Permit # SD-_____-_____

TOWN OF COLCHESTER

APPLICATION FOR
FINAL PLAT REVIEW

All information requested on this application must be completed in full. Failure to provide the requested information either on this application form or on the sketch plan will result in your application being rejected and a delay in the review before the Development Review Board.

1) OWNER OF RECORD (Name as shown on deed, mailing address, phone and fax #)_____
Ireland Industries, Inc. PO Box 2286, S. Burlington, VT 05407 ph: (802) 863-6222, fax: (802) 860-1528

2) APPLICANT (Name, mailing address, phone and fax #)_____
Ireland Industries, Inc. PO Box 2286, S. Burlington, VT 05407 ph: (802) 863-6222, fax: (802) 860-1528

3) CONTACT PERSON (Name, mailing address, phone and fax #)_____
Robin Jeffers, Ireland Industries, Inc. PO Box 2286, S. Burlington, VT 05407 ph: (802) 316-6004

4) CONSULTANT INFORMATION (Name, mailing address, phone and fax #)_____
Michael Buscher, T.J. Boyle Associates, 301 College St., Burlington, VT 05401 ph: (802) 658-3555
David Marshall, Civil Engineering Associates, 10 Mansfield View Ln., S. Burlington, VT 05403 ph: (802) 864-2323

5) PROJECT STREET ADDRESS: 242 Severance Road

6) TAX MAP & PARCEL #(can be obtained at Assessor's Office) Tax Map 4, Parcels 30-1, 30-2, 30-3, 30-5, 30-6, 30-7, 30-8, 30-9, 30-10, 30-11, 30-12, 30-13

7) PROJECT DESCRIPTION

a)Please note if new lots are being created and whether or not the request is for a regular subdivision, planned residential development, or planned unit development:_____
This application is for a planned unit Development that will create new lots.

b) Existing Uses on Property (including description and size of each separate use) Seasonal snack bar, agriculture/farming, driveway, abandoned greenhouse

c)Proposed Uses on property (include description and size of each new use and existing uses to remain) The proposed development includes 197 residential dwelling units, 13,110 sf of retail space, 34,040 sf of office commercial space, 4,050 sf of restaurant space, and 4,275 sf of daycare space.

d) Total building square footage on property (proposed buildings and existing buildings to remain)
No existing buildings will be retained. Proposed buildings will comprise an approximate total of 55,000 gross sf of office/commercial, retail, restaurant, and daycare space. 197 residential units are proposed with an approximate total of 250,000 sf of finished space.

e) Height of building & number of floors (proposed buildings and existing buildings to remain, specify if basement and mezzanine) The development incorporates a mix of buildings to accompany the mix of uses proposed for the site. Buildings 1, 2, 8, and 10 will be single story structures with heights ranging from 16' - 20' in height. Building 3 will be a 2-1/2 stories with a maximum height of 34' – 36'. Building 4 will be 1 story with the appearance of containing a second floor in a half story. Building 4 will have a maximum height of 24' to 26'. Buildings 9 will be 2 stories and 32'-34' in height. Buildings 5, 6, 7, and 11 will be 3 story residential buildings with a maximum height of 40' and will all contain a parking level in the basement. The 33 town house units will be 2 stories (26'–30' height) and may have basements.

f) Number of residential units (if applicable, new units and existing units to remain) There are a total of 197 proposed residential units.

g) Number of employees & company vehicles (existing and proposed, note office versus non-office employees): It is anticipated that there will be 136 office/commercial employees, 14 retail employees, 8 daycare employees, and 24 restaurant employees. At this point no company vehicles are anticipated.

h) Other (list any other information pertinent to this application not specifically requested above, please note previous approvals and if the Overlay Districts are applicable): This development was previously approved through final plat and site plan in 2007, with subsequent extensions to that approval. The current application includes minor adjustments, but largely represents the previously approved development.

8) LOT INFORMATION

a) Existing Lot Size: 33.7 acres b) Acreage to Be Disturbed: approximately 21.5 acres

c) Number of Lots Being Created (please also note lot size): The current application will result in the creation of 40 lots, in addition to a public right-of-way dedication. The size of each lot is noted on the proposed subdivision sketch.

d) Building Coverage: Existing 0 % Proposed 9.8 %

e) Overall Coverage (building, parking, outside storage, etc)
Existing 4.8 % Proposed 35.6 %

f) Front Yard Coverage (along each street) Existing TBD % Proposed TBD %

g) Building Setbacks: Front 11 ft Rear 67 ft Side 88 ft Side 83 ft
***Setbacks for overall PUD**

h) Parking Lot Setbacks: Front 30 ft Rear 13 ft Side 40 ft Side 28 ft

i) Distance From Shoreline (95.5' elevation): n/a

9) ESTIMATED PROJECT COMPLETION DATE 2029

10) TYPE OF EXISTING OR PROPOSED ENCUMBRANCES ON PROPERTY (easements, covenants, leases, rights of way, etc.) An existing 15' access right-of-way easement exists for parcel 30 tax map 4, recorded in vol. 128 page 395. There are no other existing encumbrances. Post development, the existing right-of-way for parcel 30 will be eliminated and that parcel will have frontage on a public road right-of-way. Several utility easements will be created, some to be conveyed to the town, others to private utility companies. There will also be home owner covenants, leases, recreation easements, etc…

11) PROPOSED EXTENSION, RELOCATION, OR MODIFICATION OF MUNICIPAL FACILITIES (sanitary sewer, water supply, streets, storm drainage, etc.) Sanitary sewer and water supply will connect into existing lines and will not require extensions, relocation or modification of existing municipal facilities outside of the project site. Two curb-cuts onto Severance Road are proposed and a total of +/- 3,400 linear feet of proposed public streets are shown. Storm water will be handled on-site

12) PUBLIC IMPROVEMENT, ROAD, & UTILITY INFORMATION

a) Will municipal sewer be used? Yes If yes, has an allocation been requested? Yes

b) For on site wastewater disposal describe: n/a

c) Has the Wastewater Official been contacted to review soil test pits? n/a

d) Will municipal water be use? Yes If no describe water supply: n/a

e) Linear footage & width of each road/driveway proposed: Public Roads: There is a total of +/-3,400 linear feet of proposed public road. Primary roads ar 28' wide, secondary roads are 26' wide.

There is a total of 7 off-street parking areas with associated access drives. All access drives will be a minimum of 20' in width. Private driveways access single car garages on the 33 townhouse units.

f) Corner sight distance for each road/driveway: Site distances for the two proposed entrances to Severance Road

West driveway:	looking west: +/- 1,400'	looking east: +/- 1,200'
East driveway:	looking west: +/- 1,800'	looking east: +/- 850'

g) Do proposed roads include sidewalks? Yes, sidewalks are proposed along at least one side of all roads.

13) COST ESTIMATES

a) Building (including interior renovations): $ 1,612,241 (only includes streets, utilities, storm water pond)

b) Landscaping: $ 211,355 (only includes street trees and common lot plantings)

c) Describe Landscaping & Other Site Improvements: Landscape plantings will include a variety of evergreen and deciduous trees, shrubs, ground covers, and perennials. Current plans (see sheets L-2.0, L-2.1, & L2.2) detail plantings for streets, shared parking areas and community parks and greens. A network of public roads, sidewalks, recreation paths, and nature paths will be built as well as outdoor community gathering spaces with benches, tables, play equipment, and other passive and active recreational elements,

14) ESTIMATED TRAFFIC

a) Average daily traffic for entire property (in and out): see attached TIS

b) A.M. Peak hour for entire property (in and out): see attached TIS

c) P.M. Peak hour for entire property (in and out): see attached TIS

15) PEAK HOURS OF OPERATION: The project is a planned mixed-use development. Residential use will be 24 hours a day, commercial uses (including office, retail, and services) will generally take place between the hours of 6 a.m. and 9 p.m.

16) PEAK DAYS OF OPERATION: The project is a planned mixed-use development and will include activities 7 days a week.

17) FINAL PLAT PLAN AND FEE

A final plat plan shall be submitted which shows the information listed on Exhibit B attached. A final plat plan application fee shall be paid to the Town at the time of submittal (see Exhibit B). In accordance with Colchester's Fee Ordinance Chapter 6 ½ - 4 (9) applicants for all permits are responsible for costs of reviews conducted by third-party consultants/experts requested by the Town, plus a ten (10) percent administrative fee.

*Please submit one paper copy and a digital copy of the application in pdf (file not exceeding 20mb) via https://elms.colchestervt.us/egov/. If online submittal is not feasible, submissions will be accepted via CD/ DVD. Application forms, plans, and supporting documents shall each be separate pdfs and plans shall be submitted as a set whenever feasible. Files shall be named the address of the property and the type of document followed by the year (i.e. 205RooseveltHgwyApp15). Each file name shall be unique with no spaces and characters shall be numbers or letters (no characters such as hyphens, #, &, or *). All pdfs shall be at least at 300dpi, color, and to scale if a plan, elevation, or similar document.*

I hereby certify that all the information requested as part of this application has been submitted and is accurate to the best of my knowledge. ***Please be aware that sketch plan review is not a formal or appealable action. The DRB will review your sketch plan application under the regulations in effect at the time of your application. Should the Selectboard thereafter warn or adopt amendments to the Development Regulations before you file your application for preliminary (major) plat or final (minor) plat approval, that application will be reviewed under the amended regulations.***

18) FINAL PLAT REVIEW CRITERIA NARRATIVE

A narrative description of how the proposed project meets the criteria of Article Nine of the Development Regulations shall be submitted with this application.

I hereby certify that all the information requested as part of this application has been submitted and is accurate to the best of my knowledge.

SIGNATURE OF APPLICANT

SIGNATURE OF PROPERTY OWNER

By the land owner signature, the land owner is authorizing the applicant to act on their behalf.

☐ Check this box if the consultant listed is authorized to act on behalf of the applicant and land owner.

☐ Check this box if the contact person listed is authorized to act on behalf of the applicant and land owner.

Do not write below this line

DATE OF SUBMISSION: 11/14/19

FEE PAID: ✓

I have reviewed this sketch plan application and find it to be: ☒ Complete ☐ Incomplete

Zoning Administrator or Designee — Date: 11/14/19

EXHIBIT A

ADJOINING PROPERTY OWNER INFORMATION

(please use the interactive map at Colchestervt.gov for info & try to include direct abutters as well as adjacent properties along the shoreline within the area of affect as well as across the street)

Tax Map 3, Parcel 30 State of Vermont 103 So. Main Street, 10 North Waterbury, VT 05676	Tax Map 1, Parcel 19 United State of America Camp Johnson Colchester, VT 05446	
Tax Map 3, Parcel 31 Colleen Robenstein Box 171 Winooski, VT 05404	Tax Map 8, Parcel 37-2 Malcolm F. Severance 2179 Roosevelt Highway Colchester, VT 05446	
Tax Map 4, Parcel 30 Munther Thomas Balaki 1508 Northeast 110th Street Miami, FL 33161	Tax Map 8, Parcel 38-2 Malcolm F. Severance 2179 Roosevelt Highway Colchester, VT 05446	
Tax Map 4, Parcel 30-4 Malcolm F. Severance 2179 Roosevelt Highway Colchester, VT 05446	Tax Map 8, Parcel 38-1 Joyce Sweeney, Malcolm Severance, Willa Paiton, Jean Lawrence 1558 Main Street Colchester, VT 05446	
Tax Map 4, Parcel 31 Malcolm F. Severance 2179 Roosevelt Highway Colchester, VT 05446	Tax Map 8, Parcel 40 Ray L Wells Jr. (or current resident) 385 Severance Road Colchester, VT 05446	
Tax Map 4, Parcel 32 Wright & Morrissey Inc. PO Box 421 Burlington, VT 05402	Tax Map 8, Parcel 41 Bruce and Vicky Wells (or current resident) 425 Severance Road Colchester, VT 05446	
Tax Map 4, Parcel 32-1 Pheasant Woods, Inc. c/o Denise M. Longchamp 18 Pheasant Woods #101 Colchester, VT 05446	State of Vermont Agency of Transportation District #5 P.O. Box 168 Essex Jct., VT 05453	
Tax Map 4, Parcel 33 Town of Colchester P.O. Box 55 Colchester, VT 05446		

EXHIBIT B

FINAL PLAT

The following information must be shown on the plat plans meeting Article Nine of the Development Regulations. Failure to provide the following information will result in your application being rejected and a delay in the review before the Development Review Board.

- Complete survey of property by a licensed land surveyor drawn to scale (20 ft. is preferred).
- Name, license number, seal, and contact number of licensed land surveyor & date prepared.
- Survey data (acreage, property lines, zoning boundaries, watercourse, base flood elevation, etc.)
- Location of easements, public lands, r.o.w.s, sidewalks, and public or private street (w/names)
- Contours at two (2) foot elevation intervals (existing and finished)
- Boundaries and area of all abutting properties
- Building elevations & building level floor plans
- Proposed landscaping schedule (number, variety and size)
- Location of streets, abutting properties, fire hydrants, existing buildings, existing landscaping
- Location of proposed hydrants and/or building sprinkler hook-ups and fire lanes.
- Zoning boundaries
- Number and location of parking spaces (including handicapped spaces)
- Location of septic tanks, fields, & lines and/or septic test pit, and percolation information
- Lot coverage information: Building footprint, total lot, and front yard
- Numerical and graphical scale, date last revised, and north arrow.
- Exterior lighting details (cut sheets). All lights should be down casting and shielded.
- Dumpster or trash area locations
- Bicycle rack
- If restaurant is proposed, provide number seats and square footage of floor area provided for patron use but not containing fixed seats
- Area for accumulating snow
- Details of all proposed bridges or culverts.
- Location of temporary markers.
- Water line location (existing & proposed), fire flows, and pressures
- Details of drainage systems & stormwater facilities
- Physical features (streams, wetlands, vegetative cover, etc.)
- Existing highway geometries including access points near project
- Existing & proposed entrances and curb cuts (dimensions, widths, & turning radii)
- Sight distance in both direction of all driveway intersections
- Traffic level of service/capacity analysis for existing/future conditions
- Loading areas & truck circulation patterns
- Existing & proposed sidewalks, recreation paths, and pedestrian walkways
- A list of waivers desired (if any).
- Development timetable (including number of phases and start and completion dates).
- Location & size of open spaces reserved for recreation or conservation
- Location & type of restricted land (i.e. rights-of-way, easements, open space covenants, etc.)

APPLICATION FEE

☐ $355

CIVIL ENGINEERING ASSOCIATES, INC.

10 Mansfield View Lane
South Burlington, VT 05403

Phone: 802-864-2323
Fax: 802-864-2271
E-Mail: dmarshall@cea-vt.com

November 6, 2019

Ms. Lisa Riddle, Zoning Administrator
Town of Colchester
781 Blakely Road
Colchester, VT 05446

Re: Ireland Industries, Inc.
Final Plat Application for a Planned Unit Development
Severance Road – SE Quadrant Site

Dear Ms. Riddle:

We would like to thank the Develop Review Board and yourself for the rapid processing of the Preliminary Plat application and the creation of the Findings of Fact and Order for the proposed Sunderland Farms Community project.

To assist the Town in reconciling the attached Final Plat application materials with the requirements set forth in the Order, we have inserted below the applicable narrative from the Order and have inserted in bold font responses on where the information can be found.

Please note that this application does not include any proposed site plan application related components and it remains a request for subdivision and supporting infrastructure approval.

ORDER

"…the Colchester Development Review Board hereby approved the preliminary plat application"… with the following conditions:

1. All previous approvals and stipulations which are not superseded by this approval shall remain in effect. **Acknowledged.**

2. The Board granted the following PUD modifications:

   a. A 44% reduction vs. a required 50% frontage buildout for a B street.
   b. Lot #14 a reduction in setback of 7' vs. required minimum of 10'.
   c. Increase in lot width:

B Street
Lot 21 – Required 150', Granted 212'
Lot 20 - Required 150', Granted 158'
Lot 19 - Required 150', Granted 212'
Lot 23 - Required 150', Granted 228'
Lot 3 - Required 150', Granted 193'
Lot 5 - Required 150', Granted 178'

C Street
Lot 7 - Required 120', Granted 128'
Lot 8 - Required 120', Granted 122'
Lot 10 - Required 120', Granted 124'

d. Decrease in lot depth:

B Street
Lot 20 - Required 80', Granted 38'
Lot 3- Required 80', Granted 22'
Lot 5- Required 80', Granted 62'
Lot 6- Required 80', Granted 64'

C Street
Lot 10 - Required 80', Granted 48'
Lot 9 - Required 80', Granted 65'
Lot 18 - Required 80', Granted 78'

Lot 10 on a C Street
Minimum Front Setback - Required 3', Granted 0'
Minimum Side Setback - Required 3', Granted 1'

Lot 14 on a C Street
Minimum Setback for Parking lot 10' Required, Granted 7'

Acknowledged. The applicant asks that these same waiver requests be carried forward with this final plat application.

3. The Board approved the following phasing plan: **These are depicted on Sheet C1.6 – Phasing Plan.**
    a. Year 2020-2021: Phase A includes the construction of Shea Drive off of Severance Road and turns into Stuart Avenue before Shea Drive becomes the C Street. Pegs Cove is also included in Phase A off of Stuart Avenue.
    b. Year 2021-2022: Phase B involves constructing Dylan Avenue off of Severance Road and turning to connect to Stuart Avenue before it becomes a C Street.
    c. Year2022-2023: Phase C is to develop the C Street by building out and connecting Shea Drive to Dylan Avenue **Please note that the applicant seeks permission to complete infrastructure quicker than this schedule if conditions enable.**

4. Site Plan approval will be required for each building and uses will be approved at that time taking into consideration street type and floor proposed for occupancy. **Acknowledged.**

5. No block on an A or B Street shall exceed total perimeter length of 1,600 feet. Any block site on an A or B Street longer than 400 feet shall be broken up by a right of way allowing at minimum through pedestrian connections. No lots exceed 1,600 linear feet and no building approaches 400 feet in length. **Acknowledged. The block width south of Stuart Avenue, at its widest point in the east-west direction We recommend that the last sentence be revised to state "No lots exceed 1,600 linear feet and no blocks approach 400 feet in length."**

6. All utilities shall be underground. **Acknowledged as that is what is proposed.**

7. All hydrants shall have a 4" stortz. **This noted has been added to the hydrant detail on Sheet C5.-Water Details**

8. Street lights are to be turned over to the Town for ownership and maintenance and shall not be rental units owned by the power provider. To the extent possible, place metering location and/or provide landscaping to shield from street view. **Sheet C3.5-Electrical Layout Plan shows the site lighting secondary distribution and the two proposed metering locations. Landscaping Sheets L2.1 to L2.2 depicts the proposed screening at each of the meter pad locations.**

9. The applicant shall provide the following as part of the final plat submittal:
    a. The Fire District shall review and approve the proposed water design. **We have attached the comments from Fire District #3. We have provided responses to each one of the comments within the attached document entitled "Response to Colchester Fire District #3 review comments"** Documentation from Water & Fire District 3 in regards to the use of PVC C900, DR 14 pipe for water mains. **This is embedded within the Fire District's attached review letter.**
    b. Details regarding the necessary tracer wires including access points for future location. **The requirement for tracer wire is shown on the typical water trench detail on Sheet C5.1-Water Details and the tracer wire box locations have been depicted on the site utility plans (Sheets C3.1, C3.2 and C3.3)**.
    c. Updated table indicating sanitary sewer allocation needs based on the proposed subdivision. **The Impact Statement has been attached and the sewer summary can be found on the last page.**
    d. Details on how compacted areas will be restored in accordance with Section 9.051. **Actually this section of the regulations does not speak to compaction. A better citation is Article 10. Section *10.04 Landscaping, Screening, & Street Trees, D. Site Restoration. Grading or seeding shall be required to restore the condition of any portion of a site that is disturbed during construction. A plan shall be provided for the stockpiling and restoration of topsoil removed or disturbed during construction, and any soil compaction within pervious areas of the site shall be repaired in accordance with the Vermont Department of Environmental Conservation Stormwater Program's***

***guidelines*. These requirements are outlined on Sheet C6.9 EPSC Specifications and Details.**

e. Provide draft Declaration of Covenants, Easements, Restrictions and Liens. **These are attached in the "legals" subdirectory of the PDF submittal.**

10. The applicant shall provide revised plans depicting the following as part of the final plat:
    a. Street tree plans to provide missing information including common name, botanic name and height or caliper at delivery. **This has been corrected on Sheet L2.0.**
    b. Pedestrian ways and multi-use path connecting the project internally and to Severance Road. **Sheet L1.1-Recreation, Amenity & Circulation Plan depicts the proposed shared use path and sidewalk connections both internally and to Severance Road.**
    c. All proposed easements. **These are attached in the "legals" subdirectory.**
    d. The correct Metroscape Model is the 55 watt version with 48 LED lights rather than 32. The codes for color and photocell also must be included as BKTX and PHEX, respectively. Philips/Lumec also requires the intended line voltage to be included. For instance, if 120 volt current is being used, the Model should read as follows: MPTR-55W48LED-4K-G2-LE5-120-PHEX-BKTX. **The requested photocell code change is not accurate and refers to outdated ordering information. The correct code for Photocell per the manufacturer's feedback is PH8. The Metroscape Model information has been corrected on Sheet L3.0.**
    e. The highlighted banner arm is not the standard used for developments in Colchester. The standard mount is a sliding 20" arm that can be shifted from side to side and is listed as "BAS20". Philips/Lumec typically will ask for the mounting height, which should be indicated as 12" below the lamp fitter or attachment point. Also missing from the post description is the "FS1" code for provision of an inline fuse in the base of the post. **This has been corrected on Sheet L3.0 a note has been added to indicate mount 12" below fitter.**
    f. Provide electrical plans including wiring layout with power supply stanchion (meter base and shutoff) and all necessary conduit and junction boxes. Include overlapping easement areas for Town and Utility at metering location. **The proposed secondary wiring layout is shown on Sheet C3.5-Electrical Layout Plan. The details for the power board/meter/disconnect is shown on Sheet C5.0-Sewer & Electrical Details.**
    g. Plan sheets referenced in Cover Letter (referred to as "C.3.X") were not found and shall be provided at final plat. **The Sheet C3.x series (Site Utility Plans) is attached with this submittal.**
    h. Revise Sheet C-3.13 to remove old overhead light symbols (mostly along Stuart.) Provide missing power connection for three lights along Shea between Severance and Thomas. Provide easement to Town outside of ROW at west end of Stuart. Provide junction box where three conduits meet on east side of Dylan near 106+75. **This information is depicted on Sheet C3.5-Electrical Layout Plan.**
    i. Revise the placement of cluster mailbox to provide ADA compliant access to all users and also not increase maintenance operations, to the extent practicable. **The revised mail box layout is shown on Sheet C2.2-Southeast Grading & Drainage Plan with direct connection to the back of the sidewalk system ensuring ready ADA access.**
    j. The specifications of the proposed active amenities shall be provided for review and approval by the Director of Parks and Recreation as appropriate for the size and demographics of the

development. **These are being provided again for distribution to the Department of Parks & Recreation. The locations of the proposed active amenities can be found in this submittal package on Sheet L1.1. Details for the proposed amenities can be found on sheet L4.2.**

k. Provide the number of stories for each building in order to determine fire access. **This information is depicted on Sheet C1.1-Conceptual Future Build-out Plan.**
l. Revise to show metering locations more centrally located and try to limit to one or two locations. **This information is depicted on Sheet C3.5-Electrical Layout Plan.**

11. The public right of way shall be delineated with 4" x 4" concrete monuments at all property corners as well as points of curvature and tangency proposed along existing or proposed public streets. **This is depicted on Sheet PL-2 (Amended Plat of Subdivision) .**

12. All new construction shall meet the Vermont Residential and Commercial Energy Code requirements. **Acknowledged.**

13. An Ordinance amendment shall be completed along with Stop Sign Warrant Analysis and Speed Study prior to acceptance or transfer of the public road to the Town. **Acknowledged.**

14. The street lights shall be in accordance with the Colchester Public Works Specifications and Standards. The street light disconnect shall be located outside of the public ROW. **This is depicted on Sheet C3.5-Electrical Layout Plan.** An easement shall be given to the power provider for the placement and maintenance of the street light disconnect. **This is depicted on Sheet PL-2 (Amended Plat of Subdivision)** Sufficient evergreen screening shrubs shall be provided such that the street light disconnect is not visible from the Street/Road and the screening shall in no way interfere with necessary minimum sight distances. **This is depicted on Sheets L2.1 and L2.2**. All proposed street lights within public rights-of-way shall be constructed so as to become the property of the Town upon acceptance of the street. **Acknowledged.** Should the Public Works Specifications for street lights change prior to issuance of the building permit, the applicant shall amend the plans to reflect the new street lighting standard. **Acknowledged.**

15. The stormwater maintenance agreement shall be noted on all individual lot deeds. **Acknowledged.** Upon acceptance of the roadway by the Town, the Town and the Developer/HOA will become Co-applicants on a General Permit 3-9015. **Acknowledged, but it should be recognized that this project's stormwater authorization is outlined in 4940-9010.** It will be the responsibility of the Developer/HOA to initiate the process for co-applicant addition, usually at the next permit renewal cycle. **Acknowledged.** The Town of Colchester will only be responsible for the stormwater infrastructure constructed within the Town Right-of-Way. **Acknowledged.** The Developer/HOA will be responsible for all stormwater infrastructure constructed outside of the Town Right-of-Way including but not limited to private driveways, walkways, and roof areas. **Acknowledged.**

16. Post development stormwater runoff flows shall be equal to or less than pre-development stormwater runoff flows for a minimum of 25-year, 24-hour storm event. **The project has been designed so as to provide a peak flow reduction for not only the 25-year storm but also the 100-year storm event,**

17. The Developer shall be responsible for all stormwater infrastructure constructed outside of Town Rights-of-Way and the impervious surface associated with private driveways, roofs, and parking areas. **Acknowledged.**

18. Upon acceptance of the roadway by the Town, the Town and the Developer/HOA will become Co-applicants on a General Permit 3-9015. **Acknowledged, but it should be recognized that this project's stormwater authorization is outlined in 4940-9010.** It will be the responsibility of the Developer/HOA to initiate the process for co-applicant addition, usually at the next permit renewal cycle. **Acknowledged.**

19. If footing drains are proposed to be connected to the Town's storm sewer, prior to connection, the property owner or applicant shall execute and record an easement document with the Town Clerk that can be provided by Public Works upon request. **Acknowledged.**

20. The stopping of traffic on adjacent public roadway shall not be permitted without necessary traffic control measures in accordance with MUTCD including approach signing and flagmen. **Acknowledged.** Deliveries and hauling operations shall be coordinated not to occur during times of peak traffic volumes (7:30am -8:30am & 4:30pm – 5:30pm.) **Acknowledged.**

21. Prior to recording the Final Plat plan, the applicant shall submit a copy of the survey plat in digital format (Colchester Plane Coordinate System) meeting the Town of Colchester "Specifications for the Submission of Survey Plats, Final Plat Plans & Boundary Line Adjustments in Digital Form". **Acknowledged.** Upon certification by the Chairman or Clerk, the Mylar copy shall be submitted to the Town Clerk to be filed in the Town Land Records. **Acknowledged.**

22. The Final Plat plan shall be recorded in the Town of Colchester land records within 180 days or this approval is null and void. **Acknowledged.** The final plat plan shall be in the form of a Mylar copy (18" by 24") depicting meets and bounds survey of the approved subdivision and shall identify a minimum of three witness monuments located, or to be located on, the property with boundaries referenced to the Colchester Plane Coordinate System (coincident with the Vermont Plane Coordinate System) based on the 1983 North American Datum. **This is depicted on Sheet PL-2 (Amended Plat of Subdivision) .** Such monuments shall be established at a minimum survey error of closure of 1:10,000. **Acknowledged.** All plans to be recorded shall meet the requirements of the Town of Colchester's "Specifications for the Submission of Survey or Boundary Line Adjustment Mylars to be recorded in the Town Land Records" Policy. The plan shall be signed by the Development Review Board Chair or Clerk prior to recording. **Acknowledged.**

23. Prior to the issuance of any Building Permits the property front line corners for each lot shall be established with witness stakes or iron pins. **Acknowledged.** Prior to issuance of a Certificate of Occupancy said property line corners shall be established with permanent monumentation. **Acknowledged.**

24. Prior to recording the Plat for the proposed development the applicant shall submit and receive approval of the following:
    a. Executed warranty deeds for all rights-of-way and easements to be dedicated to the Town, **Acknowledged.** and a Certificate of Title showing the title to be free and clear of all encumbrances. **Acknowledged.** All proposed deeds, easements, association documents and Certificate of Titles shall be submitted to the Planning and Zoning Department in digital Word format. Deeds and certificates shall be approved by the Town Attorney. Approval of deeds by the Town does not constitute acceptance. **Acknowledged.**
    b. A Quitclaim Easement Deed for Private Utility (Across Public Road) and a Maintenance Agreement will be required for all locations where private sewer force mains cross under the proposed public road, for community septic system, open space and common areas and shall be reviewed and approved by the Town's Attorney. **Acknowledged.**
    c. Stormwater calculations and a copy of the Individual Stormwater Discharge Permit application shall be submitted to the Town Engineer for review. **Acknowledged.**
    d. Submit all covenants, homeowner's documents, legal restrictions, including but not limited to maintenance of recreation areas, maintenance, ownership, restrictions, conservation and upkeep of open space, restricted no-build and no cutting areas and proposed Bylaws to the Town Attorney for review and approval **Acknowledged.** The Declaration of Bylaws shall clearly state that the Association shall own and maintain proposed common open space and recreational amenities. The Association shall be structured so that the proposed Association Board has the authority to convey common land to the Town without signoff from each Association member. **Acknowledged.**
    e. The applicant shall submit and receive all necessary State Wastewater and Potable Water Supply Permits for the project. **Acknowledged.**

25. Prior to issuance of a building permit:
    a. Fire District Two **(Three?)** shall review and approve the water service to the project. **Acknowledged.**
    b. A landscape improvement agreement shall be provided prior to the issuance of a permit for the public infrastructure. **Acknowledged.**
    c. A public improvement agreement shall be required prior to each phase. **Acknowledged.**
    d. Obtain a 3-9015 **(3-9010 permit acquired)** and 3-9020 General Permits for stormwater discharge from the State of Vermont.
    e. The Developer/Homeowner's Association (HOA) shall enter into a stormwater maintenance agreement with the Town. The stormwater maintenance agreement shall be noted on all individual lot deeds. **Acknowledged.**

26. Prior to the issuance of a building permit for the proposed development and after the requirements of conditions #24 and #25 have been met and all requisite legal documents recorded (including but not limited to offers of dedication and easements), the applicant shall complete a pre-construction meeting with Town Staff. The applicant is responsible for ensuring the project engineer and contractors attend this meeting. **Acknowledged.**

27. A sign application must be submitted by the applicant and must be reviewed and approved by the Zoning Administrator prior to the erection of any signs. No signage is approved at this time. **Acknowledged.**

28. Prior to issuance of a Certificate of Occupancy:
    a. Street name signs shall be installed. **Acknowledged.**
    b. Prior to the issuance of a Certificate of Occupancy the applicant shall file a Residential Building Energy Standards (RBES) Certificate for each new residence in the Town Clerk's Office within 30 days of completing the project. **Acknowledged.**
    c. Each residence or commercial building shall have the E-911 number of the building displayed so as to be seen from the road if a porch light is on. If the house cannot be readily seen from the road the number must also be placed at the start of the driveway such as on a mail box. **Acknowledged.**

29. In accordance with Colchester's Fee Ordinance Chapter 6 ½ - 4 (9) the applicant is responsible for payment of all permit fees as well as for the costs of reviews conducted by third-party consultants/experts requested by the Town. All fees shall be paid prior to or at the time of obtaining a building permit. **Acknowledged.**

30. Per Section 18-23 (b) of the Colchester Code of Ordinance: Earthwork shall be scheduled for completion and the site stabilized no later than October 15th. By the end of the growing season, perennial cover shall be established and non-vegetated protection measures installed by October 15. There shall be no land disturbance activities allowed between the dates of October 15th and April 30th. A waiver of this requirement may be granted by the Director of Public Works, or his designee, following the submittal and approval of a winter construction erosion control plan consistent with the Vermont Handbook for Soil Erosion and Sediment Control on Construction Sites. **Acknowledged.**

31. No excavation, site development, or building construction shall occur until the applicant has obtained all necessary permits from the Town of Colchester in accordance with the Building, Development, Health and other applicable ordinances that may be required. **Acknowledged.**

32. Disposal of excavated earth material, stumps, brush, or other material removed from this site shall take place at a location properly permitted for such activity. **Acknowledged.** Placement of fill material in Colchester requires a permit to be obtained by the owner of the land to be filled. Improper placement of material from this site shall constitute a violation of this approval. **Acknowledged.**

33. By acceptance of these Findings of Fact and Order the Permittees agree to allow representatives of the Town of Colchester access to the property covered by the approval for the purpose of ascertaining compliance with all local regulations and with this Order. **Acknowledged.**

34. The project shall be constructed and operated in accordance with the submitted application documents, the stamped approved plans, the Findings of Fact and Order, the Colchester

Development Regulations. There shall be no change in the proposed use or approved plans without prior approval of the Town. **Acknowledged.** The Development Review Board reserves the right to review and issue supplementary Findings of Fact and Order for any substantial change in the project approved herein. **Acknowledged.** Any unauthorized change from the approved plans shall be grounds for revocation of the Order and approval pursuant to 24 V.S.A. § 4455, as may be amended. The Town reserves the right to petition the Environmental Division of the Vermont Superior Court for revocation of this approval and any permits granted hereunder, or to seek other enforcement action, if the Town believes the applicant/permittee has violated the terms of approval, or has obtained approval based on a misrepresentation of material fact. **Acknowledged.**

35. The final plat application shall be submitted within 12 months or said approval shall become null and void. **Complied with.**

This completes our summary of the supplemental materials being submitted for the Town's review on this project. If you should have any questions, please feel free to contact me at 864-2323 x310 or at dmarshall@cea-vt.com.

Respectfully,

David S. Marshall, P.E.
Principal Engineer

Attachments:

- Application
- Application Fee
- Fire District #3 Review Letter
- FDC #3 Response Letter
- Impact Statement (W&S Summary on Pg 2)
- Draft Declaration of Covenants, Easements, Restrictions and Deeds
- Final Plat Submittal Requirements Summary
  - Abutters List (embedded in application form)
  - Traffic Impact Study
  - Lot Summary Spreadsheet
  - Fire Flow Availability – Water Supply Engineers Report
  - Stormwater Calculations

Cc: R. Jeffers, CEA File 14134.00

E. Preliminary and Final Plat Submittals. In the case of major subdivisions, a final plat application shall be submitted after the approval of the preliminary plat application. Preliminary and final plat applications and plans, drawn to scale, submitted shall comply with Appendix G herein and include the following information for the Administrative Officer to deem the application complete and ready to send to the Development Review Board for its review:

1. Existing conditions plan and data:

(a) A list of the owners of record of abutting properties, which may be generated by the Assessor's Department or by the applicant. **A list of abutters is embedded within the application form.**

(b) Boundaries of existing zoning and overlay districts on the subject property and adjacent zoning and overlay district boundaries. **This is depicted on Sheet PL-2 (Amended Plat of Subdivision) .**

(c) Area and boundaries of the property, building or setback lines as required in this chapter, and lines of existing streets and adjoining lots, as shown on a survey. **These are depicted on Sheet PL-2 (Amended Plat of Subdivision) and Sheet PL-3.**

(d) Reservations, easements and areas dedicated or to be dedicated to public use shall be shown. **None of these conditions existing on the pre-existing lots.**

(e) Lot dimensions and survey data, and section and lot numbers of the subject property. The preferred scale shall be not less than one (1) inch equals thirty (30) feet. **Due to the size of the involved lands this scale is 1" = 80' as shown on Sheet PL-1 (Existing Boundaries, Amended Plat of Proposed Subdivision).**

(f) Such map shall show the applicant's entire property in a closed bound survey, adjacent properties, streets within two hundred (200) feet of the site, approximate location and dimensions of all existing structures, and location of all existing structures on adjacent properties and within one hundred (100) feet of the site boundary. At the discretion of the Administrative Officer the required area of the site plan shall be increased. **This information is shown on Sheet PL-1 (Existing Boundaries, Amended Plat of Proposed Subdivision).**

(g) Location of watercourses, waterbodies, wetlands, floodplains, and floodplain boundaries as determined by the Federal Emergency Management Agency or as mapped by the Town of Colchester, watercourses, wetlands, rock outcrops, wooded areas, existing vegetation, and other significant natural features on the site. **This information is shown on Sheet C-1.0-Existing Conditions Site Plan.**

(h) Topographic contours and profiles as needed. Existing and proposed contours should be shown at a maximum vertical interval of two (2) feet. **The existing contour are shown on Sheet C-1.0-Existing Conditions Site Plan. The proposed contours are shown on the Sheets C2.X Series of Site Grading Plans.**

(i) Location of, square footage, and height of existing structures and uses on the site. **This information is shown on Sheet C-1.0-Existing Condition Site Plan.**

(j) Existing structures and access points on adjacent properties, including those directly across a public street. **This information is shown on Sheet C-1.0-Existing Condition Site Plan.**

2. Development plan and data:

(a) The title of the development, date, North arrow, scale, name and address of the owner of record and of the applicant, if other than the owner, and of the engineer, architect, landscape architect or surveyor preparing the plan shall be shown on a site plan map. The preferred scale is one (1) inch equals thirty (30) feet. **The overall plan is shown at a scale of 1" = 80' but supporting plans showing all of this information is shown at a scale of 1" = 30'.**

(b)) Property lines and dimensions of all land that is offered, or to be offered, for dedication for public use, with purpose indicated thereon, and of all property that is proposed to be served by deed covenant for the common use of the property owners of the development. **Sheet PL-2 (Amended Plat of Subdivision) shows all of the proposed public roadways while Sheet PL-3 shows all of the easements.**

(c) Estimated project construction schedule, phasing, and date of completion. **This is shown on Sheet C-1.6- Project Phasing Plan.**

(d) All means of vehicular access and egress to and from the site onto public streets (dimensions, widths, & turning radii), **Sheet C1.4 Geometric plan shows this information** and all provisions for pedestrian access and circulation **This is shown on Sheet L1.1-Recreation, Amenity & Circulation Plan.** Existing highway geometries should be given that include access points near the project. Sight distance in both directions of all driveway intersections should also be shown on the plans. **Sheet C1.4 Geometric plan shows this information** The linear footage **Stationing is shown on the plans** and width for proposed roads/driveways should be provided **Sheet C1.4 Geometric plan shows this information**.

(e) Elevations, floor plans, and sections of proposed structures **None are proposed with this application.** showing the proposed location, use, design and height of all structures, key boxes, and fire department connections. Plans shall also show any proposed division of buildings into units of separate occupancy and location of drives and access thereto.

(h) The location and layout of any off-street parking or loading areas, traffic circulation areas, truck circulation patterns, loading areas, areas for snow storage, bike racks, pedestrian walkways, and fire lanes. **Not applicable as there are no proposed buildings for approval with this application.**

(i) Analysis of traffic impacts, including traffic level of service/capacity analysis for existing and future conditions. Estimated daily and peak hour traffic generation, and an estimate

of traffic generation during the peak hour of the adjacent street traffic. A traffic study may be required in accordance with the standards set forth in Chapter Fourteen of the Colchester Code of Ordinances (Public Works Standards). **The Traffic Impact Study and Addenda are attached.**

(j) Lot area in square feet and acres, and lot coverage calculations including building, overall, and front yard coverage. **A lot summary sheet is included which depicts this information.**

(k) The location of all proposed waterlines, valves and hydrants and sewer lines or wells and sewage tanks, fields, lines and/or septic test pit and percolation information. **This information is shown in the C3.x series of Site Utility plans.** Information on water fire flows and pressures is also required. **These sheets are attached.**

(l) Detailed landscaping plan, including type, size, and location of all materials used and plans for buffer screening and fencing. **This information is included in Sheets 2.0 through 2.2.**

(m) Cut sheets for all proposed outdoor lighting within the site including mounting heights and a point by point lighting scheme. **This is depicted on Sheet L3.0.**

(n) The general location of any free-standing signs. **No monument signs are proposed for approval with this application. The proposed traffic management signs are depicted on Sheet C1.5-Signage & Striping Plan.**

(o) The location of any outdoor storage for equipment and materials if any, and the location, type and design of all solid waste-related facilities, including dumpsters and recycling bins. **None are proposed with this application.**

(p) Location and design of all energy distribution facilities, including electrical, gas, and solar energy. **The proposed electrical and natural gas distribution is shown on the C3.x series of site utility plans.**

(q) Recreation areas if required. **These are depicted on Sheet L l.1.**

(r) Preliminary grading, drainage, **Shown on Sheets C2.X series** landscaping and buffering plan. **These are depicted on Sheets L 2.1 and L2.2.**

(s) The extent and amount of cut and fill **The site is proposed to be balanced except for the import of all granular materials required for the construction of the proposed improvements.** for all disturbed areas, including before-and-after profiles **Profiles of the proposed roadways are shown on sheets C4.0 to C4,4 (Road Profiles)** and cross sections of typical development areas **NA**, parking lots **NA** and roads **See Sheet C5.5-Road Sections and Details,** and including an erosion and sedimentation control plan **See EPSC Sheets C6.0 to C6.9**, and proposed locations of sediment sink/setting pond and interceptor swales. **See EPSC Sheets C6.0 to C6.9**

(t) Detailed plans of retaining walls, steps, ramps, paving **See Sheet C5.5 – Roadway Sections and Details**, and drainage structures **See Sheet C5.2-Storm Details**.

(u) Estimate of all earthwork, including the quantity of any material to be imported to or removed from the site or a statement that no material is to be removed or imported. **The project is designed to be balanced except for the importation of granular materials for the construction of the proposed improvements, the estimated volumes of granular materials is 13,000 CY.**

(v) Proposed stormwater management system, including (as applicable) location, supporting design data and copies of computations used as a basis for the design capacities and performance of stormwater management facilities. **The computations for the Stormwater system are attached.**

(w) The location of all existing and proposed site improvements, including drains, culverts, retaining walls and fences. **These are show on the C2.x (Grading & Drainage) and C3.x (Utility) series of plan sheets.**

(x) Finished grades of walls, pavements, and storm drains. **These are included in the C2.x (Grading & Drainage) series of plan sheets.**

(y) Proposed streets and lots within the subdivision names and numbered in numerical order within blocks in accordance with Chapter 17 of the Colchester Code of Ordinances. **This is shown on Sheet PL-2 (Amended Plat of Subdivision).**

(z) Final Plat Supporting Documents

(1) A copy of all proposed deeds, agreements, or other documents which convey or relate to the use of a privately owned street or right-of-way including a completed contract between the land owner and the Town regarding the number of lots or dwelling units to be served by the proposed right-of-way or private street and the responsibility for the roadway maintenance. **These are attached in the ”legals” subdirectory of the PDF submittal.**

(2) Copies of proposed deeds, agreements or other documents showing the manner in which open space including park and recreational areas and school site areas, are to be dedicated, reserved and maintained and a certificate of the Town Attorney that these documents are satisfactory. **These are attached in the ”legals” subdirectory.**

(3) A copy of such covenants or deed restrictions as are intended to cover all or part of the tract **These are attached in the ”legals” subdirectory.**

(4) A prospectus describing the management organization if the DRB requires the creation of an owners’ association or management organization. **This is attached in the ”legals” subdirectory.**

3. Other: Any other information or data that the Administrative Officer or DRB shall require for a full assessment of the project pursuant to this article. The Administrative Officer shall have the authority to, when reasonable, waive any application requirements for final plat approval. Any such waiver may be exercised in the event any such requirements are:
(a) found not to be requisite in the interest of public health, safety, or general welfare or;

(b) inappropriate to a particular site plan because of the particular character or limited nature of a new development or change in use or conditions peculiar to a site.

CIVIL ENGINEERING ASSOCIATES, INC.
10 Mansfield View Lane
South Burlington, VT 05403
Phone: 802-864-2323
Fax: 802-864-2271
E-Mail: dmarshall@cea-vt.com

November 5, 2019

Colchester Fire District #3
c/o Town of Colchester Planning and Zoning Department
781 Blakely Road
Colchester, VT 05446

Re: Ireland Industries, Inc.
Final Plat Application for a Planned Unit Development
Response to Colchester Fire District #3 review comments.

Dear Ms. Riddle:

On Monday November 4, 2019 we received comments from Colchester Fire District#3 as it relates to the proposed water distribution system located within the Sunderland farms Community project. The items summarized below are from the Page 1 review check list where the boxes indicating "No" or "Insufficient Information". The responses to each of these are shown in **bold font**. Following Page 1 there were a series of written comments which are also addressed later in the letter.

3.Is the depth of all water mains between 6' and 9' below grade? **On Shea Drive (Sheet C4.1) in two locations (Sta 202+45 and Sta 208+72) the depth exceeds the 9' due to gravity and storm line vertical alignment constraints and the minimum 18" vertical separation required for both water and sewer and water and storm systems. At Sta 202+45 the water line has been adjusted to be 9.5 foot maximum below finish grade. At Sta 208+72 no adjustment was made due the separation and cover constraints resulting in a maximum cover of 10 feet below finish grade.**

6.Do new tee connections include valves on all three legs? **All tee locations have valves on all three legs.**

7.Do all mains meet horizontal and vertical separation from sewers? **The site plans included in the plan package shows that the water mains meet the 10' horizontal separation distance at all locations. And the profiles show the water mains meet the 18" vertical separation. Distance at all locations.**

11. Do fire hydrants meet Town specifications? **The Town Public Works Specifications calls for new hydrants to be Mueller Super Centurion 250, Figure A-423, Kennedy K-**

81 or Waterous Pacer. The hydrant detail on Sheet C5.1 calls for the use of Kennedy K-81. On sheet C7.4 Section 2.14 the acceptable materials are per the town public works requirements.

12. Are the fire hydrants connected to main with 6" pipe and valve? **Yes, the typical detail on Sheet C5.1 shows the use of a 6" minimum Class 52 cement lined ductile iron supply pipe and 6" valve.**

13. Are there hydrants at high point(s) to aid in air removal? **The crest high points in the system are located at hydrants. Otherwise the system all slopes up to Severance Road. Hydrants have been located at the high points of the distribution system as readily observed on the profile sheets C4.0 thru C4.4.**

14. Are there mechanical thrust restraint and thrust blocks at all fittings? **Yes, the typical detail on Sheet C5.1 shows the sizes of the thrust blocks and Sheet C5.1 calls out the use of thrust blocks at all bends greater an 11.25 degrees.**

15. Do all valves meet Town specifications? **The Town Public Works Specifications calls for new valves to be Mueller, Kennedy, AFC, or approved equal. Specification sheet C7.3 section 2.07A calls for the use of these approved valves.**

18. Do all valves include a valve box at grade w/covers marked "water"? **Yes, the typical detail on Sheet C5.1 calls for the use of a valve box with a "water" valve cover. Thi sis reinforced for all valves within sheet C7.3 section 2.07 B**

19. Do all services leave water mains and enter buildings at right angles? **As this application only covers the water distribution system (there are no buildings proposed with this application) the answer for the distribution system is yes as evidence on the site plans C3.X series and is further reinforced in specification sheet C7. 4 section 2.16A.**

20. Are all services up to 2" using type K copper or CTS pipe? **The typical detail on Sheet C5.1 shows the use of Type K copper service line and specification sheet C7.4 section 2.16A provides additional requirements for water service line installments.**

21. Are there separate fire and domestic connections? **There are no buildings that are part of this application. Where Sprinkler supply is required for a building, a shared line for the domestic and sprinkler service is proposed and will be part of any future site plan application.**

22. If plastic pipe is used for services, do they include a tracer wire and metallic warning marked "Caution Water Line Below" 2' below grade? **Not applicable as the proposed services are copper.**

23. Do the plans include a water system specifications drawing, including pressure testing and disinfection requirements? **Yes, Sheet C7.4 Section 3.04 covers all of this information.**

24. Do the plans include water use estimates using the applicable table from the latest Vermont Environmental Standards? **No, this application does not have any design flows as there are no buildings proposed. However, we have attached the Impact Statement which includes the water design flows for the conceptual future buildings.**

25. Is the project large enough to require Needed Fire Flow (NFF) and/or hydraulic analysis for domestic and fire flow demands, or to prove whether or not the project may have an adverse impact to existing customers? **Based upon modeling information provided by the Fire District's engineering consultant for the new water main extension, we have attached spreadsheet modeling that indicates that the proposed system will provide adequate fire flow for the project. Please see the attached "Engineers Report" used in support of the application to the State of Vermont for Water Supply Division Permit to Construct.**

ADDITIONAL REVIEW COMMENTS

1. Water main material has been changed from DI to C900 pipe. Sheet C7.3 (Site Specifications) Section 2.02, incorrectly lists DR-14 as 200psi. The correct pressure rating should be 305psi. **This has been corrected on Sheet C7.3 section 2.02.** Per item #2 of this review checklist, CFD#3 allows DR-14 pipe provided it gets installed with approved tracer wire and metallic warning tape. **The typical detail on Sheet C5.1 calls for the use of tracer wire and metallic warning pipe.**

2. Tracer wire is called out on Sheet C5.1 (Water Details) with no specifications. We request the use of copper-clad steel wire and locking connectors from Copperhead Industries. **This callout has been added to this detail.**

3. Per item #3 of this checklist, water main depths exceed 9 feet on Shea Drive (Sheet C4.1) in at least two locations (Sta 202+45 and Sta 208+72). This should be avoided. **On Shea Drive (Sheet C4.1) in at two locations (Sta 202+45 and Sta 208+72) the depth exceeds the 9 feet due to gravity storm line vertical alignment constraints and the minimum 18" vertical separation. At Sta 202+45 the water line has been adjusted to be 9.5 foot maximum below finish grade. At Sta 208+72 no adjustment was made due to the gravity sewer and storm constraints and vertical separation requirements.**

4. Per item #4, two (2) 90 degree bends are represented on Dylan Avenue (Sheet C3.2) near Sta 107+00. Replace each bend with 45 degree elbows. **This has been revised on Sheet C3.2.**

5. Sheet C7.4 Section 2.14. Please eliminate Waterous Pacer fire hydrants **This has been removed from Sheet C7.4**. CFD#3 recommends the Kennedy K81 over the Mueller hydrant. **We have called out the Kennedy Hydrant on the hydrant**

Detail on Sheet C5.1 but the specifications remain consistent with what is permitted in the Town Public Works Specifications.

6. Tracer wire can either be terminated in the hydrant valve box or in an adjacent curb box as shown in the Tapping Sleeve & valve Detail on Sheet C5.1. **We have added the option of terminating the tracer wire in the hydrant valve box as an additional option.**

7. Per item #17, are there easement requirements to allow CFD#3, or its designee, to enter this project to inspect and/or maintain the distribution system following construction? **We have added a Note on Sheet C3.0 indicating that Colchester Fire District #3 representatives have the right to enter onto private property where any portion of the distribution system is located to conduct inspections and maintenance of the system.**

8. Checklist item #19, above, requires services to leave mains and enter buildings at right angles. This set of plans doesn't show buildings and therefore this condition is not answered. **This application does not propose any buildings. Future site plan applications will cover the issue of service alignment at the building face. Specification sheet C7.4 section 2.16 specifically addresses the orthogonal requirement between the corporation stop and the curb stop.**

9. Response needed for item 21, above. **Please see the response previously outlined in item 21.**

10. Add pressure testing and disinfection requirements to Site Specification sheet(s). **This information was and is shown on Sheets C7.4 – C7.5**

11. Per item #24, above, water use estimates are provided separate from these plans. **Please see the response previously outlined in item 24.**

12. Per item #25, above, while Needed Fire Flow (NFF) numbers have not been provided, a simple hydraulic analysis by Krebs & Lansing with the new 12" water main through Sunny Hollow should meet the project's domestic and fire needs. **Please see the response outlined in item 25.**

13. Backflow preventers are <u>required</u> on services that provide both domestic and sprinkler water. **Acknowledged. This will be addressed with each site plan application.**

14. Typical Water Trench Detail – vague use of insulation when depth of cover is less ten 6' – specify depth and required insulation, **On Sheet C5.1 We have added the requirements that a minimum of 1" of insulation be provided for each 1-foot of deficient cover with a minimum of 2' of insulation to be installed.**

15. Water/Sewer Crossing – Detail specifies 18" minimum separation. On new construction 18" should be obtainable. Clarify. **Yes, and 18" will be provided. The 18" minimum callout is provided as a reminder that any necessary field adjustments are required to meet this standard. There are locations where the gravity drainage and the gravity sewer main vertical alignments have little flexibility due to their location within the project site. Reinforcement of the 18" minimum separation distance remains a permitting requirement in a handful of locations.**

16. Water/Storm Crossing – Detail (for new construction) would dictate all water/storm crossings main are greater than 18" separation. Clarify. **Yes, the State of Vermont treats storm lines the same as sanitary lines with regard to vertical separation. There are locations within the project where the flexibility of the vertical alignment of the storm and/or sewer is limited and the vertical alignment of the non-gravity dependent water main is adjusted to provide the requisite vertical separation.**

17. Hydrant Assembly Detail – Location in relation to curb or sidewalk – See CFD#2 Standards page 16. Should the 6" water main be specified as lined DI? **The hydrant detail on Sheet C5.1 has been revised so that the water main has been called out to be class 52 cement lined ductile iron.**

18. Tapping Sleeve and Valve Detail – We don't want concrete encased fittings **Concrete encasement of the fittings is not proposed not depicted on the detail on Sheet C5.1. The plastic sheeting is called out to be used as a means of protecting the mechanical fittings from concrete splash.**

19. Replacement of existing pavement – NA to our review

20. 2.03 – F - - All fittings shall be mechanically restrained (i.e. Megalug or equal) and thrust blocked. **The word " mechanically restrained (i.e. Megalug or equal)" has replaced the word "restrained", in describing the restraint requirements over and above the use of thrust blocks on Sheet C7.3 section 2.03C.**

21. 2.05 – A – Sleeves shall be stainless steel? **This has been revised to require that the tapping sleeve be constructed on stainless steel instead of the ductile iron callout on Sheet C7.3.**

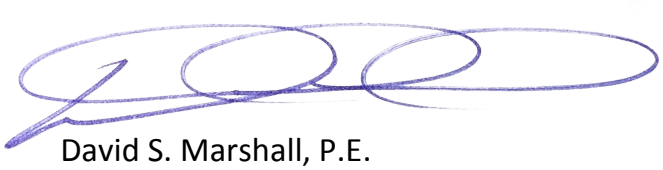
22. 2.07 – Gate valves are not required every 500'? **This requirement has bene removed from this section of Sheet C7.3.**

23. 2.16 C – Doesn't mention C900 water main. **We have added Section F. which states that "Services greater than 2" diameter shall be constructed using C900 PVC pipe in accordance with the requirements set forth in Section 2.02 on Sheet C7.3".**

24. 3.03 A & B – Specified 18" separation. Should be possible on new construction. As storm sewers aren't shown cannot determine horizontal and vertical separation with water mains. **Sewer lines and storm lines crossings of water mains were and are shown on the profiles.**

This completes our summary of the responses to Colchester Fire District #3's review comments. If you should have any questions, please feel free to contact me at 864-2323 x310 or at dmarshall@cea-vt.com.

Best Regards



David S. Marshall, P.E.
Principal Engineer

Attachments:
- Impact Statement
- Engineers Report
- Revised Sheets
  - C1.7 – Hydrant Plan
  - C3.0 - Overall Utility Plan
  - C3.1 – Northeast Utility Plan
  - C3.2 – Southeast Utility Plan
  - C3.3 – Northwest Utility Plan
  - C4.0 – C4.4 Profile Sheets
  - C5.1 – Water Details
  - C7.3 – C7.5 Specification Sheets

Cc: (w/ encl., no plans) CEA File 14134.00, Robin Jeffers (plans are in final plat submittal set)

IRELAND INDUSTRIES
SUNDERLAND FARMS COMMUNITY

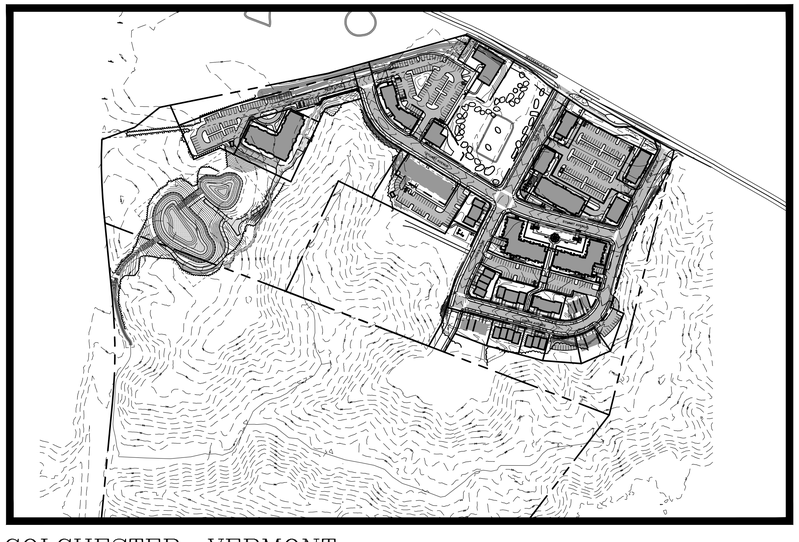
OWNERS: ROBIN JEFFERS, PROJECT COORDINATOR
IRELAND INDUSTRIES
193 INDUSTRIAL AVENUE
WILLISTON,VERMONT 05495

LANDSCAPE ARCHITECT: MICHAEL BUSCHER
T.J. BOYLE ASSOCIATES
301 COLLEGE STREET
BURLINGTON, VERMONT 05401

CIVIL ENGINEER: DAVID MARSHALL
CIVIL ENGINEERING ASSOC., INC.
10 MANSFIELD VIEW LANE,
SOUTH BURLINGTON, VERMONT 05403

TRAFFIC ENGINEER: COREY MACK, P.E.
RESOURCE SYSTEMS GROUP, INC.
180 BATTERY STREET, SUITE 350
BURLINGTON, VERMONT 05401

WETLANDS CONSULTANT: PETER SPEAR
NATURAL RESOURCES CONSULTING SERVICES
67 WEST SHORE ROAD
GRAND ISLE, VERMONT 05458



COLCHESTER, VERMONT

November 01, 2019

TABLE OF CONTENTS

LEGEND

- DECIDUOUS TREES
- DECIDUOUS SMALL TREES
- CONIFER TREES
- CONIFER SMALL TREES
- SHRUBS

SEVERANCE ROAD

PEGS COVE

STUART AVENUE

SHEA DRIVE

DYLAN AVENUE

LOT 1
LOT 2
LOT 3
LOT 4
LOT 4A
LOT 4B
LOT 5
LOT 5A
LOT 5B
LOT 6
LOT 6A
LOT 7
LOT 8
LOT 9
LOT 10
LOT 11
LOT 12
LOT 13
LOT 14
LOT 15
LOT 16
LOT 17
LOT 17A
LOT 18
LOT 18A
LOT 19
LOT 19A
LOT 20
LOT 21
LOT 21A
LOT 21B
LOT 22
LOT 23
LOT 23A
LOT 24
LOT 24A

WETLAND 'A'
CLASS II
OPEN WATER

WETLAND 'B'
CLASS II

WETLAND 'C'
CLASS II

FUTURE RESERVED PARKING SPACES

SCALE 1" = 60'
(at 24" x 36" ONLY)

RELEASED FOR PERMITS -
11/01/2019
NOT FOR CONSTRUCTION

revisions	date	revisions	date

T. J. Boyle Associates, LLC

landscape architects ● planning consultants

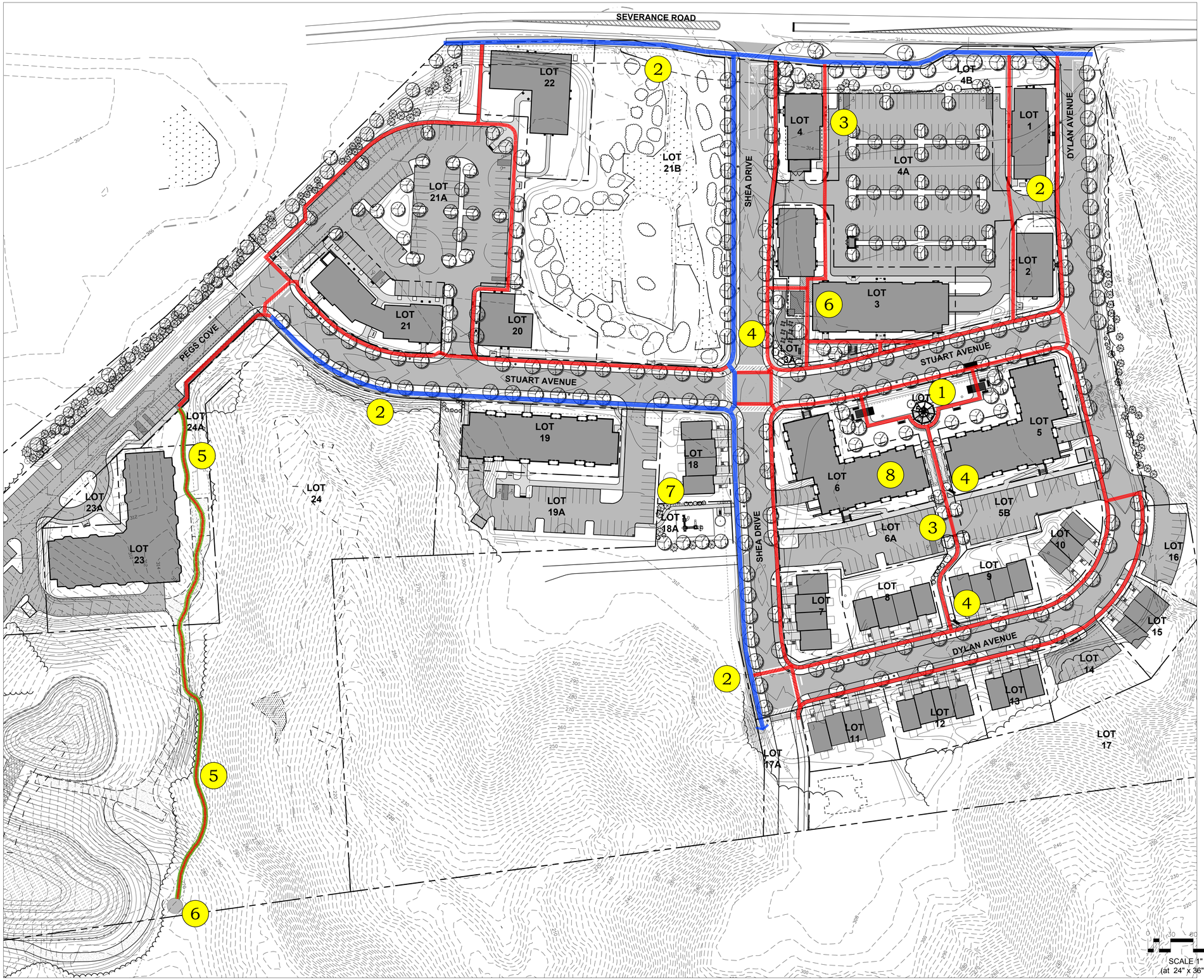
301 college street ● burlington ● vermont ● 05401 802 ●658 ●3555 http://www.tjboyle.com

north

mjb design by	dja drawn by	11/01/2019 date	
mjb checked by	scale 1" = 60'		

Sunderland Farms Community
Conceptual Future Build-out Plan

sheet no: L-1.0



LEGEND

- 8' WIDE RECREATION PATH PAVED
- 5' WIDE SIDEWALK
- INTERNAL PEDESTRIAN CIRCULATION AND NATURE PATH

Recreation Area Descriptions

1 **Central Green:** The Central Green will serve as not only a visual center of the development, but also as a social center. The Green provides open lawn area for throwing a ball or enjoying the summer sun, while a trellised gazebo, tables, and several sitting areas invite social gatherings. The Central Green is linked by an internal walkway system and transitions between the commercial core and the residential areas of the project.

2 **Sidewalks and Multi-Use Recreation Pathways:** Pedestrian circulation is emphasized throughout the project with several linked circulation systems throughout the development. All streets have 5 foot wide concrete sidewalks, and an eight foot wide recreation path runs along Stewart Avenue and Shea Drive. A future 10 foot wide recreation path that will be built along Severance Road will eventually interconnect to other developments in the Severance Corners area, as well as to the greater Colchester area.

3 **Internal Walkways:** To further promote pedestrian inter connectivity within the development, an internal pedestrian walkway is planned for the project. Beginning near the townhouses on Lot 5A, this walkway bisects through the Central Green and connects with sidewalks along Stuart Avenue and then two internal walks bring pedestrian through the front commercials area to Severance Road.

4 **Sitting Areas:** Throughout the development there are several sitting areas for residents to stop and rest while traversing the neighborhood, or simply to sit and enjoy their lunch on warm sunny days.

5 **Open Space Trail:** An open space trail towards the west side of the Project will extend past the storm water pond and provide residents access to a small picnic area. The picnic area will serve as a trail head to natural areas within the project property.

6 **Clock Tower:** Conceptual architectural features, such as a Clock Tower on future lot, will enhance the visual aesthetics of the community and help create the small town setting that is meant for the Sunderland Farms Community.

7 **Play Area:** On lot 18a a playground will be constructed to provide recreation opportunities for children within the neighborhood.

8 **Community Room:** A general use room, possibly within the future building on Lot 6 will allow indoor gatherings of the community's residents. This room will be available for use by neighborhood social groups, children's activities, and meetings of the homeowners associations.

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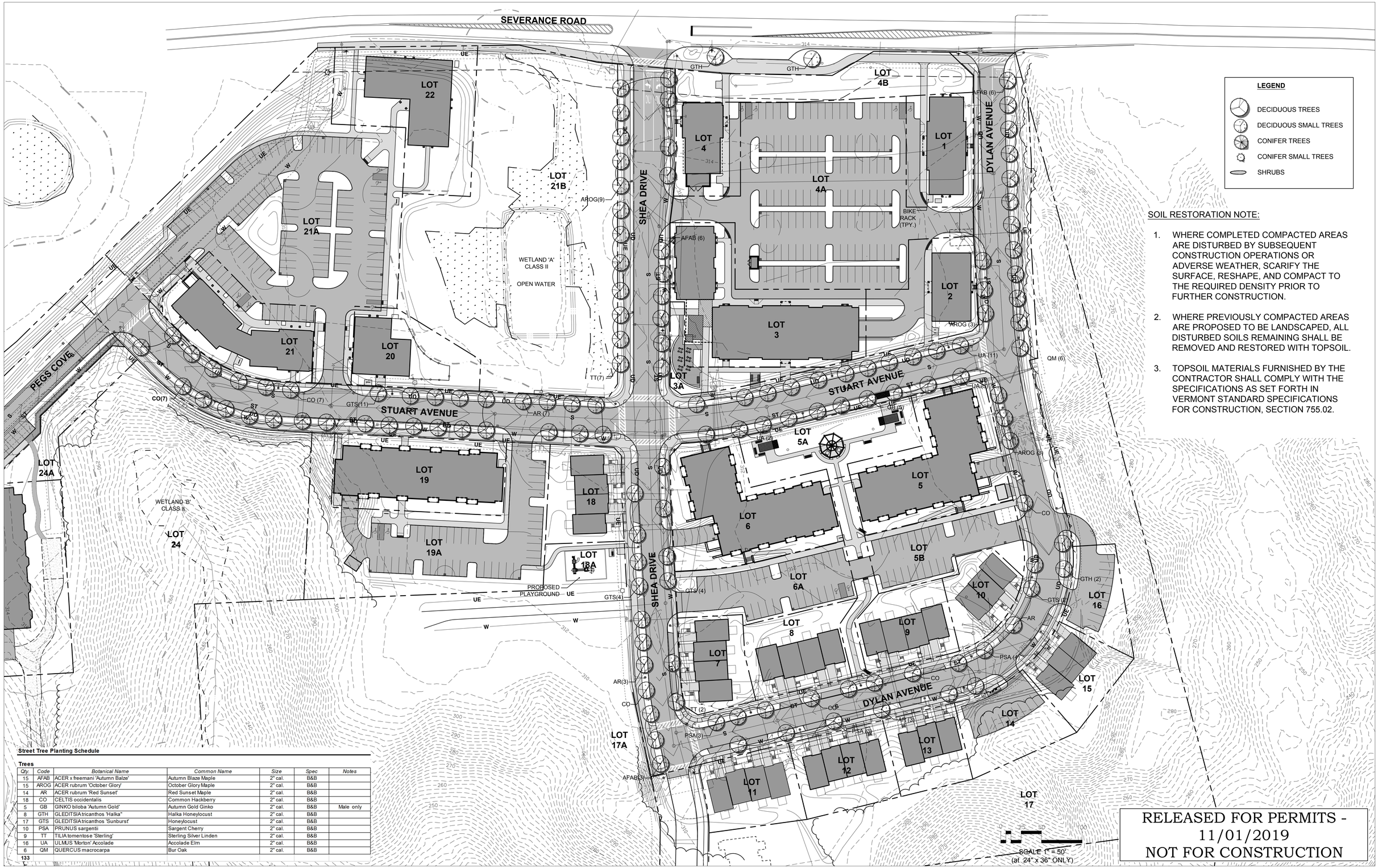
mjb design by	dja drawn by	11/01/2019 date	
mjb checked by	scale 1" = 60'		

Sunderland Farms Community
Recreation, Amenity & Circultion Plan

sheet no: L-1.1



LEGEND

- DECIDUOUS TREES
- DECIDUOUS SMALL TREES
- CONIFER TREES
- CONIFER SMALL TREES
- SHRUBS

SOIL RESTORATION NOTE:

1. WHERE COMPLETED COMPACTED AREAS ARE DISTURBED BY SUBSEQUENT CONSTRUCTION OPERATIONS OR ADVERSE WEATHER, SCARIFY THE SURFACE, RESHAPE, AND COMPACT TO THE REQUIRED DENSITY PRIOR TO FURTHER CONSTRUCTION.
2. WHERE PREVIOUSLY COMPACTED AREAS ARE PROPOSED TO BE LANDSCAPED, ALL DISTURBED SOILS REMAINING SHALL BE REMOVED AND RESTORED WITH TOPSOIL.
3. TOPSOIL MATERIALS FURNISHED BY THE CONTRACTOR SHALL COMPLY WITH THE SPECIFICATIONS AS SET FORTH IN VERMONT STANDARD SPECIFICATIONS FOR CONSTRUCTION, SECTION 755.02.

Street Tree Planting Schedule

Trees

Qty.	Code	Botanical Name	Common Name	Size	Spec	Notes
15	AFAB	ACER x freemani 'Autumn Balze'	Autumn Blaze Maple	2" cal.	B&B	
15	AROG	ACER rubrum 'October Glory'	October Glory Maple	2" cal.	B&B	
14	AR	ACER rubrum 'Red Sunset'	Red Sunset Maple	2" cal.	B&B	
18	CO	CELTIS occidentalis	Common Hackberry	2" cal.	B&B	
5	GB	GINKO biloba 'Autumn Gold'	Autumn Gold Ginko	2" cal.	B&B	Male only
8	GTH	GLEDITSIA tricanthos 'Halka"	Halka Honeylocust	2" cal.	B&B	
17	GTS	GLEDITSIA tricanthos 'Sunburst'	Honeylocust	2" cal.	B&B	
10	PSA	PRUNUS sargentii	Sargent Cherry	2" cal.	B&B	
9	TT	TILIA tomentose 'Sterling'	Sterling Silver Linden	2" cal.	B&B	
16	UA	ULMUS 'Morton' Accolade	Accolade Elm	2" cal.	B&B	
6	QM	QUERCUS macrocarpa	Bur Oak	2" cal.	B&B	
133						

SCALE 1" = 50'
(at 24" x 36" ONLY)

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mjb	dja	11/01/2019
design by	drawn by	date
mjb	1" = 50'	
checked by	scale	

Sunderland Farms Community
Street Tree Planting Plan

sheet no: L-2.0

Lots 1-17 Planting Schedule

Trees

Qty.	Code	Botanical Name	Common Name	Size	Spec	Notes
1	AB	ABIES balsamea	Balsam Fir	6' Ht.	B&B	
6	AROG	ACER rubrum 'October Glory'	October Glory Maple	2" cal.	B&B	
1	AGAB	AMELANCHIER grandiflora 'Autumn Brilliance'	Autumn Brilliance Service Berry	6-7' ht.	B&B	multi-stem
3	ARH	AMELANCHIER x grandiflora 'Robin Hill'	Robinhill Serviceberry	2" cal.	B&B	single-stem
9	BNH	BETULA nigra 'Heritage'	Heritage River Birch	2" cal.	B&B	single stem
12	CO	CELTIS occidentalis	Common Hackberry	2" cal.	B&B	
20	GTH	GLEDITSIA tricanthos 'Halka"	Halka Honeylocust	2" cal.	B&B	
6	GTS	GLEDITSIA tricanthos 'Sunburst'	Honeylocust	2" cal.	B&B	
7	MLM	MAGNOLIA x laebneri 'Leonard Messel'	Leonard Messel Magnolia	7-8' Ht.	B&B	
10	MDW	MALUS 'Donal Wyman'	Donald Wyman Crabapple	2" cal.	B&B	
4	PG	PICEA glauca	White Spruce	6' ht.	B&B	
3	PSY	PINUS sylvestris	Scotch Pine	4' Ht.	B&B	
2	PSA	PRUNUS sargentii	Sargent Cherry	2" cal.	B&B	
4	QM	QUERCUS macrocarpa	Bur Oak	2" cal.	B&B	
24	TC	TSUGA canadensis	Canadian Hemlock	5-6' Ht.	B&B	
12	UA	ULMUS 'Morton' Accolade	Accolade Elm	2" cal.	B&B	

Shrubs

Qty.	Code	Scientific Name	Common Name	Size	Spec	
2	HVG	HAMAMELIS virginiana	Common Witchhazel	4' ht.	B&B	
14	IGD	ILEX glabra 'Densa'	Densa Compact Inkberry	3' Ht.	B&B	
20	IVRS	ILEX v. 'Red Sprite'	Red Sprite Winterberry	3' Ht.	B&B	
2	RBN	RHODODENDRON 'boule de neige'	Boule de Neige Rhododendron	18-24" Ht.	B&B	
22	RC	RHODODENDRON catawbiense 'Album'	Catawbiense Album Rhododendron	18-24" Ht.	B&B	
4	SV	SYRINGA vulgaris	Common Lilac	4' Ht.	B&B	
9	TON	THUJA occidentalis 'Nigra'	Dark Green Arborvitae	5' Ht.	B&B	

Groundcovers & Perennials

Qty.	Code	Scientific Name	Common Name	Size	Spec	
10	MSG	MISCANTHUS sinensis 'Gracillimus'	Maiden Grass	18" Ht.	No. 3 Cont.	
	PM	**PERENNIAL MIX**				
34	EP	ECHINACEA p. 'Harvest Moon'	Harvest Moon Cone Flower	Clump	No. 2 Cont.	24" O.C.
38	ECX	ECHINACEA p. 'White Swan'	White Swan Echinacea	2-3' Ht.	No. 2 Cont.	18" O.C.

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Sunderland Farms Community
Landscape Plan Lots 1-17

sheet no: L-2.1

Lots 18-22 Planting Schedule

Trees

Qty.	Code	Botanical Name	Common Name	Size	Spec	Notes
1	AGAB	AMELANCHIER grandiflora 'Autumn Brilliance'	Autumn Brilliance Service Berry	6-7' ht.	B&B	multi-stem
2	AR	ACER rubrum 'Red Sunset'	Red Sunset Maple	2" cal.	B&B	
12	AROG	ACER rubrum 'October Glory'	October Glory Maple	2" cal.	B&B	
5	BNH	BETULA nigra 'Heritage'	Heritage River Birch	2" cal.	B&B	single stem
12	GTH	GLEDITSIA tricanthos 'Halka"	Halka Honeylocust	2" cal.	B&B	
16	PG	PICEA glauca	White Spruce	6' Ht.	B&B	
14	PS	PINUS strobus	Eastern White Pine	5' Ht.	B&B	
3	PSY	PINUS sylvestris	Scotch Pine	4' Ht.	B&B	
12	QM	QUERCUS macrocarpa	Bur Oak	2" cal	B&B	
4	ZS	ZELKOVA serrata 'Green Vase'	Green Vase Zelkova	2" cal.	B&B	

Shrubs

Qty.	Code	Scientific Name	Common Name	Size	Spec	
3	RBN	RHODODENDRON 'boule de neige'	Boule de Neige Rhododendron	18-24" Ht.	B&B	
10	TON	THUJA occidentalis 'Nigra'	Dark Green Arborvitae	5' Ht.	B&B	

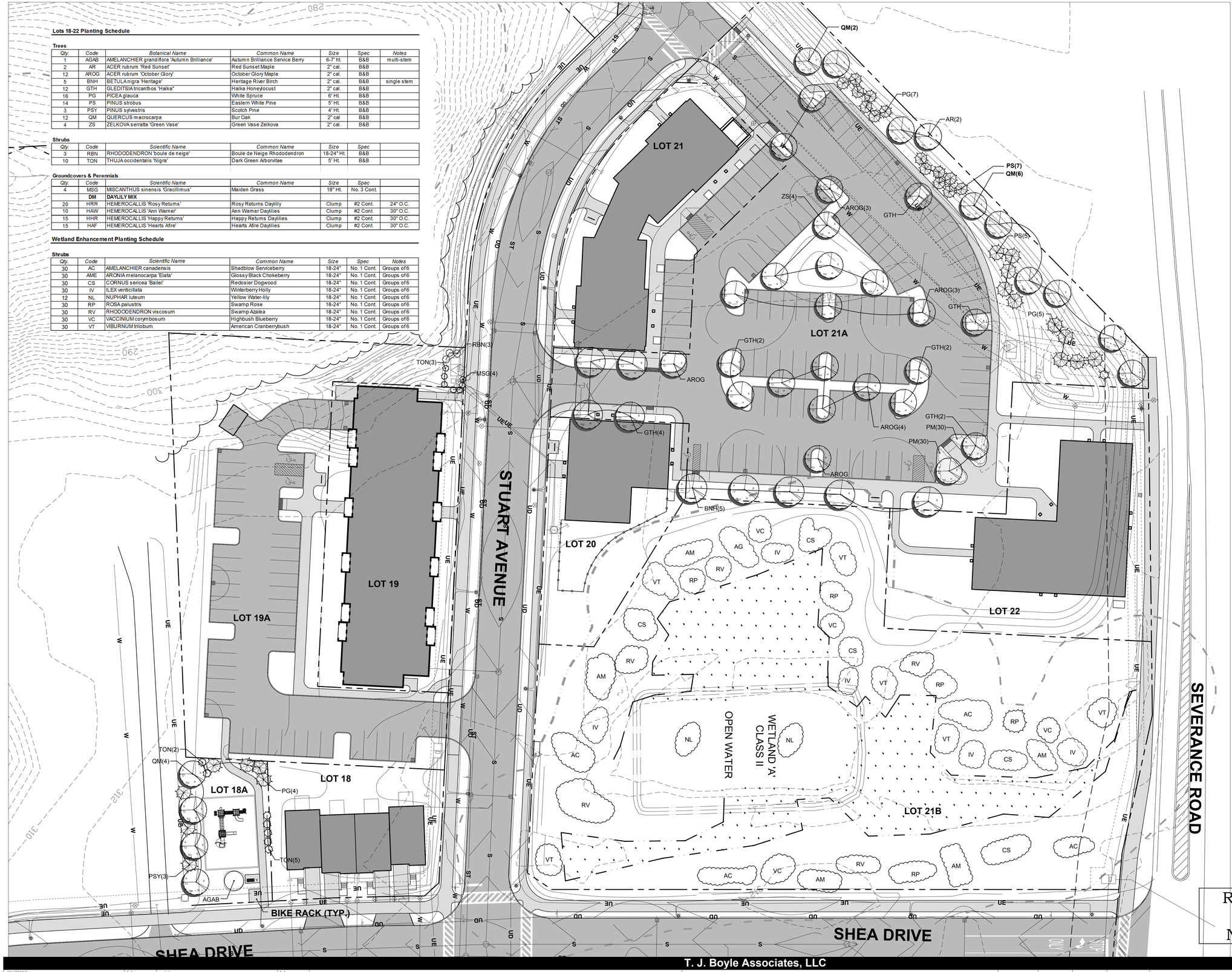
Groundcovers & Perennials

Qty.	Code	Scientific Name	Common Name	Size	Spec	
4	MSG	MISCANTHUS sinensis 'Gracillimus'	Maiden Grass	18" Ht.	No. 3 Cont.	
	DM	DAYLILY MIX				
20	HRR	HEMEROCALLIS 'Rosy Returns'	Rosy Returns Daylilly	Clump	#2 Cont.	24" O.C.
10	HAW	HEMEROCALLIS 'Ann Warner'	Ann Warner Daylilies	Clump	#2 Cont.	30" O.C.
15	HHR	HEMEROCALLIS 'Happy Returns'	Happy Returns Daylilies	Clump	#2 Cont.	30" O.C.
15	HAF	HEMEROCALLIS 'Hearts Afire'	Hearts Afire Daylilies	Clump	#2 Cont.	30" O.C.

Wetland Enhancement Planting Schedule

Shrubs

Qty.	Code	Scientific Name	Common Name	Size	Spec	Notes
30	AC	AMELANCHIER canadensis	Shadblow Serviceberry	18-24"	No. 1 Cont.	Groups of 6
30	AME	ARONIA melanocarpa 'Elata'	Glossy Black Chokeberry	18-24"	No. 1 Cont.	Groups of 6
30	CS	CORNUS sericea 'Baileii'	Redosier Dogwood	18-24"	No. 1 Cont.	Groups of 6
30	IV	ILEX verticillata	Winterberry Holly	18-24"	No. 1 Cont.	Groups of 6
12	NL	NUPHAR luteum	Yellow Water-lily	18-24"	No. 1 Cont.	Groups of 6
30	RP	ROSA palustris	Swamp Rose	18-24"	No. 1 Cont.	Groups of 6
30	RV	RHODODENDRON viscosum	Swamp Azalea	18-24"	No. 1 Cont.	Groups of 6
30	VC	VACCINIUM corymbosum	Highbush Blueberry	18-24"	No. 1 Cont.	Groups of 6
30	VT	VIBURNUM trilobum	American Cranberrybush	18-24"	No. 1 Cont.	Groups of 6



SOIL RESTORATION NOTE:

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0 15 30 60

SCALE 1" = 30'
(at 24" x 36" ONLY)

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north

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design by	drawn by	date
mjb	1" = 30'	
checked by	scale	

Sunderland Farms Community
Landscape Plan Lots 18-22

sheet no: L-2.2

Lighting Calculations

Area	Grid Spacing (ft)	Illuminance[1] Max. (fc)	Illuminance[1] Min. (fc)	Illuminance[1] Ave. (fc)	Max. / Min. Ratio Max./Min. (fc)	Max. Uniformity Ratio Ave./Min. (fc)
Public Streets	10	1.61	0.2	0.69	8.13	3.46

Footnotes:

[1] Illuminance - All calculations are in Horizontal Footcandles (fc)

Luminaire Schedule

Label	Qty.	Manufacturer/Fixture	Fixture Number	Type	Lamp	Color Temp	Lemens	BUG	Drive Current[3]	Voltage[2]	Watts	Finish	Options	CRI	Ht.[1]
A	47	Lumec - Metroscape Post Top	MPTR-55W48LED-4K-G2-LE5-120-PH8-BKTX	5	LED	4000K	5659	B3-UO-G1	350	120[2]	54	BKTX	PH8	70	14'

Pole Number	Mount *	Finish
AM6F-12-BAS20-FS1-BKTX	BAS20	BKTX

***SLIDING BANNER ARM MOUNT AT HEIGHT OF 12" BELOW THE LAMP MOUNTING RING OR FITTER**

Notes:

[1] Mounting height equates between the light source and the ground planes for using calculation photometric analysis, cut poles as needed

[2] Voltage to be verified by Electrical Engineer prior to ordering

[3] Drive Current - review drive currrent and wattage with Electrical Engineer and Contractor before installation

0 15 30 60

SCALE 1" = 30'
(at 24" x 36" ONLY)

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Sunderland Farms Community
Streets Lighting Plan

sheet no: L-3.0

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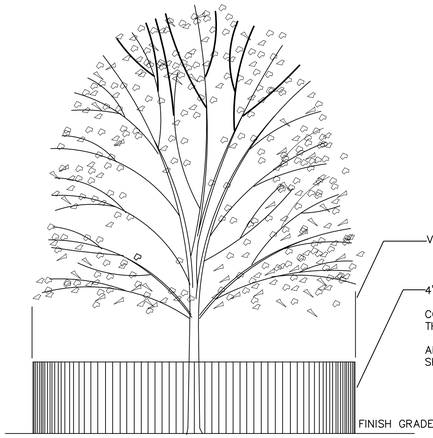
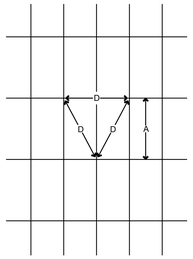


8 L4.0 TREE PROTECTION FENCE
SCALE: N/A

Spacing 'D'	Row 'A'	Number of Plants	Area Unit
6" O.C.	5.2"	4.61	1 SQ. FT.
8" O.C.	6.93"	2.6	
10" O.C.	8.66"	1.66	
12" O.C.	10.4"	1.15	
15" O.C.	13.0"	7.38	10 SQ. FT.
18" O.C.	15.6"	5.12	
24" O.C.	20.8"	2.91	
30" O.C.	26.0"	1.55	
36" O.C.	30.0"	1.25	
4' O.C.	3.46'	7.25	100 SQ. FT.
5' O.C.	4.38'	4.61	
6' O.C.	5.2'	3.2	
8' O.C.	6.93'	1.8	
10' O.C.	8.66'	1.16	
12' O.C.	10.4'	8	1000 SQ. FT.
15' O.C.	13.0'	5	
20' O.C.	17.3'	2.88	
25' O.C.	21.65'	1.85	
30' O.C.	26.0'	1.29	
40' O.C.	34.6'	7.22	10,000 SQ. FT.

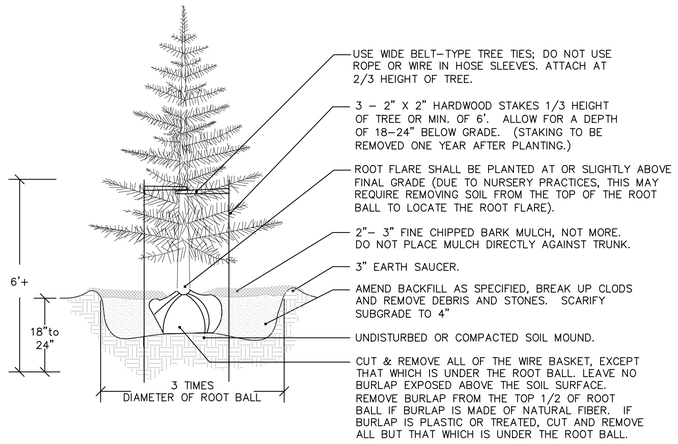
O.C. = ON CENTER

FOR USE WHEN PLANTS ARE SHOWN EQUIDISTANT FROM EACH OTHER (AS SHOWN)

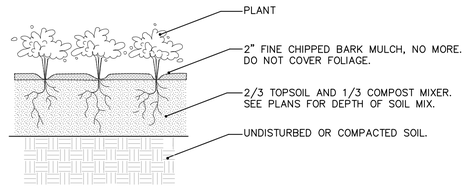


PLANT SPACING CHART

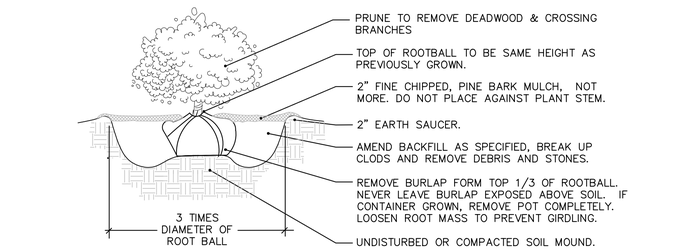
6 L4.0 PLANT SPACING CHART
SCALE: 1/2" = 1'-0"



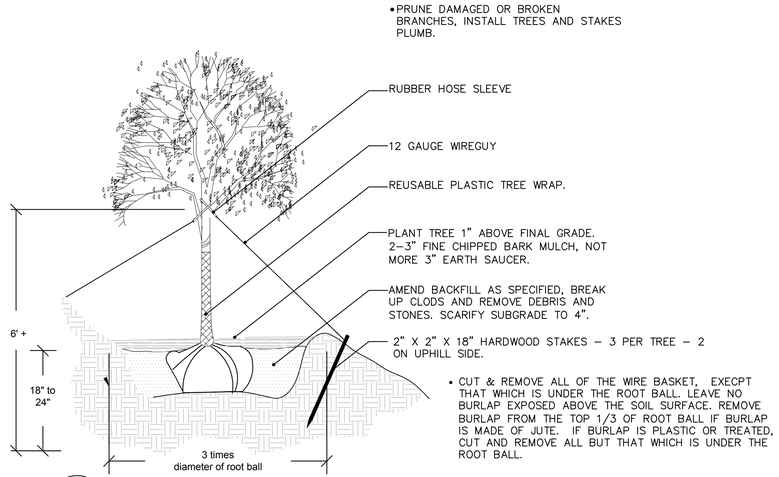
3 L4.0 CONIFEROUS TREE PLANTING
SCALE: 1/2" = 1'-0"



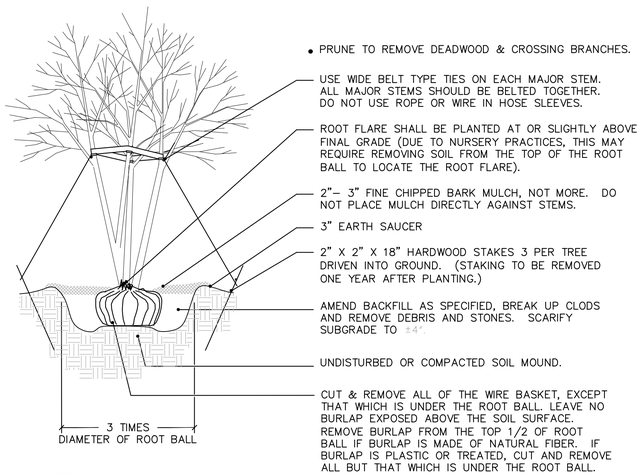
5 L4.0 GROUNDCOVER PLANTING
SCALE: 1/2" = 1'-0"



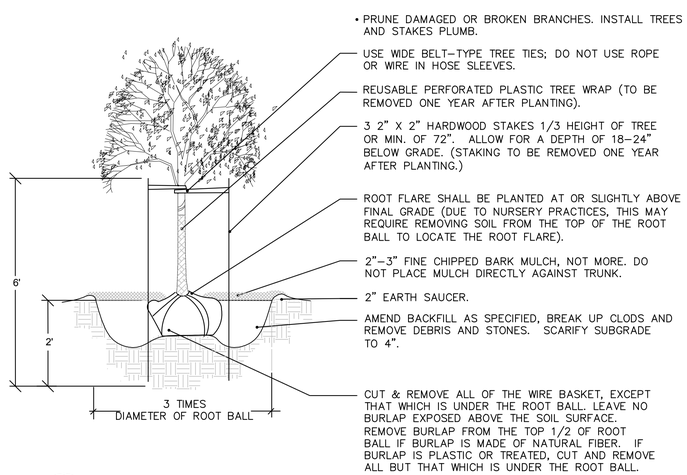
2 L4.0 SHRUB PLANTING
SCALE: 1/2" = 1'-0"



7 L4.0 PLANTING ON SLOPE
SCALE: N/A



4 L4.0 MULTI-STEM PLANTING
SCALE: 1/2" = 1'-0"



1 L4.0 DECIDUOUS TREE PLANTING
SCALE: 1/2" = 1'-0"

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mjb design by	dja drawn by	11/01/2019 date	Sunderland Farms Community
mjb checked by	scale as shown		Landscape Details

sheet no: L-4.0

LUMEC
by Signify

Outdoor

Poles and Brackets

AM6 Round Aluminum Bottleneck Pole

Made from a one piece, seamless 4" round (102 mm) tube of extruded-aluminum welded over and in a 6-5/8" round (168 mm) extruded-aluminum pole base. The assembly is welded to both the top and bottom of a cast-aluminum anchor plate. A 4-1/2" by 10" (114 by 254 mm) maintenance opening is complete with cover and copper ground lug.

Project:
Location:
Cat.No:
Type:
Lamps: Qty:
Notes:

Ordering guide

example: AM6-F-8-DE-BE2TX

Pole Family: AM6	Wall Thickness: F	Nominal Height: 14	Options: BAS20	Finish: BKTX
AM6	**F** 0.125"	**8** 8'	**DE** Pole base buried 5' (1524 mm) in the ground	**BE2TX** Midnight Blue Textured
		10 10'	**LS** Provision for loudspeaker outlet	**BE8TX** Ocean Blue Textured
		12 12'	**PH7** Button-type photoelectric cell (specify operating voltage)	**BE8TX** Royal Blue Textured
		13 13'	**PH8** Quarter-turn type photoelectric cell(specify operating voltage)	**BG2TX** Sandstone Gold Textured
		14 14'	**DR** Duplex receptacle (120V line voltage only)	**BKTX** Black Textured
		15 15'	**GFI** DR with common ground fault interrupter (120V line voltage only)	**BRTX** Bronze Textured
	U 0.226"	**8** 8'	**BA** Banner arm	**GN4TX** Blue Green Textured
		10 10'	**PS** Plant support	**GN6TX** Forest Green Textured
		12 12'	**MPL** Mid-pole luminaire	**GN8TX** Dark Forest Green Textured
		13 13'		**GNTX** Green Textured
		14 14'		**GY3TX** Medium Grey Textured
		15 15'		**RD2TX** Burgundy Textured
		16 16'		**RD4TX** Scarlet Textured
		18 18'		**WHTX** White Textured
	W 0.318"	**16** 16'		**GR** Gray Sandtex
		18 18'		**NP** Natural Alum.
		20 20'		**TG** Hammer-tone
				TS Hammer-tone Silver

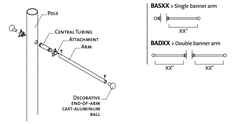
Note: The recommended method for calculating EPA (Effective Projected Area) is in accordance with AASHTO 2001 standards: for three seconds, the pole is tested in wind gusts equivalent to the strongest winds on record over the past 50 years, and with a 50 pound load (22.7 kg) placed at 1 foot (305 mm) above its center.

BA > POLE OPTION DETAILS

BAS / BAD > BANNER ARMS

BAS20*

> shown here on a straight round pole



Specifications:

Lumec's Banner Arms **BAS / BAD** are designed to fit on a round, fluted, square and multi-sided pole, using a central tubing inserted through two opposite 1 3/8" (35 mm) holes.

The aluminum banner arm (1 1/16" diameter (27 mm)) easily slip-fits into the central tubing and it is secured with the attachment by stainless steel hardware. Completing the installation are two end-of-arm decorative casting.

Consult factory for all banner arm heights and orientations.

Optional Lily Flower end-of-arm casting available (LF option).

Specify width of banner(s) as the xx dimension in the ordering number.

Order Banner in 1" (25 mm) increments only (ex: BAS11)

> Lumec strongly recommends that the banner arm should be at least 8 feet from the ground.

Decorative end-of-arm option LF

***SLIDING BANNER ARM MOUNT AT HEIGHT OF 12" BELOW THE LAMP MOUNTING RING OR FITTER**

Pole Data

Pole Family	Catalog Number	Nominal Height (ft)	Nominal Height (m)	Tenon Section (in)	Tenon Section (mm)	Wall Thickness (in)	Wall Thickness (mm)	Weight (lbs)	Weight (kg)	EPA Rating 90 MPH (sq. ft.)	EPA Rating 110 MPH (sq. ft.)	EPA Rating 120 MPH (sq. ft.)	EPA Rating 150 MPH (sq. ft.)	Anchor Bolts (in)	Anchor Bolts (mm)
AM6	**AM6F-8**	8	2.44	4	102	0.125	3.2	27	12	15.65	10.47	8.77	5.61	3/4-20	19-508
AM6	**AM6U-8**	8	2.44	4	102	0.226	5.7	37	17	27.82	18.85	15.86	10.21	3/4-20	19-508
AM6	**AM6F-10**	10	3.05	4	102	0.125	3.2	31	14	11.35	7.39	6.1	3.83	3/4-20	19-508
AM6	**AM6U-10**	10	3.05	4	102	0.226	5.7	41	19	20.61	13.73	11.47	7.31	3/4-20	19-508
AM6	**AM6F-12**	12	3.66	4	102	0.125	3.2	35	16	8.54	5.34	4.32	2.64	3/4-20	19-508
AM6	**AM6U-12**	12	3.66	4	102	0.226	5.7	45	20	15.92	10.42	8.61	5.43	3/4-20	19-508
AM6	**AM6F-13**	13	3.97	4	102	0.125	3.2	36	16	7.43	4.53	3.62	2.15	3/4-20	19-508
AM6	**AM6U-13**	13	3.97	4	102	0.226	5.7	46	21	14.17	9.13	7.52	4.7	3/4-20	19-508
AM6	**AM6F-14**	14	4.27	4	102	0.125	3.2	38	17	6.49	3.83	3	1.74	3/4-20	19-508
AM6	**AM6U-14**	14	4.27	4	102	0.226	5.7	48	22	12.64	8.05	6.57	4.06	3/4-20	19-508
AM6	**AM6F-15**	15	4.57	4	102	0.125	3.2	40	18	5.67	3.21	2.45	1.37	3/4-20	19-508
AM6	**AM6U-15**	15	4.57	4	102	0.226	5.7	50	23	11.32	7.08	5.73	3.5	3/4-20	19-508
AM6	**AM6U-16**	16	4.88	4	102	0.226	5.7	52	24	10.21	6.25	5.02	3.03	3/4-20	19-508
AM6	**AM6W-16**	16	4.88	4	102	0.318	8.1	74	34	14.43	9.18	7.49	4.61	3/4-20	19-508
AM6	**AM6U-18**	18	5.49	4	102	0.226	5.7	55	25	8.07	4.71	3.68	2.11	3/4-27	19-686
AM6	**AM6W-18**	18	5.49	4	102	0.318	8.1	87	39	11.65	7.17	5.75	3.48	3/4-27	19-686
AM6	**AM6W-20**	20	6.1	4	102	0.318	8.1	96	44	9.18	5.58	4.36	2.54	3/4-27	19-686

Specifications

Joint cover

Made from two pieces of cast-aluminum mechanically fastened to the junction with stainless steel hardware.

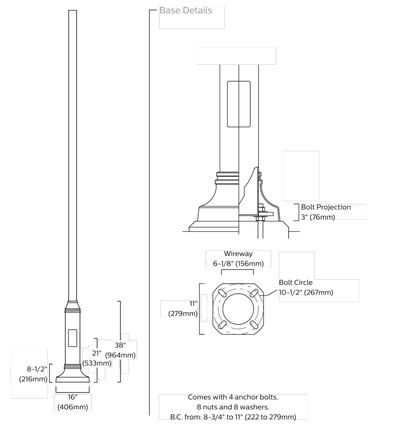
Base cover

Made from two pieces of cast aluminum mechanically fastened to the base with stainless steel hardware.

Finish

Color to be in accordance with the AAMA 2603 standard. Application of polyester powder coat paint (4 mils/100 microns) with ± 1 mils/24 microns of tolerance. The Thermosetting resins provides a discoloration resistant finish in accordance with the ASTM D2244 standard, as well as luster retention in keeping with the ASTM D523 standard and humidity proof in accordance with the ASTM D2247 standard.

Dimensions



2
L4.1
LUMEC - ROUND ALUMINUM POLE
NTS

RELEASED FOR PERMITS -
11/01/2019
NOT FOR CONSTRUCTION

MPTR MetroScape LED Post Top

Urban Luminaire

LUMEC
by Signify

Urban

MetroScape

MPTR
Post Top

Lumec **MetroScape LED** post top luminaire features flexible, robust energy-saving solutions for heritage-styled urban architectural lighting. Crowned with an ornamental hood, the post top model comes with a flat lens to highlight the thinness of the LEDs. The luminaire provides attractive lighting at night, adding appeal to the surroundings and promoting safe use of the environment. Includes Service Tag, innovative way to provide assistance throughout the life of the product

Project:
Location:
Cat.No:
Type:
Lamps: Qty:
Notes:

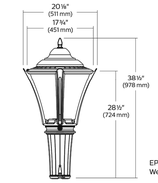
Motion Response* (must be ordered as a separate item)

Example: ACC-120-MR4PGI-BKTX

Series: ACC	Voltage	Motion Response module	Finish
ACC Accessory	**120** 120 volt **277** 277 volt	**MR4PG1** Single grey **MR4PG2** Double grey **MR4PW1** Single white **MR4PW2** Double white	Consult Lumec's Color Chart for complete specifications.

*OVR option is required for Motion Response Accessory

Dimensions



EPA: 1.97 sq ft
Weight: 31.1 lbs (14.1 kg)

LED Wattage and Lumen Values for 3000K & 4000K fixtures

Ordering Code:	Total LEDs	System current (mA)	Average System Watts† (W)	LE2 Lumen Output†	LE2 Efficacy (LPW)	LE2 BUG Rating	LE3 Lumen Output†	LE3 Efficacy (LPW)	LE3 BUG Rating	LE3W Lumen Output†	LE3W Efficacy (LPW)	LE3W BUG Rating	LE4 Lumen Output†	LE4 Efficacy (LPW)	LE4 BUG Rating	LE5 Lumen Output†	LE5 Efficacy (LPW)	LE5 BUG Rating
MPTR 3000K																		
35W32LED3K-G2	32	350	37	2875	77.7	B1-U0-G1	2895	78.2	B1-U0-G1	2948	79.7	B1-U0-G1	2893	78.2	B1-U0-G1	3107	84.0	B2-U0-G1
55W32LED3K-G2	32	530	56	4124	73.8	B1-U0-G1	4152	74.3	B1-U0-G1	4228	75.6	B1-U0-G1	4149	74.2	B1-U0-G1	4457	79.7	B3-U0-G1
72W32LED3K-G2	32	700	70	5201	74.0	B1-U0-G1	5237	74.5	B1-U0-G1	5333	75.9	B1-U0-G2	5233	74.4	B1-U0-G2	5621	80.0	B3-U0-G1
97W32LED3K-G2	32	1050	104	7172	68.8	B1-U0-G1	7221	69.2	B1-U0-G2	7353	70.5	B1-U0-G2	7216	69.2	B1-U0-G2	7751	74.3	B3-U0-G2
55W48LED3K-G2	48	350	54	4313	79.3	B1-U0-G1	4342	79.8	B1-U0-G1	4422	81.3	B1-U0-G2	4339	79.8	B1-U0-G2	4661	85.7	B3-U0-G2
80W48LED3K-G2	48	530	81	6186	76.1	B1-U0-G1	6229	76.6	B1-U0-G2	6342	78.0	B1-U0-G2	6224	76.6	B1-U0-G2	6686	82.2	B3-U0-G2
108W48LED3K-G2	48	700	105	7802	74.0	B1-U0-G1	7855	74.5	B1-U0-G2	7999	75.9	B1-U0-G2	7850	74.5	B1-U0-G2	8432	80.0	B3-U0-G2
140W48LED3K-G2	48	1050	157	10758	68.7	B2-U0-G2	10832	69.2	B2-U0-G2	11030	70.5	B2-U0-G2	10824	69.2	B2-U0-G2	11627	74.3	B4-U0-G2
70W64LED3K-G2	64	350	73	5750	78.8	B1-U0-G1	5790	79.3	B1-U0-G1	5896	80.8	B1-U0-G2	5785	79.2	B1-U0-G2	6215	85.1	B3-U0-G1
110W64LED3K-G2	64	530	105	8248	78.6	B2-U0-G2	8305	79.1	B1-U0-G2	8457	80.5	B1-U0-G2	8299	79.0	B1-U0-G2	8914	84.9	B3-U0-G2
90W80LED3K-G2	80	350	91	7188	79.3	B1-U0-G1	7237	79.8	B1-U0-G2	7370	81.3	B1-U0-G2	7232	79.7	B1-U0-G2	7768	85.6	B3-U0-G2
135W80LED3K-G2	80	530	136	10310	76.1	B2-U0-G2	10381	76.6	B2-U0-G2	10571	78.0	B2-U0-G2	10373	76.6	B2-U0-G2	11143	82.2	B4-U0-G2
MPTR 4000K																		
35W32LED4K-G2	32	350	37	3462	93.6	B1-U0-G1	3624	97.9	B1-U0-G1	3610	97.6	B1-U0-G1	3650	98.6	B1-U0-G1	3695	99.9	B3-U0-G1
55W32LED4K-G2	32	530	56	4966	88.8	B1-U0-G1	5198	93.0	B1-U0-G1	5178	92.6	B1-U0-G2	5235	93.6	B1-U0-G2	5300	94.8	B3-U0-G1
72W32LED4K-G2	32	700	70	6263	89.1	B1-U0-G1	6556	93.3	B1-U0-G2	6531	92.9	B1-U0-G2	6603	93.9	B1-U0-G2	6684	95.1	B3-U0-G2
97W32LED4K-G2	32	1050	104	8636	82.8	B2-U0-G2	9040	86.7	B1-U0-G2	9005	86.3	B1-U0-G2	9105	87.3	B1-U0-G2	9217	88.4	B4-U0-G2
55W48LED4K-G2	48	350	54	5255	96.6	B1-U0-G1	5349	98.3	B1-U0-G1	5422	99.7	B1-U0-G2	5362	98.6	B1-U0-G2	5659	104.0	B3-U0-G1
80W48LED4K-G2	48	530	81	7538	92.7	B1-U0-G1	7673	94.4	B1-U0-G2	7777	95.7	B1-U0-G2	7691	94.6	B1-U0-G2	8117	99.8	B3-U0-G2
108W48LED4K-G2	48	700	105	9507	90.2	B2-U0-G2	9677	91.8	B2-U0-G2	9808	93.1	B2-U0-G2	9700	92.0	B2-U0-G2	10237	97.1	B4-U0-G2
140W48LED4K-G2	48	1050	157	13109	83.8	B2-U0-G2	13344	85.3	B2-U0-G2	13525	86.4	B2-U0-G2	13376	85.5	B2-U0-G2	14116	90.2	B4-U0-G2
70W64LED4K-G2	64	350	73	7007	96.0	B1-U0-G1	7132	97.7	B1-U0-G2	7229	99.0	B1-U0-G2	7150	97.9	B1-U0-G2	7545	103.4	B3-U0-G2
110W64LED4K-G2	64	530	105	10050	95.7	B2-U0-G2	10231	97.4	B2-U0-G2	10369	98.8	B2-U0-G2	10255	97.7	B2-U0-G2	10822	103.1	B4-U0-G2
90W80LED4K-G2	80	350	91	8759	96.6	B2-U0-G2	8916	98.3	B1-U0-G2	9036	99.6	B2-U0-G2	8937	98.5	B1-U0-G2	9431	104.0	B4-U0-G2
135W80LED4K-G2	80	530	136	12563	92.7	B2-U0-G2	12788	94.4	B2-U0-G2	12962	95.7	B2-U0-G2	12819	94.6	B2-U0-G2	13528	99.8	B4-U0-G2

Actual performance may vary due to installation variables including optics, mounting/ceiling height, dirt depreciation, light loss factor, etc., highly recommended to confirm performance with a layout – contact Applications at signify.com/outdoorluminaires.
Note: Some data may be scaled based on tests of similar. But not identical luminaires.

Luminaire ordering guide

Example: MPTR-55W32LED4K-T-LE3-120-CDMGM2S-PH8-BKTX

Series: MPTR	LED Module: 55W48LED	CCT: 4K	Gen.: G2	Optical System: LE5	Voltage: 120	Driver	Luminaire option: PH8	Mounting	Pole	Finish: BKTX
MPTR[1] MetroScape LED post top luminaire	**35W32LED**[1] **55W32LED**[1] **72W32LED** **97W32LED**[1] **55W48LED** **80W48LED** **108W48LED** **140W48LED**[1] **70W64LED** **110W64LED** **90W80LED** **135W80LED**	**3K** 3000K **4K** 4000K	**G2** Gen2	**LE2** Type II (ASYM) flat lens **LE3** Type III (ASYM) flat lens **LE3W**[1] Type III (ASYM) wide flat lens **LE4** Type IV (ASYM) flat lens **LE5** Type V (SYMM) flat lens	**120** 120V **208** 208V **240** 240V **277** 277V **347** 347V **480** 480V	**CDMG**[2] Dynadimmer for standard dimming (consult complete Dynadimmer scenarios on pg 3) **CLO**[2] Pre-set driver to manage lumen depreciation **AST**[2] Pre-set driver for progressive start-up **OTL**[2] Pre-set driver to signal end of life of the lamp **DALI**[2] Pre-set driver compatible with the DALI control system **DMG** 0-10 volt	**HS** House Side Shield **OVR** Dynadimmer override function **PH8** Photoelectric cell **PH9** Shorting Cap **PHXL**[3] Photoelectric cell, extended life **RCD**[4] 5-Pin receptacle for dimming photoelectric cell **RCD7**[4] 7-Pin receptacle for photoelectric cell **TN3**[5] Fitter to fit over a 3" (76 mm) O.D. by 4" (102 mm) long tenon **TN3.5**[5] Fitter to fit over a 3½" (89 mm) O.D. by 4" (102 mm) long tenon	Consult the Signify web site for details and the complete line of Mountings	Consult the Signify web site for details and the complete line of Poles	**BE2TX** **BE8TX** **BE8TX** **BG2TX** **BKTX** **BRTX** **GN4TX** **GN6TX** **GN8TX** **GNTX** **GR** **GY3TX** **NP** **RD2TX** **RD4TX** **TG** **TS** **WHTX** (consult pg 4 for code descriptions)

1. DMG 0-10V driver come standard.
2. The 347V and 480V are not available.
3. Not available with HS option.
4. Use of photoelectric cell or shorting cap is required to ensure proper illumination.
5. Not available with Motion Response.

1
L4.1
LUMEC LIGHT POST TOP
NTS

revisions	date	revisions	date

T. J. Boyle Associates, LLC

landscape architects ● planning consultants

301 college street ● burlington ● vermont ● 05401 802 ●658 ●3555 http://www.tjboyle.com

north

mjb design by	dja drawn by	11/01/2019 date
mjb checked by	scale as shown	

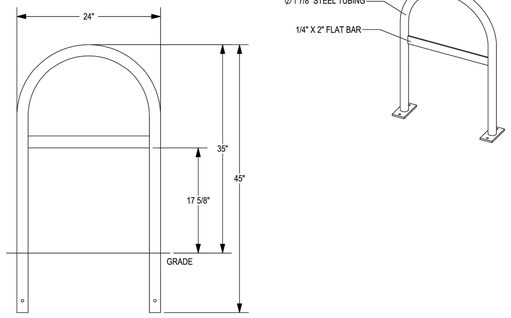
Sunderland Farms Community
Lighting Details

sheet no: L-4.1

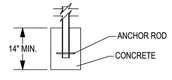
MADRAX

MADRAX DIVISION

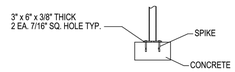
GRABER MANUFACTURING, INC.
1080 UNIEK DRIVE
WAUNAKEE, WI 53597
P(800) 448-7931, P(608) 849-1080, F(608) 849-1081
WWW.MADRAX.COM, E-MAIL: SALES@MADRAX.COM



CHECK DESIRED MOUNT



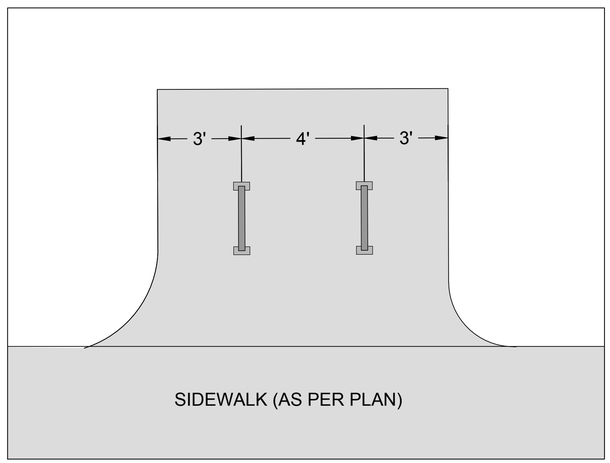
☐ IN GROUND MOUNT (IG)



☐ SURFACE FLANGE MOUNT (SF)

PRODUCT: U24-LB-IG(SF)
DESCRIPTION: 'U' BIKE RACK WITH LEAN BAR
2 BIKE, SURFACE OR IN GROUND MOUNT
DATE: 10-4-18
ENG: SMC

NOTES:
1. INSTALL BIKE RACKS ACCORDING TO MANUFACTURER'S SPECIFICATIONS.
2. CONSULTANT TO SELECT COLOR (FINISH). SEE MANUFACTURER'S SPECIFICATIONS.
3. SEE SITE PLAN FOR LOCATION OR CONSULT OWNER.



5 L4.2 BIKE RACK DETAILS
NOT TO SCALE

White Mountain Shelter Model 98-OCT020-6T

Specifications

Description: Octagon
Size: 20'
Roof Pitch: 6/12

Roof Style: Hip
Options Shown: Asphalt shingles, Rails, Trim, and Wood wraps

Features

- Clear spans
- Wood or steel posts
- Glu-laminated or steel beam
- Size range: 20'-90'
- Non-bind nesting or perch design
- Polyester powder coated
- Wind load: 90 mph class C
- Snow Load: 30 lbs
- Custom designs available
- USA Made

Options

- Hot dipped galvanized
- Stain or clear sealer for wood members
- Increased wind & snow load available
- Variety of roof pitches available
- Wood post options: square, rectangular, or round
- Steel post options: square, rectangular, or round
- Roof options: hi rib, standing seam, cedar, asphalt, tile, etc.
- Cupolas, weather vanes, clerestory
- Facades
- 2x6 or 3x6 tongue & groove roof decking
- Gutters & downspouts
- Wood wraps
- Chemical resistant Natur-Kote primer for harsh environments
- Factory installation or on-site technical assistance.

Natural Structures
PO Box 270, Baker City, OR 97814
(541) 523-0224 (800) 252-8475 Fax (541) 523-0231
www.naturalstructures.com - info@naturalstructures.com

June 2014

4 L4.2 GAZEBO DETAILS
NOT TO SCALE

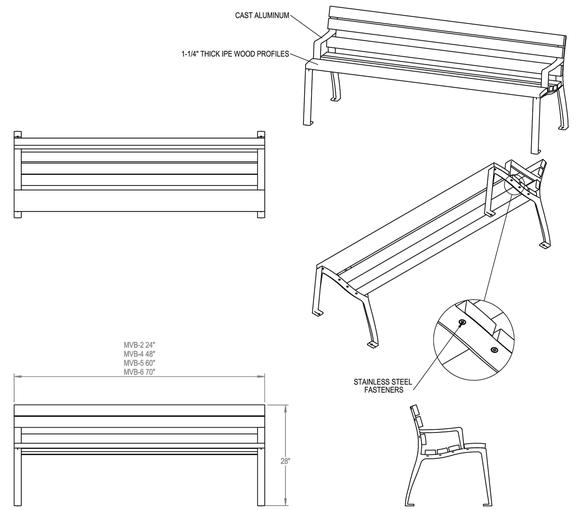
MIRACLE: ARCH SWING WITH 2 BELT SEATS

3 L4.2 SWING DETAIL
NOT TO SCALE

THOMAS STEELE

THOMAS STEELE DIVISION

GRABER MANUFACTURING, INC.
1080 UNIEK DRIVE
WAUNAKEE, WI 53597
P(800) 448-7931, P(608) 849-1080, F(608) 849-1081
WWW.MADRAX.COM, E-MAIL: SALES@MADRAX.COM

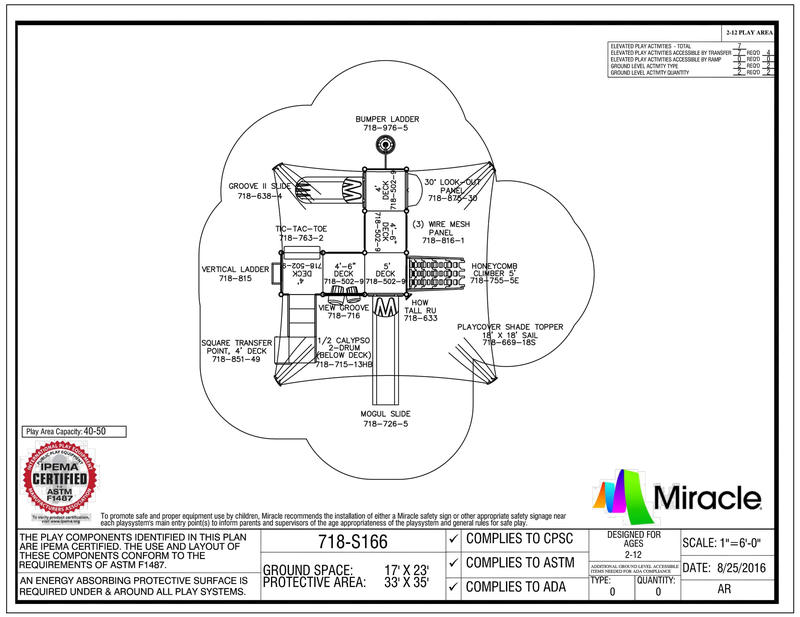


PRODUCT: MVB
DESCRIPTION: MIDVALE BENCH, IPE WOOD

DATE: 6-23-14
ENG: BMC

SITE FURNISHING IS POWDER COATED WITH TGIC POLYESTER. STEEL SURFACE PREP INCLUDES MECHANICAL AND CHEMICAL ETCHING FOLLOWED WITH A COATING TO IMPROVE ADHESION AND CORROSION RESISTANCE.

2 L4.2 BENCH DETAIL
NOT TO SCALE



1 L4.2 PLAY EQUIPMENT DETAIL
AS NOTED

T. J. Boyle Associates, LLC
landscape architects ● planning consultants
301 college street ● burlington ● vermont ● 05401 802 ●658 ●3555 http://www.tjboyle.com

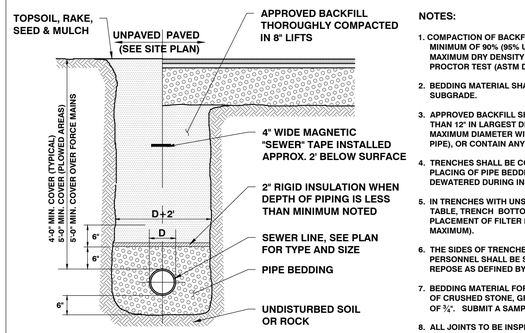
revisions	date	revisions	date

north

mjb design by | dja drawn by | 11/01/2019 date | mjb checked by | as shown scale

Sunderland Farms Community
Hardscape Details

sheet no: L-4.2



NOTES:

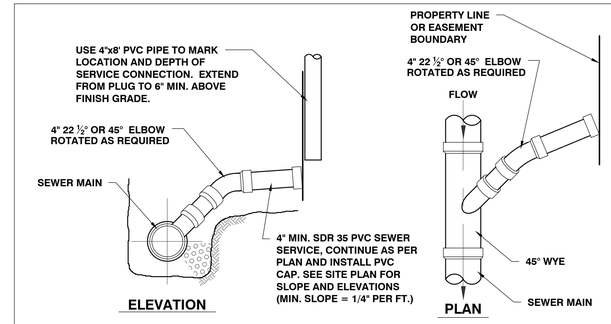
1. COMPACTION OF BACKFILL AND BEDDING SHALL BE A MINIMUM OF 90% (95% UNDER ROADWAY SURFACES) OF MAXIMUM DRY DENSITY DETERMINED IN THE STANDARD PROCTOR TEST (ASTM D698).
2. BEDDING MATERIAL SHALL NOT BE PLACED ON FROZEN SUBGRADE.
3. APPROVED BACKFILL SHALL NOT CONTAIN ANY STONES MORE THAN 12" IN LARGEST DIMENSION (6" IN ROADWAYS, 1 1/2"" MAXIMUM DIAMETER WITHIN 24" OF THE OUTSIDE OF THE PIPE), OR CONTAIN ANY FROZEN, WET, OR ORGANIC MATERIAL.
4. TRENCHES SHALL BE COMPLETELY DEWATERED PRIOR TO PLACING OF PIPE BEDDING MATERIAL AND KEPT DEWATERED DURING INSTALLATION OF PIPE AND BACKFILL.
5. IN TRENCHES WITH UNSTABLE MATERIALS OR HIGH WATER TABLE, TRENCH BOTTOM SHALL FIRST BE STABILIZED BY PLACEMENT OF FILTER FABRIC THEN CRUSHED STONE (3/4" MAXIMUM).
6. THE SIDES OF TRENCHES 4' OR MORE IN DEPTH ENTERED BY PERSONNEL SHALL BE SHEETED OR SLOPED TO THE ANGLE OF REPOSE AS DEFINED BY O.S.H.A. STANDARDS.
7. BEDDING MATERIAL FOR WASTEWATER LINES SHALL CONSIST OF CRUSHED STONE, GRAVEL, OR SAND WITH A MAXIMUM SIZE OF ¾". SUBMIT A SAMPLE TO THE ENGINEER FOR APPROVAL.
8. ALL JOINTS TO BE INSPECTED BY OWNER/ENGINEER/TOWN PRIOR TO BACKFILL.

TYPICAL SEWER TRENCH DETAIL

N.T.S.

SWR-001 Trench

SWR-001 REVISED 12/08/2016



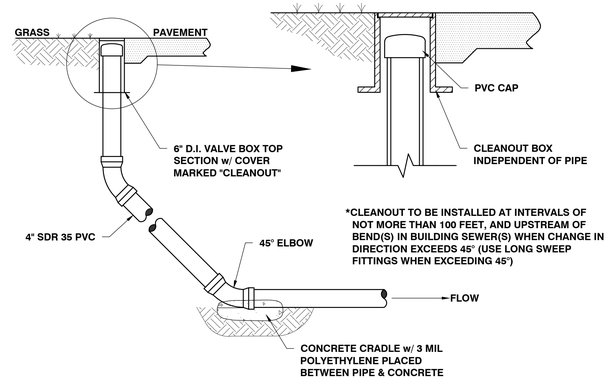
- CONTRACTOR TO PROVIDE 3 LOCATION TIES TO END OF LATERAL TO BE INCLUDED ON "AS-BUILT" DRAWINGS. (IF CONSTRUCTION IS NOT CONCURRENT WITH LATERAL)
- SEE TYPICAL TRENCH FOR BEDDING AND BACKFILL REQUIREMENTS.

SEWER SERVICE CONNECTION

N.T.S.

SWR-002 Service Con

SWR-002 REVISED 08/01/2014



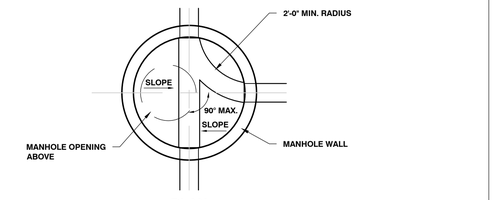
*CLEANOUT TO BE INSTALLED AT INTERVALS OF NOT MORE THAN 100 FEET, AND UPSTREAM OF BEND(S) IN BUILDING SEWER(S) WHEN CHANGE IN DIRECTION EXCEEDS 45° (USE LONG SWEEP FITTINGS WHEN EXCEEDING 45°)

TYPICAL CLEANOUT DETAIL

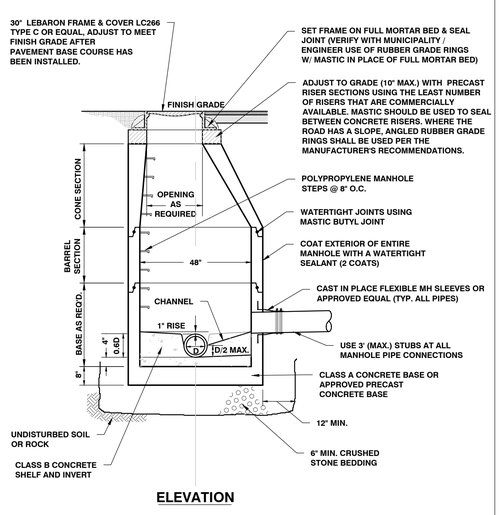
N.T.S.

SWR-007B CO

SWR-007B REVISED 2/28/2017



PLAN



ELEVATION

NOTES:

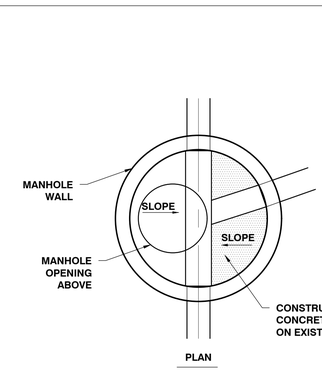
1. INTERIOR JOINTS SHALL NOT BE GROUTED.
2. IF DEPTH OF MANHOLE IS 7' OR LESS FROM RIM TO CENTERLINE INVERT, THEN A FLAT TOP SHOULD BE SUBSTITUTED FOR THE CONE SECTION.
3. CENTERLINE INVERT ELEVATION IF SHOWN ON THE PLAN IS THE AVERAGE INVERT IN THE MANHOLE. THE INLET IN SHALL BE 0.05 FEET HIGHER AND THE INLET OUT SHALL BE 0.05 FEET LOWER.
4. PRECAST RISER AND BASES FOR MANHOLES SHALL CONFORM TO ASTM SPEC C-478.

TYPICAL SANITARY SEWER MANHOLE

N.T.S.

SWR-004 Typ MH

SWR-004 REVISED 1/29/2015



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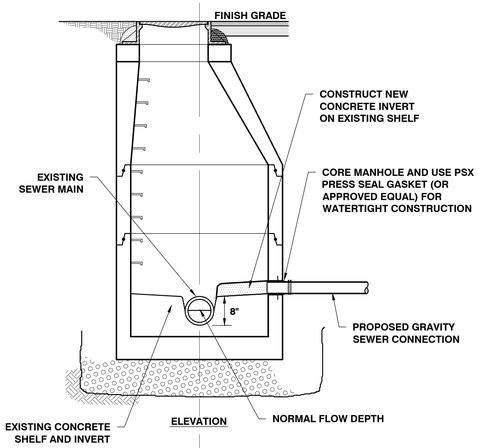


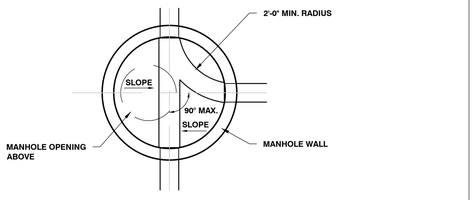
ELEVATION

CONNECTION TO EXISTING SEWER MANHOLE

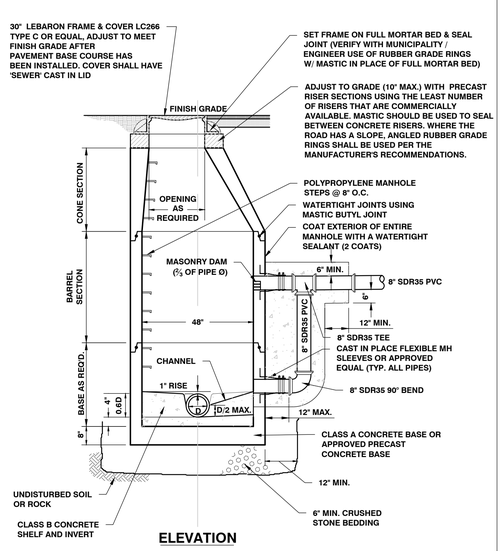
N.T.S.

SWR-020 Gravity Connection to Ex MH

SWR-020 REVISED 09/29/2014



PLAN



ELEVATION

NOTES:

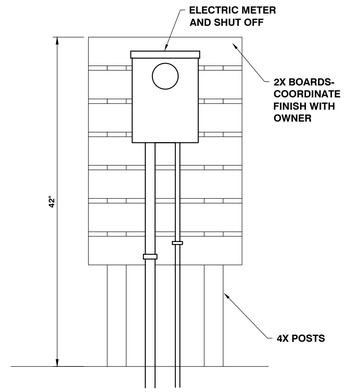
1. INTERIOR JOINTS SHALL NOT BE GROUTED.
2. IF DEPTH OF MANHOLE IS 7' OR LESS FROM RIM TO CENTERLINE INVERT, THEN A FLAT TOP SHOULD BE SUBSTITUTED FOR THE CONE SECTION.
3. CENTERLINE INVERT ELEVATION IF SHOWN ON THE PLAN IS THE AVERAGE INVERT IN THE MANHOLE. THE INLET IN SHALL BE 0.05 FEET HIGHER AND THE INLET OUT SHALL BE 0.05 FEET LOWER.
4. PRECAST RISER AND BASES FOR MANHOLES SHALL CONFORM TO ASTM SPEC C-478.
5. CONCRETE ENCASEMENT TO BE EXTENDED TO FIRST PIPE JOINT LOCATED AT LEAST 12 INCHES BEYOND EXCAVATION FOR DROP CONNECTION.

TYPICAL SANITARY SEWER MANHOLE w/ EXTERIOR DROP CONNECTION

N.T.S.

SWR-004 Typ MH

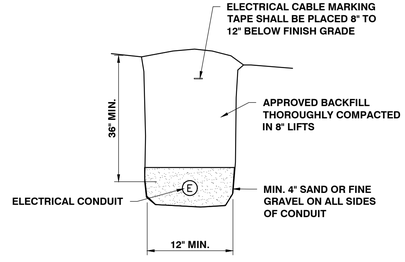
SWR-004 REVISED 1/29/2015



METER BOARD

N.T.S.

COORDINATE WITH UTILITY COMPANY FOR DESIGN REQUIREMENTS



ELECTRICAL TRENCH - SECONDARY

N.T.S.

M-008a Elec Trench Secondary

M-008a REVISED 06/16/2015

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SEWER AND ELECTRICAL DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

DRAWING NUMBER: C5.0

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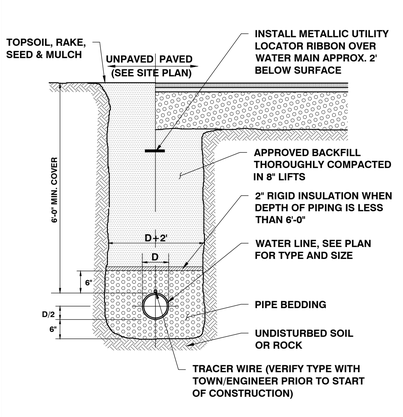


NOTES:

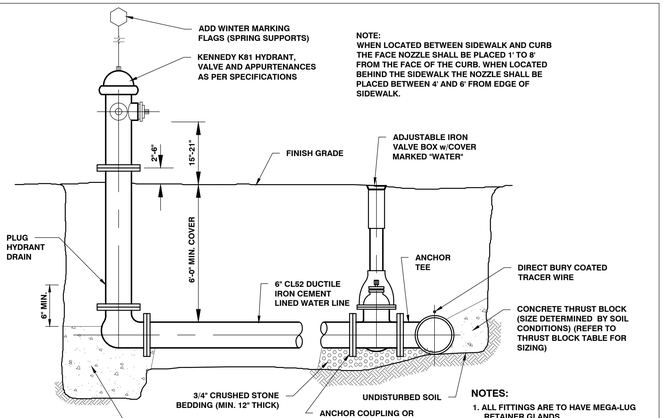
1. COMPACTION OF BACKFILL AND BEDDING SHALL BE A MINIMUM OF 90% (95% UNDER ROADWAY SURFACES) OF MAXIMUM DRY DENSITY DETERMINED IN THE STANDARD PROCTOR TEST (ASTM D698).
2. BEDDING MATERIAL SHALL NOT BE PLACED ON FROZEN SUBGRADE.
3. APPROVED BACKFILL SHALL NOT CONTAIN ANY STONES MORE THAN 12" IN LARGEST DIMENSION (6" IN ROADWAYS, 1 1/2"" MAXIMUM DIAMETER WITHIN 24" OF THE OUTSIDE OF THE PIPE), OR CONTAIN ANY FROZEN, WET, OR ORGANIC MATERIAL.
4. TRENCHES SHALL BE COMPLETELY DEWATERED PRIOR TO PLACING OF PIPE BEDDING MATERIAL AND KEPT DEWATERED DURING INSTALLATION OF PIPE AND BACKFILL.
5. IN TRENCHES WITH UNSTABLE MATERIALS OR HIGH WATER TABLE, TRENCH BOTTOM SHALL FIRST BE STABILIZED BY PLACEMENT OF FILTER FABRIC THEN CRUSHED STONE (3/4" MAXIMUM).
6. THE SIDES OF TRENCHES 4' OR MORE IN DEPTH ENTERED BY PERSONNEL SHALL BE SHEETED OR SLOPED TO THE ANGLE OF REPOSE AS DEFINED BY O.S.H.A. STANDARDS.
7. BEDDING MATERIAL SHALL CONSIST OF CRUSHED STONE, OR SAND WITH A MAXIMUM SIZE OF ¾". SUBMIT A SAMPLE TO THE ENGINEER FOR APPROVAL.
8. CONTRACTOR TO INSTALL TRACER WIRE ALONG ALL SECTIONS OF NEW WATER LINE. TRACER WIRE SHALL BE COPPER-CLAD STEEL WIRE AND LOCKING CONNECTORS FROM COPPERHEAD INDUSTRIES OR APPROVED EQUAL. TERMINATE TRACER WIRE AT ALL VALVE BOXES AND HYDRANTS. COORDINATE INSTALLATION WITH TOWN AND ENGINEER.
9. MINIMUM OF 1" OF RIGID INSULATION BE PROVIDED FOR EACH 1-FOOT OF DEFICIENT COVER WITH A MINIMUM OF 2" OF INSULATION TO BE INSTALLED.

TYPICAL WATER TRENCH DETAIL

N.T.S.

W-001 Trench

W-001 REVISED 12/08/2016



NOTE:
WHEN LOCATED BETWEEN SIDEWALK AND CURB THE FACE NOZZLE SHALL BE PLACED 1' TO 8' FROM THE FACE OF THE CURB. WHEN LOCATED BEHIND THE SIDEWALK THE NOZZLE SHALL BE PLACED BETWEEN 4' AND 6' FROM EDGE OF SIDEWALK.

NOTES:

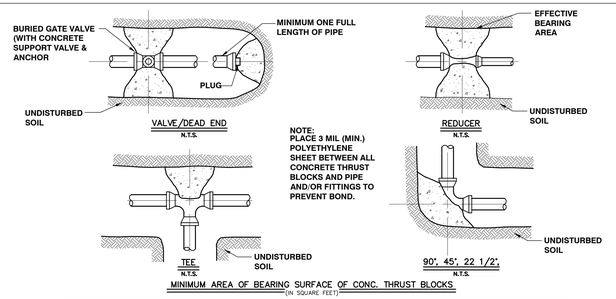
1. ALL FITTINGS ARE TO HAVE MEGA-LUG RETAINER GLANDS.
2. PRIOR TO POURING THRUST BLOCKS ALL FITTINGS ARE TO BE WRAPPED WITH 4 mil POLYETHYLENE.
3. ALL HYDRANTS SHALL BE OUTFITTED WITH A 4" STORTZ CONNECTION.

HYDRANT ASSEMBLY DETAIL

N.T.S.

W-004 Hyd

W-004 REVISED 3/9/2015



NOTE:
PLACE 3 MIL (MIN.) POLYETHYLENE SHEET BETWEEN ALL CONCRETE THRUST BLOCKS AND PIPE AND/OR FITTINGS TO PREVENT BOND.

MINIMUM AREA OF BEARING SURFACE OF CONC. THRUST BLOCKS
(IN SQUARE FEET)

3"			4"			6"			8"			12"			16"			SOIL CONDITION	SAFE BEARING LOAD (PSF)
ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.		
0.5	0.5	0.5	0.5	0.5	1.0	0.5	0.5	1.0	1.5	1.0	0.5	2.0	2.5	1.5	1.0	4.0	5.5	3.0	1.5	8.0	10.0	5.0	4.0	SOUND SHALE	10,000
1.0	1.0	1.0	0.5	1.5	2.0	1.0	0.5	3.0	4.0	2.0	1.0	4.5	6.5	3.5	2.0	10.0	14.0	7.5	4.0	25.0	30.0	15.0	12.0	CEMENTED GRAVEL AND SAND	4,000
1.0	1.5	1.0	0.5	2.0	2.5	1.5	1.0	3.5	5.0	3.0	1.5	6.0	8.5	5.0	2.5	13.0	18.5	10.0	5.0	30.0	35.0	20.0	15.0	COMPACT GRAVEL AND COARSE SAND	3,000
1.5	2.5	1.5	1.0	2.5	3.5	2.0	1.0	5.5	7.5	4.0	2.0	9.0	13.0	7.0	3.5	20.0	27.5	15.0	8.0	40.0	45.0	25.0	20.0	MEDIUM STIFF CLAY OR SILT, SPARSELY	2,000
3.0	4.5	2.5	1.5	5.0	7.0	4.0	2.0	10.5	15.0	8.0	4.0	18.0	25.0	14.0	7.0	39.0	55.0	30.0	15.0	80.0	90.0	50.0	40.0	SOFT CLAY	1,000

MAXIMUM WATER PRESSURE = 300 PSI NOTE: REDUCER BEARING AREA = 45° BEND OF LARGER PIPE

NOTE: THRUST BLOCK SHALL BE USED AT ALL BENDS, TEES & REDUCERS

THRUST BLOCK DETAILS

NO BACKFILLING WILL BE ALLOWED UNTIL ANY CONC. THRUST BLOCKS HAVE SET SUFFICIENTLY, AS DETERMINED BY THE ENGINEER AND/OR LOCAL WATER DEPT.

N.T.S.

W-003 Thrust

W-003 REVISED 2/23/2015

REFERENCE:
VT. WATER SUPPLY RULE CHAPTER 21, APPENDIX A, SECTION 8.6

WATER/SEWER CROSSING

N.T.S.

W-007 Water-Sewer Crossing

W-007 REVISED 6/15/2015

NOTES:

1. TAPPING SLEEVES AND VALVES ARE TO MEET THE LOCAL WATER DEPARTMENT'S STANDARD SPECIFICATIONS AND THE VERMONT WATER SUPPLY RULES.
2. WET TAPS SHALL BE PREFORMED BY PRE-APPROVED FIRMS ONLY.
3. ALL FITTINGS THAT ARE TO HAVE CONCRETE POURED AROUND THEM ARE TO BE WRAPPED WITH 4 mil. POLYETHYLENE PRIOR TO CONCRETE PLACEMENT.

ALL TAPPING SLEEVE NUTS & BOLTS SHALL BE COATED BY HEAVY BRUSH WITH BITUMASTIC COLD APPLIED MATERIAL PRIOR TO BACKFILL

TAPPING SLEEVE & VALVE DETAIL

N.T.S.

W-002 Tap

W-002 REVISED 6/15/2015

NOTES:

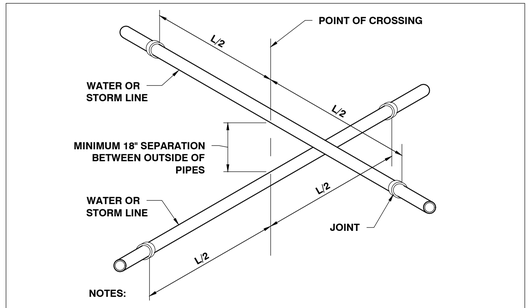
1. THE CONTRACTOR SHALL MAINTAIN AT LEAST ONE-WAY TRAFFIC AT ALL TIMES DURING WORK WITHIN THE R.O.W.
2. MAINTENANCE AND PROTECTION OF TRAFFIC DURING WORK WITHIN THE HIGHWAY R.O.W. SHALL BE PROVIDED IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. THE CONTRACTOR SHALL NOT WORK WITHIN THE R.O.W. WITHOUT APPROPRIATE CONSTRUCTION SIGNING IN PLACE.
3. ALL BACKFILL SHALL BE MADE IN SIX INCH (6") LIFTS AND COMPACTED TO NOT LESS THAN 95% MAXIMUM DRY DENSITY ACCORDING TO ASTM D698.
4. REPLACE EXISTING ROAD STRIPING AS NECESSARY.

REPLACEMENT OF EXISTING PAVEMENT

N.T.S.

S-005 Replace Ex. Pav

S-005 REVISED 09/29/2014



NOTES:

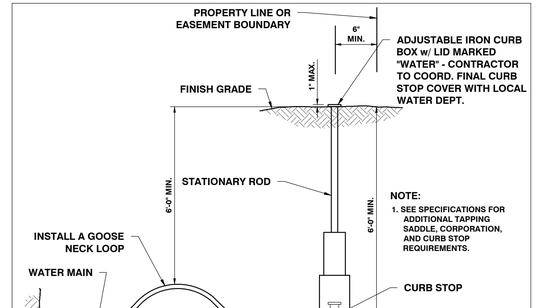
1. AT CROSSINGS, ONE FULL LENGTH OF WATER/STORM PIPE SHALL BE LOCATED SO BOTH JOINTS WILL BE AS FAR FROM THE WATER/STORM AS POSSIBLE.
2. IF THE STORM MAIN IS OVER THE WATER MAIN, THE FIRST STORM PIPE JOINTS ON EACH SIDE OF THE WATER MAIN MUST BE CONCRETE ENCASED. SPECIAL STRUCTURAL SUPPORT FOR THE WATER AND STORM PIPES MAY BE REQUIRED.
3. WHERE IT IS IMPOSSIBLE TO MAINTAIN THE 18" SEPARATION, THE STORM MATERIALS SHALL BE WATER MAIN PIPE OR EQUIVALENT AND SHALL BE PRESSURE TESTED TO WATER MAIN STANDARDS.
4. WATER MAINS AND STORM LINES OR MANHOLES SHALL HAVE AT LEAST 10' HORIZONTAL SEPARATION. THIS DISTANCE SHALL BE MEASURED EDGE TO EDGE.

WATER/STORM CROSSING

N.T.S.

W-007A Water-Storm Crossing

W-007A REVISED 12/23/2014



NOTE:
1. SEE SPECIFICATIONS FOR ADDITIONAL TAPPING SADDLE, CORPORATION, AND CURB STOP REQUIREMENTS.

WATER SERVICE CONNECTION

N.T.S.

W-006 Serv Con

W-006 REVISED 2/23/2015

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

WATER DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

DRAWING NUMBER: C5.1

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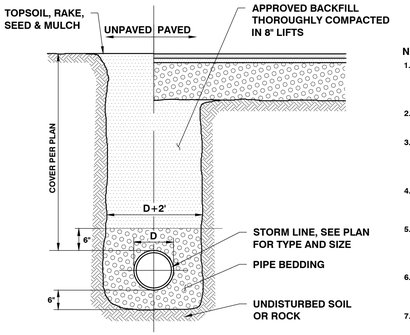

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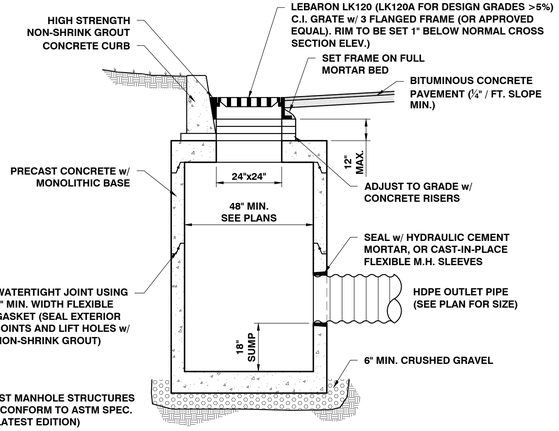
7. BEDDING MATERIAL SHALL CONSIST OF CRUSHED STONE, GRAVEL, OR SAND WITH A MAXIMUM SIZE OF ¾". SUBMIT A SAMPLE TO THE ENGINEER FOR APPROVAL.

TYPICAL STORM TRENCH

N.T.S.

ST-003 Storm Trench

ST-003 REVISED 12/08/2016

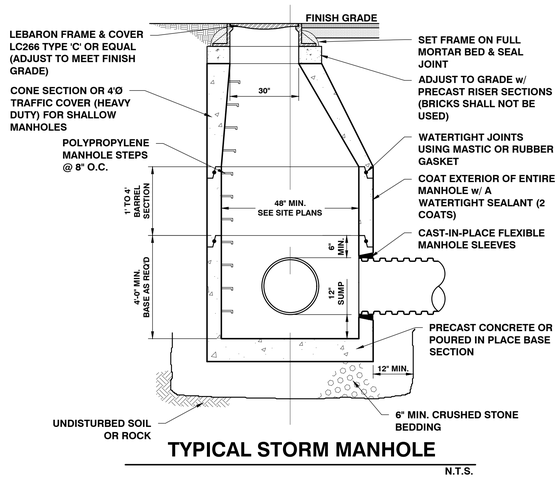


TYPICAL CATCH BASIN @ CURB

(SIMILAR WITHOUT CURB) N.T.S.

ST-002 Typ CB

ST-002 REVISED 9/24/2015

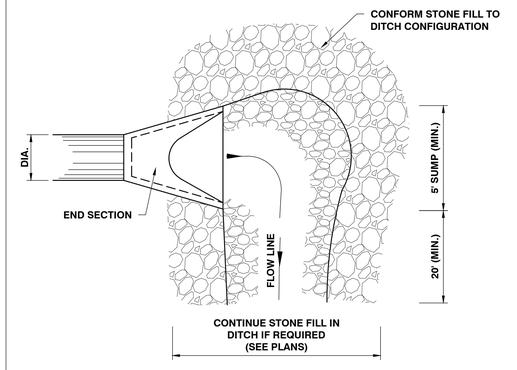


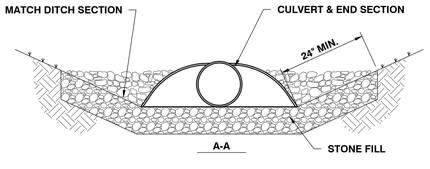
TYPICAL STORM MANHOLE

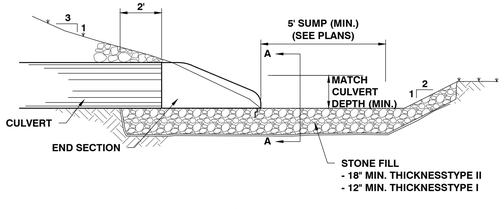
N.T.S.

ST-001 Typ MH

ST-001 REVISED 01/09/2015







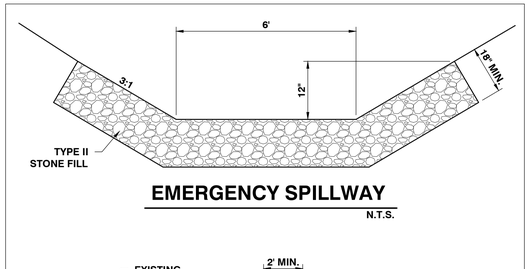
END SECTION DETAIL w/ STONE FILL @ INLET

N.T.S.

NOTE: ALL DRAINAGE PIPES TO HAVE AN END SECTION & STONE FILL @ THE INLET

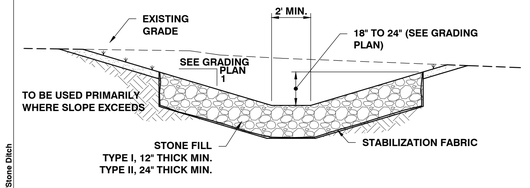
ST-015 End Section-Stone Spillway

ST-015 REVISED 08/11/2015



EMERGENCY SPILLWAY

N.T.S.

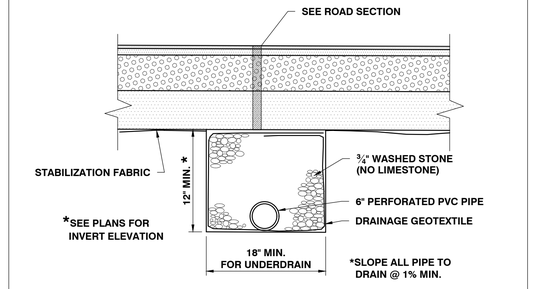


STONE LINED DITCH

N.T.S.

ST-012 Spillway/Stone Ditch

ST-012 REVISED 08/01/2014

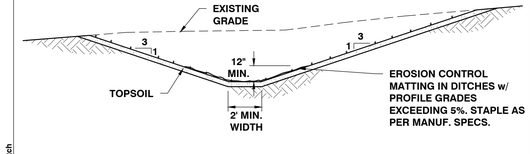


TYPICAL UNDERDRAIN SECTION

N.T.S.

ST-009 Underdrain

ST-009 REVISED 12/16/2014



GRASS LINED DITCH

N.T.S.

ST-014 Grass Ditch

ST-014 REVISED 10/07/2015

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

STORM DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

DRAWING NUMBER: C5.2

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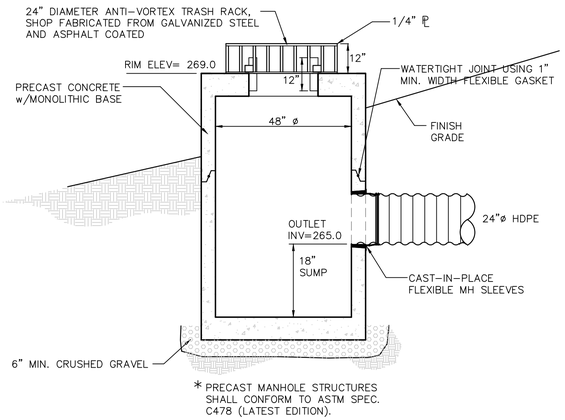
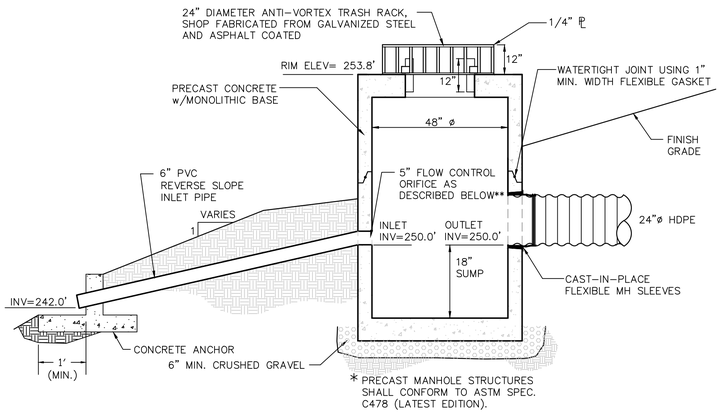


POND OUTLET STRUCTURE #1

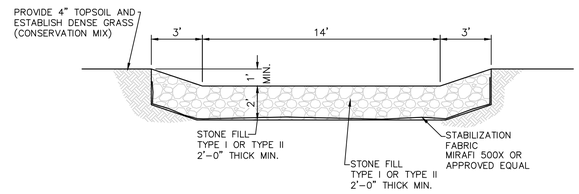
N.T.S.



** CONTROL ORIFICE TO CONSIST OF: DRILLED PVC END CAP, REDUCING BUSHING, OR EQUIVALENT MEANS

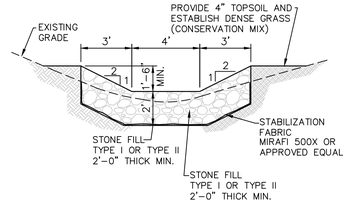
POND OUTLET STRUCTURE #2

N.T.S.



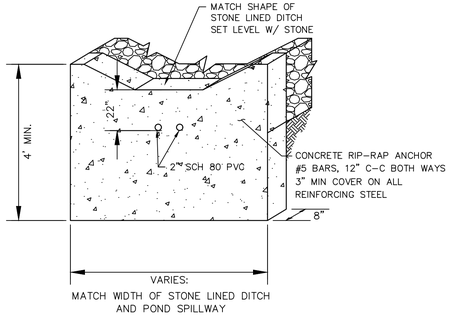
DETENTION BASIN OVERFLOW DITCH

N.T.S.



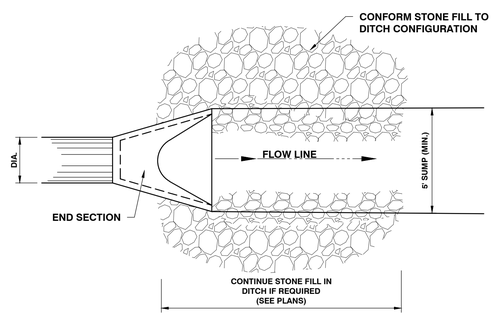
STONE LINED DITCH (FROM DETENTION BASIN)

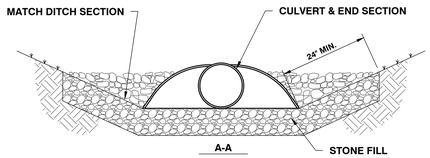
N.T.S.



RIP-RAP ANCHOR

N.T.S.





END SECTION DETAIL w/ STONE FILL @ INLET

N.T.S.

NOTE: ALL DRAINAGE PIPES TO HAVE AN END SECTION & STONE FILL @ THE INLET

ST-015 REVISED 08/11/2015

ST-015 End Section-Stone Spillway

P:\AutoCADD Projects\2014\14134\1-CADD Files-14134\dwg\14134 - Details.dwg, 10/24/2019 11:22:30 AM, mburke

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

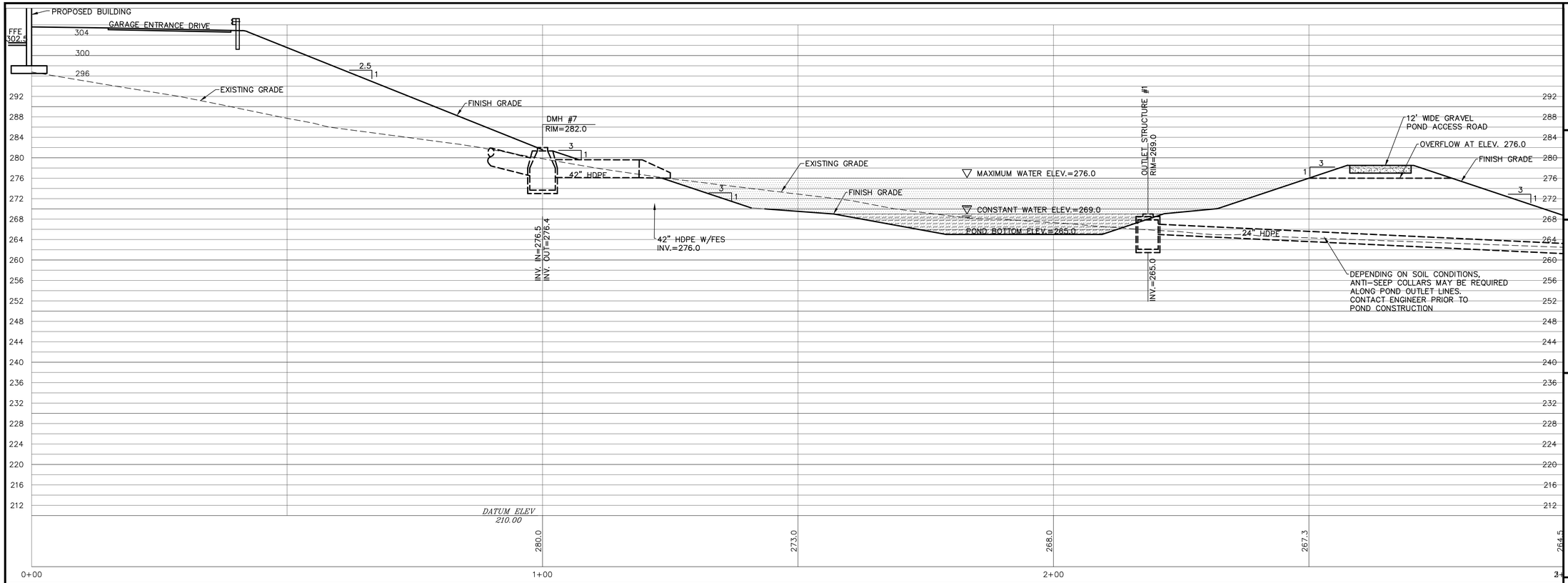
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

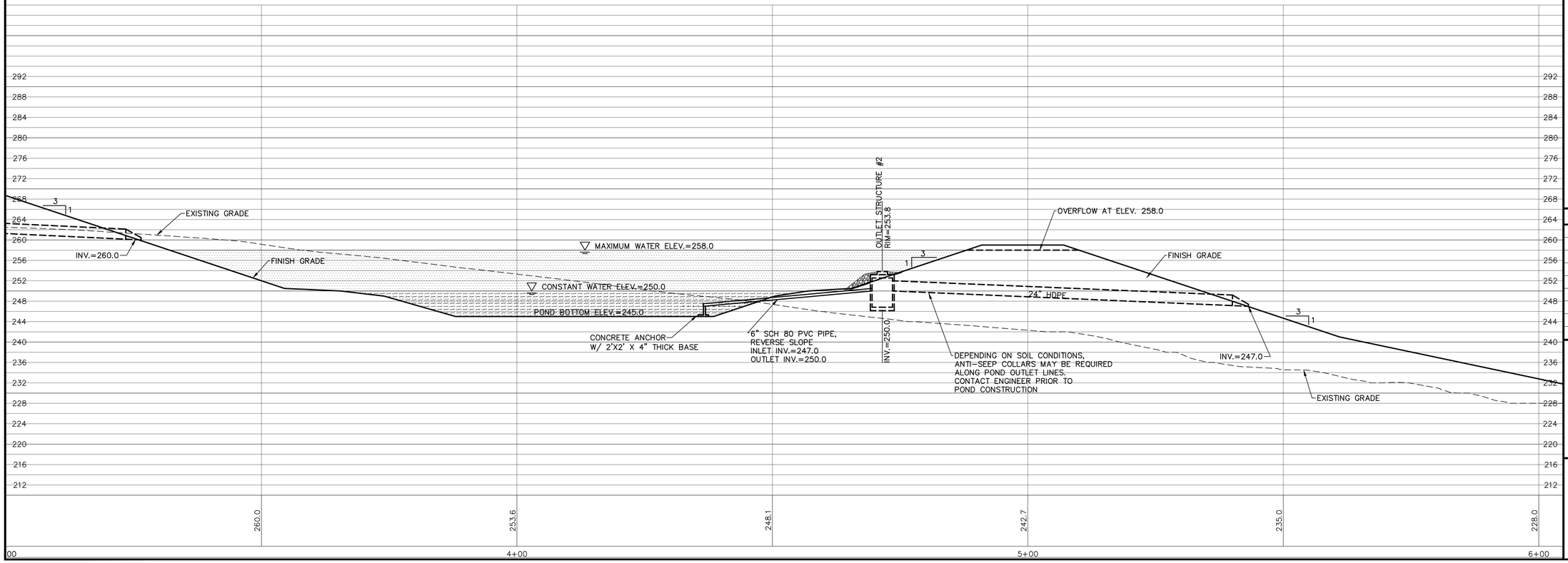
DATE	CHECKED	REVISION

STORM DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

DRAWING NUMBER: C5.3





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DSM

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193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

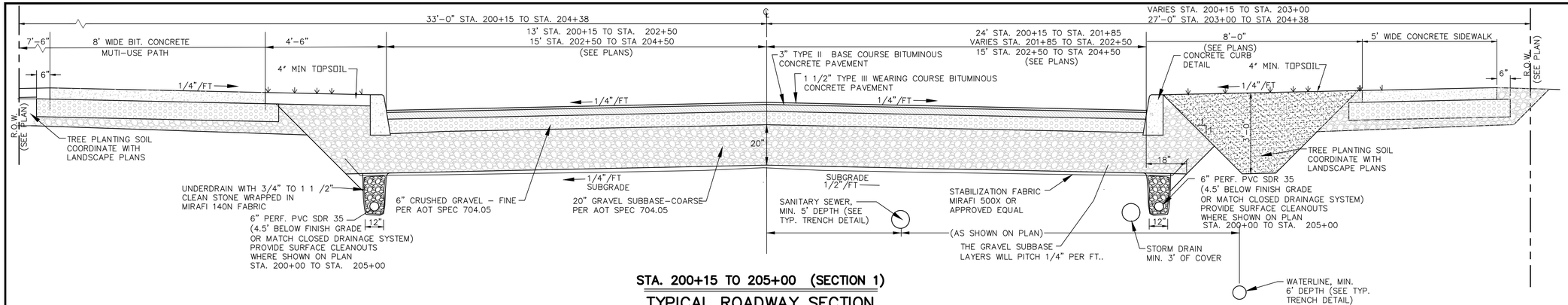
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

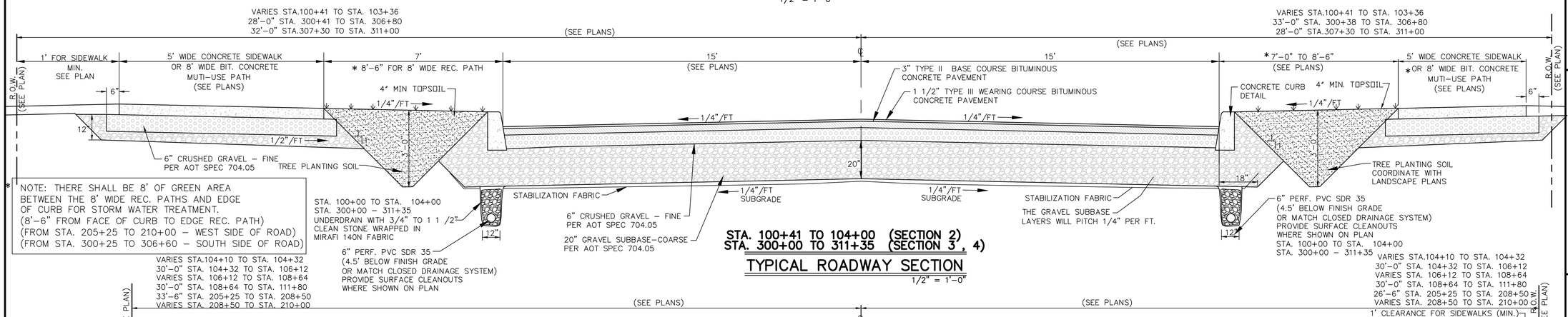
DETENTION POND SECTIONS

DATE
11/01/2019
SCALE
1" = 10'
PROJ. NO.
14134

DRAWING NUMBER
C5.4

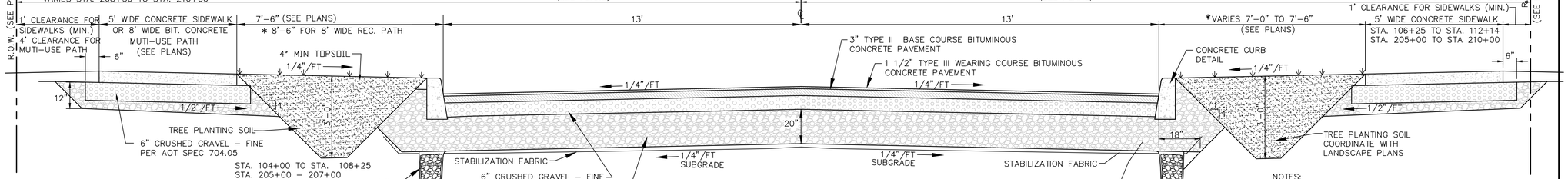


STA. 200+15 TO 205+00 (SECTION 1)
TYPICAL ROADWAY SECTION
1/2" = 1'-0"



NOTE: THERE SHALL BE 8' OF GREEN AREA BETWEEN THE 8' WIDE REC. PATHS AND EDGE OF CURB FOR STORM WATER TREATMENT.
(8'–6" FROM FACE OF CURB TO EDGE REC. PATH)
(FROM STA. 205+25 TO 210+00 – WEST SIDE OF ROAD)
(FROM STA. 300+25 TO 306+60 – SOUTH SIDE OF ROAD)

STA. 100+41 TO 104+00 (SECTION 2)
STA. 300+00 TO 311+35 (SECTION 3 , 4)
TYPICAL ROADWAY SECTION
1/2" = 1'-0"



STA. 205+00 TO 210+00 (SECTION 5)
STA. 104+00 TO 112+14 (SECTION 6)
TYPICAL ROADWAY SECTION
1/2" = 1'-0"

NOTES:
1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE TOWN PUBLIC WORKS REQUIREMENTS, THE VERMONT STATE STANDARD SPECIFICATIONS FOR CONSTRUCTION, AND THE ENGINEERING PLANS AND SPECIFICATIONS.
THE ROADWAY TYPICAL SECTIONS HAVE BEEN MODIFIED FROM THE SPECIAL STRUCTURAL SECTION AS PART OF A WAIVER REQUEST. THE TYPICAL PUBLIC WORKS ROADWAY CROSS–SECTION DIMENSIONAL REQUIREMENTS WERE MODIFIED AS PART OF A PREVIOUSLY APPROVED WAIVER REQUEST. OTHERWISE THE TYPICAL ROADWAY SECTIONS WERE NOT INTENTED TO SUPERSEDE THE DEPARTMENT OF PUBLIC WORKS SPECIFICATIONS AND STANDARDS.

1. CURBING SHALL BE CONSTRUCTED IN 10' SECTIONS WITH 1/8" JOINT BETWEEN SECTIONS.
2. CURBING EXPANSION JOINTS SHALL BE CONSTRUCTED EVERY 20' AND SHALL BE CONSTRUCTED OF MATERIAL CONFORMING TO AASHTO DESIGNATION M–153 (1/2" SPONGE RUBBER OR CORK).
3. ASPHALT TREATED FELT TO BE USED BETWEEN SIDEWALK AND CONCRETE CURB TOP.

TYPICAL CONCRETE CURB w/SIDEWALK DETAIL
N.T.S.

1. CURBING SHALL BE CONSTRUCTED IN 10' SECTIONS WITH 1/8" JOINT BETWEEN SECTIONS.
2. CURBING EXPANSION JOINTS SHALL BE CONSTRUCTED EVERY 20' AND SHALL BE CONSTRUCTED OF MATERIAL CONFORMING TO AASHTO DESIGNATION M–153 (1/2" SPONGE RUBBER OR CORK).

CONCRETE CURB DETAIL
N.T.S.

NOTE: PAVEMENT MARKINGS AND STOP SIGN TO MEET STATE STANDARDS E–120, E–121, E–143, E–191, E–192, AND E–193

INTERSECTION CONSTRUCTION DETAILS
N.T.S.

TYPICAL PARKING LOT SECTION
N.T.S.

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10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

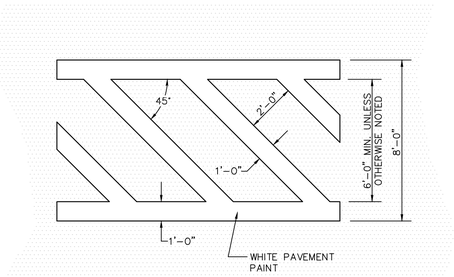
PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

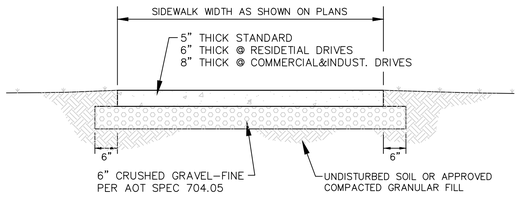
ROAD SECTIONS AND DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

DRAWING NUMBER: C5.5



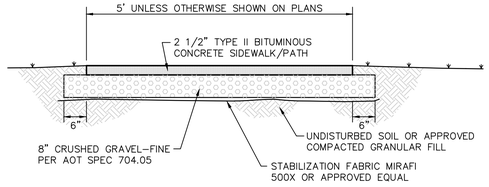
CROSSWALK DETAIL
N.T.S.



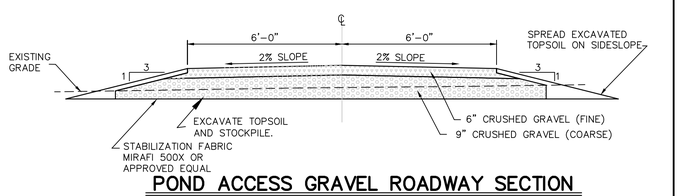
NOTES:

1. EXPANSION JOINTS SHALL BE PLACED EVERY 20' AND SHALL BE CONSTRUCTED OF PREFORMED JOINT FILLER (1/4 CORK OR BITUMINOUS TYPE)
2. BETWEEN EXPANSION JOINTS THE SIDEWALK SHALL BE DIVIDED AT INTERVALS OF FIVE FEET BY DUMMY JOINTS.

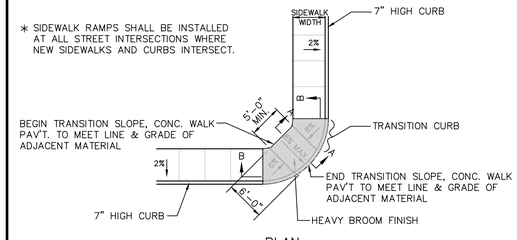
TYPICAL CONCRETE SIDEWALK DETAIL
N.T.S.



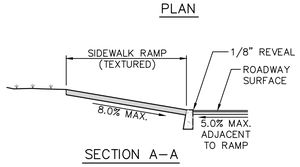
BITUMINOUS CONCRETE SIDEWALK/PATH DETAIL
N.T.S.



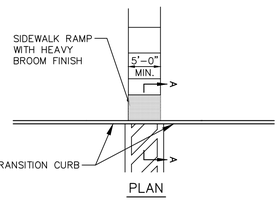
POND ACCESS GRAVEL ROADWAY SECTION
NTS



PLAN



SECTION A-A



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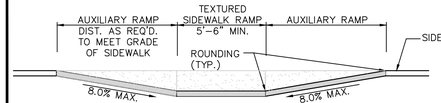
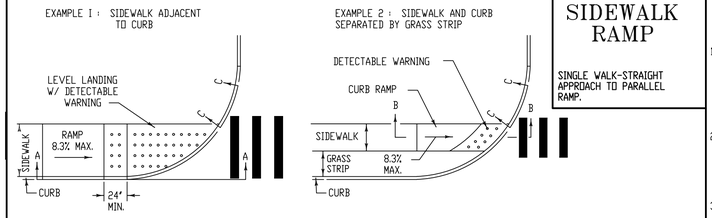


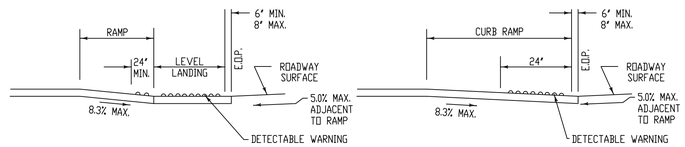
SECTION B-B

TYPICAL SIDEWALK RAMP
N.T.S.

SECTION A-A

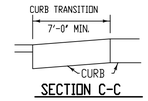
TYPICAL SIDEWALK RAMP
N.T.S.



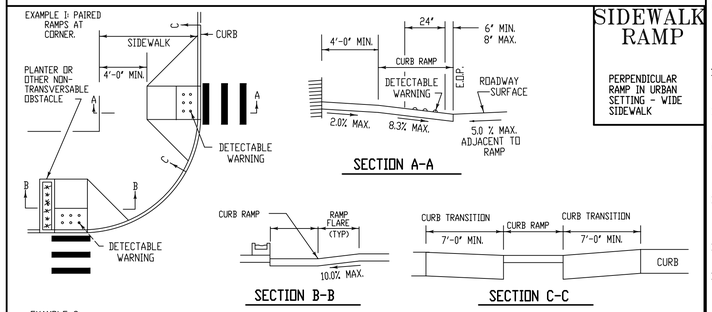


SECTION A-A SECTION B-B

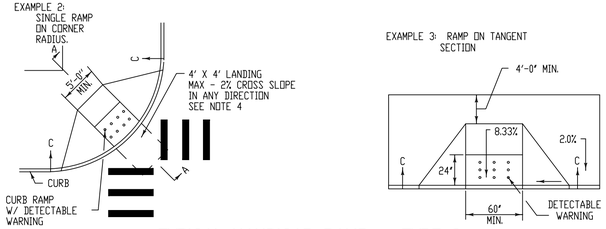
TYPICAL HANDICAP RAMP - TYPE 1
N.T.S.



SECTION C-C



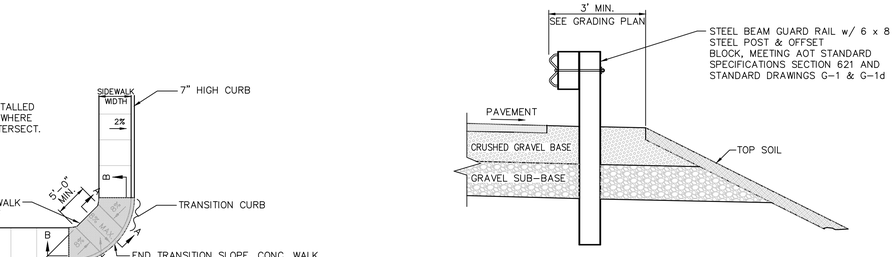
SECTION B-B SECTION C-C



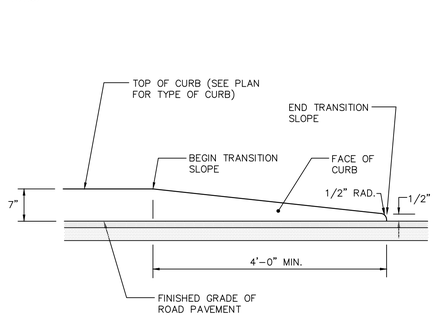
TYPICAL HANDICAP RAMP - TYPE 2
N.T.S.

GENERAL NOTES:

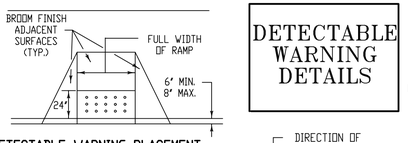
1. THE DIMENSIONS AND GRADES SHOWN ON THIS STANDARD WILL BE ADHERED TO IN THE DESIGN AND THE CONSTRUCTION OF SIDEWALK RAMPS . WHERE SIDEWALKS RUN ADJACENT TO ROADWAYS ON STEEP (5% OR GREATER) GRADES, RAMP GRADES WILL BE AS FLAT AS POSSIBLE. (ON LOW SIDE OF DRIVES AND INTERSECTING SIDE STREETS, RAMPS SHALL SLOPE TOWARDS DRIVE OR SIDE STREET @ 2%)
2. NOMINAL RAMP DIMENSIONS:
   RAMP WIDTH - 5'-0" MINIMUM
   RAMP SLOPE - 8.3% MAXIMUM
   FLARE SLOPE - 10% MAXIMUM
   RAMP CROSS SLOPE - 2.0% MAXIMUM
3. A LEVEL LANDING (ND GREATER THAN 2.0% SLOPE IN ANY DIRECTION) SHALL BE PROVIDED AT THE TOP OF SIDEWALK RAMPS TO ALLOW FOR STOPPING AND MANEUVERING OF WHEELCHAIRS.
4. LEVEL LANDINGS AT THE BOTTOM OF PERPENDICULAR RAMPS SHALL BE WHOLLY CONTAINED WITHIN MARKED CROSSWALKS.
5. DUMMY JOINTS SHALL BE PROVIDED AT TRANSITIONS (GRADE CHANGES) AT TOPS AND BOTTOMS OF RAMPS AND FLARES.
6. VERTICAL DROP-OFF EDGES TO RAMPS WILL NOT BE BUILT UNLESS THE RAMP ABUTS AN AREA WHICH WILL NOT BE USED BY PEDESTRIANS.
7. NO VERTICAL 'LIP' OR 'CURB REVEAL' WILL BE PROVIDED WHERE THE RAMP ADJOINS THE ROADWAY.
8. AT MARKED CROSSWALKS, THE FULL WIDTH OF THE RAMP OR LANDING SHALL BE CONTAINED WITHIN THE PAVEMENT MARKINGS.
9. WHERE POSSIBLE, RAMP FLARES SHOULD BE LOCATED OUTSIDE THE DIRECT LINE OF TRAVEL MOST LIKELY TO BE FOLLOWED BY THE VISUALLY IMPAIRED.
10. SIGNS, POLES, PLANTERS, MAILBOXES, ETC. SHALL NOT BE LOCATED WHERE THEY WILL INTERFERE WITH THE USE OF SIDEWALK RAMPS.
11. WHERE POSSIBLE, SIDEWALK RAMPS SHOULD NOT BE LOCATED WHERE USERS MUST CROSS DROP INLET GRATES, MANHOLE COVERS OR OTHER ACCESS LIDS. IF THIS CANNOT BE AVOIDED THEN GRATE DESIGN AND PLACEMENT SHALL CONFORM TO ADA REQUIREMENTS.
12. CURB DRAINAGE SHOULD BE CONSTRUCTED SO AS TO PRECLUDE THE FLOW OF WATER PAST THE SIDEWALK RAMP.
13. WHEREVER FEASIBLE, TWO SIDEWALK PAMPS ARE RECOMMENDED IN PREFERENCE TO A SINGLE RAMP.
14. JOINTS WILL BE CONSTRUCTED IN ACCORDANCE WITH CURRENT SIDEWALK SPECIFICATIONS, HOWEVER EXPANSION JOINTS WITHIN THE SIDEWALK RAMP AREA WILL BE AVOIDED WHEREVER POSSIBLE.
15. SIDEWALKS THAT ARE LESS THAN 5' WIDE REQUIRE 5' WIDE BY 5' LONG PASSING AREAS (ND GREATER THAN 2.0% CROSS SLOPE) AT INTERVALS NOT TO EXCEED 200 FEET.
16. E.O.P. = EDGE OF PAVEMENT
17. THE PUBLIC SIDEWALK CURB RAMP STANDARDS DEPICTED HERE MAY NOT BE APPROPRIATE FOR ALL LOCATIONS. FIELD CONDITIONS AT INDIVIDUAL LOCATIONS MAY REQUIRE SPECIFIC DESIGNS. DESIGNS MUST BE CONSISTENT WITH THE PROVISIONS OF THIS SHEET TO THE MAXIMUM EXTENT FEASIBLE ON ALTERATION PROJECTS AND WHEN STRUCTURALLY PRACTICABLE ON NEW CONSTRUCTION PROJECTS AS REQUIRED BY THE AMERICANS WITH DISABILITIES ACT ACCESSIBILITY GUIDELINES.



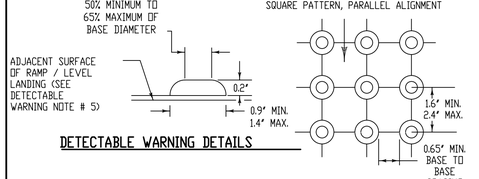
GUARD RAIL DETAIL
N.T.S.



TRANSITION CURB
N.T.S.



DETECTABLE WARNING PLACEMENT



DETECTABLE WARNING DETAILS

DETECTABLE WARNING DETAILS
N.T.S.

DETECTABLE WARNING NOTES:

1. DETECTABLE WARNING SURFACES SHALL BE PAID FOR AS SPECIFIED IN THE CONTRACT.
2. CONCRETE ADJACENT TO ALL DETECTABLE WARNINGS SHALL HAVE A BROOM FINISH.
3. THE COLOR OF THE DETECTABLE WARNING SHALL PROVIDE A VISUAL CONTRAST TO THE SURROUNDING SURFACE AND SHALL BE AS SPECIFIED IN THE DOCUMENTS.
4. TRUNCATED DOMES SHALL BE ALIGNED ON A SQUARE GRID IN THE PREDOMINANT DIRECTION OF PEDESTRIAN TRAVEL.
5. SIDEWALK RAMP SHALL BE CONSTRUCTED WITH "TRUNCATED DOMES" IN ACCORDANCE WITH ADA ACCESSIBILITY GUIDELINES. DETECTABLE WARNINGS SURFACE SHALL BE CONSTRUCTED OF CAST IRON. EAST JORDAN IRON WORKS 7005 SERIES DETECTABLE WARNING PLATES OR EQUIVALENT.
6. SEE THE TOWN OF COLCHESTER FOR A LIST OF ACCEPTABLE DETECTABLE WARNINGS MANUFACTURERS FOR ANY WARNINGS TO BE INSTALLED WITHIN THE PUBLIC RIGHT-OF-WAY.

SITE ENGINEER:
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10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

ROADWAY AND SITE DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134
DRAWING NUMBER: C5.6

LEGEND

- CONSTRUCTION LIMITS TAPE
- CONSTRUCTION FENCE W/ REINFORCED SILT FENCE
- EROSION CONTROL MATTING
- SILT FENCE
- INLET PROTECTION
- STONE CHECK DAM
- SPLIT RAIL FENCE

SEVERANCE ROAD

UTILITY CORRIDOR

INSTALL SPLIT RAIL FENCE

INSTALL REINFORCED SILT FENCING (TYP.)

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

TOP SOIL STOCK PILE

CLASS II WETLAND

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

INSTALL CONSTRUCTION LIMITS TAPE (TYP.)

CONSTRUCTION ENTRANCE

INSTALL CONSTRUCTION LIMITS TAPE

SHEA DRIVE

DYLAN AVENUE

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

INSTALL PERMANENT SPLIT RAIL FENCING

INSTALL INLET PROTECTION

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

OPEN SPACE

TOP SOIL STOCK PILE

PEGG COVE

STUART AVENUE

INSTALL REINFORCED SILT FENCING (TYP.)

INSTALL PERMANENT SPLIT RAIL FENCE

INSTALL INLET PROTECTION

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

INSTALL SILT FENCE DOWNSLOPE OF ALL DISTURBED AREAS

INSTALL INLET PROTECTION

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

UTILITY CORRIDOR

SHEA DRIVE

TOP SOIL STOCK PILE

DYLAN AVENUE

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

TOP SOIL STOCK PILE

STONE OR GRAVEL SANDBAG CHECK DAMS (TYP.)

INSTALL CONSTRUCTION LIMITS TAPE

INSTALL SILT FENCE DOWNSLOPE OF ALL DISTURBED AREAS

PERMANENT STABILIZATION 10' BIT. CONCRETE REACTION PATH

INSTALL SILT FENCE DOWNSLOPE OF ALL DISTURBED AREAS

PERMANENT STABILIZATION CONCRETE SIDEWALK (TYP.)

PERMANENT STABILIZATION BIT. CONCRETE ROADWAY

PERMANENT STABILIZATION 4" LOAM, FERTILIZE, SEED AND MULCH ALL CURB PROTECTED ISLANDS

TREE CLEARING LIMITS (TYP.)

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

DETENTION POND

UTILIZE AS SEDIMENT BASIN DURING INITIAL PHASES OF CONSTRUCTION

METHADRASSIL

GRAPHIC SCALE

(IN FEET)
1 inch = 60 ft.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

OVERALL EROSION CONTROL PLAN

DATE: 11/01/2019
SCALE: 1" = 60'
PROJ. NO.: 14134

DRAWING NUMBER: C-6.0

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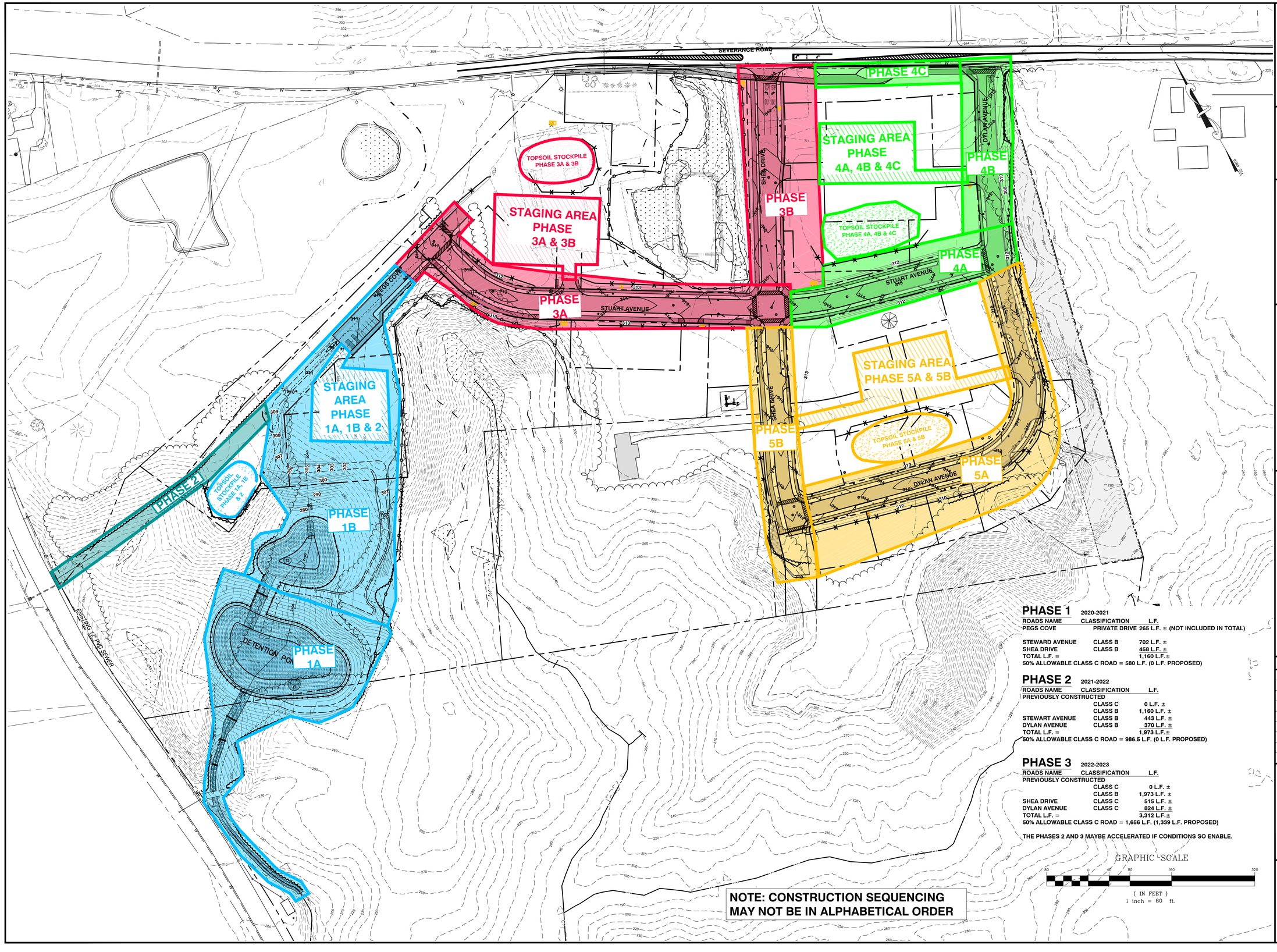

PHASE 1 2020-2021

ROADS NAME	CLASSIFICATION	L.F.
PEGS COVE	PRIVATE DRIVE	265 L.F. ± (NOT INCLUDED IN TOTAL)
STEWARD AVENUE	CLASS B	702 L.F. ±
SHEA DRIVE	CLASS B	458 L.F. ±
TOTAL L.F. =		1,160 L.F.±

50% ALLOWABLE CLASS C ROAD = 580 L.F. (0 L.F. PROPOSED)

PHASE 2 2021-2022

ROADS NAME	CLASSIFICATION	L.F.
PREVIOUSLY CONSTRUCTED		
	CLASS C	0 L.F. ±
	CLASS B	1,160 L.F. ±
STEWART AVENUE	CLASS B	443 L.F. ±
DYLAN AVENUE	CLASS B	370 L.F. ±
TOTAL L.F. =		1,973 L.F.±

50% ALLOWABLE CLASS C ROAD = 986.5 L.F. (0 L.F. PROPOSED)

PHASE 3 2022-2023

ROADS NAME	CLASSIFICATION	L.F.
PREVIOUSLY CONSTRUCTED		
	CLASS C	0 L.F. ±
	CLASS B	1,973 L.F. ±
SHEA DRIVE	CLASS C	515 L.F. ±
DYLAN AVENUE	CLASS C	824 L.F. ±
TOTAL L.F. =		3,312 L.F.±

50% ALLOWABLE CLASS C ROAD = 1,656 L.F. (1,339 L.F. PROPOSED)

THE PHASES 2 AND 3 MAYBE ACCELERATED IF CONDITIONS SO ENABLE.

NOTE: CONSTRUCTION SEQUENCING MAY NOT BE IN ALPHABETICAL ORDER

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

SITE ENGINEER:

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CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

OVERALL EROSION CONTROL PHASING PLAN

DATE: 07/01/2019
SCALE: 1" = 80'
PROJ. NO.: 14134

DRAWING NUMBER: C-6.0A

SEVERANCE ROAD

EXISTING 12" DI WATER MAIN

EX. 18" CMP

CONSTRUCTION ENTRANCE

INSTALL CONSTRUCTION LIMITS TAPE

INSTALL REINFORCED SILT FENCING (TYP.)

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

INSTALL INLET PROTECTION

INSTALL PERMANENT SPLIT RAIL FENCING

TOP SOIL STOCK PILE

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

WETLAND 'A'
CLASS II

OPEN WATER

WETLAND PERMIT
2014-392

INSTALL INLET PROTECTION

SHEA DRIVE

DYLAN AVENUE

STUART AVENUE

N/F PHEASANT WOODS, INC.

OPEN SPACE

INSTALL SILT FENCE DOWNSLOPE OF ALL DISTURBED AREAS

INSTALL INLET PROTECTION

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

LEGEND

- CONSTRUCTION LIMITS TAPE
- CONSTRUCTION FENCE W/ REINFORCED SILT FENCE
- EROSION CONTROL MATTING
- SILT FENCE
- INLET PROTECTION
- STONE CHECK DAM
- SPLIT RAIL FENCE

GRAPHIC SCALE
(IN FEET)
1 inch = 30 ft.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
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P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

NORTHEAST EROSION CONTROL PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-6.1

LEGEND

- CONSTRUCTION LIMITS TAPE
- CONSTRUCTION FENCE W/ REINFORCED SILT FENCE
- EROSION CONTROL MATTING
- SILT FENCE
- INLET PROTECTION
- STONE CHECK DAM
- SPLIT RAIL FENCE

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

TOP SOIL STOCK PILE

INSTALL INLET PROTECTION

SHEA DRIVE

DYLAN AVENUE

UTILITY CORRIDOR

INSTALL CONSTRUCTION LIMITS TAPE

INSTALL SILT FENCE DOWNSLOPE OF ALL DISTURBED AREAS

PERMANENT STABILIZATION 10' BIT. CONCRETE REACTION PATH

N/F BALAKI ± 5.1 ACRES

INSTALL SILT FENCE DOWNSLOPE OF ALL DISTURBED AREAS

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

PERMANENT STABILIZATION CONCRETE SIDEWALK (TYP.)

PERMANENT STABILIZATION BIT. CONCRETE ROADWAY

PERMANENT STABILIZATION 4" LOAM, FERTILIZE, SEED AND MULCH ALL CURB PROTECTED ISLANDS

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)

1 inch = 30 ft.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.

10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403

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DRAWN: MAB

CHECKED: DSM

APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SOUTHEAST EROSION CONTROL PLAN

DATE: 11/01/2019

SCALE: 1" = 30'

PROJ. NO.: 14134

DRAWING NUMBER: C-6.2

LEGEND

- CONSTRUCTION LIMITS TAPE
- CONSTRUCTION FENCE W/ REINFORCED SILT FENCE
- EROSION CONTROL MATTING
- SILT FENCE
- INLET PROTECTION
- STONE CHECK DAM
- SPLIT RAIL FENCE

EXISTING 12" D.I. WATER MAIN

EXIST. CB
RIM 307.0
INV. 298.0

EXIST. CMP

UTILITY CORRIDOR

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

INSTALL SPLIT RAIL FENCE

INSTALL REINFORCED SILT FENCING (TYP.)

TOP SOIL STOCK PILE

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

INSTALL CONSTRUCTION LIMITS TAPE (TYP.)

N/F STATE OF VERMONT

PEGS COVE

INSTALL INLET PROTECTION

STUART AVENUE

INSTALL REINFORCED SILT FENCING (TYP.)

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

INSTALL PERMANENT SPLIT RAIL FENCE

WETLAND 'B'
CLASS II

50' WETLAND BUFFER

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

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SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

NORTHWEST EROSION CONTROL PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-6.3

STABILIZED CONSTRUCTION LAYDOWN AREA (CRUSHED STONE)

WETLAND CLASS III

100' BUFFER

TOP SOIL STOCK PILE

INSTALL REINFORCED SILT FENCING (TYP.)

INSTALL PERMANENT SPLIT RAIL FENCE

STONE OR GRAVEL SANDBAG CHECK DAMS (TYP.)

50' WETLAND BUFFER

WETLAND CLASS II

GRAVEL ACCESS ROAD

TREE CLEARING LIMITS (TYP.)

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

DETENTION POND

UTILIZE AS SEDIMENT BASIN DURING INITIAL PHASES OF CONSTRUCTION

FINAL STABILIZATION - STONE LINED DITCH

FINAL STABILIZATION -

N/F
WRIGHT AND MORRISSEY, INC.
± 53.0 ACRES

LEGEND

- CONSTRUCTION LIMITS TAPE
- CONSTRUCTION FENCE W/ REINFORCED SILT FENCE
- EROSION CONTROL MATTING
- SILT FENCE
- INLET PROTECTION
- STONE CHECK DAM

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SOUTHWEST EROSION CONTROL PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-6.4

UTILIZE AS SEDIMENT BASIN DURING INITIAL PHASES OF CONSTRUCTION

N/F
WRIGHT AND MORRISSEY, INC.
± 53.0 ACRES

FINAL STABILIZATION - STONE LINED DITCH

FINAL STABILIZATION - INSTALL CONCRETE RIP RAP ANCHORS

INSTALL 4" TOPSOIL, FERTILIZE, LAWN SEED AND INSTALL ROLLED EROSION CONTROL MATTING (TYP.)

24" HDPE CULVERT

EXIST. GRAVEL ACCESS ROAD

EXISTING 12" D.I. WATER MAIN

FINAL STABILIZATION - GRAVEL ACCESS

GRAVEL SANDBAG CHECK DAMS AT 50' O.C.

FINAL STABILIZATION - STONE LINED DITCH

INSTALL CONSTRUCTION LIMITS TAPE

FINAL STABILIZATION - STONE LINED EX. SWALE AS NECESSARY

N/F
ROBENSTEIN

LEGEND

- CONSTRUCTION LIMITS TAPE
- CONSTRUCTION FENCE W/ REINFORCED SILT FENCE
- EROSION CONTROL MATTING
- SILT FENCE
- INLET PROTECTION
- STONE CHECK DAM
- SPLIT RAIL FENCE

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
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193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

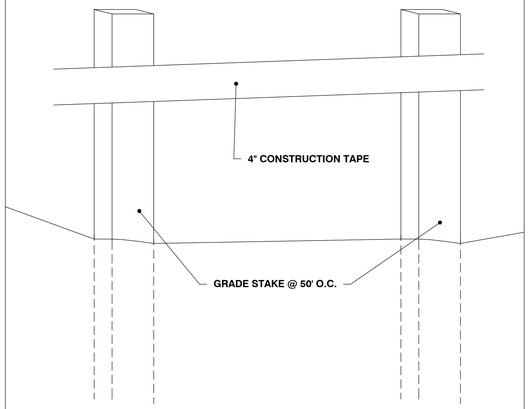
PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SOUTHWEST EROSION CONTROL PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-6.5

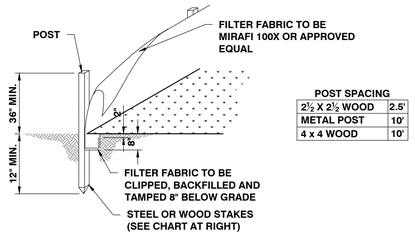


CONSTRUCTION LIMITS TAPE

N.T.S.

E-003 Silt Fence

E-003 REVISED 08/01/2014



POST SPACING	
2½ X 2½ WOOD	2.5'
METAL POST	10'
4 x 4 WOOD	10'

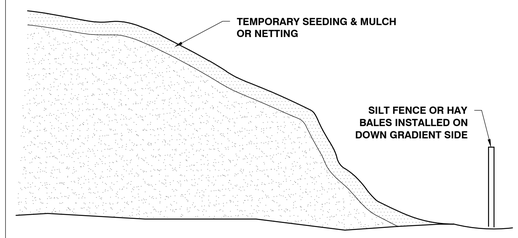
NOTES:

1. INSTALL MIRIFI ENVIROFENCE, OR APPROVED EQUAL OR AS DETAILED HEREIN.
2. INSTALL SILT FENCES AT TOES OF ALL UNPROTECTED SLOPES AND AS PARALLEL TO CONTOURS AS POSSIBLE. THIS INCLUDES ALL FILLED OR UNPROTECTED SLOPES CREATED DURING CONSTRUCTION, NOT NECESSARILY REFLECTED ON THE FINAL PLANS. CURVE THE ENDS OF THE FENCE UP INTO THE SLOPE. REMOVE SEDIMENT WHEN ACCUMULATED TO HALF THE HEIGHT OF THE FENCE. SILT FENCES ARE TO BE MAINTAINED UNTIL SLOPES ARE STABILIZED.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6", FOLDED AND STAPLED.

SILT FENCE DETAIL

N.T.S.

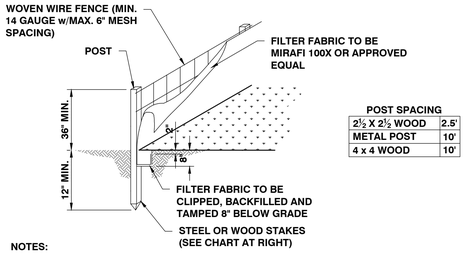
E-005 Stockpile



TEMPORARY STOCKPILE DETAIL

N.T.S.

E-005 REVISED 08/01/2014



POST SPACING	
2½ X 2½ WOOD	2.5'
METAL POST	10'
4 x 4 WOOD	10'

NOTES:

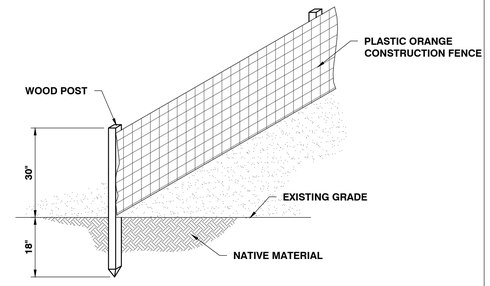
1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES. WIRE FENCE REINFORCEMENT REQUIRED WITHIN 100 FT UPSLOPE OF RECEIVING WATERS.
2. INSTALL MIRAFI ENVIROFENCE, OR APPROVED EQUAL OR AS DETAILED HEREIN.
3. INSTALL SILT FENCES AT TOES OF ALL UNPROTECTED SLOPES AND AS PARALLEL TO CONTOURS AS POSSIBLE. THIS INCLUDES ALL FILLED OR UNPROTECTED SLOPES CREATED DURING CONSTRUCTION, NOT NECESSARILY REFLECTED ON THE FINAL PLANS. CURVE THE ENDS OF THE FENCE UP INTO THE SLOPE. REMOVE SEDIMENT WHEN ACCUMULATED TO HALF THE HEIGHT OF THE FENCE. SILT FENCES ARE TO BE MAINTAINED UNTIL SLOPES ARE STABILIZED.
4. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6", FOLDED AND STAPLED.

REINFORCED SILT FENCE DETAIL

N.T.S.

E-003 Silt Fence - wire

E-003 REVISED 09/24/2014

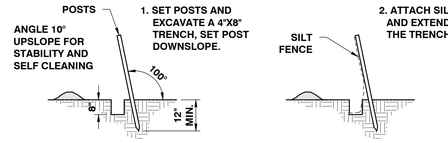


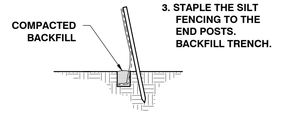
CONSTRUCTION FENCE DETAIL

N.T.S.

E-002 Constr Fence

E-002 REVISED 08/01/2014



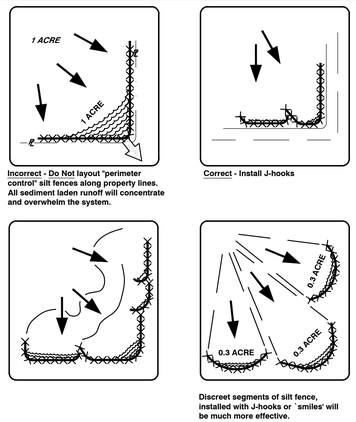


SILT FENCE CONSTRUCTION DETAIL

N.T.S.

E-007 Infilt Sect

E-007 REVISED 08/01/2014

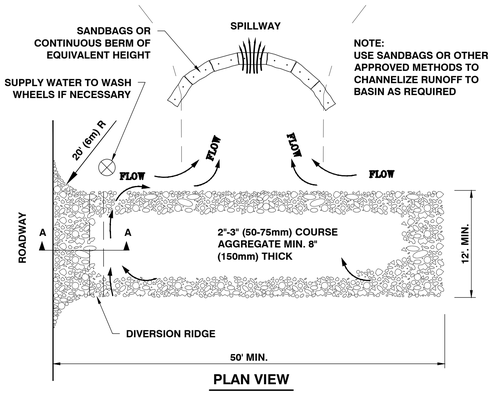


SILT FENCE PLACEMENT FOR PERIMETER CONTROL

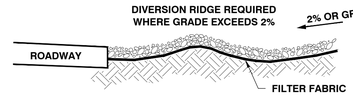
N.T.S.

E-010 Silt Fence Perimeter Control

E-010 REVISED 12/19/2014



PLAN VIEW



SECTION A-A

NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

STABILIZED CONSTRUCTION ENTRANCE

N.T.S.

E-004 Constr. Ent

E-004 REVISED 08/01/2014

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

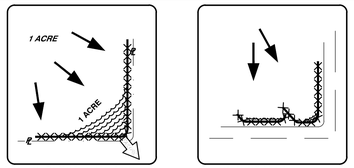
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

ESPC SPECIFICATIONS & DETAILS

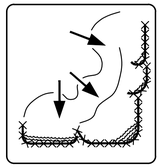
DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

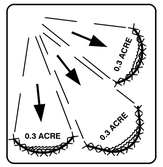
DRAWING NUMBER: C6.6



Incorrect - Do Not layout "perimeter control" silt fences along property lines. All sediment laden runoff will concentrate and overwhelm the system.

Correct - Install J-hooks





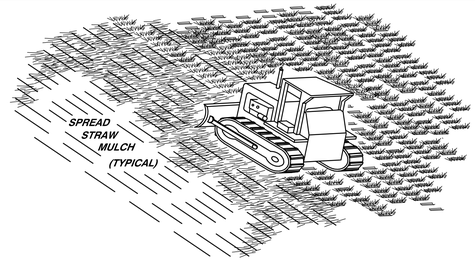
Discreet segments of silt fence, installed with J-hooks or 'smiles' will be much more effective.

SILT FENCE PLACEMENT FOR PERIMETER CONTROL

N.T.S.

E-010 Silt Fence Perimeter Control

E-010 REVISED 12/19/2014



'TRACKING' WITH MACHINERY ON SANDY SOIL PROVIDES ROUGHENING WITHOUT UNDUE COMPACTION.

NOTES:

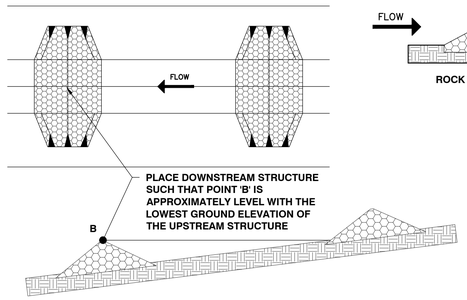
1. ROUGHEN SLOPE WITH BULLDOZER.
2. BROADCAST SEED AND FERTILIZER.
3. SPREAD STRAW MULCH 3" (2½ TONS PER ACRE)
4. PUNCH STRAW MULCH INTO SLOPE BY RUNNING BULLDOZER UP AND DOWN SLOPE.

STRAW ANCHORING

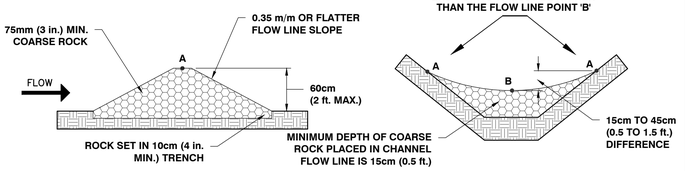
N.T.S.

E-012 Straw Anchoring

E-012 REVISED 12/19/2014



PLACE DOWNSTREAM STRUCTURE SUCH THAT POINT 'B' IS APPROXIMATELY LEVEL WITH THE LOWEST GROUND ELEVATION OF THE UPSTREAM STRUCTURE



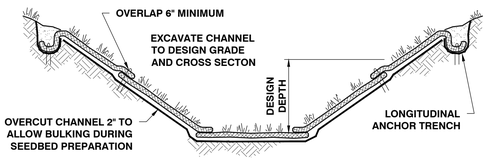
D-50 OF ROCK (MM)	DOWNSTREAM FLOWLINE SLOPE OF STRUCTURE (m/m) 0.35	0.30	0.25	0.20	0.15	0.10
	MAXIMUM WATER DEPTH OVER ROCK (mm)					
75	15	18	20	25	33	48
150	30	36	41	50	66	100

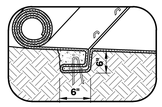
STONE CHECK DAM STRUCTURE

N.T.S.

E-006 Check Dam

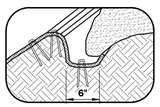
E-006 REVISED 08/01/2014



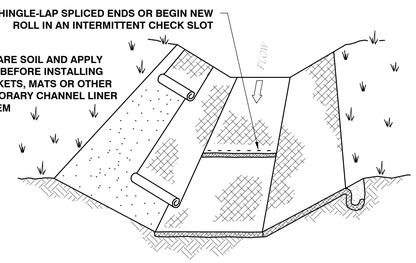


INTERMITTENT CHECK SLOT

TYPICAL INSTALLATION WITH EROSION CONTROL BLANKETS OR TURF REINFORCEMENT MATS



LONGITUDINAL ANCHOR TRENCH



NOTES:

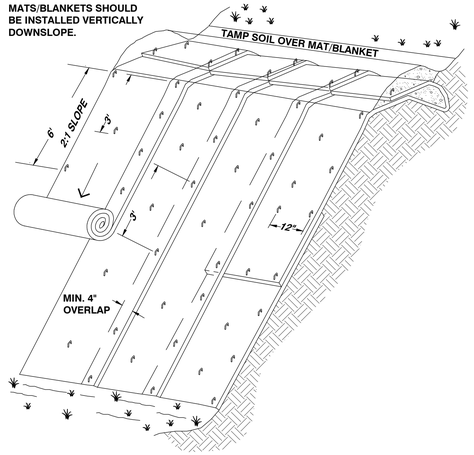
1. DESIGN VELOCITIES EXCEEDING 2 FT./SEC/ REQUIRE TEMPORARY BLANKETS, MATS OR SIMILAR LINERS TO PROTECT SEED AND SOIL UNTIL VEGETATION BECOMES ESTABLISHED.
2. GRASS-LINED CHANNELS WITH DESIGN VELOCITIES EXCEEDING 6 FT./SEC. SHOULD INCLUDE TURF REINFORCEMENT MATS.

GRASS-LINED CHANNEL TYPICAL INSTALLATION

N.T.S.

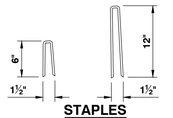
E-011 Grass Lined Channel

E-011 REVISED 12/19/2014

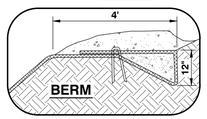


ISOMETRIC VIEW

TYPICAL SLOPE SOIL STABILIZATION



STAPLES



BERM

NOTES:

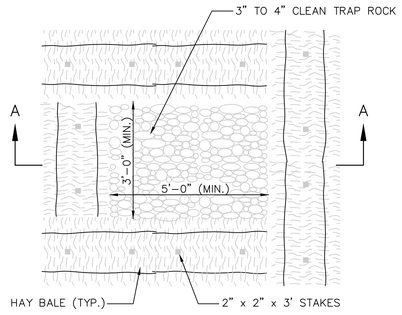
1. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS AND GRASS. MATS/BLANKETS SHALL HAVE GOOD SOIL CONTACT.
2. APPLY PERMANENT SEEDING BEFORE PLACING BLANKETS.
3. LAY BLANKETS LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH THE SOIL. DO NOT STRETCH.

EROSION BLANKETS & TURF REINFORCEMENT MATS SLOPE INSTALLATION

N.T.S.

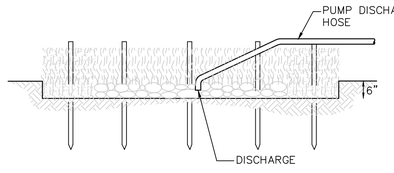
E-009 Slope Erosion Blankets

E-009 REVISED 08/01/2014



NOTE: ALL DEWATERING DISCHARGES SHALL BE THROUGH SEDIMENT CONTROL TRAPS, CONTRACTOR SHALL MAINTAIN AND CLEAN TRAPS AS REQUIRED.

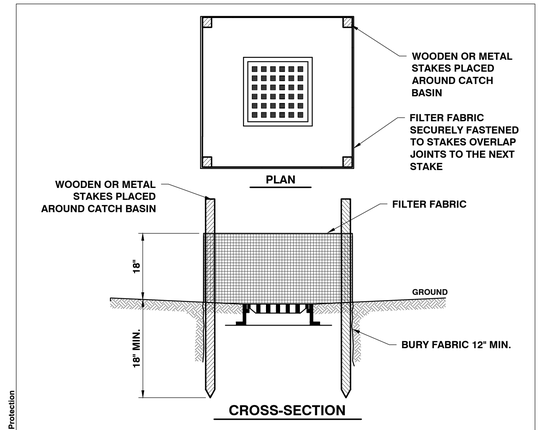
PLAN



SECTION A–A

SEDIMENT CONTROL TRAP DETAIL

N.T.S.



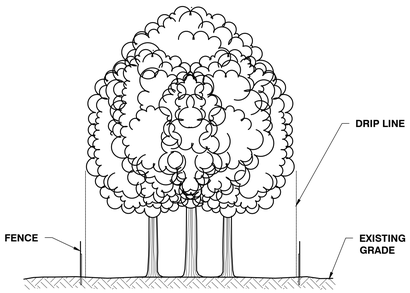
CATCH BASIN INLET PROTECTION

(W/ FABRIC)

N.T.S.

E-013 Catch Basin Protection

E-013 REVISED 12/19/2014



NOTES:

1. THIS FENCE SHALL BE LOCATED OUTSIDE THE DRIP LINE OF THE TREE TO BE SAVED AND IN NO CASE CLOSER THAN 5' TO THE TRUNK OF ANY TREE.
2. FENCE POST SHALL BE STANDARD STEEL POSTS OR WOOD POSTS WITH A MINIMUM CROSS SECTIONAL AREA OF 3.0 SQ. IN.
3. THE FENCE MAY BE EITHER 40" HIGH SNOW FENCE, 40" PLASTIC WEB FENCING OR ANY OTHER MATERIAL AS APPROVED BY THE ENGINEER..

TREE PROTECTION - FENCING

N.T.S.

L-006 Tree Protection

L-006 REVISED 2/12/2015

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

ESPC SPECIFICATIONS & DETAILS

DATE 11/01/2019
SCALE AS SHOWN
PROJ. NO. 14134
DRAWING NUMBER C6.7

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Winter EPSC Requirements

Introduction - Rains in late fall, thaws throughout the winter, and spring melt and rains can produce significant flows over frozen and saturated ground, greatly increasing the potential for erosion. At the same time as the erosion risk increases, the "toolbox" available to the contractor and on-site plan coordinator shrinks significantly over this period (Table 3.4 below).

Table 3.4 Effects of Winter on EPSC Practices

EPSC Measure	Effect of Winter Conditions
Vegetative Ground Cover	Cannot be established outside of growing
Hydroseeding	Stabilizers are poor in cold conditions, poor/no growth of seed over
Diversion Structures	Difficult or impossible to implement in frozen soils.
Sedimentation Basins	Must be installed pre-ground freezing. Can be overwhelmed by spring flows
Silt Fence	Difficult to install in frozen ground. Often fail during spring melt.
Erosion Blankets	Cannot be installed correctly on frozen ground. Improper installations (not keyed in) melt flows. wash away in melt flows.
Grassed line swales	Installation following ground freezing difficult, leaving unprotected concentrated flows with significant erosion potential
Impervious Stabilization	Paving, other measures cannot be completed in winter

In particular, establishing vigorous vegetation during winter construction is not possible. Based upon the activities anticipated to be undertaken during this period, the Contractor shall plan and implement the following Winter EPSC measures.

EPSC Plan Requirements for -Winter Shutdown-

For those projects that will complete earth disturbance activities prior to the winter period (October 15), the following must be implemented by the Site Contractor in coordination with the On-Site Plan Coordinator:

1. For areas to be stabilized by vegetation, all seeding shall be completed no later than September 15 to ensure adequate growth and cover.
2. Non-vegetative stabilization of all areas of disturbed soils without existing vegetation shall be completed no later than October 15.
3. When mulch is used as a temporary means of stabilization, the rate of application shall be double that of the regular construction season rate, or roughly 2 inches of mulch with 80-90% cover. Mulch should be tracked in when weather permits or stabilized with netting or an approved tackifier.

EPSC Plan Requirements for -Winter Construction-

If construction activities involving earth disturbance continue past October 15 or begin before April 15, the following must be implemented by the Owner/Site Contractor:

1. Enlarged stabilized access points to provide for snow stockpiling.
2. Limits of disturbance flagging moved or replaced to reflect the boundaries of winter work.
3. A snow management plan which implements the following requirements:
   a. adequate storage and control of snowmelt by diverting these flows around the work area,
   b. cleared snow is to be stored down gradient of all areas of disturbance
   c. Storage of snow in stormwater treatment structures is prohibited.
   d. All drainage structures shall be kept open and free of snow/ice.
   e. buffer is to be maintained from the perimeter controls such as silt fence to allow for snow clearing and maintenance.
   f. Install silt fence a minimum of 25 feet down gradient of areas of disturbance and snow storage areas. Reinforce fence in areas where snow load forces may be an issue due to site constrictions.
4. In areas of disturbance within 100 feet of a receiving water, silt fence shall be reinforced or else replaced with perimeter dikes, swales, or other practices resistant to the forces of snow loads.
5. All silt fence and other practices requiring earth disturbance shall be installed ahead of ground freezing.
6. Where mulch is the selected stabilization measure, the mulch shall be installed at double the standard rate of mulch, or roughly 2 inches of mulch with 80-90% cover.
7. Mulch should be tracked in when weather permits or stabilized with netting or an approved tackifier to prevent removal by wind.
8. To ensure cover of disturbed soil in advance of a melt event, areas of disturbed soil must be stabilized at the end of each work day, with the following exceptions:
   a. If no precipitation within 24 hours is forecast and work will resume in the same disturbed area within 24 hours, daily stabilization is not necessary.
   b. Disturbed areas that collect and retain runoff, such as house foundations or open utility trenches."
9. Directions to remove snow or ice to less than 1" thickness prior to temporary or permanent stabilization.
10. Stone stabilization shall be installed a width of 10 to 20ft wide around the perimeter of buildings under construction, where construction vehicle traffic is anticipated.

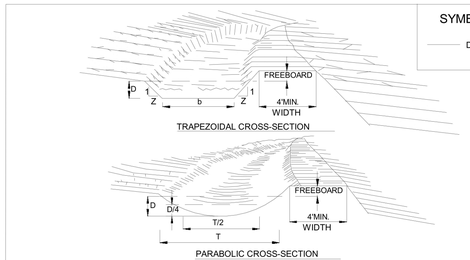

Figure 4.14 Diversion

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

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COLCHESTER, VT

DATE	CHECKED	REVISION

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DATE: 11/01/2019
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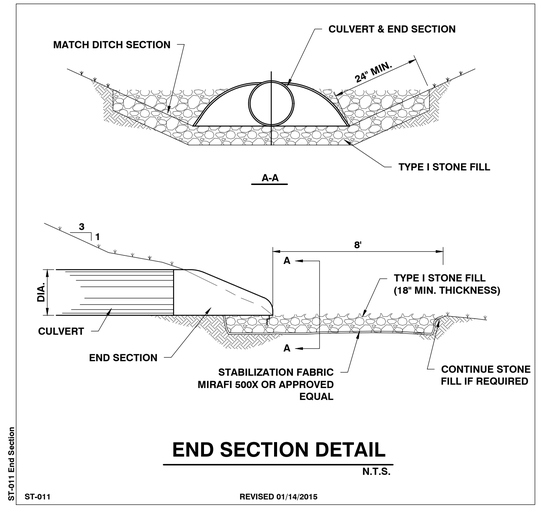
PROJ. NO.: 14134
DRAWING NUMBER: C6.8

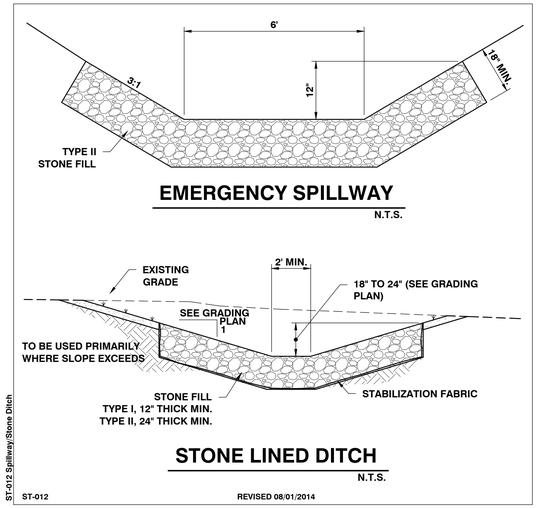


END SECTION DETAIL

N.T.S.

ST-011 End Section

ST-011 REVISED 01/14/2015



EMERGENCY SPILLWAY

N.T.S.

STONE LINED DITCH

N.T.S.

ST-012 Spillway/Stone Ditch

ST-012 REVISED 08/01/2014

CONSTRUCTION NOTES:

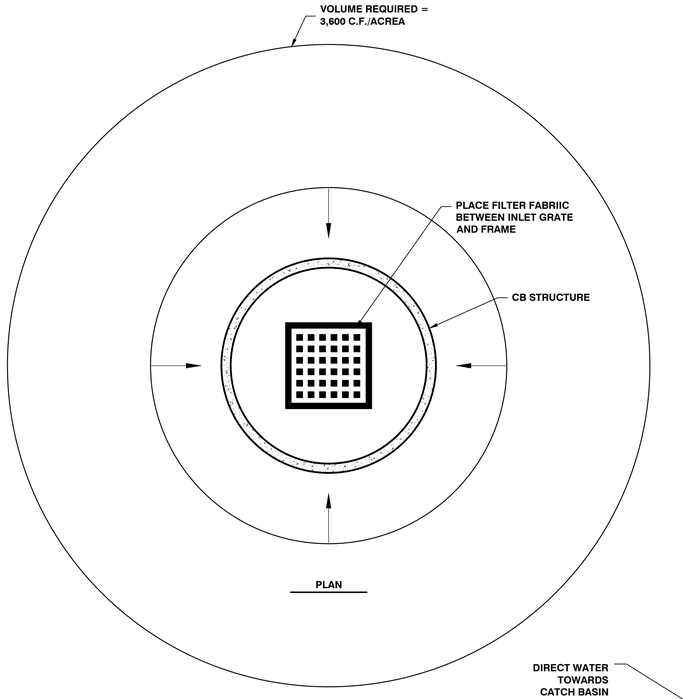
1. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.

2. THE VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.

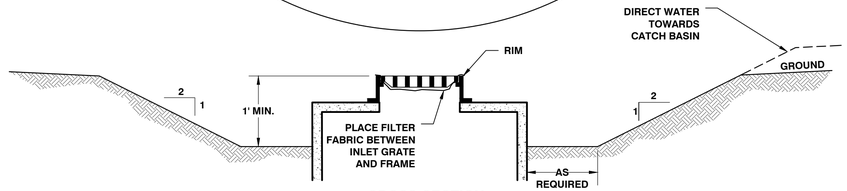
3. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.

4. THE SEDIMENT TRAP SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE CONSTRUCTED DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

5. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.



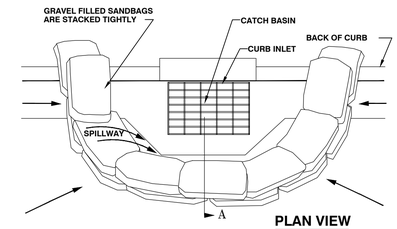
PLAN



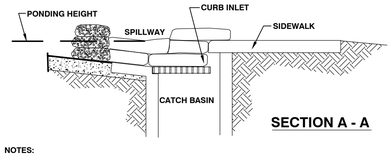
CROSS-SECTION

CATCH BASIN SEDIMENT TRAP

N.T.S.



PLAN VIEW



SECTION A - A

NOTES:

1. **PLACE CURB TYPE SEDIMENT BARRIERS ON GENTLY SLOPING STREET SEGMENTS WHERE WATER CAN POND AND ALLOW SEDIMENT TO SEPARATE FROM RUNOFF.**
2. **SANDBAGS, OF EITHER BURLAP OR WOVEN GEOTEXTILE FABRIC, ARE FILLED WITH GRAVEL, LAYERED AND PACKED TIGHTLY.**
3. **LEAVE ONE SANDBAG GAP IN THE TOP ROW TO PROVIDE A SPILLWAY FOR OVERFLOW.**
4. **INSPECT BARRIERS AND REMOVE SEDIMENT AFTER EACH STORM EVENT. SEDIMENT AND GRAVEL MUST BE REMOVED FROM THE TRAVELED WAY IMMEDIATELY.**

CURB INLET SEDIMENT BARRIER (SANDBAG)

N.T.S.

2017 Vermont Stormwater Management Manual Rule and Design Guidance

Required Elements:

- The Post-Construction Soil Depth and Quality Standard shall apply to all disturbed areas within the limits of the site which are not covered by an impervious surface, incorporated into a structural stormwater treatment practice, or engineered as structural fill once development is complete.
- Undisturbed areas where the duff layer and native topsoil are retained meet the intent of this Standard and shall not be subject to disturbance solely for the purpose of soil amendment.
- This practice shall not be required on soil slopes greater than 33 percent.
- The practice standard of 4 inches shall apply on sites with fill soils that have replaced native soils, and sites where native topsoil was removed, regardless of whether or not existing soils have less than 4 inches of topsoil.

Post-Construction Soil Depth and Quality Treatment

Required Elements:

Soil retention. Retain, in an undisturbed state, the duff layer and native topsoil to the maximum extent practicable.

Soil quality. All areas subject to the Standard shall demonstrate the following:

- A topsoil layer with a minimum organic matter content of 4% dry weight in planting beds and turf areas. The topsoil layer shall have a minimum depth of 4 inches, except where tree roots limit the depth of incorporation of amendments needed to meet the criteria or where native mapped soils indicate less than 4 inches of naturally occurring topsoil on an NRCS Official Soil Series Description. In those cases in which native mapped soils indicate less than 4 inches of naturally occurring topsoil, restored top soil depth shall match that indicated on the NRCS Official Soil Series Description.
- Compost and other materials shall be used that meet the following requirements:
  - o The compost or other materials shall have a carbon to nitrogen ratio below 25:1.
  - o Compost shall meet the definition of "compost" in the Agency's Solid Waste Management Rules or shall meet the contaminant standards in the Vermont Solid Waste Management Rules §6-1104(g)(6-7), §6-1105(e)(8-9), and §6-1106(e)(7-9). Compost or other organic materials may be amended to meet the foregoing requirements.
  - o Exceptional Quality biosolids (EQ biosolids) may be used as a soil amendment, at a maximum proportion of 35% of the total soil volume, and shall be well mixed with existing soil before or during application.
- The resulting soil shall be conducive to the type of vegetation to be established.
- The soil quality requirements shall be met by using one or a combination of the following methods:
  - o Option 1: Leave undisturbed native vegetation and soil, and protect from compaction during construction. Identify areas of the site that will not be stripped, logged, graded, or driven on, and fence off those areas to prevent impacts during construction.

    FAILURE TO ESTABLISH AND MAINTAIN EXCLUSIONARY CONTROLS AROUND THESE AREAS DURING THE CONSTRUCTION PHASE MAY TRIGGER THE REQUIREMENT TO RESTORE SOILS PER ONE OF THE FOLLOWING OPTIONS.
  - o Option 2: Amend existing site topsoil or subsoil in place.
    - Scarify or till subsoils to 4 inches of depth or to depth needed to achieve a total depth of 8 inches of uncompacted soil after calculated amount of amendment is added. Except for within the drip line of existing trees, the entire surface shall be disturbed by scarification;
    - Amend soil to meet organic content requirements:
    - PRE-APPROVED RATE: Place 1 inch of composted material with an organic matter content between 40 and 65% and rototill into 3 inches of soil, or
    - CALCULATED RATE: Place calculated amount of composted material or approved organic material and rototill into depth of soil needed to achieve 4 inches of settled soil at 4% organic content;
    - Rake beds to smooth and remove surface rocks larger than 2 inches in diameter; and
    - Water or roll to compact soil in turf areas to 85% of maximum dry density.
  - o Option 3: Remove and stockpile existing topsoil during grading.
    - Stockpile soil on site in a designated controlled area, at least 50 feet from surface waters, wetlands, floodplains, or other critical resource areas;
    - Scarify or till subgrade to a depth of 4 inches. Except for within the drip line of existing trees, the entire surface shall be disturbed by scarification;
    - Stockpiled topsoil shall also be amended, if needed, to meet the organic content requirements:
- PRE-APPROVED RATE: Compost shall be incorporated with an organic matter content between 40 and 65% into the topsoil at a ratio 1:3, or
- CALCULATED RATE: Incorporate composted material or approved organic material at a calculated rate to achieve 4 inches of settled soil at 4% organic content;
  - Replace stockpiled topsoil prior to planting; and
  - Rake to level, and remove surface rocks larger than 2 inches in diameter.
  - o Option 4: Import topsoil mix, or other materials for mixing, including compost, of sufficient organic content and depth.
    - Scarify or till subgrade to a depth of 4 inches. Except for within the drip line of existing trees, the entire surface shall be disturbed by scarification;
    - Place 4 inches of imported topsoil mix on surface. The imported topsoil mix shall contain 4% organic matter. Soils used in the mix shall be sand or sandy loam as defined by the USDA;
    - Rake beds to smooth and remove surface rocks larger than 2 inches in diameter; and
    - Water or roll to compact soil in turf areas to 85% of maximum dry density.

Post-Construction Soil Depth and Quality Vegetation and Landscaping

Required Elements:

- Soil depth and quality shall be established towards the end of construction and once established, protected from compaction, such as from large machinery, vehicle traffic, and from erosion; and
- Includes instructions for contractor verification of the Standard, including a sampling scheme, for verification by the contractor, that includes nine 8-inch deep test holes per acre of area subject to Standard. Test holes shall be excavated using only a shovel driven solely by inspector's weight and shall be at least 50 feet apart from each other.
- A dense and vigorous vegetative cover shall be established over turf areas.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
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IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

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DRAWING NUMBER: C6.9

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP

Definition

A temporary sediment control device formed by excavation and/or embankment to intercept sediment laden runoff and retain the sediment.

Purpose

The purpose of the structure is to intercept sediment-laden runoff and trap the sediment in order to protect drainage ways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainage way, at a storm drain inlet, or other points of collection from a disturbed area.

Sediment traps should be used to artificially break up the natural drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If any of the design criteria presented here cannot be met, see Standard and Specification for Sediment Basin.

Drainage Area

The drainage area for sediment traps shall be in accordance with the specific type of sediment trap used (Type I through V).

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must not be located any closer than 20 feet from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of the trap. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed.

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

Type of Sediment Traps

There are five (5) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Grass Outlet Sediment Trap
III. Catch Basin Sediment Trap
IV. Stone Outlet Sediment Trap
V. Riprap Outlet Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¼ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or
2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Select pipe diameter from the following table:

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area with a required storage of 3600 cubic feet per acre of drainage area.

Pipe outlet sediment traps may be interchangeable in the field with stone outlet or riprap sediment traps provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

II. Grass Outlet Sediment Trap

A Grass Outlet Sediment Trap consists of a trap formed by excavating the earth to create a holding area. The trap has a discharge point over natural existing grass. The outlet crest width (feet) shall be equal to four (4) times the drainage area (acres) with a minimum width of four (4) feet. The outlet shall be free of any restrictions to flow. The outlet lip must remain undisturbed and level. The volume of this trap shall be computed at the elevation of the crest of the outlet. Grass outlet sediment traps shall be limited to

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP

a five (5) acre maximum drainage area with a required storage of 3600 cubic feet per acre of drainage area.

III. Catch Basin Sediment Trap

A Catch Basin Sediment Trap consists of a basin formed by excavation on natural ground that discharges through an opening in a storm drain inlet structure. This opening can either be the inlet opening or a temporary opening made by omitting bricks or blocks in the inlet.

A yard drain inlet or an inlet in the median strip of a dual highway could use the inlet opening for the type outlet. The trap should be out of the roadway so as not to interfere with future compaction or construction. Placing the trap on the opposite side of the opening and diverting water from the roadway to the trap is one means of doing this. Catch basin sediment traps shall be limited to a three (3) acre maximum drainage area. The volume of this trap is measured at the elevation of the crest of the outlet (invert of the inlet opening).

IV. Stone Outlet Sediment Trap

A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres) with a required storage 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe or riprap outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

V. Riprap Outlet Sediment Trap

A Riprap Outlet Sediment Trap consists of a trap formed by an excavation and embankment. The outlet for this trap shall be through a partially excavated channel lined with riprap. This outlet channel shall discharge onto a stabilized area or to a stable watercourse. The riprap outlet sediment trap may be used for drainage areas of up to a maximum of 15 acres.

Design Criteria for Riprap Outlet Sediment Trap

1. The total contributing drainage area (disturbed or undisturbed either on or off the developing property) shall not exceed 15 acres.
2. The storage needs for this trap shall be computed using 3600 cubic feet of required storage for each acre of drainage area. The storage volume provided can be figured by computing the volume of storage area available behind the outlet structure up to an elevation of one (1) foot below the level weir crest.
3. The maximum height of embankment shall not exceed five (5) feet.
4. The elevation of the top of any dike directing water to a riprap outlet sediment trap will equal or exceed the minimum elevation of the embankment along the entire length of this trap.

Optional Dewatering Methods

Optional dewatering devices may be designed for use with sediment traps. Included are two methods, which may be used.

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP

Riprap Outlet Sediment Trap ST-V
(for Stone Lined Channel)

Contributing Drainage Area (ac.)	Depth of Channel (a) (ft.)	Length of Weir (b) (ft.)
1	1.5	4.0
2	1.5	5.0
3	1.5	6.0
4	1.5	10.0
5	1.5	12.0
6	1.5	14.0
7	1.5	16.0
8	2.0	10.0
9	2.0	10.0
10	2.0	12.0
11	2.0	14.0
12	2.0	14.0
13	2.0	16.0
14	2.0	16.0
15	2.0	18.0

Considerations

Select locations for sediment traps during site evaluation. Note natural drainage divides and select trap sites so that runoff from potential sediment-producing areas can easily be diverted into the traps. Make traps readily accessible for periodic sediment removal and other necessary maintenance. Plan locations for sediment disposal as part of trap site selection. Clearly designate all disposal areas on the plans.

Sediment trapping is achieved primarily by settling within a permanent pool formed by excavation, or by a combination of excavation and embankment. Sediment-trapping efficiency is a function of surface area and inflow rate. Installations that provide pools with large length to width ratios reduce short-circuiting and allow more of the pool surface area for settling. This optimizes efficiency.

The minimum length of flow through the trap should be 10 feet and the minimum length to width ratio should be 2:1. If site conditions permit a greater travel distance through the basin and greater length to width ratio the water quality benefit provided by the sediment trap will be enhanced. The average trap permanent pool depth should be a minimum of 3 feet to prevent resuspension of sediments.

Because well-planned sediment traps are key measures to preventing off-site sedimentation, they should be installed in the first stages of project development.

Plans and Specifications

Plans and specifications for installing sediment traps shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)
9. The construction detail for each type of sediment trap designated.

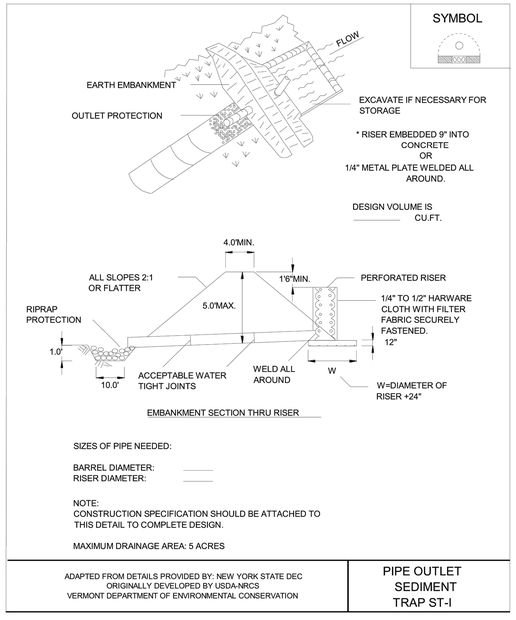

Figure 5.4a Pipe Outlet Sediment Trap ST-1

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

ESPC SPECIFICATIONS & DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134
DRAWING NUMBER: C6.10

Erosion Prevention and Sediment Control Program

Construction Stormwater Discharge
The development of a new mixed use project by Ireland Development, LLC is to be permitted as an individual site under the State of Vermont Construction General Permit (CGP# 3-9020) for Discharges of Stormwater from Construction Sites issued for this project.

Parties associated with the issuance and implementation of the requirements set forth in the General Permit and the details within this document include:

-State of Vermont Department of Environmental Conservation, Water Quality Division (State)
-State of Vermont Environmental Commission (Act 250)
-On-Site Plan Coordinator (OSPC)
-Environmental Specialist (ES)
-Engineer (E)
-Site Owner (Owner)
-Site Erosion Prevention and Sediment Control Plan Designer (EPSC Designer)
-Owner's Builder/Contractor (Contractor)

This permit has the goal of minimizing discharges of sediment-laden water from the site by implementing appropriate best management practices (BMP's) during construction an stabilization of the site.

The Contractor will be responsible for ensuring compliance with all construction stormwater permit conditions within the entire project construction area.

Groundwater Dewatering
If dewatering of trenches, pits or other excavations is required during construction, the groundwater will be pumped to a suitable settling facility approved by the engineer and the VT DEC.

Inspection Program

The inspection responsibilities of the Contractor and the On-Site Plan Coordinator (OSC) are outlined in the chart below:

Feature	Daily	Weekly	After Rain Event	Bi-Weekly
Storm Sewer Inlets	C	OSPC,	C, OSPC	ES
Silt Fence	C	OSPC,	C, OSPC	ES
Check Dams	C	OSPC,	C, OSPC	ES
Construction Fencing	C	OSPC,	C, OSPC	ES
Construction Entrance	C	OSPC,	C, OSPC	ES
Stabilized Areas	C	OSPC,	C, OSPC	ES
Report	C	OSPC,	OSPC	ES

Sunderland Woods Community
Erosion Protection and Sediment Control Narrative
October 30, 2019

Ireland Development, LLC is proposing the construction of a mixed use project on 33.7 acres in the southeast quadrant of the Severance Road - Route 2/7 Corridor.

Existing Conditions - The 33.7 acre property is comprised of a combination of modest topography in the northern portion of the property and rolling topography in the southern half.

Of the 33.7 acres of the property, approximately 13.4 acres of the property is proposed to be disturbed as part of this project.

The site is comprised of an upper plateau with fine sandy loam overlying silty clay while the steep slope areas are loams and silty loams over a silty clay base.

The NRCS soil mapping of the property is summarized below.

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AdA	Adams and Windsor loamy sands, 0 to 5 percent slopes	.15	0.3	0.9%
AgA	Agawam fine sandy loam, 0 to 5 percent slopes	.20	3.9	11.2%
BlA	Belgrade and Eldridge soils, 0 to 3 percent slopes	.32	2.9	8.3%
HtB	Hartland very fine sandy loam, 2 to 6 percent slopes	.32	9.8	27.8%
HtE	Hartland very fine sandy loam, 25 to 60 percent slopes	.32	13.1	37.1%
HnA	Hinesburg fine sandy loam, 0 to 3 percent slopes	.17	1.2	3.4%
MuD	Munson and Belgrade silt loams, 12 to 25 percent slopes	.32	2.2	6.3%
MyB	Munson and Raynham silt loams, 2 to 6 percent slopes	.49	1.8	5.1%
Totals for Area of Interest			**35.2**	**100.0%**

Except for the Munson and Raynham silt loams, 94.9% of the site has a K value of 0.32 or less which means that this site has a moderate to high rate of erodibility and will need to be managed by reducing the time of exposure and mitigation with proper BMPs.

Class II wetlands are located in the mid northern portion of the property. The only other wetlands are located along the valley of the drainages flowing out in the southerly direction.

Large portions of the proposed development area are currently in active turn management while approximately 1/3 of the proposed disturbance area is wooded.

Approximately 1/3 of the property is currently is agricultural use and about 75% of the property is located on the upper plateau which by its flat nature, creates a lesser exposure to sediment laden runoff to the receiving waters. Any dewatering activities will require adequate detention time to settle the fines and clays. It is proposed that polyacrylimides be used to mitigate the size of the structures to provide proper settling of suspended solids.

Most of the site has been designed to provide a 50-foot buffer to existing Class II wetlands, the exception being 24s SF of wetland being impacted for outflow management.

The topographical mapping for the property was developed from a series of field surveys.

Areas of Concern - The primary areas of concern for the management of EPSC include (These are depicted on Sheet C3.0):
1. The construction of the stormwater management facility in the drainage way at the west end of the property.
2. The placement of fill over the top of the embankments.
3. Work adjacent to the Class II wetland.

Phasing - The project is proposed to be constructed in Phases over three construction seasons beginning in 2020 and ending in 2022. The goal is to construction critical water, sewer and drainage facilities first with the supporting roadways and then to expand the utility roadway network in subsequent phases.

The phasing work areas are shown on Sheet A6.0A

Best Management Practices- The project will use the following BMPs for the protection of the soils and mitigation of suspended solids in the runoff.

1. Construction entrances prior to entering a paved surface
2. Washing equipment tire and tracks in upland areas away from wetlands, streams or drainages
3. Construction fencing for limits of disturbance (LOD) in areas within 50 feet of a wetland or stream.
4. Construction flagging for LOD
5. Super silt fence for all work within 50-feet of a wetland or stream.
6. Silt fence at all downgradient locations with area of disturbance limited to 1/3 acre for each low point in the fence installation.
7. Surface water diversion for areas with large upgradient watersheds
8. Sediment traps at low points of sites.
9. Inlet Protection.
10. Minimizing the amount of time within each work area.
11. Stabilizing the site within 3 days of completion of finish grading.
12. Utilize erosion control matting (ecm) or straw mulch in all areas of disturbance.

Project Characteristics - The average slope of the areas of disturbance is 8%.

The project does not propose only minor wetland impacts.

Except for the import of granular materials required for the construction of the roadways, sidewalks,, and pie work, the intent of the project is to balance the cuts and the fills so as to minimize the need export waste materials or import fill material.

Preconstruction measures will include the use of construction fencing to demarcate the limits of disturbance along those areas where sensitive features are present (e.g. wetlands or tree retention areas), construction flagging for the remaining areas, Construction access (entrances road and laydown areas) stabilization, surveyed tree clearing limits and silt fence. These areas are shown on Sheets C6.0 thru C6.5.

The on-site temporary measures will include the use of contained sites (e.g. pond excavation, utility trenching), inlet protection, temporary stabilization of disturbed surfaces through the use of straw mulch or erosion control matting.

The temporary off-site measures (outside of specific phase areas) to be employed will include the previously discussed surface water diversions and stormwater management facilities. These are shown on Sheets C6.0 thru C6.5.

The permanent on-site measures to be used to stabilize the site will include paved roadways, concrete sidewalks, paved recreation paths, and grassing of the remaining areas.

The project will require that within 7 days of initial disturbance that soils be permanently or temporarily stabilized through the use of hay mulch, ECM, or a crushed stone surface unless these areas are part of an on-going earth disturbance activity or are located within a contained area. The goal is to immediately grass each of the work areas in support of maximizing grow-in of the site.

Winter Construction - Winter construction is proposed.

EROSION AND SEDIMENT CONTROL STRATEGY - The following techniques are anticipated to be utilized as part of the erosion and sediment control program. The timing and use of each of the techniques is further defined within the Construction Phasing of the project. But will be the responsibility of the contractor to implement on an as needed basis based upon the changing nature of the site disturbance activities only controlled by the site contractor.

1. Use rapidly germinating cover crops prior to seeding when the ground would otherwise be bare.
2. Include rapidly germinating grasses in the seed mixtures when they will not compromise the integrity of the final product.
3. Utilize hydroseeding with mulch when feasible.
4. Utilize erosion control netting or blankets, with or without seed contained in them on slopes greater than 3:1.
5. Utilizing stabilization materials or sodding areas where runoff is rapid or concentrated.
6. Limiting traffic in the vicinity of streams and wetlands and installing as few temporary crossings as possible.
7. Installing water bars (swale/berms) on slopes to and channels before it gains sufficient volume and momentum to cause scouring.

8. Using stone check dams and silt fences once the soil has begun to move.
9. Preserving existing trees and vegetation near and within buffer areas until after the site has been stabilized.
10. Controlling dust by providing parking lots with prepared surfaces, limiting traffic in all possible ways, planting stockpiles with cover crops or protective blankets, using water trucks, refraining from cultivating and smoothing seedbeds until immediately prior to seeding.

Field Protocol - Areas of special concern will be reviewed with the Contractor prior to initiating site clearing activities. These areas will be continually reviewed by the Contractor and the OSPC and any issues will be identified in the daily or weekly reports. All reports shall be distributed via e-mail to all parties in support of the efforts to address areas of concern in a timely manner.

Best Management Practices - BMP's - Examples include, but are not limited to: sediment fence, erosion control matting, seed, and mulch in accordance with the attached Construction Phasing plan and the Vermont Erosion Prevention and Sediment Control Filed Guide.

Installation Sequencing

1. Construction Staking
A. The construction limits are to be staked in the field by a qualified Surveyor.
B. The remaining clearing and site disturbance limits shall be reviewed by the Engineer prior to initiating any clearing. The Engineer shall designate specimen trees and critical vegetative cover along buffer areas that are to remain during the initial phases of construction.

2. Clearing - The clearing limits shall be demarcated in the field with continuous flagging. Construction fencing shall be installed along the edges of any stream or wetland buffer areas adjacent to or on the lot. Prior to any timber being harvested and removed from the site, a construction entrance pad shall be installed at the entrance point to the project site. Chipping of branches and other woody material is allowed but the material must be disposed of in an approved manner.

3. Inlet Protection - Ensure that BMP's are in place and functioning at catch basins, drainage swales, culvert inlets, and other areas as shown on the EPSC site plan.

4. Protection of Adjacent Sites - Install BMP's along the common lot line of adjacent sites. This would include construction fencing to help avoid unintentional encroachment onto the adjacent property and silt fence when the adjacent lot is downgradient of the construction site.

5. Protection of Construction Site - Prior to initiating earthwork on the lot, surface runoff from areas upgradient portions of the construction site shall be diverted from the proposed areas of disturbance using diversion swales, structures, sand bags, curbing, or other approved method. Protect steep exposed slopes from surface runoff by collecting runoff at the top of the slope and diverting it into a stabilized conveyance, such as a slope drain or stabilized swale.

6. Grubbing
A. Grubbing shall occur only after the erosion control measures around the downgradient perimeter of the site has been established. Those locations shall be reviewed with the Environmental Specialist and Independent Engineer. Existing topsoil shall be retained and stockpiled on site for re-use.
B. The Contractor shall remove all remaining woody material and tree stumps and dispose of them utilizing one or more of the following methods:
i. Burning, provided that permits are acquired from the State of Vermont Solid Waste Management Division and the Town of Shelburne..
ii. Disposal on site within designated slope disposal areas only after an insignificant waste Disposal Permit is acquired. At these sites the following standards shall be met
a. 3' separation to the seasonal high groundwater table.
b. 100' separation to surface waters.
c. Thorough mixing of soil and woody material to minimize future settlement.
d. Covering with a minimum of four (4) feet of cover material.
iii. Chipping with on-site disposal in accordance with Item 5 or disposal off-site in accordance with State requirements.
iv. Disposal at a certified landfill facility.
C. All grubbing of woody materials shall be completed to a depth of at least 12".
D. The Contractor shall remove all medium to large stones and boulders present within the limits of disturbance including future drainage and infrastructure improvements.
i. The larger boulders shall be saved for use in retaining walls.
ii. The smaller stones may be buried in predetermined disposal sites.

7. Soil Stockpiles
A. The Contractor shall strip and stockpile as much as possible of the native topsoil for re-use during a later stage of the project.
B. Each topsoil stockpile shall be placed in locations respective of existing environmental features of the site. Special consideration shall be made to maximize the distance (minimum 100') to the nearest water course.
C. Each topsoil pile shall be surrounded on the downgradient side by a row of silt fence.
D. Any topsoil pile which is to remain in place for greater than 15 days shall be temporarily seeded with winter rye to preserve the integrity and minimize the erosion of the soil constituents and release of soluble nutrients.
E. The Contractor shall locate stockpiles on the uphill side of the disturbed areas, if possible. During windy conditions, stockpiled material shall be covered or watered appropriately to prevent wind erosion.

8. Earth Excavation/Grading
A. Mass earth placement to create the building plateau shall commence only after all remaining EPSC measures depicted on the plans are installed.
B. Surface water diversion BMP's shall employed at the high point of the site until the new drainage swale/hollow is installed.
C. The Contractor shall also limit the soil disturbance and seeding application dates to between April 16th and September 15th.

D. All exposed soils areas (not including structural fill soils or stabilized stone areas) shall be protected prior to any forecasted rain event with mulch or erosion control matting. Pin matting with wire staples in accordance with the manufacturers recommendations to ensure full bonding with soil surface.
E. Install stone check dams in grass-lined swales 50 feet on center to prevent silt from washing into the drainage system during construction. Check dams are to be removed when vegetation is established.

9. Temporary Construction Entrance **-** Required for entrance and egress points from the site.

10. Planting Preparation, Seed, Mulch, Germination, Maintenance
A. The preparation of the topsoil for planting includes final smoothing and removal of small stones. This work shall occur immediately prior to seedingor placement of EC matting so as to avoid exposure to erosion damage and to reduce the amount of dust generated as part of this process.
B. Planting is to occur immediately after the topsoil preparation with special caution being given to upcoming storm events that may displace the seed/soil.
C. The planted areas shall be water regularly to protect the new plants but not over watered so as to cause excess runoff and erosion.
D. All ditches that are not stone-lined shall be topsoiled, and stabilized with erosion control matting. Any area which shows signs of erosion shall be restabilized immediately and maintained until permanent vegetation is established. of
E. Maintenance:
1. All erosion control measures shall be inspected weekly and repaired and/or replaced as needed.
2. All erosion control measures shall be inspected after periods of heavy rain.
3. The stabilized road entrance shall be top dressed with additional stone should the existing stone become clogged with sediment.
4. Hay or straw mulch is subject to wind action. Mulch, where permitted) may require anchoring as the weather conditions warrant.

11. Surface Stabilization - The following stabilization methods are required:
A. Temporary stabilization - Straw mulch (during the earliest phases of the project) or erosion control matting placement is required on all non-contained disturbed areas prior to forcasted rain events.
B. Install stone check dams in drainage swales 50 feet on a center to prevent silt from washing into the drainage system during construction. Check dams shall be removed when vegetation is established.
C. Control dust through the application of water. The exact number of applications and amount shall be based upon field and weather conditions. It shall be spread in such manner and by such devices that uniform distribution is attained over the entire area on which it is ordered placed.
D. Install crushed stone apron of at least 15' width around the perimeter of the building following backfill of the foundation walls.
E. Install temporary (sacrificial) crushed stone on all access ways and laydown areas. These areas will be covered later with the roadway/perking lot base materials or with topsoil.
F. Permanent Stabilization - Required of all surfaces at the completion of construction. The Contractor will install 4" topsoil, sod, seed (where permitted), fertilize, lime, and mulch (seeded areas) the disturbed areas as soon as possible following completion of construction.

1. Use rapidly germinating cover crops prior to seeding when the ground would otherwise be bare.
2. Include rapidly germinating grasses in the seed mixtures when they will not compromise the integrity of the final product.
3. Utilize hydroseeding with mulch when feasible.

Owner/Contractor Responsibilities**:**
1. The Owner/Contractor (O/C) is responsible for the on-going maintenance of all lot specific erosion prevention and sediment control devices and practices. Any subcontractor conducting earth disturbance activities on the project site shall review the EPSC plan and General Permit and shall complete an application and file with the State a request for Co-Permittee status.

2. Periodic inspections shall be performed in accordance with the above schedule to ensure that the erosion and sediment control measures are functioning as required. In addition to the standard periodic inspections, inspections of all of the on-site systems shall be conducted after a rain event causing stormwater to leave the site. Any problems noted during these inspections shall be corrected immediately.

3. Once construction has commenced, the O/C is responsible for the maintenance of erosion and sediment control measures protecting nearby stormwater collection systems and water courses. It is critical that sediment not be allowed to invade the receiving waters.

4. The temporary construction entrance provides a place for parking vehicles off-street and a spot where material can be off-loaded. The intent of the requirement is to provide a stable surface for parking vehicles where mud and debris is not likely to be tracked onto the street. Proper maintenance of the area is required until such time as a permanent driveway can be put into place.

5. During the entire construction process, the O/C is responsible for ensuring that mud, dirt, rocks, and other debris are not allowed to erode or be tracked onto the street system by construction vehicles. Should any mud or other debris find its way to the road system, the O/C shall take immediate steps to have it removed.

6. Maintenance - Silt Fence

A. Inspect sediment fences daily to ensure that construction activities have not impacted their operability and after each rainfall event causing runoff from the site.
B. Should the fabric of the sediment fence collapse, tear, decompose, or become ineffective, replace promptly.
C. Remove the sediment deposits as necessary to provide adequate storage volume for the next rain event and to reduce pressure on the fence. Take care to avoid damaging or undermining the fence during clean-out.
D. If the utilities are installed after BMP's have been put into place, the permit holder is responsible for control of erosion and sediment during the construction process and for ensuring that all BMP devices are re-installed per the original design.

CONTINUED ON TO C6.12 EPSC

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

ESPC NARRATIVE

DATE 11/01/2019
SCALE AS SHOWN
PROJ. NO. 14134

DRAWING NUMBER C6.11

On-Site Plan Coordinator Inspections
1. The OSPC will normally inspect erosion prevention and sediment control measures in conjunction with routine inspections. Inspections will ensure that proper placement and installation of the erosion prevention and sediment control measures are in place.

2. The first inspection will occur prior to clearing of the site to ensure that proper BMP's are in place, including proper demarcation of the clearing limits, installation of construction fencing along the stream/wetland buffer limits, and any other devices required to protect the receiving waters from sediment deposition during the clearing phase.

3. Prior to initiating grubbing and mass earth excavation, the OSPC shall inspect the site to ensure that the construction fencing, silt fence, construction entrance, and other required BMP's are in place.

4. The OSPC will conduct weekly inspections and will prepare weekly reports which are to remain on-site until final stabilization is acheived.

Additional Requirements:

1. All sediment removed from sediment control practices as part of maintenance shall be disposed of in an area that is:
 a. Less than 5% slope.
 b. At least 100ft from any downslope water body or conveyance to a waterbody (including storm drain inlet or ditch)
 c. Area shall be vegetated

2. Stabilize Exposed Soil

Purpose:
Seeding and mulching, applying erosion control matting, and hydroseeding are all methods to stabilize exposed soil. Mulches and matting protect the soil surface while grass is establishing.

Requirements:
All areas of disturbance must have temporary or permanent stabilization within 7 days of initial disturbance, as stated in the project authorization. After this time, any disturbance in the area must be stabilized at the end of each work day.

The following exceptions apply:

- Stabilization is not required if earthwork is to continue in the area within the next 24 hours and there is no precipitation forecast for the next 24 hours.
- Stabilization is not required if the work is occurring in a self-contained excavation (i.e. no outlet) with a depth of 2 feet or greater (e.g. house foundation excavation, utility trenches).

All areas of disturbance must have permanent stabilization within 48 hours of reaching final grade.

How to comply:
Prepare bare soil for seeding by grading the top 3 to 6 inches of soil and removing any large rocks or debris.

Seeding Rates for Temporary Stabilization
April 15 - Sept. 15 --- Ryegrass (annual or perennial: 20 lbs/acre)
Sept. 15 - April 15 --- Winter rye: 120 lbs/acre

Seeding Rates for Final Stabilization:Choose - See Sheet C6.6

Mulching Rates
April 15 - Sept.15 -- Hay or Straw: 1 inch deep (1-2 bales/1000 s.f.)
Sept.15 - April 15 -- Hay or Straw: 2 in. deep (2-4 bales/1000 s.f.)

Erosion Control Matting
As per manufacturer's instructions

Hydroseed
As per manufacturer's instructions

3. Stabilize Soil at Final Grade

Purpose:
Stabilizing the site with seed and mulch or erosion control matting when it reaches final grade is the best way to prevent erosion while construction continues.

Requirements:
Within 48 hours of final grading, the exposed soil must be seeded and mulched or covered with erosion control matting.

How to comply:
Bring the site or sections of the site to final grade as soon as possible after construction is completed. This will reduce the need for additional sediment and erosion control measures and will reduce the total disturbed area.
For seeding and mulching rates, follow the specifications under Rule 8, Stabilizing Exposed Soil.

4. Dewatering Activities

Purpose:
Treat water pumped from dewatering activities so that it is clear when leaving the construction site.

Requirements:
Water from dewatering activities that flows off of the construction site must be clear. Water must not be pumped into storm sewers, lakes, or wetlands unless the water is clear.

How to comply:
Using sock filters or sediment filter bags on dewatering discharge hoses or pipes, discharge water into silt fence enclosures installed in vegetated areas away from waterways. Remove accumulated sediment after the water has dispersed and stabilize the area with seed and mulch.

END OF SECTION ESPC NARRATIVE

SECTION 02150 - EROSION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
 1. The work under this section includes but is not limited to providing all labor, equipment and materials for the installation of all required site related erosion control measures. If not otherwise directed on the plans, erosion control shall be in strict conformity with the latest revision of the "Vermont Erosion Prevention and Sediment Control Field Guide" available from the Stormwater Section of the Vermont Water Quality Division.

B. Related sections:
 1. Section 02210 - Site Earthwork
 2. Section 02936 - Permanent Seeding

1.02 GENERAL NOTES

A. The discharge of sediment laden water from the project site is prohibited. All discharged water from dewatering operations shall discharge into a temporary sedimentation basin.

B. Contractor shall install all erosion control measures as depicted on plans and details or as recommended by the Stormwater Section of the Vermont Water Quality Division prior to any construction. Contractor shall also be responsible for inspecting and maintaining all erosion control measures until project is completed.

C. Contractor shall also limit the soil disturbance and seeding application dates to between April 15th and September 15th. If soil disturbance occurs later than October 15th and prior to April 15th, winter erosion control measures will be necessary. Contractor shall consult with the Engineer for additional site specific winter erosion control measures.

D. All stockpile material (topsoil, borrow, etc.) will have a silt fence constructed around the perimeter. Seed and mulch stockpiled material as soon as possible to prevent soil erosion and sedimentation off site. Locate stockpiles on the uphill side of the disturbed areas, if possible. During windy conditions, stockpiled material shall be covered or watered appropriately to prevent wind erosion.

E. Slopes greater than 3:1 (H:V) shall have erosion control matting tting installed to stabilize the slope and reduce the erosion potential. Install matting so that all parts are in contact with the underlying soil. Pin matting with wire staples 3' o.c. to ensure full bonding with soil surface. Matting shall be installed in accordance with manufacturer's recommendations.

F. Control dust through the application of calcium chloride or water. An average application of one pound of calcium chloride per square yard of exposed area should be considered for each treatment. The exact number of applications and amount of dust controller shall be based upon field and weather conditions. It shall be spread in such manner and by such devices that uniform distribution is attained over the entire area on which it is ordered placed.

PART 2 - PRODUCTS

2.01 EROSION CONTROL NETTING

A. Jute netting shall consist of undyed and unbleached yarn woven into a uniform open plain weave mesh.

2.02 EROSION CONTROL MATTING

A. Where required on the plans or where directed by the Engineer, erosion control blankets (matting) shall be North American Green S150BN for swales and slope stabilization, or approved equal, for all areas for permanent installation, and C125 and SC150 where matting is being used as temporary protection of disturbed soils until a final surface stabilization method is employed.

2.03 FILTER FABRIC

A. When filter fabric is required, it shall conform to the requirements of Mirafi 500X or approved equivalent.

2.04 CALCIUM CHLORIDE

A. Calcium chloride shall conform to the requirements of AASHTO M 144. Either regular flake calcium chloride, Type 1 or concentrated flake, pellet or other granular calcium chloride, Type 2, may be used.

2.05 WATER

A. All water used shall be clean and free of harmful amounts of oil, salt, acids, alkalies, sugar, organic matter and other substances injurious to the finished product, plant life or the establishment of vegetation.

2.06 SEDIMENT WATTLES

A. Sediment wattles shall be King Fibre Corporation silt trapper sediment wattles or approved equal.

2.07 POLYACRUMIDE

A. Polyacrumide (polymer) logs (blocks) shall only be used with permission from the Engineer and VT ANR Water Quality Division. Type shall be Applied Polymer Systems, Inc. floc log or approved equal. The type of floc log used shall be based upon a site specific testing of the native soils.

2.08 STONE CHECK DAMS

A. Stone check dams should be constructed of 2 to 3 inch stone. Hand or mechanical placement will be necessary to achieve complete coverage of the ditch or swale and to ensure that the center of the dam is lower than the edges. The maximum contributing drainage area from any one check dam shall not exceed two acres. See the detail drawing in the Erosion Control Details Drawings for the proper installation of stone check dams.

PART 3 - EXECUTION

3.01 HAY BALE CHECK DAM AND INLET PROTECTION

A. Hay bales shall not be used to construct check dams or as a means of inlet protection.

3.02 SILT FENCES

A. The silt fences shall be constructed in accordance with the construction detail. The fence shall generally be placed 10 feet from the toe of the slope or as shown on the plans. The ends of the fence shall be placed uphill to form a horseshoe shape to trap all runoff. Silt fence shall not be placed across areas of concentrated flow.

B. The silt fences shall be inspected periodically for damage or build-up of sediments. All damaged fences shall be repaired or replaced. Sediment deposits shall be removed from the fence as they build up and be placed in an area where there is no danger of further erosion.

3.03 EROSION MATTING

A. Erosion matting shall be placed on all grass-lined ditches with profile grades exceeding 5.0% and all other areas called out on the plans, and shall be placed and maintained in accordance with the Vermont Agency of Transportation Standard Specifications Sections 654 and 755.07.

3.04 RESTORATION

A. As soon as construction is completed in a given area, it shall be topsoiled, seeded, fertilized and mulched as specified in Section 02936 - Permanent Seeding.

3.05 STABILIZED ROAD ENTRANCE

A. A stabilized pad of crushed stone located at any point where traffic will be entering or leaving the construction site to or from a public right-of-way or street or as shown on the drawings shall be constructed for the purpose of preventing the tracking of sediment onto public rights-of-way.

B. Design Criteria:
 1. Use 1.5 to 2.5 inch stone.
 2. Use 8 inch layer of stone.
 3. Stone pad shall be full width of entrance.
 4. Minimum length shall be 50 feet.

3.06 GRASS-LINED DITCHES

A. All ditches that are not stone-lined shall be topsoiled, seeded, fertilized and mulched. Any area which shows signs of erosion shall be reseeded immediately and maintained until permanent vegetation is established.

3.07 MAINTENANCE

A. All erosion control measures shall be inspected daily and repaired and/or replaced as needed.

B. All erosion control measures shall be inspected after periods of heavy rain.

C. The stabilized road entrance shall be top dressed with additional stone should the existing stone become clogged with sediment.

D. Hay or straw mulch is subject to wind action. Mulch may require anchoring as the weather conditions warrant.

3.08 STONE CHECK DAMS

A. The drainage area of the ditch or swale being protected should not exceed 10 acres.

B. The drainage area to any check dam shall not exceed 2 acres.

C. The maximum height of the check dam should be 2 feet. The center of the check dam must be at least 6 inches lower than the outer edges. The maximum spacing between the dams should be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.

D. Check dams should be installed before runoff is directed to the swale or drainage ditch.

3.09 DEWATERING METHODS

A. All dewatering methods associated with this project are to be approved by the VT DEC and the engineer prior to use.

END OF SECTION 02150

SECTION 02936 - PERMANENT SEEDING

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:
 1. Furnishing all labor, materials, and equipment to complete all seeding work as shown on the drawings and specified herein.
 2. Except where otherwise shown or specified, the Contractor shall seed all areas where new contours are shown on the drawings and all areas where existing ground cover has been disturbed by the Contractor's operations.

B. All work and materials of this Section shall conform to the applicable requirements of the VAOT Standard Specifications, Division 600.

1.02 SUBMITTALS

A. Provide the following for approval prior to delivery to the site:
 1. Supplier's Certificate of Compliance attesting that lime, fertilizer and seed meet the requirements specified.
 2. The Contractor shall provide representative topsoil samples for testing and approval, deliver samples to a public extension service agency testing laboratory, have testing report sent directly to the Engineer and pay all costs. Testing shall report on mechanical and chemical (pH soluble salts) analysis. Report shall be submitted at least one month before any loaming is to be done.

1.03 SEEDING SEASONS

A. Seeding and initial fertilizing shall be done between April 1 and June 1, between August 15 and October 15, or as permitted. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untillable. If seeding is done during July or August, additional mulch material may be required by the Engineer.

PART 2 - PRODUCTS

2.01 LIME

A. Lime shall be standard, ground dolomite limestone, agricultural grade, containing a minimum of 95% of calcium and magnesium carbonates. 100% shall pass the 10 mesh sieve: minimum 90% shall pass the 20 mesh sieve; minimum 40% shall pass the 100 mesh sieve.

2.02 FERTILIZER

A. Fertilizer shall be commercial grade granular fertilizer as required for soil conditions as specified in Section 643 of the VAOT Standard Specifications. The fertilizer shall be delivered to the project in new, clean, sealed containers which bear a label fully describing the contents, the chemical analysis of each nutrient, the fertilizer grade, the net bulk, the brand and the name and address of the manufacturer. The fertilizer and labels shall conform to all existing State and Federal regulations, and shall meet the standards of the Association of Official Agricultural Chemists.

2.03 GRASS SEED

A. Provide fresh, clean, new-crop seed of the grass species, proportions and minimum percentages of purity, germination and maximum percentage of weed seed as follows:

1. Park seed shall normally be used on loam areas. This seed mixture shall conform to the following table:

Kind of Seed	Minimum Purity	Minimum Germination	Lbs/Acre
Creeping Red Fescue	96%	85%	40
Perennial Ryegrass	98%	90%	50
Kentucky Bluegrass	97%	85%	25
Redtop	95%	80%	5
		TOTAL =	120

2. Slope seed shall normally be used for all slope work, usually 3:1 or steeper and shall conform to the following table:

Kind of Seed	Minimum Purity	Minimum Germination	Lbs/Acre
Creeping Red Fescue	96%	85%	35
Perennial Ryegrass	98%	90%	30
Redtop	95%	80%	5
Alsike Clover	97%	90%	5
Birdsfoot Trefoil	98%	80%	5
		TOTAL =	80

3. Shade seed shall normally be used in shaded areas in or along the edge of wooded areas. This seed mixture shall conform to the following table:

Kind of Seed	Minimum Purity	Minimum Germination	Lbs/Acre
Creeping Red Fescue	95%	80%	30
Tall Fescue	96%	80%	20
Crownvetch	95%	80%	30
		TOTAL =	80

B. The seed mixture shall be delivered in new, clean, sealed containers. Labels and contents shall conform to all State and Federal regulations. Seed shall be subject to the testing provisions of the Association of Official Seed Analysts.

C. Seed that has become wet, moldy, or otherwise damaged will be rejected.

2.04 MULCH

A. Mulch must be installed on all seeded areas. The following mulches are acceptable for use.
 1. Hay mulch free of weeds and coarse matter at a rate of 90 pounds per 1,000 square feet.
 2. Wood fiber applied in a slurry (1/6" or longer) at a rate of 40 pounds per 1,000 square feet.

2.05 WATER

A. All water used shall be obtained from fresh water sources and shall be free from injurious chemical and other toxic substances harmful to plant life. No water which is brackish will be permitted at any time. The Contractor shall identify to the Engineer all sources of water at least two weeks prior to use. The Engineer, at his discretion, may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source which is disapproved by the Engineer following such tests.

PART 3 - EXECUTION

3.01 PREPARATION

A. Examine finish surfaces and grades. Do not start seeding work until unsatisfactory conditions are corrected. Perform seeding work only after planting and other work affecting ground surface has been completed.

B. Notify Landscape Architect at least seven (7) working days prior to starting seeding.

C. Prepare areas immediately prior to seeding as follows:
 1. Loosen soil of seed areas to a minimum depth of 4".
 2. Remove stones over 1" in any diameter and sticks, roots, rubbish and extraneous matter.
 3. Remove existing weeds and grasses by pulling or tilling under.
 4. Grade areas to be seeded to a smooth, free draining even surface with a loose, moderately coarse texture.
 5. Remove ridges and fill depressions as required to drain.
 6. Restore prepared areas if eroded or disturbed prior to seeding.

CONTINUED ON SHEET C6.13

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN SAL
CHECKED DSM
APPROVED DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

ESPC NARRATIVE

DATE 11/01/2019
SCALE AS SHOWN
PROJ. NO. 14134

DRAWING NUMBER C6.12

3.02 SEEDING CONDITIONS

A. Seeding shall not be done when the ground is frozen, snow covered, muddy, or in any other unsatisfactory condition for planting. No seeding operations shall be conducted under adverse weather conditions or when soil moisture conditions are unfavorable (too wet or too dry) or when winds exceed 5 MPH.

B. Construction methods shall be those established as agronomically acceptable and feasible. The Contractor shall keep all equipment and vehicular and pedestrian traffic off areas that have been seeded to prevent excessive compaction and damage to young plants. Where such compaction has occurred, the Contractor shall rework the soil to make a suitable seed bed; then reseed and mulch such areas with the full amounts of the specified materials, at no extra expense to the Owner.

C. Surface and seepage water should be drained or diverted from the site to prevent drowning or winter killing of the plants.

D. All areas and parts of areas which fail to show a uniform stand of grass for any reason whatsoever shall be reseeded, and such areas and parts of areas shall be seeded repeatedly until all areas are covered with a satisfactory growth of grass.

E. Watering is considered a necessary element for establishment and survival.

F. Where ryegrass has been planted for temporary erosion control and has not been eliminated prior to the completion of the work, such areas shall be disced at least 3 inches deep and seeded to permanent grasses to prevent the ryegrass from reseeding and becoming competitive with and retarding development of the permanent cover.

3.03 SEEDING

A. Lime and fertilizer should be applied prior to or at the time of seeding and incorporated into the soil. Kinds and amounts of lime and fertilizer should be based on an evaluation of soil tests. When a soil test is not available, the following minimum amounts should be applied:

Agricultural limestone, 2 tons per acre or 100 lbs. per 1,000 square feet.

Nitrogen (N), 50 lbs. per acre or 1.1 lbs. per 1,000 square feet.

Phosphate (P2O5), 100 lbs. per acre or 2.2 lbs. per 1,000 square feet.

Potash (K2O), 100 lbs. per acre or 2.2 lbs. per 1,000 square feet.

(Note: This is the equivalent of 500 lbs. per acre of 10-20-20 fertilizer or 1,000 lbs. per acre 5-10-10).

B. Seed should be spread uniformly by the method most appropriate for the site. Methods include broadcasting and hydroseeding as follows:
1. Broadcasting: Sow seed using mechanical spreader at a rate of 4 lbs./1,000 square feet. Distribute seed evenly over entire area by sowing equal quantity in tow directions at right angles to each other. Rake seed lightly into top 1/8" of topsoil, roll lightly and water with a fine spray.
2. Hydroseeding: Mix specified seed, fertilize and pulverize mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate.

3.04 MULCHING

A. Mulch materials shall be spread uniformly by hand or machine at a rate of two 50 lb. bales per 1,000 square feet.

B. Organic Mulch Anchoring - Straw or hay mulch must be anchored immediately after spreading to prevent wind blowing.

3.05 MAINTENANCE

A. The maintenance period shall begin immediately after seeding and shall continue until acceptance.

B. All mulches must be inspected periodically, in particular after rainstorms, to check for rill erosion. Where erosion is observed, additional mulch shall be applied. Net should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, reinstall net as necessary after repairing damage to the slope. Inspections should take place until grasses are firmly established. Grasses shall not be considered established until a ground cover is achieved which is mature enough to control soil erosion and to survive severe weather conditions. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

C. Seeding areas shall be protected and maintained by watering, reseeding, mowing, weeding, rolling, insect or disease control measures, re-fertilizing and repair of washouts which are necessary.

D. The Contractor shall maintain all seeded areas until full vegetation is established.

E. All seeded areas shall be kept free from weeds and debris, such as stones, cables, baling wire, and all slopes 4:1 or less (flatter) and level turf shall be mowed in the following manner:

1. When grass reaches a height of 4-6", mow to a height of 3".
2. At least two cuttings shall be made prior to final acceptance.

F. Following mowing, all permanent seeding grass areas (mowed and unmowed) shall receive a uniform application of slow release fertilizer hydraulically placed at the rate of 10 pounds per 100 square feet.

3.06 ACCEPTANCE

A. Inspection to determine acceptance of seeded areas will be made by the Landscape Architect, upon Contractor's written request.
1. Provide notification at least ten (10) working days before requested inspection date.

B. Seeded areas will be acceptable provided all installation and maintenance requirements have been complied with and a healthy uniform lawn is established.

C. Upon acceptance, the Owner will assume maintenance.

3.07 WARRANTY

A. All seeded areas will be warranted for a period of twelve months from date of Owner's acceptance. Should any seeded areas fail to maintain full vegetation, failed areas will be refurbished until this specification is achieved at the cost of the Contractor.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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SUNDERLAND FARMS COMMUNITY
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14134

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C6.13

PROJECT COORDINATION

PART 1 – GENERAL

1.01 MEETINGS & PROJECT ACCESS

A. The Owner shall be notified five (5) days prior to commencement of Work by the Contractor.

B. The Contractor will coordinate with the Owner to arrange an on–site pre–construction meeting prior to commencement of any work. Job superintendents and subcontractors shall be included in this meeting.

C. The Contractor will coordinate all phases of the Work, so as not to interfere with the normal work procedures in the area.

D. The Contractor shall conduct his work in such a manner as to not interfere with or endanger work or traffic in areas adjacent to the construction area, except as permitted by the Owner. The Contractor shall so arrange his construction operations as to provide access for emergency vehicles and equipment to the work site at all times.

1.02 LABOR

A. The Contractor and subcontractors will employ mechanics skilled in their respective trades.

B. All labor will be performed in a neat and workmanlike manner.

1.03 PROTECTION OF PERSONS AND PROPERTY

A. The Contractor shall be responsible for initiating, maintaining, and supervising all O.S.H.A. safety precautions in connection with the Work.

B. Fire Protection: The Contractor shall take all necessary precautions to prevent fires adjacent to the Work and shall provide adequate facilities for extinguishing fires. The Contractor shall also prevent fires in project related buildings and shall prevent the spread of fires to areas outside the limits of the Work.

C. Safety Precautions: Prior to commencement of Work, the Contractor shall be familiar with all safety regulations and practices applicable with construction operations. No additional payments will be made for equipment and procedures necessitated by these safety precautions.

1.04 CORRECTION OF WORK

A. The Contractor shall promptly correct all Work rejected by the Owner as defective or as failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such rejected Work.

1.05 WEATHER CONDITIONS

A. No Work shall be done when, in the opinion of the Owner, the weather is unsuitable. No concrete, earth backfill, embankment, or paving shall be placed upon frozen material. If there is delay or interruption in the Work due to weather conditions, the necessary precautions must be taken to bond new Work to old.

B. Protection Against Water and Storm: The Contractor shall take all precautions to prevent damage to the Work by storms or by water entering the site of the Work directly or through the ground. In case of damage by storm or water, the Contractor, at his own expense, shall make repairs or replacements or rebuild such parts of the Work as the Engineer may require in order that the finished work may be completed as required by the Drawings and Specifications.

1.06 DISPOSAL OF DEBRIS

A. All debris and excess materials, other than that which is authorized to be reused, become the property of the Contractor and shall be promptly removed from the property. The Contractor shall receive title to all debris and/or excess material. The Owner will not be responsible for any loss or damage to debris or excess material owned by the Contractor.

1.07 PROJECT LAYOUT

A. The Contractor shall be responsible for providing all necessary survey staking.

1. Locate and protect control points before starting work on the site.
2. Preserve permanent reference points during progress of the Work.
3. Establish a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
   a. Record locations, with horizontal and vertical data, on Project Record Documents.

1.08 TESTING

A. The Contractor is responsible for obtaining testing and inspection services.

SITE CLEARING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Remove surface debris.
2. Clear site of plant life and grass.
3. Remove trees and shrubs.
4. Remove root system of trees and shrubs.

PART 2 – PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 PROTECTION

A. Protect utilities that remain from damage.

B. Protect trees, plant growth, and features designated to remain as final landscaping.

C. Protect bench marks and existing structures from damage or displacement.

D. Use means necessary to prevent dust becoming a nuisance to the public, to neighbors, and to other work being performed on or near the site.

E. Maintain access to the site at all times.

3.02 CLEARING

A. Clear areas required for access to site and execution of Work.

B. Remove trees and shrubs within marked areas. Remove stumps, roots and tap roots and other projections 1" or greater in diameter to 2'–0" below the excavated surfaces in cut areas and 2'–0" below the exposed subgrade in fill areas.

3.03 REMOVAL

A. Remove debris, rock, and extracted plant life from site.

B. The Contractor shall coordinate Work with the Engineer and Owner in establishing suitable areas within the property limits for depositing debris, rocks and extracted plant life. The Contractor shall be responsible for backfilling (capping) and grading all waste sites.

3.04 UTILITIES

A. Coordinate with utility companies and agencies as required.

SITE EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. All excavation (unless covered in other sections of these specifications), removal and stockpile of topsoil, stabilization fabric, and other miscellaneous and appurtenant works.
2. Site filling.
3. Roadway structural sections.

1.02 PROTECTION

A. Protect bench marks and existing structures.

B. Protect above or below grade utilities which are to remain.

1.03 SUBMITTALS

A. Testing laboratory reports indicating that material for backfill meets requirements of this Section.

B. Field density test reports of site fill in place.

C. Field density test reports for roadway structural sections in place.

D. Stabilization Fabric: Submit copies of manufacturer's specifications and installation instructions.

PART 2 – PRODUCTS

2.01 STRUCTURAL FILL – CRUSHED GRAVEL (AOT SPEC. 704.05, FINE)

A. All materials shall be secured from approved sources. This gravel shall consist of angular and round fragments of hard durable rock of uniform quality throughout, reasonably free from thin elongated pieces, soft or disintegrated stone, dirt, organic or other objectionable matter. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
2"	100
1 1/2"	90 – 100
No. 4	30 – 60
No. 100	0 – 12
No. 200	0 – 6

2.02 CRUSHED GRAVEL (AOT SPEC. 704.05, COARSE)

A. This material shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
4"	95 – 100
No. 4	25 – 50
No. 100	0 – 12
No. 200	0 – 6

At least 50% by mass (weight) of the material coarser than the No. 4 sieve shall have at least one fractured face.

2.03 COMPACTED FILL/GRANULAR BORROW

A. This material shall be free of shale, clay, friable material, debris, and organic matter, graded in accordance with ANSI/ASTM C136 within the following limits:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
3"	100
¾"	75 – 100
No. 4	20 – 100
No. 100	0 – 20
No. 200	0 – 6

2.04 DRAINAGE COURSE (AOT SPEC. 704.16)

A. Rock for drainage applications shall be produced from natural gravels or crushed quarried rock and shall consist of clean, hard, sound, and durable material. It shall be obtained from approved sources and shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
1"	100
¾"	90 – 100
¾"	20 – 55
No. 4	0 – 10
No. 8	0 – 10

2.05 DENSE GRADED CRUSHED STONE

A. Dense Graded Crushed Stone should consist of a well graded crushed run stone and should meet the requirements for Vermont AOT Standard Specifications Item 704.06 Dense Graded Crushed Stone for Subbase and the gradation requirements shown in Table 704.06A of the Vermont AOT Standard Specifications.

Sieve Designation	Percent Finer by Weight
3½"	100
3"	90 – 100
2"	75 – 100
1"	50 – 80
½"	30 – 60
No. 4	15 – 40
No. 200	0 – 6

2.06 RECYCLED ASPHALT PAVEMENT (RAP) 1½" MINUS CRUSHED ASPHALT

A. This material shall be free of Portland Cement and approved by the engineer prior to installation. This material shall not be mixed with gravel and shall meet the following grading requirements:

Sieve Designation	Percent by Weight Passing Square Mesh Sieve
2"	100
1½"	90 – 100
No. 4	30 – 60
No. 100	0 – 12
No. 200	0 – 6

2.07 SAND BORROW AND CUSHION

A. Sand Borrow shall consist of maerial reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the requirements for Vermont AOT Standard Specifications and the gradation requirements shown in Table 703.03A of the Vermont AOT Standard Specifications.

Sieve Designation	Percent Finer by Weight
2"	100
1½"	90 – 100
½"	70 – 100
No. 4	60 – 100
No. 100	0 – 20
No. 200	0 – 8

2.08 GEOTEXTILE

A. Subsurface Drainage Geotextile: Nonwoven needle–punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.
2. Grab Tensile Strength: 120 lbf; ASTM D 4632.
3. Tear Strength: 50 lbf; ASTM D 4533.
4. Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
5. Permittivity: 1.7 per second, minimum; ASTM D 4491.
6. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 3; AASHTO M 288.
2. Grab Tensile Strength: 200 lbf; ASTM D 4632.
3. Sewn Seam Strength: 222 lbf; ASTM D 4632.
4. Tear Strength: 75 lbf; ASTM D 4533.
5. Puncture Strength: 90 lbf; ASTM D 4833.
6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
7. Permittivity: 0.02 per second, minimum; ASTM D 4491.
8. UV Stability: 50 percent after 500 hours' exposure; ASTM D 4355.
9. Weight: 4.0 oz/yd² minimum.

PART 3 – EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Identify known below grade utilities. Stake and flag locations.

C. Maintain and protect existing utilities remaining which pass through work area.

D. Upon discovery of unknown utility or concealed conditions, discontinue affected work; notify Engineer.

3.02 EROSION CONTROL

A. Erosion control must be installed prior to beginning any earthwork operations.

3.03 TOPSOIL EXCAVATION

A. Excavate topsoil from areas to be excavated, re–landscaped or regraded and stockpile in areas designated on site or as directed by the Engineer.

B. Maintain the stockpile in a manner which will not obstruct the natural flow of drainage.

1. Maintain stockpile free from debris and trash.
2. Keep the topsoil damp to prevent dust and drying out.

3.04 SUBSOIL EXCAVATION

A. Excavate subsoil from areas to be regraded in accordance with plans.

B. Excavate subsoil required to accommodate site structures, construction operations, roads, and parking areas.

C. Grade top perimeter of excavation to prevent surface water from draining into excavation.

D. Notify engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Correct areas over–excavated by error as directed by the Engineer.

3.05 DITCHES

A. Cut accurately to the cross–sections, grades, and elevations shown.

B. Maintain excavations free from detrimental quantities of leaves, sticks, trash, and other debris until completion of the work.

C. Dispose of excavated materials as shown on the drawings or directed by the Engineer; except do not, in any case, deposit materials less than three feet from the edge of a ditch.

3.06 ROADWAY EMBANKMENTS AND BERMS

A. When embankments are to be made on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.

B. Any excavated rock, ledge, boulders, and stone, except where required in the construction of other items or otherwise directed, shall be used in the construction of embankments to the extent of the project requirements and generally shall be placed so as to form the base of an embankment.

C. Frozen material shall not be used in the construction of embankments, nor shall the embankments or successive layers of the embankments be placed upon frozen material. Placement of material other than rock shall stop when the sustained air temperature, below 32 degrees Fahrenheit, prohibits the obtaining of the required compaction. If the material is otherwise acceptable, it shall be stockpiled and reserved for future use when its condition is acceptable for use in embankments.

D. When an embankment is to be constructed across a swamp, muck, or areas of unstable soils, the unsuitable material shall be excavated to reach soils of adequate bearing capacity and the embankment begun. Alternative methods, such as use of a stabilization fabric in place of excavation and backfill, may be utilized only after approval of same by the Engineer.

E. Material being placed in embankments shall be placed in horizontal layers of uniform thickness across the full width of the embankment. Stumps, trees, rubbish, and other unsuitable material shall not be placed in embankments.

F. Embankment areas shall be placed in eight–inch maximum lifts. Effective spreading equipment shall be used on each layer to obtain uniform thickness prior to compaction. Each layer shall be kept crowned to shed water to the outside edge of embankment and continuous leveling and manipulating will be required to assure uniform density. The entire area of each layer shall be uniformly compacted to at least the required minimum density by use of compaction equipment consisting of rollers, compactors, or a combination thereof. Earth–moving and other equipment not specifically manufactured for compaction purposes will not be considered as compaction equipment.

G. All fill material shall be compacted at a moisture content suitable for obtaining the required density. In no case shall the moisture content in each layer under construction be more than three percent above the optimum moisture content and shall be less than that quantity that will cause the embankment to become unstable during compaction. Sponginess, shoving, or other displacement under heavy equipment shall be considered evidence for an engineering determination of lack of stability under this requirement, and further placement of material in the area affected shall be stopped or retarded to allow the material to stabilize.

H. When the moisture content of the material in the layer under construction is less than the amount necessary to obtain satisfactory compaction by mechanical compaction methods, water shall be added by pressure distributors or other approved equipment. Water may also be added in excavation or borrow pits. The water shall be uniformly and thoroughly incorporated into the soil by disc, harrowing, blading, or by other approved methods. This manipulation may be omitted for sands and gravel. When the moisture content of the material is in excess of three percent above optimum moisture content, dry material shall be thoroughly incorporated into the wet material, or the wet material shall be aerated by disking, harrowing, blading, rotary mixing, or by other approved methods; or compaction of the layer of wet material shall be deferred until the layer has dried to the required moisture content by evaporation.

3.07 COMPACTION REQUIREMENTS

A. All backfills and fills shall be compacted in even lifts (12" maximum) to attain the required densities as follows:

Location	Modified Proctor ASTM D–1557
Subgrade (8") and Gravel for Roads and Parking Lots	95%
General Embankments	90%

UTILITY TRENCHING AND BACKFILLING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Trench, backfill, and compact as specified herein and as needed for installation of underground utilities.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

C. Comply with all requirements of governmental agencies having jurisdiction.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

A. Fill and backfill materials:

1. Provide backfill materials free from organic matter and deleterious substances, containing no rocks or lumps over 6" in greatest dimension.
2. Fill material is subject to the approval of the Engineer, and is that material removed from excavations or imported from off–site borrow areas, predominantly granular, non–expansive soil free from roots and other deleterious matter.
3. Do not permit rocks having a dimension greater than 2" within 2' of the outside of pipe.
4. Cohesionless material used for backfill: Provide sand free from organic material and other foreign matter, and as approved by the Engineer.

PART 3 – EXECUTION

3.01 PROCEDURES

A. Existing Utilities:

1. Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. If damaged, repair or replace at no additional cost to the Owner.
2. When existing underground utilities, which are not scheduled for removal or abandonment, are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.
3. If the service is interrupted as a result of work under this section, immediately restore service by repairing the damaged utility at no additional cost to the Owner.
4. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the Engineer and secure his instructions.
5. Do not proceed with permanent relocation of utilities until written instructions are received from the Engineer.

B. Protection of persons and property:

1. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or with public access.
2. Operate warning lights during hours from dusk to dawn each day and as otherwise required.
3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this section.

C. Dewatering: The Contractor, at all times, shall conduct his operations so as to prevent the accumulation of water, ice, and snow in excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress of quality of the work. Under no conditions shall water be allowed to rise in open trenches after pipe has been placed.

D. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner which will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets, nor cause any interference in the use of streets and road by the public. Pipes under construction shall not be used for drainage of excavations.

E. Maintain access to adjacent areas at all time.

3.02 TRENCHING

A. Care shall be exercised by the Contractor to avoid disrupting the operation of existing facilities without prior written approval of the Engineer.

B. Provide sheeting and shoring necessary for protection of the work and for the safety of personnel.

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134

DRAWING NUMBER C7.0

1. Sheeting and bracing required for trenches shall be removed to the elevation of the pipe, but no sheeting will be allowed to be pulled, removed, or disturbed below the pipe.

C. A trench shall be excavated to the required depth and to a width sufficient to allow for joining of the pipe and compaction of the bedding and backfill material under and around the pipe. Where feasible, trench walls shall be vertical.

D. The completed trench bottom shall be firm for its full length and width.

E. If indicated on the plans or directed by the Engineer, poor foundation material encountered below the normal grade of the pipe bed shall be removed and replaced with granular backfill.

F. Where pipes are to be placed in embankment fill, the excavation shall be made after the embankment has been completed to a height of 3 feet plus the diameter of the pipe above the designed grade of the pipe.

G. Excavating for appurtenances:

1. Excavate for manholes and similar structures to a distance sufficient to leave at least 12" clear between outer surfaces and the embankment or shoring that may be used to hold and protect the banks.

2. Over-depth excavation beyond such appurtenances that has not been directed will be considered unauthorized. Fill with sand, gravel, or lean concrete as directed by the Engineer, and at no additional cost to the Owner.

H. Excavation shall not interfere with normal 45° bearing splay of foundations.

I. All trenching shall be in accordance with the latest OSHA requirements.

J. Where utility runs traverse public property or are subject to governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.

K. Where trenching occurs in existing lawns, remove turf in sections and keep damp. Replace turf upon completion of the backfilling.

3.03 BEDDING

A. Pipe Bedding Area: Prior to laying pipe, bedding material shall be placed to the limits of the excavation and to a depth beneath the pipe as specified. This material shall be either sand, gravel, or crushed stone and shall not contain large lumps and stones over one inch in diameter. As the pipe is laid, bedding material shall be extended to 6" above the pipe and leveled along the width of the trench.

3.04 BACKFILLING

A. Backfilling shall not be done in freezing weather, with frozen materials, or when materials already placed are frozen.

B. Unless otherwise specified or indicated on the plans, material used for backfilling trenches above the bedding area shall be suitable material which was removed during excavation or obtained from borrow and when compacted shall make a dense stable fill. The material shall not contain vegetation, porous matter, masses of roots, individual roots more than 18 inches long or ½ inch thick, or stones greater than 50 pounds or larger than six inches in the widest dimension.

C. If additional material is required, it shall be furnished from approved sources.

D. Backfill material shall be evenly spread and compacted in lifts not more than 12 inches thick or as approved by the Engineer. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction.

E. Reopen trenches which have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the Engineer.

F. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work and, after approvals have been made, refill and compact as specified, all at no additional cost to the Owner.

G. Take special care in backfilling and bedding operations to not damage pipe and pipe coatings.

H. No compacting shall be done when the material is too wet to be compacted properly. At such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions are taken as may be necessary to obtain proper compaction.

I. Backfill material shall be compacted to the following percentages of maximum dry density and the in-place moisture content shall not be more than 2% above the optimum moisture content, as determined by Modified Proctor ASTM D1557.

1. Around all structures, under roadway paving, shoulder and embankments – 95%.

2. All other areas – 90%.

BITUMINOUS CONCRETE PAVING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Base Courses

2. Leveling Courses

3. Finish Course

B. General: This work shall consist of one or more courses of bituminous mixture, constructed on a prepared foundation in accordance with these Specifications and the type of surface being placed, and in conformity with the lines, grades, thicknesses and typical cross sections shown on the plans or established by the Engineer.

1.02 QUALITY ASSURANCE

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. All materials and installation shall be in accordance with The Asphalt Institute Manual (MS-4) and the VAOT Standard Specifications, (Latest Edition).

C. Mixing Plant: Conform to State of Vermont Standards.

D. Obtain materials from same source throughout.

1.03 PROJECT CONDITIONS

A. Bituminous concrete shall not be placed between November 1 and May 1. Material shall not be placed when the granular subbase is wet or when the air temperature at the paving site in the shade and away from artificial heat is as follows:

Air Temperature Degrees Fahrenheit	Pavement Compacted Depth
40 Degrees or below	1 1/4" or Greater
50 Degrees or below	Less than 1 1/4"

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials shall be combined and graded to meet the criteria as defined in the VAOT Standard Specifications, Division 700 for bituminous concrete.

B. Gradation: Materials shall be combined and graded to meet composition limits specified in VAOT Standard Specification, Section 406.03, for the base course and finish course. Unless specifically shown on the Plans, all

1. Bituminous concrete pavement shall be designed in conformance with the design criteria for heavy duty bituminous concrete pavement. (75 blows/side)

2. All Asphalt Cement used in the bituminous concrete pavement shall be PG 58-28 (or VTrans approved mix) unless otherwise noted.

C. Thickness of paving for drives and parking lots shall be as shown on the plans, consisting of base course and finish course.

D. For pavement reconstruction areas due to trenching, the depth of each course shall be increased by 1/2". Pavement reconstruction caused by trench reopening due to improper placement or non-approved placement shall be performed at no additional cost to the Owner.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install in accordance with VAOT Standard Specifications, Section 406.

3.02 EXAMINATION

A. Verify that compacted granular base is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.03 PREPARATION

A. Matching Surfaces: When a new pavement is to match an existing bituminous pavement for a roadway or trench, the Contractor shall vertically smooth cut the existing pavement, over the existing gravel base. The smooth cut shall be thoroughly cleaned and coated with Emulsified Asphalt, RS-1, just prior to paving.

3.04 PREPARATION – TACK COAT

A. When the bottom course of bituminous concrete pavement is left over the winter, or paving is to be made over an existing bituminous concrete pavement, the existing surface shall be cleaned and Emulsified Asphalt applied before the next course is applied.

B. Also apply to contact surfaces of curbs.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 PLACING ASPHALT PAVEMENT

A. Place to compacted thickness identified on the plans.

B. Compact pavement by rolling. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

C. Develop rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.06 JOINTS

A. Joints between old and new pavements or between successive day's work shall be made so as to insure a thorough and continuous bond between the old and new mixtures. Whenever the spreading process is interrupted long enough for the mixture to attain its initial stability, the paver shall be removed from the mat and a joint constructed.

B. Butt joints shall be formed by cutting the pavement in a vertical plane at right angles to the centerline where the pavement has a true surface as determined by the use of a straight-edge. The butt joint shall be thoroughly coated with Emulsified Asphalt, Type RS-1, just prior to depositing the paving mixtures.

C. Longitudinal joints that have become cold shall be coated with Emulsified Asphalt, Type RS-1, before the adjacent mat is placed. If they have been exposed to traffic, they shall be cut back to a clean vertical edge prior to painting with the emulsion.

D. Unless otherwise directed, longitudinal joints shall be offset at least 6" from any joint in the lower courses of pavement. Transverse joints shall not be constructed nearer than one foot from the transverse joints constructed in lower courses.

3.07 TOLERANCES

A. The surface will be tested by the Engineer using a 16 foot straight-edge at selected locations parallel with the centerline. Any variations exceeding 3/16 of an inch between any two contacts shall be satisfactorily eliminated. A 10 foot straight-edge may be used on a vertical curve. The straight-edges shall be provided by the Contractor.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation from True Elevation: Within 1/2 inch.

3.08 FIELD QUALITY CONTROL

A. Permit no vehicular traffic on surfaces until thoroughly cool and hard.

3.09 REPAIR OF SUBSIDENCE

A. Settlement – Should any pavement settle within one year of completion of the Contract, such pavement shall be repaired at the Contractor's expense. If the Contractor fails to make such repairs promptly upon receipt of notice to do so from the Owner, then the Owner may make such repairs as necessary and the Contractor shall pay the Owner for all costs incurred in making such repairs.

ROCK AND BOULDER EXCAVATION

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work included: Furnish all labor and equipment required for excavation, disposal and replacement of rock and boulders.

a. All boulders within the range boundaries shown on the site plans to be removed shall be included as part of the Contractors mass rock removal.

1.2 SUBMITTALS

A. Blasting Plan: For record purposes; approved by authorities having jurisdiction.

B. Seismic Survey Report: For record purposes; from seismic survey agency.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earthwork operations. Submit before earthwork begins.

1.3 QUALITY ASSURANCE

A. Blasting: Comply with applicable requirements in NFPA 495, "Explosive Materials Code," and prepare a blasting plan reporting the following:

1. Types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.

2. Seismographic monitoring during blasting operations.

3. Explosive Firm: The company specializing in explosives for disintegration of rock with a minimum of five (5) years documented experience.

B. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.

2. Seismographic monitoring during blasting operations.

3. Seismic Survey Firm: The company specializing in seismic surveys with a minimum of five (5) years documented experience.

1.4 SCHEDULING

A. Drilling operations shall be conducted Monday through Friday, from 7:00 A.M. to 4:00 P.M.

B. Blasting operations shall be conducted Monday through Friday, from 8:00 A.M. to 4:00 P.M.

C. Notification: Notify adjacent property owners and residents (within 1,500') a minimum of seven (7) days in advance of all anticipated blasting operations. Explain blasting and seismic operation and schedule.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Pre-Blast Survey and Site Examination:

1. Conduct a pre-blast survey on all adjacent buildings and individual water systems within a distance of 1,500 feet. Also include pre-blast surveys for up to six (6) residences along Range Road in Underhill Center. The survey shall include pictures and notes of all signs of distress in the buildings and verification of quality and quantity of water in all individual water systems.

2. Verify site conditions and note all subsurface irregularities, which may affect any work requiring blasting.

3. Identify required lines, levels, contours and datum.

4. Obtain a seismic survey prior to rock excavation to determine maximum charges that can be used without damaging adjacent properties, other work or existing utilities.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, and other hazards created by blasting operations.

B. When ledge rock or boulders are encountered, the material shall be uncovered and the Contractor shall take cross-sections of the ledge rock surface. If the Contractor uncovers ledge but fails to cross section the undisturbed material, the Contractor shall have no right-of-claim to any classification other than that allowed by the Owner.

3.3 EXPLOSIVES

A. Explosives: Obtain written permission and all necessary permits from authorities having jurisdiction (local, state and federal) before bringing explosives to Project site or using explosives on Project site.

1. Perform blasting without damaging adjacent structures, property, or site improvements.

2. Perform blasting without weakening the bearing capacity of rock subgrade and with the least-practicable disturbance to rock to remain.

3.4 EXCAVATION, GENERAL

A. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction.

3.5 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavations under construction.

1. If rock below grade is shattered by blasting caused by holes drilled too deep, or too heavy charges of explosives, or any other circumstance due to blasting, and if such shattered rock does not provide suitable foundation, the rock shall be removed and the excavation refilled with screened gravel at the expense of the Contractor.

DRAINAGE

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Culvert pipe and appurtenances.

2. Stone fill.

3. Drainage Structures

1.02 REFERENCES

A. Vermont Agency of Transportation Standard Specifications, Latest Edition.

1.03 SUBMITTALS

A. Manufacturer's technical data for:

1. Pipe and appurtenances.

2. Structures.

PART 2 – PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer.

B. All culverts and storm drains shall meet the requirements of Section 601 of the Standard Specifications.

2.02 DRAINAGE PIPE & PERFORATED PIPE

A. Culvert / Drainage Pipe

1. Corrugated Polyethylene pipe and fittings (smooth interior) meeting the requirements of AASHTO M-294 and M-252

2. for drainage piping installed by directional boring techniques, use PE 3408 high density polyethylene pipe meeting ASTM D3350 Standard (SDR 11 or better)

2.03 CONCRETE STRUCTURES

A. ASTM C478, sized as indicated.

2.04 METAL ACCESSORIES

A. Manhole frames and covers:

1. Ductile Cast Iron.

2.05 STONE FILL

A. Stone for stone fill shall be approved, hard, blasted angular rock other than serpentine rock containing the fibrous variety chrysotile (asbestos). The least dimension of the stone shall be greater than 1/3 of the longest dimension. The stone fill shall be reasonably well graded from the smallest to the maximum size stone specified so as to form a compact mass when in place.

1. Type 1 – The longest dimension of the stone shall vary from 1 inch to 12 inches, and at least 50 percent of the volume of the stone in place shall have a dimension of 4 inches.

2. Type II – The longest dimension of the stone shall vary from 2 inches to 36 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 12 inches.

3. Type III – The longest dimension of the stone shall vary from 3 inches to 48 inches and at least 50 percent of the volume of the stone in place shall have a least dimension of 16 inches.

4. Type IV – The longest dimension of the stone shall vary from 3 inches to 60 inches, and at least 50 percent of the volume of the stone in place shall have a least dimension of 20 inches.

PART 3 – EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which storm sewer system work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 GENERAL

A. When existing underground utilities, which are not scheduled for removal or abandonment, are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.

3.03 PREPARATION

A. Hand trim excavation (where necessary) to required elevations. Correct over-excavations with fill material.

B. The slopes shall be graded to match the grade as shown on the plans. Where required, end sections shall be placed and backfilled to prevent undermining.

C. Remove large stones or other hard matter which could damage drainage structures or impede consistent backfilling or compaction.

3.04 INSTALLATION OF PIPE

A. All pipe and fittings shall be carefully examined for defects and no pipe or fittings shall be laid which are known to be defective. If any defective piece is discovered after laying, it shall be removed and replaced at the Contractor's expense. All pipes and fittings shall be cleaned before they are laid and shall be kept clean until accepted in the completed work.

B. The pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade.

C. Unless otherwise permitted by the Engineer, the Contractor shall provide for the temporary diversion of water to permit the installation of the pipe in a reasonably dry trench.

D. Where the pipe is to be laid below the existing ground line, a trench shall be excavated to the required depth and to a width sufficient to allow for joining of the pipe and compaction of the bedding and backfill material under and around the pipe.

E. The completed trench bottom shall be firm for its full length and width.

F. If indicated on the plans or directed by the Engineer, unsuitable foundation material encountered below the normal grade of the pipe bed shall be removed and replaced with Granular Backfill, or other specified or approved material.

G. The Contractor shall take all necessary precautions to prevent floatation of the pipe in the trench.

H. When pipe laying is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe is eliminated.

3.05 MANHOLES

A. Precast concrete structures:

1. Place precast concrete structures and covers as shown on the Drawings.

2. Where manholes occur in pavement, set tops of frames and covers flush with finish surface.

3. Provide rubber joint gasket complying with ASTM C443.

CURBS AND WALKS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Concrete Curbs

2. Concrete Sidewalks

PART 2 – PRODUCTS

2.01 CONCRETE

A. The concrete shall have a minimum compressive strength of 4,000 psi at 28 days and shall conform to the requirements of Cast-in-Place Concrete.

2.02 ADMIXTURES

A. Air-entraining admixture shall meet or exceed ASTM C260. Air content shall range from minimum of 5% to 7%.

2.03 EXPANSION JOINT MATERIAL

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134
DRAWING NUMBER C7.1

A. Expansion joint material shall be premolded bituminous filler conforming to ASTM D994.

PART 3 – EXECUTION

3.01 CONCRETE CURBS

A. Excavation shall be made to the required depth and the base material upon which the curb is to be set shall be compacted to a firm, even surface. All soft and unsuitable material shall be removed and replaced with suitable material which shall be thoroughly compacted.

B. Installation: The curb shall be set so that the front top line is in close conformity to the line and grade required. All space under the curbing shall be filled and thoroughly tamped with material meeting the requirements of the material for the bed course.

C. Concrete Mixing and Placing: Compaction of concrete placed in the forms shall be by spading or other approved methods. Forms shall be left in place for 24 hours or until the concrete has set sufficiently so that they can be removed without injury to the curbing. Upon removal of the forms, the curb shall be immediately rubbed down to a smooth and uniform surface but no plastering will be permitted. For this work, competent and skillful finishers shall be employed.

D. Sections: Curbing shall be constructed in sections having a uniform length of ten feet, unless otherwise ordered. Sections shall be separated by open joints 1/8 inch wide except at expansion joints.

E. Expansion Joints: Expansion joints shall be formed at the intervals shown on the plans using a pre–formed expansion joint filler having a thickness of 1/4 inch cut to conform to the cross–section of the curb. They shall be constructed at 20 foot intervals or as directed by the Engineer. When the curb is constructed adjacent to or on concrete pavement, expansion joints shall be located opposite or at expansion joints in the pavement.

F. Backfilling: After the concrete has set sufficiently, the spaces in front and back of the curb shall be filled to the required elevation with layers of not more than six inches of the same material as the bedding and thoroughly tamped.

G. The Contractor shall protect the curb and keep it in alignment until the completion of the contract. Each curb which is damaged at any time previous to final acceptance of the work shall be removed and replaced with satisfactory curb at the Contractor's expense.

H. Anti–spalling compound: When the initial curbing period is over (approximately 28 days after placement), all exposed surfaces shall receive two (2) coats of anti–spalling compound. The surfaces shall be cleaned, and then the compound shall be applied; the first coat at a rate of .025 gallons per square yard, and the second at a rate of .015 gallons per square yard. Anti–spalling compound shall only be applied when the air temperature is above 50 degrees Fahrenheit.

3.02 GRANITE CURBING

A. Sloped granite curbing shall be hard, durable, reasonably uniform in appearance and free from weakening seams. Surfaces shall be as follows:

– Top: 6" wide, sawn true plane.

– Front Face: Smooth quarry split, right angle top (No drill holes showing in top 10")

– Back Face Exposed: Plane parallel with front face, straight split to 1 1/2" below surface.

– End Face Exposed: Square planes on top and face.

– Joints Exposed: Maximum 1" and pointed with mortar. Exposed faces shall be finished with a jointer. Remove all excess mortar from exposed faces.

– Length: Minimum length 3'.

Provide curved curbing to conform to radii indicated on the Contract Plans.

3.03 CONCRETE SIDEWALKS

A. Excavation and Foundation: Excavation shall be made to the required depth and to a width that will permit placing of bed course material and the installation and bracing of the forms. Bed course material shall be placed to the depth and section shown on the plans. When the layer required exceeds six inches, two layers of approximately equal depth shall be placed and each layer thoroughly compacted so that it is hard and unyielding. The wetting of bed course material may be required to obtain the compaction.

B. Finishing: The surface shall be finished with a wooden float. No plastering will be permitted. The edges shall be rounded with an edger having a radius of 1/4 inch. The surface of the sidewalk, after the floating and screeding process is completed, shall be finished with a broom of a type approved by the Engineer, drawn over the surface parallel to the transverse joints. Special texturing on sidewalk ramps shall be installed in accordance with construction plan details.

C. Joints: Unless otherwise indicated on the plans or directed by the Engineer, expansion joints shall not be used in the sidewalk. Expansion joints shall be formed around all appurtenances such as manholes, utility poles and other obstructions extending into and through the sidewalk. Pre–formed joint filler 1/4 inch thick shall be installed in these joints. Expansion joint filler of the thickness indicated shall be installed between concrete sidewalks and any fixed structure such as a building or bridge. This expansion joint material shall extend for the full depth of the walk. Between the expansion joints, the sidewalk shall be divided at intervals of 5 feet by dummy joints formed by sawcutting or other acceptable means as directed to provide grooves approximately 1/16 inch wide and at least 1/3 of the depth.

When the sidewalk is constructed next to a concrete curb expansion, joint material shall be placed between sidewalk and curb for the depth of the sidewalk.

D. Curing: During the curing period all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as the Engineer may direct.

E. Backfilling: Before the concrete has been opened to traffic, the space on each side of the sidewalk shall be backfilled to the required elevation with suitable material, firmly compacted and neatly graded.

SANITARY SEWER SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Gravity Sewer Pipe
2. Manhole Structures and Appurtenances
3. Pressure Sewer Pipe

B. Related Sections:

1. Section 02225 – Utility Trenching and Backfilling

1.02 SUBMITTALS

A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements.

1.03 QUALITY ASSURANCE

A. All sanitary sewer materials and construction of same shall be as shown on the Contract Plans and shall meet the requirements of the State of Vermont Agency of Natural Resources (Department of Environmental Conservation) and the Public Works Standards and Specifications of the local municipality.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer to provide a complete and operable system.

2.02 PVC GRAVITY SANITARY SEWER PIPE

A. PVC sewer pipe shall conform in all respects to the latest revision of ASTM Specifications D–3034 or F679, Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings, SDR 35 pipe. All pipe and fittings shall be clearly marked as follows:

– Manufacturer's Name and Trademark

– Nominal Pipe Size (as shown on plans)

– Material Designation 12454–C PVC

– Legend "Type PSM SDR 35 PVC Sewer Pipe" or "PS 46 PVC Sewer Pipe"

– Designation ASTM D–3034 or F679

B. Joints shall be push–on type using elastomeric gaskets and shall conform to ASTM D–3212. The gaskets shall be factory installed. The pipe shall be furnished in nominal 13 foot lengths. Sufficient numbers of short lengths and full machine fittings shall be provided for use at manholes and connections. All connections will require the use of manufactured fittings. Field fabricated, saddle–type connections will not be considered acceptable.

C. Any pipe or fitting having a crack or other defect or which has received a severe blow shall be marked rejected and removed at once from the work site. All field cuts are to be made with saw and 90 degree miter box. Bevel the cut end to the same as the factory bevel and remove all interior burrs. Measure and place a homing mark on the pipe before assembling. The pipe installed under this specification shall be installed so that the initial deflection, measured as described below, shall be less than five percent (5%).

D. The manhole water stop gasket and stainless steel clamp assembly must be approved by the Town Wastewater Treatment Department prior to the installation of any pipe.

E. The Contractor will submit certification that the materials of construction have been sampled, tested, inspected, and meet all the requirements including wall thickness in accordance with ASTM D–3034 or ASTM F679 for all pipe and fittings to be included in project work. PVC pipe shall not be installed when the temperature drops below 32 degrees Fahrenheit or goes above 100 degrees Fahrenheit. During cold weather, the flexibility and impact resistance of PVC pipe is reduced. Extra care is required when handling PVC pipe during cold weather. PVC pipe shall not be stored outside and exposed to prolonged periods of sunlight, as pipe discoloration and reduction in pipe impact strength will occur. Canvas and other opaque material shall be used to cover PVC pipe when stored outside.

2.03 PVC PRESSURE SEWER PIPE

A. PVC pipe shall conform in all respects to the latest revisions of ASTM Specifications D–2241. All pipe and fittings shall be SDR 26 (or as specified on plans) clearly marked as follows:

– Manufacturer's Name and Trademark
– Nominal Pipe Size (as shown on plans)
– Material Designation 12454–A PVC ASTM D–1784

B. Joints shall be push–on type using elastomeric gaskets factory installed conforming to ASTM Specification D–3212.

2.04 MANHOLES

A. Manholes shall be sized as indicated on the plan and shall be precast concrete with a monolithic base and shall conform to the latest version of ASTM Specification C478.

B. Shelves shall be constructed with concrete having a minimum compressive strength of 3,000 psi at 28 days. Inverts for sewer manholes shall be as shown on the plans and details and shall be constructed with concrete or brick, as per the local municipality's standards. Inverts shall have the exact shape of the sewer to which they are connected, and any change in size of direction shall be gradual and even.

C. All manholes are to be provided with copolymer polypropylene plastic steps with steel reinforcement 12 inches on center.

D. All manholes shall be provided with rough, gray, cast iron manhole frames and covers. All iron castings shall be thoroughly cleaned and then coated with hot tar before being delivered. Frames and covers shall be LeBaron LC 266, or an approved equal, and have a minimum weight of 400 pounds.

E. Precast risers and bases for manholes shall conform to ASTM Specification C–478. The pipe opening in the precast manhole system shall have a cast–in–place flexible gasket or an equivalent system for pipe installation as approved by the Engineer. Joints between manhole risers shall be 1" minimum width flexible gasket or approved equals.

2.05 CLEANOUTS

A. Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Engineer. Cleanout frames and covers shall be of tough gray cast iron. Castings shall be true to pattern and free from flaws. The bearing surface of cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference.

2.06 PIPELINE INSULATION

A. Approved sewer lines with less than four feet (4'–0") of cover over the crown, five (5'–0") in plowed areas that cross a storm sewer, or where indicated on the plans, shall be protected against freezing by the installation of two inch (2") thick highest available density extruded polystyrene insulating sheets or equivalent. Sheets shall be the the lesser of 3' or 2 x diameter of the pipe. The sheets shall be placed six inches (6") above the crown after placement of four to six inches (4"–6") of clean medium or coarse sand below the pipe bottom and four to six inches (4"–6") above the crown. Joints shall be overlapped so there is no gap that will allow frost to penetrate. Care shall be exercised during backfill and compaction over the polystyrene sheets to prevent damage to the sheets. The polystyrene sheets shall meet the comprehensive strength requirements of ASTM D1621–73. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe. When sewer line passes within 5 feet of a catch basin install 2" min. rigid insulation, polystyrene sheets, between sewer line and cb.

PART 3 – EXECUTION

3.01 GENERAL

A. Care shall be exercised by the Contractor to avoid disrupting the operation of existing sanitary sewer facilities without prior written approval of the Engineer.

B. When existing underground utilities not scheduled for removal or abandonment are encountered in the excavation, they shall be adequately supported and protected from damage. Any damage to utilities shall be repaired promptly at no additional cost to the Owner.

C. Installation of pipe shall be in accordance with the Utility Trenching and Backfilling and as specified by this section.

3.02 BEDDING FOR PIPE

A. The bedding material shall be shaped to fit the pipe for a depth of not less than 10 percent of its total height and shall have recesses to receive the bell.

3.03 LAYING PIPE

A. In general, sewer pipe shall be installed in accordance with the latest detailed instructions of the manufacturer.

B. The laying shall begin at the outlet end and the lower segment of the pipe shall be in contact with the shaped bedding throughout its full length. Bell or grooved ends of rigid pipes and the circumferential laps of flexible pipe shall be placed facing upstream.

C. All pipe and fittings shall be carefully examined for defects and no pipe or fittings shall be laid which are known to be defective. If any defective piece is discovered after laying, it shall be removed and replaced at the Contractor's expense. All pipes and fittings shall be cleaned before they are laid and shall be kept clean until accepted in the completed work.

D. The pipe shall be laid to conform to the lines and grades indicated on the drawings or given by the Engineer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade.

E. The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.

F. When pipe laying is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe is eliminated.

G. For force mains, concrete reaction blocking shall be provided as detailed at all bends deflecting 22½ degrees or more. At the Contractor's option, retainer glands may be used at bends in lieu of concrete blocking. Retainer glands shall also be provided at all joints within three pipe lengths each side of the bends.

H. Any pipe that is not laid to grade and alignment shall be re–laid to the satisfaction of the Town Wastewater Department. The bedding material shall be placed and compacted on each side of the pipe to a height equal to one–half (1/2) the pipe diameter and for the full width of the excavated trench and as shown on the accepted plans. Bedding shall be #2 pea stone from Shelburne Limestone or an equivalent approved by the Town Wastewater Department and the Engineer.

I. All sewer pipes shall be marked with magnetic marking tape. The marking tape shall be installed one (1) foot directly over . Concrete thrust blocks "sewer "the pipe and shall be labeled or anchors shall be placed at bends, tees, fittings, and other locations on the force main as shown on the contract drawings or as directed by the Town Wastewater Department. Concrete for thrust blocks and anchors shall be Class B concrete. Steel rods and clamps as required shall be galvanized and rust proofed or painted.

3.04 GRAVITY SEWER PIPE TESTING

A. The Contractor shall provide all necessary equipment and instrumentation required for proper completion of the flushing and testing. Quality of water, test procedures, and method of disposal of water shall be approved by the Engineer. Prior to testing, flush with water to remove construction debris and pass through a full gauge squeegee.

B. All tests shall be made in the presence of the Engineer. Preliminary tests made by the Contractor without being observed by the Engineer will not be accepted. The Engineer will be notified at least eight hours before any work is to be inspected or tested. The Town shall be notified at least at least two (2) days before testing.

C. The maximum sewer length to be tested at one time shall be that length between any two manholes.

D. Air Testing: Low pressure air testing shall be conducted in accordance with the following procedures:

1. Each end of the test section and laterals shall be plugged, capped and braced. Necessary safety precautions shall be taken to prevent blowouts and possible injury.

2. An air hose shall be connected to a tapped plug used for an air inlet. The hose will be connected to the air control equipment, which shall include valves and pressure gauges. These shall allow air to enter the sewer test line, monitor air pressure in the sewer, shut off air, and provide pressure reduction and relief. The monitoring pressure gauge shall have a range of 0–10 psi with divisions of 0.10 psi and accuracy of 0.05 psi±.

3. The air compressor and air supply shall be connected to the test line and the test section filled slowly, until a constant pressure of 4.0 psig is maintained.

4. A pressure above 3.0 psig shall be maintained for at least five minutes to allow the temperature to stabilize. A check for leaks shall be made and if any are found, the pressure shall be released and the fitting replaced or repaired.

5. After the stabilization period, the pressure shall be adjusted to 3.5 psig and the air supply disconnected.

6. Measure and record the time interval for the test line pressure to drop from 3.5 psig to 2.5 psig.

7. If the groundwater table is above the pipe, increase above test pressures 0.5 psig for each foot the groundwater is above the invert of the pipe.

8. The requirements of this specification shall be considered satisfied if the time required in seconds for the pressure to decrease from 3.5 to 2.5 psi greater than the average back pressure of any groundwater that may submerge the pipe is not less than that computed according to the following table:

Minimum Test Time for Various Pipe Sizes

Diameter (Inches)	Time (Sec./100 Ft.)
4	18
6	45
8	75
10	90
12	110

3.05 MANHOLES

A. The excavation shall be to the depth indicated on the plans r ordered by the Engineer, and carefully shaped and graded.

B. Manhole sections shall be precast concrete and shall conform to the dimensions indicated on the plans or ordered by the Engineer.

C. Channels, inverts and floor areas for sewer manholes shall be constructed of concrete. Inverts shall have the exact shape of the sewer to which they are connected and any change in size or direction shall be gradual and even. All construction of sewer manholes must be carried out to insure watertight work.

D. The required precast concrete risers shall be placed on top of the concrete to the elevation indicated on the plans or as ordered by the Engineer.

E. The cast iron frame shall be set as indicated on the plans in a full mortar bed. The cover shall be properly placed in the frame.

3.06 MANHOLE TESTING

A. Manholes shall be tested separately by one of the following two procedures:

1. Exfiltration Leakage Test: All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blowout. The manhole shall then be filled with water to the top of the cone section. A period of time may be permitted, if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary, and the measuring time of at least four hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be converted to gallons per vertical foot depth for 24 hours. The leakage for each manhole shall not exceed one gallon/vertical foot/day. If leakage exceeds the allowable rate, repairs shall be made as approved by the Engineer and the manhole retested. If the Contractor elects to backfill prior to testing, the testing shall be at his own risk, and it shall be incumbent upon the Contractor to determine the reason for any failure of the test. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorption, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.

2. Vacuum Test: This method of testing manholes for leakage involves the use of a device for sealing the top of the manhole cone section and pumping the air out of the manhole, creating a vacuum and holding this vacuum for a prescribed period of time. The procedure for this test is as follows:

a. All lifting holes and exterior joints shall be filled and pointed with an approved non–shrinking mortar. The completed manhole shall not be backfilled prior to testing. Manholes which have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of the exfiltration leakage test.

b. All pipes and other openings into the manhole shall be suitably plugged in a manner to prevent displacement.

c. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

d. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of air shall then be stopped and the test begun.

e. The manhole shall pass this test if the vacuum holds at 10" Hg or drops no lower than 9" Hg within the following times:

Depth of 4'ø Manhole	Minutes	Seconds
0' – 10'	2	0
10' – 15'	2	30
15' – 20'	3	0
20' – 25'	3	30

f. If the vacuum drop exceeds 1" Hg during the specified time periods, the manhole shall be resealed and Steps 2 through 5 above repeated until the vacuum holds for the specified time.

g. After the manhole passes the vacuum test, it shall be backfilled carefully so that no leaks are created. If the manhole is disturbed in any way during backfill, it shall again be vacuum tested according to Steps 1 through 5 above. If the manhole fails the vacuum test, the Contractor shall test the manhole using the manhole exfiltration test.

h. The Contractor shall provide the Engineer with a written log of each manhole leakage test result.

i. Manholes shall be tested and accepted prior to building manhole inverts.

3.07 PRESSURE PIPE TESTING

A. General: All force mains shall pass the hydrostatic pressure test and leakage test described herein. Prior to testing, all anchors and braces shall be installed. All concrete thrust blocks and restraints shall be in place and cured at least seven days. All buried pipe shall be backfilled. Suitable test plugs shall be installed and air release valves shall be installed at the high points.

B. Hydrostatic Test: The following procedure shall be used:

1. All air release valves shall be opened and the pipe shall be filled with water at a rate not to exceed the venting capacity of the air release valves.

2. The water pressure shall be raised to 150 percent of the designed operating pressure or 60 psi minimum at the highest point.

3. Failure to hold the designated pressure within 5 psi of the specified test pressure for the two hour period constitutes a failure of the section tested.

C. Leakage Test: The following procedure shall be used:

1. Leakage shall be defined as the quantity of water that must be supplied into the pipe being tested to maintain pressure within 5 psi of the specified test pressure.

2. No pipe installation shall be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{ND(P)^{0.5}}{7{,}400}$$

Whichever is less

$$L = \frac{SD(P)^{0.5}}{133{,}100}$$

S = Length of Pipe Testing
L = Allowable Leakage in Gal/Hr
D = Nominal Diameter of Pipe (")
P = Average Test Pressure (psi)
N = Number of Joints in the Pipeline Tested

All testing shall be conducted in accordance with AWWA C600–87 or latest revision.

3.08 PUMP STATION AND STORAGE TANK TESTING

A. Pump Station and Storage Tank Testing: All manholes and storage tanks shall be tested for leakage in accordance with the following procedure:

B. Water Test: After the structure has been assembled in place, all lifting holes and exterior joints shall be filled and pointed with non shrinking mortar. All pipes and other openings into the structure shall be suitably plugged and the plugs placed to prevent blowout.

1. Each structure shall be checked for exfiltration by filling with water to the top of the cone section. A stabilization period of one hour shall be provided to allow for absorption. At the end of this period, the structure shall be refilled to the top of the cone, if necessary, and the measuring time of at least six hours begun. At the end of the test period, the structure shall be refilled to the top of the cone measuring the volume of water added.

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134

DRAWING NUMBER C7.2

2. This amount shall be converted to a 24–hour rate and the leakage determined on the basis of depth and size of structure. The leakage for each structure shall not exceed one gallon per vertical foot per 15 linear feet of wall (as measured in plan view) for a 24 hour period for exfiltration and there shall be no visible infiltration.

C. Air Test: Alternatively, the manhole may be tested for leakage using the following procedure:

1. All lifting hole and exterior joints shall be filled and pointed with an approved non–shrinking mortar. The completed manhole shall not be backfilled prior to testing. Structures that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.

2. All pipes and other openings in the manhole shall be suitably plugged in a manner to prevent displacement.

3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun.

5. The vacuum must not drop below 9 inches of mercury within a 2 minute test period. If more than 1 inch of drop in vacuum occurs within the 2 minute test period the manhole has failed the test and shall be repaired or reconstructed and retested.

D. Following satisfactory test results, the manhole may be backfilled.

3.09 SERVICE CONNECTION

No sanitary sewer shall be placed in service until such time as the Town has given final approval to the sewer installation, including satisfactory completion of all required tests. Service connections shall not be made until all receiving sewer mains have been completed and approved and as–builts received along with GPS coordinates and approved by the Town Wastewater Department.

A. Laterals

Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification. Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Town Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.

In the case of reconnection of existing services, such reconnection will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be the same as for sewer mains.

B. Cleanouts for Sewers

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Town Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.

C. Chimneys

Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye from a service connection.

3.10 Force Main

After force mains have been laid and the trench backfilled, the pipe shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.

3.11 Wet well

The pre–cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.

PART 4 – PUMP STATION

4.00 SPARE PARTS

A. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.

B. Two (2) spare volute gaskets shall be provided.

C. A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.

D. Provide 100% spare lamps and fuses for control panel.

E. Provide all lubricants required for initial operation.

F. Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.

G. Provide one (1) spare level transducer.

4.01 O & M MANUALS

A. Installation of all mechanical equipment shall be done in accordance with written instructions provided by the manufacturer. Installation instructions shall be delivered with the station.

B. The manufacturer shall provide 5 copies of a complete and detailed operating and maintenance manual. This manual shall provide all design criteria, general operating procedures, maintenance and servicing procedures for all major components, and as–built drawings of the contributory gravity sewer system, the pumping station and force main. All instructions and parts lists shall be prepared for the specific equipment furnished and shall not refer to similar equipment. Operating manuals must be submitted to the Town prior to final acceptance of the station.

4.02 POLYETHYLENE (PE3408) SANITARY SEWER FORCE MAINS

A. This specification covers requirements for PE3408 high density polyethylene sanitary sewer force mains. All work shall be performed in accordance with these specifications and manufacturer requirements.

B. Referenced Standards. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.

C. Warranty and Acceptance. The Contractor shall warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications. In the event deficiencies are discovered during the warranty period, they shall be corrected by the Contractor without additional charge to the owner before final acceptance. During the warranty period, the Project Engineer shall determine if warranty repairs or replacement work shall be performed by the Contractor. The decision of the Project Engineer shall be binding upon the Contractor.

D. Polyethylene Pipe and Fittings

1. Qualification of Manufacturers. The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative. Qualified manufacturers shall be approved by the Project Engineer.

2. Materials. Materials used for the manufacture of polyethylene pipe and fittings shall be PE3408 high density polyethylene (SDR 11 or better) meeting cell classification 345444C or 345444E per ASTM D 3350; and shall be listed in the name of the pipe and fitting manufacturer in Plastics Pipe Institute's TR–4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fitting

Compounds, with a standard grade HDB rating of 1,600 psi at 73°F. The manufacturer shall certify that the materials used to manufacture pipe and fittings meets these requirements.

3. Polyethylene Pipe. Polyethylene pipe shall be manufactured in accordance with ASTM F 714, Polyethylene (PE) Plastic Pipe (SDR–11 rating or better) Based on Outside Diameter, and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, (from pipe) dimensions and ring tensile strength.

4. Polyethylene Fittings & Custom Fabrications. Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications and connections shall be fully rated for the same internal pressure as the mating pipe. Pressure de–rated fabricated fittings are prohibited.

5. Molded Fittings. Molded fittings shall be manufactured in accordance with ASTM D 3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (IPE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the tests required under ASTM D 3261.

6. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.

7. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient through–bore length to be clamped in a butt fusion joining machine without the use of a stub–end holder.

8. Back–up Rings & Flange Bolts. Flange adapters shall be fitted with back–up rings pressure rated equal to or grater than the mating pipe. The back–up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 6 or higher (stainless steel).

9. Compliance Tests. Manufacturer's inspection and testing of the materials. In case of conflict with manufacturer's certifications, the Contractor, Project Engineer, or Owner may request retesting by the manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense, and shall be performed in accordance with the Specifications.

E. Joining

1. Heat Fusion Joining. Joints between plain end pipes and fittings shall be made by butt fusion, electrofusion couplings and joints between the main and saddle branch fittings shall be made using saddle fusion procedures that are recommended by the pipe and fitting manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

2. Butt Fusion of Unlike Wall Thicknesses. Fusions of different wall thickness are acceptable, as long as the difference is limited to a one SDR difference, i.e. SDR 11 to SDR 9. Transitions between unlike wall thicknesses greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.

3. Joining by Other Means. Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and backup rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, or (c) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be followed. All connections shall maintain the total pressure rating of the force main.

4. Mechanical Joint Installation. Mechanical joints shall be installed in accordance with the manufacturer's recommended procedure. When an OD compression mechanical coupling is used, a stiffener shall be installed in the bore of the polyethylene pipe.

5. Branch Connections. Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.

4.03 HORIZONTAL DIRECTIONAL DRILLING W/ POLYETHYLENE PIPE

A. Directional boring with PE3408 pipe shall be completed in accordance with the manufacturer's requirements and shall not in any way affect the joint connections or the overall strength characteristics of the pipe.

B. References:

"Mini–Horizontal Directional Drilling Manual" published by North American Society for Trenchless Technology (NASTT).

"Guidelines for a Successful Directional Crossing Bid Package" published by Directional Crossing Contractors Association (DCCA).

"Polyethylene Pipe for Horizontal Directional Drilling" of the Plastic Pipe Institute's Handbook of Polyethylene Piping.

C. Quality Control. All directional boring shall be completed in such a way as not to jeopardize the existing infrastructure/facilities, such as the roadway, utility poles, subsurface utilities, structures/foundations, or significant landscaping. Prior to directional drilling, all potential conflicts shall be field verified.

D. General

1. Directional drilling shall be performed in a manner required to install HDPE utility line as indicated on the drawings. Furnish all manpower and equipment required to perform the pipeline installation. The operation shall include all excavation and dewatering, drilling calculations, pilot hole, and pullback operations. Contractor shall be responsible for type of reamer, diameter, and other pertinent operations required for a complete installation. Contractor shall be responsible for mobilizing on–site with a full range of drill stems and reaming heads to allow for various factors which may occur. Drill stems shall be of proper size and diameter to allow for full thrust and torque capabilities of the drilling machines.

2. Contractor shall perform utility survey to locate information concerning existing utility lines located in the areas of the directional drilling work.

3. Directional drilling shall be accomplished by drilling from one side of the crossing to the other using an approved method. One method shall be drilling a small diameter pilot hole along the proposed utility route. Steering shall be accomplished by using drilling mud which is pumped into the drill pipe to provide rotational energy in a drill bit at the end of the drill pipe. A jet bit shall force the mud through small orifices and jet away the earth and to allow the drilled path to curve in the proper direction as the drill pipe is thrust forward. An electronic survey instrument shall be placed inside the drill pipe head. The instrument shall signal a computer of the drilled paths magnetic azimuth, vertical inclination, and orientation of the bend. This data shall be used by the drilling contractor to calculate location of the drill bit and allow steering adjustments to be made.

4. After completing the pilot hole, larger diameter reaming heads shall be pulled back in order to enlarge the hole as required to allow for the pipe pullback. The Contractor shall be responsible for multiple reaming operations as required to complete the work. Pull back operations shall be carried out as soon as possible following the final preream. During this phase of the work, the Contractor shall continue his work operations without interruption regardless of the day of week or hour of the day. A pullback head shall be attached to the pipe to allow fastening to the swivel head reamer. The head shall be closed to prevent drilling mud from entering the main during the pullback operation.

5. Upon completion of the drilling operations, the equipment and materials used shall be removed from the site and the areas disturbed shall be restored to original conditions. The main shall be tested in accordance with Section 02730 of the Specifications. If the main fails the testing, it shall be removed and the work repeated at no additional cost to the Owner.

WATER SUPPLY SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Pipe Materials
2. Hydrants
3. Valves
4. Fittings
5. All other appurtenances necessary to complete the water main system as shown on the Contract Plans.

1.02 SUBMITTALS

A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements to the Engineer and local municipality.

1.03 QUALITY ASSURANCE

A. All materials and the installation procedure shall be in accordance with the Department of Environmental Conservation, Water Supply Division and the applicable construction ordinances of the local municipality.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer as necessary to complete the water system.

2.02 WATER MAIN MATERIAL

C–900 PVC WATER MAIN

A. Pipe shall be C–900 (DR–14 305 psi) PVC (sizes as shown on the plans) conforming to current AWWA C–900, latest revision and shall be UL and FM approved. Larger size mains will be required if necessary to allow withdrawal of the required fire flow while maintaining the minimum pressure specified in the VT Water Supply Rule, Chapter 21, 8.1.1. Any proposed departure from minimum requirements shall be justified by hydraulic analysis and future water use assessment, and will be considered only in special circumstances (VT Water Supply Rule, Chapter 21 8.1.4). Push–on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.

B. When a pipe material is specifically noted on the contract drawings,the contractor/developer shall not have the option of utilizing any other pipe material. Galvanized pipe or fittings shall not be used in any water system owned or maintained by the Town. The Town Water Department requires the use of polyethylene pipe sleeve encasements and/or alternate pipe materials in known or suspected corrosive soil conditions.

DUCTILE IRON WATER PIPE

A. Pipe shall be Tyton Ductile Iron Class 52 (sizes as shown on the plans) conforming to current ANSI/AWWA C151/A21.51 latest revision. Push–on joint pipe shall be minimum thickness Class 52. Push–on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.

B. Pipe shall be cement mortar lined on the inside in accordance with ANSI Specification A21.4 except that the cement lining thickness shall not be less than 1/8 inch. A plus tolerance of 1/8 inch will be permitted.

C. Pipe shall be given an exterior petroleum asphaltic coating in accordance with ANSI/AWWA Specification C151/ASNI A21.51.

D. Pipe shall be poly wrapped with a minimum thickness of 4 mil poly in accordance with AWWA Specification C105 / ANSI A21.5, unless approved otherwise.

2.03 FITTINGS

A. Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10, 350 PSI working pressure. Ductile iron fittings larger than twelve inches (12") shall have a standard body length equal to Class 250 Cast Iron fittings. Cast Iron Class 250 fittings will be allowed in lieu of ductile iron fittings larger than twelve inches (12"). Ductile iron fittings shall be rated for 250 p.s.i. However, twelve inch (12") and smaller may be rated for 350 p.s.i. with the use of special gaskets. All ductile iron compact fittings shall conforming to AWWA/ANSI C153/A21,53 standards.

B. Anchor tees shall be standard mechanical joint tees except that the branch is plain Class 250 cast iron or Class 350 ductile iron, cement lined, conforming to ANSI/AWWA C110/ A21.10, C111/A21,11, and C104/A21.4. Anchor tees shall be Clow F–1217, U.S. Pipe U5–92 or equal.

C. Mechanical Joint restraints shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron, and have a minimum working pressure of 350 psi. Twist off nuts (i.e. mega–lug) or equal shall be used to ensure proper actuating of the restraining devices. Contractors may also use approved grip ring (or equal) retainer glands.

D. Bolts shall conform to ANSI Specification A21.10.

E. Pipeline couplings shall conform to AWWA Standards C110 and ANSI A21.10. Mechanical joint connecting pieces of proper diameter shall be installed in accordance with the manufacturer recommendations and at locations directed by the plans or the Town Water Department.

F. All fittings shall be mechanically restrained (i.e. Megalug or equal); double poly wrapped and have concrete thrust blocks poured in place as defined herein.

2.04 TAPPING SLEEVES AND VALVES

A. The Town Water Department shall be notified whenever a proposed tap is to be made on any transmission main within the municipal system.

B. Only approved tapping companies shall be allowed to perform wet taps on any Town Water Department water mains.

C. All materials used when tapping for a branch connection or interconnection from any Town Water Department water transmission or distribution pipelines shall be specified below

2.05 TAPPING SLEEVES

For use on existing asbestos cement, gray cast iron, ductile iron or PVC C–900 pipe:

A. Tapping sleeves shall be of the split sleeve design, constructed with two solid half–sleeves bolted together. Sleeves shall be constructed of stainless steel, shall have a working pressure of at least 250 psi, and shall have mechanical joint ends with end and side gasket seals.

B. All iron body tapping sleeves shall be provided with a 3/4" NPT test plug, or other provisions must be made for air testing the valve and sleeve at maximum working pressure, prior to tapping.

C. All bolts and nuts for mechanical joints of tapping sleeves shall be of high–strength cast iron or high–strength, low–alloy steel conforming to ANSI/AWWA C111/A21.11.

D. All bolts and nuts for flanged joints of tapping sleeves shall be of high–strength, low carbon steel conforming to ANSI/AWWA C110/A21.10.

E. All bolts and nuts shall be sound, clean, and coated with a rust–resistant lubricant; their surfaces shall be free of objectionable protrusions that would interfere with their fit in the made–up mechanical or flanged joint.

2.06 TAPPING VALVES

A. Tapping valves shall conform to ANSI/AWWA C509 Standard for Resilient–Seated Gate Valves for Water and Sewage Systems, except as modified herein. Valves shall open counterclockwise and shall have a minimum working pressure of 200 psi. Inlet flanges shall be Class 125 conforming to ANSI Specification B16.1 or ANSI/AWWA C110/A21.10, and outlet connection shall be Standardized Mechanical Joint unless specified otherwise on the drawings for the type of pipe required for the branch or lateral pipeline.

B. Tapping valves over sixteen inches (16") diameter shall be installed with their stems horizontal, shall be equipped with rollers, tracks and scrapers, and shall be provided with bypass valves unless otherwise specified.

C. Buried tapping valves shall be provided with a two inch (2") square wrench nut and shall be installed with a cast iron valve box as required to allow positive access to the valve operating nut at all times. In installations where the depth from grade to top of valve operating nut is greater than 5'0", a valve stem riser shall be provided and installed such that the depth from valve stem riser nut to grade is from four feet to five feet (4'–5'), (minimum length of valve stem riser is two feet (2')). Valve stem riser shall be of high strength steel and of welded construction.

D. All contractors (or others) who apply for water line tapping permits shall submit complete specifications of the tapping material they intend to use at the time the tapping permit application is submitted on 8 1/2" x 11" shop drawing sheets

E. All bolts and nuts used with all pipe sleeves shall, upon final tightening and testing, be brush coated heavily with bitumastic cold–applied material to thoroughly cover all exposed surfaces of the bolts and nuts.

2.07 GATE VALVES–RESILIENT SEAT

A. Valves shall be manufactured to meet all requirements of AWWA Specification C509, latest edition. Valves twelve inches (12") and smaller shall be bubble tight, zero leakage at 200 psi working pressure. Valves shall have non–rising stems, open counter clockwise, and provide a two inch (2") square operating nut with arrow cast in the metal indicating direction of opening. Each valve shall have maker's name, pressure rating and year in which manufactured cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure. Gate valves shall be Mueller, Kennedy, AFC, or approved equal.

B. Buried valves shall be installed with a gate valve Box with a cover marked "water".

C. Tee intersections shall have a minimum of three (3) gate valves. Cross sections (four way intersections) shall have a minimum of four (4) valves.

D. The Town Water Department may require all bolts, studs and nuts be made from a corrosion resistant–material stainless steel.

2.08 VALVE BOXES

A. Valve boxes shall be of the three–piece Cast iron slide–type with a minimum inside shaft diameter of five and one quarter inches (5 1/4") and a six foot (6') trench depth. Valve boxes shall not transfer loads onto the valve.

B. Valve boxes shall have a cast iron cover, marked "WATER". The boxes shall be dirt tight with the top of the cover flush with the top of the box rim.countersunk brass pentagon plug for paved or concrete areas, and standard two holes for grass areas. Curb box couplings and extensions will be the same material as the curb box. Both cover and upper section of the box shall be able to be located with an aqua type metal locator.

C. All service connections shall be installed to the curb stop for all building lots before the street is paved.

D. Valve boxes located in roadways shall have one non–adjusting paving riser of a height ranging from one and a half inches (1.5") to six inches (6") as needed to be brought to final pavement grade.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE: 11/01/2019
SCALE: NONE
PROJ. NO.: 14134

DRAWING NUMBER: C7.3

2.09 BACKFLOW PREVENTION DEVICES

A. No water service connection shall be approved or maintained by the Town Water Department unless the water supply is protected as required by State laws, regulations and ordinances. The type of protective device shall depend on the degree of hazard that exists. In general, backflow devices designed to protect potable water supplies in accordance with national plumbing codes for non–health hazard cross connections and continuous pressure applications shall be used, i.e. Watts Series 007 or approved equal. Watts Series 709 Double Check Valve Assembly or approved equal shall be installed on all sprinkler systems. A shop drawing detail assembly showing backflow devices and meter placements shall be required by the Town Water Department.

2.10 PIPE BEDDING

A. Water lines shall be laid and maintained on lines and grades established by the plans for the project. Pipeline trenches shall be excavated to the width and depths shown on the plan typicals. Pipeline trenches in which pipe is to be laid directly on the trench bottom shall not be excavated entirely by machinery, but shall be finally excavated by hand tools such that the trench shall have a bottom shaped to support the pipe throughout its entire length by firm and undisturbed material. Pipeline trenches, for which bedding is required, may be excavated to the required depths using machinery. No pipe shall be laid directly on ledge, hard shale or a very compact glacial till. When an unstable trench bottom is encountered and the Town Water Department determines that it cannot support the pipe adequately, an additional depth shall be excavated and refilled to the pipe invert with approved material at the contractor's expense. Pipeline trenches shall be dry during the laying of pipe. Wood supports under pipe shall be removed prior to backfilling. Pipeline installation procedures can be found in AWWA Standard C600.

B. Bedding material shall consist of crushed or natural stone conforming to ASTM D2321.

Sieve	Percent Passing
1" Screen	100%
¾" Screen	100%
½" Screen	90 – 100%
⅜" Screen	40 – 70%
No. 4 Sieve	0 – 15%

C. Bedding and blanket material shall be Class II material (ASTM D2321) consisting of clean, granular material (sand), particle size limits described as follows:

Sieve	Percent Passing
No. 4	100%
No. 100	30%
No. 200	12%

2.11 PIPELINE INSULATION

A. Approved waterlines with less than six feet (6'–0") of cover over the crown, that cross a storm sewer, or where indicated on the plans, shall be protected against freezing by the installation of two inch (2") thick highest available density extruded polystyrene insulating sheets or equivalent. Sheets shall be the the lesser of 3' or 2 x diameter of the pipe. The sheets shall be placed six inches (6") above the crown after placement of four to six inches (4" – 6") of clean medium or coarse sand below the pipe bottom and four to six inches (4" – 6") above the crown. Joints shall be overlapped so there is no gap that will allow frost to penetrate. Care shall be exercised during backfill and compaction over the polystyrene sheets to prevent damage to the sheets. The polystyrene sheets shall meet the comprehensive strength requirements of ASTM D1621–73. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.When water line passes within 5 feet of a catch basin install 2" min. rigid insulation, polystyrene sheets, between water line and cb.

2.12 POLYETHYLENE PIPE ENCASEMENT

A. Polyethylene pipe encasement may be required in areas of corrosive soils and shall conform to current ANSI/AWWA C105/A21.5 Specifications. Minimum material requirements for the polyethylene film shall be high density, cross laminated virgin polyethylene 4 mil film. The Town Water Department reserves the right to specify Polyethylene pipe, C–900, in areas of corrosive soils.

B. The polyethylene encasement shall prevent contact between the pipe or fittings and the surrounding backfill and bedding material and shall be installed as outlined in Section 4.1 of the above ANSI/AWWA standard.

2.13 CONCRETE FOR THRUST BLOCKS

A. Concrete shall be Portland Cement concrete of 3,000 psi minimum 28 day compressive strength. ASTM C–94 specification for transit mixed concrete shall control the concrete quality. A maximum water cement ratio of 6 gallons per sack and a maximum slump of four inches (4") will be allowed.

2.14 FIRE HYDRANTS AND HYDRANT BRANCHES

A. Fire hydrants shall be Mueller Super Centurion 250, Figure A–423 or Kennedy K–81 Hydrant and shall conform to AWWA C502 with the following specifications:

1. Main Valve Opening: 5 1/4 inches
2. Nozzle Arrangement: Two 2 1/2 inch Hose Nozzles with National Standard Thread (NST)
3. 4" Storz nozzle in place of or as an attachment to: One 4 1/2 inch Pumper Nozzle with National Standard Thread (NST).
4. Inlet Connection: 6 inch Mechanical Joint, "Mega–Lug" or equivalent retaining gland and concrete thrust block
5. Operating Nut: Standard 1 1/2 inch Pentagon
6. Direction of Opening: Counterclockwise
7. Depth of Bury: Six–foot cover. The hydrant shall have at least 15 inches and no more than 21 inches between the bottom of the steamer cap and the ground.
8. Drain: The hydrant shall be non–draining or have the drains permanently plugged.
9. Color: Red enamel
10. Other: Hydrants shall be compression type closing with the pressure. Hose and pumper nozzles shall be 1/4 turn type secured by stainless steel or corrosion resistant pins or screws. Pressure seals behind the nozzle flanges shall be "O" rings. A breakable coupling retained in place by stainless steel or corrosion resistant pins shall make the union between the upper and lower stems. The two–piece traffic flange shall be held in place by nuts and bolts. The upper barrel shall be able to rotate 360 degrees without removing any bolts. Hydrant flags shall be required and supplied for each hydrant. Wherever a traffic hazard appears to exist, curbing and/or bollards shall protect the hydrant.

B. For single–family house subdivisions, there will be at least one hydrant at each intersection and a maximum of five hundred feet (500') between hydrants with a minimum water flow of 500 gallons per minute (gpm) at the flow hydrant with a 20–psi residual pressure at the residual hydrant. Hydrants should be located immediately adjacent to street property lines. A 20' x 20' easement will be required around all hydrants. No structures or plantings are to be placed within a 20' x 20' area of any hydrant.

C. Where dead–end mains occur, they shall be provided with a fire hydrant if flow and pressure meet minimum requirements. If flows and pressure are not sufficient, then an approved flushing hydrant or blow off shall be installed for flushing purposes. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. The open end of a blow off must be capped and terminate at least eighteen inches (18") above grade.

D. When set in lawn space between the curb and sidewalk, no portion of the hydrant or nozzle cap will be less than one foot off the gutter face of the curb or edge of the sidewalk. Hydrants shall be a minimum of four feet (4') and a maximum of six feet (6') from the edge of the sidewalk to the closest point on the hydrant when placed behind the sidewalk. In the absence of a curb or sidewalk, no hydrant shall be placed more than six feet (6') from the edge of pavement. Hydrants shall be located so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2.15 HYDRANT ASSEMBLIES

A. Hydrant assemblies shall consist of an anchor tee, a six inch (6") mechanical joint gate valve conforming to the above specifications, the appropriate length of six inch (6") Ductile Iron Cement Lined, Class 52 pipe, all necessary anchor couplings and approved restraining glands, the fire hydrant and appropriate thrust block.

B. Care shall be taken to prevent damage to hydrants and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of the hydrant bowl; all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. All hydrants shall be carefully incorporated in the water main and supported in their respective positions free from distortion and strain. Hydrants shall be set plumb. All hydrants shall be oriented to most efficiently allow fire truck access and connection for emergency purposes. They shall be installed away from the curb line at sufficient distance to avoid damage from or to vehicles. Traffic model hydrants shall be installed so the breakaway flange is not less than two inches (2"), nor more than six inches (6") above the established grade, according to manufacturer recommendations. Hydrant locations are subject to the approval of the Town Water Department and the appropriate municipality's fire department. Installation for fire hydrants can be found in AWWA Standard C600.

2.16 SERVICE CONNECTIONS

A. Service lines shall be installed so as to run perpendicular, in a straight line from the water main to the curb stop.

B. Each service shall consist of a corporation, curb stop, copper tubing and a curb box with a cast iron or stainless steel service rod. Service lines from three–quarter to two inch (3/4" to 2") shall be copper tubing from the corporation stop to the curb stop. Copper tubing shall be type "K", soft temper, conforming to ASTM B88. The name or trademark of the manufacturer and type shall be stamped at regular intervals along the pipe. Copper service pipe shall be one piece from the corporation to the curb stop. The minimum service for a single–family residence shall be three–quarter inch (3/4"). The minimum service for a duplex shall be one inch (1").

C. Corporations shall be AY McDonald or Cambridge Brass Low–Lead and manufactured in accordance with AWWA C800. Corporations shall have threads per AWWA C800 Table 7 / Figure 2, at the inlet and a compression type fitting at the outlet. Both inlet and outlet shall be the same size. Three–quarter inch and one–inch corporations shall be directly tapped into ductile iron pipe six inches (6") and larger in diameter. Larger size corporations up to two inches (2") shall use a tapping saddle. Pipe less than six inches (6") shall require the use of a tapping saddle and corporation. Corporations shall be used for all taps up to two inches (2"). In no instance, except when a tapping sleeve and valve are used, shall a tap be made without a corporation. Corporations shall be Mueller 110 (3/4" – 1"), or Mueller H 15013 (1 1/2" – 2"). A connection made to a pipe that requires a tapping saddle or is not ductile iron will have a body with a suitable outlet, seal, and suitable means for attachment to the main. The body shall be made to conform to the outside configuration of the main. The service saddle shall be designed to provide a drip tight connection. The body shall be Teflon or Epoxy coated with stainless steel strap(s), bolts, nuts, and mechanism for attaching to the pipe barrel.

D. Curb stops shall be a ball valve type with a minimum allowable pressure rating of 300 psi and be manufactured in accordance with AWWA C800. The curb stop shall open left, have a positive stop, be full port, provide drip–tight shutoff in the closed position and be of the tee design or flat design. No curb stop shall have the ability to drain the service line. Both the inlet and outlet of the curb stop shall have compression type fittings. The tee head of the curb stop shall have the provision for the connection of a service rod. Curb stops shall be AY McDonald or Cambridge Brass Low–Lead, or approved equal. The curb stop shall rest on a four inch by eight inch by sixteen–inch (4" x 8" x 16") concrete block for support. Curb stops shall be installed just inside the municipality R.O.W.

E. Curb boxes shall be of sliding adjustable type capable of adjusting from five feet to six feet (5' – 6') (Erie Style). The base of the box shall be arch type so as to prevent the box from resting on the curb stop. The adjustable upper section shall be one inch (1") diameter for use with 3/4" and 1" curb stops. For larger curb stops, the upper section shall be 1 1/4" in diameter. Stationary rods affixed to the key of the curb stop with a brass pin shall be thirty inches (30") in length for 3/4" and 1" curb stops and twenty–four inches (24") for large curb stops. Curb box rods may be cast iron or stainless steel, as determined by the Town Water Department. The word "WATER" shall be inscribed on the cover of the box.

F. Services greater than 2" diameter shall be constructed using C900 PVC pipe in accordance with the requirements set forth in Section 2.02 on Sheet C7.3

PART 3 – EXECUTION

3.01 INSTALLATION

A. Contractors shall notify the Town Water Department and Dig Safe at least seven days prior to any work on the water system.

B. Skilled workers experienced in such work shall install all items. Tools shall be adequate for the work and in good condition so as to produce good, clean cut threads of the correct size, pitch, and taper.

C. Installation of all water lines shall be in accordance with the latest version of AWWA C600 or AWWA C605 , as applicable, current edition.

D. Connection to an existing water main shall be done under the supervision of and with the approval of the Town Water Department. It is the applicant's, developer's, or owner of record's responsibility to secure ALL necessary connection permits and pay ALL applicable fees to make the connection, and to coordinate all parties involved in the process. The engineer and the Town Water Department shall be notified at least two working days in advance of the intended connection time. No existing valves, hydrants, curb stops, etc. shall be operated without prior approval of the Town Water Department. The Town Water Department shall operate all valves initially to ensure the integrity of the valve. The Town Water Department may then allow the contractor to operate those valves. Any damage occurring after the use of any valve operated by the contractor shall be the contractor's responsibility.

E. Care shall be taken to prevent damage to valves and other appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign matter cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper functioning, and all other nuts and bolts checked for tightness. Valves and other equipment, which do not operate easily, or are otherwise defective, shall be replaced. All valves shall be carefully incorporated into the water main and supported in their respective positions free from all distortion and strain. Valves and valve boxes shall be set plumb. Valve boxes, besides being plumb, shall be centered directly over the valves.

F. All pipes showing cracks shall be rejected. If cracks occur in the pipe, the contractor may, at his own expense and after approval of the Town Water Department, cut off cracked portions at a point at least twice the pipe diameter from the visible limits of the crack and use the sound portion of the pipe.

G. All water mains shall have no less than six feet (6') of cover unless waived by the Town Water Department. The pipe shall be laid to conform to the lines and grades indicated on the Department. The Town Water Department may restrict work before November 15 and after April 1 during adverse weather conditions. The Town Water Department may not allow excavating for water mains during the winter months except by special permission for emergencies. Each pipe shall be laid so as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.

H. Temporary support, adequate protection, and maintenance of all underground structures, drains, sewers and other obstructions encountered in the progress of the work shall be provided at all times. If utility service is interrupted as a result of work for the project, the contractor shall immediately restore service by repairing the damaged utility at the contractor's expense.

I. At all times, when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. During construction, the contractor shall conduct operations so as to prevent the accumulation of water, ice, and snow in the vicinity of excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress and quality of the work.

J. Under no conditions shall water be allowed to rise in open trenches after pipe has been laid.

K. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner that will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets. Disposal shall not cause any interference in the use of streets and roads by the public. Pipes under construction shall not be used for drainage of excavations.

L. Any deflection of joints in pipe up to twelve–inch (12") diameter shall be within the limits specified by the manufacturer, but not to exceed five degrees or nineteen inches (19") per eighteen feet (18') of pipe length.

M. Concrete thrust blocks shall be installed on all hydrants, plugs, tees, and bends deflecting 11 1/4 degrees or more. Concrete thrust blocks shall be used in conjunction with "Mega–Lug" restraining glands or equivalent. Care shall be taken to ensure that concrete will not come into contact with flanges, joints, or bolts. The required area of thrust blocks shall be indicated on plan typicals and approved by the Town Water Department. Concrete shall be placed against undisturbed soil. Wooden side forms or equal shall be provided for thrust blocks. No backfilling shall be allowed until concrete masonry has set sufficiently. Where directed by the Town Water Department or engineer, concrete encasement of the waterline may be made for stream crossings and similar purposes. Where required on the plans or as directed by the Town Water Department or engineer, a concrete cradle shall be used to bolster and strengthen the pipe. The Town Water Department or his designee shall inspect all thrust blocks prior to backfilling.

N. All trenching safety standards shall be in conformance with all applicable State and Federal guidelines. The contractor shall be solely responsible for any safety citations by State or Federal inspectors.

O. There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks that are supplied with water that is, or may be, contaminated.

P. As necessary, temporary PVC markers shall be supplied at all gate valves, curb boxes, and at the end of water lines to a minimum of twelve inches (12") above finish grade until accepted by the Town Water Department.

Q. All surplus material and debris shall be removed as the project progresses, leaving all areas clean and presentable.

R. Unless otherwise required, all paving and sidewalks that may be damaged during construction shall be replaced with the same kind of material that previously existed.

S. The contractor shall be responsible for proper protection of persons and property on the project. The contractor shall barricade open holes and depressions occurring as part of the work, and post warning lights on adjacent property to or with public access.

T. Warning lights shall be operated during hours from dusk to dawn and as otherwise requested.

U. The contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by construction operations.

V. No water lines shall be installed after November 15 or before April 1 without prior approval of the Town Water Department.

3.02 BACKFILLING

A. Trenches shall be backfilled to subgrade with, wherever possible, material excavated from the trench, and shall be done only after the approval of the Town Water Department. Material for backfilling shall be free of roots, stumps, and frost. Backfill shall not be placed on frozen material. Materials used for backfilling trenches shall be free of stones measuring more than twenty four (24) pounds. No stones measuring over three inches (3") in the longest dimension shall be placed within one foot (1') of the pipeline being backfilled. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe. In general, use of blasted rock as trench backfill will not be permitted.

B. Backfill material shall be tamped in layers around the pipe to a sufficient height above the pipe to adequately support and protect the pipe. Backfill for pipelines shall be placed in six inch (6") lifts, each lift being compacted to not less than 95% of maximum dry density as determined by the AASHTO–T–99 Standard Proctor. If conditions warrant, the backfilling of trenches may be done with mechanical equipment. Particular precautions shall be taken in the placement and compaction of the backfill material in order not to damage the pipe, pipe coating or structure. The backfill shall be brought up evenly. Around valve boxes, the backfill shall be tamped to a distance of four feet (4') on all sides of the box, or to the undisturbed trench face, if less than four feet (4'). Backfilling in all public roadways shall be so compacted as to leave no depression in the road. Additional backfill requirements may apply within State or local Highway Right–of–Ways. All public road surfaces shall be restored to a condition at least equal to that which existed prior to the start of construction. Precautions shall be taken against undue damage to existing surface materials.

C. No compacting shall be done when the material is too wet to be compacted properly. At such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions are taken as may be necessary to obtain proper compaction.

D. Surplus excavated materials shall be disposed of in a satisfactory manner. Surplus material or spoil shall be removed promptly and disposed of so as not to be objectionable to abutters or the general public.

E. Trenches that have been improperly backfilled, enclosed or covered before inspection of fittings and joints shall be reopened and re–backfilled at the contractor's expense.

3.03 WATER/SEWER SEPARATION

A. Water mains crossing sewers shall be laid to provide minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer line. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of pipe shall be located so both joints will be as far from the sewer as possible. This vertical separation shall be maintained for that portion of the water main located within ten feet (10') horizontally of any sewer it crosses. Water mains must be laid at least five feet (5') horizontally from any existing or proposed storm sewer and ten feet (10') from any existing or proposed sanitary sewer.

B. When it is impossible to obtain horizontal and vertical separation on new installations, both the water main and sewer main shall be constructed of waterworks material with watertight joints and shall be pressure tested before backfilling. A PVC sleeve may be required for one or both mains in addition to the waterworks material. Lines may also be encased in concrete as required by the Retail Department. No water main shall pass through or come in contact with any part of a sewer manhole.

C. Distribution lines shall not be placed closer than fifty feet (50') horizontal distance from any septic tank or leach field unless approved by the VT Water Supply Rule Provisions under Chapter 21.8.6.4 or the Town Water Department.

D. Force main crossing shall be arranged so that at least one full length of sewer pipe is centered above or below the water line, with the sewer joints as far as possible from the water joints. The new force main line shall be constructed to water main standards for a minimum of twenty feet (20') on either side of the crossing. The section constructed to water main standards shall be pressure tested to maintain 50 psi for fifteen (15) minutes without leakage prior to backfilling. In those areas that proper cover cannot be provided, proper insulation shall be installed.

E. Sewer and waterline separation shall conform to all VT Water Supply Rule requirements, and installed in accordance with the latest edition of the "Ten States Standards – Recommended Standards for Water."

3.04 TESTING AND DISINFECTION

A. All water mains shall be constructed, tested and disinfected in accordance with AWWA Standards C–600, C–605, C651 and The Vermont Water Supply Rule. All tests shall be conducted by and at the expense of the Contractor.

1. The Contractor shall furnish all gauges, testing plugs, caps and all other necessary equipment and labor to perform leakage and pressure tests in sections of an approved length. Each valved section, including hydrant laterals, or a maximum length of 1,000 feet of pipe shall be tested. The Contractor shall provide at his own expense any additional taps to the water line necessary to perform the pressure and leakage test between valves. All didinfection/testing shall be completed by an independent third party unless otherwise approved by the Engineer or local municipality.
2. All water required for testing shall be potable. All testing shall be conducted in the presence of the Engineer.
3. The Contractor shall make the necessary provisions to tap the pipe at the high point to release all air and shall plug same after completing the test. Hydrants or blowoffs located at high points may be used for air release in lieu of taps if approved by the Engineer.
4. For the pressure test, the Contractor shall develop and maintain for two hours, 150% of the working pressure, or 200 psi, whichever is greater. Failure to hold within 5 psi of the designated pressure for the two hour period constitutes a failure of the section tested.
5. No pipe installation shall be accepted if the leakage is greater than that determined by the following. Maximum allowable leakage will be:

$$L = \frac{SD\sqrt{P}}{148{,}000} \quad \text{or} \quad L = \frac{ND\sqrt{P}}{7{,}400}$$

whichever is less

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge).
N = Number of joints in the pipeline tested

All testing shall be conducted in accordance with AWWA C600 (latest edition)

6. Should any section of pipe fail either the pressure or leakage test, the Contractor shall do everything necessary to locate and repair or replace the defective pipe, fittings, or joints at no cost to the Owner.
7. Disinfection: Disinfection of the pipeline shall be directed by the Engineer and at the Contractor's expense. AWWA Standard C–651 shall be used as a basis for the disinfection process.

B. The Engineer or Town Water Department will require as minimum:

1. Complete flushing of the pipeline to wash out all dirt, debris, etc. which may have accumulated in the pipeline during construction. A reducing agent shall be used at the point of flushing to eliminate the free chlorine residual per the direction of the Town Water Department.
2. Following flushing to clean clear water, the Contractor will add chlorine through continuous feed to the entire pipeline volume of water such that the water will have not less than 25 mg/L free chlorine, and let the mixture set for at least 24 hours.
3. After the 24–hour duration, the water in the pipeline shall be tested for residual free chlorine and must contain a minimum of 10 mg/L chlorine. If less than 10 mg/L are found, then the disinfection procedure shall be repeated until at least 10 mg/L chlorine residual is indicated by test.
4. Upon successful completion of step 3 above, the pipeline shall be flushed again until the chlorine concentration in the pipeline is no higher than that prevailing in the supply system. A reducing agent shall be used to eliminate the free chlorine residual in the flushing process per the direction of the Town Water Department.

C. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main, and submitted to the Vermont Health Department for analysis. At least one set of samples

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134

DRAWING NUMBER C7.4

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shall be collected from every 1,000 feet of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall show the absence of coliform organisms and, if required, the presence of a chlorine residual (AWWA C651–99). If the initial disinfection fails to produce samples which pass the V.S.H.D. requirements for potable drinking water, then the new main shall be refllushed and shall be resampled until satisfactory test results are obtained.

D. Upon satisfactory results by the Vermont State Health Department, the pipeline may be placed in service. All costs for water, materials, equipment and labor to perform the required testing disinfection, and flushing of the pipeline shall be paid by the Contractor.

3.05 SUBMITTAL OF TEST RESULTS

A. A. The Applicant or Project Engineer shall be responsible for submittal of test results to the Town Water Department. The Applicant or Project Engineer shall also provide a letter to the Town Water Department certifying that the water system has passed all tests, is constructed in accordance with the approved plans, except as may have been modified by approved Change Order, and is in condition to be placed in service. Submittal of all test results shall be required prior to the water main being placed into service.

3.06 FINAL INSPECTION

A. For one year from the date the new system is placed into service, the applicant's developer/contractor will be responsible for any necessary repairs or corrections as part of the project warranty. At the end of a one–year period, an inspection will be performed by the Town Water Department prior to the system owner assuming ownership of any of the lines and appurtenances. The contractor shall correct any punch list items accumulated during the inspection after receipt of this list. Incomplete work on the system shall not be included in the initial inspection, but shall be inspected as the project continues. The contractor shall repair, replace, or retest promptly as directed by the Town Water Department and without further charges, all work equipment, materials or parts, which may fail during the one year warranty period.

B. A final walk–through inspection shall be conducted by the Town Water Department prior to the water system being accepted for ownership by the system owner. This inspection shall include but not be limited to:

1. Valves, hydrants, and curb stops operating properly.
2. Valve boxes and covers set plumb and at proper elevations.
3. Proper hydrant nozzle height above grade.
4. Proper hydrant opening direction, nozzle thread, and barrel color.
5. Proper distance from the face of the curb of hydrant nozzles.
6. Hydrant flags meeting Town Water Department specifications installed on each fire hydrant at the time of installation.
7. Static and residual hydrant pressures and flow rates.
8. Curb boxes inside ROW, set to grade, containing operating rod, and plumb.
9. Tie information and record drawings complete and submitted.
10. Material testing results, lab reports, manufacturers' certificates, and leakage test results complete and on file.
11. General appearance and restoration.
12. Submittal of O&M manuals in hard copy and Adobe Acrobat Reader (.pdf) format.
13. Submittal of As–Builts in hard copy format and Auto–CAD.DWG Version 2000 format or newer within 14 days of completion.

3.07 GENERAL INFORMATION

A. All persons taking water must keep the fixtures and service pipe within their own premises in good repair and fully protected from frost, and must prevent unnecessary leakage of water. The Town Water Department shall not be liable for leakage of hydrants, pipes or fixtures upon the premises of any consumer, nor for obstructions therein by freezing or otherwise, nor for damages resulting from any of the forgoing causes. All leaks that are on the building side of the curb stop will be the owner's responsibility and repaired at the owner's expense.

B. Water rates shall be collected for all water used until the water is shut off at the curb stop by the Town Water Department. No abatement of water rates will be allowed by reason of disuse, diminished use, or vacancy of premises without proper notice to the Town Water Department.

C. The Town Water Department or system owner shall not be liable for any injury, loss or damage of whatever nature occasioned by the failure to maintain a constant or uniform pressure in the water mains, or for damages occasioned by or growing out of a stoppage of said water by frost or other cause, or for damage occasioned by or growing out of an insufficient supply of the same, or for accident or damage of any kind caused by or growing out of the use or failure of said water.

D. No person shall open any hydrant or draw water there from except the Town Water Department personnel or persons under their direction, or the officers or designees of the municipal fire department and members of the fire companies under their direction for fire purposes, or those individuals who have been granted approval on a hydrant use application by the Town Water Department, in which case, all such usage shall be metered. Fines for unauthorized use of any hydrant or connection may be incurred, according to the Rules and Regulations of the Town Water Department.

E. One curb stop and one water meter shall be installed for each individual dwelling unit, condominium unit, apartment unit, commercial or office occupancy. Exceptions may be permitted in cases where a condominium association signs a binding agreement to be responsible for all collection of water bills. In cases where condominiums are converted into separate apartments, separate curb stops and water meters shall be installed for each unit. Town Water Department employees shall install all water meters. Under no circumstances are plumbers or persons other than those authorized by the Town Water Department permitted to turn water on or off at the curb stop. The water will not in any instance be turned on to any premise for use until the Town Water Department has suitably attached a meter.

F. The owner of the premises shall be responsible for all water payments. A change of tenants or premises will not relieve the owners from payment of a back bill.

STORM WATER PONDS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Construction of storm water detention pond.

PART 2 – PRODUCTS

A. Compacted Fill/Granular Borrow: The material for the fill shall be obtained from the designated areas and shall conform to the requirements of Section 02210 – Site Earthwork. The material shall be free from stumps, wood, brush, roots, sod, rubbish, and other matter that may decay. It should be free of stones over 2 inches in diameter where compacted by hand or mechanical tampers, or over 6 inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill, nor shall the fill material be placed on a frozen foundation.

B. Stone Fill: Stone fill shall conform to the requirements of Type I Stone Fill as specified in Section 02439 – Stone Fill.

C. Riser and Drain Pipe: Riser and drain pipe shall conform to the requirements of the Drainage section.

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. The area to be covered by the pond and embankments shall be cleared of all trees, brush, stumps, roots and other objectionable material. The area to be covered by the earth embankment and the surface of the borrow area shall be stripped of all grass, roots, organic materials, or other objectionable materials to a depth that will insure the removal of any materials which will prevent bond between the foundation and the fill. Material cleared shall be disposed of in accordance with Section 02110 – Site Clearing. Where the embankment will be on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.

3.02 COMPACTED FILL/GRANULAR BORROW

A. Preparation of Foundation: Upon completion of the clearing operation and just prior to placing the fill material on any portion of the foundation, that portion shall be scarified, plowed, or disked to a depth of 3 inches. All objectionable material exposed by this operation shall be disposed of outside the limits of the fill.

B. Placing and Spreading Material: The placing and spreading of material shall be started at the lowest part of the section under construction and the fill constructed in layers of 6 inches. The layers shall slope slightly towards the reservoir to prevent puddles and provide for faster runoff in case of rain. Where possible, the layers shall extend over the entire area of the fill. The distribution and gradation of the materials throughout the fill shall be such that there be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. The most porous borrow material shall be placed on the downstream portions of the embankment.

C. Compaction: All fill shall be compacted to 95 % maximum density per ASTM D–698.

D. Limits: The embankment shall be constructed where located and as detailed in the Contract Plans. Side slope shall be 1 vertical to 3 horizontal.

E. Revisions to the proposed design of the detention pond may be necessary if, in the opinion of the Engineer, unsuitable material is found at the pond location.

3.03 SLOPE PROTECTION

A. Placement: Stone Fill Type I shall be placed at locations indicated on the plans to a minimum thickness of 1'–0" in one course in a manner that will result in a reasonably well graded surface. Care shall be taken in the placing to avoid displacing of the underlying material. The stones shall be placed and distributed so that there will be no accumulations of either the larger or the smaller stones. Re–arrangement of the stone fill by hand labor or mechanical equipment may be required to obtain the specified results.

3.04 LANDSCAPING

A. At completion of grading, slopes, ditches, and all disturbed areas shall be smooth and free of pockets with sufficient slope to ensure drainage. All disturbed areas shall receive a minimum of four inches (4") of topsoil and shall be seeded, fertilized, limed, and mulched in accordance with the following:

1. Seed mixture in all areas shall be urban mix conforming to the table below. For seeding between September 1 and October 1, winter rye shall be used at an application rate of 100 pounds per acre.
2. Fertilizer shall be standard commercial grade conforming to the State Fertilizer Law and to the Standards of the Association of Official Agricultural Chemists. Dry fertilizer, if used, shall be applied at the rate of 500 pounds per acre. Liquid fertilizer, if used, shall be applied in a 1–2–1 ratio with the minimum rate to include 100 pounds of nitrogen, 200 pounds of phosphate, and 100 pounds of potash per acre.
3. Limestone shall conform to all State and Federal regulations and to the Standards of the Association of Official Agricultural Chemists. The limestone shall be applied at a rate of one ton per acre as directed.
4. Within twenty–four (24) hours of application of fertilizer, lime, and seed, the surface shall be mulched with a hay mulch. Mulch shall be spread uniformly over the area at a rate of two (2) tons per acre.
5. All turf establishment shall be performed in accordance with the Vermont Standard Specifications for Construction, Section 651.

URBAN MIX GRASS SEED

Percentage By Weight	Pounds Live Seed Per Acre	Type of Seed
37.50%	45.0	Creeping Red Fescue
37.25%	37.5	Kentucky Blue Grass, Winter Hardy, Perennial Rye
31.25%	37.5	(variety Pennfine, Manhattan, or similar varieties)
100%	120 pounds live seed per acre	

LANDSCAPE GRADING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Finish grading; bring rough grade in areas to design elevations as shown on the drawings.
2. Topsoil: Work shall consist of furnishing, placing and shaping topsoil, or placing, spreading, and shaping topsoil form stockpiles or stripped areas.

PART 2 – PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be loose, friable, reasonably free of admixtures of subsoil, free from refuses, stumps, roots, brush, weeds, rocks, and stones 1 1/4 inch in overall dimensions. The topsoil shall also be free from any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth. It shall contain not less than three (3) nor more than twenty (20) percent organic matter. Any material which has become mixed with undue amounts of subsoil during any operation at the source or during placing or spreading will be rejected and shall be replaced by the Contractor with acceptable material.

PART 3 – EXECUTION

3.01 SUBGRADE PREPARATION

A. Clean subgrade of all stumps, stones, roots, trash or other materials which might hinder proper tillage or spreading.

B. All surfaces on which topsoil is to be placed shall be graded to a reasonably true surface and scarified by raking, discing or other approved means to a minimum depth of two inches before placing topsoil.

3.03 PLACING TOPSOIL

A. Minimum final depth of topsoil shall be 4 inches.

B. Place topsoil when seeding operations can closely follow spreading operations. Use topsoil in relatively dry state.

C. Topsoil shall be spread and shaped to the lines and grades shown on the plans, or as directed by the Engineer. The depth stated in the contract to which the topsoil is to be placed is that required after final rolling of the material has taken place. All stones, roots and debris over 1¼ inch in diameter along with any sodding weeds and other undesirable material shall be removed.

D. After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled area to prevent excessive compaction. The Contractor shall perform such work as required to provide a friable surface for seed germination and plant growth prior to seeding.

E. It shall be the Contractor's responsibility to restore to the line, grade and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition until the completion of the work.

SEEDING

PART 1 – GENERAL

1.1 Section Includes:

A. Seeding.

1. Furnish all labor, materials and equipment to complete all seeding work as shown on the drawings and specified herein.
2. Except where otherwise shown or specified, the Contractor shall seed all areas where new contours are shown on the drawings and all areas where existing ground cover has been disturbed by the Contractor's operations.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

Planting Restrictions: Seeding and initial fertilizing shall be done between May 1st and September 15th unless otherwise authorized. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untillable. If seeding is done during July or August, additional mulch material may be required. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 SEED

A. Conservation Seed Mix:

Kind of Seed	Minimum Purity	Minimum Germination	Lbs/Acre
Creeping Red Fescue	98%	85%	22.5
Tall Fescue	95%	95%	22.5
Red Top	95%	90%	3
Birdsfoot Trefoil	98%	85%	9
Annual Ryegrass	95%	85%	3
		TOTAL =	60

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum of 85 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.

2.3 FERTILIZER

A. Commercial Fertilizer: Commercial–grade complete fertilizer of neutral character, consisting of fast– and slow–release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.

B. Slow–Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water–insoluble nitrogen, phosphorus, and potassium.

2.4 MULCHES

A. Mulch: Provide air–dry, clean, mildew– and seed–free, hay or threshed straw of wheat, rye, oats, or barley.

B. Compost Mulch: Well–composted, stable, and weed–free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1–inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

PART 3 – EXECUTION .

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Provide erosion–control measures to prevent erosion or displacement of soils and discharge of soil–bearing water runoff or airborne dust to adjacent properties and walkways.

C. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

1. Apply fertilizer directly to subgrade before loosening.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Mix lime with dry soil before mixing fertilizer.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.2 APPLICATION RATES

A. When a soil test is not available, the following minimum amounts should be applied:

1. Agricultural limestone: 2 tons/acre.
2. Nitrogen (N): 50 lbs./acre.
3. Phosphate: 100 lbs./acre.
4. Potash: 100 lbs./acre.
   a. This is the equivalent of 500 lbs./acre of 10–20–20 fertilizer or 1,000 lbs./acre of 5–10–10.
5. Hay mulch: 2 tons/acre.

3.3 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

C. Protect seeded areas with slopes exceeding 1:3 with erosion–control blankets installed and stapled according to manufacturer's written instructions.

D. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a depth of 3/16 inch, and roll surface smooth.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber–mulch manufacturer's recommended tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one–step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500–lb/acre dry weight, and seed component is deposited at not less than the specified seed–sowing rate.

3.5 MAINTENANCE

A. Maintain and establish seeding by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
2. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
   a. Seeded Areas: 90 days from date of Substantial Completion.
   b. When initial maintenance period has not elapsed before end of planting season, or if seeding is not fully established, continue maintenance during next planting season.

3.6 SATISFACTORY CONDITIONS

A. Installations shall meet the following criteria as determined by Engineer/Owner:

1. Satisfactory Seeded Area: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish area that do not comply with requirements and continue maintenance until areas are satisfactory.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by work. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

C. Remove nondegradable erosion–control measures after grass establishment period.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134

DRAWING NUMBER C7.5

CIVIL ENGINEERING ASSOCIATES, INC.
10 Mansfield View Lane
South Burlington, VT 05403
Phone: 802-864-2323
Fax: 802-864-2271
E-Mail: dmarshall@cea-vt.com

November 5, 2019

Ms. Allison Murphy, P.E., Division Engineer
Vermont Department of Environmental Conservation
Drinking Water and Groundwater Protection Division
1 National Life Drive, Main 2
Montpelier, Vermont 05620-3522

Re: Request for Public Water System Permit to Construct
Ireland Development, Inc. – Sunderland Farms PUD
Severance Road, Colchester, VT
Engineer's Report

Dear Ms. Murphy:

We have created the Engineer's Report which follows the numbering system found in Appendix A of the Vermont Water Supply Rule - Chapter 21. This information specifically covers the hydraulic analysis associated with the proposed expansion of the existing municipal distribution system.

In support of this application we have enclosed a site utility plan, details and specifications which show the proposed system improvements and services for the proposed project.

1.2.1 General Information:

a) **Name and Address of Official Applicant and future Owner:**
Ireland Development, Inc.
193 Industrial Avenue
Williston, Vermont 05495

b) **Identification of Area:**
The area is located on Severance Road in Colchester and is a ¼ mile east of the intersection of Severance Road and Route 2. The project area is depicted on the attached design plans and attached orthophoto plan (Attachment 1).

c) **Existing Water Works:**
There is a newly constructed (by Colchester Fire District #3) 12" HDPE Water Main located along Severance Road with water being distributed by the Colchester Fire District #3.

d) **Letter of Allocation:**
This proposed project will provide potable water to a mixed use project including multi-unit office buildings, restaurant, offices and the like. These design flows for the project are:

Severance Road PUD
Water Design Flows
Severance Road
14-Aug-18

No.	Description		GPD	Flow/Unit		GPD
Building 1 (5,540sf office)						
22	Employees	x	15	GPD/Empl.	=	330
10	% Low Flow Reduc. Credit					(33)
Building 2 (4,030 sf office)						
16	Employees	x	15	GPD/Empl.	=	240
10	% Low Flow Reduc. Credit					(24)
Building 3 (12,400 sf Retail/13,260 sf residential)						
16	1-Bedroom Units	x	135	*GPD/Unit	=	2,160
50	Employees	x	15	GPD/Empl.	=	750
10	% Low Flow Reduc. Credit					(75)
Building 4 (4,050sf restaurant)						
75	Seats	x	30	GPD/Unit	=	2,250
10	% Low Flow Reduc. Credit					(225)
Building 5 (3 story - 47,700sf residential)						
4	1-Bedroom Units	x	135	*GPD/Unit	=	540
32	2-Bedroom Units	x	270	*GPD/Unit	=	8,640
Building 6 (3 story - 46,900 sf residential)						
3	1-Bedroom Units	x	135	*GPD/Unit	=	405
32	2-Bedroom Units	x	270	*GPD/Unit	=	8,640
Building 7 (43,940 sf - 32 residential units)						
4	1-Bedroom Units	x	135	*GPD/Unit	=	540
25	2-Bedroom Units	x	270	*GPD/Unit	=	6,750
3	3-Bedroom Units	x	405	*GPD/Unit	=	1,215
Building 8 (4,275 sf daycare)						
57	People	x	15	GPD/Perso	=	855
10	% Low Flow Reduc. Credit					(86)
Buildings 9 (16,180 sf office)						
66	Employees	x	15	GPD/Empl.	=	990
10	% Low Flow Reduc. Credit					(99)
Building 10 (8,130 sf office)						
32	Employees	x	15	GPD/Empl.	=	480
10	% Low Flow Reduc. Credit					(48)
Building 11 (17,920 sf residential)						
45	3-Bedroom Units	x	405	*GPD/Unit	=	18,225
Town Houses (58,460 sf residential)						
30	3-Bedroom Units	x	405	*GPD/Unit	=	12,150
				Total Design Flow		**64,571**

* Low Flow Reductions have been integrated into the per bedromm design values

The Town of Colchester has approved the water allocation request and it is attached in this submittal. (See Attachment 2).

e) **Fire Protection:**
Fire protection will be provided by installing 3,600± feet of 8" C900 PVC water main into the project site from the newly installed 12" HDPE water main located along Severance Road.

Areal fire protection will be provided through the installation of twelve additional hydrants to protect and provide a connection in the event of a fire. See attachment 1 for general distribution system layout and the design plans for additional detail.

1.2.2 Extent of Water Works System:

a) **Nature and extent of area to be served:**
The area to be served includes the Planned Unit Development which consists of residential and commercial buildings.

The specifics for the project distribution system calls for the installation of 3,600± LF of 8" C900 PVC water main and 330± LF of 6” C900 PVC water main; twelve new hydrants; and ¾” to 1" copper services for 30 residential units per the attached plans.

b) **Provisions for extending water system:**
Proposed Expansion – The project calls for a new branch off the Severance Road water main.

Future Expansion – There is an 8” C900 PVC stub to be installed for future connection to the Balaki Parcel.

c) **Future requirements:**
No future requirements have been identified for this project as this program represents full build-out potential of the property.

1.2.3 Alternate Plans:

No alternate plans for the supply of these proposed users was undertaken other than the use of drilled wells which was deemed imprudent base on the ready availability of the existing municipal water supply.

1.2.4 Design Criteria:

a)- c) Not applicable.

d) **Average and maximum day demands:**
The average day demand is estimated at 64,571 GPD (please see computation in Section 1.2.1(d) above)

Based on a factor of two, the maximum daily demand would be approximately 129,142 GPD.

e) **Existing and proposed services:**
There are no existing services at this location.

The proposed project will create new Planned Unit Development with commercial and residential aspects and service lines to each building.

f) **Fire Fighting Requirements:**
The minimum required fire flows for this project is 1,551.3 GPM (See Attachment 6). The calculated available fire flow is 2,292 GPM (8in line) (See Attachment 5).

g)- l) Not applicable.

1.2.5 Soil and Groundwater Conditions:

a) **Character of the soil for water main installation:**
The existing soils are mapped by the Soil Conservation Service as being Agawam fine sandy loam, 0 to 5 percent slopes; Belgrade and Eldridge soils, 0 to 3 percent slopes; Hartland very fine sandy loam, 2 to 6 percent slopes; Hartland very fine sandy loam, 25 to 60 percent slopes; Hinesburg fine sandy loam, 0 to 3 percent slopes; Munson and Raynham silt loams, 2 to 6 percent slopes. (See Attachment 3).

b) **Soil conditions for proposed structures:**
The soil conditions for the proposed structures are similar to those to be experienced in the installation of the water mains.

c) The water table varies from one foot to three feet below the surface. Due to the presence of fine grained materials and a perched water table, the springtime water table is close to the surface.

1.2.6 Water Use Data:

a) Not applicable.

b) **Present consumption and project demands:**
None. The additional flows are estimated at 64,571 GPD.

c) **Unusual Occurrences:**
None.

1.2.7 Hydraulic Analysis:

Since the project is proposing to tie-in to the existing 12" Colchester Fire District #3 water main located on Severance Road, water availability did not appear to be an issue when offered by the Fire District.

The water distribution system is served by a municipal storage tank at Water Tower Hill in Colchester. The ability of the proposed expansion of the distribution system to serve the Sunderland Farm Community project is premised on the hydraulic modeling completing by the Colchester Fire District #3's engineer, Krebs & Lansing. (See attachment 4).

In this situation, the performance of the Town's new 12" HDPE water main project was modeled using the baseline information from the Fire District. Is a worst case scenario, an analysis assuming a dead-end feed was undertaken to determine what the available fire flow would be at the most remote portion of the site.

The analysis showed that the existing and proposed extension of the system was capable of providing 2,282 GPM while maintaining a minimum residual pressure in the surrounding system of at least 20 PSI (See Attachment 5).

1.2.8 Fire Flow Requirements:

a) **Requirements of the Insurance Services Office:**

The minimum required fire flows for this project, based on ISO requirements for one and two family dwellings with separation distances of 11 to 30 feet is 1,551 GPM (See Attachment 6). The calculated available fire flow is 2,882 GPM (See Attachment 5).

1.2.9 Sewerage System Availability:

Sewerage for this project is readily available along US Route 7. The proposed sewer for the PUD will connect to an existing manhole present on the east side of Route 7. The buildings will be service by a 6-8" SDR 35 PVC sewer services that will all collect into an 8" sewer main to Route 7.

1.2.10 Source of Water Supply

The existing water supply will be from the Colchester Fire District #3 distribution system.

1.2.11 Proposed Treatment Processes

There are no proposed treatment processes associated with this application.

1.2.12 through 1.2.16 Not Applicable.

1.3 Plans for Construction:

Enclosed for your review are the proposed utility plans depicting the proposed improvements.

1.4 Design Specifications:

The design specifications for this project are included in the design plan set associated with this submission.

This completes the "Engineers Report" for the proposed construction of the proposed expansion of the Town of Shelburne distribution system. If you should have any questions, please feel free to contact me at 864-2323 x310.

Respectfully,

David S. Marshall, P.E.
Project Engineer

Enclosures:

- Site Utility Plan, details and specifications
- Attachment 1 – Water Service Area Mapping
- Attachment 2 – Water Distribution System – Ortho 1-5000
- Attachment 3 – Soils Mapping w Water Mains
- Attachment 4 - Hydrant Flow Test Results
- Attachment 5 - Hydraulic Analysis Fire Flow Availability
- Attachment 6 – Required Fire Flow

cc: (w/ enclosures)
CEA File 14134.00 (w/ enclosures)

VERMONT

Water Service Mapping Area

Vermont Agency of Natural Resources

vermont.gov

LEGEND

- Parcels (Standardized)
- Roads
  - Interstate
  - Principal Arterial
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
  - Not part of function Classification System
- Waterbody
- Stream
- Parcels (Non-Standardized)
- Town Boundary

1: 5,000

1in = 417 ft.
1cm = 50 meters

254.0 0 127.00 254.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

NOTES

Map created using ANR's Natural Resources Atlas

COLCHESTER FIRE DISTRICT #3
428 Main Street
Colchester, Vermont 05446
802-878-4337

October 1, 2019

Ms. Robin Jeffers
S.D. Ireland Companies
193 Industrial Avenue
Williston, VT 05495

Re: Sunderland Farms Community
Water Storage Capacity – Ability To Serve

Dear Ms. Jeffers,

Colchester Fire District #3 (CFD#3) has sufficient water storage capacity to accommodate the additional demand required by your proposed development - Sunderland Farms Community at Severance Corners. Your request for this proposed development is 64,571 gallons per day.

A 12" water main is currently under construction through Sunny Hollow that will directly connect the Severance Corners area to water storage tanks on Water Tower Hill. Our present hydraulic model indicates that once completed, this water main will substantially reinforce the water system infrastructure that serves Severance Corners and beyond.

Please note, that as of July 2018 an impact fee was adopted for all future development in CFD#3 requiring water allocations, to assist in deferring the cost of debt incurred as a result of (water system) capital improvements. This was previously discussed with Patrick O'Brien (SD Ireland). Payments to CFD#3 can be phased to coincide with your development schedule (amounts to be determined at that time).

This water storage capacity letter is good for three (3) years from the date signed. If this letter is not filed with the appropriate agencies, or if the necessary permits are not obtained within this time period, your water storage capacity allocation will become void and necessitate reapplication at that time. Also, any changes in water demand rates or proposed property utilization that alters the demand, will also require a revised allocation request application. Please contact me if you have additional questions.

Sincerely,

FOR

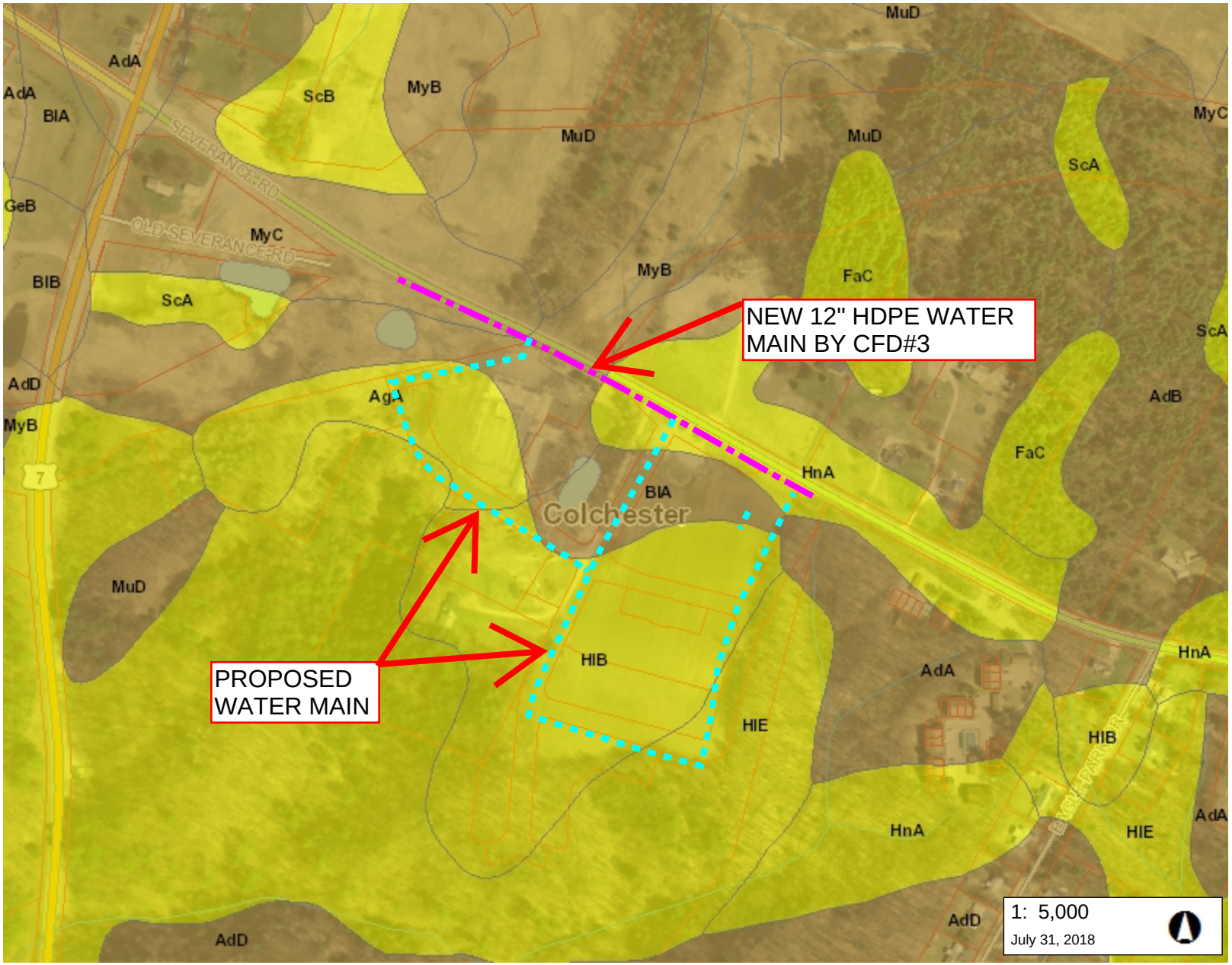
Marianne Terrien
Clerk/Treasurer
Colchester Fire District #3

VERMONT

Water Service Soils Map

Vermont Agency of Natural Resources

vermont.gov



LEGEND

- Soils
  - <all other values>
  - Association
  - Consociation
  - Undifferentiated group
  - Complex
- Parcels (Standardized)
- Roads
  - Interstate
  - Principal Arterial
  - Minor Arterial
  - Major Collector
  - Minor Collector
  - Local
  - Not part of function Classification S
- Waterbody
- Stream
- Parcels (Non-Standardized)
- Town Boundary

1: 5,000

July 31, 2018

254.0 0 127.00 254.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 417 Ft. 1cm = 50 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

NOTES

Map created using ANR's Natural Resources Atlas

JOB CFD#3 - Sunderland Hollow Water
SHEET NO. 1 OF
CALCULATED BY WHJ DATE 9-21-18
CHECKED BY MTS DATE 17259
SCALE

KREBS & LANSING
CONSULTING ENGINEERS, INC.
164 Main Street Ste. 201
COLCHESTER, VERMONT 05446
(802) 878-0375 Fax (802) 878-9618
email@krebsandlansing.com

CFD #3 - SUNDERLAND HOLLOW

FLOW = 1,500 gpm hydrant FLOW AT HYDRANT #235
WATER TOWER HILL TANK = WATER ELEVATION AT 492.7'

NO IMPROVEMENTS TO SO. OAK CURVE
NO IMPROVENTS TO RTE 7 / ROOSEVELT

MODEL CONDITION	RESIDUAL PRESSURE AT HYDRANT #236
STATIC	69.44
	- 25.68
EXISTING CONDITIONS	61.55
16" (12" ID) HDPE PIPE THROUGH HOLLOW	59.81
14" (10.7" ID) HDPE PIPE THROUGH HOLLOW	57.86
12" (9.75" ID) HDPE PIPE THROUGH HOLLOW	51.70
10" (8.2" ID) HDPE PIPE THROUGH HOLLOW	39.73
8" (6.6" ID) HDPE PIPE THROUGH HOLLOW	

For 12" HDPE as designed.

HYDRANT FLOW TEST
DETERMINATION OF AVAILABLE HYDRANT FLOWS

PROJECT:	Sunderland Farms
LOCATION:	COLCHESTER, VERMONT
DATE:	November 5, 2019

= Location for manual input of information.

HYDRANT FLOW TEST DATA

Flowed Hydrant Location	Hydrant 235
Flow Rate (GPM)	1500
Measured Point of Sunderland E	Shea Drive and Severance Road Intersection
Static Pressure (PSI)	69.44
Residual Pressure (PSI)	57.86
Approx. ground elevation (FT)	314

DISTRIBUTION SYSTEM INFORMATION

Dia. of water main at Sunderland Farms (IN)	9.75	
Estimated C Value for line	150	
Number of Directions flow is coming from	1	
Distance from CFD#3 to Sunderland Entrance		0
Length of water main from Sunderland Entrance to Hydrant near Condos on South end of site (FT)		905
Diameter of the water main extension (IN)	10	
Estimated C Value for this line	150	
Approx. ground elevation (FT)	309.5	

Minimum required pressure for System (Hydrant on dead end) at design point (PSI) 20

HYDRAULIC CALCULATIONS

Based on the Hazen-William relationship of :

$$\frac{Qf}{Qr} = \frac{K(hf)^{0.54}}{K(hr)^{0.54}} = \frac{(hf)^{0.54}}{(hr)^{0.54}}, \quad \text{(Eq. 1)}$$

the amount of flow available will be dependent on the allowable reduction in pressure (at the measured hydrant) in comparison to the amount of pressure drop experienced at the measured hydrant.

ESTIMATED AVAILABLE FLOW (GPM) 2857

Based on the estimated flow, the available pressure drop at the measured hydrant would be:

Static pressure:	69.44	PSI
- Minimum pressure to be maintained at design point	20.00	PSI
- Pressure loss in the water main extension up Shea Drive to Hyd	13.20	PSI
- Elevation Adjustment	-1.95	PSI
AVAILABLE PRESSURE DROP	38.19	PSI

AVAILABLE FLOW (Eq. 1) 2857 GPM

Note: For program users, the estimated flow should be adjusted until the available flow equals the estimated flow.

FIRE FLOW REQUIREMENTS

INSURANCE SERVICES OFFICE METHOD

PROJECT:	SUNDERLAND FARMS
LOCATION:	COLCHESTER, VERMONT
DATE:	November 5, 2019

= Location to manually input information

Building Condo 27/28 (Wood Frame) to Building 28 separated by Fire Resistant siding and 2- Hr Doc
Building Condo 27/28 (Wood Frame) to Building 24/25 separated by Firewall

CONSTRUCTION FACTOR (Ci)

Ci = 18F(Ai)^0.5

F = 1.5 FOR CONSTRUCTION CLASS 1 (FRAME)
F = 1.0 FOR CONSTRUCTION CLASS 2 (JOISTED MASONRY)
F = 0.8 FOR CONSTRUCTION CLASS 3 (NONCOMBUSTIBLE)
F = 0.8 FOR CONSTRUCTION CLASS 4 (MASONRY, NONCOMBUSTIBLE)
F = 0.6 FOR CONSTRUCTION CLASS 5 (MODIFIED FIRE RESISTIVE)
F = 0.6 FOR CONSTRUCTION CLASS 6 (FIRE RESISTIVE)

Ai = EFFECTIVE AREA

The effective area is the total square foot area of the largest floor in the building plus the following percentage of the other floors:
+ For buildings of construction class 1-4, 50% of all other floors.
+ For buildings of construction classes 5 or 6 see AWWA Manual A31.

Maximum Ci value is limited to the following:

Class 1 and 2	8000 gpm
Class 2, 3, 4 and 5	6000 gpm
One story Building	6000 gpm

For this project,

F = 1.5 Wood Frame Construction

Effective Area

First floor area =	1,950	SF
Remaining floor area =	1,950	SF

Ai =	2,925	SF	
Ci =	1,460	gpm	Minimum Ci = 500 gpm Round to the nearest 250 gpm
Ci =	**1,500**	**gpm**	

OCCUPANCY FACTOR (Oi)

Combustibility Class	Occupancy Factor (Oi)	
C-1 Noncombustible	0.75	
C-2 Limited Combustible	0.85	Residential
C-3 Combustible	1.00	
C-4 Free Burning	1.15	
C-5 Rapid Burning	1.25	

See Figures 1-1 and 1-2 for typical occupancy classifications (i.e Supermarkets are Classification 3 (combustible)).

Building Occupancy Factor = 0.85

::

EXPOSURES (Xi) and COMMUNICATION (Pi) FACTORS

The exposures and communications factors reflect the influence of exposed and communicating buildings on the needed fire flow.

A value for (Xi + Pi) shall be developed for each side of the building as follows:

(X + P)i = 1.0 + sum of (Xi + Pi) for each side

EXPOSURE FACTOR (Xi)

	(Ft) Distance to the Exposed Building		Length*Height of facing Wall of Exposed Building		Construction Class		Semiprotected (Semi) or Unprotected Openings (UO) or Blank Wall		Exposure Factor Xi
North Side	>100								0
East Side	>100						Semi		0
South Side	>100								0
West Side	25		840		2		None		0.25

The Length-Height factor is the length of the wall of the exposed building, in feet, times its height in stories.

COMMUNICATIONS FACTOR (Pi)

	Type of Protection of Passageway Openings		Fire Resistive, Noncombustible, or Slow Burning Communications					Communications with Combustible Construction			**Commun. Factor (PI)**
			OPEN		ENCLOSED		DISTANCE	OPEN	ENCLOSED	DISTANCE	
North Side	NA										0
East Side	NA										0
South Side	NA										0
West Side	NA										0

PROTECTION OF PASSAGEWAY OPENINGS

TYPE	DESCRIPTION
UN	Unprotected
A	Single Class A fire door at one end of passageway
B	Single Class B fire door at one end of passageway
AA	Single Class A fire door at each end or double class A fire doors at one end of passageway
BB	Single Class B fire door at each end or double class B fire doors at one end of passageway
NA	Not Applicable

Calculated Exposure and Communications Factor

(X + P)i = 1.25

NEEDED FIRE FLOW

1,460 0.85 0 0

NFF = (Ci)(Oi)(1+(X + P))i = 1551.3 GPM

Sunderland Woods Community
Lot Summary

Novermber 4, 2019

LOT NUMBER	AREA		LOT COVERAGE (S.F.)		
	S.F.	ACRES	BUILDING	OVERALL	FRONT YARD
1	11,326	0.26	0	0	0
2	14,375	0.33	0	0	0
3	27,617	0.63	0	0	0
3A	5,663	0.13	0	0	0
4	9,148	0.21	0	0	0
4A	54,014	1.24	0	0	0
4B	15,246	0.35	0	1,153	1,153
5	22,651	0.52	0	0	0
5A	20,038	0.46	0	0	0
5B	12,632	0.29	0	76	76
6	24,394	0.56	0	0	0
6A	14,810	0.34	0	168	168
7	9,583	0.22	0	0	0
8	11,761	0.27	0	0	0
9	10,454	0.24	0	0	0
10	7,405	0.17	0	0	0
11	10,454	0.24	0	0	0
12	11,761	0.27	0	0	0
13	8,712	0.20	0	0	0
14	10,890	0.25	0	0	0
15	9,583	0.22	0	0	0
16	8,276	0.19	0	0	0
17	109,771	2.52	0	0	0
17A	4,356	0.10	0	0	0
18	10,890	0.25	0	0	0
18A	5,663	0.13	0	0	0
19	19,166	0.44	0	0	0
19A	37,462	0.86	0	0	0
20	12,197	0.28	0	0	0
21	17,860	0.41	0	17	17
21A	68,825	1.58	0	2,252	1,325
21B	89,298	2.05	0	0	0
22	27,878	0.64	0	0	0
23	43,560	1.00	0	2,762	0
23A	4,792	0.11	0	0	0
23B	60,984	1.40	0	10,613	570
24	385,942	8.86	0	10,964	0
24A	7,841	0.18	0	0	0
24B	27,443	0.63	0	0	0

CFD#3 - WATER SYSTEM REVIEW

PROJECT: Sunderland Farms Community

LOCATION: 242 Severance Road

OWNER: Ireland Development LLC

ENGINEER: Civil Engineering Associates

DATE REC'D: 9/3/19

DATE REV'D: 11/1/19

PLAN DATE/REV: 8/1/18

REV'D BY: S. Roy & Lance Llewellyn

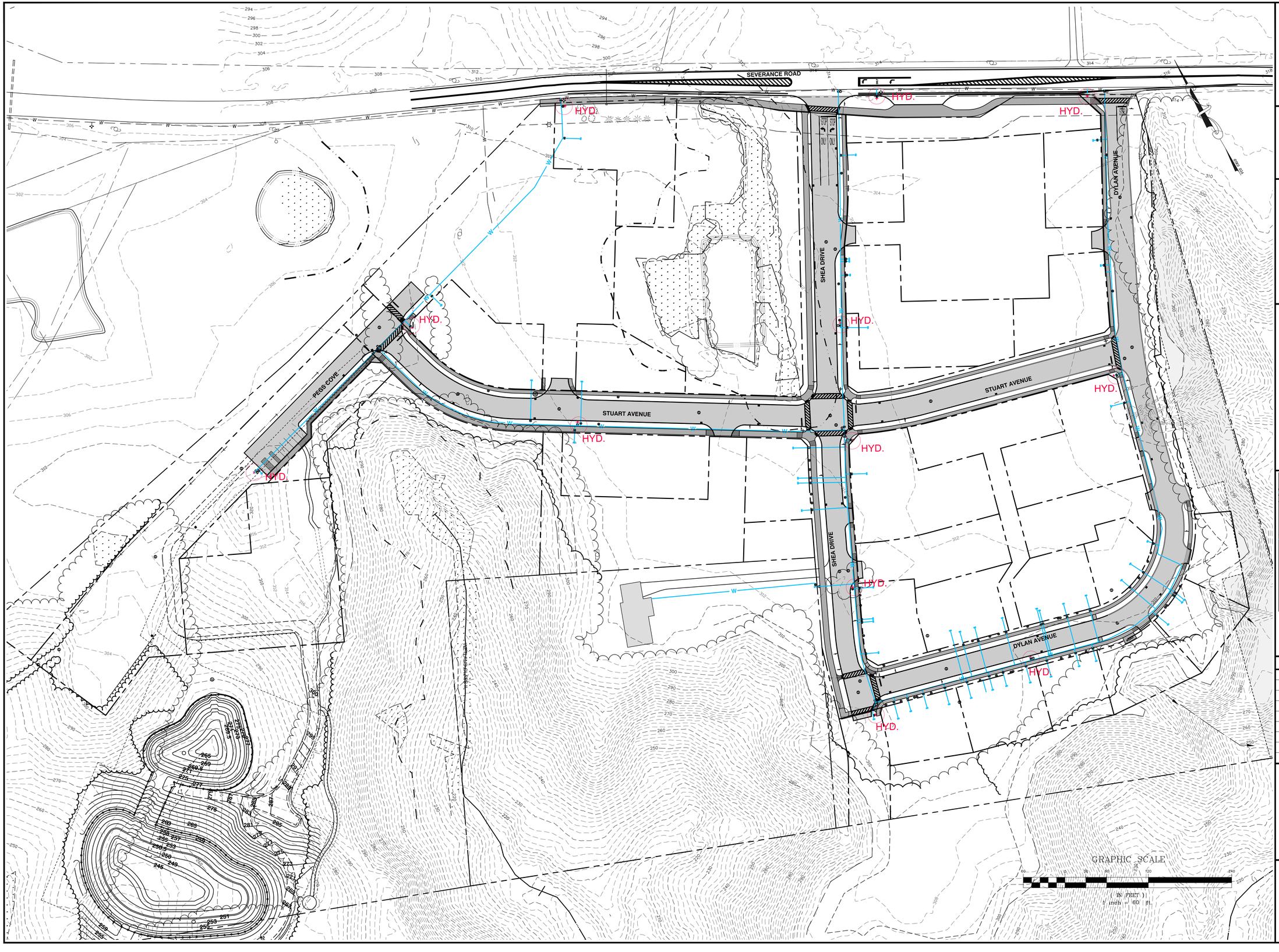
	Yes	No	N/A	Insuff. Info
1.Are the water mains located under/adjacent to the proposed street(s)?	☒	☐	☐	☐
2.Are the public water mains 8" minimum Class 51/52 DI pipe or C900 DR14 (305 psi) pipe with tracer wire and metallic warning tape?	☒	☐	☐	☐
3.Is the depth of all water mains between 6' and 9' below grade?	☐	☐	☐	☒
4.Does the proposed design avoid 90 degree bends?	☒	☐	☐	☐
5.Does the proposed design prevent dead ends?	☒	☐	☐	☐
6.Do new tee connections include valves on all three legs?	☐	☒	☐	☐
7.Do all mains meet horizontal and vertical separation from sewers?	☐	☐	☐	☒
8.Are fire hydrants located every 500' residential and 300' commercial?	☒	☐	☐	☐
9.Are there fire hydrants located within 100' of a sprinklered building?	☒	☐	☐	☐
10. Are fire hydrants set back at least 3' from paved areas?	☒	☐	☐	☐
11. Do fire hydrants meet Town specifications?	☐	☐	☐	☒
12. Are the fire hydrants connected to main with 6" pipe and valve?	☐	☐	☐	☒
13. Are there hydrants at high point(s) to aid in air removal?	☐	☐	☐	☒
14. Are there mechanical thrust restraint and thrust blocks at all fittings?	☐	☐	☐	☒
15. Do all valves meet Town specifications?	☐	☐	☐	☒
16. Are all valves and curbstops located within town right-of-way?	☒	☐	☐	☐
17. Are there any special easement requirements on this project?	☐	☐	☐	☐
18. Do all valves include a valve box at grade w/covers marked "water"?	☐	☐	☐	☒
19. Do all services leave water mains and enter buildings at right angles?	☐	☐	☐	☒
20. Are all services up to 2" using type K copper or CTS pipe?	☐	☐	☐	☒
21. Are there separate fire and domestic connections?	☐	☒	☐	☐
22. If plastic pipe is used for services, do they include a tracer wire and metallic warning marked "Caution Water Line Below" 2' below grade?	☐	☐	☐	☒
23. Do the plans include a water system specifications drawing, including pressure testing and disinfection requirements?	☐	☒	☐	☐
24. Do the plans include water use estimates using the applicable table from the latest Vermont Environmental Standards?	☐	☒	☐	☐
25. Is the project large enough to require Needed Fire Flow (NFF) and/or hydraulic analysis for domestic and fire flow demands, or to prove whether or not the project may have an adverse impact to existing customers?	☐	☐	☐	☐
26. Does or should (circle one) the design include a looped water system?	☒	☐	☐	☐
27. Do multifamily dwellings have means for separate metering?	☐	☐	☒	☐
28. Do the plans include backflow preventers as required by CWD/CFD?	☐	☐	☐	☐

ADDITIONAL REVIEW COMMENTS

1. Water main material has been changed from DI to C900 pipe. Sheet C7.3 (Site Specifications) Section 2.02, incorrectly lists DR-14 as 200psi. The correct pressure rating should be 305psi.

Per item #2 of this review checklist, CFD#3 allows DR-14 pipe provided it gets installed with approved tracer wire and metallic warning tape.

2. Tracer wire is called out on Sheet C5.1 (Water Details) with no specifications. We request the use of copper-clad steel wire and locking connectors from Copperhead Industries.
3. Per item #3 of this checklist, water main depths exceed 9 feet on Shea Drive (Sheet C4.1) in at least two locations (Sta 202+45 and Sta 208+72). This should be avoided.
4. Per item #4, two (2) 90 degree bends are represented on Dylan Avenue (Sheet C3.2) near Sta 107+00. Replace each bend with 45 degree elbows.
5. Sheet C7.4 Section 2.14. Please eliminate Waterous Pacer fire hydrants. CFD#3 recommends the Kennedy K81 over the Mueller hydrant.
6. Tracer wire can either be terminated in the hydrant valve box or in an adjacent curb box as shown in the Tapping Sleeve & valve Detail on Sheet C5.1.
7. Per item #17, are there easement requirements to allow CFD#3, or its designee, to enter this project to inspect and/or maintain the distribution system following construction?
8. Checklist item #19, above, requires services to leave mains and enter buildings at right angles. This set of plans doesn't show buildings and therefore this condition is not answered.
9. Response needed for item 21, above.
10. Add pressure testing and disinfection requirements to Site Specification sheet(s).
11. Per item #24, above, water use estimates are provided separate from these plans.
12. Per item #25, above, while Needed Fire Flow (NFF) numbers have not been provided, a simple hydraulic analysis by Krebs & Lansing with the new 12" water main through Sunny Hollow should meet the project's domestic and fire needs.
13. Backflow preventers are <u>required</u> on services that provide both domestic and sprinkler water.
14. Typical Water Trench Detail – vague use of insulation when depth of cover is less then 6' – specify depth and required insulation
15. Water/Sewer Crossing – Detail specifies 18" minimum separation. On new construction 18" should be obtainable. Clarify.
16. Water/Storm Crossing – Detail (for new construction) would dictate all water/storm crossings main are greater than 18" separation. Clarify.
17. Hydrant Assembly Detail – Location in relation to curb or sidewalk – See CFD#2 Standards page 16. Should the 6" water main be specified as lined DI?
18. Tapping Sleeve and Valve Detail – We don't want concrete encased fittings
19. Replacement of existing pavement – NA to our review
20. 2.03 – F - - All fittings shall be mechanically restrained (i.e. Megalug or equal) and thrust blocked.
21. 2.05 – A – Sleeves shall be stainless steel?
22. 2.07 – Gate valves are not required every 500'?
23. 2.16 C – Doesn't mention C900 water main.
24. 3.03 A & B – Specified 18" separation. Should be possible on new construction. As storm sewers aren't shown cannot determine horizontal and vertical separation with water mains.



SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN
MAB
CHECKED
DSM
APPROVED
DSM

CLIENT:

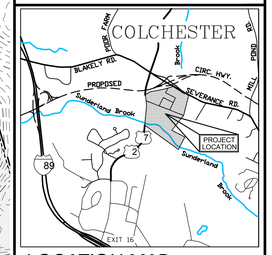
IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT



LOCATION MAP
N.T.S.

DATE	CHECKED	REVISION

HYDRANT PLAN

DATE
11/01/2019
SCALE
1" = 60'
PROJ. NO.
14134

DRAWING NUMBER
C-1.7

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SEVERANCE ROAD

LOT 22

LOT 21B

LOT 21A
(FUTURE PARKING - NEED NOT BE BUILT)

WETLAND 'A' CLASS II

OPEN WATER

WETLAND PERMIT 2014-392

LOT 21

LOT 20

LOT 4B
(OPEN SPACE)

LOT 1

LOT 4

LOT 4A
(FUTURE PARKING - NEED NOT BE BUILT)

DYLAN AVENUE

SHEA DRIVE

LOT 2

LOT 3

LOT 3A
(OPEN SPACE)

METERING LOCATION

STUART AVENUE

PEDS COVE

(OPEN SPACE)

LOT 24A

METERING LOCATION

LOT 19

LOT 18

LOT 5A
(OPEN SPACE)

LOT 5

LOT 6

LOT 5B
(FUTURE PARKING - NEED NOT BE BUILT)

WETLAND 'B' CLASS II

LOT 24

LOT 19A
(FUTURE PARKING - NEED NOT BE BUILT)

LOT 18A
(FUTURE PLAYGROUND NEED NOT BE BUILT)

LOT 6A
(FUTURE PARKING - NEED NOT BE BUILT)

LOT 10

LOT 16
(FUTURE PARKING - NEED NOT BE BUILT)

LOT 9

LOT 23A

WETLAND 'A' CLASS II

LOT 24B

LOT 23

LOT 7

LOT 8

LOT 15

LOT 23B
(FUTURE PARKING - NEED NOT BE BUILT)

LOT 14
(FUTURE PARKING - NEED NOT BE BUILT)

LOT 13

LOT 12

LOT 11

LOT 17
2.50± AC.

WETLAND 'C' CLASS III

DETENTION POND

NOTE:
THE TOWN OF COLCHESTER FIRE DISTRICT #3 REPRESENTATIVES HAVE THE RIGHT TO ENTER ONTO PRIVATE PROPERTY WHERE ANY PORTION OF THE DISTRIBUTION SYSTEM IS LOCATED TO CONDUCT INSPECTIONS AND MAINTENANCE OF THE SYSTEM.

GRAPHIC SCALE
(IN FEET)
1 inch = 60 ft.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

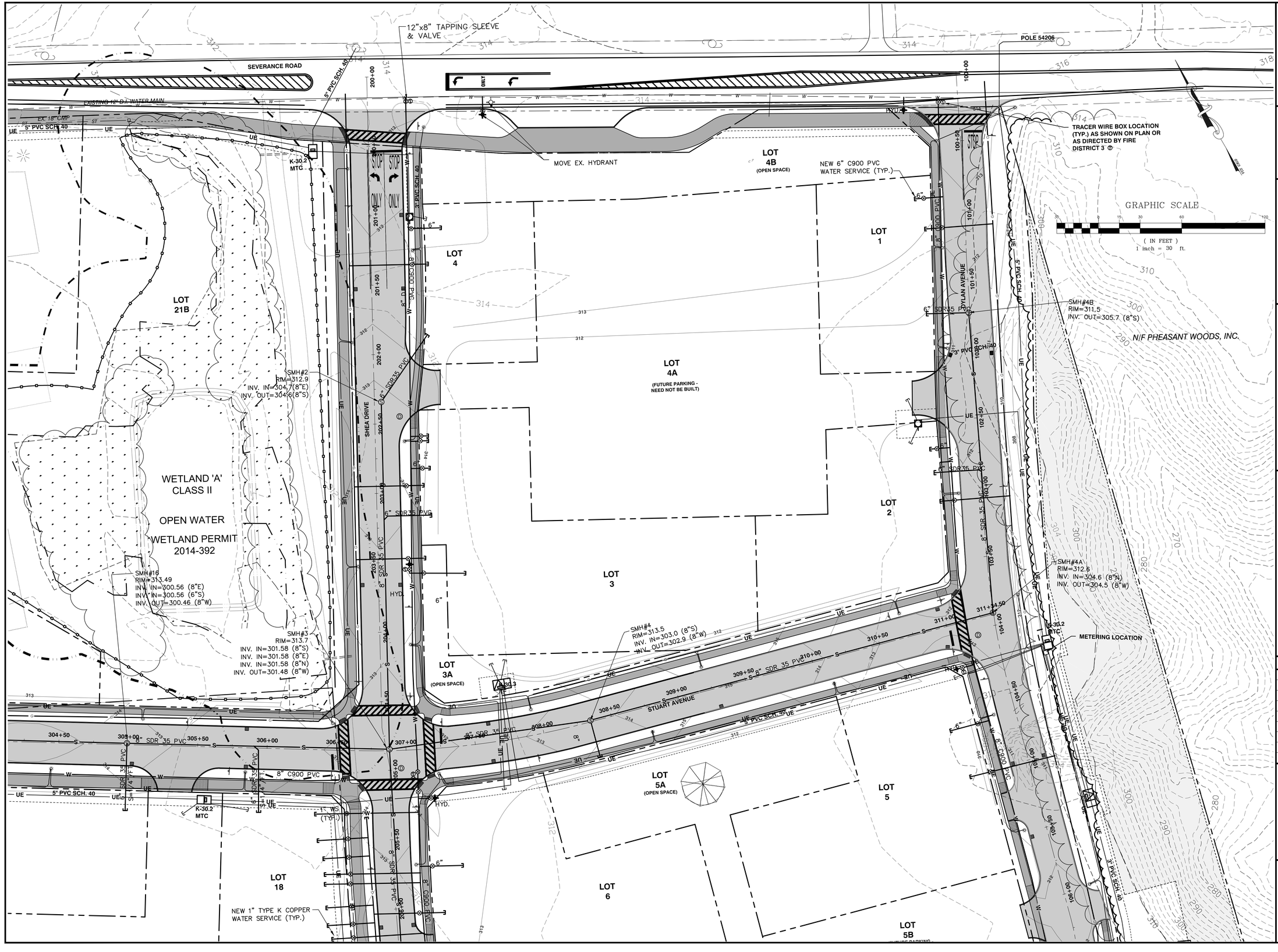
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

OVERALL UTILITY PLAN

DATE: 11/01/2019
SCALE: 1" = 60'
PROJ. NO.: 14134

DRAWING NUMBER: C-3.0



SITE ENGINEER:

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10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
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DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

NORTHEAST UTILITY PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-3.1

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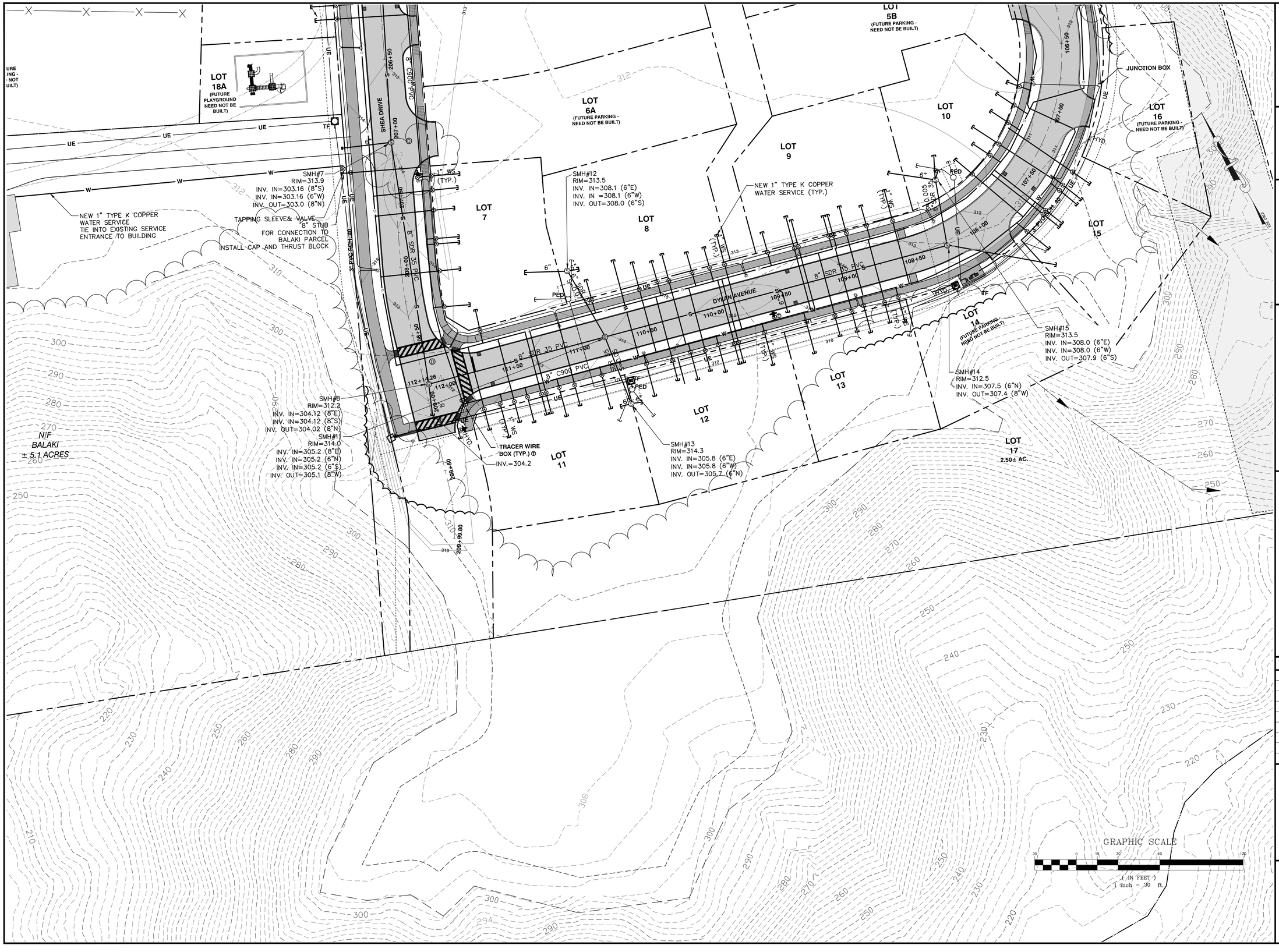


SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

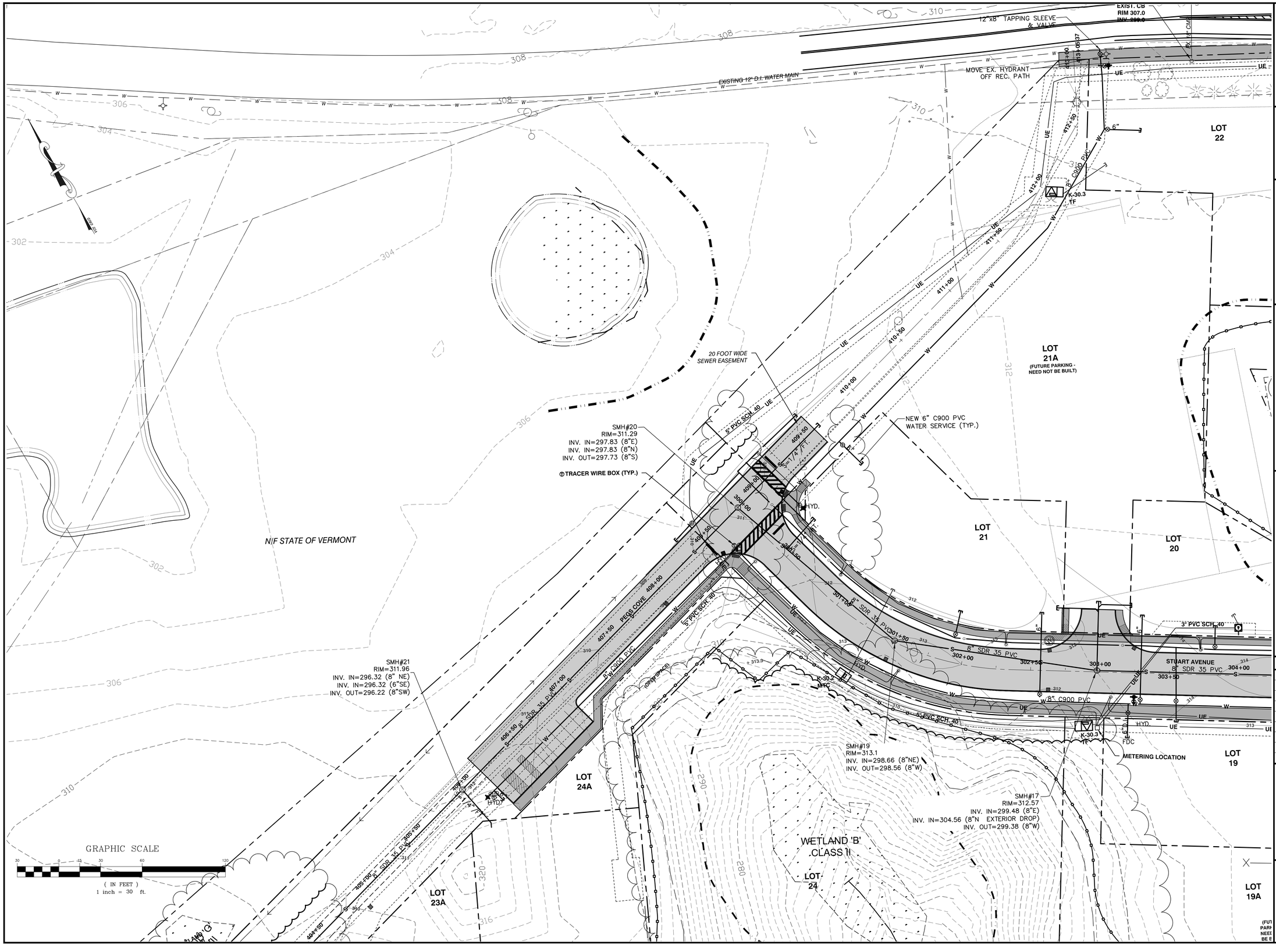
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SOUTHEAST UTILITY PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-3.2



SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

NORTHWEST UTILITY PLAN

DATE: 11/01/2019
SCALE: 1" = 30'
PROJ. NO.: 14134

DRAWING NUMBER: C-3.3

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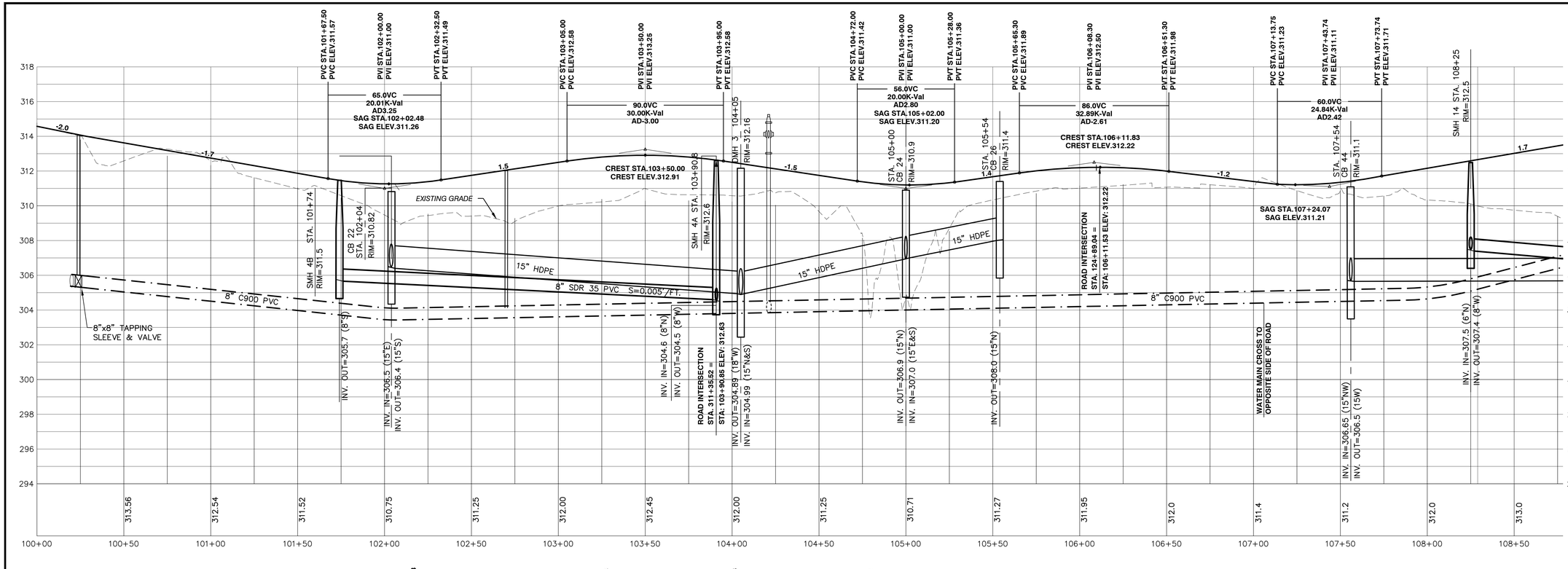
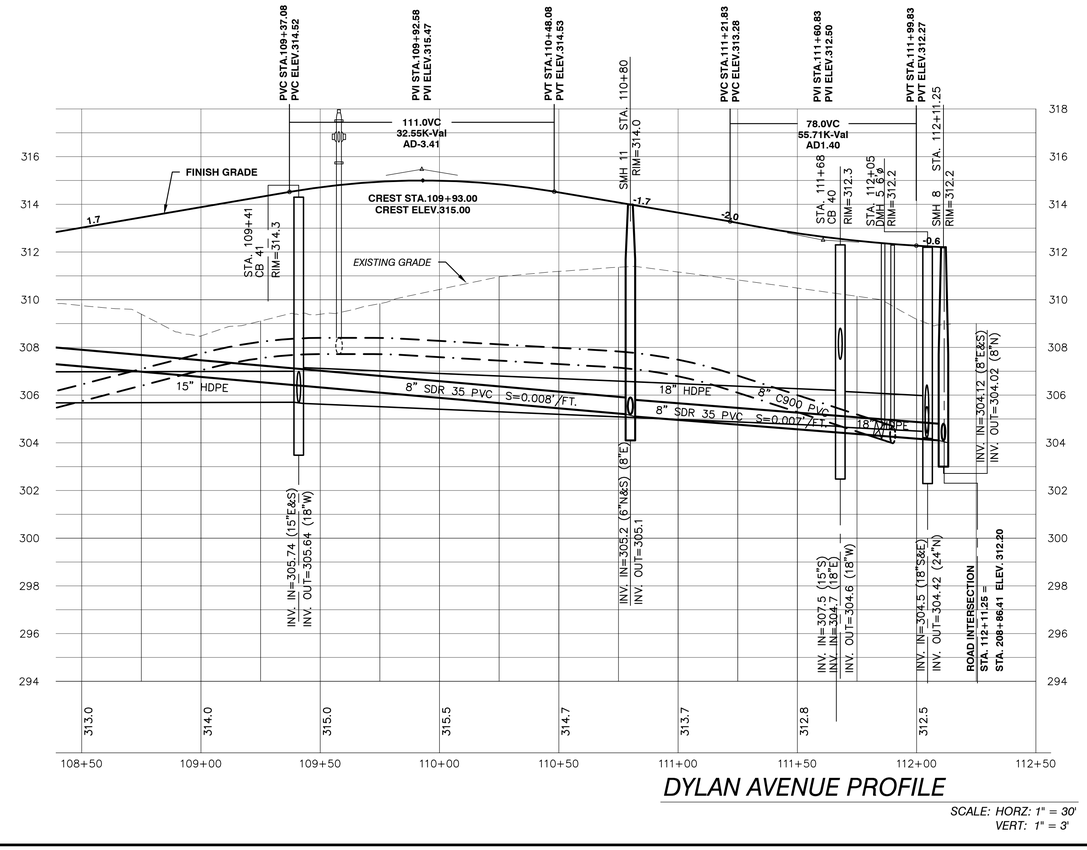




DYLAN AVENUE PROFILE

SCALE: HORZ: 1" = 30'
VERT: 1" = 3'

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

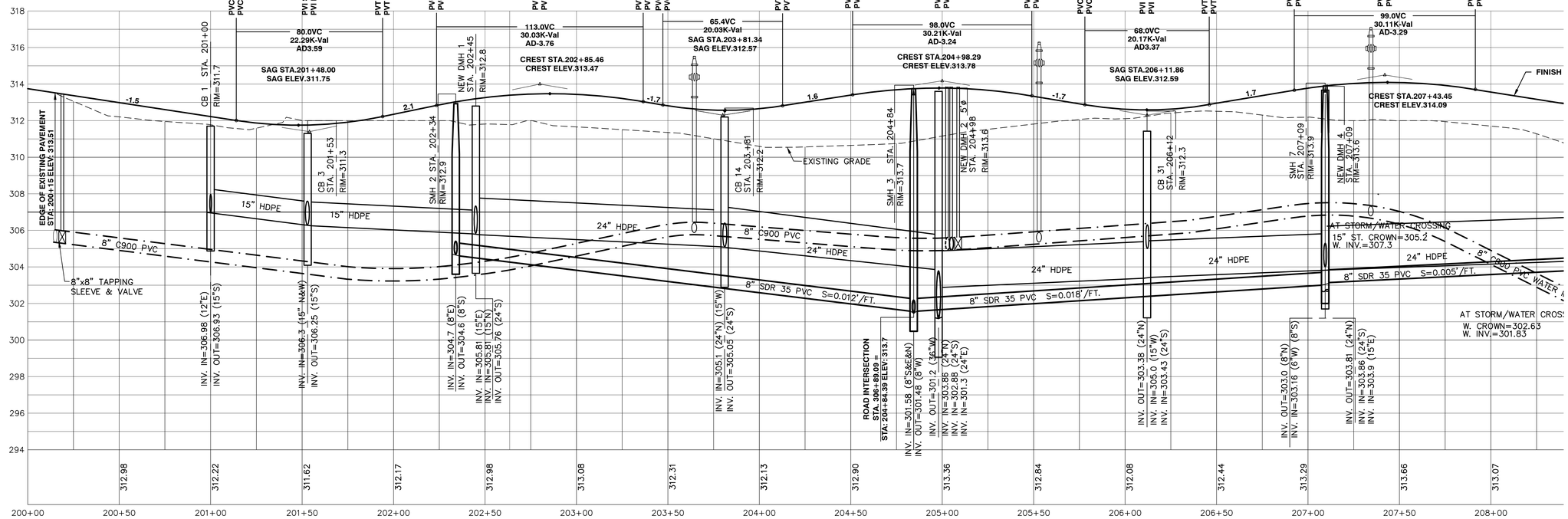
SEVERANCE ROAD
COLCHESTER, VT

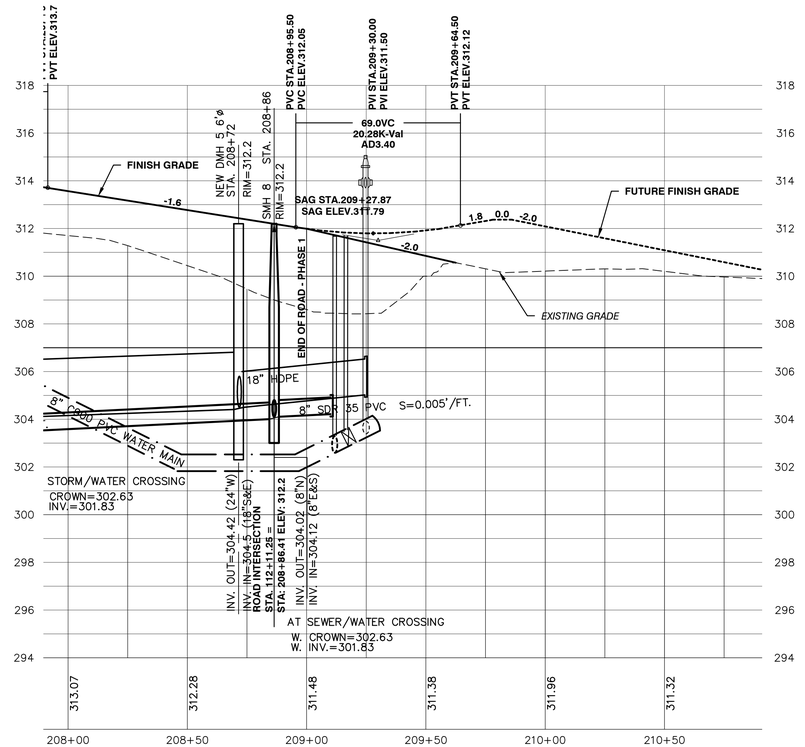
DATE	CHECKED	REVISION

DYLAN AVENUE ROAD PROFILE STA. 100+00 - 112+11

DATE: 11/01/2019
SCALE: HORZ: 1" = 30' VERT: 1" = 3'
PROJ. NO.: 14134

DRAWING NUMBER: C4.0





SHEA DRIVE PROFILE

SCALE: HORZ: 1" = 30'
VERT: 1" = 3'

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

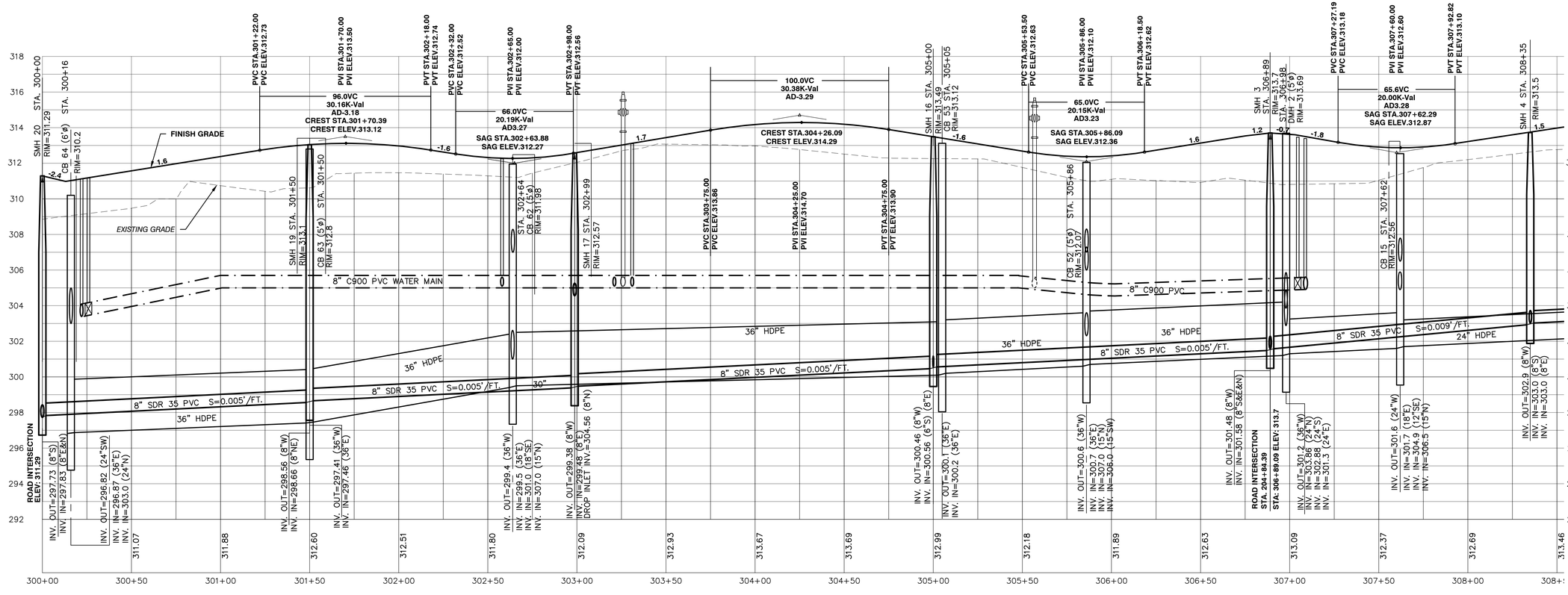
SEVERANCE ROAD
COLCHESTER, VT

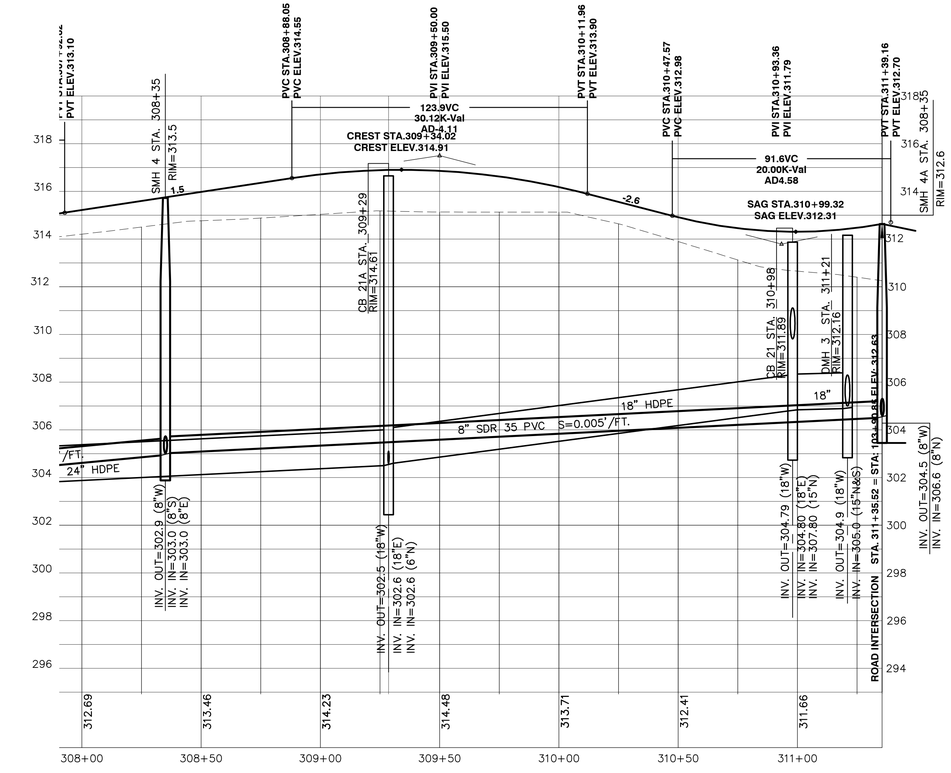
DATE	CHECKED	REVISION

SHEA DRIVE ROAD PROFILE STA. 200+00 - 209+73

DATE: 11/01/2019
SCALE: HORZ: 1" = 30' VERT: 1" = 3'
PROJ. NO.: 14134

DRAWING NUMBER: C4.1





STUART AVE PROFILE

SCALE: HORZ: 1" = 30'
VERT: 1" = 3'

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

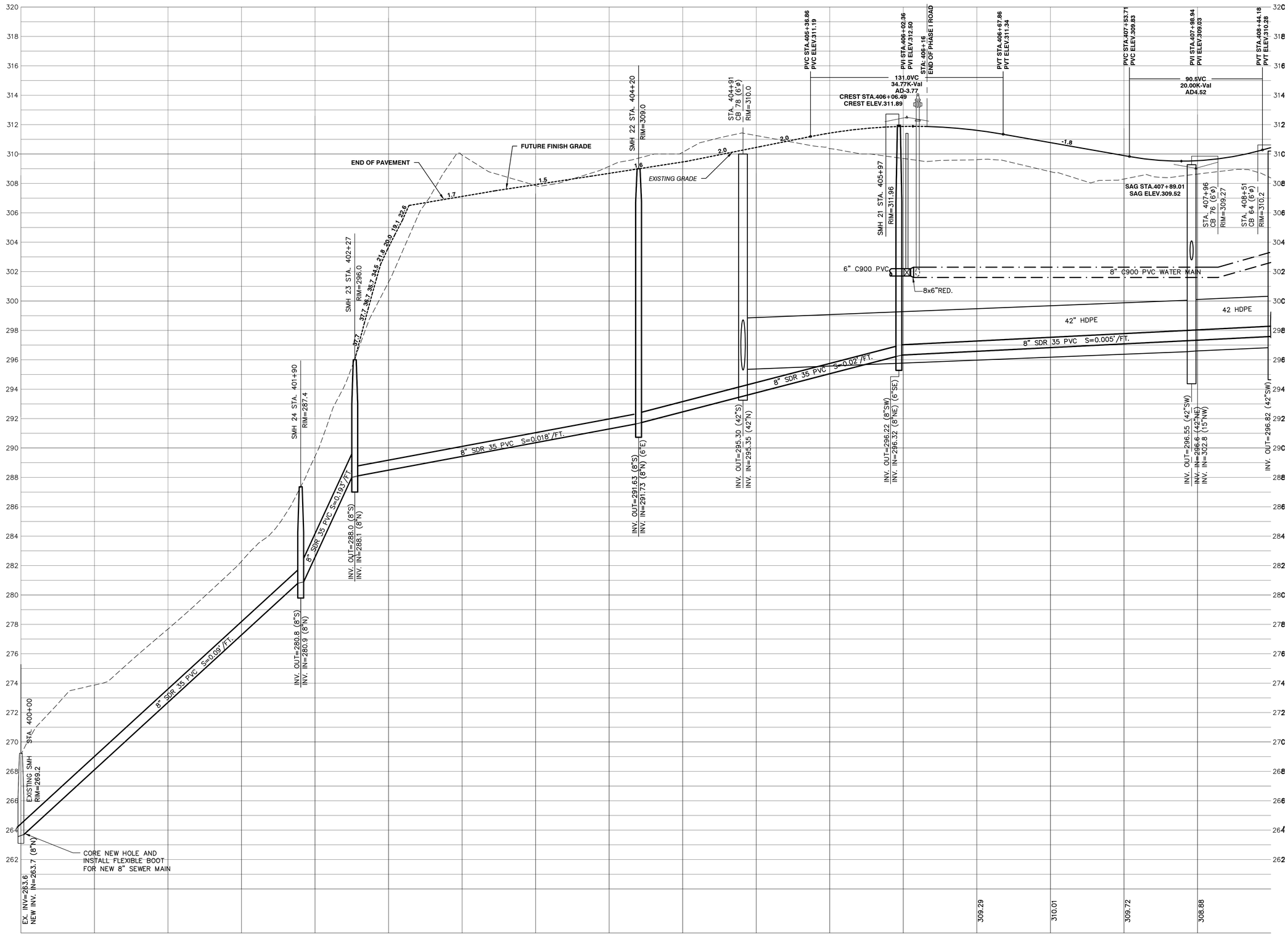
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

STUART AVENUE ROAD PROFILE STA. 300+00 - 311+35.5

DATE: 11/01/2019
SCALE: HORZ: 1" = 30' VERT: 1" = 3'
PROJ. NO. 14134

DRAWING NUMBER: C4.2



PEGS COVE PROFILE

SCALE: HORZ: 1" = 30'
VERT: 1" = 3'

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

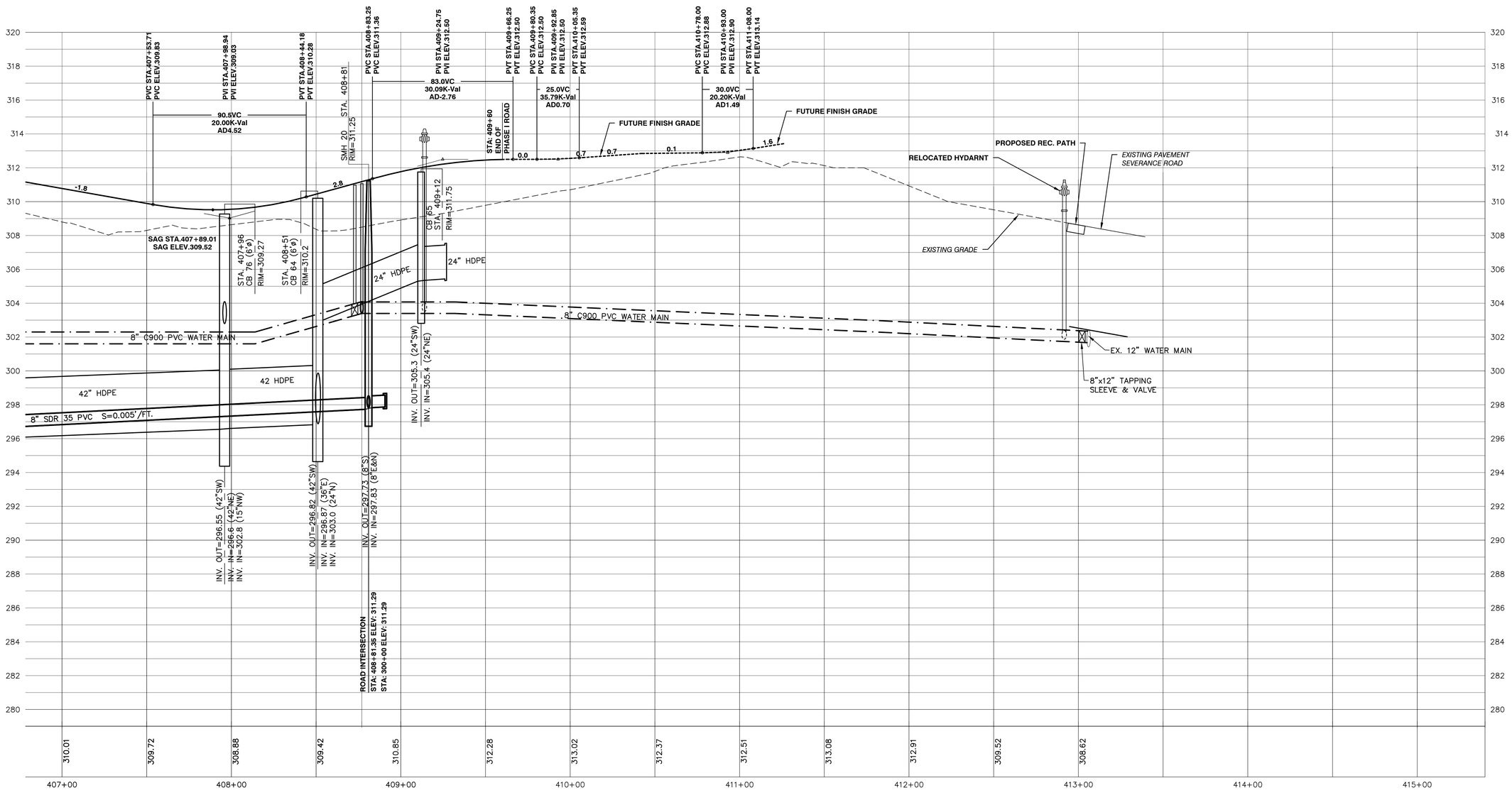
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

PEGS COVE ROAD PROFILE STA. 400+00 - 408+00

DATE: 11/01/2019
SCALE: HORZ: 1" = 30' VERT: 1" = 3'
PROJ. NO.: 14134

DRAWING NUMBER: C4.3



PEGS COVE PROFILE

SCALE: HORZ: 1" = 30'
VERT: 1" = 3'

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

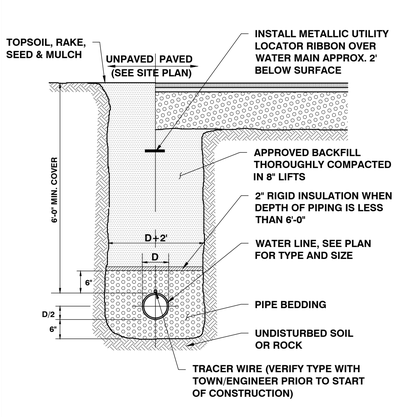
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

PEGS COVE
ROAD PROFILE
STA. 407+00 -
415+37

DATE: 11/01/2019
SCALE: HORZ: 1" = 30'
VERT: 1" = 3'
PROJ. NO.: 14134

DRAWING NUMBER: C4.4



NOTES:

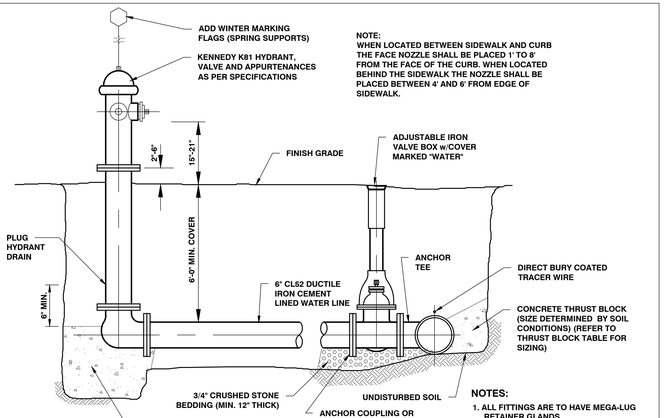
1. COMPACTION OF BACKFILL AND BEDDING SHALL BE A MINIMUM OF 90% (95% UNDER ROADWAY SURFACES) OF MAXIMUM DRY DENSITY DETERMINED IN THE STANDARD PROCTOR TEST (ASTM D698).
2. BEDDING MATERIAL SHALL NOT BE PLACED ON FROZEN SUBGRADE.
3. APPROVED BACKFILL SHALL NOT CONTAIN ANY STONES MORE THAN 12" IN LARGEST DIMENSION (6" IN ROADWAYS, 1 1/2"" MAXIMUM DIAMETER WITHIN 24" OF THE OUTSIDE OF THE PIPE), OR CONTAIN ANY FROZEN, WET, OR ORGANIC MATERIAL.
4. TRENCHES SHALL BE COMPLETELY DEWATERED PRIOR TO PLACING OF PIPE BEDDING MATERIAL AND KEPT DEWATERED DURING INSTALLATION OF PIPE AND BACKFILL.
5. IN TRENCHES WITH UNSTABLE MATERIALS OR HIGH WATER TABLE, TRENCH BOTTOM SHALL FIRST BE STABILIZED BY PLACEMENT OF FILTER FABRIC THEN CRUSHED STONE (3/4" MAXIMUM).
6. THE SIDES OF TRENCHES 4' OR MORE IN DEPTH ENTERED BY PERSONNEL SHALL BE SHEETED OR SLOPED TO THE ANGLE OF REPOSE AS DEFINED BY O.S.H.A. STANDARDS.
7. BEDDING MATERIAL SHALL CONSIST OF CRUSHED STONE, OR SAND WITH A MAXIMUM SIZE OF ¾". SUBMIT A SAMPLE TO THE ENGINEER FOR APPROVAL.
8. CONTRACTOR TO INSTALL TRACER WIRE ALONG ALL SECTIONS OF NEW WATER LINE. TRACER WIRE SHALL BE COPPER-CLAD STEEL WIRE AND LOCKING CONNECTORS FROM COPPERHEAD INDUSTRIES OR APPROVED EQUAL. TERMINATE TRACER WIRE AT ALL VALVE BOXES AND HYDRANTS. COORDINATE INSTALLATION WITH TOWN AND ENGINEER.
9. MINIMUM OF 1" OF RIGID INSULATION BE PROVIDED FOR EACH 1-FOOT OF DEFICIENT COVER WITH A MINIMUM OF 2" OF INSULATION TO BE INSTALLED.

TYPICAL WATER TRENCH DETAIL

N.T.S.

W-001 Trench

W-001 REVISED 12/08/2016



NOTE:
WHEN LOCATED BETWEEN SIDEWALK AND CURB THE FACE NOZZLE SHALL BE PLACED 1' TO 8' FROM THE FACE OF THE CURB. WHEN LOCATED BEHIND THE SIDEWALK THE NOZZLE SHALL BE PLACED BETWEEN 4' AND 6' FROM EDGE OF SIDEWALK.

NOTES:

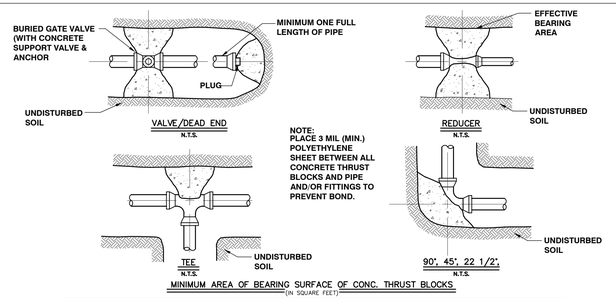
1. ALL FITTINGS ARE TO HAVE MEGA-LUG RETAINER GLANDS.
2. PRIOR TO POURING THRUST BLOCKS ALL FITTINGS ARE TO BE WRAPPED WITH 4 mil POLYETHYLENE.
3. ALL HYDRANTS SHALL BE OUTFITTED WITH A 4" STORTZ CONNECTION.

HYDRANT ASSEMBLY DETAIL

N.T.S.

W-004 Hyd

W-004 REVISED 3/9/2015



NOTE:
PLACE 3 MIL (MIN.) POLYETHYLENE SHEET BETWEEN ALL CONCRETE THRUST BLOCKS AND PIPE AND/OR FITTINGS TO PREVENT BOND.

MINIMUM AREA OF BEARING SURFACE OF CONC. THRUST BLOCKS
(IN SQUARE FEET)

3"			4"			6"			8"			12"			16"			SOIL CONDITION	SAFE BEARING LOAD (PSF)
ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.	ENDS & TEES	90° ELB.	45° ELB.	22.5° ELB.		
0.5	0.5	0.5	0.5	0.5	1.0	0.5	0.5	1.0	1.5	1.0	0.5	2.0	2.5	1.5	1.0	4.0	5.5	3.0	1.5	8.0	10.0	5.0	4.0	SOUND SHALE	10,000
1.0	1.0	1.0	0.5	1.5	2.0	1.0	0.5	3.0	4.0	2.0	1.0	4.5	6.5	3.5	2.0	10.0	14.0	7.5	4.0	25.0	30.0	15.0	12.0	CEMENTED GRAVEL AND SAND	4,000
1.0	1.5	1.0	0.5	2.0	2.5	1.5	1.0	3.5	5.0	3.0	1.5	6.0	8.5	5.0	2.5	13.0	18.5	10.0	5.0	30.0	35.0	20.0	15.0	COMPACT GRAVEL AND COARSE SAND	3,000
1.5	2.5	1.5	1.0	2.5	3.5	2.0	1.0	5.5	7.5	4.0	2.0	9.0	13.0	7.0	3.5	20.0	27.5	15.0	8.0	40.0	45.0	25.0	20.0	MEDIUM STIFF CLAY OR SILT, SPARSELY	2,000
3.0	4.5	2.5	1.5	5.0	7.0	4.0	2.0	10.5	15.0	8.0	4.0	18.0	25.0	14.0	7.0	39.0	55.0	30.0	15.0	80.0	90.0	50.0	40.0	SOFT CLAY	1,000

MAXIMUM WATER PRESSURE = 300 PSI NOTE: REDUCER BEARING AREA = 45° BEND OF LARGER PIPE

NOTE: THRUST BLOCK SHALL BE USED AT ALL BENDS, TEES & REDUCERS

THRUST BLOCK DETAILS

NO BACKFILLING WILL BE ALLOWED UNTIL ANY CONC. THRUST BLOCKS HAVE SET SUFFICIENTLY, AS DETERMINED BY THE ENGINEER AND/OR LOCAL WATER DEPT.

N.T.S.

W-003 Thrust

W-003 REVISED 2/23/2015

REFERENCE:
VT. WATER SUPPLY RULE CHAPTER 21, APPENDIX A, SECTION 8.6

WATER/SEWER CROSSING

N.T.S.

W-007 Water-Sewer Crossing

W-007 REVISED 6/15/2015

NOTES:

1. TAPPING SLEEVES AND VALVES ARE TO MEET THE LOCAL WATER DEPARTMENT'S STANDARD SPECIFICATIONS AND THE VERMONT WATER SUPPLY RULES.
2. WET TAPS SHALL BE PREFORMED BY PRE-APPROVED FIRMS ONLY.
3. ALL FITTINGS THAT ARE TO HAVE CONCRETE POURED AROUND THEM ARE TO BE WRAPPED WITH 4 mil. POLYETHYLENE PRIOR TO CONCRETE PLACEMENT.

ALL TAPPING SLEEVE NUTS & BOLTS SHALL BE COATED BY HEAVY BRUSH WITH BITUMASTIC COLD APPLIED MATERIAL PRIOR TO BACKFILL

TAPPING SLEEVE & VALVE DETAIL

N.T.S.

W-002 Tap

W-002 REVISED 6/15/2015

NOTES:

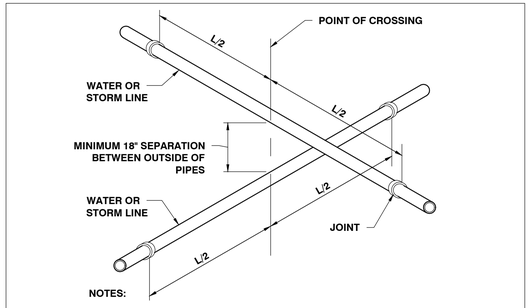
1. THE CONTRACTOR SHALL MAINTAIN AT LEAST ONE-WAY TRAFFIC AT ALL TIMES DURING WORK WITHIN THE R.O.W.
2. MAINTENANCE AND PROTECTION OF TRAFFIC DURING WORK WITHIN THE HIGHWAY R.O.W. SHALL BE PROVIDED IN ACCORDANCE WITH THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES. THE CONTRACTOR SHALL NOT WORK WITHIN THE R.O.W. WITHOUT APPROPRIATE CONSTRUCTION SIGNING IN PLACE.
3. ALL BACKFILL SHALL BE MADE IN SIX INCH (6") LIFTS AND COMPACTED TO NOT LESS THAN 95% MAXIMUM DRY DENSITY ACCORDING TO ASTM D698.
4. REPLACE EXISTING ROAD STRIPING AS NECESSARY.

REPLACEMENT OF EXISTING PAVEMENT

N.T.S.

S-005 Replace Ex. Pav

S-005 REVISED 09/29/2014



NOTES:

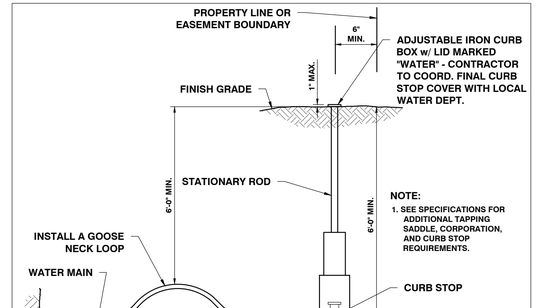
1. AT CROSSINGS, ONE FULL LENGTH OF WATER/STORM PIPE SHALL BE LOCATED SO BOTH JOINTS WILL BE AS FAR FROM THE WATER/STORM AS POSSIBLE.
2. IF THE STORM MAIN IS OVER THE WATER MAIN, THE FIRST STORM PIPE JOINTS ON EACH SIDE OF THE WATER MAIN MUST BE CONCRETE ENCASED. SPECIAL STRUCTURAL SUPPORT FOR THE WATER AND STORM PIPES MAY BE REQUIRED.
3. WHERE IT IS IMPOSSIBLE TO MAINTAIN THE 18" SEPARATION, THE STORM MATERIALS SHALL BE WATER MAIN PIPE OR EQUIVALENT AND SHALL BE PRESSURE TESTED TO WATER MAIN STANDARDS.
4. WATER MAINS AND STORM LINES OR MANHOLES SHALL HAVE AT LEAST 10' HORIZONTAL SEPARATION. THIS DISTANCE SHALL BE MEASURED EDGE TO EDGE.

WATER/STORM CROSSING

N.T.S.

W-007A Water-Storm Crossing

W-007A REVISED 12/23/2014



NOTE:
1. SEE SPECIFICATIONS FOR ADDITIONAL TAPPING SADDLE, CORPORATION, AND CURB STOP REQUIREMENTS.

WATER SERVICE CONNECTION

N.T.S.

W-006 Serv Con

W-006 REVISED 2/23/2015

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: SAL
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

WATER DETAILS

DATE: 11/01/2019
SCALE: AS SHOWN
PROJ. NO.: 14134

DRAWING NUMBER: C5.1

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2. This amount shall be converted to a 24–hour rate and the leakage determined on the basis of depth and size of structure. The leakage for each structure shall not exceed one gallon per vertical foot per 15 linear feet of wall (as measured in plan view) for a 24 hour period for exfiltration and there shall be no visible infiltration.

C. Air Test: Alternatively, the manhole may be tested for leakage using the following procedure:

1. All lifting hole and exterior joints shall be filled and pointed with an approved non–shrinking mortar. The completed manhole shall not be backfilled prior to testing. Structures that have been backfilled shall be excavated to expose the entire exterior prior to vacuum testing or the manhole shall be tested for leakage by means of a hydrostatic test.

2. All pipes and other openings in the manhole shall be suitably plugged in a manner to prevent displacement.

3. A plate with an inflatable rubber ring the size of the top of the manhole shall be installed by inflating the ring with air to a pressure adequate to prevent leakage of air between the rubber ring and the manhole wall.

4. Air shall then be pumped out of the manhole through an opening in the plate until a vacuum is created inside of the manhole equal to 10 inches of mercury on an approved vacuum gauge. The removal of the air shall then be stopped and the test time begun.

5. The vacuum must not drop below 9 inches of mercury within a 2 minute test period. If more than 1 inch of drop in vacuum occurs within the 2 minute test period the manhole has failed the test and shall be repaired or reconstructed and retested.

D. Following satisfactory test results, the manhole may be backfilled.

3.09 SERVICE CONNECTION

No sanitary sewer shall be placed in service until such time as the Town has given final approval to the sewer installation, including satisfactory completion of all required tests. Service connections shall not be made until all receiving sewer mains have been completed and approved and as–builts received along with GPS coordinates and approved by the Town Wastewater Department.

A. Laterals

Where required on the plans, sewer service connections for one house shall be constructed of four inch (4") pipe, unless otherwise noted on the plans, of the type material specified under this section. The pipe shall be laid and its joints made as required for sewer construction in this specification. Open ends of pipes shall be properly sealed to prevent damage and intrusion of foreign matter where hookup to the building sewer is not coincident with sewer main construction. Additionally, the Contractor will provide a stable, temporary marker approved by the Town Wastewater Department from the sewer service invert up to six inches (6") above the finish grade and seated securely into the ground for ease in relocating the end of sewer service connection for hooking up the building sewer. Two (2) tie points to permanent objects shall be documented. The tie points shall be submitted to the homeowner and to the Wastewater Department.

In the case of reconnection of existing services, such reconnection will be made only after the new sewer main has been completed, tested, and accepted. The excavation, bedding material, installation, and backfill for service connections shall be the same as for sewer mains.

B. Cleanouts for Sewers

Cleanouts for gravity sewers and force mains shall be provided at locations indicated on the plans or as directed by the Town Wastewater Department. Cleanout frames and covers against each other shall be machined to give continuous contact throughout their circumference. All iron castings shall be thoroughly cleaned and then coated with hot coal tar before being delivered. Individual laterals shall have cleanouts every one hundred feet (100'). Cleanouts shall also be installed in laterals with changes of alignment of 45 degrees or greater.

C. Chimneys

Chimneys shall be built of four inch (4") pipe and/or as indicated on the contract drawings. Each chimney shall be plugged or capped at end until ready to connect to existing services. Chimneys are required where the vertical drop between the finished grade surface and the main sewer line exceeds fifteen feet (15') at the wye from a service connection.

3.10 Force Main

After force mains have been laid and the trench backfilled, the pipe shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard for Installation of Cast Iron Water Main, AWWA C600 (latest issue), Section 13. The hydrostatic pressure shall be 150 percent (150%) of normal operational pressure. After the pressure test has been satisfactorily completed, a leakage test shall be conducted in accordance with AWWA C600 (latest issue), Section 13. The minimum test pressure shall be 75 pounds per square inch at the high point in the system.

3.11 Wet well

The pre–cast concrete wet well shall be externally coated with an asphaltic sealant and tested for water tightness using an approved vacuum or water testing procedure.

PART 4 – PUMP STATION

4.00 SPARE PARTS

A. A complete replacement pump shaft seal assembly shall be furnished with each lift station. The spare seal shall be securely fastened to the control panel and shall include complete installation instructions.

B. Two (2) spare volute gaskets shall be provided.

C. A spare filter cone for the seal filter shall be provided in the same container as the pump shaft seal.

D. Provide 100% spare lamps and fuses for control panel.

E. Provide all lubricants required for initial operation.

F. Provide one (1) spare input and output card, processor, and power supply for the Programmable logic controller (PLC) system.

G. Provide one (1) spare level transducer.

4.01 O & M MANUALS

A. Installation of all mechanical equipment shall be done in accordance with written instructions provided by the manufacturer. Installation instructions shall be delivered with the station.

B. The manufacturer shall provide 5 copies of a complete and detailed operating and maintenance manual. This manual shall provide all design criteria, general operating procedures, maintenance and servicing procedures for all major components, and as–built drawings of the contributory gravity sewer system, the pumping station and force main. All instructions and parts lists shall be prepared for the specific equipment furnished and shall not refer to similar equipment. Operating manuals must be submitted to the Town prior to final acceptance of the station.

4.02 POLYETHYLENE (PE3408) SANITARY SEWER FORCE MAINS

A. This specification covers requirements for PE3408 high density polyethylene sanitary sewer force mains. All work shall be performed in accordance with these specifications and manufacturer requirements.

B. Referenced Standards. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.

C. Warranty and Acceptance. The Contractor shall warrant all work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If work meets these specifications, a letter of acceptance, subject to the one year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one year warranty period, provided the work still complies with these specifications. In the event deficiencies are discovered during the warranty period, they shall be corrected by the Contractor without additional charge to the owner before final acceptance. During the warranty period, the Project Engineer shall determine if warranty repairs or replacement work shall be performed by the Contractor. The decision of the Project Engineer shall be binding upon the Contractor.

D. Polyethylene Pipe and Fittings

1. Qualification of Manufacturers. The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these Specifications. The manufacturer's production facilities shall be open for inspection by the Owner or his Authorized Representative. Qualified manufacturers shall be approved by the Project Engineer.

2. Materials. Materials used for the manufacture of polyethylene pipe and fittings shall be PE3408 high density polyethylene (SDR 11 or better) meeting cell classification 345444C or 345444E per ASTM D 3350; and shall be listed in the name of the pipe and fitting manufacturer in Plastics Pipe Institute's TR–4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fitting

Compounds, with a standard grade HDB rating of 1,600 psi at 73°F. The manufacturer shall certify that the materials used to manufacture pipe and fittings meets these requirements.

3. Polyethylene Pipe. Polyethylene pipe shall be manufactured in accordance with ASTM F 714, Polyethylene (PE) Plastic Pipe (SDR–11 rating or better) Based on Outside Diameter, and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, (from pipe) dimensions and ring tensile strength.

4. Polyethylene Fittings & Custom Fabrications. Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications and connections shall be fully rated for the same internal pressure as the mating pipe. Pressure de–rated fabricated fittings are prohibited.

5. Molded Fittings. Molded fittings shall be manufactured in accordance with ASTM D 3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (IPE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the tests required under ASTM D 3261.

6. Fabricated Fittings. Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.

7. Polyethylene Flange Adapters. Flange adapters shall be made with sufficient through–bore length to be clamped in a butt fusion joining machine without the use of a stub–end holder.

8. Back–up Rings & Flange Bolts. Flange adapters shall be fitted with back–up rings pressure rated equal to or grater than the mating pipe. The back–up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 6 or higher (stainless steel).

9. Compliance Tests. Manufacturer's inspection and testing of the materials. In case of conflict with manufacturer's certifications, the Contractor, Project Engineer, or Owner may request retesting by the manufacturer or have retests performed by an outside testing service. All retesting shall be at the requestor's expense, and shall be performed in accordance with the Specifications.

E. Joining

1. Heat Fusion Joining. Joints between plain end pipes and fittings shall be made by butt fusion, electrofusion couplings and joints between the main and saddle branch fittings shall be made using saddle fusion procedures that are recommended by the pipe and fitting manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.

2. Butt Fusion of Unlike Wall Thicknesses. Fusions of different wall thickness are acceptable, as long as the difference is limited to a one SDR difference, i.e. SDR 11 to SDR 9. Transitions between unlike wall thicknesses greater than one SDR shall be made with a transition nipple (a short length of the heavier wall pipe with one end machined to the lighter wall) or by mechanical means.

3. Joining by Other Means. Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and backup rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, or (c) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be followed. All connections shall maintain the total pressure rating of the force main.

4. Mechanical Joint Installation. Mechanical joints shall be installed in accordance with the manufacturer's recommended procedure. When an OD compression mechanical coupling is used, a stiffener shall be installed in the bore of the polyethylene pipe.

5. Branch Connections. Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main pipe.

4.03 HORIZONTAL DIRECTIONAL DRILLING W/ POLYETHYLENE PIPE

A. Directional boring with PE3408 pipe shall be completed in accordance with the manufacturer's requirements and shall not in any way affect the joint connections or the overall strength characteristics of the pipe.

B. References:

"Mini–Horizontal Directional Drilling Manual" published by North American Society for Trenchless Technology (NASTT).

"Guidelines for a Successful Directional Crossing Bid Package" published by Directional Crossing Contractors Association (DCCA).

"Polyethylene Pipe for Horizontal Directional Drilling" of the Plastic Pipe Institute's Handbook of Polyethylene Piping.

C. Quality Control. All directional boring shall be completed in such a way as not to jeopardize the existing infrastructure/facilities, such as the roadway, utility poles, subsurface utilities, structures/foundations, or significant landscaping. Prior to directional drilling, all potential conflicts shall be field verified.

D. General

1. Directional drilling shall be performed in a manner required to install HDPE utility line as indicated on the drawings. Furnish all manpower and equipment required to perform the pipeline installation. The operation shall include all excavation and dewatering, drilling calculations, pilot hole, and pullback operations. Contractor shall be responsible for type of reamer, diameter, and other pertinent operations required for a complete installation. Contractor shall be responsible for mobilizing on–site with a full range of drill stems and reaming heads to allow for various factors which may occur. Drill stems shall be of proper size and diameter to allow for full thrust and torque capabilities of the drilling machines.

2. Contractor shall perform utility survey to locate information concerning existing utility lines located in the areas of the directional drilling work.

3. Directional drilling shall be accomplished by drilling from one side of the crossing to the other using an approved method. One method shall be drilling a small diameter pilot hole along the proposed utility route. Steering shall be accomplished by using drilling mud which is pumped into the drill pipe to provide rotational energy in a drill bit at the end of the drill pipe. A jet bit shall force the mud through small orifices and jet away the earth and to allow the drilled path to curve in the proper direction as the drill pipe is thrust forward. An electronic survey instrument shall be placed inside the drill pipe head. The instrument shall signal a computer of the drilled paths magnetic azimuth, vertical inclination, and orientation of the bend. This data shall be used by the drilling contractor to calculate location of the drill bit and allow steering adjustments to be made.

4. After completing the pilot hole, larger diameter reaming heads shall be pulled back in order to enlarge the hole as required to allow for the pipe pullback. The Contractor shall be responsible for multiple reaming operations as required to complete the work. Pull back operations shall be carried out as soon as possible following the final preream. During this phase of the work, the Contractor shall continue his work operations without interruption regardless of the day of week or hour of the day. A pullback head shall be attached to the pipe to allow fastening to the swivel head reamer. The head shall be closed to prevent drilling mud from entering the main during the pullback operation.

5. Upon completion of the drilling operations, the equipment and materials used shall be removed from the site and the areas disturbed shall be restored to original conditions. The main shall be tested in accordance with Section 02730 of the Specifications. If the main fails the testing, it shall be removed and the work repeated at no additional cost to the Owner.

WATER SUPPLY SYSTEM

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Pipe Materials
2. Hydrants
3. Valves
4. Fittings
5. All other appurtenances necessary to complete the water main system as shown on the Contract Plans.

1.02 SUBMITTALS

A. Product Data: Submit published data from manufacturers of products and accessories specified, indicating compliance with requirements to the Engineer and local municipality.

1.03 QUALITY ASSURANCE

A. All materials and the installation procedure shall be in accordance with the Department of Environmental Conservation, Water Supply Division and the applicable construction ordinances of the local municipality.

PART 2 – PRODUCTS

2.01 GENERAL

A. Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties as acceptable to the Engineer as necessary to complete the water system.

2.02 WATER MAIN MATERIAL

C–900 PVC WATER MAIN

A. Pipe shall be C–900 (DR–14 305 psi) PVC (sizes as shown on the plans) conforming to current AWWA C–900, latest revision and shall be UL and FM approved. Larger size mains will be required if necessary to allow withdrawal of the required fire flow while maintaining the minimum pressure specified in the VT Water Supply Rule, Chapter 21, 8.1.1. Any proposed departure from minimum requirements shall be justified by hydraulic analysis and future water use assessment, and will be considered only in special circumstances (VT Water Supply Rule, Chapter 21 8.1.4). Push–on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.

B. When a pipe material is specifically noted on the contract drawings,the contractor/developer shall not have the option of utilizing any other pipe material. Galvanized pipe or fittings shall not be used in any water system owned or maintained by the Town. The Town Water Department requires the use of polyethylene pipe sleeve encasements and/or alternate pipe materials in known or suspected corrosive soil conditions.

DUCTILE IRON WATER PIPE

A. Pipe shall be Tyton Ductile Iron Class 52 (sizes as shown on the plans) conforming to current ANSI/AWWA C151/A21.51 latest revision. Push–on joint pipe shall be minimum thickness Class 52. Push–on joint accessories shall conform to applicable requirements of ANSI/AWWA C111/A21.11.

B. Pipe shall be cement mortar lined on the inside in accordance with ANSI Specification A21.4 except that the cement lining thickness shall not be less than 1/8 inch. A plus tolerance of 1/8 inch will be permitted.

C. Pipe shall be given an exterior petroleum asphaltic coating in accordance with ANSI/AWWA Specification C151/ASNI A21.51.

D. Pipe shall be poly wrapped with a minimum thickness of 4 mil poly in accordance with AWWA Specification C105 / ANSI A21.5, unless approved otherwise.

2.03 FITTINGS

A. Ductile iron fittings shall conform to ANSI/AWWA C110/A21.10, 350 PSI working pressure. Ductile iron fittings larger than twelve inches (12") shall have a standard body length equal to Class 250 Cast Iron fittings. Cast Iron Class 250 fittings will be allowed in lieu of ductile iron fittings larger than twelve inches (12"). Ductile iron fittings shall be rated for 250 p.s.i. However, twelve inch (12") and smaller may be rated for 350 p.s.i. with the use of special gaskets. All ductile iron compact fittings shall conforming to AWWA/ANSI C153/A21,53 standards.

B. Anchor tees shall be standard mechanical joint tees except that the branch is plain Class 250 cast iron or Class 350 ductile iron, cement lined, conforming to ANSI/AWWA C110/ A21.10, C111/A21,11, and C104/A21.4. Anchor tees shall be Clow F–1217, U.S. Pipe U5–92 or equal.

C. Mechanical Joint restraints shall be incorporated into the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron, and have a minimum working pressure of 350 psi. Twist off nuts (i.e. mega–lug) or equal shall be used to ensure proper actuating of the restraining devices. Contractors may also use approved grip ring (or equal) retainer glands.

D. Bolts shall conform to ANSI Specification A21.10.

E. Pipeline couplings shall conform to AWWA Standards C110 and ANSI A21.10. Mechanical joint connecting pieces of proper diameter shall be installed in accordance with the manufacturer recommendations and at locations directed by the plans or the Town Water Department.

F. All fittings shall be mechanically restrained (i.e. Megalug or equal); double poly wrapped and have concrete thrust blocks poured in place as defined herein.

2.04 TAPPING SLEEVES AND VALVES

A. The Town Water Department shall be notified whenever a proposed tap is to be made on any transmission main within the municipal system.

B. Only approved tapping companies shall be allowed to perform wet taps on any Town Water Department water mains.

C. All materials used when tapping for a branch connection or interconnection from any Town Water Department water transmission or distribution pipelines shall be specified below

2.05 TAPPING SLEEVES

For use on existing asbestos cement, gray cast iron, ductile iron or PVC C–900 pipe:

A. Tapping sleeves shall be of the split sleeve design, constructed with two solid half–sleeves bolted together. Sleeves shall be constructed of stainless steel, shall have a working pressure of at least 250 psi, and shall have mechanical joint ends with end and side gasket seals.

B. All iron body tapping sleeves shall be provided with a 3/4" NPT test plug, or other provisions must be made for air testing the valve and sleeve at maximum working pressure, prior to tapping.

C. All bolts and nuts for mechanical joints of tapping sleeves shall be of high–strength cast iron or high–strength, low–alloy steel conforming to ANSI/AWWA C111/A21.11.

D. All bolts and nuts for flanged joints of tapping sleeves shall be of high–strength, low carbon steel conforming to ANSI/AWWA C110/A21.10.

E. All bolts and nuts shall be sound, clean, and coated with a rust–resistant lubricant; their surfaces shall be free of objectionable protrusions that would interfere with their fit in the made–up mechanical or flanged joint.

2.06 TAPPING VALVES

A. Tapping valves shall conform to ANSI/AWWA C509 Standard for Resilient–Seated Gate Valves for Water and Sewage Systems, except as modified herein. Valves shall open counterclockwise and shall have a minimum working pressure of 200 psi. Inlet flanges shall be Class 125 conforming to ANSI Specification B16.1 or ANSI/AWWA C110/A21.10, and outlet connection shall be Standardized Mechanical Joint unless specified otherwise on the drawings for the type of pipe required for the branch or lateral pipeline.

B. Tapping valves over sixteen inches (16") diameter shall be installed with their stems horizontal, shall be equipped with rollers, tracks and scrapers, and shall be provided with bypass valves unless otherwise specified.

C. Buried tapping valves shall be provided with a two inch (2") square wrench nut and shall be installed with a cast iron valve box as required to allow positive access to the valve operating nut at all times. In installations where the depth from grade to top of valve operating nut is greater than 5'0", a valve stem riser shall be provided and installed such that the depth from valve stem riser nut to grade is from four feet to five feet (4'–5'), (minimum length of valve stem riser is two feet (2')). Valve stem riser shall be of high strength steel and of welded construction.

D. All contractors (or others) who apply for water line tapping permits shall submit complete specifications of the tapping material they intend to use at the time the tapping permit application is submitted on 8 1/2" x 11" shop drawing sheets

E. All bolts and nuts used with all pipe sleeves shall, upon final tightening and testing, be brush coated heavily with bitumastic cold–applied material to thoroughly cover all exposed surfaces of the bolts and nuts.

2.07 GATE VALVES–RESILIENT SEAT

A. Valves shall be manufactured to meet all requirements of AWWA Specification C509, latest edition. Valves twelve inches (12") and smaller shall be bubble tight, zero leakage at 200 psi working pressure. Valves shall have non–rising stems, open counter clockwise, and provide a two inch (2") square operating nut with arrow cast in the metal indicating direction of opening. Each valve shall have maker's name, pressure rating and year in which manufactured cast on the body. Prior to shipment from the factory, each valve shall be tested by hydrostatic pressure equal to twice the specified working pressure. Gate valves shall be Mueller, Kennedy, AFC, or approved equal.

B. Buried valves shall be installed with a gate valve Box with a cover marked "water".

C. Tee intersections shall have a minimum of three (3) gate valves. Cross sections (four way intersections) shall have a minimum of four (4) valves.

D. The Town Water Department may require all bolts, studs and nuts be made from a corrosion resistant–material stainless steel.

2.08 VALVE BOXES

A. Valve boxes shall be of the three–piece Cast iron slide–type with a minimum inside shaft diameter of five and one quarter inches (5 1/4") and a six foot (6') trench depth. Valve boxes shall not transfer loads onto the valve.

B. Valve boxes shall have a cast iron cover, marked "WATER". The boxes shall be dirt tight with the top of the cover flush with the top of the box rim.countersunk brass pentagon plug for paved or concrete areas, and standard two holes for grass areas. Curb box couplings and extensions will be the same material as the curb box. Both cover and upper section of the box shall be able to be located with an aqua type metal locator.

C. All service connections shall be installed to the curb stop for all building lots before the street is paved.

D. Valve boxes located in roadways shall have one non–adjusting paving riser of a height ranging from one and a half inches (1.5") to six inches (6") as needed to be brought to final pavement grade.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN: MAB
CHECKED: DSM
APPROVED: DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE: 11/01/2019
SCALE: NONE
PROJ. NO.: 14134

DRAWING NUMBER: C7.3

2.09 BACKFLOW PREVENTION DEVICES

A. No water service connection shall be approved or maintained by the Town Water Department unless the water supply is protected as required by State laws, regulations and ordinances. The type of protective device shall depend on the degree of hazard that exists. In general, backflow devices designed to protect potable water supplies in accordance with national plumbing codes for non–health hazard cross connections and continuous pressure applications shall be used, i.e. Watts Series 007 or approved equal. Watts Series 709 Double Check Valve Assembly or approved equal shall be installed on all sprinkler systems. A shop drawing detail assembly showing backflow devices and meter placements shall be required by the Town Water Department.

2.10 PIPE BEDDING

A. Water lines shall be laid and maintained on lines and grades established by the plans for the project. Pipeline trenches shall be excavated to the width and depths shown on the plan typicals. Pipeline trenches in which pipe is to be laid directly on the trench bottom shall not be excavated entirely by machinery, but shall be finally excavated by hand tools such that the trench shall have a bottom shaped to support the pipe throughout its entire length by firm and undisturbed material. Pipeline trenches, for which bedding is required, may be excavated to the required depths using machinery. No pipe shall be laid directly on ledge, hard shale or a very compact glacial till. When an unstable trench bottom is encountered and the Town Water Department determines that it cannot support the pipe adequately, an additional depth shall be excavated and refilled to the pipe invert with approved material at the contractor's expense. Pipeline trenches shall be dry during the laying of pipe. Wood supports under pipe shall be removed prior to backfilling. Pipeline installation procedures can be found in AWWA Standard C600.

B. Bedding material shall consist of crushed or natural stone conforming to ASTM D2321.

Sieve	Percent Passing
1" Screen	100%
¾" Screen	100%
½" Screen	90 – 100%
⅜" Screen	40 – 70%
No. 4 Sieve	0 – 15%

C. Bedding and blanket material shall be Class II material (ASTM D2321) consisting of clean, granular material (sand), particle size limits described as follows:

Sieve	Percent Passing
No. 4	100%
No. 100	30%
No. 200	12%

2.11 PIPELINE INSULATION

A. Approved waterlines with less than six feet (6'–0") of cover over the crown, that cross a storm sewer, or where indicated on the plans, shall be protected against freezing by the installation of two inch (2") thick highest available density extruded polystyrene insulating sheets or equivalent. Sheets shall be the the lesser of 3' or 2 x diameter of the pipe. The sheets shall be placed six inches (6") above the crown after placement of four to six inches (4" – 6") of clean medium or coarse sand below the pipe bottom and four to six inches (4" – 6") above the crown. Joints shall be overlapped so there is no gap that will allow frost to penetrate. Care shall be exercised during backfill and compaction over the polystyrene sheets to prevent damage to the sheets. The polystyrene sheets shall meet the comprehensive strength requirements of ASTM D1621–73. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.When water line passes within 5 feet of a catch basin install 2" min. rigid insulation, polystyrene sheets, between water line and cb.

2.12 POLYETHYLENE PIPE ENCASEMENT

A. Polyethylene pipe encasement may be required in areas of corrosive soils and shall conform to current ANSI/AWWA C105/A21.5 Specifications. Minimum material requirements for the polyethylene film shall be high density, cross laminated virgin polyethylene 4 mil film. The Town Water Department reserves the right to specify Polyethylene pipe, C–900, in areas of corrosive soils.

B. The polyethylene encasement shall prevent contact between the pipe or fittings and the surrounding backfill and bedding material and shall be installed as outlined in Section 4.1 of the above ANSI/AWWA standard.

2.13 CONCRETE FOR THRUST BLOCKS

A. Concrete shall be Portland Cement concrete of 3,000 psi minimum 28 day compressive strength. ASTM C–94 specification for transit mixed concrete shall control the concrete quality. A maximum water cement ratio of 6 gallons per sack and a maximum slump of four inches (4") will be allowed.

2.14 FIRE HYDRANTS AND HYDRANT BRANCHES

A. Fire hydrants shall be Mueller Super Centurion 250, Figure A–423 or Kennedy K–81 Hydrant and shall conform to AWWA C502 with the following specifications:

1. Main Valve Opening: 5 1/4 inches
2. Nozzle Arrangement: Two 2 1/2 inch Hose Nozzles with National Standard Thread (NST)
3. 4" Storz nozzle in place of or as an attachment to: One 4 1/2 inch Pumper Nozzle with National Standard Thread (NST).
4. Inlet Connection: 6 inch Mechanical Joint, "Mega–Lug" or equivalent retaining gland and concrete thrust block
5. Operating Nut: Standard 1 1/2 inch Pentagon
6. Direction of Opening: Counterclockwise
7. Depth of Bury: Six–foot cover. The hydrant shall have at least 15 inches and no more than 21 inches between the bottom of the steamer cap and the ground.
8. Drain: The hydrant shall be non–draining or have the drains permanently plugged.
9. Color: Red enamel
10. Other: Hydrants shall be compression type closing with the pressure. Hose and pumper nozzles shall be 1/4 turn type secured by stainless steel or corrosion resistant pins or screws. Pressure seals behind the nozzle flanges shall be "O" rings. A breakable coupling retained in place by stainless steel or corrosion resistant pins shall make the union between the upper and lower stems. The two–piece traffic flange shall be held in place by nuts and bolts. The upper barrel shall be able to rotate 360 degrees without removing any bolts. Hydrant flags shall be required and supplied for each hydrant. Wherever a traffic hazard appears to exist, curbing and/or bollards shall protect the hydrant.

B. For single–family house subdivisions, there will be at least one hydrant at each intersection and a maximum of five hundred feet (500') between hydrants with a minimum water flow of 500 gallons per minute (gpm) at the flow hydrant with a 20–psi residual pressure at the residual hydrant. Hydrants should be located immediately adjacent to street property lines. A 20' x 20' easement will be required around all hydrants. No structures or plantings are to be placed within a 20' x 20' area of any hydrant.

C. Where dead–end mains occur, they shall be provided with a fire hydrant if flow and pressure meet minimum requirements. If flows and pressure are not sufficient, then an approved flushing hydrant or blow off shall be installed for flushing purposes. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. The open end of a blow off must be capped and terminate at least eighteen inches (18") above grade.

D. When set in lawn space between the curb and sidewalk, no portion of the hydrant or nozzle cap will be less than one foot off the gutter face of the curb or edge of the sidewalk. Hydrants shall be a minimum of four feet (4') and a maximum of six feet (6') from the edge of the sidewalk to the closest point on the hydrant when placed behind the sidewalk. In the absence of a curb or sidewalk, no hydrant shall be placed more than six feet (6') from the edge of pavement. Hydrants shall be located so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2.15 HYDRANT ASSEMBLIES

A. Hydrant assemblies shall consist of an anchor tee, a six inch (6") mechanical joint gate valve conforming to the above specifications, the appropriate length of six inch (6") Ductile Iron Cement Lined, Class 52 pipe, all necessary anchor couplings and approved restraining glands, the fire hydrant and appropriate thrust block.

B. Care shall be taken to prevent damage to hydrants and appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign material cleaned out of the hydrant bowl; all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness. All hydrants shall be carefully incorporated in the water main and supported in their respective positions free from distortion and strain. Hydrants shall be set plumb. All hydrants shall be oriented to most efficiently allow fire truck access and connection for emergency purposes. They shall be installed away from the curb line at sufficient distance to avoid damage from or to vehicles. Traffic model hydrants shall be installed so the breakaway flange is not less than two inches (2"), nor more than six inches (6") above the established grade, according to manufacturer recommendations. Hydrant locations are subject to the approval of the Town Water Department and the appropriate municipality's fire department. Installation for fire hydrants can be found in AWWA Standard C600.

2.16 SERVICE CONNECTIONS

A. Service lines shall be installed so as to run perpendicular, in a straight line from the water main to the curb stop.

B. Each service shall consist of a corporation, curb stop, copper tubing and a curb box with a cast iron or stainless steel service rod. Service lines from three–quarter to two inch (3/4" to 2") shall be copper tubing from the corporation stop to the curb stop. Copper tubing shall be type "K", soft temper, conforming to ASTM B88. The name or trademark of the manufacturer and type shall be stamped at regular intervals along the pipe. Copper service pipe shall be one piece from the corporation to the curb stop. The minimum service for a single–family residence shall be three–quarter inch (3/4"). The minimum service for a duplex shall be one inch (1").

C. Corporations shall be AY McDonald or Cambridge Brass Low–Lead and manufactured in accordance with AWWA C800. Corporations shall have threads per AWWA C800 Table 7 / Figure 2, at the inlet and a compression type fitting at the outlet. Both inlet and outlet shall be the same size. Three–quarter inch and one–inch corporations shall be directly tapped into ductile iron pipe six inches (6") and larger in diameter. Larger size corporations up to two inches (2") shall use a tapping saddle. Pipe less than six inches (6") shall require the use of a tapping saddle and corporation. Corporations shall be used for all taps up to two inches (2"). In no instance, except when a tapping sleeve and valve are used, shall a tap be made without a corporation. Corporations shall be Mueller 110 (3/4" – 1"), or Mueller H 15013 (1 1/2" – 2"). A connection made to a pipe that requires a tapping saddle or is not ductile iron will have a body with a suitable outlet, seal, and suitable means for attachment to the main. The body shall be made to conform to the outside configuration of the main. The service saddle shall be designed to provide a drip tight connection. The body shall be Teflon or Epoxy coated with stainless steel strap(s), bolts, nuts, and mechanism for attaching to the pipe barrel.

D. Curb stops shall be a ball valve type with a minimum allowable pressure rating of 300 psi and be manufactured in accordance with AWWA C800. The curb stop shall open left, have a positive stop, be full port, provide drip–tight shutoff in the closed position and be of the tee design or flat design. No curb stop shall have the ability to drain the service line. Both the inlet and outlet of the curb stop shall have compression type fittings. The tee head of the curb stop shall have the provision for the connection of a service rod. Curb stops shall be AY McDonald or Cambridge Brass Low–Lead, or approved equal. The curb stop shall rest on a four inch by eight inch by sixteen–inch (4" x 8" x 16") concrete block for support. Curb stops shall be installed just inside the municipality R.O.W.

E. Curb boxes shall be of sliding adjustable type capable of adjusting from five feet to six feet (5' – 6') (Erie Style). The base of the box shall be arch type so as to prevent the box from resting on the curb stop. The adjustable upper section shall be one inch (1") diameter for use with 3/4" and 1" curb stops. For larger curb stops, the upper section shall be 1 1/4" in diameter. Stationary rods affixed to the key of the curb stop with a brass pin shall be thirty inches (30") in length for 3/4" and 1" curb stops and twenty–four inches (24") for large curb stops. Curb box rods may be cast iron or stainless steel, as determined by the Town Water Department. The word "WATER" shall be inscribed on the cover of the box.

F. Services greater than 2" diameter shall be constructed using C900 PVC pipe in accordance with the requirements set forth in Section 2.02 on Sheet C7.3

PART 3 – EXECUTION

3.01 INSTALLATION

A. Contractors shall notify the Town Water Department and Dig Safe at least seven days prior to any work on the water system.

B. Skilled workers experienced in such work shall install all items. Tools shall be adequate for the work and in good condition so as to produce good, clean cut threads of the correct size, pitch, and taper.

C. Installation of all water lines shall be in accordance with the latest version of AWWA C600 or AWWA C605 , as applicable, current edition.

D. Connection to an existing water main shall be done under the supervision of and with the approval of the Town Water Department. It is the applicant's, developer's, or owner of record's responsibility to secure ALL necessary connection permits and pay ALL applicable fees to make the connection, and to coordinate all parties involved in the process. The engineer and the Town Water Department shall be notified at least two working days in advance of the intended connection time. No existing valves, hydrants, curb stops, etc. shall be operated without prior approval of the Town Water Department. The Town Water Department shall operate all valves initially to ensure the integrity of the valve. The Town Water Department may then allow the contractor to operate those valves. Any damage occurring after the use of any valve operated by the contractor shall be the contractor's responsibility.

E. Care shall be taken to prevent damage to valves and other appurtenances during handling and installation. All materials shall be carefully inspected for defects in workmanship and materials; all debris and foreign matter cleaned out of valve openings, etc.; all operating mechanisms operated to check their proper functioning, and all other nuts and bolts checked for tightness. Valves and other equipment, which do not operate easily, or are otherwise defective, shall be replaced. All valves shall be carefully incorporated into the water main and supported in their respective positions free from all distortion and strain. Valves and valve boxes shall be set plumb. Valve boxes, besides being plumb, shall be centered directly over the valves.

F. All pipes showing cracks shall be rejected. If cracks occur in the pipe, the contractor may, at his own expense and after approval of the Town Water Department, cut off cracked portions at a point at least twice the pipe diameter from the visible limits of the crack and use the sound portion of the pipe.

G. All water mains shall have no less than six feet (6') of cover unless waived by the Town Water Department. The pipe shall be laid to conform to the lines and grades indicated on the Department. The Town Water Department may restrict work before November 15 and after April 1 during adverse weather conditions. The Town Water Department may not allow excavating for water mains during the winter months except by special permission for emergencies. Each pipe shall be laid so as to form a close joint with the next adjoining pipe and to bring the inverts continuously to the required grade. In no cases shall the waterline have less than four feet (4') of cover over the top of the pipe.

H. Temporary support, adequate protection, and maintenance of all underground structures, drains, sewers and other obstructions encountered in the progress of the work shall be provided at all times. If utility service is interrupted as a result of work for the project, the contractor shall immediately restore service by repairing the damaged utility at the contractor's expense.

I. At all times, when pipe laying is not actually in progress, the open ends of the pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. During construction, the contractor shall conduct operations so as to prevent the accumulation of water, ice, and snow in the vicinity of excavations or in the vicinity of excavated areas, and to prevent water from interfering with the progress and quality of the work.

J. Under no conditions shall water be allowed to rise in open trenches after pipe has been laid.

K. Accumulated water, ice, and snow shall be promptly removed and disposed of by pumping or other approved means. Disposal shall be carried out in a manner that will not create a hazard to public health, nor cause injury to public or private property, work completed or in progress, or public streets. Disposal shall not cause any interference in the use of streets and roads by the public. Pipes under construction shall not be used for drainage of excavations.

L. Any deflection of joints in pipe up to twelve–inch (12") diameter shall be within the limits specified by the manufacturer, but not to exceed five degrees or nineteen inches (19") per eighteen feet (18') of pipe length.

M. Concrete thrust blocks shall be installed on all hydrants, plugs, tees, and bends deflecting 11 1/4 degrees or more. Concrete thrust blocks shall be used in conjunction with "Mega–Lug" restraining glands or equivalent. Care shall be taken to ensure that concrete will not come into contact with flanges, joints, or bolts. The required area of thrust blocks shall be indicated on plan typicals and approved by the Town Water Department. Concrete shall be placed against undisturbed soil. Wooden side forms or equal shall be provided for thrust blocks. No backfilling shall be allowed until concrete masonry has set sufficiently. Where directed by the Town Water Department or engineer, concrete encasement of the waterline may be made for stream crossings and similar purposes. Where required on the plans or as directed by the Town Water Department or engineer, a concrete cradle shall be used to bolster and strengthen the pipe. The Town Water Department or his designee shall inspect all thrust blocks prior to backfilling.

N. All trenching safety standards shall be in conformance with all applicable State and Federal guidelines. The contractor shall be solely responsible for any safety citations by State or Federal inspectors.

O. There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks that are supplied with water that is, or may be, contaminated.

P. As necessary, temporary PVC markers shall be supplied at all gate valves, curb boxes, and at the end of water lines to a minimum of twelve inches (12") above finish grade until accepted by the Town Water Department.

Q. All surplus material and debris shall be removed as the project progresses, leaving all areas clean and presentable.

R. Unless otherwise required, all paving and sidewalks that may be damaged during construction shall be replaced with the same kind of material that previously existed.

S. The contractor shall be responsible for proper protection of persons and property on the project. The contractor shall barricade open holes and depressions occurring as part of the work, and post warning lights on adjacent property to or with public access.

T. Warning lights shall be operated during hours from dusk to dawn and as otherwise requested.

U. The contractor shall protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by construction operations.

V. No water lines shall be installed after November 15 or before April 1 without prior approval of the Town Water Department.

3.02 BACKFILLING

A. Trenches shall be backfilled to subgrade with, wherever possible, material excavated from the trench, and shall be done only after the approval of the Town Water Department. Material for backfilling shall be free of roots, stumps, and frost. Backfill shall not be placed on frozen material. Materials used for backfilling trenches shall be free of stones measuring more than twenty four (24) pounds. No stones measuring over three inches (3") in the longest dimension shall be placed within one foot (1') of the pipeline being backfilled. Stones found in the trench shall be removed for a depth of at least six inches (6") below the bottom of the pipe. In general, use of blasted rock as trench backfill will not be permitted.

B. Backfill material shall be tamped in layers around the pipe to a sufficient height above the pipe to adequately support and protect the pipe. Backfill for pipelines shall be placed in six inch (6") lifts, each lift being compacted to not less than 95% of maximum dry density as determined by the AASHTO–T–99 Standard Proctor. If conditions warrant, the backfilling of trenches may be done with mechanical equipment. Particular precautions shall be taken in the placement and compaction of the backfill material in order not to damage the pipe, pipe coating or structure. The backfill shall be brought up evenly. Around valve boxes, the backfill shall be tamped to a distance of four feet (4') on all sides of the box, or to the undisturbed trench face, if less than four feet (4'). Backfilling in all public roadways shall be so compacted as to leave no depression in the road. Additional backfill requirements may apply within State or local Highway Right–of–Ways. All public road surfaces shall be restored to a condition at least equal to that which existed prior to the start of construction. Precautions shall be taken against undue damage to existing surface materials.

C. No compacting shall be done when the material is too wet to be compacted properly. At such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compaction, or such other precautions are taken as may be necessary to obtain proper compaction.

D. Surplus excavated materials shall be disposed of in a satisfactory manner. Surplus material or spoil shall be removed promptly and disposed of so as not to be objectionable to abutters or the general public.

E. Trenches that have been improperly backfilled, enclosed or covered before inspection of fittings and joints shall be reopened and re–backfilled at the contractor's expense.

3.03 WATER/SEWER SEPARATION

A. Water mains crossing sewers shall be laid to provide minimum vertical distance of eighteen inches (18") between the outside of the water main and the outside of the sewer line. This shall be the case where the water main is either above or below the sewer. At crossings, one full length of pipe shall be located so both joints will be as far from the sewer as possible. This vertical separation shall be maintained for that portion of the water main located within ten feet (10') horizontally of any sewer it crosses. Water mains must be laid at least five feet (5') horizontally from any existing or proposed storm sewer and ten feet (10') from any existing or proposed sanitary sewer.

B. When it is impossible to obtain horizontal and vertical separation on new installations, both the water main and sewer main shall be constructed of waterworks material with watertight joints and shall be pressure tested before backfilling. A PVC sleeve may be required for one or both mains in addition to the waterworks material. Lines may also be encased in concrete as required by the Retail Department. No water main shall pass through or come in contact with any part of a sewer manhole.

C. Distribution lines shall not be placed closer than fifty feet (50') horizontal distance from any septic tank or leach field unless approved by the VT Water Supply Rule Provisions under Chapter 21.8.6.4 or the Town Water Department.

D. Force main crossing shall be arranged so that at least one full length of sewer pipe is centered above or below the water line, with the sewer joints as far as possible from the water joints. The new force main line shall be constructed to water main standards for a minimum of twenty feet (20') on either side of the crossing. The section constructed to water main standards shall be pressure tested to maintain 50 psi for fifteen (15) minutes without leakage prior to backfilling. In those areas that proper cover cannot be provided, proper insulation shall be installed.

E. Sewer and waterline separation shall conform to all VT Water Supply Rule requirements, and installed in accordance with the latest edition of the "Ten States Standards – Recommended Standards for Water."

3.04 TESTING AND DISINFECTION

A. All water mains shall be constructed, tested and disinfected in accordance with AWWA Standards C–600, C–605, C651 and The Vermont Water Supply Rule. All tests shall be conducted by and at the expense of the Contractor.

1. The Contractor shall furnish all gauges, testing plugs, caps and all other necessary equipment and labor to perform leakage and pressure tests in sections of an approved length. Each valved section, including hydrant laterals, or a maximum length of 1,000 feet of pipe shall be tested. The Contractor shall provide at his own expense any additional taps to the water line necessary to perform the pressure and leakage test between valves. All didinfection/testing shall be completed by an independent third party unless otherwise approved by the Engineer or local municipality.
2. All water required for testing shall be potable. All testing shall be conducted in the presence of the Engineer.
3. The Contractor shall make the necessary provisions to tap the pipe at the high point to release all air and shall plug same after completing the test. Hydrants or blowoffs located at high points may be used for air release in lieu of taps if approved by the Engineer.
4. For the pressure test, the Contractor shall develop and maintain for two hours, 150% of the working pressure, or 200 psi, whichever is greater. Failure to hold within 5 psi of the designated pressure for the two hour period constitutes a failure of the section tested.
5. No pipe installation shall be accepted if the leakage is greater than that determined by the following. Maximum allowable leakage will be:

$$L = \frac{SD\sqrt{P}}{148{,}000} \quad \text{or} \quad L = \frac{ND\sqrt{P}}{7{,}400}$$

whichever is less

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge).
N = Number of joints in the pipeline tested

All testing shall be conducted in accordance with AWWA C600 (latest edition)

6. Should any section of pipe fail either the pressure or leakage test, the Contractor shall do everything necessary to locate and repair or replace the defective pipe, fittings, or joints at no cost to the Owner.
7. Disinfection: Disinfection of the pipeline shall be directed by the Engineer and at the Contractor's expense. AWWA Standard C–651 shall be used as a basis for the disinfection process.

B. The Engineer or Town Water Department will require as minimum:

1. Complete flushing of the pipeline to wash out all dirt, debris, etc. which may have accumulated in the pipeline during construction. A reducing agent shall be used at the point of flushing to eliminate the free chlorine residual per the direction of the Town Water Department.
2. Following flushing to clean clear water, the Contractor will add chlorine through continuous feed to the entire pipeline volume of water such that the water will have not less than 25 mg/L free chlorine, and let the mixture set for at least 24 hours.
3. After the 24–hour duration, the water in the pipeline shall be tested for residual free chlorine and must contain a minimum of 10 mg/L chlorine. If less than 10 mg/L are found, then the disinfection procedure shall be repeated until at least 10 mg/L chlorine residual is indicated by test.
4. Upon successful completion of step 3 above, the pipeline shall be flushed again until the chlorine concentration in the pipeline is no higher than that prevailing in the supply system. A reducing agent shall be used to eliminate the free chlorine residual in the flushing process per the direction of the Town Water Department.

C. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main, and submitted to the Vermont Health Department for analysis. At least one set of samples

SITE ENGINEER:
CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:
IRELAND DEVELOPMENT, LLC
193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:
SUNDERLAND FARMS COMMUNITY
SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134

DRAWING NUMBER C7.4

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shall be collected from every 1,000 feet of the new water main, plus one set from the end of the line and at least one set from each branch. All samples shall show the absence of coliform organisms and, if required, the presence of a chlorine residual (AWWA C651–99). If the initial disinfection fails to produce samples which pass the V.S.H.D. requirements for potable drinking water, then the new main shall be refllushed and shall be resampled until satisfactory test results are obtained.

D. Upon satisfactory results by the Vermont State Health Department, the pipeline may be placed in service. All costs for water, materials, equipment and labor to perform the required testing disinfection, and flushing of the pipeline shall be paid by the Contractor.

3.05 SUBMITTAL OF TEST RESULTS

A. A. The Applicant or Project Engineer shall be responsible for submittal of test results to the Town Water Department. The Applicant or Project Engineer shall also provide a letter to the Town Water Department certifying that the water system has passed all tests, is constructed in accordance with the approved plans, except as may have been modified by approved Change Order, and is in condition to be placed in service. Submittal of all test results shall be required prior to the water main being placed into service.

3.06 FINAL INSPECTION

A. For one year from the date the new system is placed into service, the applicant's developer/contractor will be responsible for any necessary repairs or corrections as part of the project warranty. At the end of a one–year period, an inspection will be performed by the Town Water Department prior to the system owner assuming ownership of any of the lines and appurtenances. The contractor shall correct any punch list items accumulated during the inspection after receipt of this list. Incomplete work on the system shall not be included in the initial inspection, but shall be inspected as the project continues. The contractor shall repair, replace, or retest promptly as directed by the Town Water Department and without further charges, all work equipment, materials or parts, which may fail during the one year warranty period.

B. A final walk–through inspection shall be conducted by the Town Water Department prior to the water system being accepted for ownership by the system owner. This inspection shall include but not be limited to:

1. Valves, hydrants, and curb stops operating properly.
2. Valve boxes and covers set plumb and at proper elevations.
3. Proper hydrant nozzle height above grade.
4. Proper hydrant opening direction, nozzle thread, and barrel color.
5. Proper distance from the face of the curb of hydrant nozzles.
6. Hydrant flags meeting Town Water Department specifications installed on each fire hydrant at the time of installation.
7. Static and residual hydrant pressures and flow rates.
8. Curb boxes inside ROW, set to grade, containing operating rod, and plumb.
9. Tie information and record drawings complete and submitted.
10. Material testing results, lab reports, manufacturers' certificates, and leakage test results complete and on file.
11. General appearance and restoration.
12. Submittal of O&M manuals in hard copy and Adobe Acrobat Reader (.pdf) format.
13. Submittal of As–Builts in hard copy format and Auto–CAD.DWG Version 2000 format or newer within 14 days of completion.

3.07 GENERAL INFORMATION

A. All persons taking water must keep the fixtures and service pipe within their own premises in good repair and fully protected from frost, and must prevent unnecessary leakage of water. The Town Water Department shall not be liable for leakage of hydrants, pipes or fixtures upon the premises of any consumer, nor for obstructions therein by freezing or otherwise, nor for damages resulting from any of the forgoing causes. All leaks that are on the building side of the curb stop will be the owner's responsibility and repaired at the owner's expense.

B. Water rates shall be collected for all water used until the water is shut off at the curb stop by the Town Water Department. No abatement of water rates will be allowed by reason of disuse, diminished use, or vacancy of premises without proper notice to the Town Water Department.

C. The Town Water Department or system owner shall not be liable for any injury, loss or damage of whatever nature occasioned by the failure to maintain a constant or uniform pressure in the water mains, or for damages occasioned by or growing out of a stoppage of said water by frost or other cause, or for damage occasioned by or growing out of an insufficient supply of the same, or for accident or damage of any kind caused by or growing out of the use or failure of said water.

D. No person shall open any hydrant or draw water there from except the Town Water Department personnel or persons under their direction, or the officers or designees of the municipal fire department and members of the fire companies under their direction for fire purposes, or those individuals who have been granted approval on a hydrant use application by the Town Water Department, in which case, all such usage shall be metered. Fines for unauthorized use of any hydrant or connection may be incurred, according to the Rules and Regulations of the Town Water Department.

E. One curb stop and one water meter shall be installed for each individual dwelling unit, condominium unit, apartment unit, commercial or office occupancy. Exceptions may be permitted in cases where a condominium association signs a binding agreement to be responsible for all collection of water bills. In cases where condominiums are converted into separate apartments, separate curb stops and water meters shall be installed for each unit. Town Water Department employees shall install all water meters. Under no circumstances are plumbers or persons other than those authorized by the Town Water Department permitted to turn water on or off at the curb stop. The water will not in any instance be turned on to any premise for use until the Town Water Department has suitably attached a meter.

F. The owner of the premises shall be responsible for all water payments. A change of tenants or premises will not relieve the owners from payment of a back bill.

STORM WATER PONDS

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Construction of storm water detention pond.

PART 2 – PRODUCTS

A. Compacted Fill/Granular Borrow: The material for the fill shall be obtained from the designated areas and shall conform to the requirements of Section 02210 – Site Earthwork. The material shall be free from stumps, wood, brush, roots, sod, rubbish, and other matter that may decay. It should be free of stones over 2 inches in diameter where compacted by hand or mechanical tampers, or over 6 inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill, nor shall the fill material be placed on a frozen foundation.

B. Stone Fill: Stone fill shall conform to the requirements of Type I Stone Fill as specified in Section 02439 – Stone Fill.

C. Riser and Drain Pipe: Riser and drain pipe shall conform to the requirements of the Drainage section.

PART 3 – EXECUTION

3.01 SITE PREPARATION

A. The area to be covered by the pond and embankments shall be cleared of all trees, brush, stumps, roots and other objectionable material. The area to be covered by the earth embankment and the surface of the borrow area shall be stripped of all grass, roots, organic materials, or other objectionable materials to a depth that will insure the removal of any materials which will prevent bond between the foundation and the fill. Material cleared shall be disposed of in accordance with Section 02110 – Site Clearing. Where the embankment will be on a hillside, the slope of the original ground on which the embankments are to be constructed shall be stepped and properly drained as the fill is constructed so that adverse movements of the slopes do not occur.

3.02 COMPACTED FILL/GRANULAR BORROW

A. Preparation of Foundation: Upon completion of the clearing operation and just prior to placing the fill material on any portion of the foundation, that portion shall be scarified, plowed, or disked to a depth of 3 inches. All objectionable material exposed by this operation shall be disposed of outside the limits of the fill.

B. Placing and Spreading Material: The placing and spreading of material shall be started at the lowest part of the section under construction and the fill constructed in layers of 6 inches. The layers shall slope slightly towards the reservoir to prevent puddles and provide for faster runoff in case of rain. Where possible, the layers shall extend over the entire area of the fill. The distribution and gradation of the materials throughout the fill shall be such that there be no lenses, pockets, streaks, or layers of material differing substantially in texture or gradation from the surrounding material. The most porous borrow material shall be placed on the downstream portions of the embankment.

C. Compaction: All fill shall be compacted to 95 % maximum density per ASTM D–698.

D. Limits: The embankment shall be constructed where located and as detailed in the Contract Plans. Side slope shall be 1 vertical to 3 horizontal.

E. Revisions to the proposed design of the detention pond may be necessary if, in the opinion of the Engineer, unsuitable material is found at the pond location.

3.03 SLOPE PROTECTION

A. Placement: Stone Fill Type I shall be placed at locations indicated on the plans to a minimum thickness of 1'–0" in one course in a manner that will result in a reasonably well graded surface. Care shall be taken in the placing to avoid displacing of the underlying material. The stones shall be placed and distributed so that there will be no accumulations of either the larger or the smaller stones. Re–arrangement of the stone fill by hand labor or mechanical equipment may be required to obtain the specified results.

3.04 LANDSCAPING

A. At completion of grading, slopes, ditches, and all disturbed areas shall be smooth and free of pockets with sufficient slope to ensure drainage. All disturbed areas shall receive a minimum of four inches (4") of topsoil and shall be seeded, fertilized, limed, and mulched in accordance with the following:

1. Seed mixture in all areas shall be urban mix conforming to the table below. For seeding between September 1 and October 1, winter rye shall be used at an application rate of 100 pounds per acre.
2. Fertilizer shall be standard commercial grade conforming to the State Fertilizer Law and to the Standards of the Association of Official Agricultural Chemists. Dry fertilizer, if used, shall be applied at the rate of 500 pounds per acre. Liquid fertilizer, if used, shall be applied in a 1–2–1 ratio with the minimum rate to include 100 pounds of nitrogen, 200 pounds of phosphate, and 100 pounds of potash per acre.
3. Limestone shall conform to all State and Federal regulations and to the Standards of the Association of Official Agricultural Chemists. The limestone shall be applied at a rate of one ton per acre as directed.
4. Within twenty–four (24) hours of application of fertilizer, lime, and seed, the surface shall be mulched with a hay mulch. Mulch shall be spread uniformly over the area at a rate of two (2) tons per acre.
5. All turf establishment shall be performed in accordance with the Vermont Standard Specifications for Construction, Section 651.

URBAN MIX GRASS SEED

Percentage By Weight	Pounds Live Seed Per Acre	Type of Seed
37.50%	45.0	Creeping Red Fescue
37.25%	37.5	Kentucky Blue Grass, Winter Hardy, Perennial Rye
31.25%	37.5	(variety Pennfine, Manhattan, or similar varieties)
100%	120 pounds live seed per acre	

LANDSCAPE GRADING

PART 1 – GENERAL

1.01 SUMMARY

A. Section includes:

1. Finish grading; bring rough grade in areas to design elevations as shown on the drawings.
2. Topsoil: Work shall consist of furnishing, placing and shaping topsoil, or placing, spreading, and shaping topsoil form stockpiles or stripped areas.

PART 2 – PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be loose, friable, reasonably free of admixtures of subsoil, free from refuses, stumps, roots, brush, weeds, rocks, and stones 1 1/4 inch in overall dimensions. The topsoil shall also be free from any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth. It shall contain not less than three (3) nor more than twenty (20) percent organic matter. Any material which has become mixed with undue amounts of subsoil during any operation at the source or during placing or spreading will be rejected and shall be replaced by the Contractor with acceptable material.

PART 3 – EXECUTION

3.01 SUBGRADE PREPARATION

A. Clean subgrade of all stumps, stones, roots, trash or other materials which might hinder proper tillage or spreading.

B. All surfaces on which topsoil is to be placed shall be graded to a reasonably true surface and scarified by raking, discing or other approved means to a minimum depth of two inches before placing topsoil.

3.03 PLACING TOPSOIL

A. Minimum final depth of topsoil shall be 4 inches.

B. Place topsoil when seeding operations can closely follow spreading operations. Use topsoil in relatively dry state.

C. Topsoil shall be spread and shaped to the lines and grades shown on the plans, or as directed by the Engineer. The depth stated in the contract to which the topsoil is to be placed is that required after final rolling of the material has taken place. All stones, roots and debris over 1¼ inch in diameter along with any sodding weeds and other undesirable material shall be removed.

D. After shaping and grading, all trucks and other equipment shall be excluded from the topsoiled area to prevent excessive compaction. The Contractor shall perform such work as required to provide a friable surface for seed germination and plant growth prior to seeding.

E. It shall be the Contractor's responsibility to restore to the line, grade and surface all eroded areas with approved material and to keep topsoiled areas in acceptable condition until the completion of the work.

SEEDING

PART 1 – GENERAL

1.1 Section Includes:

A. Seeding.

1. Furnish all labor, materials and equipment to complete all seeding work as shown on the drawings and specified herein.
2. Except where otherwise shown or specified, the Contractor shall seed all areas where new contours are shown on the drawings and all areas where existing ground cover has been disturbed by the Contractor's operations.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

Planting Restrictions: Seeding and initial fertilizing shall be done between May 1st and September 15th unless otherwise authorized. Seeding shall not be done during windy weather or when the ground is frozen, excessively wet, or otherwise untillable. If seeding is done during July or August, additional mulch material may be required. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 SEED

A. Conservation Seed Mix:

Kind of Seed	Minimum Purity	Minimum Germination	Lbs/Acre
Creeping Red Fescue	98%	85%	22.5
Tall Fescue	95%	95%	22.5
Red Top	95%	90%	3
Birdsfoot Trefoil	98%	85%	9
Annual Ryegrass	95%	85%	3
		TOTAL =	60

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C 602, agricultural limestone containing a minimum of 85 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through No. 8 sieve and a minimum of 75 percent passing through No. 60 sieve.

2.3 FERTILIZER

A. Commercial Fertilizer: Commercial–grade complete fertilizer of neutral character, consisting of fast– and slow–release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.

B. Slow–Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water–insoluble nitrogen, phosphorus, and potassium.

2.4 MULCHES

A. Mulch: Provide air–dry, clean, mildew– and seed–free, hay or threshed straw of wheat, rye, oats, or barley.

B. Compost Mulch: Well–composted, stable, and weed–free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1–inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.

PART 3 – EXECUTION .

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Provide erosion–control measures to prevent erosion or displacement of soils and discharge of soil–bearing water runoff or airborne dust to adjacent properties and walkways.

C. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

1. Apply fertilizer directly to subgrade before loosening.
   a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
   b. Mix lime with dry soil before mixing fertilizer.

D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.

E. Moisten prepared areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Before planting, restore areas if eroded or otherwise disturbed after finish grading.

3.2 APPLICATION RATES

A. When a soil test is not available, the following minimum amounts should be applied:

1. Agricultural limestone: 2 tons/acre.
2. Nitrogen (N): 50 lbs./acre.
3. Phosphate: 100 lbs./acre.
4. Potash: 100 lbs./acre.
   a. This is the equivalent of 500 lbs./acre of 10–20–20 fertilizer or 1,000 lbs./acre of 5–10–10.
5. Hay mulch: 2 tons/acre.

3.3 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged.
2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

C. Protect seeded areas with slopes exceeding 1:3 with erosion–control blankets installed and stapled according to manufacturer's written instructions.

D. Protect seeded areas from hot, dry weather or drying winds by applying mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a depth of 3/16 inch, and roll surface smooth.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with fiber–mulch manufacturer's recommended tackifier.
2. Apply slurry uniformly to all areas to be seeded in a one–step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500–lb/acre dry weight, and seed component is deposited at not less than the specified seed–sowing rate.

3.5 MAINTENANCE

A. Maintain and establish seeding by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.

1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
2. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
   a. Seeded Areas: 90 days from date of Substantial Completion.
   b. When initial maintenance period has not elapsed before end of planting season, or if seeding is not fully established, continue maintenance during next planting season.

3.6 SATISFACTORY CONDITIONS

A. Installations shall meet the following criteria as determined by Engineer/Owner:

1. Satisfactory Seeded Area: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

B. Use specified materials to reestablish area that do not comply with requirements and continue maintenance until areas are satisfactory.

3.7 CLEANUP AND PROTECTION

A. Promptly remove soil and debris, created by work. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after lawn is established.

C. Remove nondegradable erosion–control measures after grass establishment period.

SITE ENGINEER:

CIVIL ENGINEERING ASSOCIATES, INC.
10 MANSFIELD VIEW LANE, SOUTH BURLINGTON, VT 05403
P: 802-864-2323 FAX: 802-864-2271 web: www.cea-vt.com

DRAWN MAB
CHECKED DSM
APPROVED DSM

CLIENT:

IRELAND DEVELOPMENT, LLC

193 INDUSTRIAL AVENUE
WILLISTON, VERMONT 05403

PROJECT:

SUNDERLAND FARMS COMMUNITY

SEVERANCE ROAD
COLCHESTER, VT

DATE	CHECKED	REVISION

SITE SPECIFICATIONS

DATE 11/01/2019
SCALE NONE
PROJ. NO. 14134

DRAWING NUMBER C7.5

Severance Road PUD - Water & Sewer Allocations - WW Permit App

April 25, 2019

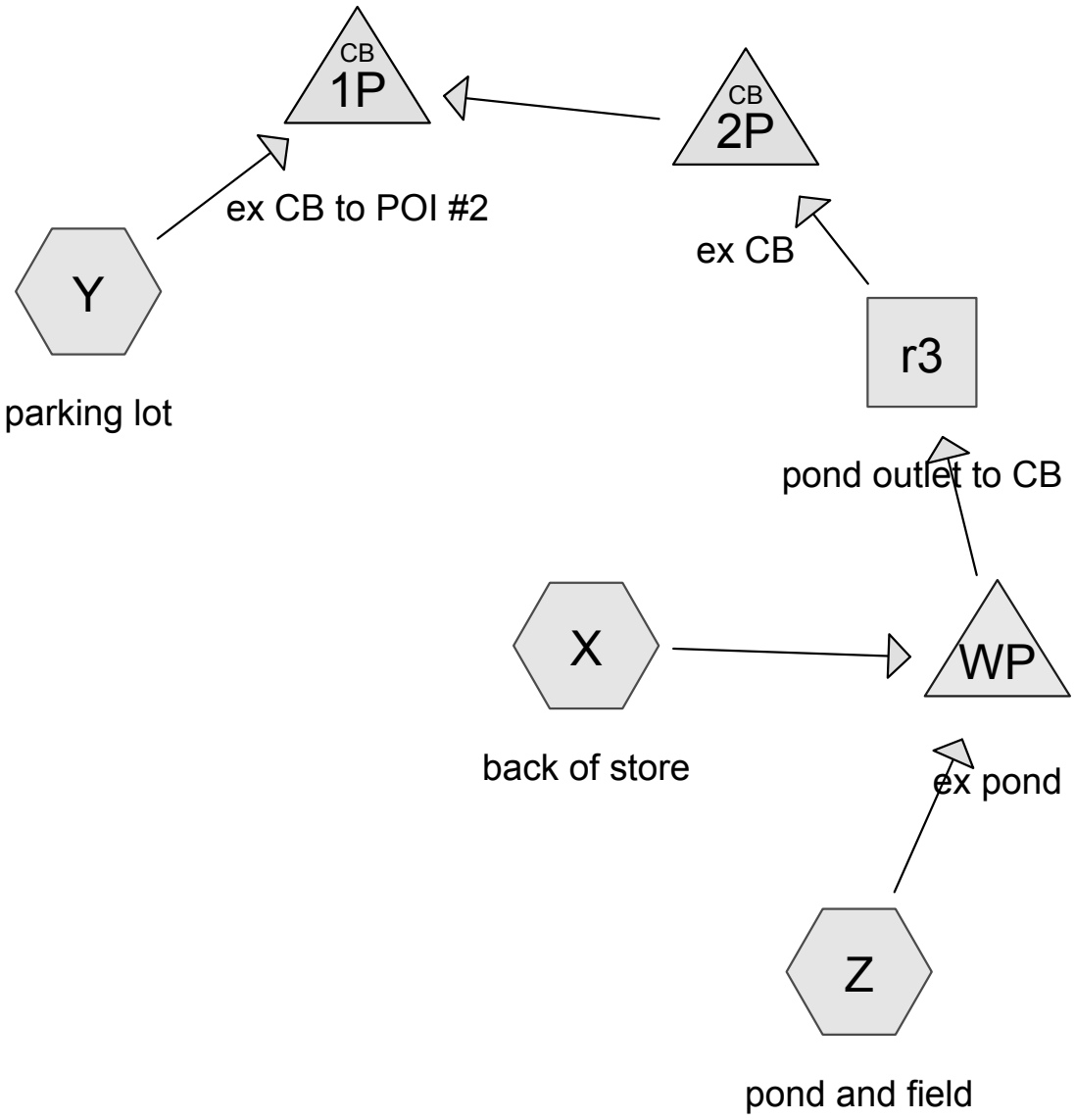
Existing - Occupied - Connected										
Building	Address	Residential			Retail/Office Employees	Assembly (interior)	Day Care Students	Restaurant / Salon Seats		Wastewater (gpd)	Water (gpd)
		1-Bdrm	2-bdrm	3-bdrm							
1	Dylan Avenue	0	0	0	0	0	0	0		0	0
2	Dylan Avenue	0	0	0	0	0	0	0		0	0
3	Shea Drive	0	0	0	0	0	0	0		0	0
4	Shea Drive	0	0	0	0	0	0	0		0	0
5	Shea Drive	0	0	0	0	0	0	0		0	0
6	Shea Drive	0	0	0	0	0	0	0		0	0
7	Stuart Avenue	0	0	0	0	0	0	0		0	0
8	Stuart Avenue	0	0	0	0	0	0	0		0	0
9	Stuart Avenue	0	0	0	0	0	0	0		0	0
10	Pegs Cove	0	0	0	0	0	0	0		0	0
11	Pegs Cove	0	0	0	0	0	0	0		0	0
Townhouses		0	0	0	0	0	0	0		0	0
	Infiltration									0	0
								Connected		-	-

Existing - Vacant										
Building	Address	Residential			Retail/Office Employees	Assembly (interior)	Day Care Students	Restaurant / Salon Seats		Wastewater (gpd)	Water (gpd)
		1-Bdrm	2-bdrm	3-bdrm							
1	Dylan Avenue	0	0	0	0	0	0	0		0	0
2	Dylan Avenue	0	0	0	0	0	0	0		0	0
3	Shea Drive	0	0	0	0	0	0	0		0	0
4	Shea Drive	0	0	0	0	0	0	0		0	0
5	Shea Drive	0	0	0	0	0	0	0		0	0
6	Shea Drive	0	0	0	0	0	0	0		0	0
7	Stuart Avenue	0	0	0	0	0	0	0		0	0
8	Stuart Avenue	0	0	0	0	0	0	0		0	0
9	Stuart Avenue	0	0	0	0	0	0	0		0	0
10	Pegs Cove	0	0	0	0	0	0	0		0	0
11	Pegs Cove	0	0	0	0	0	0	0		0	0
Townhouses		0	0	0	0	0	0	0		0	0
	Infiltration									0	0
								Existing - Vacant		-	-

Current Existing Plus Proposed Building X											
Building	Address	Residential			Retail/Office Employees	Assembly (interior)	Day Care Students	Restaurant / Salon Seats		Wastewater (gpd)	Water (gpd)
		1-Bdrm	2-bdrm	3-bdrm							
1	Dylan Avenue	0	0	0	0	0	0	0		0	0
2	Dylan Avenue	0	0	0	0	0	0	0		0	0
3	Shea Drive	0	0	0	0	0	0	0		0	0
4	Shea Drive	0	0	0	0	0	0	0		0	0
5	Shea Drive	0	0	0	0	0	0	0		0	0
6	Shea Drive	0	0	0	0	0	0	0		0	0
7	Stuart Avenue	0	0	0	0	0	0	0		0	0
8	Stuart Avenue	0	0	0	0	0	0	0		0	0
9	Stuart Avenue	0	0	0	0	0	0	0		0	0
10	Pegs Cove	0	0	0	0	0	0	0		0	0
11	Pegs Cove	0	0	0	0	0	0	0		0	0
Townhouses		0	0	0	0	0	0	0		0	0
Infiltration										0	0
									Current Existing Plus New Building X	-	-
									Current Allocations	45,511	64,571
									Requested Allocation	45,511	64,571

Future Planned											
Building	Address	Residential			Retail/Office Employees	Assembly (interior)	Day Care Students	Restaurant / Salon Seats		Wastewater (gpd)	Water (gpd)
		1-Bdrm	2-bdrm	3-bdrm							
1	Dylan Avenue	0	0	0	22	0	0	0		286	286
2	Dylan Avenue	0	0	0	16	0	0	0		208	208
3	Shea Drive	16	0	0	50	0	0	0		2890	2890
4	Shea Drive	0	0	0	0	0	0	75		2025	2025
5	Shea Drive	4	32	0	0	0	0	0		7280	9520
6	Shea Drive	3	32	0	0	0	0	0		7140	9380
7	Stuart Avenue	4	25	3	0	0	0	0		6440	8640
8	Stuart Avenue	0	0	0	0	0	57	0		741	741
9	Stuart Avenue	0	0	0	66	0	0	0		858	858
10	Pegs Cove	0	0	0	32	0	0	0		416	416
11	Pegs Cove	0	0	45	0	0	0	0		9450	16200
Townhouses		0	0	30	0	0	0	0		6300	10800
Infiltration										1945	0
									Future Planned Total	45,979	61,964

	(gpd)	(gpd)
Total Needed at Full Build-out	45,979	61,964



Subcat Reach Pond Link

Drainage Diagram for severance existing POI #2
Prepared by Civil Engineering Associates 1/9/2007

Time span=2.00-30.00 hrs, dt=0.02 hrs, 1401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment X: back of store Runoff Area=45,426 sf Runoff Depth=1.91"
Flow Length=100' Tc=7.4 min CN=87 Runoff=3.34 cfs 0.166 af

Subcatchment Y: parking lot Runoff Area=34,113 sf Runoff Depth=2.45"
Flow Length=180' Tc=1.9 min CN=93 Runoff=3.64 cfs 0.160 af

Subcatchment Z: pond and field Runoff Area=265,370 sf Runoff Depth=1.40"
Flow Length=500' Tc=33.0 min CN=80 Runoff=6.82 cfs 0.712 af

Reach r3: pond outlet to CB Peak Depth=0.66' Max Vel=1.8 fps Inflow=4.63 cfs 0.864 af
n=0.050 L=260.0' S=0.0115 '/' Capacity=2.88 cfs Outflow=4.60 cfs 0.864 af

Pond 1P: ex CB to POI #2 Peak Elev=300.26' Inflow=4.80 cfs 1.024 af
18.0" x 60.0' Culvert Outflow=4.80 cfs 1.024 af

Pond 2P: ex CB Peak Elev=301.94' Inflow=4.60 cfs 0.864 af
18.0" x 135.0' Culvert Outflow=4.60 cfs 0.864 af

Pond WP: ex pond Peak Elev=309.91' Storage=42,044 cf Inflow=7.28 cfs 0.878 af
Outflow=4.63 cfs 0.864 af

Total Runoff Area = 7.918 ac Runoff Volume = 1.038 af Average Runoff Depth = 1.57"

Subcatchment X: back of store

Runoff = 3.34 cfs @ 11.99 hrs, Volume= 0.166 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
6,377	98	Paved parking & roofs
21,750	89	Gravel roads, HSG C
7,299	89	Gravel roads, HSG C (PLANTS)
10,000	74	>75% Grass cover, Good, HSG C
45,426	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0200	1.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
6.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
7.4	100	Total			

Subcatchment Y: parking lot

Runoff = 3.64 cfs @ 11.92 hrs, Volume= 0.160 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
26,613	98	Paved parking & roofs
7,500	74	>75% Grass cover, Good, HSG C
34,113	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0167	1.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.3	50	0.0200	2.9		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	30	0.0600	3.7		**Shallow Concentrated Flow, flow to cb** Grassed Waterway Kv= 15.0 fps
1.9	180	Total			

Subcatchment Z: pond and field

Runoff = 6.82 cfs @ 12.29 hrs, Volume= 0.712 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
14,500	89	Gravel roads, HSG C
115,000	82	Row crops, SR + CR, Good, HSG C
67,935	79	50-75% Grass cover, Fair, HSG C
67,935	76	Woods/grass comb., Fair, HSG C
265,370	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	150	0.0070	0.2		**Sheet Flow, flow from cornfields** Cultivated: Residue<=20% n= 0.060 P2= 2.30"
21.3	350	0.0030	0.3		**Shallow Concentrated Flow, flow to pond** Woodland Kv= 5.0 fps
33.0	500	Total			

Reach r3: pond outlet to CB

Inflow Area = 7.135 ac, Inflow Depth > 1.45" for Q-10 event
Inflow = 4.63 cfs @ 12.55 hrs, Volume= 0.864 af
Outflow = 4.60 cfs @ 12.58 hrs, Volume= 0.864 af, Atten= 0%, Lag= 2.0 min

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.8 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.7 fps, Avg. Travel Time= 6.2 min

Peak Depth= 0.66' @ 12.58 hrs
Capacity at bank full= 2.88 cfs
Inlet Invert= 310.00', Outlet Invert= 307.00'
2.50' x 0.50' deep channel, n= 0.050 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 4.50'
Length= 260.0' Slope= 0.0115 '/'

Pond 1P: ex CB to POI #2

Inflow Area = 7.918 ac, Inflow Depth > 1.55" for Q-10 event
Inflow = 4.80 cfs @ 12.58 hrs, Volume= 1.024 af
Outflow = 4.80 cfs @ 12.58 hrs, Volume= 1.024 af, Atten= 0%, Lag= 0.0 min
Primary = 4.80 cfs @ 12.58 hrs, Volume= 1.024 af

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Peak Elev= 300.26' @ 12.58 hrs
Flood Elev= 307.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (920.6 - 920.6)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.00'	**18.0" x 60.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 296.60' S= 0.0400 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=4.80 cfs @ 12.58 hrs HW=300.26' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 4.80 cfs @ 3.0 fps)

Pond 2P: ex CB

Inflow Area = 7.135 ac, Inflow Depth > 1.45" for Q-10 event
Inflow = 4.60 cfs @ 12.58 hrs, Volume= 0.864 af
Outflow = 4.60 cfs @ 12.58 hrs, Volume= 0.864 af, Atten= 0%, Lag= 0.0 min
Primary = 4.60 cfs @ 12.58 hrs, Volume= 0.864 af

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Peak Elev= 301.94' @ 12.58 hrs
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.35'	**18.0" x 135.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 299.00' S= 0.0100 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=4.60 cfs @ 12.58 hrs HW=301.94' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 4.60 cfs @ 3.1 fps)

Pond WP: ex pond

Inflow Area = 7.135 ac, Inflow Depth = 1.48" for Q-10 event
Inflow = 7.28 cfs @ 12.28 hrs, Volume= 0.878 af
Outflow = 4.63 cfs @ 12.55 hrs, Volume= 0.864 af, Atten= 36%, Lag= 16.0 min
Primary = 4.63 cfs @ 12.55 hrs, Volume= 0.864 af

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Starting Elev= 309.00' Surf.Area= 12,211 sf Storage= 30,661 cf
Peak Elev= 309.91' @ 12.55 hrs Surf.Area= 12,926 sf Storage= 42,044 cf (11,383 cf above start)
Plug-Flow detention time= 660.4 min calculated for 0.161 af (18% of inflow)
Center-of-Mass det. time= 86.6 min (942.1 - 855.5)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	64,766 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	5,000	0	0
307.00	10,633	7,817	7,817
310.00	13,000	35,450	43,266
311.00	30,000	21,500	64,766

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**1.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00

			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	309.50'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=4.62 cfs @ 12.55 hrs HW=309.91' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Weir Controls 2.51 cfs @ 2.8 fps)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.11 cfs @ 1.7 fps)

Time span=2.00-30.00 hrs, dt=0.02 hrs, 1401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment X: back of store Runoff Area=45,426 sf Runoff Depth=3.76"
Flow Length=100' Tc=7.4 min CN=87 Runoff=6.34 cfs 0.326 af

Subcatchment Y: parking lot Runoff Area=34,113 sf Runoff Depth=4.39"
Flow Length=180' Tc=1.9 min CN=93 Runoff=6.26 cfs 0.287 af

Subcatchment Z: pond and field Runoff Area=265,370 sf Runoff Depth=3.07"
Flow Length=500' Tc=33.0 min CN=80 Runoff=15.25 cfs 1.558 af

Reach r3: pond outlet to CB Peak Depth=1.42' Max Vel=2.1 fps Inflow=12.54 cfs 1.867 af
n=0.050 L=260.0' S=0.0115 '/' Capacity=2.88 cfs Outflow=12.48 cfs 1.867 af

Pond 1P: ex CB to POI #2 Peak Elev=304.48' Inflow=12.87 cfs 2.154 af
18.0" x 60.0' Culvert Outflow=12.87 cfs 2.154 af

Pond 2P: ex CB Peak Elev=312.16' Inflow=12.48 cfs 1.867 af
18.0" x 135.0' Culvert Outflow=12.48 cfs 1.867 af

Pond WP: ex pond Peak Elev=310.39' Storage=49,604 cf Inflow=16.10 cfs 1.884 af
Outflow=12.54 cfs 1.867 af

Total Runoff Area = 7.918 ac Runoff Volume = 2.171 af Average Runoff Depth = 3.29"

Subcatchment X: back of store

Runoff = 6.34 cfs @ 11.98 hrs, Volume= 0.326 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
6,377	98	Paved parking & roofs
21,750	89	Gravel roads, HSG C
7,299	89	Gravel roads, HSG C (PLANTS)
10,000	74	>75% Grass cover, Good, HSG C
45,426	87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0200	1.0		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
6.6	50	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
7.4	100	Total			

Subcatchment Y: parking lot

Runoff = 6.26 cfs @ 11.92 hrs, Volume= 0.287 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
26,613	98	Paved parking & roofs
7,500	74	>75% Grass cover, Good, HSG C
34,113	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	100	0.0167	1.1		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
0.3	50	0.0200	2.9		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	30	0.0600	3.7		**Shallow Concentrated Flow, flow to cb** Grassed Waterway Kv= 15.0 fps
1.9	180	Total			

Subcatchment Z: pond and field

Runoff = 15.25 cfs @ 12.28 hrs, Volume= 1.558 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
14,500	89	Gravel roads, HSG C
115,000	82	Row crops, SR + CR, Good, HSG C
67,935	79	50-75% Grass cover, Fair, HSG C
67,935	76	Woods/grass comb., Fair, HSG C
265,370	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.7	150	0.0070	0.2		**Sheet Flow, flow from cornfields** Cultivated: Residue<=20% n= 0.060 P2= 2.30"
21.3	350	0.0030	0.3		**Shallow Concentrated Flow, flow to pond** Woodland Kv= 5.0 fps
33.0	500	Total			

Reach r3: pond outlet to CB

Inflow Area = 7.135 ac, Inflow Depth > 3.14" for Q-100 event
Inflow = 12.54 cfs @ 12.46 hrs, Volume= 1.867 af
Outflow = 12.48 cfs @ 12.49 hrs, Volume= 1.867 af, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.1 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 5.3 min

Peak Depth= 1.42' @ 12.49 hrs
Capacity at bank full= 2.88 cfs
Inlet Invert= 310.00', Outlet Invert= 307.00'
2.50' x 0.50' deep channel, n= 0.050 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 4.50'
Length= 260.0' Slope= 0.0115 '/'

Pond 1P: ex CB to POI #2

Inflow Area = 7.918 ac, Inflow Depth > 3.26" for Q-100 event
Inflow = 12.87 cfs @ 12.48 hrs, Volume= 2.154 af
Outflow = 12.87 cfs @ 12.48 hrs, Volume= 2.154 af, Atten= 0%, Lag= 0.0 min
Primary = 12.87 cfs @ 12.48 hrs, Volume= 2.154 af

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Peak Elev= 304.48' @ 12.48 hrs
Flood Elev= 307.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (881.6 - 881.6)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.00'	**18.0" x 60.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 296.60' S= 0.0400 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=12.87 cfs @ 12.48 hrs HW=304.48' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.87 cfs @ 7.3 fps)

Pond 2P: ex CB

Inflow Area = 7.135 ac, Inflow Depth > 3.14" for Q-100 event
Inflow = 12.48 cfs @ 12.49 hrs, Volume= 1.867 af
Outflow = 12.48 cfs @ 12.49 hrs, Volume= 1.867 af, Atten= 0%, Lag= 0.0 min
Primary = 12.48 cfs @ 12.49 hrs, Volume= 1.867 af

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Peak Elev= 312.16' @ 12.49 hrs
Plug-Flow detention time= 0.0 min calculated for 1.867 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (898.7 - 898.7)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.35'	**18.0" x 135.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 299.00' S= 0.0100 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=12.48 cfs @ 12.49 hrs HW=312.15' (Free Discharge)
└**1=Culvert** (Barrel Controls 12.48 cfs @ 7.1 fps)

Pond WP: ex pond

Inflow Area = 7.135 ac, Inflow Depth = 3.17" for Q-100 event
Inflow = 16.10 cfs @ 12.27 hrs, Volume= 1.884 af
Outflow = 12.54 cfs @ 12.46 hrs, Volume= 1.867 af, Atten= 22%, Lag= 10.9 min
Primary = 12.54 cfs @ 12.46 hrs, Volume= 1.867 af

Routing by Stor-Ind method, Time Span= 2.00-30.00 hrs, dt= 0.02 hrs
Starting Elev= 309.00' Surf.Area= 12,211 sf Storage= 30,661 cf
Peak Elev= 310.39' @ 12.46 hrs Surf.Area= 19,608 sf Storage= 49,604 cf (18,943 cf above start)
Plug-Flow detention time= 267.3 min calculated for 1.164 af (62% of inflow)
Center-of-Mass det. time= 61.5 min (895.9 - 834.4)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	64,766 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

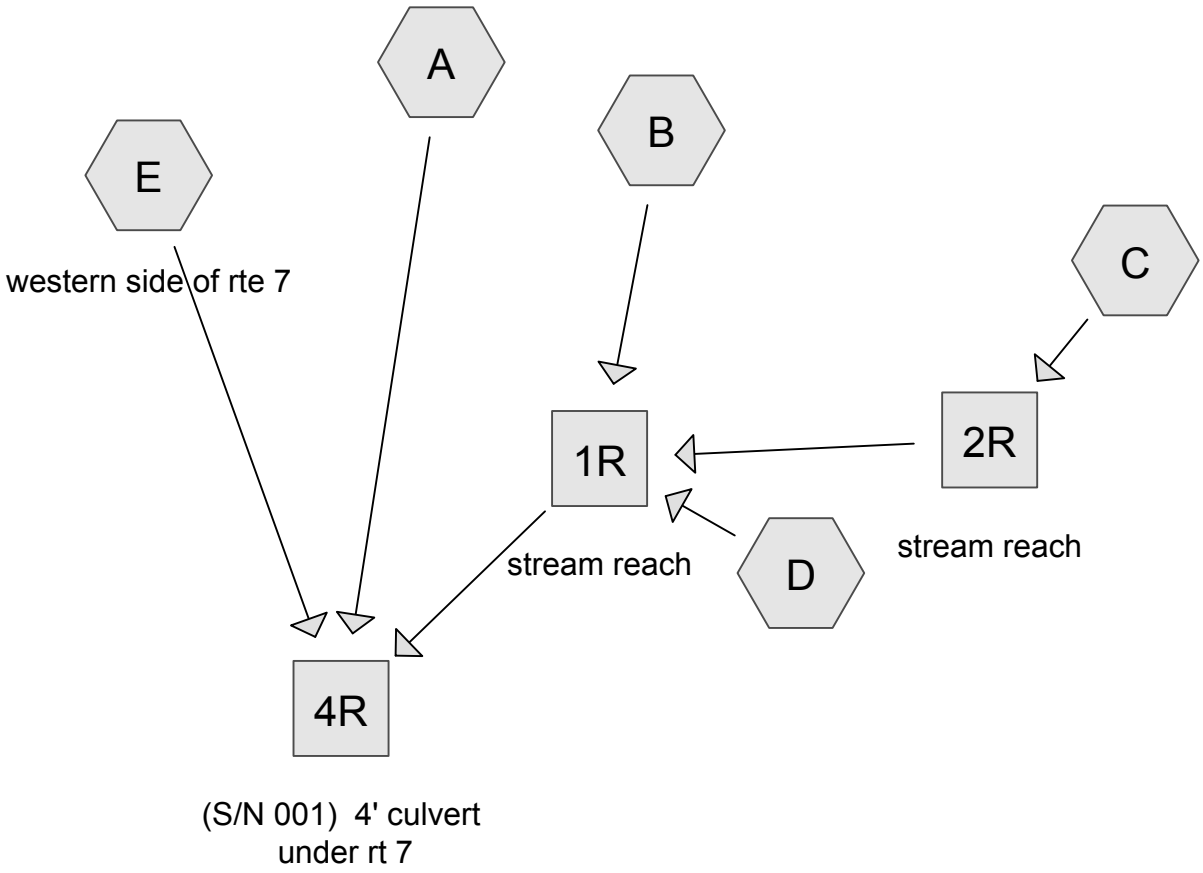
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	5,000	0	0
307.00	10,633	7,817	7,817
310.00	13,000	35,450	43,266
311.00	30,000	21,500	64,766

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**1.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00

Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

#2	Primary	309.50'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=12.53 cfs @ 12.46 hrs HW=310.39' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 5.22 cfs @ 3.8 fps)
2=Broad-Crested Rectangular Weir (Weir Controls 7.31 cfs @ 2.7 fps)



Subcat Reach Pond Link

Drainage Diagram for severance existing SN 001
Prepared by Civil Engineering Associates 1/9/2007

Time span=2.00-36.00 hrs, dt=0.03 hrs, 1134 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment A: Runoff Area=660,956 sf Runoff Depth=0.37"
Flow Length=1,690' Tc=25.1 min CN=59 Runoff=3.11 cfs 0.473 af

Subcatchment B: Runoff Area=771,059 sf Runoff Depth=0.41"
Flow Length=1,630' Tc=28.6 min CN=60 Runoff=3.87 cfs 0.602 af

Subcatchment C: Runoff Area=1,862,400 sf Runoff Depth=0.25"
Flow Length=990' Tc=12.8 min CN=55 Runoff=5.98 cfs 0.894 af

Subcatchment D: Runoff Area=239,147 sf Runoff Depth=0.13"
Flow Length=385' Tc=12.2 min CN=50 Runoff=0.12 cfs 0.059 af

Subcatchment E: western side of rte 7 Runoff Area=314,587 sf Runoff Depth=0.44"
Flow Length=1,220' Tc=10.0 min CN=61 Runoff=3.63 cfs 0.267 af

Reach 1R: stream reach Peak Depth=0.63' Max Vel=3.5 fps Inflow=7.92 cfs 1.555 af
n=0.045 L=330.0' S=0.0300 '/' Capacity=17.80 cfs Outflow=7.90 cfs 1.555 af

Reach 2R: stream reach Peak Depth=0.51' Max Vel=3.2 fps Inflow=5.98 cfs 0.894 af
n=0.045 L=1,750.0' S=0.0340 '/' Capacity=6.48 cfs Outflow=4.09 cfs 0.894 af

Reach 4R: (S/N 001) 4' culvert under rt 7 Peak Depth=0.97' Max Vel=5.1 fps Inflow=12.08 cfs 2.295 af
D=48.0" n=0.030 L=175.0' S=0.0229 '/' Capacity=94.11 cfs Outflow=12.07 cfs 2.295 af

Total Runoff Area = 88.341 ac Runoff Volume = 2.295 af Average Runoff Depth = 0.31"

Subcatchment A:

Runoff = 3.11 cfs @ 12.27 hrs, Volume= 0.473 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
23,840	98	ex road
100,650	48	Brush, Good, HSG B
41,500	65	Brush, Good, HSG C
92,554	77	Woods, Good, HSG D
402,412	55	Woods, Good, HSG B
660,956	59	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	150	0.0130	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	340	0.1600	2.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.3	1,200	0.0820	6.1	16.30	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.67' Z= 3.0 '/' Top.W=6.02' n= 0.040 Earth, dense weeds
25.1	1,690	Total			

Subcatchment B:

Runoff = 3.87 cfs @ 12.31 hrs, Volume= 0.602 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
27,257	98	Paved parking & roofs
29,050	61	>75% Grass cover, Good, HSG B
563,199	55	Woods, Good, HSG B
88,550	74	>75% Grass cover, Good, HSG C
50,000	70	Woods, Good, HSG C
13,003	87	Dirt roads, HSG C (PLANT AREAS)
771,059	60	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	150	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.4	125	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	155	0.2900	2.7		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8	400	0.1000	3.7	2.44	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.33' Z= 3.0 '/' Top.W=2.98' n= 0.045 Winding stream, pools & shoals
3.3	800	0.0470	4.0	6.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.040 Winding stream, pools & shoals
28.6	1,630	Total			

Subcatchment C:

Runoff = 5.98 cfs @ 12.11 hrs, Volume= 0.894 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
27,094	98	ex road
40,990	98	ex houses and drives
218,675	70	Woods, Good, HSG C
518,495	30	Woods, Good, HSG A
43,081	39	>75% Grass cover, Good, HSG A
255,864	82	Row crops, SR + CR, Good, HSG C
758,201	55	Woods, Good, HSG B
1,862,400	55	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	100	0.0150	0.3		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.30"
2.4	160	0.0150	1.1		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.2	180	0.2670	2.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	550	0.0330	3.1	3.08	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.50' Z= 2.0 '/' Top.W=3.00' n= 0.040 Winding stream, pools & shoals
12.8	990	Total			

Subcatchment D:

Runoff = 0.12 cfs @ 12.46 hrs, Volume= 0.059 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
7,500	98	ex road
168,267	55	Woods, Good, HSG B
63,380	30	Woods, Good, HSG A
239,147	50	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	120	0.2500	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	265	0.3400	2.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.2	385	Total			

Subcatchment E: western side of rte 7

Runoff = 3.63 cfs @ 12.05 hrs, Volume= 0.267 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
23,840	98	ex pavement
290,747	58	Woods/grass comb., Good, HSG B
314,587	61	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.4000	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.9	175	0.4000	3.2		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	800	0.1000	7.6	11.96	**Trap/Vee/Rect Channel Flow, roadside ditch** Bot.W=1.00' D=0.67' Z= 2.0 '/' Top.W=3.68' n= 0.033 Earth, grassed & winding
0.7	175	0.0200	4.4	13.86	**Circular Channel (pipe), ex culvert under rd** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.030 Corrugated metal
1.0					**Direct Entry, outlet conditions**
10.0	1,220	Total			

Reach 1R: stream reach

Inflow Area = 65.946 ac, Inflow Depth = 0.28" for Q-10 event
Inflow = 7.92 cfs @ 12.28 hrs, Volume= 1.555 af
Outflow = 7.90 cfs @ 12.30 hrs, Volume= 1.555 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind method, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Max. Velocity= 3.5 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 4.9 min

Peak Depth= 0.63' @ 12.30 hrs
Capacity at bank full= 17.80 cfs
3.00' x 1.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 5.00'
Length= 330.0' Slope= 0.0300 '/'

Reach 2R: stream reach

Inflow Area = 42.755 ac, Inflow Depth = 0.25" for Q-10 event
Inflow = 5.98 cfs @ 12.11 hrs, Volume= 0.894 af
Outflow = 4.09 cfs @ 12.24 hrs, Volume= 0.894 af, Atten= 32%, Lag= 7.3 min

Routing by Stor-Ind method, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Max. Velocity= 3.2 fps, Min. Travel Time= 9.2 min
Avg. Velocity = 1.1 fps, Avg. Travel Time= 27.2 min

Peak Depth= 0.51' @ 12.24 hrs
Capacity at bank full= 6.48 cfs
2.00' x 0.67' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 3.34'
Length= 1,750.0' Slope= 0.0340 '/'

Reach 4R: (S/N 001) 4' culvert under rt 7

Inflow Area = 88.341 ac, Inflow Depth = 0.31" for Q-10 event
Inflow = 12.08 cfs @ 12.27 hrs, Volume= 2.295 af
Outflow = 12.07 cfs @ 12.28 hrs, Volume= 2.295 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind method, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Max. Velocity= 5.1 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 1.6 min

Peak Depth= 0.97' @ 12.28 hrs
Capacity at bank full= 94.11 cfs
Inlet Invert= 160.00', Outlet Invert= 156.00'
48.0" Diameter Pipe, n= 0.030 Corrugated metal
Length= 175.0' Slope= 0.0229 '/'

Time span=2.00-36.00 hrs, dt=0.03 hrs, 1134 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment A: Runoff Area=660,956 sf Runoff Depth=1.35"
Flow Length=1,690' Tc=25.1 min CN=59 Runoff=17.57 cfs 1.706 af

Subcatchment B: Runoff Area=771,059 sf Runoff Depth=1.42"
Flow Length=1,630' Tc=28.6 min CN=60 Runoff=19.97 cfs 2.094 af

Subcatchment C: Runoff Area=1,862,400 sf Runoff Depth=1.08"
Flow Length=990' Tc=12.8 min CN=55 Runoff=55.77 cfs 3.852 af

Subcatchment D: Runoff Area=239,147 sf Runoff Depth=0.78"
Flow Length=385' Tc=12.2 min CN=50 Runoff=4.52 cfs 0.355 af

Subcatchment E: western side of rte 7 Runoff Area=314,587 sf Runoff Depth=1.49"
Flow Length=1,220' Tc=10.0 min CN=61 Runoff=15.88 cfs 0.897 af

Reach 1R: stream reach Peak Depth=2.48' Max Vel=5.6 fps Inflow=64.11 cfs 6.301 af
n=0.045 L=330.0' S=0.0300 '/' Capacity=17.80 cfs Outflow=63.89 cfs 6.301 af

Reach 2R: stream reach Peak Depth=2.88' Max Vel=4.8 fps Inflow=55.77 cfs 3.852 af
n=0.045 L=1,750.0' S=0.0340 '/' Capacity=6.48 cfs Outflow=43.97 cfs 3.852 af

Reach 4R: (S/N 001) 4' culvert under rt 7 Peak Depth=3.05' Max Vel=8.5 fps Inflow=87.38 cfs 8.904 af
D=48.0" n=0.030 L=175.0' S=0.0229 '/' Capacity=94.11 cfs Outflow=87.36 cfs 8.904 af

Total Runoff Area = 88.341 ac Runoff Volume = 8.904 af Average Runoff Depth = 1.21"

Subcatchment A:

Runoff = 17.57 cfs @ 12.21 hrs, Volume= 1.706 af, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
23,840	98	ex road
100,650	48	Brush, Good, HSG B
41,500	65	Brush, Good, HSG C
92,554	77	Woods, Good, HSG D
402,412	55	Woods, Good, HSG B
660,956	59	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	150	0.0130	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	340	0.1600	2.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.3	1,200	0.0820	6.1	16.30	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.67' Z= 3.0 '/' Top.W=6.02' n= 0.040 Earth, dense weeds
25.1	1,690	Total			

Subcatchment B:

Runoff = 19.97 cfs @ 12.25 hrs, Volume= 2.094 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
27,257	98	Paved parking & roofs
29,050	61	>75% Grass cover, Good, HSG B
563,199	55	Woods, Good, HSG B
88,550	74	>75% Grass cover, Good, HSG C
50,000	70	Woods, Good, HSG C
13,003	87	Dirt roads, HSG C (PLANT AREAS)
771,059	60	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	150	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.4	125	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	155	0.2900	2.7		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8	400	0.1000	3.7	2.44	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.33' Z= 3.0 '/' Top.W=2.98' n= 0.045 Winding stream, pools & shoals
3.3	800	0.0470	4.0	6.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.040 Winding stream, pools & shoals
28.6	1,630	Total			

Subcatchment C:

Runoff = 55.77 cfs @ 12.07 hrs, Volume= 3.852 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
27,094	98	ex road
40,990	98	ex houses and drives
218,675	70	Woods, Good, HSG C
518,495	30	Woods, Good, HSG A
43,081	39	>75% Grass cover, Good, HSG A
255,864	82	Row crops, SR + CR, Good, HSG C
758,201	55	Woods, Good, HSG B
1,862,400	55	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	100	0.0150	0.3		**Sheet Flow,** Cultivated: Residue<=20% n= 0.060 P2= 2.30"
2.4	160	0.0150	1.1		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.2	180	0.2670	2.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	550	0.0330	3.1	3.08	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.50' Z= 2.0 '/' Top.W=3.00' n= 0.040 Winding stream, pools & shoals
12.8	990	Total			

Subcatchment D:

Runoff = 4.52 cfs @ 12.07 hrs, Volume= 0.355 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
7,500	98	ex road
168,267	55	Woods, Good, HSG B
63,380	30	Woods, Good, HSG A
239,147	50	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	120	0.2500	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	265	0.3400	2.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.2	385	Total			

Subcatchment E: western side of rte 7

Runoff = 15.88 cfs @ 12.03 hrs, Volume= 0.897 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
23,840	98	ex pavement
290,747	58	Woods/grass comb., Good, HSG B
314,587	61	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.4000	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.9	175	0.4000	3.2		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	800	0.1000	7.6	11.96	**Trap/Vee/Rect Channel Flow, roadside ditch** Bot.W=1.00' D=0.67' Z= 2.0 '/' Top.W=3.68' n= 0.033 Earth, grassed & winding
0.7	175	0.0200	4.4	13.86	**Circular Channel (pipe), ex culvert under rd** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.030 Corrugated metal
1.0					**Direct Entry, outlet conditions**
10.0	1,220	Total			

Reach 1R: stream reach

Inflow Area = 65.946 ac, Inflow Depth = 1.15" for Q-100 event
Inflow = 64.11 cfs @ 12.16 hrs, Volume= 6.301 af
Outflow = 63.89 cfs @ 12.17 hrs, Volume= 6.301 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Max. Velocity= 5.6 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 3.4 min

Peak Depth= 2.48' @ 12.17 hrs
Capacity at bank full= 17.80 cfs
3.00' x 1.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 5.00'
Length= 330.0' Slope= 0.0300 '/'

Reach 2R: stream reach

Inflow Area = 42.755 ac, Inflow Depth = 1.08" for Q-100 event
Inflow = 55.77 cfs @ 12.07 hrs, Volume= 3.852 af
Outflow = 43.97 cfs @ 12.14 hrs, Volume= 3.852 af, Atten= 21%, Lag= 4.5 min

Routing by Stor-Ind method, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Max. Velocity= 4.8 fps, Min. Travel Time= 6.1 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 19.0 min

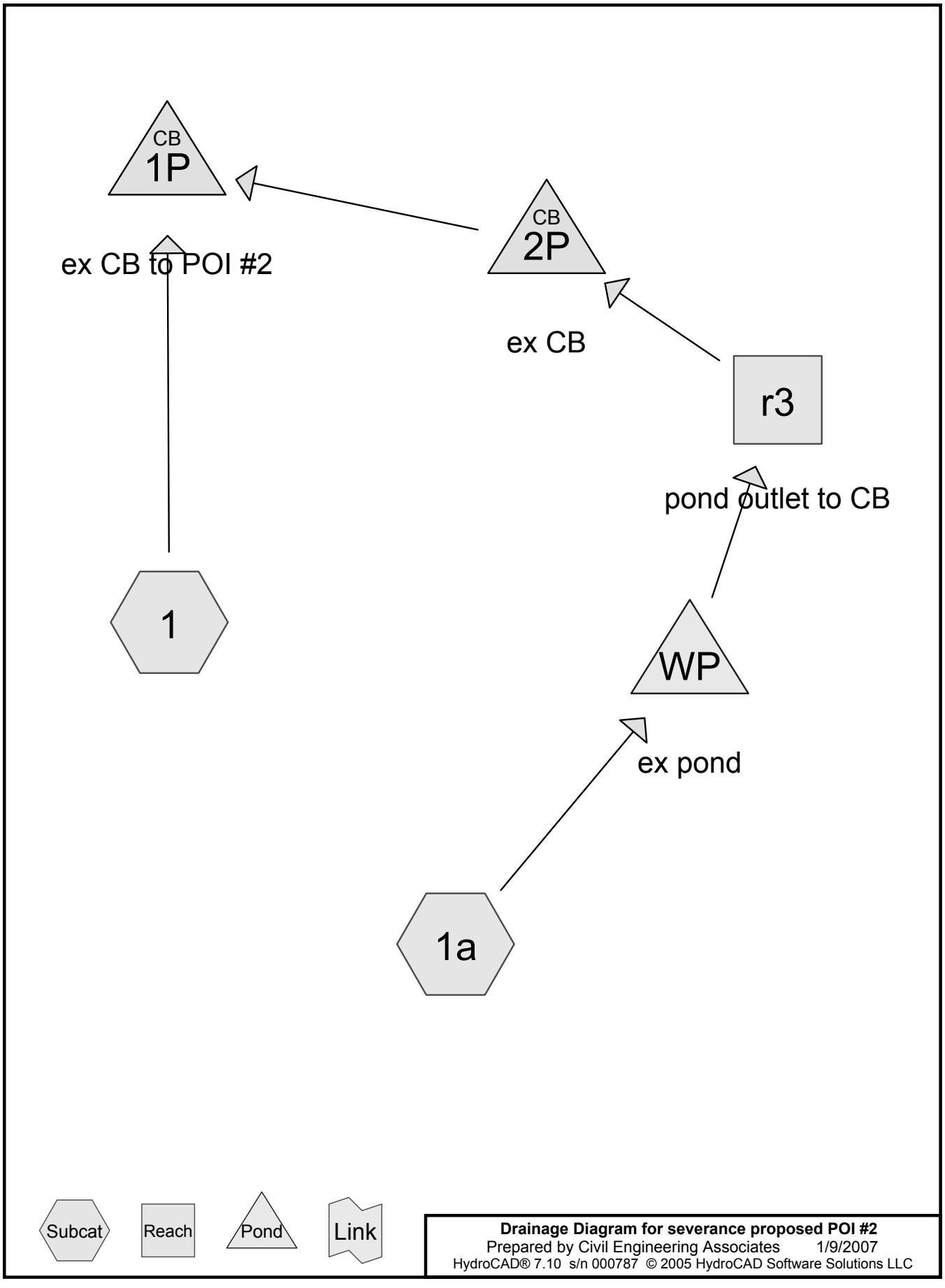
Peak Depth= 2.88' @ 12.14 hrs
Capacity at bank full= 6.48 cfs
2.00' x 0.67' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 3.34'
Length= 1,750.0' Slope= 0.0340 '/'

Reach 4R: (S/N 001) 4' culvert under rt 7

Inflow Area = 88.341 ac, Inflow Depth = 1.21" for Q-100 event
Inflow = 87.38 cfs @ 12.16 hrs, Volume= 8.904 af
Outflow = 87.36 cfs @ 12.17 hrs, Volume= 8.904 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind method, Time Span= 2.00-35.99 hrs, dt= 0.03 hrs
Max. Velocity= 8.5 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 1.2 min

Peak Depth= 3.05' @ 12.17 hrs
Capacity at bank full= 94.11 cfs
Inlet Invert= 160.00', Outlet Invert= 156.00'
48.0" Diameter Pipe, n= 0.030 Corrugated metal
Length= 175.0' Slope= 0.0229 '/'



Drainage Diagram for severance proposed POI #2
Prepared by Civil Engineering Associates 1/9/2007

Time span=2.00-36.00 hrs, dt=0.02 hrs, 1701 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=1.363 ac Runoff Depth=0.54"
Flow Length=90' Tc=18.6 min CN=78 Runoff=0.77 cfs 0.062 af

Subcatchment 1a: Runoff Area=74,210 sf Runoff Depth=0.37"
Flow Length=100' Tc=14.3 min CN=73 Runoff=0.66 cfs 0.052 af

Reach r3: pond outlet to CB Peak Depth=0.03' Max Vel=0.7 fps Inflow=0.06 cfs 0.050 af
n=0.025 L=260.0' S=0.0115 '/' Capacity=5.75 cfs Outflow=0.06 cfs 0.050 af

Pond 1P: ex CB to POI #2 Peak Elev=299.44' Inflow=0.77 cfs 0.112 af
18.0" x 60.0' Culvert Outflow=0.77 cfs 0.112 af

Pond 2P: ex CB Peak Elev=300.51' Inflow=0.06 cfs 0.050 af
18.0" x 135.0' Culvert Outflow=0.06 cfs 0.050 af

Pond WP: ex pond Peak Elev=309.07' Storage=31,563 cf Inflow=0.66 cfs 0.052 af
Outflow=0.06 cfs 0.050 af

Total Runoff Area = 3.067 ac Runoff Volume = 0.113 af Average Runoff Depth = 0.44"

Subcatchment 1:

Runoff = 0.77 cfs @ 12.13 hrs, Volume= 0.062 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.110	98	bldg roof
0.046	98	wetland path
0.088	98	sidewalks & bikepath
0.120	98	ex severance rd
0.388	65	Brush, Good, HSG C
0.115	71	Meadow, non-grazed, HSG C
0.496	74	>75% Grass cover, Good, HSG C
1.363	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	15	0.2000	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
17.6	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
18.6	90	Total			

Subcatchment 1a:

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (sf)	CN	Description
1,495	98	new sidewalk and rec path
2,500	98	bldg roof
4,760	98	wetland path
29,600	65	Brush, Good, HSG C
27,100	71	Meadow, non-grazed, HSG C
8,755	79	50-75% Grass cover, Fair, HSG C
74,210	73	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0300	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"

Reach r3: pond outlet to CB

Inflow Area = 1.704 ac, Inflow Depth > 0.36" for Q-1 event
Inflow = 0.06 cfs @ 13.96 hrs, Volume= 0.050 af
Outflow = 0.06 cfs @ 14.15 hrs, Volume= 0.050 af, Atten= 0%, Lag= 10.9 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.7 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.4 fps, Avg. Travel Time= 9.7 min

Peak Depth= 0.03' @ 14.04 hrs
Capacity at bank full= 5.75 cfs
Inlet Invert= 310.00', Outlet Invert= 307.00'
2.50' x 0.50' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 2.0 '/' Top Width= 4.50'
Length= 260.0' Slope= 0.0115 '/'

Pond 1P: ex CB to POI #2

Inflow Area = 3.067 ac, Inflow Depth > 0.44" for Q-1 event
Inflow = 0.77 cfs @ 12.13 hrs, Volume= 0.112 af
Outflow = 0.77 cfs @ 12.13 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.13 hrs, Volume= 0.112 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 299.44' @ 12.13 hrs
Flood Elev= 307.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,021.3 - 1,021.3)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.00'	**18.0" x 60.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 296.60' S= 0.0400 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=0.76 cfs @ 12.13 hrs HW=299.44' (Free Discharge)
1=Culvert (Inlet Controls 0.76 cfs @ 1.8 fps)

Pond 2P: ex CB

Inflow Area = 1.704 ac, Inflow Depth > 0.35" for Q-1 event
Inflow = 0.06 cfs @ 14.15 hrs, Volume= 0.050 af
Outflow = 0.06 cfs @ 14.15 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min
Primary = 0.06 cfs @ 14.15 hrs, Volume= 0.050 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 300.51' @ 14.15 hrs
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,188.4 - 1,188.4)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.35'	**18.0" x 135.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 299.00' S= 0.0100 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=0.06 cfs @ 14.15 hrs HW=300.51' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.06 cfs @ 0.9 fps)

Pond WP: ex pond

Inflow Area = 1.704 ac, Inflow Depth = 0.37" for Q-1 event
Inflow = 0.66 cfs @ 12.09 hrs, Volume= 0.052 af
Outflow = 0.06 cfs @ 13.96 hrs, Volume= 0.050 af, Atten= 91%, Lag= 112.4 min
Primary = 0.06 cfs @ 13.96 hrs, Volume= 0.050 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Starting Elev= 309.00' Surf.Area= 12,211 sf Storage= 30,661 cf
Peak Elev= 309.07' @ 13.96 hrs Surf.Area= 12,269 sf Storage= 31,563 cf (903 cf above start)
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 270.1 min (1,175.6 - 905.5)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	64,766 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	5,000	0	0
307.00	10,633	7,817	7,817
310.00	13,000	35,450	43,266
311.00	30,000	21,500	64,766

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**1.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	309.50'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.05 cfs @ 13.96 hrs HW=309.07' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.7 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=2.00-36.00 hrs, dt=0.02 hrs, 1701 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=1.363 ac Runoff Depth=1.27"
Flow Length=90' Tc=18.6 min CN=78 Runoff=1.97 cfs 0.145 af

Subcatchment 1a: Runoff Area=74,210 sf Runoff Depth=0.98"
Flow Length=100' Tc=14.3 min CN=73 Runoff=2.12 cfs 0.140 af

Reach r3: pond outlet to CB Peak Depth=0.08' Max Vel=1.1 fps Inflow=0.25 cfs 0.137 af
n=0.025 L=260.0' S=0.0115 '/' Capacity=5.75 cfs Outflow=0.25 cfs 0.137 af

Pond 1P: ex CB to POI #2 Peak Elev=299.74' Inflow=2.00 cfs 0.282 af
18.0" x 60.0' Culvert Outflow=2.00 cfs 0.282 af

Pond 2P: ex CB Peak Elev=300.67' Inflow=0.25 cfs 0.137 af
18.0" x 135.0' Culvert Outflow=0.25 cfs 0.137 af

Pond WP: ex pond Peak Elev=309.20' Storage=33,169 cf Inflow=2.12 cfs 0.140 af
Outflow=0.25 cfs 0.137 af

Total Runoff Area = 3.067 ac Runoff Volume = 0.284 af Average Runoff Depth = 1.11"

Subcatchment 1:

Runoff = 1.97 cfs @ 12.12 hrs, Volume= 0.145 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.110	98	bldg roof
0.046	98	wetland path
0.088	98	sidewalks & bikepath
0.120	98	ex severance rd
0.388	65	Brush, Good, HSG C
0.115	71	Meadow, non-grazed, HSG C
0.496	74	>75% Grass cover, Good, HSG C
1.363	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	15	0.2000	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
17.6	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
18.6	90	Total			

Subcatchment 1a:

Runoff = 2.12 cfs @ 12.07 hrs, Volume= 0.140 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
1,495	98	new sidewalk and rec path
2,500	98	bldg roof
4,760	98	wetland path
29,600	65	Brush, Good, HSG C
27,100	71	Meadow, non-grazed, HSG C
8,755	79	50-75% Grass cover, Fair, HSG C
74,210	73	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0300	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"

Reach r3: pond outlet to CB

Inflow Area = 1.704 ac, Inflow Depth > 0.97" for Q-10 event
Inflow = 0.25 cfs @ 12.78 hrs, Volume= 0.137 af
Outflow = 0.25 cfs @ 12.89 hrs, Volume= 0.137 af, Atten= 0%, Lag= 6.5 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.1 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.6 fps, Avg. Travel Time= 7.1 min

Peak Depth= 0.08' @ 12.83 hrs
Capacity at bank full= 5.75 cfs
Inlet Invert= 310.00', Outlet Invert= 307.00'
2.50' x 0.50' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 2.0 '/' Top Width= 4.50'
Length= 260.0' Slope= 0.0115 '/'

Pond 1P: ex CB to POI #2

Inflow Area = 3.067 ac, Inflow Depth > 1.10" for Q-10 event
Inflow = 2.00 cfs @ 12.12 hrs, Volume= 0.282 af
Outflow = 2.00 cfs @ 12.12 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min
Primary = 2.00 cfs @ 12.12 hrs, Volume= 0.282 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 299.74' @ 12.12 hrs
Flood Elev= 307.00'
Plug-Flow detention time= 0.0 min calculated for 0.282 af (100% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.00'	**18.0" x 60.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 296.60' S= 0.0400 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=2.00 cfs @ 12.12 hrs HW=299.74' (Free Discharge)
1=Culvert (Inlet Controls 2.00 cfs @ 2.3 fps)

Pond 2P: ex CB

Inflow Area = 1.704 ac, Inflow Depth > 0.97" for Q-10 event
Inflow = 0.25 cfs @ 12.89 hrs, Volume= 0.137 af
Outflow = 0.25 cfs @ 12.89 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.89 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 300.67' @ 12.89 hrs
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.35'	**18.0" x 135.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 299.00' S= 0.0100 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=0.25 cfs @ 12.89 hrs HW=300.67' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.25 cfs @ 1.4 fps)

Pond WP: ex pond

Inflow Area = 1.704 ac, Inflow Depth = 0.98" for Q-10 event
Inflow = 2.12 cfs @ 12.07 hrs, Volume= 0.140 af
Outflow = 0.25 cfs @ 12.78 hrs, Volume= 0.137 af, Atten= 88%, Lag= 42.5 min
Primary = 0.25 cfs @ 12.78 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Starting Elev= 309.00' Surf.Area= 12,211 sf Storage= 30,661 cf
Peak Elev= 309.20' @ 12.78 hrs Surf.Area= 12,372 sf Storage= 33,169 cf (2,508 cf above start)
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 200.4 min (1,070.2 - 869.8)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	64,766 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	5,000	0	0
307.00	10,633	7,817	7,817
310.00	13,000	35,450	43,266
311.00	30,000	21,500	64,766

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**1.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	309.50'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.25 cfs @ 12.78 hrs HW=309.20' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 1.2 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=2.00-36.00 hrs, dt=0.02 hrs, 1701 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Runoff Area=1.363 ac Runoff Depth=2.88"
Flow Length=90' Tc=18.6 min CN=78 Runoff=4.55 cfs 0.327 af

Subcatchment 1a: Runoff Area=74,210 sf Runoff Depth=2.44"
Flow Length=100' Tc=14.3 min CN=73 Runoff=5.50 cfs 0.346 af

Reach r3: pond outlet to CB Peak Depth=0.19' Max Vel=1.9 fps Inflow=1.04 cfs 0.343 af
n=0.025 L=260.0' S=0.0115 '/' Capacity=5.75 cfs Outflow=1.04 cfs 0.343 af

Pond 1P: ex CB to POI #2 Peak Elev=300.29' Inflow=4.95 cfs 0.670 af
18.0" x 60.0' Culvert Outflow=4.95 cfs 0.670 af

Pond 2P: ex CB Peak Elev=301.00' Inflow=1.04 cfs 0.343 af
18.0" x 135.0' Culvert Outflow=1.04 cfs 0.343 af

Pond WP: ex pond Peak Elev=309.52' Storage=37,057 cf Inflow=5.50 cfs 0.346 af
Outflow=1.04 cfs 0.343 af

Total Runoff Area = 3.067 ac Runoff Volume = 0.674 af Average Runoff Depth = 2.64"

Subcatchment 1:

Runoff = 4.55 cfs @ 12.11 hrs, Volume= 0.327 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.110	98	bldg roof
0.046	98	wetland path
0.088	98	sidewalks & bikepath
0.120	98	ex severance rd
0.388	65	Brush, Good, HSG C
0.115	71	Meadow, non-grazed, HSG C
0.496	74	>75% Grass cover, Good, HSG C
1.363	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	15	0.2000	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
17.6	75	0.0100	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"
18.6	90	Total			

Subcatchment 1a:

Runoff = 5.50 cfs @ 12.07 hrs, Volume= 0.346 af, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
1,495	98	new sidewalk and rec path
2,500	98	bldg roof
4,760	98	wetland path
29,600	65	Brush, Good, HSG C
27,100	71	Meadow, non-grazed, HSG C
8,755	79	50-75% Grass cover, Fair, HSG C
74,210	73	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0300	0.1		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.30"

Reach r3: pond outlet to CB

Inflow Area = 1.704 ac, Inflow Depth > 2.42" for Q-100 event
Inflow = 1.04 cfs @ 12.46 hrs, Volume= 0.343 af
Outflow = 1.04 cfs @ 12.52 hrs, Volume= 0.343 af, Atten= 0%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.9 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 0.8 fps, Avg. Travel Time= 5.7 min

Peak Depth= 0.19' @ 12.49 hrs
Capacity at bank full= 5.75 cfs
Inlet Invert= 310.00', Outlet Invert= 307.00'
2.50' x 0.50' deep channel, n= 0.025 Earth, clean & straight
Side Slope Z-value= 2.0 '/' Top Width= 4.50'
Length= 260.0' Slope= 0.0115 '/'

Pond 1P: ex CB to POI #2

Inflow Area = 3.067 ac, Inflow Depth > 2.62" for Q-100 event
Inflow = 4.95 cfs @ 12.13 hrs, Volume= 0.670 af
Outflow = 4.95 cfs @ 12.13 hrs, Volume= 0.670 af, Atten= 0%, Lag= 0.0 min
Primary = 4.95 cfs @ 12.13 hrs, Volume= 0.670 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 300.29' @ 12.13 hrs
Flood Elev= 307.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (916.3 - 916.3)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.00'	**18.0" x 60.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 296.60' S= 0.0400 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=4.95 cfs @ 12.13 hrs HW=300.29' (Free Discharge)
1=Culvert (Inlet Controls 4.95 cfs @ 3.1 fps)

Pond 2P: ex CB

Inflow Area = 1.704 ac, Inflow Depth > 2.41" for Q-100 event
Inflow = 1.04 cfs @ 12.52 hrs, Volume= 0.343 af
Outflow = 1.04 cfs @ 12.52 hrs, Volume= 0.343 af, Atten= 0%, Lag= 0.0 min
Primary = 1.04 cfs @ 12.52 hrs, Volume= 0.343 af

Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Peak Elev= 301.00' @ 12.52 hrs
Plug-Flow detention time= 0.0 min calculated for 0.343 af (100% of inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.35'	**18.0" x 135.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 299.00' S= 0.0100 '/' Cc= 0.900 n= 0.030 Corrugated metal

Primary OutFlow Max=1.04 cfs @ 12.52 hrs HW=301.00' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.04 cfs @ 2.1 fps)

Pond WP: ex pond

Inflow Area = 1.704 ac, Inflow Depth = 2.44" for Q-100 event
Inflow = 5.50 cfs @ 12.07 hrs, Volume= 0.346 af
Outflow = 1.04 cfs @ 12.46 hrs, Volume= 0.343 af, Atten= 81%, Lag= 23.5 min
Primary = 1.04 cfs @ 12.46 hrs, Volume= 0.343 af

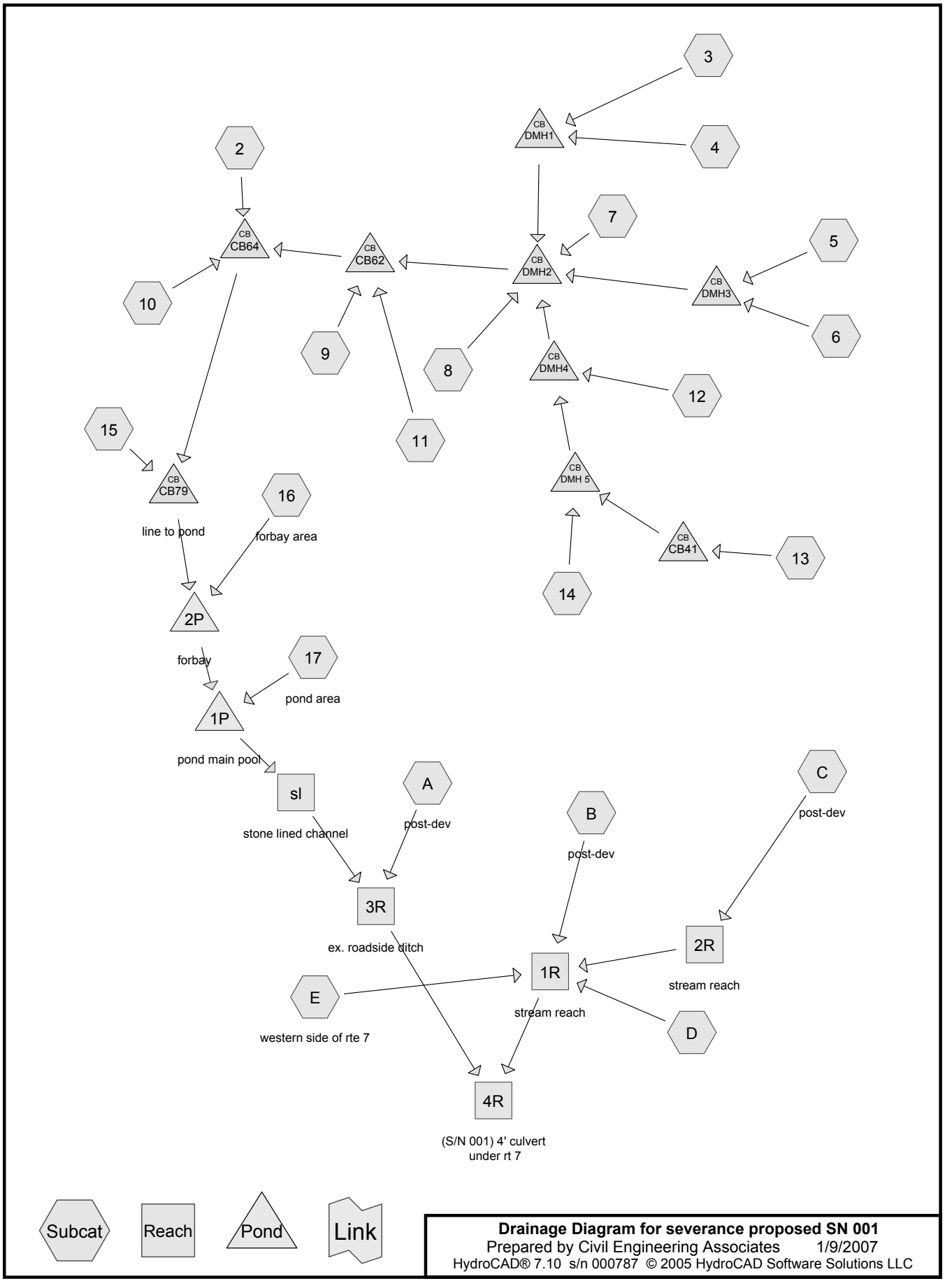
Routing by Stor-Ind method, Time Span= 2.00-36.00 hrs, dt= 0.02 hrs
Starting Elev= 309.00' Surf.Area= 12,211 sf Storage= 30,661 cf
Peak Elev= 309.52' @ 12.46 hrs Surf.Area= 12,618 sf Storage= 37,057 cf (6,396 cf above start)
Plug-Flow detention time= (not calculated: initial storage excedes outflow)
Center-of-Mass det. time= 147.1 min (989.5 - 842.5)

Volume	Invert	Avail.Storage	Storage Description
#1	306.00'	64,766 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
306.00	5,000	0	0
307.00	10,633	7,817	7,817
310.00	13,000	35,450	43,266
311.00	30,000	21,500	64,766

Device	Routing	Invert	Outlet Devices
#1	Primary	309.00'	**1.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Primary	309.50'	**3.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=1.03 cfs @ 12.46 hrs HW=309.52' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 1.01 cfs @ 2.0 fps)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.3 fps)



Drainage Diagram for severance proposed SN 001
Prepared by Civil Engineering Associates 1/9/2007

Time span=2.00-72.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 2: Runoff Area=1.522 ac Runoff Depth=1.41"
Flow Length=505' Tc=2.8 min CN=93 Runoff=4.11 cfs 0.178 af

Subcatchment 3: Runoff Area=1.276 ac Runoff Depth=0.62"
Flow Length=479' Tc=5.0 min CN=80 Runoff=1.46 cfs 0.066 af

Subcatchment 4: Runoff Area=1.661 ac Runoff Depth=1.67"
Flow Length=415' Tc=2.0 min CN=96 Runoff=5.17 cfs 0.231 af

Subcatchment 5: Runoff Area=0.638 ac Runoff Depth=1.33"
Flow Length=370' Tc=3.6 min CN=92 Runoff=1.60 cfs 0.071 af

Subcatchment 6: Runoff Area=1.007 ac Runoff Depth=1.33"
Flow Length=144' Tc=3.3 min CN=92 Runoff=2.55 cfs 0.111 af

Subcatchment 7: Runoff Area=1.715 ac Runoff Depth=1.11"
Flow Length=316' Tc=3.4 min CN=89 Runoff=3.71 cfs 0.159 af

Subcatchment 8: Runoff Area=1.250 ac Runoff Depth=1.18"
Flow Length=74' Tc=8.4 min CN=90 Runoff=2.39 cfs 0.123 af

Subcatchment 9: Runoff Area=0.664 ac Runoff Depth=1.25"
Flow Length=109' Tc=4.2 min CN=91 Runoff=1.55 cfs 0.069 af

Subcatchment 10: Runoff Area=0.916 ac Runoff Depth=1.11"
Flow Length=140' Tc=2.1 min CN=89 Runoff=2.06 cfs 0.085 af

Subcatchment 11: Runoff Area=0.649 ac Runoff Depth=1.41"
Flow Length=393' Tc=4.5 min CN=93 Runoff=1.66 cfs 0.076 af

Subcatchment 12: Runoff Area=1.738 ac Runoff Depth=1.11"
Flow Length=481' Tc=8.4 min CN=89 Runoff=3.15 cfs 0.161 af

Subcatchment 13: Runoff Area=1.810 ac Runoff Depth=1.49"
Flow Length=220' Tc=4.7 min CN=94 Runoff=4.80 cfs 0.225 af

Subcatchment 14: Runoff Area=0.943 ac Runoff Depth=1.41"
Flow Length=510' Tc=6.7 min CN=93 Runoff=2.23 cfs 0.111 af

Subcatchment 15: Runoff Area=1.339 ac Runoff Depth=1.33"
Flow Length=350' Tc=2.2 min CN=92 Runoff=3.50 cfs 0.148 af

Subcatchment 16: forbay area Runoff Area=1.586 ac Runoff Depth=0.21"
Flow Length=100' Tc=4.3 min CN=67 Runoff=0.40 cfs 0.027 af

Subcatchment 17: pond area Runoff Area=2.458 ac Runoff Depth=0.16"
Flow Length=77' Tc=3.1 min CN=65 Runoff=0.42 cfs 0.033 af

Subcatchment A: post-dev Runoff Area=447,647 sf Runoff Depth=0.05"
Flow Length=1,230' Tc=23.2 min CN=58 Runoff=0.06 cfs 0.046 af

Subcatchment B: post-dev Runoff Area=641,086 sf Runoff Depth=0.02"
Flow Length=1,580' Tc=22.7 min CN=55 Runoff=0.04 cfs 0.030 af

Subcatchment C: post-dev Runoff Area=1,527,401 sf Runoff Depth=0.00"
Flow Length=990' Tc=20.9 min CN=49 Runoff=0.00 cfs 0.000 af

Subcatchment D: Runoff Area=239,147 sf Runoff Depth=0.00"
Flow Length=385' Tc=12.2 min CN=50 Runoff=0.00 cfs 0.000 af

Subcatchment E: western side of rte 7 Runoff Area=314,587 sf Runoff Depth=0.09"
Flow Length=1,220' Tc=10.0 min CN=61 Runoff=0.13 cfs 0.056 af

Reach 1R: stream reach Peak Depth=0.05' Max Vel=0.8 fps Inflow=0.13 cfs 0.087 af
n=0.045 L=330.0' S=0.0300 '/' Capacity=17.80 cfs Outflow=0.13 cfs 0.087 af

Reach 2R: stream reach Peak Depth=0.00' Max Vel=0.2 fps Inflow=0.00 cfs 0.000 af
n=0.045 L=1,750.0' S=0.0340 '/' Capacity=6.48 cfs Outflow=0.00 cfs 0.000 af

Reach 3R: ex. roadside ditch Peak Depth=0.13' Max Vel=3.2 fps Inflow=0.93 cfs 1.915 af
n=0.030 L=470.0' S=0.0745 '/' Capacity=91.77 cfs Outflow=0.93 cfs 1.915 af

Reach 4R: (S/N 001) 4' culvert under rt 7 Peak Depth=0.29' Max Vel=2.5 fps Inflow=1.03 cfs 2.003 af
D=48.0" n=0.030 L=175.0' S=0.0229 '/' Capacity=94.11 cfs Outflow=1.03 cfs 2.003 af

Reach sl: stone lined channel Peak Depth=0.09' Max Vel=2.4 fps Inflow=0.87 cfs 1.869 af
n=0.040 L=365.0' S=0.1205 '/' Capacity=133.67 cfs Outflow=0.87 cfs 1.869 af

Pond 1P: pond main pool Peak Elev=247.82' Storage=88,063 cf Inflow=22.63 cfs 1.875 af
Primary=0.87 cfs 1.869 af Secondary=0.00 cfs 0.000 af Outflow=0.87 cfs 1.869 af

Pond 2P: forbay Peak Elev=266.18' Storage=17,898 cf Inflow=38.18 cfs 1.841 af
Primary=22.33 cfs 1.841 af Secondary=0.00 cfs 0.000 af Outflow=22.33 cfs 1.841 af

Pond CB41: Peak Elev=305.81' Inflow=4.80 cfs 0.225 af
18.0" x 270.0' Culvert Outflow=4.80 cfs 0.225 af

Pond CB62: Peak Elev=300.73' Inflow=28.57 cfs 1.403 af
36.0" x 260.0' Culvert Outflow=28.57 cfs 1.403 af

Pond CB64: Peak Elev=299.41' Inflow=34.54 cfs 1.666 af
42.0" x 360.0' Culvert Outflow=34.54 cfs 1.666 af

Pond CB79: line to pond Peak Elev=297.03' Inflow=37.90 cfs 1.814 af
42.0" x 115.0' Culvert Outflow=37.90 cfs 1.814 af

Pond DMH 5: Peak Elev=303.29' Inflow=6.96 cfs 0.335 af
20.0" x 142.0' Culvert Outflow=6.96 cfs 0.335 af

Pond DMH1: Peak Elev=306.97' Inflow=6.36 cfs 0.298 af
20.0" x 251.0' Culvert Outflow=6.36 cfs 0.298 af

Pond DMH2: Peak Elev=302.22' Inflow=25.37 cfs 1.258 af
36.0" x 432.0' Culvert Outflow=25.37 cfs 1.258 af

Pond DMH3: Peak Elev=303.10' Inflow=4.15 cfs 0.182 af
18.0" x 425.0' Culvert Outflow=4.15 cfs 0.182 af

Pond DMH4: Peak Elev=302.82' Inflow=9.86 cfs 0.496 af
24.0" x 210.0' Culvert Outflow=9.86 cfs 0.496 af

Total Runoff Area = 93.942 ac Runoff Volume = 2.008 af Average Runoff Depth = 0.26"

Subcatchment 2:

Runoff = 4.11 cfs @ 11.93 hrs, Volume= 0.178 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
1.186	98	Paved parking & roofs
0.336	74	>75% Grass cover, Good, HSG C
1.522	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	75	0.0160	1.0		**Sheet Flow, flow off parking lot** Smooth surfaces n= 0.011 P2= 2.30"
1.2	300	0.0060	4.1	5.00	**Circular Channel (pipe), flow to CB** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	130	0.0070	5.3	11.64	**Circular Channel (pipe), flow to CB 65** Diam= 20.0" Area= 2.2 sf Perim= 5.2' r= 0.42' n= 0.013 Corrugated PE, smooth interior
2.8	505	Total			

Subcatchment 3:

Runoff = 1.46 cfs @ 11.97 hrs, Volume= 0.066 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.650	98	Paved parking & roofs
0.626	61	>75% Grass cover, Good, HSG B
1.276	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	35	0.0600	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
1.3	300	0.0074	3.9	3.06	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	144	0.0080	4.7	5.78	**Circular Channel (pipe), line to DMH 1** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
5.0	479	Total			

Subcatchment 4:

Runoff = 5.17 cfs @ 11.92 hrs, Volume= 0.231 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
1.523	98	Paved parking & roofs
0.138	74	>75% Grass cover, Good, HSG C
1.661	96	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0300	1.2		**Sheet Flow, flow off parking lot** Smooth surfaces n= 0.011 P2= 2.30"
1.3	365	0.0085	4.9	5.96	**Circular Channel (pipe), flow to DMH 1** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.0	415	Total			

Subcatchment 5:

Runoff = 1.60 cfs @ 11.94 hrs, Volume= 0.071 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.469	98	Paved parking & roofs
0.169	74	>75% Grass cover, Good, HSG C
0.638	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.1000	0.2		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
0.8	140	0.0210	2.9		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
0.5	200	0.0180	7.1	8.67	**Circular Channel (pipe), flow in storm line** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
3.6	370	Total			

Subcatchment 6:

Runoff = 2.55 cfs @ 11.94 hrs, Volume= 0.111 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.745	98	Paved parking & roofs
0.262	74	>75% Grass cover, Good, HSG C
1.007	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	30	0.0670	0.2		**Sheet Flow, flow off grass** Grass: Short n= 0.150 P2= 2.30"
0.1	20	0.0120	2.2		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
0.5	94	0.0040	3.3	4.09	**Circular Channel (pipe), flow in storm line** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
3.3	144	Total			

Subcatchment 7:

Runoff = 3.71 cfs @ 11.94 hrs, Volume= 0.159 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
1.045	98	Paved parking & roofs
0.670	74	>75% Grass cover, Good, HSG C
1.715	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	25	0.0600	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
0.6	115	0.0050	3.2	2.52	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.1	110	0.0850	13.2	10.39	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.2	66	0.0060	4.9	10.78	**Circular Channel (pipe), line to DMH 2** Diam= 20.0" Area= 2.2 sf Perim= 5.2' r= 0.42' n= 0.013 Corrugated PE, smooth interior
3.4	316	Total			

Subcatchment 8:

Runoff = 2.39 cfs @ 12.00 hrs, Volume= 0.123 af, Depth= 1.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.822	98	Paved parking & roofs
0.428	74	>75% Grass cover, Good, HSG C
1.250	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	60	0.0310	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.2	8	0.0200	0.7		**Sheet Flow, flow across sidewalk** Smooth surfaces n= 0.011 P2= 2.30"
1.8	6	0.0200	0.1		**Sheet Flow, flow to street CB 52** Grass: Dense n= 0.240 P2= 2.30"
8.4	74	Total			

Subcatchment 9:

Runoff = 1.55 cfs @ 11.95 hrs, Volume= 0.069 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.482	98	Paved parking & roofs
0.182	74	>75% Grass cover, Good, HSG C
0.664	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	18	0.0500	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.2	8	0.0300	0.8		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.5	8	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.5	75	0.0180	2.7		**Shallow Concentrated Flow, flow along curb to CB 62** Paved Kv= 20.3 fps
4.2	109	Total			

Subcatchment 10:

Runoff = 2.06 cfs @ 11.93 hrs, Volume= 0.085 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.564	98	Paved parking & roofs
0.352	74	>75% Grass cover, Good, HSG C
0.916	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	18	0.2000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.8	90	0.0160	1.9		**Shallow Concentrated Flow, roadside swale** Grassed Waterway Kv= 15.0 fps
0.1	32	0.0150	6.4	7.91	**Circular Channel (pipe), flow to CB 76** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.1	140	Total			

Subcatchment 11:

Runoff = 1.66 cfs @ 11.95 hrs, Volume= 0.076 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.510	98	Paved parking & roofs
0.139	74	>75% Grass cover, Good, HSG C
0.649	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	25	0.0400	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.1	65	0.0180	1.0		**Sheet Flow, flow across lot** Smooth surfaces n= 0.011 P2= 2.30"
0.3	195	0.0380	10.3	12.59	**Circular Channel (pipe), flow in line to DMH 6** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	108	0.0190	8.2	14.48	**Circular Channel (pipe), line to CB 62** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
4.5	393	Total			

Subcatchment 12:

Runoff = 3.15 cfs @ 12.00 hrs, Volume= 0.161 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
1.061	98	Paved parking & roofs
0.677	74	>75% Grass cover, Good, HSG C
1.738	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	75	0.0400	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
0.2	36	0.0060	3.5	2.76	**Circular Channel (pipe), flow in YD line** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.2	370	0.0090	5.0	6.13	**Circular Channel (pipe), flow to DMH 4** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.4	481	Total			

Subcatchment 13:

Runoff = 4.80 cfs @ 11.96 hrs, Volume= 0.225 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
1.546	98	Paved parking & roofs
0.264	74	>75% Grass cover, Good, HSG C
1.810	94	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	30	0.0330	0.1		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
1.1	190	0.0200	2.9		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
4.7	220	Total			

Subcatchment 14:

Runoff = 2.23 cfs @ 11.98 hrs, Volume= 0.111 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.765	98	Paved parking & roofs
0.178	74	>75% Grass cover, Good, HSG C
0.943	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	35	0.0290	0.1		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
0.4	80	0.0250	3.2		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
2.0	395	0.0040	3.3	4.09	**Circular Channel (pipe), flow in pipe to DMH 5** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
6.7	510	Total			

Subcatchment 15:

Runoff = 3.50 cfs @ 11.93 hrs, Volume= 0.148 af, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
1.011	98	Paved parking & roofs
0.328	74	>75% Grass cover, Good, HSG C
1.339	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	90	0.0200	1.1		**Sheet Flow, flow across parking lot** Smooth surfaces n= 0.011 P2= 2.30"
0.8	150	0.0220	3.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	110	0.0800	14.9	18.27	**Circular Channel (pipe), line to CB 79** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.2	350	Total			

Subcatchment 16: forbay area

Runoff = 0.40 cfs @ 11.99 hrs, Volume= 0.027 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.094	98	Paved parking & roofs
0.103	85	Gravel roads, HSG B
0.386	78	Meadow, non-grazed, HSG D
1.003	58	Meadow, non-grazed, HSG B
1.586	67	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.2360	0.4		**Sheet Flow, flow from pond bank** Grass: Short n= 0.150 P2= 2.30"

Subcatchment 17: pond area

Runoff = 0.42 cfs @ 11.98 hrs, Volume= 0.033 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (ac)	CN	Description
0.562	55	Woods, Good, HSG B
0.298	58	Meadow, non-grazed, HSG B
0.289	98	pond water surface
1.199	61	>75% Grass cover, Good, HSG B
0.110	89	Gravel roads, HSG C
2.458	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.3300	0.4		**Sheet Flow, flow on pond bank** Grass: Short n= 0.150 P2= 2.30"

Subcatchment A: post-dev

Runoff = 0.06 cfs @ 13.64 hrs, Volume= 0.046 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (sf)	CN	Description
23,840	98	ex road
27,667	48	Brush, Good, HSG B
29,865	77	Woods, Good, HSG D
366,275	55	Woods, Good, HSG B
447,647	58	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	150	0.0130	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	340	0.1600	2.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	740	0.1000	8.9	24.00	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.67' Z= 3.0 '/' Top.W=6.02' n= 0.030 Earth, grassed & winding
23.2	1,230	Total			

Subcatchment B: post-dev

Runoff = 0.04 cfs @ 17.98 hrs, Volume= 0.030 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (sf)	CN	Description
641,086	55	Woods, Good, HSG B

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	100	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.4	125	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	155	0.2900	2.7		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8	400	0.1000	3.7	2.44	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.33' Z= 3.0 '/' Top.W=2.98' n= 0.045 Winding stream, pools & shoals
3.3	800	0.0470	4.0	6.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.040 Winding stream, pools & shoals
22.7	1,580	Total			

Subcatchment C: post-dev

Runoff = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (sf)	CN	Description
22,400	98	ex road and bikepath
40,990	98	ex houses and drives
165,352	70	Woods, Good, HSG C
517,000	30	Woods, Good, HSG A
43,081	39	>75% Grass cover, Good, HSG A
738,578	55	Woods, Good, HSG B
1,527,401	49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0150	0.1		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.30"
2.4	160	0.0150	1.1		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.2	180	0.2670	2.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	550	0.0330	3.1	3.08	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.50' Z= 2.0 '/' Top.W=3.00' n= 0.040 Winding stream, pools & shoals
20.9	990	Total			

Subcatchment D:

Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (sf)	CN	Description
7,500	98	ex road
168,267	55	Woods, Good, HSG B
63,380	30	Woods, Good, HSG A
239,147	50	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	120	0.2500	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	265	0.3400	2.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.2	385	Total			

Subcatchment E: western side of rte 7

Runoff = 0.13 cfs @ 12.37 hrs, Volume= 0.056 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-1 Rainfall=2.10"

Area (sf)	CN	Description
23,840	98	ex pavement
290,747	58	Woods/grass comb., Good, HSG B
314,587	61	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.4000	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.9	175	0.4000	3.2		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	800	0.1000	7.6	11.96	**Trap/Vee/Rect Channel Flow, roadside ditch** Bot.W=1.00' D=0.67' Z= 2.0 '/' Top.W=3.68' n= 0.033 Earth, grassed & winding
0.7	175	0.0200	4.4	13.86	**Circular Channel (pipe), ex culvert under rd** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.030 Corrugated metal
1.0					**Direct Entry, outlet conditions**
10.0	1,220	Total			

Reach 1R: stream reach

Inflow Area = 62.494 ac, Inflow Depth = 0.02" for Q-1 event
Inflow = 0.13 cfs @ 12.37 hrs, Volume= 0.087 af
Outflow = 0.13 cfs @ 12.45 hrs, Volume= 0.087 af, Atten= 2%, Lag= 4.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.8 fps, Min. Travel Time= 6.9 min
Avg. Velocity = 0.5 fps, Avg. Travel Time= 10.4 min

Peak Depth= 0.05' @ 12.45 hrs
Capacity at bank full= 17.80 cfs
3.00' x 1.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 5.00'
Length= 330.0' Slope= 0.0300 '/'

Reach 2R: stream reach

Inflow Area = 35.064 ac, Inflow Depth = 0.00" for Q-1 event
Inflow = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.45 hrs, Volume= 0.000 af, Atten= 80%, Lag= 19.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.2 fps, Min. Travel Time= 135.3 min
Avg. Velocity = 0.2 fps, Avg. Travel Time= 135.3 min

Peak Depth= 0.00' @ 24.45 hrs
Capacity at bank full= 6.48 cfs
2.00' x 0.67' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 3.34'
Length= 1,750.0' Slope= 0.0340 '/'

Reach 3R: ex. roadside ditch

Inflow Area = 31.449 ac, Inflow Depth > 0.73" for Q-1 event
Inflow = 0.93 cfs @ 15.24 hrs, Volume= 1.915 af
Outflow = 0.93 cfs @ 15.25 hrs, Volume= 1.915 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 3.2 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 4.2 min

Peak Depth= 0.13' @ 15.25 hrs
Capacity at bank full= 91.77 cfs
Inlet Invert= 200.00', Outlet Invert= 165.00'
2.00' x 1.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 470.0' Slope= 0.0745 '/'

Reach 4R: (S/N 001) 4' culvert under rt 7

Inflow Area = 93.942 ac, Inflow Depth > 0.26" for Q-1 event
Inflow = 1.03 cfs @ 15.24 hrs, Volume= 2.003 af
Outflow = 1.03 cfs @ 15.24 hrs, Volume= 2.003 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.5 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 1.9 min

Peak Depth= 0.29' @ 15.24 hrs
Capacity at bank full= 94.11 cfs
Inlet Invert= 160.00', Outlet Invert= 156.00'
48.0" Diameter Pipe, n= 0.030 Corrugated metal
Length= 175.0' Slope= 0.0229 '/'

Reach sl: stone lined channel

Inflow Area = 21.172 ac, Inflow Depth > 1.06" for Q-1 event
Inflow = 0.87 cfs @ 15.66 hrs, Volume= 1.869 af
Outflow = 0.87 cfs @ 15.69 hrs, Volume= 1.869 af, Atten= 0%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.4 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 1.5 fps, Avg. Travel Time= 4.0 min

Peak Depth= 0.09' @ 15.69 hrs
Capacity at bank full= 133.67 cfs
Inlet Invert= 234.00', Outlet Invert= 190.00'
4.00' x 1.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 365.0' Slope= 0.1205 '/'

Pond 1P: pond main pool

Inflow Area = 21.172 ac, Inflow Depth = 1.06" for Q-1 event
Inflow = 22.63 cfs @ 12.01 hrs, Volume= 1.875 af
Outflow = 0.87 cfs @ 15.66 hrs, Volume= 1.869 af, Atten= 96%, Lag= 219.1 min
Primary = 0.87 cfs @ 15.66 hrs, Volume= 1.869 af
Secondary = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Starting Elev= 245.00' Surf.Area= 12,637 sf Storage= 36,029 cf
Peak Elev= 247.82' @ 15.66 hrs Surf.Area= 21,211 sf Storage= 88,063 cf (52,034 cf above start)
Plug-Flow detention time= 1,279.9 min calculated for 1.042 af (56% of inflow)
Center-of-Mass det. time= 738.6 min (1,559.0 - 820.4)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	526,586 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
240.00	4,312	0	0
242.00	6,232	10,544	10,544
244.00	8,623	14,855	25,399
245.00	12,637	10,630	36,029
245.50	17,255	7,473	43,502
246.00	18,082	8,834	52,336
248.00	21,523	39,605	91,941
250.00	25,190	46,713	138,654
262.00	29,084	325,644	464,298
264.00	33,204	62,288	526,586

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**24.0" x 100.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 242.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	241.00'	**5.0" x 30.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 243.00' S= -0.0667 '/' Cc= 0.900 n= 0.010 PVC, smooth interior
#3	Device 1	248.80'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Secondary	253.00'	**3.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.87 cfs @ 15.66 hrs HW=247.82' TW=234.09' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.87 cfs of 20.40 cfs potential flow)
  └─**2=Culvert** (Inlet Controls 0.87 cfs @ 6.4 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 2.00 hrs HW=245.00' TW=234.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: forbay

Inflow Area = 18.714 ac, Inflow Depth = 1.18" for Q-1 event
Inflow = 38.18 cfs @ 11.94 hrs, Volume= 1.841 af
Outflow = 22.33 cfs @ 12.02 hrs, Volume= 1.841 af, Atten= 42%, Lag= 4.7 min
Primary = 22.33 cfs @ 12.02 hrs, Volume= 1.841 af
Secondary = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Starting Elev= 264.00' Surf.Area= 2,724 sf Storage= 6,078 cf
Peak Elev= 266.18' @ 12.02 hrs Surf.Area= 6,668 sf Storage= 17,898 cf (11,820 cf above start)
Plug-Flow detention time= 65.7 min calculated for 1.701 af (92% of inflow)
Center-of-Mass det. time= 6.8 min (818.0 - 811.2)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	75,303 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
260.00	592	0	0
262.00	1,381	1,973	1,973
264.00	2,724	4,105	6,078
264.50	5,101	1,956	8,034
266.00	6,486	8,690	16,725
268.00	8,531	15,017	31,742
270.00	10,837	19,368	51,110
272.00	13,356	24,193	75,303

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" x 105.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 255.00' S= 0.0476 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	264.00'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#3	Secondary	270.50'	**4.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=22.32 cfs @ 12.02 hrs HW=266.18' TW=246.43' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 22.32 cfs of 34.42 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 22.32 cfs @ 7.1 fps)

Secondary OutFlow Max=0.00 cfs @ 2.00 hrs HW=264.00' TW=245.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond CB41:

Inflow Area = 1.810 ac, Inflow Depth = 1.49" for Q-1 event
Inflow = 4.80 cfs @ 11.96 hrs, Volume= 0.225 af
Outflow = 4.80 cfs @ 11.96 hrs, Volume= 0.225 af, Atten= 0%, Lag= 0.0 min
Primary = 4.80 cfs @ 11.96 hrs, Volume= 0.225 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 305.81' @ 11.96 hrs
Flood Elev= 309.90'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (797.5 - 797.5)

Device	Routing	Invert	Outlet Devices
#1	Primary	304.73'	**18.0" x 270.0' long line to DMH 5** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 301.90' S= 0.0105 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=4.76 cfs @ 11.96 hrs HW=305.80' TW=303.14' (Dynamic Tailwater)
↑—**1=line to DMH 5** (Inlet Controls 4.76 cfs @ 3.5 fps)

Pond CB62:

Inflow Area = 13.351 ac, Inflow Depth = 1.26" for Q-1 event
Inflow = 28.57 cfs @ 11.95 hrs, Volume= 1.403 af
Outflow = 28.57 cfs @ 11.95 hrs, Volume= 1.403 af, Atten= 0%, Lag= 0.0 min
Primary = 28.57 cfs @ 11.95 hrs, Volume= 1.403 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 300.73' @ 11.95 hrs
Flood Elev= 309.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	297.90'	**36.0" x 260.0' long line to CB 64** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 296.87' S= 0.0040 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=27.97 cfs @ 11.95 hrs HW=300.70' TW=299.40' (Dynamic Tailwater)
↑—**1=line to CB 64** (Outlet Controls 27.97 cfs @ 5.3 fps)

Pond CB64:

Inflow Area = 15.789 ac, Inflow Depth = 1.27" for Q-1 event
Inflow = 34.54 cfs @ 11.94 hrs, Volume= 1.666 af
Outflow = 34.54 cfs @ 11.94 hrs, Volume= 1.666 af, Atten= 0%, Lag= 0.0 min
Primary = 34.54 cfs @ 11.94 hrs, Volume= 1.666 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 299.41' @ 11.94 hrs
Flood Elev= 309.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	296.82'	**42.0" x 360.0' long storm line to CB 78**

CPP, square edge headwall, Ke= 0.500
Outlet Invert= 295.35' S= 0.0041 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=34.34 cfs @ 11.94 hrs HW=299.41' TW=297.02' (Dynamic Tailwater)
1=storm line to CB 78 (Barrel Controls 34.34 cfs @ 6.3 fps)

Pond CB79: line to pond

Inflow Area = 17.128 ac, Inflow Depth = 1.27" for Q-1 event
Inflow = 37.90 cfs @ 11.94 hrs, Volume= 1.814 af
Outflow = 37.90 cfs @ 11.94 hrs, Volume= 1.814 af, Atten= 0%, Lag= 0.0 min
Primary = 37.90 cfs @ 11.94 hrs, Volume= 1.814 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 297.03' @ 11.94 hrs
Flood Elev= 310.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	294.60'	**42.0" x 115.0' long line to pond** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 271.60' S= 0.2000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=37.81 cfs @ 11.94 hrs HW=297.03' TW=265.71' (Dynamic Tailwater)
1=line to pond (Inlet Controls 37.81 cfs @ 5.3 fps)

Pond DMH 5:

Inflow Area = 2.753 ac, Inflow Depth = 1.46" for Q-1 event
Inflow = 6.96 cfs @ 11.96 hrs, Volume= 0.335 af
Outflow = 6.96 cfs @ 11.96 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.0 min
Primary = 6.96 cfs @ 11.96 hrs, Volume= 0.335 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 303.29' @ 11.98 hrs
Flood Elev= 312.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (800.2 - 800.2)

Device	Routing	Invert	Outlet Devices
#1	Primary	301.19'	**20.0" x 142.0' long Storm line to DMH 4** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 300.61' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.92 cfs @ 11.96 hrs HW=303.19' TW=302.77' (Dynamic Tailwater)
1=Storm line to DMH 4 (Outlet Controls 5.92 cfs @ 2.9 fps)

Pond DMH1:

Inflow Area = 2.937 ac, Inflow Depth = 1.22" for Q-1 event
Inflow = 6.36 cfs @ 11.93 hrs, Volume= 0.298 af
Outflow = 6.36 cfs @ 11.93 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.0 min
Primary = 6.36 cfs @ 11.93 hrs, Volume= 0.298 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 306.97' @ 11.93 hrs
Flood Elev= 312.64'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (798.5 - 798.5)

Device	Routing	Invert	Outlet Devices
#1	Primary	305.76'	**20.0" x 251.0' long line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0244 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=6.28 cfs @ 11.93 hrs HW=306.96' TW=302.08' (Dynamic Tailwater)
1=line to DMH 2 (Inlet Controls 6.28 cfs @ 3.7 fps)

Pond DMH2:

Inflow Area = 12.038 ac, Inflow Depth = 1.25" for Q-1 event
Inflow = 25.37 cfs @ 11.95 hrs, Volume= 1.258 af
Outflow = 25.37 cfs @ 11.95 hrs, Volume= 1.258 af, Atten= 0%, Lag= 0.0 min
Primary = 25.37 cfs @ 11.95 hrs, Volume= 1.258 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 302.22' @ 11.96 hrs
Flood Elev= 313.20'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.53'	**36.0" x 432.0' long storm line to CB 62** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 297.95' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=24.32 cfs @ 11.95 hrs HW=302.19' TW=300.70' (Dynamic Tailwater)
1=storm line to CB 62 (Outlet Controls 24.32 cfs @ 4.9 fps)

Pond DMH3:

Inflow Area = 1.645 ac, Inflow Depth = 1.33" for Q-1 event
Inflow = 4.15 cfs @ 11.94 hrs, Volume= 0.182 af
Outflow = 4.15 cfs @ 11.94 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.0 min
Primary = 4.15 cfs @ 11.94 hrs, Volume= 0.182 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 303.10' @ 11.95 hrs
Flood Elev= 311.60'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	301.60'	**18.0" x 425.0' long storm line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.85 cfs @ 11.94 hrs HW=303.07' TW=302.18' (Dynamic Tailwater)
↑—**1=storm line to DMH 2** (Outlet Controls 3.85 cfs @ 2.8 fps)

Pond DMH4:

Inflow Area = 4.491 ac, Inflow Depth = 1.33" for Q-1 event
Inflow = 9.86 cfs @ 11.97 hrs, Volume= 0.496 af
Outflow = 9.86 cfs @ 11.97 hrs, Volume= 0.496 af, Atten= 0%, Lag= 0.0 min
Primary = 9.86 cfs @ 11.97 hrs, Volume= 0.496 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 302.82' @ 11.97 hrs
Flood Elev= 313.20'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (809.3 - 809.3)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.36'	**24.0" x 210.0' long line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=9.89 cfs @ 11.97 hrs HW=302.79' TW=302.19' (Dynamic Tailwater)
↑—**1=line to DMH 2** (Outlet Controls 9.89 cfs @ 3.3 fps)

Time span=2.00-72.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 2: Runoff Area=1.522 ac Runoff Depth=2.45"
Flow Length=505' Tc=2.8 min CN=93 Runoff=6.88 cfs 0.310 af

Subcatchment 3: Runoff Area=1.276 ac Runoff Depth=1.40"
Flow Length=479' Tc=5.0 min CN=80 Runoff=3.32 cfs 0.149 af

Subcatchment 4: Runoff Area=1.661 ac Runoff Depth=2.75"
Flow Length=415' Tc=2.0 min CN=96 Runoff=8.21 cfs 0.381 af

Subcatchment 5: Runoff Area=0.638 ac Runoff Depth=2.35"
Flow Length=370' Tc=3.6 min CN=92 Runoff=2.74 cfs 0.125 af

Subcatchment 6: Runoff Area=1.007 ac Runoff Depth=2.35"
Flow Length=144' Tc=3.3 min CN=92 Runoff=4.37 cfs 0.197 af

Subcatchment 7: Runoff Area=1.715 ac Runoff Depth=2.08"
Flow Length=316' Tc=3.4 min CN=89 Runoff=6.76 cfs 0.297 af

Subcatchment 8: Runoff Area=1.250 ac Runoff Depth=2.17"
Flow Length=74' Tc=8.4 min CN=90 Runoff=4.30 cfs 0.226 af

Subcatchment 9: Runoff Area=0.664 ac Runoff Depth=2.26"
Flow Length=109' Tc=4.2 min CN=91 Runoff=2.71 cfs 0.125 af

Subcatchment 10: Runoff Area=0.916 ac Runoff Depth=2.08"
Flow Length=140' Tc=2.1 min CN=89 Runoff=3.75 cfs 0.159 af

Subcatchment 11: Runoff Area=0.649 ac Runoff Depth=2.45"
Flow Length=393' Tc=4.5 min CN=93 Runoff=2.78 cfs 0.132 af

Subcatchment 12: Runoff Area=1.738 ac Runoff Depth=2.08"
Flow Length=481' Tc=8.4 min CN=89 Runoff=5.78 cfs 0.301 af

Subcatchment 13: Runoff Area=1.810 ac Runoff Depth=2.54"
Flow Length=220' Tc=4.7 min CN=94 Runoff=7.91 cfs 0.384 af

Subcatchment 14: Runoff Area=0.943 ac Runoff Depth=2.45"
Flow Length=510' Tc=6.7 min CN=93 Runoff=3.76 cfs 0.192 af

Subcatchment 15: Runoff Area=1.339 ac Runoff Depth=2.35"
Flow Length=350' Tc=2.2 min CN=92 Runoff=5.98 cfs 0.262 af

Subcatchment 16: forbay area Runoff Area=1.586 ac Runoff Depth=0.69"
Flow Length=100' Tc=4.3 min CN=67 Runoff=1.95 cfs 0.091 af

Subcatchment 17: pond area Runoff Area=2.458 ac Runoff Depth=0.60"
Flow Length=77' Tc=3.1 min CN=65 Runoff=2.69 cfs 0.123 af

Subcatchment A: post-dev Runoff Area=447,647 sf Runoff Depth=0.34"
Flow Length=1,230' Tc=23.2 min CN=58 Runoff=1.87 cfs 0.292 af

Subcatchment B: post-dev Runoff Area=641,086 sf Runoff Depth=0.25"
Flow Length=1,580' Tc=22.7 min CN=55 Runoff=1.43 cfs 0.308 af

Subcatchment C: post-dev Runoff Area=1,527,401 sf Runoff Depth=0.11"
Flow Length=990' Tc=20.9 min CN=49 Runoff=0.51 cfs 0.317 af

Subcatchment D: Runoff Area=239,147 sf Runoff Depth=0.13"
Flow Length=385' Tc=12.2 min CN=50 Runoff=0.12 cfs 0.059 af

Subcatchment E: western side of rte 7 Runoff Area=314,587 sf Runoff Depth=0.44"
Flow Length=1,220' Tc=10.0 min CN=61 Runoff=3.65 cfs 0.267 af

Reach 1R: stream reach Peak Depth=0.41' Max Vel=2.8 fps Inflow=4.03 cfs 0.951 af
n=0.045 L=330.0' S=0.0300 '/' Capacity=17.80 cfs Outflow=3.91 cfs 0.951 af

Reach 2R: stream reach Peak Depth=0.15' Max Vel=1.6 fps Inflow=0.51 cfs 0.317 af
n=0.045 L=1,750.0' S=0.0340 '/' Capacity=6.48 cfs Outflow=0.49 cfs 0.317 af

Reach 3R: ex. roadside ditch Peak Depth=0.45' Max Vel=6.4 fps Inflow=8.39 cfs 3.739 af
n=0.030 L=470.0' S=0.0745 '/' Capacity=91.77 cfs Outflow=8.37 cfs 3.739 af

Reach 4R: (S/N 001) 4' culvert under rt 7 Peak Depth=0.89' Max Vel=4.9 fps Inflow=10.30 cfs 4.690 af
D=48.0" n=0.030 L=175.0' S=0.0229 '/' Capacity=94.11 cfs Outflow=10.30 cfs 4.690 af

Reach sl: stone lined channel Peak Depth=0.30' Max Vel=5.3 fps Inflow=7.41 cfs 3.447 af
n=0.040 L=365.0' S=0.1205 '/' Capacity=133.67 cfs Outflow=7.40 cfs 3.447 af

Pond 1P: pond main pool Peak Elev=249.26' Storage=120,442 cf Inflow=32.62 cfs 3.455 af
Primary=7.41 cfs 3.447 af Secondary=0.00 cfs 0.000 af Outflow=7.41 cfs 3.447 af

Pond 2P: forbay Peak Elev=268.24' Storage=33,862 cf Inflow=67.74 cfs 3.332 af
Primary=31.16 cfs 3.332 af Secondary=0.00 cfs 0.000 af Outflow=31.16 cfs 3.332 af

Pond CB41: Peak Elev=310.04' Inflow=7.91 cfs 0.384 af
18.0" x 270.0' Culvert Outflow=7.91 cfs 0.384 af

Pond CB62: Peak Elev=303.25' Inflow=49.92 cfs 2.510 af
36.0" x 260.0' Culvert Outflow=49.92 cfs 2.510 af

Pond CB64: Peak Elev=300.70' Inflow=60.18 cfs 2.979 af
42.0" x 360.0' Culvert Outflow=60.18 cfs 2.979 af

Pond CB79: line to pond Peak Elev=298.38' Inflow=65.93 cfs 3.241 af
42.0" x 115.0' Culvert Outflow=65.93 cfs 3.241 af

Pond DMH 5: Peak Elev=308.97' Inflow=11.56 cfs 0.576 af
20.0" x 142.0' Culvert Outflow=11.56 cfs 0.576 af

Pond DMH1: Peak Elev=307.70' Inflow=11.07 cfs 0.530 af
20.0" x 251.0' Culvert Outflow=11.07 cfs 0.530 af

Pond DMH2: Peak Elev=305.89' Inflow=44.44 cfs 2.253 af
36.0" x 432.0' Culvert Outflow=44.44 cfs 2.253 af

Pond DMH3: Peak Elev=307.56' Inflow=7.10 cfs 0.322 af
18.0" x 425.0' Culvert Outflow=7.10 cfs 0.322 af

Pond DMH4: Peak Elev=307.71' Inflow=16.94 cfs 0.877 af
24.0" x 210.0' Culvert Outflow=16.94 cfs 0.877 af

Total Runoff Area = 93.942 ac Runoff Volume = 4.698 af Average Runoff Depth = 0.60"

Subcatchment 2:

Runoff = 6.88 cfs @ 11.93 hrs, Volume= 0.310 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
1.186	98	Paved parking & roofs
0.336	74	>75% Grass cover, Good, HSG C
1.522	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	75	0.0160	1.0		**Sheet Flow, flow off parking lot** Smooth surfaces n= 0.011 P2= 2.30"
1.2	300	0.0060	4.1	5.00	**Circular Channel (pipe), flow to CB** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	130	0.0070	5.3	11.64	**Circular Channel (pipe), flow to CB 65** Diam= 20.0" Area= 2.2 sf Perim= 5.2' r= 0.42' n= 0.013 Corrugated PE, smooth interior
2.8	505	Total			

Subcatchment 3:

Runoff = 3.32 cfs @ 11.96 hrs, Volume= 0.149 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.650	98	Paved parking & roofs
0.626	61	>75% Grass cover, Good, HSG B
1.276	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	35	0.0600	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
1.3	300	0.0074	3.9	3.06	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	144	0.0080	4.7	5.78	**Circular Channel (pipe), line to DMH 1** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
5.0	479	Total			

Subcatchment 4:

Runoff = 8.21 cfs @ 11.92 hrs, Volume= 0.381 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
1.523	98	Paved parking & roofs
0.138	74	>75% Grass cover, Good, HSG C
1.661	96	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0300	1.2		**Sheet Flow, flow off parking lot** Smooth surfaces n= 0.011 P2= 2.30"
1.3	365	0.0085	4.9	5.96	**Circular Channel (pipe), flow to DMH 1** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.0	415	Total			

Subcatchment 5:

Runoff = 2.74 cfs @ 11.94 hrs, Volume= 0.125 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.469	98	Paved parking & roofs
0.169	74	>75% Grass cover, Good, HSG C
0.638	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.1000	0.2		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
0.8	140	0.0210	2.9		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
0.5	200	0.0180	7.1	8.67	**Circular Channel (pipe), flow in storm line** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
3.6	370	Total			

Subcatchment 6:

Runoff = 4.37 cfs @ 11.94 hrs, Volume= 0.197 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.745	98	Paved parking & roofs
0.262	74	>75% Grass cover, Good, HSG C
1.007	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	30	0.0670	0.2		**Sheet Flow, flow off grass** Grass: Short n= 0.150 P2= 2.30"
0.1	20	0.0120	2.2		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
0.5	94	0.0040	3.3	4.09	**Circular Channel (pipe), flow in storm line** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
3.3	144	Total			

Subcatchment 7:

Runoff = 6.76 cfs @ 11.94 hrs, Volume= 0.297 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
1.045	98	Paved parking & roofs
0.670	74	>75% Grass cover, Good, HSG C
1.715	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	25	0.0600	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
0.6	115	0.0050	3.2	2.52	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.1	110	0.0850	13.2	10.39	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.2	66	0.0060	4.9	10.78	**Circular Channel (pipe), line to DMH 2** Diam= 20.0" Area= 2.2 sf Perim= 5.2' r= 0.42' n= 0.013 Corrugated PE, smooth interior
3.4	316	Total			

Subcatchment 8:

Runoff = 4.30 cfs @ 12.00 hrs, Volume= 0.226 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.822	98	Paved parking & roofs
0.428	74	>75% Grass cover, Good, HSG C
1.250	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	60	0.0310	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.2	8	0.0200	0.7		**Sheet Flow, flow across sidewalk** Smooth surfaces n= 0.011 P2= 2.30"
1.8	6	0.0200	0.1		**Sheet Flow, flow to street CB 52** Grass: Dense n= 0.240 P2= 2.30"
8.4	74	Total			

Subcatchment 9:

Runoff = 2.71 cfs @ 11.95 hrs, Volume= 0.125 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.482	98	Paved parking & roofs
0.182	74	>75% Grass cover, Good, HSG C
0.664	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	18	0.0500	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.2	8	0.0300	0.8		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.5	8	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.5	75	0.0180	2.7		**Shallow Concentrated Flow, flow along curb to CB 62** Paved Kv= 20.3 fps
4.2	109	Total			

Subcatchment 10:

Runoff = 3.75 cfs @ 11.92 hrs, Volume= 0.159 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.564	98	Paved parking & roofs
0.352	74	>75% Grass cover, Good, HSG C
0.916	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	18	0.2000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.8	90	0.0160	1.9		**Shallow Concentrated Flow, roadside swale** Grassed Waterway Kv= 15.0 fps
0.1	32	0.0150	6.4	7.91	**Circular Channel (pipe), flow to CB 76** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.1	140	Total			

Subcatchment 11:

Runoff = 2.78 cfs @ 11.95 hrs, Volume= 0.132 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.510	98	Paved parking & roofs
0.139	74	>75% Grass cover, Good, HSG C
0.649	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	25	0.0400	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.1	65	0.0180	1.0		**Sheet Flow, flow across lot** Smooth surfaces n= 0.011 P2= 2.30"
0.3	195	0.0380	10.3	12.59	**Circular Channel (pipe), flow in line to DMH 6** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	108	0.0190	8.2	14.48	**Circular Channel (pipe), line to CB 62** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
4.5	393	Total			

Subcatchment 12:

Runoff = 5.78 cfs @ 12.00 hrs, Volume= 0.301 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
1.061	98	Paved parking & roofs
0.677	74	>75% Grass cover, Good, HSG C
1.738	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	75	0.0400	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
0.2	36	0.0060	3.5	2.76	**Circular Channel (pipe), flow in YD line** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.2	370	0.0090	5.0	6.13	**Circular Channel (pipe), flow to DMH 4** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.4	481	Total			

Subcatchment 13:

Runoff = 7.91 cfs @ 11.95 hrs, Volume= 0.384 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
1.546	98	Paved parking & roofs
0.264	74	>75% Grass cover, Good, HSG C
1.810	94	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	30	0.0330	0.1		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
1.1	190	0.0200	2.9		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
4.7	220	Total			

Subcatchment 14:

Runoff = 3.76 cfs @ 11.98 hrs, Volume= 0.192 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.765	98	Paved parking & roofs
0.178	74	>75% Grass cover, Good, HSG C
0.943	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	35	0.0290	0.1		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
0.4	80	0.0250	3.2		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
2.0	395	0.0040	3.3	4.09	**Circular Channel (pipe), flow in pipe to DMH 5** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
6.7	510	Total			

Subcatchment 15:

Runoff = 5.98 cfs @ 11.92 hrs, Volume= 0.262 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
1.011	98	Paved parking & roofs
0.328	74	>75% Grass cover, Good, HSG C
1.339	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	90	0.0200	1.1		**Sheet Flow, flow across parking lot** Smooth surfaces n= 0.011 P2= 2.30"
0.8	150	0.0220	3.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	110	0.0800	14.9	18.27	**Circular Channel (pipe), line to CB 79** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.2	350	Total			

Subcatchment 16: forbay area

Runoff = 1.95 cfs @ 11.96 hrs, Volume= 0.091 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.094	98	Paved parking & roofs
0.103	85	Gravel roads, HSG B
0.386	78	Meadow, non-grazed, HSG D
1.003	58	Meadow, non-grazed, HSG B
1.586	67	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.2360	0.4		**Sheet Flow, flow from pond bank** Grass: Short n= 0.150 P2= 2.30"

Subcatchment 17: pond area

Runoff = 2.69 cfs @ 11.95 hrs, Volume= 0.123 af, Depth= 0.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.562	55	Woods, Good, HSG B
0.298	58	Meadow, non-grazed, HSG B
0.289	98	pond water surface
1.199	61	>75% Grass cover, Good, HSG B
0.110	89	Gravel roads, HSG C
2.458	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.3300	0.4		**Sheet Flow, flow on pond bank** Grass: Short n= 0.150 P2= 2.30"

Subcatchment A: post-dev

Runoff = 1.87 cfs @ 12.24 hrs, Volume= 0.292 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
23,840	98	ex road
27,667	48	Brush, Good, HSG B
29,865	77	Woods, Good, HSG D
366,275	55	Woods, Good, HSG B
447,647	58	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	150	0.0130	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	340	0.1600	2.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	740	0.1000	8.9	24.00	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.67' Z= 3.0 '/' Top.W=6.02' n= 0.030 Earth, grassed & winding
23.2	1,230	Total			

Subcatchment B: post-dev

Runoff = 1.43 cfs @ 12.27 hrs, Volume= 0.308 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
641,086	55	Woods, Good, HSG B

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	100	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.4	125	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	155	0.2900	2.7		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8	400	0.1000	3.7	2.44	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.33' Z= 3.0 '/' Top.W=2.98' n= 0.045 Winding stream, pools & shoals
3.3	800	0.0470	4.0	6.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.040 Winding stream, pools & shoals
22.7	1,580	Total			

Subcatchment C: post-dev

Runoff = 0.51 cfs @ 12.98 hrs, Volume= 0.317 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
22,400	98	ex road and bikepath
40,990	98	ex houses and drives
165,352	70	Woods, Good, HSG C
517,000	30	Woods, Good, HSG A
43,081	39	>75% Grass cover, Good, HSG A
738,578	55	Woods, Good, HSG B
1,527,401	49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0150	0.1		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.30"
2.4	160	0.0150	1.1		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.2	180	0.2670	2.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	550	0.0330	3.1	3.08	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.50' Z= 2.0 '/' Top.W=3.00' n= 0.040 Winding stream, pools & shoals
20.9	990	Total			

Subcatchment D:

Runoff = 0.12 cfs @ 12.46 hrs, Volume= 0.059 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
7,500	98	ex road
168,267	55	Woods, Good, HSG B
63,380	30	Woods, Good, HSG A
239,147	50	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	120	0.2500	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	265	0.3400	2.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.2	385	Total			

Subcatchment E: western side of rte 7

Runoff = 3.65 cfs @ 12.05 hrs, Volume= 0.267 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
23,840	98	ex pavement
290,747	58	Woods/grass comb., Good, HSG B
314,587	61	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.4000	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.9	175	0.4000	3.2		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	800	0.1000	7.6	11.96	**Trap/Vee/Rect Channel Flow, roadside ditch** Bot.W=1.00' D=0.67' Z= 2.0 '/' Top.W=3.68' n= 0.033 Earth, grassed & winding
0.7	175	0.0200	4.4	13.86	**Circular Channel (pipe), ex culvert under rd** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.030 Corrugated metal
1.0					**Direct Entry, outlet conditions**
10.0	1,220	Total			

Reach 1R: stream reach

Inflow Area = 62.494 ac, Inflow Depth = 0.18" for Q-10 event
Inflow = 4.03 cfs @ 12.06 hrs, Volume= 0.951 af
Outflow = 3.91 cfs @ 12.08 hrs, Volume= 0.951 af, Atten= 3%, Lag= 1.5 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 2.8 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.9 fps, Avg. Travel Time= 6.0 min

Peak Depth= 0.41' @ 12.08 hrs
Capacity at bank full= 17.80 cfs
3.00' x 1.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 5.00'
Length= 330.0' Slope= 0.0300 '/'

Reach 2R: stream reach

Inflow Area = 35.064 ac, Inflow Depth = 0.11" for Q-10 event
Inflow = 0.51 cfs @ 12.98 hrs, Volume= 0.317 af
Outflow = 0.49 cfs @ 13.32 hrs, Volume= 0.317 af, Atten= 3%, Lag= 20.1 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 1.6 fps, Min. Travel Time= 18.6 min
Avg. Velocity = 0.7 fps, Avg. Travel Time= 39.1 min

Peak Depth= 0.15' @ 13.32 hrs
Capacity at bank full= 6.48 cfs
2.00' x 0.67' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 3.34'
Length= 1,750.0' Slope= 0.0340 '/'

Reach 3R: ex. roadside ditch

Inflow Area = 31.449 ac, Inflow Depth > 1.43" for Q-10 event
Inflow = 8.39 cfs @ 12.61 hrs, Volume= 3.739 af
Outflow = 8.37 cfs @ 12.63 hrs, Volume= 3.739 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 6.4 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 2.3 fps, Avg. Travel Time= 3.4 min

Peak Depth= 0.45' @ 12.63 hrs
Capacity at bank full= 91.77 cfs
Inlet Invert= 200.00', Outlet Invert= 165.00'
2.00' x 1.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 470.0' Slope= 0.0745 '/'

Reach 4R: (S/N 001) 4' culvert under rt 7

Inflow Area = 93.942 ac, Inflow Depth > 0.60" for Q-10 event
Inflow = 10.30 cfs @ 12.62 hrs, Volume= 4.690 af
Outflow = 10.30 cfs @ 12.63 hrs, Volume= 4.690 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.9 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 1.5 min

Peak Depth= 0.89' @ 12.63 hrs
Capacity at bank full= 94.11 cfs
Inlet Invert= 160.00', Outlet Invert= 156.00'
48.0" Diameter Pipe, n= 0.030 Corrugated metal
Length= 175.0' Slope= 0.0229 '/'

Reach sl: stone lined channel

Inflow Area = 21.172 ac, Inflow Depth > 1.95" for Q-10 event
Inflow = 7.41 cfs @ 12.61 hrs, Volume= 3.447 af
Outflow = 7.40 cfs @ 12.62 hrs, Volume= 3.447 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.3 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 3.3 min

Peak Depth= 0.30' @ 12.62 hrs
Capacity at bank full= 133.67 cfs
Inlet Invert= 234.00', Outlet Invert= 190.00'
4.00' x 1.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 365.0' Slope= 0.1205 '/'

Pond 1P: pond main pool

Inflow Area = 21.172 ac, Inflow Depth = 1.96" for Q-10 event
Inflow = 32.62 cfs @ 12.00 hrs, Volume= 3.455 af
Outflow = 7.41 cfs @ 12.61 hrs, Volume= 3.447 af, Atten= 77%, Lag= 36.1 min
Primary = 7.41 cfs @ 12.61 hrs, Volume= 3.447 af
Secondary = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Starting Elev= 245.00' Surf.Area= 12,637 sf Storage= 36,029 cf
Peak Elev= 249.26' @ 12.61 hrs Surf.Area= 23,828 sf Storage= 120,442 cf (84,413 cf above start)
Plug-Flow detention time= 1,045.5 min calculated for 2.619 af (76% of inflow)
Center-of-Mass det. time= 714.7 min (1,522.3 - 807.6)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	526,586 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
240.00	4,312	0	0
242.00	6,232	10,544	10,544
244.00	8,623	14,855	25,399
245.00	12,637	10,630	36,029
245.50	17,255	7,473	43,502
246.00	18,082	8,834	52,336
248.00	21,523	39,605	91,941
250.00	25,190	46,713	138,654
262.00	29,084	325,644	464,298
264.00	33,204	62,288	526,586

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**24.0" x 100.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 242.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	241.00'	**5.0" x 30.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 243.00' S= -0.0667 '/' Cc= 0.900 n= 0.010 PVC, smooth interior
#3	Device 1	248.80'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Secondary	253.00'	**3.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=7.41 cfs @ 12.61 hrs HW=249.26' TW=234.30' (Dynamic Tailwater)
└─**1=Culvert** (Passes 7.41 cfs of 27.30 cfs potential flow)
  ├─**2=Culvert** (Inlet Controls 1.07 cfs @ 7.8 fps)
  └─**3=Orifice/Grate** (Weir Controls 6.34 cfs @ 2.2 fps)

Secondary OutFlow Max=0.00 cfs @ 2.00 hrs HW=245.00' TW=234.00' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: forbay

Inflow Area = 18.714 ac, Inflow Depth = 2.14" for Q-10 event
Inflow = 67.74 cfs @ 11.94 hrs, Volume= 3.332 af
Outflow = 31.16 cfs @ 12.04 hrs, Volume= 3.332 af, Atten= 54%, Lag= 5.8 min
Primary = 31.16 cfs @ 12.04 hrs, Volume= 3.332 af
Secondary = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Starting Elev= 264.00' Surf.Area= 2,724 sf Storage= 6,078 cf
Peak Elev= 268.24' @ 12.04 hrs Surf.Area= 8,813 sf Storage= 33,862 cf (27,784 cf above start)
Plug-Flow detention time= 46.9 min calculated for 3.192 af (96% of inflow)
Center-of-Mass det. time= 8.2 min (804.6 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	75,303 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
260.00	592	0	0
262.00	1,381	1,973	1,973
264.00	2,724	4,105	6,078
264.50	5,101	1,956	8,034
266.00	6,486	8,690	16,725
268.00	8,531	15,017	31,742
270.00	10,837	19,368	51,110
272.00	13,356	24,193	75,303

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" x 105.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 255.00' S= 0.0476 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	264.00'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#3	Secondary	270.50'	**4.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=31.15 cfs @ 12.04 hrs HW=268.24' TW=247.49' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 31.15 cfs of 40.70 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 31.15 cfs @ 9.9 fps)

Secondary OutFlow Max=0.00 cfs @ 2.00 hrs HW=264.00' TW=245.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond CB41:

Inflow Area = 1.810 ac, Inflow Depth = 2.54" for Q-10 event
Inflow = 7.91 cfs @ 11.95 hrs, Volume= 0.384 af
Outflow = 7.91 cfs @ 11.95 hrs, Volume= 0.384 af, Atten= 0%, Lag= 0.0 min
Primary = 7.91 cfs @ 11.95 hrs, Volume= 0.384 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 310.04' @ 12.00 hrs
Flood Elev= 309.90'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (782.6 - 782.6)

Device	Routing	Invert	Outlet Devices
#1	Primary	304.73'	**18.0" x 270.0' long line to DMH 5** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 301.90' S= 0.0105 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=4.60 cfs @ 11.95 hrs HW=307.75' TW=307.07' (Dynamic Tailwater)
↑—**1=line to DMH 5** (Outlet Controls 4.60 cfs @ 2.6 fps)

Pond CB62:

Inflow Area = 13.351 ac, Inflow Depth = 2.26" for Q-10 event
Inflow = 49.92 cfs @ 11.95 hrs, Volume= 2.510 af
Outflow = 49.92 cfs @ 11.95 hrs, Volume= 2.510 af, Atten= 0%, Lag= 0.0 min
Primary = 49.92 cfs @ 11.95 hrs, Volume= 2.510 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 303.25' @ 11.95 hrs
Flood Elev= 309.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (794.5 - 794.5)

Device	Routing	Invert	Outlet Devices
#1	Primary	297.90'	**36.0" x 260.0' long line to CB 64** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 296.87' S= 0.0040 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=48.54 cfs @ 11.95 hrs HW=303.16' TW=300.68' (Dynamic Tailwater)
↑—**1=line to CB 64** (Outlet Controls 48.54 cfs @ 6.9 fps)

Pond CB64:

Inflow Area = 15.789 ac, Inflow Depth = 2.26" for Q-10 event
Inflow = 60.18 cfs @ 11.94 hrs, Volume= 2.979 af
Outflow = 60.18 cfs @ 11.94 hrs, Volume= 2.979 af, Atten= 0%, Lag= 0.0 min
Primary = 60.18 cfs @ 11.94 hrs, Volume= 2.979 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 300.70' @ 11.95 hrs
Flood Elev= 309.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (794.2 - 794.2)

Device	Routing	Invert	Outlet Devices
#1	Primary	296.82'	**42.0" x 360.0' long storm line to CB 78**

CPP, square edge headwall, Ke= 0.500
Outlet Invert= 295.35' S= 0.0041 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=58.74 cfs @ 11.94 hrs HW=300.68' TW=298.36' (Dynamic Tailwater)
1=storm line to CB 78 (Outlet Controls 58.74 cfs @ 6.9 fps)

Pond CB79: line to pond

Inflow Area = 17.128 ac, Inflow Depth = 2.27" for Q-10 event
Inflow = 65.93 cfs @ 11.94 hrs, Volume= 3.241 af
Outflow = 65.93 cfs @ 11.94 hrs, Volume= 3.241 af, Atten= 0%, Lag= 0.0 min
Primary = 65.93 cfs @ 11.94 hrs, Volume= 3.241 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 298.38' @ 11.94 hrs
Flood Elev= 310.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	294.60'	**42.0" x 115.0' long line to pond** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 271.60' S= 0.2000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=65.91 cfs @ 11.94 hrs HW=298.37' TW=267.28' (Dynamic Tailwater)
1=line to pond (Inlet Controls 65.91 cfs @ 6.9 fps)

Pond DMH 5:

Inflow Area = 2.753 ac, Inflow Depth = 2.51" for Q-10 event
Inflow = 11.56 cfs @ 11.96 hrs, Volume= 0.576 af
Outflow = 11.56 cfs @ 11.96 hrs, Volume= 0.576 af, Atten= 0%, Lag= 0.0 min
Primary = 11.56 cfs @ 11.96 hrs, Volume= 0.576 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 308.97' @ 11.99 hrs
Flood Elev= 312.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (785.1 - 785.1)

Device	Routing	Invert	Outlet Devices
#1	Primary	301.19'	**20.0" x 142.0' long Storm line to DMH 4** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 300.61' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.01 cfs @ 11.96 hrs HW=307.46' TW=307.16' (Dynamic Tailwater)
1=Storm line to DMH 4 (Outlet Controls 5.01 cfs @ 2.3 fps)

Pond DMH1:

Inflow Area = 2.937 ac, Inflow Depth = 2.16" for Q-10 event
Inflow = 11.07 cfs @ 11.93 hrs, Volume= 0.530 af
Outflow = 11.07 cfs @ 11.93 hrs, Volume= 0.530 af, Atten= 0%, Lag= 0.0 min
Primary = 11.07 cfs @ 11.93 hrs, Volume= 0.530 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 307.70' @ 11.93 hrs
Flood Elev= 312.64'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (787.0 - 787.0)

Device	Routing	Invert	Outlet Devices
#1	Primary	305.76'	**20.0" x 251.0' long line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0244 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=10.95 cfs @ 11.93 hrs HW=307.68' TW=304.67' (Dynamic Tailwater)
1=line to DMH 2 (Inlet Controls 10.95 cfs @ 5.0 fps)

Pond DMH2:

Inflow Area = 12.038 ac, Inflow Depth = 2.25" for Q-10 event
Inflow = 44.44 cfs @ 11.95 hrs, Volume= 2.253 af
Outflow = 44.44 cfs @ 11.95 hrs, Volume= 2.253 af, Atten= 0%, Lag= 0.0 min
Primary = 44.44 cfs @ 11.95 hrs, Volume= 2.253 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 305.89' @ 11.96 hrs
Flood Elev= 313.20'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (794.7 - 794.7)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.53'	**36.0" x 432.0' long storm line to CB 62** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 297.95' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=40.61 cfs @ 11.95 hrs HW=305.53' TW=303.16' (Dynamic Tailwater)
1=storm line to CB 62 (Outlet Controls 40.61 cfs @ 5.7 fps)

Pond DMH3:

Inflow Area = 1.645 ac, Inflow Depth = 2.35" for Q-10 event
Inflow = 7.10 cfs @ 11.94 hrs, Volume= 0.322 af
Outflow = 7.10 cfs @ 11.94 hrs, Volume= 0.322 af, Atten= 0%, Lag= 0.0 min
Primary = 7.10 cfs @ 11.94 hrs, Volume= 0.322 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 307.56' @ 11.97 hrs
Flood Elev= 311.60'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Device	Routing	Invert	Outlet Devices
#1	Primary	301.60'	**18.0" x 425.0' long storm line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.07 cfs @ 11.94 hrs HW=306.51' TW=305.33' (Dynamic Tailwater)
↑—**1=storm line to DMH 2** (Outlet Controls 5.07 cfs @ 2.9 fps)

Pond DMH4:

Inflow Area = 4.491 ac, Inflow Depth = 2.34" for Q-10 event
Inflow = 16.94 cfs @ 11.97 hrs, Volume= 0.877 af
Outflow = 16.94 cfs @ 11.97 hrs, Volume= 0.877 af, Atten= 0%, Lag= 0.0 min
Primary = 16.94 cfs @ 11.97 hrs, Volume= 0.877 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 307.71' @ 11.98 hrs
Flood Elev= 313.20'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (793.8 - 793.8)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.36'	**24.0" x 210.0' long line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=15.99 cfs @ 11.97 hrs HW=307.42' TW=305.76' (Dynamic Tailwater)
↑—**1=line to DMH 2** (Outlet Controls 15.99 cfs @ 5.1 fps)

Time span=2.00-72.00 hrs, dt=0.02 hrs, 3501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 2: Runoff Area=1.522 ac Runoff Depth=4.39"
Flow Length=505' Tc=2.8 min CN=93 Runoff=11.86 cfs 0.557 af

Subcatchment 3: Runoff Area=1.276 ac Runoff Depth=3.07"
Flow Length=479' Tc=5.0 min CN=80 Runoff=7.13 cfs 0.326 af

Subcatchment 4: Runoff Area=1.661 ac Runoff Depth>4.73"
Flow Length=415' Tc=2.0 min CN=96 Runoff=13.66 cfs 0.655 af

Subcatchment 5: Runoff Area=0.638 ac Runoff Depth=4.28"
Flow Length=370' Tc=3.6 min CN=92 Runoff=4.79 cfs 0.228 af

Subcatchment 6: Runoff Area=1.007 ac Runoff Depth=4.28"
Flow Length=144' Tc=3.3 min CN=92 Runoff=7.63 cfs 0.360 af

Subcatchment 7: Runoff Area=1.715 ac Runoff Depth=3.96"
Flow Length=316' Tc=3.4 min CN=89 Runoff=12.36 cfs 0.566 af

Subcatchment 8: Runoff Area=1.250 ac Runoff Depth=4.07"
Flow Length=74' Tc=8.4 min CN=90 Runoff=7.78 cfs 0.424 af

Subcatchment 9: Runoff Area=0.664 ac Runoff Depth=4.18"
Flow Length=109' Tc=4.2 min CN=91 Runoff=4.81 cfs 0.231 af

Subcatchment 10: Runoff Area=0.916 ac Runoff Depth=3.96"
Flow Length=140' Tc=2.1 min CN=89 Runoff=6.85 cfs 0.303 af

Subcatchment 11: Runoff Area=0.649 ac Runoff Depth=4.39"
Flow Length=393' Tc=4.5 min CN=93 Runoff=4.80 cfs 0.238 af

Subcatchment 12: Runoff Area=1.738 ac Runoff Depth=3.96"
Flow Length=481' Tc=8.4 min CN=89 Runoff=10.63 cfs 0.574 af

Subcatchment 13: Runoff Area=1.810 ac Runoff Depth=4.51"
Flow Length=220' Tc=4.7 min CN=94 Runoff=13.47 cfs 0.680 af

Subcatchment 14: Runoff Area=0.943 ac Runoff Depth=4.39"
Flow Length=510' Tc=6.7 min CN=93 Runoff=6.50 cfs 0.345 af

Subcatchment 15: Runoff Area=1.339 ac Runoff Depth=4.28"
Flow Length=350' Tc=2.2 min CN=92 Runoff=10.45 cfs 0.478 af

Subcatchment 16: forbay area Runoff Area=1.586 ac Runoff Depth=1.94"
Flow Length=100' Tc=4.3 min CN=67 Runoff=5.87 cfs 0.257 af

Subcatchment 17: pond area Runoff Area=2.458 ac Runoff Depth=1.79"
Flow Length=77' Tc=3.1 min CN=65 Runoff=8.75 cfs 0.366 af

Subcatchment A: post-dev Runoff Area=447,647 sf Runoff Depth=1.28"
Flow Length=1,230' Tc=23.2 min CN=58 Runoff=11.70 cfs 1.096 af

Subcatchment B: post-dev Runoff Area=641,086 sf Runoff Depth=1.08"
Flow Length=1,580' Tc=22.7 min CN=55 Runoff=13.45 cfs 1.326 af

Subcatchment C: post-dev Runoff Area=1,527,401 sf Runoff Depth=0.72"
Flow Length=990' Tc=20.9 min CN=49 Runoff=17.90 cfs 2.101 af

Subcatchment D: Runoff Area=239,147 sf Runoff Depth=0.78"
Flow Length=385' Tc=12.2 min CN=50 Runoff=4.53 cfs 0.355 af

Subcatchment E: western side of rte 7 Runoff Area=314,587 sf Runoff Depth=1.49"
Flow Length=1,220' Tc=10.0 min CN=61 Runoff=15.92 cfs 0.897 af

Reach 1R: stream reach Peak Depth=1.53' Max Vel=5.2 fps Inflow=34.30 cfs 4.679 af
n=0.045 L=330.0' S=0.0300 '/' Capacity=17.80 cfs Outflow=34.25 cfs 4.679 af

Reach 2R: stream reach Peak Depth=1.18' Max Vel=4.3 fps Inflow=17.90 cfs 2.101 af
n=0.045 L=1,750.0' S=0.0340 '/' Capacity=6.48 cfs Outflow=15.21 cfs 2.101 af

Reach 3R: ex. roadside ditch Peak Depth=0.87' Max Vel=9.1 fps Inflow=29.86 cfs 7.675 af
n=0.030 L=470.0' S=0.0745 '/' Capacity=91.77 cfs Outflow=29.83 cfs 7.675 af

Reach 4R: (S/N 001) 4' culvert under rt 7 Peak Depth=2.42' Max Vel=8.0 fps Inflow=63.85 cfs 12.354 af
D=48.0" n=0.030 L=175.0' S=0.0229 '/' Capacity=94.11 cfs Outflow=63.84 cfs 12.354 af

Reach sl: stone lined channel Peak Depth=0.58' Max Vel=7.6 fps Inflow=22.98 cfs 6.579 af
n=0.040 L=365.0' S=0.1205 '/' Capacity=133.67 cfs Outflow=22.98 cfs 6.579 af

Pond 1P: pond main pool Peak Elev=250.86' Storage=160,500 cf Inflow=55.03 cfs 6.588 af
Primary=22.98 cfs 6.579 af Secondary=0.00 cfs 0.000 af Outflow=22.98 cfs 6.579 af

Pond 2P: forbay Peak Elev=271.50' Storage=68,811 cf Inflow=122.81 cfs 6.221 af
Primary=41.43 cfs 6.104 af Secondary=10.56 cfs 0.117 af Outflow=51.99 cfs 6.221 af

Pond CB41: Peak Elev=336.47' Inflow=13.47 cfs 0.680 af
18.0" x 270.0' Culvert Outflow=13.47 cfs 0.680 af

Pond CB62: Peak Elev=317.36' Inflow=89.07 cfs 4.626 af
36.0" x 260.0' Culvert Outflow=89.07 cfs 4.626 af

Pond CB64: Peak Elev=309.50' Inflow=107.11 cfs 5.486 af
42.0" x 360.0' Culvert Outflow=107.11 cfs 5.486 af

Pond CB79: line to pond Peak Elev=302.75' Inflow=117.15 cfs 5.964 af
42.0" x 115.0' Culvert Outflow=117.15 cfs 5.964 af

Pond DMH 5: Peak Elev=333.90' Inflow=19.80 cfs 1.025 af
20.0" x 142.0' Culvert Outflow=19.80 cfs 1.025 af

Pond DMH1: Peak Elev=328.86' Inflow=19.99 cfs 0.981 af
20.0" x 251.0' Culvert Outflow=19.99 cfs 0.981 af

Pond DMH2: Peak Elev=325.22' Inflow=79.48 cfs 4.158 af
36.0" x 432.0' Culvert Outflow=79.48 cfs 4.158 af

Pond DMH3: Peak Elev=329.42' Inflow=12.42 cfs 0.587 af
18.0" x 425.0' Culvert Outflow=12.42 cfs 0.587 af

Pond DMH4: Peak Elev=330.55' Inflow=29.78 cfs 1.599 af
24.0" x 210.0' Culvert Outflow=29.78 cfs 1.599 af

Total Runoff Area = 93.942 ac Runoff Volume = 12.363 af Average Runoff Depth = 1.58"

Subcatchment 2:

Runoff = 11.86 cfs @ 11.93 hrs, Volume= 0.557 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
1.186	98	Paved parking & roofs
0.336	74	>75% Grass cover, Good, HSG C
1.522	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	75	0.0160	1.0		**Sheet Flow, flow off parking lot** Smooth surfaces n= 0.011 P2= 2.30"
1.2	300	0.0060	4.1	5.00	**Circular Channel (pipe), flow to CB** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.4	130	0.0070	5.3	11.64	**Circular Channel (pipe), flow to CB 65** Diam= 20.0" Area= 2.2 sf Perim= 5.2' r= 0.42' n= 0.013 Corrugated PE, smooth interior
2.8	505	Total			

Subcatchment 3:

Runoff = 7.13 cfs @ 11.96 hrs, Volume= 0.326 af, Depth= 3.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.650	98	Paved parking & roofs
0.626	61	>75% Grass cover, Good, HSG B
1.276	80	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	35	0.0600	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
1.3	300	0.0074	3.9	3.06	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.5	144	0.0080	4.7	5.78	**Circular Channel (pipe), line to DMH 1** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
5.0	479	Total			

Subcatchment 4:

Runoff = 13.66 cfs @ 11.92 hrs, Volume= 0.655 af, Depth> 4.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
1.523	98	Paved parking & roofs
0.138	74	>75% Grass cover, Good, HSG C
1.661	96	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0300	1.2		**Sheet Flow, flow off parking lot** Smooth surfaces n= 0.011 P2= 2.30"
1.3	365	0.0085	4.9	5.96	**Circular Channel (pipe), flow to DMH 1** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.0	415	Total			

Subcatchment 5:

Runoff = 4.79 cfs @ 11.94 hrs, Volume= 0.228 af, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.469	98	Paved parking & roofs
0.169	74	>75% Grass cover, Good, HSG C
0.638	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	30	0.1000	0.2		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
0.8	140	0.0210	2.9		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
0.5	200	0.0180	7.1	8.67	**Circular Channel (pipe), flow in storm line** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
3.6	370	Total			

Subcatchment 6:

Runoff = 7.63 cfs @ 11.94 hrs, Volume= 0.360 af, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.745	98	Paved parking & roofs
0.262	74	>75% Grass cover, Good, HSG C
1.007	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	30	0.0670	0.2		**Sheet Flow, flow off grass** Grass: Short n= 0.150 P2= 2.30"
0.1	20	0.0120	2.2		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
0.5	94	0.0040	3.3	4.09	**Circular Channel (pipe), flow in storm line** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
3.3	144	Total			

Subcatchment 7:

Runoff = 12.36 cfs @ 11.94 hrs, Volume= 0.566 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
1.045	98	Paved parking & roofs
0.670	74	>75% Grass cover, Good, HSG C
1.715	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	25	0.0600	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
0.6	115	0.0050	3.2	2.52	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.1	110	0.0850	13.2	10.39	**Circular Channel (pipe),** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
0.2	66	0.0060	4.9	10.78	**Circular Channel (pipe), line to DMH 2** Diam= 20.0" Area= 2.2 sf Perim= 5.2' r= 0.42' n= 0.013 Corrugated PE, smooth interior
3.4	316	Total			

Subcatchment 8:

Runoff = 7.78 cfs @ 11.99 hrs, Volume= 0.424 af, Depth= 4.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.822	98	Paved parking & roofs
0.428	74	>75% Grass cover, Good, HSG C
1.250	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	60	0.0310	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.2	8	0.0200	0.7		**Sheet Flow, flow across sidewalk** Smooth surfaces n= 0.011 P2= 2.30"
1.8	6	0.0200	0.1		**Sheet Flow, flow to street CB 52** Grass: Dense n= 0.240 P2= 2.30"
8.4	74	Total			

Subcatchment 9:

Runoff = 4.81 cfs @ 11.95 hrs, Volume= 0.231 af, Depth= 4.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.482	98	Paved parking & roofs
0.182	74	>75% Grass cover, Good, HSG C
0.664	91	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	18	0.0500	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.2	8	0.0300	0.8		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
1.5	8	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.5	75	0.0180	2.7		**Shallow Concentrated Flow, flow along curb to CB 62** Paved Kv= 20.3 fps
4.2	109	Total			

Subcatchment 10:

Runoff = 6.85 cfs @ 11.92 hrs, Volume= 0.303 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.564	98	Paved parking & roofs
0.352	74	>75% Grass cover, Good, HSG C
0.916	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	18	0.2000	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
0.8	90	0.0160	1.9		**Shallow Concentrated Flow, roadside swale** Grassed Waterway Kv= 15.0 fps
0.1	32	0.0150	6.4	7.91	**Circular Channel (pipe), flow to CB 76** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.1	140	Total			

Subcatchment 11:

Runoff = 4.80 cfs @ 11.95 hrs, Volume= 0.238 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.510	98	Paved parking & roofs
0.139	74	>75% Grass cover, Good, HSG C
0.649	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	25	0.0400	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.1	65	0.0180	1.0		**Sheet Flow, flow across lot** Smooth surfaces n= 0.011 P2= 2.30"
0.3	195	0.0380	10.3	12.59	**Circular Channel (pipe), flow in line to DMH 6** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
0.2	108	0.0190	8.2	14.48	**Circular Channel (pipe), line to CB 62** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
4.5	393	Total			

Subcatchment 12:

Runoff = 10.63 cfs @ 12.00 hrs, Volume= 0.574 af, Depth= 3.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
1.061	98	Paved parking & roofs
0.677	74	>75% Grass cover, Good, HSG C
1.738	89	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	75	0.0400	0.2		**Sheet Flow, flow to YD** Grass: Short n= 0.150 P2= 2.30"
0.2	36	0.0060	3.5	2.76	**Circular Channel (pipe), flow in YD line** Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.2	370	0.0090	5.0	6.13	**Circular Channel (pipe), flow to DMH 4** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
8.4	481	Total			

Subcatchment 13:

Runoff = 13.47 cfs @ 11.95 hrs, Volume= 0.680 af, Depth= 4.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
1.546	98	Paved parking & roofs
0.264	74	>75% Grass cover, Good, HSG C
1.810	94	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	30	0.0330	0.1		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
1.1	190	0.0200	2.9		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
4.7	220	Total			

Subcatchment 14:

Runoff = 6.50 cfs @ 11.98 hrs, Volume= 0.345 af, Depth= 4.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.765	98	Paved parking & roofs
0.178	74	>75% Grass cover, Good, HSG C
0.943	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	35	0.0290	0.1		**Sheet Flow, flow off lawn** Grass: Short n= 0.150 P2= 2.30"
0.4	80	0.0250	3.2		**Shallow Concentrated Flow, flow along curb** Paved Kv= 20.3 fps
2.0	395	0.0040	3.3	4.09	**Circular Channel (pipe), flow in pipe to DMH 5** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
6.7	510	Total			

Subcatchment 15:

Runoff = 10.45 cfs @ 11.92 hrs, Volume= 0.478 af, Depth= 4.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
1.011	98	Paved parking & roofs
0.328	74	>75% Grass cover, Good, HSG C
1.339	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	90	0.0200	1.1		**Sheet Flow, flow across parking lot** Smooth surfaces n= 0.011 P2= 2.30"
0.8	150	0.0220	3.0		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.1	110	0.0800	14.9	18.27	**Circular Channel (pipe), line to CB 79** Diam= 15.0" Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Corrugated PE, smooth interior
2.2	350	Total			

Subcatchment 16: forbay area

Runoff = 5.87 cfs @ 11.96 hrs, Volume= 0.257 af, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.094	98	Paved parking & roofs
0.103	85	Gravel roads, HSG B
0.386	78	Meadow, non-grazed, HSG D
1.003	58	Meadow, non-grazed, HSG B
1.586	67	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	100	0.2360	0.4		**Sheet Flow, flow from pond bank** Grass: Short n= 0.150 P2= 2.30"

Subcatchment 17: pond area

Runoff = 8.75 cfs @ 11.94 hrs, Volume= 0.366 af, Depth= 1.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (ac)	CN	Description
0.562	55	Woods, Good, HSG B
0.298	58	Meadow, non-grazed, HSG B
0.289	98	pond water surface
1.199	61	>75% Grass cover, Good, HSG B
0.110	89	Gravel roads, HSG C
2.458	65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	77	0.3300	0.4		**Sheet Flow, flow on pond bank** Grass: Short n= 0.150 P2= 2.30"

Subcatchment A: post-dev

Runoff = 11.70 cfs @ 12.19 hrs, Volume= 1.096 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
23,840	98	ex road
27,667	48	Brush, Good, HSG B
29,865	77	Woods, Good, HSG D
366,275	55	Woods, Good, HSG B
447,647	58	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0	150	0.0130	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	340	0.1600	2.0		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.4	740	0.1000	8.9	24.00	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.67' Z= 3.0 '/' Top.W=6.02' n= 0.030 Earth, grassed & winding
23.2	1,230	Total			

Subcatchment B: post-dev

Runoff = 13.45 cfs @ 12.19 hrs, Volume= 1.326 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
641,086	55	Woods, Good, HSG B

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2	100	0.0100	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.4	125	0.0100	1.5		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.0	155	0.2900	2.7		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8	400	0.1000	3.7	2.44	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.33' Z= 3.0 '/' Top.W=2.98' n= 0.045 Winding stream, pools & shoals
3.3	800	0.0470	4.0	6.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.040 Winding stream, pools & shoals
22.7	1,580	Total			

Subcatchment C: post-dev

Runoff = 17.90 cfs @ 12.19 hrs, Volume= 2.101 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
22,400	98	ex road and bikepath
40,990	98	ex houses and drives
165,352	70	Woods, Good, HSG C
517,000	30	Woods, Good, HSG A
43,081	39	>75% Grass cover, Good, HSG A
738,578	55	Woods, Good, HSG B
1,527,401	49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	100	0.0150	0.1		**Sheet Flow,** Cultivated: Residue>20% n= 0.170 P2= 2.30"
2.4	160	0.0150	1.1		**Shallow Concentrated Flow,** Cultivated Straight Rows Kv= 9.0 fps
1.2	180	0.2670	2.6		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.0	550	0.0330	3.1	3.08	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=0.50' Z= 2.0 '/' Top.W=3.00' n= 0.040 Winding stream, pools & shoals
20.9	990	Total			

Subcatchment D:

Runoff = 4.53 cfs @ 12.07 hrs, Volume= 0.355 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
7,500	98	ex road
168,267	55	Woods, Good, HSG B
63,380	30	Woods, Good, HSG A
239,147	50	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	120	0.2500	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
1.5	265	0.3400	2.9		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.2	385	Total			

Subcatchment E: western side of rte 7

Runoff = 15.92 cfs @ 12.03 hrs, Volume= 0.897 af, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-100 Rainfall=5.20"

Area (sf)	CN	Description
23,840	98	ex pavement
290,747	58	Woods/grass comb., Good, HSG B
314,587	61	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	70	0.4000	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.30"
0.9	175	0.4000	3.2		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	800	0.1000	7.6	11.96	**Trap/Vee/Rect Channel Flow, roadside ditch** Bot.W=1.00' D=0.67' Z= 2.0 '/' Top.W=3.68' n= 0.033 Earth, grassed & winding
0.7	175	0.0200	4.4	13.86	**Circular Channel (pipe), ex culvert under rd** Diam= 24.0" Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.030 Corrugated metal
1.0					**Direct Entry, outlet conditions**
10.0	1,220	Total			

Reach 1R: stream reach

Inflow Area = 62.494 ac, Inflow Depth = 0.90" for Q-100 event
Inflow = 34.30 cfs @ 12.19 hrs, Volume= 4.679 af
Outflow = 34.25 cfs @ 12.21 hrs, Volume= 4.679 af, Atten= 0%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 5.2 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 3.9 min

Peak Depth= 1.53' @ 12.21 hrs
Capacity at bank full= 17.80 cfs
3.00' x 1.00' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 5.00'
Length= 330.0' Slope= 0.0300 '/'

Reach 2R: stream reach

Inflow Area = 35.064 ac, Inflow Depth = 0.72" for Q-100 event
Inflow = 17.90 cfs @ 12.19 hrs, Volume= 2.101 af
Outflow = 15.21 cfs @ 12.29 hrs, Volume= 2.101 af, Atten= 15%, Lag= 5.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 4.3 fps, Min. Travel Time= 6.7 min
Avg. Velocity = 1.2 fps, Avg. Travel Time= 23.5 min

Peak Depth= 1.18' @ 12.29 hrs
Capacity at bank full= 6.48 cfs
2.00' x 0.67' deep channel, n= 0.045 Winding stream, pools & shoals
Side Slope Z-value= 1.0 '/' Top Width= 3.34'
Length= 1,750.0' Slope= 0.0340 '/'

Reach 3R: ex. roadside ditch

Inflow Area = 31.449 ac, Inflow Depth > 2.93" for Q-100 event
Inflow = 29.86 cfs @ 12.24 hrs, Volume= 7.675 af
Outflow = 29.83 cfs @ 12.26 hrs, Volume= 7.675 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 9.1 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 3.0 min

Peak Depth= 0.87' @ 12.26 hrs
Capacity at bank full= 91.77 cfs
Inlet Invert= 200.00', Outlet Invert= 165.00'
2.00' x 1.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 470.0' Slope= 0.0745 '/'

Reach 4R: (S/N 001) 4' culvert under rt 7

Inflow Area = 93.942 ac, Inflow Depth = 1.58" for Q-100 event
Inflow = 63.85 cfs @ 12.23 hrs, Volume= 12.354 af
Outflow = 63.84 cfs @ 12.23 hrs, Volume= 12.354 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 8.0 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.2 fps, Avg. Travel Time= 1.4 min

Peak Depth= 2.42' @ 12.23 hrs
Capacity at bank full= 94.11 cfs
Inlet Invert= 160.00', Outlet Invert= 156.00'
48.0" Diameter Pipe, n= 0.030 Corrugated metal
Length= 175.0' Slope= 0.0229 '/'

Reach sl: stone lined channel

Inflow Area = 21.172 ac, Inflow Depth > 3.73" for Q-100 event
Inflow = 22.98 cfs @ 12.72 hrs, Volume= 6.579 af
Outflow = 22.98 cfs @ 12.73 hrs, Volume= 6.579 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Max. Velocity= 7.6 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.0 fps, Avg. Travel Time= 3.0 min

Peak Depth= 0.58' @ 12.73 hrs
Capacity at bank full= 133.67 cfs
Inlet Invert= 234.00', Outlet Invert= 190.00'
4.00' x 1.50' deep channel, n= 0.040 Earth, cobble bottom, clean sides
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 365.0' Slope= 0.1205 '/'

Pond 1P: pond main pool

Inflow Area = 21.172 ac, Inflow Depth = 3.73" for Q-100 event
Inflow = 55.03 cfs @ 12.02 hrs, Volume= 6.588 af
Outflow = 22.98 cfs @ 12.72 hrs, Volume= 6.579 af, Atten= 58%, Lag= 41.9 min
Primary = 22.98 cfs @ 12.72 hrs, Volume= 6.579 af
Secondary = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Starting Elev= 245.00' Surf.Area= 12,637 sf Storage= 36,029 cf
Peak Elev= 250.86' @ 12.72 hrs Surf.Area= 25,470 sf Storage= 160,500 cf (124,471 cf above start)
Plug-Flow detention time= 564.0 min calculated for 5.750 af (87% of inflow)
Center-of-Mass det. time= 426.9 min (1,222.4 - 795.4)

Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	526,586 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
240.00	4,312	0	0
242.00	6,232	10,544	10,544
244.00	8,623	14,855	25,399
245.00	12,637	10,630	36,029
245.50	17,255	7,473	43,502
246.00	18,082	8,834	52,336
248.00	21,523	39,605	91,941
250.00	25,190	46,713	138,654
262.00	29,084	325,644	464,298
264.00	33,204	62,288	526,586

Device	Routing	Invert	Outlet Devices
#1	Primary	245.00'	**24.0" x 100.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 242.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	241.00'	**5.0" x 30.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 243.00' S= -0.0667 '/' Cc= 0.900 n= 0.010 PVC, smooth interior
#3	Device 1	248.80'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Secondary	253.00'	**3.0' long x 18.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=22.98 cfs @ 12.72 hrs HW=250.86' TW=234.58' (Dynamic Tailwater)
└**1=Culvert** (Passes 22.98 cfs of 33.36 cfs potential flow)
└**2=Culvert** (Inlet Controls 1.25 cfs @ 9.2 fps)
└**3=Orifice/Grate** (Orifice Controls 21.72 cfs @ 6.9 fps)

Secondary OutFlow Max=0.00 cfs @ 2.00 hrs HW=245.00' TW=234.00' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: forbay

Inflow Area = 18.714 ac, Inflow Depth > 3.99" for Q-100 event
Inflow = 122.81 cfs @ 11.94 hrs, Volume= 6.221 af
Outflow = 51.99 cfs @ 12.04 hrs, Volume= 6.221 af, Atten= 58%, Lag= 6.2 min
Primary = 41.43 cfs @ 12.04 hrs, Volume= 6.104 af
Secondary = 10.56 cfs @ 12.04 hrs, Volume= 0.117 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Starting Elev= 264.00' Surf.Area= 2,724 sf Storage= 6,078 cf
Peak Elev= 271.50' @ 12.04 hrs Surf.Area= 12,729 sf Storage= 68,811 cf (62,733 cf above start)
Plug-Flow detention time= 35.4 min calculated for 6.082 af (98% of inflow)
Center-of-Mass det. time= 11.0 min (792.1 - 781.1)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	75,303 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
260.00	592	0	0
262.00	1,381	1,973	1,973
264.00	2,724	4,105	6,078
264.50	5,101	1,956	8,034
266.00	6,486	8,690	16,725
268.00	8,531	15,017	31,742
270.00	10,837	19,368	51,110
272.00	13,356	24,193	75,303

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**24.0" x 105.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 255.00' S= 0.0476 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Device 1	264.00'	**24.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#3	Secondary	270.50'	**4.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=41.42 cfs @ 12.04 hrs HW=271.50' TW=249.30' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 41.42 cfs of 49.01 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 41.42 cfs @ 13.2 fps)

Secondary OutFlow Max=10.47 cfs @ 12.04 hrs HW=271.50' TW=249.30' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Weir Controls 10.47 cfs @ 2.6 fps)

Pond CB41:

Inflow Area = 1.810 ac, Inflow Depth = 4.51" for Q-100 event
Inflow = 13.47 cfs @ 11.95 hrs, Volume= 0.680 af
Outflow = 13.47 cfs @ 11.95 hrs, Volume= 0.680 af, Atten= 0%, Lag= 0.0 min
Primary = 13.47 cfs @ 11.95 hrs, Volume= 0.680 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs

Peak Elev= 336.47' @ 12.01 hrs
Flood Elev= 309.90'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (767.6 - 767.6)

Device	Routing	Invert	Outlet Devices
#1	Primary	304.73'	**18.0" x 270.0' long line to DMH 5** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 301.90' S= 0.0105 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.65 cfs @ 11.95 hrs HW=326.36' TW=325.94' (Dynamic Tailwater)
1=line to DMH 5 (Outlet Controls 3.65 cfs @ 2.1 fps)

Pond CB62:

Inflow Area = 13.351 ac, Inflow Depth > 4.16" for Q-100 event
Inflow = 89.07 cfs @ 11.95 hrs, Volume= 4.626 af
Outflow = 89.07 cfs @ 11.95 hrs, Volume= 4.626 af, Atten= 0%, Lag= 0.0 min
Primary = 89.07 cfs @ 11.95 hrs, Volume= 4.626 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 317.36' @ 11.96 hrs
Flood Elev= 309.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (778.9 - 778.9)

Device	Routing	Invert	Outlet Devices
#1	Primary	297.90'	**36.0" x 260.0' long line to CB 64** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 296.87' S= 0.0040 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=82.16 cfs @ 11.95 hrs HW=316.39' TW=309.28' (Dynamic Tailwater)
1=line to CB 64 (Outlet Controls 82.16 cfs @ 11.6 fps)

Pond CB64:

Inflow Area = 15.789 ac, Inflow Depth > 4.17" for Q-100 event
Inflow = 107.11 cfs @ 11.94 hrs, Volume= 5.486 af
Outflow = 107.11 cfs @ 11.94 hrs, Volume= 5.486 af, Atten= 0%, Lag= 0.0 min
Primary = 107.11 cfs @ 11.94 hrs, Volume= 5.486 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 309.50' @ 11.95 hrs
Flood Elev= 309.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (778.5 - 778.5)

Device	Routing	Invert	Outlet Devices
#1	Primary	296.82'	**42.0" x 360.0' long storm line to CB 78**

CPP, square edge headwall, Ke= 0.500
Outlet Invert= 295.35' S= 0.0041 '/' Cc= 0.900
n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=103.91 cfs @ 11.94 hrs HW=309.28' TW=302.70' (Dynamic Tailwater)
1=storm line to CB 78 (Outlet Controls 103.91 cfs @ 10.8 fps)

Pond CB79: line to pond

Inflow Area = 17.128 ac, Inflow Depth > 4.18" for Q-100 event
Inflow = 117.15 cfs @ 11.94 hrs, Volume= 5.964 af
Outflow = 117.15 cfs @ 11.94 hrs, Volume= 5.964 af, Atten= 0%, Lag= 0.0 min
Primary = 117.15 cfs @ 11.94 hrs, Volume= 5.964 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 302.75' @ 11.94 hrs
Flood Elev= 310.50'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (778.2 - 778.2)

Device	Routing	Invert	Outlet Devices
#1	Primary	294.60'	**42.0" x 115.0' long line to pond** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 271.60' S= 0.2000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=117.00 cfs @ 11.94 hrs HW=302.73' TW=269.98' (Dynamic Tailwater)
1=line to pond (Inlet Controls 117.00 cfs @ 12.2 fps)

Pond DMH 5:

Inflow Area = 2.753 ac, Inflow Depth = 4.47" for Q-100 event
Inflow = 19.80 cfs @ 11.96 hrs, Volume= 1.025 af
Outflow = 19.80 cfs @ 11.96 hrs, Volume= 1.025 af, Atten= 0%, Lag= 0.0 min
Primary = 19.80 cfs @ 11.96 hrs, Volume= 1.025 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 333.90' @ 12.00 hrs
Flood Elev= 312.00'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (769.9 - 769.9)

Device	Routing	Invert	Outlet Devices
#1	Primary	301.19'	**20.0" x 142.0' long Storm line to DMH 4** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 300.61' S= 0.0041 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.65 cfs @ 11.96 hrs HW=327.38' TW=327.34' (Dynamic Tailwater)
1=Storm line to DMH 4 (Outlet Controls 1.65 cfs @ 0.8 fps)

Pond DMH1:

Inflow Area = 2.937 ac, Inflow Depth > 4.01" for Q-100 event
Inflow = 19.99 cfs @ 11.93 hrs, Volume= 0.981 af
Outflow = 19.99 cfs @ 11.93 hrs, Volume= 0.981 af, Atten= 0%, Lag= 0.0 min
Primary = 19.99 cfs @ 11.93 hrs, Volume= 0.981 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 328.86' @ 11.98 hrs
Flood Elev= 312.64'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (774.8 - 774.8)

Device	Routing	Invert	Outlet Devices
#1	Primary	305.76'	**20.0" x 251.0' long line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0244 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=12.52 cfs @ 11.93 hrs HW=322.40' TW=319.59' (Dynamic Tailwater)
1=line to DMH 2 (Outlet Controls 12.52 cfs @ 5.7 fps)

Pond DMH2:

Inflow Area = 12.038 ac, Inflow Depth > 4.14" for Q-100 event
Inflow = 79.48 cfs @ 11.95 hrs, Volume= 4.158 af
Outflow = 79.48 cfs @ 11.95 hrs, Volume= 4.158 af, Atten= 0%, Lag= 0.0 min
Primary = 79.48 cfs @ 11.95 hrs, Volume= 4.158 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 325.22' @ 11.97 hrs
Flood Elev= 313.20'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (779.2 - 779.2)

Device	Routing	Invert	Outlet Devices
#1	Primary	299.53'	**36.0" x 432.0' long storm line to CB 62** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 297.95' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=66.91 cfs @ 11.95 hrs HW=322.81' TW=316.36' (Dynamic Tailwater)
1=storm line to CB 62 (Outlet Controls 66.91 cfs @ 9.5 fps)

Pond DMH3:

Inflow Area = 1.645 ac, Inflow Depth = 4.28" for Q-100 event
Inflow = 12.42 cfs @ 11.94 hrs, Volume= 0.587 af
Outflow = 12.42 cfs @ 11.94 hrs, Volume= 0.587 af, Atten= 0%, Lag= 0.0 min
Primary = 12.42 cfs @ 11.94 hrs, Volume= 0.587 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 329.42' @ 11.98 hrs
Flood Elev= 311.60'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (775.7 - 775.7)

Device	Routing	Invert	Outlet Devices
#1	Primary	301.60'	**18.0" x 425.0' long storm line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0046 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=7.92 cfs @ 11.94 hrs HW=324.57' TW=321.69' (Dynamic Tailwater)
↑—**1=storm line to DMH 2** (Outlet Controls 7.92 cfs @ 4.5 fps)

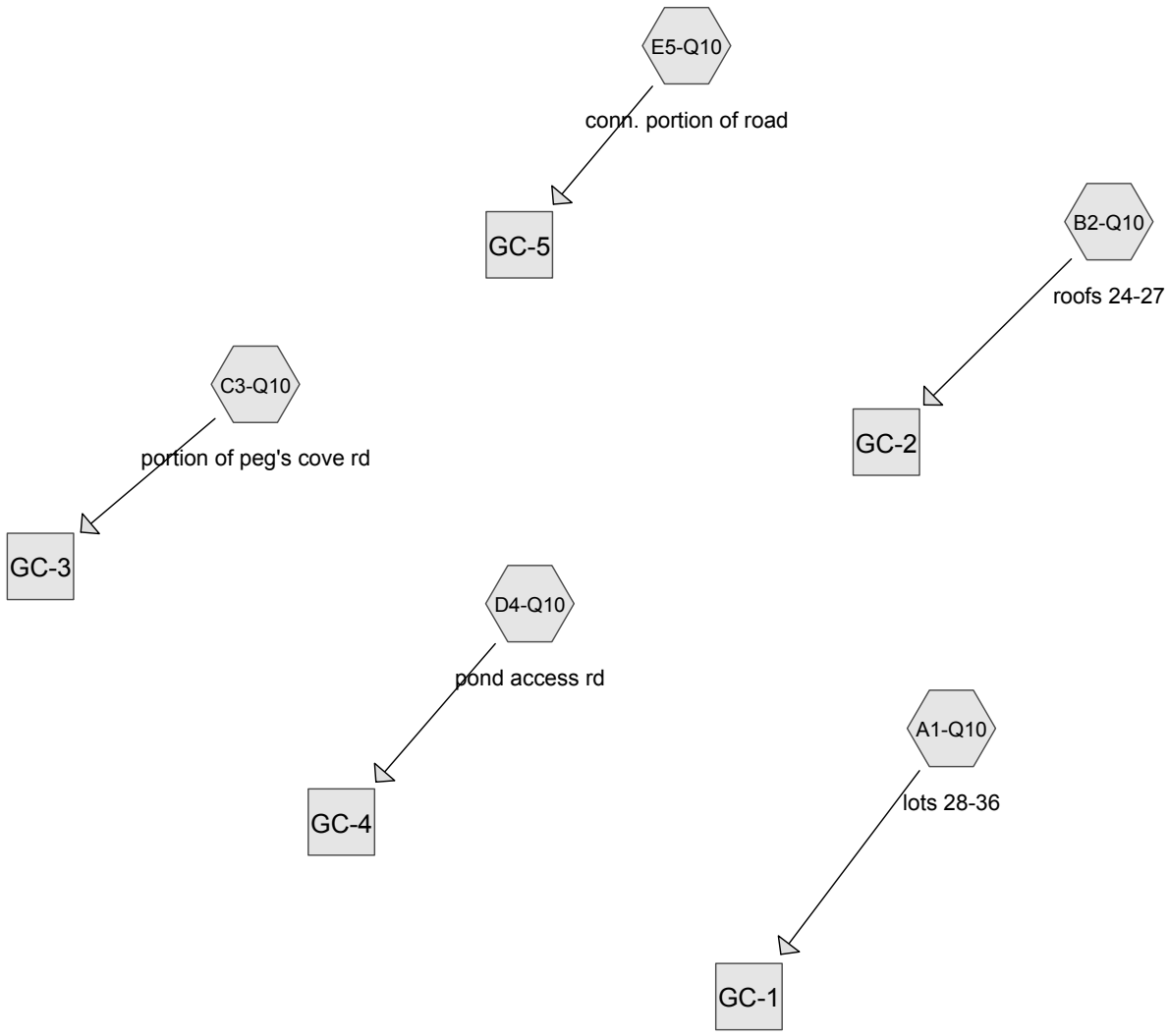
Pond DMH4:

Inflow Area = 4.491 ac, Inflow Depth = 4.27" for Q-100 event
Inflow = 29.78 cfs @ 11.97 hrs, Volume= 1.599 af
Outflow = 29.78 cfs @ 11.97 hrs, Volume= 1.599 af, Atten= 0%, Lag= 0.0 min
Primary = 29.78 cfs @ 11.97 hrs, Volume= 1.599 af

Routing by Dyn-Stor-Ind method, Time Span= 2.00-72.00 hrs, dt= 0.02 hrs
Peak Elev= 330.55' @ 11.99 hrs
Flood Elev= 313.20'
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (777.8 - 777.8)

Device	Routing	Invert	Outlet Devices
#1	Primary	300.36'	**24.0" x 210.0' long line to DMH 2** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 299.63' S= 0.0035 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=24.63 cfs @ 11.97 hrs HW=328.74' TW=324.81' (Dynamic Tailwater)
↑—**1=line to DMH 2** (Outlet Controls 24.63 cfs @ 7.8 fps)



Subcat Reach Pond Link

Drainage Diagram for WQ swales-Q10
Prepared by Civil Engineering Associates 1/9/2007

Time span=2.00-22.00 hrs, dt=0.02 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1-Q10: lots 28-36 Runoff Area=12,458 sf Runoff Depth>1.55"
Flow Length=36' Tc=2.8 min CN=83 Runoff=0.92 cfs 0.037 af

Subcatchment B2-Q10: roofs 24-27 Runoff Area=0.190 ac Runoff Depth>1.41"
Flow Length=56' Tc=3.5 min CN=81 Runoff=0.55 cfs 0.022 af

Subcatchment C3-Q10: portion of peg's cove rd Runoff Area=10,019 sf Runoff Depth>1.22"
Tc=1.0 min CN=78 Runoff=0.62 cfs 0.023 af

Subcatchment D4-Q10: pond access rd Runoff Area=8,498 sf Runoff Depth>1.22"
Flow Length=110' Tc=4.8 min CN=78 Runoff=0.46 cfs 0.020 af

Subcatchment E5-Q10: conn. portion of road Runoff Area=0.174 ac Runoff Depth>0.99"
Tc=1.0 min CN=74 Runoff=0.38 cfs 0.014 af

Reach GC-1: Peak Depth=0.31' Max Vel=0.6 fps Inflow=0.92 cfs 0.037 af
n=0.150 L=230.0' S=0.0261 '/' Capacity=9.23 cfs Outflow=0.68 cfs 0.037 af

Reach GC-2: Peak Depth=0.19' Max Vel=0.5 fps Inflow=0.55 cfs 0.022 af
n=0.150 L=140.0' S=0.0250 '/' Capacity=11.36 cfs Outflow=0.45 cfs 0.022 af

Reach GC-3: Peak Depth=0.28' Max Vel=0.4 fps Inflow=0.62 cfs 0.023 af
n=0.150 L=310.0' S=0.0161 '/' Capacity=4.48 cfs Outflow=0.35 cfs 0.023 af

Reach GC-4: Peak Depth=0.24' Max Vel=0.6 fps Inflow=0.46 cfs 0.020 af
n=0.150 L=195.0' S=0.0308 '/' Capacity=6.19 cfs Outflow=0.37 cfs 0.020 af

Reach GC-5: Peak Depth=0.24' Max Vel=0.3 fps Inflow=0.38 cfs 0.014 af
n=0.150 L=200.0' S=0.0100 '/' Capacity=0.94 cfs Outflow=0.22 cfs 0.014 af

Total Runoff Area = 1.075 ac Runoff Volume = 0.117 af Average Runoff Depth = 1.30"

Subcatchment A1-Q10: lots 28-36

Runoff = 0.92 cfs @ 11.94 hrs, Volume= 0.037 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
4,922	98	Paved parking & roofs
7,536	74	>75% Grass cover, Good, HSG C
12,458	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.7	16	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	36	Total			

Subcatchment B2-Q10: roofs 24-27

Runoff = 0.55 cfs @ 11.94 hrs, Volume= 0.022 af, Depth> 1.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.052	98	Paved parking & roofs
0.138	74	>75% Grass cover, Good, HSG C
0.190	81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
3.4	36	0.0550	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
3.5	56	Total			

Subcatchment C3-Q10: portion of peg's cove rd

Runoff = 0.62 cfs @ 11.91 hrs, Volume= 0.023 af, Depth> 1.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
1,760	98	Paved parking & roofs
8,259	74	>75% Grass cover, Good, HSG C
10,019	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Subcatchment D4-Q10: pond access rd

Runoff = 0.46 cfs @ 11.96 hrs, Volume= 0.020 af, Depth> 1.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (sf)	CN	Description
2,160	89	Gravel roads, HSG C
6,338	74	>75% Grass cover, Good, HSG C
8,498	78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	30	0.0300	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.0	80	0.0500	1.3	4.28	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 3.0 '/' Top.W=6.50' n= 0.150
4.8	110	Total			

Subcatchment E5-Q10: conn. portion of road

Runoff = 0.38 cfs @ 11.92 hrs, Volume= 0.014 af, Depth> 0.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr Q-10 Rainfall=3.20"

Area (ac)	CN	Description
0.061	98	Paved parking & roofs
0.113	61	>75% Grass cover, Good, HSG B
0.174	74	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Reach GC-1:

Inflow Area = 0.286 ac, Inflow Depth > 1.55" for Q-10 event
Inflow = 0.92 cfs @ 11.94 hrs, Volume= 0.037 af
Outflow = 0.68 cfs @ 11.98 hrs, Volume= 0.037 af, Atten= 26%, Lag= 2.8 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.6 fps, Min. Travel Time= 6.9 min
Avg. Velocity = 0.2 fps, Avg. Travel Time= 21.2 min

Peak Depth= 0.31' @ 11.98 hrs
Capacity at bank full= 9.23 cfs
Inlet Invert= 311.00', Outlet Invert= 305.00'
2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 10.0 3.0 '/' Top Width= 15.00'
Length= 230.0' Slope= 0.0261 '/'

Reach GC-2:

Inflow Area = 0.190 ac, Inflow Depth > 1.41" for Q-10 event
Inflow = 0.55 cfs @ 11.94 hrs, Volume= 0.022 af
Outflow = 0.45 cfs @ 11.98 hrs, Volume= 0.022 af, Atten= 18%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.5 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 18.2 min

Peak Depth= 0.19' @ 11.98 hrs
Capacity at bank full= 11.36 cfs
Inlet Invert= 311.00', Outlet Invert= 307.50'
4.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 8.0 4.0 '/' Top Width= 16.00'
Length= 140.0' Slope= 0.0250 '/'

Reach GC-3:

Inflow Area = 0.230 ac, Inflow Depth > 1.22" for Q-10 event
Inflow = 0.62 cfs @ 11.91 hrs, Volume= 0.023 af
Outflow = 0.35 cfs @ 11.97 hrs, Volume= 0.023 af, Atten= 43%, Lag= 3.5 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.4 fps, Min. Travel Time= 11.6 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 34.5 min

Peak Depth= 0.28' @ 11.97 hrs
Capacity at bank full= 4.48 cfs
Inlet Invert= 311.00', Outlet Invert= 306.00'
2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 310.0' Slope= 0.0161 '/'

Reach GC-4:

Inflow Area = 0.195 ac, Inflow Depth > 1.22" for Q-10 event
Inflow = 0.46 cfs @ 11.96 hrs, Volume= 0.020 af
Outflow = 0.37 cfs @ 12.01 hrs, Volume= 0.020 af, Atten= 20%, Lag= 2.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.6 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.2 fps, Avg. Travel Time= 18.7 min

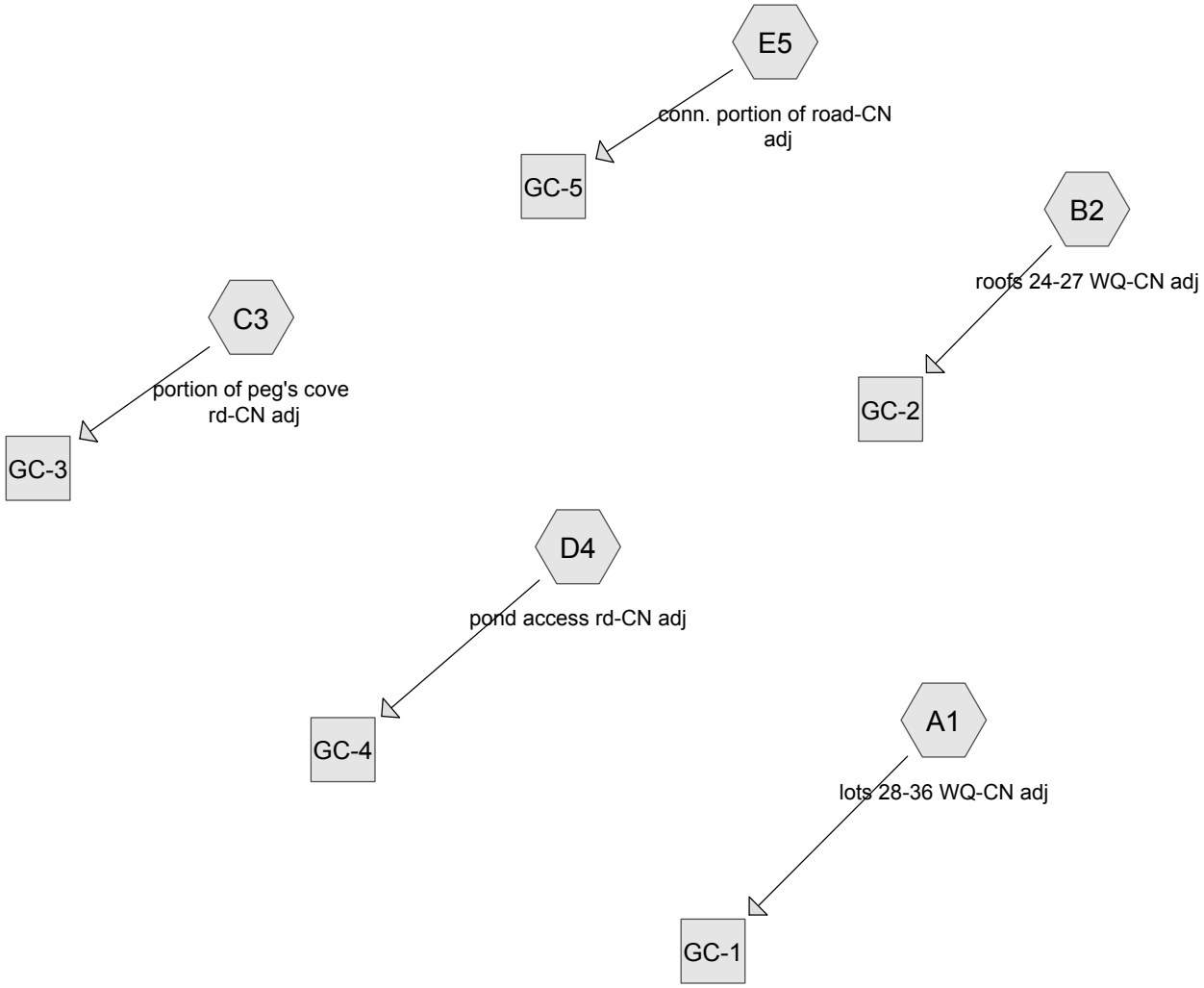
Peak Depth= 0.24' @ 12.01 hrs
Capacity at bank full= 6.19 cfs
Inlet Invert= 304.00', Outlet Invert= 298.00'
2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 195.0' Slope= 0.0308 '/'

Reach GC-5:

Inflow Area = 0.174 ac, Inflow Depth > 0.99" for Q-10 event
Inflow = 0.38 cfs @ 11.92 hrs, Volume= 0.014 af
Outflow = 0.22 cfs @ 11.97 hrs, Volume= 0.014 af, Atten= 43%, Lag= 3.5 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.3 fps, Min. Travel Time= 10.7 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 30.2 min

Peak Depth= 0.24' @ 11.97 hrs
Capacity at bank full= 0.94 cfs
Inlet Invert= 311.00', Outlet Invert= 309.00'
2.00' x 0.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 5.0 '/' Top Width= 6.00'
Length= 200.0' Slope= 0.0100 '/'



Subcat Reach Pond Link

Drainage Diagram for WQ swales-WQ storm (0.9)
Prepared by Civil Engineering Associates 1/9/2007

Time span=2.00-22.00 hrs, dt=0.02 hrs, 1001 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A1: lots 28-36 WQ-CN adj Runoff Area=0.286 ac Runoff Depth>0.36"
Flow Length=36' Tc=2.8 min CN=93 Runoff=0.22 cfs 0.009 af

Subcatchment B2: roofs 24-27 WQ-CN adj Runoff Area=8,261 sf Runoff Depth>0.24"
Flow Length=56' Tc=3.5 min CN=90 Runoff=0.09 cfs 0.004 af

Subcatchment C3: portion of peg's cove rd-CN adj Runoff Area=0.230 ac Runoff Depth>0.19"
Tc=1.0 min CN=88 Runoff=0.09 cfs 0.004 af

Subcatchment D4: pond access rd-CN adj Runoff Area=8,498 sf Runoff Depth>0.24"
Flow Length=110' Tc=4.8 min CN=90 Runoff=0.09 cfs 0.004 af

Subcatchment E5: conn. portion of road-CN adj Runoff Area=0.174 ac Runoff Depth>0.32"
Tc=1.0 min CN=92 Runoff=0.12 cfs 0.005 af

Reach GC-1: Peak Depth=0.13' Max Vel=0.3 fps Inflow=0.22 cfs 0.009 af
n=0.150 L=230.0' S=0.0261 '/' Capacity=9.23 cfs Outflow=0.13 cfs 0.008 af

Reach GC-2: Peak Depth=0.06' Max Vel=0.2 fps Inflow=0.09 cfs 0.004 af
n=0.150 L=140.0' S=0.0250 '/' Capacity=11.36 cfs Outflow=0.06 cfs 0.004 af

Reach GC-3: Peak Depth=0.06' Max Vel=0.2 fps Inflow=0.09 cfs 0.004 af
n=0.150 L=310.0' S=0.0161 '/' Capacity=4.48 cfs Outflow=0.03 cfs 0.003 af

Reach GC-4: Peak Depth=0.08' Max Vel=0.3 fps Inflow=0.09 cfs 0.004 af
n=0.150 L=195.0' S=0.0308 '/' Capacity=6.19 cfs Outflow=0.06 cfs 0.004 af

Reach GC-5: Peak Depth=0.11' Max Vel=0.2 fps Inflow=0.12 cfs 0.005 af
n=0.150 L=200.0' S=0.0100 '/' Capacity=0.94 cfs Outflow=0.06 cfs 0.004 af

Total Runoff Area = 1.075 ac Runoff Volume = 0.025 af Average Runoff Depth = 0.27"

Subcatchment A1: lots 28-36 WQ-CN adj

Runoff = 0.22 cfs @ 11.94 hrs, Volume= 0.009 af, Depth> 0.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr WQv-0.9" Rainfall=0.90"

Area (ac)	CN	Description
0.113	93	roofs
0.173	93	lawn
0.286	93	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
2.7	16	0.0200	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
2.8	36	Total			

Subcatchment B2: roofs 24-27 WQ-CN adj

Runoff = 0.09 cfs @ 11.95 hrs, Volume= 0.004 af, Depth> 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr WQv-0.9" Rainfall=0.90"

Area (sf)	CN	Description
2,250	90	roofs
6,011	90	>75% Grass cover, Good, HSG C
8,261	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	20	0.3000	2.5		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.30"
3.4	36	0.0550	0.2		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
3.5	56	Total			

Subcatchment C3: portion of peg's cove rd-CN adj

Runoff = 0.09 cfs @ 11.92 hrs, Volume= 0.004 af, Depth> 0.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr WQv-0.9" Rainfall=0.90"

Area (ac)	CN	Description
0.040	88	Paved parking & roofs
0.190	88	>75% Grass cover, Good, HSG C
0.230	88	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Subcatchment D4: pond access rd-CN adj

Runoff = 0.09 cfs @ 11.97 hrs, Volume= 0.004 af, Depth> 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr WQv-0.9" Rainfall=0.90"

Area (sf)	CN	Description
2,160	90	Gravel roads, HSG C
6,338	90	>75% Grass cover, Good, HSG C
8,498	90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	30	0.0300	0.1		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.30"
1.0	80	0.0500	1.3	4.28	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=0.75' Z= 3.0 '/' Top.W=6.50' n= 0.150
4.8	110	Total			

Subcatchment E5: conn. portion of road-CN adj

Runoff = 0.12 cfs @ 11.92 hrs, Volume= 0.005 af, Depth> 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Type II 24-hr WQv-0.9" Rainfall=0.90"

Area (ac)	CN	Description
0.061	92	
0.113	92	>75% Grass cover, Good, HSG B
0.174	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0					**Direct Entry,**

Reach GC-1:

Inflow Area = 0.286 ac, Inflow Depth > 0.36" for WQv-0.9" event
Inflow = 0.22 cfs @ 11.94 hrs, Volume= 0.009 af
Outflow = 0.13 cfs @ 12.00 hrs, Volume= 0.008 af, Atten= 39%, Lag= 3.7 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.3 fps, Min. Travel Time= 11.1 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 32.3 min

Peak Depth= 0.13' @ 12.00 hrs
Capacity at bank full= 9.23 cfs
Inlet Invert= 311.00', Outlet Invert= 305.00'
2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 10.0 3.0 '/' Top Width= 15.00'
Length= 230.0' Slope= 0.0261 '/'

Reach GC-2:

Inflow Area = 0.190 ac, Inflow Depth > 0.24" for WQv-0.9" event
Inflow = 0.09 cfs @ 11.95 hrs, Volume= 0.004 af
Outflow = 0.06 cfs @ 12.01 hrs, Volume= 0.004 af, Atten= 40%, Lag= 3.8 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.2 fps, Min. Travel Time= 10.4 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 28.3 min

Peak Depth= 0.06' @ 12.01 hrs
Capacity at bank full= 11.36 cfs
Inlet Invert= 311.00', Outlet Invert= 307.50'
4.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 8.0 4.0 '/' Top Width= 16.00'
Length= 140.0' Slope= 0.0250 '/'

Reach GC-3:

Inflow Area = 0.230 ac, Inflow Depth > 0.19" for WQv-0.9" event
Inflow = 0.09 cfs @ 11.92 hrs, Volume= 0.004 af
Outflow = 0.03 cfs @ 12.01 hrs, Volume= 0.003 af, Atten= 73%, Lag= 5.3 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.2 fps, Min. Travel Time= 27.9 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 59.5 min

Peak Depth= 0.06' @ 12.01 hrs
Capacity at bank full= 4.48 cfs
Inlet Invert= 311.00', Outlet Invert= 306.00'
2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 310.0' Slope= 0.0161 '/'

Reach GC-4:

Inflow Area = 0.195 ac, Inflow Depth > 0.24" for WQv-0.9" event
Inflow = 0.09 cfs @ 11.97 hrs, Volume= 0.004 af
Outflow = 0.06 cfs @ 12.03 hrs, Volume= 0.004 af, Atten= 39%, Lag= 4.1 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.3 fps, Min. Travel Time= 10.7 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 30.7 min

Peak Depth= 0.08' @ 12.03 hrs
Capacity at bank full= 6.19 cfs
Inlet Invert= 304.00', Outlet Invert= 298.00'
2.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 8.00'
Length= 195.0' Slope= 0.0308 '/'

Reach GC-5:

Inflow Area = 0.174 ac, Inflow Depth > 0.32" for WQv-0.9" event
Inflow = 0.12 cfs @ 11.92 hrs, Volume= 0.005 af
Outflow = 0.06 cfs @ 11.98 hrs, Volume= 0.004 af, Atten= 53%, Lag= 4.1 min

Routing by Dyn-Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.2 fps, Min. Travel Time= 16.2 min
Avg. Velocity = 0.1 fps, Avg. Travel Time= 46.4 min

Peak Depth= 0.11' @ 11.98 hrs
Capacity at bank full= 0.94 cfs
Inlet Invert= 311.00', Outlet Invert= 309.00'
2.00' x 0.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 5.0 '/' Top Width= 6.00'
Length= 200.0' Slope= 0.0100 '/'

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the science of insight

IRELAND DEVELOPMENT, LLC

SEVERANCE ROAD PUD TRAFFIC IMPACT STUDY

DRAFT | June 20, 2019

PREPARED FOR:
IRELAND DEVELOPMENT, LLC

SUBMITTED BY:
RSG

180 Battery Street, Suite 350
Burlington, VT 05401
802.383.0118
www.rsginc.com

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 EXECUTIVE SUMMARY

RSG has completed a traffic analysis of the existing road network in Colchester adjacent to the proposed Severance Road Planned Use Development (SRPUD). This memorandum documents the analysis and results of the expected traffic impacts as a result of the proposed development.

This Traffic Impact Study (TIS) includes the following sections:

1. Geographic and Scenario Scope
2. Existing Traffic Volumes
3. Proposed Development Trip Generation and Distribution
4. Congestion Analysis
5. Turn Lane Warrant Analysis
6. Crash Review and Safety Analysis
7. Summary of Analysis

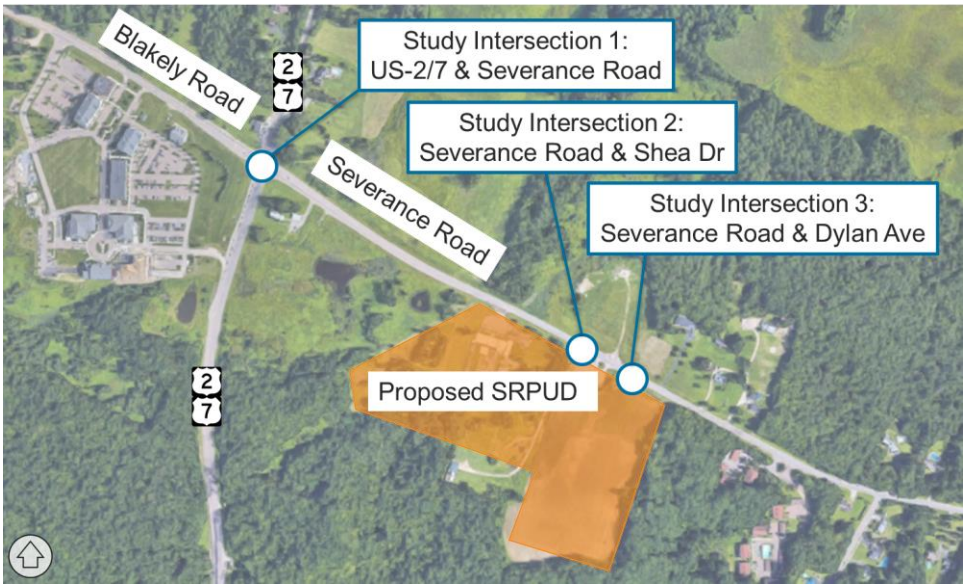
Summary:

- RSG evaluated the a.m. and p.m. peak hour traffic operations at three intersections (Severance Road at US-2/7, Shea Drive (western driveway), and Dylan Avenue (eastern driveway)) and two design years (2020 and 2025) in the build and no-build conditions.
- SRPUD is forecast to generate 145 and 157 new external trips in the a.m. and p.m. peak hours, respectively.
- Both driveway entrances into the proposed development from Severance Road, Shea Drive and Dylan Avenue, are proposed as full access (all turning movements allowed). The driveways are not expected to interact with any adjacent intersections or queues.
- The driveway entrances at Shea Drive and Dylan Avenue are expected to operate acceptably in all analyzed base and future peak hour periods.
- The additional trips generated by the SRPUD will add traffic to the congested US-2/7 / Blakely Road / Severance Road intersection with increases to delay in both the a.m. and p.m. peak hours. The proposed Severance Corners Intersection Project COLCHESTER STPG 5600(17) is expected to greatly increase intersection capacity.
- A westbound left turn from Severance Road is warranted into the development and recommended due to existing history of rear end crashes along Severance Road. RSG recommends the location of the westbound left turn lane at Shea Drive.

2.0 GEOGRAPHIC AND SCENARIO SCOPE

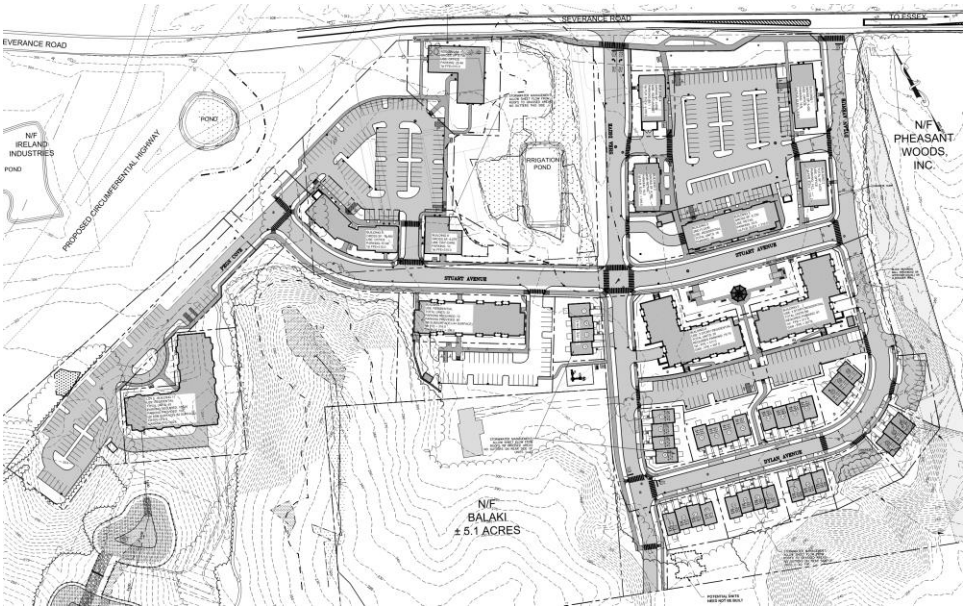
The location of the proposed SRPUD is approximately 1500 feet east of US Route 2/7 (US-2/7) along Severance Road in Colchester, Vermont.

FIGURE 1: LOCATION OF SRPUD AND TIS STUDY INTERSECTIONS IN COLCHESTER, VERMONT.



The SRPUD site plan is illustrated in Figure 2.

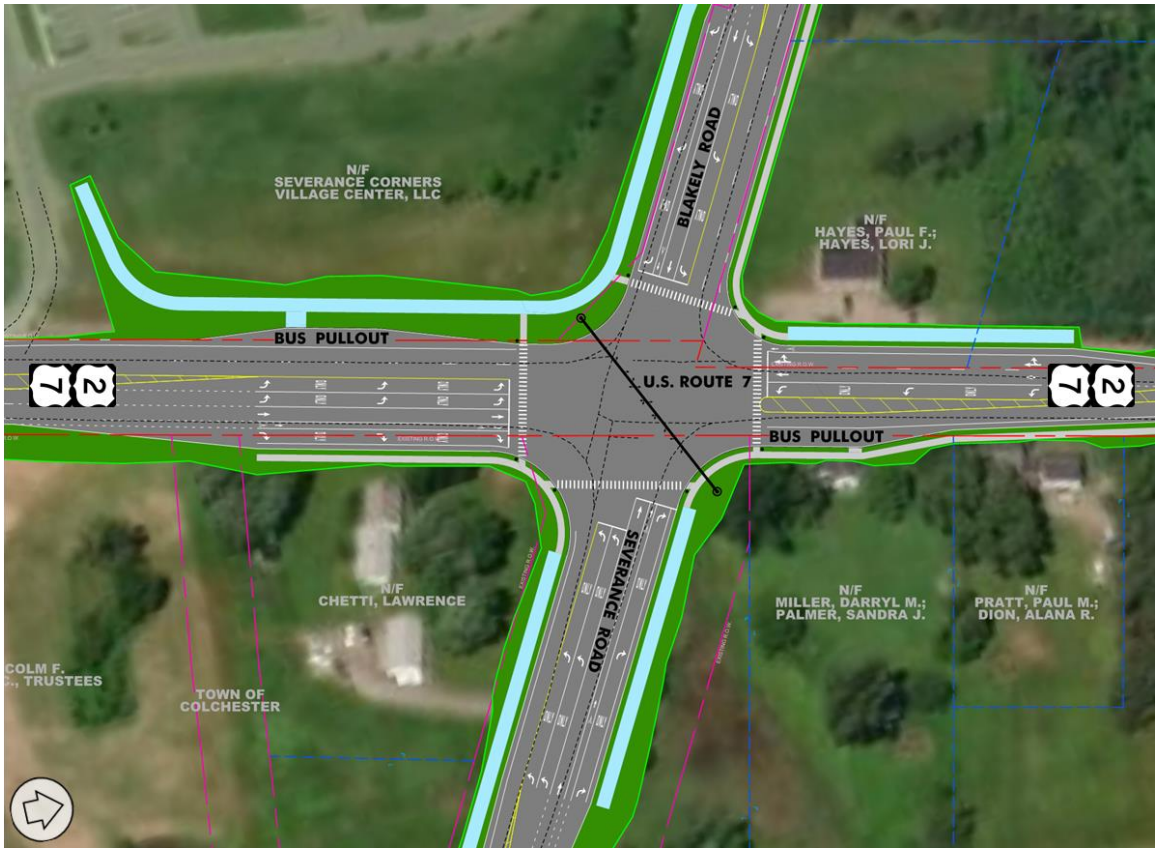
FIGURE 2: SRPUD SITE PLAN.



This TIS focuses on the two proposed full-access (all turning movements allowed) driveways along Severance Road. The TIS also reviews potential interactions with the site driveways and queues associated with the US-2/7 intersection. The west driveway, Shea Drive, is located approximately 1,650 feet east of the US-2/7 intersection, while the eastern driveway, Dylan Avenue, is located approximately 400 feet further east along Severance Road.

VTrans is planning improvements to the US-2/7 intersection under project COLCHESTER STPG 5600(17). The latest Statewide Transportation Improvement Plan (STIP) identifies the construction year for these improvements in Fiscal Year 2022.

FIGURE 3: PROPOSED COLCHESTER STPG 5600(17) INTERSECTION IMPROVEMENTS.



Typically, a TIS assesses the a.m. and p.m. peak hour traffic conditions in the proposed build year, and five years after buildout. This TIS analyzes conditions in the year 2020 and 2025. Given construction of these intersection improvements is expected in 2022, the 2025 analysis will assume the intersection is constructed as designed with associated capacity improvements.

3.0 EXISTING TRAFFIC VOLUMES

This study relies upon design standards and analysis procedures documented in the Highway Capacity Manual 6th Edition,[1] Trip Generation,[2] A Policy on Geometric Design of Highways and Streets,[3] Manual on Uniform Traffic Control Devices (MUTCD),[4] Traffic Impact Evaluation: Study and Review Guide,[5] and the Vermont State Design Standards,[6] which are the generally accepted traffic analysis references relied upon by traffic engineering professionals and VTrans for projects of this type in Vermont.

VTrans guidelines specify that a traffic study should be considered if the proposed development will generate 75 or more peak hour trips. The geographic scope of the study should also include the immediate access points and those intersections or highway segments receiving 75 or more project-generated peak hour trips.[7]

3.1 EXISTING ROADWAY BACKGROUND

US-2/7 is a State Highway under VTrans jurisdiction with a speed limit of 40 mph. Severance Road (TH-7, MA S5616) and Blakely Road (TH-9, MA S5600) are Class 2 town highways, classified as minor arterials, both with a speed limit of 35 mph.

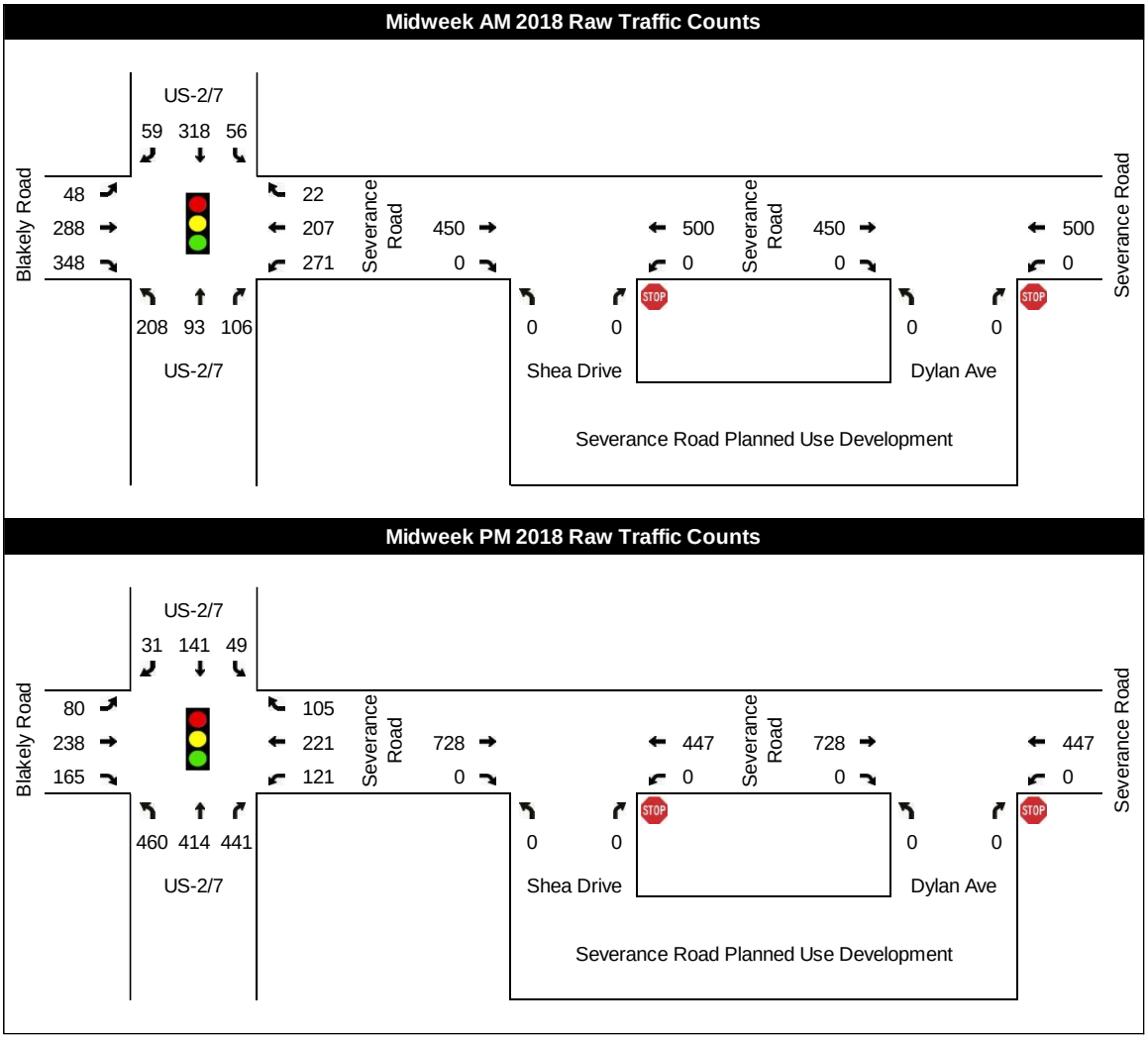
3.2 TRAFFIC COUNTS

The study area includes the three intersections depicted in Figure 1. RSG compiled the traffic volumes for the US-2/7 & Severance Road intersection from an intersection count conducted by VTrans. The 6 a.m. – 12 p.m. count was conducted on Tuesday, June 12, 2018, and the 12 p.m. – 6 p.m. count was conducted on Monday, June 11, 2018.

[1] Transportation Research Board, National Research Council, *Highway Capacity Manual* (Washington, DC: National Academy of Sciences, 2010).
[2] Institute of Transportation Engineers, *Trip Generation* 10th Edition (Washington, D.C.: Institute of Transportation Engineers, 2017).
[3] American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 7th Edition (Washington DC: AASHTO, 2018).
[4] American Traffic Safety Services Association (ATSSA), ITE, and AASHTO, *Manual on Uniform Traffic Control Devices*, 2009 Edition (Washington DC: FHWA, 2009).
[5] Vermont Agency of Transportation, Development Review Section, *Traffic Impact Evaluation Study and Review Guide* (October 2008).
[6] State of Vermont Agency of Transportation, *Vermont State Standards* (Montpelier: VTrans, 1 July 1997).
[7] Vermont Agency of Transportation, Development Review Section, *Traffic Impact Evaluation Study and Review Guide* (October 2008).

The a.m. and p.m. peak hour turning movements as observed (unadjusted) on the date of the counts are illustrated in Figure 4. The a.m. peak hour was observed between 7:15 a.m. – 8:15 a.m., and the p.m. peak hour was observed between 4:30 p.m. and 5:30 p.m.

FIGURE 4: A.M. AND P.M. PEAK HOUR TURNING MOVEMENT COUNTS AS OBSERVED.



3.3 ADJUSTMENTS TO OBSERVED VOLUMES

RSG applied the following adjustments to the observed traffic volumes at the US-2/7 and Severance Road intersection:

1. The design hour volume (DHV) adjustment factor is based on VTrans continuous traffic counter (CTC) station D040 located approximately ½ mile south of Severance Road along US-2/7. RSG compared the 2018 DHV at this station to the southbound (SB)

exiting and northbound (NB) entering peak hour volumes of the turning movement count to formulate DHV adjustments. DHV adjustments change raw count volumes by +1%.

2. The VTrans Redbook estimates regional background traffic growth factor of +1% from 2018 to 2020, and +3% from 2018 to 2025.

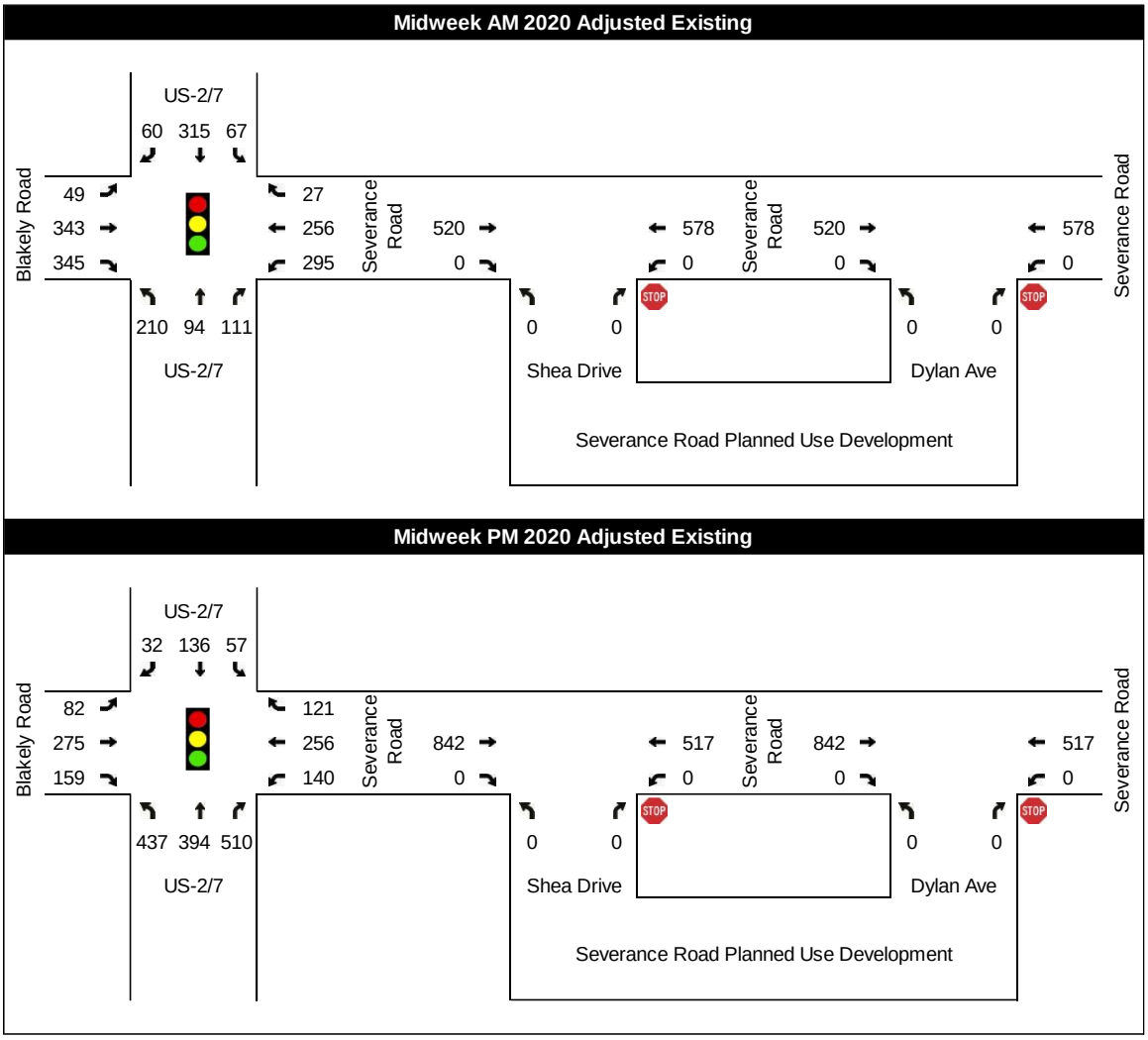
The total US-2/7 and Severance Road intersection adjustment from 2018 observed traffic volumes to 2020 adjusted traffic volumes is +2%.

RSG applied the following adjustments to the observed traffic volumes along Severance Road:

1. The design hour volume (DHV) adjustment factor is based on VTrans automatic traffic recorder (CTC) station D519 located approximately ½ mile east of US-2/7 along Severance Road. RSG compared the 2016 DHV at this station to the eastbound (EB) exiting and westbound (WB) entering peak hour volumes of the turning movement count to formulate DHV adjustments. DHV adjustments change raw count volumes by +13%.
2. The VTrans Redbook estimates regional background traffic growth factor of +2% from 2016 to 2020, and +4% from 2016 to 2025.

The total Severance Road adjustment from 2018 observed traffic volumes to 2020 adjusted traffic volumes is +16%. RSG balanced the contributing Severance Road approach volumes within the US-2/7 intersection to maintain consistency with CTC D040. This resulted in a net increase of +24 trips and +84 trips through the US-2/7 intersection in the a.m. and p.m. peak hours, respectively.

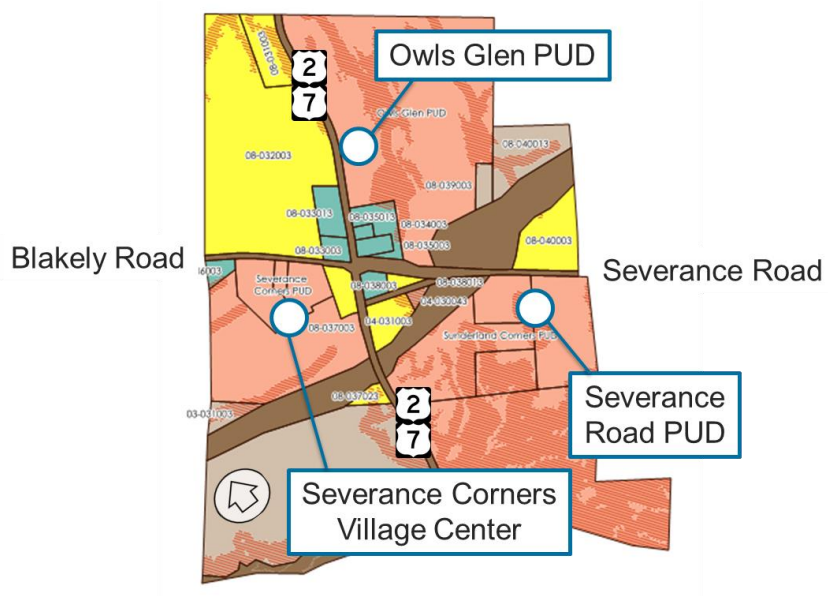
FIGURE 5: 2020 ADJUSTED PEAK HOUR TURNING MOVEMENT VOLUMES.



3.4 OTHER DEVELOPMENT VOLUMES

Other development volumes (ODVs) represent trips generated by anticipated developments in the study area. Trips generated by ODVs are included in all future scenarios. The Town of Colchester has highlighted two other developments in the area that may impact traffic volumes by 2020: continued development within Severance Corners Village Center, and the Owls Glen PUD. These two developments are illustrated in Figure 6.

FIGURE 6: OTHER DEVELOPMENTS NEAR SEVERANCE ROAD PUD.



Severance Corners Village Development

There are several permitted but unoccupied or unfinished projects within the Severance Corners Village Center development on the southwest corner of US-2/7. These projects include:

- 74 residential units
- 1,800 SF high turnover restaurant
- 14,200 SF office space

RSG prepared an analysis of traffic resulting from these projects dated April 10, 2017, attached as Appendix A. The same a.m. and p.m. peak hour estimated traffic volumes are added into the background traffic.

Owls Glen PUD

The Owls Glen PUD consists of 113 residential units on the northeast corner of US-2/7 and Severance Road, west of the Circumferential Highway right-of-way. Access to the PUD will be on US-2/7.

Since only the total number of units within Owls Glen PUD is known but not the specific type of residential unit, RSG applied Land Use Code 270 – Residential Planned Use Development to estimate the trip generation rates. Typical with residential developments, pass-by and mixed-use development reductions are not applicable. Table 1 documents the estimated a.m. and p.m. peak hour trip generation expected from the Owls Glen PUD.

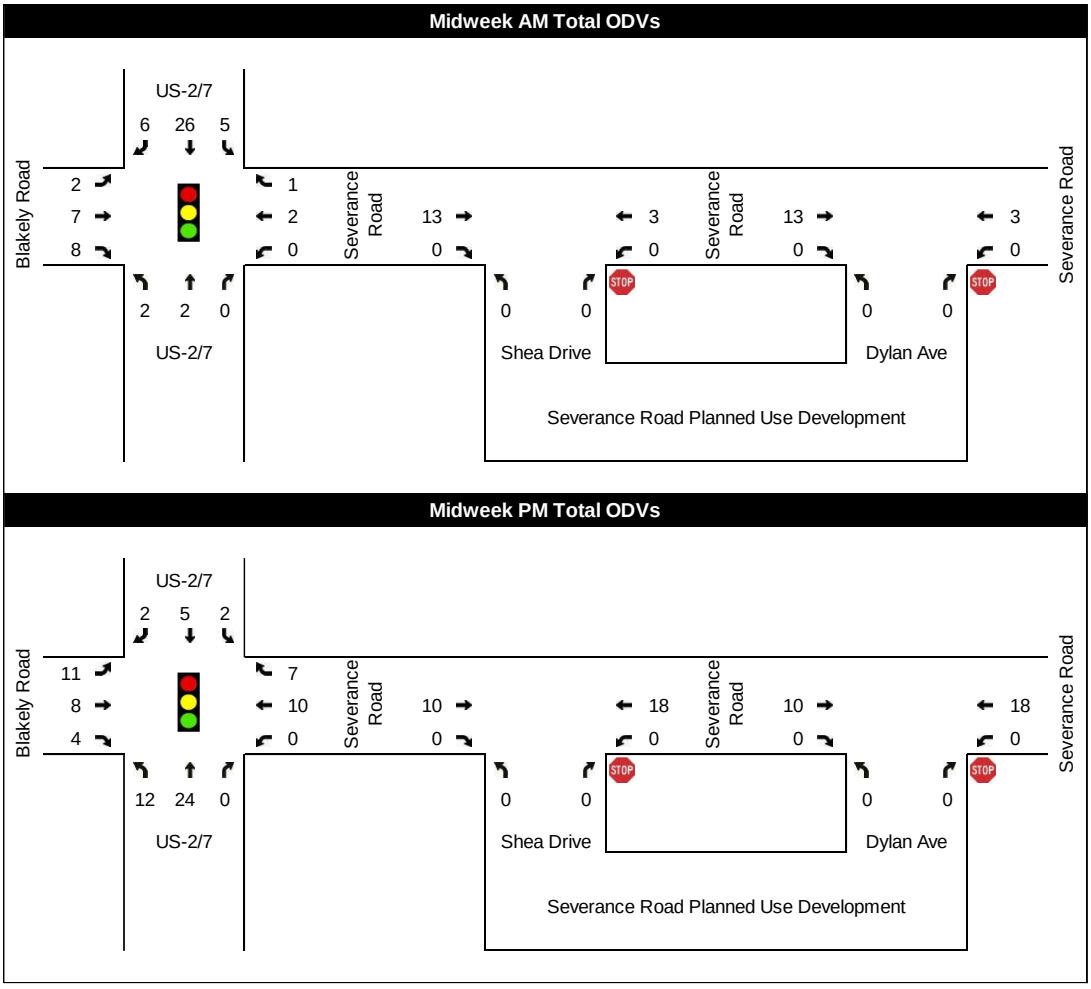
TABLE 1: ESTIMATED OWLS GLEN TRIP GENERATION.

	Projected Trip Generation				
	Primary		Passby		Total
	Enter	Exit	Enter	Exit	
LUC: 270 - Residential Planned Use Development					
Weekday AM Peak Hour	14	50	0	0	64
Weekday PM Peak Hour	51	27	0	0	78

ODV Trip Distribution

The ODV trips were distributed proportional to the adjusted observed volumes. The 4/10/17 memo documents the trip distribution process for the continued development of the Severance Corners Village Center; Appendix B of this TIS documents trip distribution associated with Owls Glen. The ODV trips added into the network are illustrated in Figure 7.

FIGURE 7: TOTAL ODV TRIPS ASSOCIATED WITH CONTINUED DEVELOPMENT OF THE SERVERANCE CORNERS VILLAGE CENTER AND OWLS GLEN PUD.



3.5 NO BUILD SCENARIO VOLUMES

The 2020 and 2025 No Build Scenario Volumes for the a.m. and p.m. peak hours are illustrated in Figure 8 and Figure 9, respectively. The scenario volumes include all adjustments, balancing, and ODVs as described earlier in the TIS.

FIGURE 8: 2020 NO BUILD SCENARIO VOLUMES FOR THE AM AND PM PEAK HOURS.

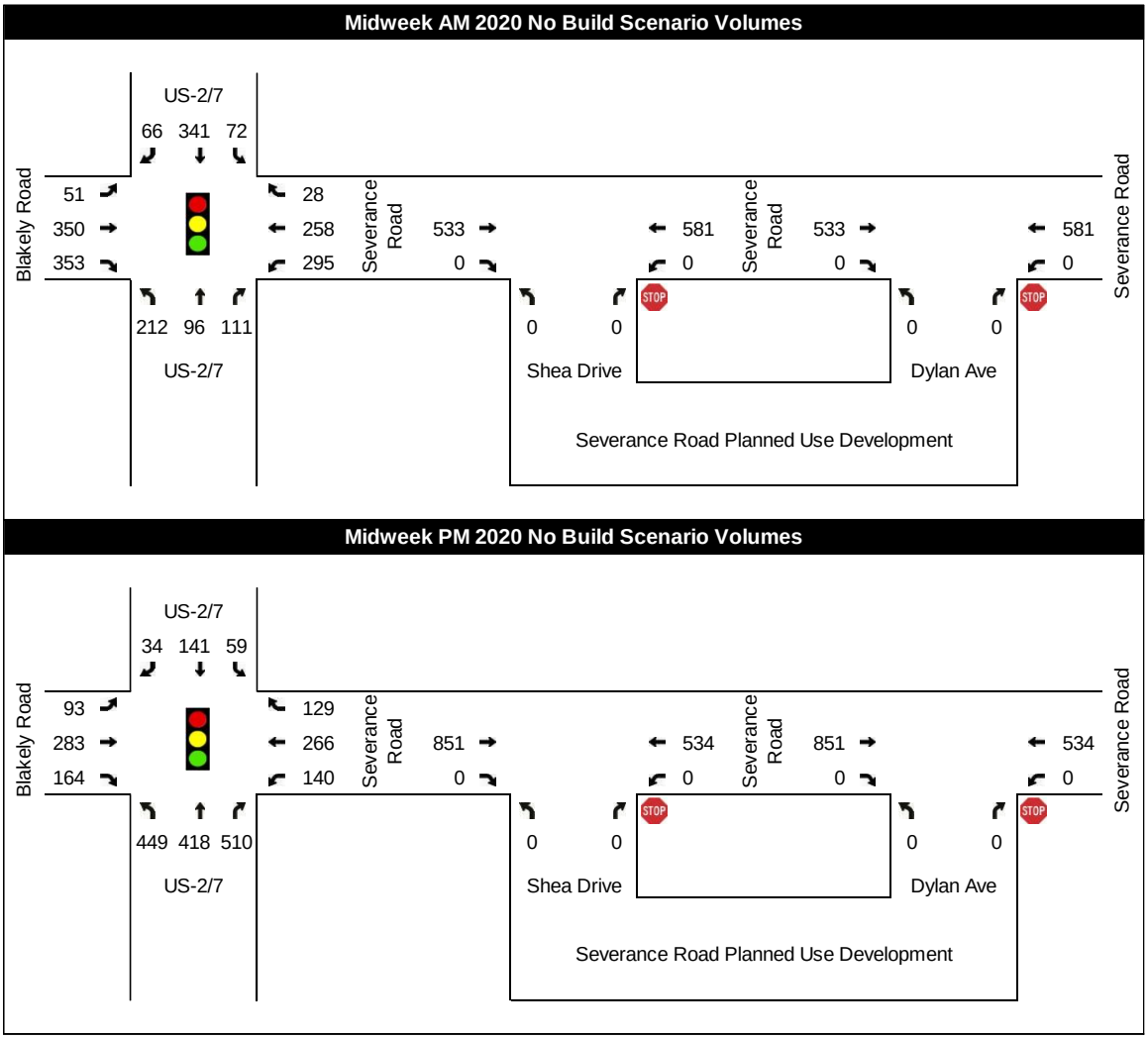
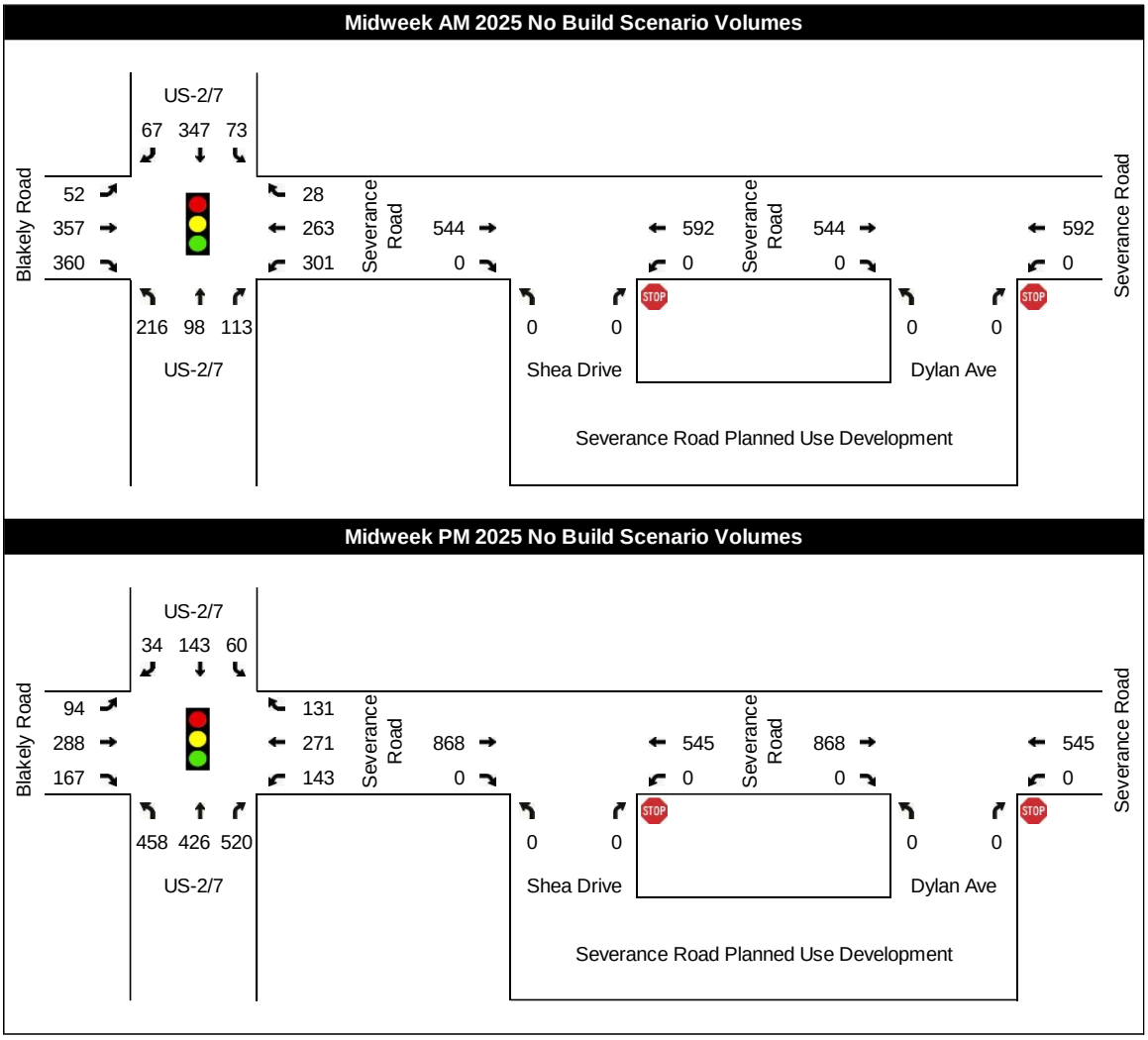


FIGURE 9: 2025 NO BUILD SCENARIO VOLUMES FOR THE AM AND PM PEAK HOURS.



4.0 PROPOSED DEVELOPMENT VOLUMES

Trip generation estimates for the proposed land uses are shown in Table 1; refer to Figure 10 for corresponding building numbers. Following VTrans Transportation Demand Management Guidance[8], a 4% credit is taken to account for Transportation Demand Management (TDM) measures made to encourage the use of alternate modes for mixed use developments with low existing transit usage rates. Internal capture estimates the number of trips that would be between uses within the development due to its mixed-use nature. More detailed Trip Generation and Distribution Summary and Internal Capture Worksheets are included as Appendix B and Appendix D, respectively, to this TIS.

TABLE 2: AM PEAK AND PM PEAK TRIP GENEREATION ESTIMATES FOR SRPUD.

			ITE Land Use Description							External Trips		Passby Trips	
Building	Land Use	ITE LUC	Mid-rise Apartment Units	Low-rise Units	General Office Sq. Ft.	Daycare Sq. Ft.	Retail Sq. Ft.	Restaurant Sq. Ft.	Passby Rate	AM Peak	PM Peak	AM Peak	PM Peak
n/a	Townhouses	220		30						14	17	0	0
1	Office	710			5,540					6	6	0	0
2	Office	710			4,030					5	5	0	0
3	Apartment	221	16							6	7	0	0
3	Retail	820					8,730		34%	5	22	3	11
3	Retail	820					4,380		34%	3	11	1	6
4	Restaurant	932						4,050	43%	23	23	17	17
5	Apartment	221	36							13	16	0	0
6	Apartment	221	35							13	15	0	0
7	Apartment	221	32							12	14	0	0
8	Daycare	565				4,275				47	48	0	0
9	Office	710			16,480					19	19	0	0
10	Office	710			8,130					9	9	0	0
11	Apartment	221	45							16	20	0	0
			164	30	34,180	4,275	13,110	4,050		191	231	22	34
									TDM credit	8	9		
									less internal capture#	38	66		
									TOTAL EXTERNAL TRIPS	145	156		

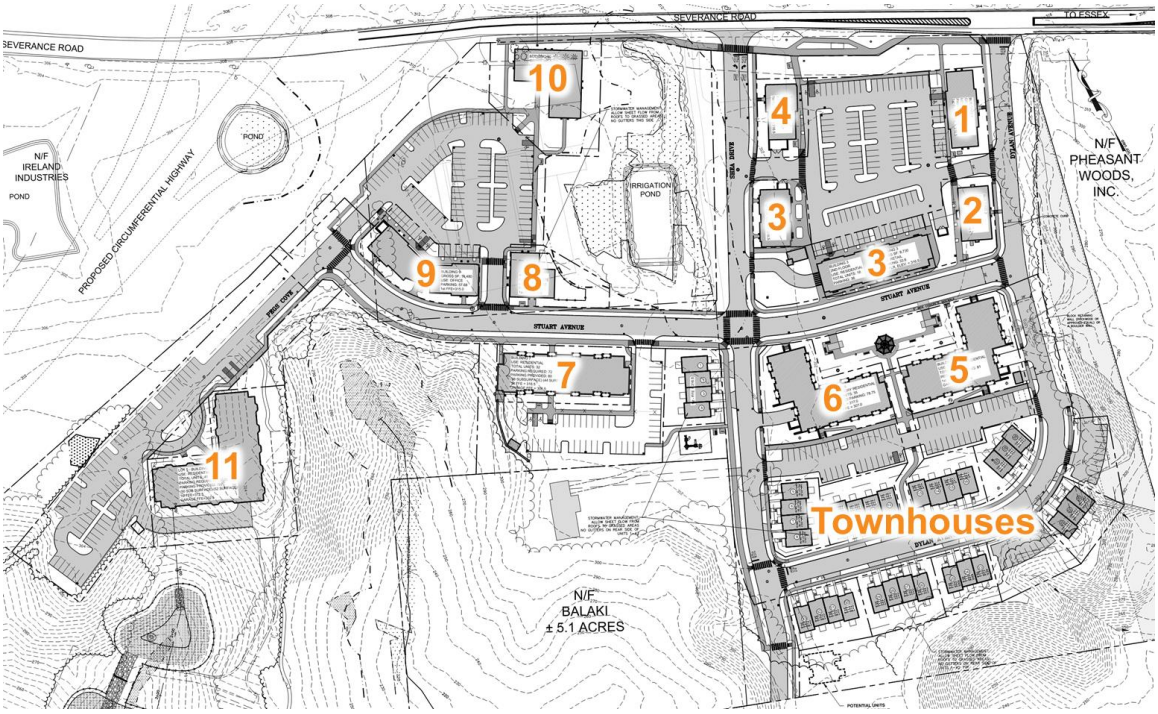
LUC = Land Use Code

*Trip rates estimated from ITE Trip Generation Manual 10th edition commercial land use rates are per 1,000 s.f.

internal capture estimated using NCHRP 8-51 Internal Capture Estimation Tool, daily trips assume pm peak is 12% (K=DHV/ADT)

[8]https://vtrans.vermont.gov/sites/aot/files/planning/documents/trafficresearch/VTrans%20TDM%20Guidance%20Feb%202017.pdf

FIGURE 10: BUILDING NUMBERS WITHIN SRPUD.



4.1 SRPUD TRIP DISTRIBUTION

RSG calculated the entering and exiting trips using ITE trip generation data, and then used the no build scenario volumes and local knowledge of the highway network to proportionally distribute entering and exiting traffic volumes. The entering and exiting trip distribution by land use for the a.m. and p.m. peak hours is shown in Table 3 and Table 4, respectively.

TABLE 3: AM PEAK HOUR ENTERING AND EXITING TRIP DISTRIBUTION FROM SRPUD, WITH 4% TDM CREDIT APPLIED.

	Total Trips by Use Category			AM Peak Hour - Total Trips					
	AM	PM	daily	ENTER	EXIT	ENTER	EXIT	PBY ENT.	PBY EXIT
office	40	39	333	86%	14%	33	5		
mid-rise apartments	59	72	892	26%	74%	15	42		
low-rise residential	14	17	220	23%	77%	3	10		
retail	12	50	495	62%	38%	7	4	2	2
restaurant	40	40	454	55%	45%	21	17	9	7
other (daycare)	47	48	204	53%	47%	24	21		
	212	265	2597						
					Total Trips (less TDM)	103	101	204	
					less internal capture[#]	19	19		
					Total Passby Trips	12	9		
					Total External Trips	**72**	**73**	**145**	

TABLE 4: PM PEAK HOUR ENTERING AND EXITING TRIP DISTRIBUTION FROM SRPUD, WITH 4% TDM CREDIT APPLIED.

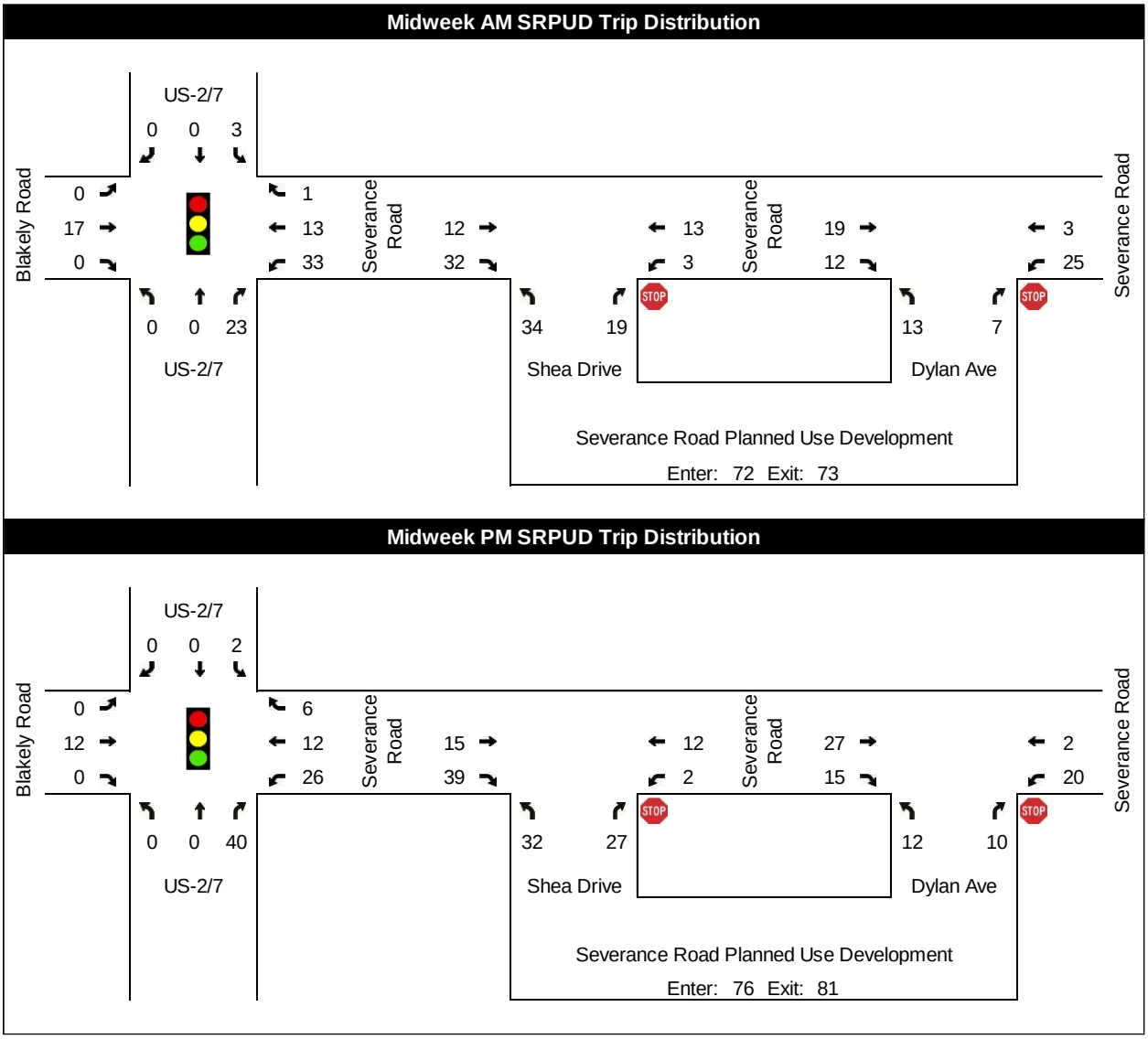
	Total Trips by Use Category			PM Peak Hour					
	AM	PM	daily	ENTER	EXIT	ENTER	EXIT	PBY ENT.	PBY EXIT
office	40	39	333	16%	84%	6	32		
mid-rise apartments	59	72	892	61%	39%	42	27		
low-rise residential	14	17	220	63%	37%	10	6		
retail	12	50	495	48%	52%	23	25	8	8
restaurant	40	40	454	62%	38%	24	14	10	6
other (daycare)	47	48	204	47%	53%	21	24		
	212	265	2597						
					Total Trips (less TDM)	126	128	255	
					less internal capture[#]	33	33		
					Total Passby Trips	18	15		
					Total External Trips	**76**	**81**	**156**	

Based on the proximity to Exit 16 and I-89 to the south of the project along US-2/7, RSG assumed a higher proportion of trips are destined to or originating from Exit 16 than the background traffic volumes may suggest. RSG assigned 25% of all entering and exiting trips through Exit 16. RSG assigned the remaining 75% of entering and exiting trips proportionally based on the no build scenario volumes.

SRPUD has two drives accessing the development along Severance Road: Shea Drive and Dylan Avenue. Both driveways offer full turning access to the development. Shea Drive is the closest driveway to eight of the buildings within the development; Dylan Avenue is the closest drive to three of the buildings. The Townhouses are assumed to be equidistant to the two driveways. Shea Drive is assumed to handle 8/11, or 73%, of the trips, with Dylan Avenue receiving the remaining 27% of trips. The exception to this driveway utilization distribution is with the westbound lefts; 90% of the WB lefts are assumed to use the Dylan Avenue WB left turn lane on Severance Road, with the remaining 10% of WB lefts at Shea Drive.

The resulting trip distribution is illustrated in Figure 11.

FIGURE 11: ESTIMATED TRIP DISTRIBUTION RESULTING FROM PROPOSED SRPUD.



4.2 BUILD SCENARIO VOLUMES

The 2020 and 2025 No Build Scenario Volumes for the a.m. and p.m. peak hours are illustrated in Figure 12 and Figure 13, respectively. The scenario volumes include all adjustments, balancing, and ODVs as described earlier in the TIS.

FIGURE 12: 2020 BUILD SCENARIO VOLUMES FROM PROPOSED SRPUD.

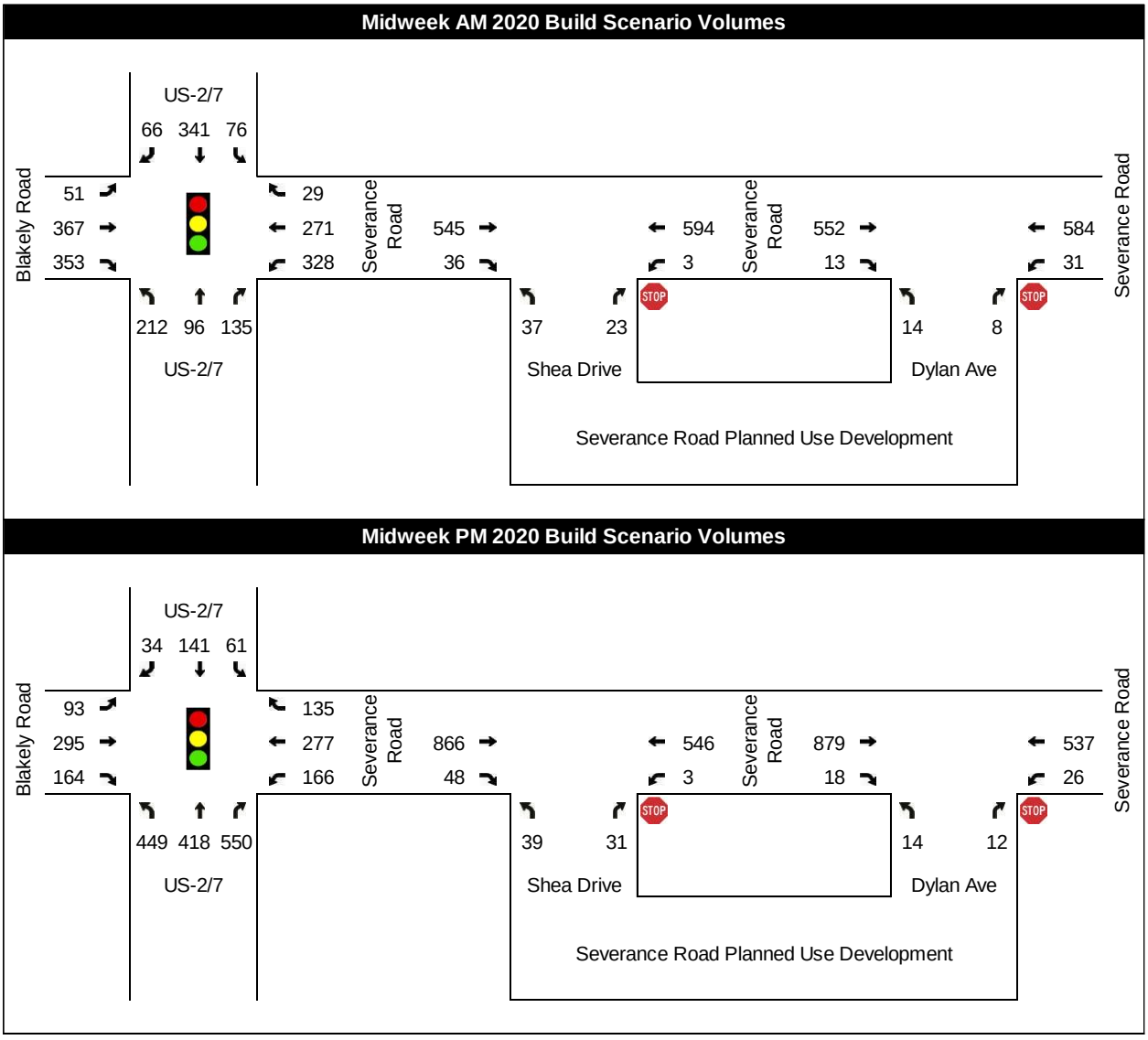
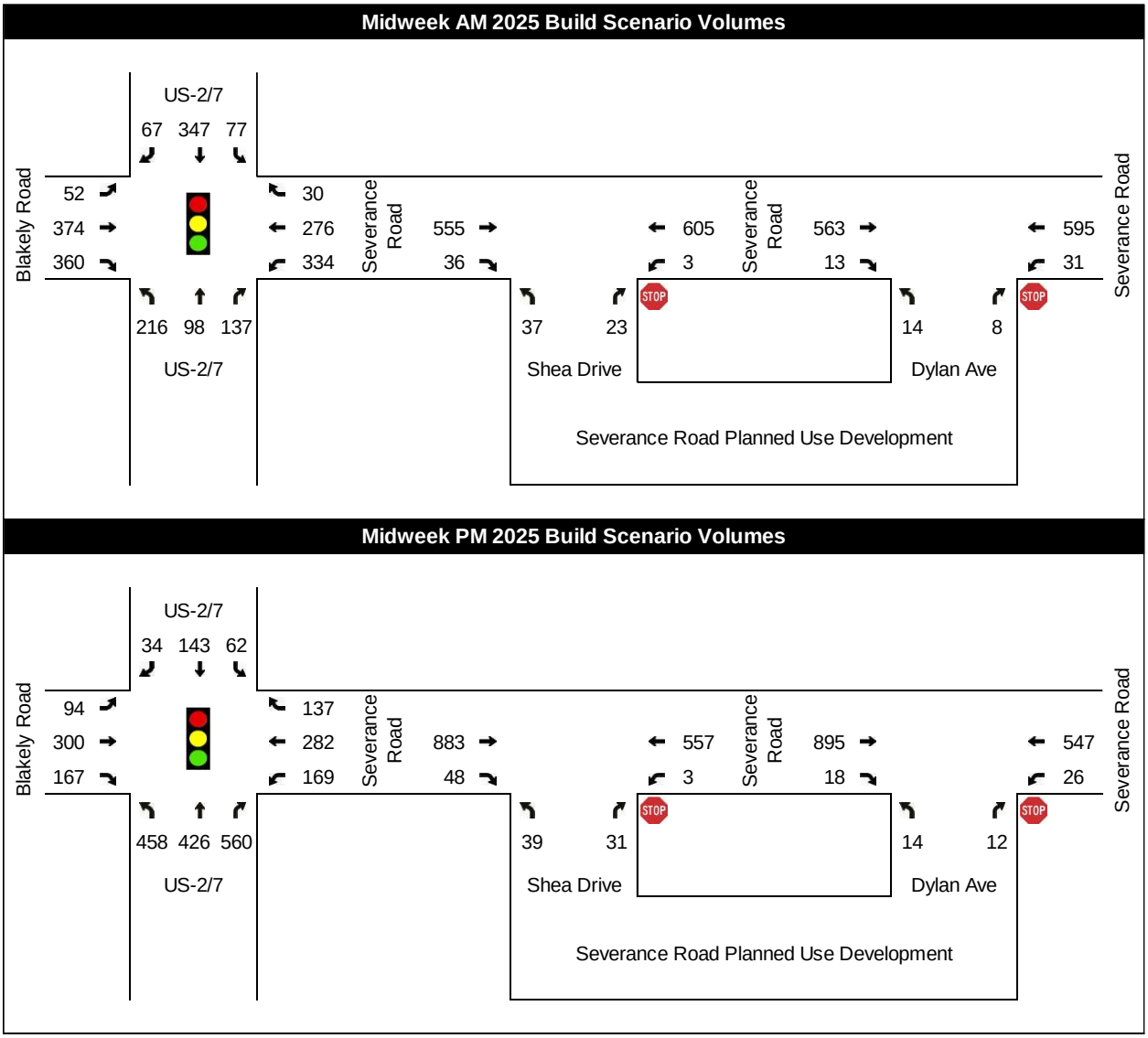


FIGURE 13: 2025 BUILD SCENARIO VOLUMES FROM PROPOSED SRPUD.



5.0 CONGESTION ANALYSIS

5.1 LEVEL-OF-SERVICE DEFINITION

Level-of-service (LOS) is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. LOS is calculated using the procedures outlined in the Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis[9] (HCM6). In addition to traffic volumes, key inputs include the number of lanes at each intersection, traffic control type (signalized or unsignalized), and the traffic signal timing plans.

The HCM6 defines six qualitative grades to describe the level of service at an intersection. Level-of-service is based on the average control delay per vehicle. Table 5 shows the various LOS grades and descriptions for signalized and unsignalized intersections.

TABLE 5: LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS

LOS	Characteristics	Unsignalized Total Delay (sec)	Signalized Total Delay (sec)
A	Little or no delay	≤ 10.0	≤ 10.0
B	Short delays	10.1-15.0	10.1-20.0
C	Average delays	15.1-25.0	20.1-35.0
D	Long delays	25.1-35.0	35.1-55.0
E	Very long delays	35.1-50.0	55.1-80.0
F	Extreme delays	> 50.0	> 80.0

The delay thresholds for LOS at signalized and unsignalized intersections differ because of the driver's expectations of the operating efficiency for the respective traffic control conditions. According to HCM procedures, an overall LOS cannot be calculated for two-way stop-controlled intersections because not all movements experience delay. In signalized and all-way stop-controlled intersections, all movements experience delay and an overall LOS can be calculated.

The VTrans policy on level of service is:

- Overall LOS C should be maintained for state-maintained highways and other streets accessing the state's facilities.

[9] The HCM6 does not provide methodologies for calculating intersection delays at certain intersection types including signalized intersections with exclusive pedestrian phases and signalized intersections with non NEMA-standard phasing. Because of these limitations, HCM 2000 and HCM 2010 methodologies are employed where necessary and as noted.

- Reduced LOS may be acceptable on a case-by-case basis when considering, at minimum, current and future traffic volumes, delays, volume to capacity ratios, crash rates, and negative impacts resulting from improvements necessary to achieve LOS C.
- LOS D should be maintained for side roads with volumes exceeding 100 vehicles/hour for a single lane approach (150 vehicles/hour for a two-lane approach) at two-way stop-controlled intersections.

5.2 TRAFFIC MODELING SCENARIOS

RSG built a Synchro / SimTraffic model using the 2020 and 2025 adjusted intersection volumes for the No Build and Build scenarios. The performance results for the a.m. and p.m. peak hours are shown in Table 6 and Table 7, respectively. These results assume optimized traffic signal timings. Delay is reported in seconds per vehicle. Highlighting indicates where the LOS exceeds VTrans guidelines.

TABLE 6: AM PEAK HOUR PERFORMANCE RESULTS FOR THE BASE YEAR (2020) AND FUTURE YEAR (2025).

	AM Peak Hour											
	2020 No Build			2020 Build			2025 No Build			2025 Build		
Intersections	LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c
US-2-7/Blakely Road/Severance Road												
Overall	D	40	0.95	D	43	0.96	C	29	0.87	C	29	0.86
EB Blakely Left	C	25	0.14	C	26	0.14	C	22	0.15	C	22	0.15
EB Blakely Thru	D	43	0.80	D	49	0.85	C	34	0.73	D	35	0.76
EB Blakely Right	E	69	0.95	E	73	0.96	D	45	0.87	D	45	0.86
WB Severance Left	D	37	0.82	D	45	0.89	C	23	0.53	C	25	0.59
WB Severance Thru	C	25	0.48	C	25	0.48	C	25	0.47	C	26	0.49
WB Severance Right	-	-	-	-	-	-	C	22	0.06	C	22	0.06
NB US-2/7 Left	C	30	0.69	C	30	0.69	B	19	0.31	B	19	0.32
NB US-2/7 Thru	C	23	0.16	C	24	0.16	C	21	0.16	C	21	0.16
NB US-2/7 Right	C	23	0.22	C	25	0.26	C	22	0.21	C	22	0.27
SB US-2/7 Left	C	22	0.15	C	23	0.16	B	18	0.14	B	18	0.15
SB US-2/7 Thru	D	43	0.81	D	46	0.82	C	28	0.57	C	28	0.59
SB US-2/7 Right	-	-	-	-	-	-	C	21	0.13	C	21	0.13
Severance Road / Shea Drive												
EB Severance Thru / Right	-	-	-	A	<1	0.00	-	-	-	A	<1	0.00
WB Severance Thru / Left	-	-	-	A	9	0.00	-	-	-	A	9	0.00
NB Shea Left	-	-	-	D	25	0.17	-	-	-	D	26	0.18
NB Shea Right	-	-	-	B	12	0.04	-	-	-	B	12	0.04
Severance Road / Dylan Avenue												
EB Severance Thru / Right	-	-	-	A	<1	0.00	-	-	-	A	<1	0.00
WB Severance Left	-	-	-	A	9	0.03	-	-	-	A	9	0.03
WB Severance Thru	-	-	-	A	<1	0.00	-	-	-	A	<1	0.00
NB Dylan Left / Right	-	-	-	C	20	0.09	-	-	-	C	21	0.09

As expected, the US-2/7 / Severance Road / Blakely Road intersection is near capacity in the a.m. peak hour existing condition. The addition of new traffic associated with the development reduces the overall signal capacity and performance, particularly in regard to the eastbound approaches. In the future year (2025 condition), the planned intersection improvement project

COLCHESTER STPG 5600(17) greatly improves signal operations. Both Shea Drive and Dylan Avenue operate acceptably in the base year and future year a.m. peak hour scenarios.

TABLE 7: PM PEAK HOUR PERFORMANCE RESULTS FOR THE BASE YEAR (2020) AND FUTURE YEAR (2025).

	PM Peak Hour											
	2020 No Build			2020 Build			2025 No Build			2025 Build		
Intersections	LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c
US-2-7/Blakely Road/Severance Road												
Overall	C	33	0.90	D	36	0.93	C	26	0.81	C	28	0.87
EB Blakely Left	C	26	0.44	C	27	0.45	C	27	0.39	C	26	0.38
EB Blakely Thru	C	31	0.62	C	33	0.65	D	38	0.81	D	37	0.81
EB Blakely Right	C	29	0.42	C	29	0.43	C	32	0.55	C	31	0.53
WB Severance Left	C	26	0.48	C	27	0.56	C	26	0.32	C	25	0.36
WB Severance Thru	D	51	0.90	D	53	0.91	D	36	0.76	C	35	0.75
WB Severance Right	-	-	-	-	-	-	C	31	0.44	C	30	0.44
NB US-2/7 Left	C	23	0.74	C	24	0.75	B	15	0.38	B	15	0.38
NB US-2/7 Thru	C	25	0.59	C	26	0.60	C	21	0.55	C	22	0.56
NB US-2/7 Right	D	39	0.85	D	49	0.93	C	30	0.79	D	38	0.87
SB US-2/7 Left	C	25	0.21	C	26	0.22	B	15	0.19	B	16	0.21
SB US-2/7 Thru	C	33	0.45	C	34	0.45	B	17	0.20	B	19	0.21
SB US-2/7 Right	-	-	-	-	-	-	B	16	0.06	B	17	0.06
Severance Road / Shea Drive												
EB Severance Thru / Right	-	-	-	A	<1	0.00	-	-	-	A	<1	0.00
WB Severance Thru / Left	-	-	-	A	10	0.00	-	-	-	A	10	0.00
NB Shea Left	-	-	-	E	39	0.27	-	-	-	E	41	0.28
NB Shea Right	-	-	-	C	17	0.09	-	-	-	C	17	0.09
Severance Road / Dylan Avenue												
EB Severance Thru / Right	-	-	-	A	<1	0.00	-	-	-	A	<1	0.00
WB Severance Left	-	-	-	A	10	0.03	-	-	-	A	10	0.04
WB Severance Thru	-	-	-	A	<1	0.00	-	-	-	A	<1	0.00
NB Dylan Left / Right	-	-	-	D	28	0.14	-	-	-	D	28	0.14

Similar to the a.m. peak hour, the US-2/7 / Severance Road / Blakely Road intersection is near capacity in the p.m. peak hour existing condition. The addition of new traffic associated with the development reduces the overall signal capacity and performance. In the future year (2025 condition), the planned intersection improvement project greatly improves signal operations. Delay at Shea Drive is estimated to be elevated, however as a side-street with under 100 vph and rerouting options through Dylan Avenue, LOS E is acceptable at this location. Dylan Avenue is estimated to operate acceptably in the base year and future year p.m. peak hour scenarios.

RSG modeled the traffic queues using SimTraffic microsimulation software. SimTraffic microsimulation results, as opposed to Highway Capacity Manual procedures, are recommended in congested locations such as the US-2/7 / Severance Road / Blakey Road intersections because they better reflect the interaction of queue spillover from adjacent lanes. Average queue results, as presented in Table 8, represent the queue length in the number of cars assuming one car length is 20 feet.

TABLE 8: SIMTRAFFIC QUEUING ANALYSIS RESULTS, REPORTED IN NUMBER OF VEHICLES.

	Average Queue Length in Vehicles							
	AM Peak Hour				PM Peak Hour			
	2020		2025		2020		2025	
	No Build	Build	No Build	Build	No Build	Build	No Build	Build
Intersection 1: US 2/7 & Severance Road & Blakely Road								
EB	25	26	11	12	7	9	8	9
WB	17	19	6	6	14	15	7	7
NB	6	6	4	4	10	9	10	10
SB	19	26	8	8	5	5	4	4
Intersection 2: Severance Road & Shea Drive								
EB	0	0	0	0	0	0	0	0
WB	0	0	0	0	0	0	0	0
NB	0	1	0	1	0	2	0	1
Intersection 3: Severance Road & Dylan Avenue								
EB	0	0	0	0	0	0	0	0
WB	0	1	0	1	0	1	0	1
NB	0	1	0	1	0	1	0	1

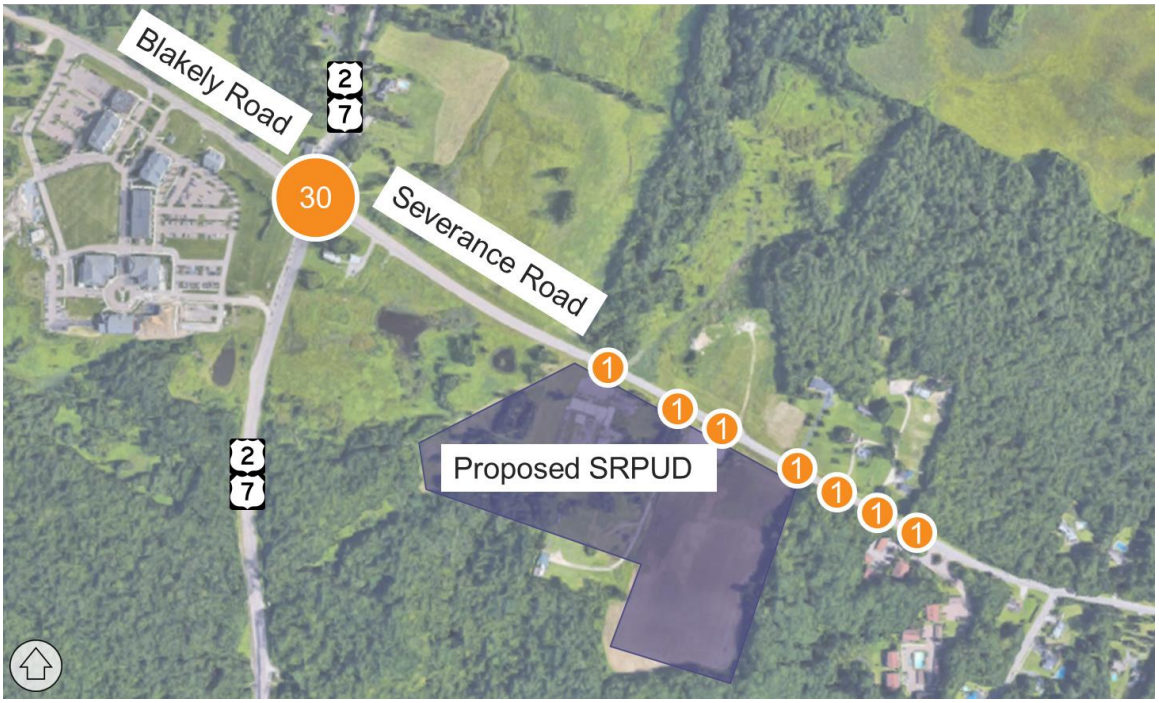
The most significant increase in estimated queue occurs in the a.m. peak hour in the base year (2020) model. RSG estimates the southbound US-2/7 queue will increase by seven vehicles. At 520 feet (or 26 vehicle lengths), the average eastbound Blakely Road queue is estimated to extend just short of the Severance Green northbound intersection. The average westbound Severance Road queue is not estimated to interact with any other roadways, including Shea Drive. The US-2/7 queues do not approach any adjacent intersection. As noted earlier, the planned intersection construction improvement project, COLCHESTER STPG 5600(17), is expected to significantly improve intersection operations, resulting in shorter queues in the future year (2025) scenario.

6.0 CRASH REVIEW AND SAFETY ANALYSIS

6.1 CRASH HISTORIES

RSG compiled available crash incidents reported by VTrans from January 1, 2014 through December 31, 2018. VTrans maintains a statewide database of all reported crashes along all state highways and federal aid road segments.[10] The data was investigated to develop an assessment of the general trends and crash types in the study area. RSG identified 37 crashes along Severance Road between US 2/7 and approximately 500 feet east of the SRPUD. Figure 14 illustrates the location of these crashes.

FIGURE 14: REPORTED CRASHES BETWEEN JANUARY 1, 2014 THROUGH DECEMBER 31, 2018 ON SEVERANCE ROAD BETWEEN US-2/7 AND A POINT APPROXIMATELY 500 FEET EAST OF THE SRPUD.



As shown in Figure 14, 30 crashes were located at the US-2/7 / Severance Road / Blakely intersection. The proposed COLCHESTER STPG 5600(17) intersection improvement project, illustrated in Figure 3, is intended to address congestion issues and improve vehicle safety at this location.

[10] This data is exempt from Discovery or Admission under 23 U.S.C. 409.

RSG identified seven reported crashes along Severance Road within 500 feet of the SRPUD. Of these seven, one crash, involving a single vehicle, resulted in an injury; the remaining six crashes were considered property damage only. Three of the seven crashes (including the injury crash) were single vehicle crashes, three were rear end crashes, and one was not classified. Only one of the crashes occurred during the winter months.

As noted, 43% of the crashes along Severance Road were rear end crashes. This type of crash occurs when a vehicle must slow or stop in the travel way. It is unlikely the rear end crashes were a result of queues forming from US-2/7 nearly a quarter mile to the west; it is more likely that these vehicles were stopped to turn left and drivers approaching in the same direction were unaware or unable to slow and stop their vehicle to avoid a collision. A left turn lane would allow the left turning vehicles to exit the traffic stream and reduce potential conflicts with same direction through movements.

6.2 SIGHT DISTANCE OBSERVATIONS

As defined in the 2011 publication *A Policy on Geometric Design of Highways and Streets*, from the American Association of State Highway and Transportation Officials (AASHTO), sight distance is the "the length of roadway ahead that is visible to the driver."[11] Sight distances of sufficient length are necessary at all points along a roadway to ensure vehicles can safely stop or avoid colliding with potential obstructions or other vehicles on the roadway.

Standard practice in assessing intersection safety and operations involves measuring two separate sight distances – **stopping sight distance** and **intersection sight distance**.

Stopping sight distance is the visible distance along a roadway between an advancing motorist and a potential obstacle in the roadway. It is measured from a point representing the approaching driver's eye and a point representing an obstacle in the roadway.[12] Stopping sight distances of adequate length are needed along all roadways, both at and away from intersections, so that drivers travelling at design speeds can react to potential obstacles and safely brake to avoid collisions. Design minimum stopping sight distances are calculated based on factors such as design speed, response times, and grades as reported in the *2011 Policy on Geometric Design of Highways and Streets*.[13]

[11] American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, Fifth Edition (Washington D.C.: American Association of State Highway and Transportation Officials, 2011). Page 3-2.
[12] As noted in the 2011 Policy on Geometric Design of Highways and Streets (page3-14 to 3-15), the height of the driver's eye is assumed to be 3.5' above the road surface and the height of a potential obstacle is 2.0' above the road surface.
[13] American Association of State Highway and Transportation Officials, A Policy on Geometric Design of Highways and Streets, Fifth Edition (Washington D.C.: American Association of State Highway and Transportation Officials, 2011). Page 3-5.

Intersection sight distance is the distance available along the major road travelled way corresponding with the maximum visibility between an advancing motorist on the major road and an entering motorist on an intersecting minor road. It is measured between a point representing the advancing driver's eye above the major road and the entering driver's eye above the intersecting road.[14]

The *2011 Policy on Geometric Design of Highways and Streets* states that the available intersection sight distance should be at least equal to the required stopping sight distance along the major road.

> *"Sight distance is also provided at intersections to allow the drivers of stopped vehicles a sufficient view of the intersecting highway to decide when to enter the intersecting highway or to cross it. If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions."*

However, when possible it is desirable to have intersection sight distances that exceed the design minimum stopping sight distances in order to offer improved operations, such that major road traffic need not decelerate to accommodate entering traffic.

> *"However, in some cases a major-road vehicle may need to stop or slow to accommodate the maneuver by a minor road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road."*

Based on the 35 mph speed limit and relatively level grade along Severance Road in the project area, the design minimum intersection sight distance for turning traffic is 390 feet and the design minimum stopping sight distance is 250 feet.

RSG reviewed sight distances in the field in the approximate location of the SRPUD drive entrances. The sight distance exceeds 500 feet in both directions for vehicles turning out of Shea Drive and Dylan Avenue. The intersection sight distance to the west was slightly restricted by some vegetation, however the SRPUD site plan will remove these obstructing trees. The intersection sight distance view to the east and west along Severance Road from the proposed location of Shea Drive are shown in Figure 15.

The stopping sight distance along Severance Road exceeded 500 feet in the project area.

[14] As noted in the 2011 Policy on Geometric Design of Highways and Streets (page3-14 to 3-15), the height of the driver's eye of the approaching vehicle is assumed to be 3.5' above the road surface of the major road and the height of the driver's eye of the entering vehicle is assumed to 3.5' above the minor road surface and 14.5' back from the edge of the major road travelled way.

FIGURE 15: INTERSECTION SIGHT DISTANCE VIEWS TO THE WEST (LEFT) AND EAST (RIGHT) NEAR PROPOSED SHEA DRIVE ON SEVERANCE ROAD.

7.0 TURN LANE WARRANT ANALYSIS

RSG conducted a turn lane warrant analysis to determine if projected peak hour traffic volumes are sufficient to meet warrant thresholds for construction of a dedicated left- or right- turn lane on Severance Road. Dedicated turn lanes have the safety and capacity benefits of removing turning traffic from the through volume traffic stream but also promote higher vehicle speeds and require increased pavement widths.

7.1 LEFT TURN LANE WARRANT

Using the scenario volumes, RSG conducted a left turn lane warrant analysis at the Severance Road intersections with the two drive entrances. The original site layout includes a left turn lane at the Dylan Avenue intersection. RSG assumed 90% of the westbound left turn demand would utilize this intersection. VTrans has identified the Kikuchi and Chakroborty (K&C) model as the preferred turn lane warrant analysis model, using 85% of the DHV (VTrans email 26 April 2019 from Christopher Clow).

Assuming 90% of the WB left turns are assigned to one development entrance, a left turn lane is warranted in the either the base year (2020) a.m. peak hour and future year (2025) p.m. peak hour build scenarios. The warrant in the base year a.m. peak hour is just on the threshold. As background through traffic grows into the future year, the percentage of left-turns decreases, and the warrant is no longer met. Similarly, in the p.m. peak hour, the left turn lane is only warranted as the opposing volume increases in the future.

Assuming the WB left turns are split equally between both development entrances, a left turn lane is still warranted, but only in the p.m. peak hour for the future year.

TABLE 9: RESULTS OF LEFT TURN LANE WARRANT ANALYSIS ASSUMING 90% OF WESTBOUND LEFT TURNING VEHICLES USE ONE DRIVE (LEFT) AND THE WESTBOUND LEFTS USE BOTH DRIVES EQUALLY (RIGHT, FILLED GREY).

	90% Use Dylan Ave				Entrances Used Equally			
	EB Left Turn Lane		WB Left Turn Lane		EB Left Turn Lane		WB Left Turn Lane	
	AM	PM	AM	PM	AM	PM	AM	PM
Kikuchi and Chakroborty Model								
2020 NoBuild	-	-	-	-	-	-	-	-
2020 Build	-	-	Yes	No	-	-	No	No
2025 NoBuild	-	-	-	-	-	-	-	-
2025 Build	-	-	No	Yes	-	-	No	Yes

Additional consideration should be given to roadway context. As minor arterials, the roadways should prioritize efficient through movements. While the speed limit is low (35 mph), the left turn

lanes allow stopped vehicles to exit the traffic stream, allowing for more efficient through movement and reducing the risk of rear end collisions.

The crash history discussed in Section 6 indicates a high percentage of rear end crashes resulting from left turning vehicles. The proposed SRPUD will increase the number of left turning vehicles on Severance Road, and a left turn lane will remove the conflict from the through movement. Although the current site plan indicates the left turn lane at Dylan Avenue, RSG estimates the left turn demand will be greater at Shea Drive due to its more central location within the PUD. RSG recommends relocating the proposed left turn lane on Severance Road to Shea Drive instead of Dylan Avenue.

7.2 RIGHT TURN LANE WARRANT

Using the scenario volumes, RSG conducted a right turn lane warrant analysis at the Severance Road intersections with the two drive entrances. The original site layout does not include a right turn lane.

From the building layout with respect to the driveways, RSG assigned 73% of the right turn demand from Severance Road to Shea Drive. Using the VTrans methodology for evaluating warrants for a right turn lane based on speed limit, the advancing volume, and the percentage of right turns at an intersection, RSG determined that a right turn lane is not warranted at Shea Drive or Dylan Avenue.

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55 Railroad Row
White River Junction, VT 05001
802.295.4999
www.rsginc.com


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APPENDIX A.

Severance Corners Village Center Traffic Update Memo

MEMORANDUM

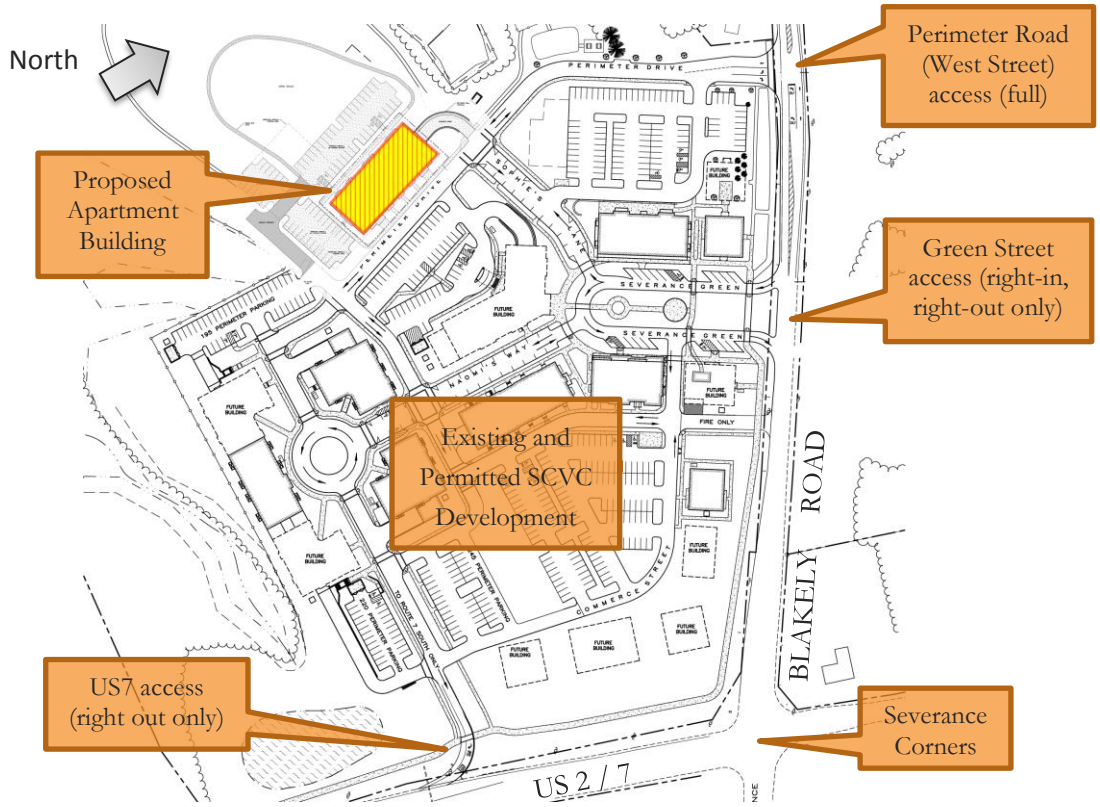
TO: Robin Jeffers, SD Ireland
FROM: Mark Smith, PE.
DATE: April 10, 2017
SUBJECT: Severance Corners Village Center – Traffic Impact Update

RSG has conducted the following analysis of traffic operations, signal warrants, and safety proximate to the proposed additional housing at Severance Corners Village Center in Colchester, Vermont.

1.0 PROJECT DESCRIPTION

This study evaluates the traffic and potential infrastructure impacts associated with the construction of 36 housing units adjacent to the existing developments in Severance Corners Village Center (SCVC). As shown in Figure 1, the development has three access points; two off Blakely Road (one unrestricted access, one limited to right turns in and out only), and one on US7 (limited to exiting right turns only).

FIGURE 1: PROJECT SITE PLAN



This study relies upon design standards and analysis procedures documented in the 2010 Highway Capacity Manual,[1] Trip Generation,[2] A Policy on Geometric Design of Highways and Streets,[3] Manual on Uniform Traffic Control Devices (MUTCD),[4] Traffic Impact Evaluation: Study and Review Guide,[5] and the Vermont State Design Standards,[6] which are the generally accepted traffic analysis references relied upon by traffic engineering professionals and VTrans for projects of this type in Vermont.

2.0 PROJECT SCOPE

VTrans guidelines specify that a traffic study should be considered if the proposed development will generate 75 or more peak hour trips. The geographic scope of the study should also include the immediate access points and those intersections or highway segments receiving 75 or more project-generated peak hour trips.[7] We project no intersections will meet the 75 vehicle per hour trip generation threshold. This study is therefore limited to the project access points.

3.0 LOCAL TRAFFIC

The project is located at the southwest corner of the intersection of Blakely Road and US7 in Colchester, Vermont (Figure 2). This intersection, also referred to as Severance Corners, is located 1.8 miles north of I-89 Exit 16.

Blakely Road is a two-lane minor arterial, with a posted speed limit of 35 miles per hour. In 2013, VTrans reported an Annual Average Daily Traffic Volume (AADT) of 10,400 vehicles per day[8].

US7 is a 2-lane principal arterial, posted at 50 mph. In 2017, VTrans reported an Annual Average Daily Traffic Volume (AADT) of 14,433 vehicles per day[9].

[1] Transportation Research Board, National Research Council, *Highway Capacity Manual* (Washington, DC: National Academy of Sciences, 2010).
[2] Institute of Transportation Engineers, *Trip Generation* 9th Edition (Washington, D.C.: Institute of Transportation Engineers, 2012).
[3] American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 6th Edition (Washington DC: AASHTO, 2011).
[4] American Traffic Safety Services Association (ATSSA), ITE, and AASHTO, *Manual on Uniform Traffic Control Devices*, 2009 Edition (Washington DC: FHWA, 2009).
[5] Vermont Agency of Transportation, Development Review Section, *Traffic Impact Evaluation Study and Review Guide* (October 2008).
[6] State of Vermont Agency of Transportation, *Vermont State Standards* (Montpelier: VTrans, 1 July 1997).
[7] Vermont Agency of Transportation, Development Review Section, *Traffic Impact Evaluation Study and Review Guide* (January 2003).
[8] Automatic Traffic Recording station D407, located 0.7 miles east of Lavigne Rd, or 0.6 miles west of the Perimeter Rd.
[9] Continuous Traffic Counting station D040. Located 0.6 miles south of Blakely Rd.

FIGURE 2: PROJECT AND NEARBY TRAFFIC COUNTER LOCATIONS

4.0 ANALYSIS TRAFFIC VOLUMES

This analysis examines AM and PM design hour vehicle delays and capacity at the project access points.

These measures are examined first with baseline, **No Build** scenario traffic volumes, which represent the anticipated design hour conditions in the target study years without the proposed development in place.

Once baseline conditions are established, anticipated traffic associated with the proposed development is added to the No Build scenario volumes to create **Build** scenario traffic volumes, which are in turn used to project intersection delays, levels of service and volume to capacity ratios with the proposed development in place.

A detailed description of the elements that contribute to the No Build and Build scenario traffic volumes is presented below.

Worksheets detailing the development of traffic volumes for each scenario (AM, PM, No-Build, Build), including the distribution of traffic on to the network and volumes from other developments are attached to this memo.

4.1 | BACKGROUND TRAFFIC VOLUMES AND ADJUSTMENTS

RSG obtained the most recent VTrans turning movement count data for the intersection of Blakely Severance and US7, counted in June of 2015. Turning Movement Counts were performed by RSG at the project access points in March 2017.

Following VTrans traffic study guidelines, raw peak hour traffic volumes were adjusted to represent the design hour volume (DHV)[10] in 2017 and 2022[11] using two adjustment factors:

1. Design hour adjustment factors are based on the CTC D040 on US7 for the corresponding access point, and the ATR D407 on Blakely Rd for those access points. The 2017 DHV at each counter was compared to the peak hour volumes on the date of each corresponding turning movement count to formulate DHV adjustments. DHV adjustments decreased the raw count volumes by 1% on Blakely Road, and increased the count by 26% on US7[12].
2. An annual adjustment factor, which represents general background traffic growth as presented in the 2015 VTrans Red Book. The short term (5 year) growth expected is +4%, thus background traffic was increased by this amount for the future planning year in this analysis (2022).

4.2 | PROJECT TRIP GENERATION

Trip generation refers to the number of new vehicle trips originating at or destined for a particular development. To estimate the number of new vehicle trips for the project, we examined trip generation rates presented in the Institute of Transportation Engineer's *Trip Generation Manual.*[13] Applying trip generation rates for 36 apartments (ITE Land Use Code 220) we calculate the additional residences will generate approximately 18 trips during the weekday AM peak hour, and 22 new vehicle trips during the PM peak hour. Figure 3 presents the projected trip generation in the weekday peak hours. There are expected to be 239 total weekday trips from the additional development.

FIGURE 3: PROJECT PEAK HOUR TRIP GENERATION SUMMARY

		Project Trip Generation			
		AM Peak		PM Peak	
Land Use	units	Enter	Exit	Enter	Exit
Apartment	36	3	15	15	7
Total Trips		18		22	

[10] The DHV is the 30th highest hour of traffic for the year and is used as the design standard in Vermont.
[11] VTrans requires analysis during the year project construction is expected to be complete and in a future year scenario 5 years after project completion.
[12] While the latter adjustment is unusually high, it appears justified from recent observations of the southern approach to Severance Corners intersection, which appears to be over capacity in the PM Peak Hour.
[13] Institute of Transportation Engineers, Trip Generation 9th Edition (Washington, D.C.: Institute of Transportation Engineers, 2012).

4.3 | OTHER DEVELOPMENT VOLUMES

Other development volumes (ODVs) represent trips generated by anticipated developments in the study area. Trips generated by ODVs are included in every scenario (both No Build and Build) because we assume they are already present on the road network in the analysis years.

Through communications with the Town Planning and Zoning staff, it was determined that there were no imminent projects in the vicinity of this growth center that might generate additional traffic in the near future.

There are several permitted but unbuilt (or unoccupied) projects within the Village Center development itself however, including;

- 1,800 s.f. high turnover restaurant
- 14,200 s.f. office space
- 45 residential units

Additional traffic expected from these elements has been estimate using ITE Trip Generation estimates, which are summarized in Figure 4. These volumes are included in both the no-build and build scenarios. Pass-by trips, which refer to trips that are already on the adjacent highway but are diverted to the new land use, are accounted for separately.

FIGURE 4: PEAK HOUR TRAFFIC FROM PERMITTED BUT UNBUILT OR UNOCCUPIED DEVELOMENT IN SCVC

			ODV Trip Generation							
			AM Peak				PM Peak			
			Primary		Pass-by		Primary		Pass-by	
Land Use	size	units	Enter	Exit	Enter	Exit	Enter	Exit	Enter	Exit
General Office Building	14,200	sq. ft.	19	3	0	0	4	18	0	0
High-Turnover (Sit-Down) Restaurant	1,800	sq. ft.	11	9	0	0	6	4	5	3
Apartment	45	d. u.	5	21	0	0	18	10	0	0
		sub-total	35	32	0	0	28	31	5	3
		Total Trips	67		0		59		8	

Two maps detailing the anticipated distribution of traffic from the development and the various access points are attached at the end of this memo.

4.4 | DEVELOPMENT VOLUME SUMMARY

The total traffic entering and exiting the SCVC development, including existing traffic, permitted but unoccupied or unbuilt (ODV), and the proposed apratments is summarized in Figure 5 below.

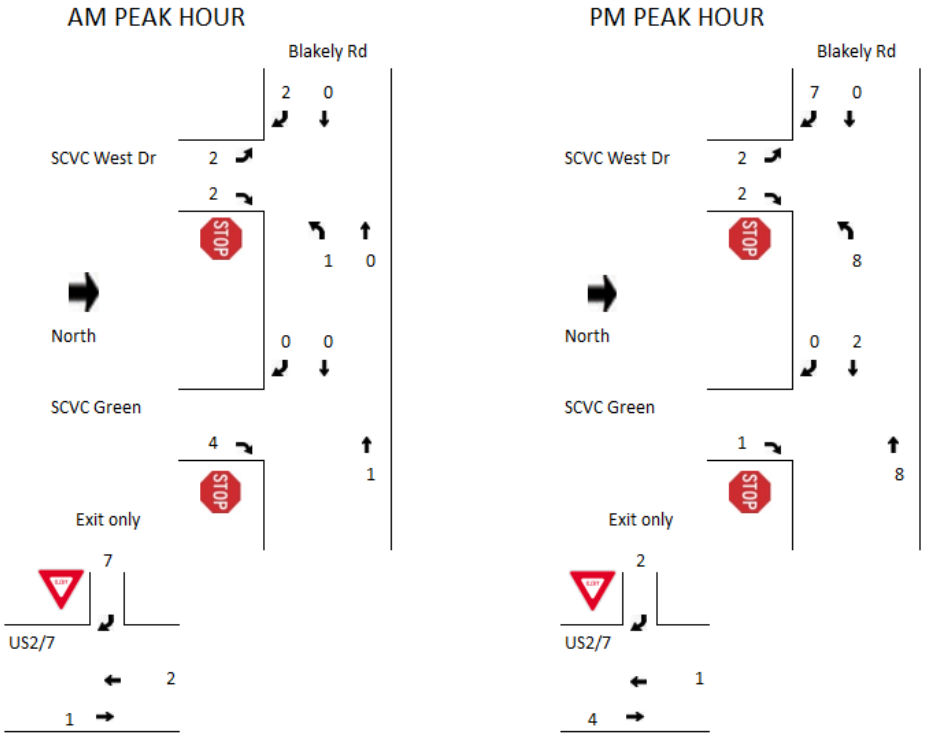
FIGURE 5. TOTAL SCVC DEVELOPMENT TRAFFIC

	AM Peak		PM Peak	
	Enter	Exit	Enter	Exit
Existing Counts (March 2017)	67	114	125	80
Permitted but unoccupied or unbuilt	35	32	32	34
Proposed apartments	3	15	15	7
Sub-total	105	161	172	121
Total	266		293	

4.5 | SCENARIO VOLUME GRAPHICS

Figure 6 represents the peak hour traffic generated by the proposed additional housing, and subsequent trips through each access point.

FIGURE 6: PROJECT PEAK HOUR TRAFFIC



Figures 7 and 8 present the 2017 No Build and Build scenario traffic volumes at the study intersection, respectively. Figures 9 and 10 present the 2022 No Build and Build scenario traffic volumes at the study intersection, respectively.

No Build traffic volumes include the raw count volumes, adjusted to design hour conditions, and projected traffic from recently permitted developments in the area (ODVs, if applicable), as well as traffic from permitted but unbuilt traffic within the SCVC development. Build scenario volumes represent the addition of project-generated traffic (the proposed additional housing) to the No Build traffic volumes.

FIGURE 7: 2017 PEAK HOUR NO-BUILD TURNING MOVEMENT VOLUMES

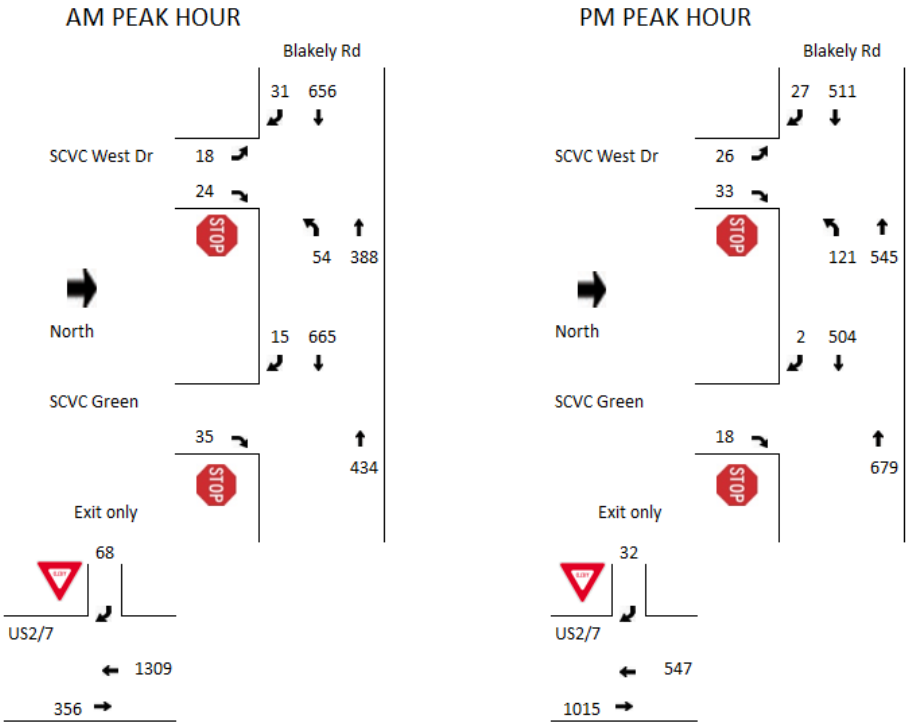


FIGURE 8: 2017 PEAK HOUR BUILD TURNING MOVEMENT VOLUMES

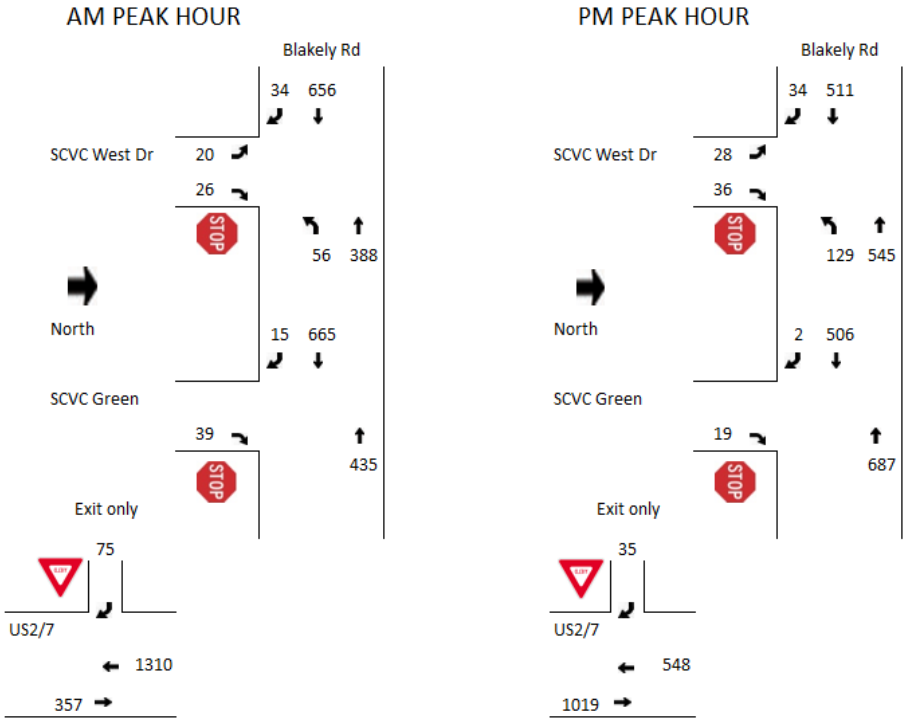


FIGURE 9: 2022 NO BUILD TURNING MOVEMENT VOLUMES

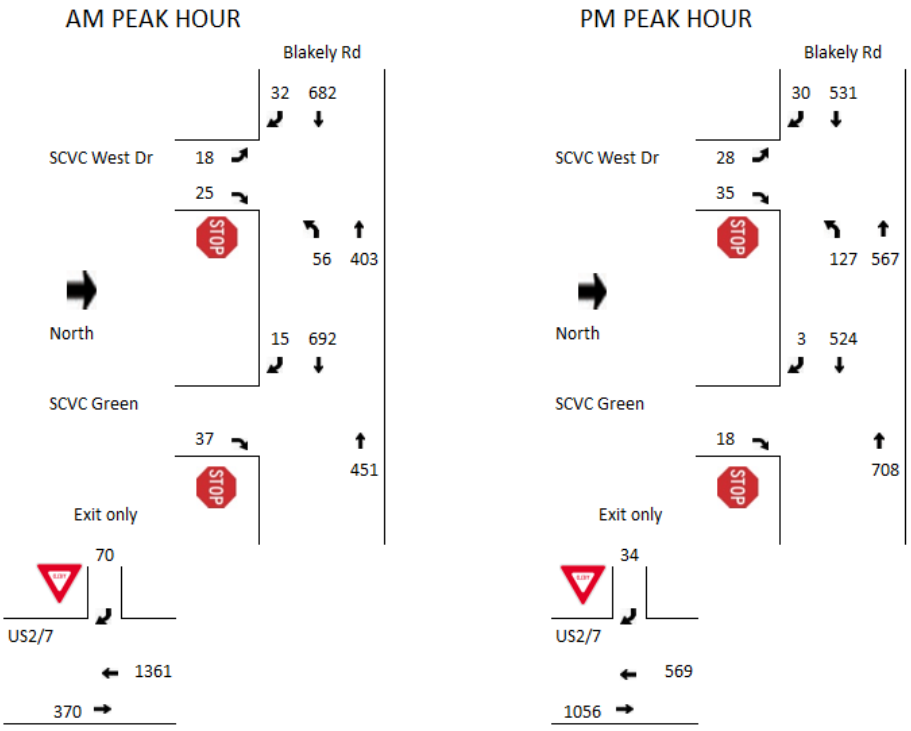
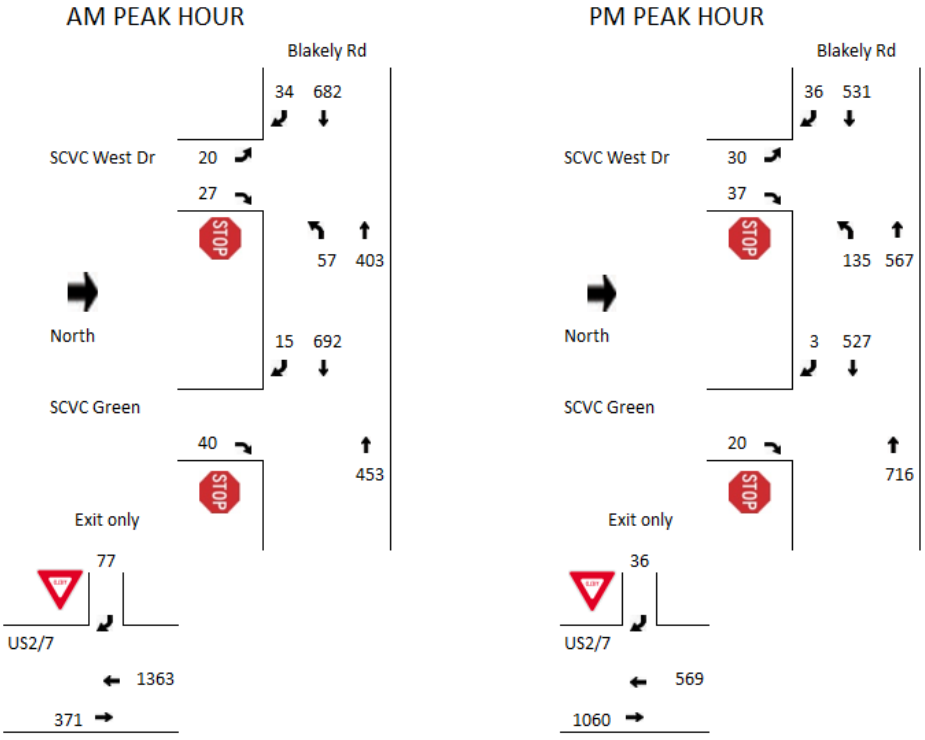


FIGURE 10: 2022 BUILD TURNING MOVEMENT VOLUMES



5.0 CONGESTION ANALYSIS

5.1 | LEVEL-OF-SERVICE DEFINITION

Level-of-service (LOS) is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. LOS is calculated using the procedures outlined in the 2000 and 2010 Highway Capacity Manuals.[14] In addition to traffic volumes, key inputs include the number of lanes at each intersection, traffic control type (signalized or unsignalized), and the traffic signal timing plans (if applicable).

The 2010 Highway Capacity Manual defines six qualitative grades to describe the level of service at an intersection. Level-of-Service is based on the average control delay per vehicle. Figure 11 shows the various LOS grades and descriptions for signalized and unsignalized intersections.

FIGURE 11: LEVEL-OF-SERVICE CRITERIA FOR SIGNALIZED AND UNSIGNALIZED INTERSECTIONS

LOS	CHARACTERISTICS	UNSIGNALIZED TOTAL DELAY (SEC)	SIGNALIZED TOTAL DELAY (SEC)
A	Little or no delay	≤ 10.0	≤ 10.0
B	Short delays	10.1-15.0	10.1-20.0
C	Average delays	15.1-25.0	20.1-35.0
D	Long delays	25.1-35.0	35.1-55.0
E	Very long delays	35.1-50.0	55.1-80.0
F	Extreme delays	> 50.0	> 80.0

The delay thresholds for LOS at signalized and unsignalized intersections differ because of the driver's expectations of the operating efficiency for the respective traffic control conditions. According to HCM procedures, an overall LOS cannot be calculated for two-way stop-controlled intersections because not all movements experience delay. In signalized and all-way stop-controlled intersections, all movements experience delay and an overall LOS can be calculated.

The VTrans policy on level of service is:

- Overall LOS C should be maintained for state-maintained highways and other streets accessing the state's facilities
- Reduced LOS may be acceptable on a case-by-case basis when considering, at minimum, current and future traffic volumes, delays, volume to capacity ratios, crash rates, and negative impacts as a result of improvement necessary to achieve LOS C.
- LOS D should be maintained for side roads with volumes exceeding 100 vehicles/hour for a single lane approach (150 vehicles/hour for a two-lane approach) at two-way stop-controlled intersections. No LOS criteria are in effect for volumes less than these.

[14] The HCM 2010 does not provide methodologies for calculating intersection delays at certain intersection types including signalized intersections with exclusive pedestrian phases and signalized intersections with non NEMA-standard phasing. Because of these limitations, HCM 2000 methodologies are employed where necessary.

For stop controlled side approaches with volumes lower than those noted above, the volume to capacity ratios (V/C) should remain below 0.85 on side road approaches with volumes less than these.

Detailed Synchro LOS worksheets are attached at the end of this memo.

5.2 | LEVEL-OF-SERVICE RESULTS

The Highway Capacity Manual congestion reports within Synchro (v8), a traffic analysis software package from Trafficware, routinely relied upon by transportation engineering professionals, were used to assess traffic congestion at the study intersections. Figures 12 and 13 presents the LOS, delay (seconds/vehicle), and volume/capacity ratio[15] (v/c) results during the weekday AM and PM peak hour.

FIGURE 12: AM PEAK HOUR LOS RESULTS

	AM Peak Hour											
	2017 No Build			2017 Build			2022 No Build			2022 Build		
Intersections	LOS	Dela	v/c	LOS	Dela	v/c	LOS	Dela	v/c	LOS	Dela	v/c
SCVC Perimeter Road/Blakely Road												
NB Left, exiting Development	C	24.7	0.09	D	25.1	0.10	D	26.2	0.10	D	26.5	0.11
NB Right, exiting Development	B	13.3	0.05	B	13.4	0.06	B	13.7	0.06	B	13.7	0.06
WB Left, on Blakely	A	9.2	0.06	A	9.2	0.06	A	9.3	0.06	A	9.3	0.06
SCVC Green/Blakely Road												
NB Right exiting Development	B	13.6	0.08	B	13.7	0.08	B	14.0	0.08	B	14.0	0.09
SCVC Exit/US7												
EB Right from Development	D	33.7	0.36	D	34.8	0.39	E	36.9	0.39	E	39.2	0.43

FIGURE 13: PM PEAK HOUR LOS RESULTS

	PM Peak Hour											
	2017 No Build			2017 Build			2022 No Build			2022 Build		
Intersections	LOS	Dela	v/c	LOS	Dela	v/c	LOS	Dela	v/c	LOS	Dela	v/c
SCVC Perimeter Road/Blakely Road												
NB Left, exiting Development	D	33.1	0.17	D	34.7	0.19	E	36.5	0.20	E	38.5	0.22
NB Right, exiting Development	B	11.9	0.06	B	12.0	0.07	B	12.2	0.07	B	12.2	0.07
WB Left, on Blakely	A	9.0	0.12	A	9.0	0.13	A	9.1	0.13	A	9.1	0.13
SCVC Green/Blakely Road												
NB Right exiting Development	B	11.6	0.03	B	11.6	0.03	B	11.7	0.03	B	11.8	0.04
SCVC Exit/US7												
EB Right from Development	B	12.1	0.06	B	12.2	0.07	B	12.4	0.07	B	12.4	0.07

It should be noted that the delay exiting the US7 access in the AM Peak, and the Perimeter Rd access in PM Peak are significant, however the volumes on these approaches are well below the threshold for the VTrans LOS policy guidelines, and the volume to capacity ratios are well within reason.

6.0 CRASH HISTORIES

VTrans maintains a statewide database of all reported crashes along all state highways and federal aid road segments. Crash histories were reviewed for the most recent 5 years of available data (January 1, 2012 through December 31, 2016). Within this 5 year period, 3 crash was reported on Blakely Road

[15] v/c, also referred to as the degree of saturation is the fraction of actual volume (v) to theoretical capacity to process vehicles for the given study period (c), thus a v/c value of 1.0 or greater indicates the traffic movement or intersection is at or over capacity.

within the design stopping sight distance (250 feet at 35 mph) of either project access point (east of the Green).

The Vermont Agency of Transportation maintains a list of high crash locations (HCL), which are intersections and roadway segments that have high crash rates over five years compared to other intersections or segments with similar functional classification and traffic levels. In order to be classified as a High Crash Location, an intersection or road segment (0.3 mile segments) must have more than 5 crashes in 5 years and must have an actual crash rate higher than the critical crash rate calculated by VTrans for similar roadways.

There are no high crash locations in the immediate vicinity of this project access points, however the intersection of Blakely Road, Severance Road and US7 is listed as a high crash intersection. This intersection is slated for reconstruction as part of the FY17-20 State Transportation Improvement Program (STIP)[16].

7.0 TRAFFIC SIGNAL WARRANTS

There are several applicable traffic signal warrants to review in the case of the intersection of Perimeter Drive (a.k.a. West Road) and Blakely Road:

- Peak Hour Volumes
- 4 Hour Volumes
- 8 Hour Volumes
- Crash Experience

The lowest threshold for the volume warrants are not met, as the peak volume expected on the Perimeter Drive approach is 67 vehicles in the 2022 PM Peak hour. The threshold for the Peak, 4 hour and 8 hour warrants for the minor approach (such as Perimeter Drive) is 150, 115, and 100 vehicles per hour respectively. To meet the Crash Experience warrant there must be five or more crashes in a 12 month period (among other criteria). There was one crashes within stopping sight distance of this intersection within the last 5 years.

8.0 CONCLUSIONS

The project as proposed will include 36 new apartments, which will generate approximately 18 trips during the weekday AM peak hour, 22 trips in the PM Peak Hour, and a total of 239 daily trips.

The three project access points were evaluated for capacity and performance, and were found to meet VTrans guidelines for acceptable levels of service. Volume to capacity ratios in all cases are also acceptable. In addition, little change in delay or capacity was realized at these intersections due to the proposed additional housing.

A review of traffic signal warrants reveals that warrants will not be met in the build condition, even with additional traffic expected in the future planning year (2022).

[16] VTrans Project Number STPG 5600(17)

Based on the analysis presented above we conclude that the proposed additional housing, as proposed, will not cause unreasonable congestion or unsafe conditions on the local roadway network and will not adversely impact the public investment in roadway infrastructure in the adjacent area.

END OF MEMO

Attachments:

Turning movement volume development

- AM Peak Hour
- PM Peak Hour

Synchro traffic analysis worksheets:

- 2016 AM Peak No-build
- 2016 AM Peak Build
- 2016 PM Peak No-build
- 2016 PM Peak Build
- 2021 AM Peak No-build
- 2021 AM Peak Build
- 2021 PM Peak No-build
- 2021 PM Peak Build

(30 pages total)

APPENDIX B.

SRPUD Trip Generation Worksheet

Severance Road PUD (Sunderland Woods) Trip Generation Summary 6/20/2019

ref: progress plan by CEA 4-12-19

			ITE Land Use Description						Trip Rate*				External Trips			Passby Trips		
Building	Land Use	ITE LUC	Mid-rise Apartment Units	Low-rise Units	General Office Sq. Ft.	Daycare Sq. Ft.	Retail Sq. Ft.	Restaurant Sq. Ft.	AM Peak	PM Peak	daily	Passby Rate	AM Peak	PM Peak	daily	AM Peak	PM Peak	daily
n/a	Townhouses	220		30					0.46	0.56	7.32		14	17	220	0	0	0
1	Office	710			5,540				1.16	1.15	9.74		6	6	54	0	0	0
2	Office	710			4,030				1.16	1.15	9.74		5	5	39	0	0	0
3	Apartment	221	16						0.36	0.44	5.44		6	7	87	0	0	0
3	Retail	820					8,730		0.94	3.81	37.75	34%	5	22	218	3	11	112
3	Retail	820					4,380		0.94	3.81	37.75	34%	3	11	109	1	6	56
4	Restaurant	932						4,050	9.94	9.77	112.18	43%	23	23	259	17	17	195
5	Apartment	221	36						0.36	0.44	5.44		13	16	196	0	0	0
6	Apartment	221	35						0.36	0.44	5.44		13	15	190	0	0	0
7	Apartment	221	32						0.36	0.44	5.44		12	14	174	0	0	0
8	Daycare	565				4,275			11	11.12	47.62		47	48	204	0	0	0
9	Office	710			16,480				1.16	1.15	9.74		19	19	161	0	0	0
10	Office	710			8,130				1.16	1.15	9.74		9	9	79	0	0	0
11	Apartment	221	45						0.36	0.44	5.44		16	20	245	0	0	0
			164	30	34,180	4,275	13,110	4,050					191	231	2234	22	34	364
												4% TDM credit	8	9	89			
												less internal capture#	38	66	550			
												TOTAL EXTERNAL TRIPS	145	156	1594			

LUC = Land Use Code

*Trip rates estimated from ITE Trip Generation Manual 10th edition

commercial land use rates are per 1,000 s.f.

internal capture estimated using NCHRP 8-51 Internal Capture Estimation Tool, daily trips assume pm peak is 12% (K=DHV/ADT)

Severance Road PUD (Sunderland Woods) Distribution Summary (less TDM trips)

	Total Trips by Use Category			AM Peak Hour - Total Trips						PM Peak Hour					
	AM	PM	daily	ENTER	EXIT	ENTER	EXIT	PBY ENT.	PBY EXIT	ENTER	EXIT	ENTER	EXIT	PBY ENT.	PBY EXIT
office	40	39	333	86%	14%	33	5			16%	84%	6	32		
mid-rise apartments	59	72	892	26%	74%	15	42			61%	39%	42	27		
low-rise residential	14	17	220	23%	77%	3	10			63%	37%	10	6		
retail	12	50	495	62%	38%	7	4	2	2	48%	52%	23	25	8	8
restaurant	40	40	454	55%	45%	21	17	9	7	62%	38%	24	14	10	6
other (daycare)	47	48	204	53%	47%	24	21			47%	53%	21	24		
	212	265	2597												
					Total Trips (less TDM)	103	101	204				126	128	255	
					less internal capture#	19	19					33	33		
					Total Passby Trips	12	9					18	15		
					Total External Trips	**72**	**73**	**145**				**76**	**81**	**156**	

internal capture estimated using NCHRP 8-51 Internal Capture Estimation Tool

RSG

Severance Road PUD (Sunderland Woods) Land Use Summary

			Vehicle Trip Generation		
Building #	Units	Use	AM Peak	PM Peak	Daily
3, 5, 6, 7, 11	164	apartments	59	72	892
n/a	30	townhouses	14	17	220
1, 2, 9, 10	34,180	office	40	39	333
8	4,275	daycare	47	48	204
4	4,050	restaurant	40	40	454
3	13,110	retail	12	50	495
			212	265	2597
		TDM credit	8	9	89
		less internal capture#	38	66	550
		TOTAL EXTERNAL TRIPS	145	156	1594

APPENDIX C.

Volume Development and Trip Distribution Worksheets

06/20/19 11:55 AM

	Raw Count Data					DHV & Annual Adjustments (1) to 2020	DHV & Annual Adjustments (2) to 2020	DHV & Annual Adjustments (3) to 2020	Apply Adjustments
									1 = Apply Adjustment 1 2 = Apply Adjustment 2 3 = Apply Adjustment 3
		7:15-8:15							
		EB	WB	NB	SB				EB WB NB SB
US-7 & SEVERANCE RD	L	48	271	208	56				L 1 1 1 2
COLCHESTER	T	288	207	93	318				T 2 2 1 1
6/12/2018	R	348	22	106	59	2024			R 1 2 1 1
2nd Tuesday	Enter	684	500	407	433	2024			
30405715	Exit	450	474	163	937	2024			
	% Trucks								
	Peds	0	0	0	0	1.02 (From PM Peak)	1.16 (From PM Peak)	0.60 (From PM Peak)	
		EB	WB	NB	SB				EB WB NB SB
SEVERANCE RD & SHEA DRIVE	L								L 2 2 2 2
COLCHESTER	T	450	500						T 2 2 2 2
6/12/2018	R					950			R 2 2 2 2
2nd Tuesday	Enter	450	500	0	0	950			
30405715	Exit	450	500	0	0	950			
	% Trucks								
	Peds	0	0	0	0	1.02 (From PM Peak)	1.16 (From PM Peak)	0.60 (From PM Peak)	
		EB	WB	NB	SB				EB WB NB SB
SEVERANCE RD & DYLAN AVE	L								L 2 2 2 2
COLCHESTER	T	450	500						T 2 2 2 2
6/12/2018	R					950			R 2 2 2 2
2nd Tuesday	Enter	450	500	0	0	950			
30405715	Exit	450	500	0	0	950			

Adjusted Raw Counts — 2020

	EB	WB	NB	SB	
L	49	276	212	65	
T	333	239	95	324	
R	355	25	108	60	2142
Enter	737	541	415	449	2142
Exit	506	512	169	956	2142

Balancing — 2020

EB Exit 14 | WB Enter 37

	EB	WB	NB	SB	
L		19	-2	2	
T	10	16	-1	-9	
R	-10	2	3		29
Enter	0	37	0	-7	29
Exit	14	14	1	0	29

Balanced Adjusted Raw Counts — 2020

	EB	WB	NB	SB	
L	49	295	210	67	
T	343	256	94	315	
R	345	27	111	60	2172
Enter	737	578	415	442	2172
Exit	520	526	170	956	2172

ODVs — Sev Cor Vill Cen

From 4/10/17 Memo

	EB	WB	NB	SB	
L	1	0	2	0	
T	7	2	0	0	
R	8	0	0	1	22
Enter	17	2	2	1	22
Exit	7	5	1	8	22

ODVs — Owls Glen

	Enter	Exit	
AM	14	50	64

	EB	WB	NB	SB	
L	1			5	
T			2	26	
R		1		5	40
Enter	1	1	2	36	40
Exit	5	5	4	26	40

Total ODVs

	EB	WB	NB	SB	
L	2	0	2	5	
T	7	2	2	26	
R	8	1	0	6	62
Enter	18	3	4	37	62
Exit	13	10	5	34	62

No Build — 2020

	EB	WB	NB	SB	
L	51	295	212	72	
T	350	258	96	341	
R	353	28	111	66	2234
Enter	754	581	419	479	2234
Exit	533	536	175	990	2234

Trip Generation (Primary)

	Enter	Exit	
AM	72	73	145

25% to / from US-2/7

	EB	WB	NB	SB	
L		33		3	
T	17	13			
R		1	23		91
Enter	17	47	23	3	91
Exit	44	13	1	33	91

	EB	WB	NB	SB	
L	0	0	0	0	
T	520	578	0	0	
R	0	0	0	0	1098
Enter	520	578	0	0	1098
Exit	520	578	0	0	1098

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L	0	0	0	0	
T	520	578	0	0	
R	0	0	0	0	1098
Enter	520	578	0	0	1098
Exit	520	578	0	0	1098

	EB	WB	NB	SB	
L					
T	7	2			
R					10
Enter	7	2	0	0	10
Exit	7	2	0	0	10

	EB	WB	NB	SB	
L					
T	5	1			
R					6
Enter	5	1	0	0	6
Exit	5	1	0	0	6

	EB	WB	NB	SB	
L	0	0	0	0	
T	13	3	0	0	
R	0	0	0	0	16
Enter	13	3	0	0	16
Exit	13	3	0	0	16

	EB	WB	NB	SB	
L	0	0	0	0	
T	533	581	0	0	
R	0	0	0	0	1114
Enter	533	581	0	0	1114
Exit	533	581	0	0	1114

73% Drive Util. WB LT 10%

	EB	WB	NB	SB	
L		3	34		
T	12	13			
R	32		19		113
Enter	44	15	53	0	113
Exit	31	47	0	35	113

	EB	WB	NB	SB	
L	0	0	0	0	
T	520	578	0	0	
R	0	0	0	0	1098
Enter	520	578	0	0	1098
Exit	520	578	0	0	1098

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L	0	0	0	0	
T	520	578	0	0	
R	0	0	0	0	1098
Enter	520	578	0	0	1098
Exit	520	578	0	0	1098

	EB	WB	NB	SB	
L					
T	7	2			
R					10
Enter	7	2	0	0	10
Exit	7	2	0	0	10

	EB	WB	NB	SB	
L					
T	5	1			
R					6
Enter	5	1	0	0	6
Exit	5	1	0	0	6

	EB	WB	NB	SB	
L	0	0	0	0	
T	13	3	0	0	
R	0	0	0	0	16
Enter	13	3	0	0	16
Exit	13	3	0	0	16

	EB	WB	NB	SB	
L	0	0	0	0	
T	533	581	0	0	
R	0	0	0	0	1114
Enter	533	581	0	0	1114
Exit	533	581	0	0	1114

27% Drive Util. WB LT 90%

	EB	WB	NB	SB	
L		25	13		
T	19	3			
R	12		7		79
Enter	31	28	20	0	79
Exit	26	15	0	37	79

Trip Generation (Pass by)

	Enter	Exit	
AM	12	9	21

Build 2020

	EB	WB	NB	SB	
L	51	328	212	76	
T	367	271	96	341	
R	353	29	135	66	2325
Enter	771	628	443	483	2325
Exit	577	549	176	1022	2325

Annual Adjustment 2025

1	1.02
2	1.02
3	1.02

Adjusted Raw Counts 2025

	EB	WB	NB	SB	
L	50	301	214	68	
T	349	261	96	322	
R	352	28	113	61	2215
Enter	751	590	423	451	2215
Exit	531	536	173	975	2215

Balancing 2025

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

Balanced Adjusted Raw Counts 2025

	EB	WB	NB	SB	
L	50	301	214	68	
T	349	261	96	322	
R	352	28	113	61	2215
Enter	751	590	423	451	2215
Exit	531	536	173	975	2215

No Build 2025

	EB	WB	NB	SB	
L	52	301	216	73	
T	357	263	98	347	
R	360	28	113	67	2277
Enter	769	592	428	488	2277
Exit	544	547	178	1008	2277

Build 2025

	EB	WB	NB	SB	
L	52	334	216	77	
T	374	276	98	347	
R	360	30	137	67	2368
Enter	786	639	451	492	2368
Exit	587	559	180	1041	2368

	EB	WB	NB	SB	
L		1	3		
T					
R	4		3		11
Enter	4	1	7	0	11
Exit	3	3	0	5	11

	EB	WB	NB	SB	
L	0	3	37	0	
T	545	594	0	0	
R	36	0	23	0	1238
Enter	581	597	60	0	1238
Exit	568	631	0	40	1238

1	1.02
2	1.02
3	1.02

	EB	WB	NB	SB	
L	0	0	0	0	
T	531	590	0	0	
R	0	0	0	0	1120
Enter	531	590	0	0	1120
Exit	531	590	0	0	1120

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L	0	0	0	0	
T	531	590	0	0	
R	0	0	0	0	1120
Enter	531	590	0	0	1120
Exit	531	590	0	0	1120

	EB	WB	NB	SB	
L	0	0	0	0	
T	544	592	0	0	
R	0	0	0	0	1136
Enter	544	592	0	0	1136
Exit	544	592	0	0	1136

	EB	WB	NB	SB	
L	0	3	37	0	
T	555	605	0	0	
R	36	0	23	0	1260
Enter	592	608	60	0	1260
Exit	578	642	0	40	1260

	EB	WB	NB	SB	
L		6	1		
T					
R	2		1		10
Enter	2	6	2	0	10
Exit	1	1	0	7	10

	EB	WB	NB	SB	
L	0	31	14	0	
T	552	584	0	0	
R	13	0	8	0	1203
Enter	566	615	22	0	1203
Exit	561	598	0	44	1203

1	1.02
2	1.02
3	1.02

	EB	WB	NB	SB	
L	0	0	0	0	
T	531	590	0	0	
R	0	0	0	0	1120
Enter	531	590	0	0	1120
Exit	531	590	0	0	1120

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L	0	0	0	0	
T	531	590	0	0	
R	0	0	0	0	1120
Enter	531	590	0	0	1120
Exit	531	590	0	0	1120

	EB	WB	NB	SB	
L	0	0	0	0	
T	544	592	0	0	
R	0	0	0	0	1136
Enter	544	592	0	0	1136
Exit	544	592	0	0	1136

	EB	WB	NB	SB	
L	0	31	14	0	
T	563	595	0	0	
R	13	0	8	0	1224
Enter	576	626	22	0	1224
Exit	571	609	0	44	1224

06/20/19 11:52 AM

Raw Count Data | **DHV & Annual Adjustments (1) to 2020** | **DHV & Annual Adjustments (2) to 2020** | **DHV & Annual Adjustments (3) to 2020** | **Apply Adjustments**

16:30-17:30

#REF! 255

1 = Apply Adjustment 1
2 = Apply Adjustment 2
3 = Apply Adjustment 3

US-7 & SEVERANCE RD
COLCHESTER
6/11/2018
2nd Monday
30405715

	EB	WB	NB	SB	
L	80	121	460	49	
T	238	221	414	141	
R	165	105	441	31	2466
Enter	483	447	1315	221	2466
Exit	728	712	599	427	2466
% Trucks					
Peds	0	0	0	0	

DHV Calculations

ATR Station	D040	DHV Year	2018
Method	1	Analysis Year	2020
DHV	1,759	2018-2020 Growth	1.01
Corr. Count	1,742		
DHV Adjustment	1.01		
Total Adjustment	1.02		

DHV Calculations

ATR Station	D519	DHV Year	2016
Method		Analysis Year	2020
DHV	1,332	2016-2020 Growth	1.02
Corr. Count	1,175		
DHV Adjustment	1.13		
Total Adjustment	1.16		

DHV Calculations

ATR Station		DHV Year	2012
Method		Analysis Year	2020
DHV	708	2012-2020 Growth	1.00
Corr. Count	1,175		
DHV Adjustment	0.60		
Total Adjustment	0.60		

	EB	WB	NB	SB
L	1	1	1	1
T	1	1	1	1
R	1	1	1	1

SEVERENCE RD & WEST DRIVE
COLCHESTER
6/11/2018
2nd Monday
30405715

	EB	WB	NB	SB	
L					
T	728	447			
R					1175
Enter	728	447	0	0	1175
Exit	728	447	0	0	1175
% Trucks					
Peds	0	0	0	0	

DHV Calculations

ATR Station		DHV Year	2018
Method		Analysis Year	2020
DHV		2018-2020 Growth	
Corr. Count			
DHV Adjustment			
Total Adjustment	1.02		

DHV Calculations

ATR Station		DHV Year	2012
Method		Analysis Year	DHV
DHV		2012-2020 Growth	
Corr. Count			
DHV Adjustment			
Total Adjustment	1.16		

DHV Calculations

ATR Station		DHV Year	2012
Method		Analysis Year	DHV
DHV	708	2012-2020 Growth	1.00
Corr. Count	1,175		
DHV Adjustment	0.60		
Total Adjustment	0.60		

	EB	WB	NB	SB
L	2	2	2	2
T	2	2	2	2
R	2	2	2	2

SEVERENCE RD & EAST DRIVE
COLCHESTER
6/11/2018
2nd Monday
30405715

	EB	WB	NB	SB	
L					
T	728	447			
R					1175
Enter	728	447	0	0	1175
Exit	728	447	0	0	1175
% Trucks					
Peds	0	0	0	0	

DHV Calculations

ATR Station		DHV Year	2018
Method		Analysis Year	2020
DHV		2018-2020 Growth	
Corr. Count			
DHV Adjustment			
Total Adjustment	1.02		

DHV Calculations

ATR Station		DHV Year	2012
Method		Analysis Year	DHV
DHV		2012-2020 Growth	
Corr. Count			
DHV Adjustment			
Total Adjustment	1.16		

DHV Calculations

ATR Station		DHV Year	2012
Method		Analysis Year	DHV
DHV	708	2012-2020 Growth	1.00
Corr. Count	1,175		
DHV Adjustment	0.60		
Total Adjustment	0.60		

	EB	WB	NB	SB
L	2	2	2	2
T	2	2	2	2
R	2	2	2	2

Adjusted Raw Counts
2020

	EB	WB	NB	SB	
L	82	123	469	50	
T	243	225	422	144	
R	168	107	450	32	2515
Enter	493	456	1341	225	2515
Exit	742	726	611	435	2515

	EB	WB	NB	SB	
L	82	140	437	57	
T	275	256	394	136	
R	159	121	510	32	2599
Enter	516	517	1341	224	2599
Exit	842	725	597	435	2599

	EB	WB	NB	SB	
L	0	0	0	0	
T	842	517	0	0	
R	0	0	0	0	1359
Enter	842	517	0	0	1359
Exit	842	517	0	0	1359

	EB	WB	NB	SB	
L	0	0	0	0	
T	842	517	0	0	
R	0	0	0	0	1359
Enter	842	517	0	0	1359
Exit	842	517	0	0	1359

Balancing
2020

EB Exit 99 WB Enter 61

	EB	WB	NB	SB	
L		17	-32	7	
T	32	30	-29	-8	
R	-9	14	60		84
Enter	24	61	0	-1	84
Exit	99	-2	-14	0	84

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

Balanced Adjusted Raw Counts
2020

	EB	WB	NB	SB	
L	82	140	437	57	
T	275	256	394	136	
R	159	121	510	32	2599
Enter	516	517	1341	224	2599
Exit	842	725	597	435	2599

	EB	WB	NB	SB	
L	0	0	0	0	
T	842	517	0	0	
R	0	0	0	0	1359
Enter	842	517	0	0	1359
Exit	842	517	0	0	1359

	EB	WB	NB	SB	
L	0	0	0	0	
T	842	517	0	0	
R	0	0	0	0	1359
Enter	842	517	0	0	1359
Exit	842	517	0	0	1359

ODVs
Sev Cor Vil Cen

From 4/10/17 Memo

	EB	WB	NB	SB	
L	6	0	12	0	
T	8	10	0	0	
R	4	0	0	1	42
Enter	18	10	12	1	42
Exit	8	23	6	4	42

	EB	WB	NB	SB	
L					
T					
R					18
Enter	8	10	0	0	18
Exit	8	10	0	0	18

	EB	WB	NB	SB	
L					
T					
R					18
Enter	8	10	0	0	18
Exit	8	10	0	0	18

ODVs
Owls Glen

	Enter	Exit	
PM	51	27	78

	EB	WB	NB	SB	
L	5			2	
T			24	5	
R		7		1	44
Enter	5	7	24	7	44
Exit	2	1	37	5	44

	EB	WB	NB	SB	
L	2	7			
T					
R					9
Enter	2	7	0	0	9
Exit	2	7	0	0	9

	EB	WB	NB	SB	
L	2	7			
T					
R					9
Enter	2	7	0	0	9
Exit	2	7	0	0	9

Total ODVs

	EB	WB	NB	SB	
L	11	0	12	2	
T	8	10	24	5	
R	4	7	0	2	86
Enter	23	18	36	9	86
Exit	10	24	43	9	86

	EB	WB	NB	SB	
L	0	0	0	0	
T	10	18	0	0	
R	0	0	0	0	27
Enter	10	18	0	0	27
Exit	10	18	0	0	27

	EB	WB	NB	SB	
L	0	0	0	0	
T	10	18	0	0	
R	0	0	0	0	27
Enter	10	18	0	0	27
Exit	10	18	0	0	27

No Build
2020

	EB	WB	NB	SB	
L	93	140	449	59	
T	283	266	418	141	
R	164	129	510	34	2684
Enter	539	534	1377	233	2684
Exit	851	749	640	444	2684

	EB	WB	NB	SB	
L	0	0	0	0	
T	851	534	0	0	
R	0	0	0	0	1386
Enter	851	534	0	0	1386
Exit	851	534	0	0	1386

	EB	WB	NB	SB	
L	0	0	0	0	
T	851	534	0	0	
R	0	0	0	0	1386
Enter	851	534	0	0	1386
Exit	851	534	0	0	1386

Trip Generation (Primary)

	Enter	Exit	
PM	76	81	157

25% to / from US-2/7

	EB	WB	NB	SB	
L		26		2	
T	12	12			
R		6	40		98
Enter	12	44	40	2	98
Exit	54	12	6	26	98

73% Drive Util. WB LT 10%

	EB	WB	NB	SB	
L		2	32		
T	15	12			
R	39		27		127
Enter	54	14	59	0	127
Exit	42	44	0	42	127

27% Drive Util. WB LT 90%

	EB	WB	NB	SB	
L		20	12		
T	27	2			
R	15		10		86
Enter	42	22	22	0	86
Exit	37	14	0	34	86

Trip Generation (Pass by)

	Enter	Exit	
PM	18	15	33

Build 2020

	EB	WB	NB	SB	
L	93	166	449	61	
T	295	277	418	141	
R	164	135	550	34	2782
Enter	551	578	1417	236	2782
Exit	905	761	645	471	2782

Annual Adjustment 2025

From Redbook 2020 → 2025

1	1.02
2	1.02
3	1.02

Adjusted Raw Counts 2025

	EB	WB	NB	SB	
L	83	143	446	58	
T	281	261	402	139	
R	163	124	520	32	2650
Enter	526	527	1368	229	2650
Exit	858	739	609	444	2650

Balancing 2025

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

Balanced Adjusted Raw Counts 2025

	EB	WB	NB	SB	
L	83	143	446	58	
T	281	261	402	139	
R	163	124	520	32	2650
Enter	526	527	1368	229	2650
Exit	858	739	609	444	2650

No Build 2025

	EB	WB	NB	SB	
L	94	143	458	60	
T	288	271	426	143	
R	167	131	520	34	2736
Enter	550	545	1404	238	2736
Exit	868	763	651	453	2736

Build 2025

	EB	WB	NB	SB	
L	94	169	458	62	
T	300	282	426	143	
R	167	137	560	34	2834
Enter	561	588	1444	240	2834
Exit	922	775	657	479	2834

	EB	WB	NB	SB	
L		1	7		
T					
R	8		4		20
Enter	8	1	11	0	20
Exit	4	7	0	9	20

	EB	WB	NB	SB	
L	0	3	39	0	
T	866	546	0	0	
R	48	0	31	0	1533
Enter	913	549	70	0	1533
Exit	897	585	0	50	1533

1	1.02
2	1.02
3	1.02

	EB	WB	NB	SB	
L	0	0	0	0	
T	858	527	0	0	
R	0	0	0	0	1386
Enter	858	527	0	0	1386
Exit	858	527	0	0	1386

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L	0	0	0	0	
T	858	527	0	0	
R	0	0	0	0	1386
Enter	858	527	0	0	1386
Exit	858	527	0	0	1386

	EB	WB	NB	SB	
L	0	0	0	0	
T	868	545	0	0	
R	0	0	0	0	1413
Enter	868	545	0	0	1413
Exit	868	545	0	0	1413

	EB	WB	NB	SB	
L	0	3	39	0	
T	883	557	0	0	
R	48	0	31	0	1560
Enter	930	559	70	0	1560
Exit	914	595	0	50	1560

	EB	WB	NB	SB	
L		6	2		
T					
R	3		2		13
Enter	3	6	4	0	13
Exit	2	2	0	9	13

	EB	WB	NB	SB	
L	0	26	14	0	
T	879	537	0	0	
R	18	0	12	0	1485
Enter	896	563	26	0	1485
Exit	890	551	0	44	1485

1	1.02
2	1.02
3	1.02

	EB	WB	NB	SB	
L	0	0	0	0	
T	858	527	0	0	
R	0	0	0	0	1386
Enter	858	527	0	0	1386
Exit	858	527	0	0	1386

	EB	WB	NB	SB	
L					
T					
R					0
Enter	0	0	0	0	0
Exit	0	0	0	0	0

	EB	WB	NB	SB	
L	0	0	0	0	
T	858	527	0	0	
R	0	0	0	0	1386
Enter	858	527	0	0	1386
Exit	858	527	0	0	1386

	EB	WB	NB	SB	
L	0	0	0	0	
T	868	545	0	0	
R	0	0	0	0	1413
Enter	868	545	0	0	1413
Exit	868	545	0	0	1413

	EB	WB	NB	SB	
L	0	26	14	0	
T	895	547	0	0	
R	18	0	12	0	1512
Enter	913	573	26	0	1512
Exit	907	561	0	44	1512

APPENDIX D.

Internal Capture Worksheet

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	Sunderland Woods	**Organization:**	RSG
Project Location:	Colchester, VT	**Performed By:**	CDM
Scenario Description:	Progress plan by CEA dated 4/12/19	**Date:**	5/28/2019
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**AM Street Peak Hour**	**Date:**	

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				38	33	5
Retail				11	7	4
Restaurant				38	21	17
Cinema/Entertainment				0		
Residential				70	18	52
Hotel				0		
All Other Land Uses[2]				45	24	21
Total				202	103	99

Table 2-A: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	3	0	0	0
Retail	1		1	0	0	0
Restaurant	5	1		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	4	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary

	Total	Entering	Exiting
All Person-Trips	202	103	99
Internal Capture Percentage	19%	18%	19%
External Vehicle-Trips[3]	164	84	80
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-A: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	21%	80%
Retail	43%	50%
Restaurant	38%	41%
Cinema/Entertainment	N/A	N/A
Residential	6%	12%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Sunderland Woods
Analysis Period:	**AM Street Peak Hour**

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	33	33	1.00	5	5
Retail	1.00	7	7	1.00	4	4
Restaurant	1.00	21	21	1.00	17	17
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	18	18	1.00	52	52
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		1	3	0	0	0
Retail	1		1	0	1	0
Restaurant	5	2		0	1	1
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	10	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	5	0	0	0
Retail	1		11	0	0	0
Restaurant	5	1		0	1	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	1	4	0		0
Hotel	1	0	1	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	7	26	33	26	0	0
Retail	3	4	7	4	0	0
Restaurant	8	13	21	13	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	1	17	18	17	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	24	24	24	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	4	1	5	1	0	0
Retail	2	2	4	2	0	0
Restaurant	7	10	17	10	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	6	46	52	46	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	21	21	21	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 8-51 Internal Trip Capture Estimation Tool			
Project Name:	Sunderland Woods	**Organization:**	RSG
Project Location:	Colchester, VT	**Performed By:**	CDM
Scenario Description:	Progress plan by CEA dated 4/12/19	**Date:**	5/28/2019
Analysis Year:	2019	**Checked By:**	
Analysis Period:	**PM Street Peak Hour**	**Date:**	

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)

Land Use	Development Data (*For Information Only*)			Estimated Vehicle-Trips		
	ITE LUCs[1]	Quantity	Units	Total	Entering	Exiting
Office				38	6	32
Retail				48	23	25
Restaurant				39	24	15
Cinema/Entertainment				0		
Residential				85	52	33
Hotel				0		
All Other Land Uses[2]				45	21	24
Total				255	126	129

Table 2-P: Mode Split and Vehicle Occupancy Estimates

Land Use	Entering Trips			Exiting Trips		
	Veh. Occ.	% Transit	% Non-Motorized	Veh. Occ.	% Transit	% Non-Motorized
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses[2]						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	0	0	1	0
Retail	1		7	0	7	0
Restaurant	0	6		0	3	0
Cinema/Entertainment	0	0	0		0	0
Residential	1	2	3	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary

	Total	Entering	Exiting
All Person-Trips	255	126	129
Internal Capture Percentage	26%	26%	26%
External Vehicle-Trips[3]	189	93	96
External Transit-Trips[4]	0	0	0
External Non-Motorized Trips[4]	0	0	0

Table 6-P: Internal Trip Capture Percentages by Land Use

Land Use	Entering Trips	Exiting Trips
Office	33%	9%
Retail	43%	60%
Restaurant	42%	60%
Cinema/Entertainment	N/A	N/A
Residential	21%	18%
Hotel	N/A	N/A

[1]Land Use Codes (LUCs) from *Trip Generation Informational Report*, published by the Institute of Transportation Engineers.
[2]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator
[3]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P
[4]Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas Transportation Institute

Project Name:	Sunderland Woods
Analysis Period:	**PM Street Peak Hour**

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends

Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	6	6	1.00	32	32
Retail	1.00	23	23	1.00	25	25
Restaurant	1.00	24	24	1.00	15	15
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	52	52	1.00	33	33
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		6	1	0	1	0
Retail	1		7	1	7	1
Restaurant	0	6		1	3	1
Cinema/Entertainment	0	0	0		0	0
Residential	1	14	7	0		1
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)

Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		2	0	0	2	0
Retail	2		7	0	24	0
Restaurant	2	12		0	8	0
Cinema/Entertainment	0	1	1		2	0
Residential	3	2	3	0		0
Hotel	0	0	1	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)

Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	2	4	6	4	0	0
Retail	10	13	23	13	0	0
Restaurant	10	14	24	14	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	11	41	52	41	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	21	21	21	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)

Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles[1]	Transit[2]	Non-Motorized[2]
Office	3	29	32	29	0	0
Retail	15	10	25	10	0	0
Restaurant	9	6	15	6	0	0
Cinema/Entertainment	0	0	0	0	0	0
Residential	6	27	33	27	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses[3]	0	24	24	24	0	0

[1]Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

[2]Person-Trips

[3]Total estimate for all other land uses at mixed-use development site-not subject to internal trip capture computations in this estimator

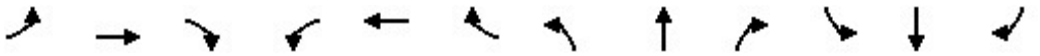
*Indicates computation that has been rounded to the nearest whole number.

APPENDIX E.

Synchro and SimTraffic Reports

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/14/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	350	353	295	258	28	212	96	111	72	341	66
Future Volume (veh/h)	51	350	353	295	258	28	212	96	111	72	341	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	51	350	353	295	258	28	212	96	111	72	341	66
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	373	436	370	360	542	59	306	599	508	489	423	82
Arrive On Green	0.04	0.23	0.23	0.13	0.33	0.33	0.09	0.32	0.32	0.05	0.28	0.28
Sat Flow, veh/h	1781	1870	1585	1781	1658	180	1781	1870	1585	1781	1523	295
Grp Volume(v), veh/h	51	350	353	295	0	286	212	96	111	72	0	407
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1838	1781	1870	1585	1781	0	1817
Q Serve(g_s), s	1.9	15.9	19.8	10.9	0.0	11.2	7.7	3.3	4.6	2.6	0.0	18.8
Cycle Q Clear(g_c), s	1.9	15.9	19.8	10.9	0.0	11.2	7.7	3.3	4.6	2.6	0.0	18.8
Prop In Lane	1.00		1.00	1.00		0.10	1.00		1.00	1.00		0.16
Lane Grp Cap(c), veh/h	373	436	370	360	0	600	306	599	508	489	0	505
V/C Ratio(X)	0.14	0.80	0.95	0.82	0.00	0.48	0.69	0.16	0.22	0.15	0.00	0.81
Avail Cap(c_a), veh/h	400	436	370	360	0	600	306	599	508	505	0	505
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.5	32.5	34.0	22.7	0.0	24.2	23.0	21.9	22.4	21.4	0.0	30.2
Incr Delay (d2), s/veh	0.2	10.3	35.0	13.9	0.0	0.6	6.5	0.6	1.0	0.1	0.0	12.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	8.3	11.0	5.8	0.0	4.8	3.7	1.5	1.8	1.1	0.0	9.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.7	42.9	69.0	36.7	0.0	24.8	29.5	22.5	23.3	21.6	0.0	43.2
LnGrp LOS	C	D	E	D	A	C	C	C	C	C	A	D
Approach Vol, veh/h		754			581			419			479	
Approach Delay, s/veh		53.9			30.8			26.3			39.9	
Approach LOS		D			C			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.2	34.8	18.0	27.0	14.0	31.0	9.6	35.4
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	28.0	12.0	21.0	8.0	25.0	5.0	28.0
Max Q Clear Time (g_c+I1), s	4.6	6.6	12.9	21.8	9.7	20.8	3.9	13.2
Green Ext Time (p_c), s	0.0	0.8	0.0	0.0	0.0	1.0	0.0	1.4

Intersection Summary	
HCM 6th Ctrl Delay	39.7
HCM 6th LOS	D

Queuing and Blocking Report
2020 No Build AM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	204	1044	205	125	722	228	109	83	85	668
Average Queue (ft)	59	497	180	118	336	116	44	30	51	378
95th Queue (ft)	166	1127	256	144	746	199	94	65	105	677
Link Distance (ft)		1494			1568		1354	1354		1282
Upstream Blk Time (%)		1								
Queuing Penalty (veh)		0								
Storage Bay Dist (ft)	180		180	100		350			60	
Storage Blk Time (%)		31	8	41	14				2	65
Queuing Penalty (veh)		126	32	116	40				10	47

Intersection: 6: Shea Dr & Severance Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: Dylan Ave & Severance Rd

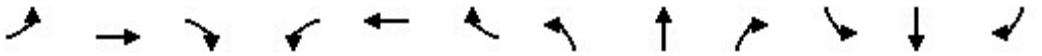
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 372

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/14/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	283	164	140	266	129	449	418	510	59	141	34
Future Volume (veh/h)	93	283	164	140	266	129	449	418	510	59	141	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	93	283	164	140	266	129	449	418	510	59	141	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	211	459	389	289	295	143	610	710	601	281	316	76
Arrive On Green	0.05	0.25	0.25	0.06	0.25	0.25	0.21	0.38	0.38	0.04	0.22	0.22
Sat Flow, veh/h	1781	1870	1585	1781	1190	577	1781	1870	1585	1781	1456	351
Grp Volume(v), veh/h	93	283	164	140	0	395	449	418	510	59	0	175
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1767	1781	1870	1585	1781	0	1807
Q Serve(g_s), s	3.4	11.8	7.6	5.0	0.0	19.0	16.3	15.6	25.8	2.2	0.0	7.3
Cycle Q Clear(g_c), s	3.4	11.8	7.6	5.0	0.0	19.0	16.3	15.6	25.8	2.2	0.0	7.3
Prop In Lane	1.00		1.00	1.00		0.33	1.00		1.00	1.00		0.19
Lane Grp Cap(c), veh/h	211	459	389	289	0	438	610	710	601	281	0	392
V/C Ratio(X)	0.44	0.62	0.42	0.48	0.00	0.90	0.74	0.59	0.85	0.21	0.00	0.45
Avail Cap(c_a), veh/h	215	513	435	289	0	485	610	710	601	305	0	392
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.8	29.3	27.8	24.4	0.0	31.9	18.8	21.7	24.8	24.7	0.0	29.7
Incr Delay (d2), s/veh	1.4	1.8	0.7	1.3	0.0	18.9	4.6	3.6	13.9	0.4	0.0	3.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	5.4	2.9	2.2	0.0	10.1	7.1	7.3	11.5	0.9	0.0	3.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	31.2	28.5	25.6	0.0	50.8	23.4	25.3	38.7	25.1	0.0	33.3
LnGrp LOS	C	C	C	C	A	D	C	C	D	C	A	C
Approach Vol, veh/h		540			535			1377			234	
Approach Delay, s/veh		29.5			44.2			29.6			31.2	
Approach LOS		C			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.8	39.2	11.0	27.5	24.0	25.0	10.8	27.7
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	32.0	5.0	24.0	18.0	19.0	5.0	24.0
Max Q Clear Time (g_c+I1), s	4.2	27.8	7.0	13.8	18.3	9.3	5.4	21.0
Green Ext Time (p_c), s	0.0	1.9	0.0	1.6	0.0	0.6	0.0	0.7

Intersection Summary	
HCM 6th Ctrl Delay	32.7
HCM 6th LOS	C

Queuing and Blocking Report
2020 No Build PM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	172	276	205	124	543	329	471	323	85	231
Average Queue (ft)	58	140	68	97	282	192	182	129	47	104
95th Queue (ft)	122	234	163	159	500	327	432	254	94	187
Link Distance (ft)		1494			1568		1354	1354		1282
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	180		180	100		350			60	
Storage Blk Time (%)	0	4	0	7	41	3	0		2	24
Queuing Penalty (veh)	0	10	0	28	57	11	1		4	14

Intersection: 6: Shea Dr & Severance Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 8: Dylan Ave & Severance Rd

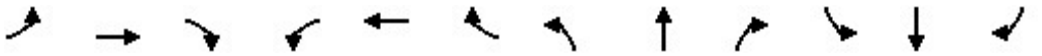
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 124

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/20/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	367	353	328	271	29	212	96	135	76	341	66
Future Volume (veh/h)	51	367	353	328	271	29	212	96	135	76	341	66
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	51	367	353	328	271	29	212	96	135	76	341	66
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	373	433	367	371	565	60	307	604	512	472	417	81
Arrive On Green	0.04	0.23	0.23	0.15	0.34	0.34	0.09	0.32	0.32	0.05	0.27	0.27
Sat Flow, veh/h	1781	1870	1585	1781	1661	178	1781	1870	1585	1781	1523	295
Grp Volume(v), veh/h	51	367	353	328	0	300	212	96	135	76	0	407
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1838	1781	1870	1585	1781	0	1817
Q Serve(g_s), s	2.0	17.8	20.9	12.9	0.0	12.2	8.0	3.5	6.0	2.9	0.0	19.9
Cycle Q Clear(g_c), s	2.0	17.8	20.9	12.9	0.0	12.2	8.0	3.5	6.0	2.9	0.0	19.9
Prop In Lane	1.00		1.00	1.00		0.10	1.00		1.00	1.00		0.16
Lane Grp Cap(c), veh/h	373	433	367	371	0	625	307	604	512	472	0	497
V/C Ratio(X)	0.14	0.85	0.96	0.89	0.00	0.48	0.69	0.16	0.26	0.16	0.00	0.82
Avail Cap(c_a), veh/h	398	433	367	371	0	625	307	604	512	484	0	497
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	26.0	34.9	36.1	23.8	0.0	24.7	23.9	23.0	23.8	23.0	0.0	32.3
Incr Delay (d2), s/veh	0.2	14.5	36.9	21.7	0.0	0.6	6.4	0.6	1.3	0.2	0.0	13.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	9.7	11.7	7.4	0.0	5.3	3.8	1.6	2.4	1.2	0.0	10.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.2	49.4	72.9	45.4	0.0	25.3	30.3	23.5	25.1	23.2	0.0	46.2
LnGrp LOS	C	D	E	D	A	C	C	C	C	C	A	D
Approach Vol, veh/h		771			628			443			483	
Approach Delay, s/veh		58.6			35.8			27.2			42.6	
Approach LOS		E			D			C			D	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.3	36.7	20.0	28.0	15.0	32.0	9.7	38.3
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	30.0	14.0	22.0	9.0	26.0	5.0	31.0
Max Q Clear Time (g_c+I1), s	4.9	8.0	14.9	22.9	10.0	21.9	4.0	14.2
Green Ext Time (p_c), s	0.0	0.9	0.0	0.0	0.0	0.9	0.0	1.6

Intersection Summary	
HCM 6th Ctrl Delay	43.2
HCM 6th LOS	D

HCM 6th TWSC
6: Shea Dr & Severance Rd

06/20/2019

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	545	36	3	594	37	23
Future Vol, veh/h	545	36	3	594	37	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	545	36	3	594	37	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	581	0	1163	563
Stage 1	-	-	-	-	563	-
Stage 2	-	-	-	-	600	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	993	-	215	526
Stage 1	-	-	-	-	570	-
Stage 2	-	-	-	-	548	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	993	-	214	526
Mov Cap-2 Maneuver	-	-	-	-	214	-
Stage 1	-	-	-	-	570	-
Stage 2	-	-	-	-	545	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	20.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	214	526	-	-	993	-
HCM Lane V/C Ratio	0.173	0.044	-	-	0.003	-
HCM Control Delay (s)	25.3	12.2	-	-	8.6	0
HCM Lane LOS	D	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-

HCM 6th TWSC
8: Dylan Ave & Severance Rd

06/20/2019

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	553	13	31	584	14	8
Future Vol, veh/h	553	13	31	584	14	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	553	13	31	584	14	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	566	0	1206	560
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	646	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1006	-	203	528
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	522	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1006	-	197	528
Mov Cap-2 Maneuver	-	-	-	-	197	-
Stage 1	-	-	-	-	572	-
Stage 2	-	-	-	-	506	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	20.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	255	-	-	1006	-
HCM Lane V/C Ratio	0.086	-	-	0.031	-
HCM Control Delay (s)	20.4	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Queuing and Blocking Report
2020 Build AM

06/20/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	204	1048	205	124	802	221	108	79	84	912
Average Queue (ft)	58	522	180	121	377	112	39	32	51	523
95th Queue (ft)	168	1157	251	135	743	191	82	65	104	913
Link Distance (ft)		1494			1568		1354	1354		1282
Upstream Blk Time (%)		3								
Queuing Penalty (veh)		0								
Storage Bay Dist (ft)	180		180	100		350			60	
Storage Blk Time (%)	0	33	9	48	15				3	69
Queuing Penalty (veh)	0	134	37	143	49				12	52

Intersection: 6: Shea Dr & Severance Rd

Movement	WB	NB	NB
Directions Served	LT	L	R
Maximum Queue (ft)	100	66	35
Average Queue (ft)	4	28	17
95th Queue (ft)	38	58	42
Link Distance (ft)	283	322	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		150	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Dylan Ave & Severance Rd

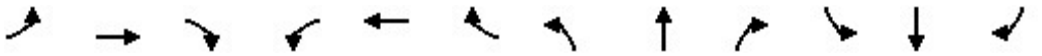
Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	42	53
Average Queue (ft)	12	18
95th Queue (ft)	38	45
Link Distance (ft)		320
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	120	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Network Summary

Network wide Queuing Penalty: 426

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/14/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	93	295	164	166	277	135	449	418	550	61	141	34
Future Volume (veh/h)	93	295	164	166	277	135	449	418	550	61	141	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	93	295	164	166	277	135	449	418	550	61	141	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	207	453	384	296	303	148	602	701	594	273	313	75
Arrive On Green	0.06	0.24	0.24	0.07	0.26	0.26	0.20	0.37	0.37	0.04	0.21	0.21
Sat Flow, veh/h	1781	1870	1585	1781	1187	579	1781	1870	1585	1781	1456	351
Grp Volume(v), veh/h	93	295	164	166	0	412	449	418	550	61	0	175
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1781	0	1766	1781	1870	1585	1781	0	1807
Q Serve(g_s), s	3.4	12.5	7.7	6.0	0.0	20.0	16.7	15.9	29.4	2.3	0.0	7.4
Cycle Q Clear(g_c), s	3.4	12.5	7.7	6.0	0.0	20.0	16.7	15.9	29.4	2.3	0.0	7.4
Prop In Lane	1.00		1.00	1.00		0.33	1.00		1.00	1.00		0.19
Lane Grp Cap(c), veh/h	207	453	384	296	0	450	602	701	594	273	0	388
V/C Ratio(X)	0.45	0.65	0.43	0.56	0.00	0.91	0.75	0.60	0.93	0.22	0.00	0.45
Avail Cap(c_a), veh/h	210	487	412	296	0	479	602	701	594	295	0	388
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.3	30.1	28.3	24.7	0.0	32.0	19.3	22.3	26.5	25.2	0.0	30.2
Incr Delay (d2), s/veh	1.5	2.8	0.8	2.4	0.0	21.4	5.0	3.7	22.7	0.4	0.0	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	5.8	3.0	2.8	0.0	11.0	7.3	7.4	14.2	1.0	0.0	3.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.8	32.9	29.1	27.1	0.0	53.4	24.3	26.0	49.2	25.6	0.0	33.9
LnGrp LOS	C	C	C	C	A	D	C	C	D	C	A	C
Approach Vol, veh/h		552			578			1417			236	
Approach Delay, s/veh		30.7			45.9			34.5			31.8	
Approach LOS		C			D			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.9	39.1	12.0	27.4	24.0	25.0	10.9	28.6
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	32.0	6.0	23.0	18.0	19.0	5.0	24.0
Max Q Clear Time (g_c+I1), s	4.3	31.4	8.0	14.5	18.7	9.4	5.4	22.0
Green Ext Time (p_c), s	0.0	0.3	0.0	1.5	0.0	0.6	0.0	0.5

Intersection Summary	
HCM 6th Ctrl Delay	35.9
HCM 6th LOS	D

HCM 6th TWSC
6: Shea Dr & Severance Rd

06/14/2019

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	866	48	3	546	39	31
Future Vol, veh/h	866	48	3	546	39	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	866	48	3	546	39	31

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	914	0	1442	890
Stage 1	-	-	-	-	890	-
Stage 2	-	-	-	-	552	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	746	-	146	342
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	577	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	746	-	145	342
Mov Cap-2 Maneuver	-	-	-	-	145	-
Stage 1	-	-	-	-	401	-
Stage 2	-	-	-	-	574	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	28.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	145	342	-	-	746	-
HCM Lane V/C Ratio	0.269	0.091	-	-	0.004	-
HCM Control Delay (s)	38.7	16.6	-	-	9.8	0
HCM Lane LOS	E	C	-	-	A	A
HCM 95th %tile Q(veh)	1	0.3	-	-	0	-

HCM 6th TWSC
8: Dylan Ave & Severance Rd

06/14/2019

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	879	18	26	537	14	12
Future Vol, veh/h	879	18	26	537	14	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	879	18	26	537	14	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	897	0	1477	888
Stage 1	-	-	-	-	888	-
Stage 2	-	-	-	-	589	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	757	-	139	343
Stage 1	-	-	-	-	402	-
Stage 2	-	-	-	-	554	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	757	-	134	343
Mov Cap-2 Maneuver	-	-	-	-	134	-
Stage 1	-	-	-	-	402	-
Stage 2	-	-	-	-	535	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	27.5
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	186	-	-	757	-
HCM Lane V/C Ratio	0.14	-	-	0.034	-
HCM Control Delay (s)	27.5	-	-	9.9	-
HCM Lane LOS	D	-	-	A	-
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Queuing and Blocking Report
2020 Build PM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	203	420	205	125	625	335	282	304	85	198
Average Queue (ft)	62	170	77	100	297	186	146	148	52	101
95th Queue (ft)	131	317	180	156	561	295	242	259	95	171
Link Distance (ft)		1494			1568		1354	1354		1282
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	180		180	100		350			60	
Storage Blk Time (%)	0	7	0	8	40	0			3	22
Queuing Penalty (veh)	1	17	0	32	67	1			6	13

Intersection: 6: Shea Dr & Severance Rd

Movement	WB	NB	NB
Directions Served	LT	L	R
Maximum Queue (ft)	55	86	55
Average Queue (ft)	4	30	21
95th Queue (ft)	30	66	48
Link Distance (ft)	283	322	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: Dylan Ave & Severance Rd

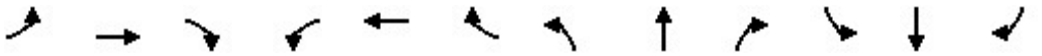
Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	60	57
Average Queue (ft)	17	21
95th Queue (ft)	47	49
Link Distance (ft)		320
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	120	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Network Summary

Network wide Queuing Penalty: 138

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/14/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	357	360	301	263	28	216	98	113	73	347	67
Future Volume (veh/h)	52	357	360	301	263	28	216	98	113	73	347	67
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	52	357	360	301	263	28	216	98	113	73	347	67
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	358	487	412	568	561	475	686	624	529	516	605	513
Arrive On Green	0.04	0.26	0.26	0.08	0.30	0.30	0.06	0.33	0.33	0.05	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	3456	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	52	357	360	301	263	28	216	98	113	73	347	67
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1728	1870	1585	1781	1870	1585
Q Serve(g_s), s	1.8	15.1	18.8	5.4	9.9	1.1	3.6	3.2	4.4	2.3	13.3	2.6
Cycle Q Clear(g_c), s	1.8	15.1	18.8	5.4	9.9	1.1	3.6	3.2	4.4	2.3	13.3	2.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	358	487	412	568	561	475	686	624	529	516	605	513
V/C Ratio(X)	0.15	0.73	0.87	0.53	0.47	0.06	0.31	0.16	0.21	0.14	0.57	0.13
Avail Cap(c_a), veh/h	388	562	476	568	605	513	686	624	529	534	605	513
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.0	29.3	30.6	22.2	24.7	21.6	18.8	20.3	20.7	17.8	24.3	20.7
Incr Delay (d2), s/veh	0.2	4.2	14.7	0.9	0.6	0.1	0.3	0.5	0.9	0.1	3.9	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	7.1	8.6	2.2	4.4	0.4	1.4	1.5	1.7	0.9	6.4	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.2	33.5	45.4	23.2	25.3	21.6	19.1	20.8	21.6	18.0	28.2	21.2
LnGrp LOS	C	C	D	C	C	C	B	C	C	B	C	C
Approach Vol, veh/h		769			592			427			487	
Approach Delay, s/veh		38.3			24.0			20.1			25.7	
Approach LOS		D			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.1	34.9	13.0	28.5	11.0	34.0	9.6	31.9
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	28.0	7.0	26.0	5.0	28.0	5.0	28.0
Max Q Clear Time (g_c+I1), s	4.3	6.4	7.4	20.8	5.6	15.3	3.8	11.9
Green Ext Time (p_c), s	0.0	0.8	0.0	1.7	0.0	1.9	0.0	1.4

Intersection Summary	
HCM 6th Ctrl Delay	28.5
HCM 6th LOS	C

Queuing and Blocking Report
2025 No Build AM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	L	T	R	L
Maximum Queue (ft)	204	514	205	143	174	342	117	126	138	115	82	174
Average Queue (ft)	46	211	133	71	89	119	13	36	73	43	28	54
95th Queue (ft)	133	390	238	121	157	237	61	96	124	92	63	135
Link Distance (ft)		1498				1563				1325	1325	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	180		180	150	150		150	150	150			150
Storage Blk Time (%)	0	11	1	0	0	4	0	0	0	0		0
Queuing Penalty (veh)	0	44	2	0	0	12	0	0	0	0		0

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	312	175
Average Queue (ft)	165	50
95th Queue (ft)	277	143
Link Distance (ft)	1264	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	10	0
Queuing Penalty (veh)	14	0

Intersection: 6: Shea Dr & Severance Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Queuing and Blocking Report
2025 No Build AM

06/19/2019

Intersection: 8: Dylan Ave & Severance Rd

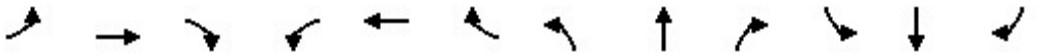
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 72

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/14/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	94	288	167	143	271	131	458	426	520	60	143	34
Future Volume (veh/h)	94	288	167	143	271	131	458	426	520	60	143	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	94	288	167	143	271	131	458	426	520	60	143	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	243	356	301	454	355	301	1216	777	658	312	726	615
Arrive On Green	0.06	0.19	0.19	0.06	0.19	0.19	0.07	0.42	0.42	0.05	0.39	0.39
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	3456	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	94	288	167	143	271	131	458	426	520	60	143	34
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1728	1870	1585	1781	1870	1585
Q Serve(g_s), s	3.5	12.2	7.9	2.7	11.3	6.0	6.0	14.2	23.5	1.6	4.2	1.1
Cycle Q Clear(g_c), s	3.5	12.2	7.9	2.7	11.3	6.0	6.0	14.2	23.5	1.6	4.2	1.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	243	356	301	454	355	301	1216	777	658	312	726	615
V/C Ratio(X)	0.39	0.81	0.55	0.32	0.76	0.44	0.38	0.55	0.79	0.19	0.20	0.06
Avail Cap(c_a), veh/h	269	521	442	462	499	423	1216	777	658	339	726	615
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.5	32.0	30.2	25.3	31.7	29.5	14.3	18.3	21.0	14.7	16.7	15.8
Incr Delay (d2), s/veh	1.0	6.0	1.6	0.4	4.4	1.0	0.2	2.8	9.4	0.3	0.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	5.9	3.1	1.1	5.4	2.3	2.5	6.4	9.8	0.6	1.8	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	26.5	38.0	31.8	25.7	36.1	30.5	14.5	21.0	30.3	15.0	17.3	16.0
LnGrp LOS	C	D	C	C	D	C	B	C	C	B	B	B
Approach Vol, veh/h		549			545			1404			237	
Approach Delay, s/veh		34.1			32.0			22.3			16.5	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.7	40.3	10.8	21.7	12.0	38.0	10.8	21.7
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	33.0	5.0	23.0	6.0	32.0	6.0	22.0
Max Q Clear Time (g_c+I1), s	3.6	25.5	4.7	14.2	8.0	6.2	5.5	13.3
Green Ext Time (p_c), s	0.0	2.9	0.0	1.5	0.0	0.9	0.0	1.3

Intersection Summary	
HCM 6th Ctrl Delay	26.1
HCM 6th LOS	C

Queuing and Blocking Report
2025 No Build PM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	L	T	R	L
Maximum Queue (ft)	204	283	205	66	174	352	175	161	175	477	274	92
Average Queue (ft)	65	156	69	25	57	138	63	67	131	191	134	37
95th Queue (ft)	143	251	169	58	120	264	151	146	204	392	240	73
Link Distance (ft)		1468				1563				1342	1342	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	180		180	150	150		150	150	150			150
Storage Blk Time (%)		5	0		0	7	0	0	1	9		0
Queuing Penalty (veh)		14	0		0	18	0	1	4	42		0

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	162	74
Average Queue (ft)	75	18
95th Queue (ft)	134	52
Link Distance (ft)	1264	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 6: Shea Dr & Severance Rd

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Queuing and Blocking Report
2025 No Build PM

06/19/2019

Intersection: 8: Dylan Ave & Severance Rd

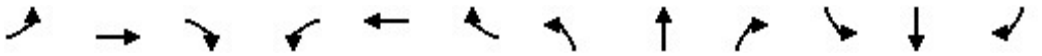
Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 81

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/19/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	52	374	360	334	276	30	216	98	137	77	347	67
Future Volume (veh/h)	52	374	360	334	276	30	216	98	137	77	347	67
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	52	374	360	334	276	30	216	98	137	77	347	67
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	349	487	413	552	562	476	685	622	527	509	605	513
Arrive On Green	0.04	0.26	0.26	0.08	0.30	0.30	0.06	0.33	0.33	0.05	0.32	0.32
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	3456	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	52	374	360	334	276	30	216	98	137	77	347	67
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1728	1870	1585	1781	1870	1585
Q Serve(g_s), s	1.8	16.0	18.8	6.1	10.5	1.2	3.6	3.2	5.5	2.5	13.3	2.6
Cycle Q Clear(g_c), s	1.8	16.0	18.8	6.1	10.5	1.2	3.6	3.2	5.5	2.5	13.3	2.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	349	487	413	552	562	476	685	622	527	509	605	513
V/C Ratio(X)	0.15	0.77	0.87	0.60	0.49	0.06	0.32	0.16	0.26	0.15	0.57	0.13
Avail Cap(c_a), veh/h	378	562	476	552	605	513	685	622	527	525	605	513
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.0	29.6	30.6	22.7	24.9	21.6	18.8	20.3	21.1	17.9	24.3	20.7
Incr Delay (d2), s/veh	0.2	5.5	14.6	1.9	0.7	0.1	0.3	0.5	1.2	0.1	3.9	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	7.7	8.6	2.5	4.6	0.4	1.4	1.5	2.1	1.0	6.4	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.2	35.1	45.2	24.6	25.5	21.7	19.1	20.9	22.3	18.0	28.2	21.2
LnGrp LOS	C	D	D	C	C	C	B	C	C	B	C	C
Approach Vol, veh/h		786			640			451			491	
Approach Delay, s/veh		38.9			24.9			20.5			25.7	
Approach LOS		D			C			C			C	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.2	34.8	13.0	28.6	11.0	34.0	9.6	32.0
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	28.0	7.0	26.0	5.0	28.0	5.0	28.0
Max Q Clear Time (g_c+I1), s	4.5	7.5	8.1	20.8	5.6	15.3	3.8	12.5
Green Ext Time (p_c), s	0.0	0.9	0.0	1.7	0.0	1.9	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	28.8
HCM 6th LOS	C

HCM 6th TWSC
6: Shea Dr & Severance Rd

06/19/2019

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	555	36	3	605	37	23
Future Vol, veh/h	555	36	3	605	37	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	555	36	3	605	37	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	591	0	1184	573
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	611	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	985	-	209	519
Stage 1	-	-	-	-	564	-
Stage 2	-	-	-	-	542	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	985	-	208	519
Mov Cap-2 Maneuver	-	-	-	-	208	-
Stage 1	-	-	-	-	564	-
Stage 2	-	-	-	-	539	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	20.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	208	519	-	-	985	-
HCM Lane V/C Ratio	0.178	0.044	-	-	0.003	-
HCM Control Delay (s)	26	12.3	-	-	8.7	0
HCM Lane LOS	D	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	0.1	-	-	0	-

HCM 6th TWSC
8: Dylan Ave & Severance Rd

06/19/2019

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	563	13	31	595	14	8
Future Vol, veh/h	563	13	31	595	14	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	563	13	31	595	14	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	576	0	1227	570
Stage 1	-	-	-	-	570	-
Stage 2	-	-	-	-	657	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	997	-	197	521
Stage 1	-	-	-	-	566	-
Stage 2	-	-	-	-	516	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	997	-	191	521
Mov Cap-2 Maneuver	-	-	-	-	191	-
Stage 1	-	-	-	-	566	-
Stage 2	-	-	-	-	500	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	20.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	248	-	-	997	-
HCM Lane V/C Ratio	0.089	-	-	0.031	-
HCM Control Delay (s)	20.9	-	-	8.7	-
HCM Lane LOS	C	-	-	A	-
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Queuing and Blocking Report
2025 Build AM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	L	T	R	L
Maximum Queue (ft)	182	598	205	147	174	283	122	139	148	106	88	174
Average Queue (ft)	42	235	140	69	89	122	13	33	71	38	38	51
95th Queue (ft)	122	448	245	119	155	218	56	86	122	79	76	134
Link Distance (ft)		1456				1563				1335	1335	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	180		180	150	150		150	150	150			150
Storage Blk Time (%)		14	1	0	0	4	0	0	0			0
Queuing Penalty (veh)		59	3	0	0	13	0	0	0			0

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	316	175
Average Queue (ft)	165	41
95th Queue (ft)	269	117
Link Distance (ft)	1264	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	10	0
Queuing Penalty (veh)	15	0

Intersection: 6: Shea Dr & Severance Rd

Movement	WB	NB	NB
Directions Served	LT	L	R
Maximum Queue (ft)	104	66	36
Average Queue (ft)	4	26	18
95th Queue (ft)	48	55	44
Link Distance (ft)	283	317	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			150
Storage Blk Time (%)			
Queuing Penalty (veh)			

Queuing and Blocking Report
2025 Build AM

06/19/2019

Intersection: 8: Dylan Ave & Severance Rd

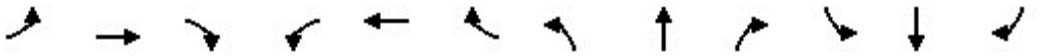
Movement	EB	WB	NB
Directions Served	TR	L	LR
Maximum Queue (ft)	4	45	52
Average Queue (ft)	0	11	18
95th Queue (ft)	3	37	45
Link Distance (ft)	283		320
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		120	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 90

HCM 6th Signalized Intersection Summary
3: US-2/7 & Blakely Rd/Severance Rd

06/14/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	94	300	167	169	282	139	458	426	560	62	143	34
Future Volume (veh/h)	94	300	167	169	282	139	458	426	560	62	143	34
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	94	300	167	169	282	139	458	426	560	62	143	34
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	247	369	313	465	374	317	1200	755	640	300	682	578
Arrive On Green	0.06	0.20	0.20	0.06	0.20	0.20	0.09	0.40	0.40	0.05	0.36	0.36
Sat Flow, veh/h	1781	1870	1585	3456	1870	1585	3456	1870	1585	1781	1870	1585
Grp Volume(v), veh/h	94	300	167	169	282	139	458	426	560	62	143	34
Grp Sat Flow(s),veh/h/ln	1781	1870	1585	1728	1870	1585	1728	1870	1585	1781	1870	1585
Q Serve(g_s), s	3.4	12.6	7.8	3.1	11.7	6.3	6.9	14.5	26.8	1.7	4.3	1.1
Cycle Q Clear(g_c), s	3.4	12.6	7.8	3.1	11.7	6.3	6.9	14.5	26.8	1.7	4.3	1.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	247	369	313	465	374	317	1200	755	640	300	682	578
V/C Ratio(X)	0.38	0.81	0.53	0.36	0.75	0.44	0.38	0.56	0.87	0.21	0.21	0.06
Avail Cap(c_a), veh/h	274	546	463	465	523	443	1200	755	640	326	682	578
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	31.5	29.6	24.9	31.0	28.8	14.5	18.9	22.6	15.7	18.0	17.0
Incr Delay (d2), s/veh	1.0	5.8	1.4	0.5	3.9	1.0	0.2	3.0	15.4	0.3	0.7	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	6.1	3.0	1.3	5.5	2.4	2.6	6.6	12.0	0.7	1.9	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.9	37.3	31.0	25.3	34.9	29.8	14.7	22.0	38.0	16.0	18.7	17.2
LnGrp LOS	C	D	C	C	C	C	B	C	D	B	B	B
Approach Vol, veh/h		561			590			1444			239	
Approach Delay, s/veh		33.5			31.0			25.9			17.8	
Approach LOS		C			C			C			B	

Timer - Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.8	39.2	11.0	22.2	13.0	36.0	10.8	22.5
Change Period (Y+Rc), s	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Max Green Setting (Gmax), s	5.0	32.0	5.0	24.0	7.0	30.0	6.0	23.0
Max Q Clear Time (g_c+I1), s	3.7	28.8	5.1	14.6	8.9	6.3	5.4	13.7
Green Ext Time (p_c), s	0.0	1.6	0.0	1.6	0.0	0.8	0.0	1.5

Intersection Summary	
HCM 6th Ctrl Delay	27.8
HCM 6th LOS	C

HCM 6th TWSC
6: Shea Dr & Severance Rd

06/14/2019

Intersection	
Int Delay, s/veh	1.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	883	48	3	557	39	31
Future Vol, veh/h	883	48	3	557	39	31
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	883	48	3	557	39	31

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	931	0	1470	907
Stage 1	-	-	-	-	907	-
Stage 2	-	-	-	-	563	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	735	-	140	334
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	570	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	735	-	139	334
Mov Cap-2 Maneuver	-	-	-	-	139	-
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	567	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	30.2
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	139	334	-	-	735	-
HCM Lane V/C Ratio	0.281	0.093	-	-	0.004	-
HCM Control Delay (s)	40.7	16.9	-	-	9.9	0
HCM Lane LOS	E	C	-	-	A	A
HCM 95th %tile Q(veh)	1.1	0.3	-	-	0	-

HCM 6th TWSC
8: Dylan Ave & Severance Rd

06/14/2019

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	895	18	26	547	14	12
Future Vol, veh/h	895	18	26	547	14	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	120	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	895	18	26	547	14	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	913	0	1503	904
Stage 1	-	-	-	-	904	-
Stage 2	-	-	-	-	599	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	746	-	134	335
Stage 1	-	-	-	-	395	-
Stage 2	-	-	-	-	549	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	746	-	129	335
Mov Cap-2 Maneuver	-	-	-	-	129	-
Stage 1	-	-	-	-	395	-
Stage 2	-	-	-	-	530	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	28.3
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	180	-	-	746	-
HCM Lane V/C Ratio	0.144	-	-	0.035	-
HCM Control Delay (s)	28.3	-	-	10	-
HCM Lane LOS	D	-	-	B	-
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Queuing and Blocking Report
2025 Build PM

06/19/2019

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB	SB
Directions Served	L	T	R	L	L	T	R	L	L	T	R	L
Maximum Queue (ft)	187	390	205	97	174	306	175	161	175	463	386	103
Average Queue (ft)	60	174	70	35	70	144	58	72	134	197	157	40
95th Queue (ft)	125	304	176	75	146	247	143	153	206	381	281	80
Link Distance (ft)		1478				1563				1316	1316	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	180		180	150	150		150	150	150			150
Storage Blk Time (%)		8	0		0	6	0	0	2	10		
Queuing Penalty (veh)		20	0		0	19	0	1	7	45		

Intersection: 3: US-2/7 & Blakely Rd/Severance Rd

Movement	SB	SB
Directions Served	T	R
Maximum Queue (ft)	152	102
Average Queue (ft)	74	20
95th Queue (ft)	133	61
Link Distance (ft)	1264	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		150
Storage Blk Time (%)	1	0
Queuing Penalty (veh)	0	0

Intersection: 6: Shea Dr & Severance Rd

Movement	EB	WB	NB	NB
Directions Served	TR	LT	L	R
Maximum Queue (ft)	4	125	97	56
Average Queue (ft)	0	6	28	22
95th Queue (ft)	3	54	70	50
Link Distance (ft)	1563	283	317	
Upstream Blk Time (%)		0		
Queuing Penalty (veh)		0		
Storage Bay Dist (ft)			150	
Storage Blk Time (%)			0	
Queuing Penalty (veh)			0	

Queuing and Blocking Report
2025 Build PM

06/19/2019

Intersection: 8: Dylan Ave & Severance Rd

Movement	EB	WB	NB
Directions Served	TR	L	LR
Maximum Queue (ft)	4	39	61
Average Queue (ft)	0	11	18
95th Queue (ft)	3	36	48
Link Distance (ft)	283		320
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		120	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty: 93