Memorandum

To: David Upson, Town of Hardwick

From: Jessica Louisos, PE, SLR

Date: 12/6/2022

Subject: North Main Street Stormwater Improvements, Operation and Maintenance Information

A water quality improvement project was constructed at 64 North Main Street including three pre-treatment separator units and underground infiltration chambers.

Redline plans dated 12/2/2022 document post-construction conditions (attached).

This memo and attachments provide additional details and recommendations from the product manufacturers to accompany and provide background for the "Operation and Maintenance Plan" and "Operation and Maintenance Agreement" filed with Vermont Department of Environmental Conservation.

Short term and long-term operation and maintenance are critical to the ongoing success of an underground treatment system to meet expected water quality goals and allow the units to last for their full design life. Operation and maintenance of the treatment system should follow the manufacturer maintenance guides (attached). The primary recommendations follow:

- Set a regular inspection schedule. Use a measuring tool or rod to record sediment accumulation. Keep a record of sediment depth captured in the system and when maintenance is performed.
- During the first year of operation, inspect the sediment accumulated in the unit after each large storm (e.g., larger than 1 inch of precipitation), or at a minimum each quarter to set a baseline for future years.
- During following years, consider reducing the inspection schedule to a minimum of two times per year, once in the spring and once in the fall. If monitoring during the first year indicates that this schedule will be sufficient to ensure sediment accumulation is less than 50% of the capacity between cleanouts. Additionally, inspect the system after any storm with more than 2.5 inches of rainfall in 24 hours.
- During inspections make sure all inlet grates and outlet areas are unclogged and erosion is not taking place. Remove debris and stabilize as necessary.
- Clean out sediment when it is accumulated to more than 12 inches in either the pre-treatment separators or the CMP detention system. Use a vacuum truck to suck material out of the sediment areas. Skim floating debris off of the water.

- If salting agents are observed accumulated in the CMP pipe, rinse the piping.
- Entry into the units is typically not required for maintenance. If entry does become required, all liquid should be evacuated prior to entry. Confined space entry procedures must be followed if the unit is entered.
- Dispose of sediments removed from the system according to state and local regulation. Sediment should be used or placed so it will not be reintroduced to stormwater runoff.

Drawings: W:\CAD\DESIGN\14658.00008-DE\CAD\NM-TITLE.DWG Layout: Tab1:11X17-TITLE

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

CONSTRUCTION PLANS
FEBRUARY 18, 2022
POST-CONSTRUCTION PLANS - DECEMBER 2, 2022

POST CONSTRUCTION CONDITIONS DENOTED IN RED

LIST OF DRAWINGS:

- 01 - TITLE PAGE & PROJECT LOCATION
- 02 - NOTES & LEGEND
- 03 - SITE PLAN - EXISTING CONDITIONS
- 04 - SITE PLAN - PROPOSED CONDITIONS
- 05 - SITE PLAN - LAYOUT
- 06 - SITE PLAN - GRADING
- 07 - SITE PLAN - CONSTRUCTION ACCESS & EROSION CONTROL
- 08 - PROFILE
- 09 - DETAILS - EROSION CONTROL
- 10 - DETAILS - SITE
- 11 - DETAILS - CASCADE SEPARATOR
- 12-15 - DETAILS - DETENTION SYSTEM
- 16 - DETAILS - STORMCEPTOR
- 17 - DETAILS - TESTPITS

PROJECT PARTNERS

- Caledonia County Natural Resources Conservation District
  481 Summer Street, Suite 202
  St. Johnsbury, Vermont 05819

  Town of Hardwick
  P.O Box 523
  Hardwick, Vermont 05843

  Isaac Jacobs (Landowner)
  Craftsbury Common, Vermont 05827

  Ecosystem Restoration Program
  Vermont Department of Environmental Conservation
  Montpelier, Vermont 05620

CONSTRUCTION COMPLETED BY:
DESROCHES CONSTRUCTION SERVICES, INC.

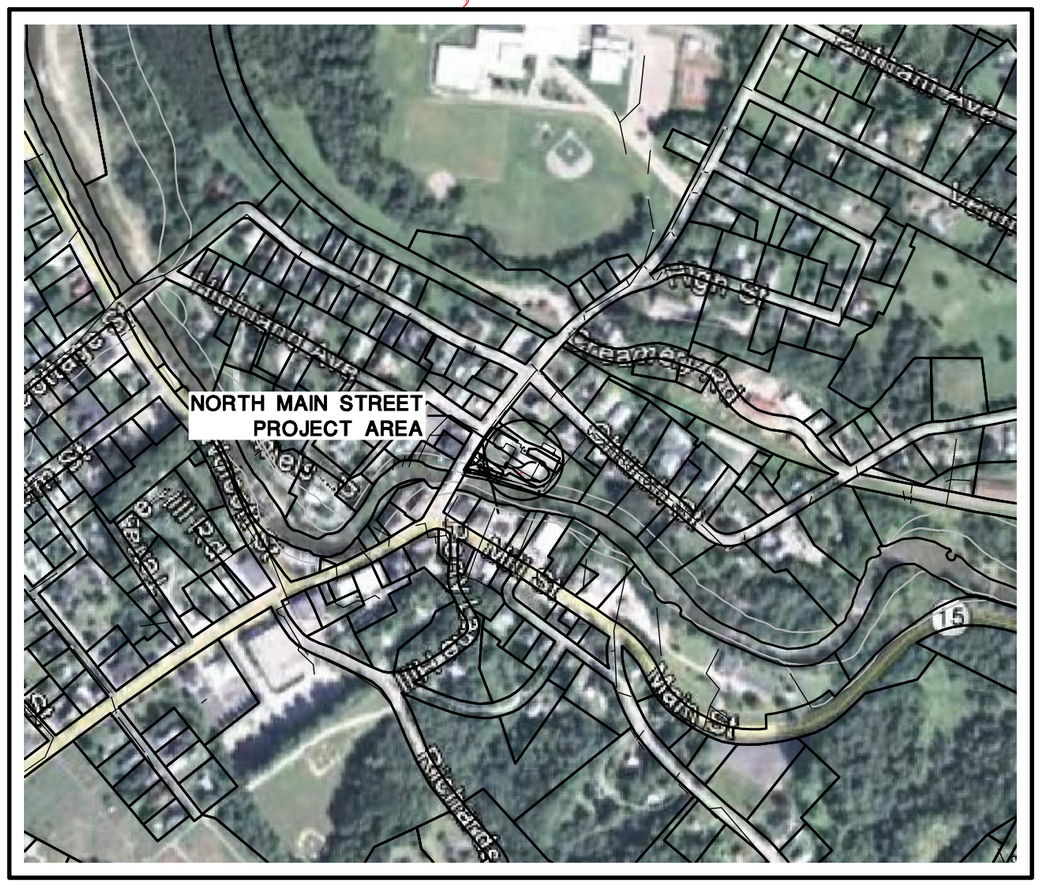
CONSTRUCTION OVERSIGHT BY:
SLR INTERNATIONAL CORPORATION

CONSTRUCTION PROJECT MANAGEMENT:
CALENDONIA COUNTY NRCD

PROJECT IMPLEMENTATION FUNDING:
VTDEC'S CLEAN WATER INITIATIVE, BLOCK GRANT

PREPARED BY:

- SLR Consulting (formerly Milone & MacBroom, Inc.)
  1 South Main Street, 2nd Floor
  Waterbury, Vermont 05676



PROJECT SITE VICINITY MAP:

1"=500'

Plotted by: JLOUSOS On this date: Fri, 2022 December 2 - 11:45am

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CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL DESIGNATE A SUPERINTENDENT AT THE START OF CONSTRUCTION AND THE CONTRACTOR'S SUPERINTENDENT SHALL BE ON-SITE AT ALL TIMES DURING CONSTRUCTION. THE CONTRACTOR AND HIS/HER JOB SUPERINTENDENT SHALL BE RESPONSIBLE FOR COMPLYING WITH THE JOB SPECIFICATIONS AND PERMIT REQUIREMENTS.

2. ALL DIMENSIONS AND ELEVATIONS SHALL BE VERIFIED IN THE FIELD PRIOR TO CONSTRUCTION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE PROJECT ENGINEER FOR DETERMINATION. THE CONTRACTOR IS EXPECTED TO PROVIDE FIELD ENGINEERING SERVICES DURING CONSTRUCTION TO ESTABLISH AND RECORD GRADES, LINES, AND ELEVATIONS.

3. THE LOCATION OF ALL EXISTING UTILITIES SHOULD BE CONFIRMED PRIOR TO BEGINNING CONSTRUCTION. CALL "DIG SAFE" AT 1-888-DIG-SAFE (344-7233). THE CONTRACTOR SHALL TAKE PRECAUTIONS NOT TO DISTURB EXISTING UTILITIES.

4. CONTRACTOR MUST COMPLY WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL PERMITS AND REGULATIONS THROUGHOUT DURATION OF PROJECT. COMPLIANCE WITH ALL CONDITIONS OF APPLICABLE AND SECURED PERMITS IS THE RESPONSIBILITY OF BOTH THE CONTRACTOR AND THE PERMITTEE. COPIES OF ALL PERMITS AND AUTHORIZATIONS SHALL BE MAINTAINED ON THE PROJECT SITE BY THE CONTRACTOR THROUGHOUT CONSTRUCTION.

5. THE CONSTRUCTION CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTION SURVEY LAYOUT. FINAL LOCATION OF THE PROPOSED MANHOLES, HYDRODYNAMIC SEPARATORS, AND LIMITS OF THE UNDERGROUND CHAMBERS SHALL BE CONFIRMED IN THE FIELD BY PROJECT ENGINEER PRIOR TO CONSTRUCTION.

6. ALL PROPOSED GRADES AND SPOT ELEVATIONS IN PLAN VIEW INDICATE FINISHED GRADE. THE NEED TO MODIFY PROPOSED FINISHED GRADES MAY BE REQUIRED IF UNEXPECTED CONDITIONS ARE ENCOUNTERED (E.G., BEDROCK, LEDGE, ETC.) OR IF SIGNIFICANT CHANGES TO EXISTING CONDITIONS OCCURS. CONSULT PROJECT ENGINEER FOR CHANGES.

7. NO DISTURBANCE BEYOND THE ESTABLISHED LIMITS OF CLEARING IS ALLOWED UNLESS PRIOR PERMISSION IS OBTAINED FROM THE PROJECT ENGINEER.

8. ALL STORAGE AND ACCESS ROUTES, PEDESTRIAN FENCES/BARRIERS, WORKING HOURS, AND LIMITS OF CLEARING SHALL BE FLAGGED BY CONTRACTOR PRIOR TO CONSTRUCTION AND APPROVED BY TOWN, AND PROJECT ENGINEER.

9. ALL EQUIPMENT USED IN OR NEAR TO THE WATER SHALL HAVE TIGHT SEALS, AND SHALL NOT POLLUTE THE WATER. NO CONSTRUCTION VEHICLES SHALL BE STORED, SERVICED, WASHED OR FLUSHED IN A LOCATION WHERE LEAKS, SPILLAGE, WASTE MATERIALS, CLEANERS, OR WATERS WILL BE INTRODUCED OR FLOW INTO WETLANDS OR WATERCOURSES. AN EMERGENCY MANAGEMENT PLAN AND SPILL KIT WILL BE MAINTAINED ON SITE AT ALL TIMES. IN THE EVENT OF AN ACCIDENTAL RELEASE, IMMEDIATELY STOP CONSTRUCTION WORK, CONTAIN THE SPILL, AND NOTIFY THE TOWN, APPROPRIATE AUTHORITIES AND PROJECT ENGINEER.

10. THE CONTRACTOR SHALL MAINTAIN ALL ROADWAYS, SIDEWALKS, AND WALKWAYS IN THE AREA FREE OF SOIL, MUD, AND CONSTRUCTION DEBRIS. CONSTRUCTION ENTRANCES MUST BE MAINTAINED AT EACH SITE ACCESS POINT. SEE PLANS AND DETAILS.

11. TRAFFIC CONTROL IF NECESSARY MUST CONFORM TO GUIDELINES SET IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS", MOST CURRENT EDITION, AS PUBLISHED BY U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION.

12. IF ROAD CLOSURE IS REQUIRED THE CONTRACTOR MUSH OBTAIN PRIOR APPROVAL FROM THE TOWN AND THE CONTRACTOR IS RESPONSIBLE FOR ALL FLAGGING SERVICES AND SIGNAGE AT NO ADDITIONAL COST.

13. ANY MATERIAL EXPORTED OFF-SITE SHALL BE LEGALLY DISPOSED OF IN AN UPLAND LOCATION AT NO ADDITIONAL COST. THE CONTRACTOR IS RESPONSIBLE FOR FINDING A SUITABLE RECIPIENT OF THE MATERIAL, GAINING REGULATORY APPROVAL FOR EXPORTED MATERIAL PLACEMENT IF NEEDED, AND HAULING.

14. ALL AREAS SURROUNDING THE PROJECT SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED UPON COMPLETION OF CONSTRUCTION. THE RESTORATION OF THE SITE IS SUBJECT TO APPROVAL BY THE TOWN AND THE PROJECT ENGINEER.

15. FOLLOWING COMPLETION OF CONSTRUCTION, THE CONTRACTOR SHALL PARTICIPATE IN A FINAL SITE INSPECTION WITH THE TOWN AND PROJECT ENGINEER FOR THE PURPOSE OF VERIFYING THAT THE PROJECT HAS BEEN COMPLETED ACCORDING TO THE CONSTRUCTION PLANS, SPECIFICATIONS AND THE TERMS AND CONDITIONS OF THE CONTRACT.

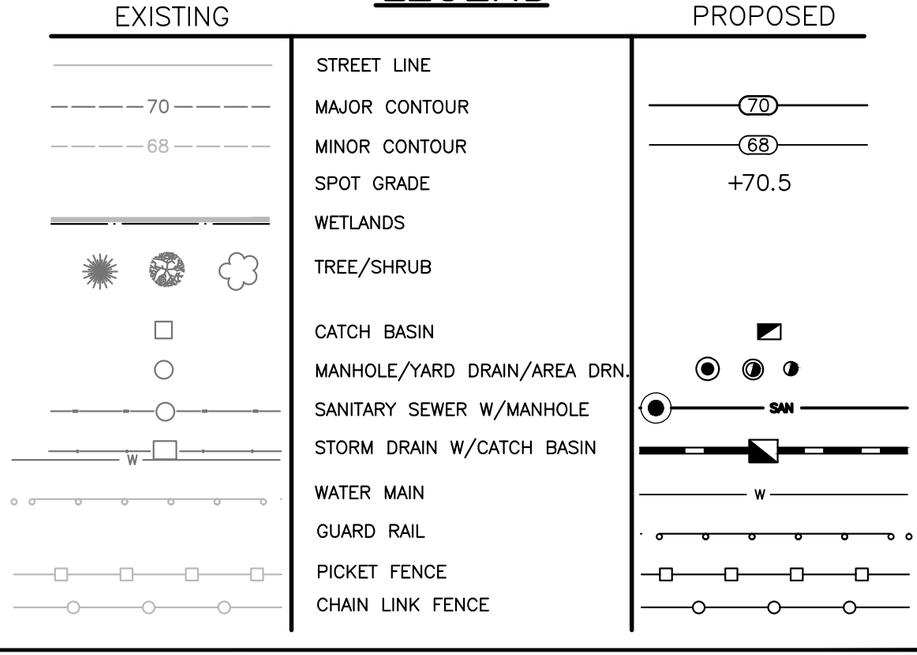
CONSTRUCTION SEQUENCE:

THIS PROPOSED SEQUENCE OF CONSTRUCTION IS PROVIDED FOR GENERAL INFORMATION ONLY. SEE PLANS FOR ADDITIONAL NOTES. THE OVERALL SEQUENCE OF CONSTRUCTION IS TO BE DETERMINED AND SUBMITTED BY THE CONTRACTOR AND APPROVED BY THE PROJECT ENGINEER.

1. OBTAIN ANY NECESSARY WORK PERMITS AND SUBMIT SCHEDULES, PLANS AND PRODUCT INFORMATION, INCLUDING THE SEDIMENT AND EROSION CONTROL PLAN, CONSTRUCTION SEQUENCE, WATER CONTROL PLAN AND EMERGENCY OPERATION PLAN TO THE PROJECT ENGINEER FOR REVIEW SEVEN DAYS PRIOR TO INITIATION OF CONSTRUCTION. .
2. CONTRACTOR SHALL PARTICIPATE IN A PRE-CONSTRUCTION SITE MEETING WITH THE PROJECT ENGINEER AND OTHERS TO REVIEW PERMIT REQUIREMENTS, CONTRACT PROVISIONS AND SPECIFICATIONS, PROJECT LIMITS AND CONSTRUCTION DETAILS.
3. STAKE OUT LIMITS OF WORK AND INSTALL SEDIMENT AND EROSION CONTROLS AND SAFETY FENCING TO BE REVIEWED BY PROJECT ENGINEER.
4. STAKE OUT LOCATIONS OF PROPOSED STRUCTURES AND CORNERS OF UNDERGROUND STORAGE UNITS FOR APPROVAL FROM PROJECT ENGINEER.
5. COMPLETE SITE PREPARATION INCLUDING STABILIZATION OF SITE FEATURES TO REMAIN ~~AND RELOCATION OF PROPANE TANK~~.
6. INSTALL CASCADE SEPARATORS AND OVERFLOW DISCHARGE PIPES. NOTE THAT INSTALLATION OF THE OVERFLOW PIPES WILL REQUIRE WORK ON THE GRANITE BLOCK RETAINING WALL AT THE RIVER. WHEN INSTALLATION IS COMPLETE, BLOCK PIPES THAT WILL DISCHARGE TO THE UNDERGROUND UNITS. THIS WILL DIRECT ALL PIPE FLOW OUT THE OVERFLOW DISCHARGE PIPE AND AWAY FROM THE PROJECT WORK AREA.
7. INSTALL STORM MANHOLE AND TIE INTO EXISTING OUTLET PIPE THROUGH WALL.
8. INSTALL STORMCEPTOR UNIT.
9. EXCAVATE HOLE FOR UNDERGROUND UNITS AND PREPARE SUBBASE. STOCKPILE GRAVEL AND TOPSOIL TO BE REUSED. INSTALL UNDERGROUND STORAGE UNITS PER DETAILS AND MANUFACTURER SPECIFICATIONS. MAKE CONNECTIONS TO ALL SPECIFIED STRUCTURES PER PLANS. PROJECT ENGINEER WILL INSPECT INSTALLATION BEFORE BACKFILL.
10. BACKFILL OVER STORMWATER SYSTEM. BRING PROJECT TO FINAL GRADE.
11. PAVE DRIVEWAY.
12. PERFORM SITE RECOVERY.
13. COMPLETE POST-CONSTRUCTION SITE WALK FOR FINAL APPROVAL.

POST CONSTRUCTION CONDITIONS DENOTED IN RED

LEGEND



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1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
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REVISIONS

NOTES & LEGEND
NORTH MAIN STREET STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

NTS (SCALE)
FEBRUARY 18, 2022 (DATE)
14658.00008 (PROJECT NO.)
02 (SHEET NO.)

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Plotted by: JLOUISOS On: this date: Fri, 2022 December 2 - 11:45am

Drawing: W:\CAD\DESIGN\14658.00008-DE\CAD\XM-EXISTING.DWG Layout: Tab:11X17

CATCHBASIN 11N
RIM=834.18'
24" INVERT IN=829.03'

STORM MANHOLE
RIM=834.35'
24" INV. IN=828.54'
24" INV. OUT=824.58'
BOTTOM=821.90'

N/F
ISAAC JACOBS

PROPANE TANK

POST CONSTRUCTION CONDITIONS
DENOTED IN RED

BUILDING

PARKING &
DRIVEWAY

SMALL PROPANE TANK.

BUILDING

2013 SURVEY
POINT, TYP.

PARKING
SPACES

TEST PIT
LOCATION, TYP.

ENTRANCE
DRIVE

TOWN OF HARDWICK
33' EASEMENT

24" HDPE, L=96', S=1.8%

21 ESHGW = 825.4'
INF = 6.1 IN/HR

22 ESHGW < 823.8'
INF = 20.8 IN/HR

1 GW = 820.0'

23 ESHGW = 822.5'
INF = 11.7 IN/HR

2 GW = 820.9'

24 ESHGW < 823.8'
INF = 8.1 IN/HR

25 ESHGW = 825.0'
INF = 17.8 IN/HR

CATCHBASIN 12N
RIM=829.80'
24" INVERT IN=824.80'
24" INVERT OUT=824.56

24" HDPE, L=25', S=6.5%

OUTLET PIPE HDPE
24" INVERT OUT=822.74'

RIVER WATER SURFACE
4/18/2013=818.20'

RIVER WATER SURFACE
4/29/2020=817.7'

EDGE OF PARKING/
DRIVEWAY

N. MAIN
STREET
BRIDGE
WINGWALL

BM IPIN
ELEV=830.91'

BM IPIN
ELEV=831.26'

GRANITE BLOCK
RETAINING WALL

LAMOILLE RIVER

FEMA EFFECTIVE
FLOODWAY

APPROX. PROPERTY
BOUNDARY

RIVER WATER SURFACE
4/29/2020=819.0'

12" STORM PIPE OUTLET
INVERT OUT=824.19'

12" CLAY, L=247', S=9.4%

BENCHMARK: BRIDGE WINGWALL
ACROSS RIVER, NGS 2020
MONUMENT: 833.03 FT NAVD88

REFERENCES

1. SITE SURVEY COMPLETED BY RUSSELL BROWN LAND SURVEYING, APRIL 11, 2013.
2. TOPOGRAPHIC CONTOURS CREATED BY MMI BASED ON SURVEY (REFERENCE 1).
3. SITE FEATURES PARTIALLY DIGITIZED FROM USDA NATIONAL AGRICULTURAL IMAGERY PROGRAM (NAIP) AERIAL PHOTOGRAPHY TAKEN 2008 AND UPDATED WITH MMI GPS SITE DATA FROM APRIL 29, 2020 SITE VISIT.
4. STORMWATER BASEMAPPING FROM HARDWICK VILLAGE STORMWATER INFRASTRUCTURE GIS GEODATABASE PROVIDED BY THE VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION, ECOSYSTEM RESTORATION PROGRAM.
5. FEMA FLOODWAY DIGITIZED BY MMI FROM FEMA FLOOD INSURANCE RATE MAP FOR THE TOWN AND VILLAGE OF HARDWICK, VERMONT, CALEDONIA COUNTY, COMMUNITY PANEL NUMBER 500027 0012 D. MAP REVISED JULY 17, 2002.
6. TEST PITS OBSERVED BY MMI #1–2 APRIL 18, 2013 AND #21–25 APRIL 29, 2020.
7. HORIZONTAL DATUM NAD83 STATE PLANE VERMONT FEET. VERTICAL DATUM NAVD88.
8. PROPERTY BOUNDARIES APPROXIMATE. FROM VCGI DATA LIBRARY.

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REVISIONS

SITE PLAN - EXISTING CONDITIONS

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

1"=20'
SCALE

FEBRUARY 18, 2022
DATE

14658.00008
PROJECT NO.

03
SHEET NO.

Plotted by: JLOUISOS On: this date: Fri, 2022 December 2 – 11:23am

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Drawing: W:\CAD\DESIGN\14658.00008-DE\CAD\NM-LAYOUT.DWG Layout: Tab:LAYOUT

CATCHBASIN 11N
RIM=834.18'
24" INVERT IN=829.03'

STORM MANHOLE
RIM=824.75'
24" INV. IN=824.75'
24" INV. OUT=824.58'
BOTTOM=821.90'

INSTALL ~~CASCADE~~ HYDROWORKS HD6 SEPARATOR #1, SEE DETAIL

12.6' 24" HDPE S=0.8%

9' 12" HDPE S=0%

INSTALL RISER, SEE DETAIL, TYP.

INSTALL UNDERGROUND RETENTION SYSTEM, MANUFACTURED BY ~~CONTECH ENGINEERED SOLUTIONS LLC~~ LANE, SEE DETAIL

REMOVE UNUSED PORTION OF EXISTING STORM PIPE

INSTALL ~~STORMCEPTOR~~ HYDROWORKS HS4, SEE DETAIL

EXTENT OF BACKFILL

INSTALL ~~CASCADE~~ HYDROWORKS HD5 SEPARATOR #2, SEE DETAIL

POST CONSTRUCTION CONDITIONS DENOTED IN RED

N/F ISAACSON, BS

BUILDING

PARKING & DRIVEWAY

PARKING SPACES

TOWN OF HARDWICK 33' EASEMENT

ENTRANCE DRIVE

52' 18" HDPE S=3.8%

4' 24" HDPE S=0%

CATCHBASIN 12N
RIM=829.86'
24" INVERT IN=824.80'
24" INVERT OUT=824.36'

24" HDPE, L=25.6', S=1.7%

OUTLET PIPE HDPE
24" INVERT OUT=822.74'
INV=822.90'

N. MAIN STREET BRIDGE WINGWALL

OUTFALL #1
INV=~~827.15~~'
INSTALL ~~WASTOP WS440-S3-304~~ 18" PROFLEX 790 LOW HEADLOSS INLINE CHECK VALVE INV=827.61'

INSTALLATION OF OVERFLOW PIPE WILL REQUIRE DISASEMBLE AND REASSEMBLE OF GRANITE BLOCK WALL

REPLACED 3FT TO WEST

EXISTING OUTFALL #3 THROUGH WALL ~~TO BE REUSED~~. INSTALL ~~WASTOP BRAND INLINE CHECK VALVE WS590-S3-304~~ OR APPROVED EQUIVALENT. 24" PROFLEX 790 LOW HEADLOSS INLINE CHECK VALVE

EDGE OF PARKING/ DRIVEWAY

INSTALL STORM MANHOLE TO CONTROL FLOW FROM UNDERGROUND STORAGE CHAMBERS TO EXISTING OUTLET PIPE, MATCH EXISTING 24" HDPE INV.

GRANITE BLOCK RETAINING WALL

LAMOILLE RIVER

FEMA EFFECTIVE FLOODWAY

APPROX. PROPERTY BOUNDARY

PROTECT OVERHEAD WIRES. CONTRACTOR WILL COORDINATE WITH LINE OWNER TO DE-ENERGIZE IF DEEMED NECESSARY.

REPAIR GRANITE BLOCK WALL, REMOVE MATERIAL BEHIND AS NEEDED AND RESTACK WITH EXISTING MATERIALS. MATCH DOWNSTREAM WALL. RECREATE LEVEL LAWN AREA BEHIND WALL

CONTRACTOR RESPONSIBLE FOR WALL INTEGRITY AND STABILIZATION.

NEW OUTFALL TO BE INTEGRATED INTO REPAIRED BLOCK WALL

12" STORM PIPE OUTLET
INVERT OUT=824.19'

STABILIZE WALL DURING CONSTRUCTION

12' 12" HDPE S=0%

24" HDPE, L=24.7', S=9.4%

32' 18" HDPE S=5.0%

OUTFALL #2
INV = ~~827.5'~~ INSTALL ~~WASTOP WS440-S3-304~~ 18" PROFLEX 790 LOW HEADLOSS INLINE CHECK VALVE INV=826.10'

0' 10' 20'
0 1/2" 1"

N S W E

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REVISIONS

SITE PLAN - PROPOSED CONDITIONS

NORTH MAIN STREET STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL DESIGNED	JCL DRAWN	RKS CHECKED
SCALE: 1"=20'		
DATE: FEBRUARY 18, 2022		
PROJECT NO.: 14658.00008		
SHEET NO.: 04		

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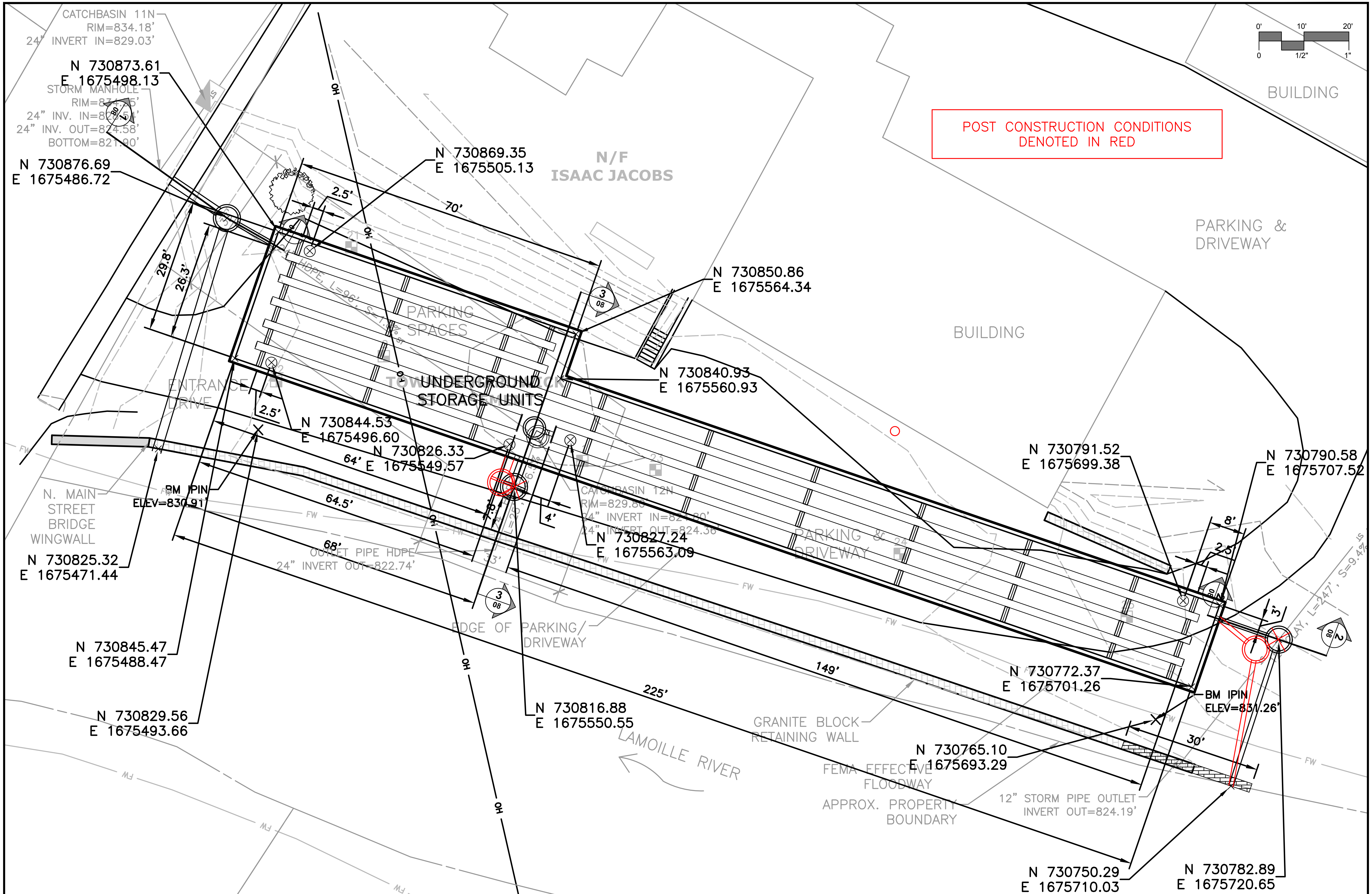

CATCHBASIN 11N
RIM=834.18'
24" INVERT IN=829.03'
N 730873.61
E 1675498.13
STORM MANHOLE
N 730876.69
E 1675486.72
N 730869.35
E 1675505.13
N/F
ISAAC JACOBS
POST CONSTRUCTION CONDITIONS DENOTED IN RED
BUILDING
PARKING & DRIVEWAY
N 730850.86
E 1675564.34
BUILDING
PARKING SPACES
UNDERGROUND STORAGE UNITS
N 730840.93
E 1675560.93
ENTRANCE DRIVE
N 730844.53
E 1675496.60
N 730826.33
E 1675549.57
N 730791.52
E 1675699.38
N 730790.58
E 1675707.52
N. MAIN STREET BRIDGE WINGWALL
BM IPIN
ELEV=830.91'
CATCHBASIN 12N
N 730827.24
E 1675563.09
N 730825.32
E 1675471.44
OUTLET PIPE HDPE
24" INVERT OUT=822.74'
PARKING & DRIVEWAY
EDGE OF PARKING/ DRIVEWAY
N 730845.47
E 1675488.47
N 730772.37
E 1675701.26
BM IPIN
ELEV=831.26'
N 730829.56
E 1675493.66
N 730816.88
E 1675550.55
LAMOILLE RIVER
GRANITE BLOCK RETAINING WALL
N 730765.10
E 1675693.29
FEMA EFFECTIVE FLOODWAY
APPROX. PROPERTY BOUNDARY
12" STORM PIPE OUTLET
INVERT OUT=824.19'
N 730750.29
E 1675710.03
N 730782.89
E 1675720.65
70'
64'
64.5'
68'
149'
225'
30'
2.5'
8'
4'
3'
29.8'
26.3'

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REVISIONS

SITE PLAN - LAYOUT

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

DESIGNED	DRAWN	CHECKED
JCL	JCL	RKS

SCALE 1"=20'

DATE FEBRUARY 18, 2022

PROJECT NO. 14658.00008

SHEET NO. 05

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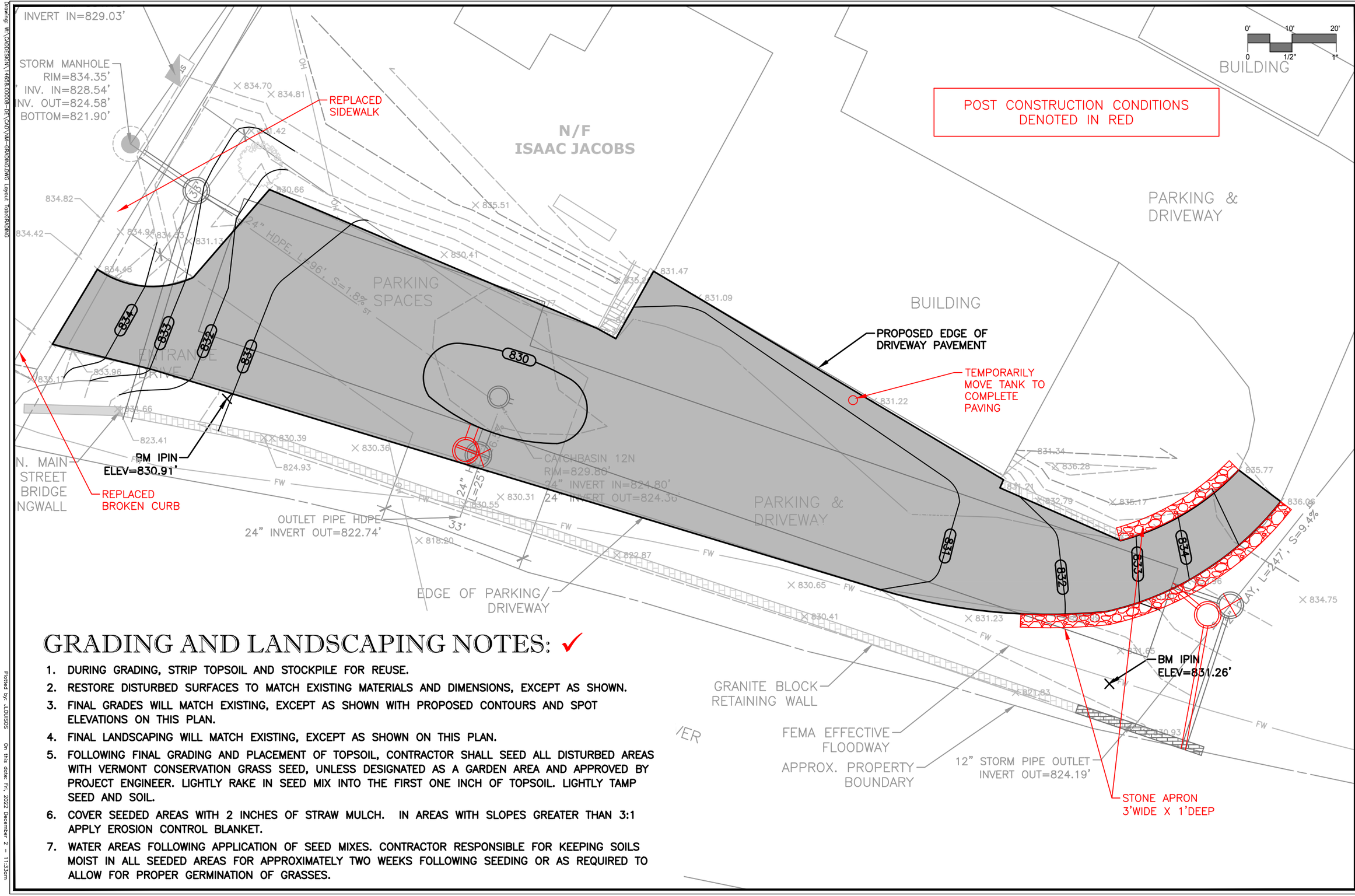

GRADING AND LANDSCAPING NOTES: ✓

1. DURING GRADING, STRIP TOPSOIL AND STOCKPILE FOR REUSE.
2. RESTORE DISTURBED SURFACES TO MATCH EXISTING MATERIALS AND DIMENSIONS, EXCEPT AS SHOWN.
3. FINAL GRADES WILL MATCH EXISTING, EXCEPT AS SHOWN WITH PROPOSED CONTOURS AND SPOT ELEVATIONS ON THIS PLAN.
4. FINAL LANDSCAPING WILL MATCH EXISTING, EXCEPT AS SHOWN ON THIS PLAN.
5. FOLLOWING FINAL GRADING AND PLACEMENT OF TOPSOIL, CONTRACTOR SHALL SEED ALL DISTURBED AREAS WITH VERMONT CONSERVATION GRASS SEED, UNLESS DESIGNATED AS A GARDEN AREA AND APPROVED BY PROJECT ENGINEER. LIGHTLY RAKE IN SEED MIX INTO THE FIRST ONE INCH OF TOPSOIL. LIGHTLY TAMP SEED AND SOIL.
6. COVER SEEDED AREAS WITH 2 INCHES OF STRAW MULCH. IN AREAS WITH SLOPES GREATER THAN 3:1 APPLY EROSION CONTROL BLANKET.
7. WATER AREAS FOLLOWING APPLICATION OF SEED MIXES. CONTRACTOR RESPONSIBLE FOR KEEPING SOILS MOIST IN ALL SEEDED AREAS FOR APPROXIMATELY TWO WEEKS FOLLOWING SEEDING OR AS REQUIRED TO ALLOW FOR PROPER GERMINATION OF GRASSES.

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REVISIONS

SITE PLAN - GRADING
NORTH MAIN STREET
STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

1"=20'
SCALE

FEBRUARY 18, 2022
DATE

14658.00008
PROJECT NO.

06
SHEET NO.

Plotted by: JLOUSOS On this date: Fri, 2022 December 2 – 11:33am

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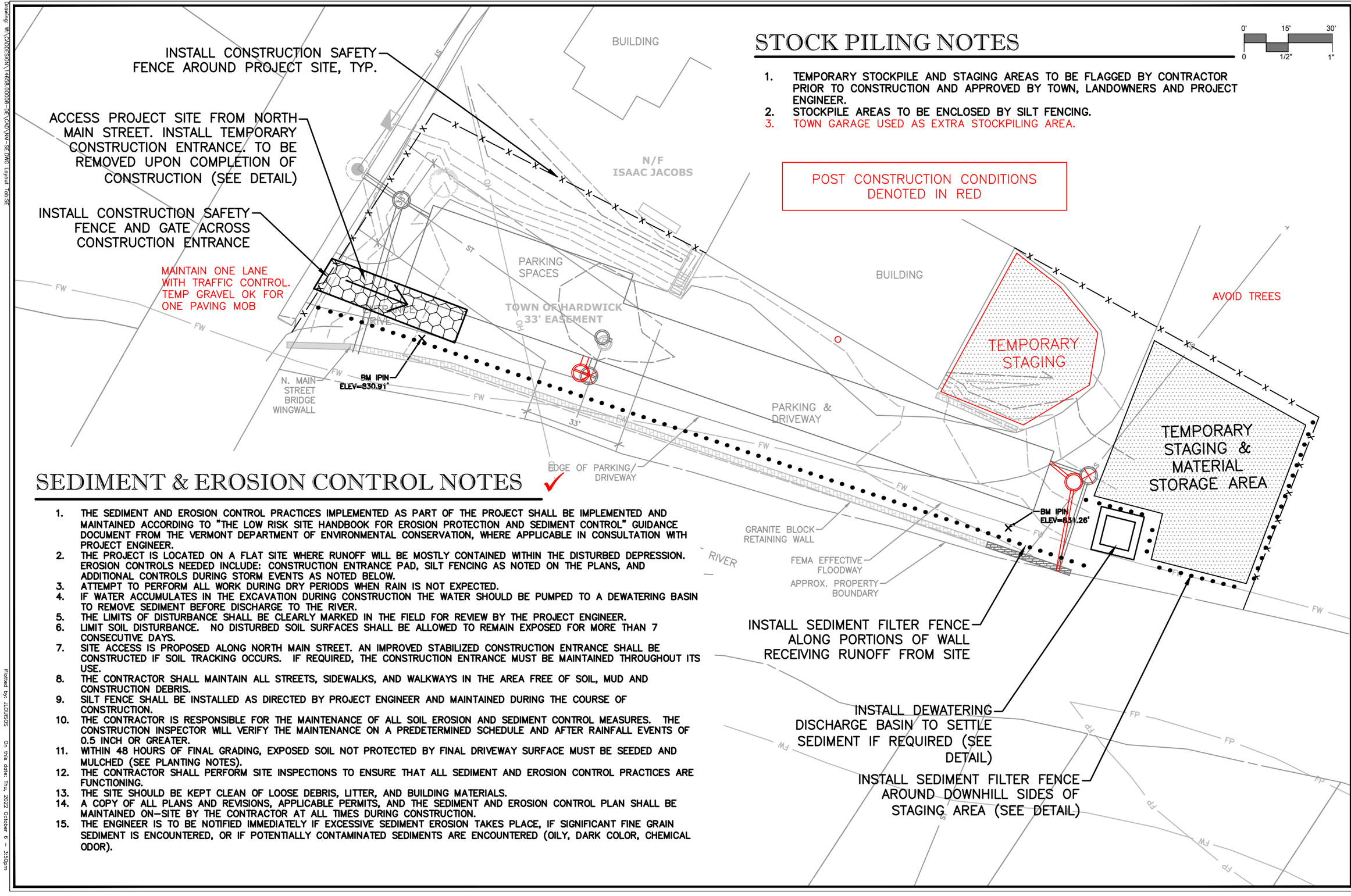

STOCK PILING NOTES

0' 15' 30'
0 1/2" 1"

1. TEMPORARY STOCKPILE AND STAGING AREAS TO BE FLAGGED BY CONTRACTOR PRIOR TO CONSTRUCTION AND APPROVED BY TOWN, LANDOWNERS AND PROJECT ENGINEER.
2. STOCKPILE AREAS TO BE ENCLOSED BY SILT FENCING.
3. TOWN GARAGE USED AS EXTRA STOCKPILING AREA.

POST CONSTRUCTION CONDITIONS DENOTED IN RED

SEDIMENT & EROSION CONTROL NOTES

1. THE SEDIMENT AND EROSION CONTROL PRACTICES IMPLEMENTED AS PART OF THE PROJECT SHALL BE IMPLEMENTED AND MAINTAINED ACCORDING TO "THE LOW RISK SITE HANDBOOK FOR EROSION PROTECTION AND SEDIMENT CONTROL" GUIDANCE DOCUMENT FROM THE VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION, WHERE APPLICABLE IN CONSULTATION WITH PROJECT ENGINEER.
2. THE PROJECT IS LOCATED ON A FLAT SITE WHERE RUNOFF WILL BE MOSTLY CONTAINED WITHIN THE DISTURBED DEPRESSION. EROSION CONTROLS NEEDED INCLUDE: CONSTRUCTION ENTRANCE PAD, SILT FENCING AS NOTED ON THE PLANS, AND ADDITIONAL CONTROLS DURING STORM EVENTS AS NOTED BELOW.
3. ATTEMPT TO PERFORM ALL WORK DURING DRY PERIODS WHEN RAIN IS NOT EXPECTED.
4. IF WATER ACCUMULATES IN THE EXCAVATION DURING CONSTRUCTION THE WATER SHOULD BE PUMPED TO A DEWATERING BASIN TO REMOVE SEDIMENT BEFORE DISCHARGE TO THE RIVER.
5. THE LIMITS OF DISTURBANCE SHALL BE CLEARLY MARKED IN THE FIELD FOR REVIEW BY THE PROJECT ENGINEER.
6. LIMIT SOIL DISTURBANCE. NO DISTURBED SOIL SURFACES SHALL BE ALLOWED TO REMAIN EXPOSED FOR MORE THAN 7 CONSECUTIVE DAYS.
7. SITE ACCESS IS PROPOSED ALONG NORTH MAIN STREET. AN IMPROVED STABILIZED CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED IF SOIL TRACKING OCCURS. IF REQUIRED, THE CONSTRUCTION ENTRANCE MUST BE MAINTAINED THROUGHOUT ITS USE.
8. THE CONTRACTOR SHALL MAINTAIN ALL STREETS, SIDEWALKS, AND WALKWAYS IN THE AREA FREE OF SOIL, MUD AND CONSTRUCTION DEBRIS.
9. SILT FENCE SHALL BE INSTALLED AS DIRECTED BY PROJECT ENGINEER AND MAINTAINED DURING THE COURSE OF CONSTRUCTION.
10. THE CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE OF ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES. THE CONSTRUCTION INSPECTOR WILL VERIFY THE MAINTENANCE ON A PREDETERMINED SCHEDULE AND AFTER RAINFALL EVENTS OF 0.5 INCH OR GREATER.
11. WITHIN 48 HOURS OF FINAL GRADING, EXPOSED SOIL NOT PROTECTED BY FINAL DRIVEWAY SURFACE MUST BE SEEDED AND MULCHED (SEE PLANTING NOTES).
12. THE CONTRACTOR SHALL PERFORM SITE INSPECTIONS TO ENSURE THAT ALL SEDIMENT AND EROSION CONTROL PRACTICES ARE FUNCTIONING.
13. THE SITE SHOULD BE KEPT CLEAN OF LOOSE DEBRIS, LITTER, AND BUILDING MATERIALS.
14. A COPY OF ALL PLANS AND REVISIONS, APPLICABLE PERMITS, AND THE SEDIMENT AND EROSION CONTROL PLAN SHALL BE MAINTAINED ON-SITE BY THE CONTRACTOR AT ALL TIMES DURING CONSTRUCTION.
15. THE ENGINEER IS TO BE NOTIFIED IMMEDIATELY IF EXCESSIVE SEDIMENT EROSION TAKES PLACE, IF SIGNIFICANT FINE GRAIN SEDIMENT IS ENCOUNTERED, OR IF POTENTIALLY CONTAMINATED SEDIMENTS ARE ENCOUNTERED (OILY, DARK COLOR, CHEMICAL ODOR).

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REVISIONS

SITE PLAN - CONSTRUCTION ACCESS & EROSION CONTROL
NORTH MAIN STREET STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=30'
DATE: FEBRUARY 18, 2022
PROJECT NO.: 14658.00008
SHEET NO.: 07

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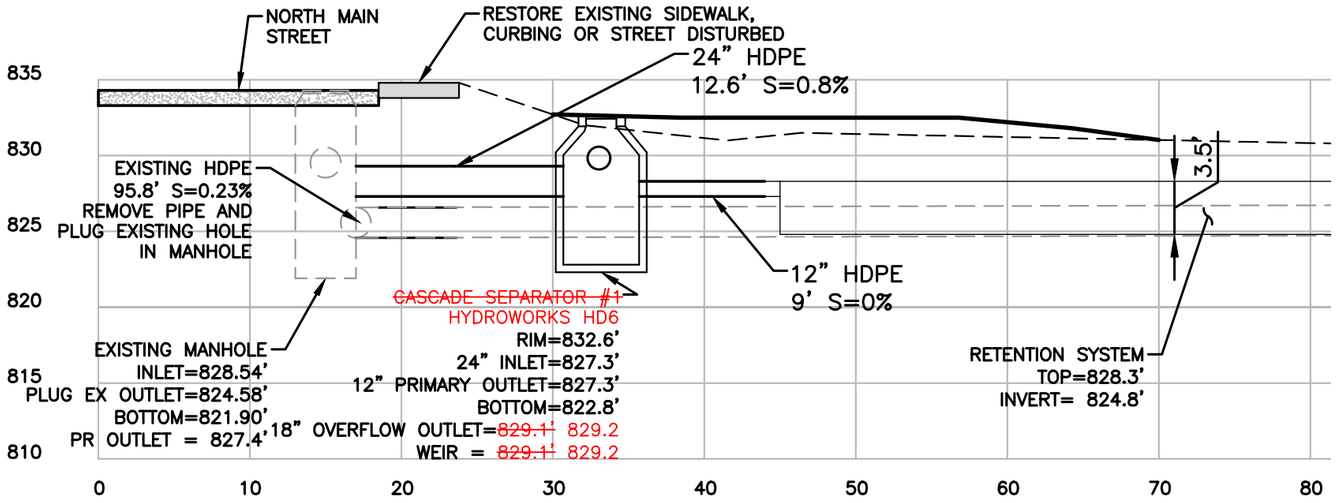
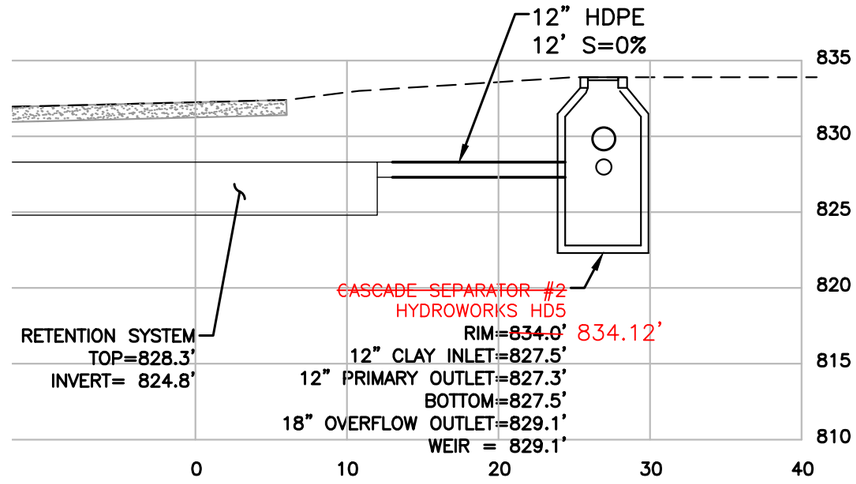
Plotted by: JLOUSOS On this date: Thu, 2022 October 6 - 3:56pm



PROFILE 1– INFLOW FROM N. MAIN STREET

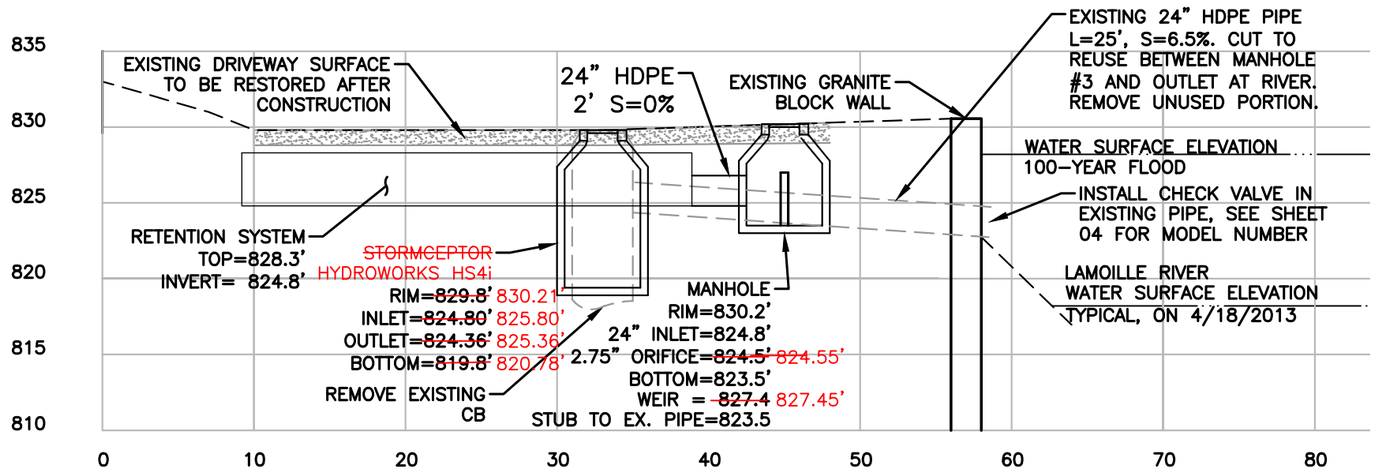
1"=10'



PROFILE 2 – INFLOW FROM CHURCH STREET

1"=10'

POST CONSTRUCTION CONDITIONS DENOTED IN RED



PROFILE 3– OUTFLOW STRUCTURE

1"=10'

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REVISIONS

PROFILE

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=10'

DATE: FEBRUARY 18, 2022

PROJECT NO.: 14658.00008

SHEET NO.: 08

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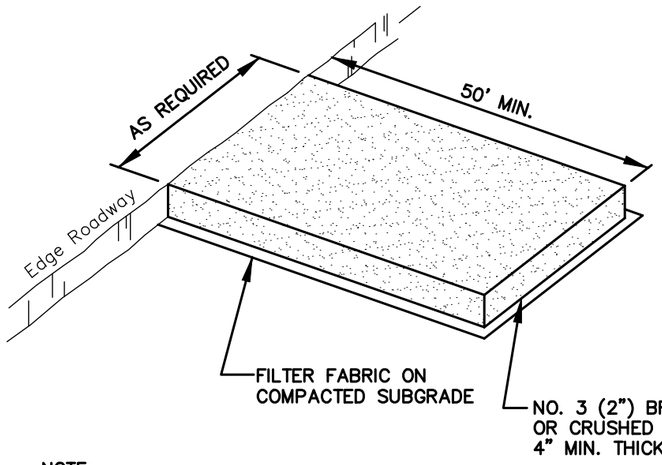
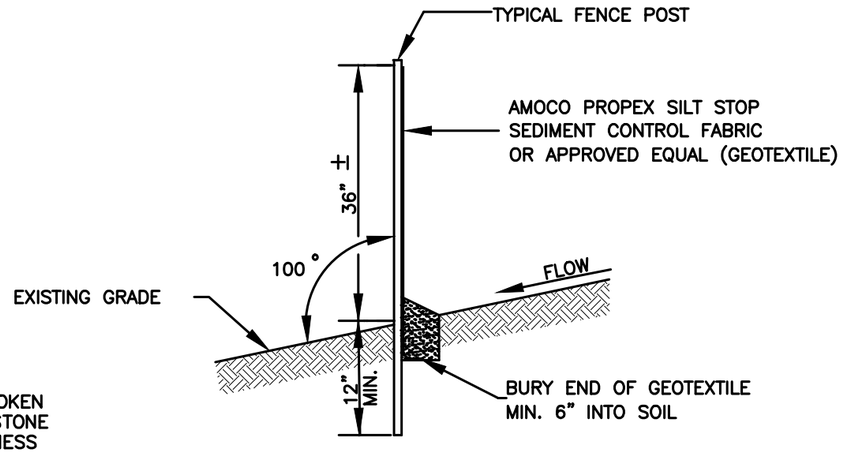


NOTE:
CONSTRUCTION ENTRANCE PAD SHALL BE INSTALLED AND MAINTAINED DURING OPERATIONS WHICH PROMOTE VEHICULAR TRACKING OF MUD

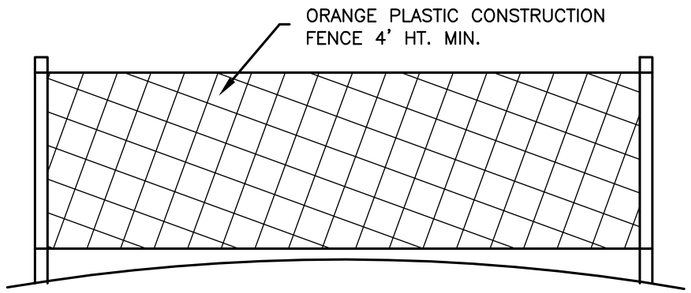
CONSTRUCTION ENTRANCE PAD

NOT TO SCALE



SEDIMENT FILTER FENCE

NOT TO SCALE



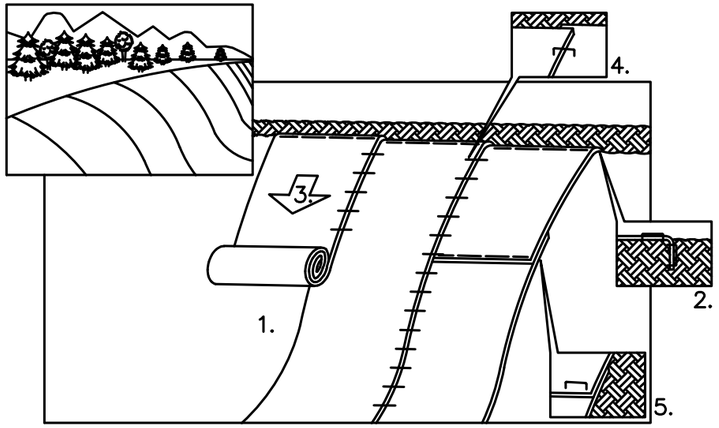
NOTE:
1. CONTRACTOR SHALL COORDINATE TEMPORARY FENCE INSTALLATION WITH OWNERS REPRESENTATIVES.

ORANGE CONSTRUCTION SAFETY FENCING

NOT TO SCALE

USED BARRIER TAPE

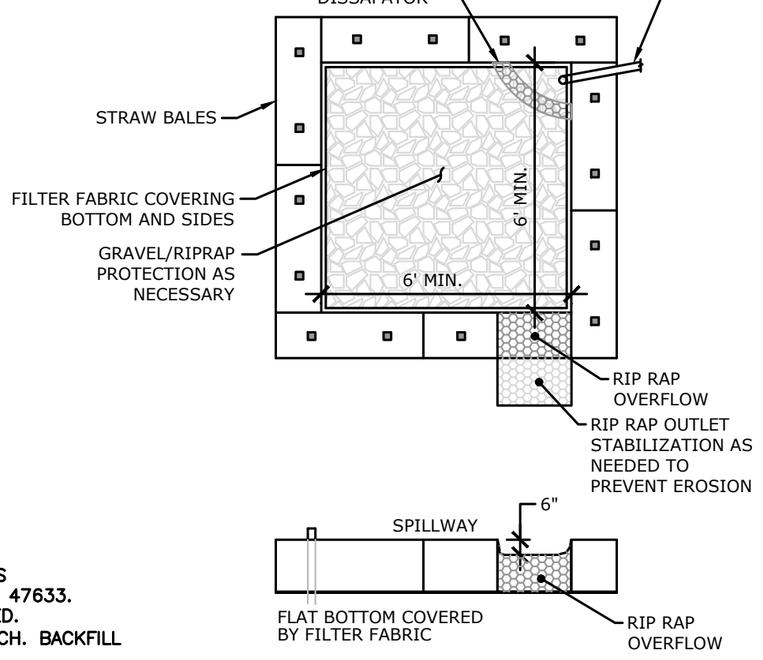
POST CONSTRUCTION CONDITIONS
DENOTED IN RED

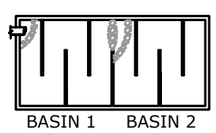


EROSION CONTROL BLANKET

NOT TO SCALE

1. USE BIONET SHORT TERM BIODEGRADABLE EROSION CONTROL BLANKETS ITEM NUMBER S150BN, AS MANUFACTURED BY NORTH AMERICAN GREEN, 5401 ST. WENDEL–CYNTHIANA ROAD, POSEYVILLE, IN 47633.
2. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING APPLICATION OF AMENDED SOIL AND SEED.
3. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" DEEP BY 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
4. ROLL THE BLANKETS DOWN THE SLOPE IN THE DIRECTION OF THE WATER FLOW.
5. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2" OVERLAP.
6. WHEN BLANKETS MUST BE SPLICED DOWN THE SLOPE, PLACE BLANKETS END OVER END (SHINGLE STYLE) WITH APPROXIMATELY 6" OVERLAP. STAPLE THROUGH OVERLAP AREA, APPROXIMATELY 12" APART
7. REFER TO GENERAL STAPLE PATTERN GUIDE IN NORTH AMERICAN GREEN CATALOG FOR CORRECT STAPLE PATTERN RECOMMENDATIONS FOR SLOPE INSTALLATIONS.





EXTEND BASIN LENGTH FOR ADDITIONAL SETTLING TIME, IF NECESSARY

NOTES:
1. IF PUMPING VOLUME EXCEEDS BASIN CAPACITY, BASIN MAY BE USED IN TANDEM OR TIERS.
2. INCREASE RIPRAP SIZE ON BASIN BOTTOM, OR SIZE/LENGTH OF OUTLET STABILIZATION AS NECESSARY TO MAINTAIN SEDIMENT-FREE DISCHARGE WATERS.
3. ALTERNATIVE OPTIONS MAY BE REVIEWED AND APPROVED BY THE ENGINEER.
4. IF NATURAL, STABLE DEPRESSION(S) OF SUFFICIENT CAPACITY, CONTAINING INFILTRATION-PRONE SOILS, BEING RELATIVELY FLAT WITH NO OUTLET WHERE CHANNELIZED FLOW (AND THE POTENTIAL FOR EROSION) CAN DEVELOP, ARE PRESENT IN THE AREA(S) OF DISCHARGE, THESE AREAS SHOULD BE UTILIZED IN FAVOR OVER THE STRAW BALE IMPOUNDMENTS WHERE POSSIBLE. IN SUCH CASES, HOSE ENDS SHOULD DISCHARGE ONTO STABLE RIP-RAP STONE OUTLET APRONS.

DEWATERING DISCHARGE BASIN

NOT TO SCALE

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REVISIONS

DETAILS - EROSION CONTROL

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

VARIES
SCALE

FEBRUARY 18, 2022
DATE

14658.00008
PROJECT NO.

09
SHEET NO.

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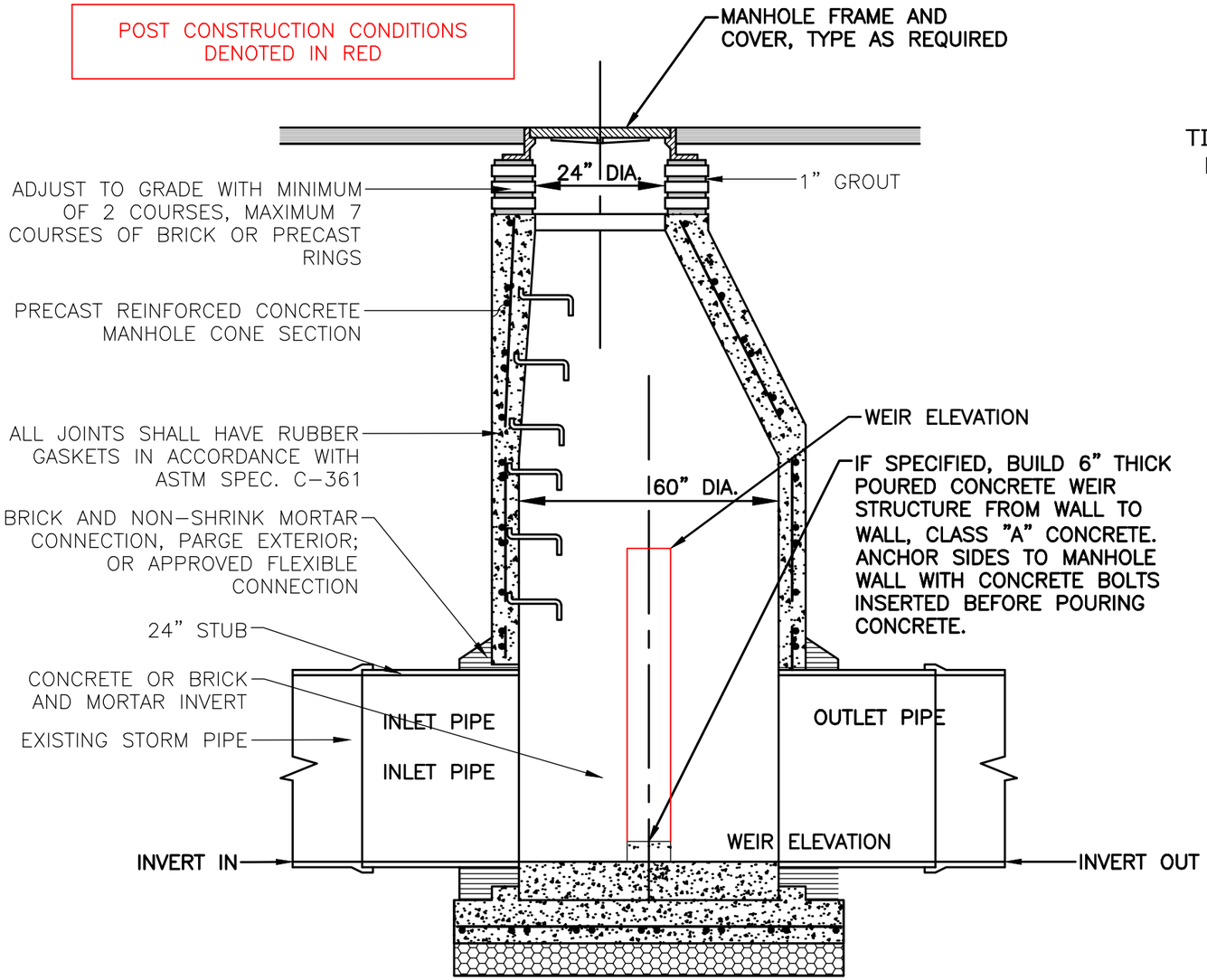
POST CONSTRUCTION CONDITIONS DENOTED IN RED



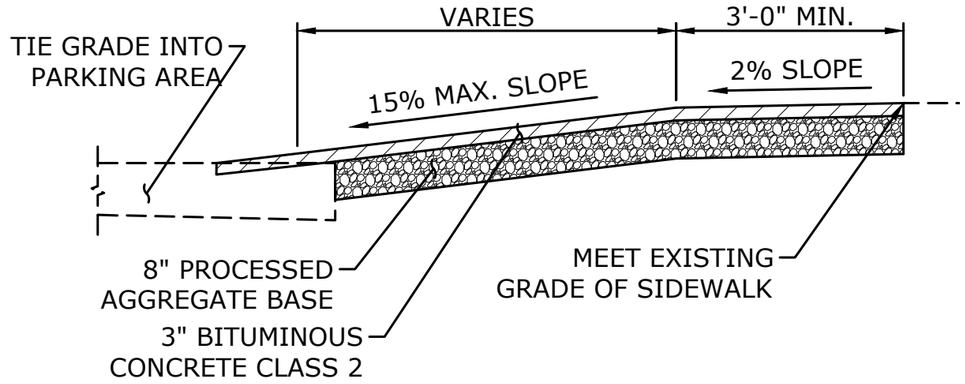
NOTES:
THIS DETAIL REPRESENTS A MODIFICATION OF A STANDARD OVERSIZED MANHOLE FOR USE IN CONTROLLING THE OUTLET FLOW DIVERTED TO THE TREATMENT SYSTEMS.

SEE PROFILE FOR INVERT AND WEIR ELEVATION DETAILS.

SEE LAYOUT FOR PIPE CONFIGURATION DETAILS.

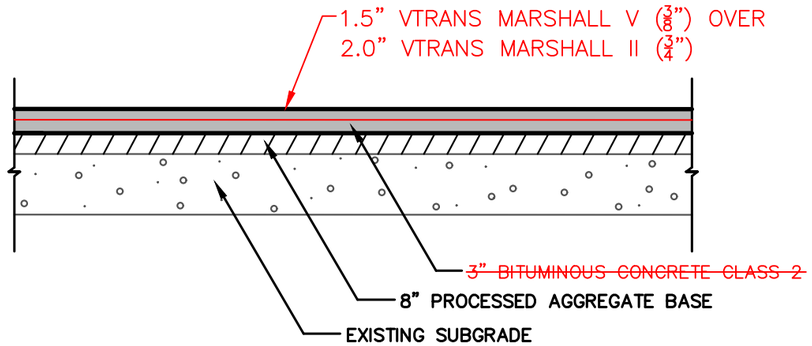
STORM MANHOLE WITH WEIR

N.T.S.



ASPHALT DRIVEWAY APRON

N.T.S.



ASPHALT DRIVEWAY SECTION

N.T.S.

- PROPOSED ON DRIVEWAY OUTSIDE OF TREATMENT UNIT AREAS
- ROAD PAVING INCLUDED VTRANS STANDARDS FOR BACKFILL AND COMPACTION
- 1.5" SUPERPAVE TYPE IVS OVER
- 2.5" SUPERPAVE TYPE IVS

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REVISIONS

DETAILS - SITE

NORTH MAIN STREET STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL	JCL	JCL
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: FEBRUARY 18, 2022

PROJECT NO.: 14658.00008

SHEET NO.: 10

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Plotted by: JLOUISOS On: this date: Fri, 2022 December 2 — 11:45am

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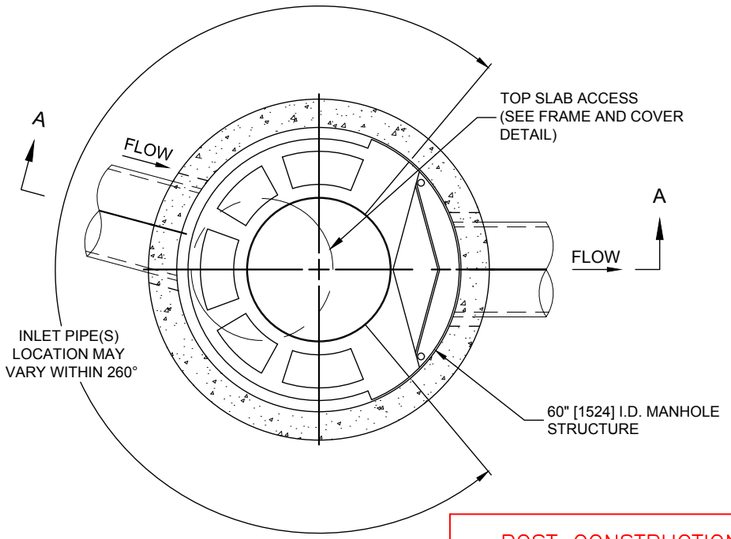
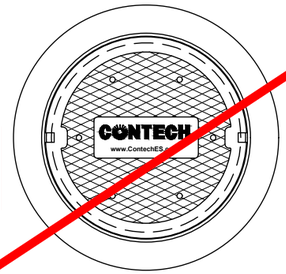
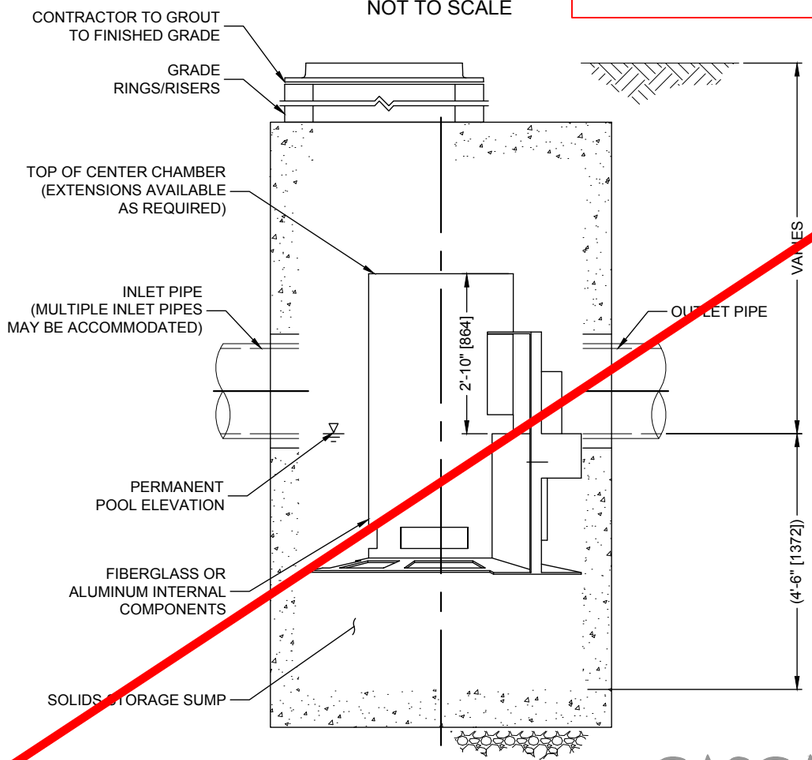


PLAN VIEW B-B
NOT TO SCALE

POST CONSTRUCTION CONDITIONS
DENOTED IN RED



FRAME AND COVER
(DIAMETER VARIES)
NOT TO SCALE



ELEVATION A-A
NOT TO SCALE

CASCADE SEPARATOR DESIGN NOTES

THE STANDARD #### CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CASCADE SEPARATOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. CASCADE SEPARATOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. CASCADE SEPARATOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CASCADE SEPARATOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CASCADE separator™

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SEE ATTACHED HYDROWORKS SUBMITTAL

CS-5
CASCADE SEPARATOR
STANDARD DETAIL

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REVISIONS

DETAILS - CASCADE SEPARATOR
NORTH MAIN STREET
STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL DESIGNED	JCL DRAWN	RKS CHECKED

SCALE: N/A
DATE: FEBRUARY 18, 2022
PROJECT NO.: 14658.00008
SHEET NO.: 11

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PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 1,096 lf.

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = 19,000 cf.
- PIPE STORAGE VOLUME = 10,547 cf.
- BACKFILL STORAGE VOLUME = 8,754 cf.
- TOTAL STORAGE PROVIDED = 19,301 cf.

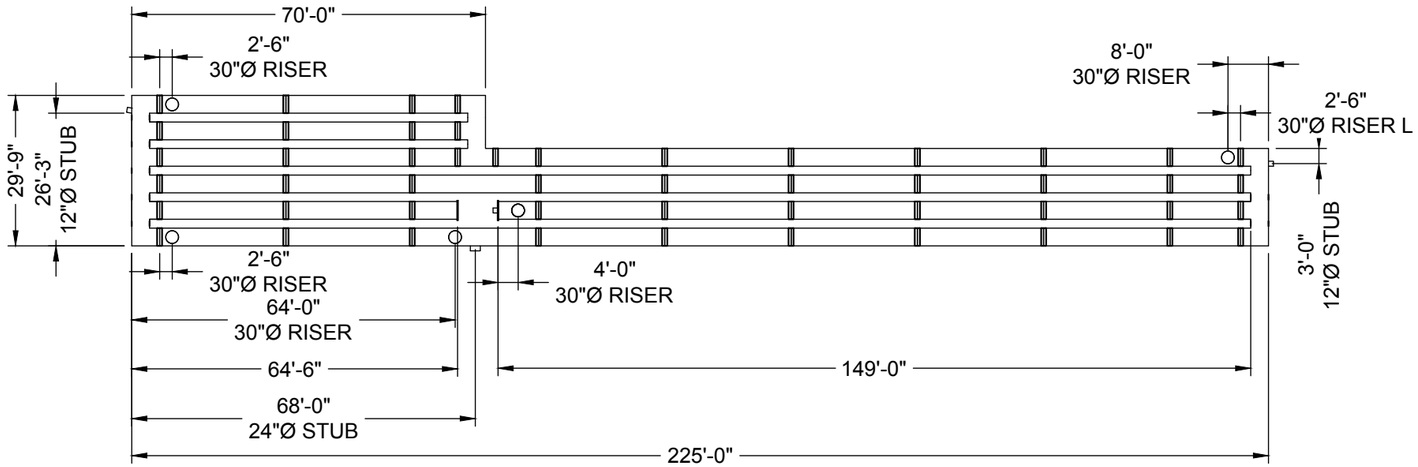
PIPE DETAILS
- DIAMETER = 42 IN.
- CORRUGATION = 2 2/3x1/2
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 21 IN.

BACKFILL DETAILS
- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 6 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 6 IN.

RISER INFORMATION		
PIECE	RISER INVERT	SYSTEM INVERT
30"Ø RISER F2	830.5	824.8
30"Ø RISER G2	830.2	824.8
30"Ø RISER H1	832.5	824.8
30"Ø RISER	830.2	824.8
30"Ø RISER	833.8	824.8
30"Ø RISER	832	824.8

STUB INFORMATION		
PIECE	STUB INVERT	SYSTEM INVERT
12"Ø STUB A1	827.3	824.8
12"Ø STUB C1	827.3	824.8
24"Ø STUB G1	824.8	824.8
12"Ø STUB F1	825.8	824.8

POST CONSTRUCTION CONDITIONS
DENOTED IN RED



ASSEMBLY
SCALE: 1" = 30'

FINAL SHOP
DRAWINGS FROM
LANE ATTACHED

NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.

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REVISIONS

DETAILS - DETENTION SYSTEM

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=20'

DATE: FEBRUARY 18, 2022

PROJECT NO.: 14658.00008

SHEET NO.: 12

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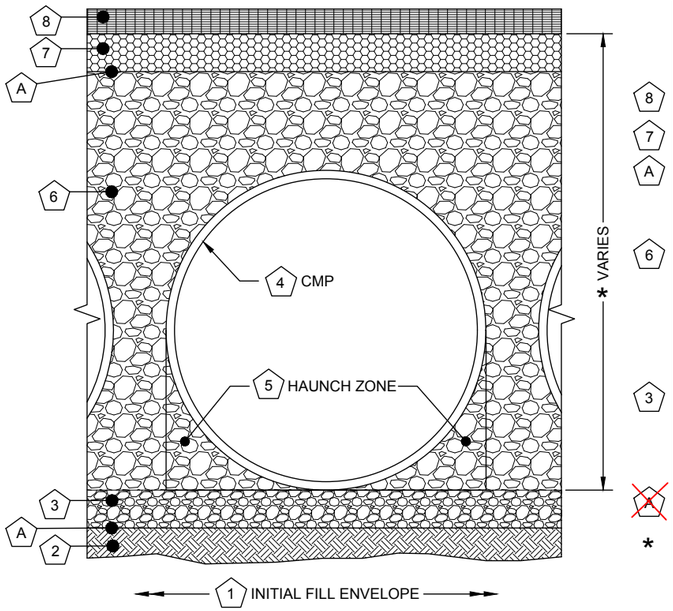


Infiltration Systems - CMP Infiltration & CMP Perforated Drainage Pipe			
Material Location	Description	Material Designation	Designation
8 Rigid or Flexible Pavement (if applicable)			
7 Road Base (if applicable 1.5" PLANT MIX			
A Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types. Wrap the trench only.
6 Backfill	Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded, free draining stone, with a particle size of ½" – 2 ½" diameter is recommended.	AASHTO M 145-A-1 or AASHTO M 43 - 3, 4 OPEN/GAPGRADED ANGULAR STONE W/ NO FINES	Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, air-tamper, vibratory rod, or other effective methods. Compaction of all placed fill material is necessary and shall be considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the Project Engineer or his representative is satisfied with the level of compaction"
3 Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	For soil aggregates larger than 3/8" a dedicated bedding layer is not required for CMP. Pipe may be placed on the trench bottom comprised of native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Soil aggregates less than 3/8" and unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation.
~~2~~ Geotextile Layer REMOVED	None	None	Contech does not recommend geotextiles be placed under the invert of Infiltration systems due to the propensity for geotextiles to clog over time.
* Note: The listed AASHTO designations are for gradation only. The stone must also be angular and clean.			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT.

FOUNDATION/BEDDING PREPARATION

2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMLY COMPACTED WITHOUT SOFT SPOTS.

BACKFILL

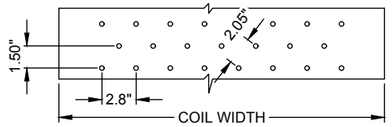
MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

EQUIPMENT USED TO PLACE AND COMPACT THE BACKFILL SHALL BE OF A SIZE AND TYPE SO AS NOT TO DISTORT, DAMAGE, OR DISPLACE THE PIPE. ATTENTION MUST BE GIVEN TO PROVIDING ADEQUATE MINIMUM COVER FOR SUCH EQUIPMENT. MAINTAIN BALANCED LOADING ON ALL PIPES IN THE SYSTEM DURING ALL SUCH OPERATIONS.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

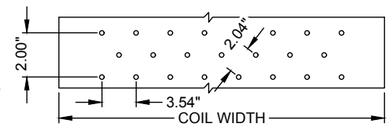
POST CONSTRUCTION CONDITIONS DENOTED IN RED

2 2/3" x 1/2" CORRUGATION - STEEL AND ALUMINUM CMP EDGE SPACING EQUAL ON BOTH SIDES



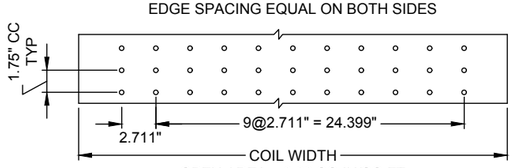
OPEN AREA = 3.76 SQ IN/SQ FT

3" x 1" CORRUGATION - STEEL AND ALUMINUM CMP (COIL PROVIDED FROM CONTECH LANTANA, FL PLANT)



OPEN AREA = 4.16 SQ IN/SQ FT

5" x 1" CORRUGATION - STEEL ONLY
EDGE SPACING EQUAL ON BOTH SIDES



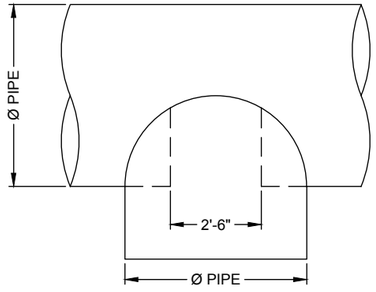
OPEN AREA = 3.33 SQ IN/SQ FT

NOTES:

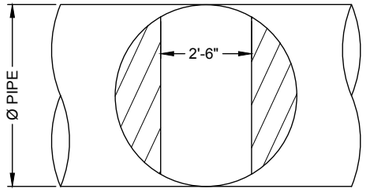
1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. ALL HOLES Ø3/8".

TYPICAL PERFORATION DETAIL

SCALE: N.T.S.



PLAN

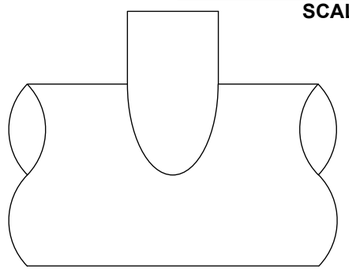


FRONT

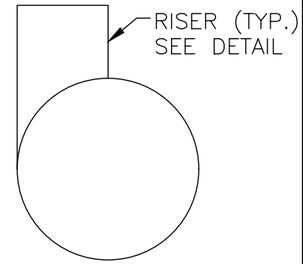
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

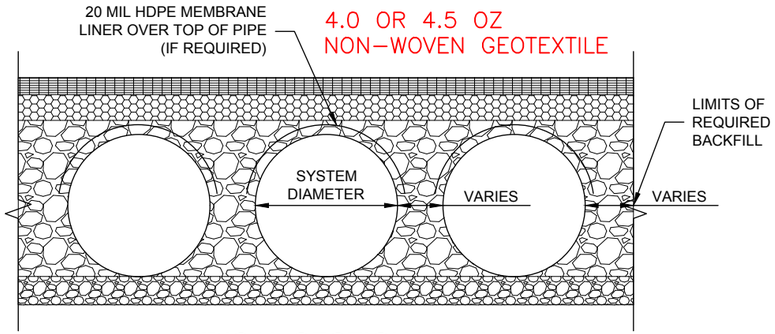


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

MILONE & MACBROOM®
1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
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REVISIONS

DETAILS - DETENTION SYSTEM
NORTH MAIN STREET STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL DESIGNED	JCL DRAWN	RKS CHECKED
SCALE: VARIES		
DATE: FEBRUARY 18, 2022		
PROJECT NO.: 14658.00008		
SHEET NO.: 13		

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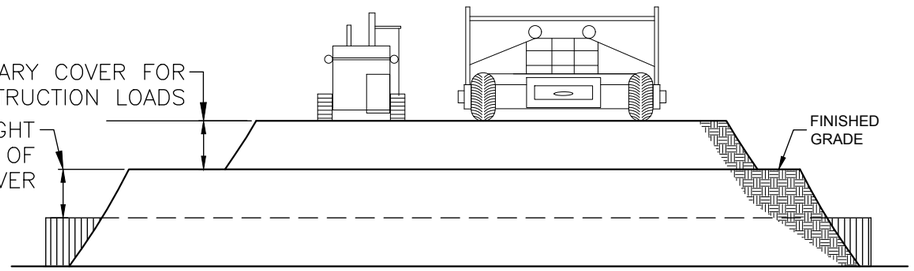


CONSTRUCTION LOADS

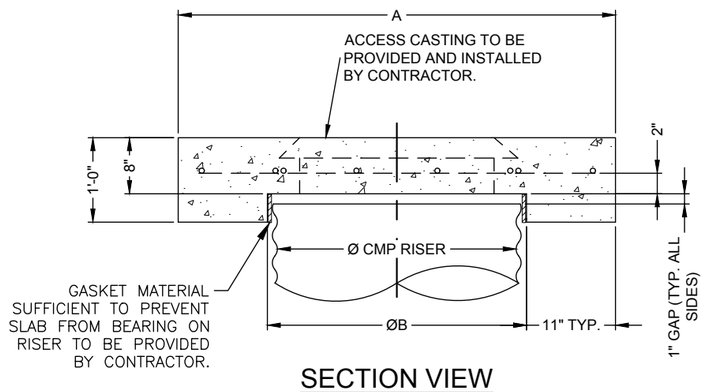
FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM ✓

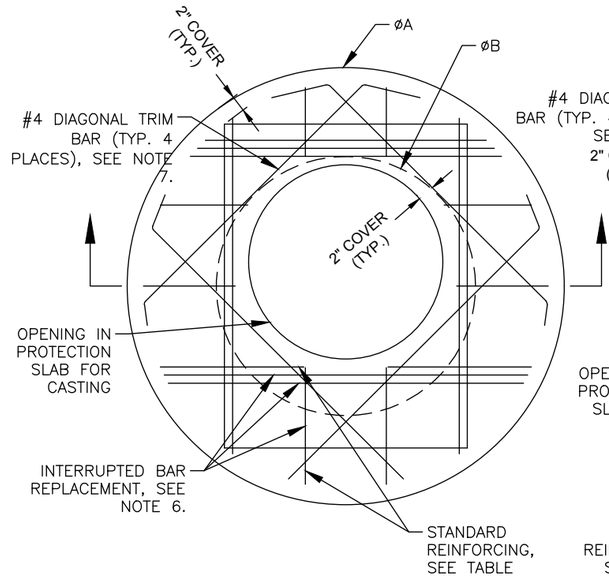
SCALE: N.T.S.



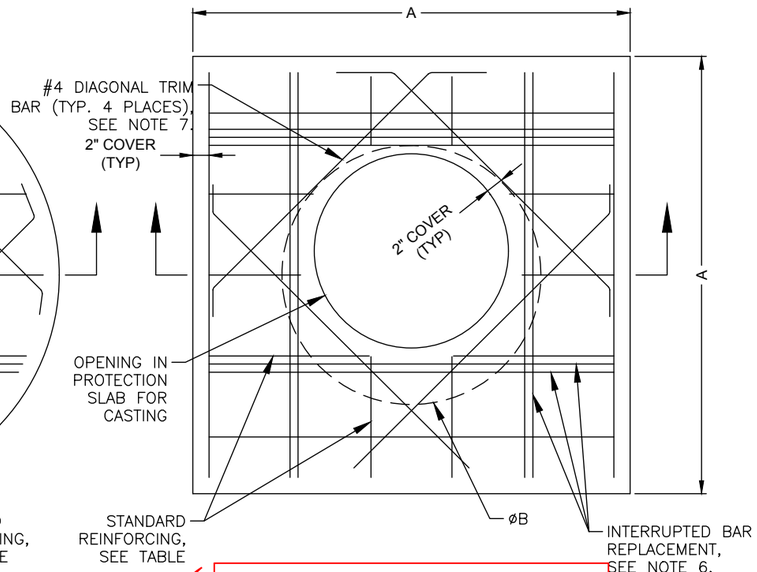
SECTION VIEW

REINFORCING TABLE				
Ø CMP RISER	A	Ø B	REINFORCING	**BEARING PRESSURE (PSF)
24"	Ø 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	Ø 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	Ø 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	Ø 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	Ø 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



✓ SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

POST CONSTRUCTION CONDITIONS DENOTED IN RED

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

MILONE & MACBROOM®
1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
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REVISIONS

DETAILS - DETENTION SYSTEM
NORTH MAIN STREET STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: VARIES
DATE: FEBRUARY 18, 2022
PROJECT NO.: 14658.00008
SHEET NO.: 14

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Drawing: W:\CAD\DESIGN\14658.00008\CAD\VM\LAYOUT.DWG Layout: Tab:SITE DETAILS 2

Drawing: W:\CAD\DESIGN\14658.00008~DEC\CAD\XM~LAYOUT.DWG Layout: Tab:INSTALLATION

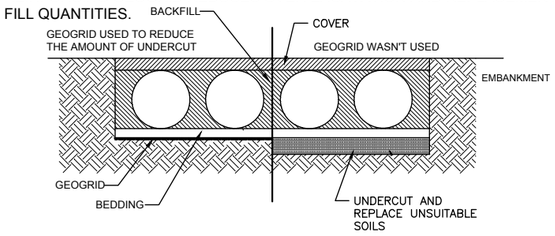
CMP DETENTION INSTALLATION GUIDE ✓

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

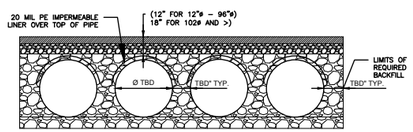


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

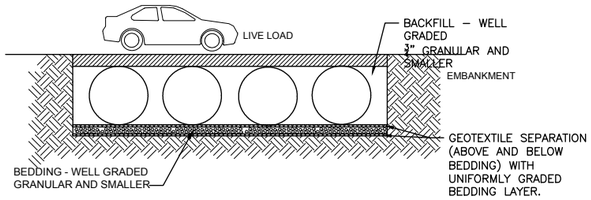
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

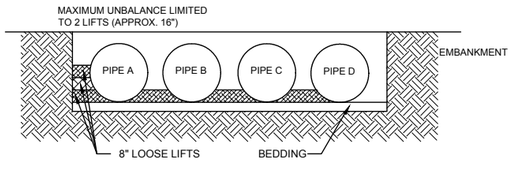
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



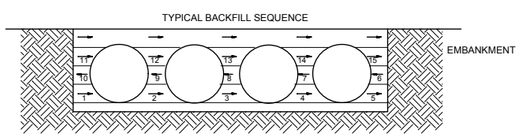
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.



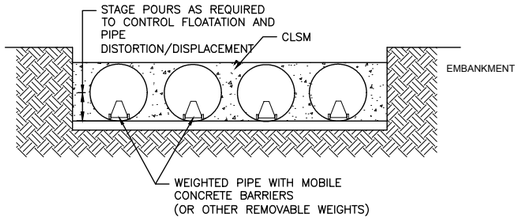
IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



POST CONSTRUCTION CONDITIONS DENOTED IN RED

WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

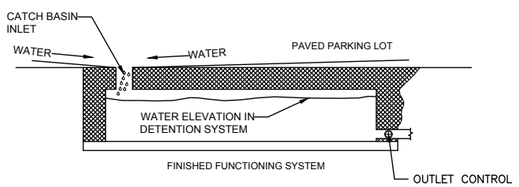


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



*ENDS ARE NOT PERFORATED

CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

LANE CONFIRMED

MILONE & MACBROOM®
1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
www.milonemacbroom.com

REVISIONS

DETAILS - DETENTION SYSTEM

NORTH MAIN STREET STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL DESIGNED	JCL DRAWN	RKS CHECKED
SCALE: VARIES		
DATE: FEBRUARY 18, 2022		
PROJECT NO.: 14658.00008		
SHEET NO.: 15		

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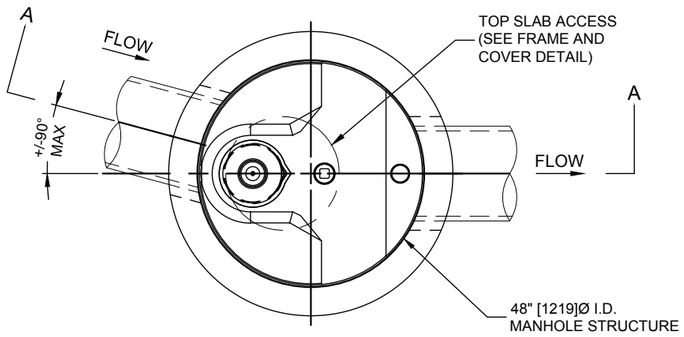
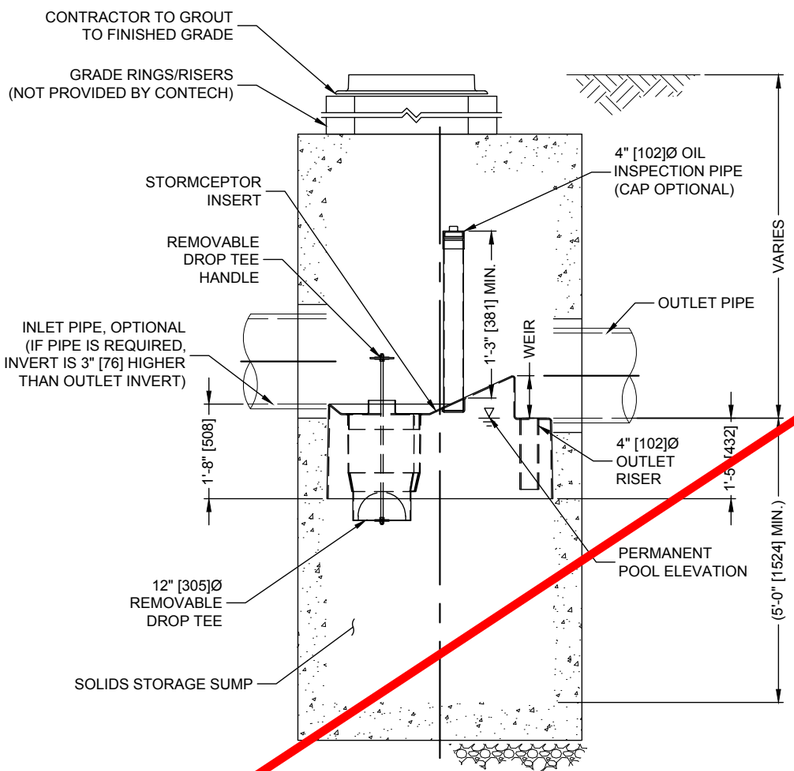


PLAN VIEW
TOP SLAB NOT SHOWN



SECTION A-S

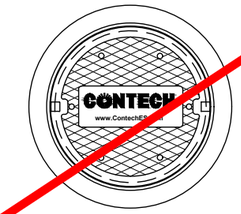
Stormceptor®
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

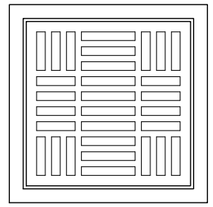
STORMCEPTOR DESIGN NOTES

THE STANDARD ####### CONFIGURATION WITH ROUND, SOLID FRAME AND COVER, AND INLET PIPE IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES

POST CONSTRUCTION CONDITIONS DENOTED IN RED





SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

FRAME AND COVER
(MAY VARY)
NOT TO SCALE

FRAME AND GRATE
(MAY VARY)
NOT TO SCALE

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. STORMCEPTOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STORMCEPTOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. STORMCEPTOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMCEPTOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SEE ATTACHED HYDROWORKS SUBMITTAL

STC450i
STORMCEPTOR
STANDARD DETAIL

MILONE & MACBROOM®
1 South Main Street, 2nd Floor
Waterbury, Vermont 05676
(802) 882-8335 Fax (802) 882-8346
www.miloneandmacbroom.com

REVISIONS

DETAILS - STORMCEPTOR
NORTH MAIN STREET STORMWATER IMPROVEMENTS
HARDWICK, VERMONT

JCL DESIGNED	JCL DRAWN	RKS CHECKED

SCALE: N/A
DATE: FEBRUARY 18, 2022
PROJECT NO.: 14658.00008
SHEET NO.: 16

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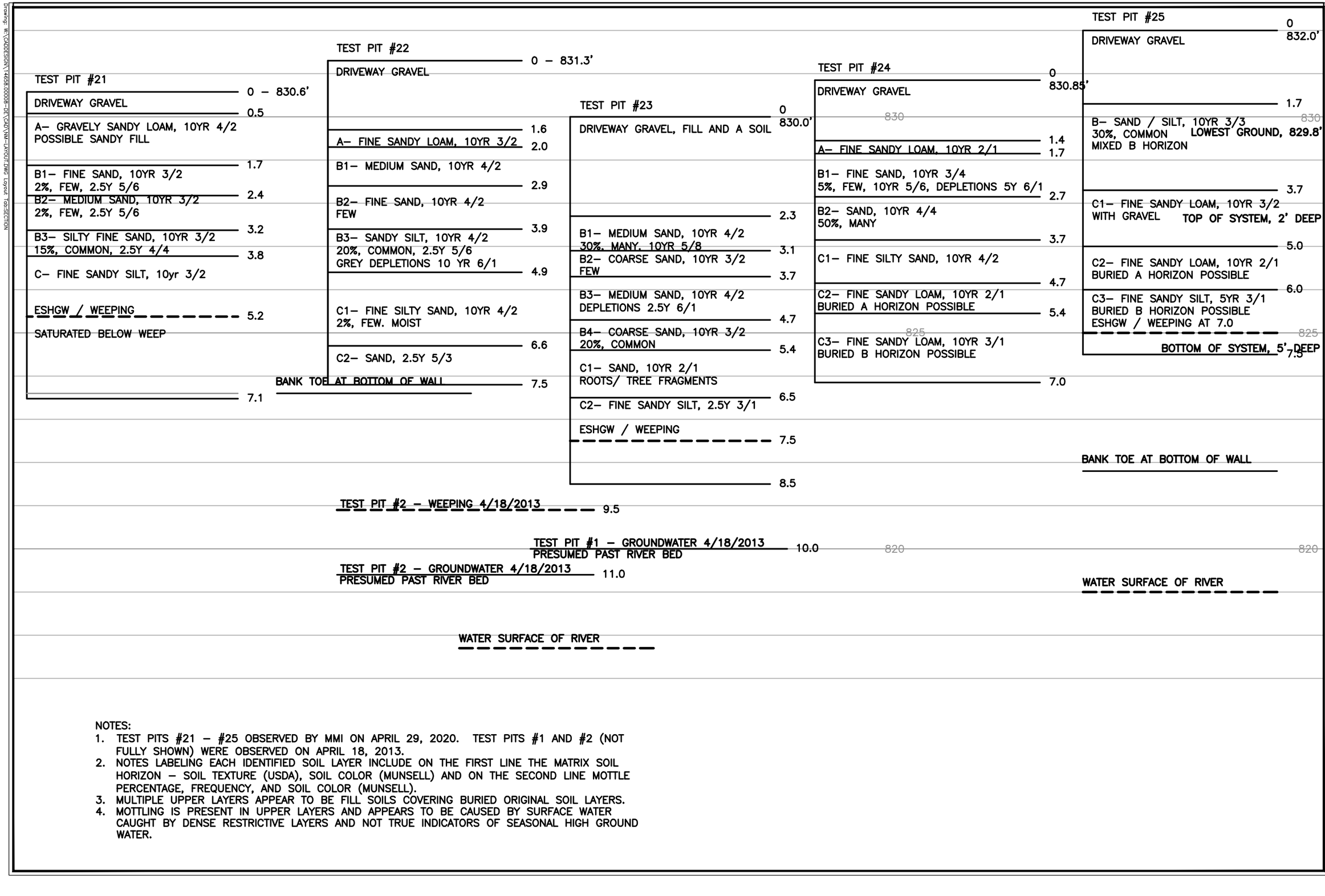
Drawing: W:\CAD\DESIGN\14658.00008-DE\CAD\NM-LAYOUT.DWG Layout Tab:STORMCEPTOR
Plotted by: JLOUIS0S On this date: Fri, 2022 December 2 — 11:45am
W:\CADDESIGN\14658.00008-DE\CAD\NM-LAYOUT.DWG 12/2/2022 11:47 AM



NOTES:

1. TEST PITS #21 – #25 OBSERVED BY MMI ON APRIL 29, 2020. TEST PITS #1 AND #2 (NOT FULLY SHOWN) WERE OBSERVED ON APRIL 18, 2013.
2. NOTES LABELING EACH IDENTIFIED SOIL LAYER INCLUDE ON THE FIRST LINE THE MATRIX SOIL HORIZON – SOIL TEXTURE (USDA), SOIL COLOR (MUNSELL) AND ON THE SECOND LINE MOTTLE PERCENTAGE, FREQUENCY, AND SOIL COLOR (MUNSELL).
3. MULTIPLE UPPER LAYERS APPEAR TO BE FILL SOILS COVERING BURIED ORIGINAL SOIL LAYERS.
4. MOTTLING IS PRESENT IN UPPER LAYERS AND APPEARS TO BE CAUSED BY SURFACE WATER CAUGHT BY DENSE RESTRICTIVE LAYERS AND NOT TRUE INDICATORS OF SEASONAL HIGH GROUND WATER.

MILONE & MACBROOM®
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REVISIONS

DETAILS - TESTPITS

NORTH MAIN STREET
STORMWATER IMPROVEMENTS

HARDWICK, VERMONT

JCL	JCL	RKS
DESIGNED	DRAWN	CHECKED

SCALE: 1"=2'

DATE: FEBRUARY 18, 2022

PROJECT NO.: 14658.00008

SHEET NO.: 17

Drawing: W:\CAD\DESIGN\14658.00008-DEC\CAD\XM-LAYOUT.DWG Layout: Tab:SECTION

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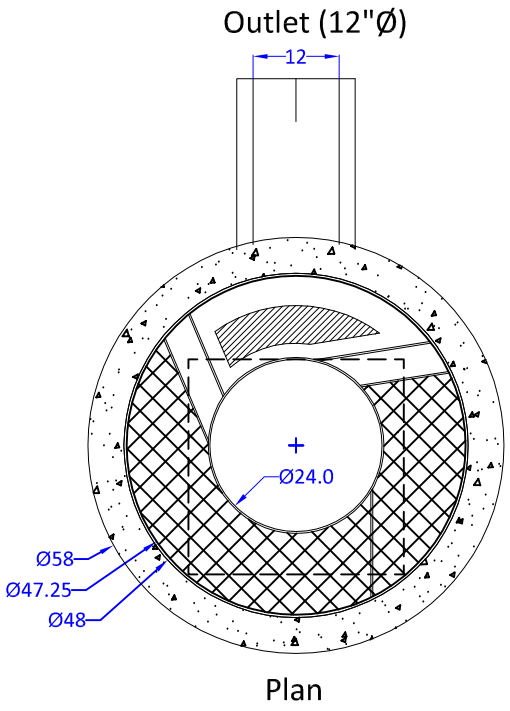
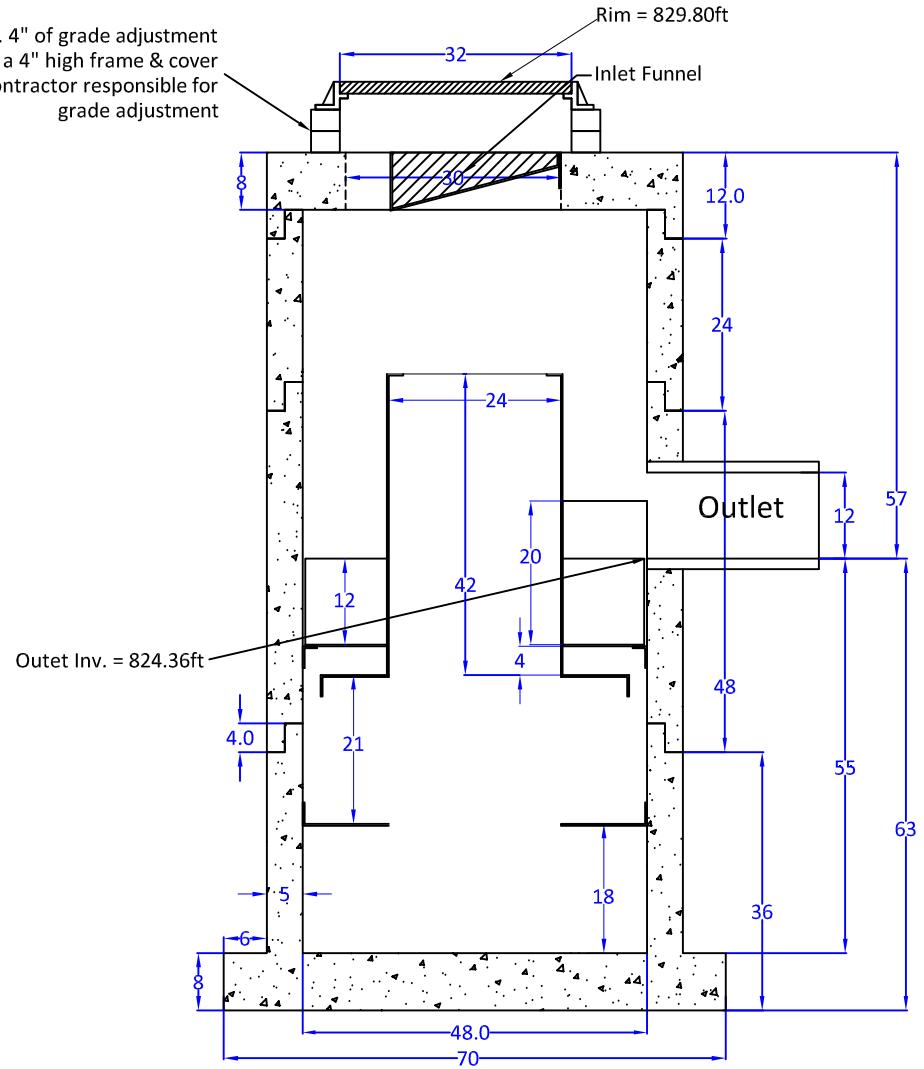
SELLING AGENT RESPONSIBLE FOR PROVIDING CONTRACTOR WITH PAGE 1



Plan



Profile

Alternate equals must be NJDEP certified based on testing completed at an independent laboratory

Vendor testing and/or field testing are not acceptable to demonstrate an alternate equal due to the lack of repeatability.

HydroStorm
U.S. Patent #10,710,907
www.hydroworks.com
888-290-7900

Hydroworks HS4i (48"Ø)

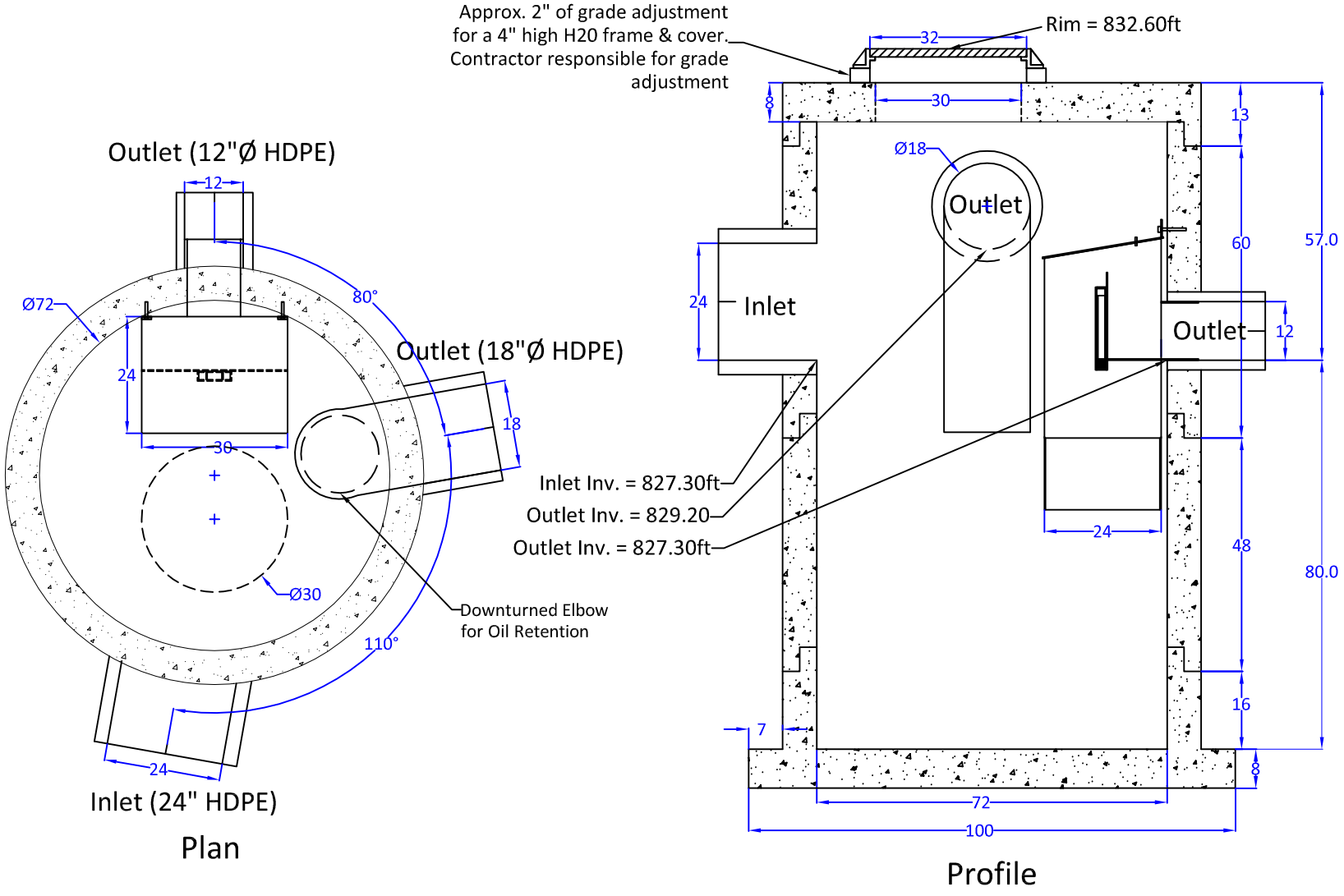
PROJECT: North Main Street

LOCATION: Hardwick, Vermont

REVISION DATE: 05/10/2022

Hydroworks

SELLING AGENT RESPONSIBLE FOR PROVIDING CONTRACTOR WITH PAGE 1



Any alternate equal must have independent testing to both the 2013 NJDEP separator protocol and the 2013 ETV Canada separator protocol

HydroDome by
Hydroworks, LLC
U.S. Patent #10,801,196
www.hydroworks.com
888-290-7900

Hydroworks HD6 (72"Ø)

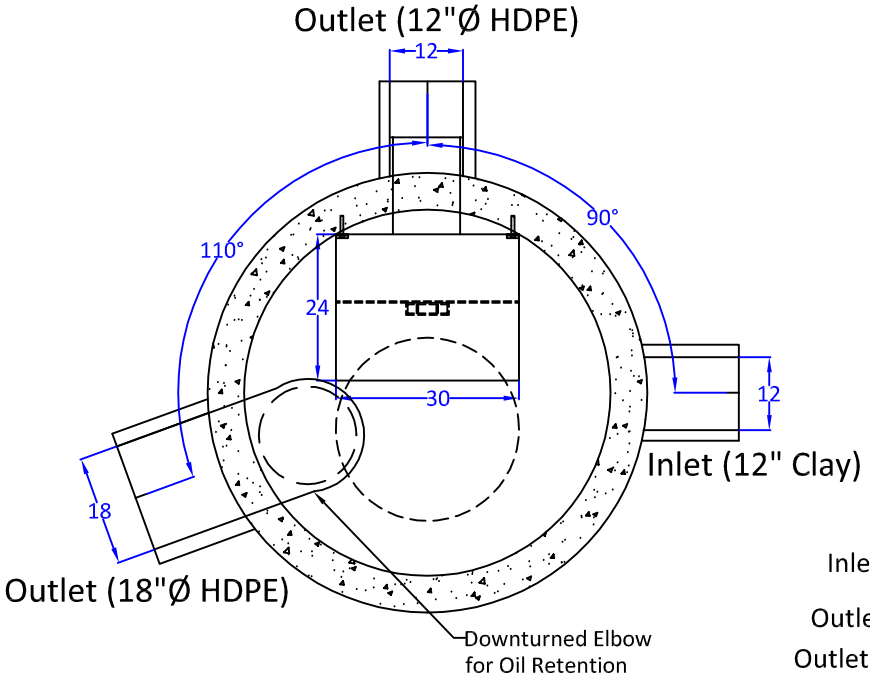
PROJECT: North Main Street

LOCATION: Hardwick, Vermont

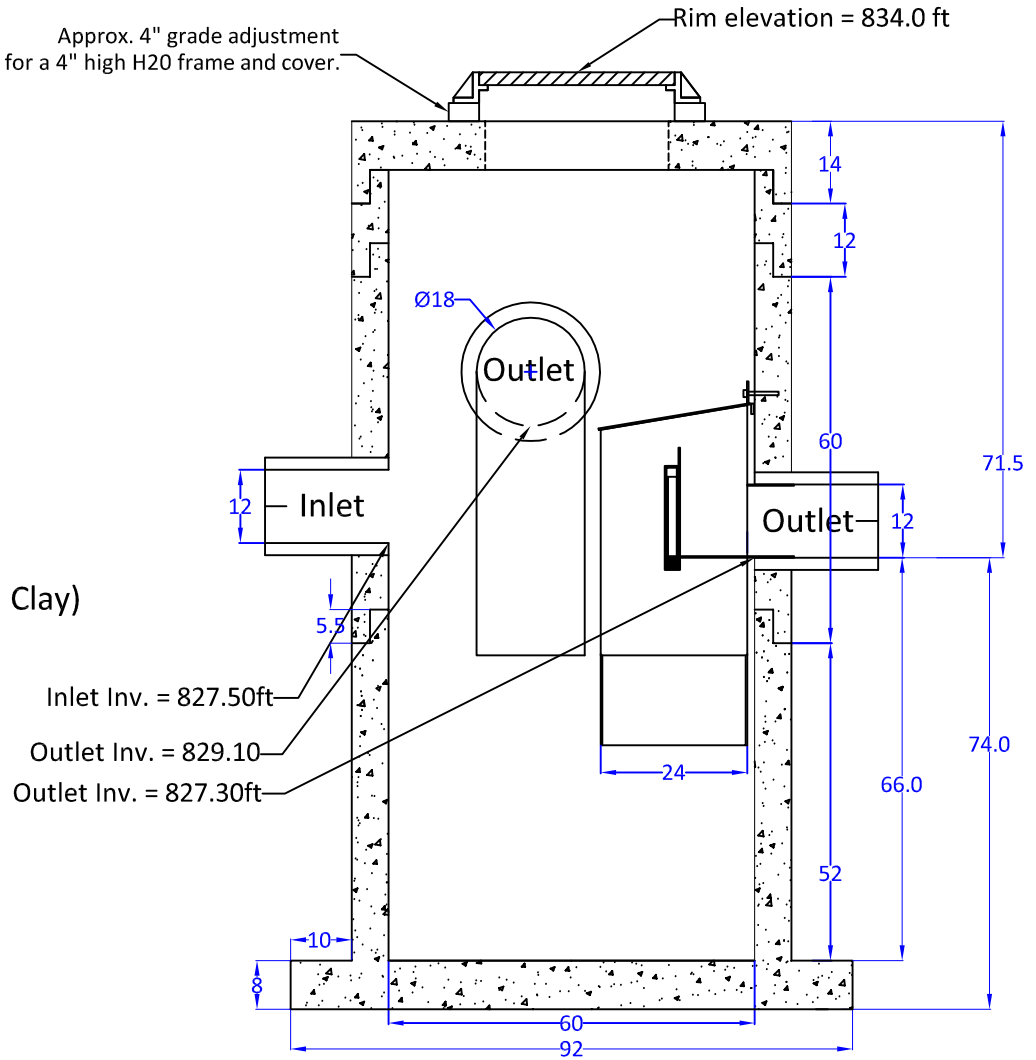
REVISION DATE: 05/09/2022

Hydroworks

SELLING AGENT RESPONSIBLE FOR PROVIDING CONTRACTOR WITH PAGE 1



Plan



Profile

Any alternate equal must have independent testing to both the 2013 NJDEP separator protocol and the 2013 ETV Canada separator protocol

HydroDome by
Hydroworks, LLC
U.S. Patent #10,801,196
www.hydroworks.com
888-290-7900

Hydroworks HD5 (60"Ø)

PROJECT: Church Street

LOCATION: Hardwick, Vermont

REVISION DATE: 05/09/2022

Hydroworks

NORTH MAIN STREET

HARDWICK, VT

LANE CMP STORMWATER MANAGEMENT SYSTEM

NOTES:

1. THE LANE CMP STORM WATER MANAGEMENT SYSTEM SHALL BE INSTALLED IN ACCORDANCE WITH INDUSTRY STANDARD INSTALLATION PRACTICES ADAPTED TO THE SPECIAL INSTALLATION PROCEDURES CONTAINED HEREIN.
2. CONSTRUCTION EQUIPMENT SHALL NOT TRAVERSE OR OTHERWISE BE LOCATED ATOP THE PIPE SYSTEM OR ITS COMPONENTS UNTIL SUFFICIENT COVER IS PROPERLY PLACED AND COMPACTED. CONSTRUCTION LOADING RESTRICTIONS ARE CONTAINED HEREIN. THE INSTALLER SHALL CONTACT THE MANUFACTURER TO ADDRESS ANY UNCERTAINTIES IN THIS REGARD.
3. THE FOUNDATION AND/OR BEDDING STONE MUST BE PROPERLY LEVELED TO THE ELEVATION SHOWN ON THE PROJECT PLANS PRIOR TO THE PLACEMENT OF ANY PIPE OR FITTINGS.
4. SPACINGS SHOWN BETWEEN PIPE RUNS ARE STANDARD AND WILL ENSURE SUFFICIENT SPACE FOR MATERIAL PLACEMENT AND COMPACTION. CONSIDERATIONS FOR SPACING REDUCTIONS WILL NOT BE MADE UNLESS THE INSTALLER FORMALLY ACKNOWLEDGES THAT THE DESIRED REDUCTION WILL NOT COMPROMISE THE ABILITY TO PROPERLY PLACE AND COMPACT BACKFILL IN AFFECTED AREAS.
5. BACKFILL AND BEDDING MATERIALS SHALL BE AS SPECIFIED IN THE PROJECT PLANS AND CONSISTENT WITH THE NOTES CONTAINED HEREIN.
6. THE PLACEMENT OF A GEOMEMBRANE OVER THE ENTIRE SYSTEM IS CONSIDERED A BEST MANAGEMENT PRACTICE WHEN THE SYSTEM IS LOCATED BENEATH PAVEMENT IN THE MORE NORTHERN REGIONS WHERE SEVERE WINTERS INCLUDE HEAVIER USES OF DEICING SALTS.
7. DETENTION SYSTEMS ARE SUBJECT TO GREATER LEAKAGE THAN TYPICAL SINGLE RUN STORM SEWER APPLICATIONS AND THEREFORE ARE NOT APPROPRIATE FOR APPLICATIONS REQUIRING LONG-TERM CONTAINMENT OR HYDROSTATIC PRESSURE. LEAKAGE PERFORMANCE REQUIREMENTS ARE MORE APPROPRIATELY ADDRESSED USING PERFORATED PIPE BACKFILLED WITH AN OPEN-GRADED STONE ENVELOPE IN AN IMPERVIOUS LINER (DESIGNED BY OTHERS).
8. CONTACT YOUR LOCAL LANE SALES REPRESENTATIVE FOR ANY MODIFICATIONS NEEDED TO THE SYSTEM DESIGN.

STORM STORAGE

LANE

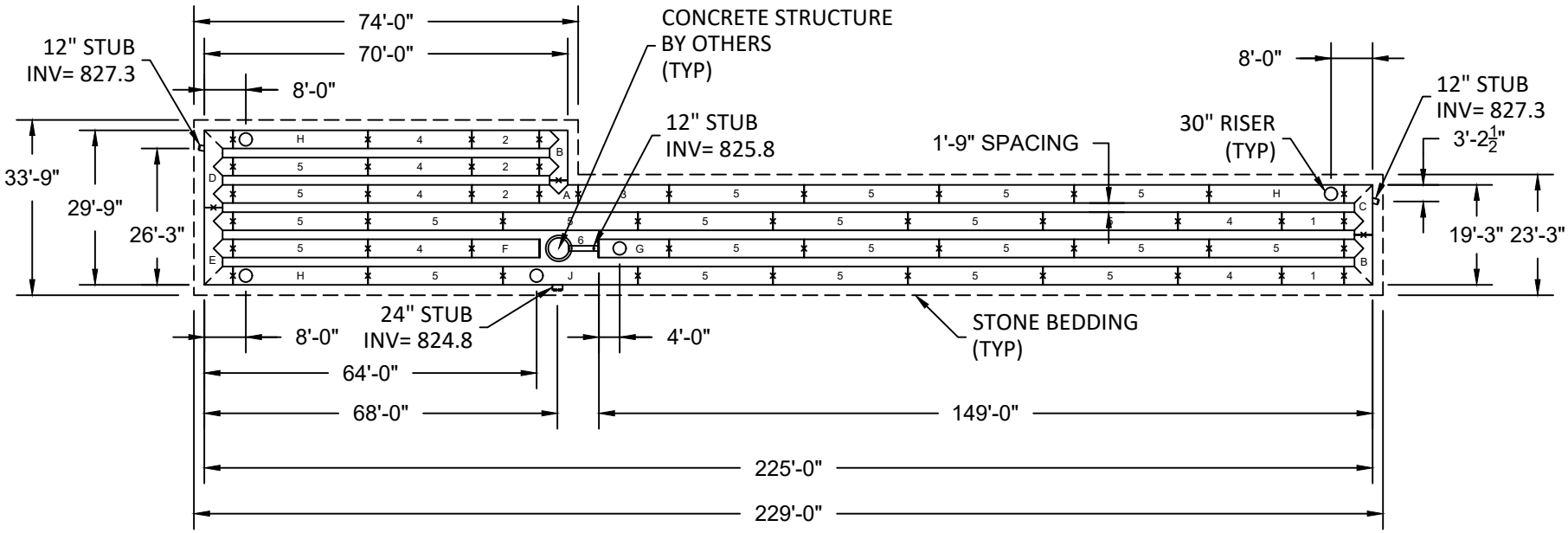
LANE

NORTH MAIN STREET
HARDWICK, VT
DESROCHES CONSTRUCTION SERVICES INC.
42" CMP STORMWATER MANAGEMENT SYSTEM

LANE ENTERPRISES, INC.

SCALE:	DRAWN BY:	DATE:	DRAWING NUMBER:
N.T.S.	JMB	06-02-2022	C0015

PAGE: 1 OF 13



PLAN VIEW
INV= 824.8

BILL OF MATERIALS

MARK	DESCRIPTION	NO. REQUIRED
A	42" CMP SINGLE TEE	1
B	42" CMP SINGLE TEE/ 90° ELBOW COMBO	2
C	42" CMP SINGLE TEE/ 90° ELBOW COMBO & 12" STUB	1
D	42" CMP DOUBLE TEE/ 90° ELBOW COMBO & 12" STUB	1
E	42" CMP DOUBLE TEE/ 90° ELBOW COMBO	1
F	42" CMP (13-0" LENGTH) W/ BULKHEAD	1
G	42" CMP (13'-6" LENGTH) W/ 30" RISER, BULKHEAD & 12" STUB	1
H	42" CMP (26'-0" LENGTH) W/ 30" STUB	3
J	42" CMP (26'-0" LENGTH) W/ 24" STUB & 30" RISER	1
1	42" CMP (12'-0" LENGTH)	2
2	42" CMP (13'-0" LENGTH)	3
3	42" CMP (17'-6" LENGTH)	1
4	42" CMP (20'-0" LENGTH)	6
5	42" CMP (26'-0" LENGTH)	23
6	12" CMP (5'-0" LENGTH)	1
	12" MAR MAC COUPLER (BY OTHERS)	2
	24" MAR MAC COUPLER (BY OTHERS)	1
	12" BAND	1
	42" BAND	51

FOR APPROVAL ONLY
SIGNATURE: Ronald Desroches
DATE: 6-14-22
NOT FOR CONSTRUCTION

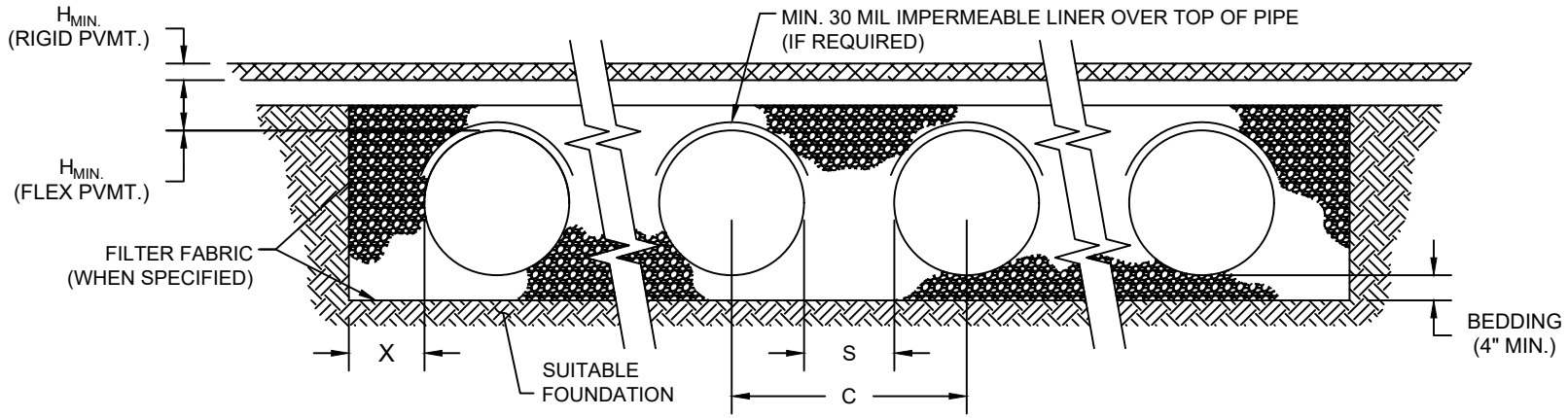
REVISIONS			
NO	BY	DATE	NOTES

NOTES:

1. ALL 42" PIPE IS FULLY PERFORATED, T2, 16GA. $2\frac{2}{3}$" X $\frac{1}{2}$" CORRUGATION.
2. DASHED LINE INDICATES WELD.
3. ALL REINFORCEMENT SHALL MEET ASTM A998.
4. REFER TO PAGE 3 & 4 OF 13 FOR INSTALLATION NOTES.

NORTH MAIN STREET
HARDWICK, VT
DESROCHES CONSTRUCTION SERVICES INC.
42" CMP STORMWATER MANAGEMENT SYSTEM
LANE ENTERPRISES, INC.

SCALE: 1/32" = 1'
DRAWN BY: JMB
DATE: 06-02-2022
DRAWING NUMBER: C0015



TYPICAL CROSS SECTION

1. ALL CORRUGATED METAL PIPE (CMP) SHALL BE THE DIAMETER, CORRUGATION SIZE, AND GAUGE SPECIFIED ON THE PLANS. CORRUGATED STEEL PIPE WITH A METALLIC COATING SHALL CONFORM TO AASHTO M36 AND/OR ASTM A760. CORRUGATED STEEL PIPE WITH A POLYMER COATING SHALL CONFORM TO AASHTO M245 AND/OR ASTM A762. CORRUGATED ALUMINUM ALLOY PIPE SHALL CONFORM TO AASHTO M196 AND/OR ASTM B745. ALL RISERS AND STUBS ARE 16-GAUGE WITH A 2⅔" X ½" CORRUGATION UNLESS OTHERWISE NOTED. FITTINGS SHALL MEET THE MINIMUM DESIGN REQUIREMENTS OF ASTM A998 FOR THE BURIAL DEPTH SHOWN ON THE PLANS.

2. IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR OR THEIR AGENT TO RESEARCH AND IMPLEMENT APPLICABLE SAFETY, HAZARD, AND HEALTH REGULATIONS; AND OBTAIN THE NECESSARY APPROVALS, CONSENTS OR PERMITS FROM APPLICABLE AGENCIES, PRIVATE LANDOWNERS, OR PUBLIC ROAD AUTHORITIES.

3. THE CONTRACTOR SHALL BE ADVISED THAT CORRUGATED METAL PIPE IS FLEXIBLE AND THEREFORE DERIVES STRUCTURAL STABILITY FROM THE STRENGTH AND RELATIVE STIFFNESS OF THE SURROUNDING BACKFILL MATERIAL. THE RESULTING SOIL-CULVERT INTERACTION SYSTEM DEFINES THE ABILITY OF THE FLEXIBLE PIPE TO WITHSTAND ANTICIPATED LOADS.

4. PIPE BEDDING AND EMBEDMENT SHALL BE SELECT GRANULAR MATERIALS MEETING THE REQUIREMENTS OF AASHTO M145 FOR A-1, A-2 AND A-3 CLASSIFICATIONS. WELL-GRADED EMBEDMENT MATERIALS SHALL BE FREE OF ORGANICS, ROCK FRAGMENTS LARGER THAN THREE INCHES, AND FROZEN LUMPS. APPLICATIONS THAT INVOLVE PERFORATED PIPE FOR RETENTION PURPOSES SHALL BE BEDDED AND BACKFILLED WITH A CLEAN, OPEN-GRADED, ANGULAR STONE WITH A SIZE DISTRIBUTION BETWEEN 0.75 AND 2 INCHES. OPEN-GRADED EMBEDMENT MATERIALS REQUIRE THE USE OF A FILTER FABRIC TO ELIMINATE THE POTENTIAL OF SOIL MIGRATION FROM ADJACENT SOILS.

5. ALL CMP SHALL BE INSTALLED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS, THE MANUFACTURER'S RECOMMENDATIONS, ASTM A798 FOR CORRUGATED STEEL PIPE OR ASTM B788 FOR CORRUGATED ALUMINUM ALLOY PIPE, AND/OR SECTION 26 OF THE AASHTO LRFD BRIDGE CONSTRUCTION SPECIFICATIONS. IN GENERAL, BEDDING SHALL BE A MINIMUM OF 4 INCHES IN DEPTH AND LEFT LOOSELY PLACED UNDER AND ROUGHLY SHAPED TO THE MIDDLE-THIRD OF THE PIPE SPAN, AND THE EMBEDMENT SHALL BE INSTALLED IN LOOSE LIFTS NOT EXCEEDING 8 INCHES AND COMPACTED TO A MINIMUM 90% AASHTO T99 STANDARD PROCTOR DENSITY. EMBEDMENT SHALL BE RAISED EVENLY, AS DESCRIBED BELOW, WITH A MAXIMUM SIDE-TO-SIDE DIFFERENTIAL OF 24 INCHES OR ONE-THIRD OF THE PIPE DIAMETER, WHICHEVER IS LESS. SELECT EMBEDMENT MATERIALS SHALL EXTEND ABOVE THE PIPE A MINIMUM DISTANCE OF ONE-EIGHTH THE DIAMETER OR 12 INCHES, WHICHEVER IS GREATER.

6. PUBLISHED INSTALLATION STANDARDS REFERENCED ABOVE SHALL BE SUPPLEMENTED WITH THE FOLLOWING INSTRUCTIONS TO ACCOUNT FOR THE PRESENCE OF MANIFOLDS AND PARALLEL PIPE RUNS: THE BACKFILL OPERATION SHALL COMMENCE AND PROGRESS EVENLY ON BOTH SIDES OF THE MANIFOLD AND ALONGSIDE THE PIPE RUNS SIMULTANEOUSLY. IN THIS MANNER, THE OVERALL BACKFILL OPERATION SHALL PROGRESS IN THE DIRECTION OF THE PIPE RUNS AND TOWARDS THE OPPOSITE MANIFOLD, WHERE CARE IS AGAIN TAKEN TO ENSURE THE BACKFILLING IS DONE EVENLY. PERIMETER BACKFILL MUST BE BROUGHT UP EVENLY AS WELL, AND EXTENDED HORIZONTALLY TO STABLE AND/OR UNDISTURBED TRENCH WALLS. SPECIAL CARE SHALL BE TAKEN TO ENSURE THE HAUNCH REGIONS OF THE PIPE ARE COMPLETELY FILLED AND PROPERLY COMPACTED. FILLING THE INSIDE HAUNCH REGIONS OF THE MANIFOLD BETWEEN STUBS IS MORE CHALLENGING AND WILL REQUIRE ADDITIONAL CARE.

7. NO EQUIPMENT SHALL BE OPERATED ON THE SYSTEM UNTIL A MINIMUM OF 12 INCHES OF COVER HAS BEEN ESTABLISHED, AT WHICH TIME ONLY WALK-BEHIND COMPACTION EQUIPMENT AND SMALL SPREADING EQUIPMENT MAY BE USED. EXCAVATORS MUST BE LOCATED OFF THE BED, AND DUMP TRUCKS SHALL NOT DUMP STONE DIRECTLY ON TO THE BED.

8. PROVIDE MINIMUM 30 MIL IMPERMEABLE LINER DRAPED OVER TOP HALF OF PIPE (LATERALS AND MANIFOLDS) TO PREVENT ANY PARKING LOT SEEPAGE FROM ENTERING THE TOP HALF OF THE PIPE, BUT ALLOWING DRAINAGE BETWEEN PIPES. LINER REQUIRES MINIMUM 2" BACKFILL CUSHION AROUND PIPE.

DIAMETER (in)	Standard Spacing			H_{MIN} (ft)
	S (ft)	C (ft)	X (ft)	
24"	1.0	3.0	2.0	1.00
30"	1.25	3.75	2.0	1.00
36"	1.5	4.5	2.0	1.00
42"	1.75	5.25	2.0	1.00
48"	2.0	6.0	2.0	1.00
54"	2.25	6.75	2.0	1.00
60"	2.5	7.5	2.0	1.00
66"	2.75	8.25	2.0	1.00
72"	3.0	9.0	2.0	1.00
78"	3.0	9.5	2.0	1.00
84"	3.0	10.0	2.0	1.00
90"	3.0	10.5	2.0	1.00
96"	3.0	11.0	2.0	1.00
102"	3.0	11.5	2.0	1.25
108"	3.0	12.0	2.0	1.25
114"	3.0	12.5	2.0	1.25
120"	3.0	13.0	2.0	1.25
126"	3.0	13.5	2.0	1.50
132"	3.0	14.0	2.0	1.50
138"	3.0	14.5	2.0	1.50
144"	3.0	15.0	2.0	1.50

LANE

NORTH MAIN STREET
HARDWICK, VT
DESROCHES CONSTRUCTION SERVICES INC.
42" CMP STORMWATER MANAGEMENT SYSTEM

LANE ENTERPRISES, INC.

SCALE: N.T.S.
DRAWN BY: JMB
DATE: 06-02-2022
DRAWING NUMBER: C0015

ACCESS RISER NOTES

1. THE ACCESS RISER DETAIL SHALL BE CONSIDERED CONCEPTUAL WITH THE INTENTION OF ILLUSTRATING HOW LOADS PLACED ON THE COVER OR SURROUNDING PAVEMENT WILL BE TRANSFERRED TO THE SUBGRADE AND NOT BE BROUGHT TO BEAR DIRECTLY ON THE RISER PIPE.
2. ALL RISERS SHALL BE FIELD CUT TO THE ELEVATION NEEDED TO ACCOMMODATE CONSTRUCTION OF THE RISER DETAIL.
3. POURED-IN-PLACE CONCRETE COLLARS SHALL BE PROPERLY FORMED TO PROVIDE A SMALL GAP AROUND THE OUTSIDE DIAMETER OF THE RISER, WITH THE TOP LEVEL OF THE COLLAR SET APPROXIMATELY TWO INCHES ABOVE THE TOP OF THE RISER PIPE.
4. FLAT TOPS, MANHOLE OPENINGS, AND APPURTENANCES SHALL BE CONSTRUCTED AND/OR PROVIDED IN ACCORDANCE WITH THE STANDARD DETAILS AND SPECIFICATIONS OF THE STATE OR LOCAL ROAD AUTHORITY FOR AN H25/HS25 HIGHWAY TRUCK LOADING.
5. STANDARD RISER DIAMETERS ARE BETWEEN 12 AND 48 INCHES, AND THEIR FITTINGS/STUBS ARE SUBJECT TO REINFORCEMENT CONSIDERATIONS IN ACCORDANCE WITH ASTM A998. RELATED REQUIREMENTS ARE DEPENDENT ON THE MAINLINE DIAMETER AND THE BURIAL DEPTH AND MAY BE NEGATED BY OPTING FOR A SMALLER DIAMETER RISER IN THIS RANGE.
6. STUBS FOR RISERS AND IN GENERAL ARE DETERMINED BY THE MANUFACTURER BASED ON FABRICATION STANDARDS AND/OR SHIPPING LIMITATIONS.

TEMPORARY MINIMUM COVER FOR CONSTRUCTION EQUIPMENT NOTES

1. DURING CONSTRUCTION AND PRIOR TO THE CONSTRUCTION OF PAVEMENT ADDITIONAL TEMPORARY COVER MAY BE REQUIRED TO ACCOMMODATE CONSTRUCTION EQUIPMENT TRAFFIC OVER THE PIPE SYSTEM IN ACCORDANCE WITH TABLE 1.
2. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.
3. TEMPORARY COVER SHALL BE DULY COMPACTED AND MAINTAINED AT THE PROPER ELEVATION TO ENSURE NO LOSS OF REQUIRED COVER OVER TIME. CLEAN, OPEN-GRADED MANUFACTURED AGGREGATE MAY BE UNSUITABLE FOR THESE PURPOSES UNLESS PROPERLY LOCKED-IN PLACE OR CONFINED WITH A BINDER MATERIAL.

STANDARD CONNECTING BAND NOTES

1. PIPE ENDS SHALL BE REROLLED TO FORM AN ANNULAR 2⅔" X ½" CORRUGATION WITH SUFFICIENT CORRUGATIONS TO ACCOMMODATE THE MINIMUM WIDTH OF A FULLY CORRUGATED CONNECTING BAND.
2. FULLY CORRUGATED CONNECTING BAND THICKNESS SHALL BE IN ACCORDANCE WITH TABLE 2, AND SHALL HAVE A MINIMUM WIDTH OF 12 INCHES FOR PIPE DIAMETERS UP TO AND INCLUDING 96 INCHES, AND A MINIMUM WIDTH OF 24 INCHES THEREAFTER.
3. STANDARD LUG CONNECTORS SHALL BE USED ON FULLY CORRUGATED CONNECTING BANDS.
4. STANDARD SLEEVE GASKETS, WHEN REQUIRED, SHALL BE ⅜" THICK NEOPRENE MEETING THE MATERIAL REQUIREMENTS OF ASTM D1056, AND SHALL COMPLETELY UNDERLIE THE CONNECTING BAND.
5. ALL JOINT PERFORMANCE REQUIREMENTS SHALL BE IN ACCORDANCE WITH SECTION 9 OF ASTM A760. STANDARD SLEEVE GASKETS SHALL BE REQUIRED FOR JOINTS SPECIFIED TO MEET ANY LEVEL OF LEAK RESISTANT PERFORMANCE AS WELL AS SILT TIGHT PERFORMANCE. IN LIEU OF A GASKET, A GEOTEXTILE WRAP SHALL BE CONSIDERED SUFFICIENT TO MEET SILT TIGHT JOINT PERFORMANCE. GASKETS SHALL NOT BE REQUIRED FOR PERFORATED PIPE SYSTEMS AND JOINTS SPECIFIED TO MEET SOIL TIGHT REQUIREMENTS.
6. CONNECTING BANDS FOR 12 THROUGH 48-INCH DIAMETER PIPE SHALL BE A ONE-PIECE BAND. CONNECTING BANDS FOR 54 THROUGH 96-INCH DIAMETER PIPE SHALL BE A TWO-PIECE BAND. CONNECTING BANDS FOR 102 THROUGH 144-INCH DIAMETER PIPE SHALL BE A THREE-PIECE BAND.
7. CONNECTING BAND MATERIAL AND/OR COATING SHALL MATCH THE PIPE MATERIAL.

ACCESS RISER DETAIL

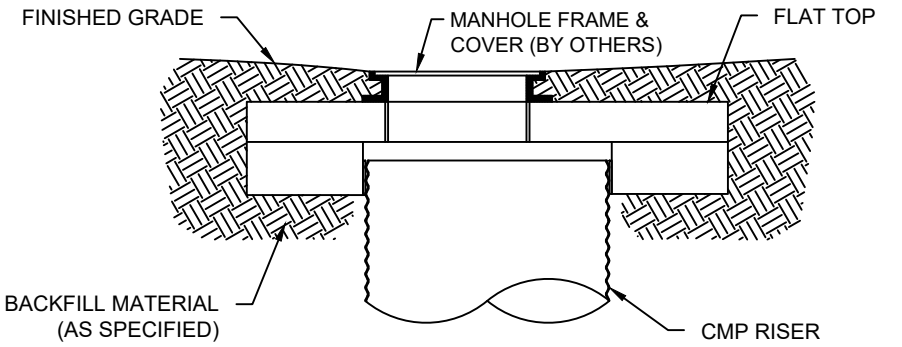


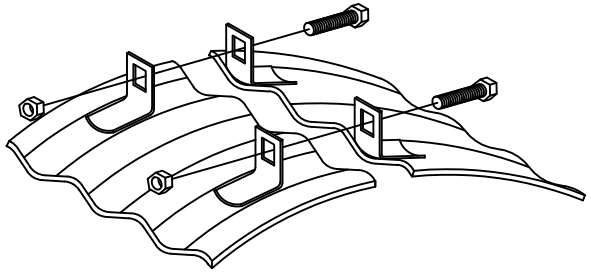
TABLE 1
TEMPORARY MIMIMUM COVER FOR CONSTRUCTION EQUIPMENT

Pipe Dia. (in)	Minimum Cover (ft) for Indicated Axle Loads			
	18-50 kips	50-75 kips	75-110 kips	110-150 kips
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

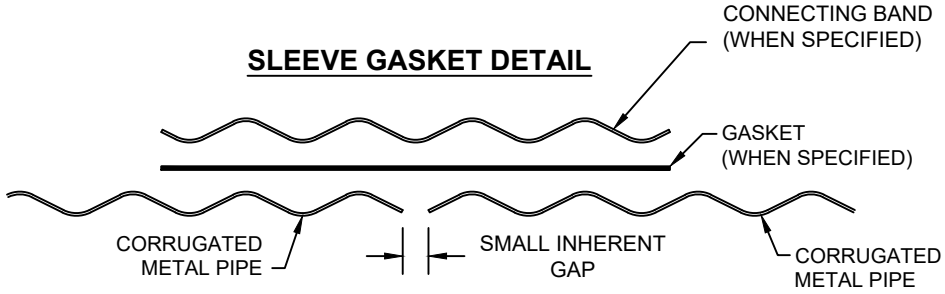
TABLE 2
STANDARD CONNECTING BAND THICKNESS

Pipe Thickness		Minimum Band Thickness	
16 ga	0.064"	18 ga	0.052"
14 ga	0.079"	18 ga	0.052"
12 ga	0.109"	18 ga	0.052"
10 ga	0.138"	16 ga	0.064"
8 ga	0.168"	14 ga	0.079"

STANDARD LUG CONNECTOR DETAIL



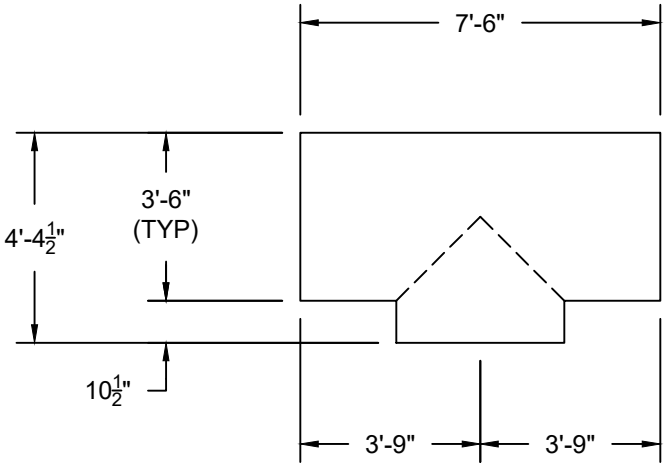
SLEEVE GASKET DETAIL



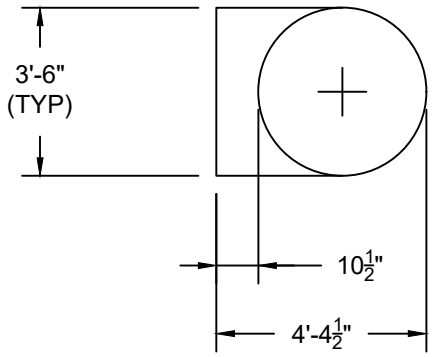
LANE ENTERPRISES, INC.

NORTH MAIN STREET
HARDWICK, VT
DESROCHES CONSTRUCTION SERVICES INC.
42" CMP STORMWATER MANAGEMENT SYSTEM

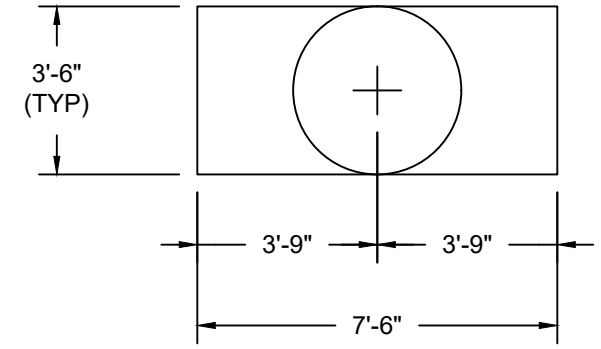
SCALE:	DRAWN BY:	DATE:	DRAWING NUMBER:
N.T.S.	JMB	06-02-2022	C0015



TOP VIEW



SECTION A-A



SECTION B-B

FOR APPROVAL ONLY
SIGNATURE: Ronald Desroches
DATE: _____
NOT FOR CONSTRUCTION

NOTES:

1. ALL 42" PIPE IS FULLY PERFORATED, T2, 16GA. 2⅔" X ½" CORRUGATION.
2. DASHED LINE INDICATES WELD.
3. ALL REINFORCEMENT SHALL MEET ASTM A998.
4. ALL DIMENSIONS ARE NOMINAL, UNLESS OTHERWISE NOTED.

FITTING "A"
DETAIL
-(1) REQUIRED-

NORTH MAIN STREET
HARDWICK, VT
DESROCHES CONSTRUCTION SERVICES INC.
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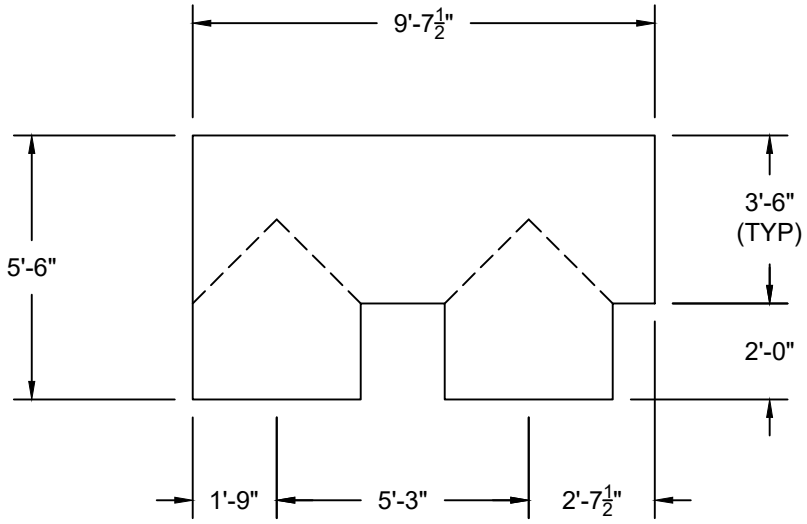
LANE ENTERPRISES, INC.

SCALE:	DRAWN BY:	DATE:	DRAWING NUMBER:
1/4"= 1'	JMB	06-02-2022	C0015

PAGE: 5 OF 13



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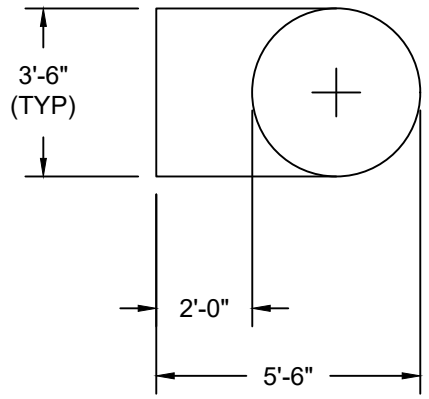

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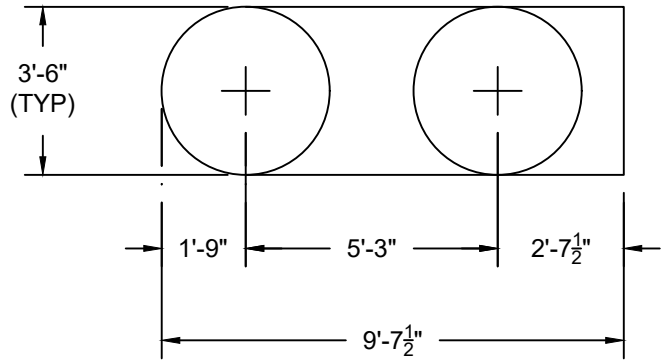

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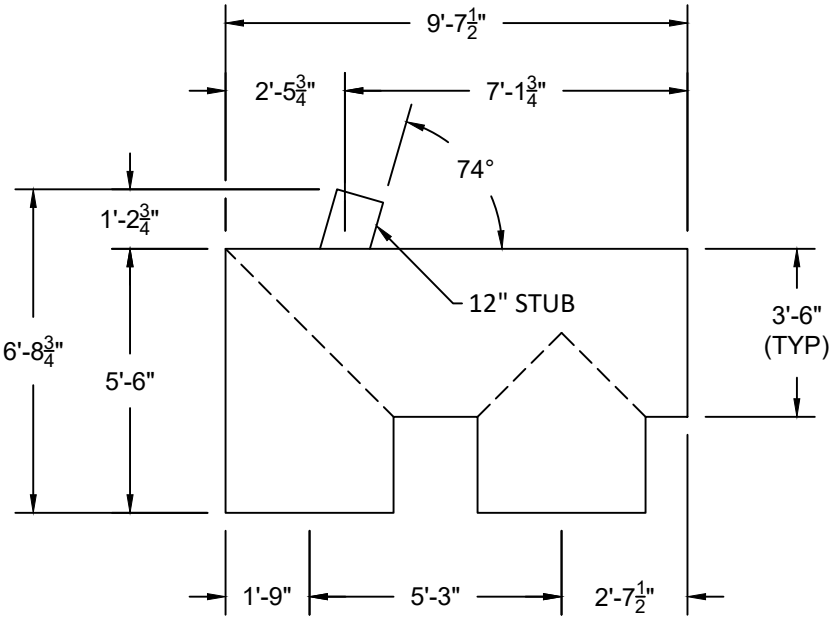
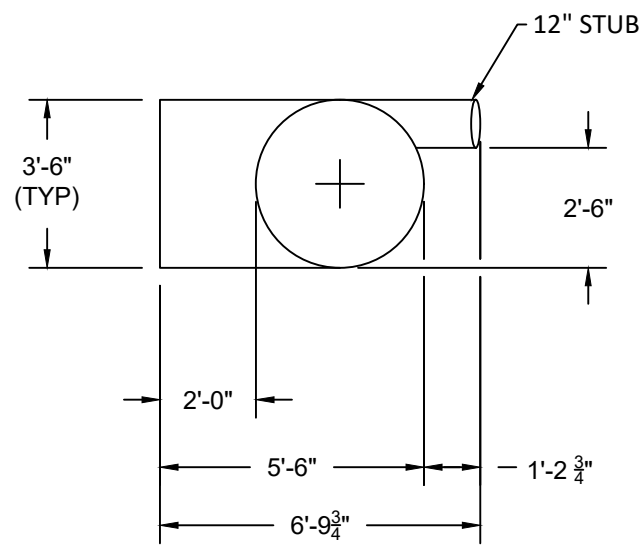


TOP VIEW



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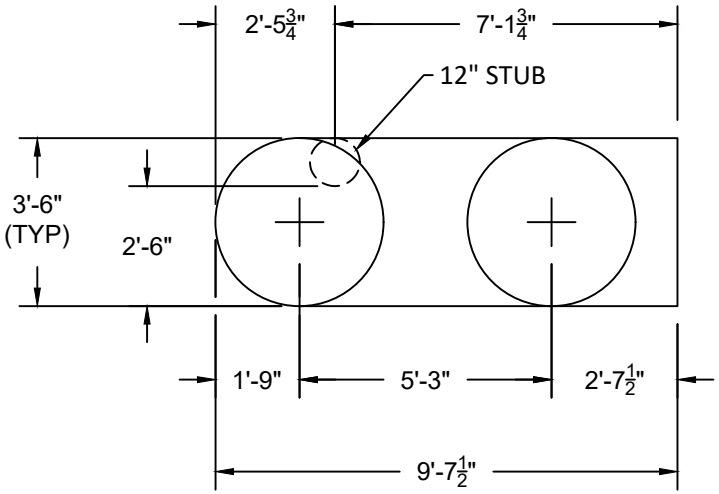

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FITTING "C"
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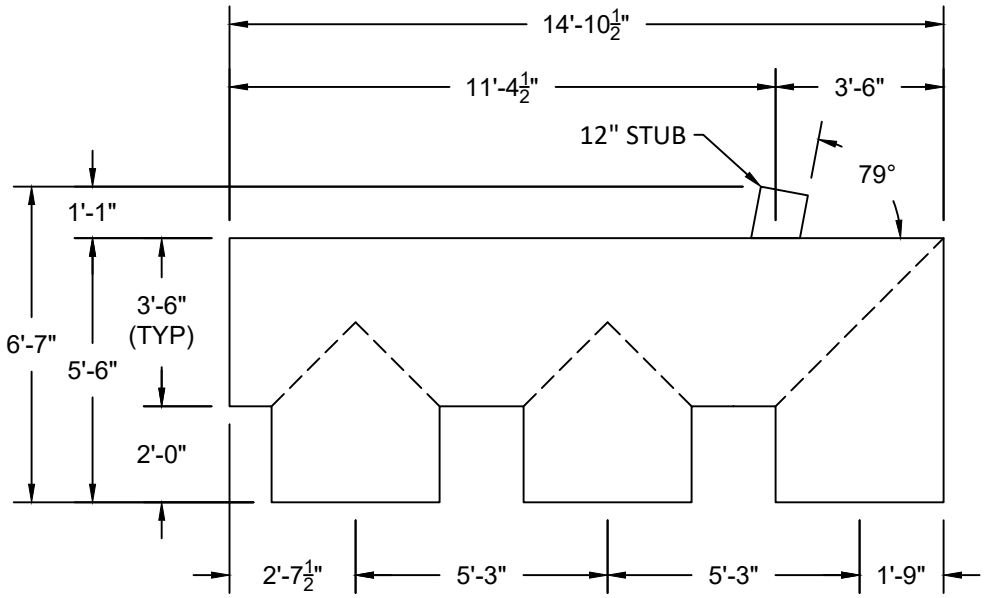

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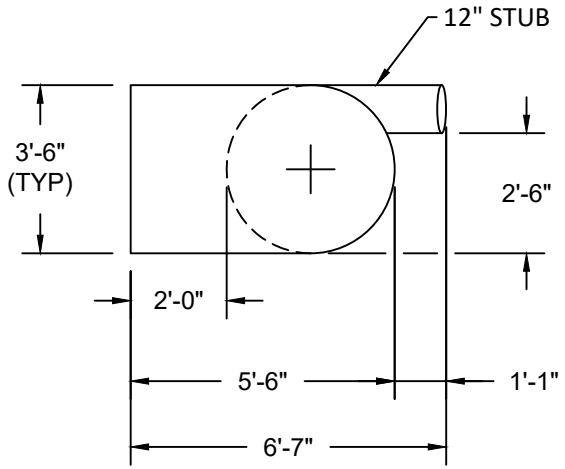

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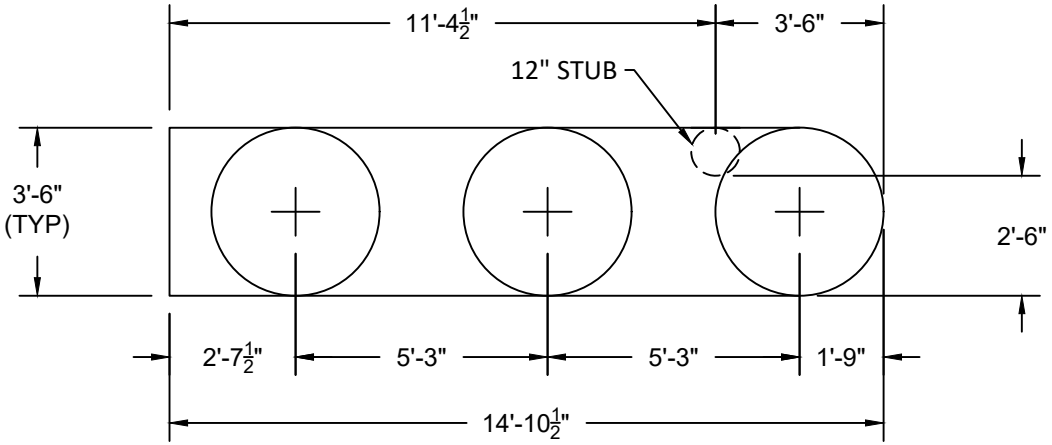

SECTION B-B

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FITTING "D"
DETAIL
-(1) REQUIRED-

LANE

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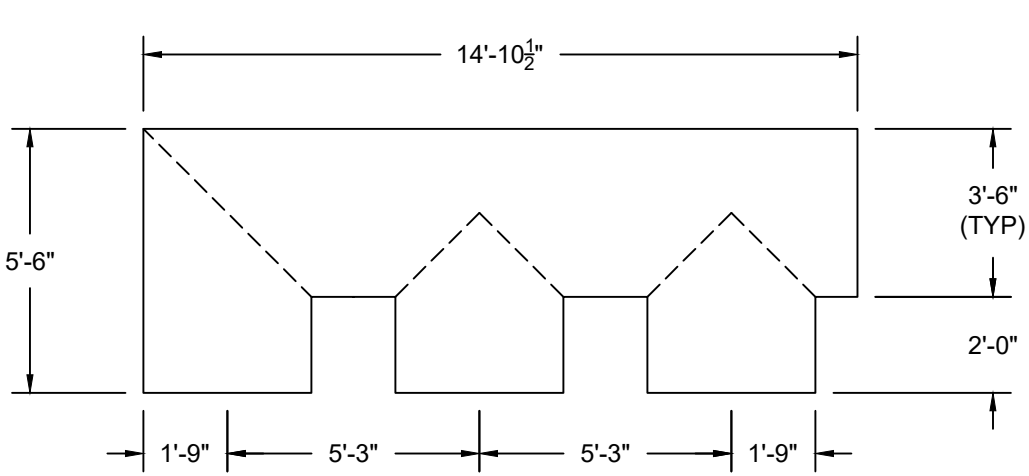

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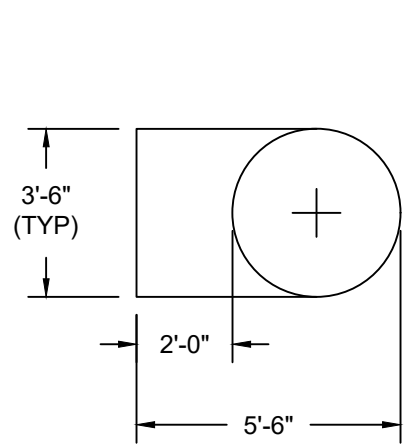

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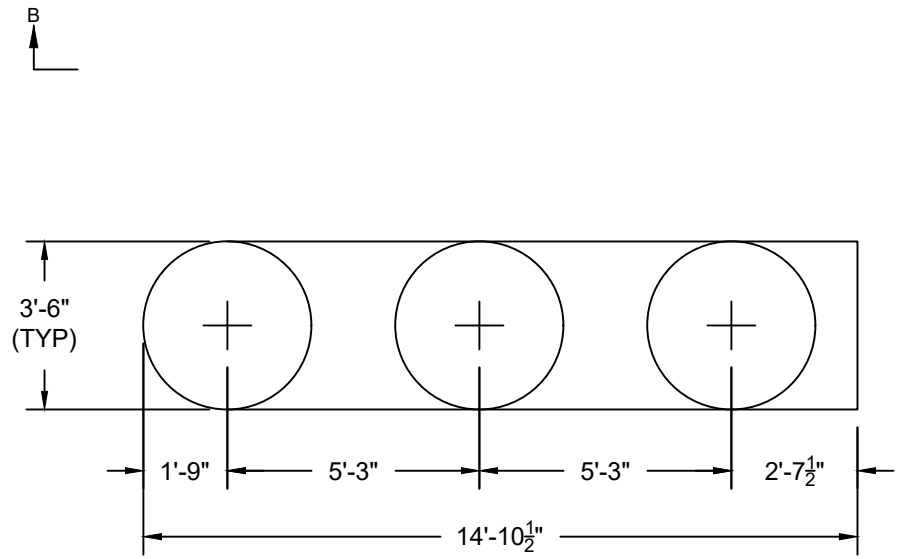

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FITTING "E"
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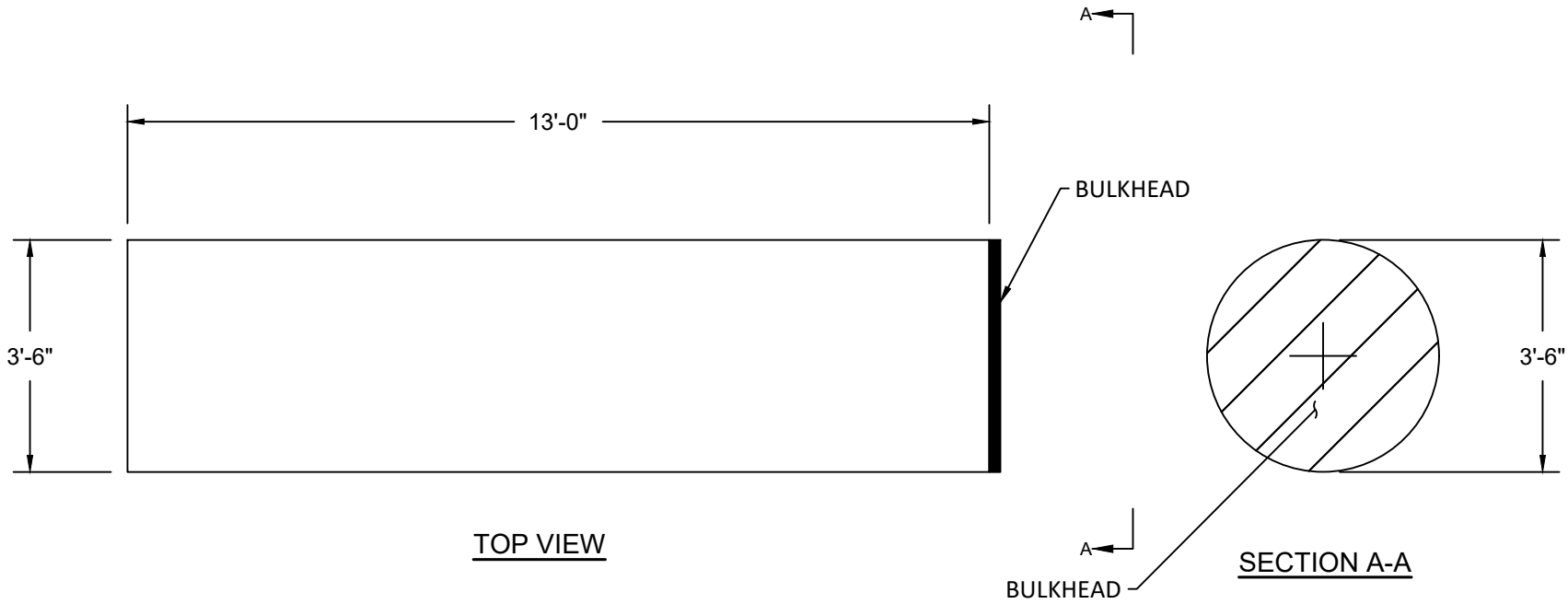

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DATE: 6-14-22
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FITTING "F"
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3/8"= 1'	JMB	06-02-2022	C0015

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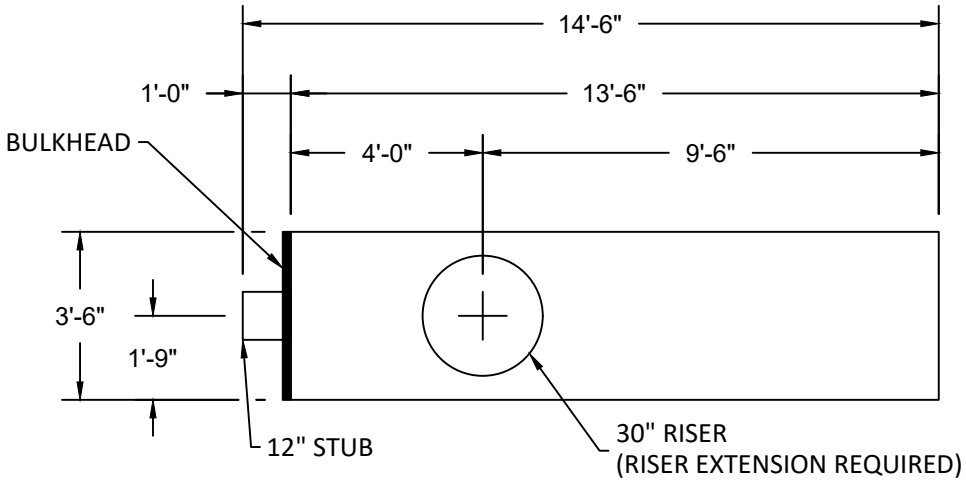
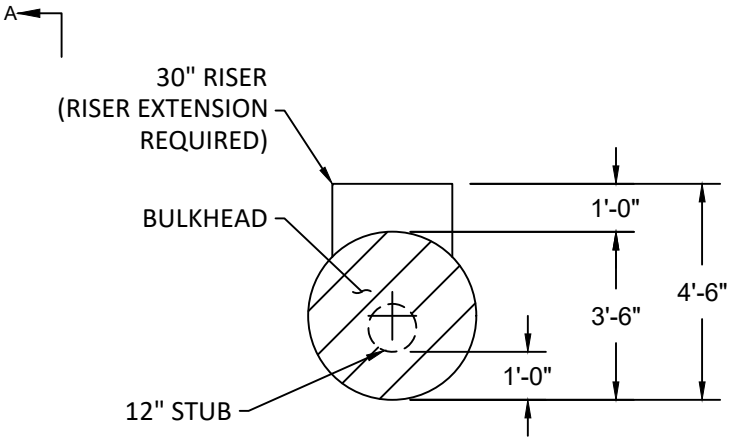


TOP VIEW



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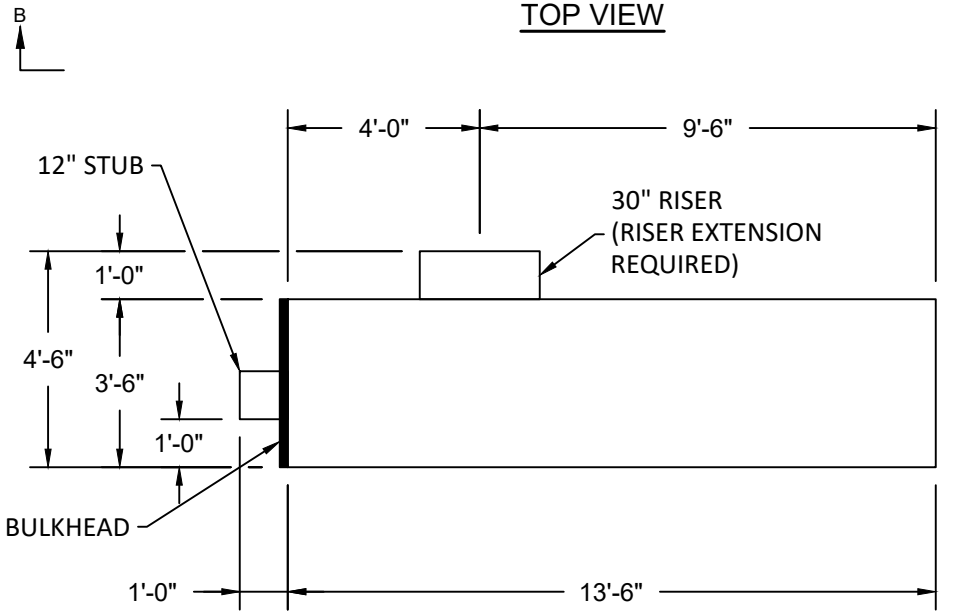

SECTION B-B

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FITTING "G"
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-(1) REQUIRED-

LANE

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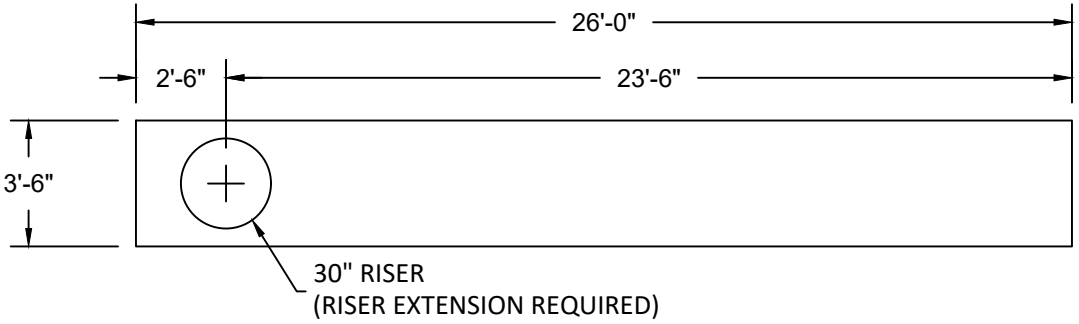

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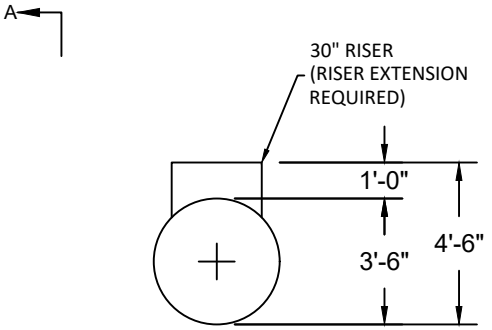

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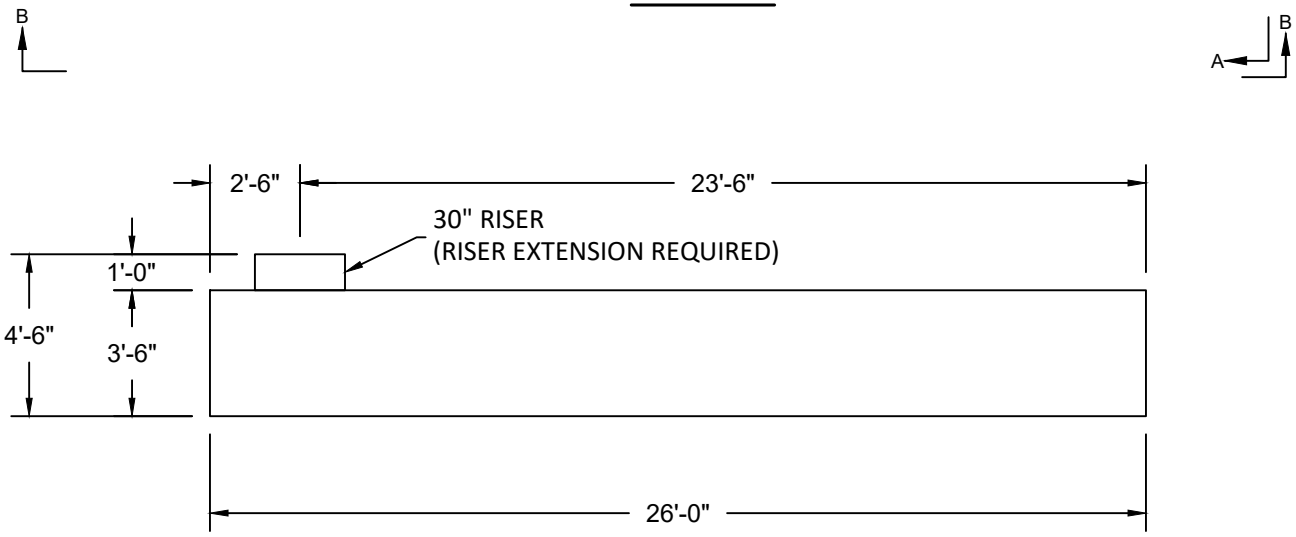

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FITTING "H"
DETAIL
-(3) REQUIRED-

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DESROCHES CONSTRUCTION SERVICES INC.
42" CMP STORMWATER MANAGEMENT SYSTEM
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SCALE:	DRAWN BY:	DATE:	DRAWING NUMBER:
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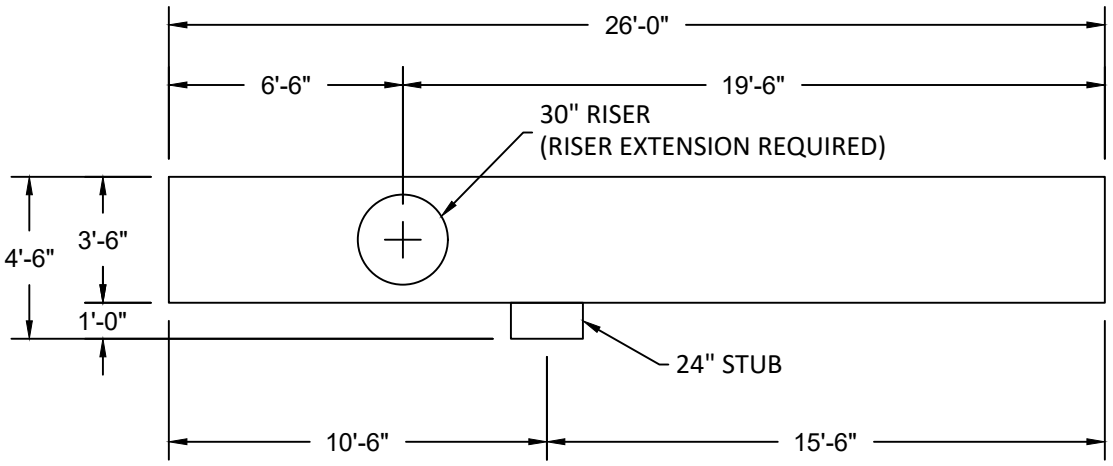

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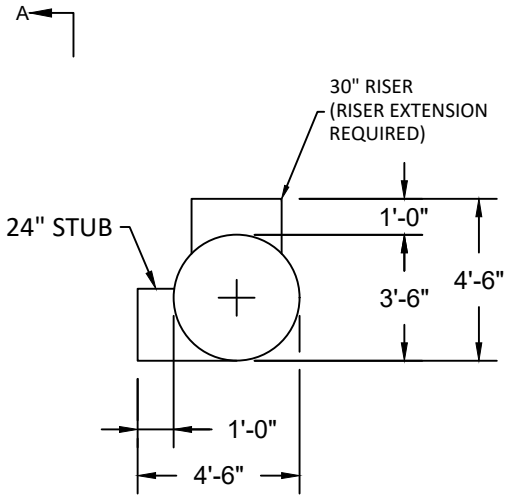
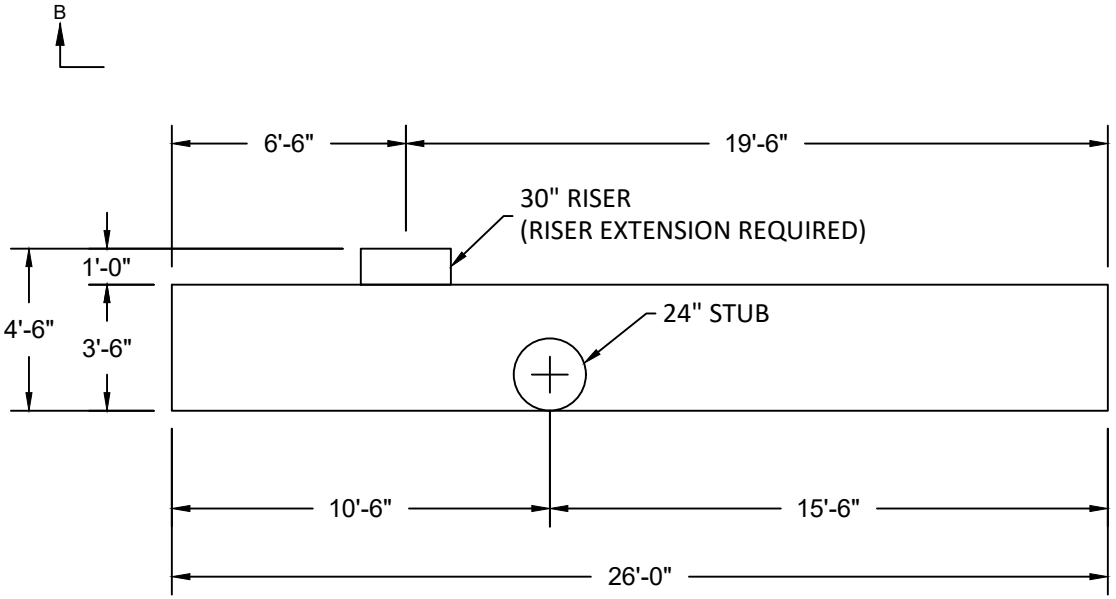


SECTION A-A



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FITTING "J"
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LANE

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3/16"= 1'	JMB	06-02-2022	C0015

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Hydroworks® HydroDome

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please email a copy of the completed checklist to Hydroworks at support@hydroworks.com for our records.

Introduction

The HydroDome (Figure 1) is a state-of-the-art hydrodynamic separator. HydroDome can be used for water quality and quantity flow control if desired.

Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroDome is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroDome.

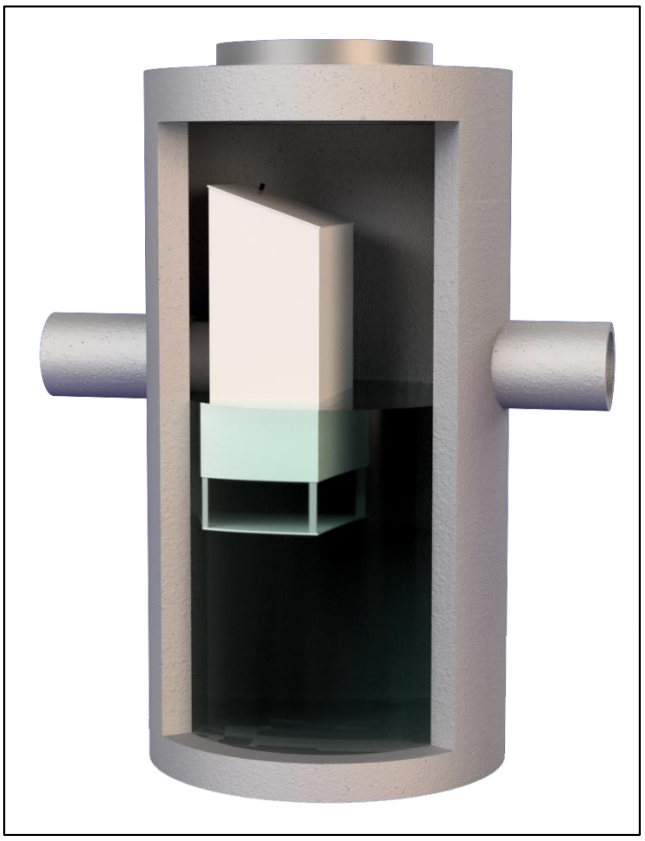

Figure 1. Hydroworks HydroDome

Hydroworks

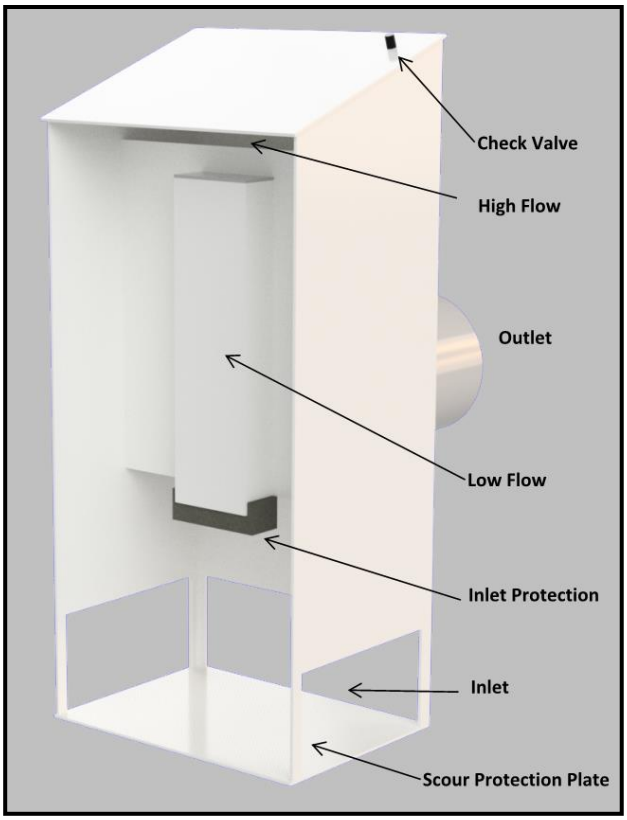

Figure 2 HydroDome Internal Components

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the cover/grate and looking down into the separator.

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. Several readings (2 or 3) should be made at different locations of the structure to ensure that an accurate TSS depth measurement is recorded.

Operation

The water level during periods without rain should be near the outlet invert of the structure. If the water level remains near the top of the HydroDome this may suggest that there is an obstruction downstream of the HydroDome or that the inlet protection at the HydroDome may need to be cleaned.

Frequency

Construction Period

The HydroDome separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroDome separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized areas (storage piles, exposed soils), the HydroDome separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, elevated water level)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroDome unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroDome separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

The area around the HydroDome provides clear access to the bottom of the structure (Figure 3). This is the area where a vacuum hose would be lowered to clean the unit.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature.

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Maintenance of a Hydroworks HydroDome unit will typically take 1 to 2 hours depending on size of unit and using a vacuum truck. Cleaning may take longer for other cleaning methods (i.e. clamshell bucket).

Inlet protection (Figure 2) is located at the inlet to the low flow opening in the HydroDome to ensure the opening does not become clogged. Although it is not anticipated that the inlet protection will have to be replaced on a regular (i.e. annual) basis since the inlet protection is protected by the submerged entrance to the HydroDome , the inlet protection should be checked each time the HydroDome is inspected or maintained. The inlet protection is removable and should be rinsed with water to ensure any debris caught on the protection is discarded. Unless damaged, the inlet protection can be reinstalled. A replacement piece can be bought through Hydroworks and/or retail stores. Hydroworks can provide information on the inlet protection and where it can be bought. A sign that the inlet protection needs cleaning/replacement would be a water level near the crown of the outlet pipe in the structure during periods with no flow (i.e. unit does not drain down to the pipe invert).

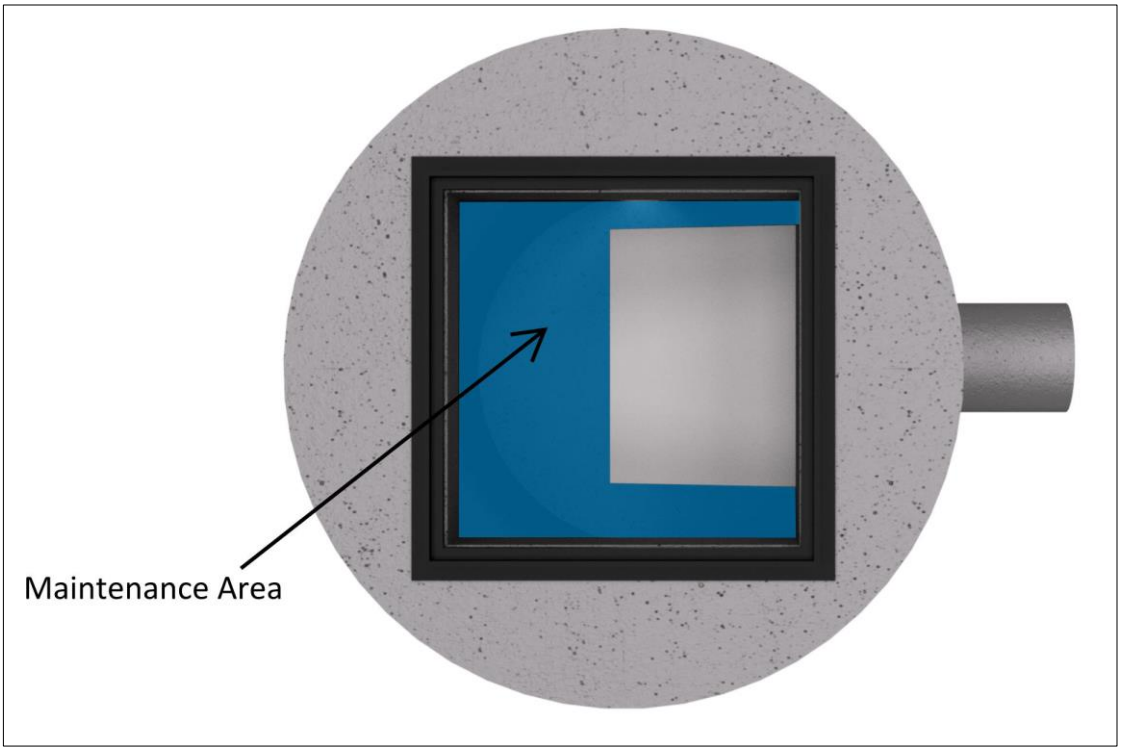

Figure 3. HydroDome Maintenance Access

Frequency

Construction Period

A HydroDome separator can fill with construction sediment quickly during the construction period. The HydroDome must be maintained during the construction period when the depth of TSS/sediment reaches 24” (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroDome separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. Please contact Hydroworks at 888-290-7900 to inquire whether your HydroDome was designed with extra sump depth to extend the frequency of maintenance.

The HydroDome separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 75% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroDome Models

Model	Diameter ft (mm)	Maintenance Sediment Depth in (mm)
HD 3	3 (900)	12 (300)
HD 4	4 (1200)	12 (300)
HD 5	5 (1500)	12 (300)
HD 6	6 (1800)	12 (300)
HD 7	7 (2100)	12 (300)
HD 8	8 (2400)	12 (300)
HD 10	10 (3000)	12 (300)
HD 12	12 (3600)	12 (300)

HYDRODOME INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroDome	**Yes**	**No**
Obstructions in the inlet	☐ *	☐
Damage to HydroDome (cracked, broken, loose pieces)	☐ **	☐
Improperly installed outlet pipe	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Raised water level (water level close to top of HydroDome)	☐ ***	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____“

Routine Measurements

Floating debris depth	**< 0.5” (13mm)**	☐	**>0.5” 13mm)**	☐ *
Floating debris coverage	**< 75% of surface area**	☐	**> 75% surface area**	☐ *
Sludge depth	**< 12” (300mm)**	☐	**> 12” (300mm)**	☐ *****

* Maintenance required
** Repairs required
*** Further investigation is required

Note: Inspections should not be made within 24 hours of a storm to allow the water to drain from the structure to assess a raised water level or water level seepage

Hydroworks

Other Comments:

Hydroworks

Hydroworks® HydroDome

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroDome to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroDome are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroDome, or the cost of other goods or services related to the purchase and installation of the HydroDome. For this Limited Warranty to apply, the HydroDome must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroDome arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroDome, whether the claim is based upon contract, tort, or other legal basis.

Hydroworks® HydroStorm

Operations & Maintenance Manual

Version 1.1

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

Introduction

The HydroStorm is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroStorm is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroStorm.

Hydroworks® HydroStorm Operation

The Hydroworks HydroStorm (HS) separator is a unique hydrodynamic by-pass separator. It incorporates a protected submerged pretreatment zone to collect larger solids, a treatment tank to remove finer solids, and a dual set of weirs to create a high flow bypass. High flows are conveyed directly to the outlet and do not enter the treatment area, however, the submerged pretreatment area still allows removal of coarse solids during high flows.

Under normal or low flows, water enters an inlet area with a horizontal grate. The area underneath the grate is submerged with openings to the main treatment area of the separator. Coarse solids fall through the grate and are either trapped in the pretreatment area or conveyed into the main treatment area depending on the flow rate. Fines are transported into the main treatment area. Openings and weirs in the pretreatment area allow entry of water and solids into the main treatment area and cause water to rotate in the main treatment area creating a vortex motion. Water in the main treatment area is forced to rise along the walls of the separator to discharge from the treatment area to the downstream pipe.

The vortex motion forces solids and floatables to the middle of the inner chamber. Floatables are trapped since the inlet to the treatment area is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while water must flow up the walls of the separator to discharge into the downstream pipe.

A set of high flow weirs near the outlet pipe create a high flow bypass over both the pretreatment area and main treatment chamber. The rate of flow into the treatment area is regulated by the number and size of openings into the treatment chamber and the height of by-pass weirs. High flows flow over the weirs directly to the outlet pipe preventing the scour and resuspension of any fines collected in the treatment chamber.

A central access tube is located in the structure to provide access for cleaning. The arrangement of the inlet area and bypass weirs near the outlet pipe facilitate the use of multiple inlet pipes.

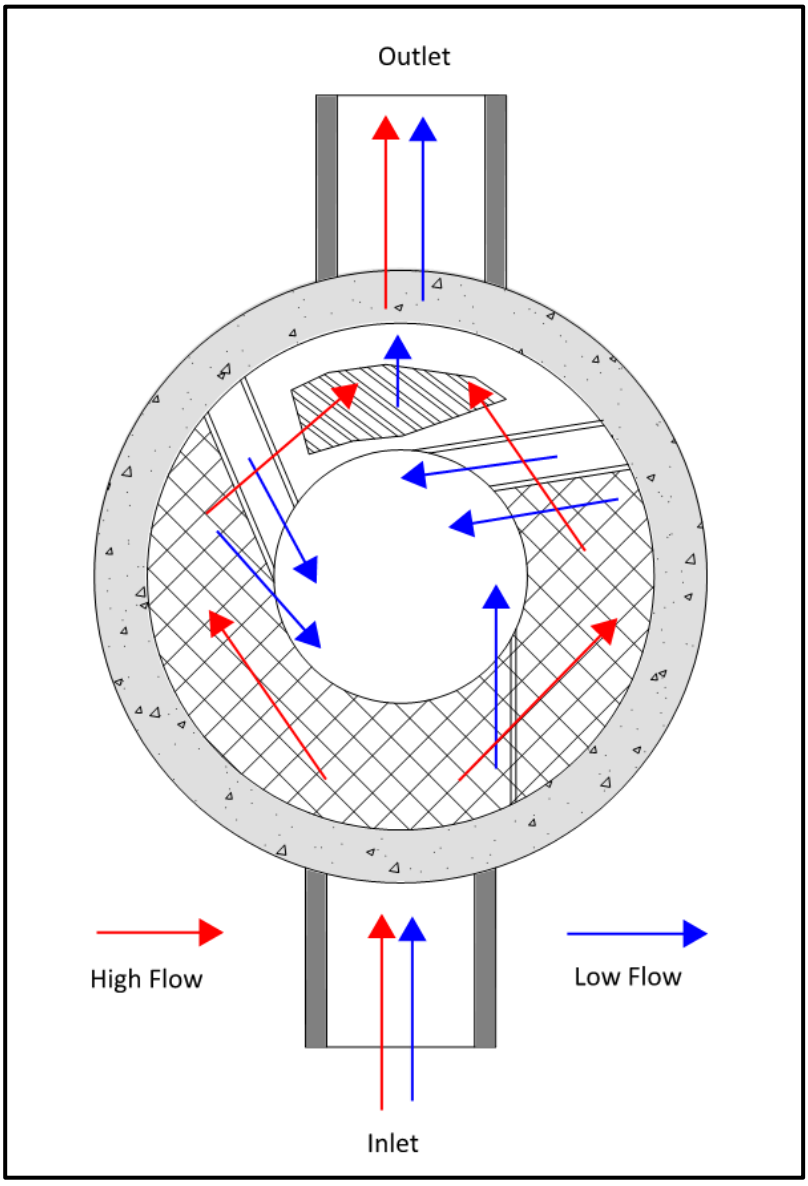

Figure 1. Hydroworks HydroStorm Operation – Plan View

Figure 2 is a profile view of the HydroStorm separator showing the flow patterns for low and high flows.

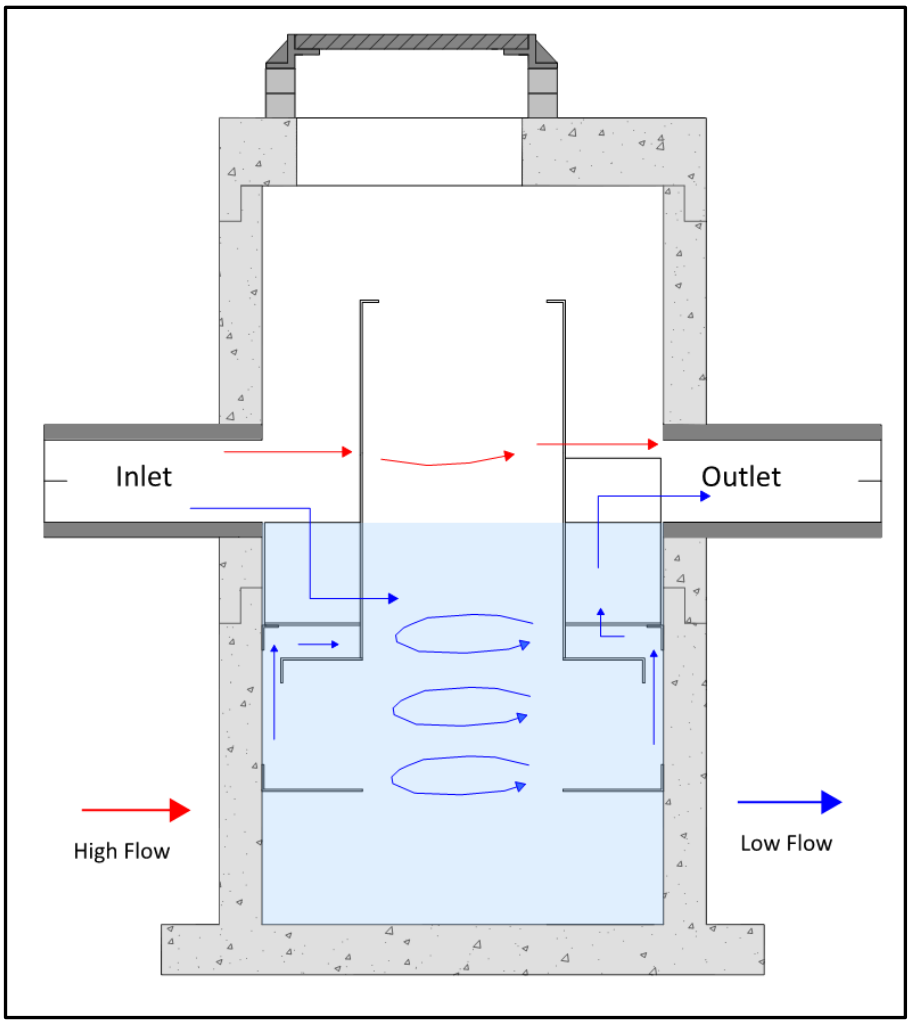

Figure 2. Hydroworks HydroStorm Operation – Profile View

The HS 4i is an inlet version of the HS 4 separator. There is a catch-basin grate on top of the HS 4i. A funnel sits sits underneath the grate on the frame and directs the water to the inlet side of the separator to ensure all lows flows are properly treated. The whole funnel is removed for inspection and cleaning.

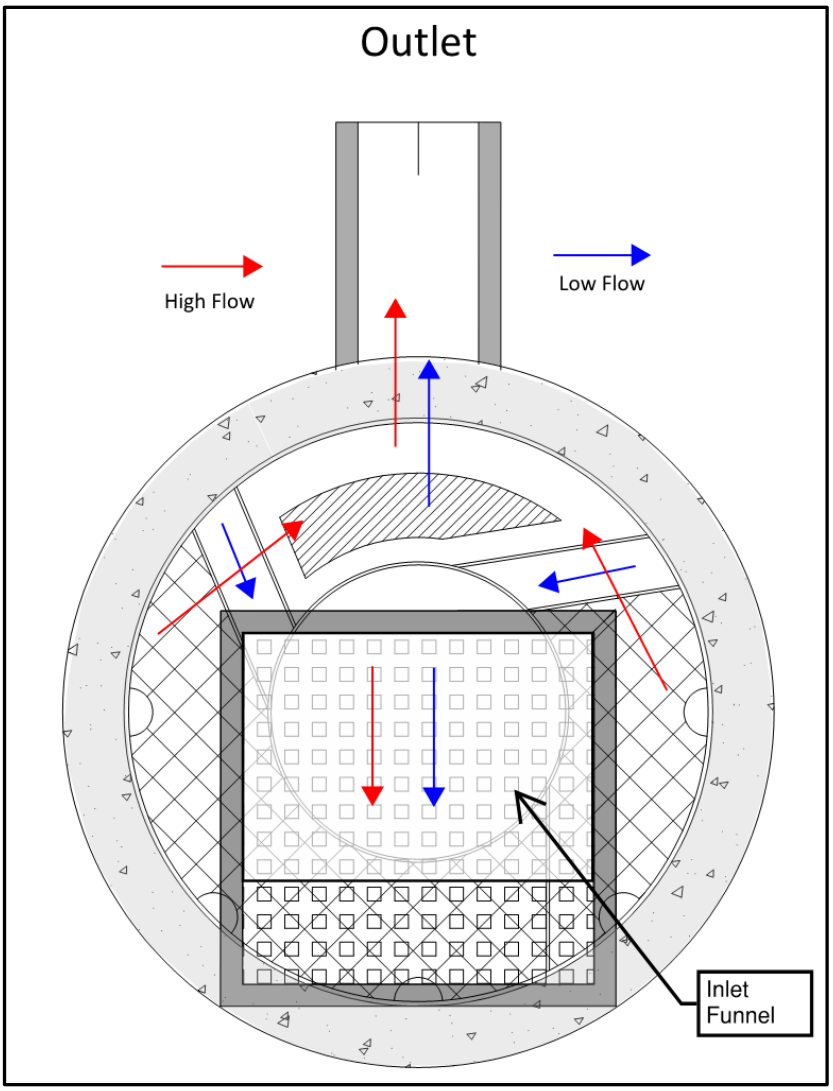

Figure 3. Hydroworks HS 4i Funnel

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the center access tube of the separator. Separators with an inlet grate (HS 4i or custom separator) will have a plastic funnel located under the grate that must be removed from the frame prior to inspection or maintenance. If you are missing a funnel please contact Hydroworks at the numbers provided at the end of this document.

Hydroworks

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HydroStorm separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroStorm separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HydroStorm separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required future frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroStorm unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroStorm separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

A central access opening (24” or greater) is provided to the gain access to the lower treatment tank of the unit. This is the primary location to maintain by vacuum truck. The pretreatment area can also be vacuumed and/or flushed into the lower treatment tank of the separator for cleaning via the central access once the water level is lowered below the pretreatment floor.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature.

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HydroStorm unit will typically take 1 to 2 hours based on a vacuum truck and longer for other cleaning methods (i.e. clamshell bucket).

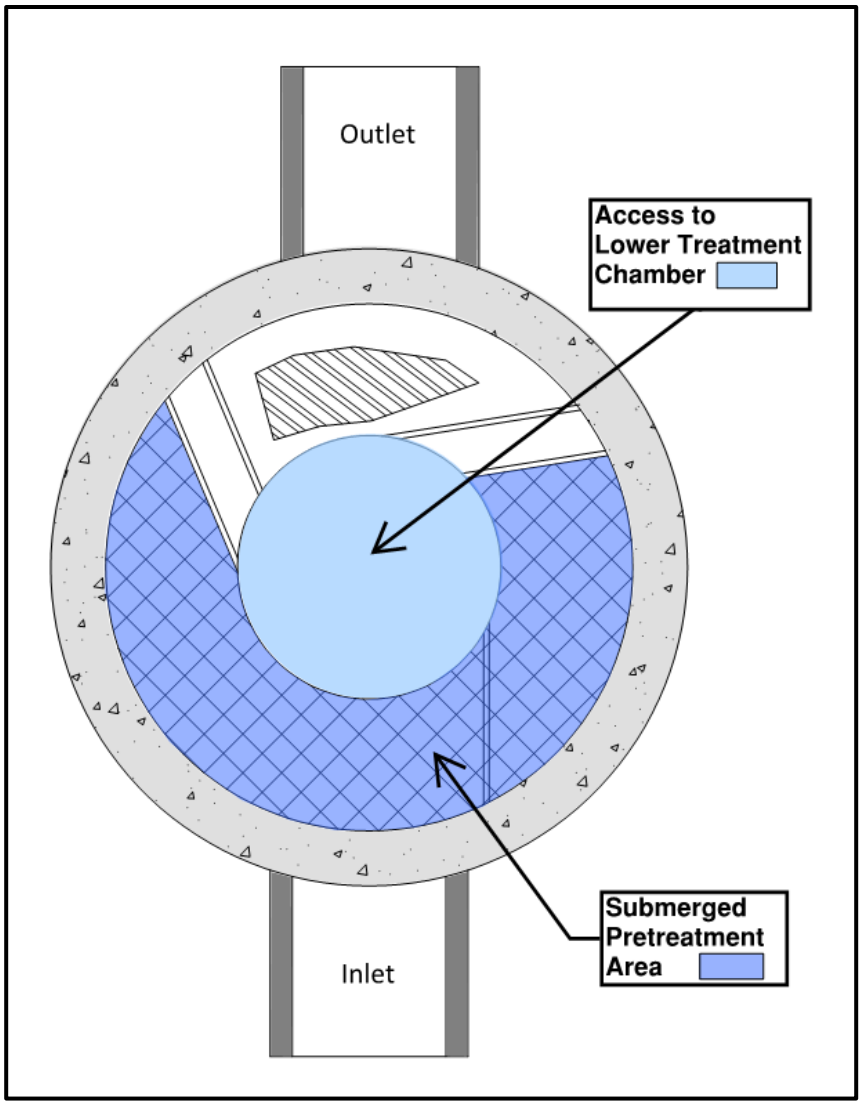

Figure 3. Maintenance Access

Frequency

Construction Period

A HydroStorm separator can fill with construction sediment quickly during the construction period. The HydroStorm must be maintained during the construction period when the depth of TSS/sediment reaches 24” (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroStorm separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The HydroStorm was independently tested by Alden Research Laboratory in 2017. A HydroStorm HS 4 was tested for scour with a 50% sediment depth of 0.5 ft. Therefore, maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. A measurement of the total water depth in the separator through the central access tube should be taken and compared to water depth given in Table 1. The standard water depth from Table 1 should be subtracted from the measured water depth and the resulting extra depth should be added to the 1 ft to determine the site-specific sediment maintenance depth for that separator.

For example, if the measured water depth in the HS-7 is 7 feet, then the sediment maintenance depth for that HS-7 is 2 ft (= 1 + 7 – 6) and the separator does not need to be cleaned for sediment accumulation until the measure sediment depth is 2 ft.

The HydroStorm separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroStorm Models

Model	Diameter (ft)	Total Water Depth (ft)	Sediment Maintenance Depth for Table 1 Total Water Depth(ft)
HS-3	3	3	1
HS-4	4	4	1
HS-5	5	4	1
HS-6	6	4	1
HS-7	7	6	1
HS-8	8	7	1
HS-9	9	7.5	1
HS-10	10	8	1
HS-11	11	9	1
HS-12	12	9.5	1

HYDROSTORM INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroStorm	**Yes**	**No**
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____“

Routine Measurements

Floating debris depth	**< 0.5” (13mm)**	☐	**>0.5” 13mm)**	☐ *
Floating debris coverage	**< 50% of surface area**	☐	**> 50% surface area**	☐ *
Sludge depth	**< 12” (300mm)**	☐	**> 12” (300mm)**	☐ ****

* Maintenance required
** Repairs required
*** Further investigation is required

Hydroworks

Other Comments:

Hydroworks

Hydroworks® HydroStorm

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroStorm to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroStorm are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroStorm, or the cost of other goods or services related to the purchase and installation of the HydroStorm. For this Limited Warranty to apply, the HydroStorm must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroStorm arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroStorm, whether the claim is based upon contract, tort, or other legal basis.

Contech® CMP Detention Inspection and Maintenance Guide

Underground stormwater detention and infiltration systems must be inspected and maintained at regular intervals for purposes of performance and longevity.

Inspection

Inspection is the key to effective maintenance of CMP detention systems and is easily performed. Contech recommends ongoing, quarterly inspections. The rate at which the system collects pollutants will depend more on site specific activities rather than the size or configuration of the system.

Inspections should be performed more often in equipment washdown areas, in climates where sanding and/or salting operations take place, and in other various instances in which one would expect higher accumulations of sediment or abrasive/corrosive conditions. A record of each inspection is to be maintained for the life of the system.

Maintenance

CMP detention systems should be cleaned when an inspection reveals accumulated sediment or trash is clogging the discharge orifice.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities. Contech suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Systems are to be rinsed, including above the spring line, annually soon after the spring thaw, and after any additional use of salting agents, as part of the maintenance program for all systems where salting agents may accumulate inside the pipe.

Maintaining an underground detention or infiltration system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

The foregoing inspection and maintenance efforts help ensure underground pipe systems used for stormwater storage continue to function as intended by identifying recommended regular inspection and maintenance practices. Inspection and maintenance related to the structural integrity of the pipe or the soundness of pipe joint connections is beyond the scope of this guide.

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS A WARRANTY. APPLICATIONS SUGGESTED HEREIN ARE DESCRIBED ONLY TO HELP READERS MAKE THEIR OWN EVALUATIONS AND DECISIONS, AND ARE NEITHER GUARANTEES NOR WARRANTIES OF SUITABILITY FOR ANY APPLICATION. CONTECH MAKES NO WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, RELATED TO THE APPLICATIONS, MATERIALS, COATINGS, OR PRODUCTS DISCUSSED HEREIN. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY CONTECH. SEE CONTECH'S CONDITIONS OF SALE (AVAILABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION

CONTECH®
CMP DETENTION SYSTEMS

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