Hybrid (HDD / Open Cut) Highway Crossing Plan

24” Sleeve/8” Waterline Crossing
Immediately North of Houghton Lane Bridge
US Route 7
Bennington, Vermont

Prepared by Contractor:
Casella Construction, Inc.
25 Industrial Lane
Mendon, VT 05701
Jeff Chase
jeff.chase@casellainc.com
802-282-1607

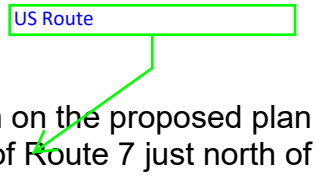
With assistance from:
Morse’s Directional Drilling, Inc.

And information from:
MSK Engineering

Originally Submitted to VTRANS on 2/17/21
Revised on 3/31/21

CCI / Contractor Comments (3/31/21):
The configuration of the attached traffic plan reflects that the left side onramp of the North Bound Route 7 is not a high speed lane (onramp lane) and that the travel lane ends just above the crossing. CCI and its traffic engineer, Ruggles Engineering, is available by video conference if additional is required for traffic plan concerns.

1. Overview



The submittal includes information on the proposed plan to cross both the Southbound (SB) and Northbound (NB) lanes of Route 7 just north of the Houghton Lane Bridge with 24" sleeve that will carry 8" waterline for the Bennington Water System Remedial Expansion Contract 6. The sleeve will spans from west limit of ROW to east limit of ROW. The sleeve will be approximately 390lf. MSK Engineering is the design engineer for this project. Casella Construction, Inc. (CCI) is the prime contractor for this project. Morse Directional Drilling (MDD) is CCI subcontractor provided horizontal direction drilling experience.

2. Site Investigation

During initial project planning QCQA Labs perform geotechnical test bores along the proposed path of the sleeve, B29, B30, and B31. See Appendix A for this information.

Upon further analysis by CCI and discussing with Engineers Constructors Incorporated (ECI) and Brierley Associates (geotechnical consultants), it was determined more site investigation was needed. On April 15, 2020 test pits were excavated, CCI 1, CCI2, and CCI3. See Appendix A for this information, including a memo summarizing the results from Brian Dorwart at Brierley Associates.

After presenting this information to MSK's geotechnical engineers and reviewing with VTRANS on April 27, 2020 it was determined additional test pits were needed. CCI completed these test pits on July 9, 2020 under direct supervision of MSK geotechnical engineers. These are test pits MSK1, MSK2, and MSK3. See Appendix A EXB1 US7 and EXB1A US7 for test pit locations and information. After performing this site investigations, it became apparent that directional drilling was likely not going to a successful option to install a sleeve within the highway ROW limits. MSK and CCI presented an Open Cut Crossing Plan on September 9, 2020 to VTRANS. See plans EXB1 US7 EXB1A US7, and DETL US7 in Appendix A.

Upon further review by all parties a hybrid HDD and Open Cut method was discussed as a potential solution to avoid disturbance to the SB lane. CCI then hired MDD to perform horizontal 4" diameter test bores with a 30,000 lb horizontal directional drill (Ditch witch JT30). On November 9, 2020 we setup on the SB west shoulder and attempted to drill under the SB lanes. After 5 attempts a successful bore was accomplished to the median. The successful bore was approximately 6 feet north of the

proposed path shown on EXB1 US7. See last page of Appendix A for a markup of EXB1 US7 showing the proposed path based on this successful bore.

3. Hybrid Crossing Plan

What's the plan if a successful drill cannot be not achieved under the southbound lane - has this been discussed? What's the level of confidence this will be a success?

CCI is proposing a hybrid / open cut crossing method. Working with MDD we will utilize a Vermeer 50/100 Horizontal Direction Drill with 49,600 lbs of pull back capacity. We proposed to start on the west side ROW fence line and drill east. Based on the successful bore to median on November 9, 2020 we anticipate reaching the median and will continue to drill until refusal. We have developed a Proposed Crossing Plan, shown in Appendix B. On this plan we show zones for Contingency Plan A, B, and C. Below we outline the sequence of plan along with the Contingency Plans.

Appendix B also contain shoring plans for working in the Median, NB Left Lane, NB Right Lane, and the NB West Shoulder; and the HDD Plan prepared by MDD.

Could there be disturbance to traffic on the highway when pulling back the 24" casing (thru ledge material)? If so, should additional traffic control measures be planned for during this activity (would traffic need to be stopped for any reason)?

Sequence:

1. Setup Drill Equipment on west side of highway outside of fence line.
2. Commence Drilling

Best Outcome - No Refusal under southbound and northbound

1. Stop drill 5 feet east of northbound east ditch line.
2. Implement Traffic Plan - Northbound Right Lane Closure and Shoring Layo NB Shoulder Work
3. Construct receiving pit over end of drill head with 6'x20' trench box
4. Excavate pit
5. Drill (During the drill and sleeve the contractor will observe roadway for settlement or any damage to the roadway.
6. Ream
7. Connect on 24" casing pipe and pull back
8. Open cut the remainder of the sleave to the ROW limits (open cutting will occur on both sides from ditch lines to ROW limits) (Implement Traffic Control Plan – Southbound Right Lane Closure and Shoring Layout SB Shoulder Work for SB Shoulder work).

Contingency A - Hit obstruction within median

1. Implement Traffic Plan – Southbound Left Lane Closure and Northbound Left Lane Closure and Shoring Layout Median Work
2. Construct receiving pit over end of drill head with 6’x28’ min. trench box
3. Excavate pit
4. Ream drill
5. Connect on 24” casing pipe and pull back.

This doesn't agree with trench box noted on plans (typ).

What does "plated" actually mean? Would these plates warrant a separate submittal process with the Agency to assure that these are designed to handle the anticipated traffic? It seems like using a cross-over and allowing nb & sb traffic to be in one barrel at a time would be safer terms allowing work to happen without having to manage traffic within the work zone.

Is the plate described here in the median (not the traveled lane)?

This contradicts comment later where it states road will be paved each night. If not possible, under no circumstance will plates be left in roadway over a weekend.

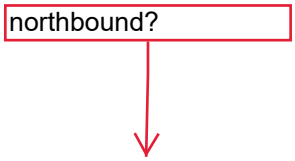
6. Backfill and remove trench box (if steps 3-6 takes multiple days excavation will be plated at end day prior to pick up of traffic control lane closure devices)
7. Implement Traffic Plan Northbound Left Lane Closure and Shoring Layout NB Left Lane Work
8. Open cut northbound left lane and install sleeve and backfill (complete during daytime and open backup to traffic at end of day with temp pavement)
9. Implement Traffic Plan Northbound Right Lane Closure and Shoring Layout NB Right Lane Work
10. Open cut northbound right lane and breakdown lane and install sleeve and backfill (complete during daytime and open backup to traffic at end of day with temp pavement)
11. Implement Traffic Plan Northbound Right Lane Work and Shoring Layout NB Shoulder Work
12. Open cut northbound east shoulder and install sleeve all the way to the ROW and backfill.
13. Implement Traffic Plan Southbound Right Lane Closure and Shoring Layout SB Shoulder Work.
14. Open cut southbound east shoulder from ditch centerline to ROW and install sleeve and backfill.
15. Permanent Pave Northbound (implement TCP as necessary)
    a. Day 1 – Demo, Grade, and Pave Left Lane
    b. Day 2 – Demo, Grade, and Pave Right Lane and Shoulder
16. Remark Northbound
17. Clean up

how is traffic going to be protected from the excavation pit? traffic barrier? Again, it seems like building a cross-over would be preferable.

Contingency B - Hit obstruction in left lane of northbound

1. Implement Traffic Plan – Southbound Left Lane Closure and Northbound Left Lane Closure and Shoring Layout Median Work
2. Pull Back Drill Head so it is under the median.
3. Construct receiving pit over end of drill head with 6’x28’ min. trench box
4. Excavate pit
5. Ream drill
6. Connect on 24” casing pipe and pull back
7. Backfill and remove trench box (if steps 4-7 take multiple days excavation will be plated at end day prior to pick up of traffic control lane closure devices)
8. Implement Traffic Plan Northbound Left Lane Closure and Shoring Layout NB Left Lane Work
9. Open cut northbound left lane and install sleeve and backfill (complete during daytime and open backup to traffic at end of day with temp pavement)
10. Implement Traffic Plan Northbound Right Lane Closure and Shoring Layout NB Right Lane Work
11. Open cut northbound right lane and breakdown lane and install sleeve and backfill (complete during daytime and open backup to traffic at end of day with temp pavement)

12. Implement Traffic Plan Northbound Right Lane Work and Shoring Layout NB Shoulder Work
13. Open cut northbound east shoulder and install sleeve all the way to the ROW and backfill.
14. Implement Traffic Plan Southbound Right Lane Closure and Shoring Layout SB Shoulder Work.
15. Open cut southbound east shoulder from ditch centerline to ROW and install sleeve and backfill.
16. Permanent Pave Northbound (implement TCP as necessary)
    a. Day 1 – Demo, Grade, and Pave Left Lane
    b. Day 2 – Demo, Grade, and Pave Right Lane and Shoulder
17. Remark Northbound
18. Clean up



Contigency C- Hit obstruction in right lane of southbound or breakdown lane

1. Construct temporary widen if needed to provide 1 – 14’ travel lane.
2. Implement Traffic Plan Northbound Right Lane Closure and Shoring Layout NB Right Lane Work
3. Open cut northbound right and breakdown lane (complete during daytime and open backup to traffic at end of day with temp pavement) and construct receiving pit over end of drill head with 6’x28’ min. trench box
4. Ream drill
5. Connect on 24” casing pipe and pull back.
6. Backfill and remove trench box
7. Implement Traffic Plan Southbound Right Lane Closure and Shoring Layout SB Shoulder Work.
8. Open cut northbound east shoulder and install sleeve all the way to the ROW and backfill
9. Implement Traffic Plan Southbound Right Lane Closure and Shoring Layout SB Shoulder Work.
10. Open cut southbound east shoulder from ditch centerline to ROW and install sleeve and backfill.
11. Permanent Pave Northbound (implement TCP as necessary)
    a. Day 1 – Demo, Grade, Mill and Pave Left Lane if necessary
    b. Day 2 – Demo, Grade, Mill and Pave Right Lane and Shoulder
12. Remark Northbound
13. Remove temporary widening if installed.
14. Clean up

4.0 Traffic Plans

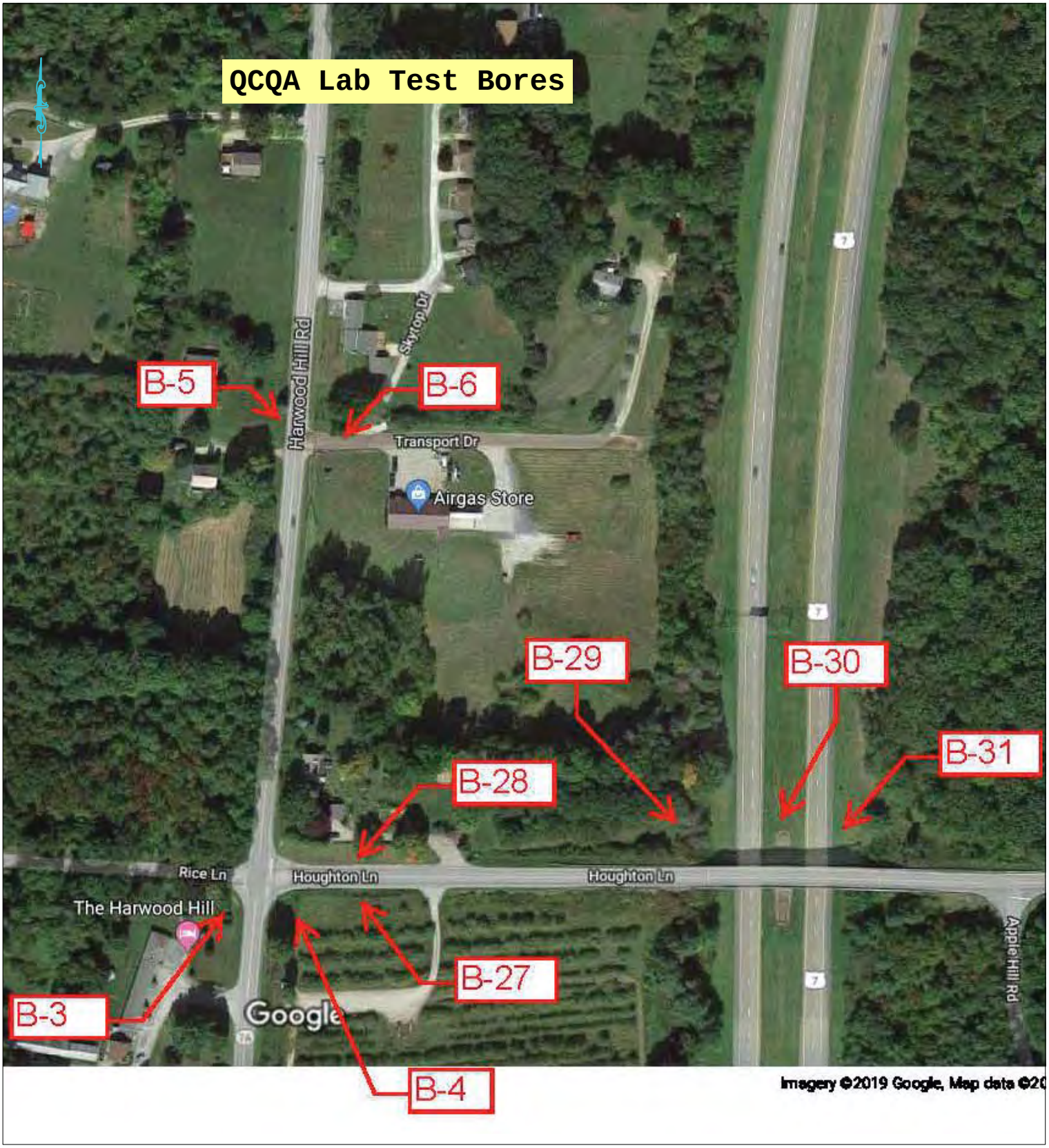
Appendix C contains our traffic plans, prepared by Ruggles Engineering, for:

Northbound Left Lane Closure
Northbound Right Lane Closure
Southbound Left Lane Closure (if needed)
Southbound Right Lane Closure (if needed)

5.0 Schedule

CCI proposed to commence drilling after the VTRANS winter shut down period (ending April 15th). Baring weather we would start the 3 weeks of April and depending on drilling conditions work would be occurring for a period of 2 to 4 weeks. At the end of every day the highway would be open for two lane traffic in both directions and paved.

Appendix A: Site Investigations



NOTE: TEST BORING LOCATIONS ARE APPROXIMATE.

QCQA Labs
QC/QA LABORATORIES, INC.
DRILLING & TESTING SERVICES
877 ROUTE 4 S
SCHUYLERVILLE, NEW YORK 12871
PHONE (518) 372-4067
FAX (518) 507-6113

SCALE: NTS

DRAWN BY: *TMK*

DATE: 3/21/19

PROJECT No.: SE19-006

FIGURE No.: 3

TEST BORING LOCATION PLAN

BENNINGTON MUNICIPAL WATERLINE
EXTENSION – PHASE II
ZONES C & D
BENNINGTON, VERMONT

QCQA Lab Test Bores

DATE
START: 3/13/2019
FINISH: 3/13/2019

SHEET 1 OF 1

QCQA Labs
QC/QA LABORATORIES, INC.
DRILLING & TESTING SERVICES
SUBSURFACE EXPLORATION LOG

BORING NO. B-29
PROJ. NO. SE19-006
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Bennington Municipal Waterline Extension - Phase II
LOCATION: VT Route 7
Bennington, VT

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
		1	4	5	9	15	14	1.4	FILL: Brown Firm Fine-Medium SAND, Some Silt, Little Gravel, Dry	
		2	18	11	10	7	21	1.5	"AND" GRAVEL, "Little" Silt	
5		3	6	7	5	5	12	1.1	Gray Firm Fine-Medium SAND AND SILT, Little Gravel, Moist	
		4	5	3	4	5	7	0.9	Loose	
		5	5	4	4	5	8	0.6	Similar	
10									Boring Terminated at a Depth of 10.0'	Free standing water was not encountered upon completion of drilling.
15										
20										
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Leonhardt
DRILL RIG TYPE : CME 550X
METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

QCQA Lab Test Bores

DATE
START: 3/7/2019
FINISH: 3/7/2019

SHEET 1 OF 1

QCQA Labs
QC/QA LABORATORIES, INC.
DRILLING & TESTING SERVICES
SUBSURFACE EXPLORATION LOG

BORING NO. B-30
PROJ. NO. SE19-006
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Bennington Municipal Waterline Extension - Phase II
LOCATION: VT Route 7
Bennington, VT

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
		1	15	17	9	15	26	1.7	FILL: Brown Firm Fine-Medium SAND, Little Gravel, Trace to Little Silt, Moist	
		2	16	42	23	12	65	1.0	Very Compact, COBBLE	REF = Sample Spoon Refusal.
		3	6	5	4	4	9	1.5	Loose, "AND" CLAY	NR = No Recovery.
5		4	5	2	2	3	4	1.0	Gray, "AND" SILT, "NO" Clay	
		5	5	100/.3			REF	0.2	ROCK FRAGMENTS, Dry	
10									Light Gray Hard QUARTZITE, Slightly Weathered and Highly Fractured.	Run #1: 9.0' - 12.0' REC = 87% RQD = 8%
									Boring Terminated at a Depth of 12.0'	Free standing water was not encountered upon completion of drilling.
15										
20										
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Leonhardt
DRILL RIG TYPE : CME 550X
METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

QCQA Lab Test Bores

DATE
START: 3/8/2019
FINISH: 3/8/2019

SHEET 1 OF 1

QCQA Labs
QC/QA LABORATORIES, INC.
DRILLING & TESTING SERVICES
SUBSURFACE EXPLORATION LOG

BORING NO. B-31
PROJ. NO. SE19-006
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Bennington Municipal Waterline Extension - Phase II
LOCATION: VT Route 7
Bennington, VT

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
		1	5	2	54	18	56	1.3	FILL: Brown Very Compact Fine-Medium SAND, Some Gravel, Trace-Little Silt, Dry	
		2	24	15	18	14	33	0.5	FILL: Light Brown Compact GRAVEL, Some Fine-Medium Sand, Trace Silt, Dry	REF = Sample Spoon Refusal.
		3	7	9	14	11	23	0.6	Firm	
5		4	7	7	11	14	18	0.6	Similar	
		5	7	8	100/.4		REF	0.4	Very Compact	
10									Light Gray Hard QUARTZITE, Slightly Weathered and Moderately Fractured.	Run #1: 9.0' - 12.0' REC = 83% RQD = 33%
									Boring Terminated at a Depth of 12.0'	Free standing water was not encountered upon completion of drilling.
15										
20										
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Leonhardt
DRILL RIG TYPE : CME 550X
METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

April 15, 2020 CCI Test Pit - Field Data

24-50-17
MICHAEL P FINCKEL
1042 HARWOOD HILLL RD
BENNINGTON VT 05201
BK. 462, PG. 132

24-50-24
WAKEMAN REALTY TRUST
33 TRANSPORT DR
BENNINGTON VT 05201
BK. 231, PG. 191

24-50-19
PLH LLC
0 RICE LANE
BENNINGTON VT 05201
BK. 511, PG. 155

24-50-23
LONNIE L WEST
50 HOUGHTON LN
BENNINGTON VT 05201
BK. 466, PG. 112

24-50-22
WATERING II LLC
55 HOUGHTON LN
BENNINGTON VT 05201
BK. 390, PG. 6

24-50-20
RECKLESS PHEASANT LLC
864 HARWOOD HILL RD
BENNINGTON VT 05201
BK. 502, PG. 140

SEE SHEETS C102-C111
FOR HARWOOD HILL ROAD
(VT ROUTE 7A) WATER MAINS

CI-4
CI-3
CI-2 20 FT I
CI-1

170+00
169+00
168+00
167+00
166+00
165+00
164+00
163+00

RICE LANE
HOUGHTON LANE
HARWOOD HILL ROAD (VT ROUTE 7A)
U.S. ROUTE 7 (SOUTH)
U.S. ROUTE 7 (NORTH)

CONTRACT 6
CONTRACT 5

PROVIDE SEDIMENT PROTECTION FOR STRUCTURE (TYPICAL)

B-28
GND EL: 779.33
LG EL: 0.00
LEDGE PRESENT:

INV: 779.28

3/4" CORPORATION STOP
TO SAMPLING STATION
STA: 44+10

8x6 TEE TO HYDRANT ASSEMBLY
STA: 44+20

8" GATE VALVE
STA: 45+60

10x8 REDUCER WITH MJxPE ADAPTER
STA: 45+70

BEGIN TRENCHLESS INSTALLATION:
10" DR 9 HDPE IN 24" DR 17 HDPE SLEEVE
STA: 45+80

NEW 8" DI WATER MAIN

B29-2
GND EL: 789.77
LEDGE PRESENT:
LG EL: 0.00)

REMOVE TEMPORARY END CAP
AND BEGIN 8" DI WATER MAIN
STA: 43+80

18" CMP
INV: 778.67

1
C401

B-3+/-
GND EL: 775.83
LG EL: 0.00
LEDGE PRESENT:

B-4
GND EL: 780.58
LG EL: 0.00
LEDGE PRESENT:

B-27
GND EL: 783.23
LG EL: 0.00
LEDGE PRESENT:

P-164 DRILLED
GND EL: 774.23
LG EL: 767.73
LEDGE PRESENT: Y

Locations of CCI Test Pits

Hole 2
Hole 3
Hole 1

CATCH BASIN
RIM: 795.41
INV OUT: 791.24 24" CMP

24" CMP

10x8 REDUCER WITH MJxPE ADAPTER
STA: 49+70

END TRENCHLESS INSTALLATION:
10" DR 9 HDPE IN 24" DR 17 HDPE SLEEVE
STA: 49+60

CATCH BASIN
RIM: 788.66
INV IN: 785.66 24" CMP
INV OUT: 785.66 24" CMP

CATCH BASIN
RIM: 785.55
INV OUT: 781.97 24" CMP

B-30
GND EL: 791.03
LEDGE PRESENT:
LG EL: 0.00

B-31
GND EL: 791.50
LEDGE PRESENT:
LG EL: 0.00

REMOVE AND RESET FENCE

B-30-2
GND EL: 790.77
LG EL: 0.00
LEDGE PRESENT:

B-31-2
GND EL: 791.27
LG EL: 0.00
LEDGE PRESENT:

24" CMP

CATCH BASIN
RIM: 772.69
INV IN: 769.36 24" CMP

CATCH BASIN
RIM: 772.98
INV IN: 769.73 24" CMP

STA: 49+75 (SEE NEXT SHEET: C120)

1 HOUGHTON LANE
(CONTRACT 6)

0 40 80 Feet

Scale: 1:40

NORTH

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

REVISIONS		
NO.	DATE	DESCRIPTION
1	05-29-2019	REVISED PER ADDENDUM 1

TOWN OF BENNINGTON
MUNICIPAL WATER SYSTEM
REMEDIAL EXPANSION PHASE II
BENNINGTON, VERMONT

DRAWINGS THIS SHEET

SERVICE DISTRICT C
PLAN

NUMBER	DATE
1001-019.7	05-14-2019
DRAWN	CHECKED
MSK	JMD

SHEET NUMBER

C119

K:_DRAWING DATABASE\1001-019.7 PWA REMEDIATION II\SHEETS\DISTRICT C\1001-019.7 T08 DISTRICT C3 HOUGHTON LA.DWG
20 May 2019 10:20:21

April 15, 2020 CCI Test Pit - Field Data

Bennington Contract 6 Route 7 Boring Probe Results

Hole # 1

Location shown on attached drawing.

Found refusal at 10’6” +/- below fog line elevation of road see photos attached for material found while excavating 0-10'6" Blasted Rock up to 2'0" diameter.

April 15, 2020 CCI Test Pit - Field Data

Hole # 2

Location shown on plan attached

Refusal found at 11’ below fog line elevation of road see photos attached for material found while excavating

```
0-6' Silty Clay soil with cobbles 6-12" in diameter.
6-11' Silt Clay with more cobbles then upper zone.
```

April 15, 2020 CCI Test Pit - Field Data

April 15, 2020 CCI Test Pit - Field Data

Hole #3

Location shown on plan attached

Refusal found at 11’ 6” below fog line elevation of road see photos attached for material found while excavating `0-11'6" Silt clay with little cobbles.`

April 15, 2020 CCI Test Pit - Brierley Memo

5/14/2020

Summary of crossing options

To: Jeff Chase, Casella Const.

From: Brian Dorwart, PE Brierley Associates

Bennington Water System Remediation – Contract 6

Route 7 Crossing

Objective:

Install a cased pipe crossing 4 lanes with a median Route 7 in Bennington, VT
Control 1: Minimum depth of cover at 5.6 feet
Control 2: Storm drain running in median between north and south bound lanes.
Control 3: Access only from outside state ROW lines.
Control 4: No highway damage
Control 5: No traffic impact

Design:

Pipe: 10" DR9 HDPE inside 24" DR17 HDPE sleeve. ***Assume IPS size***
Length: 45+80 to 49+60 Total = 380LF
Installation method Trenchless using HDD means and methods
2 horizontal and 2 vertical curves say 400-foot radius each resulting in compound curve of 280 feet
Pipe Entry El = 782.5 Exit El = 800 Delta = 17.5 ft (2.6 degree incline)
Drain Control 2 at Sta 47+50 existing pipe Invert at 785.54 feet

Conditions

- Borings B29, B30, B31 all with ledge indicated at ground surface
- Test borings did not penetrate ledge in area of HDD crossing at crossing depth and did not provide drilling rates of penetration and no lab testing was done on the rock. Rock classified as Hard Quartzite.
- Post contract test pits indicated highly fractured tan quartzite.

Constructability Concerns

- It can be built with HDD but past experience with drilling in this formation suggests a high risk that this rock can cause significant cost and schedule issues during construction using HDD means and methods.
- This rock is:
    - Highly abrasive thus tool life may be as little as 10 to 20 feet of penetration.
    - Very tough and hard which causes very slow production rates that are quite probably significantly lower than any reasonably experienced HDD contractor would estimate based on the data provided.
    - The highly fractured condition with many rock pieces less than 6 inches creates instability in the relatively large unsupported bore sides as the hole is enlarged for the final product pipe which is likely around 36 inches in diameter. An unstable hole can

collapse on the drill string and literally cut the drill rod or prevent the construction of an opening that will allow installation of the casing pipe.

- Random weathered zones in the rock create hard and soft areas that is expected to impact the ability to steer reliably enough to manage damage to the Condition 2 drain pipe and adjacent manhole and manhole foundation without going significantly deeper to mitigate this risk.

Construction Options:

1. Open cut
2. Pipe Ramming above solid rock
3. Microtunnel with SBU
4. Horizontal Directional Drilling thru Rock
5. Water Hammer/Air Hammer directional drill.

Comparitive Issues

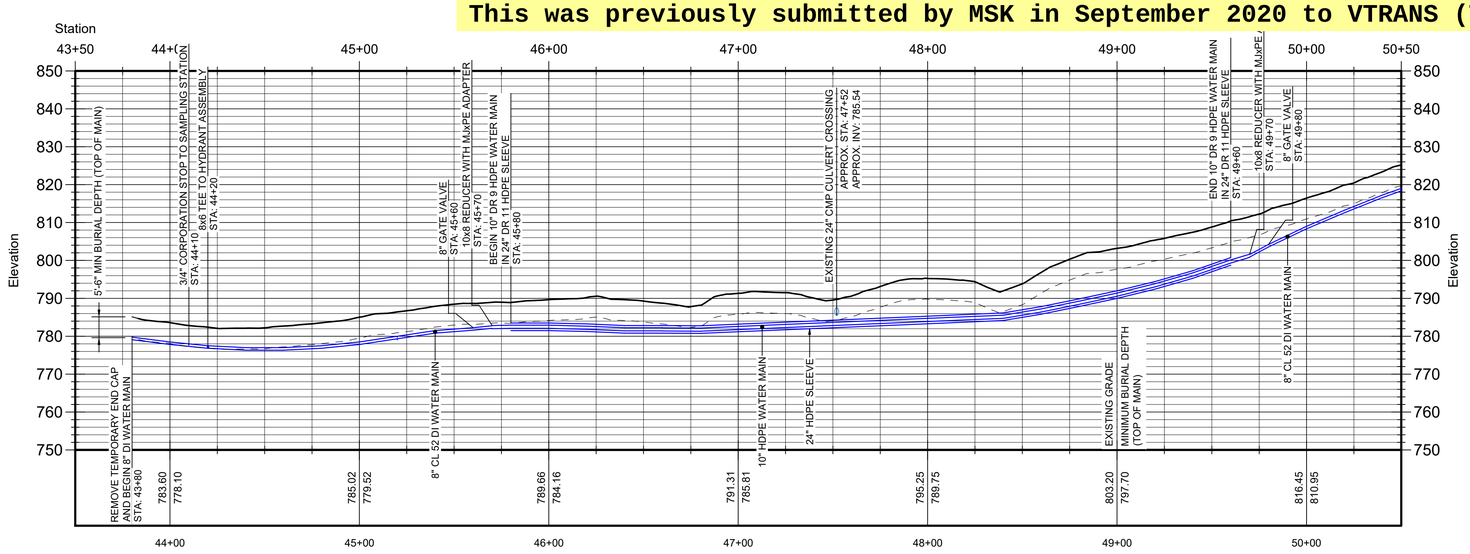
Handling Control Conditions	Minimum Cover	Avoiding Drain	380 foot length	Highway Damage	Traffic impacts
Open Cut	Yes	Yes	Yes	Yes - Repave	Lane shutdowns
Pipe ram above rock	No	No	Too Long, Max 100'	Chance	Chance
Microtunnel SBU	Yes	Yes	Yes	No	No
HDD	Yes	Yes	Yes	No	No
Air/Water Hammer directional Drill	Yes	Yes	Yes	No	No

Design Characteristics	Trajectorary	Steerable	Guidance	Handle mixed conditions	Ranking Success for site conditions
Open Cut	Variable	Can place pipe per design	Optical Survey	Yes	1
Pipe ram above rock	Streight only	No	None	Low	5
Microtunnel SBU	Streight only	Small amounts	Laser	Difficulty in broken rock and hard/tough rock	3
HDD	Curved	Yes	Walkover if access available but limited by highway. Gyro will not work		4
Air/Water Hammer directional Drill	Streight possible to curve Air Hammer	Needs special tooling to steer curves	Laser or limited walkover	Limited in size to maximum 36" and slow but can handle hard rock, difficulty in broken rock	2

Initial Discussion Topics:

1. Relocate the crossing alignment
2. Work inside state ROW
3. Construct new Drain discharge under southbound with new downstream intake to permit raising water pipe grade, making the trajectory a straight line vs curved to allow other options for construction, and handle poor constructability issues.
4. Chance of having enough soil for a ram
5. Chance of construction failure for given trenchless techniques which is much higher than for open cutting.

MSK Test Pits Performed on July 9, 2020
MSK1, MSK2, and MSK3 Test Pit Info
This was previously submitted by MSK in September 2020 to VTRANS (Theresa Gilman)



1A PROFILE: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

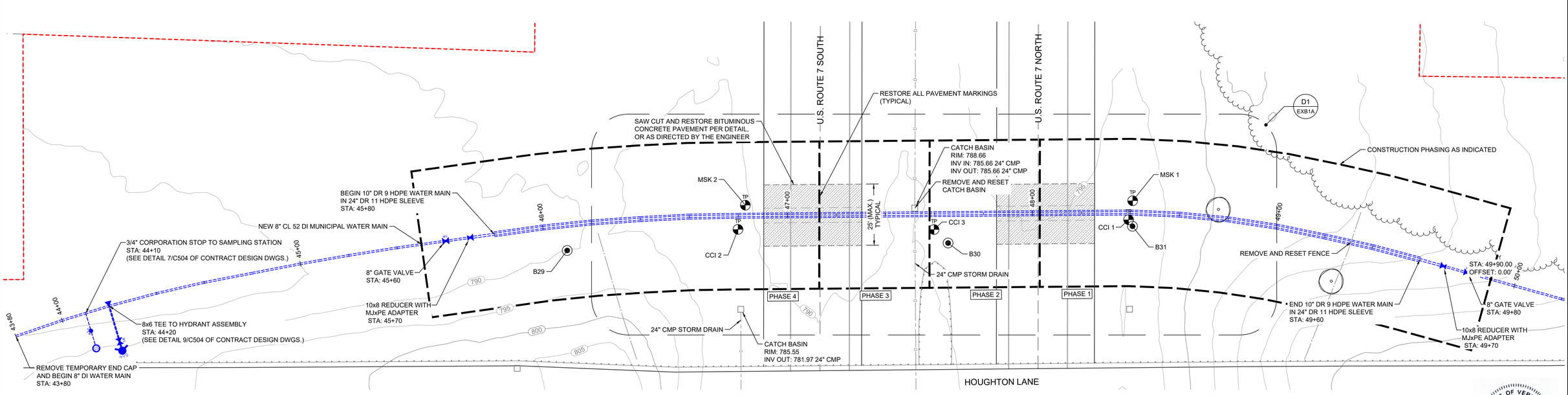
NOTE: THIS PROFILE IS PROVIDED FOR INFORMATION ONLY AND REPRESENTS THE INSTALLATION WHEN DIRECTIONAL DRILLING WAS PROPOSED

Scale: 1:40 HORIZONTAL; 1:20 VERTICAL

0 40 80 Feet

ES:

1. ALL WORK SHALL MEET THE DESIGN GUIDELINES AND THE REQUIREMENTS OF THE VERMONT AGENCY OF TRANSPORTATION (VTRANS) 2018 STANDARD SPECIFICATIONS FOR CONSTRUCTION
2. THE WORK DESCRIBED IN THIS EXHIBIT SHALL BE PERFORMED AS PART OF 1001-019.7 TOWN OF BENNINGTON MUNICIPAL WATER SYSTEM REMEDIAL EXPANSION PHASE II CONTRACT 6, AND ITS ASSOCIATED DESIGN DRAWINGS AND CONTRACT DOCUMENTS, SIGNED AND SEALED BY MSK ENGINEERING AND DESIGN, INC (14 MAY 2019).
3. PROVIDE TRENCH SUPPORT IN ACCORDANCE WITH OSHA REQUIREMENTS. MINIMIZE LOSS OF SOIL AND MAXIMIZE SUPPORT OF TRENCH WALLS.
4. ALL TRENCH BACKFILL SHALL BE COMPACTED TO 95% MODIFIED PROCTOR PER AASHTO T-180 METHOD D.
5. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A TRAFFIC CONTROL PLAN APPROVED BY VTRANS, AND ALL NECESSARY PERMITS. THE TRAFFIC CONTROL PLAN MUST BE PREPARED, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF VERMONT.
6. PIPE DETAILS IN ROADWAY ARE DEFINED AS SHOULDER TO SHOULDER.
7. RESTORE GRASSED AREAS IN ACCORDANCE WITH VTRANS SECTION 651.
8. WATERLINE INSTALLATION TO OCCUR IN 4 SEPARATE PHASES TO ALLOW FOR MAINTENANCE OF TRAFFIC IN BOTH DIRECTIONS. PHASES ARE LISTED IN ORDER OF PROPOSED WORK.



1 PLAN: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

0 20 40 Feet

WHEN PLOTTED FULL SIZE ON ANSI D 22x34

Scale: 1:20

NORTH

STATE OF VERMONT ANDREW RODRIGUE No. 0134479 CIVIL LICENSED PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

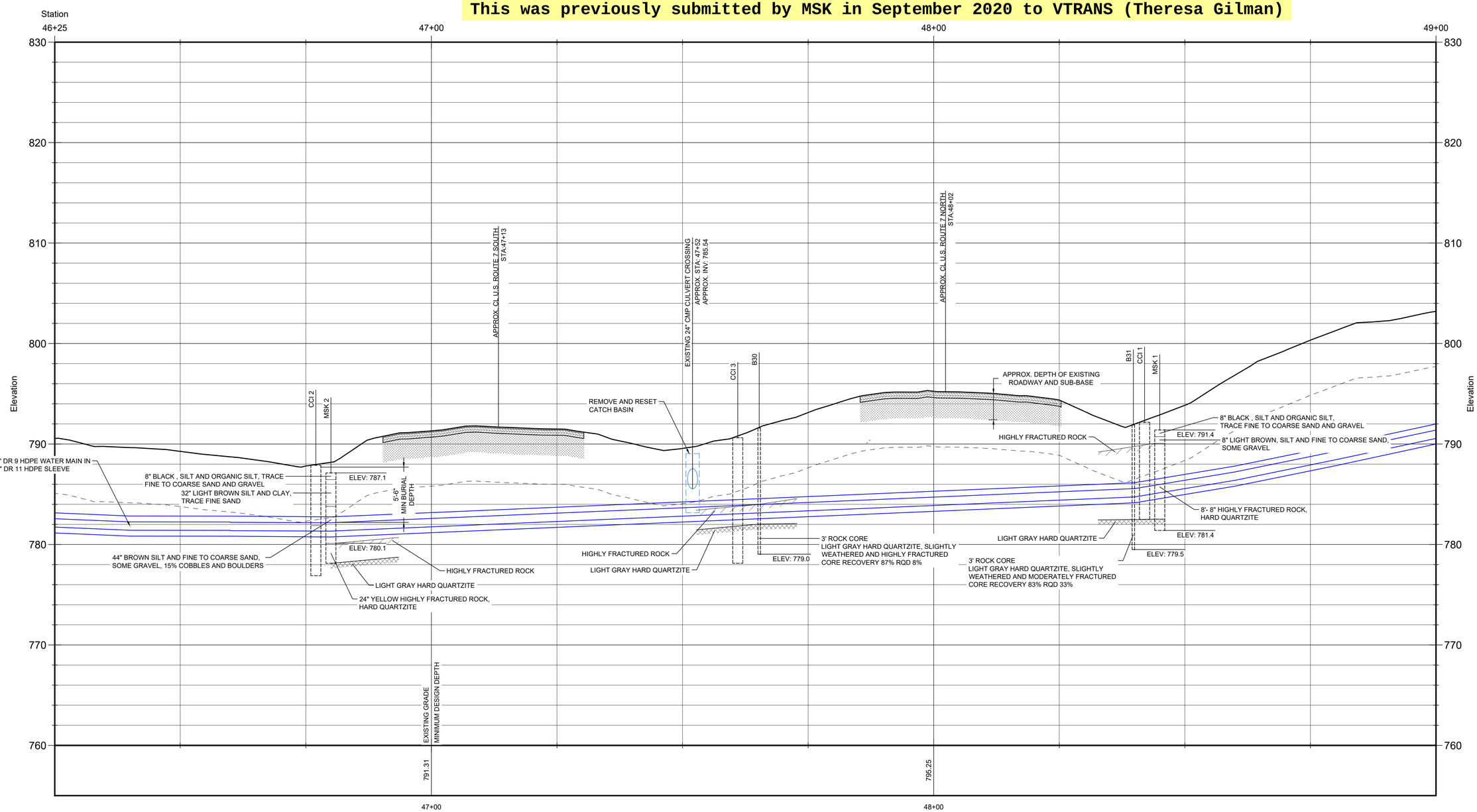
TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1 US7

MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

MSK Test Pits Performed on July 9, 2020
MSK1, MSK2, and MSK3 Test Pit Info
This was previously submitted by MSK in September 2020 to VTRANS (Theresa Gilman)



D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

0 10 20 Feet

WHEN PLOTTED FULL SIZE ON ANSI D 22x34

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

STATE OF VERMONT
ANDREW RODRIGUEZ
No. 0134479
Civil
LICENSED
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

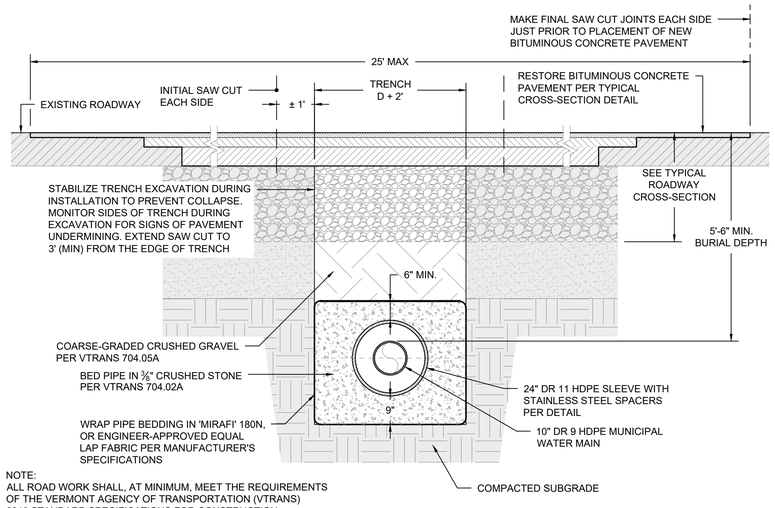
MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

SHEET NUMBER
EXB1A US7

09 September 2020 10:18:02

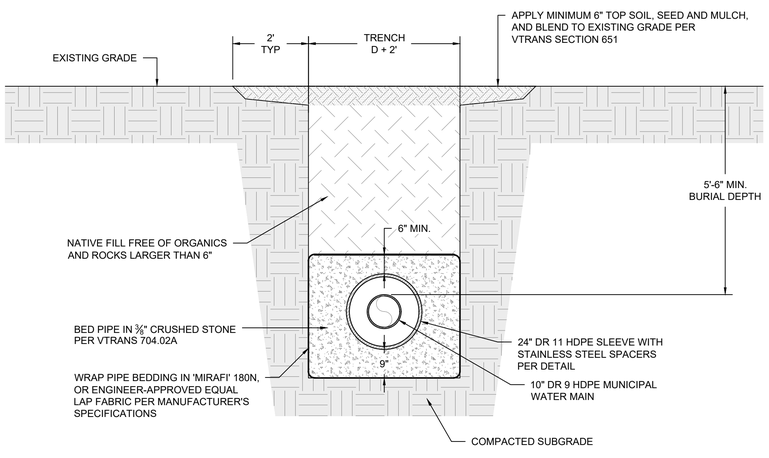
K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

MSK Test Pits Performed on July 9, 2020
MSK1, MSK2, and MSK3 Test Pit Info
This was previously submitted by MSK in September 2020 to VTRANS (Theresa Gilman)



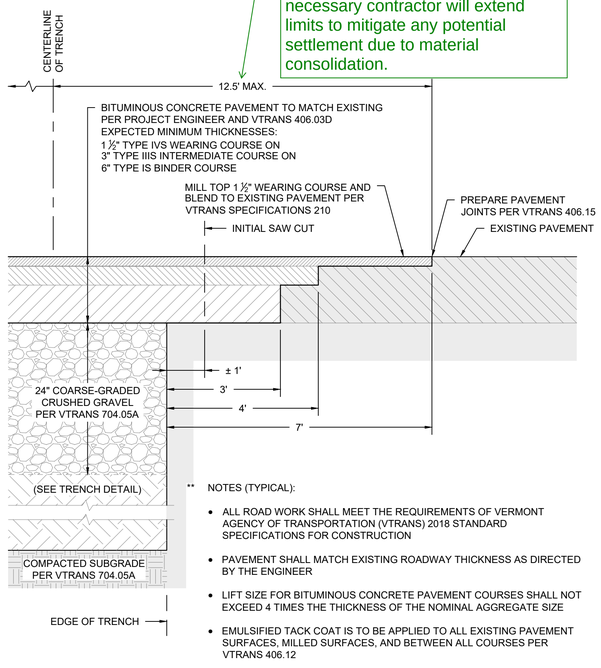
NOTE:
ALL ROAD WORK SHALL, AT MINIMUM, MEET THE REQUIREMENTS OF THE VERMONT AGENCY OF TRANSPORTATION (VTRANS) 2018 STANDARD SPECIFICATIONS FOR CONSTRUCTION

1 OPEN CUT TRENCH DETAIL
ROADWAY Scale: NTS



2 OPEN CUT TRENCH DETAIL
MEDIANS AND GRASSED AREAS Scale: NTS

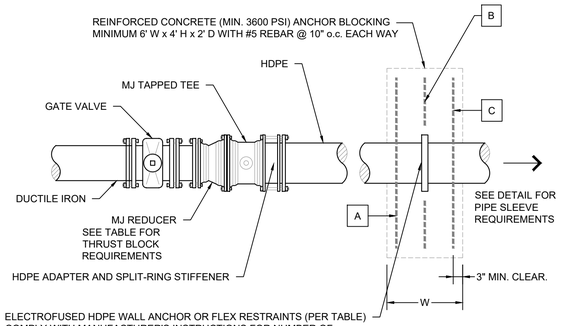
Contractor will request site visit with District Maintenance and Pavement Section (atleast 10 days before paving will occur) if open cut is necessary. Limits of trenching will be reviewed and final cut and mill limits will be determined. If necessary contractor will extend limits to mitigate any potential settlement due to material consolidation.



** NOTES (TYPICAL):

- ALL ROAD WORK SHALL MEET THE REQUIREMENTS OF VERMONT AGENCY OF TRANSPORTATION (VTRANS) 2018 STANDARD SPECIFICATIONS FOR CONSTRUCTION
- PAVEMENT SHALL MATCH EXISTING ROADWAY THICKNESS AS DIRECTED BY THE ENGINEER
- LIFT SIZE FOR BITUMINOUS CONCRETE PAVEMENT COURSES SHALL NOT EXCEED 4 TIMES THE THICKNESS OF THE NOMINAL AGGREGATE SIZE
- EMULSIFIED TACK COAT IS TO BE APPLIED TO ALL EXISTING PAVEMENT SURFACES, MILLED SURFACES, AND BETWEEN ALL COURSES PER VTRANS 406.12

3 TYPICAL PAVEMENT CROSS-SECTION
U.S. ROUTE 7 Scale: NTS



SIDE VIEW

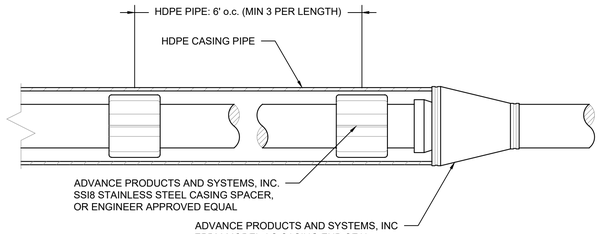
APPROX. DEAD END THRUST AT 200 PSI WATER PRESSURE		UNDISTURBED SOIL BEARING AREA (SQ FT)	APPROX. SOIL PRESSURE BEARING LOAD (LB/ SQ FT)	MINIMUM WIDTH "W" (INCHES)	APPROXIMATE CONCRETE VOLUME	
HDPE NOMINAL PIPE SIZE (INCHES)	TOTAL THRUST (LBS)				CUBIC FT	CUBIC YARDS
3-4	2,130	15	142	10	20	0.74
6	4,616	15	308	10	20	0.74
8	7,823	15	522	12	24	0.89
10	12,153	15	810	12	24	0.89
12	17,094	15	1,140	14	28	1.04

4 TYPICAL HDPE TRANSITION DETAIL
Scale: NTS

NOTES:

1. INSTALL (2) EXTRA HIGH-STRENGTH # 12 AWG SOLID COPPER TRACER WIRE WITH BLUE 45 mil INSULATION. CONNECT AT DUCTILE IRON PIPE, RUN ABOVE HDPE, AND IN SLEEVE. TRACER WIRE TO BE ELECTRICALLY CONTINUOUS TO BOTH ENDS OF HDPE, AND BONDED TO DUCTILE IRON. TERMINATE TRACER WIRE AT INDIVIDUAL ACCESS POINTS.
2. FLEX RESTRAINTS MUST BE RATED AT 8,000 LBS OF FORCE OR HIGHER
3. WHEN DIRECTED BY THE ENGINEER, THE CONCRETE ANCHOR BLOCK SIZE MAY BE ADJUSTED, BASED ON SOIL CLASSIFICATION AND PIPE DIAMETER
4. ENGINEER TO CONFIRM ADEQUATE SOIL PRESSURE BEARING CAPACITY FOR CONCRETE ANCHOR BLOCKING
5. REINFORCEMENT NOTES
   a. FOR 4 TO 10 INCH PIPE, PLACE ONE MAT OF #5 REBAR AT LOCATION "B" AS SHOWN ON DIAGRAM
   b. FOR 12 INCH PIPE, PLACE TWO MATS OF #5 REBAR, ONE AT LOCATION "A" AND ONE AT LOCATION "C" AS SHOWN ON THE DIAGRAM

MINIMUM NUMBER OF FLEX RESTRAINTS BY PIPE SIZE	
HDPE NOMINAL PIPE SIZE (INCHES)	NUMBER OF FLEX RESTRAINTS
4 THROUGH 8	2
10 THROUGH 12	3



SLEEVE PIPE SIZE AND THICKNESS		
CARRIER DIA	CASING DIA/MATL	MIN THICKNESS
10" HDPE	24" HDPE	DR 11

5 SLEEVE PIPE DETAIL
Scale: NTS

STATE OF VERMONT
ANDREW RODRIGUEZ
No. 0134479
CIVIL
LICENSED
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
DETL US7

MUNICIPAL WATER SUPPLY
CROSSING AT U.S. ROUTE 7

2 WEEK LOOK AHEAD
Casella Construction, Inc.

PROJECT: Bennington Water System, Remediation C6 **BY:** ZT/JC **DAY STARTING:** 9/28/2020

ACTIVITY	Resource	Mon 9/28	Tues 9/29	Weds 9/30	Thurs 10/1	Fri 10/2	Sat 10/3	Sun 10/4	Mon 10/5	Tues 10/6	Weds 10/7	Thurs 10/8	Fri 10/9
Rt 7 Crossing													
Phase 1A (No impact to Rt7 Traffic - Work off Houghton Lane)													
Trench and Sleeve Install	CCI	Week Prior											
Phase 1B (Working within Rt 7 and will have TCP set up)	NB Right Lane												
Trench and Sleeve Install	CCI	X											
Pave	Pike								X				
Cleanup	CCI										X		
Phase 2 (Working within Rt 7 and will have TCP set up)	NB Left Lane												
Trench and Sleeve Install	CCI		X										
Pave	Pike									X			
Cleanup	CCI										X		
Phase 3 (Working within Rt 7 and will have TCP set up)	SB Right Lane												
Trench and Sleeve Install	CCI			X									
Pave	Pike								X				
Cleanup	CCI										X		
Phase 4A (Working within Rt 7 and will have TCP set up)	SB Left Lane												
Trench and Sleeve Install	CCI				X								
Pave	Pike									X			
Cleanup	CCI										X		
Phase 4B (No impact to Rt7 Traffic - Work off Houghton Lane)													
Trench and Sleeve Install	CCI					X							
Pavement Markings											X		

November 11, 2020 HDD Test Bores - Field Data
MSK Field Notes from November 2021 Test Bores under SB Lanes - Page 1

WORK OBSERVED / EVENTS OF NOTICE

Josh H / RT 7 Test Drills #1-4

- 8:30 AM – Casella on site awaiting arrival of Morse's Directional Drilling (MDD). Casella foreman was Jeff Gokey.
- 8:45 AM – MDD arrived on site with a three-person crew. Off loaded drill rig and began set up for first test drill attempt.
- 9:00 AM – Drill was staged approximately on the centerline of the proposed 8" DI mainline route shown on drawing C119 near STA: 45+90. Centerline was established by Casella layout.
- 9:15 AM – Began first test drill. Note: Driller used 10' rods.

DRILL LOG| RT 7 Test Drill – Attempt #1 along Centerline										
ROD #	1	2	3	4	5	6	7	8	9	10
DEPTH	2'2"	4'3"	6'6"	8'5"	9'2"	8'10"	7'9"	7'2"	6'5"	5'3"
STA #	46+00	46+10	46+20	46+30	46+40	46+50	46+60	46+70	46+80	46+90

- 9:45 AM – Drill encountered ledge near shoulder of ditch (~STA: 46+65). Drill head jumped from 3% pitch to 12%, then to 18%. Operator could not advance drill without it coming up. Began pull back.
- 10:00 AM – Zack Thompson (Casella superintendent) arrived on site to discuss first test drill and plan with Corky Morse of MDD. Z. Thompson directed MDD to perform two more test drills – one north of centerline and one south of centerline.
- 10:15 AM – MDD left site to fill water tanks on pump truck.
- 11:45 AM – MDD returned to site and set up drill rig for section attempt. Rig was reset 6'6" south of centerline at same station of ~45+90.
- 11:55 AM – Began second test drill.

DRILL LOG| RT 7 Test Drill – Attempt #2 – 6'6" south of Centerline										
ROD #	1	2	3	4	5	6	7			
DEPTH	2'7"	3'6"	5'4"	6'8"	8'7"	10'0"	10'4"			
STA #	46+00	46+10	46+20	46+30	46+40	46+50	46+60			

- 12:10 PM – Drill progressed 70' and then encountered a solid ledge face. Operator could not advance the drill in any direction. Attempted to steer the drill head up and down but both directions were met with refusal.
- 12:15 PM – MDD began pull back of second attempt.
- 12:25 PM – MDD elected to reset machine to 18' north of centerline at approximately STA: 46+05. Drill rig was set here as they felt it would provide their best attempt at progressing the drill head. This logic was based on the visible ledge along the Houghton Lane embankment and their first two attempted drills.
- 12:50 PM – MDD began third test drill.

DRILL LOG| RT 7 Test Drill – Attempt #3– 18' north of Centerline										
ROD #	1	2	3	4						
DEPTH	2'2"	4'4"	6'7"	7'8"						
STA #	46+15	46+25	46+35	46+43						

- 1:00 PM – Drill progressed 38' and then encountered a solid ledge face. Operator could not advance the drill in any direction.
- 1:00 PM – MDD began pull back of third attempt.
- 1:20 PM – Drill rig was reset to ~STA: 46+00 with alignment 5' north of centerline.
- 1:25 PM – Began fourth test drill.

DRILL LOG| RT 7 Test Drill – Attempt #4– 5' north of Centerline										
ROD #	1	2	3	4	5	6				
DEPTH	1'4"	2'7"	4'0"	5'1"	6'7"	6'11"				
STA #	46+10	46+20	46+30	46+40	46+50	46+60				

- 1:35 PM – Near the end of rod #3, drill head shifted south as it passed under visible tree stumps. The drill head shifted approximately back to centerline (first attempt). Operator advanced three more rods but was unable to correct the shifted alignment. Because this test drill was following the same line as the first attempt, MDD began pull back.
- 1:50 PM – Drill rig was moved slightly (1'6" north from previous attempt) to 6'6" north of centerline.
- 1:55 PM – MDD began fifth test drill.
- 1:55 PM – E. Loveland took over observation duties from J. Herrington.

Successful Bore

Ethan L / RT 7 Test Drill #5

DRILL LOG| RT 7 Test Drill – Attempt #5– 6'6" north of Centerline										
ROD #	1	2	3	4	5	6	7	8	9	10
DEPTH	1'9"	3'8"	5'3"	6'8"	6'7"	5'11"	5'5"	5'4"	9'0"	10'1"
STA #	46+10	46+20	46+30	46+40	46+50	46+60	46+70	46+80	46+90	47+00
ROD #	11	12	13	14						
DEPTH	10'1"	9'8"	8'10"	8'1"						
STA #	47+10	47+20	47+30	47+40						

- 2:05 PM – Drill progressed 140' and entered the median of US RT 7. Drill head was located 16' off the yellow line of the southbound lane. Per J. Gokey, last rod was "resting on ledge."
- 2:20 PM – MDD completed pull back of the fifth and final attempt.
- 2:30 PM – Site was cleaned up. MDD mobilized and left site. Casella also left site.
- This concludes test drills under US RT 7.

OWNER'S REPRESENTATIVE:	CONTRACTOR'S REPRESENTATIVE:
	Zack Thompson

November 11, 2020 Test Bores - Field Data
MDD Field Notes

11/10/2020

Test Bore RT 7

Test from west to East

Lenth & Depth

1st Attempt (Red flag stakes)

10' = 2.2' 20' = 4.3' 30' = 6.6' 40' = 8.5'
50' = 9.2' 60' = 8.10' 70' = 7.9' 80' = 7.2'
90' = 6.5' 100' = 5.3'

AT Aprox 46+90 Drill started Climbing at 18'

AT 80' Drill started going Southward

2end (Orange flags)

6.5' South of 1st Attempt

10' = 2.7' 20' = 3.6' 30' = 5.4' 40' = 6.8'
50' = 8.7' 60' = 10' 70' = 10.4'

70' Drill stopped Lake Hitting Await

3end

18' North of 1st Attempt

10' = 2.2' 20' = 4.4' 30' = 6.7'
38' = 7.8'

38' Drill Rod stopped would not go

November 11, 2020 Test Bores - Field Data
MDD Field Notes

4th - moved closer to fence
To see if can make it under RT 7
5' North of 1st Attempt

10' = 1.4' 20' = 2.7' 30' = 4' 40' = 5.1'
50' = 6.7' 60' = 6.11'
at 30' The Drill Rod Headed
Southward

5th - 6.5' from 1st Attempt

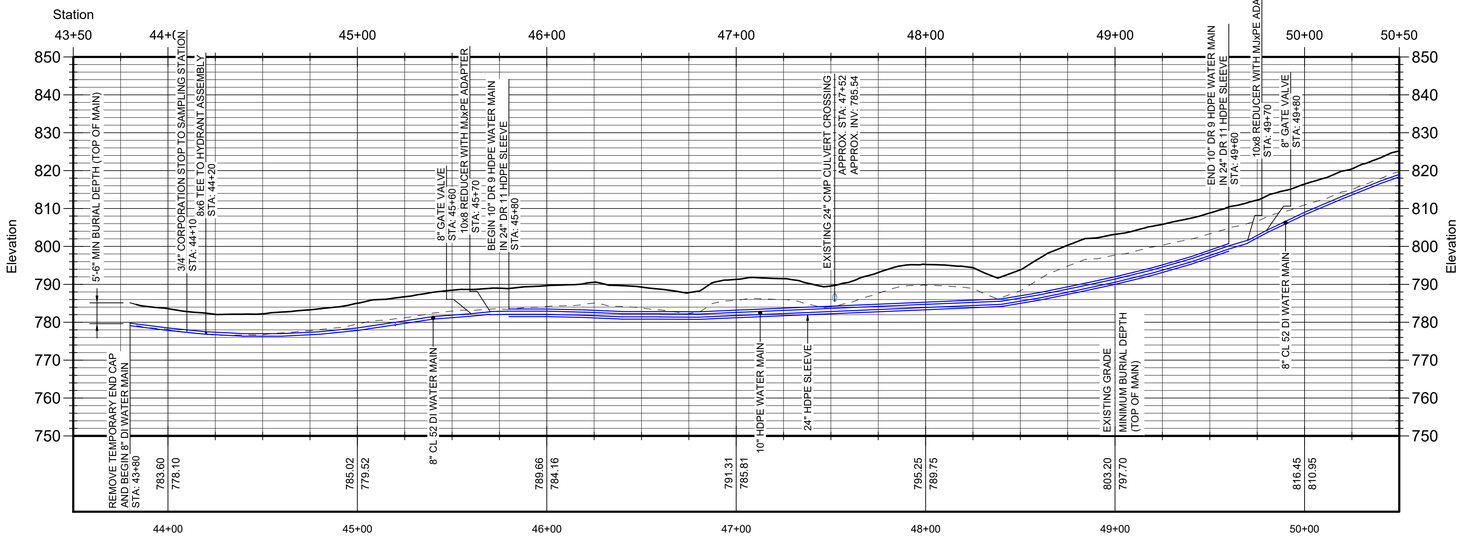
10' = 1.9' 20' = 3.8' 30' = 5.3' 40' = 6.8'
50' = 6.7' 60' = 5.11' 70' = 5.5' 80' = 5.4'
90' = 9.0" 100' = 10.1' 110' = 10.1' 120' = 9.8'
130' = 8.10" 140' = 8.1'

90' to 130' is SouthBound Lane of RT 7
16' off Yellow Line (East side of SouthBound) is where we Ended - Drill was not going Deeper (MDD said Ita was Rodding on the Ledge By the feel of it)

09 September 2020 10:19:05

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

Proposed Bore Path based on Successful Bore Attempt on November 9, 2020



1A PROFILE: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

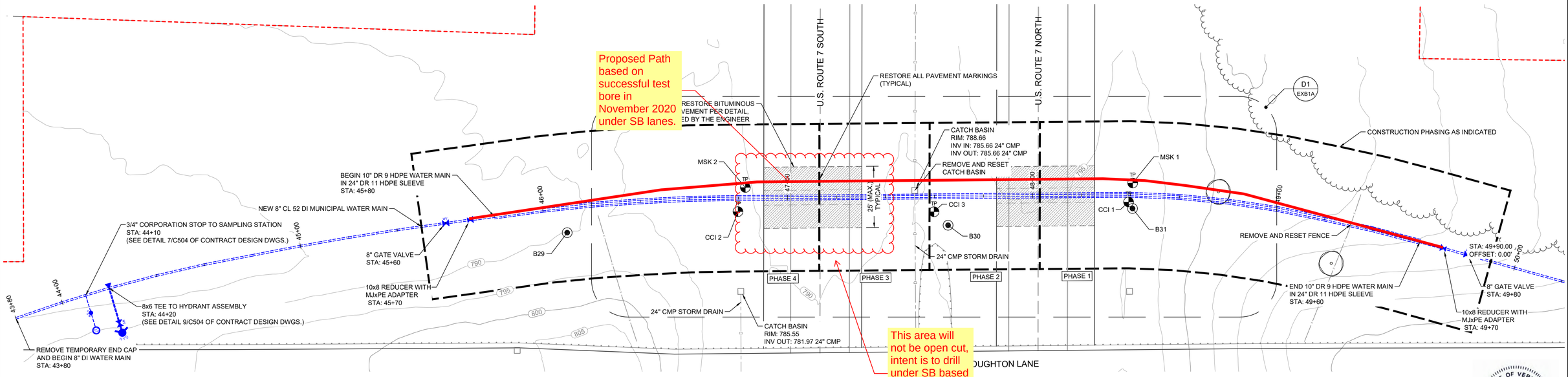
NOTE: THIS PROFILE IS PROVIDED FOR INFORMATION ONLY AND REPRESENTS THE INSTALLATION WHEN DIRECTIONAL DRILLING WAS PROPOSED

Scale: 1:40 HORIZONTAL; 1:20 VERTICAL

0 40 80 Feet

NOTES:

1. ALL WORK SHALL MEET THE DESIGN GUIDELINES AND THE REQUIREMENTS OF THE VERMONT AGENCY OF TRANSPORTATION (VTRANS) 2018 STANDARD SPECIFICATIONS FOR CONSTRUCTION
2. THE WORK DESCRIBED IN THIS EXHIBIT SHALL BE PERFORMED AS PART OF 1001-019.7 TOWN OF BENNINGTON MUNICIPAL WATER SYSTEM REMEDIAL EXPANSION PHASE II CONTRACT 6, AND ITS ASSOCIATED DESIGN DRAWINGS AND CONTRACT DOCUMENTS, SIGNED AND SEALED BY MSK ENGINEERING AND DESIGN, INC (14 MAY 2019).
3. PROVIDE TRENCH SUPPORT IN ACCORDANCE WITH OSHA REQUIREMENTS. MINIMIZE LOSS OF SOIL AND MAXIMIZE SUPPORT OF TRENCH WALLS.
4. ALL TRENCH BACKFILL SHALL BE COMPACTED TO 95% MODIFIED PROCTOR PER AASHTO T-180 METHOD D.
5. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL OBTAIN A TRAFFIC CONTROL PLAN APPROVED BY VTRANS, AND ALL NECESSARY PERMITS. THE TRAFFIC CONTROL PLAN MUST BE PREPARED, SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN THE STATE OF VERMONT.
6. PIPE DETAILS IN ROADWAY ARE DEFINED AS SHOULDER TO SHOULDER.
7. RESTORE GRASSED AREAS IN ACCORDANCE WITH VTRANS SECTION 651.
8. WATERLINE INSTALLATION TO OCCUR IN 4 SEPARATE PHASES TO ALLOW FOR MAINTENANCE OF TRAFFIC IN BOTH DIRECTIONS. PHASES ARE LISTED IN ORDER OF PROPOSED WORK.



1 PLAN: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

0 20 40 Feet

WHEN PLOTTED FULL SIZE ON ANSI D 22x34

Scale: 1:20

NORTH

STATE OF VERMONT
ANDREW RODRIGUE
No. 0134479
CIVIL
LICENSED
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1 US7

MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

Appendix B: Proposed Hybrid Crossing Plan

09 September 2020 10:18:02

Drill Plan with zones of Contingencies

Start Directional Drill Here Outside of fence. Approx. 50 to get to 6'6" depth to centerline of pipe

End Directional Drill and then establish pit and uncover drill head and then pull back sleeve pipe.

After crossing is complete CCI would open cut this segment and sleeve to grade.

After crossing is complete CCI would open cut this segment and sleeve to and install sleeve.

Zone of Contingency Plan A

Zone of Contingency Plan B

Zone of Contingency Plan C

Zone of Best Outcome

Station
46+25
47+00
48+00
49+00

Elevation
830
820
810
800
790
780
770
760

APPROX. CL U.S. ROUTE 7 SOUTH STA:47+13

EXISTING 24" CMP CULVERT CROSSING
APPROX. STA: 47+52
APPROX. INV: 785.54

APPROX. CL U.S. ROUTE 7 NORTH STA:48+02

CCI 2
MSK 2
CCI 3
B30
B31
CCI 1
MSK 1

REMOVE AND RESET CATCH BASIN

APPROX. DEPTH OF EXISTING ROADWAY AND SUB-BASE

10" DR 9 HDPE WATER MAIN IN 24" DR 11 HDPE SLEEVE

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
32" LIGHT BROWN SILT AND CLAY, TRACE FINE SAND

ELEV: 787.1

6'6" min. depth

5'-6" MIN BURIAL DEPTH

ELEV: 780.1

44" BROWN SILT AND FINE TO COARSE SAND, SOME GRAVEL, 15% COBBLES AND BOULDERS

HIGHLY FRACTURED ROCK

LIGHT GRAY HARD QUARTZITE

24" YELLOW HIGHLY FRACTURED ROCK, HARD QUARTZITE

EXISTING GRADE
MINIMUM DESIGN DEPTH

791.31

HIGHLY FRACTURED ROCK

LIGHT GRAY HARD QUARTZITE

ELEV: 779.0

3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND HIGHLY FRACTURED
CORE RECOVERY 87% RQD 8%

3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND MODERATELY FRACTURED
CORE RECOVERY 83% RQD 33%

795.25

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
ELEV: 791.4

8" LIGHT BROWN, SILT AND FINE TO COARSE SAND, SOME GRAVEL

8'- 8" HIGHLY FRACTURED ROCK, HARD QUARTZITE

LIGHT GRAY HARD QUARTZITE

ELEV: 781.4

ELEV: 779.5

D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

0 10 20 Feet
WHEN PLOTTED FULL SIZE ON ANSI D 22x34

STATE OF VERMONT
ANDREW RODRIGUEZ
No. 0134479
CIVIL
LICENSED
PROFESSIONAL ENGINEER

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

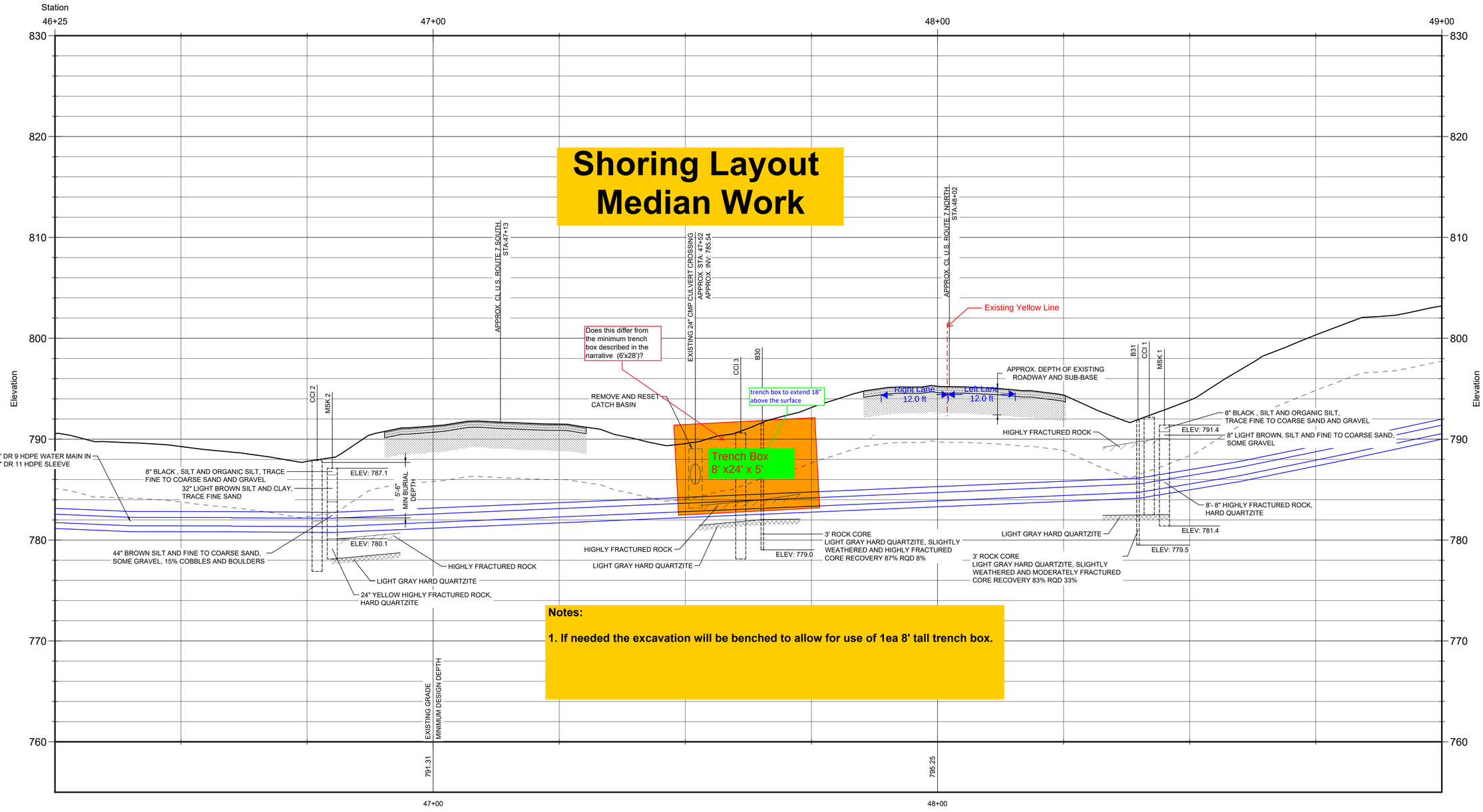
SHEET NUMBER
EXB1A US7

MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

09 September 2020 10:18:02

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

Shoring Layout Median Work



Notes:

1. If needed the excavation will be benched to allow for use of 1ea 8' tall trench box.

D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

0 10 20 Feet

WHEN PLOTTED FULL SIZE ON ANSI D 22x34

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

STATE OF VERMONT ANDREW RODRIGUEZ No. 0134479 Civil LICENSED PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1A US7

09 September 2020 10:18:02

Shoring Layout
NB Left Lane Work

Station
46+25 47+00 48+00 49+00

Elevation
830 820 810 800 790 780 770 760

APPROX. CL U.S. ROUTE 7 SOUTH
STA:47+13

EXISTING 24" CMP CULVERT CROSSING
APPROX. STA: 47+52
APPROX. INV: 785.54

APPROX. CL U.S. ROUTE 7 NORTH
STA:48+02

Per the 2009 MUTCD
Short-term stationary is defined as a daytime work that occupies a location for more than 1 hour within a single daylight period.
Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
Long-term stationary is work that occupies a location more than 3 days.

At end of day the excavation will be backfilled and Per T-35 Chart A Note 2 ~~Channelizing Devices~~ may be used instead of Barrier for Short Term Operations.

Per T-35 with a off set distance between 4'-6 wide, with a drop-off greater than 6" and the slope is greater than 1:3 than concrete barrier is required

Trench boxes must extend eighteen inches above the surface and be no more than two feet from the bottom of the trench. Should the trench depth exceed twenty feet, an OSHA trench box requirements stipulate a certified, professional engineer must design the trench box.

Existing Yellow Line

~~*Closed* 16.6 ft~~ | Buffer 6.0 ft | ~~*Travel Lane* 12.0 ft~~

Right Lane 12.0 ft | Left Lane 12.0 ft

Trench Box
8' x24' x 5'

CCI 2
MSK 2
B30
CCI 3
B31
CCI 1
MSK 1

REMOVE AND RESET CATCH BASIN

APPROX. DEPTH OF EXISTING ROADWAY AND SUB-BASE

10" DR 9 HDPE WATER MAIN IN 24" DR 11 HDPE SLEEVE

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
ELEV: 787.1
32" LIGHT BROWN SILT AND CLAY, TRACE FINE SAND
5'-6" MIN BURIAL DEPTH
ELEV: 780.1
44" BROWN SILT AND FINE TO COARSE SAND, SOME GRAVEL, 15% COBBLES AND BOULDERS
HIGHLY FRACTURED ROCK
LIGHT GRAY HARD QUARTZITE
24" YELLOW HIGHLY FRACTURED ROCK, HARD QUARTZITE

HIGHLY FRACTURED ROCK
LIGHT GRAY HARD QUARTZITE
3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND HIGHLY FRACTURED CORE RECOVERY 87% RQD 8%
ELEV: 779.0

HIGHLY FRACTURED ROCK
8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
ELEV: 791.4
8" LIGHT BROWN, SILT AND FINE TO COARSE SAND, SOME GRAVEL
8'- 8" HIGHLY FRACTURED ROCK, HARD QUARTZITE
ELEV: 781.4
LIGHT GRAY HARD QUARTZITE
ELEV: 779.5
3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND MODERATELY FRACTURED CORE RECOVERY 83% RQD 33%

EXISTING GRADE
MINIMUM DESIGN DEPTH
791.31
795.25

Notes:
1. Lane will only be close from sunrise to sunset.
2. Prior to end of day lane will be temporarily paved.
3. Excavation will be benched to allow for use of 1ea 8' tall trench box.

D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

0 10 20 Feet
WHEN PLOTTED FULL SIZE ON ANSI D 22x34

STATE OF VERMONT
ANDREW RODRIGUEZ
No. 0134479
Civil
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

MUNICIPAL WATER SUPPLY
CROSSING AT U.S. ROUTE 7

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1A US7

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

09 September 2020 10:18:02

Shoring Layout
NB Right Lane Work

Station
46+25 47+00 48+00 49+00

Elevation
830 820 810 800 790 780 770 760

Per the 2009 MUTCD
Short-term stationary is defined as a daytime work that occupies a location for more than 1 hour within a single daylight period.
Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
Long-term stationary is work that occupies a location more than 3 days.

At end of day the excavation will be backfilled and Per T-35 Chart A Note 2 Channelizing Devices may be used instead of Barrier for Short Term Operations.

Per T-35 with a off set distance between 4'-6 wide, with a drop-off greater than 6" and the slope is greater than 1:3 than concrete barrier is required

Trench boxes must extend eighteen inches above the surface and be no more than two feet from the bottom of the trench. Should the trench depth exceed twenty feet, an OSHA trench box requirements stipulate a certified, professional engineer must design the trench box.

Temporarily widen road upto 6' to allow for safe passage. Widen to be further detailed on traffic plan.

APPROX. CL U.S. ROUTE 7 SOUTH STA:47+13

EXISTING 24" CMP CULVERT CROSSING
APPROX. STA: 47+52
APPROX. INV: 785.54

APPROX. CL U.S. ROUTE 7 NORTH STA:48+02

Existing Yellow Line

Travel Lane 12.0 ft | Buffer 6.0 ft | *Closed 20.4 ft*

Right Lane 12.0 ft | Left Lane 12.0 ft

Trench Box
8' x24' x 5'

APPROX. DEPTH OF EXISTING ROADWAY AND SUB-BASE

REMOVE AND RESET CATCH BASIN

CCI 2 MSK 2 CCI 3 B30 B31 CCI 1 MSK 1

10" DR 9 HDPE WATER MAIN IN 24" DR 11 HDPE SLEEVE

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
ELEV: 787.1
32" LIGHT BROWN SILT AND CLAY, TRACE FINE SAND
5'-6" MIN BURIAL DEPTH
ELEV: 780.1
44" BROWN SILT AND FINE TO COARSE SAND, SOME GRAVEL, 15% COBBLES AND BOULDERS
HIGHLY FRACTURED ROCK
LIGHT GRAY HARD QUARTZITE
24" YELLOW HIGHLY FRACTURED ROCK, HARD QUARTZITE

HIGHLY FRACTURED ROCK
LIGHT GRAY HARD QUARTZITE
3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND HIGHLY FRACTURED
CORE RECOVERY 87% RQD 8%
ELEV: 779.0

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
ELEV: 791.4
8" LIGHT BROWN, SILT AND FINE TO COARSE SAND, SOME GRAVEL
8'- 8" HIGHLY FRACTURED ROCK, HARD QUARTZITE
ELEV: 781.4
LIGHT GRAY HARD QUARTZITE
3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND MODERATELY FRACTURED
CORE RECOVERY 83% RQD 33%
ELEV: 779.5

EXISTING GRADE
MINIMUM DESIGN DEPTH
791.31
795.25

Notes:
1. Lane will only be close from sunrise to sunset.
2. Prior to end of day lane will be temporarily paved.
3. Excavation will be benched to allow for use of 1ea 8' tall trench box.

D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

0 10 20 Feet
WHEN PLOTTED FULL SIZE ON ANSI D 22x34

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

STATE OF VERMONT
ANDREW RODRIGUEZ
No. 0134479
Civil
LICENSED
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1A US7

MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

09 September 2020 10:18:02

Shoring Layout
NB Shoulder Work

Per the 2009 MUTCD
Short-term stationary is defined as a daytime work that occupies a location for more than 1 hour within a single daylight period.
Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
Long-term stationary is work that occupies a location more than 3 days.

Per T-35 with a off set distance between 10' to the clear zone width, with a drop-off greater than 12" and the slope is greater than 1:3 than concrete barrier is required

Trench boxes must extend eighteen inches above the surface and be no more than two feet from the bottom of the trench. Should the trench depth exceed twenty feet, an OSHA trench box requirements stipulate a certified, professional engineer must design the trench box.

Station
46+25 47+00 48+00 49+00

Elevation
830 820 810 800 790 780 770 760

APPROX. CL U.S. ROUTE 7 SOUTH
STA:47+13

EXISTING 24" CMP CULVERT CROSSING
APPROX. STA: 47+52
APPROX. INV: 785.54

APPROX. CL U.S. ROUTE 7 NORTH
STA:48+02

Existing Yellow Line

Travel Lane 12.0 ft | Buffer 6.0 ft | Closed 15.5 ft

Right Lane 12.0 ft | Left Lane 12.0 ft

CCI 2 | MSK 2 | CCI 3 | B30 | B31 | CCI 1 | MSK 1

REMOVE AND RESET CATCH BASIN

APPROX. DEPTH OF EXISTING ROADWAY AND SUB-BASE

HIGHLY FRACTURED ROCK

Trench Box 8' x24' x 5'

ELEV: 791.4

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL

8" LIGHT BROWN, SILT AND FINE TO COARSE SAND, SOME GRAVEL

10" DR 9 HDPE WATER MAIN IN 24" DR 11 HDPE SLEEVE

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL

ELEV: 787.1

32" LIGHT BROWN SILT AND CLAY, TRACE FINE SAND

5'-6" MIN BURIAL DEPTH

8'- 8" HIGHLY FRACTURED ROCK, HARD QUARTZITE

ELEV: 781.4

LIGHT GRAY HARD QUARTZITE

ELEV: 781.5

3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND MODERATELY FRACTURED
CORE RECOVERY 83% RQD 33%

ELEV: 780.1

44" BROWN SILT AND FINE TO COARSE SAND, SOME GRAVEL, 15% COBBLES AND BOULDERS

HIGHLY FRACTURED ROCK

LIGHT GRAY HARD QUARTZITE

24" YELLOW HIGHLY FRACTURED ROCK, HARD QUARTZITE

HIGHLY FRACTURED ROCK

LIGHT GRAY HARD QUARTZITE

3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND HIGHLY FRACTURED
CORE RECOVERY 87% RQD 8%

ELEV: 779.0

EXISTING GRADE
MINIMUM DESIGN DEPTH

791.31

795.25

Notes:
1. Lane will only be close from sunrise to sunset.
2. Excavation will be benched to allow for use of 1ea 8' tall trench box.

D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

0 10 20 Feet

WHEN PLOTTED FULL SIZE ON ANSI D 22x34

STATE OF VERMONT
ANDREW RODRIGUEZ
No. 0134479
Civil
LICENSED
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

MUNICIPAL WATER SUPPLY
CROSSING AT U.S. ROUTE 7

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1A US7

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

09 September 2020 10:18:02

Shoring Layout
SB Shoulder Work

Per the 2009 MUTCD
Short-term stationary is defined as a daytime work that occupies a location for more than 1 hour within a single daylight period.
Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
Long-term stationary is work that occupies a location more than 3 days.

Trench boxes must extend eighteen inches above the surface and be no more than two feet from the bottom of the trench. Should the trench depth exceed twenty feet, an OSHA trench box requirements stipulate a certified, professional engineer must design the trench box.

Per T-35 with a off set distance between 10' to the clear zone width, with a drop-off greater than 12" and the slope is greater than 1:3 than concrete barrier is required

Both SB lanes would be open during this shoulder work.

Trench Box
8' x24' x 5'

Station
46+25
47+00
48+00
49+00

Elevation
830
820
810
800
790
780
770
760

APPROX. CL U.S. ROUTE 7 SOUTH
STA:47+13

EXISTING 24" CMP CULVERT CROSSING
APPROX. STA: 47+52
APPROX. INV: 785.54

APPROX. CL U.S. ROUTE 7 NORTH
STA:48+02

CCI 2
MSK 2
CCI 3
B30
B31
CCI 1
MSK 1

REMOVE AND RESET CATCH BASIN

APPROX. DEPTH OF EXISTING ROADWAY AND SUB-BASE

Right Lane 12.0 ft
Left Lane 12.0 ft

10" DR 9 HDPE WATER MAIN IN 24" DR 11 HDPE SLEEVE

8" BLACK , SILT AND ORGANIC SILT, TRACE FINE TO COARSE SAND AND GRAVEL
32" LIGH
TRACE I

ELEV: 787.1

5'-6" MIN BURIAL DEPTH

ELEV: 780.1

44" BROWN SILT AND FINE TO COARSE SAND, SOME GRAVEL, 15% COBBLES AND BOULDERS

HIGHLY FRACTURED ROCK

LIGHT GRAY HARD QUARTZITE

24" YELLOW HIGHLY FRACTURED ROCK, HARD QUARTZITE

HIGHLY FRACTURED ROCK

LIGHT GRAY HARD QUARTZITE

ELEV: 779.0

3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND HIGHLY FRACTURED
CORE RECOVERY 87% RQD 8%

HIGHLY FRACTURED ROCK

8" BLACK , SILT AND ORGANIC SILT,
TRACE FINE TO COARSE SAND AND GRAVEL

ELEV: 791.4

8" LIGHT BROWN, SILT AND FINE TO COARSE SAND, SOME GRAVEL

8'- 8" HIGHLY FRACTURED ROCK, HARD QUARTZITE

LIGHT GRAY HARD QUARTZITE

ELEV: 781.4

ELEV: 779.5

3' ROCK CORE
LIGHT GRAY HARD QUARTZITE, SLIGHTLY WEATHERED AND MODERATELY FRACTURED
CORE RECOVERY 83% RQD 33%

EXISTING GRADE
MINIMUM DESIGN DEPTH

791.31

795.25

Notes:
1. Excavation will be benched to allow for use of 1ea 8' tall trench box.

D1 PROFILE DETAIL: MUNICIPAL WATER SUPPLY CROSSING AT U.S. ROUTE 7

0 10 20 Feet

WHEN PLOTTED FULL SIZE ON ANSI D 22x34

Scale: 1:10 HORIZONTAL; 1:5 VERTICAL

STATE OF VERMONT
ANDREW RODRIGUES
No. 0134479
Civil
LICENSED
PROFESSIONAL ENGINEER

MSK ENGINEERING AND DESIGN, INC.
P.O. BOX 139, 150 DEPOT STREET
BENNINGTON, VERMONT 05201
PH: (802) 447-1402 FAX: (802) 445-1291

TOWN OF BENNINGTON
WATER RESOURCES DIVISION
REMEDIAL EXPANSION PHASE II CONTRACT 6
BENNINGTON, VERMONT

NUMBER	DATE
1001-019.7	09-08-2020
DRAWN	CHECKED
MSK	AR

SHEET NUMBER
EXB1A US7

MUNICIPAL WATER SUPPLY
CROSSING AT U.S. ROUTE 7

K:_DRAWING DATABASE\1001-019.7 PFOA REMEDIATION II\SHEETS_EXHIBITS\1001-019.7 RT 7 CROSSING EXB.DWG

Horizontal Directional Drilling (HDD) Submittal Package

Town of Bennington Water System Remedial Expansion

Contract **6**

Morse's Directional Drilling, Inc.

Prepared By: Nicole Morse

Reviewed and Approved By: Harold Morse

Overview:

This packet includes the submittal for the horizontal directional drilling work to be conducted as part of Town of Bennington Water System Remedial Expansion Contract. The attachments include drill operator qualifications, equipment specifications and drilling fluid MSDS sheets.

Bore Plan:

Mobilize to the site. The entry angle will vary between -9° to -13°. The actual bore path will depend on existing utilities. The pilot hole will maintain a minimal depth of 5 ½'. When the bit reaches the exit pit, it will be removed and a reamer (hole opener) will be installed when needed. A swivel will be placed between the reamer and pipe. The pipe will be pulled in as the reamer is pulled back. It will be unhooked; the machine will be moved to next site and start the process over.

During the boring process, we will be using a variety of drill rigs coupled with a DitchWitch mud mixing system. A subsite locating equipment will be used to track the drill bit. It's a walkover system that records the depth, location, temperature, and direction of the bore path. All equipment specifications are attached.

The excess boring fluid is vacuumed up with a DitchWitch 800-gallon vac trailer. The waste is vacuumed up and dumped at a pre-determined site provided by the contractor. If there is a blowout, we will use the DitchWitch vac trailer to vacuum it up and dump it at the pre-determined disposal site.

Notification Procedures:

All releases of drilling fluid, despite size or duration, will be controlled and cleaned up to the viable extent. Upon discovery of any release, the driller shall immediately begin control procedures and report of any significant releases.

Control and Corrective Procedures:

Immediately upon detection, the following measures are executed to control, minimize and clean up the release of drilling fluid and the affected area:

- Determine the extent of the release and execute corrective actions

- Attempt to isolate the release to the surface from the borehole
- Contain and clean the release
- Determine the cause of the release and execute measures to minimalize future occurrences, such as adjusting fluid thickness

Record Keeping:

The driller shall maintain a log of all drilling operations using the attached Bore Log. Logs will be provided to the engineer at completion of the work.

Drilling Procedures:

Site Preparation:

Survey the drill path for any interference of the locating equipment prior to the start of work. The drill will enter and exit at predetermined locations.

Drilling Procedure – Safety:

Morse's Directional Drilling works to all applicable VOSHA safety regulations at all times.

Pilot Hole:

If the pilot hole becomes larger than 15% over 100 feet, the driller will pull-back and correct the steering. Mix ground conditions may require a modified bore profile.

Pull-Back:

A swivel will be placed between the reamer and pipe. The pipe will be pulled in as the reamer is pulled back. Once pull-back operations have been started they will continue until the pipe is successfully installed and move to the next site.

Site Restoration:

After drilling operations have been completed and drilling equipment demobilized, site restoration will be the contractor's responsibility.

Unintended Fluid Return Plan:

Routine HDD operations have the possibility to release drilling fluids to the surface through unintended return. This is often caused by blockage of the fluid flow path that follow a path of least resistance. Because drilling fluids consist largely of bentonite clay-water mixtures, they are generally considered non-toxic. Drilling fluids to be used will be a mixture of bentonite clay, water, and drilling additives (which may include water softener, viscosifiers, filtration control additives, biopolymer gel, and torque reducer).

Monitoring and Detection:

Drilling operations will be closely monitored by the driller to determine if an unintended return is occurring. Monitoring procedures will include, but are not limited to:

- Visually observing the drill path regularly
- Analyzing drilling fluid volumes continuously
- Monitoring the drilling rate, fluid thickness, and position along the intended profile

Drilling System & Equipment:

- **Drill Rig:** Vermeer 50/100
- **Drill Head:** The drill head will be selected by the driller based on subsurface conditions and borehole diameter
- **Mud Motor:** Not Required
- **Guidance System:** Subsite 750TKR Locator

Fluid Management System:

- **Mixing System:** DitchWitch FM25X
- **Drilling Fluid:** The mix of the drilling fluid will be determined by the driller based on subsurface conditions and the condition of the hole

Attachments:

1. Drill Operator Qualifications
2. DitchWitch JT30 Drill Specifications
3. Vermeer D50x100 Drill Specifications
4. DitchWitch JT921 Drill Specifications
5. Subsite 750TKR Locator Specifications
6. DitchWitch FM25X Mixer Specifications
7. DitchWitch MV800 Vacuum Excavator Specifications
8. Drilling Fluid (Bore-Gel) MSDS Sheets
9. Sample Bore Log Sheet

Corky Morse
1483 White Rd., Eden, VT 05652
Phone: 802.730.9244
Email: corkymorse@hotmail.com

Directional Drilling Experience

I started directional drilling in 1996 and have performed bores from 50 ft to 3,000 ft in length using ½" to 30" pipe. I've drilled under roads, brooks & lakes. Operated machines ranging from 10,000 to 250,000 lbs.

I have attended numerous mud schools, including a week at Baroid mud school in Houston, Texas.

The following are jobs that I have performed:

- Athens, VT – 250' of 6" HDPE sleeve & 240' of 3" conduit
- Williston, VT – 585' of 3" HDPE conduit for power
- Jericho, VT – 380' of 4" HDPE pipe for water line
- St. Johnsbury, VT – 280' of 10" HDPE pipe for sewer main
- RT 7 Shelburne Road, VT – 116' of 18" HDPE sleeve and 120' of 10" HDPE watermain
- Vergennes, VT – 700' of 10" HDPE pipe for new watermain

References:

Brent Herrmann – Herrmann Construction 802.362.4400
Steve Zaluzny – Zaluzny Excavating Corp. 802.254.0080
Bob Hoffman – Daman Construction 315.255.3231
Ken Lougee – The Belden Company 802.773.9004

Dana Morse
232 Mary Deuso Rd., Eden, VT 05652
Phone: 802.760.8302
Email: danamorse.mdd@gmail.com

Directional Drilling Experience

I began directional drilling in 2005. I started mixing mud and locating, then moved to drill operating. Some of the drills that I have operated ranged from 10,000 to 100,000 lbs. I've performed bores from 50 to 2,600 ft in length using ½" to 24" pipe. Locations I have drilled were under roads, rivers, and railroad tracks.

I have completed numerous Baroid mud classes.

The following are jobs that I have performed:

- Athens, VT – 250' of 6" HDPE sleeve & 240' of 3" conduit
- Williston, VT – 585' of 3" HDPE conduit for power
- Jericho, VT – 380' of 4" HDPE pipe for water line
- St. Johnsbury, VT – 280' of 10" HDPE pipe for sewer main
- RT 7 Shelburne Road, VT – 116' of 18" HDPE sleeve and 120' of 10" HDPE watermain
- Vergennes, VT – 700' of 10" HDPE pipe for new watermain

References:
Brent Herrmann – Herrmann Construction 802.362.4400
Steve Zaluzny – Zaluzny Excavating Corp. 802.254.0080
Bob Hoffman – Daman Construction 315.255.3231
Ken Lougee – The Belden Company 802.773.9004

JT30 DIRECTIONAL DRILL

OPERATION	U.S.	METRIC
Spindle speed, max*	225 rpm	225 rpm
Spindle torque, max	4000 ft·lb	5420 N·m
Carriage thrust travel speed*	120 fpm	37 m/min
Carriage pullback travel speed*	120 fpm	37 m/min
Thrust force*	24,800 fpm	110 kN
Pullback force*	30,000 lb	133 kN
Ground travel speed		
Forward	2.4 mph	3.9 km/h
Reverse	2.2 mph	3.5 km/h

POWER (TIER 3)		
Engine	Cummins® QSB4.5	
Emissions compliance	EPA Tier 3	EU Stage IIIA
Fuel	Diesel	
Cooling medium	Liquid	
Injection	Direct	
Aspiration	Turbocharged & charge air cooled	
Number of cylinders	4	
Displacement	275 in^3	4.5 L
Bore	4.21 in	107 mm
Stroke	4.88 in	124 kW
Manufacturer's gross power rating	148 hp	110 kW
Rated speed	2,300 rpm	

POWER (TIER 4)

Engine	Cummins QSB4.5	
Emissions compliance	EPA Tier 4	EU Stage IV
Fuel	Diesel	
Cooling medium	Liquid	
Injection	Direct	
Aspiration	Turbocharged & charge air cooled	
Number of cylinders	4	
Displacement	275 in^3	4.5 L
Bore	4.21 in	107 mm
Stroke	4.88 in	124 mm
Manufacturer's gross power rating	160 hp	119 kW
Estimated net power rating	152 hp	113 kW
Rated speed	2,300 rpm	

DIMENSIONS	U.S.	METRIC
Transport length	221 in	5.61 m
Width	80 in	2.03 m
Width w/cab	89 in	2.26 m
Transport height	94 in	2.39 m
Operating weight	17,080 lb	7747 kg
Weight w/cab	17,975 lb	8153 kg
Entry angle	10-16°	
Angle of approach	19°	
Angle of approach, w/cab	15°	
Angle of departure	18°	

DRILLING FLUID SYSTEM (ON BOARD)	U.S.	METRIC
Pressure, max	1,500 psi	103 bar
Flow, max	50 gpm	189 l/min

FLUID CAPACITIES	U.S.	METRIC
Hydraulic reservoir	27 gal	102 L
Fuel tank	48 gal	182 L
Engine lubrication oil, w/filter	13.7 qt	13 L
Engine cooling system	24 qt	22.7 L
Antifreeze tank	8 gal	30 L
Diesel exhaust fluid tank	5 gal	18.9 L

POWER PIPE® HD	U.S.	METRIC
Length	118 in	3 m
Joint diameter	2.75 in	70 mm
Pipe diameter	2.38 in	60 mm
Bend radius, min	123 ft	37.5 m
Weight of drill pipe, lined	88 lb	39 kg
Weight of drill pipe & large box (48 pipe)	5,204 lb	2361 kg
Weight of drill pipe & small box (24 pipe)	2,897 lb	1314 kg

POWER PIPE FORGED	U.S.	METRIC
Length	120 in	3.05 m
Joint diameter	2.63 in	66.7 mm
Pipe diameter	2.38 in	60 mm
Bend radius, min	108.2 ft	33m
Weight of drill pipe	73 lb	33 kg

BATTERY	
SAE reserve capacity rating	195 min
SAE cold crank rating @ 0°F (-18°C)	950 amps

NOISE LEVEL

Operator sound	86 dBA
Operator sound w/cab	83 dBA

Specifications are general and subject to change without notice. If exact measurements are required, equipment should be weighed and measured. Due to selected options, delivered equipment may not necessarily match that shown.

EQUIPMENT SPECIFICATIONS LIBRARY

Drill

BASIC MODEL INFORMATION

Manufacturer: Vermeer

Model: D50x100

Rig Size: 30,001 - 50,000 lbs pullback

View Manufacturers | View Models | Back to Listing

SPECS

US

Fuel Type	Cummins 6BTA5.9
Ground Drive Speed	2.1 mph
Height	96 In
Length	15 Ft
Length	21 Ft
Manufacturer's Gross HP Rating	185 HP
Max Flow	150 GPM
Max Pressure	1000 PSI
Max Spindle Speed	80/106/160 RPM
Max Spindle Torque	10,000 ft-lb @ 80 RPM
Min Bore Diameter	4.5"
Pipe Diameter	3.5 In
Thrust	38,000/49,600 lbs
Type	Firestick
Weight	230 lbs
Weight	29,200 lbs with 270' (82.3m) of 3.5" (8.9 cm) rod
Width	93 Ft

ADDITIONAL INFO

DIMENSIONS
Length: 21' (6.4 m)
Width: 93" (236 cm)
Height: 96" (244 cm)
Weight: 29,200 lbs (13,245 kg) with 270' (82.3m) of 3.5" (8.9 cm) rod
Hydraulic pipe vise: Yes
Transport speed: 2.1 mph (3.4 km/h)
Rod box on rack: Yes - 300' (91.4 m)/2.875" (7.3 cm) rod, 270' (82.3 m)/3.5" (8.9 cm) rod
Automated Rod Loader: Yes

DRILL PIPE
Firestick
One-piece forged design: Yes
Length: 15' (4.6 m)
Diameter: Standard - 3.5" (8.9 cm), Optional - 2.875" (7.3 cm)
Feet of rod/90 degrees: Standard - 310' (94.5 m), Optional - 265' (80.8 m)
Weight: Standard - 230 lbs (104 kg), Optional - 195 lbs (88 kg)
Max Torque: Standard - 10,000 ft-lb (13,560 Nm), Optional - 9,000 ft-lb (12,204 Nm)

OPERATIONAL
Maximum Spindle Speed: 80/106/160 RPM
Maximum Spindle Torque: 10,000 ft-lb (13,560 Nm) @ 80 RPM, 7,600 ft-lb (10,300 Nm) @ 106 RPM, 3,300 ft-lb (4,470 Nm) @ 160 RPM
Actual Thrust/Pullback: 38,000/49,600 lbs (17,237/22,499 kg)
Electrical System: 12 Volt DC

BORE
Minimum bore diameter: 4.5" (11.4 cm)
Drill head works with all well-known Detection systems
Maximum backreamed diameter and bore length varies - Dependent on ground condition.

POWER SOURCE
Engine: Cummins 6BTA5.9
HP: 185 HP

DRILLING FLUID SYSTEM
Maximum Flow: 150 GPM (567 LPM)
Maximum Pressure: 1000 PSI (69 bar)

View Manufacturers | View Models | Back to Listing

EQUIPMENT SPECIFICATIONS LIBRARY

BASIC MODEL INFORMATION

Manufacturer: Ditch Witch
Model: JT921
Rig Size: 0 - 10,000 lbs Pullback

View Manufacturers | View Models

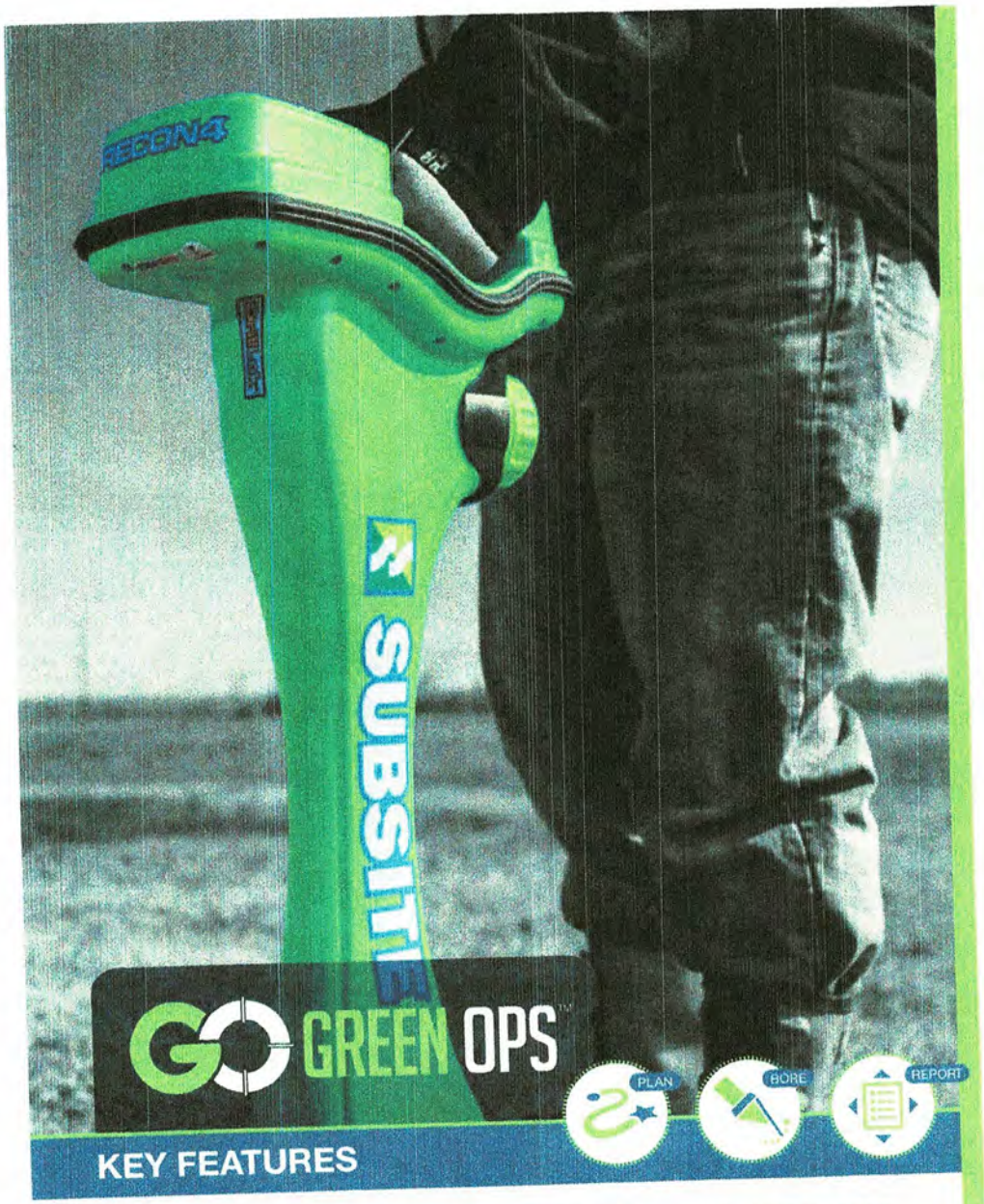
SPECS

US | Metric

Displacement	135 in3
Engine Cooling System	Liquid
Entry Angle	10-14Â°
Fluid Tank	55 gal
Fuel Tank Capacity	11.5 gal
Fuel Type	Diesel
Ground Drive Speed	1.8 mph
Height	76"
Hydraulic Tank Capacity	16.5 gal
Joint Diameter	2"
Length	193"
Length	78.75"
Make and Model	Caterpillar 3024C
Manufacturer's Gross HP Rating	50 HP
Max Flow	9 gpm
Max Pressure	750 psi
Max Spindle Speed	180 rpm
Max Spindle Torque	1100 ft-lbs
Min Bend Radius	105'
Min Bore Diameter	3"
Number of Cylinders	4
Pipe Diameter	1.58"
Pullback	9000 lbs
Rated Engine RPM	2800 RPM

Thrust	9000 lbs
Weight	6670 lbs
Weight	29 lbs
Width	47"

View Manufacturers | View Models



TK RECON™ SERIES

HDD GUIDANCE SYSTEM

The Subsite® TK RECON Series HDD Guidance System features proven TK performance with dual locating methods (walkover and Drill-To™), making it easy for experienced and novice operators. The TK RECON even lets you map your bore using GPS. With an industry-leading depth range of up to 110 feet (33.5 m) and new features including improved radio performance with increased interference immunity and faster information transfer, you can be more productive and efficient on every jobsite.

An important part of the Green Ops process.

KEY FEATURES

:: Two locating methods let you use your preferred method of locating, while using the second method to verify your results.
- Walkover enables the operator to pinpoint drill head location with peak and null techniques.
- Time-saving Drill-To™ mode enables the drill operator to make real-time corrections to improve bore accuracy or avoid obstacles. Use Drill-To with our optional Swivel Stand to keep your tracker level on any surface.

:: Robust radio offers increased interference immunity and faster information transfer for more efficiency on the jobsite.

:: Walkover tracking up to 110 feet with standard-size beacons (15" and 17") is deeper than anything else available. The long 2,000-foot range between the tracker and drill operator helps keep you more productive.

:: Communicate with the tracker, update tracker and display software, and download bore information into TSR Mobile through Windows® or your Android® or iOS (iPhone® / iPad®) mobile devices.

:: TSR Mobile software provides As-Built report of completed bore path.

:: Bore-path analyzer software shows which frequency works best for your particular job and conditions.

:: Three cases available, including a new, lightweight, EVA case.

:: Choose Li Ion, NiMH, or "C" Alkaline batteries for cost flexibility and better cold-weather performance.
- Rechargeable Li Ion batteries deliver twice the battery life of Alkaline.
- "C" batteries offer a "safety net" should you forget to recharge or lose charge on the jobsite.

SUBSITE® ELECTRONICS
subsite.com

TK RECON SERIES HDD GUIDANCE SYSTEM SPECIFICATIONS

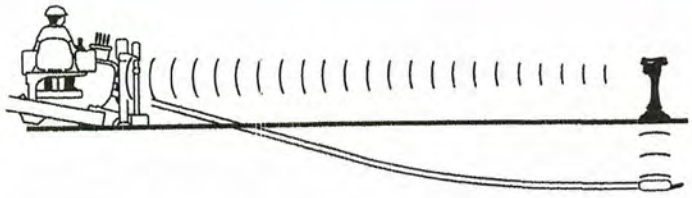
TRACKER

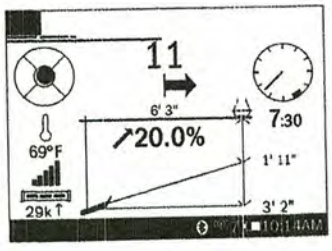
Dimensions	13 x 7 x 30 in. (330 x 178 x 762 mm)
Weight (with battery)	9 lbs (4.1 kg)
Operating temperature	-4 to 140°F (-20 to 60°C)
Environmental rating	IP65
Power source	C-Cell alkaline or NiMH rechargeable or Inspired Energy NB2038 Li-Ion rechargeable
Battery life	10-16 hours
Display	Hi-resolution graphic
Audio output	Speaker
Telemetry range	2000 ft (610 m)
Telemetry channels	8-12
Accuracy	+/- 5% over testable range
TK RECON™1	
Receiving frequencies	29 kHz
Depth with B pwr beacon (max)	45 - 50 ft (13.7 - 15.2 m)
Depth with H pwr beacon (max)	50 - 60 ft (15.2 - 18.3 m)
Depth with X pwr beacon (max)	65 - 70 ft (19.8 - 21.3 m)
TK RECON™2	
Receiving frequencies	12 or 29 kHz
Depth with B pwr beacon	50 - 80 ft (15.2 - 24.3 m)
Depth with H pwr beacon (max)	60 - 95 ft (18.3 - 28.9 m)
Depth with X pwr beacon (max)	70 - 120 ft (21.3 - 36.5 m)
TK RECON™4	
Receiving frequencies	1.5, 12, 20 or 29 kHz
Depth with B pwr beacon (max)	15 - 80 ft (4.7 - 24.3 m)
Depth with H pwr beacon (max)	35 - 95 ft (10.7 - 28.9 m)
Depth with X pwr beacon (max)	40 - 120 ft (12.2 - 36.5 m)

Depth Range numbers are based on the minimum and maximum of the individual tracker's receiving frequencies, using 15T, 17T, and 19T beacons.

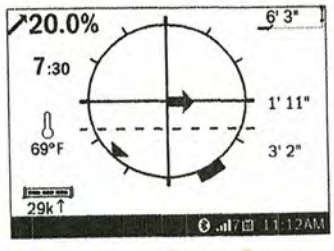
DISPLAY

Operating temperature	-4 to 140°F
Environmental rating	IP65
Power source	Powered off the HDD unit power
Display	Hi-resolution graphic
Telemetry range	2000 ft (610 m)*
Telemetry channels	8-12
TDR RECON REMOTE DISPLAY	
Dimensions	6 x 6 x 6 in. (152.4 x 152.4 x 152.4 mm)
TD RECON IN-DASH DISPLAY	
Dimensions	7 x 7 x 6.5 in. (177.8 x 177.8 x 165.1 mm)

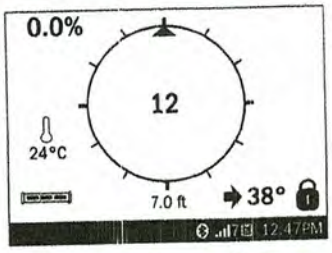




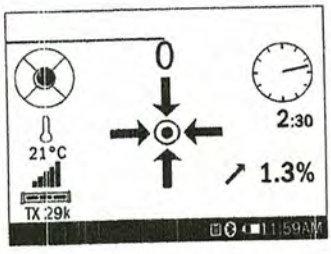
Dail-To™ Tracker Screen



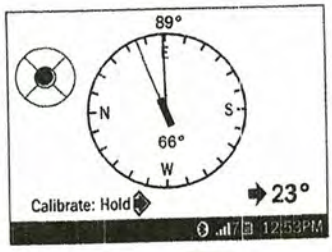
Dail-To™ Remote Display Screen



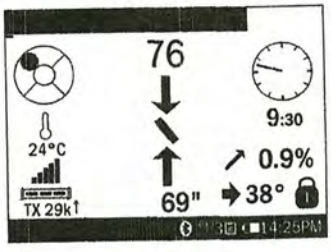
Remote Display Screen Walkover



Walkover Null Locate



Magnetic Compass Display



Walkover Pass Locate

GO GREEN OPS™

Every step of the Green Ops process utilizes modern data-sharing technology to improve the accuracy and efficiency of the task at hand. Integrating these tools into your bore routine can reduce your risk of striking something underground, while increasing your productivity and profitability. **Save time. Make money. With Green Ops.**

Learn more at SubsiteGreenOps.com

*Due to regulations in some countries, and RF interference in the area, telemetry range may be reduced. See your Ditch Witch® dealer for more information.

SUBSITE® ELECTRONICS
subsite.com

A Charles Machine Works Company

FM25X FLUID MANAGEMENT

DIMENSIONS	U.S.	METRIC
Mixing system w/two 500-gallon tanks		
Length	175 in	4.45 m
Width	92 in	2.34 m
Height		
Tank assembly w/out fill pipe	68 in	1.73 m
Tank assembly w/ fill pipe	75 in	1.91 m
Weight, empty	2,350 lb	1070 kg
Weight, full of water	10,650 lb	4830 kg
Mixing System w/two 1,000-gallon (nominal) tanks		
Length	205 in	5.21 m
Width	96 in	2.44 m
Height		
Tank assembly w/out fill pipe	72 in	1.83 m
Tank assembly w/ fill pipe	80 in	2.03 m
Weight, empty	3,450 lb	1570 kg
Weight, full of water	19,850 lb	9000 kg

FLUID/MIXING SYSTEM

Centrifugal pumps	2	
Suction port diameter	3 in	76 mm
Discharge port diameter	3 in	76 mm
Fluid pressure, max	50 psi	3.4 bar
Pump discharge rate, max (each pump)	300 gpm	1100 l/min
Flow rate to boring unit	0-200 gpm	0-750 l/min
Drilling fuid tank capacity (nominal, each tank)	500/1,000 gal	1893/3785 L
Solids addition rate w/metering plate	30 lb/min	14 kg/min
Solids addition rate w/out metering plate	75 lb/min	34 kg/m
Mixing hopper capacity (each hopper)	1 ft^3	28 L
Typical tank mixing time	7-10 min	

POWER

Engine	Kubota® D1105	
Fuel	Diesel	
Cooling medium	water	
Injection	Indirect	
Aspiration	Natural	
Number of cylinders	3	
Displacement	68.5 in^3	1.12 L
Bore	3.07 in	78 mm
Stroke	3.09 in	78.4 mm
Manufacturer's gross power rating (per SAE JT1995)	25 hp	18 kW
Rated speed	3,000 rpm	

FLUID CAPACITIES

Fuel tank	9.2 gal	35 L
Engine lubrication oil, including filter	4.2 qt	4 L

Specifications are general and subject to change without notice. If exact measurements are required, equipment should be weighed and measured. Due to selected options, delivered equipment may not necessarily match that shown.

Ditch Witch

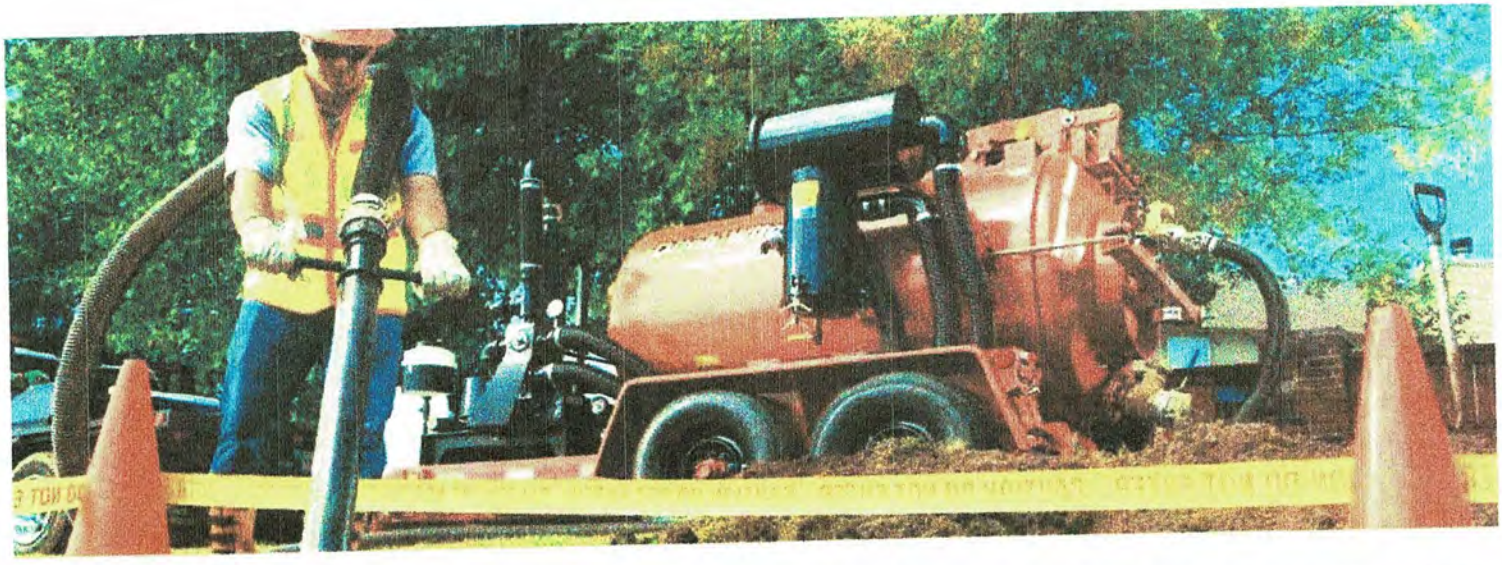
MV800 VACUUM EXCAVATOR

MV800 VACUUM EXCAVATOR SPECIFICATIONS

	U.S.	METRIC
DIMENSIONS		
Length	208 in	5283 mm
Width	96.5 in	2479 mm
Height	91.5 in	2324 mm
Weight		
No options		
Empty	4,995 lb	2265 kg
All options (water, rev. flow & hyd. door)		
Empty	5,590 lb	2536 kg
Trailer GVWR	14,000 lb	6350 kg
POWER		
Engine	Briggs & Stratton® Vanguard™	
Fuel	Gasoline	
Cooling medium	Air	
Aspiration	Natural	
Number of cylinders	2	
Displacement	54.68 in^3	896 cc
Bore	3.37 in	86 mm
Stroke	3.07 in	78 mm
Manufacturer's gross power rating (SAE J1940)	31 hp	23.1 kW
Rated speed	3,600 rpm	
Emissions compliance	EPA LSI	EU Stage II
Fuel tank capacity	6.9 gal	26.1 L

Specifications are general and subject to change without notice. If exact measurements are required, equipment should be weighed and measured. Due to selected options, delivered equipment may not necessarily match that shown.

	U.S.	METRIC
VACUUM SYSTEM		
2-lobe blower displacement	543 cfm	15.3 m^3/min
Drive type	Belt	
Vacuum, max	15 in Hg	381 mm Hg
Tank outlet valve size	6 in	152 mm
Tank inlet valve size	4 in	102 mm
Tank dump angle	45°	
Filter type	Washable polyester	
Filter area	100 ft^2	9.3 m^2
Water trap capacity	6 gal	22.7 L
Suction hose	25 ft	7.62 m
Hose size, standard	3 in	76 mm
WATER SYSTEM		
Water tank capacity	100 gal	379 L
Water pump flow	4 gpm	15.1 l/min
Water pump pressure, max	3,000 psi	207 bar
Hose reel capacity (locking)	50 ft	9.1 m
Clutch type	Electric w/auto de-clutch	
Antifreeze	50/50 water/antifreeze mix	
HYDRAULIC SYSTEM		
Power unit	12V DC	
Reservoir size	2 gal	7.6 L
Pressure	2,500 psi	172 bar
Tank dump cylinders (2)	2.5 in	63.5 mm
BATTERY		
Electrical system	12V	
SAE reserve capacity rating	120 min	
SAE cold crank @ 0°F (-18°C)	750 amps	
NOISE LEVEL		
Suction only		
Sound power	109 dBA	
Sound pressure	79 dBA	



Ditch Witch®
ditchwitch.com

BORE-GEL®

Boring Fluid System – U.S. Patent Number 5,723,416

Description

BORE-GEL® single-sack boring fluid system is specially formulated for use in horizontal directional drilling (HDD) applications. BORE-GEL fluid system is a proprietary blended product using high-quality Wyoming sodium bentonite. When BORE-GEL fluid system is mixed with fresh water, it develops an easy-to-pump slurry with desirable fluid properties for HDD.

Applications/Functions

The use of BORE-GEL fluid system promotes the following:

- Optimum gel strength for cuttings suspension and transport
- Pumpable slurry with minimal viscosity
- High reactive solids concentration for improved borehole stability in poorly consolidated/cemented sands and gravel formations
- Reduced filtration via a thin filter cake with low permeability
- Lubrication of pipe in microtunneling operations

Advantages

- Minimizes the number of boring fluid products required
- Easy to mix and fast to yield
- Low viscosity minimizes pump pressures
- Provides lubricity for pulling product line
- Can be used in Water Wells in unconsolidated formations or when additional gel strengths are required to compensate for low annular velocity
- NSF/ANSI Standard 60 certified

Typical Properties

Appearance	Tan to gray powder
pH (4% slurry or 15 lb/bbl)	10.2
Bulk density, lb/ft^3	68 to 72 (compacted)

Rev. 2/24/2011 IDP 932

Recommended Treatment

Add slowly and uniformly through a high-shear, jet-type mixer over one or more cycles of the volume of slurry. Continue to circulate and agitate the slurry until all unyielded bentonite is dispersed.

Approximate amounts of BORE-GEL® fluid system added to fresh water		
Boring Application	lb/100 gal	kg/m^3
Normal boring conditions	25 – 35	30 – 42
Poorly consolidated sand/gravel	35 – 60	42 – 72
Lubrication fluid for microtunneling	50 – 60	60 – 72

Packaging

BORE-GEL boring fluid system is packaged in a 50-lb (23-kg) multiwall paper bag.

Availability

BORE-GEL boring fluid system can be purchased through any Baroid Industrial Drilling Products Retailer. To locate the Baroid IDP retailer nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

Baroid Industrial Drilling Products
Product Service Line, Halliburton
3000 N. Sam Houston Pkwy. E.
Houston, TX 77032

Customer Service	(800) 735-6075 Toll Free	(281) 871-4612
Technical Service	(877) 379-7412 Toll Free	(281) 871-4613

HALLIBURTON

MATERIAL SAFETY DATA SHEET

Product Trade Name: **BORE-GEL®**

Revision Date: 20-Mar-2015

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BORE-GEL®
Synonyms: None
Chemical Family: Mineral
Application: Viscosifier

Manufacturer/Supplier

Baroid Fluid Services
Product Service Line of Halliburton
P.O. Box 1675
Houston, TX 77251
Telephone: (281) 871-4000
Emergency Telephone: (281) 575-5000

Prepared By

Chemical Stewardship
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

Substances	CAS Number	PERCENT (w/w)	ACGIH TLV-TWA	OSHA PEL-TWA
Bentonite	1302-78-9	60 - 100%	TWA: 1 mg/m³	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	TWA: 0.025 mg/m³	$\frac{10 \text{ mg/m}^3}{\%SiO2 + 2}$
Crystalline silica, cristobalite	14464-46-1	0.1 - 1%	TWA: 0.025 mg/m³	$\frac{1/2 \times 10 \text{ mg/m}^3}{\%SiO2 + 2}$
Crystalline silica, tridymite	15468-32-3	0.1 - 1%	0.05 mg/m³	$\frac{1/2 \times 10 \text{ mg/m}^3}{\%SiO2 + 2}$

3. HAZARDS IDENTIFICATION

Hazard Overview	**CAUTION! - ACUTE HEALTH HAZARD** May cause eye and respiratory irritation. **DANGER! - CHRONIC HEALTH HAZARD** Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, AS/NZS 1715, or equivalent respirator when using this product. Review the Safety Data Sheet (SDS) for this product, which has been provided to your employer.

4. FIRST AID MEASURES

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Notes to Physician	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flash Point/Range (F):	Not Determined
Flash Point/Range (C):	Not Determined
Flash Point Method:	Not Determined
Autoignition Temperature (F):	Not Determined
Autoignition Temperature (C):	Not Determined
Flammability Limits in Air - Lower (%):	Not Determined
Flammability Limits in Air - Upper (%):	Not Determined

Fire Extinguishing Media	All standard firefighting media.
Special Exposure Hazards	Not applicable.
Special Protective Equipment for Fire-Fighters	Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
NFPA Ratings:	Health 0, Flammability 0, Reactivity 0
HMIS Ratings:	Health 0*, Flammability 0, Physical Hazard 0 , PPE: At

6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures	Use appropriate protective equipment. Avoid creating and breathing dust.
Environmental Precautionary Measures	Prevent from entering sewers, waterways, or low areas.

Procedure for Cleaning / Absorption	Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions	This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.
Storage Information	Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls	Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.
Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Powder
Color:	Light brown or Gray
Odor:	Mild earthy
pH:	8-10
Specific Gravity @ 20 C (Water=1):	2.5
Density @ 20 C (lbs./gallon):	Not Determined
Bulk Density @ 20 C (lbs/ft3):	53 - 80
Boiling Point/Range (F):	Not Determined
Boiling Point/Range (C):	Not Determined
Freezing Point/Range (F):	Not Determined
Freezing Point/Range (C):	Not Determined
Vapor Pressure @ 20 C (mmHg):	Not Determined
Vapor Density (Air=1):	Not Determined

Percent Volatiles:	Not Determined
Evaporation Rate (Butyl Acetate=1):	Not Determined
Solubility in Water (g/100ml):	Slightly soluble
Solubility in Solvents (g/100ml):	Not Determined
VOCs (lbs./gallon):	Not Determined
Viscosity, Dynamic @ 20 C (centipoise):	Not Determined
Viscosity, Kinematic @ 20 C (centistokes):	Not Determined
Partition Coefficient/n-Octanol/Water:	Not Determined
Molecular Weight (g/mole):	Not Determined

10. STABILITY AND REACTIVITY

Stability Data:	Stable
Hazardous Polymerization:	Will Not Occur
Conditions to Avoid	None anticipated
Incompatibility (Materials to Avoid)	Hydrofluoric acid.
Hazardous Decomposition Products	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
Additional Guidelines	Not Applicable

11. TOXICOLOGICAL INFORMATION

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Acute Toxicity

Inhalation

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact	May cause eye irritation.
Skin Contact	May cause mechanical skin irritation.
Ingestion	None known.

Chronic Effects/Carcinogenicity

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Bentonite	1302-78-9	> 5000 mg/kg (Rat) > 2000 mg/kg (Rat)	No data available	> 5.27 mg/L (Rat)
Crystalline silica, quartz	14808-60-7	500 mg/kg (Rat) >15,000 mg/kg (Human)	No data available	No data available
Crystalline silica, cristobalite	14464-46-1	> 5000 mg/kg (Rat)	No data available	No data available
Crystalline silica, tridymite	15468-32-3	> 5000 mg/kg (Rat)	No data available	No data available

12. ECOLOGICAL INFORMATION

Ecotoxicological Information

Ecotoxicity Product

Acute Fish Toxicity: TLM96: 10000 ppm (Oncorhynchus mykiss)
Acute Crustaceans Toxicity: Not determined
Acute Algae Toxicity: Not determined

Ecotoxicity Substance

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Bentonite	1302-78-9	EC50(72h): > 100 mg/L (freshwater algae)	TLM96 10,000 ppm (Oncorhynchus mykiss) LC50 (96h) 16,000 - 19,000 mg/L (Oncorhynchus mykiss) LC50 (24h) 2800 -- 3200 mg/L (black bass, warmouth bass, blue gill and sunfish)	No information available	EC50 (96h) 81.6 mg/L (Metacarcinus magister) EC50 (96h) 24.8 mg/L (Pandalus danae) EC50 (48h) > 100 mg/L (Daphnia magna)
Crystalline silica, quartz	14808-60-7	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)
Crystalline silica, cristobalite	14464-46-1	No information available	LL0 (96h) 10,000 mg/L (Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)

Crystalline silica, tridymite	15468-32-3	No information available	LL0 (96h) 10,000 mg/L(Danio rerio) (similar substance)	No information available	LL50 (24h) > 10,000 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Bentonite	1302-78-9	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, quartz	14808-60-7	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, cristobalite	14464-46-1	The methods for determining biodegradability are not applicable to inorganic substances.
Crystalline silica, tridymite	15468-32-3	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Bentonite	1302-78-9	No information available
Crystalline silica, quartz	14808-60-7	No information available
Crystalline silica, cristobalite	14464-46-1	No information available
Crystalline silica, tridymite	15468-32-3	No information available

12.4. Mobility in soil

No information available

12.5. Results of PBT and vPvB assessment

No information available.

Substances	PBT and vPvB assessment
Bentonite	No data available
Crystalline silica, quartz	Not PBT/vPvB
Crystalline silica, cristobalite	No data available
Crystalline silica, tridymite	No data available

12.6. Other adverse effects

No information available

13. DISPOSAL CONSIDERATIONS

Disposal Method

If practical, recover and reclaim, recycle, or reuse by the guidelines of an approved local reuse program. Should contaminated product become a waste, dispose of in a licensed industrial landfill according to federal, state, and local regulations.

Contaminated Packaging

Follow all applicable national or local regulations.

14. TRANSPORT INFORMATION

US DOT

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

US DOT Bulk

DOT (Bulk) Not applicable

Canadian TDG

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable

IMDG/IMO

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable

IATA/ICAO

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable
Special Precautions for User: None

15. REGULATORY INFORMATION

US Regulations

US TSCA Inventory	All components listed on inventory or are exempt.
EPA SARA Title III Extremely Hazardous Substances	Not applicable
EPA SARA (311,312) Hazard Class	Acute Health Hazard Chronic Health Hazard
EPA SARA (313) Chemicals	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
EPA CERCLA/Superfund Reportable Spill Quantity	Not applicable.
EPA RCRA Hazardous Waste Classification	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
California Proposition 65	The California Proposition 65 regulations apply to this product.
MA Right-to-Know Law	One or more components listed.
NJ Right-to-Know Law	One or more components listed.
PA Right-to-Know Law	One or more components listed.

Canadian Regulations

Canadian DSL Inventory	All components listed on inventory or are exempt.
WHMIS Hazard Class	D2A Very Toxic Materials Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

END OF MSDS

Morse's Directional Drilling Inc.

Boring Log

Bore #:________________ Date:________________

Contractor:____________________________

Location:____________________________

Rod No.	Description	Pitch	Depth

Total Footage of Depth:________________ Signature:________________________

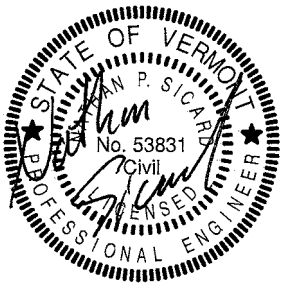
Appendix C: TCP

SITE SPECIFIC

TRAFFIC CONTROL PLAN

FOR

ROUTE 7 LIMITED ACCESS ROAD
PIPE CROSSING



Rev. 2
3/24/2021

FOR

CASELLA CONSTRUCTION INC.

25 Industrial Lane
Mendon, VT 05701

August, 2020

RUGGLES ENGINEERING SERVICES INC.

Ruggles Engineering Services, Inc., 5480 Memorial Drive, St. Johnsbury, VT 05819

www.rugglesengineeringservices.com

Table of Contents

Appendix A – Supporting Information

Sign Details

Appendix B –Standard Sheets (Not Modified)

T-1 – Traffic Control General Notes.

T-17 – Traffic Control Miscellaneous Details.

T-28 – Construction Sign Details.

T-30 – Construction Sign Details.

T-35 – Construction Zone Longitudinal Drop offs.

T-36 – Construction Zone Longitudinal Drop Off's for Paving.

SECTION 1 – GENERAL INFORMATION

1.1 Purpose:

The purpose of this Traffic Control Plan is to present site-specific construction methods for work zone traffic control. This work shall consist of furnishing, installing, maintaining and removing traffic control devices necessary to provide reasonable protection & advanced warning for motorists and construction workers. The road surface will be maintained and will be free of defect or imperfections that would inhibit safe travel.

This plan is for traffic control and does not include a worker safety plan.

This plan is intended to comply with the Traffic Control Plan Requirements in the Contract Plans, Special Provisions and as required in Section 641 of the VTrans Standard Specifications. It is also intended to comply VTrans Work Zone Safety & Mobility Guidance Document, Appendix "A" Temporary Traffic Control Devices. All traffic control devices will conform to the requirements of Part VI of the 2009 edition of the MUTCD, Rev. 2 (Manual on Uniform Traffic Control Devices) and comply with the NCHRP 350 and MASH guidelines and the requirements of this Traffic Control Plan.

A copy of this section of the manual and this Traffic Control Plan will be available at the construction site through the Key Personnel listed in section 2.3. All subcontractors working on this project along with our project superintendent will be provided with a copy of this Traffic Control Plan in addition to the field office copy.

1.2 Description of Project:

Work to be performed will include open cutting U.S. Route 7 adjacent to Bridge #15 in Bennington to install a municipal water main. The project will include phased traffic control with lane closures for both the northbound and southbound divided highway. Work will include daily closures to construct the project in segments.

SECTION 2 – SITE SPECIFIC REQUIREMENTS

2.1 Work Zone Limitations

a. Work Restrictions

The work on this project will be performed during daylight hours, Monday thru Friday. No night work is proposed. The Resident Engineer will be notified in advanced for Saturday work. VTrans may restrict work to off-peak hours.

b. Permanent Signs

The project is short term so no permanent signs will be installed.

c. Lane Width

Existing lane widths are 11 to 12 feet. Lane widths will be reduced to 11 feet through the work area.

d. Pedestrian and Bicycle Traffic

This is a limited access highway.

e. Traffic Impact

Construction phasing and sequencing will be used to minimize traffic impacts.

1. Delay Time

The Project is required to comply with Section 104.04A(b) of the 2018 VTrans Standard Specifications for Construction. Service will be maintained according to the specification when one-way traffic is being maintained, we **will** comply with the requirement that the travelling public shall not be delayed for more than 10 minutes.

2. Portable Changeable Message Signs (PCMS)

PCMS boards are not proposed for the project. However, VTrans has required that PCMS Boards are not "anticipated" and that they may be requested to allow motorists to seek alternative routes to avoid delay.

If VTrans requests PCMS Boards, VTrans requires that:
"PCMS Boards should communicate what information motorists will need to know, unnecessary information should be avoided. Messages should be updated periodically to describe current work activity so that the PCMS Board continues to command attention of the motorists.
The PCMS Board and the message it displays should not replace any of the signing detailed in the MUTCD and should not be used if standard traffic control devices adequately provide the information the motorists need to traverse the work zone safety.
The PCMS Board should be placed at least 305m (1,000ft) upstream of the decision point. IF the speed is greater than or equal to 72kph (45mph), then the PCMS board should be placed at least 1.61 km (1mi) upstream of the decision point.

3. Emergency Vehicles

Access through the work zone will be maintained for emergency vehicles.

f. Speed Reduction

A temporary speed reduction is proposed for the project from the existing 55 miles per hour to 45 miles per hour. This will also include VTrans to provide a temporary speed certificate which will need to be approved and signed for this to be an enforceable action.

g. Lane Closure

Lane closures will be daily and removed at the end of the work day. Work is planned between 7AM and 5PM. Currently there are no concerns with peak traffic flow.

h. Roadway Surface Conditions

The road surface maintained and open to traffic shall be free of defect or imperfections that would inhibit safe travel.

The trench crossing will be gravel for at least one night and will require advanced warning signs before the trench including MOTORCYCLES USE CAUTION AND BUMP".

No uneven pavement will be left between lanes.

i. Detours

No detours are proposed.

j. Signage

1. General

   a. Signs will not be placed such that they are obscured by existing signs or objects. Sign locations will not be placed such that they would interfere with existing traffic control devices, stopping sight distance and corner sight distance from driveways and town roads. Existing non-regulatory or informational signs may be covered, removed or temporarily relocated. If signs are covered, the sign covering will consist of a panel, painted flat black, the same size as the sign it covers. The plan will be wood, plywood, hardboard or any other material satisfactory to the Engineer. VTrans will not allow any material that will deteriorate by exposure to the weather during the project. Mounting of the panels will be done in such a way as not to damage the sign face material, specifically not to damage the retro-reflectivity of the sign face.

   b. **Signs will be placed according to MUTCD standards on the right side of**

the road. Signs will only be gate posted on U.S. Route 7 as the plans show.

c. Signs meeting the NCHRP Report 350 will continue to be used however newer sign hardware may be certified from the AASHTO Manual for Assessing Safety Hardware (MASH).

d. Roll up signs will have ASTM D 4956 Type VI fluorescent orange retroreflective sheeting. Solid substrate portable signs will have ASTM D 4956 Type VII, Type VIII or Type IX fluorescent orange retroreflective sheeting.

e. Vegetation that interferes with the visibility of the signs will be removed. Except urban landscaping trees will not be damaged.

2. Permanent Signs

a. None

3. Portable Movable Signs

a. Portable signs will be placed on the edge of the roadway and a minimum of 1 foot above the travel way. Portable (Daily) signs are expected to be the most effective method to warn motorists of the nearby work and workers, permanent signs can result in complacency.

b. Portable signs will be mounted on easels labeled NCHRP 350 and 2009 MUTCD compliant. The easels maybe tethered using a sand bag resting on the ground. Signs may be "Little Buster", "Big Buster" or "Tri Buster" style easels and identified as shown on the typical details and in Appendix A.

c. When signs are placed behind Guardrails, the sign face will be above the top of the rail, this may require "Big Buster" type temporary sign stands.

k. Temporary Pavement Markings

None

l. Nearby Projects

VTransparency does not identify any nearby projects in the spring of 2021, however local maintenance projects may be ongoing and will include coordination.

2.2 Flaggers and UTO's utilized in the Work Zones

a. Flaggers

Flaggers are not proposed.

b. UTO's

a. UTO's may be utilized to provide Blue Light presence as requested by the Engineer or the Town.

b. Any need for law enforcement will be relayed to local law enforcement. Local law enforcement contact information has been included in the contact information section.

UTO's will wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004 publication entitled "American National Standard for High Visibility Apparel and Headwear" and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 2 gear is the minimum required during daylight hours. The apparel background (outer) material color will be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material will be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors and will be visible a minimum distance of 1,000 feet. The retroreflective safety apparel will clearly identify the wearer as a person.
In lieu of ANSI/ISEA 107-2004 apparel, law enforcement personnel within the TTC zone may wear high-visibility safety apparel that meets the performance requirements of the ANSI/ISEA 207-2006 publication entitled "American National Standard for High-Visibility Public Safety Vests" (see Section 1A.11) and labeled as ANSI 207-2006.

2.3 Key Personnel and Contact Info*:

Casella Construction, Inc.

Onsite Superintendent (responsible person)
Zach Thompson …….. (802) 342-7203

Project Manager (responsible person)
Jeff Chase …… (802) 282-1607

Plan Preparer:
Ruggles Engineering Services, Inc. St. Johnsbury, VT 05819
Nathan P. Sicard, P.E. (802) 748-5898, nate.res@myfairpoint.net

*FOR NON-WORKING HOUR ISSUES OR EMERGENCIES SEE EMERGENCY CONTACT INFO.

The Project Superintendent listed above have the authority to correct issues and to shut down the project if the traffic control items are not in place or not up to the standards as set forth in

the MUTCD manual or as dictated in the plan. He will be responsible for reviewing work zone signs during periods of time that work is progressing on the project.

The Engineer also has the authority to notify CCI Key Personnel of issues that need to be corrected and shut down the project if the issues are not corrected within a reasonable time period.

Any significant changes needed for the traffic control plan will be provided to Plan Preparer, prior to forwarding to **the Engineer** for approval. This plan does not account for unknown miscellaneous projects within or adjacent to the work area which might affect the implementation of this traffic control plan.

2.4 Emergency and Non-Emergency Contact Information

The following is a list of contact numbers for notifying the Resident & local emergency officials, and local government officials whenever significant traffic impacts are anticipated or an emergency occurs.

EMERGENCY PHONE NUMBERS:

FIRE – POLICE – AMBULANCE …… ….911

NON- EMERGENCY PHONE NUMBERS:

Town of Bennington (Town Manager) ……..…… (802) 442-1037
Stuart Hurd, shurd@benningtonvt.org

Town of Bennington (Highways) ……..…… (802) 442-1037
Public Works Director, R.J Joly, rjoly@benningtonvt.org
Assistant Public Works Director, Larry Gates, lgates@benningtonvt.org

Town of Bennington (Police Chief) ……..…… (802) 442-1048
paul.doucette@vermont.gov

Vermont State Police
Shaftsbury Barracks) ……..…...……. (802) 442-5421
Commander, Lieutenant Thomas Mozzer, Thomas.Mozzer@vermont.gov

Bennington Village Fire Department ……(802) 442-1030
Chief James Wright

SECTION 3 – CONSTRUCTION PHASING AND SEQUENCING

3.0 GENERAL:

The project will be constructed in four phases. Closing a single lane each day. The daily closure will also require the lanes to be shifted nearest the adjacent shoulder as possible to allow for the excavation to be constructed to the midpoint of the road crossing for each northbound and southbound barrels.

The project will require multiple closure days when restoration work cannot be completed during the same day. This means that if work cannot be completed, the excavation will be backfilled and restored to grade for passable travel. Any additional closures to finish the subgrade work will begin on a subsequent day. This includes subsequent days required to resurface the work area with bituminous pavement.

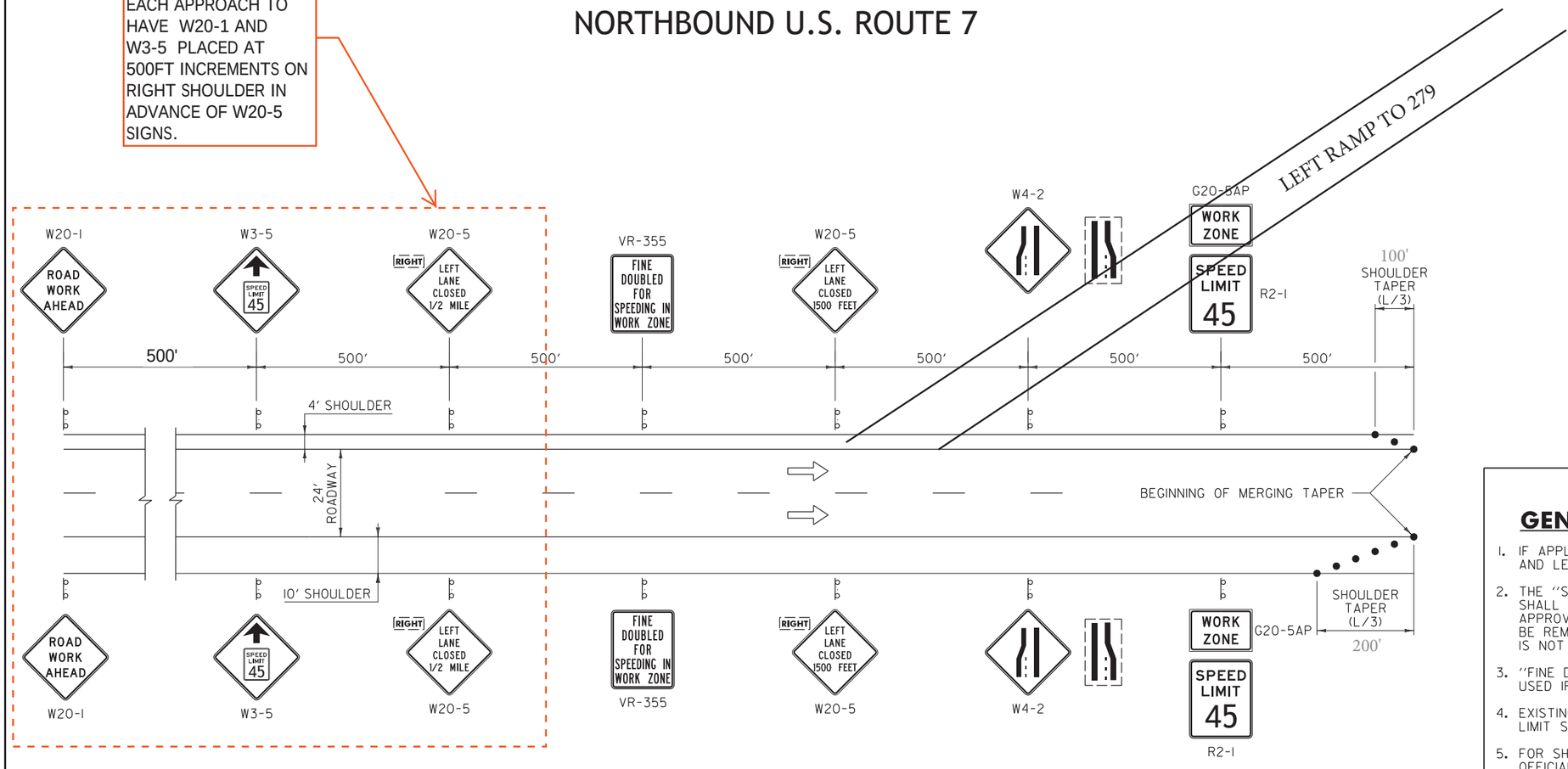
SECTION 4 – Project Diagrams and Site-Specific Drawings

4.0 GENERAL:

Each project requires site specific project diagrams or modifications to either VTrans Standard Sheets or MUTCD sheets that may better describe the situation or application. Each site introduces many factors and field decisions are needed. If field crews are not sure how to interpret the MUTCD or VTrans sheets, consultation with the designer may be needed.

SIGNS TO BE PLACED AT THE ROUTE 7/ ROUTE 279 MERGE EACH APPROACH TO HAVE W20-1 AND W3-5 PLACED AT 500FT INCREMENTS ON RIGHT SHOULDER IN ADVANCE OF W20-5 SIGNS.

DAILY ADVANCED SIGN PLAN NORTHBOUND U.S. ROUTE 7



LEGEND

⇨ FLOW OF TRAFFIC

● RETROREFLECTIVE PLASTIC DRUM

GENERAL NOTES:

1. IF APPLICABLE, THE CONTRACTOR SHALL HAVE SIGNS FOR CLOSURE OF RIGHT AND LEFT LANES ON PROJECT BEFORE WORK COMMENCES.
2. THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS SHALL ONLY BE USED IF A TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED. THE "SPEED LIMIT XX" (R2-1) AND OTHER RELATED SIGNS SHALL BE REMOVED OR COVERED WHEN WORK IS NOT IN PROGRESS AND ROADWAY IS NOT RESTRICTED.
3. "FINE DOUBLED FOR SPEEDING IN WORK ZONE" (VR-355) SHALL ONLY BE USED IF TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED.
4. EXISTING SPEED LIMIT SIGNS SHALL BE COVERED WHEN TEMPORARY SPEED LIMIT SIGNS ARE POSTED.
5. FOR SHORT TERM PROJECTS (THREE CONSECUTIVE DAYS OR LESS) WITH NO OFFICIAL TEMPORARY SPEED LIMIT, THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS MAY BE SUBSTITUTED WITH ADVISORY SPEED PLAQUES (WI3-IP) MOUNTED AS SUPPLEMENTAL SIGNS BELOW THE "LANE ENDS" (W4-2) SIGNS.
8. FOR A SHORT TERM PROJECT (THREE CONSECUTIVE DAYS OR LESS), SIGNS MAY BE POST MOUNTED OR PORTABLE.
9. THE "SPEED LIMIT XX" (R2-1) SOLID SUBSTRATE SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING AASHTO M 268 [ASTM D 4956] TYPE III.

OTHER STDS. REQUIRED: **T-1, T-12, T-31**

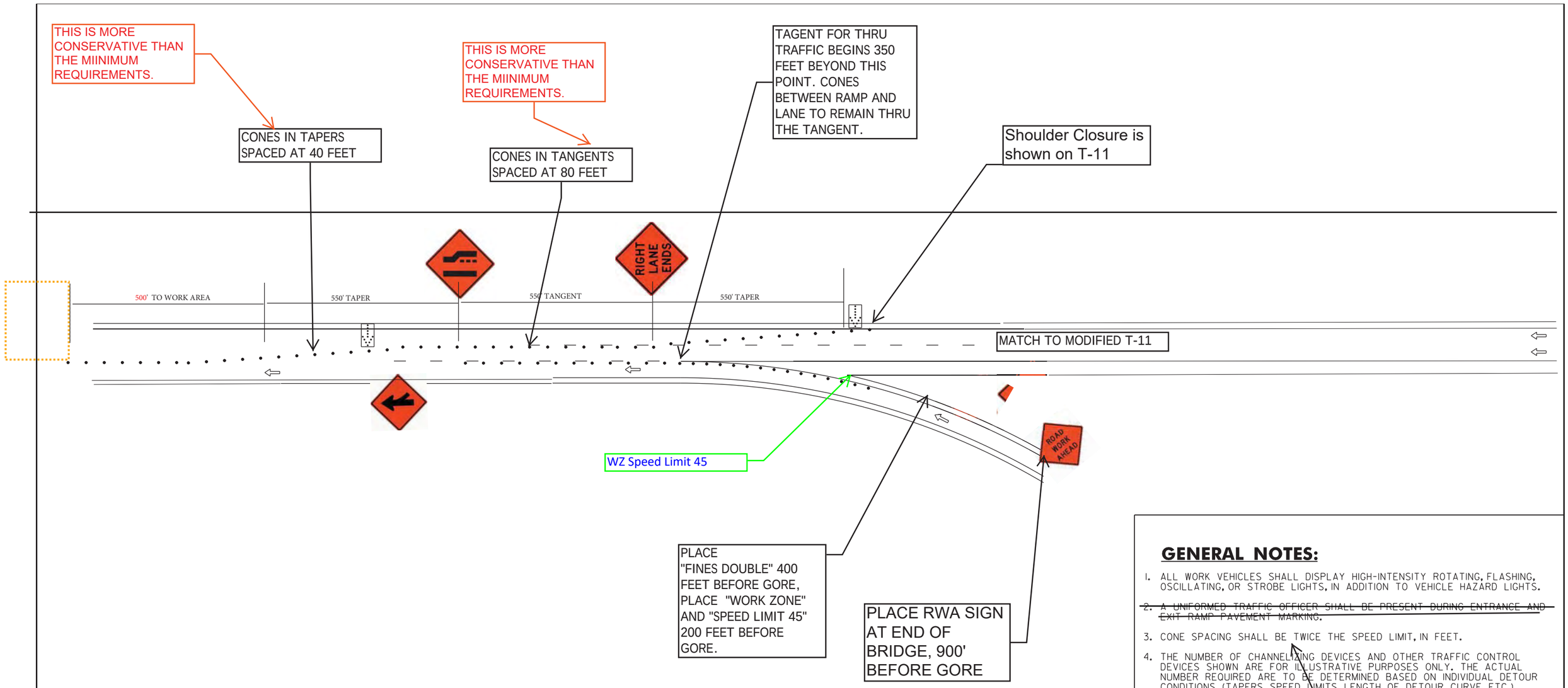
REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

CONSTRUCTION APPROACH SIGNING DIVIDED HIGHWAY ONE LANE CLOSED

STANDARD

T-11



LEGEND

⇦ FLOW OF TRAFFIC

● RETROREFLECTIVE PLASTIC DRUM **(TAPERS) OTHERWISE CONES**

FLASHING ARROW PANEL

GENERAL NOTES:

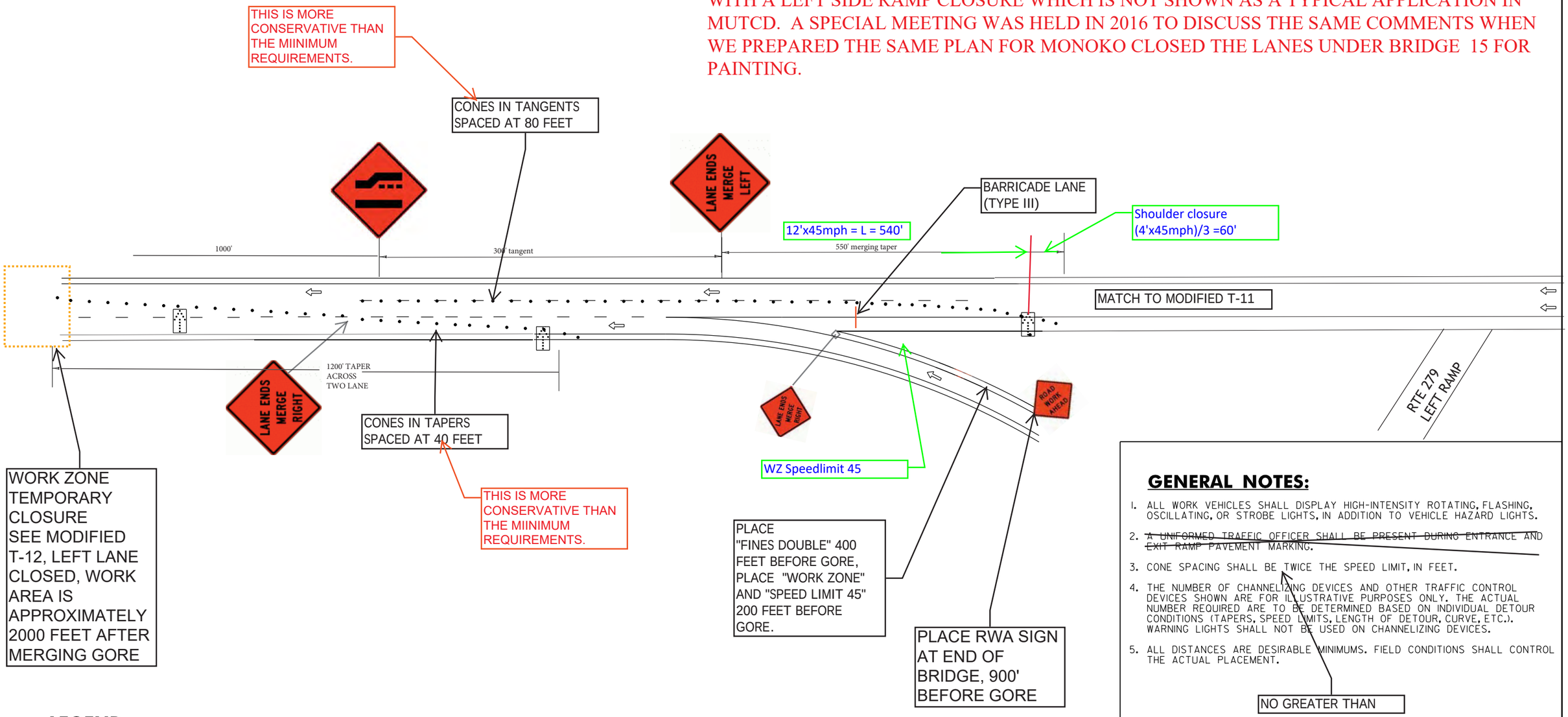
1. ALL WORK VEHICLES SHALL DISPLAY HIGH-INTENSITY ROTATING, FLASHING, OSCILLATING, OR STROBE LIGHTS, IN ADDITION TO VEHICLE HAZARD LIGHTS.
2. ~~A UNIFORMED TRAFFIC OFFICER SHALL BE PRESENT DURING ENTRANCE AND EXIT RAMP PAVEMENT MARKING.~~
3. CONE SPACING SHALL BE TWICE THE SPEED LIMIT, IN FEET.
4. THE NUMBER OF CHANNELIZING DEVICES AND OTHER TRAFFIC CONTROL DEVICES SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. THE ACTUAL NUMBER REQUIRED ARE TO BE DETERMINED BASED ON INDIVIDUAL DETOUR CONDITIONS (TAPERS, SPEED LIMITS, LENGTH OF DETOUR, CURVE, ETC.). WARNING LIGHTS SHALL NOT BE USED ON CHANNELIZING DEVICES.
5. ALL DISTANCES ARE DESIRABLE MINIMUMS. FIELD CONDITIONS SHALL CONTROL THE ACTUAL PLACEMENT.

NO GREATER THAN

OTHER STDS. REQUIRED: **T–1, T–12,**

ADVANCED WARNING SIGNS FOR DAILY RIGHT LANE CLOSURE NORTHBOUND ROUTE 7

NOTE:
THIS IS NOT A DOUBLE LANE CLOSURE ON A FREEWAY. THIS IS A LANE CLOSURE ALONG WITH A LEFT SIDE RAMP CLOSURE WHICH IS NOT SHOWN AS A TYPICAL APPLICATION IN MUTCD. A SPECIAL MEETING WAS HELD IN 2016 TO DISCUSS THE SAME COMMENTS WHEN WE PREPARED THE SAME PLAN FOR MONOKO CLOSED THE LANES UNDER BRIDGE 15 FOR PAINTING.



LEGEND

⇦ FLOW OF TRAFFIC

● RETROREFLECTIVE PLASTIC DRUM **(TAPERS) OTHERWISE CONES**

FLASHING ARROW PANEL

GENERAL NOTES:

1. ALL WORK VEHICLES SHALL DISPLAY HIGH-INTENSITY ROTATING, FLASHING, OSCILLATING, OR STROBE LIGHTS, IN ADDITION TO VEHICLE HAZARD LIGHTS.
2. ~~A UNIFORMED TRAFFIC OFFICER SHALL BE PRESENT DURING ENTRANCE AND EXIT RAMP~~ PAVEMENT MARKING.
3. CONE SPACING SHALL BE TWICE THE SPEED LIMIT, IN FEET.
4. THE NUMBER OF CHANNELIZING DEVICES AND OTHER TRAFFIC CONTROL DEVICES SHOWN ARE FOR ILLUSTRATIVE PURPOSES ONLY. THE ACTUAL NUMBER REQUIRED ARE TO BE DETERMINED BASED ON INDIVIDUAL DETOUR CONDITIONS (TAPERS, SPEED LIMITS, LENGTH OF DETOUR, CURVE, ETC.). WARNING LIGHTS SHALL NOT BE USED ON CHANNELIZING DEVICES.
5. ALL DISTANCES ARE DESIRABLE MINIMUMS. FIELD CONDITIONS SHALL CONTROL THE ACTUAL PLACEMENT.

NO GREATER THAN

OTHER STDS. REQUIRED: **T–1, T–12,**

ADVANCED WARNING SIGNS FOR DAILY LEFT LANE CLOSURE NORTHBOUND ROUTE 7

T - 23

MODIFIED

DAILY CLOSURE PLAN

ON US7 DIVIDED HIGHWAY
NORTHBOUND RIGHT LANE CLOSURE

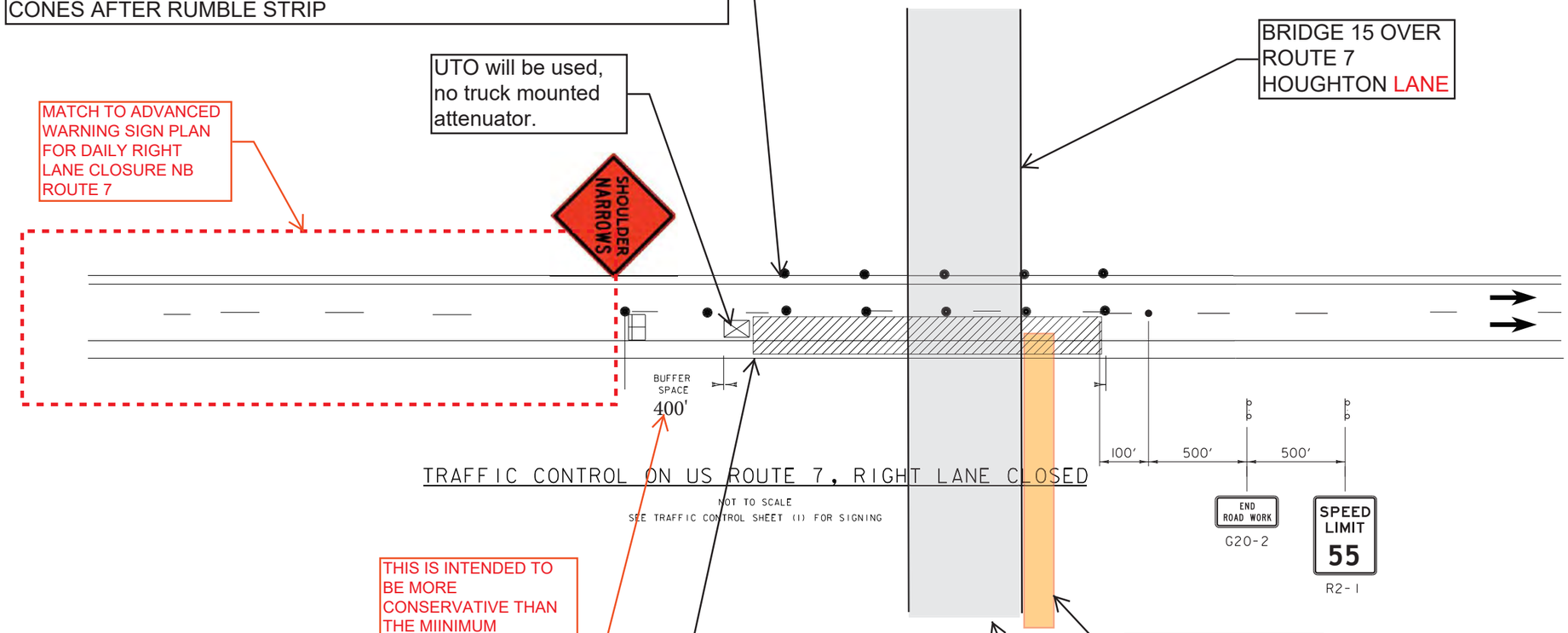
THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

CONES IN TANGENT
(80' Spacing) MAINTAIN AN 11FT LANE AND SHIFT INTO SHOULDER FOR MAXIMUM SPACING AT PIPE CROSING. RUMBLE STRIP ENDS 200FT FROM PIPE CROSSING, BEGIN 2FT SHIFT AND LEFT SIDE CONES AFTER RUMBLE STRIP

UTO will be used, no truck mounted attenuator.

BRIDGE 15 OVER ROUTE 7 HOUGHTON LANE

MATCH TO ADVANCED WARNING SIGN PLAN FOR DAILY RIGHT LANE CLOSURE NB ROUTE 7



TRAFFIC CONTROL ON US ROUTE 7, RIGHT LANE CLOSED

NOT TO SCALE

SEE TRAFFIC CONTROL SHEET (1) FOR SIGNING

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS. THE DEFINITION OF BUFFER MEANS THAT NOTHING WILL BE INSTALLED, PARKED OR PLACED WITHIN THE BUFFER ZONE.

EXCAVATION AREA NOT TO EXCEED 5 FEET INTO TRAVEL LANE. MAINTAIN 6 FEET FROM TEMPORARY LANE IN RIGHT SHOULDER

EQUIPMENT WORK ZONE TO BEGIN 100FT PRIOR TO BRIDGE

BRIDGE 15 OVER ROUTE 7
HOUGHTON LANE
THE TRAFFIC CONTROL PLAN FOR THIS ROAD IS PART OF THE EXISTING PROJECT TCP WHICH INCLUDES USING RWA AND RWA/BE PREPARED TO STOP/FLAGGER AHEAD IF THERE IS A LANE CLOSURE. SIGNS ARE SPACED AT 200FT.

DAILY CLOSURE PLAN

ON US7 DIVIDED HIGHWAY
NORTHBOUND LEFT LANE CLOSURE

BRIDGE 15 OVER ROUTE 7
HOUGHTON LANE
THE TRAFFIC CONTROL PLAN FOR THIS ROAD IS PART OF THE EXISTING PROJECT TCP WHICH INCLUDES USING RWA AND RWA/BE PREPARED TO STOP/FLAGGER AHEAD IF THERE IS A LANE CLOSURE. SIGNS ARE SPACED AT 200FT.

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS. THE DEFINITION OF BUFFER MEANS THAT NOTHING WILL BE INSTALLED, PARKED OR PLACED WITHIN THE BUFFER ZONE.

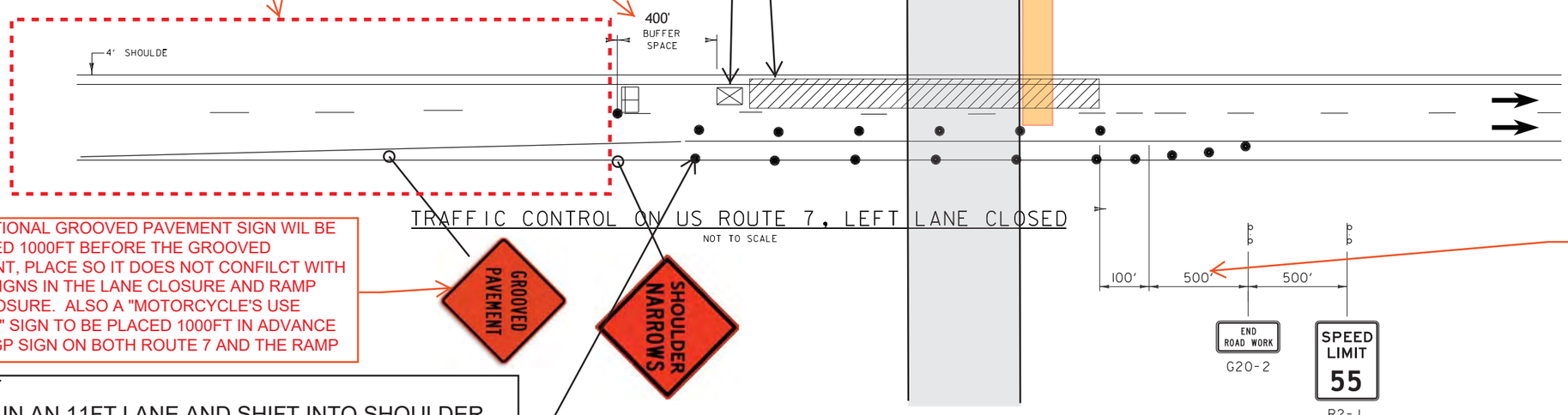
EQUIPMENT WORK ZONE TO BEGIN 100FT PRIOR TO BRIDGE

UTO will be used, no truck mounted attenuator.

EXCAVATION AREA NOT TO EXCEED 5 FEET INTO TRAVEL LANE. MAINTAIN 6 FEET FROM TEMPORARY LANE IN RIGHT SHOULDER

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

MATCH TO ADVANCED WARNING SIGN PLAN FOR DAILY LEFT LANE CLOSURE NB ROUTE 7



TRAFFIC CONTROL ON US ROUTE 7, LEFT LANE CLOSED

NOT TO SCALE

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

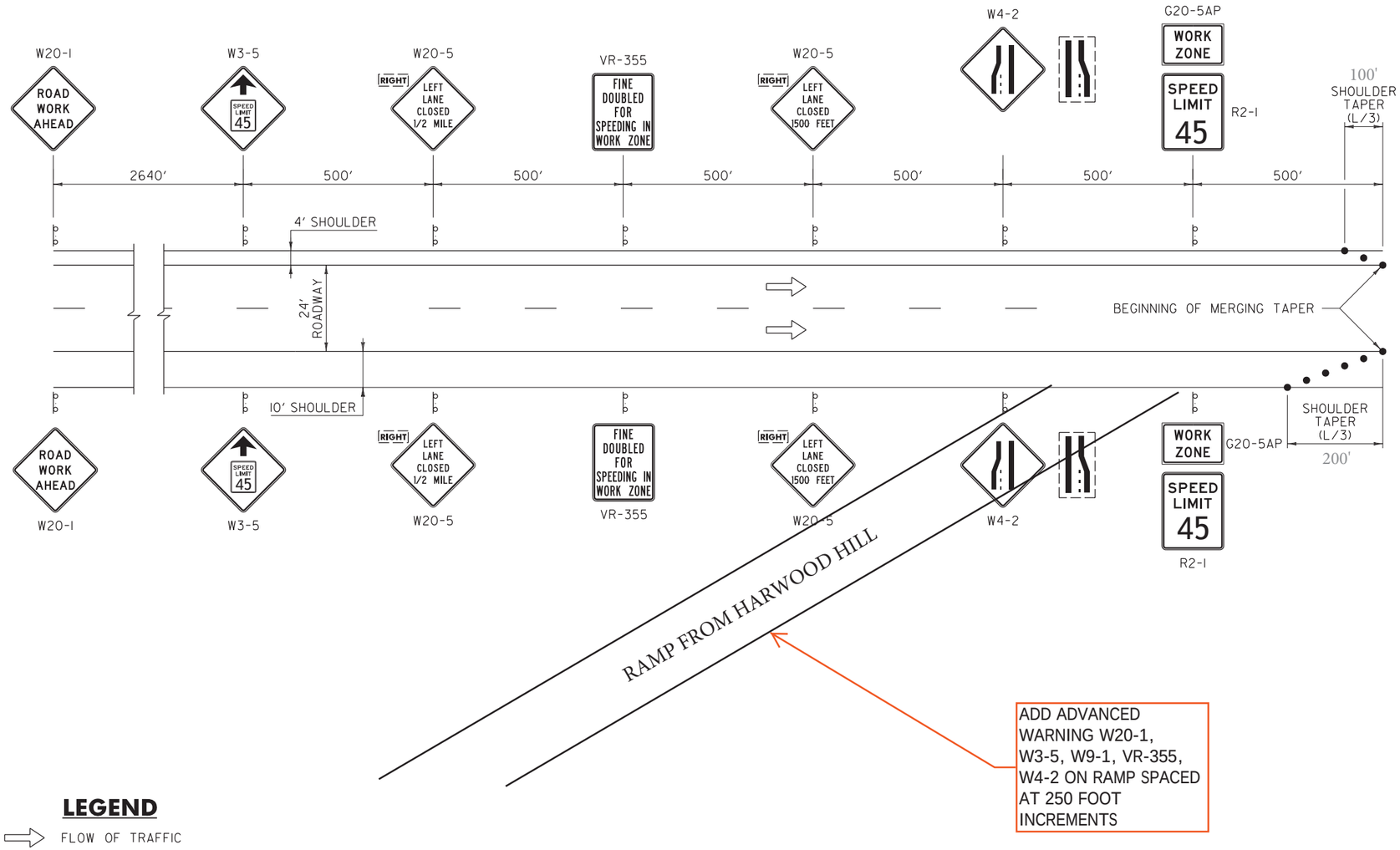
AN ADDITIONAL GROOVED PAVEMENT SIGN WIL BE INSTALLED 1000FT BEFORE THE GROOVED PAVEMENT, PLACE SO IT DOES NOT CONFILCT WITH OTHER SIGNS IN THE LANE CLOSURE AND RAMP LANE CLOSURE. ALSO A "MOTORCYCLE'S USE CAUTION" SIGN TO BE PLACED 1000FT IN ADVANCE OF THE GP SIGN ON BOTH ROUTE 7 AND THE RAMP

CONES IN TANGENT
(80' Spacing) MAINTAIN AN 11FT LANE AND SHIFT INTO SHOULDER FOR MAXIMUM SPACING AT PIPE CROSING. RUMBLES STRIP ENDS 200FT FROM PIPE CROSSING BUT WILL REQUIRE A "GROOVED PAVEMENT" SIGN 200FT WHERE RUMBLE STRIP IS WITHIN LANE

This plan is a mofied T-12

This plan also requires T-11

DAILY ADVANCED SIGN PLAN
SOUTHBOUND U.S. ROUTE 7



LEGEND

⇨ FLOW OF TRAFFIC

● RETROREFLECTIVE PLASTIC DRUM

GENERAL NOTES:

1. IF APPLICABLE, THE CONTRACTOR SHALL HAVE SIGNS FOR CLOSURE OF RIGHT AND LEFT LANES ON PROJECT BEFORE WORK COMMENCES.
2. THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS SHALL ONLY BE USED IF A TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED. THE "SPEED LIMIT XX" (R2-1) AND OTHER RELATED SIGNS SHALL BE REMOVED OR COVERED WHEN WORK IS NOT IN PROGRESS AND ROADWAY IS NOT RESTRICTED.
3. "FINE DOUBLED FOR SPEEDING IN WORK ZONE" (VR-355) SHALL ONLY BE USED IF TEMPORARY SPEED LIMIT CERTIFICATE HAS BEEN APPROVED.
4. EXISTING SPEED LIMIT SIGNS SHALL BE COVERED WHEN TEMPORARY SPEED LIMIT SIGNS ARE POSTED.
5. FOR SHORT TERM PROJECTS (THREE CONSECUTIVE DAYS OR LESS) WITH NO OFFICIAL TEMPORARY SPEED LIMIT, THE "SPEED LIMIT XX" (R2-1) AND "SPEED REDUCTION WARNING" (W3-5) SIGNS MAY BE SUBSTITUTED WITH ADVISORY SPEED PLAQUES (WI3-IP) MOUNTED AS SUPPLEMENTAL SIGNS BELOW THE "LANE ENDS" (W4-2) SIGNS.

8. FOR A SHORT TERM PROJECT (THREE CONSECUTIVE DAYS OR LESS), SIGNS MAY BE POST MOUNTED OR PORTABLE.
9. THE "SPEED LIMIT XX" (R2-1) SOLID SUBSTRATE SIGNS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING AASHTO M 268 [ASTM D 4956] TYPE III.

OTHER STDS. REQUIRED: **T-1, T-12, T-31**

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

CONSTRUCTION APPROACH SIGNING DIVIDED HIGHWAY ONE LANE CLOSED

STANDARD

T-11

DAILY CLOSURE PLAN

ON US7 DIVIDED HIGHWAY
SOUTHBOUND LEFT LANE CLOSURE

BRIDGE 15 OVER ROUTE 7
HOUGHTON LANE
THE TRAFFIC CONTROL PLAN FOR THIS ROAD IS PART OF THE EXISTING PROJECT TCP WHICH INCLUDES USING RWA AND RWA/BE PREPARED TO STOP/FLAGGER AHEAD IF THERE IS A LANE CLOSURE. SIGNS ARE SPACED AT 200FT. NO IMPACTS TO THIS ROAD ARE PLANNED FOR THE CROSSING WORK.

EQUIPMENT WORK ZONE TO BEGIN 100FT PRIOR TO BRIDGE

EXCAVATION AREA NOT TO EXCEED 5 FEET INTO TRAVEL LANE. MAINTAIN 6 FEET FROM TEMPORARY LANE IN RIGHT SHOULDER

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

UTO will be used, no truck mounted attenuator.

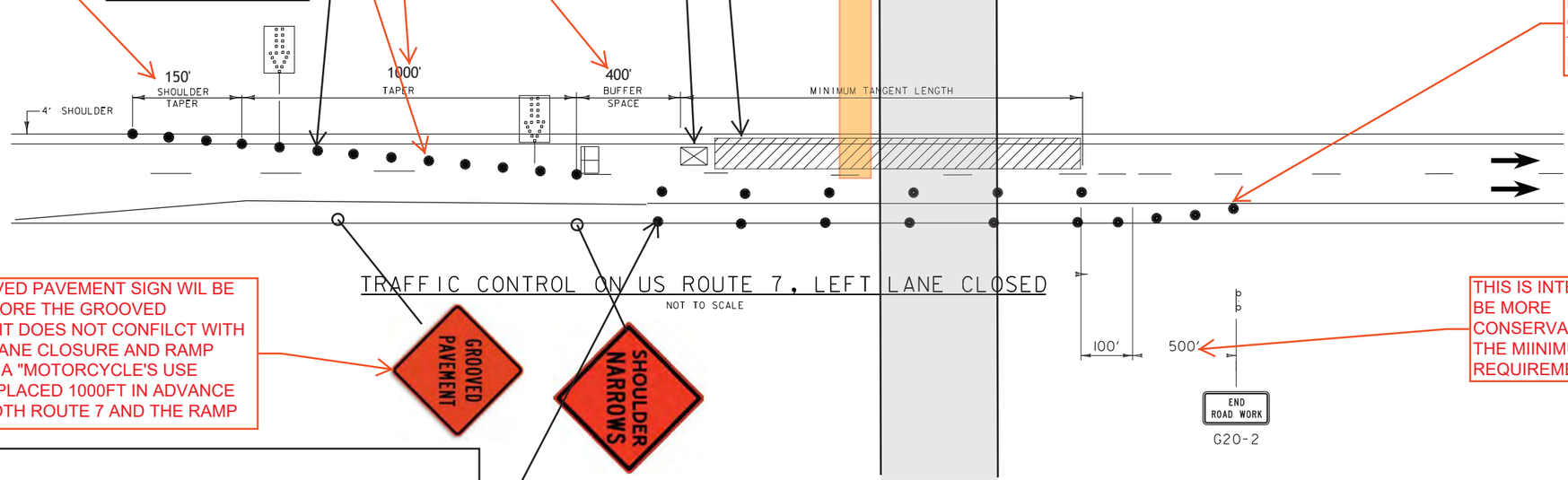
THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

WE ARE ONLY PROPOSING A SINGLE TAPER FOR THE LANE CLOSURE WITH THE LANE SHIFT. THIS IS NOT A 3 LANE HIGHWAY.

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS. THE DEFINITION OF BUFFER MEANS THAT NOTHING WILL BE INSTALLED, PARKED OR PLACED WITHIN THE BUFFER ZONE.

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

Cones in Taper (40' Spacing)



THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

MATCH TO ADVANCED WARNING SIGN PLAN

TRAFFIC CONTROL ON US ROUTE 7, LEFT LANE CLOSED

NOT TO SCALE

AN ADDITIONAL GROOVED PAVEMENT SIGN WIL BE INSTALLED 1000FT BEFORE THE GROOVED PAVEMENT, PLACE SO IT DOES NOT CONFILCT WITH OTHER SIGNS IN THE LANE CLOSURE AND RAMP LANE CLOSURE. ALSO A "MOTORCYCLE'S USE CAUTION" SIGN TO BE PLACED 1000FT IN ADVANCE OF THE GP SIGN ON BOTH ROUTE 7 AND THE RAMP

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

CONES IN TANGENT
(80' Spacing) MAINTAIN AN 11FT LANE AND SHIFT INTO SHOULDER FOR MAXIMUM SPACING AT PIPE CROSING. RUMBLES STRIP WILL BE WITHIN SHIFT AND REQUIRES A "GROOVED PAVEMENT" SIGN.

DAILY CLOSURE PLAN

ON US7 DIVIDED HIGHWAY
SOUTHBOUND RIGHT LANE CLOSURE

CONES IN TANGENT
(80' Spacing) MAINTAIN AN 11FT LANE AND SHIFT INTO SHOULDER FOR MAXIMUM SPACING AT PIPE CROSING. RUMBLE STRIP WILL BE IN EDGE OF SHIFTED LANE. USE GROOVED PAVEMENT SIGN

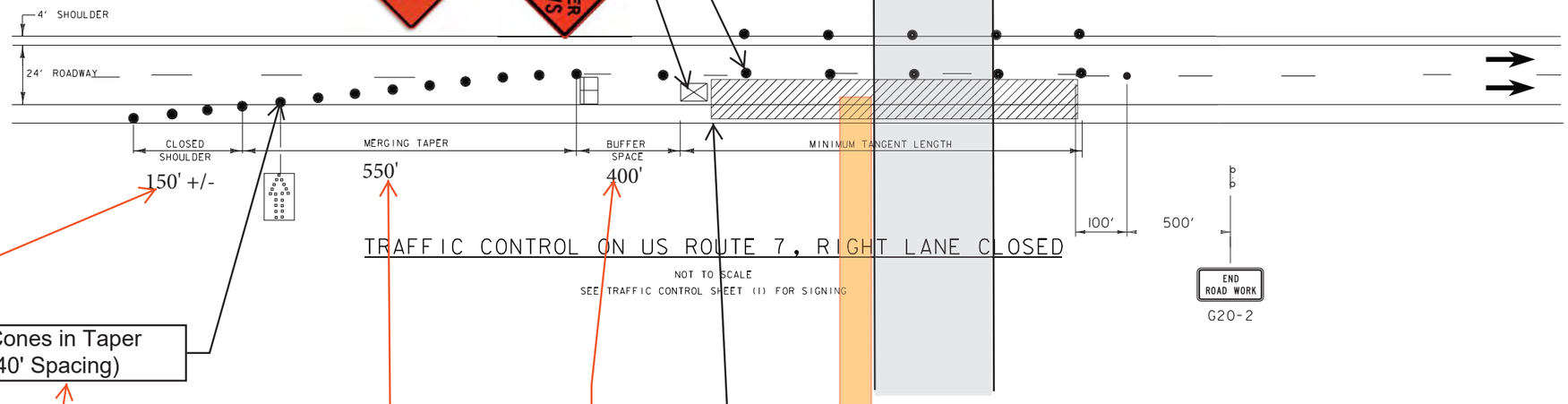
THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

BRIDGE 15 OVER ROUTE 7
HOUGHTON LANE
THE TRAFFIC CONTROL PLAN FOR THIS ROAD IS PART OF THE EXISTING PROJECT TCP WHICH INCLUDES USING RWA AND RWA/BE PREPARED TO STOP/FLAGGER AHEAD IF THERE IS A LANE CLOSURE. SIGNS ARE SPACED AT 200FT. NO IMPACTS TO THIS ROAD ARE PLANNED FOR THE CROSSING WORK.

UTO will be used, no truck mounted attenuator.

AN ADDITIONAL GROOVED PAVEMENT SIGN WIL BE INSTALLED 1000FT BEFORE THE GROOVED PAVEMENT, PLACE SO IT DOES NOT CONFILCT WITH OTHER SIGNS IN THE LANE CLOSURE AND RAMP LANE CLOSURE. ALSO A "MOTORCYCLE'S USE CAUTION" SIGN TO BE PLACED 1000FT IN ADVANCE OF THE GP SIGN ON BOTH ROUTE 7 AND THE RAMP

MATCH ADVANCED WARNING SIGN PLAN



TRAFFIC CONTROL ON US ROUTE 7, RIGHT LANE CLOSED

NOT TO SCALE
SEE TRAFFIC CONTROL SHEET (1) FOR SIGNING

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

Cones in Taper (40' Spacing)

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS.

THIS IS INTENDED TO BE MORE CONSERVATIVE THAN THE MIINIMUM REQUIREMENTS. THE DEFINITION OF BUFFER MEANS THAT NOTHING WILL BE INSTALLED, PARKED OR PLACED WITHIN THE BUFFER ZONE.

EXCAVATION AREA
NOT TO EXCEED 5 FEET INTO TRAVEL LANE. MAINTAIN 6 FEET FROM TEMPORARY LANE IN RIGHT SHOULDER

EQUIPMENT WORK ZONE TO BEGIN 100FT PRIOR TO BRIDGE

Appendix A – Supporting Information

Sign Details

TYPICAL SIGN STAND -1

Series 24000

LITTLE BUSTER SIGN STAND

PRODUCT INFORMATION

- Step-n-Drop leg feature enables you to quickly set-up the stand without having to bend over or stoop down. Simply place your foot on the release levers, step down and two legs will drop into position
- Dual spring sign stand is designed to hold 30”, 36” and 48” aluminum, wood or roll up signs in high wind conditions
- All steel construction with powder coated paint to resist rusting
- Rigid signs can achieve bottom heights of 12 to 18 inches. Roll up signs can achieve bottom heights of 12 inches to 5 feet and a 7 foot height can be achieved with optional 77 inch inner mast (RU7)
- A two position leg adjustment allows all four legs to be individually adjusted for uneven terrain
- Ideal for both roll up and rigid signs for city, utility and highway applications
- NCHRP-350 approved when used with Safe Sleeve-350 for .080 aluminum signs
- NCHRP-350 approved with roll up signs and plastic Safe Sign 350

TrafFix Devices, Inc. 160 Ave. La Pata, San Clemente, CA 92673 (949) 361-5663 Fax (949) 361-9205
www.traffixdevices.com

Series 60000

BIG BUSTER SIGN STAND

PRODUCT INFORMATION

- Step-n-Drop leg feature enables you to quickly set-up the stand without having to bend over or stoop down. Simply place your foot on the release levers, step down and two legs will drop into position
- Dual spring sign stand is designed to hold 30”, 36” and 48” aluminum, wood or roll up signs in high wind conditions
- The legs and telescoping mast are made of lightweight aluminum to reduce carrying weight
- Rigid signs can achieve bottom heights of 12 inches to 5 feet and roll up signs can achieve bottom heights from 12 inches to 7 feet
- A two position leg adjustment allows all four legs to be individually adjusted for uneven terrain
- Ideal for both roll up or rigid signs for highway applications
- NCHRP-350 approved for rigid signs at a 5 foot bottom height and with roll up signs and plastic Safe Sign 350

TrafFix Devices, Inc. 160 Ave. La Pata, San Clemente, CA 92673 (949) 361-5663 Fax (949) 361-9205
www.traffixdevices.com

TYPICAL SIGN STAND - 2

93000 Series

TRI-BUSTER SIGN STAND

PRODUCT INFORMATION

- Constructed of corrosion resistant heavy duty galvanized tubing and can be folded for compact storage
- Accommodates 48” x 48” or smaller; plywood, aluminum, aluminum poly laminate, plastic and roll up sign materials
- Three leg design is very stable in windy conditions. Ballasting hook allows sand bags or weights to be hung from sign stand for added stability
- Safety engineered with guards to protect fingers from dangerous “pinch points”
- Optional roll-up sign bracket and leg extending leveling kit may be ordered to enhance Tri-Busters performance
- NCHRP 350 approved with rigid and roll up signs

TrafFix Devices, Inc. 160 Ave. La Pata, San Clemente, CA 92673 (949) 361-5663 Fax (949) 361-9205
www.traffixdevices.com

Appendix B –Standard Sheets (Not Modified)

T-1 – Traffic Control General Notes.

T-17 – Traffic Control Miscellaneous Details.

T-28 – Construction Sign Details.

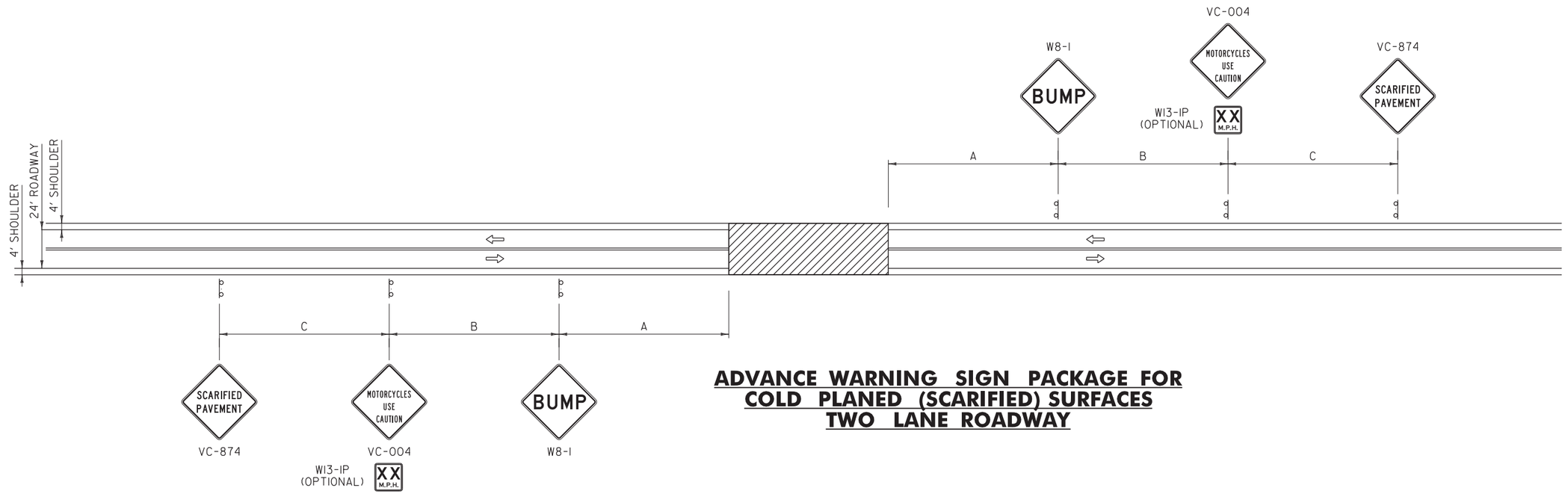
T-29 – Construction Sign Details.

T-30 – Construction Sign Details.

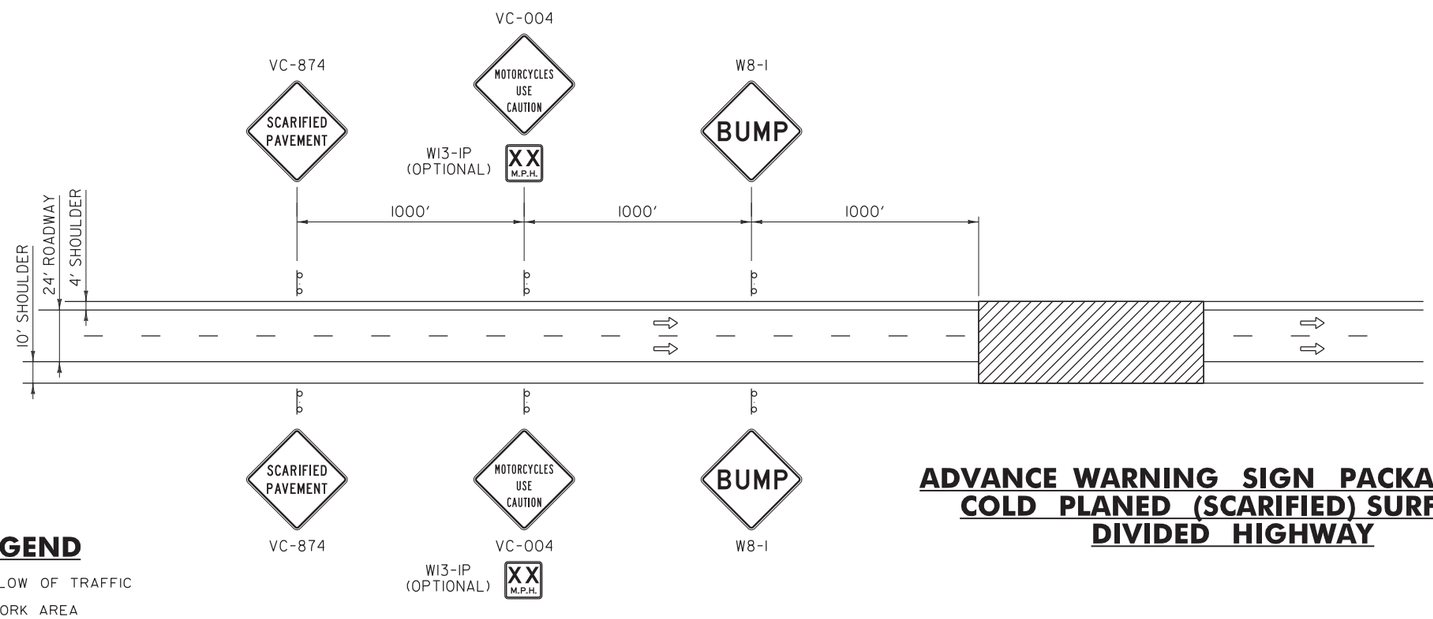
T-31 – Construction Sign Details.

T-35 – Construction Zone Longitudinal Drop offs.

T-36 – Construction Zone Longitudinal Drop Off's for Paving.



ADVANCE WARNING SIGN PACKAGE FOR COLD PLANED (SCARIFIED) SURFACES TWO LANE ROADWAY



ADVANCE WARNING SIGN PACKAGE FOR COLD PLANED (SCARIFIED) SURFACES DIVIDED HIGHWAY

LEGEND

⇨ FLOW OF TRAFFIC

WORK AREA

GENERAL NOTES:

1. THE BUMP SIGN MAY BE ELIMINATED WHEN THERE IS NO BUMP. WHEN THE CONTRACTOR IS WORKING IN THE CONSTRUCTION AREA, THE APPROPRIATE ADVANCED WARNING SIGN PACKAGE SHALL BE USED. SEE THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) FOR ADDITIONAL INFORMATION.
2. GATE POSTING OF SIGNS IS AN OPTION AS DETERMINED BY THE ENGINEER FOR TWO LANE ROADWAY WHEN PASSING, TURNING OR CLIMBING LANES LIMIT VISIBILITY.
3. FOR DIMENSIONS A, B AND C, REFER TO THE MUTCD. USE TABLE 6C-1 (RECOMMENDED ADVANCE WARNING SIGN MINIMUM SPACING), FOR SIGN SPACING.

OTHER STDS. REQUIRED: T–1, T–28

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

Mark D. Richter

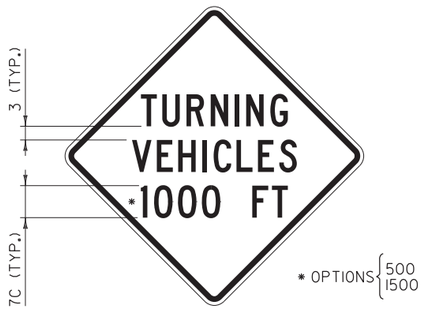
FEDERAL HIGHWAY ADMINISTRATION

TRAFFIC CONTROL MISCELLANEOUS DETAILS

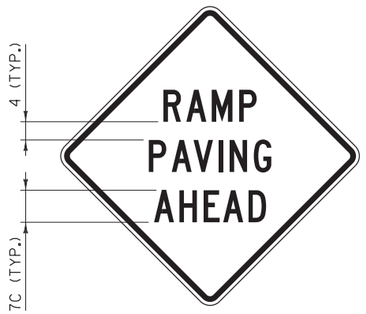
VERMONT AGENCY OF TRANSPORTATION

STANDARD

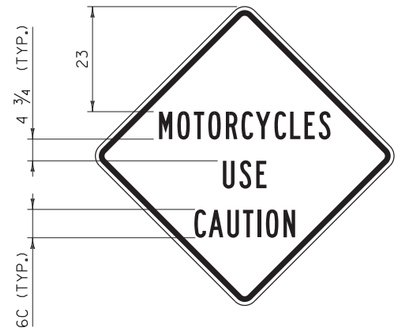
T-17



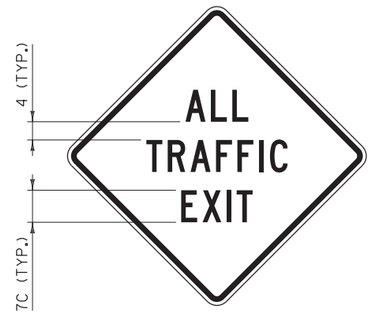
VC–001



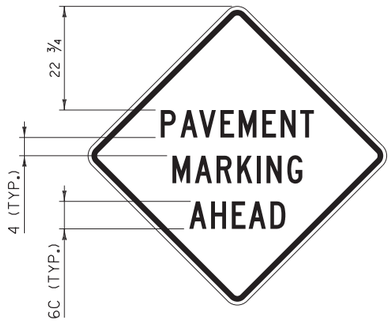
VC–003



VC–004



VC–008



VC–813

VC–869

VC–874

GENERAL NOTES:

1. COLORS FOR SIGNS SHALL BE BLACK LEGEND AND BORDER ON FLUORESCENT ORANGE BACKGROUND.
2. CONSTRUCTION SIGNS SHALL BE 48 INCH BY 48 INCH. IF SOLID SUBSTRATE SIGNS ARE USED, SIGNS SHALL HAVE CORNERS ROUNDED TO A THREE INCH RADIUS.
3. SIGNS SHALL HAVE 1 1/4 INCH WIDE BORDERS THAT ARE INDENTED 3/4 INCH FROM THE EDGE OF THE SIGN.
4. SIGNS SHALL HAVE THE LEGEND CENTERED HORIZONTALLY AND VERTICALLY ON THE SIGN UNLESS OTHERWISE INDICATED.
5. ALL DIMENSIONS SHOWN IN INCHES.

OTHER STDS. REQUIRED: T–1

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

Mark D. Richter

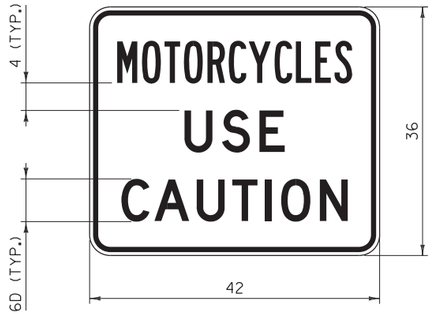
FEDERAL HIGHWAY ADMINISTRATION

CONSTRUCTION SIGN DETAILS

VERMONT AGENCY OF TRANSPORTATION

STANDARD

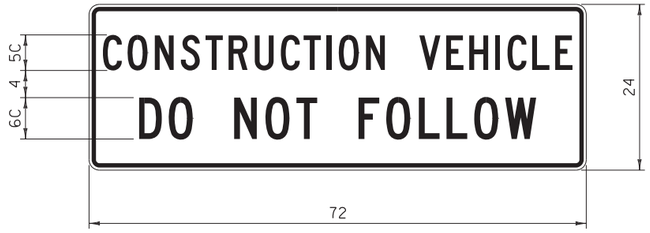
T-28



VC–004P

NOTES:

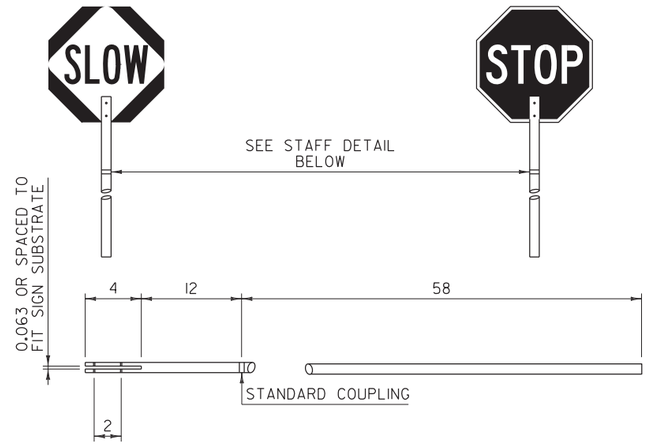
1. CORNERS SHALL BE ROUNDED TO A THREE INCH RADIUS.
2. THE BORDER SHALL BE ¾ INCH WIDE WITH A ½ INCH INDENT FROM THE EDGE OF THE SIGN.
3. "MOTORCYCLES" SHALL HAVE A SPECIFIED WIDTH OF 34 INCHES.
4. "USE" SHALL HAVE A SPECIFIED WIDTH OF 14 ½ INCHES.
5. "CAUTION" SHALL HAVE A SPECIFIED WIDTH OF 32 ¾ INCHES.
6. SIGN SHALL ONLY BE INSTALLED AS A SUPPLEMENTAL TO A PARENT WARNING SIGN AND SHALL NOT BE INSTALLED BY ITSELF.



VC–007

NOTES:

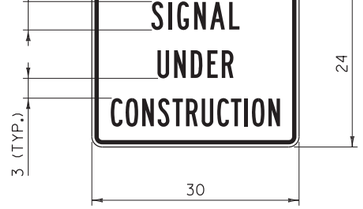
1. CORNERS SHALL BE ROUNDED TO A 1½ INCH RADIUS.
2. THE BORDER SHALL BE ⅝ INCH WIDE WITH A ⅜ INCH INDENT FROM THE EDGE OF THE SIGN.
3. "CONSTRUCTION VEHICLE" SHALL HAVE A SPECIFIED WIDTH OF 68 INCHES.
4. "DO NOT FOLLOW" SHALL HAVE A SPECIFIED WIDTH OF 57 ½ INCHES.
5. SIGN SHALL BE MOUNTED IN A CONSPICUOUS LOCATION ON THE REAR OF THE CONSTRUCTION VEHICLE.
6. THE SIGN SHALL BE MOUNTED AS NOT TO INTERFERE WITH THE VISIBILITY OF DIRECTIONAL SIGNALS OR TAIL LIGHTS AS REQUIRED BY LAW.
7. SIGN SHALL BE COVERED OR REMOVED WHEN NOT IN USE.



STOP–SLOW PADDLE & STAFF DETAIL

NOTES:

1. REFER TO THE "STANDARD HIGHWAY SIGNS AND MARKINGS" BOOK (SHSM) "TEMPORARY TRAFFIC CONTROL - WARNING SIGNS" FOR THE STOP-SLOW PADDLE DESIGN.
2. COLORS FOR THE SLOW SIDE OF THE PADDLE SHALL BE BLACK LEGEND AND BORDER ON A FLUORESCENT ORANGE DIAMOND WITH RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING AASHTO M 268 [ASTM D 4956] TYPE VII, VIII OR IX REQUIREMENTS.
3. COLORS FOR THE STOP SIDE OF THE PADDLE SHALL BE WHITE RETROREFLECTIVE LEGEND AND BORDER ON A RED RETROREFLECTIVE OCTAGON. BOTH COLORS SHALL HAVE RETROREFLECTIVE SHEETING EQUAL TO OR EXCEEDING AASHTO M 268 [ASTM D 4956] TYPE III.
4. SIGN SUBSTRATE MATERIALS SHALL BE ALUMINUM, ACRYLONITRILE BUTADIENE STYRENE (ABS) PLASTIC OR EQUIVALENT.
5. THE STAFF MAY BE RIGID ABS PLASTIC OR WOOD WITH A ONE TO 1½ INCH DIAMETER.
6. SIGNS SHALL BE MAINTAINED IN A CLEAN AND LEGIBLE CONDITION SATISFACTORY TO THE ENGINEER. THEY SHALL BE COMPLETELY VISIBLE TO APPROACHING TRAFFIC AT ALL TIMES. THEY SHALL BE KEPT PLUMB AND LEVEL, AND ALWAYS PRESENT A NEAT APPEARANCE. DAMAGED, DEFACED OR DIRTY SIGNS SHALL BE REPAIRED, CLEANED OR REPLACED AS ORDERED BY THE ENGINEER.



VC–820

NOTES:

1. CORNERS SHALL BE ROUNDED TO A 1½ INCH RADIUS.
2. THE BORDER SHALL BE ⅝ INCH WIDE WITH A ⅜ INCH INDENT FROM THE EDGE OF THE SIGN.
3. "SIGNAL" SHALL HAVE A SPECIFIED WIDTH OF 12 ¾ INCHES.
4. "UNDER" SHALL HAVE A SPECIFIED WIDTH OF 11 INCHES.
5. "CONSTRUCTION" SHALL HAVE A SPECIFIED WIDTH OF 24 ½ INCHES.
6. SIGN SHALL ONLY BE INSTALLED AS A SUPPLEMENTAL TO A PARENT WARNING SIGN AND SHALL NOT BE INSTALLED BY ITSELF.

GENERAL NOTES:

1. ALL LEGEND SHALL BE CENTERED VERTICALLY AND HORIZONTALLY UNLESS OTHERWISE NOTED.
2. COLORS FOR SIGNS SHALL BE BLACK LEGEND AND BORDER ON FLUORESCENT ORANGE BACKGROUND UNLESS OTHERWISE NOTED.
3. ALL DIMENSIONS IN INCHES.

OTHER STDS. REQUIRED: T–1

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

Mark D. Richter

FEDERAL HIGHWAY ADMINISTRATION

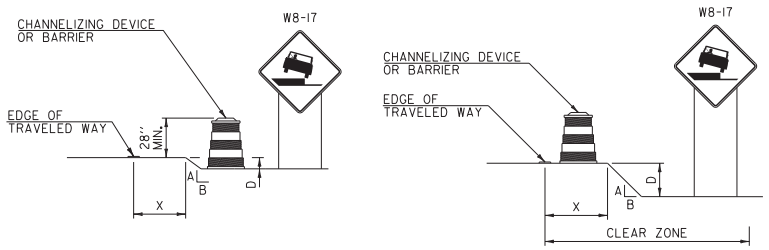
CONSTRUCTION SIGN DETAILS

VERMONT AGENCY OF TRANSPORTATION

STANDARD

T-30

DROP-OFF ADJACENT TO TRAVELED WAY

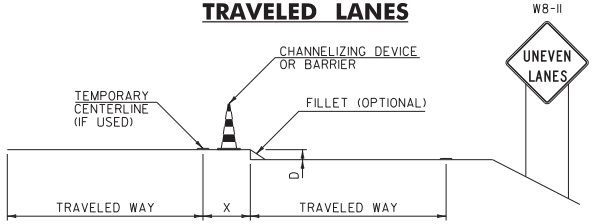


TYPE 1 **TYPE 2**

NOTES:

1. CHANNELIZING DEVICES OR BARRIER SHOULD BE PLACED TO MAXIMIZE THE WIDTH OF THE TRAVELED WAY.
2. SEE CHART "A" FOR SPECIFIC REQUIREMENTS.
3. IF THE DROP-OFF REQUIRES CHANNELIZING DEVICES TO REMAIN IN PLACE OVERNIGHT, THEN "SHOULDER DROP-OFF SYMBOL" (W8-17) SIGNS SHOULD BE INSTALLED.

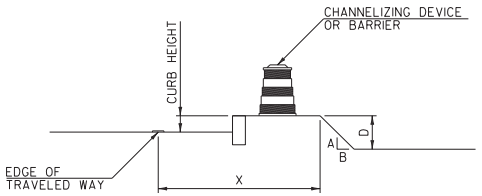
DROP-OFF BETWEEN ADJACENT TRAVELED LANES



NOTES:

1. WHENEVER A LONGITUDINAL DROP-OFF BETWEEN ADJACENT TRAVELED LANES IS TO BE LEFT OVERNIGHT, THEN "UNEVEN LANES" (W8-11) SIGNS AND CHANNELIZING DEVICES SHOULD BE INSTALLED.
2. IF REQUIRED, THE CHANNELIZING DEVICES USED SHOULD BE THOSE WHICH MAXIMIZE THE WIDTH OF THE TRAVELED LANE (I.E. CONES, VERTICAL PANELS OR TUBULAR MARKERS).
3. A BITUMINOUS CONCRETE FILLET WITH A 1.5:1 SLOPE MAY BE USED IN PLACE OF CHANNELIZING DEVICES, HOWEVER THE "UNEVEN LANES" (W8-11) SIGNS SHOULD STILL BE INSTALLED.
4. SEE CHART "A" FOR SPECIFIC REQUIREMENTS.

DROP-OFF BEYOND SHOULDER OR CURB



NOTES:

1. USE CHART "A" FOR VERTICAL CURBS UNDER SIX INCHES, MOUNTABLE CURBS OR ROADWAYS WITH A POSTED SPEED ABOVE 40 MPH.
2. USE CHART "B" FOR VERTICAL CURBS SIX INCHES OR GREATER.

CHART "A"
ALL SPEEDS WITH NO CURB OR MOUNTABLE CURB

X (FEET)	DROP (D) (INCHES)	A:B SLOPE	RECOMMENDED DEVICE
0 TO 4'	LESS THAN 2"	ANY	NONE
	2" TO 6"	1:1.5 OR FLATTER	NONE
		STEEPER THAN 1:1.5	CHANNELIZING DEVICE
	GREATER THAN 6"	1:3 OR FLATTER	NONE
		STEEPER THAN 1:3	BARRIER
4' TO 10'	LESS THAN 6"	ANY	NONE
	6" TO 12"	1:3 OR FLATTER	NONE
		STEEPER THAN 1:3	BARRIER
	GREATER THAN 12"	1:3 OR FLATTER	NONE
		STEEPER THAN 1:3	BARRIER
10' TO CZ	LESS THAN OR EQUAL TO 12"	ANY	NONE
	GREATER THAN 12"	1:3 OR FLATTER	NONE
		STEEPER THAN 1:3	BARRIER

NOTES:

1. THE MINIMUM CLEAR ZONE FOR FREEWAYS IS TO BE DETERMINED PER THE CURRENT AASHTO ROADSIDE DESIGN GUIDE. ALL OTHER HIGHWAYS WILL BE DETERMINED PER THE CURRENT "VERMONT STATE STANDARDS" BOOK.
2. CHANNELIZING DEVICES MAY BE USED INSTEAD OF BARRIER FOR SHORT TERM OPERATIONS.
3. ON BORDERLINE CONDITIONS, THE ENGINEER SHOULD DETERMINE WHICH TREATMENT IS ADEQUATE FOR THE EXISTING CONDITIONS.

CHART "B"
40 MPH OR LESS WITH VERTICAL CURB

X (FEET)	DROP (D) (INCHES)	DEVICE REQUIRED
0-10'	LESS THAN OR EQUAL TO 12"	NONE
0-10'	GREATER THAN 12"	CHANNELIZING DEVICE
GREATER THAN 10'	ANY	NONE

GENERAL NOTES:

1. THESE CONDITIONS AND TREATMENTS ARE ONLY PART OF THE TRAFFIC CONTROL SYSTEM AND SHOULD BE USED IN ADDITION TO THE PROPER WORK ZONE SIGNING.
2. THE FOLLOWING ARE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) COMPLIANT CHANNELIZING DEVICES:

   A. VERTICAL PANEL
   B. TYPE I OR TYPE II BARRICADE
   C. PLASTIC DRUM
   D. CONE - WHERE APPLICABLE
   E. TUBULAR MARKERS

   IF CHANNELIZING DEVICES ARE REQUIRED TO STAY IN PLACE DURING NIGHTTIME HOURS, THEY SHALL BE STABILIZED WHILE UNATTENDED IN ACCORDANCE WITH THE MUTCD.
3. WHERE BARRIER IS NECESSARY, THE BARRIER SHALL BE TAPERED BEYOND THE CLEAR ZONE. WHEN THE BARRIER CANNOT BE TAPERED BEYOND THE CLEAR ZONE, A MUTCD COMPLIANT END TREATMENT SHALL BE USED. BARRIER AND END TREATMENT SHALL MEET "NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM" (NCHRP) REPORT 350 OR THE "AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS" (AASHTO) "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH). THE APPROPRIATE RESOURCE SHALL BE DETERMINED AS DESCRIBED IN THE MASH PUBLICATION.
4. CHANNELIZING DEVICE SPACING ALONG A LONGITUDINAL DROP-OFF (TANGENT) SHALL BE AS FOLLOWS:

   TANGENT - CHANNELIZING DEVICES SHALL BE SPACED "2S" ("S" IS EQUAL TO THE POSTED SPEED LIMIT IN FEET) APART.
5. "LOW SHOULDER" (W8-9) AND "SHOULDER DROP-OFF SYMBOL" (W8-17) SIGNS, WHEN USED, SHOULD BEGIN PRIOR TO THE DROP-OFF CONDITION AND SHOULD BE REPEATED EVERY 1500 FEET.

OTHER STDS. REQUIRED: T-1

REVISIONS AND CORRECTIONS

AUG. 6, 2012 - ORIGINAL APPROVAL DATE

APPROVED

HIGHWAY SAFETY & DESIGN ENGINEER

DIRECTOR OF PROGRAM DEVELOPMENT

Mark B. Richter

FEDERAL HIGHWAY ADMINISTRATION

CONSTRUCTION ZONE LONGITUDINAL DROP-OFFS

VERMONT AGENCY OF TRANSPORTATION

STANDARD

T-35