONCRETE STRENGTH	f'_c:	- - -
7	PRESTRESSED CONCRETE RELEASE STRENGTH	f'_{ci}:	- - -
8	CONCRETE, HIGH PERFORMANCE CLASS LW	f'_c:	4.0 KSI
9	CONCRETE, HIGH PERFORMANCE CLASS A	f'_c:	4.0 KSI
10	CONCRETE, HIGH PERFORMANCE CLASS B	f'_c:	3.5 KSI
11	CONCRETE, CLASS C	f'_c:	3.0 KSI
12	REINFORCING STEEL	f_y:	60 KSI
13	STRUCTURAL STEEL AASHTO M270	f_y:	50 KSI
14	NOMINAL BEARING RESISTANCE OF ROCK	q_n:	160.0 KSF
15	ROCK BEARING RESISTANCE FACTOR (REFER TO AASHTO LRFD)	ϕ:	0.45
16	MICROPILE GEOTECHNICAL RESISTANCE FACTOR (TIP)	ϕ:	0.50
17	MICROPILE GEOTECHNICAL RESISTANCE FACTOR (SIDE)	ϕ:	0.55
18	MICROPILE STRUCTURAL RES. FACTOR (CASED,COMPRESSION)	ϕ:	0.75
19	LATERAL PILE DEFLECTION	Δ:	TBD
20	BASIC WIND SPEED	V_{3s}:	100 MPH
21	MINIMUM GROUND SNOW LOAD	p_g:	- - -
22	SEISMIC DATA — PGA 0.135g	S_s:	0.259g
		S_1:	0.061g
23			
24			- - -
25			- - -
26			- - -

PROJECT NAME: **NORTH HERO GRAND ISLE BRIDGE**
PROJECT NUMBER: **BHF 028-1(26)**

FILE NAME: z12b142pi.xls — PLOT DATE: 8/4/2017
PROJECT LEADER: T. FRENCH — DRAWN BY: P. LEFEBVRE
DESIGNED BY: P. LEFEBVRE — CHECKED BY: M. MOZER
PRELIMINARY INFORMATION SHEET — SHEET 3 OF 340

GENERAL INFORMATION

SYMBOLOGY LEGEND NOTE

THE SYMBOLOGY ON THIS SHEET IS INTENDED TO COVER STANDARD CONVENTIONAL SYMBOLOGY. THE SYMBOLOGY IS USED FOR EXISTING & PROPOSED FEATURES WITH HEAVIER LINEWEIGHT, IN COMBINATION WITH PROJECT ANNOTATION, AS NOTED ON PROJECT PLAN SHEETS. THIS LEGEND SHEET COVERS THE BASICS. SYMBOLOGY ON PLANS MAY VARY, PLAN ANNOTATIONS AND NOTES SHOULD BE USED TO CLARIFY AS NEEDED.

R.O.W. ABBREVIATIONS (CODES) & SYMBOLS

POINT	CODE	DESCRIPTION
	CH	CHANNEL EASEMENT
	CONST	CONSTRUCTION EASEMENT
	CUL	CULVERT EASEMENT
	D&C	DISCONNECT & CONNECT
	DIT	DITCH EASEMENT
	DR	DRAINAGE EASEMENT
	DRIVE	DRIVEWAY EASEMENT
	EC	EROSION CONTROL
	HWY	HIGHWAY EASEMENT
	I&M	INSTALL & MAINTAIN EASEMENT
	LAND	LANDSCAPE EASEMENT
	R&RES	REMOVE & RESET
	R&REP	REMOVE & REPLACE
	SR	SLOPE RIGHT
	UE	UTILITY EASEMENT
	(P)	PERMANENT EASEMENT
	(T)	TEMPORARY EASEMENT
■	BNDNS	BOUND SET
⊡	BNDNS	BOUND TO BE SET
●	IPNS	IRON PIN SET
◎	IPNS	IRON PIN TO BE SET
⊠	CALC	EXISTING ROW POINT
○	PROW	PROPOSED ROW POINT
[LENGTH]		LENGTH CARRIED ON NEXT SHEET

COMMON TOPOGRAPHIC POINT SYMBOLS

POINT	CODE	DESCRIPTION
	APL	BOUND APPARENT LOCATION
	BM	BENCHMARK
	BND	BOUND
	CB	CATCH BASIN
	COMB	COMBINATION POLE
	DITHR	DROP INLET THROATED DNC
	EL	ELECTRIC POWER POLE
	FPOLE	FLAGPOLE
	GASFIL	GAS FILLER
	GP	GUIDE POST
	GSO	GAS SHUT OFF
	GUY	GUY POLE
	GUYW	GUY WIRE
	GV	GATE VALUE
	H	TREE HARDWOOD
	HCTRL	CONTROL HORIZONTAL
	HVCTRL	CONTROL HORIZ. & VERTICAL
	HYD	HYDRANT
	IP	IRON PIN
	IPIPE	IRON PIPE
	LI	LIGHT - STREET OR YARD
	MB	MAILBOX
	MH	MANHOLE (MH)
	MM	MILE MARKER
	PM	PARKING METER
	PMK	PROJECT MARKER
	POST	POST STONE/WOOD
	RRSIG	RAILROAD SIGNAL
	RRSL	RAILROAD SWITCH LEVER
	S	TREE SOFTWOOD
	SAT	SATELLITE DISH
	SHRUB	SHRUB
	SIGN	SIGN
	STUMP	STUMP
	TEL	TELEPHONE POLE
	TIE	TIE
	TSIGN	SIGN W/DOUBLE POST
	VCTRL	CONTROL VERTICAL
	WELL	WELL
	WSO	WATER SHUT OFF

THESE ARE COMMON VAOT SURVEY POINT SYMBOLS FOR EXISTING FEATURES, ALSO USED FOR PROPOSED FEATURES WITH HEAVIER LINEWEIGHT, IN COMBINATION WITH PROPOSED ANNOTATION.

PROPOSED GEOMETRY CODES

CODE	DESCRIPTION
PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
CC	CENTER OF CURVE
PT	POINT OF TANGENCY
PCC	POINT OF COMPOUND CURVE
PRC	POINT OF REVERSE CURVE
POB	POINT OF BEGINNING
POE	POINT OF ENDING
STA	STATION PREFIX
AH	AHEAD STATION SUFFIX
BK	BACK STATION SUFFIX
D	CURVE DEGREE OF (100FT)
R	CURVE RADIUS OF
T	CURVE TANGENT LENGTH
L	CURVE LENGTH OF
E	CURVE EXTERNAL DISTANCE

UTILITY SYMBOLOGY

UNDERGROUND UTILITIES

UGU	UTILITY (GENERIC-UNKNOWN)
UT	TELEPHONE
UE	ELECTRIC
UC	CABLE (TV)
UEC	ELECTRIC+CABLE
UET	ELECTRIC+TELEPHONE
UCT	CABLE+TELEPHONE
UECT	ELECTRIC+CABLE+TELEP.
G	GAS LINE
W	WATER LINE
S	SANITARY SEWER (SEPTIC)

ABOVE GROUND UTILITIES (AERIAL)

AGU	UTILITY (GENERIC-UNKNOWN)
T	TELEPHONE
E	ELECTRIC
C	CABLE (TV)
EC	ELECTRIC+CABLE
ET	ELECTRIC+TELEPHONE
AER E&T	ELECTRIC+TELEPHONE
CT	CABLE+TELEPHONE
ECT	ELECTRIC+CABLE+TELEP.
	UTILITY POLE GUY WIRE

PROJECT CONSTRUCTION SYMBOLOGY

PROJECT DESIGN & LAYOUT SYMBOLOGY

CZ	CLEAR ZONE
	PLAN LAYOUT MATCHLINE

PROJECT CONSTRUCTION FEATURES

	TOP OF CUT SLOPE
	TOE OF FILL SLOPE
	STONE FILL
	BOTTOM OF DITCH ℄
	CULVERT PROPOSED
	STRUCTURE SUBSURFACE
PDF	PROJECT DEMARCATION FENCE
BF	BARRIER FENCE
	TREE PROTECTION ZONE (TPZ)
	STRIPING LINE REMOVAL
	SHEET PILES

CONVENTIONAL BOUNDARY SYMBOLOGY

BOUNDARY LINES

TOWN LINE	TOWN BOUNDARY LINE
COUNTY LINE	COUNTY BOUNDARY LINE
STATE LINE	STATE BOUNDARY LINE
	PROPOSED STATE R.O.W. (LIMITED ACCESS)
	PROPOSED STATE R.O.W.
	STATE ROW (LIMITED ACCESS)
	STATE ROW
	TOWN ROW
	PERMANENT EASEMENT LINE (P)
	TEMPORARY EASEMENT LINE (T)
	SURVEY LINE
P/L	PROPERTY LINE (P/L)
SR	SLOPE RIGHTS
6f	6F PROPERTY BOUNDARY
4f	4F PROPERTY BOUNDARY
HAZ	HAZARDOUS WASTE

EPSC LAYOUT PLAN SYMBOLOGY

EPSC MEASURES

- FILTER CURTAIN
- SILT FENCE
- SILT FENCE WOVEN WIRE
- CHECK DAM
- DISTURBED AREAS REQUIRING RE-VEGETATION
- EROSION MATTING

ENVIRONMENTAL RESOURCES

	WETLAND BOUNDARY
	RIPARIAN BUFFER ZONE
	WETLAND BUFFER ZONE
	SOIL TYPE BOUNDARY
T&E	THREATENED & ENDANGERED SPECIES
HAZ	HAZARDOUS WASTE AREA
AG	AGRICULTURAL LAND
HABITAT	FISH & WILDLIFE HABITAT
FLOOD PLAIN	FLOOD PLAIN
OHW	ORDINARY HIGH WATER (OHW)
	STORM WATER
	USDA FOREST SERVICE LANDS
	WILDLIFE HABITAT SUIT/CONN

ARCHEOLOGICAL & HISTORIC

ARCH	ARCHEOLOGICAL BOUNDARY
HISTORIC DIST	HISTORIC DISTRICT BOUNDARY
HISTORIC	HISTORIC AREA
(H)	HISTORIC STRUCTURE

CONVENTIONAL TOPOGRAPHIC SYMBOLOGY

EXISTING FEATURES

- ROAD EDGE PAVEMENT
- ROAD EDGE GRAVEL
- DRIVEWAY EDGE
- DITCH
- FOUNDATION
- FENCE (EXISTING)
- FENCE WOOD POST
- FENCE STEEL POST
- GARDEN
- ROAD GUARDRAIL
- RAILROAD TRACKS
- CULVERT (EXISTING)
- STONE WALL
- WALL
- WOOD LINE
- BRUSH LINE
- HEDGE
- BODY OF WATER EDGE
- LEDGE EXPOSED

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142leg.dgn
DATE/TIME : 8/4/2017
USER : 3724

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: z12b142leg.dgn	PLOT DATE: 8/4/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CONVENTIONAL SYMBOLOGY LEGEND SHEET	SHEET 14 OF 340

EPSC PLAN NARRATIVE

1.1 PROJECT DESCRIPTION

THIS PROJECT INVOLVES THE REPLACEMENT OF BRIDGE 8, A DOUBLE LEAF BASCULE BRIDGE THAT PROVIDES THE ONLY VEHICULAR CONNECTION BETWEEN NORTH HERO AND GRAND ISLE, VT. THE BRIDGE WILL BE REPLACED WITH A TWIN LEAF BASCULE BRIDGE. THE BRIDGE WILL BE ON NEW FOUNDATIONS ALONG THE SAME ALIGNMENT. A SIMILAR AESTHETIC WILL BE MAINTAINED. BRIDGE 8 IS LOCATED BETWEEN THE TOWNS OF NORTH HERO AND GRAND ISLE, ALONG US ROUTE 2, AND CROSSES OVER LAKE CHAMPLAIN.

NOTE: AREA OF DISTURBANCE INCLUDES LIMITS OF EARTH DISTURBANCE WITHIN THE PROJECT AREA, AS WELL AS WASTE, BORROW AND STAGING AREAS, AND OTHER EARTH DISTURBING ACTIVITIES WITHIN OR DIRECTLY ADJACENT TO THE PROJECT LIMITS AS SHOWN ON THE ATTACHED EPSC PLAN.

TOTAL AREA OF DISTURBANCE AS SHOWN ON THE ATTACHED EPSC PLAN IS APPROXIMATELY 2.95 ACRES.
IMPACTS BELOW THE MWL ARE APPROXIMATELY 0.71 ACRE (0.18 ACRE PERM. & 0.53 ACRE TEMP.)
IMPACTS BELOW THE OHW ARE APPROXIMATELY 0.83 ACRE (0.18 ACRE PERM. & 0.65 ACRE TEMP.)

IT IS ANTICIPATED THAT THIS PROJECT WILL LAST FOUR CONSTRUCTION SEASONS.

1.2 SITE INVENTORY

1.2.1 TOPOGRAPHY

THE TOPOGRAPHY OF THE AREA IS A SADDLE THAT IS MOSTLY OPEN AREAS AND BANK WITH SOME WOODED AREAS. US ROUTE 2, LANDING LANE, DRAWBRIDGE LANE, AND TWO PAVED DRIVEWAYS ARE WITHIN THE PROJECT SITE. THERE IS A RESIDENCE ON THE SOUTH SIDE OF THE PROJECT.

1.2.2 DRAINAGE, WATERWAYS, BODIES OF WATER, AND PROXIMITY TO NATURAL OR MAN-MADE WATER FEATURES

LAKE CHAMPLAIN IS THE ONLY WATER SOURCE ON THE PROJECT SITE.

1.2.3 VEGETATION

THE VEGETATION IN THE PROJECT AREA CONSISTS OF DECIDUOUS AND CONIFEROUS TREES, AS WELL AS SOME ADDITIONAL MINOR GROWTH. UPON PROJECT COMPLETION, AREAS OF THE CAUSEWAY WILL BE ARMORED WITH STONE FILL AS SPECIFIED ON THE PLANS. DISTURBED VEGETATION WILL BE REESTABLISHED WITH STANDARD SEED AND MULCH PRACTICES.

1.2.4 SOILS

THE SOIL IN THE PROJECT AREA IS MOSTLY FILL PLACED FOR THE CONSTRUCTION OF THE EXISTING BRIDGE. THE NORTHERNMOST AREA CONTAINS COVINGTON SILTY CLAY LOAM, K=0.49. THE SOUTHERN AREA CONTAINS AMENIA SILT LOAM, K=0.37 AND BENSON ROCKY LOAM, K=0.32.

NOTE: K-VALUES GENERALLY INDICATE THE FOLLOWING:
0.0-0.23 = LOW EROSION POTENTIAL
0.24-0.36 = MODERATE EROSION POTENTIAL
0.37 AND HIGHER = HIGH EROSION POTENTIAL

1.2.5 SENSITIVE RESOURCE AREAS

CRITICAL HABITATS: YES - THE PROJECT AREA IS AN EXCELLENT WILDLIFE HABITAT. NUMEROUS SPECIES COULD OCCUR WITHIN THE PROJECT AREA INCLUDE INVERTEBRATES, FISH, BOTTOM DWELLING ORGANISMS, WATERFOWL, BIRDS OF PREY, MIGRATORY BIRDS, MAMMALS, REPTILES, AND AMPHIBIANS.
HISTORICAL OR ARCHEOLOGICAL AREAS: YES
PRIME AGRICULTURAL LAND: NO
THREATENED AND ENDANGERED SPECIES: YES - GIANT FLOATER (PYGANODON GRANDIS) WAS THE ONLY SPECIES FOUND BY A SURVEY TRAGETING FIVE SPECIES OF FRESHWATER MUSSEL. IT HAS BEEN RECOMMENDED THAT A RESAMPLE BE TAKEN CLOSER TO CONSTRUCTION AND THAT ALL MUSSELS FOUND BE RELOCATED TO ANOTHER SUITABLE AREA BEFORE JULY 2018.
WATER RESOURCE: LAKE CHAMPLAIN
WETLANDS: NO - NO IMPACTS ARE ANTICIPATED TO THE WETLANDS, WHICH ARE LOCATED WITHIN THE NORTHWESTERN QUADRANT OF THE CAUSEWAY, DUE TO THE LIMITED SCOPE OF THE PROJECT.

1.3 RISK EVALUATION

THIS PROJECT FALLS UNDER THE JURISDICTION OF CONSTRUCTION GENERAL PERMIT 3-9020 FOR STORMWATER RUNOFF FROM CONSTRUCTION SITES FOR LOW RISK PROJECTS. ANY MODIFICATIONS TO THE PROJECT THAT INCREASE THE RISK TO ENVIRONMENTAL RESOURCES SHALL BE EVALUATED IN ACCORDANCE WITH THE PERMIT REQUIREMENTS. THE CONTRACTOR WILL BE RESPONSIBLE FOR ANY ADDITIONAL PERMITTING.

1.4 EROSION PREVENTION AND SEDIMENT CONTROL

THE EROSION CONTROL PLANS ARE MEANT AS A GUIDELINE FOR PREVENTING EROSION AND CONTROLLING SEDIMENT TRANSPORT. THE PRINCIPLES OUTLINED IN THIS NARRATIVE CONSIST OF APPLYING MEASURES THROUGHOUT CONSTRUCTION OF THE PROJECT IN ORDER TO MINIMIZE SEDIMENT TRANSPORT TO THE RECEIVING WATERS. THE MEASURES INCLUDE STABILIZATION AND STRUCTURAL PRACTICES, STORMWATER CONTROLS AND OTHER POLLUTION PREVENTION PRACTICES. THEY HAVE BEEN PROPOSED BY THE DESIGNER AS A BASIS FOR PROTECTING RESOURCES AND WILL NEED TO BE BUILT UPON BASED ON THE SPECIFIC MEANS AND METHODS OF THE CONTRACTOR. REFER TO THE LOW RISK SITE HANDBOOK AND APPROPRIATE DETAIL SHEETS FOR SPECIFIC GUIDANCE AND CONSTRUCTION DETAILING.

ALL MEASURES SHALL BE REGULARLY MAINTAINED AND SHALL BE CHECKED FOR SEDIMENT BUILD-UP. SEDIMENT SHALL BE DISPOSED OF AT AN APPROVED SITE WHERE IT WILL NOT BE SUBJECT TO EROSION.

1.4.1 MARK SITE BOUNDARIES

SITE BOUNDARIES AND AREAS CONSTRUCTION EQUIPMENT CAN ACCESS SHALL BE DELINEATED. PROJECT DEMARCATION FENCING (PDF) SHALL BE USED TO PHYSICALLY MARK SITE BOUNDARIES. BECAUSE THIS PROJECT FALLS UNDER THE CGP 3-9020, BARRIER FENCE SHALL BE USED INSTEAD OF PROJECT DEMARCATION FENCE WITHIN 100 FEET OF A WATER RESOURCE (STREAM, BROOK, LAKE, POND, WETLAND, ETC.

1.4.2 LIMIT DISTURBANCE AREA

PREVENTING INITIAL SOIL EROSION BY MINIMIZING THE EXPOSED AREA IS MUCH MORE EFFECTIVE THAN TREATING ERODED SEDIMENT. EARTH DISTURBANCE CAN BE MINIMIZED THROUGH CONSTRUCTION PHASING BY ONLY OPENING UP EARTH AS NECESSARY. THIS CAN LIMIT THE AREA THAT WILL BE DISTURBED AND EXPOSED TO EROSION. EMPLOY TEMPORARY CONSTRUCTION STABILIZATION PRACTICES IN INCREMENTAL STAGES AS PHASES CHANGE. FOR PROJECTS WHICH FALL UNDER THE CONSTRUCTION GENERAL PERMIT 3-9020, ONLY THE ACREAGE LISTED ON THE PERMIT AUTHORIZATION MAY BE EXPOSED AT ANY GIVEN TIME.

MAINTAINING VEGETATED BUFFERS ALONG STREAM BANKS, WETLANDS OR OTHER SENSITIVE AREAS IS A CRUCIAL EROSION AND SEDIMENT CONTROL MEASURE THAT SHOULD BE ESTABLISHED WHEREVER POSSIBLE.

1.4.3 SITE ENTRANCE/EXIT STABILIZATION

TRACKING OF SEDIMENT ONTO PUBLIC HIGHWAYS SHALL BE MINIMIZED TO REDUCE THE POTENTIAL FOR RUNOFF ENTERING RECEIVING WATERS. INSTALLATION SHALL COINCIDE WITH THE CONTRACTOR'S PROGRESS SCHEDULE.

STABILIZED CONSTRUCTION ENTRANCES SHALL BE INSTALLED AS PROPOSED ON THE EPSC PLAN AND ANYWHERE EQUIPMENT WILL BE GOING FROM AREAS OF EXPOSED SOILS TO PAVED SURFACES.

1.4.4 INSTALL SEDIMENT BARRIERS

SEDIMENT BARRIERS SHALL BE UTILIZED TO INTERCEPT RUNOFF AND ALLOW SUSPENDED SEDIMENT TO SETTLE OUT. THEY SHALL BE INSTALLED PRIOR TO ANY UP SLOPE WORK.

SILT FENCE WILL BE INSTALLED AS PROPOSED ON THE EPSC PLAN. BECAUSE THIS PROJECT FALLS UNDER THE CONSTRUCTION GENERAL PERMIT 3-9020, WOVEN WIRE REINFORCED SILT FENCE SHALL BE USED INSTEAD OF SILT FENCE WITHIN 100 FEET UPSLOPE OF RECEIVING WATERS.

FILTER CURTAINS WILL BE INSTALLED AS PROPOSED ON THE EPSC PLAN AND DETAIL. THE INITIAL INSTALLATION OF THE CURTAIN, FOR EARTH EXCAVATION AND BRIDGE CONSTRUCTION, SHALL CONSIST OF A DOUBLE ROW. THE SECOND INSTALLATION, FOR THE COFFERDAM REMOVAL, SHALL CONSIST OF A SINGLE ROW. EACH ROW SHALL BE PAID BY THE SQUARE FOOT UNDER ITEM 649.61 GEOTEXTILE FOR FILTER CURTAIN.

1.4.5 DIVERT UPLAND RUNOFF

DIVERSIONARY MEASURES SHALL BE USED TO INTERCEPT RUNOFF FROM ABOVE THE CONSTRUCTION AND DIRECT IT AROUND THE DISTURBED AREA SO THAT CLEAN WATER DOES NOT BECOME MUDDIED WHILE TRAVELING OVER EXPOSED SOILS ON THE CONSTRUCTION SITE.

1.4.6 SLOW DOWN CHANNELIZED RUNOFF

THIS PROJECT IS NOT EXPECTED TO PRODUCE ANY CHANNELIZED RUNOFF.

1.4.7 CONSTRUCT PERMANENT CONTROLS

THIS PROJECT DOES NOT REQUIRE ANY PERMANENT STORMWATER TREATMENT DEVICES.

1.4.8 STABILIZE EXPOSED SOILS DURING CONSTRUCTION

ALL AREAS OF DISTURBANCE MUST HAVE TEMPORARY STABILIZATION IN PLACE WITHIN 48 HOURS OF DISTURBANCE OR IN ACCORDANCE WITH THE CONSTRUCTION GENERAL PERMIT 3-9020 AUTHORIZATION.

SURFACE ROUGHENING OF ALL EXPOSED SLOPES, COMBINED WITH TEMPORARY MULCHING, SHALL BE UTILIZED ON A REGULAR BASIS. BIODEGRADABLE EROSION CONTROL MATTING OR AN EQUIVALENT SHALL BE USED TO STABILIZE ALL SLOPES STEEPER THAN 1:3.

THE FORECAST OF RAINFALL EVENTS SHALL TRIGGER IMMEDIATE PROTECTION OF EXPOSED SOILS.

1.4.9 WINTER STABILIZATION

IF CONSTRUCTION ACTIVITIES INVOLVING EARTH DISTURBANCE CONTINUE PAST OCTOBER 15 OR BEGIN BEFORE APRIL 15, THE FOLLOWING MUST BE INCORPORATED INTO THE EPSC PLAN:

1. ENLARGED ACCESS POINTS, STABILIZE TO PROVIDE FOR SNOW STOCKPILING.
2. LIMITS OF DISTURBANCE MOVED OR REPLACED TO REFLECT BOUNDARY OF WINTER WORK.
3. A SNOW MANAGEMENT PLAN INCLUDING ADEQUATE STORAGE AND CONTROL OF SNOWMELT, REQUIRING CLEARED SNOW TO BE STORED DOWN GRADIENT OF ALL AREA OF DISTURBANCE AND PROHIBITING STORAGE OF SNOW IN STORMWATER TREATMENT STRUCTURES.
4. A MINIMUM 25 FOOT BUFFER SHALL BE MAINTAINED FROM PERIMETER CONTROLS SUCH AS SILT FENCE TO ALLOW FOR SNOW CLEARING AND MAINTENANCE.
5. IN AREAS OF DISTURBANCE WITHIN 100 FEET OF A RECEIVING WATER, SILT FENCE SHALL BE REINFORCED OR ELSE REPLACED WITH PERIMETER DIKES, SWALES, OR OTHER PRACTICES RESISTANT TO THE FORCES OF SNOW LOADS.
6. DRAINAGE STRUCTURES SHALL BE KEPT OPEN AND FREE OF SNOW AND ICE DAMS.
7. THE CONTRACTOR SHALL INSTALL SILT FENCE AND OTHER PRACTICES REQUIRING EARTH DISTURBANCE AHEAD OF GROUND FREEZING.
8. WHERE MULCH IS THE SELECTED STABILIZATION MEASURE, USE DOUBLE THE STANDARD RATE OF MULCH.
9. THE REQUIREMENT FOR NETTING OR OTHER APPROACH TO ANCHOR MULCH TO PREVENT REMOVAL BY WIND.
10. TO ENSURE COVER OF DISTURBED SOIL IN ADVANCE OF A MELT EVENT, AREAS OF DISTURBED SOIL MUST BE STABILIZED AT THE END OF EACH WORK DAY, WITH THE FOLLOWING EXCEPTIONS:
    a. IF NO PRECIPITATION WITHIN 24 HOURS IS FORECAST AND WORK WILL RESUME IN THE SAME DISTURBED AREA WITHIN 24 HOURS, DAILY STABILIZATION IS NOT NECESSARY.
    b. DISTURBED AREAS THAT COLLECT AND RETAIN RUNOFF, SUCH AS HOUSE FOUNDATIONS OR OPEN UTILITY TRENCHES.
11. REMOVE SNOW OR ICE TO LESS THAN 1 INCH THICKNESS PRIOR TO STABILIZATION.

1.4.10 STABILIZE SOIL AT FINAL GRADE

EXPOSED SOIL MUST BE STABILIZED WITHIN 48 HOURS OF REACHING FINAL GRADE.

SEED, MULCH, FERTILIZER AND LIME SHALL BE USED TO ESTABLISH PERMANENT VEGETATION. FOR SLOPES STEEPER THAN 1:3, BIODEGRADABLE EROSION CONTROL MATTING OR AN EQUIVALENT SHALL BE USED INSTEAD OF MULCH.

1.4.11 DE-WATERING ACTIVITIES

DISCHARGE FROM DEWATERING ACTIVITIES THAT FLOWS OFF OF THE CONSTRUCTION SITE MUST NOT CAUSE OR CONTRIBUTE TO A VIOLATION OF THE VERMONT WATER QUALITY STANDARDS.

TREATMENT OF DEWATERING COFFERDAM IS ANTICIPATED. FILTER BAGS SHALL BE USED FOR TREATMENT OF DISCHARGE DURING DEWATERING OPERATIONS. LOCATIONS FOR TREATMENT HAVE BEEN PROPOSED AND ARE SHOWN ON THE PLANS.

1.4.12 INSPECT YOUR SITE

INSPECT THE PROJECT SITE BASED ON SPECIAL PROVISION REQUIREMENTS OR CONSTRUCTION GENERAL PERMIT AUTHORIZATION STIPULATIONS.

1.5 SEQUENCE AND STAGING

THIS SECTION WILL BE DEVELOPED BY THE CONTRACTOR USING THE GUIDANCE OUTLINED IN THE VTRANS EPSC PLAN CONTRACTOR CHECKLIST.

1.5.1 CONSTRUCTION SEQUENCE

1.5.2 OFF-SITE ACTIVITIES

IN ADDITION TO THE CONTRACTOR CHECKLIST ANY ACTIVITIES OUTSIDE THE CONSTRUCTION LIMITS SHALL FOLLOW SPECIFICATION 105.25- 105.29 OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

1.5.3 UPDATES

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 4,773 SF (0.110 ACRES) (TOTAL)

TEMPORARY IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
TEMPORARY IMPACTS BELOW MWL = 17,847.00 SF (0.410 ACRES) (TOTAL)

PERMANENT IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
PERMANENT IMPACTS BELOW MWL = 7,748.00 SF (0.178 ACRES) (TOTAL)

SCALE 1" = 20'-0"
20 0 20

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: zl2bl42env_mwl.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
IMPACTS BELOW MWL SHEET 1	SHEET 1 OF 24

FILE NAME = V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\zl2bl42env_mwl.dgn
DATE/TIME = 11/21/2017
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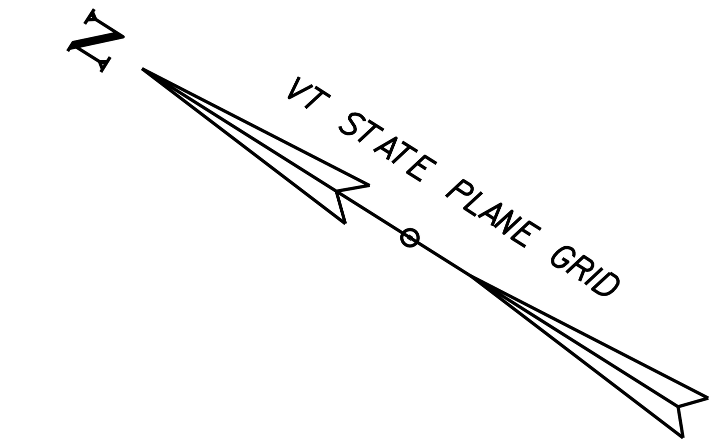

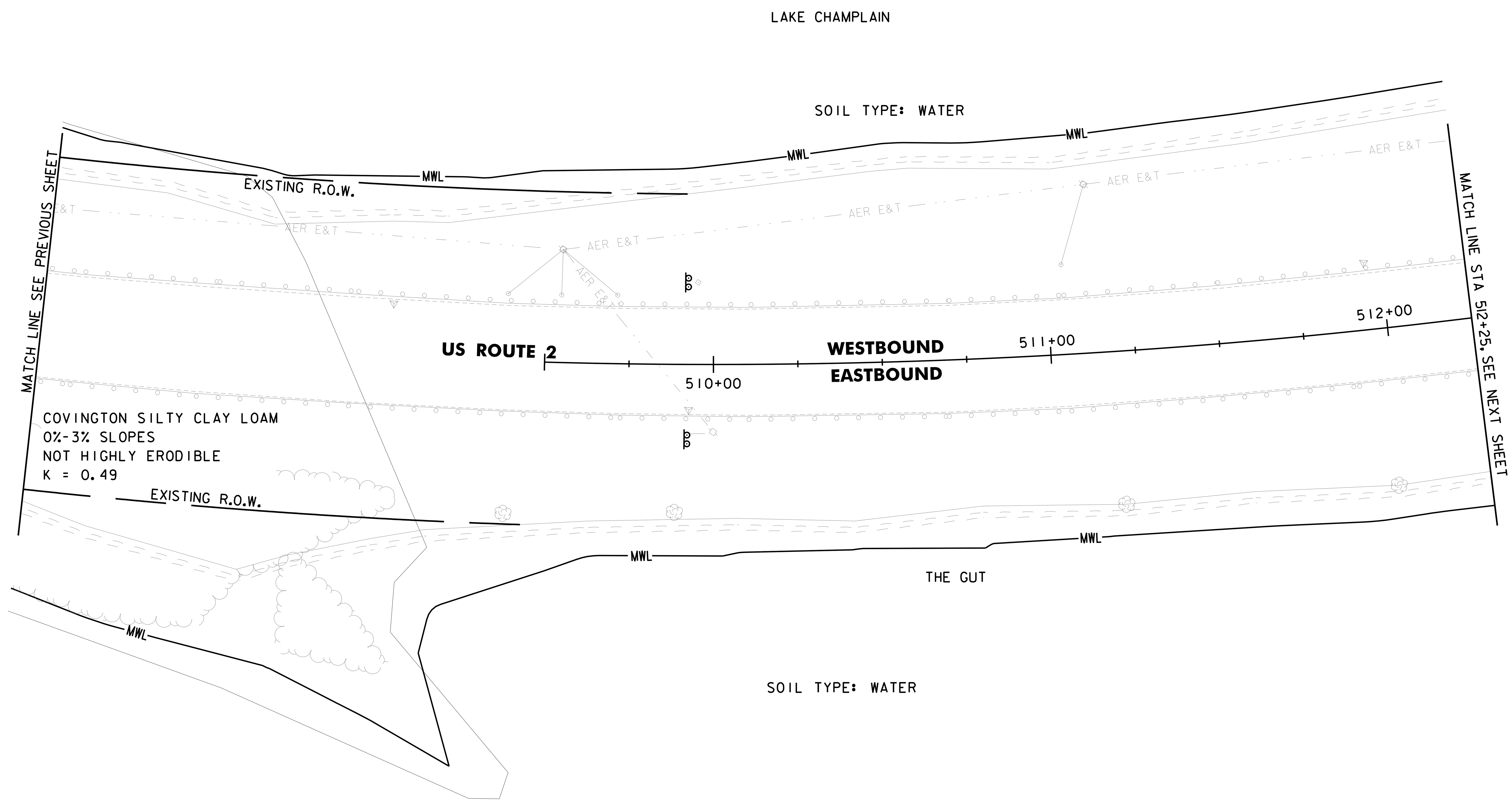

LEGEND

MWL —— MEAN WATER LEVEL (MWL) = 95.5

REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 4,773 SF (0.110 ACRES) (TOTAL)

TEMPORARY IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
TEMPORARY IMPACTS BELOW MWL = 17,847.00 SF (0.410 ACRES) (TOTAL)

PERMANENT IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
PERMANENT IMPACTS BELOW MWL = 7,748.00 SF (0.178 ACRES) (TOTAL)

SCALE 1" = 20'-0"
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IMPACTS BELOW MWL SHEET 2	SHEET 2 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142env_mwl.dgn
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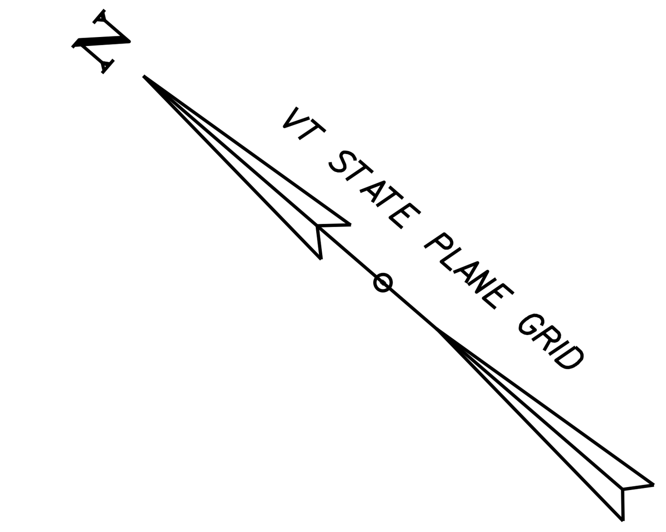

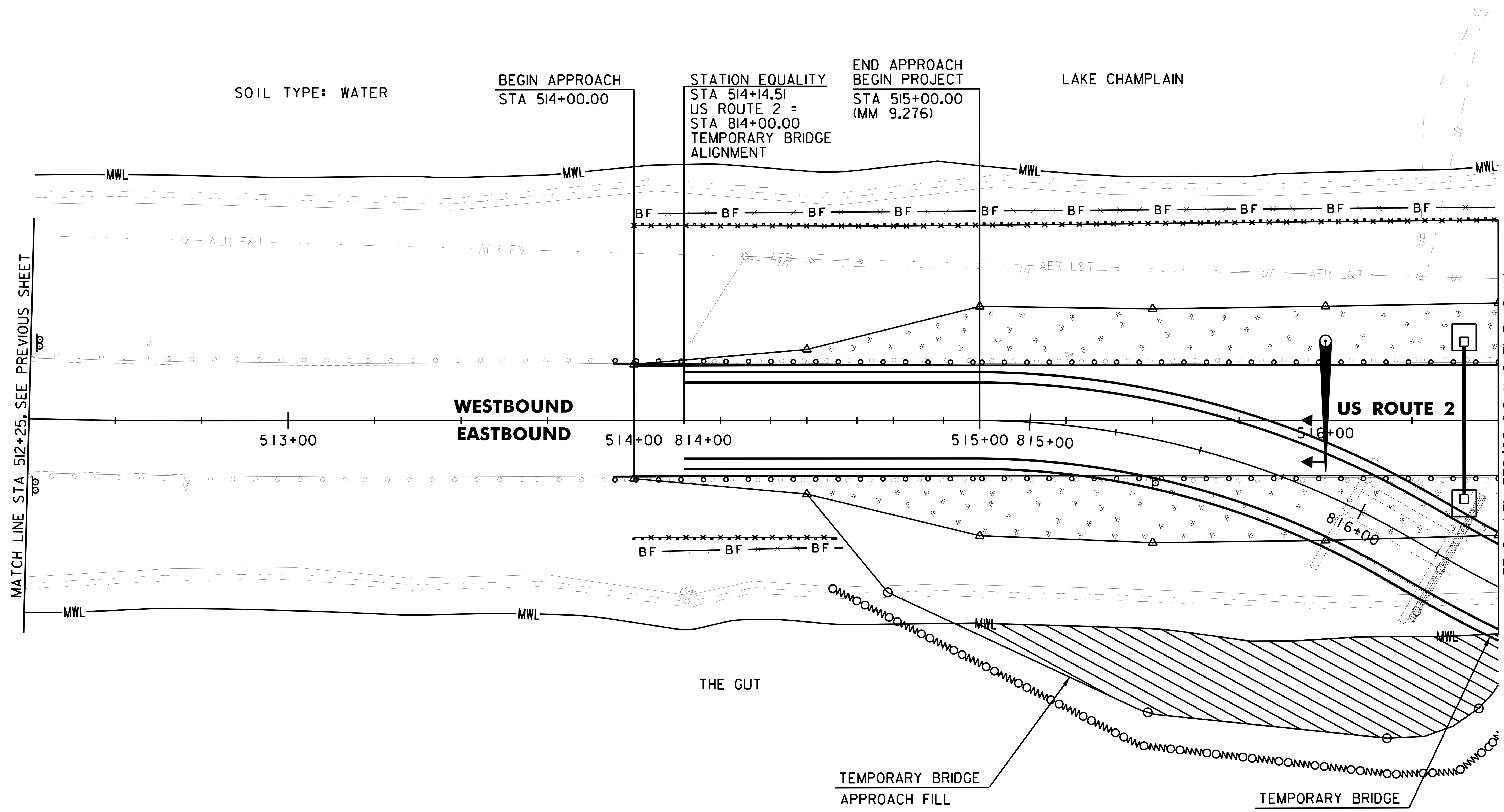

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 4,773 SF (0.110 ACRES) (TOTAL)

TEMPORARY IMPACTS BELOW MWL = 3,297.00 SF (0.076 ACRES) (THIS SHEET)
TEMPORARY IMPACTS BELOW MWL = 17,847.00 SF (0.410 ACRES) (TOTAL)

PERMANENT IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET)
PERMANENT IMPACTS BELOW MWL = 7,748.00 SF (0.178 ACRES) (TOTAL)

SCALE 1" = 20'-0"
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IMPACTS BELOW MWL SHEET 3	SHEET 3 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\zl2bl42env_mwl.dgn
DATE/TIME : 11/21/2017
USER : 3724

LEGEND

MWL	MEAN WATER LEVEL (MWL) = 95.5
(grid)	REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 4,773 SF (0.110 ACRES)(THIS SHEET) REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 4,773 SF (0.110 ACRES)(TOTAL)
(diagonal hatch)	TEMPORARY IMPACTS BELOW MWL = 12,226.00 SF (0.281 ACRES)(THIS SHEET) TEMPORARY IMPACTS BELOW MWL = 17,847.00 SF (0.410 ACRES)(TOTAL)
(cross hatch)	PERMANENT IMPACTS BELOW MWL = 7,748.00 SF (0.178 ACRES)(THIS SHEET) PERMANENT IMPACTS BELOW MWL = 7,748.00 SF (0.178 ACRES)(TOTAL)

SCALE 1" = 20'-0"
20 0 20

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IMPACTS BELOW MWL SHEET 4	SHEET 4 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142env_mwl.dgn
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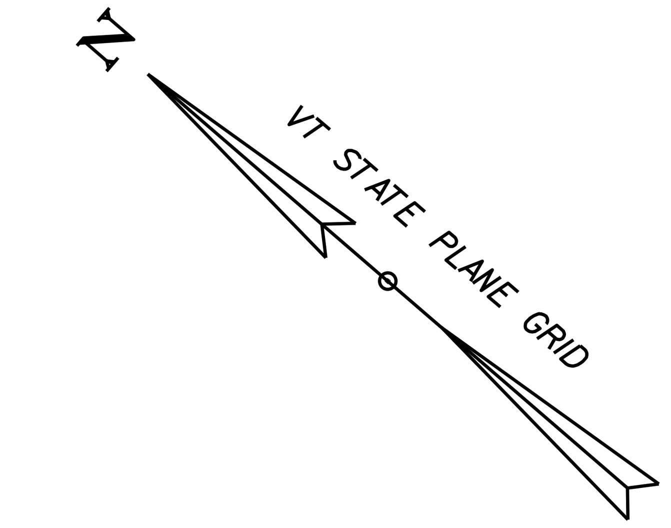

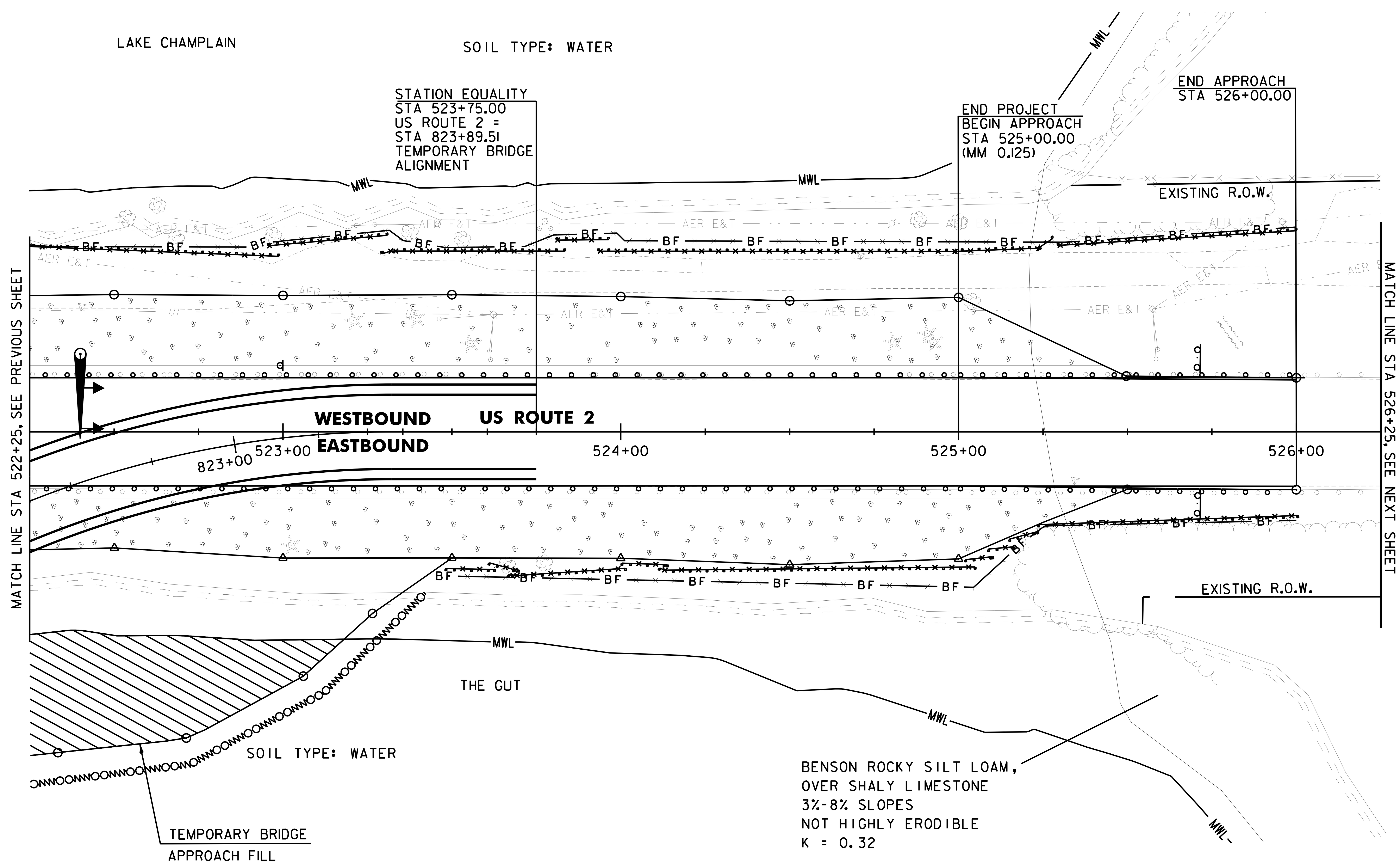

LEGEND

MWL	MEAN WATER LEVEL (MWL) = 95.5
(grid pattern)	REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET) REMOVE & RESET ARMORED STONE IMPACTS BELOW MWL = 4,773 SF (0.110 ACRES) (TOTAL)
(diagonal hatch)	TEMPORARY IMPACTS BELOW MWL = 2,325.00 SF (0.053 ACRES) (THIS SHEET) TEMPORARY IMPACTS BELOW MWL = 17,847.00 SF (0.410 ACRES) (TOTAL)
(cross hatch)	PERMANENT IMPACTS BELOW MWL = 0.00 SF (0.000 ACRES) (THIS SHEET) PERMANENT IMPACTS BELOW MWL = 7,748.00 SF (0.178 ACRES) (TOTAL)

SCALE 1" = 20'-0"
20 0 20

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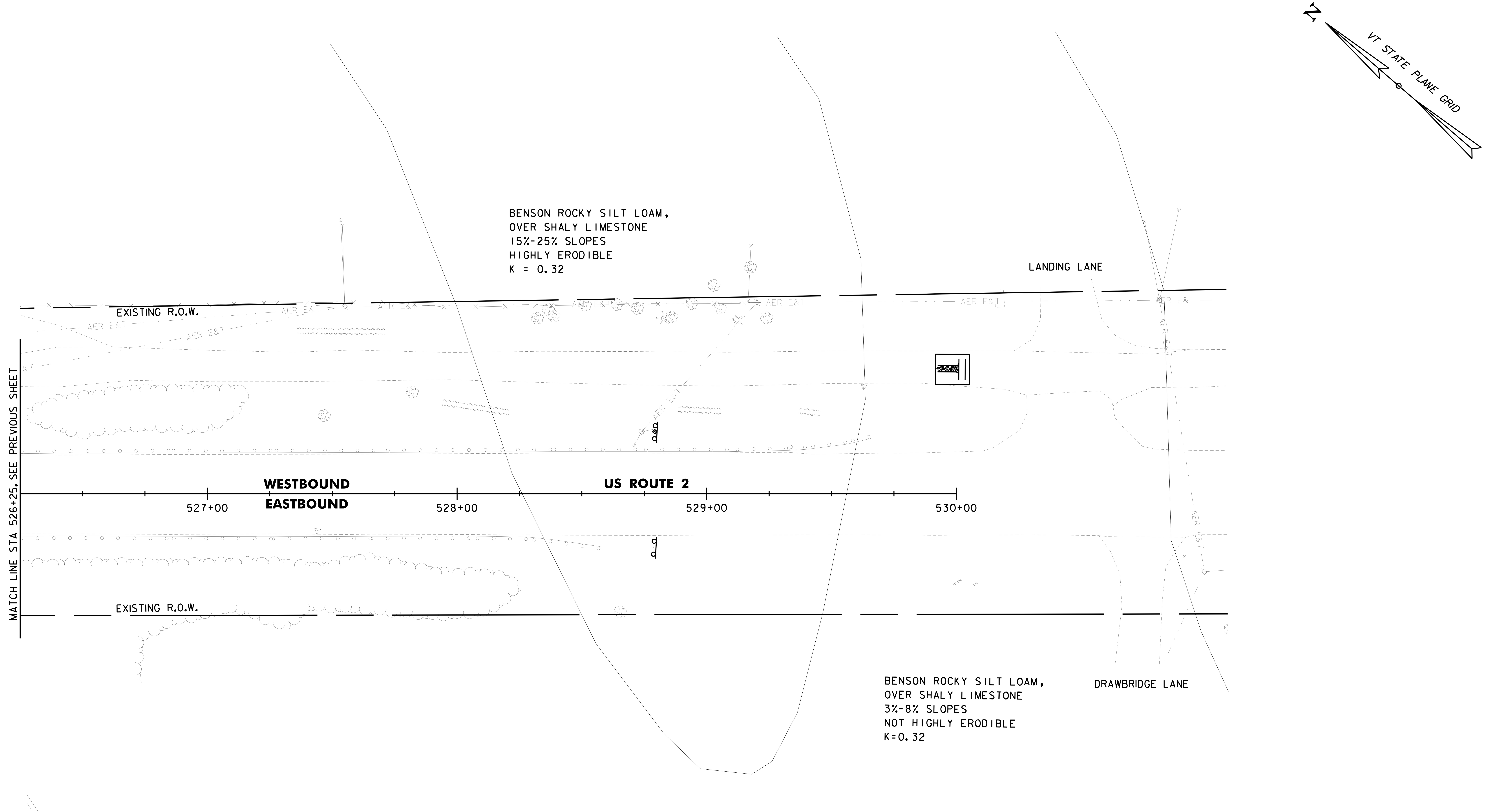
IMPACTS BELOW MWL SHEET 5	SHEET 5 OF 24



LEGEND

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IMPACTS BELOW MWL SHEET 6	SHEET 6 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142env_mwl.dgn
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0+25

0+00

SCALE 1" = 10'-0"
10 0 10

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

HDR

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: z12b142xcchanl.dgn
PROJECT LEADER: T. FRENCH
DESIGNED BY:
CHANNEL CROSS SECTIONS 1

PLOT DATE: 8/30/2017
DRAWN BY: P LEFEBVRE
CHECKED BY: M MOZER
SHEET 7 OF 24

0+75

0+50

SCALE 1" = 10'-0"
10 0 10

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

HDR

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: z12b142xcchan2.dgn	PLOT DATE: 8/30/2017
PROJECT LEADER: T. FRENCH	DRAWN BY: P LEFEBVRE
DESIGNED BY:	CHECKED BY: M MOZER
CHANNEL CROSS SECTIONS 2	SHEET 8 OF 24

1+25

1+00

SCALE 1" = 10'-0"
10 0 10

LEGEND

——— MWL ——— MEAN WATER LEVEL (MWL) = 95.5

HDR

PROJECT NAME:	NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER:	BHF 028-1(26)

FILE NAME: z12b142xcchan3.dgn	PLOT DATE: 8/30/2017
PROJECT LEADER: T. FRENCH	DRAWN BY: P LEFEBVRE
DESIGNED BY:	CHECKED BY: M MOZER
CHANNEL CROSS SECTIONS 3	SHEET 9 OF 24

1+75

1+50

SCALE 1" = 10'-0"
10 0 10

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

HDR

PROJECT NAME:	NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER:	BHF 028-1(26)
FILE NAME: z12b142xcchan4.dgn	PLOT DATE: 8/30/2017
PROJECT LEADER: T. FRENCH	DRAWN BY: P LEFEBVRE
DESIGNED BY:	CHECKED BY: M MOZER
CHANNEL CROSS SECTIONS 4	SHEET 10 OF 24

2+00

SCALE 1" = 10'-0"

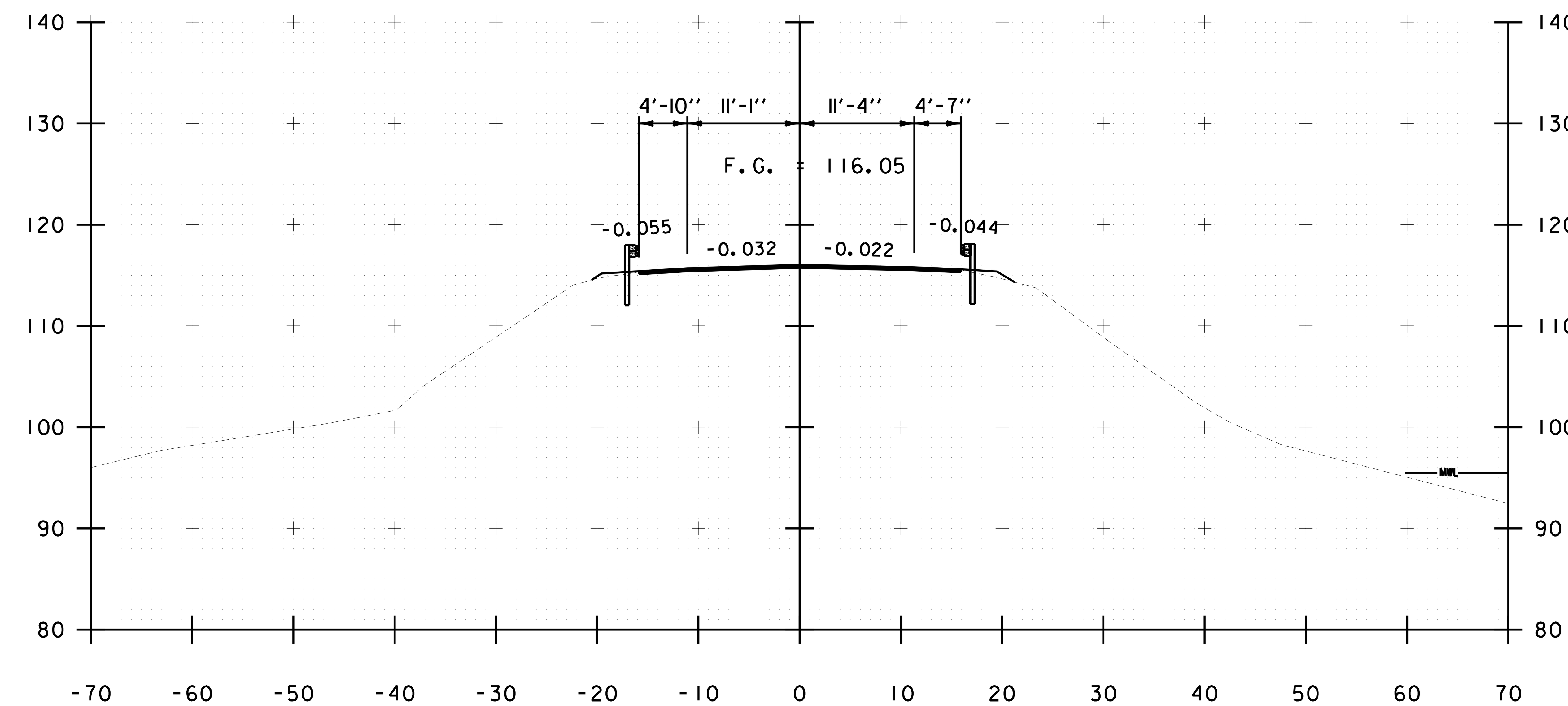
10 0 10

LEGEND

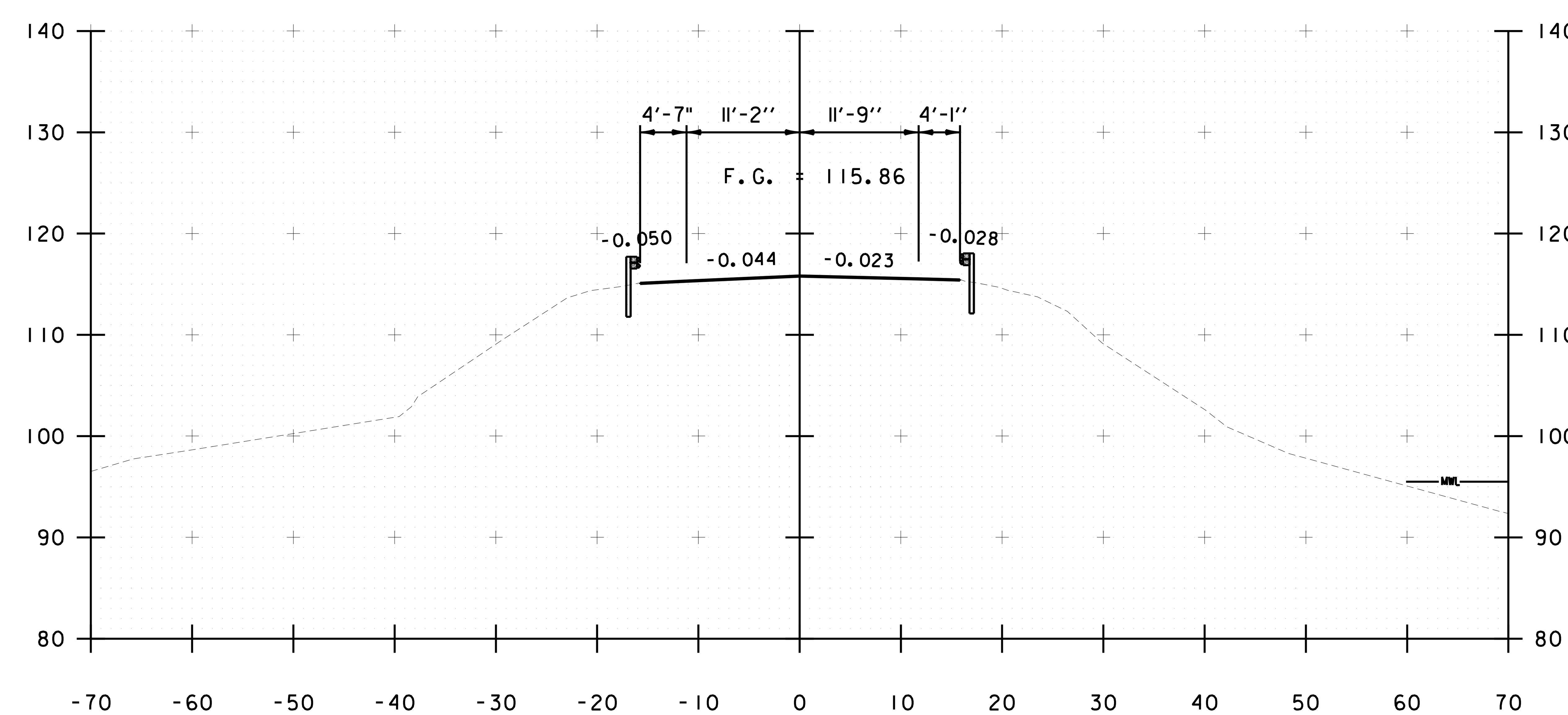
MWL — MEAN WATER LEVEL (MWL) = 95.5

HDR

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12b142xcchan5.dgn	PLOT DATE: 8/30/2017
PROJECT LEADER: T. FRENCH	DRAWN BY: P LEFEBVRE
DESIGNED BY:	CHECKED BY: M. MOZER
CHANNEL CROSS SECTIONS 5	SHEET 11 OF 24



514+50



514+00

BEGIN APPROACH STA 514+00.00

0 10 20
SCALE IN FEET

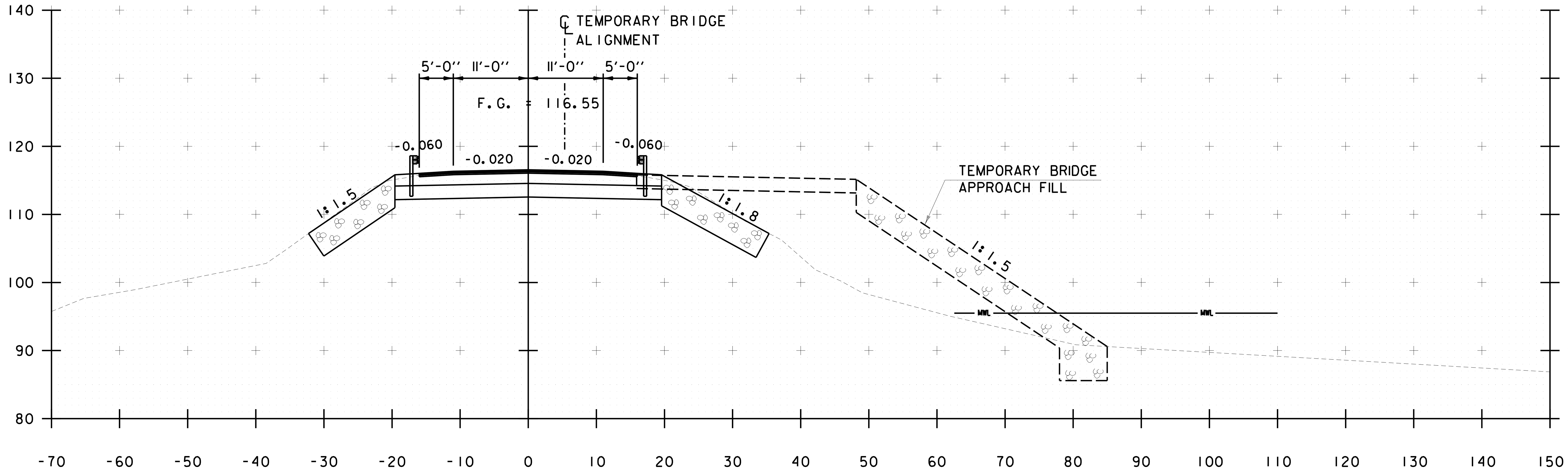
LEGEND

—— MWL —— MEAN WATER LEVEL (MWL) = 95.5

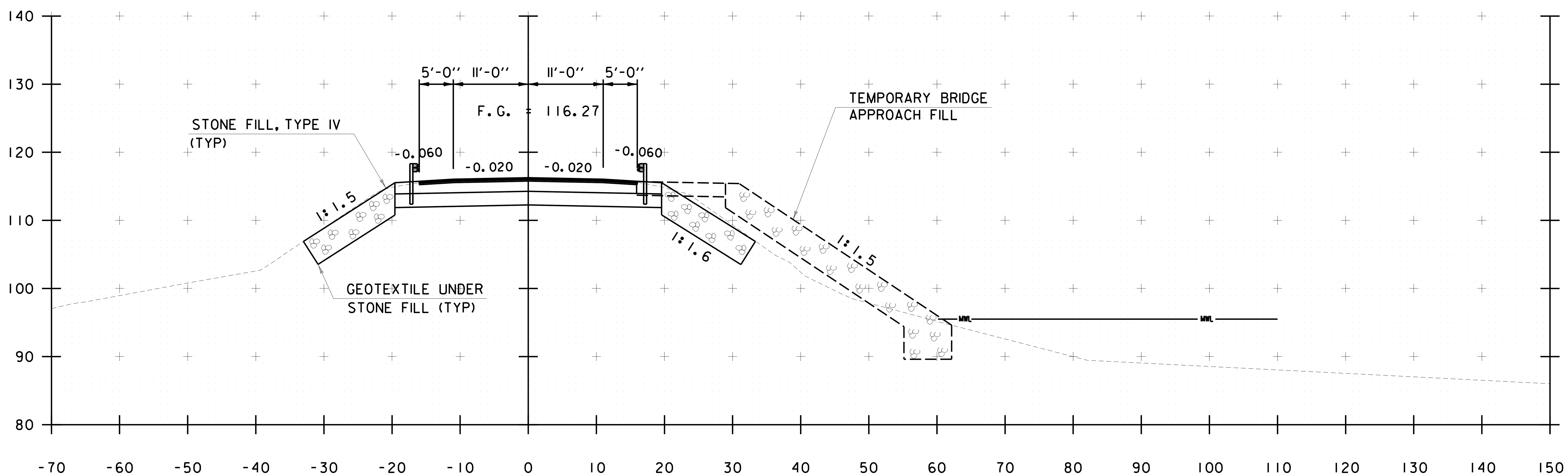
STA. 514+00 TO STA. 514+50

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 1	SHEET 12 OF 24



515+50



515+00

BEGIN PROJECT STA 515+00.00

0 10 20
SCALE IN FEET

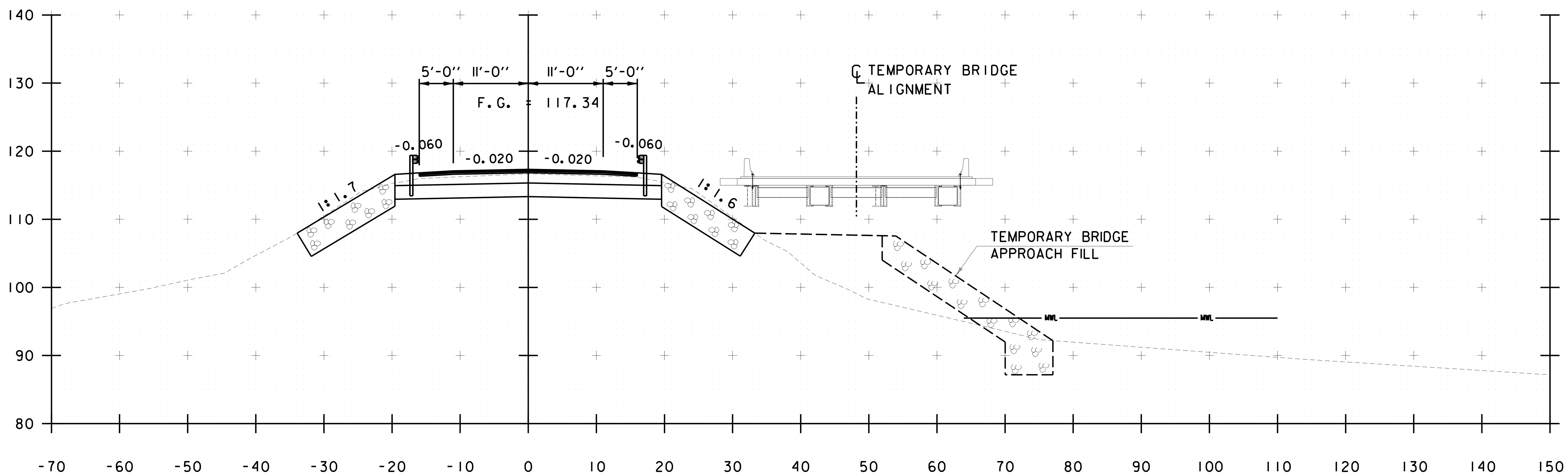
LEGEND

——MWL—— MEAN WATER LEVEL (MWL) = 95.5

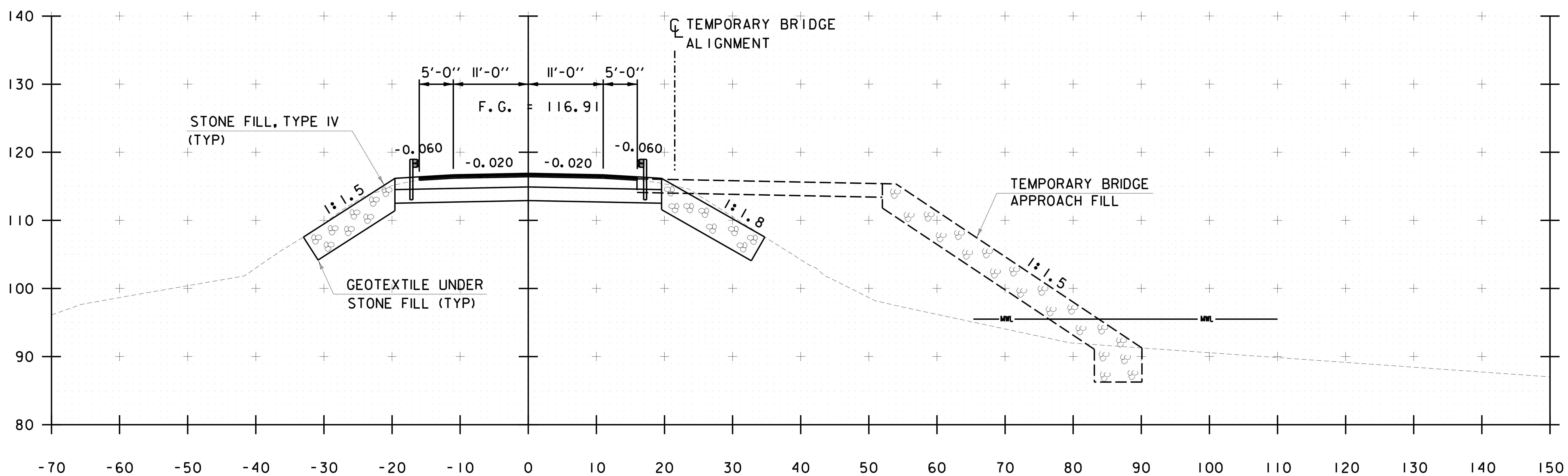
STA. 515+00 TO STA. 515+50

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: zl2bl42xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 2	SHEET 13 OF 24



516+50



516+00

0 10 20
SCALE IN FEET

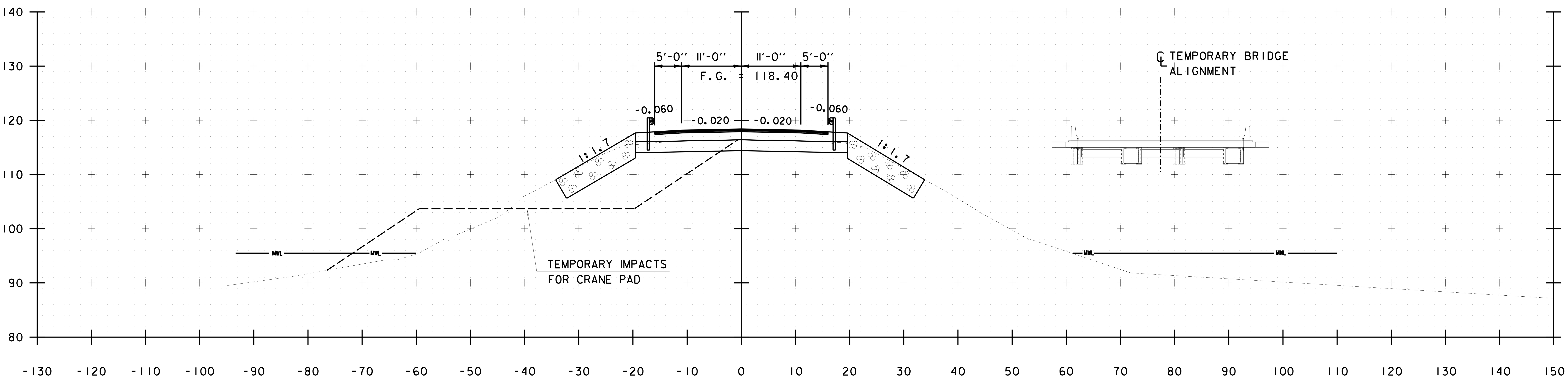
LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

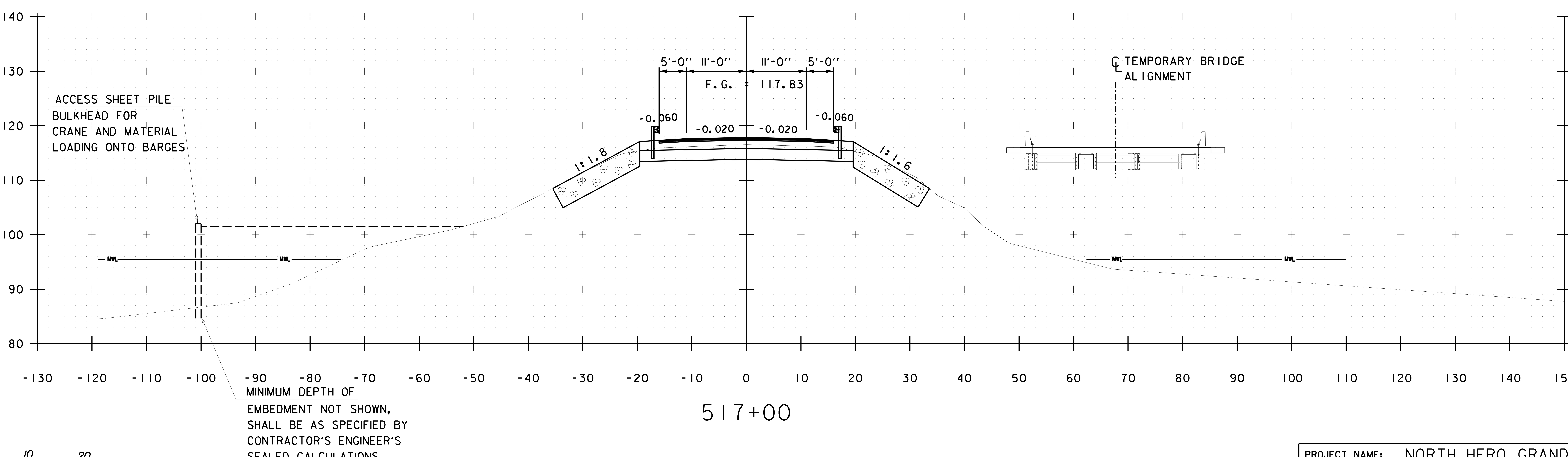
STA. 516+00 TO STA. 516+50

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: zl2bl42xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 3	SHEET 14 OF 24



517+50



517+00

0 10 20
SCALE IN FEET

LEGEND

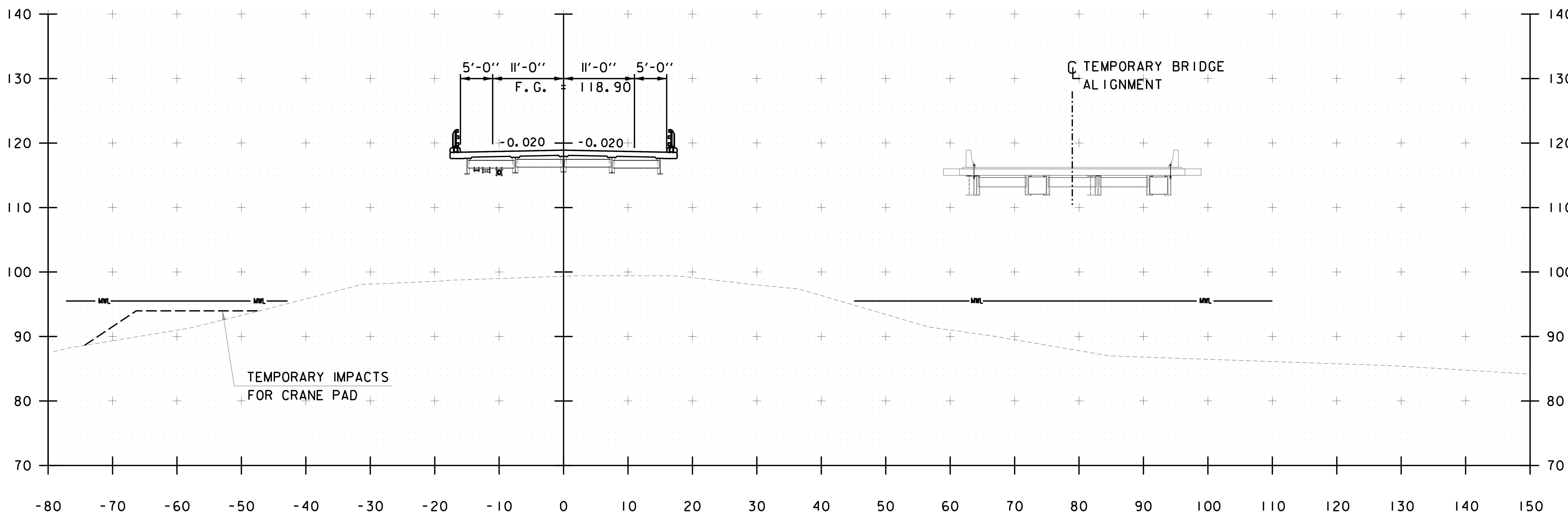
——MWL—— MEAN WATER LEVEL (MWL) = 95.5

STA. 517+00 TO STA. 517+50

CHA

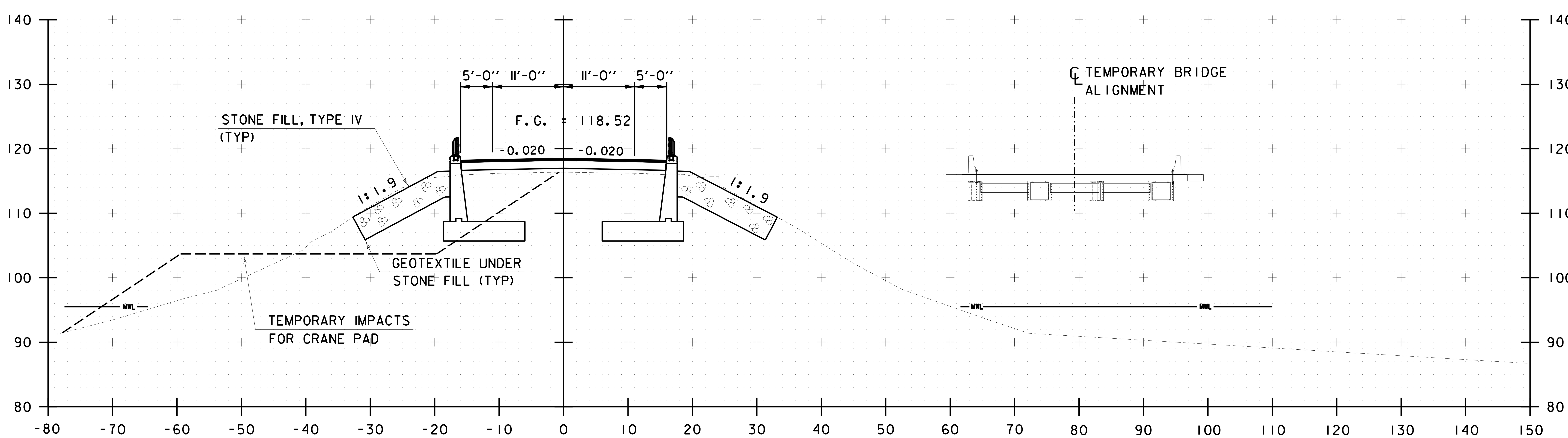
PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 4	SHEET 15 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\z12b142\Consultants\z12b142xc.dgn
DATE/TIME : 11/21/2017
USER : 3724



518+00

BEGIN BRIDGE STA 517+70.41



517+60

0 10 20
SCALE IN FEET

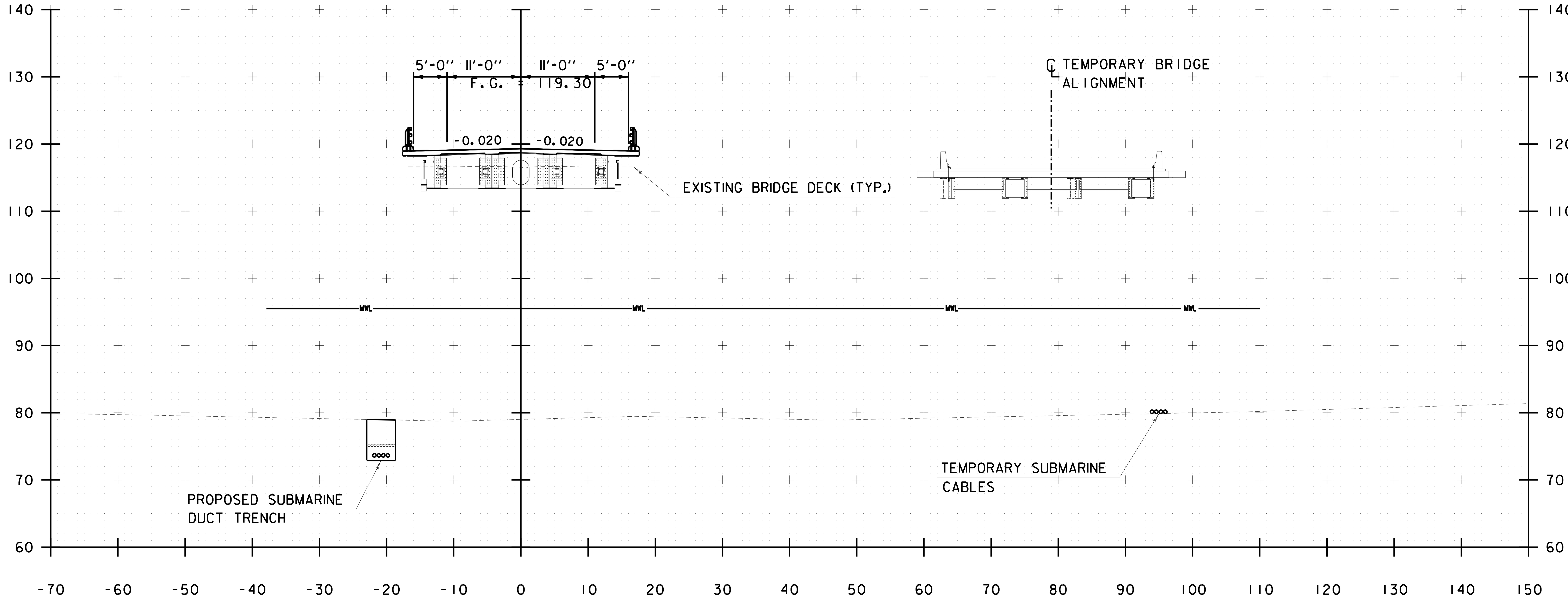
LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

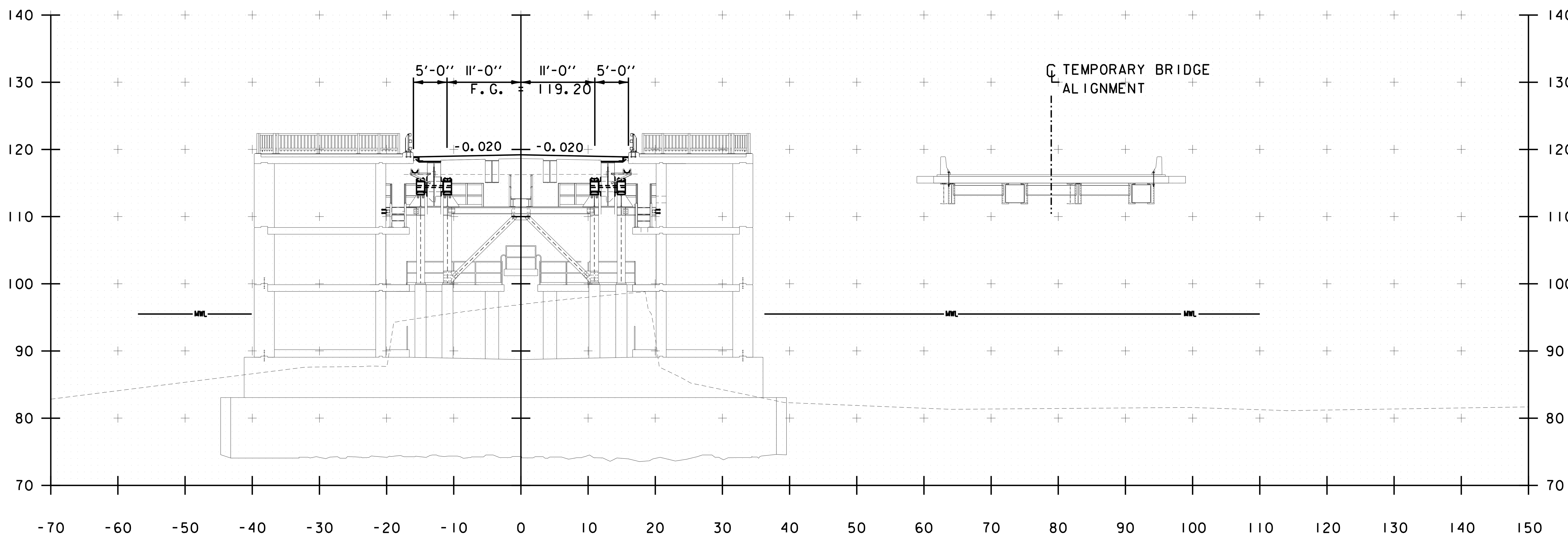
STA. 517+60 TO STA. 518+00

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 5	SHEET 16 OF 24



519+00



518+50

0 10 20
SCALE IN FEET

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

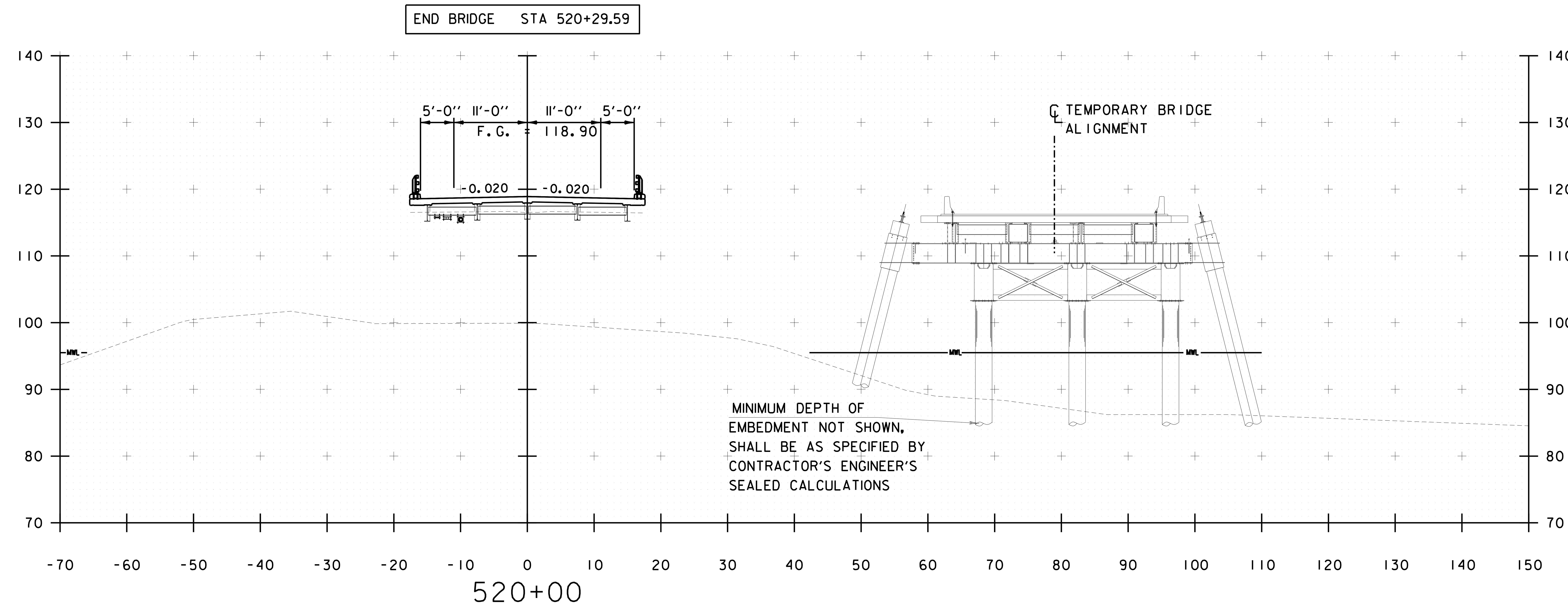
STA. 518+50 TO STA. 519+00

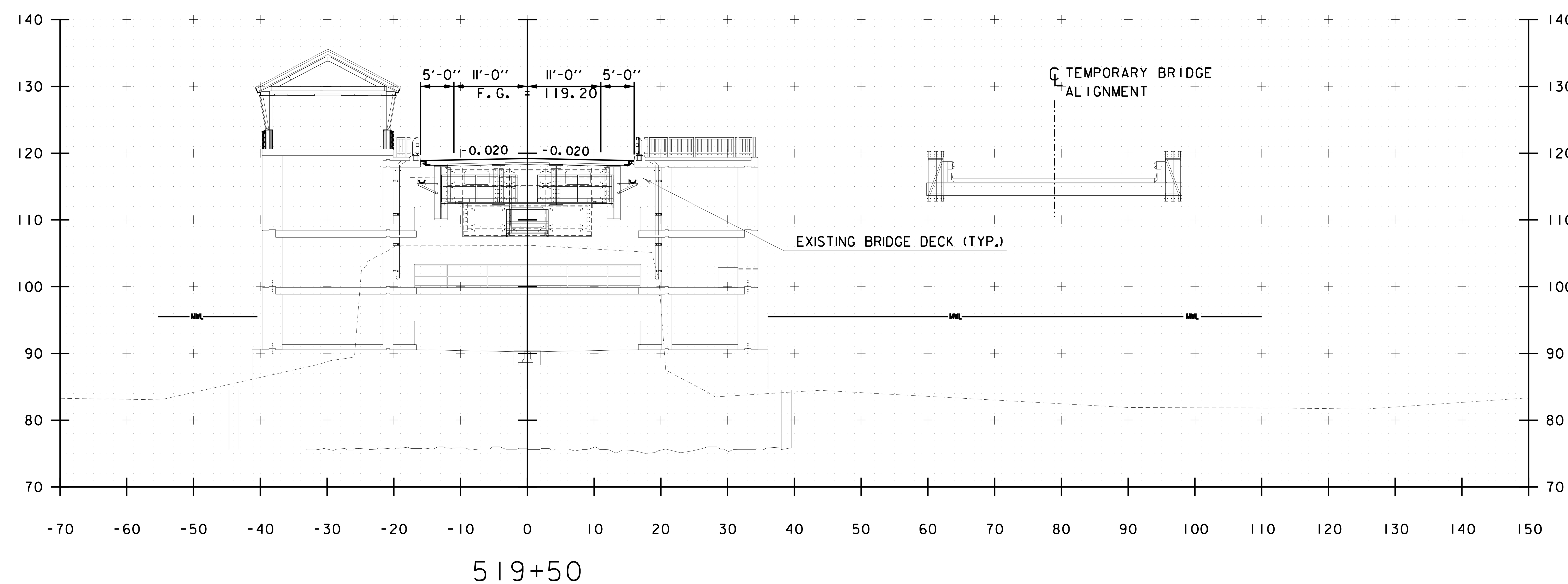
CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 6	SHEET 17 OF 24

FILE NAME = V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142xc.dgn
DATE/TIME = 11/21/2017
USER = 3724





0 10 20
SCALE IN FEET

LEGEND

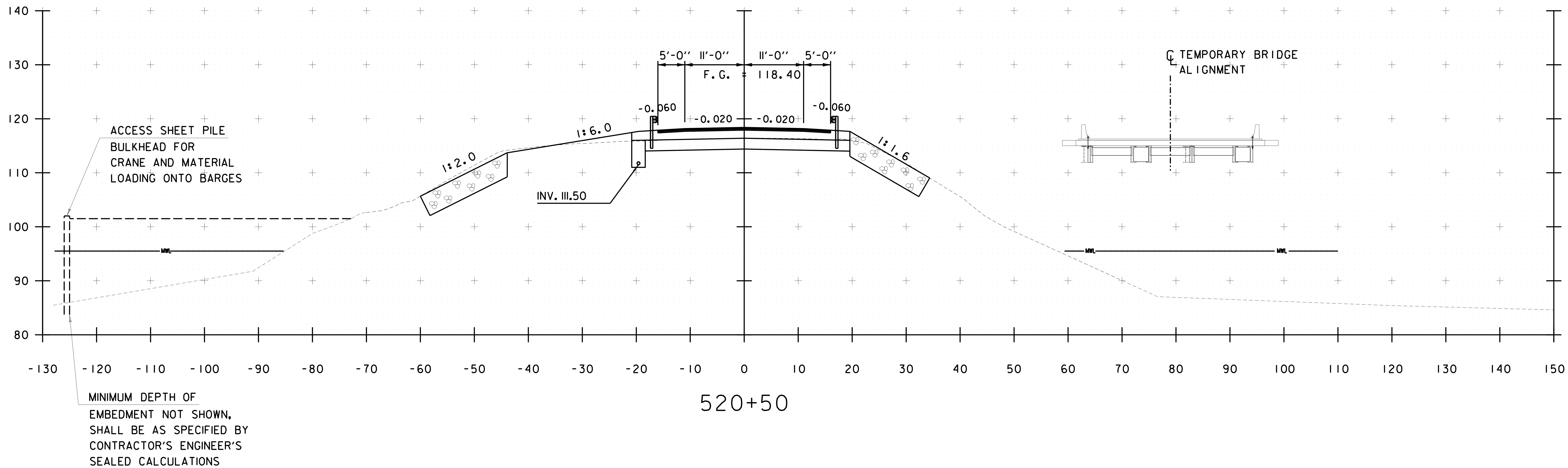
—— MWL —— MEAN WATER LEVEL (MWL) = 95.5

STA. 519+50 TO STA. 520+00

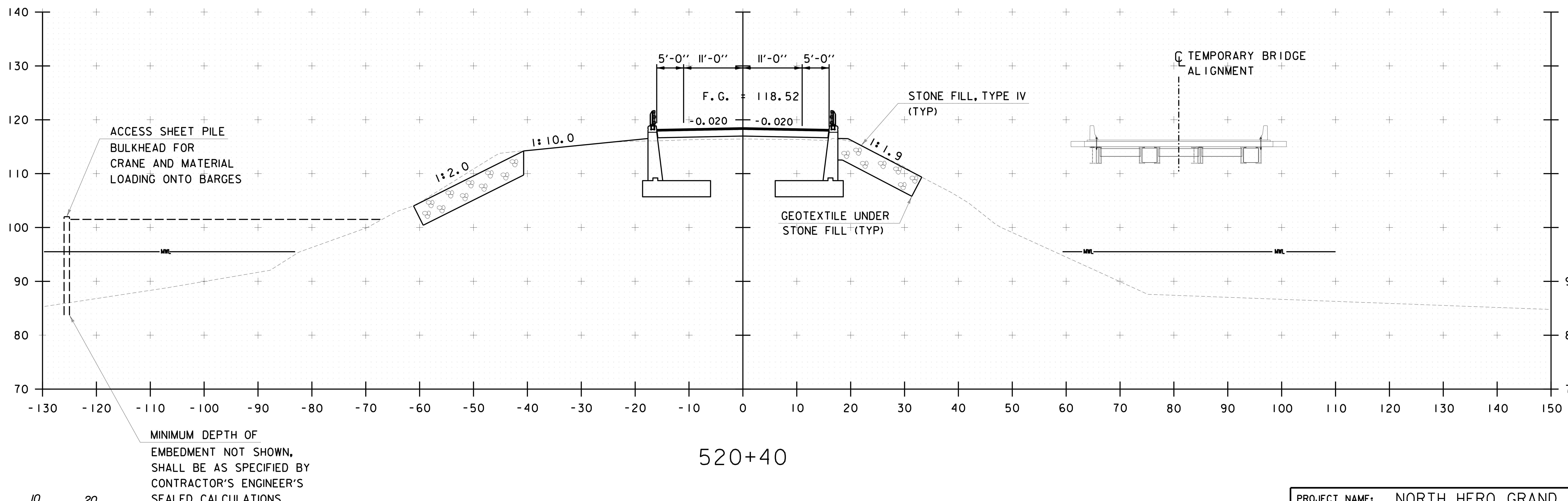
CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: zl2bl42xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 7	SHEET 18 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12bl42\Consultants\zl2bl42xc.dgn
DATE/TIME : 11/21/2017
USER : 3724



520+50



520+40

0 10 20

SCALE IN FEET

LEGEND

——MWL—— MEAN WATER LEVEL (MWL) = 95.5

STA. 520+40 TO STA. 520+50

CHA

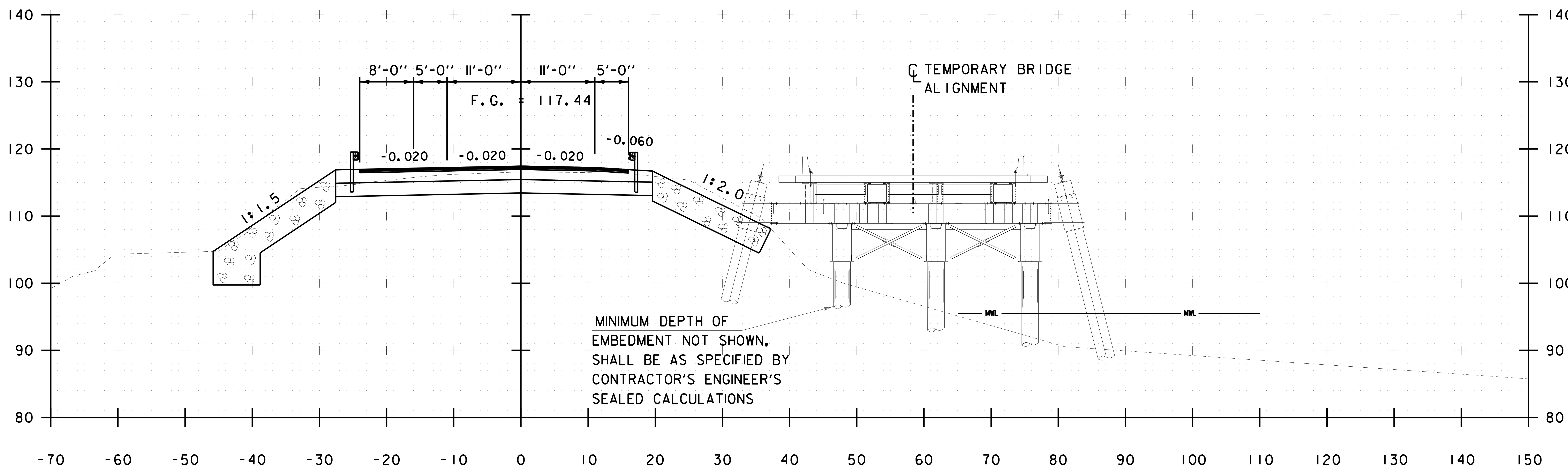
PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE

PROJECT NUMBER: BHF 028-1(26)

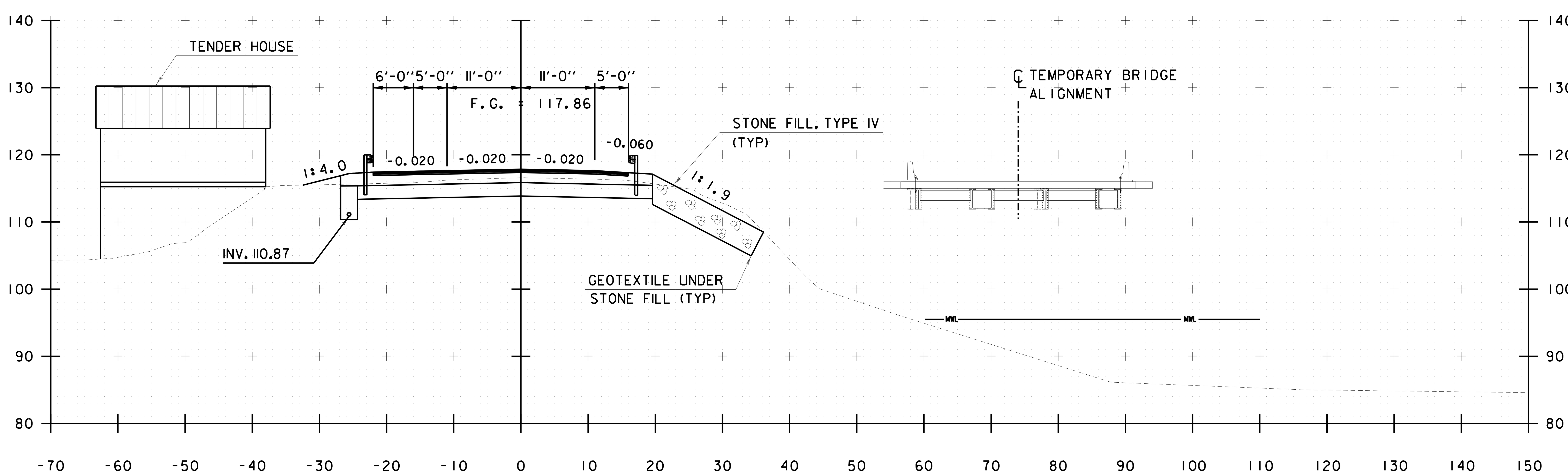
FILE NAME: z12b142xc.dgn
PROJECT LEADER: D. GOZALKOWSKI
DESIGNED BY: J. PARRELLI
CROSS SECTION SHEET 8

PLOT DATE: 11/21/2017
DRAWN BY: R. BROWN
CHECKED BY: J. SHIELDS
SHEET 19 OF 24

FILE NAME = V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142xc.dgn
DATE/TIME = 11/21/2017
USER = 3724



521+50



521+00

0 10 20
SCALE IN FEET

LEGEND

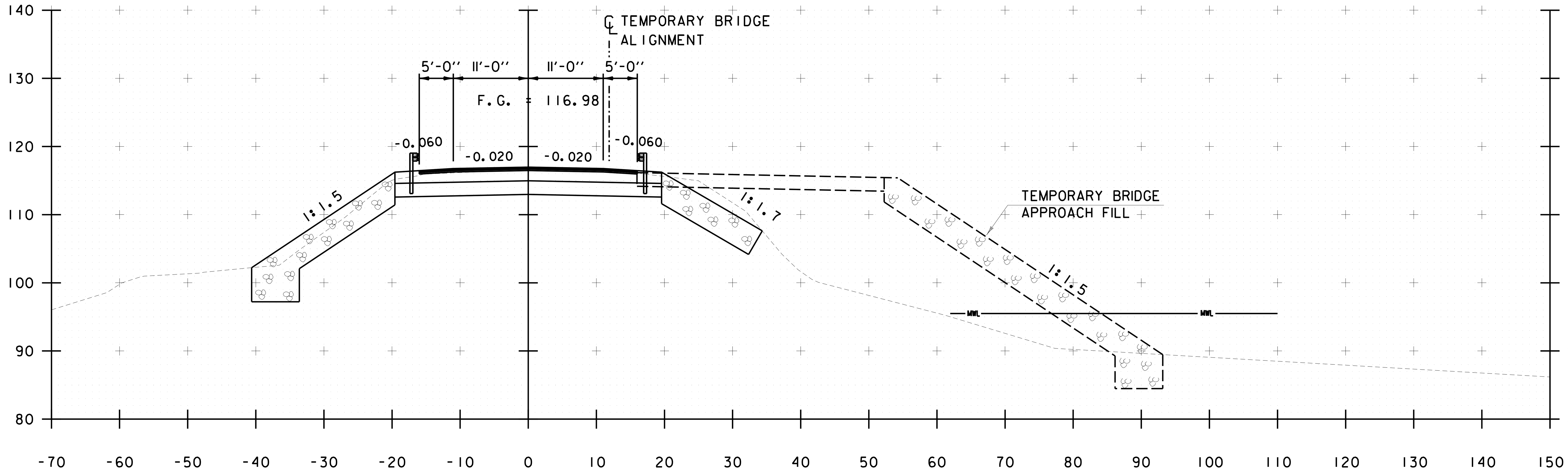
MWL — MEAN WATER LEVEL (MWL) = 95.5

STA. 521+00 TO STA. 521+50

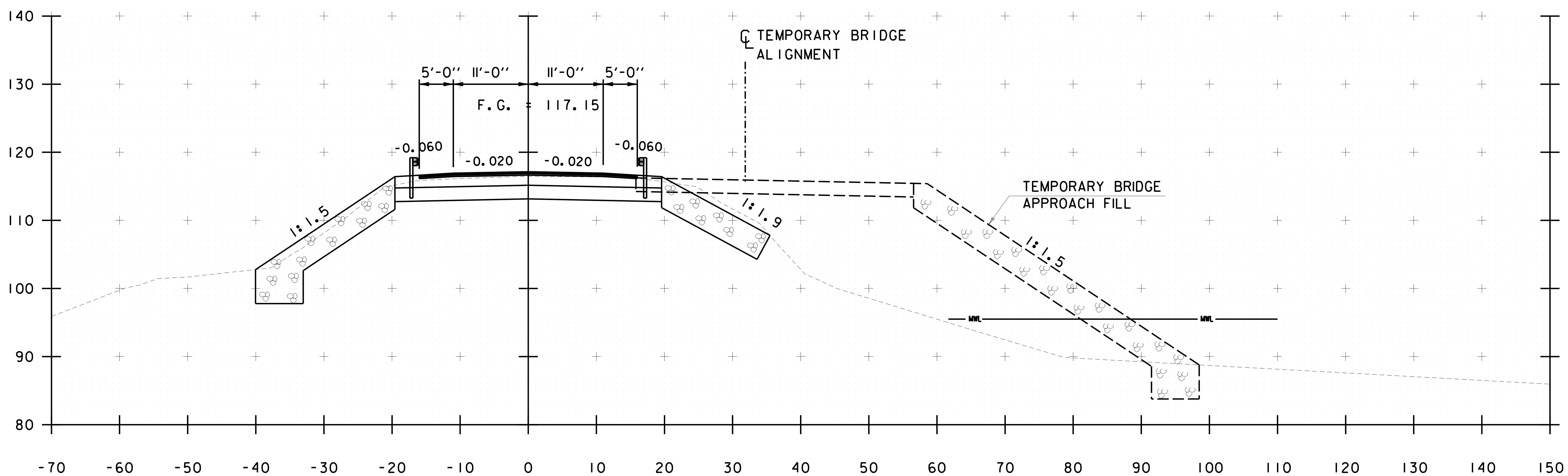
CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 9	SHEET 20 OF 24

FILE NAME = V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142xc.dgn
DATE/TIME = 11/21/2017
USER = 3724



522+50



522+00

0 10 20
SCALE IN FEET

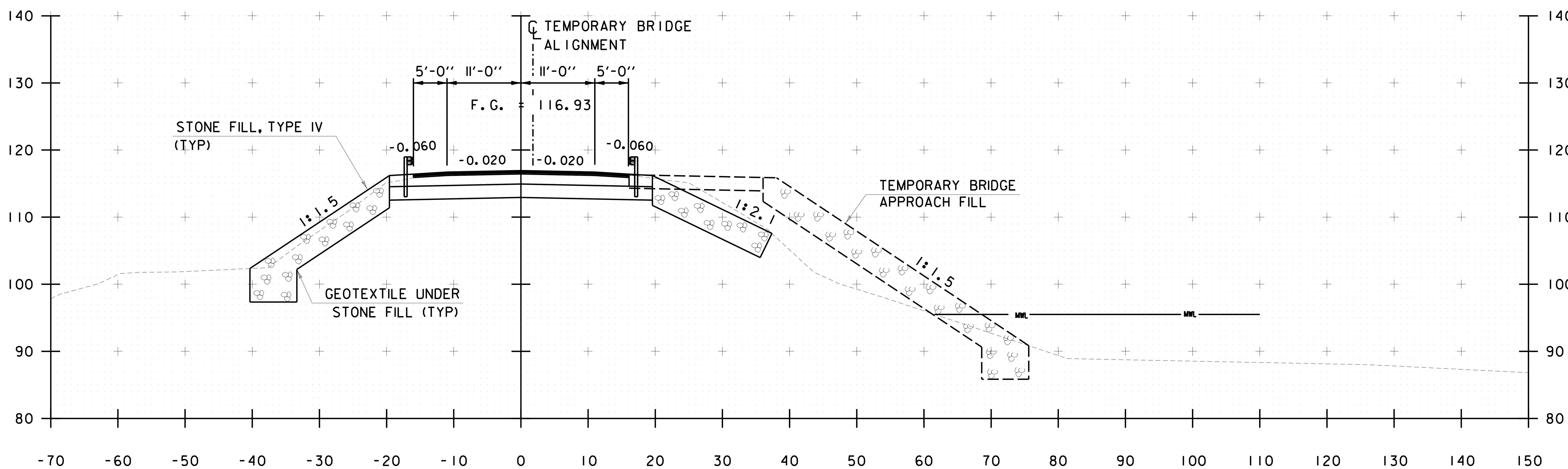
LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

STA. 522+00 TO STA. 522+50

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12bl42xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 10	SHEET 21 OF 24



523+00

0 10 20
SCALE IN FEET

LEGEND

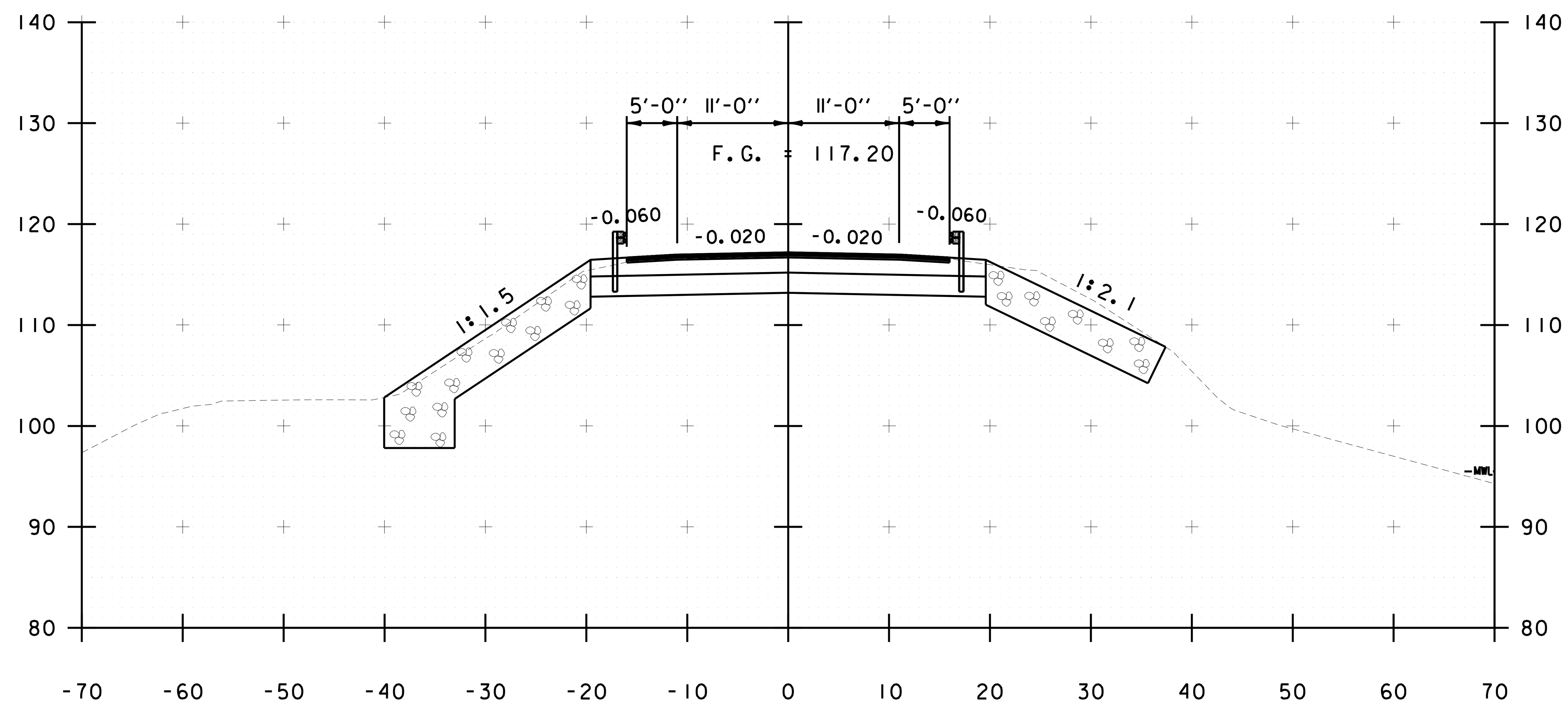
MWL — MEAN WATER LEVEL (MWL) = 95.5

STA. 523+00

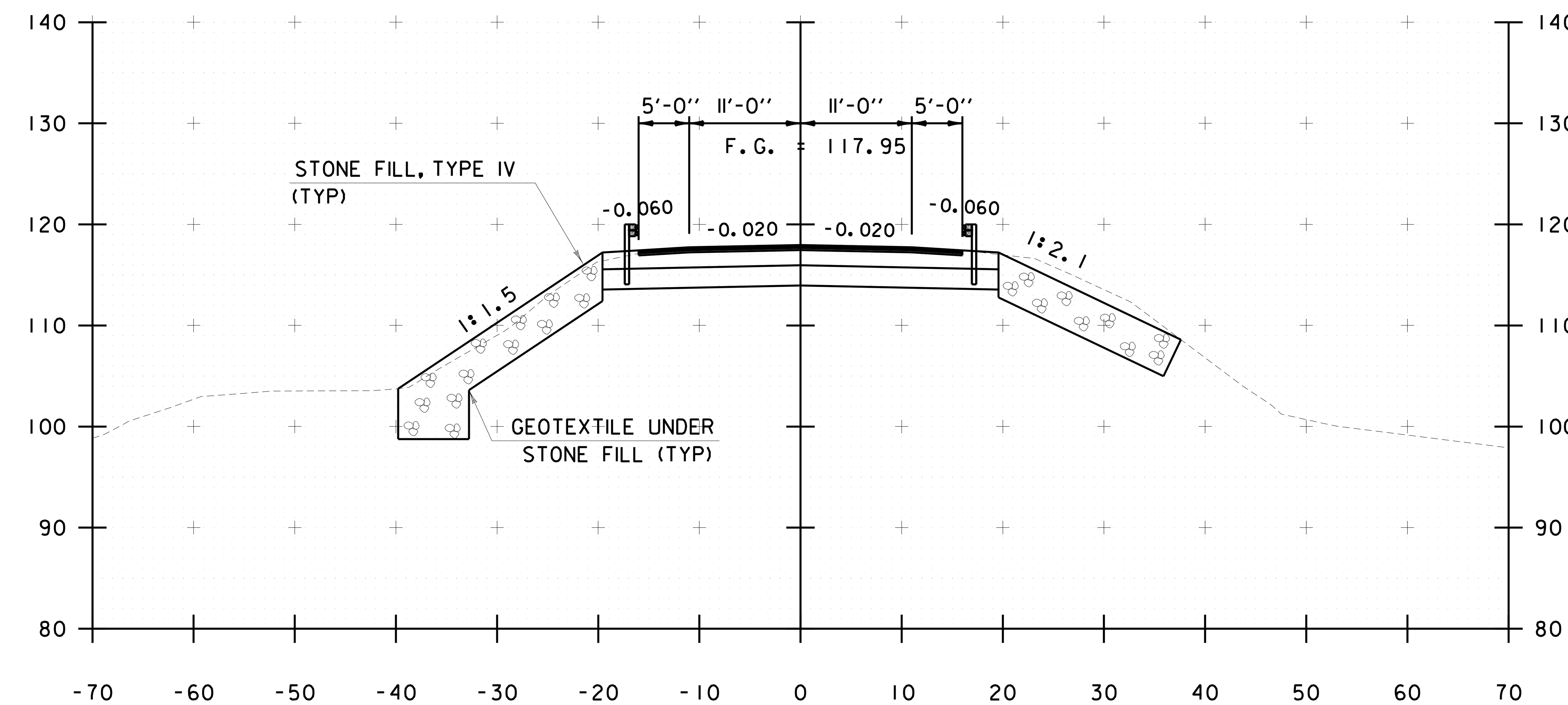
CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 11	SHEET 22 OF 24

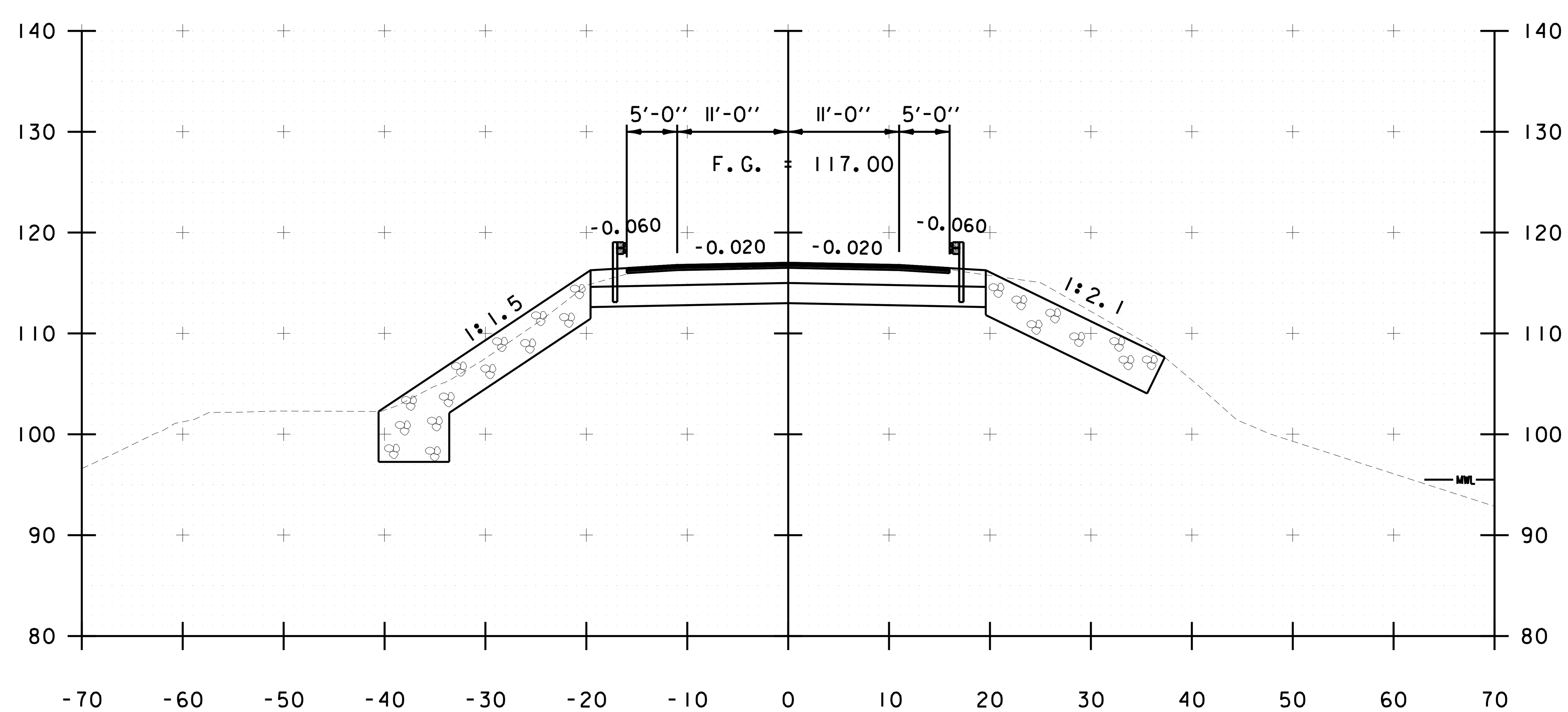


524+00

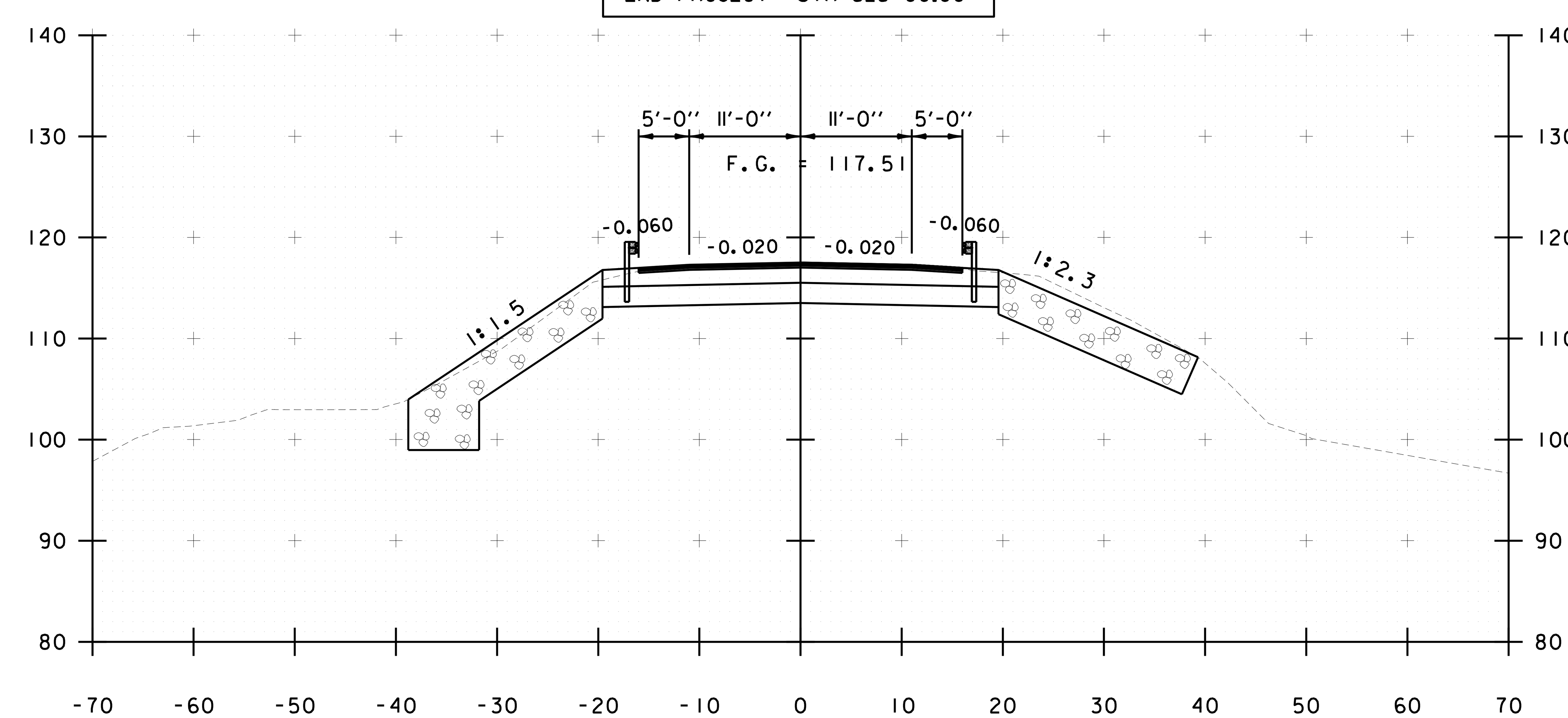


525+00

END PROJECT STA 525+00.00



523+50



524+50

0 10 20
SCALE IN FEET

LEGEND

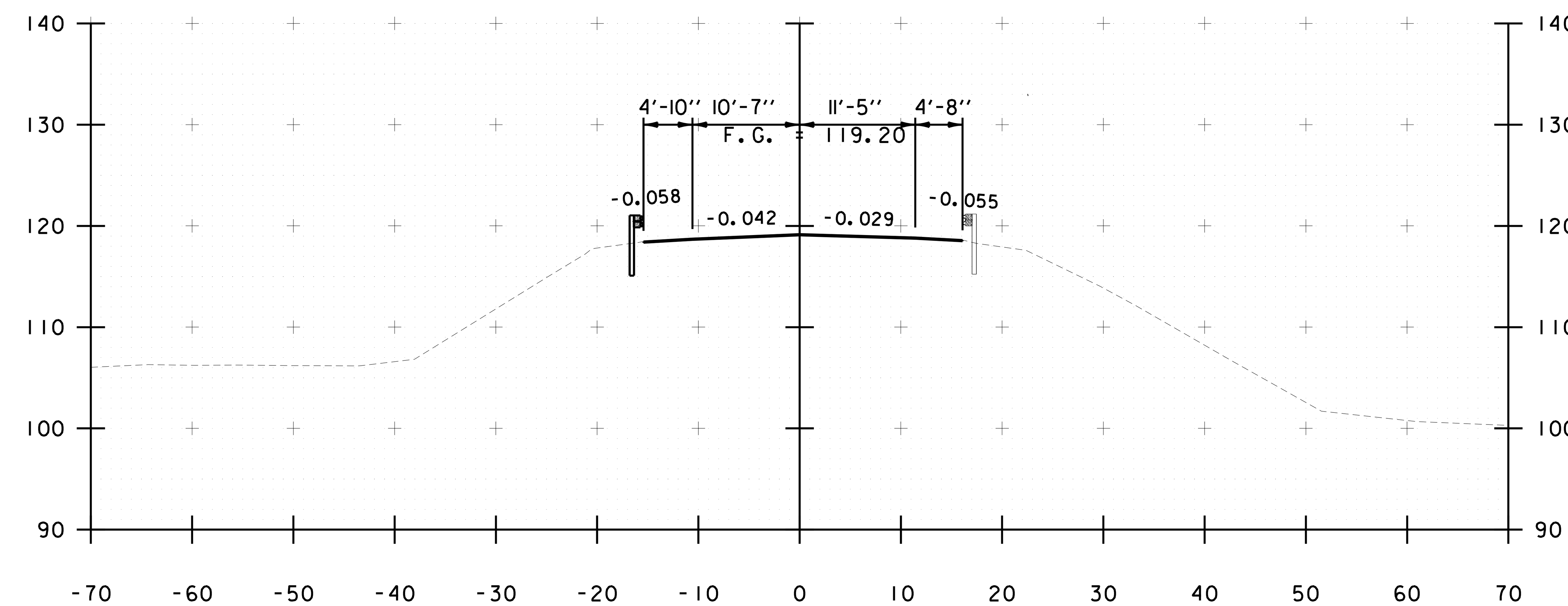
MWL — MEAN WATER LEVEL (MWL) = 95.5

STA. 523+50 TO STA. 525+00

CHA

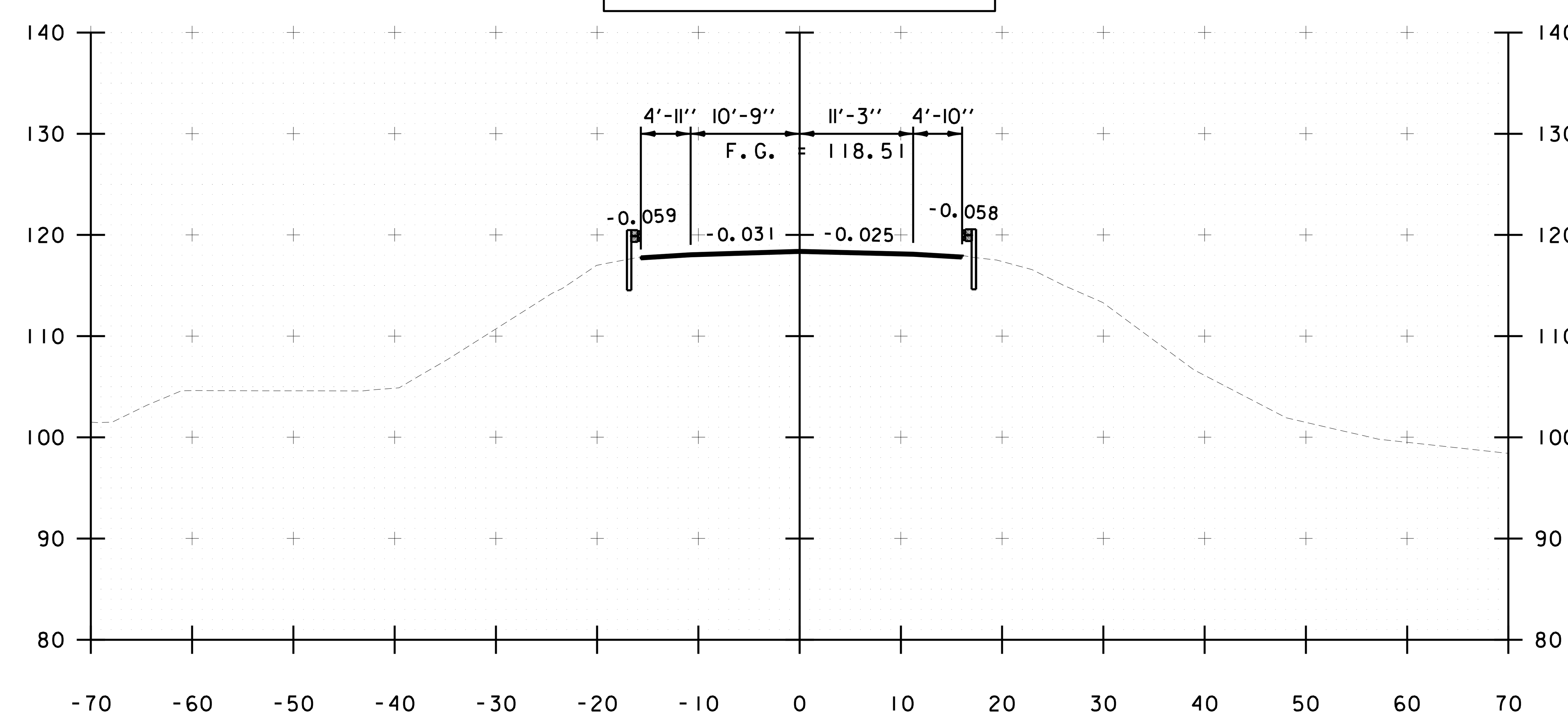
PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE	
PROJECT NUMBER: BHF 028-1(26)	
FILE NAME: z12b142xc.dgn	PLOT DATE: 11/21/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
CROSS SECTION SHEET 12	SHEET 23 OF 24

FILE NAME : V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142xc.dgn
DATE/TIME : 11/21/2017
USER : 3724



526+00

END APPROACH STA 526+00.00



525+50

0 10 20
SCALE IN FEET

LEGEND

MWL — MEAN WATER LEVEL (MWL) = 95.5

STA. 525+50 TO STA. 526+00

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: z12b142xc.dgn
PROJECT LEADER: D. GOZALKOWSKI
DESIGNED BY: J. PARRELLI
CROSS SECTION SHEET 13

PLOT DATE: 11/21/2017
DRAWN BY: R. BROWN
CHECKED BY: J. SHIELDS
SHEET 24 OF 24

FILE NAME = V:\Projects\ANY\K3\28173\CADD_MSTN\12b142\Consultants\z12b142xc.dgn
DATE/TIME = 11/21/2017
USER = 3724

VAOT LOW GROW/FINE FESCUE MIX						
	LBS/AC					
WEIGHT	BROADCAST	HYDROSEED	NAME	LATIN NAME	GERM	PURITY
38%	57	95	CREEPING RED FESCUE	FESTUCA RUBRA VAR. RUBRA	90%	98%
29%	43.5	72.5	HARD FESCUE	FESTUCA LONGIFOLIA	85%	95%
15%	22.5	37.5	CHEWINGS FESCUE	FESTUCA RUBRA VAR. COMMUTATA	87%	95%
15%	22.5	37.5	ANNUAL RYEGRASS	LOLIUM MULTIFLORUM	90%	95%
3%	4.5	7.5	INERTS			
100%	150	250				

VAOT RURAL AREA MIX						
	LBS/AC					
WEIGHT	BROADCAST	HYDROSEED	NAME	LATIN NAME	GERM	PURITY
37.5%	22.5	45	CREEPING RED FESCUE	FESTUCA RUBRA VAR. RUBRA	85%	98%
37.5%	22.5	45	TALL FESCUE	FESTUCA ARUNDINACEA	90%	95%
5.0%	3	6	RED TOP	AGROSTIS GIGANTEA	90%	95%
15.0%	9	18	WHITE FIELD CLOVER	TRIFOLIUM REPENS	85%	98%
5.0%	3	6	ANNUAL RYE GRASS	LOLIUM MULTIFLORUM	85%	95%
100%	60	120				

GENERAL AMENDMENT GUIDANCE		
FERTILIZER	LIME	
10/20/10	AG LIME	PELLITIZED
500 LBS/AC	2 TONS/AC	1 TONS/AC

CONSTRUCTION GUIDANCE

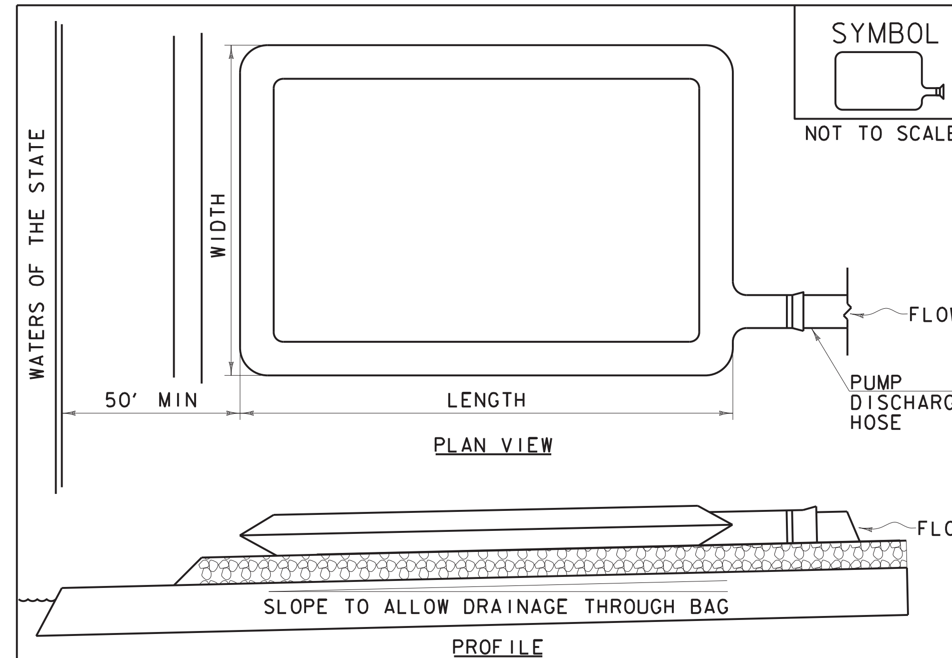
1. SEED MIX: THE CONTRACTOR SHALL COORDINATE WITH THE RESIDENT ENGINEER ON WHICH SEED MIX TO USE.
2. SEED MIX: USE AS INDICATED IN THE PLANS AND/OR FOR ALL ESTABLISHED UPLAND (NON WETLAND) AREAS DISTURBED BY THE CONTRACTOR.
3. ALL SEED MIXTURES: SHALL NOT HAVE A WEED CONTENT EXCEEDING 0.40% BY WEIGHT AND SHALL BE FREE OF ALL NOXIOUS SEED.
4. FERTILIZER AND LIMESTONE: SHALL FOLLOW RATES SHOWN ON PLAN OR AS DIRECTED BY THE ENGINEER.
5. HAY MULCH: TO BE PLACED ON EARTH SLOPES AT THE RATE OF 2 TONS/ACRE, ACHIEVE 90% GROUND COVER OR AS DIRECTED BY THE ENGINEER.
6. HYDROSEEDING: ALTHOUGH GUIDANCE IS GIVEN ABOVE THE SITE CONDITIONS AND THE TYPE OF HYDROSEED PROPOSED FOR USE WILL ULTIMATELY DICTATE THE AMOUNTS AND TYPES OF SOIL AMENDMENTS TO BE APPLIED.
7. TURF ESTABLISHMENT: PLACING SEED, FERTILIZER, LIME AND MULCH PRIOR TO SEPTEMBER 15 AND AFTER APRIL 15 CAN BETTER ENSURE A VIGOROUS GROWTH OF GRASS.

ADAPTED FROM VTRANS TECHNICAL LANDSCAPE MANUAL FOR ROADWAYS AND TRANSPORTATION FACILITIES

TURF ESTABLISHMENT

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 651 FOR SEED (PAY ITEM 651.15)

REVISIONS	
JANUARY 12, 2015	WHF



CONSTRUCTION SPECIFICATIONS

1. THE PRIMARY PURPOSE OF FILTER BAG IS TO RETAIN SILT, SAND, AND FINES DURING DEWATERING OPERATIONS.
2. FILTER BAGS SHALL BE INSTALLED ON A VEGETATED SLOPE GRADED TO ALLOW INCOMING WATER TO FLOW THROUGH THE BAG.
3. FILTER BAGS MAY ALSO BE PLACED ON COARSE AGGREGATE, STONE, OR HAYBALES TO INCREASE FILTRATION EFFICIENCY.
4. FILTER BAGS SHALL BE LOCATED A MINIMUM OF 50' FROM WATERS OF THE STATE UNLESS OTHERWISE APPROVED BY THE ENGINEER.
5. THE NECK OF THE FILTER BAG SHALL BE STRAPPED TIGHTLY TO THE DISCHARGE HOSE.
6. A FILTER BAG IS FULL WHEN IT NO LONGER CAN EFFICIENTLY FILTER SEDIMENT OR ALLOW WATER TO PASS AT A REASONABLE RATE.
7. FILTER BAG SHALL BE DISPOSED OF AS APPROVED IN THE EPSC PLAN OR AS DIRECTED BY THE ENGINEER.

FILTER BAG

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 FOR FILTER BAG (PAY ITEM 653.45) AND AS SPECIFIED IN THE CONTRACT.

REVISIONS	
MARCH 24, 2008	WHF
JANUARY 13, 2009	WHF

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: zl2bl42erodet.dgn
PROJECT LEADER: D. GOZALKOWSKI
DESIGNED BY: J. PARRELLI
EPSC DETAIL SHEET 1

PLOT DATE: 8/4/2017
DRAWN BY: R. BROWN
CHECKED BY: J. SHIELDS
SHEET 337 OF 340

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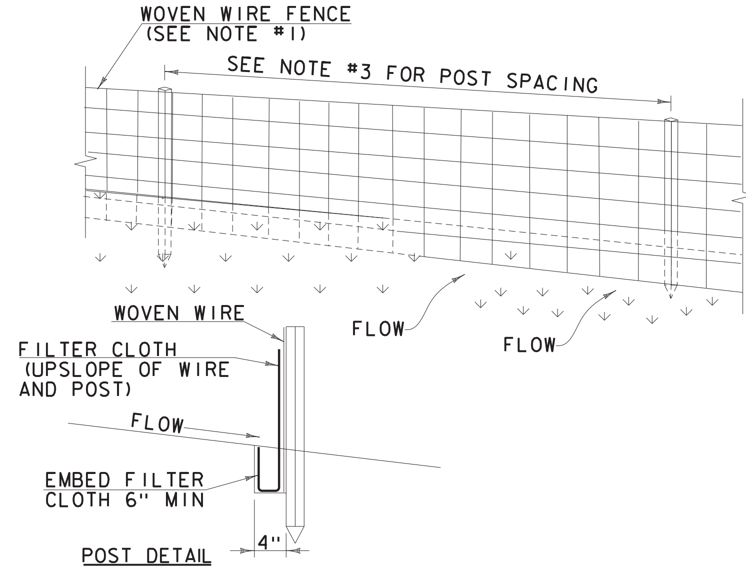


SYMBOL
SILT FENCE
SILT FENCE WOVEN WIRE
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE REINFORCED FENCE IS REQUIRED WITHIN 100' UPSLOPE OF RECEIVING WATERS WHEN THE PROJECT FALLS UNDER A CONSTRUCTION STORMWATER PERMIT. WOVEN WIRE SHALL BE A MIN. 14 GAUGE WITH A 6" MAX. MESH OPENING.
2. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI100X, STABILINKA T140N OR APPROVED EQUIVALENT.
3. POST SPACING FOR WIRE-BACKED FENCE SHALL BE 10' MAXIMUM. FOR FILTER-CLOTH FENCE, WHEN ELONGATION IS >50%, POST SPACING SHALL NOT EXCEED 4' AND WHEN ELONGATION IS <50%, POST SPACING SHALL NOT EXCEED 6'.
4. WOVEN WIRE FENCE IS TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES. FILTER CLOTH IS TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
5. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY 6" AND FOLDED.
6. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN SEDIMENT REACHES HALF OF FABRIC HEIGHT.

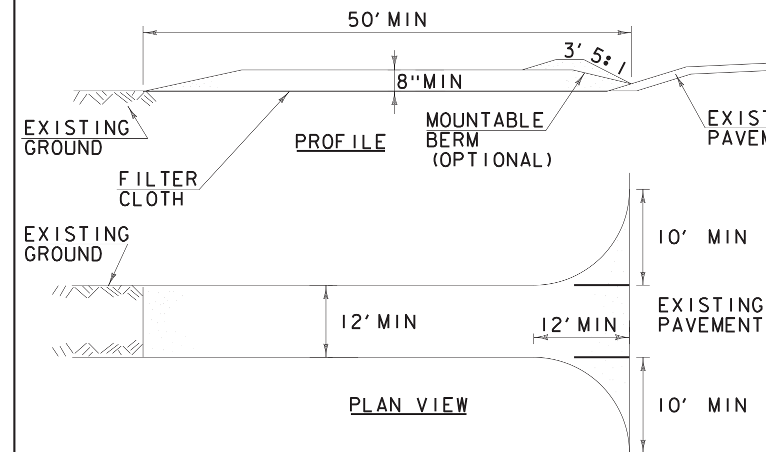
ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SILT FENCE

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- " FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 AND AS SHOWN IN THE PLANS FOR ~~GEOTEXTILE FOR SILT FENCE (PAY ITEM 649.51) OR~~ GEOTEXTILE FOR SILT FENCE, WOVEN WIRE REINFORCED (PAY ITEM 649.515).

REVISIONS	
MARCH 21, 2008	WHF
DECEMBER 11, 2008	WHF
JANUARY 13, 2009	WHF



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CONSTRUCTION SPECIFICATIONS

1. STONE SIZE- USE 1-4" STONE, RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH- NOT LESS THAN 50' (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MINIMUM LENGTH APPLIES).
3. THICKNESS- NOT LESS THAN 8".
4. WIDTH- 12' MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. 24' IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE MUST BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
6. SURFACE WATER- ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE- THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED ACCORDING TO PERMIT REQUIREMENTS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

STABILIZED CONSTRUCTION ENTRANCE

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- " FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 FOR VEHICLE TRACKING PAD (PAY ITEM 653.35) OR AS SPECIFIED IN THE CONTRACT.

REVISIONS	
MARCH 24, 2008	WHF
JANUARY 13, 2009	WHF

CHA

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: zl2bl42erodet.dgn	PLOT DATE: 8/4/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
EPSC DETAIL SHEET 2	SHEET 338 OF 340

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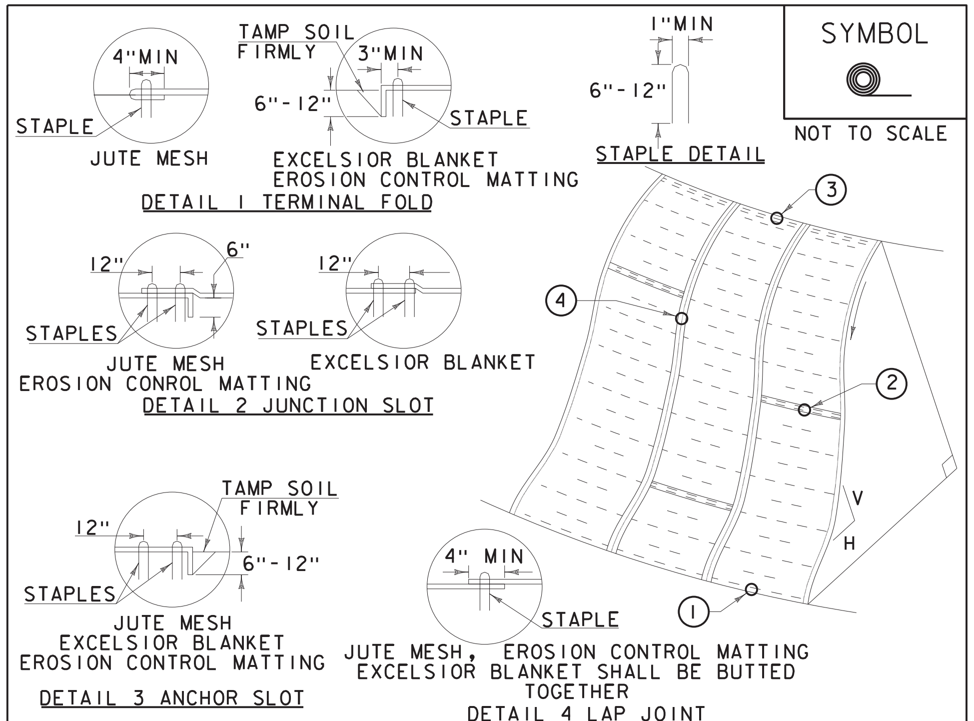

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NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. APPLY TO SLOPES GREATER THAN 3H: 1V OR WHERE NECESSARY TO AID IN ESTABLISHING VEGETATION.
2. APPLY FERTILIZER, LIME SEED PRIOR TO PLACING MATTING.
3. STAPLES ARE TO BE PLACED ALTERNATELY, IN COLUMNS APPROXIMATELY 2' APART AND IN ROWS APPROXIMATELY 3' APART. APPROXIMATELY 175 STAPLES ARE REQUIRED PER 4'X225' ROLL OF MATERIAL AND 125 STAPLES ARE REQUIRED PER 4'X150' ROLL OF MATERIAL.
4. DISTURBED AREAS SHALL BE SMOOTHLY GRADED. EROSION CONTROL MATERIAL SHALL BE PLACED LOOSELY OVER GROUND SURFACE. DO NOT STRETCH.
5. ALL TERMINAL ENDS AND TRANSVERSE LAPS SHALL BE STAPLED AT APPROXIMATELY 12" INTERVALS.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

ROLLED EROSION CONTROL PRODUCT (RECP) SIDE SLOPE

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.
THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 653 AND AS SHOWN IN THE PLANS FOR TEMPORARY EROSION MATTING (PAY ITEM 653.20) ~~OR PERMANENT EROSION MATTING (PAY ITEM 653.21).~~

REVISIONS	
APRIL 16, 2007	JMF
JANUARY 13, 2009	WHF

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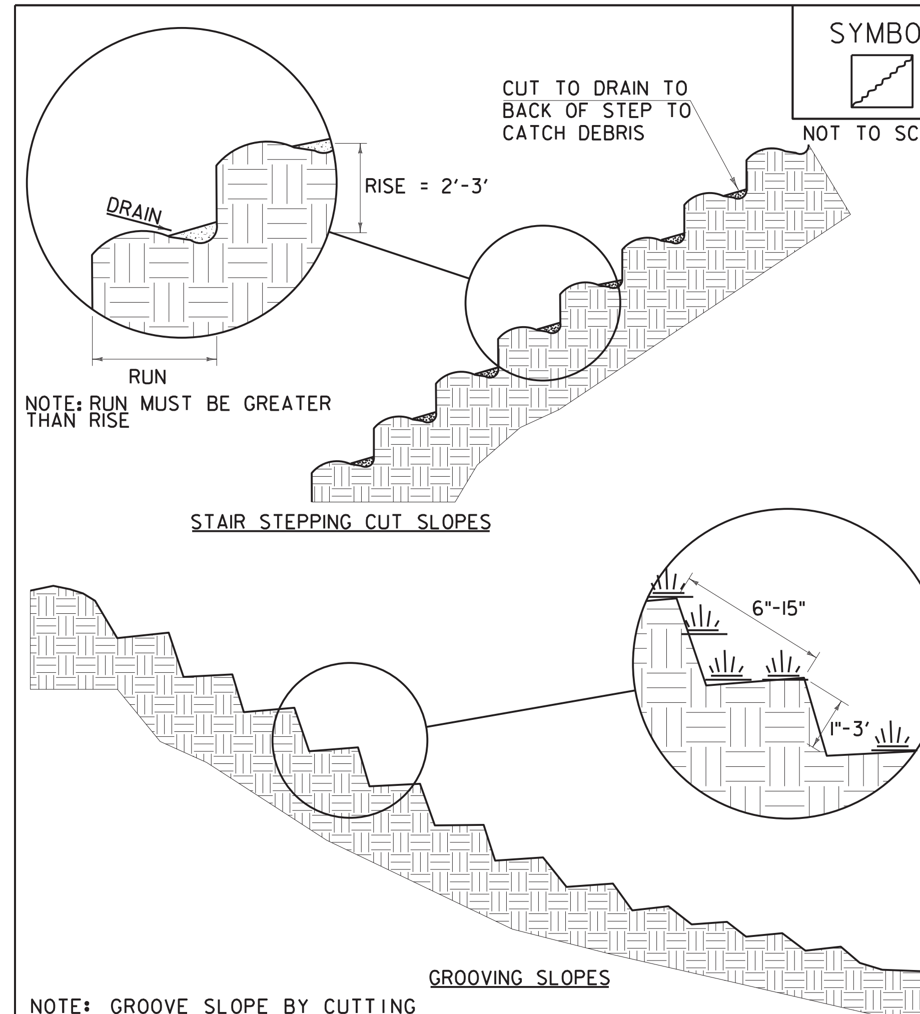
NOT TO SCALE



NOTE: GROOVE SLOPE BY CUTTING FURROWS ALONG THE CONTOUR. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND RETAIN LIME, FERTILIZER AND SEED.

ADAPTED FROM DETAILS PROVIDED BY: NEW YORK STATE DEC
ORIGINALLY DEVELOPED BY USDA-NRCS
VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SURFACE ROUGHENING

NOTES:
REFER TO "THE VERMONT STANDARDS & SPECIFICATIONS FOR EROSION PREVENTION & SEDIMENT CONTROL -2006- "FROM THE VT AGENCY OF NATURAL RESOURCES FOR ADDITIONAL GUIDANCE.

THIS WORK SHALL BE CONSIDERED INCIDENTAL TO THE CONTRACT

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF

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DATE/TIME = 8/4/2017
USER = 3724

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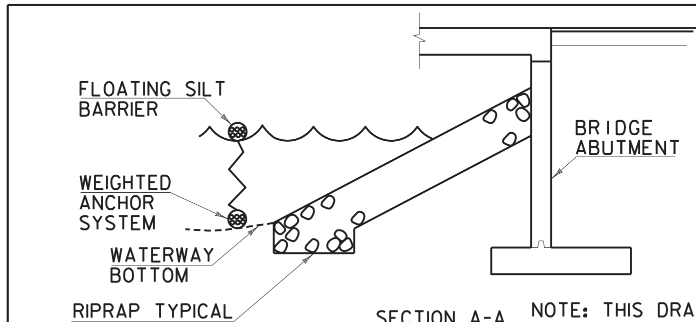
PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: zl2bl42erodet.dgn
PROJECT LEADER: D. GOZALKOWSKI
DESIGNED BY: J. PARRELLI
EPSC DETAIL SHEET 3

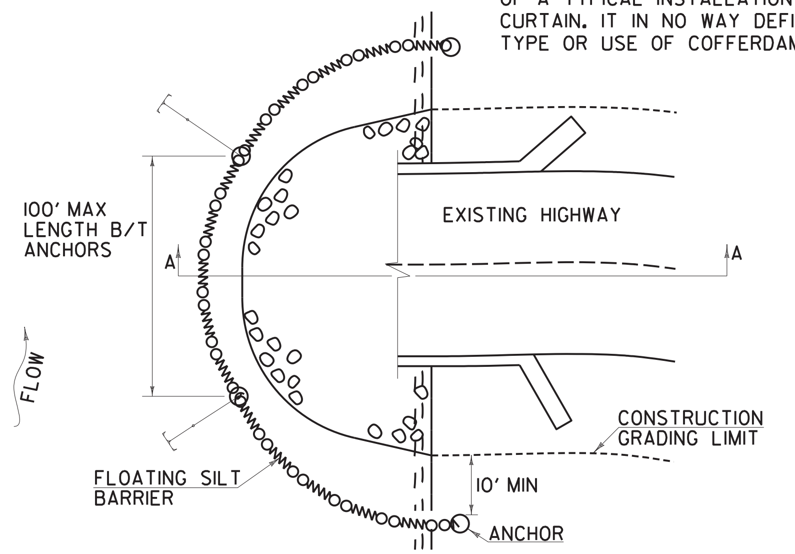
PLOT DATE: 8/4/2017
DRAWN BY: R. BROWN
CHECKED BY: J. SHIELDS



SECTION A-A

NOT TO SCALE

NOTE: THIS DRAWING IS A DEPICTION OF A TYPICAL INSTALLATION OF FILTER CURTAIN. IT IN NO WAY DEFINES THE TYPE OR USE OF COFFERDAM IF USED.



CONSTRUCTION SPECIFICATIONS

1. FILTER CURTAIN SHALL NOT BE PLACED ACROSS A FLOWING WATERWAY, OR IN A WATERWAY WITH STREAM VELOCITIES GREATER THAN 1.5 FEET/SECOND.
2. MAXIMUM 100' LENGTH BETWEEN ANCHORS.
3. LAST SECTION SHALL TERMINATE A MINIMUM OF 10' BEYOND LIMIT OF DISTURBANCE.
4. THE WEIGHTED ANCHOR SYSTEM SHALL BE A TYPE WHICH ALLOWS THE CURTAIN TO CONFORM TO THE BOTTOM OF THE WATERWAY.
5. THE CURTAIN SHALL BE REMOVED BY SLOWLY PULLING TOWARD THE SHORE MINIMIZING THE ESCAPE OF SEDIMENTS INTO WATERWAY.

FILTER CURTAIN

THIS WORK SHALL BE PERFORMED IN ACCORDANCE WITH SECTION 649 FOR GEOTEXTILE FOR FILTER CURTAIN (PAY ITEM 649.61).

REVISIONS	
APRIL 1, 2008	WHF
JANUARY 13, 2009	WHF
SEPTEMBER 4, 2009	WHF

PROJECT NAME: NORTH HERO GRAND ISLE BRIDGE
PROJECT NUMBER: BHF 028-1(26)

FILE NAME: zl2bl42erodet.dgn	PLOT DATE: 8/4/2017
PROJECT LEADER: D. GOZALKOWSKI	DRAWN BY: R. BROWN
DESIGNED BY: J. PARRELLI	CHECKED BY: J. SHIELDS
EPSC DETAIL SHEET 4	SHEET 340 OF 340

Description of Underwater Noise Attenuation System
Design Unit 6
for the
New NY Bridge Project

Revision 2
June 4, 2014

Prepared by
Tappan Zee Constructors, LLC
555 White Plains Road, Suite 400
Tarrytown, NY 10591

Document History			
Issue Date	**Description**	**By**	**Revision**
3/27/2014	Issued to NYSDEC for permit condition 9.	CC	0
5/12/2014	Revised per comments from NYSTA	CC	1
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Attachment 1 – Daily Memoranda for Underwater Acoustic Monitoring of the Tappan Zee Bridge Test Pile Installation

Attachment 2 – Design Plans for the Multi-Tier Bubble Curtain

Attachment 3 – Air Compressor Specifications

1.0 Introduction

The Pile Load Test (PLT) Program includes an underwater noise monitoring program for the installation of the test piles. The purpose of this noise monitoring program is to confirm that the underwater noise attenuation system (NAS) intended for use during production impact pile driving achieves its design goal of minimizing (to the maximum extent practicable) the effects of underwater noise during pile driving on fishes in the Hudson River. This program is being conducted pursuant to the following Tappan Zee Hudson River Crossing project requirements:

- New York State Thruway Authority (NYSTA) Tappan Zee Hudson River Crossing Project DB Contract Document Part 3 Project Requirements, Section 3 (P3PR3) Environmental Compliance, Conformed November 2012 and other applicable sections;
- New York State Department of Environmental Conservation (NYSDEC) DEC ID 3-9903-00043/00012-0014 (NYSDEC Permit); and
- National Marine Fisheries Service (NMFS) Biological Opinion (BO) April 10, 2013.

Underwater noise monitoring is conducted to verify that the NAS is deployed and operating in accordance with design specifications and determine compliance with underwater noise attenuation requirements.

Tappan Zee Constructors, LLC, (TZC) provided NYSTA and NYSDEC with a report titled *Description of Pile Load Test Program and Underwater Noise Attenuation System for the Tappan Zee Hudson River Crossing (PLT-NAS Description)* in July 2013. That report compared the NASs that were considered for possible adoption based upon the 2012 Pile Installation Demonstration Program (PIDP). The report also described the multi-tier bubble curtain which was selected for further testing. The *PLT-NAS Description* indicates the following criteria are being used to determine the effectiveness of the NAS:

1. Attenuation – System has achieved at least a 10 dB single strike sound exposure level (SELss) reduction during impact pile driving;
2. Ensonified Area – System has attenuated underwater noise to achieve the distances to the required NMFS and NYSDEC thresholds during pile driving that were established by the NMFS BO Term and Condition 9 and by NYSDEC Permit Condition 14; and
3. System Operation and Compatibility – System can be safely deployed and retrieved repeatedly during production pile driving without impact to pile driving requirements and project schedule.

The *PLT-NAS Description Report* demonstrated that the multi-tier bubble curtain can achieve at least a 10 dB SEL attenuation during impact pile driving and that the system could be safely deployed and retrieved repeatedly during production pile driving. As such, the multi-tier bubble curtain was selected for further testing during test pile installation. The report also provided a plan for testing the NAS to determine whether or not the required distances to the NMFS and NYSDEC thresholds are being achieved.

Test pile installation monitoring results provide guidance on operational specifications of the NAS monitoring, as well as the monitoring locations for production pile driving. The purpose of the present Report is to provide the results of the underwater noise monitoring during installation of test piles for the Design Unit 6 (see Attachment 1) and based on those results, provide the design plans and anticipated operational specifications for the NAS for Design Unit 6 in accordance with the following NYSDEC Permit Conditions 8 and 9:

8. The results of sound attenuation tests conducted during the 2012 Pile Installation Demonstration Program (PIDP); and any additional test results from underwater sound attenuation studies during the 2013 PIDP2 will be used to determine the most effective underwater sound attenuation system. An underwater sound attenuation system or

systems must be deployed during driving of steel piles [redacted] to minimize to the maximum extent practicable the effects of underwater sound upon fishes in the Hudson River.

9. At least 30 days before starting installation of permanent piles [redacted] within each specific in-river design unit (as identified in the March 21, 2013 letter) the Permittee must give the Department design plans and operational specifications for the underwater sound attenuation system for that design unit. Except for piles installed during the 2013 PIDP2, installation of piles [redacted] may begin when the Department has given written approval of the underwater sound attenuation system for each in-river design unit. Upon Department approval the final sound attenuation plan will be posted on the project website maintained by the Permittee.

2.0 Test Piles

The Pile Load Test Program uses test piles in each of the 10 design units plus the Main Span (11 total design units), with the primary purpose to confirm pile load capacities. Design Unit 6 consists of [redacted] piles in Piers 21 to 25. Test piles were installed with IHC S-280 and IHC S-800 impact hammers. A summary of the impact pile driving for test piles at Design Unit 6 is provided in Table 1.

Table 1. Summary of Impact Pile Driving for Test Piles at Design Unit 6

Test Pile	Pile Diameter	Impact Hammering Date
PLT-110	[redacted]	9/6/2013
PLT-109 (Day 1)*	[redacted]	10/4/2013
PLT-109 (Day 2)*	[redacted]	10/7/2013

***PLT-109 was installed over two separate days.**

3.0 Unconfined Multi-tier Bubble Curtain NAS Design

Based on the NAS effectiveness determination in the *PLT-NAS Description*, the unconfined multi-tier bubble curtain was selected for further testing during test-pile installation. Refer to Attachment 2 for engineering details on the system.

3.1 NAS Components

The unconfined multi-tier bubble curtain consists of aluminum bubbler rings suspended from the pile-driving template at four points, spaced a maximum of 10 feet vertically, and connected to the template using ½"-diameter wire rope. See Attachment 2 for bubbler ring dimensions and hole diameter, spacing, and orientation.

The aluminum ring is connected to a dedicated compressor (Figure 1). This compressor is connected to a reservoir tank to allow a continuous supply of air throughout pile driving (Figure 1). During the installation of test piles, a flow meter and air pressure gauge are used to measure air flow and pressure (Figure 2). The air compressor is capable of supplying an air pressure of up to 100 pounds per square inch (psi) at an air flow of 1600 cubic feet per meter (cfm) to each bubbler ring (Attachment 3). The reservoir tank allows the system to supply an air flow of up to 2000 cfm, to each bubbler ring, as was demonstrated during testing.

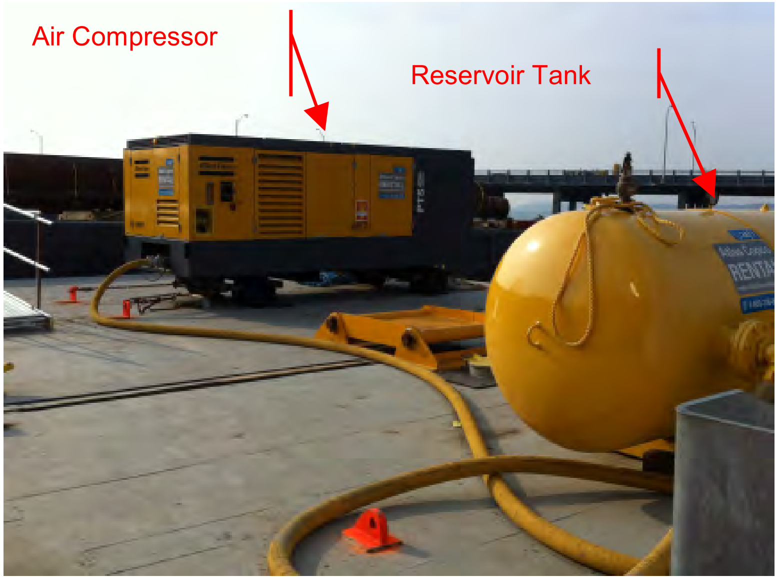

Figure 1. Air Compressor and Reservoir Tank

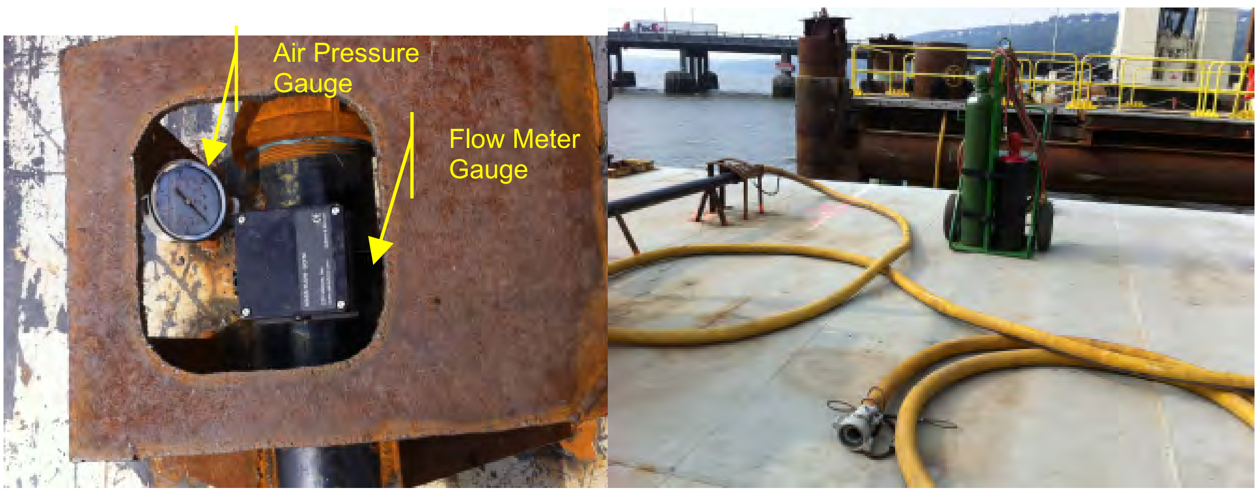

Figure 2. Flow Meter and Pressure Gauge on Outlets from the Reservoir Tank to the Bubbler Ring

3.2 NAS Deployment and Operation

The NAS deployment and operation proceeded as expected. After the piles were initially driven with the vibratory hammer, the bubble curtain ring was deployed with a crane and hung from the secondary template using wire rope slings and shackles (Figure 3). The air compressor/reservoir tank pumped air into the ring (Figure 4), the impact hammer was lofted, the piles were tapped (i.e., a series of minimal energy strikes), and then driven to the required depth.

Figure 3. Deployment of the Unconfined Multi-tier Bubble Curtain

Figure 4. Operation of the Multi-tier Bubble Curtain

4.0 Underwater Noise Monitoring During Test Pile Installation

4.1 Methods

Details of the equipment, the calibration of the equipment, the data collected, and the signal processing for underwater noise monitoring are included in the Underwater Noise Monitoring Plan. Details on the underwater noise monitoring during the installation of PLT 110, PLT 109 (Day 1), and PLT 109 (Day 2) are provided in the Daily Memoranda for each day of pile driving (Attachment 1).

Figure 5 illustrates a typical barge and hydrophone arrangement for [redacted] piles. As seen in Figure 5, a real time Autonomous Multichannel Acoustic Recorder (AMAR-RT) and two Autonomous Multichannel Acoustic Recorders (AMARs) were generally placed at the distances of the noise level thresholds predicted in the NMFS BO (although locations varied based on conditions, such as vessel traffic and currents). The AMAR-RT was continuously monitored through-out the pile driving process while data collected from the AMARs was downloaded following pile driving. The noise level thresholds predicted in the NMFS BO (April 2013) are as follows:

- peak SPL (sound pressure level) – located on the barge or survey vessel, approximately 33 feet from the pile, based on the distance that can be safely recorded (the distance to the 206 re 1 μPa peak SPL isopleth for [redacted] piles is 20 feet)
- cSEL (cumulative Sound Exposure Level) – located approximately 132 feet from the pile, based on the distance from the pile to the 187 dB re 1 μPa^2-s cSEL isopleth for [redacted] piles
- rms SPL (root mean square SPL) – located approximately 400 feet from the pile, based on the distance from the pile to the 150 dB re 1μPa rms SPL for [redacted] piles

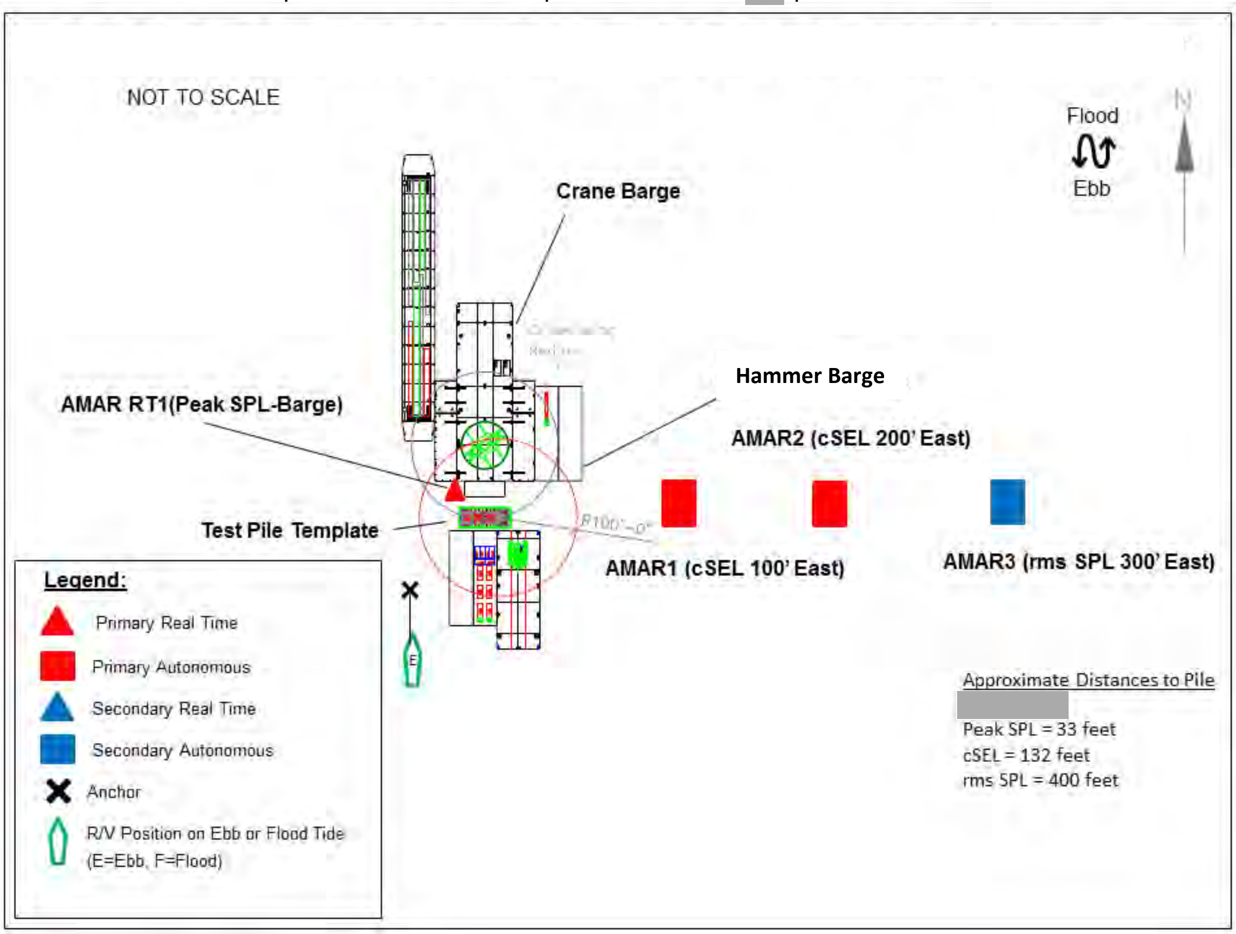

Figure 5. Plan View of a Typical Test Pile Barge Arrangement and Hydrophone Locations for [redacted] piles

Test pile installation for Design Unit 6 occurred during a variety of river current conditions (ebb flood, and slack currents). Hydrophones (AMARs) were strategically placed to capture data to analyze variation in the performance of the NAS correlated with variation in the river current and barge placement. During the installation of PLT 110 the NAS was tested up-current and cross-current in a 0. 6-knot ebb current. During the installation of PLT 109 (Day 1) the NAS was tested up-current in a 0.6-0.8-knot ebb current. During the installation of PLT 109 (Day 2) the NAS was tested down-current in a 0.6-0.8 knot flood current. Table 2 provides a summary of the underwater noise monitoring equipment deployment and position relative to the current for the driving of the two test piles.

Table 2. Equipment Deployment and Position Relative to Current for PLT 110, PLT 109 (Day 1), and PLT 109 (Day 2)

Date/Test Pile No.	Hydrophone ID	Location Relative to Pile*	Location Relative to Current	Current During Pile Driving	Distance to Pile (ft)	Water depth (ft)
9/6/2013 PLT 110	AMAR-RT 11	Peak SPL- Barge	Up-current	Ebb (0.5 – 1.6 knots)	33	18
	AMAR-175	cSEL 100' East	Cross-Current		132	18
	AMAR-221	cSEL 200' East	Cross-Current		221	18
	AMAR-228	rms SPL 300' East	Cross-Current		389	20
10/4/2013 PLT 109 (Day 1)	AMAR-RT 11	Peak SPL Barge	Up-current	Ebb (0.6 knots)	29	13
	AMAR-175	cSEL North	Up-current		263	13
	AMAR-228	rms SPL North	Up-current		707	11
10/7/2013 PLT 109 (Day 2)	AMAR-RT 11	Peak SPL Barge	Down-Current	Flood (0.6 – 0.8 knots)	33	13
	AMAR-175	cSEL North	Down-Current		264	13
	AMAR-228	rms SPL North	Down-Current		835	12

*Locations correspond to the hydrophone locations labeled in Figure 5 and are based on the following:

- peak SPL – located on the barge or survey vessel, approximately 40 feet from the pile, based on the distance from the pile to the 206 re 1 μPa peak SPL isopleth for [redacted] piles
- cSEL- located approximately 132 feet from the pile, based on the distance from the pile to the 187 dB re 1 μPa^2-s cSEL isopleth for [redacted] piles
- rms SPL – located approximately 400 feet from the pile, based on the distance from the pile to the 150 dB re 1μPa rms SPL for [redacted] piles

The tests for this design unit were informed by the previous testing within the PLT program where air flow was varied throughout pile driving but never independently of other variables, such as impact hammer energies or tidal conditions. All tests were performed at a range of tidal conditions and hammer energies which could be expected during production pile driving. Table 3 provides the number of rings deployed and the NAS settings during the installation of the two test piles.

Table 3. Description of NAS During Installation of Test Piles for Design Unit 6

Date/ Test Pile No.	Water Depth (ft)	Number of Rings	Air Flow (cfm) per Bubbler Ring	Air Pressure (psi)
9/6/2013 PLT 110	18	2	1400-1750	60-66
10/4/2013 PLT 109 (Day 1)	13	2	1050-1100	40
10/7/2013 PLT 109 (Day 2)	13	2	1750-1800	65

4.2 Results

4.2.1 NMFS Physiological and Behavioral Thresholds

In accordance with the NMFS BO Term and Condition Number 6, the monitoring program estimated (i) the peak sound pressure level (peak SPL in dB re 1 µPa) at each recorder and the distance from the pile at which the peak SPL exceeds the 206 dB re 1 µPa peak, (ii) the cSEL at each recorder and the distance from the pile at which the cSEL exceeds 187 dB re 1 µPa^2·s at the end of pile driving[1], and (iii) the rms SPL at each recorder and the distance from the pile at which rms SPL exceeds 150 dB re 1 µPa.

Table 4 provides a summary of the underwater noise levels measured at each recorder during the test pile installation. Table 5 provides the diameter of the sound level isopleths that serve as the NMFS physiological and behavioral thresholds. **These results show that when the NAS was operational, the diameter of the 206 dB re 1 µPa peak SPL did not exceed NMFS requirement of 40 feet for at Design Unit 6.** The largest diameter of the 206 dB re 1 µPa peak SPL isopleth was 17-ft, which is similar to the 206 dB re 1 µPa peak SPL for the NASs tested during the 2012 PIDP. Specifically, during the 2012 PIDP the diameters of the 206 dB re 1 µPa peak SPL isopleth were 15 – 40 feet for [redacted] piles (JASCO 2012)[2]. Furthermore, the estimated diameter of the isopleth at the end of installation of test piles that corresponded to 187 dB re 1 µPa^2-s cSEL never exceeded 146-ft. The river width is approximately 15,000 ft; therefore a fish movement corridor of more than one mile [5,280 ft], which was continuous for more than 1,500 ft, was maintained throughout pile driving, in accordance with NYSDEC Permit Condition 14.

Table 4. Summary of the Measured Sound Levels at Each Recorder During the PLT 110, PLT 109 (Day 1), and PLT 109 (Day 2)

Date Test Pile No.	Location*	Max. peak SPL (dB re 1 µPa)	cSEL (dB re 1 µPa^{2}-s)**
9/6/2013 PLT 110	Peak SPL Barge	192	195
	cSEL 100' East	177	180
	cSEL 200' East	171	176
	rms SPL 300' East	166	166
9/4/2013 PLT 109 (Day 1)	Peak SPL Barge	192	192
	cSEL North	163	162
	rms SPL North	159	152
9/7/2013 PLT 109 (Day 2)	Peak SPL Barge	188	197
	cSEL North	166	171
	rms SPL North	153	159

*Locations correspond to the hydrophone locations labeled in Figure 5 and are based on the following:
- peak SPL – located on the barge or survey vessel, approximately 33 feet from the pile, based on the distance from the pile to the 206 re 1 µPa peak SPL isopleth for [redacted] piles
- cSEL- located approximately 132 feet from the pile, based on the distance from the pile to the 187 dB re 1 µPa^2-s cSEL isopleth for [redacted] piles
- rms SPL – located approximately 400 feet from the pile, based on the distance from the pile to the 150 dB re 1µPa rms SPL for [redacted] piles

**At the completion of pile driving.

[1] cSEL increases as the number of strikes increases therefore; the diameter of the 187 dB isopleth also reaches a maximum at the end of piling.
[2] JASCO. 2012. Underwater Acoustic Monitoring of the Tappan Zee Bridge Pile Installation Demonstration Project.

Table 5. Diameters of Sound Level Isopleths that Represent NMFS Physiological and Behavioral Impact Threshold

Measurement		PLT 110	PLT 109 (Day 1)	PLT 109 (Day 2)
Pile Installation Duration (hh:mm)*		00:25	00:05	00:22
Approximate Diameter (ft) of Isopleth	206 dB re 1 µPa peak SPL	13	17	10
	187 dB re 1 µPa^2-s cSEL	140	84	146
	150 dB re 1 µPa rms SPL	572	478	476

* Net pile driving times are rounded to the nearest minute.

4.2.2 NAS Performance

The NAS was tested in ebb, flood, and slack currents with hydrophones located in up-current, down-current, and cross current positions (Table 2). Current speed ranged from 0.5 to 1.6 knots. Air flow settings ranged from air pressures of 40 to 66 psi and air flows of 1050 to 1800 cfm.

During the installation of the PLT 110 the NAS was tested in an ebb current, with speed ranging from 0.5 to 1.6 knots. Air pressure and air flow was relatively constant at 60-66 psi and 1400 to 1750 cfm, respectively, throughout the installation of PLT 110, except for a brief period where the NAS was inadvertently turned off. Hammer energy was increased independently of river current and NAS air flow. Hammer energies of 125-280 kip-ft were used. Sound levels measured at all hydrophones remained constant throughout the installation of PLT 110 while the NAS was in operation despite variation of the hammer energy. When the NAS was off, the maximum SELss recorded was approximately 180 dB re 1µPa^2•s versus approximately 165 dB re 1µPa^2•s recorded while the NAS was functional (Attachment 1: Daily Memorandum for Underwater Noise Monitoring for PLT 110). The thresholds required by the NMFS BO and NYSDEC permit were not exceeded when the NAS was operating during the installation of the PLT 110. The estimated diameter of the 206 dB re 1 µPa peak SPL isopleth using only the 15 strikes that occurred in the approximately 11 seconds when the NAS was turned off was 41 feet.

During the installation of PLT 109 (Day 1) the NAS was tested in an ebb current. Air pressure and air flow were 40 psi and 1050–1100 cfm, respectively, throughout the pile installation. The hammer energy remained constant at 160 ± 6 kip-ft. River currents were constant at approximately 0.6 knots during active pile driving. The measured sound levels at all measurement locations showed minimal variation at ± 2 dB (Attachment 1: Daily Memorandum for Underwater Noise Monitoring for PLT 109 [October 4, 2013]). The 206 dB re 1 µPa peak SPL limit as set forth by the NMFS BO was not exceeded during the installation of this test pile.

During the installation of PLT 109 (Day 2) the NAS was tested in a flood current with ranging from 0.6 to 0.8 knots. Air pressure and air flow remained constant at 65 psi and 1750–1800 cfm, respectively, for the duration of pile driving. Three distinct hammer energies were used for the installation of the pile. For the first 1,117 strikes the hammer energy was 160 kip-ft; hammer energy was then increased to 250 kip-ft for 73 strikes and finally 380 kip-ft for 16 strikes. The distance to 206 dB re 1 µPa peak SPL isopleth as set forth by the NMFS BO was not exceeded during the installation of this test pile. (Attachment 1: Daily Memorandum for Underwater Noise Monitoring for PLT 109 [October 7, 2013], Table 5).

PLT-109 was driven with the S-280 hammer on 04 October and completed on 07 October using the S-800 hammer, with significantly different river currents and NAS settings (Table 6). Despite these differences, the size of the isopleths corresponding to the noise criteria were similar between days (Table 7). In both cases the values are well within the permit limits.

Table 6. Pile driving, NAS, and environmental conditions for the pile driving of PLT-109 on 04 and 07 October 2013.

Date	Pile driving hammer			NAS settings		Environmental conditions	
	Hammer	Mean hammer energy (± SD, kip-ft)	Strikes	Air pressure (psi)	Airflow rate (cfm)	Current	Speed (knots)
04 Oct	S-280	160 (6.0)	207	40	1050–1100	Ebb	0.6
07 Oct	S-800	160 (21.7)	1206	65	1750–1800	Flood	0.6 - 0.8

Table 7. Diameter (ft) of acoustic monitoring criteria isopleths from the pile driving of PLT-109 on 04 and 07 October 2013.

Date	206 dB re 1 μPa peak SPL	187 dB re 1 μPa^2·s cSEL*	150 dB re 1 μPa rms SPL†
04 Oct	17	84	478
07 Oct	10	146	476

* Assuming 1206 strikes for each hammer
† 1 s integration time

Overall there was very little variation in sound propagation was noted during the testing for each individual test pile under air pressure settings, current conditions, measurement locations and hammer energies; however, the distances to the NMFS and NYSDEC required thresholds were not exceeded during installation of test piles for Design Unit 6.

4.3 Conclusions

In accordance with NYSDEC Permit Condition 8, "an underwater noise attenuation system or systems must be deployed during the driving of steel piles [redacted] to minimize to the maximum extent practicable the effects of underwater sound upon fishes in the Hudson River." The *PLT-NAS Description* concludes that the most effective system is the one that will be capable of attenuating noise to achieve the distance thresholds required by NMFS in the BO and that can be safely deployed and retrieved repeatedly during production pile driving without affecting pile driving requirements and project schedule.

Results of test pile installation indicate that the unconfined multi-tier bubble curtain with bubble rings spaced a maximum of ten feet vertically, is effective in minimizing noise in order to meet the NMFS and NYSDEC requirements. Not only did the NAS meet the requirements in full ebb and flood currents and for various NAS settings, underwater noise isopleths were smaller than anticipated by the NMFS BO. Results indicate that the largest estimated width of the 206 dB re 1μPa peak SPL isopleth was measured at 17 ft as compared to the 40 ft predicted by the NMFS BO. These results indicate that the size of the 206 dB re 1 μPa isopleth measured for the [redacted] piles in 13-18 ft of water was smaller than the 206 dB re 1 μPa isopleths measured during the 2012 PIDP. Furthermore, the diameter of the 187 dB re 1 μPa^2-s cSEL isopleth at the end of installation of each pile was never estimated to be more than 146 ft. Therefore, the noise levels across the majority of the river at the construction site would be less than 187 dB cSEL, and would thus provide the required corridor for sturgeon migration through the site.

5.0 NAS Design Plan and Operational Specifications

The installation of the test piles also demonstrated that the unconfined multi-tier bubble curtain is readily and safely deployable and retrievable. Given these logistical attributes, combined with the proven effectiveness at obtaining required distances to NMFS and NYSDEC thresholds, the unconfined multi-tier bubble curtain is considered most effective to minimize harm to fish in the Hudson River, to the maximum extent practicable.

During production pile driving for Design Unit 6, the unconfined multi-tier bubble curtain will be deployed and retrieved in a similar manner to the PLT 110 and PLT 109 pile installations. Based on dredging and armoring, the river bottom at Design Unit 6 will be approximately -11 feet at mean lower low water (MLLW). Bubbler rings and compressors will be deployed for each pile, so that vertical spacing in the water column is a maximum of 10 feet or less at mean higher high water (MHHW). That is, the NAS will consist of two bubbler rings in Design Unit 6, unless water depth is 20 feet or greater, in which case, three rings will be deployed. The NAS will be deployed according the Construction Work Plan. Table 8 provides the range of water depths at each Design Unit 6 pier and the anticipated number of bubble curtain rings to be deployed for pile driving at that pier.

Table 8. Range of Water Depths at Each Design Unit 6 Pier and the Number of Bubble Curtain Rings to be Deployed

Pier Number	Approximate Water Depth (feet)	Number of Bubble Rings*
21	11-13	2
22	11-13	2
23	11-13	2
24	11-14	2
25	15-18	2

*The number of bubbler rings at specific piles within a pier is subject to change, based on field measurements of water depth during pile installation. Two rings will be deployed for pile driving at Design Unit 6, unless water depth is 20 feet or greater, in which case, three rings will be deployed.

The NAS system contains three valves at the:

1. air compressor outlet to the reservoir tank (Figure 6),
2. reservoir tank inlet (Figure 7),
3. reservoir tank outlet (Figure 8) to the bubbler ring.

Prior to impact pile driving, the compressor will be turned on and the valves will be open such that air will be supplied to the bubbler rings individually to visually confirm sufficient air to each ring. All valves will be opened during the operation of the bubble curtain. The bubble curtain will remain on during periods of active pile driving. The air pressure gauge will be used to monitor NAS operation during production pile driving. Air pressure at the outlet from the reservoir tank will be maintained at a target pressure of between 60 and 80 psi with a minimum pressure of 40 psi to each bubbler ring (Figure 9).

The following will be checked for each of the piles at each pier within Design Unit 6 (as outlined in the Construction Work Plan):

- Reservoir tank is pressurized prior to pile driving.
- The tank inlet and outlet valves are open immediately prior to starting the compressor.
- Air pressure at each reservoir tank outlet approximately 5 minutes after pile driving begins.
- Visual inspection of the water surface for sufficient air bubbles.

Figure 6. Valve at the Air Compressor Outlet to the Reservoir Tank

Figure 7. Valve at the Reservoir Tank Inlet

Figure 8. Valve at the Outlet from the Reservoir Tank to the Bubble Curtain

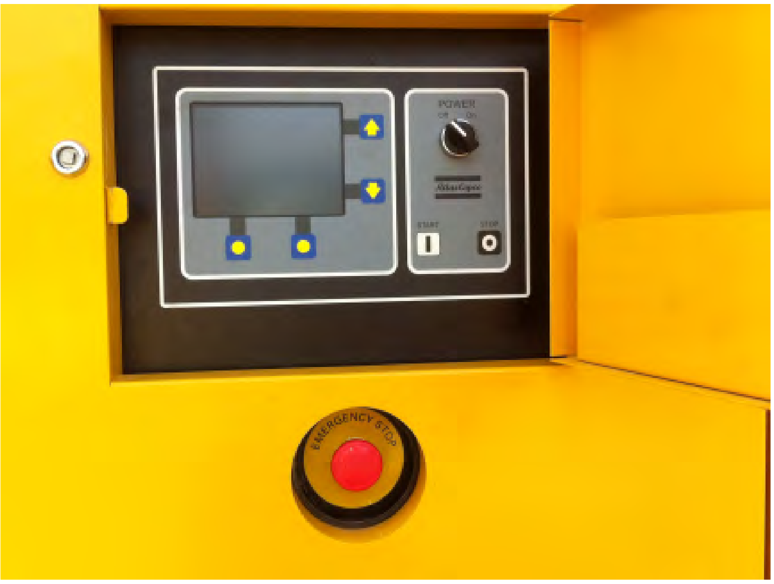

Figure 9. Air Compressor Controls

Attachment 1 – Daily Memoranda for Underwater Acoustic Monitoring of the Tappan Zee Bridge Test Pile Installation

Underwater Acoustic Monitoring of the Tappan Zee Bridge Test Pile 110 Installation

Daily Memorandum for 06 September 2013

Submitted to:
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HDR

Authors:
Jeff MacDonnell
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17 March 2014

P001206-001

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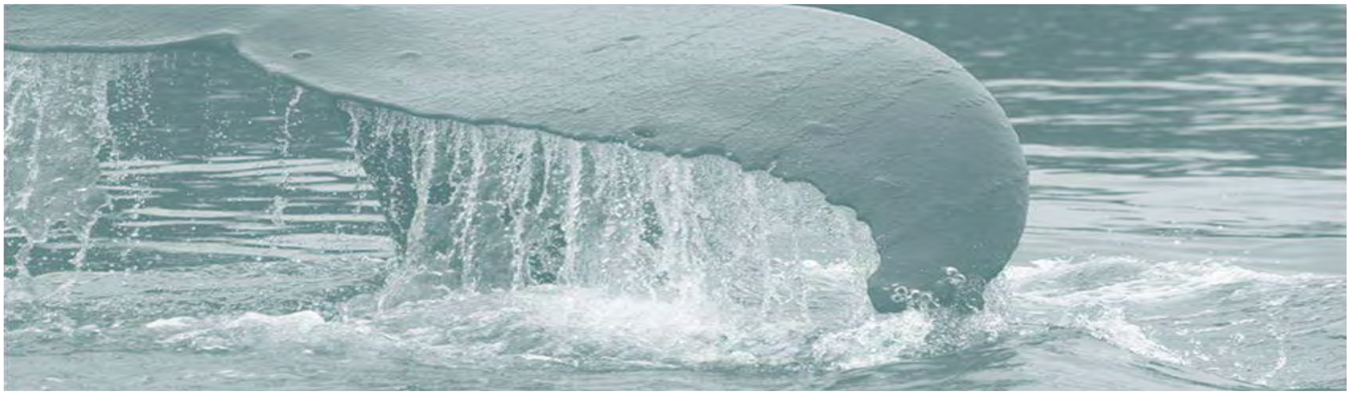

1. Summary

1.1. Pile Location and Monitoring Summary

Test Pile PLT-110 is a [redacted] pile driven at the construction site of the New NY Bridge on the west side of the navigation channel on 06 September 2013 (Table 1). One real-time acoustic monitoring system and three autonomous acoustic monitoring systems were deployed by JASCO (Section 4) on behalf of Tappan Zee Constructors, LLC (TZC) (Figure 1 and Table 2). Pile driving occurred between 16:19–17:34 Eastern Daylight Time (EDT), and full ebb current occurred at 17:09 EDT.

Table 2 provides the sound levels measured at each recorder. Plots of the measured values, frequency distributions of 1/3-octave-band single-strike sound exposure levels (SELss), and sound level statistics for the distribution of the measured data are presented in Appendix A.

Table 1. Summary of Test Pile PLT-110 activities, 06 September 2013.

Date:	06 September 2013
Pile-Driving Activity	
Test pile identifier:	PLT-110
Pile diameter:	[redacted]
Water depth:	18 ft
Hammer type:	Impact (IHC S-800)
Total hammer strikes:	[redacted]
Total penetration:	[redacted]
Net duration of pile driving (hh:mm:ss):	00:25:11
Maximum single strike energy:	283.3 thousand foot-pounds (kip-ft), (384 kJ)
Total energy transferred:	220,797 kip-ft (299 MJ)
Noise Attenuation System (NAS)	
Two-tier unconfined bubble curtain airflow rate:	1400–1750 cubic feet minute (cfm), 60–66 pounds per square inch (psi)
River conditions during pile driving:	Ebb tide, 0.5–1.6 knots (0.25–0.8 meters per second [m/s] depth dependent; Table 6 and Figure 7)

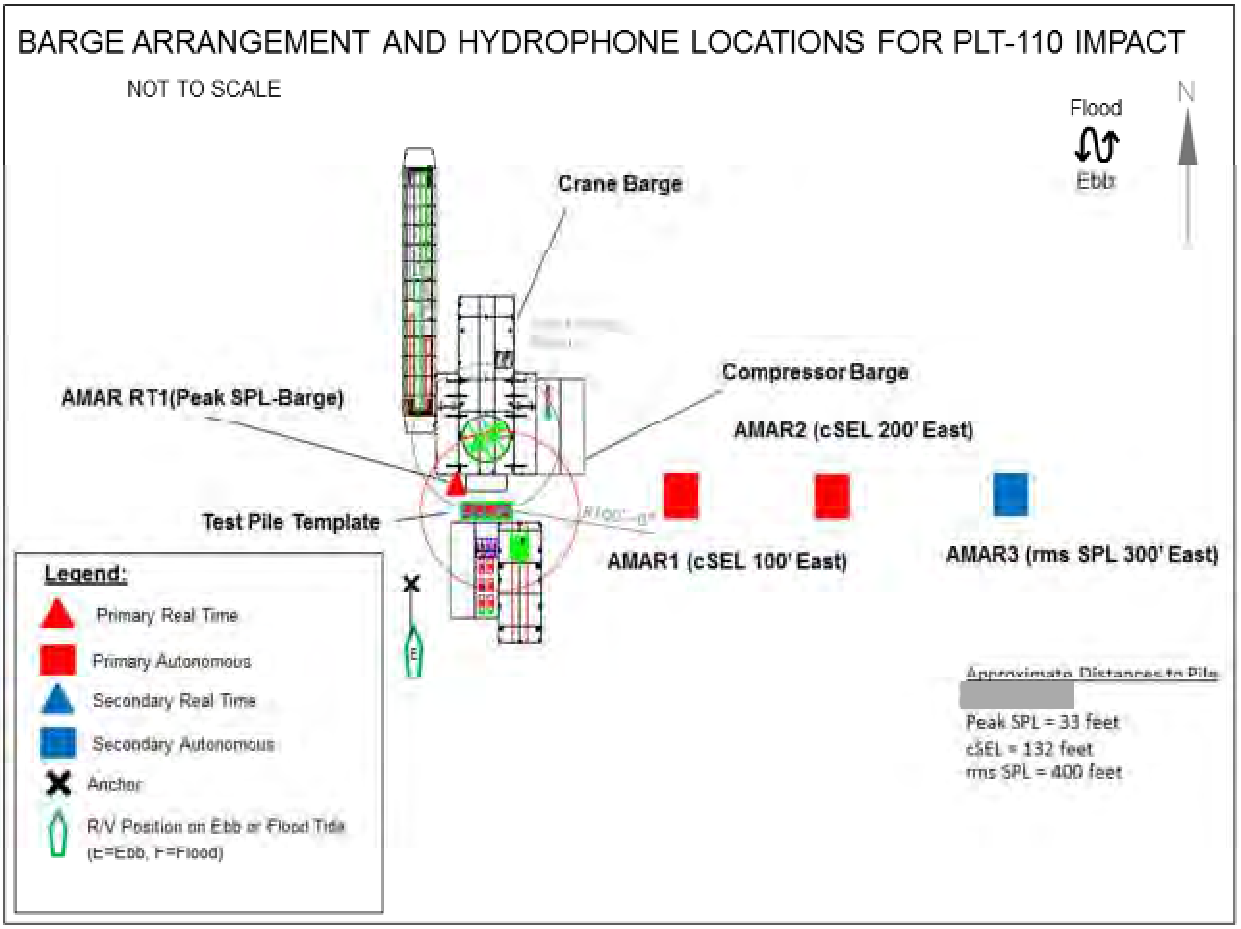

Figure 1. Plan view of pile and barge layout, 06 September 2013, PLT-110.

Table 2. Summary of Autonomous Multichannel Acoustic Recorders (AMAR) locations and measured sound levels. Detailed sound level plots are contained in Appendix A.

Location	Recorder ID	Distance to pile (ft)	Water depth (ft)	Max peak SPL (dB re 1 μPa)	cSEL (dB re 1 μPa^{2}s*)
Peak SPL Barge (up current)	AMAR-RT-11	33	18	192	195
cSEL 100’ East (cross current)	AMAR-175	132	18	177	180
cSEL 200’ East (cross current)	AMAR-221	221	18	171	176
rms SPL 300’ East (cross current)	AMAR-228	389	20	166	166

* Estimated at each recorder by multiplying the mean of the per-strike SEL by the number of strikes reported by the pile driving contractor, for the final value at the recorder, representing the total energy at the end of pile driving.

1.2. NMFS Physiological and Behavioral Thresholds

The distances from pile driving to the noise levels that serve as the National Marine Fisheries Service (NMFS) physiological and behavioral thresholds were extrapolated using a logarithmic regression based on mean values of the peak sound pressure level (SPL), root-mean-square (rms) SPL, and SELss from each recorder (Table 3 and Figure 2).

The regression indicates that the estimated diameter of the 206 dB re 1 µPa peak SPL isopleth was approximately 13 ft, and did not exceed NMFS criteria of a diameter of 40 ft for [redacted] piles. The diameter of the 187 dB re 1 µPa^2·s cumulative sound exposure level (cSEL) isopleth was estimated to be 140 ft at the end of pile driving. Since cSEL increases as the number of strikes increases, the diameter of the 187 dB isopleth was smaller than 140 ft for most of the pile driving operation. No other pile driving occurred during this pile load test. The river width is approximately 15,000 ft; therefore, a fish-movement corridor of more than one mile, which was continuous for more than 1,500 ft, was maintained throughout pile driving in accordance with New York State Department of Environmental Conservation (NYSDEC) Permit Condition 14.

Table 3. Estimated isopleth diameters for the NMFS physiological and behavioral thresholds.

Criteria	Estimated diameter (ft)
206 dB re 1 µPa peak SPL	13
187 dB re 1 µPa^2·s cSEL*	140
150 dB re 1 µPa rms SPL (1 s integration time)	572

* At the end of pile driving

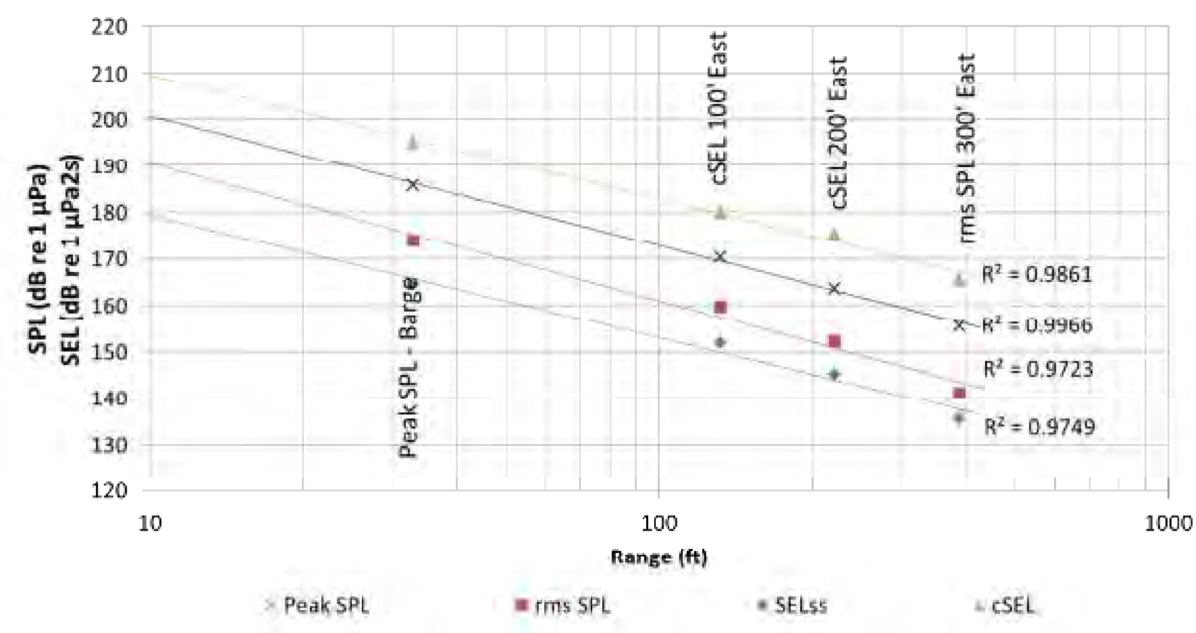

Figure 2. Regression based on mean values of the SELss, peak SPL, cSEL, and rms SPL from each recorder from pile driving of Test Pile PLT-110, 06 September 2013. SELss, peak SPL, and rms SPL are instantaneous values. The cSEL represents total sound energy measured during the pile driving.

1.3. Observations

The recorder at location cSEL 100' East (AMAR-175) was dragged by a tug boat at 16:40 EDT. After that time its position was no longer certain, so data are not included for AMAR-175 after that point. There was a brief period (16:24:37–16:25:19) of pile driving that occurred without the NAS operating. During this period, peak SPL levels of 206 dB re 1 µPa were measured at location Peak SPL Barge (Figure 8) and SELss increased by 10–15 dB at each measurement location (Figure 3). The estimated diameter the 206 dB re 1 µPa peak SPL isopleth using only the 15 strikes that occurred without the NAS was 41 feet for approximately 12 seconds (Figure 4).

The hammer energy during pile driving at PLT-110 varied from 125–280 kip-ft (Figure 3, Figure 5). The NAS air pressure and airflow were nearly constant at 60–65 psi and 1400–1750 cfm (Figure 3, Table 5). Pile driving occurred during the ebb tide, with an approximate average current of 0.5 to 1.6 knots (Figure 3, Figure 7); however, the only observable effect on the measured sound occurred when the NAS was temporarily turned off (Figure 3).

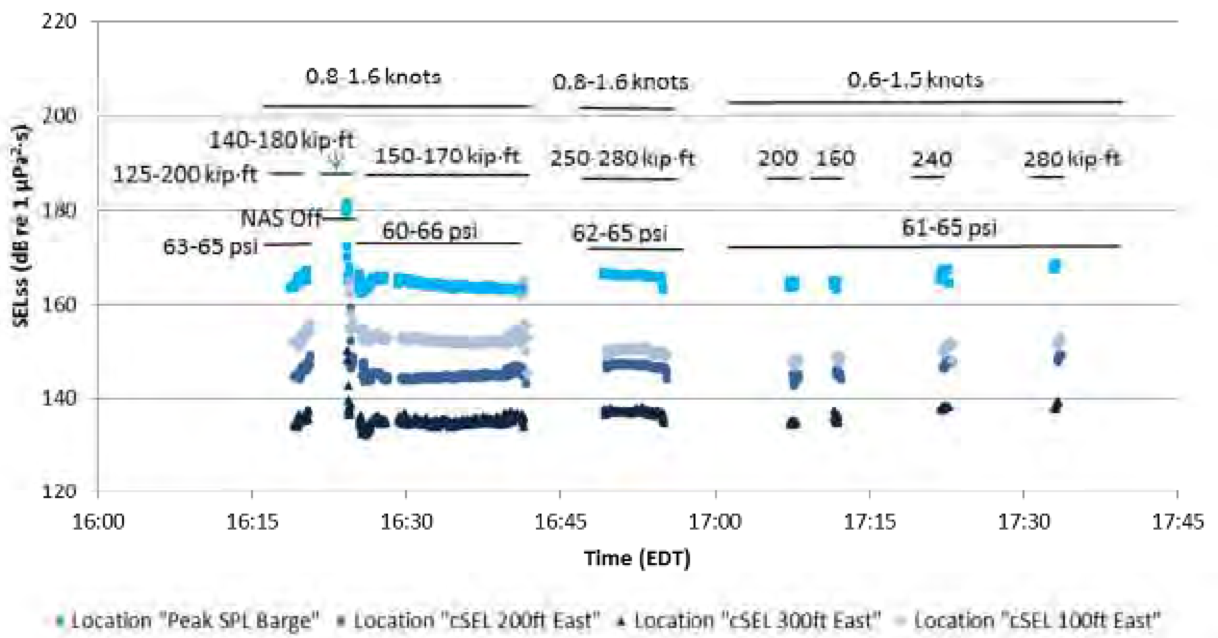

Figure 3. SELss at each location annotated with hammer energy (kip-ft), NAS air pressure (psi), and river current (knots).

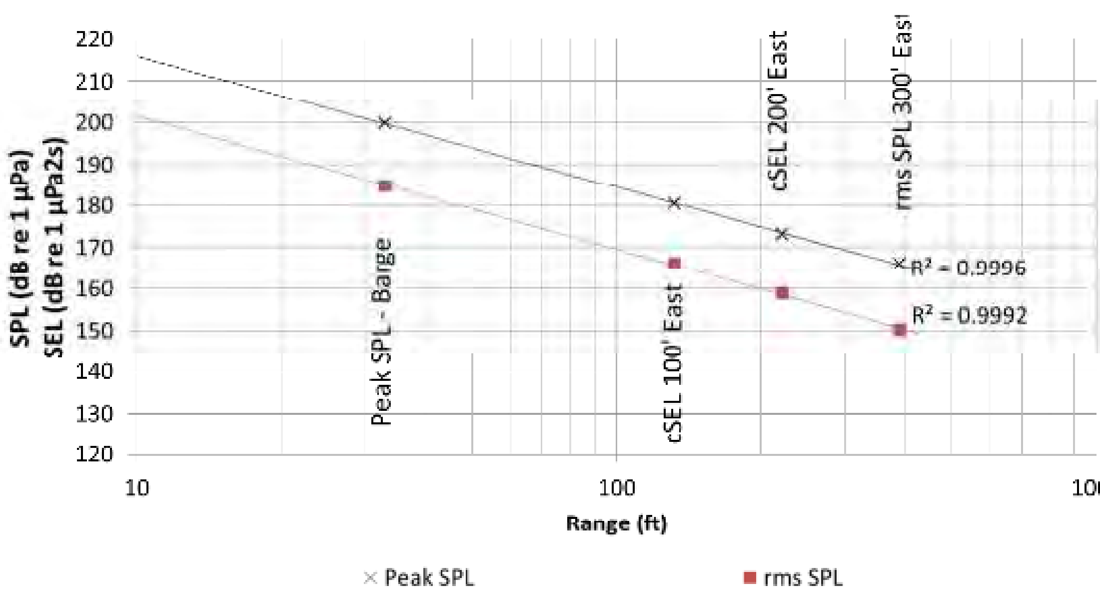

Figure 4. Regression based on mean values of the peak SPL and rms SPL from each recorder from pile driving of Test Pile PLT-110, 06 September 2013 for the 15 strikes (for approximately 12 seconds) when the NAS was disabled. peak SPL, and rms SPL are instantaneous values.

2. Activity Logs

2.1. Log of JASCO and Construction Activities

Table 4 provides activities for 06 September 2013.

Table 4. JASCO and construction activities for Test Pile PLT-110, 06 September 2013.

Time (EDT)	Activity
08:45	Arrive at Cornetta's, prep gear
09:30	Transit to job site
10:10	Begin deploying AMAR-221, AMAR-175, and AMAR-228
10:25	Transit to Hudson Harbor to standby
12:00	Transit to Cornetta's
13:15	Transit to Hudson Harbor to transfer to barge
13:30	Prepare AMAR-RT-11
14:00	Stand by
14:42	Deploy AMAR-RT-11; start crane picking hammer
16:19	Start pile driving
16:40	AMAR-175 dragged by a tugboat
17:34	Stop pile driving
17:45	Retrieve AMAR-RT-11
18:30	Retrieve AMAR-221, AMAR-175 and AMAR-228
18:45	All work complete

2.2. Pile Driving Logs

2.2.1. NAS

NAS used: Two-tier unconfined bubble curtain

NAS settings: 1400–1750 cfm, 60–66 psi

Table 5. NAS setting recorded during pile driving at Test Pile PLT-110, 06 September 2013.

Time (EDT)	Volume/min (cfm)	Pressure (psi)
16:19–16:21	1400–1650	63–65
16:24–16:28	1500–1700	60–65
16:29–16:41	1400–1750	60–66
16:49–16:55	1400–1650	62–65
17:07–17:09	1400–1650	62–65
17:12	1700–1650	62–65
17:22–17:23	1450–1700	61–65
17:33	1450–1700	61–65

2.2.2. Impact Hammering Log

Total energy: 220,797 kip-ft (299 MJ)

Total number of strikes:

Maximum per-strike energy: 283.3 kip-ft (384 kJ)

Net pile driving duration (hh:mm:ss): 00:25:11

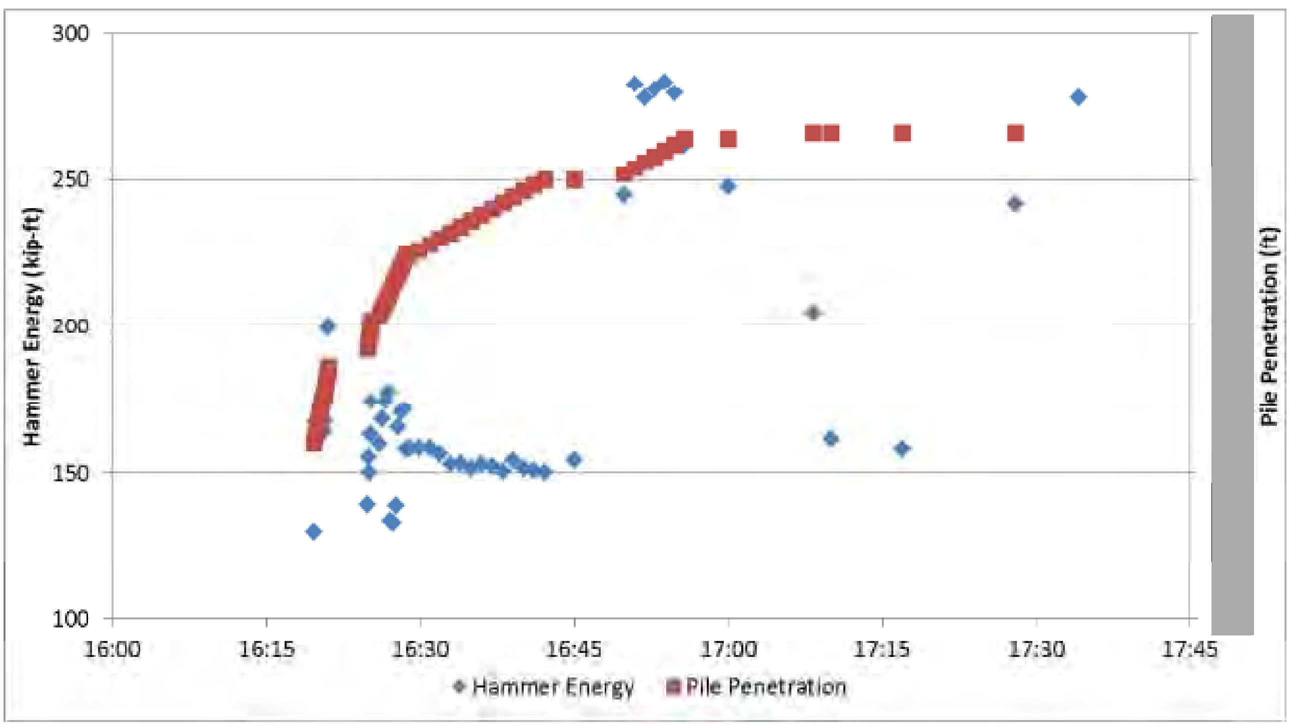

Figure 5. Hammer energy (kip-ft) and pile penetration (ft) for the impact pile driving of PLT-110 on 06 September 2013.

3. Weather and River Conditions

Table 6 provides the predicted currents at the project site for 06 September 2013. Figure 6 provides the measured speed of sound in water, based on a conductivity, temperature, depth (CTD) cast. Figure 6 provides the measured currents at the project site on 06 September 2013 using an Acoustic Doppler Current Profiler (ADCP).

Table 6. Weather conditions, and predicted local current times (EDT).

Weather conditions:	Sunny, ~ 3 knots northerly wind
Full ebb current:	17:13 (2.2 knots)
Slack current:	13:41, 20:06
Full flood current:	10:38 (1.2 knots)

Reference: http://tidesandcurrents.noaa.gov/get_predc.shtml?year=2013&stn=0611+George WashingtonBridge&secstn=Tappan+Zee+Bridge&sbfh=%2B1&sbfm=12&fldh=%2B0&fldm=55&sbeh=%2B0&sbem=52&ebbh=%2B1&ebbm=06&fldr=0.6&ebbr=0.8&fldavgd=356&ebbavgd=175&footnote=

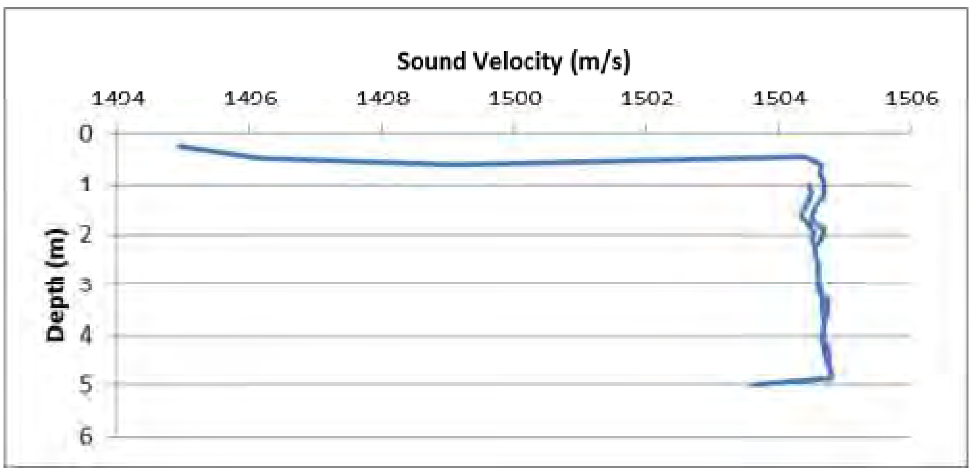

Figure 6. CTD cast performed at 14:22 (EDT) from the Alpine vessel, located 264 ft SE of the pile (41.07079 N, 73.8917 W).

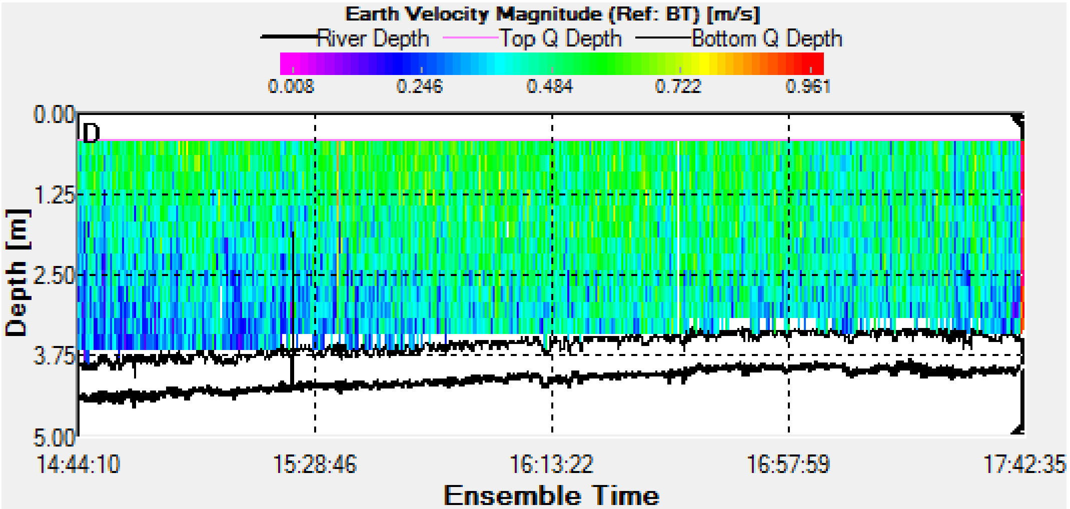

Figure 7. ADCP data from 06 September from the Alpine vessel, located 264 ft SE of the pile (41.07079 N, 73.8917 W), times are in EDT.

4. Monitoring Equipment

4.1. Real-time Monitoring Equipment

Table 7 provides information on the real-time monitoring equipment used on 06 September 2013.

Table 8 provides location information on the real-time recorders.

Table 7. Real-time monitoring equipment for Test Pile PLT-110, 06 September 2013.

Equipment used		Units deployed
Acoustic Data Logger		
Model:	AMAR RT (JASCO Applied Sciences)	1
SpectroPlotter version:	6.0.1	1
Hydrophone		
Model:	M8KC (GTI)	1
AMAR-RT-11 sensitivity:	−210.8 dB re 1 V/μPa	1
Other		
Hydrophone calibrator:	Pistonphone Type 42AC (G.R.A.S. Sound and Vibration)	1
CTD profiler:	Minos X (AML Oceanographic)	1
ADCP:	RDI Teledyne Workhorse Sentinel 1200 kHz	1

Table 8. Locations (WGS84) and deployment times (EDT) of the AMAR-RT monitoring stations, 06 September 2013.

Station	Recorder ID	Latitude (°N)	Longitude (°W)	Deployment time (EDT)	Water depth (ft)	Distance to pile (ft)
Peak SPL Barge	AMAR-RT-11	41.07143	73.89115	14:42	18	33

4.2. Autonomous Monitoring Equipment

Table 9 provides information on the autonomous monitoring equipment used on 06 September 2013. Table 10 provides the locations of the autonomous recorders.

Table 9. Autonomous monitoring equipment for Test Pile PLT-110, 06 September 2013.

Equipment used		Units deployed
Acoustic Data Logger		
Model:	AMAR G3 (JASCO Applied Sciences)	3
SpectroPlotter version:	6.0.1	3
Hydrophone		
Model:	M8E-51-0dB (GTI)	3
AMAR-221 sensitivity:	−199.9 dB re 1 V/µPa	1
AMAR-228 sensitivity:	−200.1 dB re 1 V/µPa	1
AMAR-175 sensitivity:	−200.1 dB re 1 V/µPa	1

Table 10. Locations (WGS84) and deployment times (EDT) of the long-range monitoring AMAR stations on 06 September 2013.

Station	Recorder ID	Latitude (°N)	Longitude (°W)	Deployment time (EDT)	Water depth (ft)	Distance to pile (ft)
cSEL 100' East (cross current)	AMAR-175	41.07137	73.8906	10:10	18	132
cSEL 200' East (cross current)	AMAR-221	41.07137	73.8903	10:14	18	221
rms SPL East (cross current)	AMAR-228	41.07135	73.8897	10:20	20	389

Appendix A. Pile Driving Plots

A.1. Impact Pile-Driving Sound Levels from Peak SPL Barge

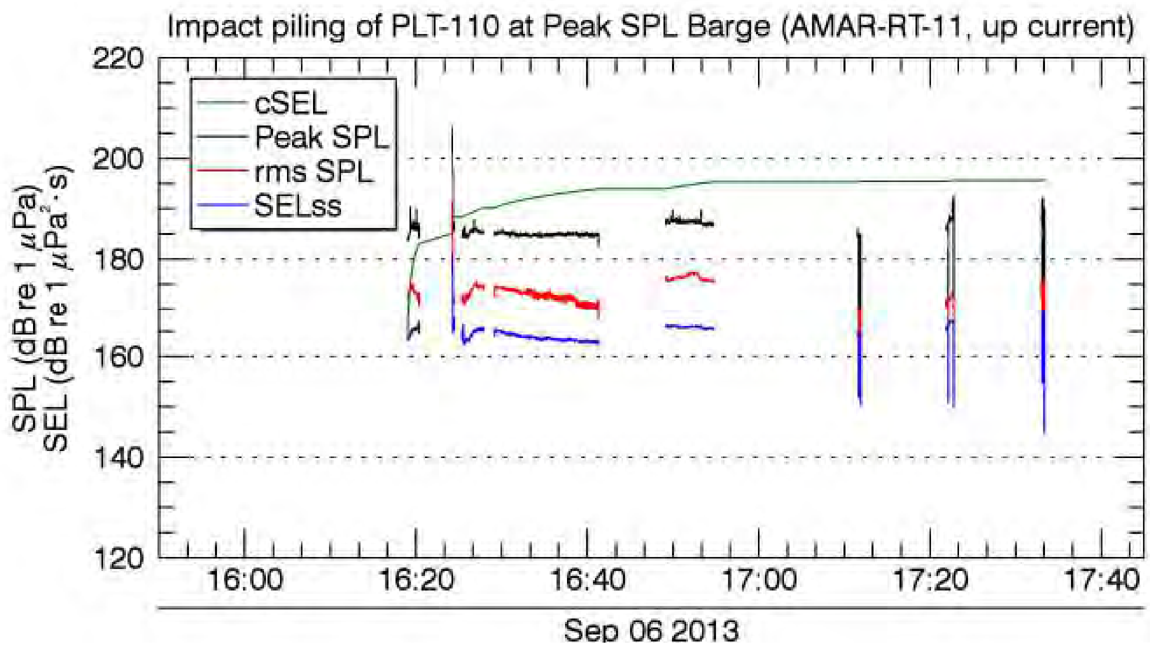

Figure 8. *Impact Pile Driving*: Peak SPL, rms SPL, SELss and cSEL versus time (EDT) for the pile driving of Test Pile PLT-110 measured 33 ft from the pile at location Peak SPL Barge using AMAR-RT-11. For periods during which there is no pile driving the cSEL is necessarily displayed as a constant value over time.

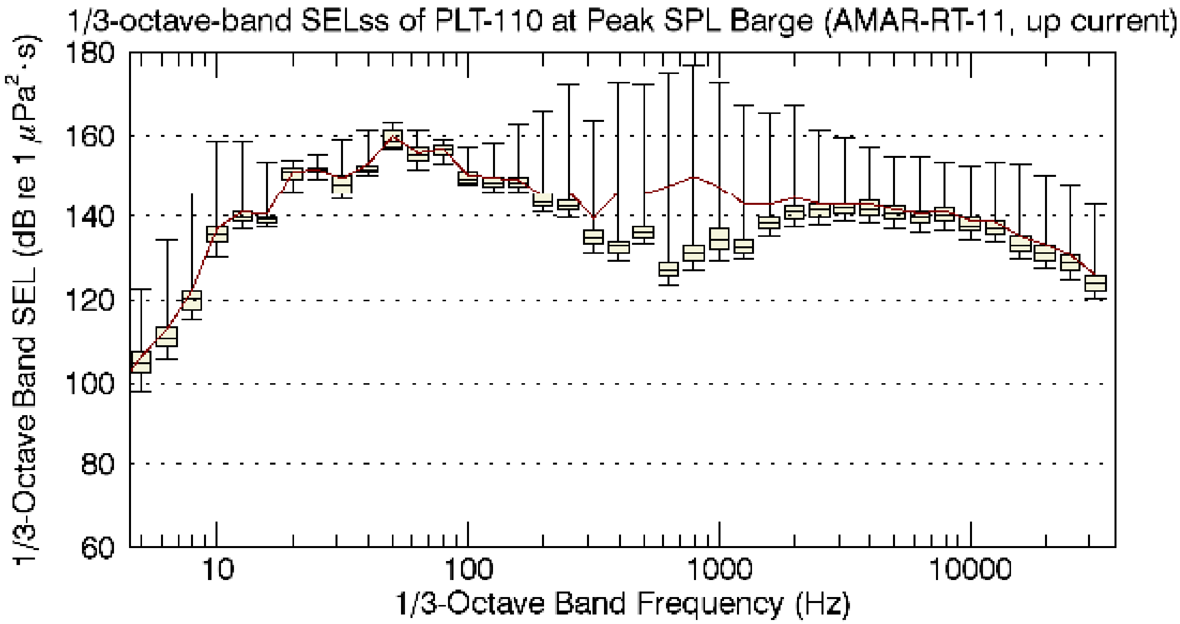

Figure 9. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-110 measured 33 ft from the pile at location Peak SPL Barge using AMAR-RT-11. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 11. Sound levels for the pile driving of Test Pile PLT-110 measured 33 ft from the pile at location Peak SPL Barge using AMAR-RT-11.

Sound level statistic*	peak SPL (dB re 1 μPa)	rms SPL (dB re 1 μPa)	SELss (dB re 1 μPa²·s)
L_{max}	192.4	177.3	168.4
L_5	187.8	176.7	166.1
L_{25}	186.7	174.6	165.6
L_{50}	185.1	173.3	164.2
L_{75}	184.7	172.0	163.3
L_{95}	184.4	170.1	162.9
L_{mean}	185.9	173.9	164.6

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.2. Impact Pile-Driving Sound Levels from cSEL 100' East

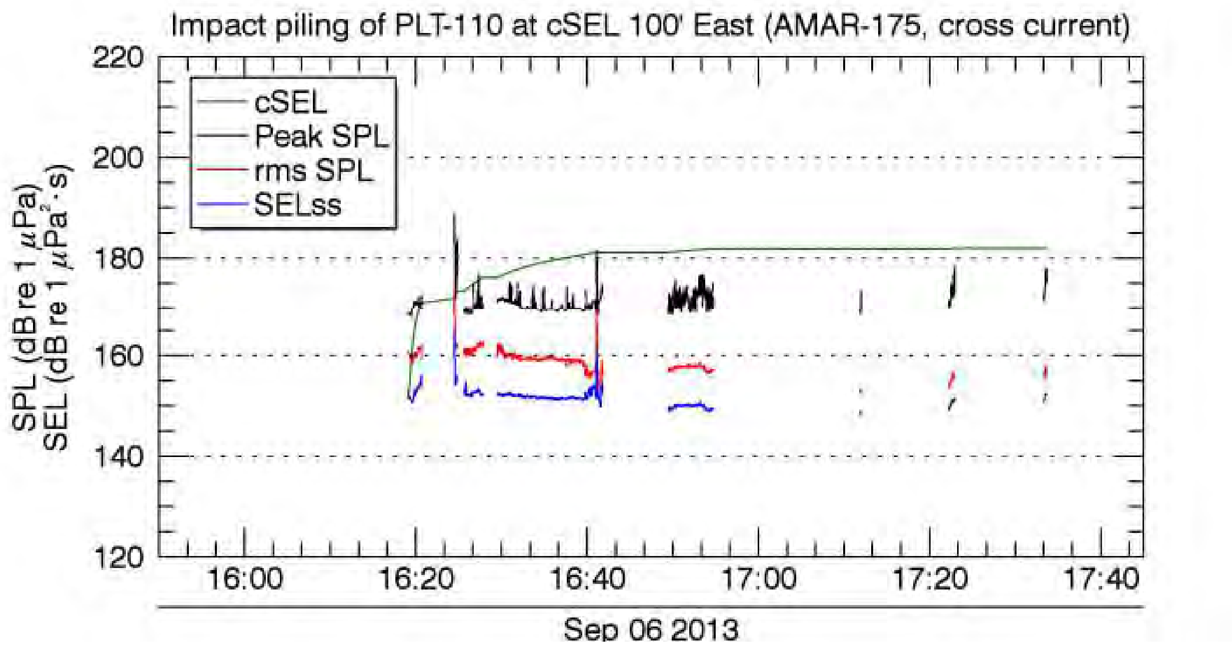

Figure 10. *Impact Pile Driving*: Peak SPL, rms SPL, SELss and cSEL versus time (EDT) for the pile driving of Test Pile PLT-110 measured 132 ft from the pile at location cSEL 100' East using AMAR-175. For periods during which there is no pile driving the cSEL is necessarily displayed as a constant value over time. The sound spike at 16:41 was caused by a tugboat dragging the recorder. Data after this time was not used in the regressions or 1/3-octave-band plots since the range to the recorder was uncertain.

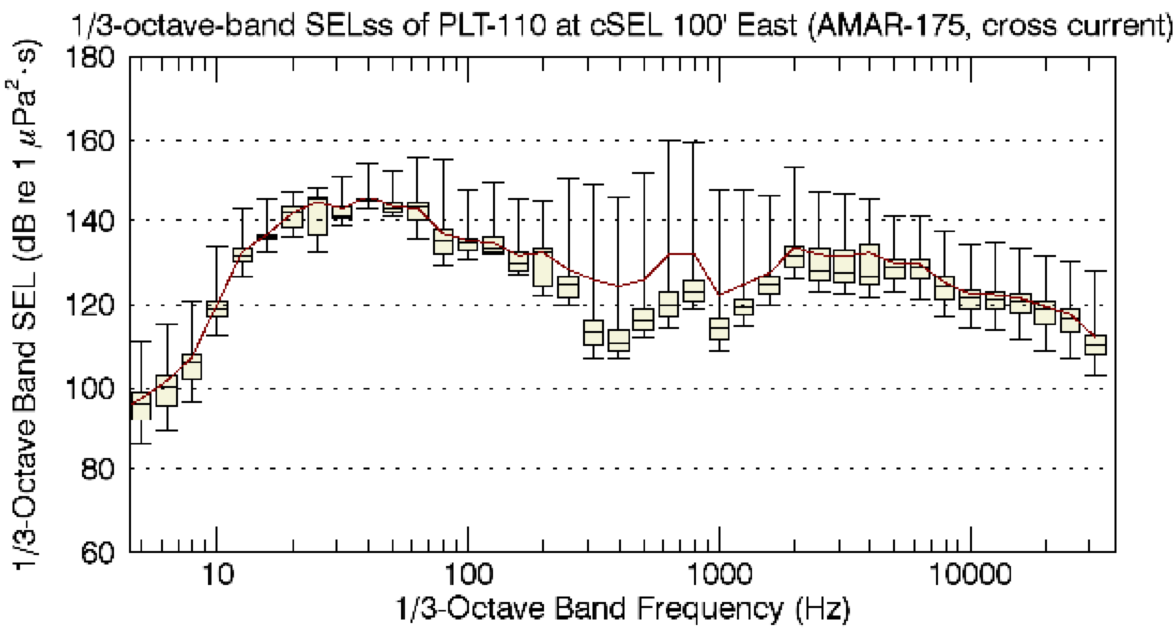

Figure 11. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-110 measured 132 ft from the pile at location cSEL 100' East using AMAR-175. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 12. Sound levels for the pile driving of Test Pile PLT-110 measured 132 ft from the pile at location cSEL 100' East using AMAR-175.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa^2·s)
L_{max}	176.9	162.6	154.3
L_5	172.2	161.8	152.9
L_{25}	170.8	160.2	152.2
L_{50}	169.7	159.4	151.7
L_{75}	169.4	159.1	151.5
L_{95}	169.0	158.5	151.3
L_{mean}	170.3	159.8	151.9

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.3. Impact Pile-Driving Sound Levels from cSEL 200' East

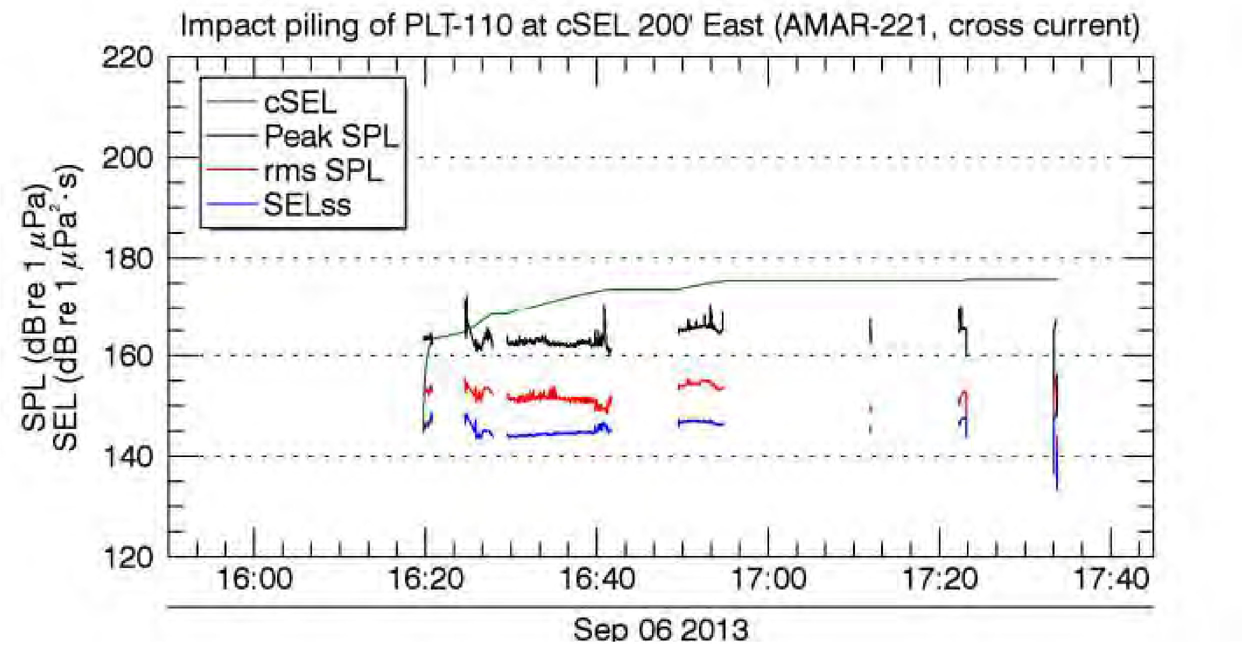

Figure 12. *Impact Pile Driving*: Peak SPL, rms SPL, SELss and cSEL versus time (EDT) for the pile driving of Test Pile PLT-100 measured 221 ft from the pile at location cSEL 200' East using AMAR-221. For periods during which there is no pile driving the cSEL is necessarily displayed as a constant value over time.

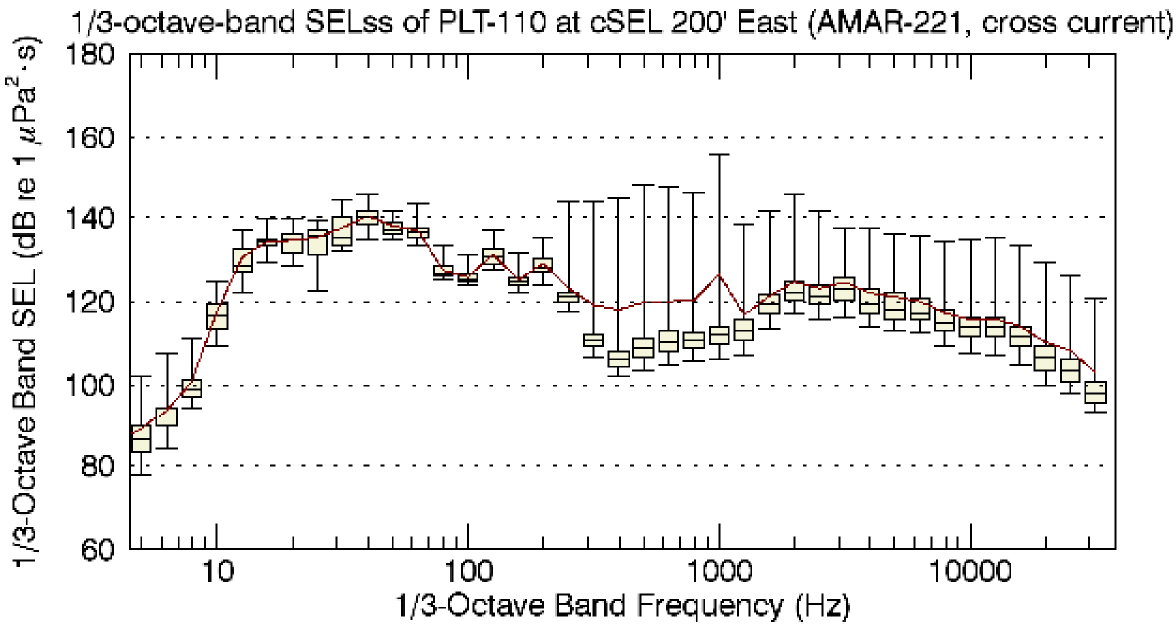

Figure 13. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-110 measured 221 ft from the pile at location cSEL 200' East using AMAR-221. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 13. Sound levels for the pile driving of Test Pile PLT-110 measured 221 ft from the pile at location cSEL 200' East using AMAR-221.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa²·s)
L_{max}	170.9	155.7	148.9
L_5	166.0	154.9	147.0
L_{25}	164.8	153.4	146.3
L_{50}	162.8	151.6	144.7
L_{75}	162.2	151.1	144.3
L_{95}	161.3	149.5	143.8
L_{mean}	163.7	152.3	145.3

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.4. Impact Pile-Driving Sound Levels from rms SPL 300’ East

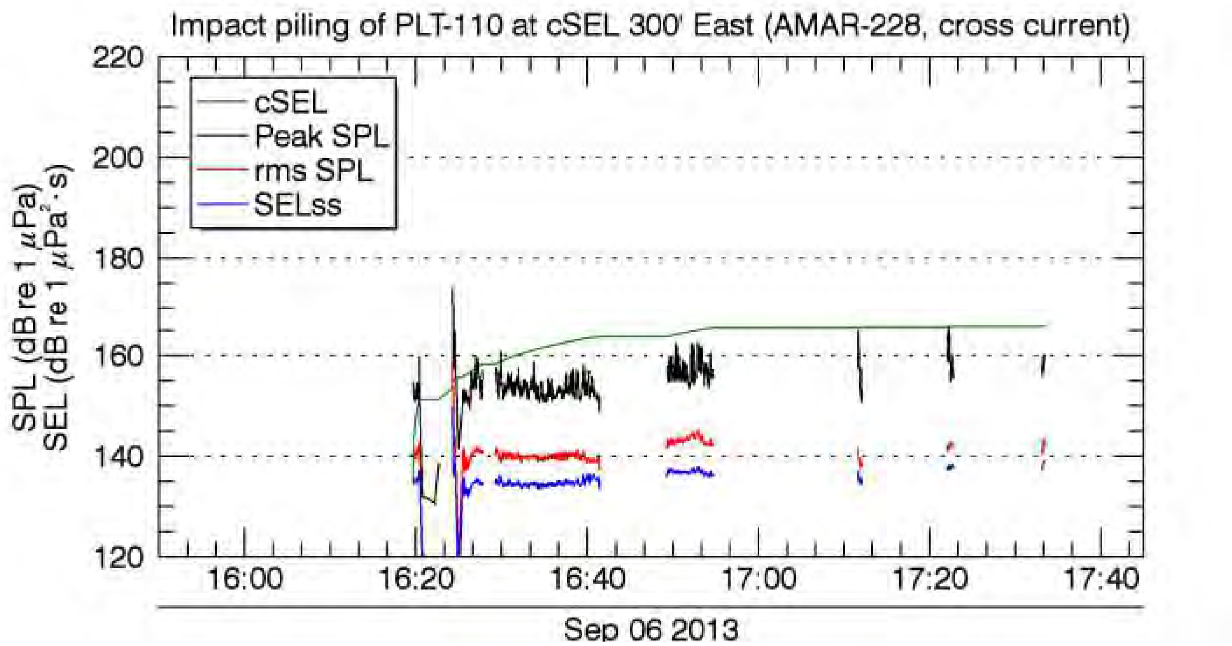

Figure 14. *Impact Pile Driving*: Peak SPL, rms SPL, SELss and cSEL versus time (EDT) for the pile driving of Test Pile PLT-110 measured 389 ft from the pile at location rms SPL 300’ East using AMAR-228. For periods during which there is no pile driving the cSEL is necessarily displayed as a constant value over time.

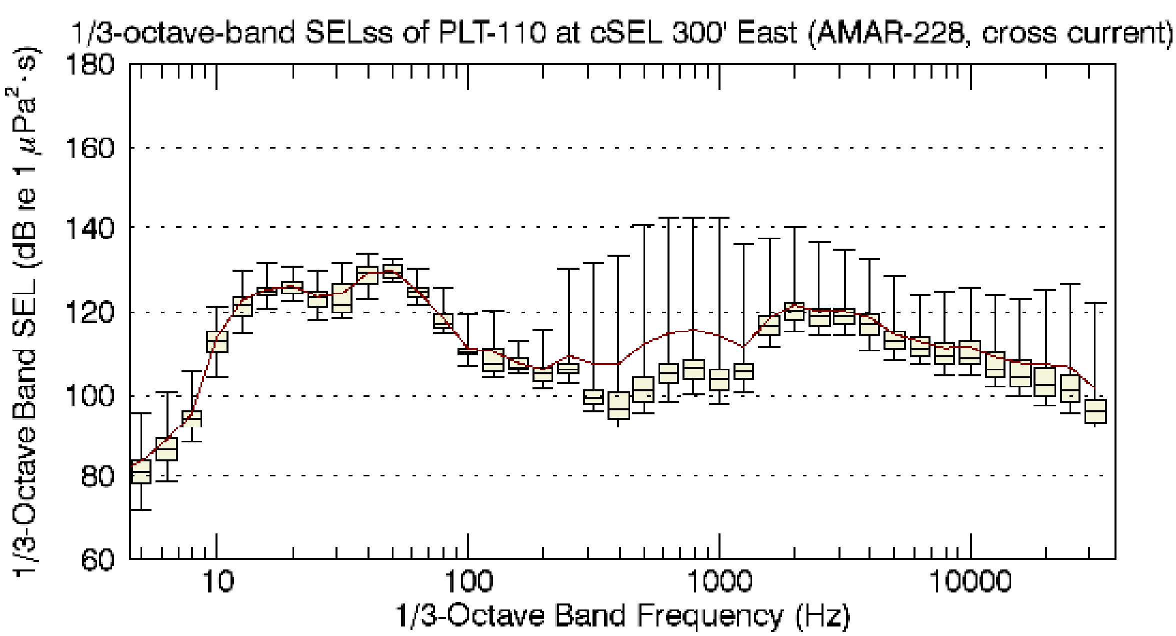

Figure 15. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-110 measured 389 ft from the pile at location rms SPL 300’ East using AMAR-228. Beige bars indicate the first, second, and

third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 14. Sound levels for the pile driving of Test Pile PLT-110 measured 389 ft from the pile at location rms SPL 300' East using AMAR-228.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa^2·s)
L_{max}	166.0	145.2	139.2
L_5	160.0	143.8	137.4
L_{25}	156.0	142.2	136.4
L_{50}	153.9	140.2	134.9
L_{75}	152.5	139.7	134.4
L_{95}	151.2	139.0	133.9
L_{mean}	155.6	141.1	135.5

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

Underwater Acoustic Monitoring of the Tappan Zee Bridge Test Pile 109 Installation

Daily Memorandum for 4 October 2013

Submitted to:
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17 March 2014

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1. Summary

1.1. Pile Location and Monitoring Summary

Test Pile PLT-109 is a [redacted] pile driven at the site of the New NY Bridge on the west side of the navigation channel on 04 October 2013 (Table 1). One real-time acoustic monitoring system and two autonomous acoustic monitoring systems were deployed by JASCO (Section 4) on behalf of Tappan Zee Constructors, LLC (TZC) (Figure 1, Table 2). Pile driving occurred between 16:46–16:50 Eastern Daylight Time (EDT), and full ebb current occurred at 16:10 EDT.

Table 2 provides the sound levels measured at each recorder. Plots of the measured values, frequency distributions of 1/3-octave-band single-strike sound exposure levels (SELss), and sound level statistics for the distribution of the measured data are presented in Appendix A.

Table 1. Summary of Test Pile PLT-109 activities, 04 October 2013.

Date:	04 October 2013
Pile-Driving Activity	
Test pile identifier:	PLT-109
Pile diameter:	[redacted]
Water depth:	13 ft
Hammer type:	Impact (IHC S-280)
Total hammer strikes:	[redacted]
Total penetration:	[redacted]
Net duration of pile driving (hh:mm:ss):	00:04:30
Maximum single strike energy:	166 thousand foot-pounds (kip-ft), (225 kJ)
Total energy transferred:	33,275 kip-ft (45 MJ)
Noise Attenuation System (NAS)	
Two-tier unconfined bubble curtain airflow rate:	1050–1100 cubic feet per minute (cfm), 40 pounds per square inch (psi)
River conditions during pile driving:	Ebb current, 0.6 knots current (0.3 meters per second [m/s], depth dependent; Table 5 and Figure 6)

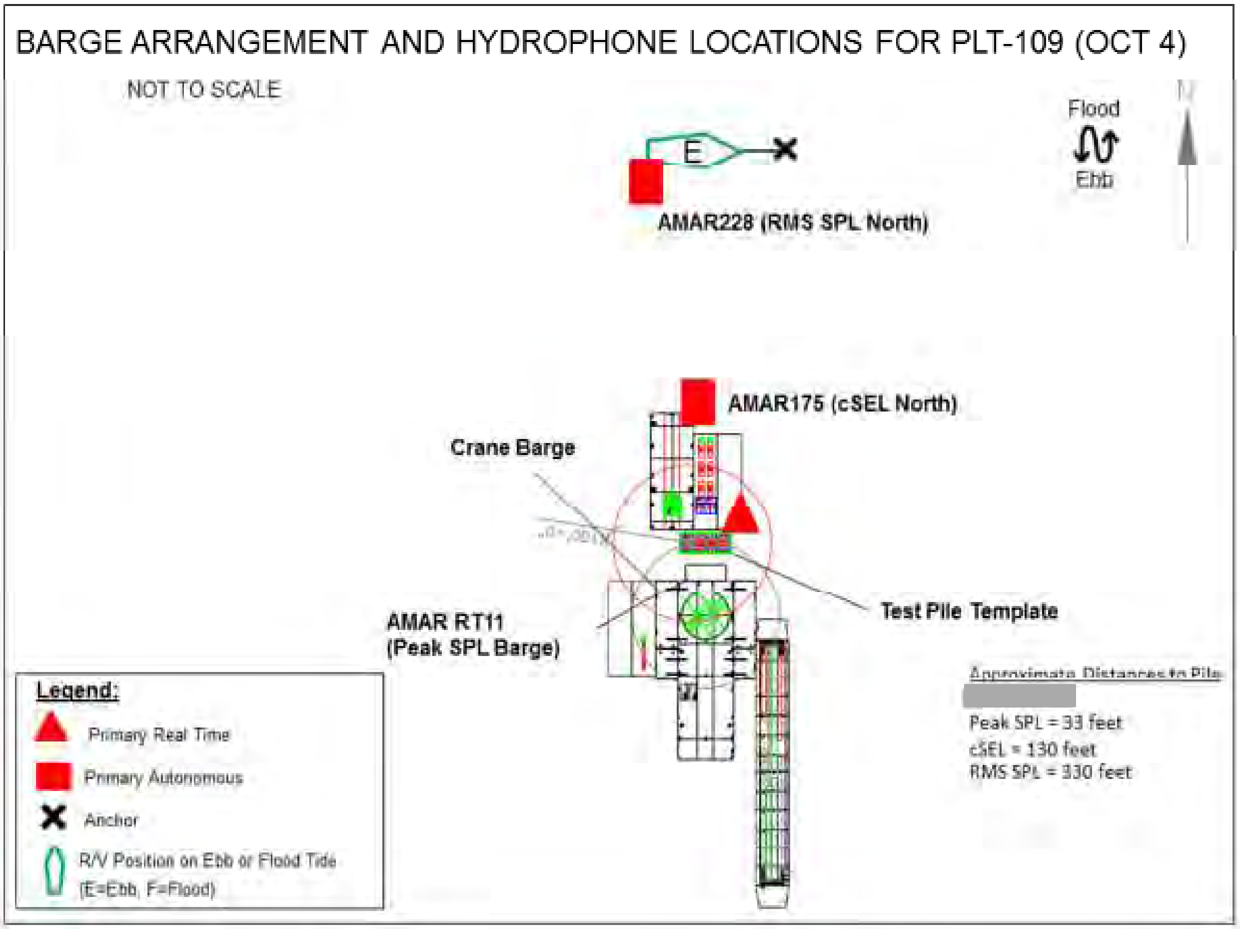

Figure 1. Plan view of pile and barge layout, 04 October 2013, Test Pile PLT-109.

Table 2. Summary of Autonomous Multichannel Acoustic Recorder (AMAR) locations and measured sound levels. Detailed sound level plots are contained in Appendix A.

Location	Recorder ID	Distance to pile (ft)	Water depth (ft)	Max peak SPL (dB re 1 μPa)	cSEL (dB re 1 $\mu Pa^2 s$)*
Peak SPL Barge (up current)	AMAR-RT-11	29	13	192	192
cSEL North (up current)	AMAR-175	263**	13	163	162
rms SPL North (up current)	AMAR-228	707	11	159	152

* Estimated at each recorder by multiplying the mean of the per-strike SEL by the number of strikes reported by the pile driving contractor, for the final value at the recorder, representing the total energy at the end of pile driving.
** Due to the barge layout this was as close to the pile as the recorder could be deployed along the north radial.

1.2. NMFS Physiological and Behavioral Thresholds

The distances from pile driving to the noise levels that serve as the National Marine Fisheries Service (NMFS) physiological and behavioral thresholds were extrapolated using a logarithmic regression based on mean values of the peak sound pressure level (SPL), root mean square (rms) SPL, and SELss from each recorder (Table 3 and Figure 2).

The regression indicates that the estimated diameter of the 206 dB re 1 µPa peak SPL isopleth was approximately 17 ft, and did not exceed NMFS criteria of a diameter of 40 ft for [redacted] piles. The diameter of the 187 dB re 1 µPa^2·s cumulative sound exposure level (cSEL) isopleth was estimated to be 84 ft at the end of pile driving. Since cSEL increases as the number of strikes increases, the diameter of the 187 dB isopleth was smaller than 84 ft for most of the pile driving operation. No other pile driving occurred during this pile load test. The river width is approximately 15,000 ft; therefore, a fish-movement corridor of more than one mile, which was continuous for more than 1,500 ft, was maintained throughout pile driving in accordance with New York State Department of Environmental Conservation (NYSDEC) Permit Condition 14.

Table 3. Estimated isopleth diameters for the NMFS physiological and behavioral thresholds.

Criteria	Estimated mean diameter (ft)
206 dB re 1 µPa peak SPL	17
187 dB re 1 µPa^2·s cSEL*	84
150 dB re 1 µPa rms SPL (1 s integration time)	478

* At the end of pile driving

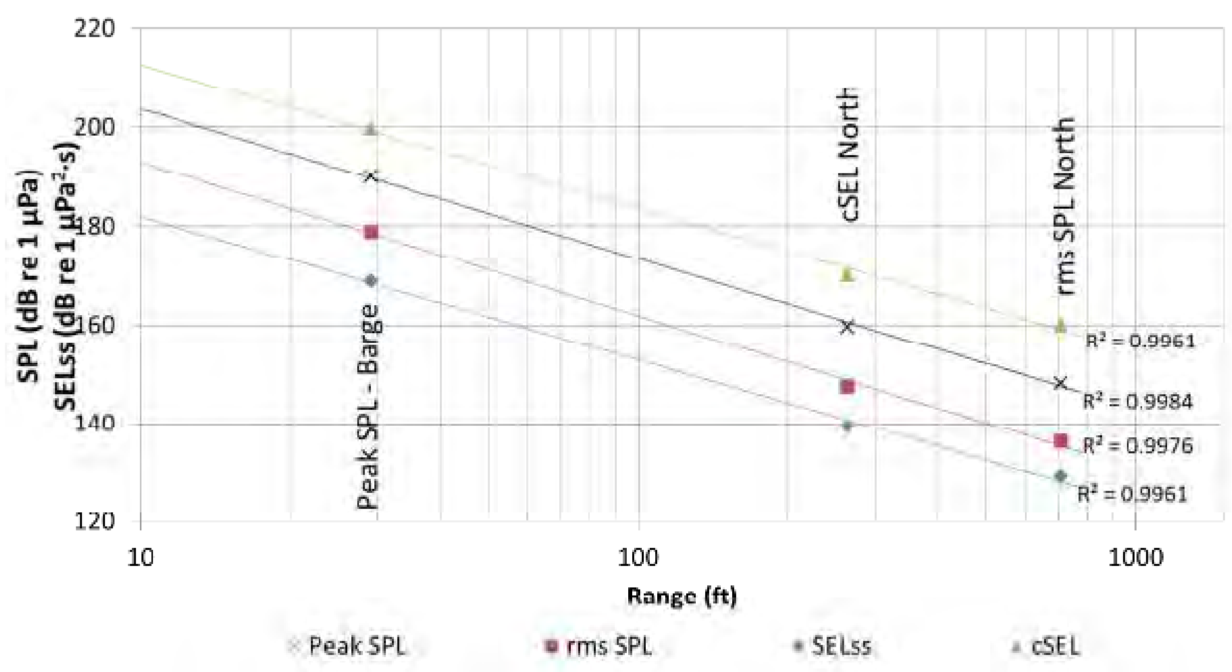

Figure 2. Regression based on mean values of the SELss, peak SPL, cSEL, and rms SPL from each recorder from pile driving of Test Pile PLT-109, 04 October 2013. SEL_{ss}, peak SPL, and rms SPL are instantaneous values. The cSEL represents the total sound energy measured during the pile driving.

1.3. Observations

PLT-109 was driven for 4 min on 04 October 2013 with a hammer energy of 160 ± 6 kip-ft (Figure 4). The NAS air pressure and airflow were constant (40 psi, 1050–1100 cfm) during the pile driving. River currents constant at ~ 0.6 knots. The measured sound levels at all measurement locations showed very small variations of ± 2dB (Figure 3, Figure 7, Figure 9, and Figure 11).

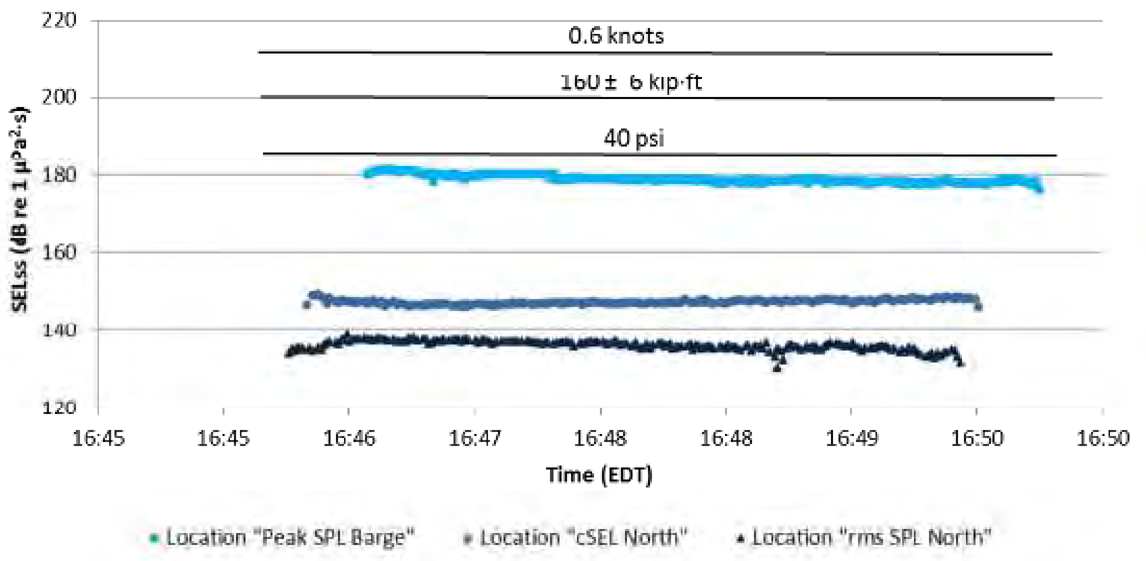

Figure 3. SELss at each location annotated with hammer energy (kip-ft), NAS air pressure (psi), and river current (knots). Note that the clocks on the three recorders were unsynchronized by ~15 seconds.

2. Activity Logs

2.1. Log of JASCO and Construction Activities

Table 4 provides activities for 04 October 2013.

Table 4. JASCO and construction activities for Test Pile PLT-109, 04 October 2013.

Time (EDT)	Activity
05:40	Arrive at dock, prep recorders
06:30	Leave dock for job site
06:50	Stand by at Cornetta's
11:00	Transfer to barge, deploy AMAR-175
11:11	Deploy AMAR-RT from barge
11:40	Deploy AMAR-228 from Alpine vessel
16:46	Start pile driving with S-280

16:50	Stop pile driving
17:00	Retrieve recorders
18:30	All work complete

2.2. Pile Driving Logs

2.2.1. NAS

NAS used: Two-tier unconfined bubble curtain

NAS settings: 1050–1100 cfm, 40 psi

2.2.2. Impact Hammering Log

Total Energy: 33,275 kip-ft (45 MJ)

Total number of strikes:

Maximum per-strike energy: 166 kip-ft (225 kJ)

Net pile driving duration (hh:mm:ss): 00:04:30

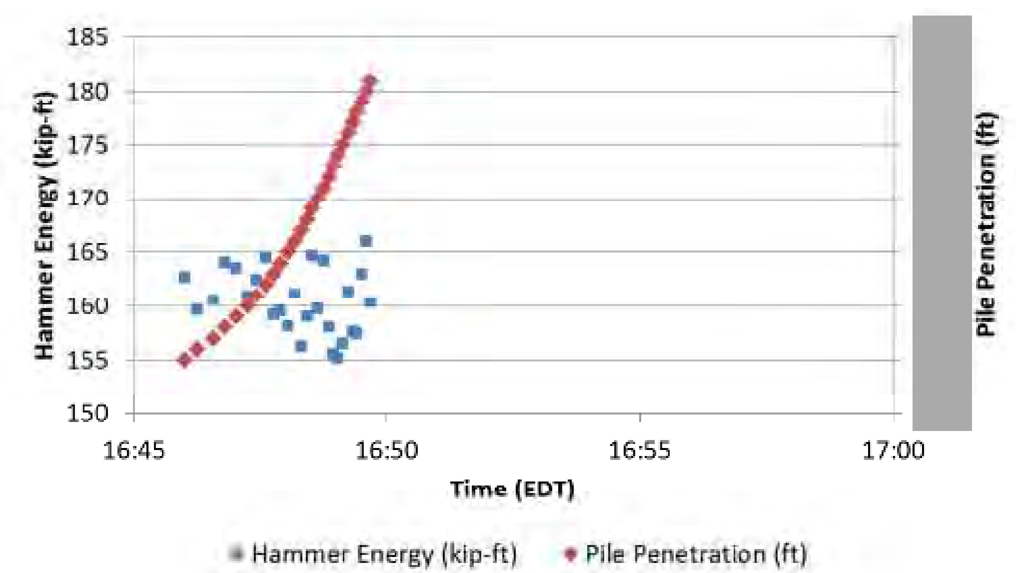

Figure 4. Hammer energy (kip-ft) and pile penetration (ft) during pile driving of PLT-109, 04 October 2013.

3. Weather and River Conditions

Table 5 provides the predicted currents at the project site on 04 October 2013. Figure 6 provides the measured currents collected using an Acoustic Doppler Current Profiler (ADCP) at the project site on 04 October 2013. Figure 5 provides the speed of sound in water, based on salinity and temperature, measured using the conductivity, temperature, depth (CTD) cast.

Table 5. Weather conditions and predicted local current times (EDT).

Weather conditions:	Sunny, light winds
Full ebb current:	16:10 (−2.3 knots)
Slack current:	12:28, 19:03
Full flood current:	09:29 (1.3 knots)

Reference: http://tidesandcurrents.noaa.gov/get_predc.shtml?year=2013&stn=0611+George Washington Bridge&secstn=Tappan+Zee+Bridge&sbfh=%2B1&sbfm=12&fldh=%2B0&fldm=55&sbeh=%2B0&sbem=52&ebbh=%2B1&ebbm=06&fldr=0.6&ebbr=0.8&fldavgd=356&ebbavgd=175&footnote=

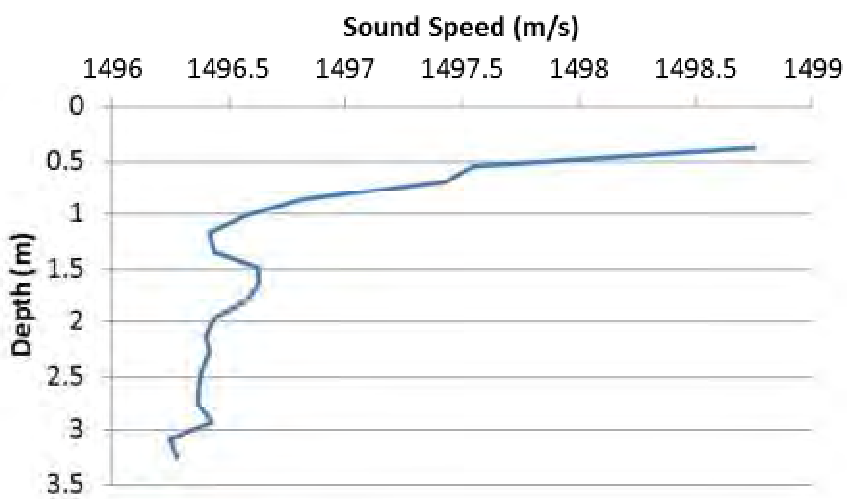

Figure 5. CTD cast performed at 16:32 EDT from the Alpine vessel, located 700 ft from the pile.

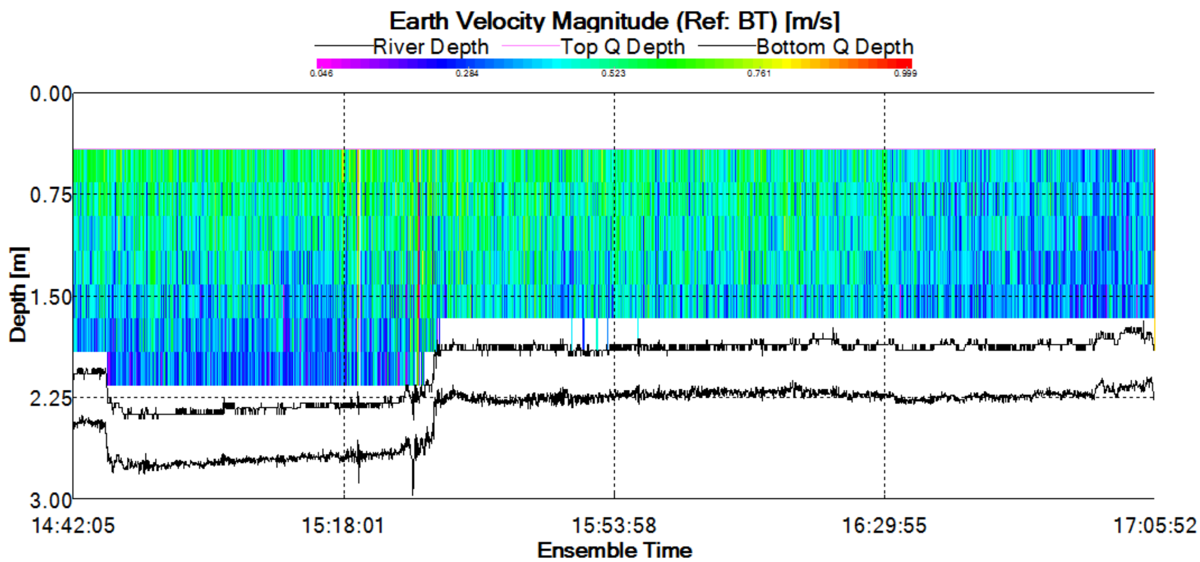

Figure 6. Current data from 04 October 2013 recorded at rms SPL North (Alpine Vessel) using an ADCP. Pile driving occurred from 16:46–16:50 EDT.

4. Monitoring Equipment

4.1. Real-time Monitoring Equipment

Table 6 provides information on the real-time monitoring equipment used on 04 October 2013.

Table 7 provides location information on the real-time recorders.

Table 6. Real-time monitoring equipment for Test Pile PTLT-109, 04 October 2013.

Equipment used		Units deployed
Acoustic data logger		
Model:	AMAR RT (JASCO Applied Sciences)	1
SpectroPlotter version:	6.0.1	1
Hydrophone		
Model:	M8KC (GTI)	1
AMAR-RT-11 sensitivity:	−210.9 dB re 1 V/µPa	1
Other		
Hydrophone calibrator:	Pistonphone Type 42AC (G.R.A.S. Sound and Vibration)	1
CTD profiler:	Minos X (AML Oceanographic)	1
ADCP:	RDI Teledyne Workhorse Sentinel 1200 kHz	1

Table 7. Locations (WGS84) and deployment times (EDT) of the AMAR-RT monitoring stations, 04 October 2013.

Station	Recorder ID	Latitude (°N)	Longitude (°W)	Deployment time (EDT)	Water depth (ft)	Distance to pile (ft)
Peak SPL Barge (up current)	AMAR-RT-11	41.07135	73.89616	11:11	13	29

4.2. Autonomous Monitoring Equipment

Table 8 provides information about the autonomous monitoring equipment used on 04 October 2013.

Table 9 provides the locations of the autonomous recorders.

Table 8. Autonomous monitoring equipment Test Pile PTLT-109, 04 October 2013.

Equipment used		Units deployed
Acoustic data logger		
Model:	AMAR G3 (JASCO Applied Sciences)	2
SpectroPlotter version:	6.0.1	2
Hydrophone		
Model:	M8E-51-0dB (GTI)	2
AMAR-228 sensitivity:	−199.74 dB re 1 V/µPa	1
AMAR-175 sensitivity:	−199.84 dB re 1 V/µPa	1

Table 9. Locations (WGS84) and deployment times (EDT) of the long-range monitoring AMAR stations on 04 October 2013

Station	Recorder ID	Latitude (°N)	Longitude (°W)	Deployment time (EDT)	Water depth (ft)	Distance to pile (ft)
cSEL North (up current)	AMAR-175	41.07198	−73.89646	11:11	13	263
rms SPL North (up current)	AMAR-228	41.07322	−73.89609	11:40	11	707

Appendix A. Pile Driving Plots

A.1. Impact Pile-Driving Sound Levels from Peak SPL Barge

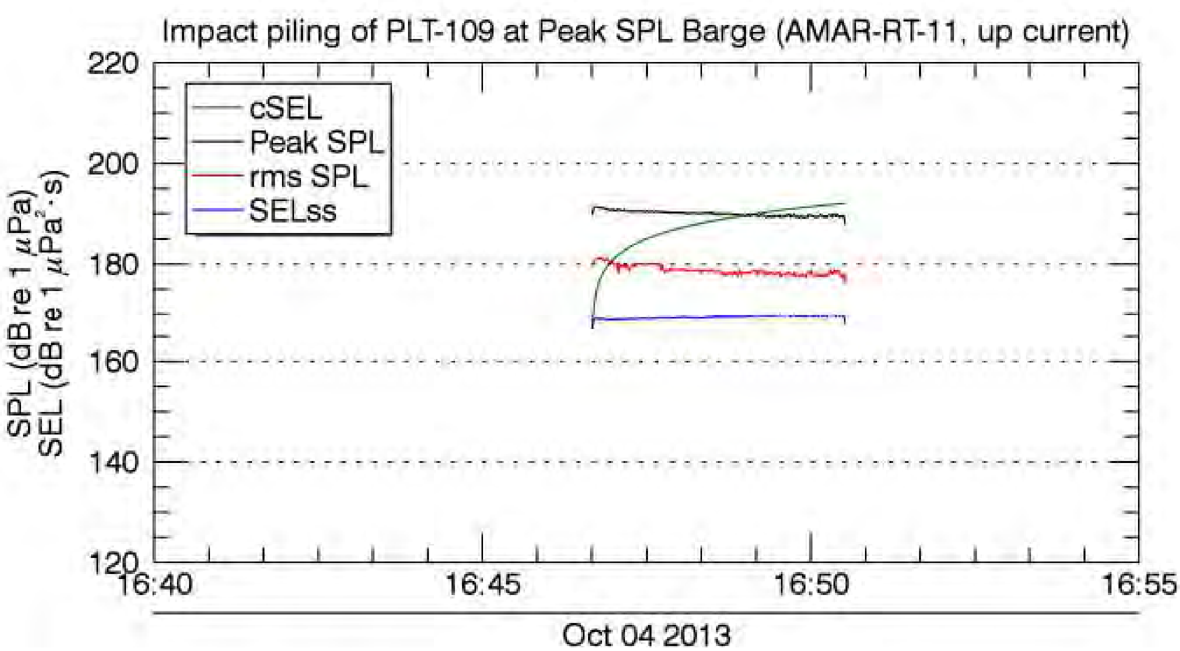

Figure 7. *Impact Pile Driving*: Peak SPL, rms SPL, SEL, and cSEL versus time (EDT) for the pile driving of Test Pile PLT-109 measured 29 ft from the pile at location Peak SPL Barge using AMAR-RT-11.

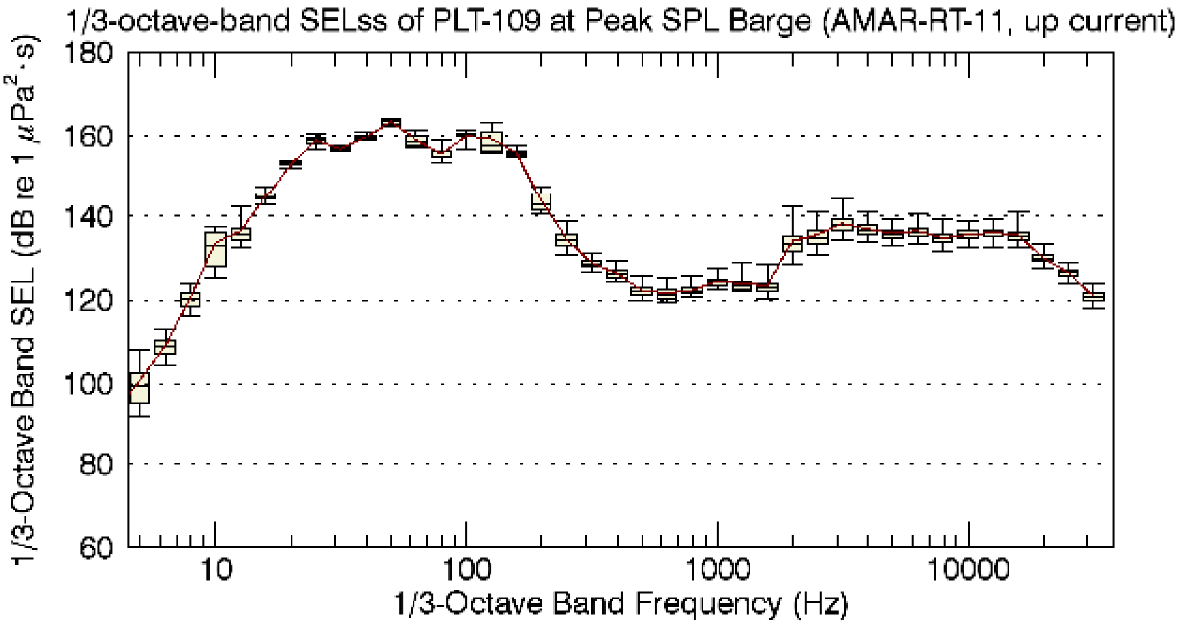

Figure 8. Distribution of 1/3-octave SELss for the pile driving of Test Pile PLT-109 measured 29 ft from the pile at location Peak SPL Barge using AMAR-RT-11. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 10. Sound levels for the pile driving of Test Pile PLT-109 measured 29 ft from the pile at location Peak SPL Barge using AMAR-RT-11.

Sound level statistic*	peak SPL (dB re 1 μPa)	rms SPL (dB re 1 μPa)	SELss (dB re 1 μPa^2·s)
L_{max}	191.5	181.3	169.7
L_5	190.9	180.6	169.4
L_{25}	190.3	179.4	169.1
L_{50}	189.9	178.6	168.9
L_{75}	189.6	178.1	168.6
L_{95}	189.3	177.6	168.4
L_{mean}	190.0	178.9	168.9

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.2. Impact Pile-Driving Sound Levels cSEL North

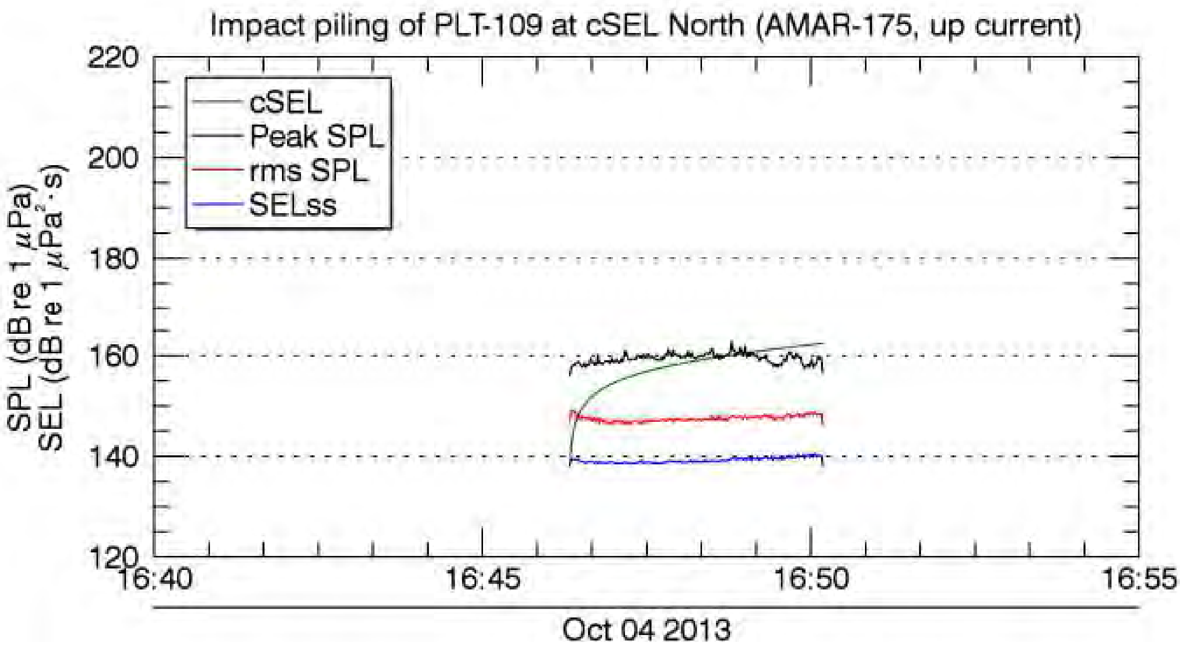

Figure 9. *Impact Pile Driving*: Peak SPL, rms SPL, SEL, and cSEL versus time (EDT) for the pile driving of Test Pile PLT-109 measured 263 ft from the pile at location cSEL North using AMAR-175.

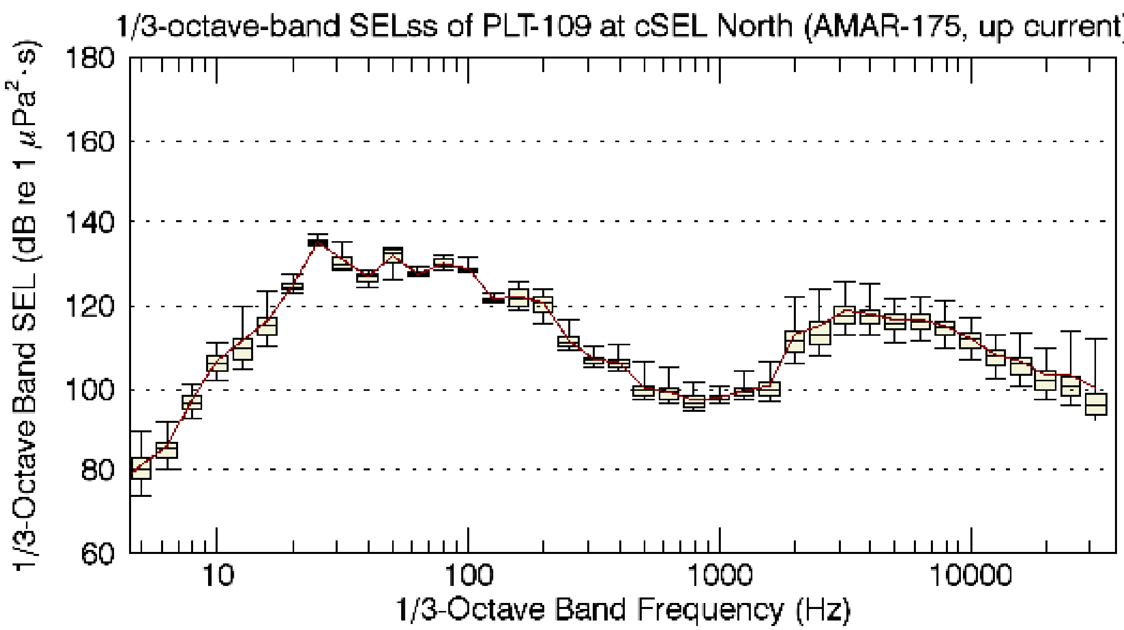

Figure 10. Distribution of 1/3-octave SELss for the pile driving of Test Pile PLT-109 measured 263 ft from the pile at location cSEL North using AMAR-175. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 11. Sound levels for the pile driving of Test Pile PLT-109 measured 263 ft from the pile at location cSEL North using AMAR-175.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa^2·s)
L_{max}	162.8	149.2	140.6
L_5	161.0	148.5	140.1
L_{25}	160.1	147.9	139.6
L_{50}	159.6	147.4	139.1
L_{75}	158.7	147.0	138.8
L_{95}	158.0	146.6	138.6
L_{mean}	159.6	147.5	139.2

*The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.3. Impact Pile-Driving Sound Levels rms SPL North

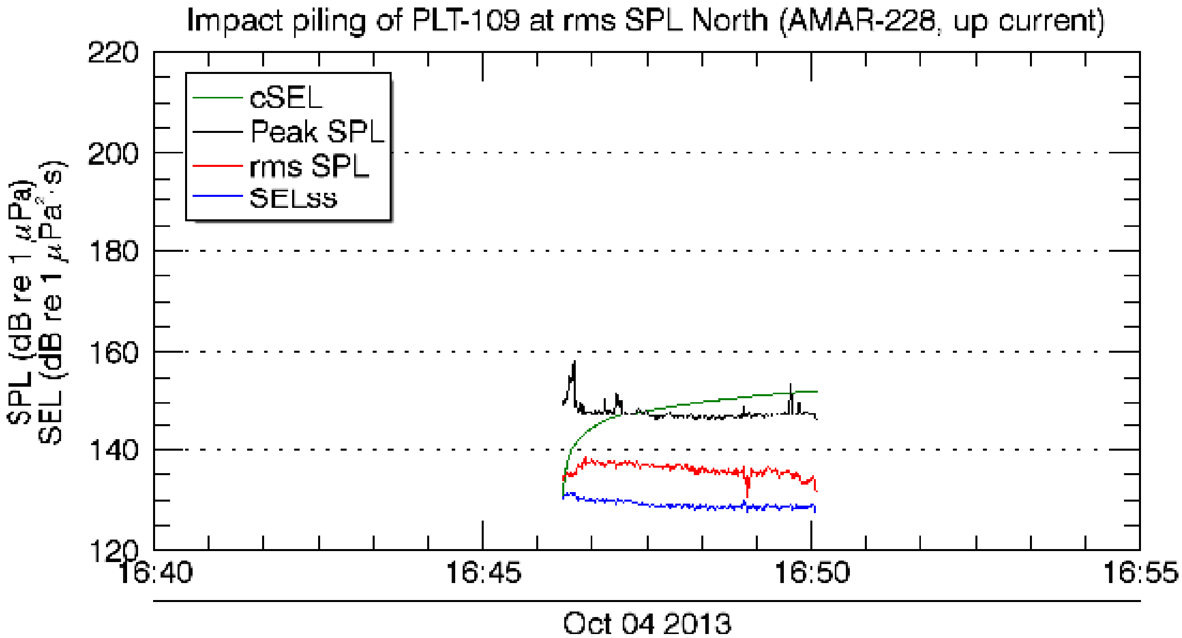

Figure 11. *Impact Pile Driving*: Peak SPL, rms SPL, SEL, and cSEL versus time (EDT) for the pile driving of Test Pile PLT-109 measured 707 ft from the pile at location rms SPL North using AMAR-228.

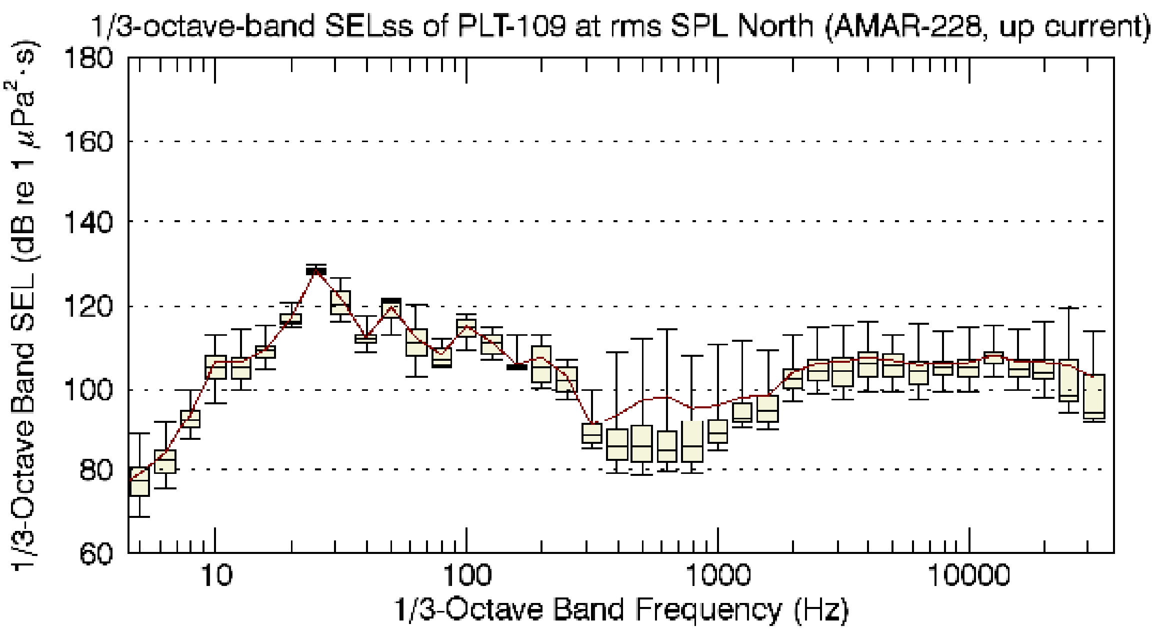

Figure 12. Distribution of 1/3-octave SELss for the pile driving of Test Pile PLT-109 measured 707 ft from the pile at location rms SPL North using AMAR-228. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 12. Sound levels for the pile driving of Test Pile PLT-109 measured 707 ft from the pile at location rms SPL North using AMAR-228.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa^2·s)
L_{max}	158.5	138.5	131.4
L_5	150.7	137.6	130.5
L_{25}	148.0	136.9	129.7
L_{50}	147.3	136.1	129.0
L_{75}	146.8	135.2	128.7
L_{95}	146.2	134.0	128.2
L_{mean}	148.2	136.2	129.2

*The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

Underwater Acoustic Monitoring of the Tappan Zee Bridge Test Pile 109 Installation

Daily Memorandum for 07 October 2013

Submitted to:
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24 March 2014

P001206-001

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1. Summary

1.1. Pile Location and Monitoring Summary

Test Pile PLT-109 is a [redacted] pile driven at the site of the New NY Bridge on the east side of the navigation channel on 07 October 2013 (Table 1). One real-time acoustic monitoring system and two autonomous acoustic monitoring systems were deployed by JASCO (Section 4) on behalf of Tappan Zee Constructors, LLC (TZC) (Figure 1, Table 2). Pile driving occurred between 08:15–09:11 Eastern Daylight Time (EDT), and slack current occurred at 07:45 EDT. The pile was started on 04 October with the S-280 impact hammer and completed with an S-800 impact hammer on 07 October.

Table 2 provides the sound levels measured at each recorder. Plots of the measured values, frequency distributions of 1/3-octave-band single-strike sound exposure levels (SELss), and sound level statistics for the distribution of the measured data are presented in Appendix A.

Table 1. Summary of Test Pile PLT-109 activities, 07 October 2013.

Date:	07 October 2013
Pile-Driving Activity	
Test pile identifier:	PLT-109
Pile diameter:	[redacted]
Water depth:	13 ft
Hammer type:	Impact (IHC S-800)
Total hammer strikes:	[redacted]
Total penetration:	[redacted]
Net duration of pile driving (hh:mm:ss):	00:22:00
Maximum single strike energy:	382.4 thousand foot-pounds (kip-ft), (519 kJ)
Total energy transferred:	181,158 kip-ft (246 MJ)
Noise Attenuation System (NAS)	
Two-tier unconfined bubble curtain airflow rate:	1750–1800 cubic feet per minute (cfm), 65 pounds per square inch (psi)
River conditions during pile driving:	Slack to flood current, 0.6-0.8 knots current (0.3 – 0.4 meters per second [m/s], depth dependent; Table 7 and Figure 6)*

*The ADCP was not available after 08:32.

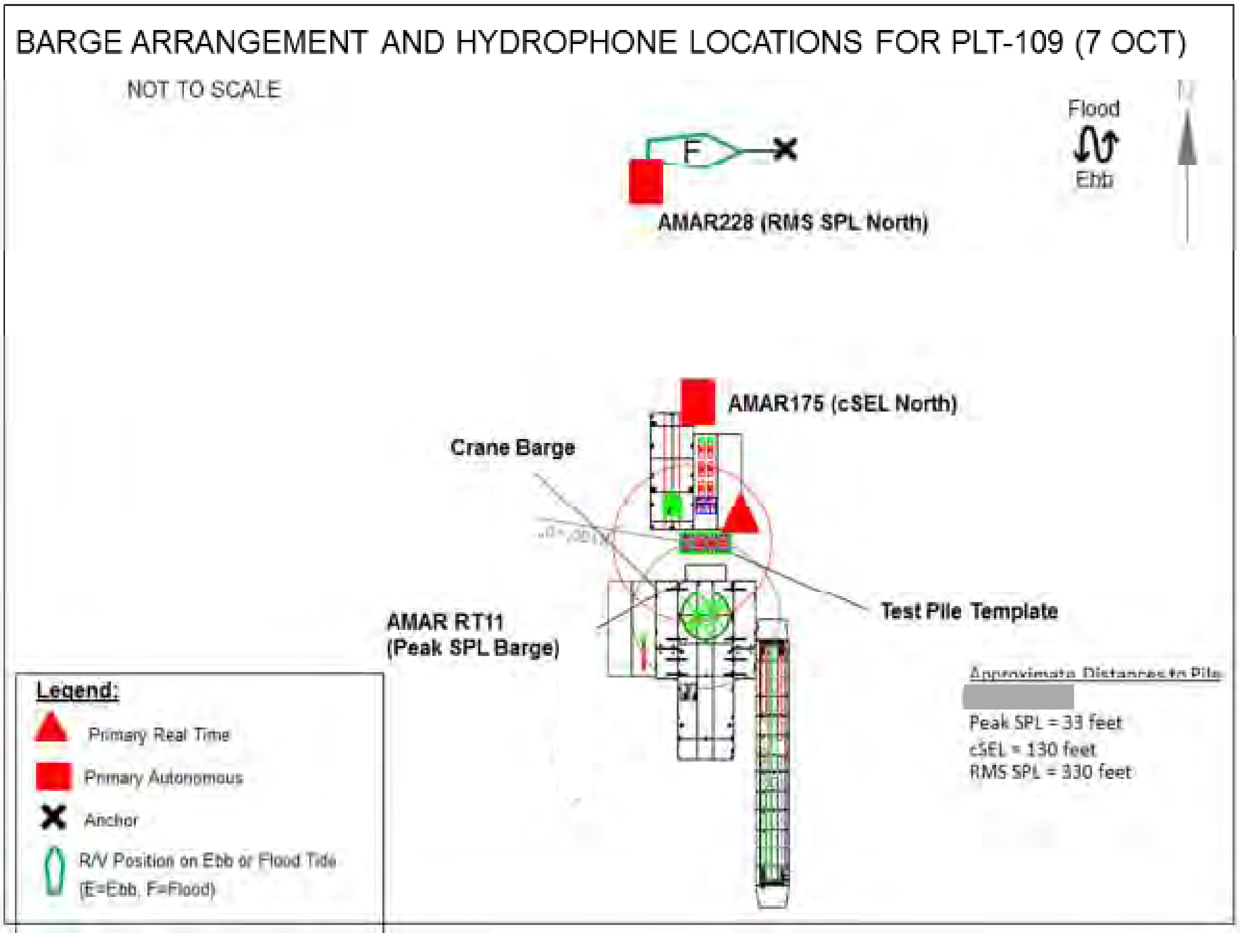


Figure 1. Plan view of pile and barge layout, 07 October 2013, Test Pile PLT-109.

Table 2. Summary of Autonomous Multichannel Acoustic Recorder (AMAR) locations and measured sound levels. Detailed sound level plots are contained in Appendix A.

Location	Recorder ID	Distance to pile (ft)	Water depth (ft)	Max peak SPL (dB re 1 µPa)	cSEL (dB re 1 µPa^{2}s)*
Peak SPL Barge (down current)	AMAR-RT-11	33	13	188	197
cSEL North (down current)	AMAR-175	264**	13	166	171
rms SPL North (down current)	AMAR-228	835	12	153	159

* Estimated at each recorder by multiplying the mean of the per-strike SEL by the number of strikes reported by the pile driving contractor, for the final value at the recorder, representing the total energy at the end of pile driving.
** Due to the barge layout this was as close to the pile as the recorder could be deployed along the north radial.

1.2. NMFS Physiological and Behavioral Thresholds

The distances from pile driving to the noise levels that serve as the National Marine Fisheries Service (NMFS) physiological and behavioral thresholds were extrapolated using a logarithmic regression based on mean values of the peak sound pressure level (SPL), root mean square (rms) SPL, and SELss from each recorder (Table 3 and Figure 2).

The regression indicates that the estimated diameter of the 206 dB re 1 μPa peak SPL isopleth was approximately 10 ft, and did not exceed NMFS criteria of a diameter of 40 ft for [redacted] piles. The diameter of the 187 dB re 1 $\mu Pa^2 \cdot s$ cumulative sound exposure level (cSEL) isopleth was estimated to be 146 ft at the end of pile driving. Since cSEL increases as the number of strikes increases, the diameter of the 187 dB isopleth was smaller than 146 ft for most of the pile driving operation. No other pile driving occurred during this pile load test. The river width is approximately 15,000 ft; therefore, a fish-movement corridor of more than one mile, which was continuous for more than 1,500 ft, was maintained throughout pile driving in accordance with New York State Department of Environmental Conservation (NYSDEC) Permit Condition 14.

Table 3. Estimated isopleth diameters for the NMFS physiological and behavioral thresholds.

Criteria	Estimated mean diameter (ft)
206 dB re 1 μPa peak SPL	10
187 dB re 1 $\mu Pa^2 \cdot s$ cSEL*	146
150 dB re 1 μPa rms SPL (1 s integration time)	476

* At the end of pile driving

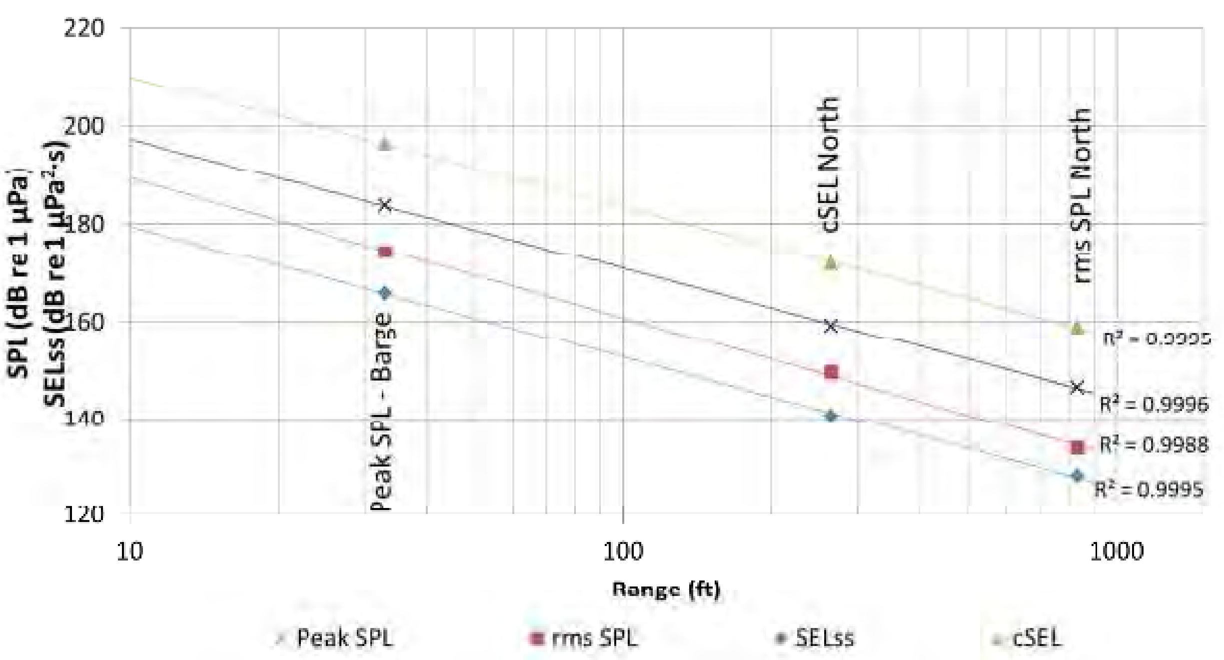


Figure 2. Regression based on mean values of the SELss, peak SPL, cSEL, and rms SPL from each recorder from pile driving of Test Pile PLT-109, 07 October 2013. SELss, peak SPL, and rms SPL are instantaneous values. The cSEL represents the total sound energy measured during the pile driving.

1.3. Observations

During the pile driving of PLT-109 on 07 October the hammer energy was increased twice within a 30 min period after the pile had hit refusal (Figure 3, Figure 4). The NAS and river current conditions were constant over this period allowing for an evaluation of the effect of hammer energy on noise levels to be performed. There were 1117 strikes at 160 kip-ft, 73 strikes at 250 kip-ft, and 16 strikes at 380 kip-ft. The peak SPL and SELss increased by 4–8 dB at all three recorders, while the rms SPL changed levels more erratically (Table 4, Figure 3, Figure 7, Figure 9, and Figure 11). The ranges to the acoustic monitoring criteria isopleths remained well within the NMFS and NYSDEC permitted levels (Table 5) at all hammer settings.

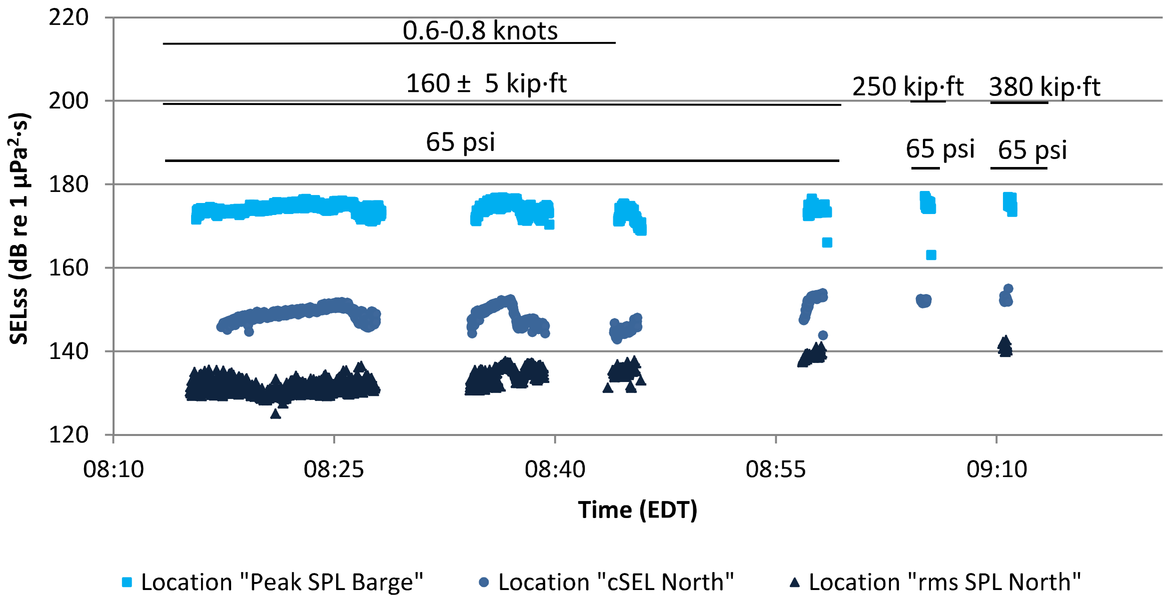


Figure 3. SELss at each location annotated with hammer energy (kip-ft), NAS air pressure (psi), and river current (knots). Note: ADCP read out not available after 8:32. Per Table 7, maximum flood current occurred at 10:54.

Table 4. Effect of hammer energy on median sound levels at PLT-109. There were 1117 strikes at 160 kip-ft, 73 at 250 kip-ft, and 16 at 380 kip-ft.

Location	Hammer energy (kip-ft)	Peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 $\mu Pa^2 \cdot s$)
Peak SPL Barge	160	183	174	165
	250	186	173	167
	380	188	175	169
cSEL North	160	158	149	140
	250	163	153	145
	380	166	153	147
rms SPL North	160	146	132	127
	250	151	139	134
	380	153	142	135

Table 5. Estimated isopleth diameters for the NMFS physiological and behavioral thresholds using the sound levels at each hammer energy.

Criteria	Estimated mean diameter, all data (ft)	Estimated mean diameter, 160 kip-ft (ft)	Estimated mean diameter, 250 kip-ft (ft)	Estimated mean diameter, 380 kip-ft (ft)
206 dB re 1 µPa peak SPL	10	10	10	14
187 dB re 1 $\mu Pa^2 \cdot s$ cSEL*	146	144	181	224
150 dB re 1 µPa rms SPL (1 s integration time)	476	458	624	716

* At the end of pile driving assuming 1206 strikes

2. Activity Logs

2.1. Log of JASCO and Construction Activities

Table 6 provides activities for 07 October 2013.

Table 6. JASCO and construction activities for Test Pile PLT-109, 07 October 2013.

Time (EDT)	Activity
06:25	Arrive at dock, prepare recorders
06:44	Leave dock for job site
07:15	Deploy AMAR-RT
07:30	Deploy AMAR-175 and AMAR-228
08:15	Start pile driving
09:11	Stop pile driving; begin retrieving AMAR
09:30	En route to barge
09:40	Standing by
14:00	Work stopped due to weather conditions
14:20	En route to dock
14:00	All work complete

2.2. Pile Driving Logs

2.2.1. NAS

NAS used: Two-tier unconfined bubble curtain

NAS settings: 1750–1800 cfm, 65 psi

2.2.2. Impact Hammering Log

Total Energy: 181,158 kip-ft (246 MJ)

Total number of strikes: [redacted]

Maximum per-strike energy: 382.4 kip-ft (518 kJ)

Net pile driving duration (hh:mm:ss): 00:22:00

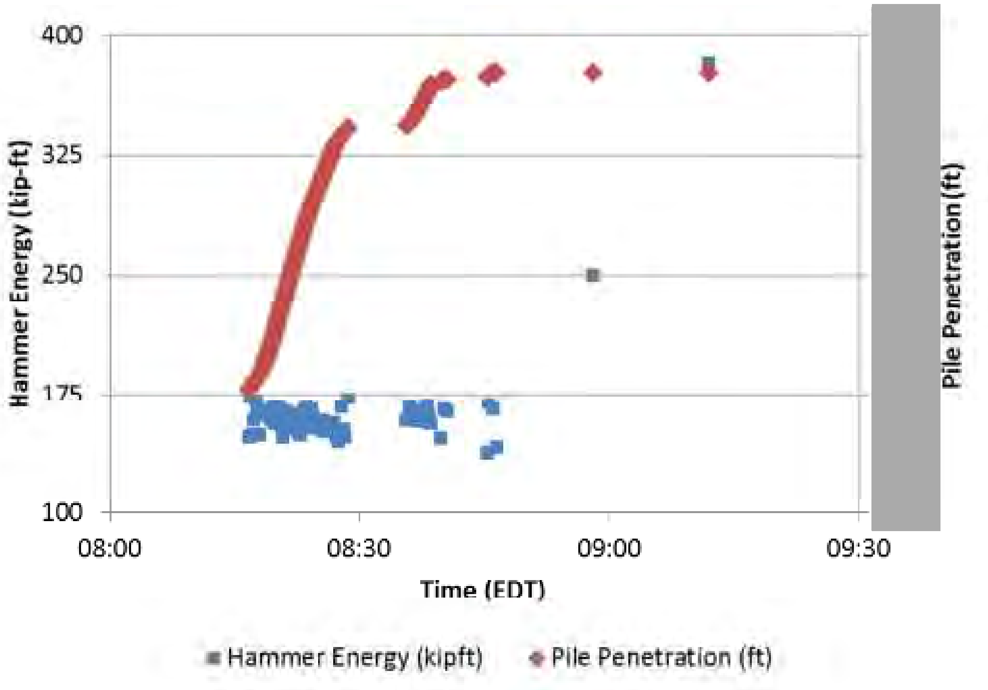


Figure 4. Hammer energy (kip-ft) and pile penetration (ft) during pile driving of PLT-109, 07 October 2013.

3. Weather and River Conditions

Table 7 provides the predicted currents at the project site on 07 October 2013. Figure 6 provides the currents measured with the Acoustic Doppler Current Profiler (ADCP) at the project site on 07 October 2013. The ADCP was not available past 08:32. Figure 5 provides the speed of sound in water, based on salinity and temperature, measured using the conductivity, temperature, depth (CTD) cast.

Table 7. Weather conditions and predicted local current times (EDT).

Weather conditions:	Sunny, light winds
Full ebb current:	05:36 (−2.3 knots)
Slack current:	08:33
Full flood current:	10:54 (1.6 knots)

Reference: http://tidesandcurrents.noaa.gov/get_predc.shtml?year=2013&stn=0611+George Washington Bridge&secstn=Tappan+Zee+Bridge&sbfh=%2B1&sbfm=12&fldh=%2B0&fldm=55&sbeh=%2B0&sbem=52&ebbh=%2B1&ebbm=06&fldr=0.6&ebbr=0.8&fldavgd=356&ebbavgd=175&footnote=

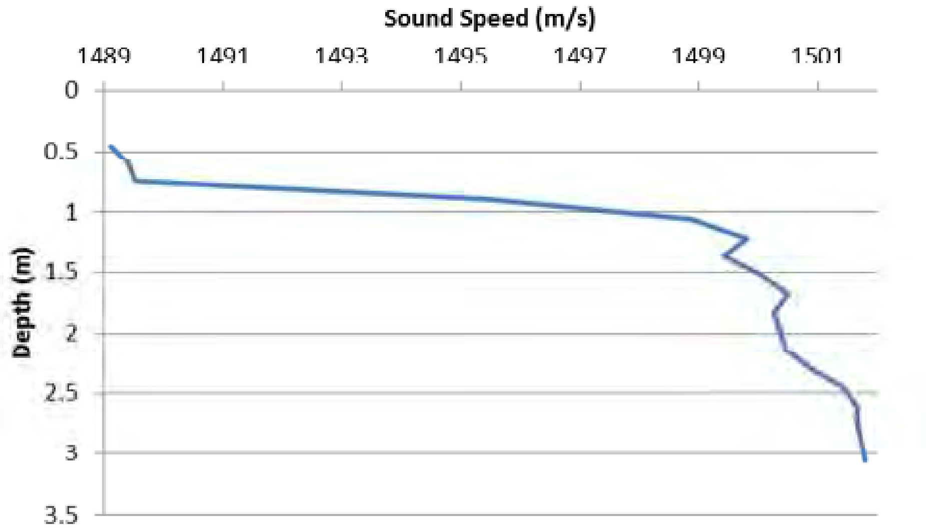


Figure 5. CTD cast performed at 11:57 EDT from the Alpine vessel, located 835 ft from the pile.

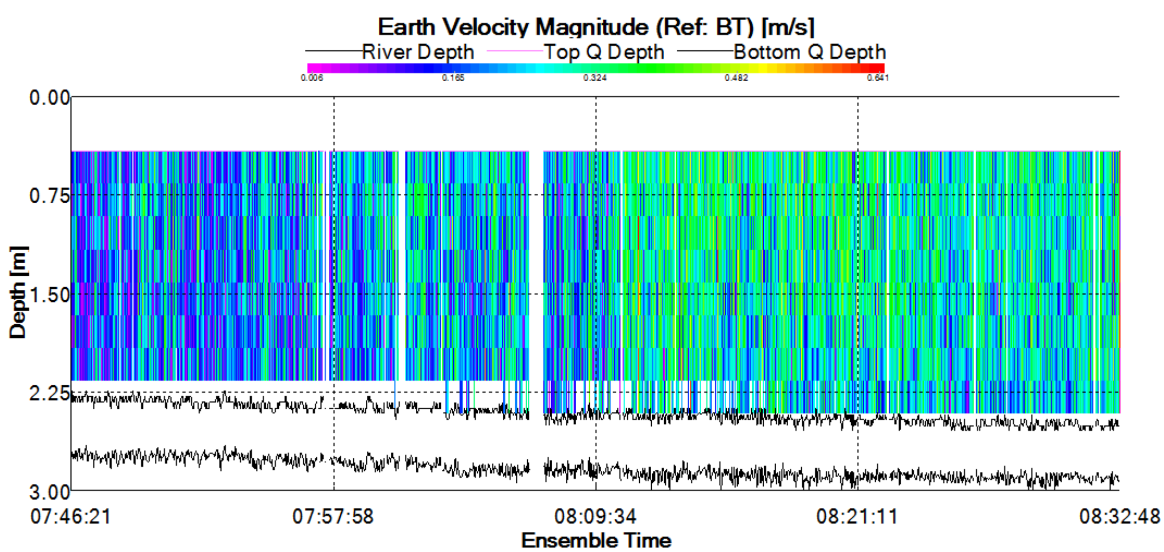


Figure 6. ADCP current data from 07 October 2013 recorded at rms SPL North (Alpine Vessel).

4. Monitoring Equipment

4.1. Real-time Monitoring Equipment

Table 8 provides information on the real-time monitoring equipment used on 07 October 2013. Table 9 provides location information on the real-time recorders.

Table 8 Real-time monitoring equipment for Test Pile PLT-109, 07 October 2013.

Equipment used		Units deployed
Acoustic data logger		
Model:	AMAR-RT (JASCO Applied Sciences)	1
SpectroPlotter version:	6.0.1	1
Hydrophone		
Model:	M8KC (GTI)	1
AMAR-RT-11 sensitivity:	−210.9 dB re 1 V/µPa	1
Other		
Hydrophone calibrator:	Pistonphone Type 42AC (G.R.A.S. Sound and Vibration)	1
CTD profiler:	Minos X (AML Oceanographic)	1
ADCP:	RDI Teledyne Workhorse Sentinel 1200 kHz	1

Table 9. Locations (WGS84) and deployment times (EDT) of the AMAR-RT monitoring stations, 07 October 2013.

Station	Recorder ID	Latitude (°N)	Longitude (°W)	Deployment time (EDT)	Water depth (ft)	Distance to pile (ft)
Peak SPL Barge (down current)	AMAR-RT-11	41.07137	73.89616	07:15	13	33

4.2. Autonomous Monitoring Equipment

Table 10 provides information about the autonomous monitoring equipment used on 07 October 2013. Table 11 provides the locations of the autonomous recorders.

Table 10. Autonomous monitoring equipment for Test Pile PLT-109, 07 October 2013.

Equipment used		Units deployed
Acoustic data logger		
Model:	AMAR G3 (JASCO Applied Sciences)	2
SpectroPlotter version:	6.0.1	2
Hydrophone		
Model:	M8E-51-0dB (GTI)	2
AMAR-228 sensitivity:	−199.74 dB re 1 V/µPa	1
AMAR-175 sensitivity:	−199.84 dB re 1 V/µPa	1

Table 11. Locations (WGS84) and deployment times (EDT) of the long-range monitoring AMAR stations on 07 October 2013

Station	Recorder ID	Latitude (°N)	Longitude (°W)	Deployment time (EDT)	Water depth (ft)	Distance to pile (ft)
cSEL North (down current)	AMAR-175	41.07197	−73.89651	07:30	13	264
rms SPL North (down current)	AMAR-228	41.07355	−73.89651	07:30	12	835

Appendix A. Pile Driving Plots

A.1. Impact Pile-Driving Sound Levels from Peak SPL Barge

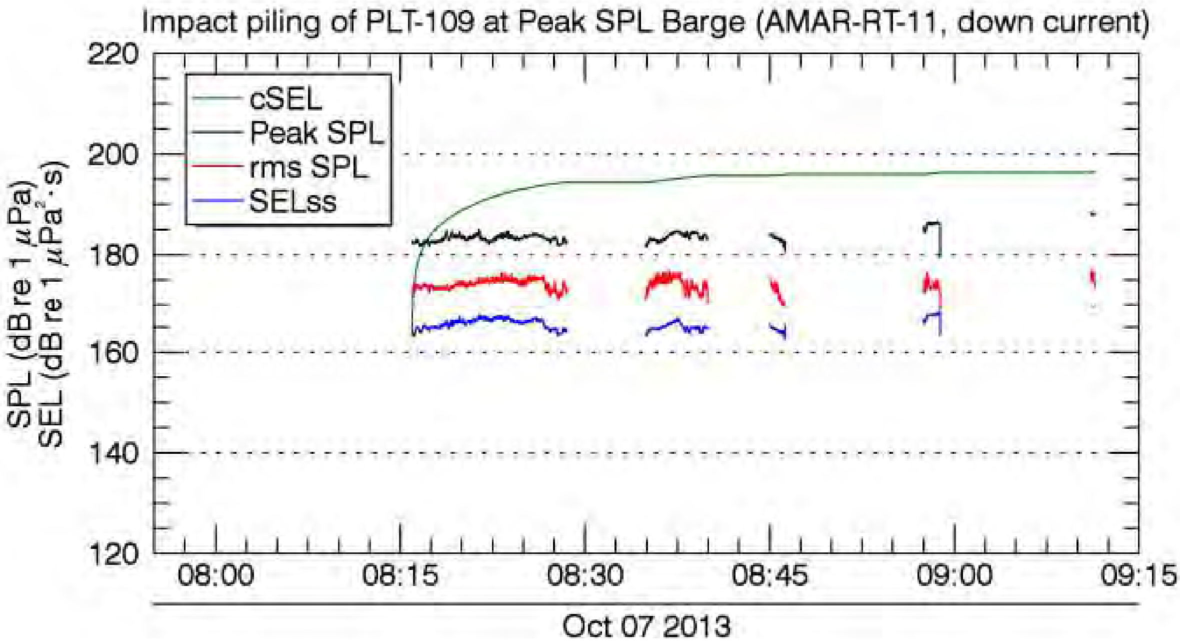


Figure 7. *Impact Pile Driving*: Peak SPL, rms SPL, SEL, and cSEL versus time (EDT) for the pile driving of Test Pile PLT-109 measured 33 ft from the pile at location Peak SPL Barge (down current) using AMAR-RT-11.

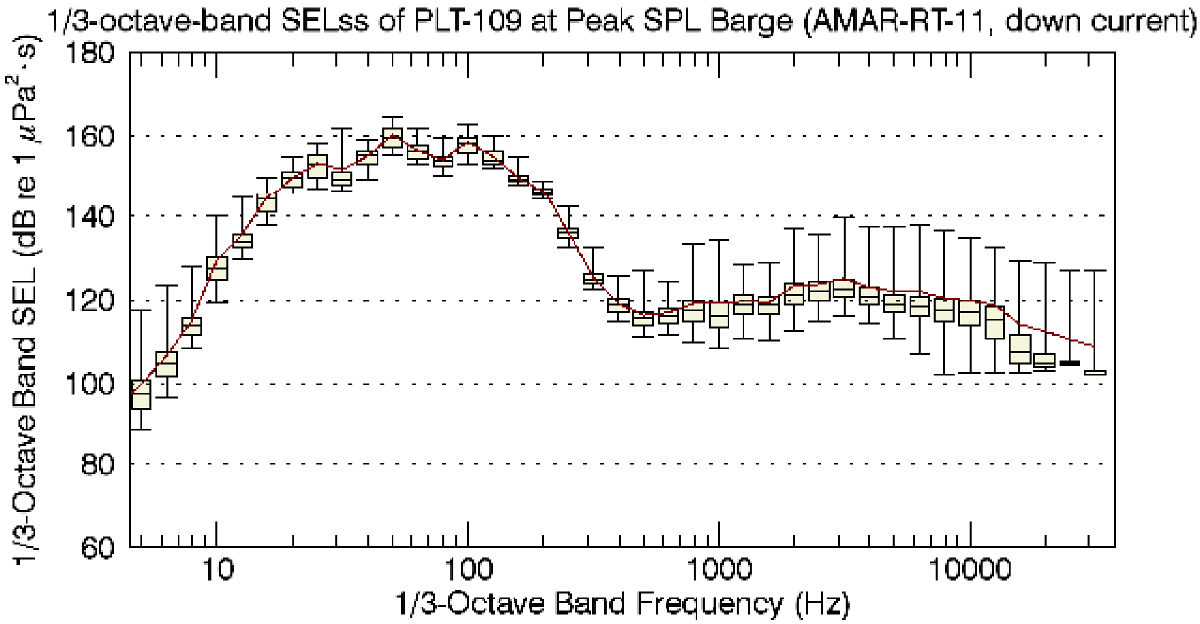


Figure 8. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-109 measured 33 ft from the pile at location Peak SPL Barge using AMAR-RT-11. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error-bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 12. Sound levels for the pile driving of Test Pile PLT-109 measured 33 ft from the pile at location Peak SPL Barge using AMAR-RT-11.

Sound level statistic*	peak SPL (dB re 1 μPa)	rms SPL (dB re 1 μPa)	SELss (dB re 1 μPa^2·s)
L_{max}	188.4	176.9	169.5
L_5	186.1	175.8	167.4
L_{25}	183.9	174.9	166.3
L_{50}	183.4	174.1	165.5
L_{75}	182.9	173.3	164.7
L_{95}	182.2	171.8	163.8
L_{mean}	183.7	174.2	165.7

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.2. Impact Pile-Driving Sound Levels cSEL North

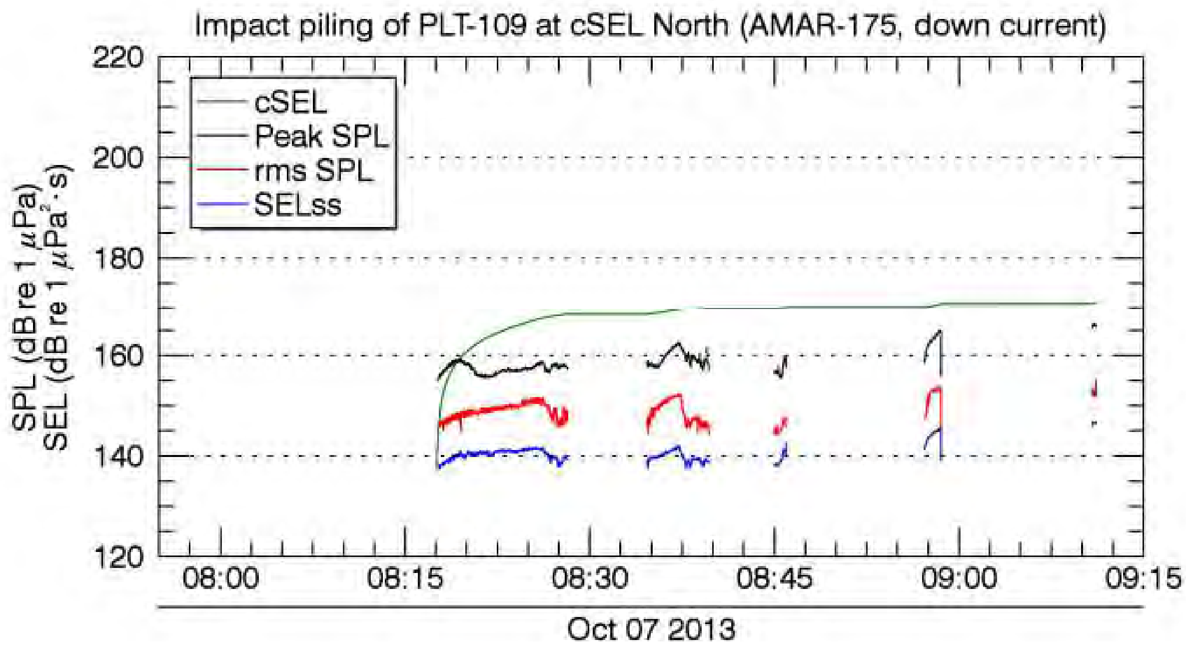


Figure 9. *Impact Pile Driving*: Peak SPL, rms SPL, SEL, and cSEL versus time (EDT) for the pile driving of Test Pile PLT-109 measured 264 ft from the pile at location cSEL North using AMAR-175.

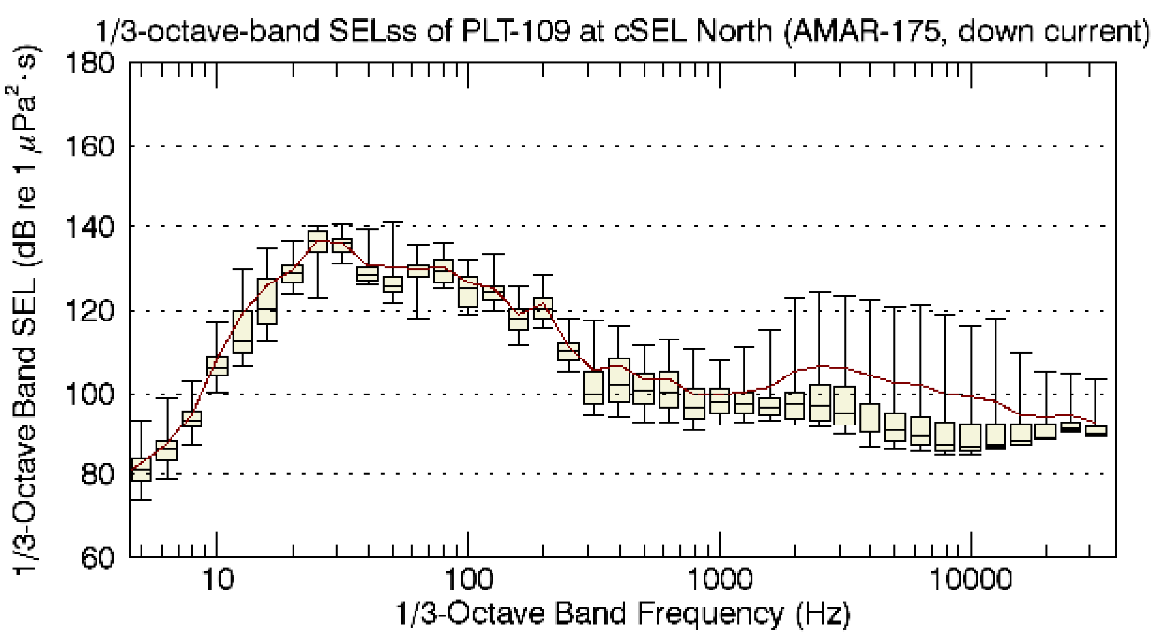


Figure 10. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-109 measured 264 ft from the pile at location cSEL North using AMAR-175. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 13. Sound levels for the pile driving of Test Pile PLT-109 measured 264 ft from the pile at location cSEL North using AMAR-175.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa^2·s)
L_{max}	166.4	155	146.8
L_5	163.1	152.5	144.4
L_{25}	159.2	150.4	141.1
L_{50}	158.0	149.1	140.4
L_{75}	157.0	147.3	139.4
L_{95}	155.8	145.7	138.2
L_{mean}	159.1	149.5	140.8

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

A.3. Impact Pile-Driving Sound Levels rms SPL North

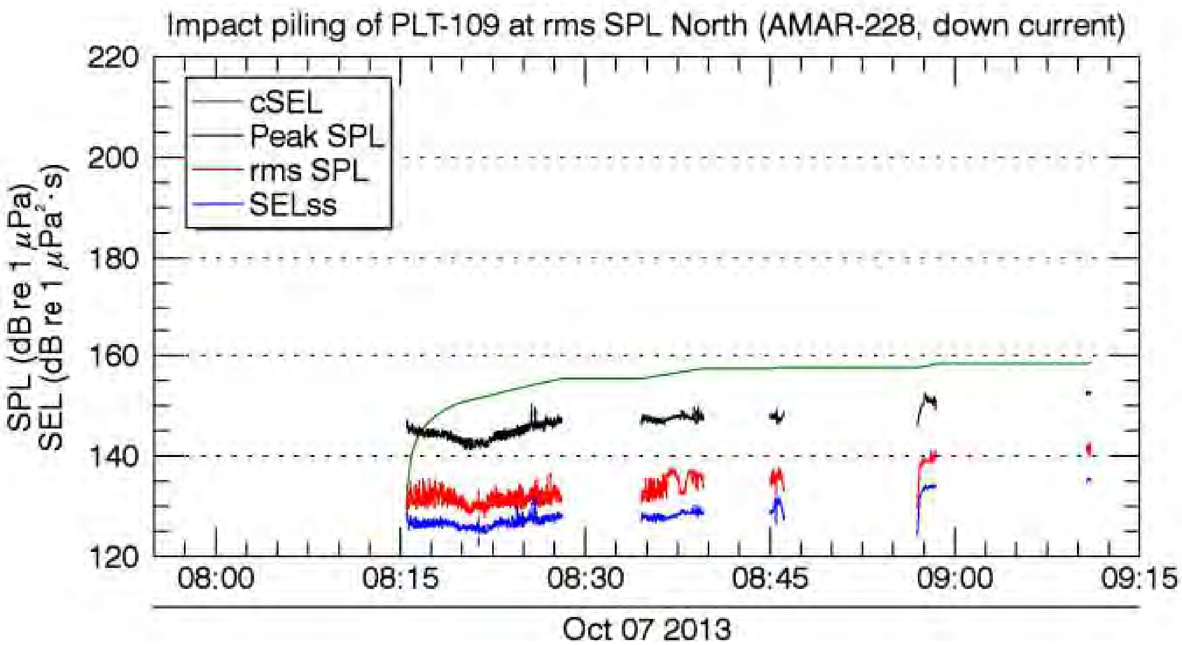


Figure 11. *Impact Pile Driving*: Peak SPL, rms SPL, SEL, and cSEL versus time (EDT) for the pile driving of Test Pile PLT-109 measured 835 ft from the pile at location rms SPL North using AMAR-228.

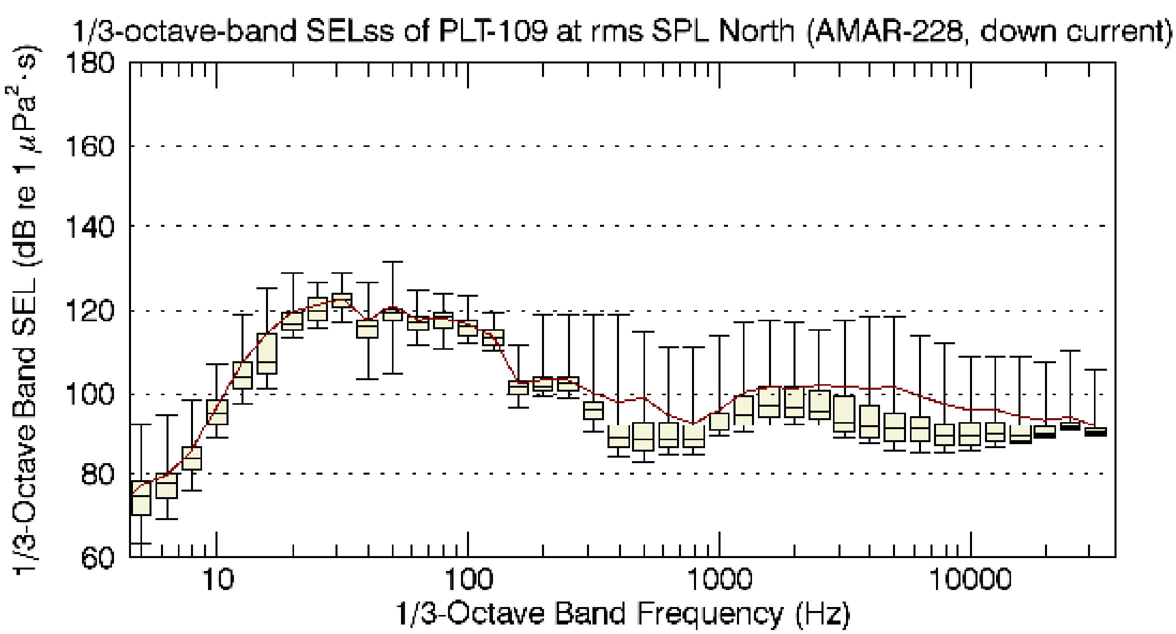


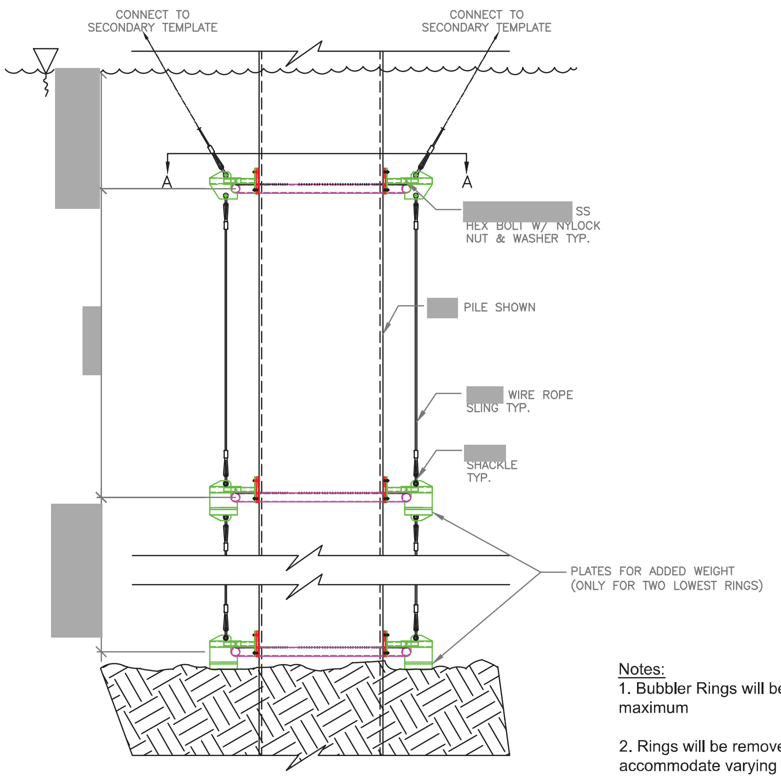
Figure 12. Distribution of 1/3-octave-band SELss for the pile driving of Test Pile PLT-109 measured 835 ft from the pile at location rms SPL North using AMAR-228. Beige bars indicate the first, second, and third quartiles (L_{25}, L_{50}, and L_{75}). Upper error bars indicate the maximum levels (L_{max}). Lower error bars indicate the 95% exceedance percentiles (L_{95}). The maroon line indicates the arithmetic mean (L_{mean}).

Table 14. Sound levels for the pile driving of Test Pile PLT-109 measured 835 ft from the pile at location rms SPL North using AMAR-228.

Sound level statistic*	peak SPL (dB re 1 µPa)	rms SPL (dB re 1 µPa)	SELss (dB re 1 µPa^2·s)
L_{max}	153.0	142.7	135.5
L_5	149.9	138.1	132.6
L_{25}	147.4	134.5	128.2
L_{50}	145.8	132.2	127.3
L_{75}	144.1	130.9	126.4
L_{95}	142.4	129.6	125.5
L_{mean}	146.5	133.9	128.2

* The sound level statistics quantify the observed distribution of recorded sound levels. Following standard acoustical practice, the *n*th percentile level (L_n) is the SPL or SEL exceeded by *n*% of the data. L_{max} is the maximum recorded sound level. L_{mean} is the linear arithmetic mean of the sound power, which can be significantly different from the median sound level (L_{50}).

Attachment 2 – Design Plans for the Multi-Tier Bubble Curtain (Drawings 1UBCR through 10UBCR)

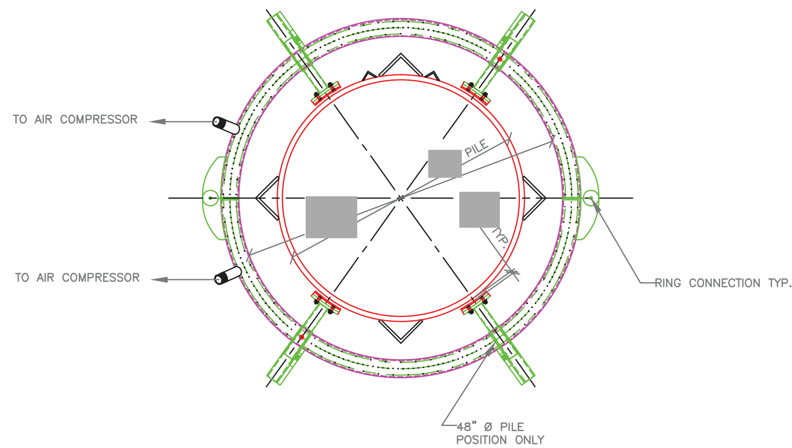


ELEVATION - BUBBLER RINGS [redacted] PILES
SCALE: NTS

Notes:
1. Bubbler Rings will be spaced at [redacted] centers maximum

2. Rings will be removed and added as needed to accommodate varying depths

3. These Bubbler Rings can be used on [redacted] diameter piles only



A/- PLAN - BUBBLER RINGS
SCALE: NTS

DESIGN SUPERVISOR: | DESIGNED BY: | CHECKED BY: | DRAFTED BY: MARTIR_ORTEZ | CHECKED BY:

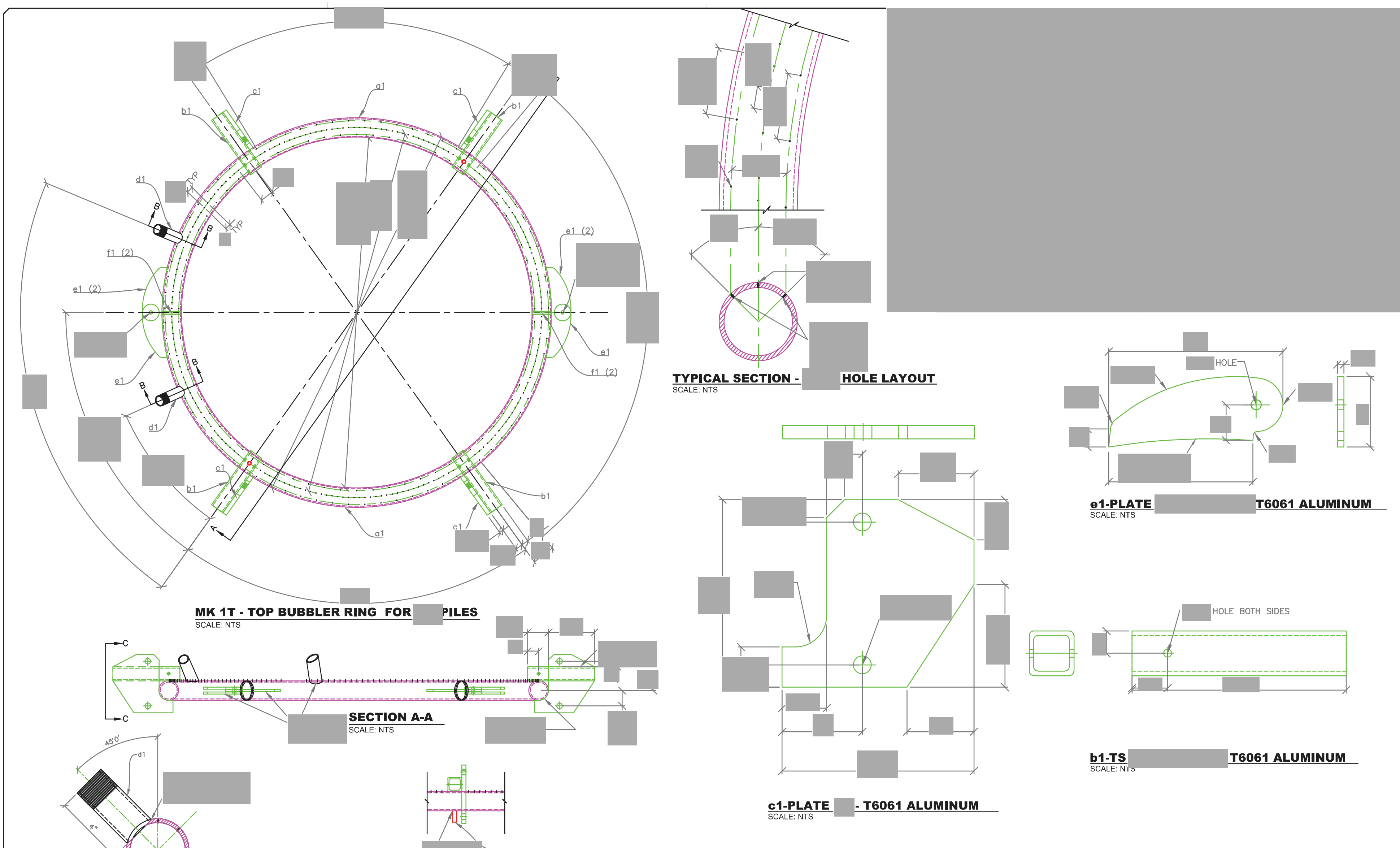
REVISIONS			
DATE	DESCRIPTION	BY	SYM.

NEW YORK STATE THRUWAY AUTHORITY

TAPPAN ZEE CONSTRUCTORS, LLC

TITLE OF PROJECT: TAPPAN_ZEE_BRIDGE –	CONTRACT NUMBER: –
LOCATION OF PROJECT: NEW_YORK_STATE –	DATE: 5/19/13
TITLE OF DRAWING: UNCONFINED_BUBBLE CURTAIN RINGS [redacted]	DRAWING NUMBER: 2UBCR

DOCUMENT TRACKING CODE: -



DESIGN SUPERVISOR:
DESIGNED BY:
CHECKED BY:
DRAFTED BY: MARTIR_ORTEZ
CHECKED BY:

DOCUMENT TRACKING CODE: -

REVISIONS			
DATE	DESCRIPTION	BY	SYM.

NEW YORK STATE THRUWAY AUTHORITY

TAPPAN ZEE CONSTRUCTORS, LLC

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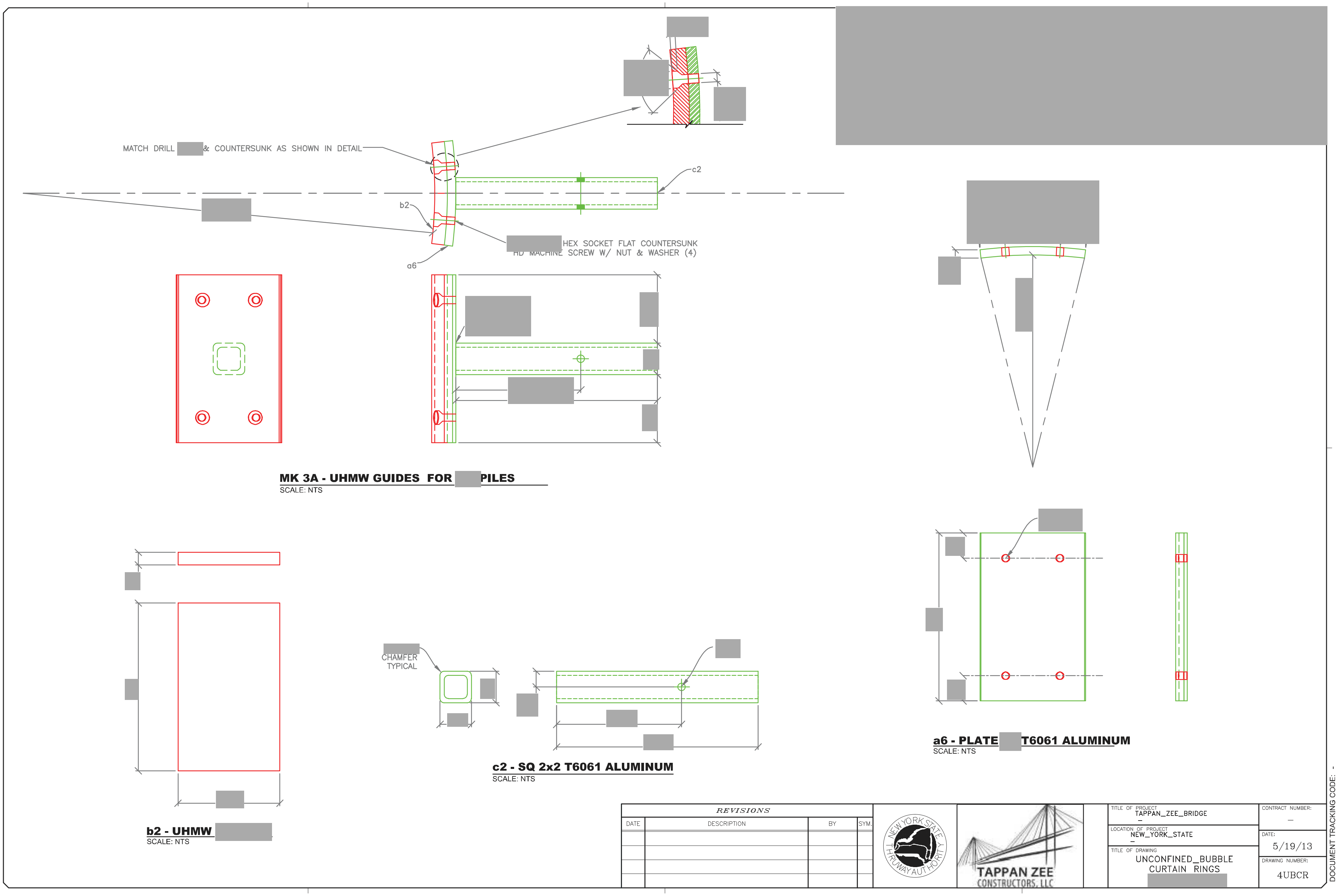
LOCATION OF PROJECT: NEW_YORK_STATE	DATE: 5/19/13
TITLE OF DRAWING: UNCONFINED_BUBBLE CURTAIN_RINGS	DRAWING NUMBER: 3UBCR


MATCH DRILL [redacted] & COUNTERSUNK AS SHOWN IN DETAIL
c2
b2
[redacted]
[redacted] HEX SOCKET FLAT COUNTERSUNK HD MACHINE SCREW W/ NUT & WASHER (4)
a6
MK 3A - UHMW GUIDES FOR [redacted] PILES
SCALE: NTS
CHAMFER TYPICAL
c2 - SQ 2x2 T6061 ALUMINUM
SCALE: NTS
a6 - PLATE [redacted] T6061 ALUMINUM
SCALE: NTS
b2 - UHMW [redacted]
SCALE: NTS
REVISIONS
DATE
DESCRIPTION
BY
SYM.
NEW YORK STATE THRUWAY AUTHORITY
TAPPAN ZEE CONSTRUCTORS, LLC
TITLE OF PROJECT
TAPPAN_ZEE_BRIDGE
LOCATION OF PROJECT
NEW_YORK_STATE
TITLE OF DRAWING
UNCONFINED_BUBBLE CURTAIN RINGS
[redacted]
CONTRACT NUMBER:
DATE:
5/19/13
DRAWING NUMBER:
4UBCR
DESIGN SUPERVISOR:
DESIGNED BY:
CHECKED BY:
DRAFTED BY: MARTIR_ORTEZ
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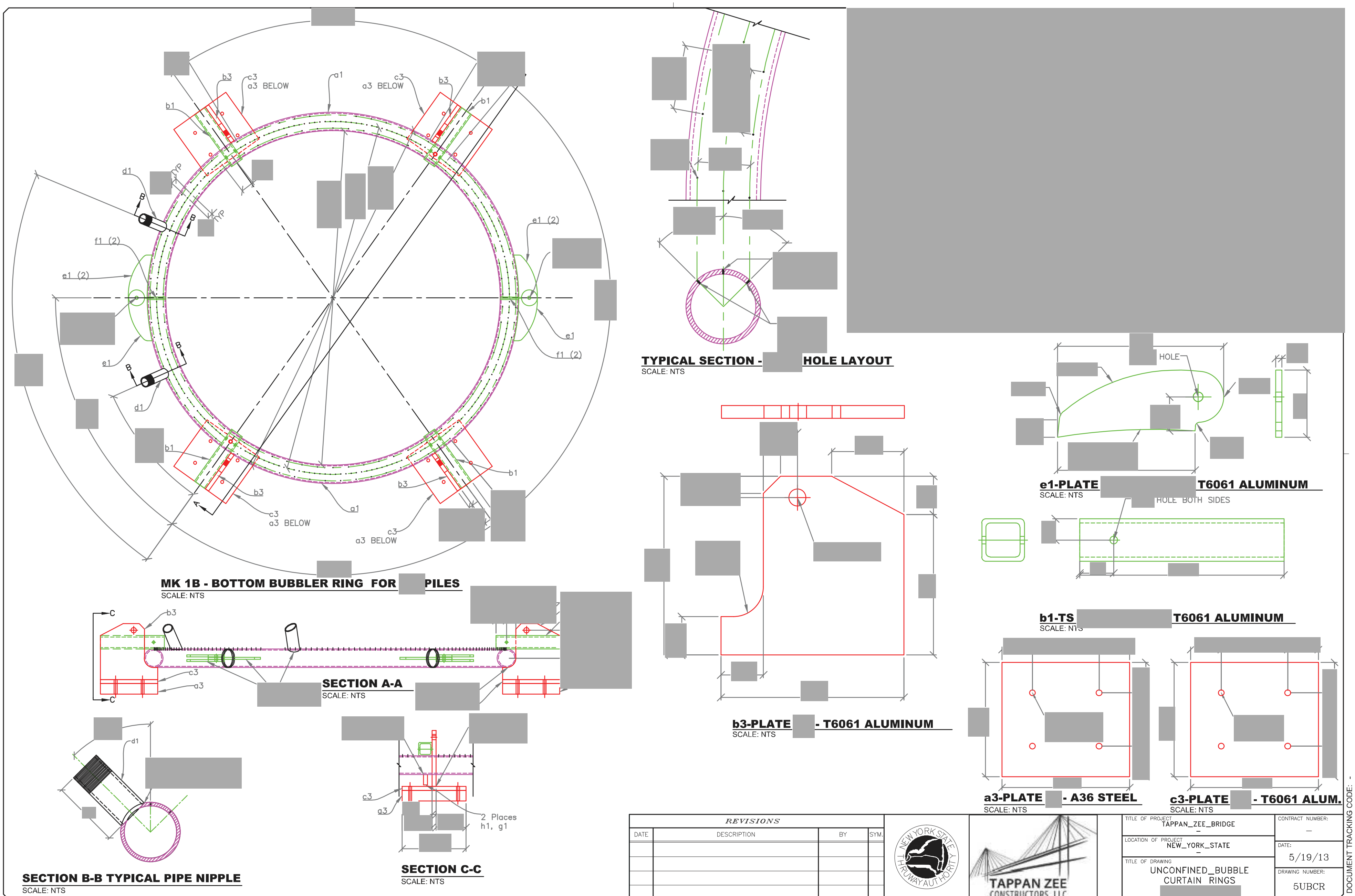

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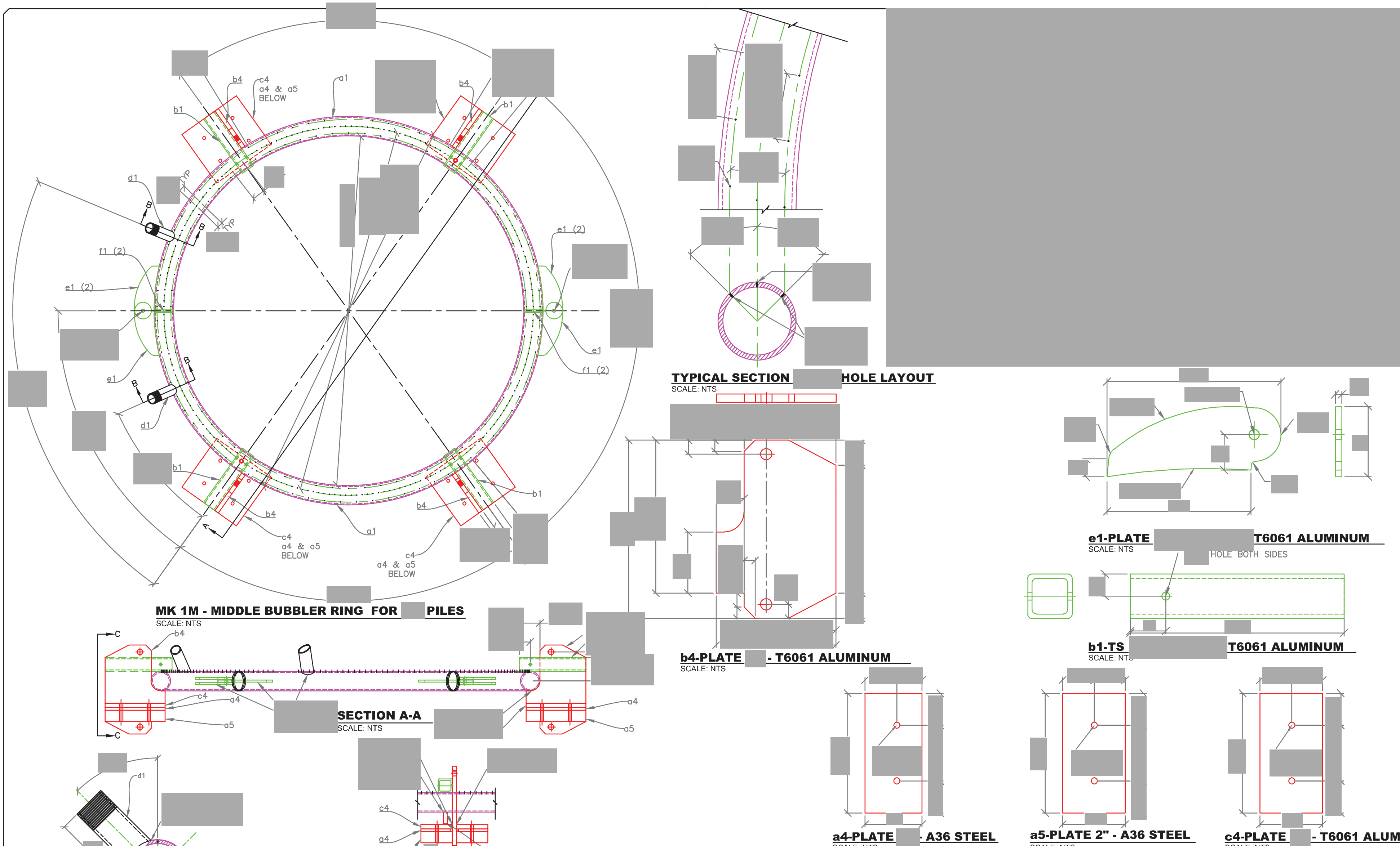

CHECKED BY:
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DESIGNED BY:
DESIGN SUPERVISOR:

REVISIONS			
DATE	DESCRIPTION	BY	SYM.

NEW YORK STATE THRUWAY AUTHORITY

TAPPAN ZEE CONSTRUCTORS, LLC

TITLE OF PROJECT: TAPPAN_ZEE_BRIDGE
LOCATION OF PROJECT: NEW_YORK_STATE
TITLE OF DRAWING: UNCONFINED_BUBBLE CURTAIN RINGS [redacted]

CONTRACT NUMBER: –
DATE: 5/19/13
DRAWING NUMBER: 6UBCR

DOCUMENT TRACKING CODE: -

Attachment 3 – Air Compressor Specifications

Atlas Copco Rental

PTS 916

100% Oil-free Air Compressor - Diesel driven - TIER III compliant

Atlas Copco Rental is the leader in 100% oil-free air compressor rentals and maintains a strong commitment to customer service and availability, with locations across North America. A highly specialized service team is readily accessible 24/7 when you work with the Atlas Copco Rental team.

Atlas Copco

Sustainable Productivity

PTS 916 100% Oil-free Air Compressor

General

Dimensions LxWxH	17'8" x 7'3" x 7'9"
Shipping weight (wet)	18,600 lbs / 8,437 kg
Fuel tank capacity	237 gal / 900 l
Sound pressure level LPA	74 dB (A)
Sound power level LWA	102 dB (A)

Engine

Engine make	Caterpillar
Type	C18 Acert
Output	575 HP / 429 kW
Fuel consumed (Gal/Hr)	22

Compressor

Number of stages	2
Maximum capacity FAD l/s	762
Maximum capacity FAD m³/min	45.7
Maximum capacity FAD cfm	1,600

Performance

Working Pressure		Free Air Delivery		
bar(e)	*psig*	*m³/min*	*m³/H*	*cfm*
6.9	10-150	45.7	2,742	1,300-1,600
9.3	135	43.1	2,586	1,522
10.3	150	37.4	2,244	1,321

Other Features

- Integrated aftercooler (15°F + A)
- Spillage free frame
- Weatherproof canopy
- Spark arrestor
- Overspeed shut down system
- Cold weather package
- Auxillary tank hook-ups w/ switching valves
- Operator safety devices:
  - Emergency stop buttons
  - Warning light
  - Alarm horn

Never use compressed air as breathing air without prior purifcation in accordance with local legislation and standards.

CLASS 0 ISO 8573-1

The TÜV found no traces of oil in the output air stream. Atlas Copco has thereby become the first compressor manufacturer to receive certification for a new industry standard of air purity: **ISO 8573-1 CLASS 0.** More information can be found on: **www.classzero.com**

All Routine Service Included

We provide routine maintenance at no charge.
No hidden costs!

Additional Rental Product Solutions

- Boosters
- Dryers
- Fuel Tanks (double wall)
- Hoses
- Manifolds
- Nitrogen Generation Equipment
- Particulate Discharge Scrubbers
- Trailers

Triple certification, Triple benefit

LLOYD'S REGISTER QUALITY ASSURANCE · ISO9001
LLOYD'S REGISTER QUALITY ASSURANCE · ISO14001
LLOYD'S REGISTER QUALITY ASSURANCE · OHSAS 18001

Atlas Copco

24/7 Rental Service all across USA and Canada
1-800-736-8267
www.AtlasCopcoRental.com

Ramsey, Jeff

From:	Stickney, Michaela
Sent:	Wednesday, December 14, 2016 11:16 AM
To:	Ramsey, Jeff; Sumner, Todd
Cc:	Cetner, Misha
Subject:	Route 2 drawbridge replacement temporary bridge - work to occur after July 1 due to fish spawning
Importance:	High

Dear Jeff and Todd,

I heard back VTFWD Fisheries Biologist Brian Chipman regarding the timing of temporary bridge construction for the Route 2 drawbridge replacement project. He stated that, "Much of the temporary bridge footprint is in warm water fish spawning habitat, so temporary bridge construction should occur after July 1 to minimize impacts on spawning." He added that, "Major species that would spawn there are yellow perch in April-May, and largemouth bass, smallmouth bass in May-June."aela

I think that is the confirmation you were looking for!

Sincerely, Michaela

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
LAKES & PONDS PROGRAM
Michaela Stickney, Regional Permit Analyst
Lake & Shoreland Permitting
1 National Life Drive, Main 2
Montpelier, VT 05620-3522
802-490-6117 / michaela.stickney@vermont.gov
www.watershedmanagement.vt.gov

Notice of Intent (NOI) for Stormwater Discharges

Associated with Construction Activities on **LOW RISK SITES**
Under Vermont Construction General Permit 3-9020

Submission of this completed Notice of Intent (NOI) constitutes notice that the entities in Section A intend to be authorized to discharge pollutants to Waters of the State, from the project identified in Section C, under Vermont's Construction General Permit (CGP). Submission of the NOI constitutes notice that the parties identified in Section A of this form have read, understand, and meet the eligibility conditions of the CGP; have determined that the project qualifies for coverage as a Low Risk project in conformance with Appendix A of the CGP; agree to comply with all applicable terms and conditions of the CGP; understand that continued authorization under the CGP is contingent on maintaining eligibility for coverage; and that all applicable practices in the Low Risk Site Handbook for Erosion Prevention and Sediment Control must be implemented and maintained for the duration of construction activities. In order to be granted coverage, all information required on this form must be provided and an application fee payable to the State of Vermont must be submitted.

A. Applicant(s) Information		
1. Landowner: Vermont Agency of Transportation c/o Jeff Ramsey		
2a. Mailing Address: 1 National Life Drive		
2b. Town: Montpelier	2c. State: VT	2d. Zip: 05633
3. Phone: 802-828-1278	4. Email: jeff.ramsey@vermont.gov	
5. Additional Contact Name/Email (if applicable):		
6. Principal Operator (if known):		
7a. Mailing Address:		
7b. Town:	7c. State:	7d. Zip:
8. Phone:	9. Email:	
10. Additional Contact Name/Email (if applicable):		
B. Application Preparer / Consultant Information		
1. Company: Vermont Agency of Transportation c/o Jeff Ramsey		
2. Name: Jeff Ramsey		
3a. Mailing Address: 1 National Life Drive		
3b. Town: Montpelier	3c. State VT	3d. Zip 05403
4. Phone: 802-828-1278	5. Email: jeff.ramsey@vermont.gov	
6. Additional Contact Name/Email (if applicable):		
C. Project Information (<u>all fields are required</u>)		
1. Project Name: North Hero-Grand Isle BHF 028-1 (26)		
2a. Is this project part of a Common Plan of Development?	☐ Yes	☑ No
2b. If yes, name of Development:		
3a. Does this project have any previously issued or pending stormwater discharge permits?	☐ Yes	☑ No
3b. If yes, prior NOI number(s):		
4a. Physical Address of Project: U.S. Route 2 drawbridge over Lake Champlain		
4b. Town: North Hero/ Grand Isle	4c. County: Grand Isle	
Project Coordinates (project center in Decimal Degrees with 5 digits to the right of the decimal)		
5a. Latitude: 44 45' 57.96" N	5b. Longitude: 73 17' 23.86" W	

6. SPAN: Enter the 11-digit number that is printed on the property tax bill for the applicable parcel(s). Projects that involve more than 1 parcel shall list all applicable SPANs.		
___ ___ ___ - ___ ___ ___ - ___ ___ ___ ___ ___	___ ___ ___ - ___ ___ ___ - ___ ___ ___ ___ ___	___ ___ ___ - ___ ___ ___ - ___ ___ ___ ___ ___
___ ___ ___ - ___ ___ ___ - ___ ___ ___ ___ ___	___ ___ ___ - ___ ___ ___ - ___ ___ ___ ___ ___	___ ___ ___ - ___ ___ ___ - ___ ___ ___ ___ ___

7. Name of receiving water(s): Lake Champlain

Include a topographic location map - Must provide sufficient information to determine the location of the project. Must be in the form of a USGS topographical map or directional map.

8. Total area of disturbance: 2.35 Acres **(≤ 5 acres: $100 per application, > 5 acres: $220 per application)**

9. Description of construction activities to be permitted:

Replacement of existing bascule drawbridge along with the construction of a temporary roadway and drawbridge, and associated roadway Improvements.

D. Public Notice Requirement

Prior to submitting the complete NOI for review, you must provide a copy of this complete NOI and related Appendix A to the municipal clerk for posting in the municipality in which the project is located. If the project and the related discharge(s) are located in different municipalities, then the completed NOI must be filed with the municipal clerk in each municipality. In order to be considered complete, **you must include the date of posting.**

Date of Posting at Municipal Office(s): 09/27/17

Information for the Municipal Clerk regarding posting instructions can be found on Page 3 of this NOI.

* In addition to the NOI and Appendix being posted in the Town Clerk(s) office(s), once the application is deemed administratively complete, the Stormwater Program starts its required 10 day public comment period. This includes sending an email notice to a list of interested parties as well as posting on our Division website for 10 days.

E. Certification Relating to the Accuracy of the Information Submitted

I hereby certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I also certify that the applicable practices in The Low Risk Site Handbook for Erosion Prevention and Sediment Control will be implemented for the duration of the project for which this NOI is submitted.

Landowner Name: Vermont Agency of Transportation c/o Jeff Ramsey Title: Environmental Specialist Supervisor

Signature: ______________________________ Date: ____________________

Principal Operator (if known): ______________________________ Title: ____________________

Signature: ______________________________ Date: ____________________

Application Preparer (if applicable): ______________________________ Title: ____________________

Signature: ______________________________ Date: ____________________

Submit this form, Appendix A, location map, and the $ $ 100.00 **fee to:**

Vermont DEC - Watershed Management Division, Stormwater Program
1 National Life Drive, Main Building Second Floor
Montpelier, VT 05620-3522

PUBLIC COMMENT

Public comments concerning this Notice of Intent to discharge under CGP 3-9020 (amended 2008) are invited and must be submitted within 10 days of receipt of this Notice by the Municipal Clerk. Comments should address how the application complies or does not comply with the terms and conditions of CGP 3-9020 (amended 2008). A letter of interest should be filed by those persons who elect not to file comments but who wish to be notified if the comment period is extended or reopened for any reason. All written comments received within the time frame described above will be considered by the Department of Environmental Conservation in its final ruling to grant or deny authorization to discharge under CGP 3-9020 (amended 2008). Send written comments to:

Vermont Department of Environmental Conservation
Watershed Management Division, Stormwater Program
1 National Life Drive, Main Building Second Floor
Montpelier, VT 05620-3522

Please cite the NOI number in any correspondence

INFORMATION FOR MUNICIPAL CLERK

Please post this notice and instruction sheet in a conspicuous place for 10 days from the date received (per 10 V.S.A. Chapter 47 §1263(b)). If you have any questions, contact the Watershed Management Division of the Department of Environmental Conservation at (802) 828-1535.

Part IV – Filing Directions

1. Low Risk Projects

Projects that qualify as Low Risk are required to implement the applicable practices detailed in the *Low Risk Site Handbook for Erosion Prevention and Sediment Control.* To obtain coverage under General Permit 3-9020 as a Low Risk project, applicants must submit the following to DEC:

1. A completed Notice of Intent form for General Permit 3-9020;
2. A completed Appendix A;
3. The required processing fee.

To satisfy the public comment requirement, **applicants must file a copy of the completed Notice of Intent form, including a copy of Appendix A, with the municipal clerk in the municipalities where the project will occur prior to submitting this information to ANR. Details of the public notice process are in Part 2 of the general permit.**

2. Moderate Risk Projects

Projects that qualify as Moderate Risk are required to implement a site-specific Erosion Prevention and Sediment Control (EPSC) Plan that conforms to *The Vermont Standards and Specifications for Erosion Prevention and Sediment Control.* To obtain coverage under General Permit 3-9020 as a Moderate Risk project, applicants must submit the following to DEC:

1. A completed Notice of Intent form for General Permit 3-9020;
2. A completed Appendix A;
3. A site-specific EPSC Plan;
4. A certification by the plan preparer that the EPSC Plan conforms to *The Vermont Standards and Specifications for Erosion Prevention and Sediment Control;*
5. The required processing fee.

To satisfy the public comment requirement, **applicants must file a copy of the completed Notice of Intent form, including a copy of Appendix A, with the municipal clerk in the municipalities where the project will occur prior to submitting this information to ANR. Details of the public notice process are in Part 3 of the general permit.**

Part III– Interpreting the Detailed Risk Evaluation

OVERALL SCORE	Risk Category	Directions for Filing for Permits
<1	Low Risk	The proposed project is eligible for the Construction General Permit as a Low Risk project provided that the requirements of Subpart 2 are met. If these requirements cannot be met, contact DEC to determine if the project should seek coverage as a Moderate Risk project or under an Individual Discharge Permit. Refer to Part IV of Appendix A for a summary of the application requirements for Low Risk projects.
1-2	Moderate Risk	The proposed project is eligible for the Construction General Permit as a Moderate Risk project provided that the requirements of Subpart 3 are met. If these requirements cannot be met, contact DEC to determine if the project should seek coverage as a Moderate Risk project or under an Individual Discharge Permit. Refer to Part IV of Appendix A for a summary of the application requirements for Moderate Risk projects.
>2	Requires Individual Permit	The proposed project is not eligible for coverage under the Construction General Permit, and therefore requires coverage under an Individual Discharge Permit. Please refer to Stormwater Section on the Water Quality Division website for more information: www.vtwaterquality.org/stormwater.htm.

Part II Continued – Detailed Risk Mitigation Factor Evaluation

Detailed Risk Evaluation – Identify Risk Mitigation Factors				
	Criteria	Answer	Score Direction	Enter Score
H.	Will stormwater leaving the construction site pass through at least 50 feet of established vegetated buffer before entering a receiving water?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
I.	Will the project be limited to two acres or less of disturbed earth at any one time?	YES ☑ NO ☐	If YES, enter 1, if NO enter 0	1
J.	Will the project have a maximum of 7 consecutive days of disturbed earth exposure in any location before temporary or final stabilization is implemented?	YES ☑ NO ☐	If YES, enter 1, if NO enter 0	1
K.	Will the project disturb less than two acres of soil with an erodibility higher than K=0.17?	YES ☑ NO ☐	If YES, enter 1, if NO enter 0	1
L.	Will the project include less than two acres of disturbance on soil that is greater than 5% slope?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
M.	**Total Score for Risk Mitigation Factors (add H through L.)**			3

Criterion H: Refer to Appendix C for a definition of vegetated buffer.
Criterion I: Refer to Appendix C for a definition of earth disturbance.
Criterion J: Refer to Appendix C for definitions of temporary and final stabilization.
Criterion K: Include disturbance for the duration of the project, not at any one point in time. The Erosion Factor K, is a measure of the inherent erodibilty of a soil type. Refer to NRCS soil maps available at USDA-NRCS District Offices. If soils data are not available (e.g. if the site is built on assorted fill material), contact DEC for directions on evaluating soil erodibility.
Criterion L: Include disturbance for the duration of the project, not at any one point in time. Slope determinations should be based on a site survey of the proposed disturbance area.

Total Risk Score		
N.	**Moderate Risk Base Score**	2
O.	**Enter Score from Line G above (Risk Factor Total)**	1
P.	**Add lines N and O**	3
Q.	**Enter Score from Line M above (Risk Mitigation Factor Total)**	3
R.	**OVERALL RISK SCORE: Subtract line Q from line P**	0

Part II – Detailed Risk Evaluation

For projects not automatically categorized as Low Risk in Part I, this Detailed Risk Evaluation must be completed to determine if a project is Low Risk, Moderate Risk, or requires an Individual Permit. This evaluation determines the risk category by weighing the balance of factors which contribute to and mitigate against the risk of a discharge of sediment from the construction project. Complete all questions in Part II for the independent project. For definitions of terms used in the evaluation, refer to Appendix C.

Detailed Risk Evaluation – Identify Risk Factors				
	Criteria	**Answer**	**Score Direction**	**Enter Score**
A.	Will the proposed project have earth disturbance within 100 ft (horizontal) upslope of any lake or pond or 50 feet (horizontal) upslope of any rivers or stream (perennial or seasonal)?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
B.	Will the project have stormwater discharges by direct conveyance (tributary, channel, ditch, storm sewer, etc.) to a water of the state listed on the 303 (d) Part A list as being impaired by stormwater or sediment; a Class A Water; or an Outstanding Resource Water?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
C.	Will the project have more than five acres of disturbed earth at any one time?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
D.	Will the project have disturbed earth in any one location for more than 14 consecutive calendar days without temporary or final stabilization?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
E.	Will the project include more than one acre of disturbance on soil that is greater than 15% slope?	YES ☑ NO ☐	If YES, enter 1, if NO enter 0	1
F.	Will the project include more than one acre of disturbance of soils with a high (K>0.36) erodibility rating?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
G.	**Total Score for Risk Factors (add A through F)**			1

Criterion A: Measure lake distance from mean water level, and stream or river distance from top of bank. Do not include disturbance for the installation of stormwater treatment facilities or road stream crossings if there are no reasonable alternative locations.
Criterion B: Refer to http://www.vtwaterquality.org/stormwater/htm/sw_cgpeligibility.htm for the listing.
Criterion C: The maximum allowable for Low Risk Projects is 7 acres. **Moderate risk projects over 5 acres may be required to file an Individual Discharge Permit application if determined necessary by the Secretary.**
Criterion D: The maximum allowable for Low Risk Projects is 21 days. **Moderate risk projects over 21 days may be required to file an Individual Discharge Permit application if determined necessary by the Secretary.**
Criterion E: Include disturbance for the duration of the project, not at any one point in time. Slope determinations should be based on a site survey of the future disturbance area.
Criterion F: Include disturbance for the entire individual project, not at any one point in time. The Erosion Factor K, is a measure of the inherent erodibilty of a soil type. Refer to NRCS soil maps for your county. If soils data is not available (e.g. if the site is built on assorted fill material), contact ANR for directions on evaluating soil erodibility.

APPENDIX A

Part I – Basic Risk Evaluation

A project may automatically be categorized as Low Risk based on a few basic project characteristics. Answer each question below to determine if a project is automatically categorized as Low Risk. For definitions of terms used in the following questions (e.g. disturbance, vegetated buffer) refer to Appendix C.

Basic Risk Evaluation				
	Criteria	Answer	Score Direction	Enter Score
1.	Will the proposed independent project alone disturb more than 2 acres of land?	YES ☑ NO ☐	If YES, enter 1, if NO enter 0	1
2.	Is the project within a watershed impaired due to stormwater or sediment as specified on Part A of the Vermont 303(d) list?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
3.	Will the project have any stormwater discharges from the construction site to receiving water(s) that **do not** first pass through a 50 ft vegetated buffer area?	YES ☑ NO ☐	If YES, enter 1, if NO enter 0	1
4.	Will the project have disturbed earth in any one location for more than 14 consecutive calendar days without temporary or final stabilization?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
5.	Will the project have more than five acres of disturbed earth at any one time?	YES ☐ NO ☑	If YES, enter 1, if NO enter 0	0
	Total Score for Basic Risk Evaluation (add score from questions 1-5)			2

If the Total Score for Basic Risk Evaluation is 0, the proposed project is eligible for coverage under this permit as a Low Risk project. Proceed to Part IV of Appendix A for a summary of the application requirements for Low Risk Projects. If not, proceed to Part II.

Criterion 1: Only include the disturbance planned for an independent project. For example, if a lot owner is only building on a single house lot in a residential subdivision, only consider the disturbance associated with that lot, not the entire common plan. Refer to Appendix C for definitions of independent project and disturbance.

Criterion 2: Refer to the following web page for a list of waters in these categories: http://www.vtwaterquality.org/stormwater/htm/sw_cgpeligibility.htm

Criterion 3: Refer to the Appendix C for the definition of vegetated buffer area.

Criterion 4: Refer to Appendix C for definitions of temporary and final stabilization.

Criterion 5: Refer to Appendix C for the definition of disturbed earth.

APPENDIX A - RISK EVALUATION

Accurately answering the questions in this appendix will allow you to determine whether a proposed construction project is considered a Low Risk or Moderate Risk project, which defines the application and permit requirements that are applicable to your project.

The risk evaluation procedure consists of two parts. Part I is a Basic Risk Evaluation, which determines if a project is automatically categorized as Low Risk based upon the answers to a few basic questions.

If a project is not automatically categorized as Low Risk based upon the Basic Risk Evaluation, you must complete Part II, Detailed Risk Evaluation, to determine the risk category for your project. This part includes questions on more detailed aspects of the project.

Once the appropriate risk category has been determined, refer to Part III for the application requirements.

You should be aware that each completed Appendix A is incorporated by reference and included in the terms of this general permit, and each permittee shall undertake its construction activities in accordance with the completed Appendix A, as a condition of this permit. Failure to comply with the completed Appendix A shall be deemed a violation of this permit and subject to enforcement action.