# **TOWN OF WINCHENDON**



# **AGENDA & NOTICE OF MEETING**

Pursuant to the provisions of Chapter 30A, Sections 18-25 of the General Laws, as amended, notice is hereby given that a meeting of the following board, committee, or commission will be held on the date and time specified below. Said meeting will be open to the public and press and will be recorded.

# BOARD/COMMITTEE: Planning Board – Regular Meeting & PUBLIC HEARING(S)

## DATE: June 18, 2019

тіме: 6:30 р.т.

## LOCATION: Town Hall – 2<sup>nd</sup> Floor Auditorium 109 Front Street Winchendon MA 01475

- 1. Call to Order & Pledge of Allegiance
- 2. Announcements
- 3. Public Comment
- 4. New Business:
  - A. 6:35 pm PUBLIC HEARING Site plan application for a Vehicle Maintenance and Repair and Commercial Forestry for 10 Gardner Rd. (Map 9 Parcels 15 & 16) Conservation will review and comment on 6/13. Planning Board will do the same at this meeting and then all concerns can be addressed for final reviews in July.
  - B. MJTC Committee Appointment

Request to reappoint Tracy Murphy to this role.

C. Capital Planning Committee Appointment

Request to reappoint Guy Corbosiero to this role.

- D. Discussion of pending Massworks Project and Planning Board Support Letter I believe that a grant application is being prepared requesting financial assistance to construct an entry road/drive off of Route 140 via Commercial Drive to allow for development that benefits the Town of Winchendon. This project is not yet ready for formal Planning Board review, but conceptual support of the Board will assist in the grant procurement process.
- 5. Minutes Review & Approval

March 6, 2018 March 6, 2018 April 16, 2019 May 21, 2019

September 4, 2018

- 6. Correspondence See summary provided
- 7. Adjourn

Notice- The above topics do not prohibit additional last-minute or unforeseen matters.

## TOWN OF WINCHENDON

Planning Board



Telephone (978) 297-5410

## 109 Front Street Winchendon, Massachusetts 01475-1758

# Town of Winchendon Planning Board <u>PUBLIC HEARING NOTICE</u>

Notice is hereby given that the Winchendon Planning Board will consider the site plan application for Vehicle Maintenance and Repair and Commercial Forestry submitted by McCarty Engineering, Inc, of 42 Jungle Road in Leominster, MA 01453 for property located at 10 Gardner Rd., Winchendon, MA 01475 identified as Winchendon Assessors Map 9 Parcels 15 & 16 owned by Twelve Forty-One Realty LLC of 125 Ellis Rd in Westminster MA 01473 at their regularly scheduled meeting on **Tuesday, June 18, 2019 at 6:35pm** in the Town Hall Aud., 2<sup>nd</sup> Fl., 109 Front St., Winchendon, MA 01475. Said property is located in the 'C1' – Highway Commercial zone within the 'Rt. 140 COD' – Route 140 Corridor Overlay District. A copy of the application is available at the Dept. of P&D, Winchendon Town Hall. All interested persons should plan to attend. Alternative translation and accommodations are available by advance request.

BY: Guy C. Corbosiero, Chair Winchendon Planning Board

Jun 4, 11



May 20, 2019

Mr. Guy Corbosiero, Chair Winchendon Planning Board 109 Front Street Winchendon, MA 01564

RE: Site Plan Approval Proposed Development 10 Gardner Road Winchendon, MA

Dear Mr. Koonce,

On behalf of Twelve One-Forty Realty LLC (Owner), McCarty Engineering Inc. (MEI) is submitting this Site Plan Application Package for work located at 10 Gardner Road. The property is approximately 4.85 ac in size as shown on Map 09, Lot 15, on the Town of Winchendon, MA Assessors maps.

The project includes the redevelopment of the existing site to support the proposed Commercial Forestry and vehicle maintenance & repair uses. The existing building is adequate to support the proposed use, therefore no modifications are proposed to the structure. To support the forestry business, the existing paved and gravel parking areas will be demolished to accommodate the re-grading of the site to provide a larger lay down area for timber staging, processing and storage. A modular block retaining wall will be incorporated into the lot layout on the south and eastern portion of the site to support the proposed pavement expansion. An infiltration basin is proposed below grade to mitigate the runoff resulting from the increase in impervious area from the development. As the proposed uses are considered land uses with higher potential pollutant loads, structural stormwater management BMP's are proposed as recommended by MassDEP and as outlined in the Massachusetts Stormwater Handbook. The overall impervious impact on the site is 65% and a waiver has been requested from the impervious coverage regulation.

Attached to this letter please find the following:

- Fifteen (15) copies of the Submittal and Supporting Documentation
- Two (2) full size copies of the Site Plans
- Eight (8) half size copies of the Site Plans
- Two (2) copies of the Drainage Report

Winchendon Planning Board May 20, 2019

We look forward to working with the Planning Board in the review of this application. Should you determine that a site inspection is required we are available for one at your convenience.

Please feel free to contact me with any questions.

Respectfully,

Su March As Ź

Brian Marchetti, P.E. Vice President, Engineering

P:\MEI\211-Rameau Winchendon\SPA\2019-05-20 Cover Letter.doc

# TOWN OF WINCHENDON



Telephone (978) 297-0085 Facsimile (978) 297-1616

#### 109 Front Street Winchendon, Massachusetts 01475-1758

# Application for Site Plan Approval

Pursuant to the provisions of Massachusetts General Law Chapter 40, Section 57, the Town Bylaw, Licenses and Permits of Delinquent Taxpayers, Section 2 L 1: 'Any Board ... shall deny the application ... for any person, corporation, or business enterprise who has neglected or refused to pay any local taxes, fees, assessments, betterments, or any other municipal charge.' Certification must be obtained from the Town Treasurer on this form before it is submitted to the Planning Board. The Town Treasurer has up to ten (10) days to complete certification.

I hereby certify that no debt is owed to the Town by the applicant or the owner of record for a period of time greater than twelve (12) months.

Jelly Wood 1	Ale
Town Treasurer	Cree
*****	*****

**Planning Board** 

Date

\*\*\*\*\*\*\*\*\*

PB # 2019 - 0522 Rec'd by Planning Board

APPLICANT name Twelve Forty-One Realty LLC

Address 125 Ellis Road, Westminster MA 01473 Tel. #

LANDOWNER name Twelve Forty-One Realty LLC

Address 125 Ellis Road, Westminster MA 01473 Tel. #

LOCATION OF LAND 10 Gardner Road

TITLE OF PLAN \_

Property is to be used for Vehicle Maintenance & Repair / Commercial Forestry

under Article 3.2 of the Schedule of Use Regulations of the Town of Winchendon

Deed to the property, as recorded in the Worcester District Registry of Deeds

Book 59,928 Page 248 and is shown on

Assessors Map 9 Parcel 15,16 Zoning Large Scale Commercial

Lot size

The undersigned hereby request approval of a site plan under Section 5.2 of the Winchendon Zoning Bylaws and further certify that all information provided in this application and site plan is true.

OWNER signature

APPLICANT signature

Original of this application must be submitted to the Town Clerk.

7/23/02

## Waiver Request Form:

Twelve One-Forty

#### Submitted 05/20/2019

We request the following waiver from the requirements of the Zoning Bylaws in Winchendon, Massachusetts:

 7.2 Table of Dimensional & Density Regulations- Maximum Impervious Area as % of Lot: 45%

The project proposes to cover 65% of the lot area with building and pavement. The proposed uses include vehicle maintenance and repair, and commercial forestry businesses, both of which are characterized by DEP as land uses with higher potential pollutant loads. As such, it is recommended that all areas of the site that will come in contact the industrial activity be covered in pavement to eliminate the potential for pollutants to infiltrate into the soil without pretreatment. The area required for laydown, storage and processing of timber is proposed to be paved, exceeding the 45% impervious coverage requirement. All stormwater runoff from the paved areas will be collected and pretreated, as required by DEP, prior to reaching the infiltration basin. Therefore, the applicant requests that the Planning Board grant a waiver to allow an impervious coverage of 65% of the lot area.

2. 7.2 Note 7. The distances shown in table 7.2 for front setback, side setback, and rear setback are the minimum distances from the respective lot lines on which any structure, whether temporary or permanent, other than a fence, a retaining wall, a driveway, a walkway, a lamppost, or an allowed sign may be placed unless allowed by the Planning Board under site plan review. The Planning Board may also waive the maximum height and maximum impervious area requirements as part of the site plan review neither shall there be any regular storage of materials allowed closer to the property line than the setback unless allowed by the Planning Board through Site Plan Review. As the site is located in the C1 Large Scale Commercial zoning district, a front setback of 75 feet is required.

The existing site was approved with parking spaces and storage of new and used vehicle inventory approximately five (5) feet from the property line fronting on Gardner Road. Additionally, the existing building was approved at 54 feet from the property line fronting on Gardner Road. Both setbacks are well within the required 75 foot setback per zoning.

Twelve One-Forty LLC Waiver Request Form 5/20/2019

The applicant proposes to utilize the existing building, therefore no changes are proposed that will change the 54 foot front setback to the building. However, the applicant does propose to modify the limit of pavement fronting on Gardner road to provide a greater setback than what exists today. A setback of 10 feet to the property line on Gardner Road is proposed at the vehicle parking area at the front of the building and a setback of 18 feet to the property line fronting on Gardner Road is proposed where the processing and storage of timber will take place. It is important to note that a treed landscaped berm is also proposed along the entire frontage on Gardner Road to screen the timber processing area. Therefore, the applicant requests that the Planning Board grant a waiver to allow the parking of vehicles and the processing and storage of timber to take place within the 75 foot front setback.

## Impact Statement - May 20, 2019:

1. Existing Conditions Element: - Refer to the Site Survey in Site Plan Submission

a. NAME OF PROJECT: ACREAGE: TYPE OF PROJECT: OWNER(S):		Twelve One-Forty Realty LLC 4.85 acres Commercial Development Twelve One-Forty Realty LLC. Mr. Randy Rameau, Owner 10 Gardner Road Winchendon, MA	
	LOCATION: ZONING DISTRICT: PARCEL NUMBERS:	10 Gardner Road C1 – Large Scale Commercial MAP 9, PARCEL 15 MAP 9, PARCEL 16	

 The site was previously occupied by Salvadore Jeep for the purpose of sales and service of new and used motor vehicles. The property contains a 7,444 SF building that was utilized by Salvadore Jeep for office space, showroom and a maintenance garage.

The existing site is currently served by:

- overhead electric from a utility pole in Gardner road
- municipal water service from the main in Spring Street
- on-site septic system
- on-site propane tank
- c. Based on the USDA Natural Resources Conservation Service soil survey the site is comprised of Adams Loamy Sand which is a Hydrologic Soil Groups (HSG) "A" Soil. Soil testing was conducted on site and it was found that the soils were consistently loamy sands and sands with high infiltrative capacities consistent with an "A" soil. Refer to the Drainage Report for the soil testing logs, and the Site Plans for the test pit locations.
- d. Not Applicable

#### 2. <u>Proposed Development Element</u>

- a. Permits required for proposed development:
  - Site Plan Approval from Winchendon Planning Board
  - Order of Conditions from Winchendon Conservation Commission
  - Special Permits from Winchendon ZBA for operation of a vehicle maintenance and repair business and for the parking of vehicles over 26,000 lb GVW.
  - Curb Cut Access Permit from MassDOT

- b. Area Tabulation:
  - Total Site Area = 4.85 Acres
  - Wetland Resource Area = 0.157 Acres
  - Area Dedicated to Drainage = 0.316 Acres
  - Proposed Impervious Area = 3.176 Acres
  - Total Area of Disturbance = 3.589 Acres
  - Area Reserved for Recreation, Parks or Open Land = 0 Acres

#### 3. Transportation Element

- a. Traffic Generation –Traffic generation calculations were not conducted because the proposed use will not result in an increase in traffic generation form existing conditions. The site currently has two access driveways onto Gardner Road. As the curb cuts are close to the intersection of Gardner Road and Spring Street, significant traffic backups along Gardner Road occur on a daily basis at rush hour and block both entrances. The project proposes to eliminate one curb cut onto Gardner Road and add one curb cut onto Spring Street which will reduce the traffic volume from the site onto Gardner Road and significantly improve access to and from the site.
- b. The pavement configuration is proposed to be modified on the site to accommodate the commercial forestry business. One curb cut from Gardner Road will be maintained, and one curb cut onto Spring Street is proposed. The access drive from Spring Street is proposed at 30 feet wide to accommodate trucks used for the commercial forestry business. The maximum grade of the access driveway from Spring Street is approximately 9%. The grades of the remaining travel ways on the site are approximately 1% to 2%.

#### 4. Construction Element

- a. Construction Phasing The initial phase of the project will consist of the clearing of trees within the proposed development area. Once the trees are cleared, the stumps and topsoil will be stripped and the required grading will take place to establish the proposed grades of the development. While the proposed grades are being established, the retaining wall and the proposed stormwater infrastructure will be installed. The final phase includes the installation of pavement, timber guardrail and landscaping. It is anticipated that the tree clearing, stumping and topsoil removal will take one to two weeks, and the grading, wall construction and drainage installation will take one to two months. The final phase including the installation of site finishes will take approximately one month. Construction is estimated to take place between the hours of 7 AM and 5 PM.
- b. The estimated costs for performing the work is as follows:

- Tree Clearing = \$8,000
- Stump removal and stripping of Topsoil = \$12,000
- Retaining wall & timber guardrail Installation = \$25,000
- Stormwater Infrastructure Installation = \$50,000
- Pavement installation = \$125,000
- Landscaping = \$15,000
- c. The estimate of proposed cut and fill volumes is as follows:
  - Cut = 11,000 CY
  - Fill = 3,000 CY
  - Net Cut = 8,000 CY

The export of material will take place between the hours of 7 AM and 5 PM and it is anticipated that Powell Stone and Gravel will be performing the work and moving the material to a gravel pit in the local vicinity.

- d. During construction, the site will be graded to maintain stormwater on site and prevent erosion from discharging to adjacent resource areas. Perimeter erosion controls such as silt fence and straw wattles will be installed downgradient of earthwork operations to prevent sediment from reaching the adjacent resource areas. Sedimentation basins will be constructed if necessary in anticipation of a significant rainfall event. Approximately 1.2 acres of undeveloped land will be cleared. Approximately 1.8 acres of previously developed land will also be disturbed as part of the development.
- e. Permanent methods to control erosion and sedimentation on site include the installation of bituminous pavement to control and direct stormwater runoff to proposed structural best management practices such as catch basins, a water quality unit and underground infiltration basin. The BMP's are designed with a sediment storage volume that will be maintained on a regular basis so all sediment will be intercepted prior to discharging to the adjacent resource area. The stormwater management system has been designed to mitigate the increase in runoff from the proposed development and is in compliance with all MassDEP Stormwater Management Standards. Refer to the drainage report submitted with this application.
- f. The Massachusetts Stormwater Handbook defines vehicle maintenance and repair, and log storage and sorting yards as land uses with higher potential pollutant loads, therefore the proposed infiltration basin was designed to treat a 1" water quality volume. As such, the infiltration basin has been designed to infiltrate approximately 10 times the volume as is required by the increase in impervious area.
- 5. Public Utility Element

- a. Water Supply and Distribution The property is serviced by a 2" water service that connects to a 12" public water supply main in Spring Street. No changes are proposed to the water supply to the facility.
- b. Sewage Treatment The property is serviced by an on-site septic system that was sized to accommodate the car dealership that previously occupied the site. As the proposed use will maintain the same office area and vehicle maintenance bay, with no expansion of the facility proposed, the existing septic system is adequate to service the proposed use. Additionally, a tight tank exists on site that receives flows from the floor drains within the vehicle maintenance bay. This tight tank will remain in use.
- c. Storm Drainage Stormwater from the existing site is directed to various BMP's such as tree box filters, swales and infiltration basins that were designed to treat the runoff prior to discharging to the adjacent resource areas. Runoff from the proposed site has also designed to direct all stormwater runoff to BMP's to treat the runoff prior to recharging to groundwater and discharging to adjacent resource areas. The stormwater management system has been designed to meet and exceed the requirements detailed within the Massachusetts Stormwater Handbook. Refer to the Stormwater Management Report that was submitted with this filing for details.
- d. Solid Waste Solid waste at the facility will be contained within a dumpster located in the rear of the building and will be emptied as required. All waste generated from the commercial forestry business is recycled. Saw dust is hauled to New England Wood Pellets in Jaffrey, NH and recycled into fuel pellets. All wood ships generated at the site is hauled to the chip plant in Westminster and used for fuel at Pinetree Power.

#### 6. Conservation and Recreation Element

- a. In existing conditions, approximately 3 acres of the 4.85 acre site was disturbed. The proposed development will disturb approximately 3.8 acres. Two wetland resource areas exist to the south of the site that receive runoff via overland flow from the property and abutting roadways. The development proposes to expand the pavement area to provide a larger working area for the commercial forestry business to be conducted on site. As such, portions of the development are proposed within the 100 foot buffer zone to the bordering vegetated wetlands, however no development will take place within the 50 foot no disturbance zone.
- b. The adjacent bordering vegetated wetlands receive runoff from adjacent roadways and other properties and detain water. Runoff from the proposed project will also discharge to these wetland, however the stormwater management design mitigates the runoff to below existing conditions.
- c. The subsurface conditions on the property consist of Adams Loamy Sand which is a Hydrologic Soil Groups (HSG) "A" Soil. Soil testing was conducted on site and it was found that the soils were consistently loamy sands and sands with high

infiltrative capacities consistent with an "A" soil. Refer to the Drainage Report for the soil testing logs, and the Site Plans for the test pit locations.

- d. The Massachusetts Stormwater Handbook defines vehicle maintenance and repair, and log storage and sorting yards as land uses with higher potential pollutant loads (LUHPPL). As such, in order to meet Standard #5, the proponent shall use specific structural stormwater management BMP's determined by the Department of Environmental Protection to be suitable for these uses. These BMP's are listed in Table LUHPPL (Volume 1, Chapter 1, Page 14) in the Massachusetts Stormwater Handbook. In addition to the required 80% TSS removal rate prior to discharge, treatment trains within a LUHPPL shall provide for at least 44% TSS removal prior to discharge to the infiltration BMP and shall also be designed to treat 1.0 inches of runoff for a water quality volume. Deep sump catch basins, a water quality unit (proprietary separator), a sediment forebay (isolator row) and an underground infiltration basin are incorporated into this project and provide this required level of pretreatment and water quality volume. As such, the proposed drainage improvements have been designed to fully comply with the Massachusetts Stormwater Guidelines.
- e. General Ecology The site is not located within an estimated or priority habitat of rare or endangered species.
- f. Refer to section 6.c above. The proposed use is compatible with existing soils at the site.
- g. No recreational facilities are proposed in the project.
- 7. <u>Sustainable Energy Element</u>
  - a. The proposed development is located in the Large Scale Commercial Zoning District, and a commercial forestry business and vehicle maintenance and repair business are proposed to occupy the property. As such, the operation of commercial machinery will be ongoing at the property however the business will employ good housekeeping practices, such as not leaving vehicle idling and proper maintenance of machinery, to limit the effects of greenhouse gases. It is important to note here that the byproducts of the commercial forestry business are recycled as detailed in section 5.d above.
- 8. Aesthetics Element
  - a. The existing building on the property is being maintained so there is no change proposed that will affect the aesthetics of the building. However, a significant landscaped berm is proposed along the frontage of the property on Gardner Road that will provide screening from the commercial activities conducted on site.
  - b. No additional lighting is proposed as part of this project. Existing building lighting will remain.

- c. As noted in section 8.a above, a significant landscaped berm is proposed along the frontage of the property on Gardner Road that will provide screening from the commercial activities conducted on site. The berm will be approximately 6 to 8 feet wide and two feet high, and will contain a mixture of evergreen and hardwood trees for screening.
- d. As detailed above, the views from Gardner Road will be screened by the proposed landscaped berm. The owner has relocated his business to this location and desires to make this site visually appealing to abutters. Commercial activities will be visible from Spring Street, however the site is elevated approximately 10 -12 feet above Spring Street which will assist in screening the activities conducted on site.

#### 9. Neighborhood and Community Element

- a. Schools The project will have no expected impact on the school system.
- b. Police The project will have no expected impact on the police service.
- c. Fire The project will have no expected impact on the fire service.
- d. Existing Neighborhood Land Use The project is located in the Large Scale Commercial Zoning District and is surrounded by other commercial uses, therefore the project is compatible with the existing neighborhood.
- e. Master Plan Element The proposed development is compatible with aspects of the Town of Winchendon Master Plan.

With respect to Economic Development, the proposed project is creating two new business in town that will generate tax revenue which will assist in stabilizing the Town's economic base in addition to the potential to create new jobs in town.

With respect to Circulation and Transportation, the proposed project includes a component to eliminate one access driveway on Gardner Road and add a new access driveway on Spring Street. This modification improves the safety of residents traveling on Gardner Road which provides better accessibility to Town from Route 2 and Southern New Hampshire.

With respect to Land Use, the project is compatible with the Master Plan because it is now occupying a vacant developed property that is highly visible from a major intersection in Town. Additionally, the property will now house an agricultural business that recycles the byproduct of its daily activities.

#### 10. Social-Economic Element

a. Population – The project is not a residential development therefore this element does not apply.

- b. Low/Moderate Income Housing The project is not a residential development therefore this element does not apply.
- c. Employment The proposed businesses currently employ 6 full time employees between the vehicle maintenance and repair business and the commercial forestry business. An additional 6 seasonal employees are on staff throughout the fall due to the high demand for firewood deliveries. The job descriptions include office manager, auto mechanics, heavy equipment operators and laborers. At this time, four (4) of the 6 employees are residents of Winchendon.

#### 11. Municipal Benefit / Cost Element

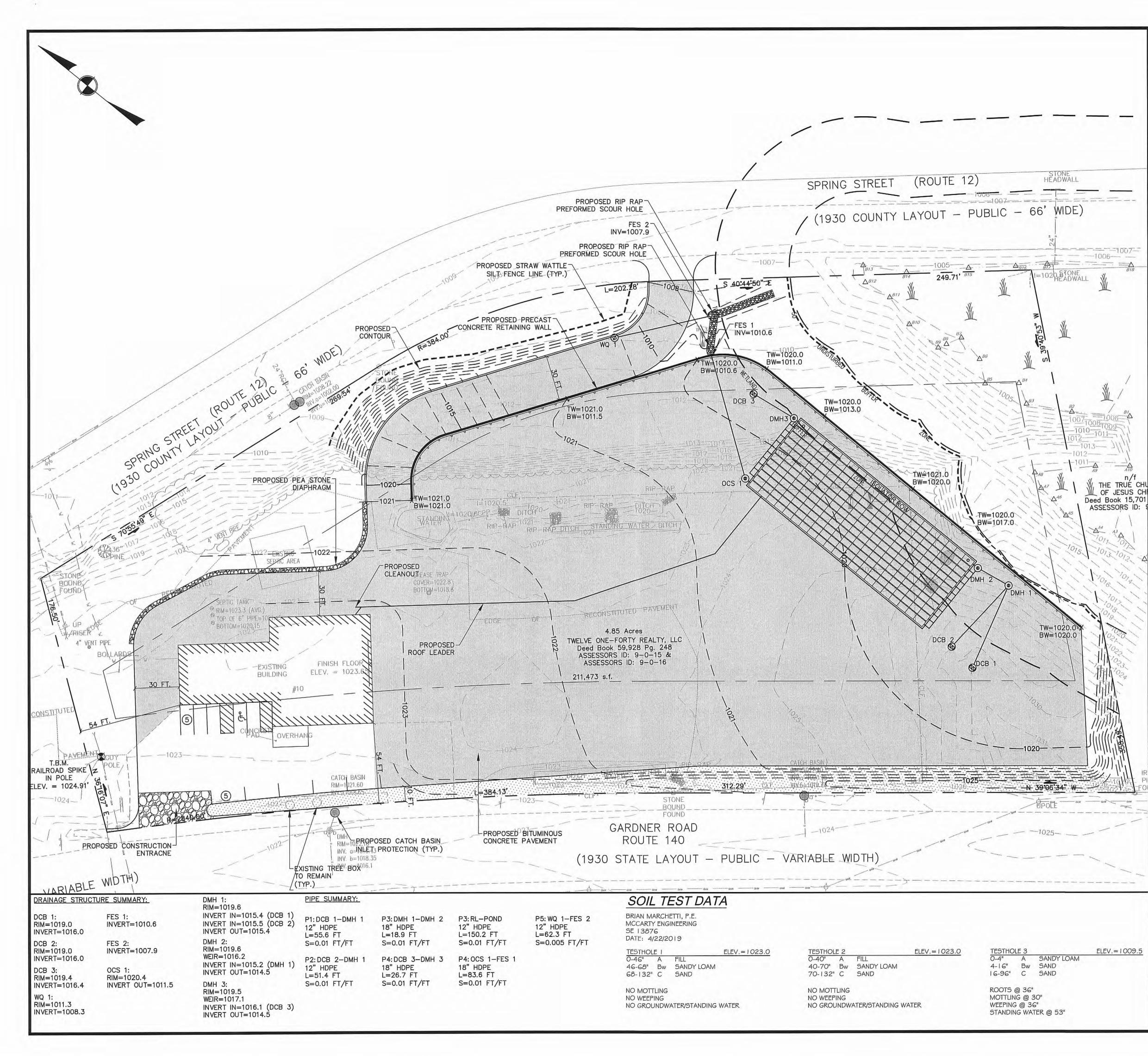
a. The monetary benefits to the Town of Winchendon after the completion of the proposed project will be recognized in the form of taxes including but not limited to real estate tax, excise tax, meal tax, sales tax and other miscellaneous taxes and fees. In addition to the taxes generated from the proposed businesses, a significant amount of tax dollars to the town are received indirectly through the day to day miscellaneous expenses of the employees who spend money for food, fuel, etc. at the nearby businesses as they conduct their daily business.

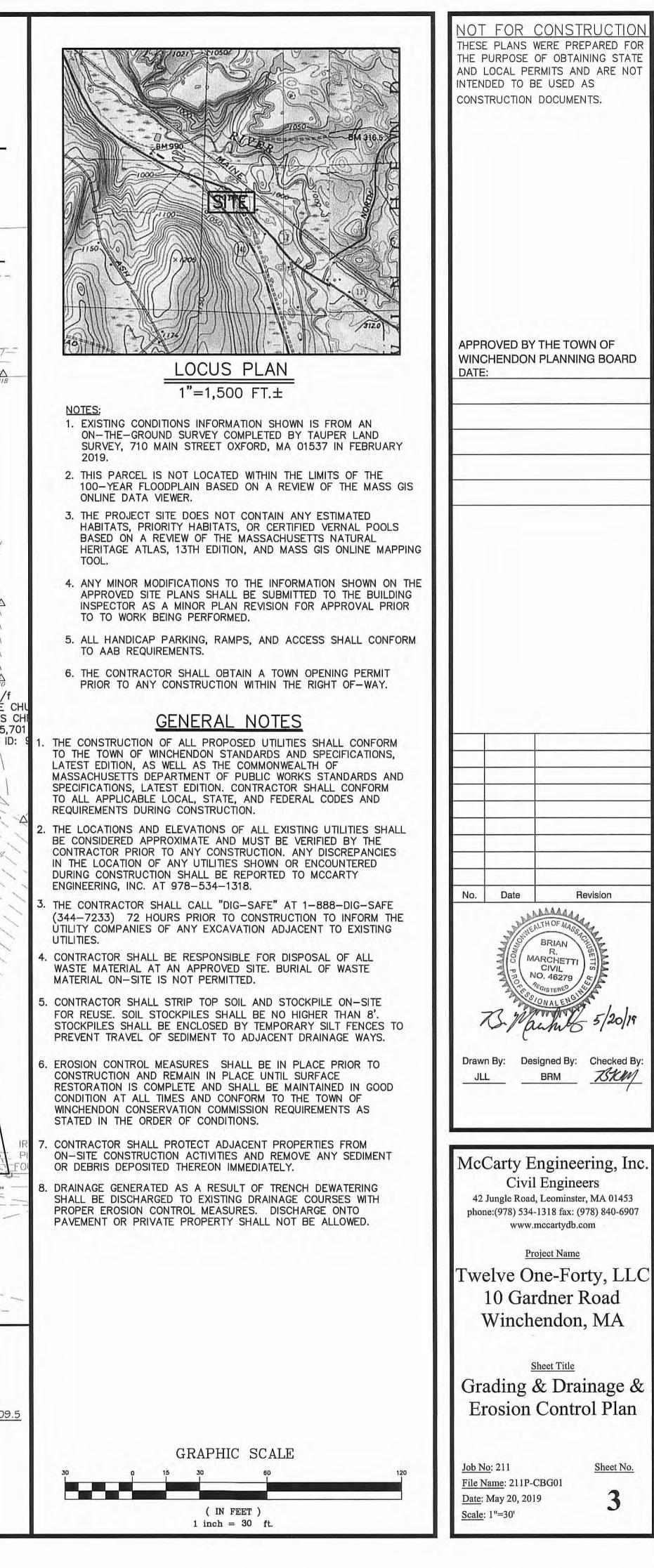
As a private business, the proposed project will not require excessive and costly maintenance or utility improvements that would be the responsibility of the Town of Winchendon. The property is served by public water but not sewer, therefore public maintenance costs will be less than normal maintenance cost by the Town. Storm water infrastructure is incorporated into the proposed design, however as a private site the cost is the sole responsibility of the property owner. Based on the elements of the design, it appears that the financial benefits of the proposed project to the Town will significantly outweigh the costs.

#### 12. Waste Generation and Disposal Element

a. One dumpster is currently located in the rear of the building at 10 Gardner Road and is used for general household waste from the office and vehicle maintenance bays. This dumpster is emptied on an as needed basis by a waste disposal contractor in town.

As stated in Section 5.d above, all waste generated from the commercial forestry business is recycled. Saw dust is hauled to New England Wood Pellets in Jaffrey, NH and recycled into fuel pellets. All wood ships generated at the site is hauled to the chip plant in Westminster and used for fuel at Pinetree Power.





## **Drainage Report:**

Twelve One-Forty Realty LLC Winchendon, Massachusetts

Submitted to:

Town of Winchendon Planning Board & Conservation Commission

May 20, 2019

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# Appendix A

NRCS Soil Survey
Soil Testing Results
Recharge Calculations
Drawdown Analysis
Water Quality Volume Calculations
TSS Removal Worksheets
Operation and Maintenance Plan
Long Term Pollution Prevention Plan
Illicit Discharge Compliance Statement
MADEP Stormwater Checklist
Pipe Sizing (Culverts) Calculations
NOAA Atlas 14 Rainfall Data

# Appendix B

Existing Conditions HydroCAD Model Proposed Conditions HydroCAD Model

Twelve One-Forty Realty LLC 10 Gardner Road Winchendon, Massachusetts STORM WATER MANAGEMENT DESIGN May 20, 2019

#### **INTRODUCTION**

The proposed project site is a 4.72 acre parcel located at 10 Gardner Road in Winchendon, Massachusetts and is located in the C1 Large Scale Commercial Zoning District. The existing site is developed and contains one 7,444 SF building, previously occupied by Salvadore Jeep, a car dealership that conducted sales and service of new and used motor vehicles. The property is bound by Gardner Road (Rt. 140) to the south and west, a wetland and undeveloped property to the southeast, and Spring Road (Rt. 12) to the north. Refer to **Figure 1** for the Locus Plan.

The Owner purchased the property in January of 2019 for the purpose of relocating his Commercial Forestry business to Winchendon. This business requires the Owner to stage cut timber on the property for the purposes of processing into fire wood for retail sale. In addition to the Commercial Forestry business, the Owner will be utilizing the garage space within the existing building for the maintenance and repair of his own large commercial vehicles, in addition to outside commercial vehicles from customers. Currently, the property has two curb cut entrances on Rt.140 for access to the site. To better support the proposed business uses and provide safer access to and from the site, the Owner proposes to eliminate one curb cut on Rt.140 and add a curb cut on Rt.12.

The project includes the redevelopment of the existing site to support the uses described above. The existing building is adequate to support the proposed use, therefore no modifications are proposed to the structure. To support the forestry business, the existing paved and gravel parking areas will be demolished to accommodate the re-grading of the site to provide a larger lay down area for timber staging, processing and storage. A modular block retaining wall will be incorporated into the lot layout on the south and eastern portion of the site to support the proposed pavement expansion. An infiltration basin is proposed below grade to mitigate the runoff resulting from the increase in impervious area from the development. The roof leader that was previously directed to an at grade basin will also be redirected to the underground infiltration basin. Runoff from the access driveway to Spring Street will be collected in a water quality inlet for treatment. After being treated through the best management practices (BMP's) described above, the runoff will be discharged to a riprap swale where it will ultimately be conveyed to a wetland resource area to the east as in existing conditions.

The Massachusetts Stormwater Handbook defines vehicle maintenance and repair, and log storage and sorting yards as land uses with higher potential pollutant loads (LUHPPL). As such, in order to meet Standard #5, the proponent shall use specific structural stormwater management BMP's determined by the Department of Environmental Protection to be suitable for these uses. These BMP's are listed in Table LUHPPL (Volume 1, Chapter 1, Page 14) in the Massachusetts Stormwater Handbook. In addition to the required 80% TSS removal rate prior to discharge, treatment trains within a LUHPPL shall provide for at least 44% TSS removal prior to discharge to the infiltration BMP and shall also be designed to treat 1.0 inches of runoff for a water quality volume. Deep sump catch basins, a water quality unit (proprietary separator), a sediment forebay (isolator row) and an underground infiltration basin are incorporated into this project and provide this required level of pretreatment and water quality volume. As such, the proposed drainage improvements have been designed to fully comply with the Massachusetts Stormwater Guidelines.

The hydrologic study area is comprised of approximately 4.175 acres. Based on the USDA Natural Resources Conservation Service soil survey the site is comprised of Adams Loamy Sand which is a Hydrologic Soil Groups (HSG) "A" Soil. Soil testing was conducted on site and it was found that the soils were consistently loamy sands and sands with high infiltrative capacities consistent with an "A" soil. As such, the Rawls Rate for an "A" soil has been used in this analysis as detailed within the MA Stormwater Handbook. Refer to **Appendix A** for the NRCS soil survey and available soil testing results.

## EXISTING CONDITIONS

As described above, the existing hydrologic study area is partially developed and comprised of approximately 1.495 ac of grass and woods, 1.191 acres of pavement, 1.308 of compacted gravel parking areas and 0.180 ac roof top. The existing site is made up of six watershed areas.

Area 1 includes the northwestern most area on the site that contains grass and a portion of a paved driveway. The stormwater runoff from these areas sheet flows overland to two existing tree box filters and onto Gardner Road. Gardner Road is considered Point of Analysis 2 (POA-2).

Area 2 includes the western portion of the site and is comprised of pavement, gravel and landscaped area that sheet flows over land to an existing drainage ditch. The runoff from this drainage ditch overflows onto Gardner Road, POA-2.

Areas 3 is located in the southwestern portion of the site which is solely comprised of woods and grass. Runoff from this area sheet flows overland to Gardner Road, POA-2.

Area 4 includes the rooftop of the existing building and portions of the bituminous and gravel parking areas. The stormwater runoff from these areas either sheet flows overland or is piped to an existing drainage basin on site. Runoff from this basin is either infiltrated or overflows to an existing wetland resource area to the south of the site which is considered Point of Analysis 1 (POA-1).

Area 5 includes woods and portions of the bituminous and gravel parking areas. The stormwater runoff from this area sheet flows overland to an existing drainage basin on site. Runoff from this basin is either infiltrated or overflows to an existing wetland resource area to the south of the site (POA-1).

Area 6 includes woods and portions of the bituminous and gravel parking areas on site and along Spring Road. The stormwater runoff from this area sheet flows overland to an existing wetland resource area to the south of the site (POA-1). Refer to **Figure 2** – Existing Watershed Plan.

## PROPOSED CONDITIONS

Under proposed conditions, the site is comprised of approximately 0.997AC of grass, 2.998 ac of pavement and 0.180 ac of roof top. The post-development run-off rates will be mitigated to less than the pre-development run-off rates for all design storm events. The proposed site is comprised of 3 watershed areas.

Area 1 includes the northwestern most area on the site that contains grass and a portion of a paved driveway. The stormwater runoff from this area sheet flows overland to two existing tree box filters and onto Gardner Road. Gardner Road is considered Point of Analysis 2 (POA-2).

Area 2 includes the existing building, landscaped area and the majority of the redeveloped pavement area on site. The stormwater runoff from this area is either piped or will sheet flow overland to proposed catch basins and will be conveyed through a piped network to proposed Underground Infiltration Basin 1. The runoff in this basin is detained and infiltrated and ultimately conveyed through an outlet structure to an existing wetland resource area to the south of the site which is considered Point of Analysis 1 (POA-1).

Area 3 includes pavement and landscaped area in the north and eastern portions of the site. The stormwater runoff from this area will either sheet flow overland to a water quality unit and be conveyed to POA-1, or will sheet flow overland directly to POA-1. Refer to **Figure 3** – Proposed Watershed Plan.

#### STORMWATER MANAGEMENT

The proposed drainage design was based on the revised Massachusetts Department of Environmental Protection (MADEP) Stormwater Management Standards (Stormwater Policy). The standards have been revised to promote increased stormwater recharge, the treatment of more runoff from polluting land uses, pollution prevention, the removal of illicit discharges to stormwater management systems, and improved operation and maintenance of stormwater best management practices (BMP's). The following summarizes the proposed project's compliance with the revised Stormwater Management Standards.

**Standard #1 Untreated Storm Water:** No new untreated storm water conveyances have been proposed to discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Storm water Best Management Practices (BMP's), such as deep sump catch basins, a water quality unit and a below grade infiltration basin is proposed within the project to provide stormwater quality control prior to discharging runoff from the site.

**Standard #2 Post-Development Peak Discharge Rates:** As a result of the increase in net impervious area from existing to proposed conditions, storm water BMP's have been developed to attenuate the peak discharge rates for the 2, 10, 25 and 100 year, 24-hour storm events. Refer to **Table 1** for the pre and post-development peak discharge rates.

**Standard #3 Recharge to Groundwater:** The project site is located within a Hydrologic Soil Group (HSG) "A" classified soil. Per MA DEP standards, recharge is required to eliminate or minimize the loss of annual recharge to groundwater through the use of environmentally sensitive site design, BMP's and good operation and maintenance. As the project consists of a mix of new and redevelopment, the increase in impervious area (1.807 ac increase) is being accounted for in the required recharge calculation. The required recharge volume for the proposed impervious area resulting from the project is 0.053 AC-FT. For the 2-year storm event, the infiltration basins will provide approximately 0.516 AC-FT of recharge to groundwater. Refer to the HydroCAD model in **Appendix B**. In addition, the project will provide approximately 0.198 AC-FT of volume (1.0" water quality volume) below the outlet to the infiltration basins. Because the basins are located within an "A" soil, the water quality volumes will draw down within 5 hours. Refer to **Appendix A** for the recharge calculations and drawdown analysis.

**Standard #4 80 Percent TSS Removal:** Based on the proposed stormwater management system design, the proposed BMP's will remove in excess of the required 80% of the Total Suspended Solids (TSS) from the stormwater runoff discharging from the site. The northeast portion of the site will sheet flow overland to Spring Street as in

existing conditions without treatment. However, the pavement in the northeast corner of the site will be directed to tree box filters as in existing conditions which receives an 80% TSS removal rate. The pavement area in the proposed access roadway will be collected in a water quality unit and treated to achieve an 85% high TSS removal rate prior to being conveyed to the receiving wetland to the south. In addition, the remaining proposed developed area existing roof top is being conveyed through deep sump catch basins, and a sediment forebay (isolator row) prior to infiltrating in the below grade infiltration basin. This treatment train will receive an 89% TSS removal rate.

As the entire impervious area on site is not directed to the TSS removal BMP's, the following weighted TSS removal rate will be achieved on site.

((10,678 sf x 80%) + (110,524 sf x 89%) + (6,799 sf x 92%) + (10,425 sf x 0%)) / (138,426 sf) = 82%

These BMP's are sized to capture in excess of the required water quality volume. The MA DEP Stormwater Management Standards require a water quality volume of 1.0 inches of runoff times the proposed impervious area since the site is considered a land use with higher potential for pollutant loading. As noted above, the proposed infiltration basins will treat the required water quality volume, which will be provided below the outlet in the basin. Refer to **Appendix A** for the Water Quality Volume calculations and the TSS Removal Worksheets.

**Standard #5 Higher Potential Pollutant Loads:** The Massachusetts Stormwater Handbook defines vehicle maintenance and repair, and log storage and sorting yards as land uses with higher potential pollutant loads (LUHPPL). Therefore, in order to meet Standard #5, specific structural stormwater management BMP's listed in Table LUHPPL, are being used in this project. In addition to the required 80% TSS removal rate prior to discharge, treatment trains within a LUHPPL shall provide for at least 44% TSS removal prior to discharge to the infiltration BMP and shall also be designed to treat 1.0 inches of runoff for a water quality volume. Deep sump catch basins, a water quality unit (proprietary separator), a sediment forebay (isolator row) and an underground infiltration basin are incorporated into this project and provide this required level of pretreatment and water quality volume.

It is important to note here that the applicant is aware of Winchendon's desire for a project to incorporate Low Impact Development (LID) BMP's in their development program, however as a LUHPPL, LID BMP's are not recommended. Furthermore, bituminous pavement is proposed on the majority of the surface area where the logging activity is taking place in order to control all surface runoff that comes in contact with the industrial activity. The impervious pavement provides a high level of protection to ensure all runoff is directed to water quality treatment BMP's prior to reaching the infiltration basin.

**Standard #6 Protection of Critical Areas:** The project site is not considered a critical area as defined by the MA DEP.

**Standard #7 Redevelopment Project:** The project is considered a mix of new and redevelopment, however all standards have been met.

**Standard #8 Erosion/Sediment Control:** Erosion and sediment controls are incorporated into the project design to prevent erosion, control sediment movement, and stabilize exposed soils during construction. During construction, control practices will be utilized such as the placement of straw wattle barriers, silt fencing, and the implementation of soil stabilization practices. These control measures will be periodically checked and maintained as necessary throughout the entire construction duration.

**Standard #9 Operation/Maintenance Plan:** A long term operation and maintenance plan has been developed to ensure the stormwater management system will function as designed. See **Appendix A** for the Operation and Maintenance Plan and Long Term Pollution Prevention plan.

**Standard #10 Illicit Discharges to Stormwater Management System:** The Stormwater Management System associated with the development of 10 Gardner Road has been designed such that prior to storm water runoff discharging from the site, it is treated through a series of best management practices. To the Engineer's knowledge, there are no known or designed non-storm water discharges that are or will be connected to the storm water collection system that would convey pollutants directly to groundwater or surface waters. See **Appendix A** for the Illicit Discharge Compliance Statement.

The proposed design meets **all** applicable DEP Stormwater Management Standards. Refer to **Appendix A** for the MADEP Stormwater Checklist.

## **DRAINAGE COLLECTION SYSTEM DESIGN**

The proposed drain pipe network is composed of deep sump catch basins and manholes that will collect runoff from the parking and landscaped areas within the proposed development and convey it to the proposed detention and infiltration basins. The pipe layout is depicted on the Grading and Drainage Plan in the plan set.

Pipe sizes were determined using the Rational Method to determine contributing flows to catch basins, as well as the Manning's Equation to calculate pipe flows (refer to **Appendix A** for pipe sizing calculations.)

The following criteria were used to design the pipe network:

- Manholes are provided at all changes in direction or changes in pipe size.
- Pipe sizes are based on flows for the 25-year storm frequency.
- Storm drain pipes shall be HDPE.
- Pipe flow velocities are maintained at a maximum of 12 fps.

## **STORMWATER QUANTITY**

Due to the proposed increase in impervious area, the project will require BMP's for infiltration and detention in order to comply with Standards # 2 and #3 of the DEP Stormwater Management Policy. The stormwater facilities proposed will include below grade infiltration basins. The proposed basins will recharge the required water quality volume in addition to attenuating the peak runoff rates for the 2, 10, 25 and 100-year, 24-hour storm events.

Hydrologic analyses were performed utilizing the computer program, HydroCAD<sup>©</sup>. In order to determine the peak rate of discharge for existing and proposed conditions, runoff hydrographs were generated for the 2-, 10-, 25- and 100-year, 24-hour storm events using the SCS TR-20 Method, NOAA Atlas 14 rainfall data and Type III rainfall distribution (refer to **Appendix B** for the existing and proposed HydroCAD models). Under proposed conditions, the post development runoff hydrographs were flood routed through the proposed stormwater management facilities.

**Table 1** compares peak runoff rates for the 2-, 10-, 25-, and 100-year storm events for existing and proposed conditions.

**Comparison of Peak Runoff Rates** 

Storm Event		Existing Flow (CFS)		Proposed Flow (CFS)	
	POA-1	POA-2	POA-1	POA-2	
2-Year	2.11	1.14	0.19	0.52	
10-Year	5.13	2.87	1.96	1.00	
25-Year	7.78	3.96	4.03	1.38	
100-Year	13.83	6.00	13.23	2.17	

#### Table 1

As shown in Table 1, peak runoff rates under proposed conditions are less than existing conditions for the 2-, 10-, 25- and 100-year storm events. Therefore, the proposed stormwater design complies with Standard #2 of the MA DEP Stormwater Management Policy.

#### **STORMWATER QUALITY**

All stormwater runoff will be treated to address water quality concerns through the use of DEP approved BMP's. The following BMP's will be provided on-site and when combined will achieve in excess of 80% TSS removal: deep sump hooded catch basins, water quality unit, tree box filter and below grade detention and infiltration basin. (See **Appendix A** for TSS Removal Worksheets)

#### Deep Sump Catch Basins

The catch basins on the proposed site will be deep sump/hooded catch basins, which will serve to trap sediment and floatables before entering the drainage system. The sump will be four-feet deep. A hood will be provided with a vacuum-break to avoid siphoning of floatables out of the catch basin. Inlets in the catch basin should be cleaned a minimum of four times per year and inspected monthly. All sediments and hydrocarbons should be properly handled and disposed, in accordance with local, state, and federal guidelines and regulations.

#### Water Quality Unit

The proposed design of the on-site drainage system will incorporate a Stormceptor® unit prior to connecting to the underground infiltration basin on site. Maintenance will be performed per the manufacturer's recommendations; however basic maintenance will consist of monthly inspections and after each major storm event during the first year of installation to accurately establish the required maintenance schedule. The structures will be cleaned out twice per year or upon the stored volume reaching 15% of the particle separator's capacity, or immediately in the event of a spill. Floatables and sediment will be removed through the 24-inch diameter outlet riser pipe and hydrocarbons will be removed through the 6-inch oil inspection port.

#### **Underground Infiltration Basins**

Once constructed, infiltration basins will be inspected at a minimum after several storm events for the first year and annually thereafter to confirm drainage system functions as designed. Problems will be addressed immediately. System shall be cleaned as required per the manufacturer's recommendations

#### Tree Box Filter

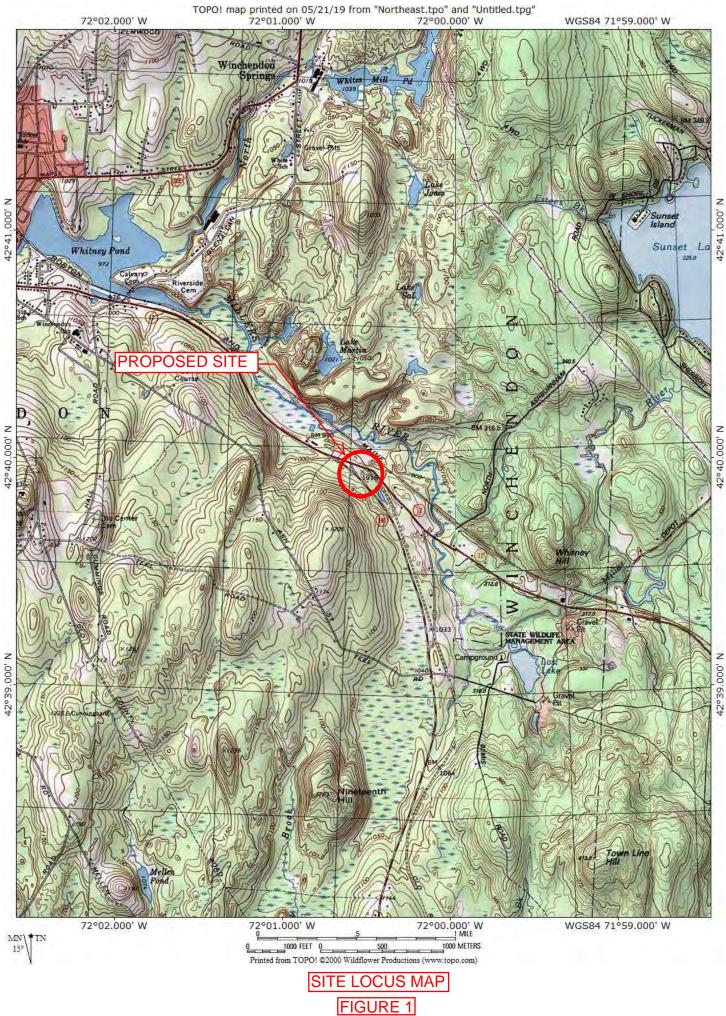
Two tree box filters were previously installed on site and are being maintained in the stormwater management design. The tree box filters should be inspected on an annual

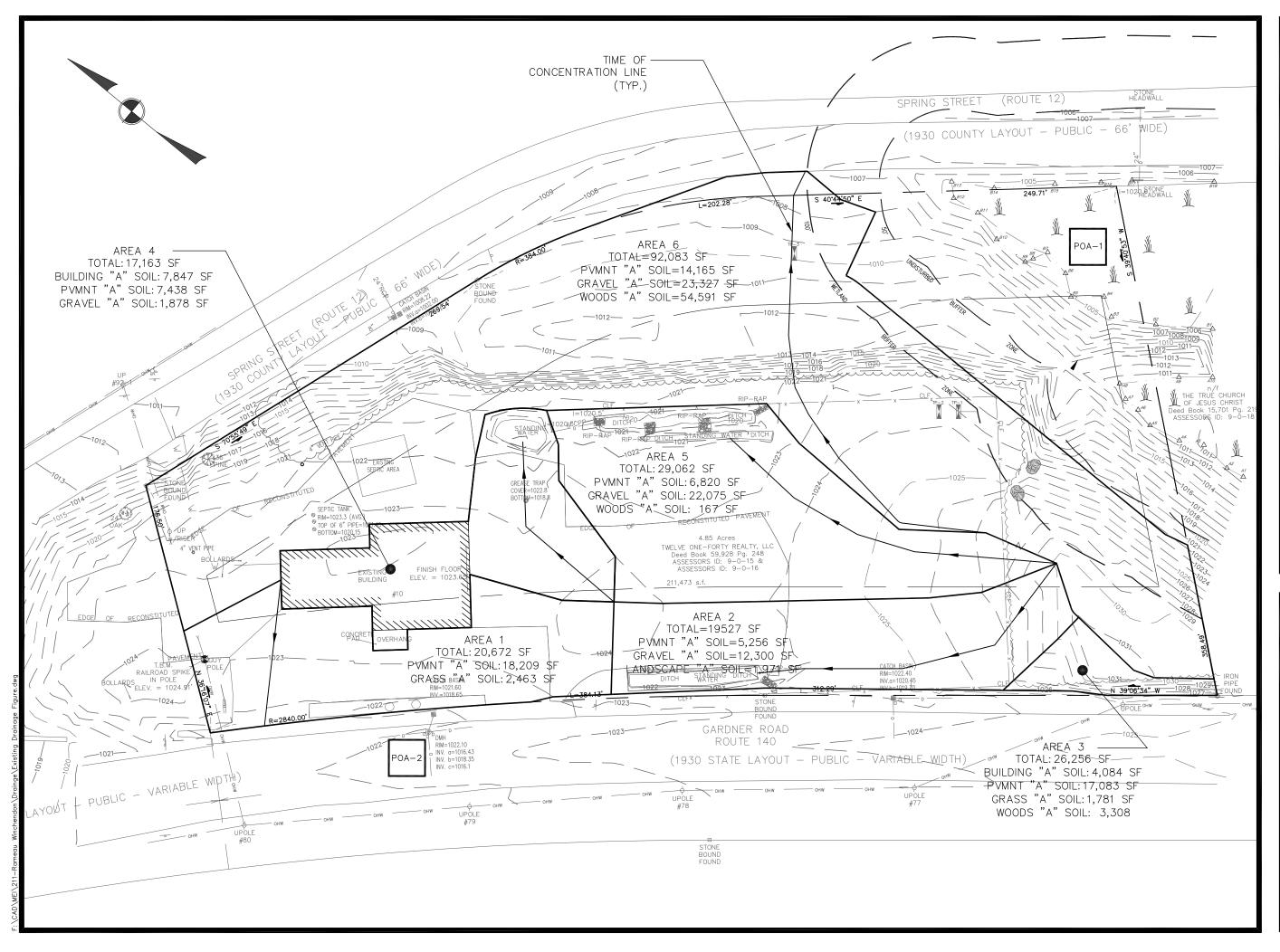
basis to ensure they are functioning as designed. The surface media should be raked twice a year to maintain the permeability of the media. The expected service life of a tree within the filter is 5-10 years, so if the tree dies the tree and media should be replaced.

#### **CONCLUSION**

The proposed stormwater management plan for the project addresses both water quantity and quality issues, and conforms to the standards outlined in the revised MADEP Stormwater Management Policy.

Figures





No.	Date	Revision		
Drawn By: Designed By: Checked By: 				

McCarty Engineering, Inc. Civil Engineers

42 Jungle Road, Leominster, MA 01453 phone:(978) 534-1318 fax: (978) 840-6907

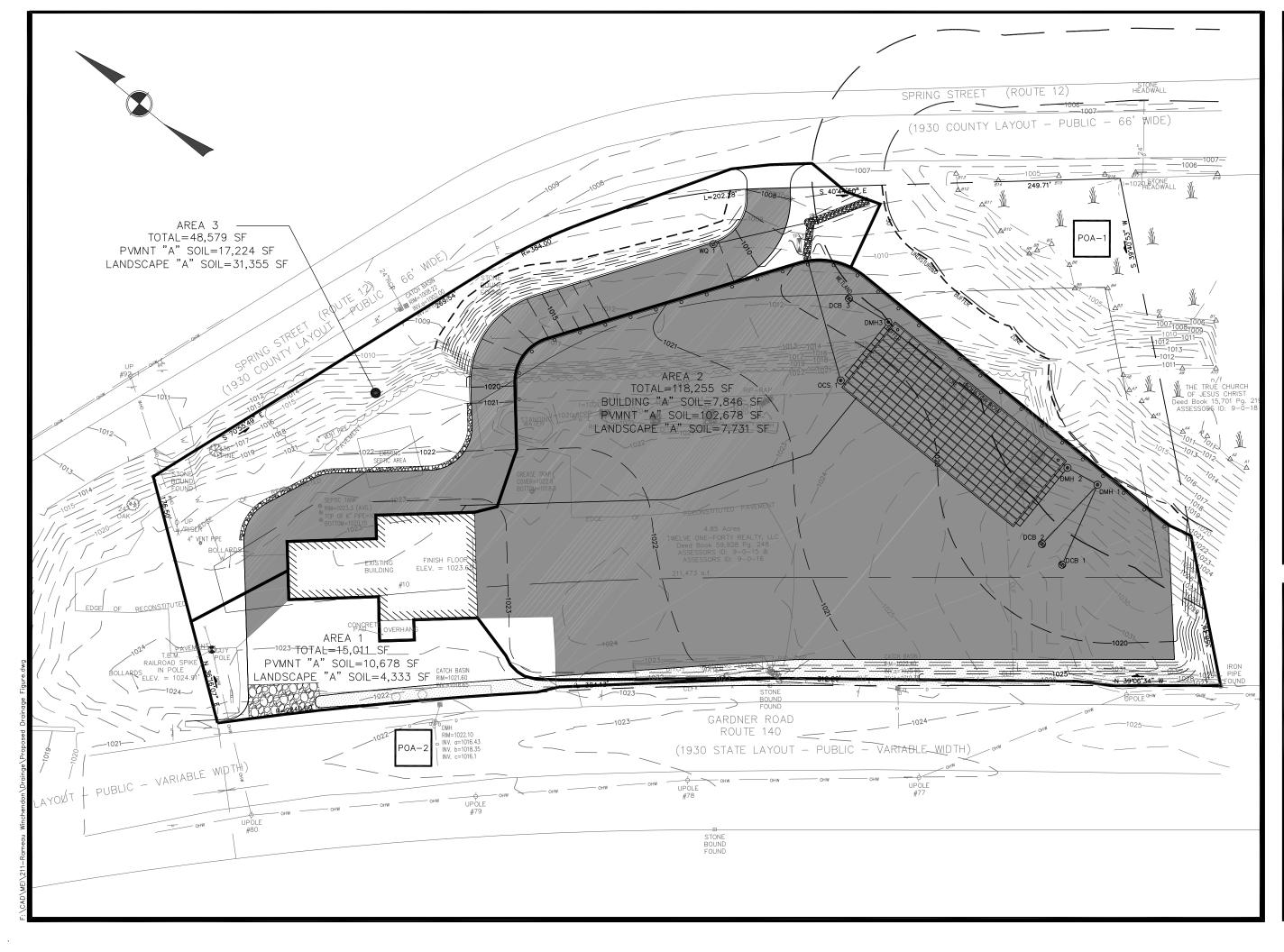
Project Name

Twelve One-Forty Realty LLC Winchendon, MA

Existing Watershed Plan

Job No: 211 File Name: 211P-Exsting Date: May 20, 2019 Scale: 1"=60' Sheet No.

2



No	Data	Povicio		
No. Date Revision				
Drawn By: Designed By: Checked By: BRM				
McCarty Engineering, Inc.				

Civil Engineers 42 Jungle Road, Leominster, MA 01453 phone:(978) 534-1318 fax: (978) 840-6907

Project Name

Twelve One-Forty Realty LLC Winchendon, MA

Proposed Watershed Plan

<u>Job No:</u> 211 <u>File Name</u>: 211P-Proposed <u>Date</u>: May 20, 2019 <u>Scale</u>: 1"=60' Sheet No.

3

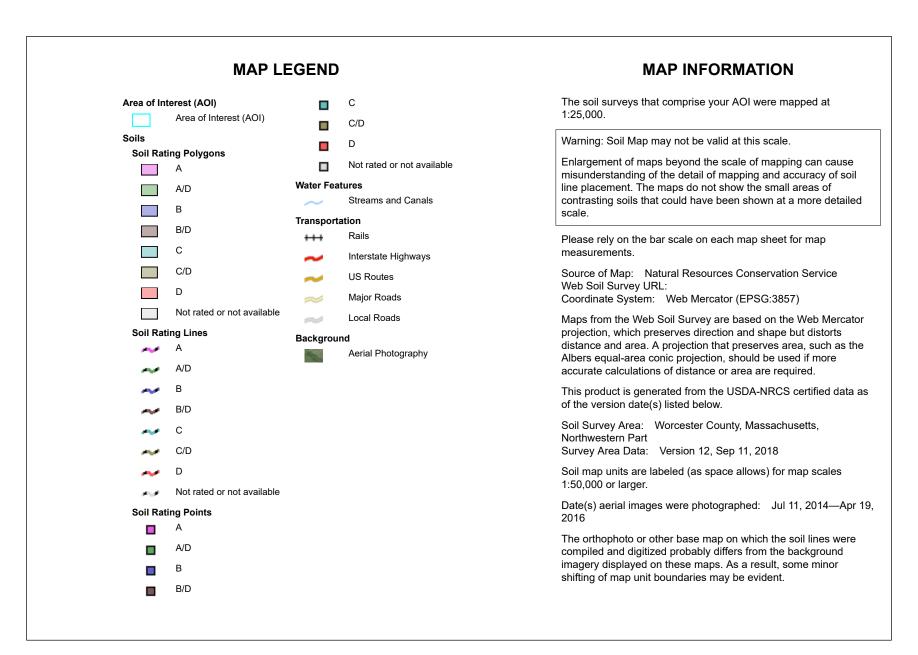
Appendix A

**NRCS Soil Survey** 



USDA Natural Resources

**Conservation Service** 





# Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
280B	Adams loamy sand, 3 to 8 percent slopes, wooded	A	3.5	100.0%
Totals for Area of Intere	st		3.5	100.0%

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## **Rating Options**

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified Tie-break Rule: Higher

Soil Testing Results

DEEP HOLE #	Condues Rod I ands / agricultur	DATE: 4/2/19	TIME: 5;	00 WEATHER	: Overast	, 30'3
LAND USE: WOODI	ANDS / AGRICULTU	AL FIELD / VACAN	T LOT / LAWN	/ GARDEN / OT	HER: Gravel	Lot
SLOPE (%) : 0-3 3	-8 8-15 15-25 25-	35 SURFACE STONE	S: COBBLES /	STONES / BOUL	DERS %	
	MAPLE R.MAPLE W.P.		FIR HEMLOCK Y	EW W.BIRCH Y.	BIRCH ASPEN	HICKORY GRASS
LANDFORM: DRUMI	IN/KAME TERRACE/1	ILL RIDGE/OUTWAS	H PLAIN/ESKER	GROUND MORAL	NE OTHER:	
	SCAPE: SUMMIT S					
DISTANCES FROM:	OPEN WATER BODY:, DRAINAGE WAY:	110 ± POSSIBLE PROPERTY	WET AREA:	DRINKING	G WATER WELL	:

## **DEEP OBSERVATION HOLE LOG**

DEPTH	SOIL HORIZON	-	SOIL TEXTURE			DIL LOR		REDOX. FEATURES	STRUCTURE	CONSISTENCY		OTHER
0" to 46"	BW1 BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI, CL, LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8		S. GRAIN GRANULAB MASSIVE BLOCKY PLATY	LOOSE VERIABLE ERIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
46" to 68"	EWD BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	MEDIUM COARSE STRATIFIED	SAND LOAMY SAND 90 NDY LOAM LOAM SILTY LOAM SILTY LOAM SI, CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	HIGH CHROMA	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
68" to 132"	A BW1 BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	LOAMY SAND SANDY LOAM LOAM SILTY LOAM SILTY LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 1 2 2 5YR 3 3 7.5YR 4 4 10YR 5 5 6 6 7 7 8 8	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BW1 BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	- SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	LOW CHROMA 1 1 2 2 10YR 3 3 2.5YR 4 4 5YR 5 5 6 6 7 7 8 8	S. GRAIN GRANULAR MASSIVE BLOCK Y PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BW1 BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	FEW COMMON MANY FINE MEDIUM COARSE	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	FAINT DISTINCT PROMINENT DEPTH:	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS

PARENT MATERIAL: Sandy Clacid Flow'al Deposits DEPTH TO BEDROCK: DEPTH TO GROUNDWATER: NA STANDING IN THE HOLE: NA WEEPING FROM PIT FACE: NA E.S.H.W.T.: Greater than No Mottling Observed 132"

ADDRESS 10 Gardner Rd, Winchendern DEEP HOLE # 2 DATE: 4/22/19 TIME: 8:30 WEATHER: LAND USE: WOODLANDS / AGRICULTURAL FIELD / VACANT LOT / LAWN / GARDEN / OTHI	Overcest 30's
LAND USE: WOODLANDS / AGRICULTURAL FIELD / VACANT LOT / LAWN / GARDEN / OTHE	ER: Gravel Lot
SLOPE(%): 0-33-8 8-15 15-25 25-35 SURFACE STONES: COBBLES / STONES / BOULDE	ERS %
VEGETATION: OAK MAPLE R.MAPLE W.PINE P.PINE CEDAR FIR HEMLOCK YEW W.BIRCH Y.BI BEECH PRNCSS. PINE GRND. PINE LEATHERLEAF HUCKLEBERRY H.B. BLUEBERRY L.B.	
LANDFORM: DRUMLIN/KAME TERRACE/TILL RIDGE/OUTWASH PLAIN/ESKER/GROUND MORAINE	OTHER:
POSITION ON LANDSCAPE: SUMMIT SHOULDER BACKSLOPE FOOTSLOPE TOESLOPE	
DISTANCES FROM: OPEN WATER BODY: $\frac{120'T}{2}$ POSSIBLE WET AREA: DRINKING DRAINAGE WAY: PROPERTY LINE: $\frac{150't}{2}$ OTHER:	WATER WELL:

**DEEP OBSERVATION HOLE LOG** 

DEPTH	SOIL HORIZON		SOIL TEXTURE			DIL LOR		REDOX. FEATURES	STRUCTURE	CONSISTENCY		OTHER
0" to 40"	BWT BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SILTY LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	3 4 5 6 7		S. <u>GRAIN</u> MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE CRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
40" 40 70"	A BWDBW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SMDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	3 4 5 6 7		S. GRAIN GRADLIL AR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM, MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
70" +0 132"	A BW1 BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUMP COARSE STRATIFIED	CAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SILCL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	2345	1 1 2 2 5YR 3 3 7.5YR 4 4 10YR 5 5 6 6 7 7 8 8	GRAIN GRANULAR MASSIVE BLOCKY PLATY	V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SILTY LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	2 2 10YR 3 3 2.5YR 4 4 5YR 5 5 6 6 7 7	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL, LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	FEW COMMON MANY FINE MEDIUM	S. GRAIN GRANULAR MASSIVE BLOCK Y PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC CI C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	FAINT DISTINCT PROMINENT DEPTH:	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS

PARENT MATERIAL: Sandy Glacial Fluvid Deposite Depth to BEDROCK: DEPTH TO GROUNDWATER: NA STANDING IN THE HOLE: NA WEEPING FROM PIT FACE: NA E.S.H.W.T.: Greater than No Mottling Observal 132"

ADDRESS 10 Gardner Rd, Winchendon DEEP HOLE # 3 DATE: 4/22/19 TIME: 9:00 WEATHER:	LOT #
LAND USE: WOODLANDS / AGRICULTURAL FIELD / VACANT LOT / LAWN / GARDEN / OTH	HER:
SLOPE(%): 0-3-3-8 8-15 15-25 25-35 SURFACE STONES: COBBLES / STONES / BOULD	DERS %
VEGETATION: OAK MAPLE R.MAPLE W.PINE P.PINE CEDAR FIR HEMLOCK YEW W.BIRCH Y.B BEECH PRNCSS. PINE GRND. PINE LEATHERLEAF HUCKLEBERRY H.B. BLUEBERRY L.B	
LANDFORM: DRUMLIN/KAME TERRACE/TILL RIDGE/OUTWASH PLAIN/ESKER/GROUND MORAIN	NE OTHER:
POSITION ON LANDSCAPE: SUMMIT SHOULDER BACKSLOPE FOOTSLOPE TOESLOPE	
DISTANCES FROM: OPEN WATER BODY: 120 + POSSIBLE WET AREA: DRINKING	G WATER WELL:

## **DEEP OBSERVATION HOLE LOG**

DEPTH	SOIL HORIZON	-	SOIL TEXTURE			DIL LOR		REDOX. FEATURES	STRUCTURE	CONSISTENCY		OTHER
0" to y"	O BWT BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8		S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V, FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
4" to "	A BW BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	COARSE STRATIFIED	CSAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SIL CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	HIGH CHROMA	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
16" to 96"	A BWI BW2 BW3 BC CI C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	EINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SILTY LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	1 1 2 2 5YR 3 3 7.5YR 4 4 10YR 5 5 6 6 7 7 8 8	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: 36 4 % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI, CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	12345678	1 2 3 4 5 6 7 8	LOW CHROMA 1 1 2 2 10YR 3 3 2.5YR 4 4 5YR 5 5 6 6 7 7 8 8	S. GRAIN GRANULAR MASSIVE BLOCK Y PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM, MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC CI C2 C3 2CD	V.EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	FEW COMMON MANY FINE MEDIUM COARSE	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS
	A BWI BW2 BW3 BC C1 C2 C3 2CD	V. EXT. GRAVELLY STONY COBBLY BOULDERY	FINE MEDIUM COARSE STRATIFIED	SAND LOAMY SAND SANDY LOAM LOAM SILTY LOAM SI. CL. LOAM	5YR 7.5YR 10YR 2.5YR 5YR 2.5YR	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8	FAINT DISTINCT PROMINENT DEPTH:	S. GRAIN GRANULAR MASSIVE BLOCKY PLATY	LOOSE V. FRIABLE FRIABLE SL. FIRM IN PLACE FIRM IN PLACE V. FIRM CEMENTED	FEW COMM. MANY	ROOTS TO: % GRAVEL % COBBLES % STONES % BOULDERS

PARENT MATERIAL: Sandy Glacid Flavial Deposite DEPTH TO BEDROCK: DEPTH TO GROUNDWATER: 30" STANDING IN THE HOLE: 53" WEEPING FROM PIT FACE: 36" E.S.H.W.T.: Molffing Observed at 30" 30 "

**Recharge Calculations** 

McCarty Engineering, INC.	Project:	Twelve One-Forty Real	ty LLC	
Stormwater Recharge		10 Gardner Road	Date:	5/20/19
			Comp:	BRM
	City:	Winchendon	Check :	PJM
	State:	MA		

#### **Recharge Required**

Hydrologic Soil	Volume to
Goup	Recharge (in)
А	0.6
В	0.35

#### **Required Recharge Volume**

	Impervious Area	Required
Soil group	(ac)	Volume (ac-ft)
А	1.807	0.053
	Total	0.053

**Recharge Provided** 

\*Total Recharge Provided in Infiltration Basins during the 2-year storm= 0.516 AC-FT

\*All recharge is taking place through the bottom of the infiltration basins. Refer to the Proposed Conditions HydroCAD Model for the Recharge Volume for all storm events.

The areas included in the Required Recharge Volume calculations reflect the increase in impervious area resulting from the proposed development.

Drawdown Analysis

Project:	Twelve One-Forty Real	211	
	10 Gardner Road	Date:	5/20/19
City:	Winchendon	Comp:	BRM
State:	MA	Check :	PJM
	City:	10 Gardner Road City: Winchendon	10 Gardner RoadDate:City:WinchendonComp:

**Underground Infiltration Basin 1** 

Storage Volume Below the Outlet = **8,638 CF** Hydraulic Conductivity for a B Soil = **2.41 in/hr (Rawls Rate)** 

**Drawdown Time = Storage Volume/(Saturated Hydraulic Conductivity x Bottom Area)** 

Drawdown Time = 8,638 cf / (2.41in/hr(1ft/12in)(9,065 sf))

**Dt = 4.8 Hours** 

Water Quality Volume Calculations

Water Quality Volume - Infiltration Basin

## 2019-04-11 Proposed Drainage

Type III 24-hr 100-Year Rainfall=7.49" Printed 5/20/2019

Prepared by McCarty Engineering, Inc. HydroCAD® 10.00-22 s/n 02034 © 2018 HydroCAD Software Solutions LLC

## Stage-Area-Storage for Pond 2P: Infiltration Basin (continued)

		<b>.</b> .				
	Elevation	Surface	Storage	Elevation	Surface	Storage
-	(feet)	(sq-ft)	(cubic-feet)	(feet)	(sq-ft)	(cubic-feet)
	1,015.06	9,065	6,031	1,015.59	9,065	9,832
	1,015.07	9,065	6,105	1,015.60	9,065	9,901
	1,015.08	9,065	6,178	1,015.61	9,065	9,970
	1,015.09	9,065	6,252	1,015.62	9,065	10,039
	1,015.10	9,065	6,325	1,015.63	9,065	10,108
	1,015.11	9,065	6,399	1,015.64	9,065	10,177
	1,015.12	9,065	6,472	1,015.65	9,065	10,246
	1,015.13	9,065	6,545	1,015.66	9,065	10,315
	1,015.14	9,065	6,619	1,015.67	9,065	10,383
	1,015.15	9,065	6,692	1,015.68	9,065	10,451
	1,015.16	9,065	6,765	1,015.69	9,065	10,520
	1,015.17	9,065	6,838	1,015.70	9,065	10,588
	1,015.18	9,065	6,911	1,015.71	9,065	10,656
	1,015.19	9,065	6,984	1,015.72	9,065	10,724
	1,015.20	9,065	7,057	1,015.73	9,065	10,792
	1,015.21	9,065	7,129	1,015.74	9,065	10,860
	1,015.22	9,065	7,202	1,015.75	9,065	10,927
	1,015.23	9,065	7,274	1,015.76	9,065	10,995
	1,015.24	9,065	7,347	1,015.77	9,065	11,062
	1,015.25	9,065	7,419	1,015.78	9,065	11,129
	1,015.26	9,065	7,492	1,015.79	9,065	11,197
	1,015.27	9,065	7,564	1,015.80	9,065	11,264
	1,015.28	9,065	7,636	1,015.81	9,065	11,331
	1,015.29	9,065	7,708	1,015.82	9,065	11,397
	1,015.30	9,065	7,780	1,015.83	9,065	11,464
	1,015.31	9,065	7,852	1,015.84	9,065	11,531
	1,015.32	9,065	7,832	1,015.85	9,005 9,065	11,597
	1,015.33	9,065	7,996	1,015.86	9,005 9,065	11,664
	1,015.34	9,065	8,067	1,015.87	9,005 9,065	11,730
	1,015.35	9,065	8,139	1,015.88	9,005 9,065	11,796
	1,015.36	9,065	8,211	1.015.89	9,065	11,862
			8,282	-WQv Provide		11,928
	1,015.37	9,065	0,202 8,353	1,015.91		
	1,015.38	9,065	8,425	1,015.92	9,065	11,993
	1,015.39	9,065			9,065	12,059
Outlet	1,015.40 <u>1.015.41</u>	9,065 9,065	8,496 8,567	1,015.93 1,015.94	9,065 9,065	12,124
Invert =						12,189 12,255
	1,015.42	9,065	8,638	1,015.95 1,015.96	9,065	,
	1,015.43	9,065	8,709		9,065	12,320
	1,015.44	9,065	8,780	1,015.97	9,065	12,385
	1,015.45	9,065	8,851	1,015.98	9,065	12,449
	1,015.46	9,065	8,921	1,015.99	9,065	12,514
	1,015.47	9,065	8,992	1,016.00	9,065	12,578
	1,015.48	9,065	9,062	1,016.01	9,065	12,643
	1,015.49	9,065	9,133	1,016.02	9,065	12,707
	1,015.50	9,065	9,203	1,016.03	9,065	12,771
	1,015.51	9,065	9,273	1,016.04	9,065	12,835
	1,015.52	9,065	9,344	1,016.05	9,065	12,899
	1,015.53	9,065	9,414	1,016.06	9,065	12,962
	1,015.54	9,065	9,484	1,016.07	9,065	13,026
	1,015.55	9,065	9,553	1,016.08	9,065	13,089
	1,015.56	9,065	9,623	1,016.09	9,065	13,153
	1,015.57	9,065	9,693	1,016.10	9,065	13,216
	1,015.58	9,065	9,762	1,016.11	9,065	13,278
		d-1 0 in v Aroa lu	nn cf v 1ft/12i	'n		

WQv Required=1.0 in x Area Imp. sf x 1ft/12in

WQv Required=1.0 in x 102,828 sf x 1ft/12in = 8,569 cf

8,638 cf > 8,569 cf

**TSS Removal Worksheets** 

#### INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu

3. After BMP is selected, TSS Removal and other Columns are automatically completed.

	Location: Tss Removal - Tree Box Filter					
	В	С	D	Е	F	
		TSS Removal	Starting TSS	Amount	Remaining	
	BMP <sup>1</sup>	Rate <sup>1</sup>	Load*	Removed (C*D)	Load (D-E)	
ŗ						
TSS Removal Calculation Worksheet	Treebox Filter	0.80	1.00	0.80	0.20	
		0.00	0.20	0.00	0.20	
		0.00	0.20	0.00	0.20	
		0.00	0.20	0.00	0.20	
0		0.00	0.20	0.00	0.20	
		80%	Separate Form Needs to be Completed for Each Outlet or BMP Train			
	Project:	Twelve One-Forty Realty LLC		2		
	Prepared By:		*Equals remaining load from previous BMP (E)			
	Date:	5/20/2019	which enters the BMP			
Non-automated TSS Calculation Sheet						

Version 1, Automated: Mar. 4, 2008

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed 1. From MassDEP Stormwater Handbook Vol. 1

#### **INSTRUCTIONS:**

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu

3. After BMP is selected, TSS Removal and other Columns are automatically completed.

	Location: Tss Removal - Deep Sump CB's & Infiltration Basin					
	В	С	D	Е	F	
TSS Removal Calculation Worksheet		TSS Removal	Starting TSS	Amount	Remaining	
	BMP <sup>1</sup>	Rate <sup>1</sup>	Load*	Removed (C*D)	Load (D-E)	
	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75	
	Sediment Forebay	0.25	0.75	0.19	0.56	
	Infiltration Basin	0.80	0.56	0.45	0.11	
		0.00	0.11	0.00	0.11	
Cal		0.00	0.11	0.00	0.11	
		89%	Separate Form Needs to be Completed for Each Outlet or BMP Train			
	Project:		_			
	Prepared By:	BRM	*Equals remaining load from previous BMP (E)			
	Date:	5/20/2019	which enters the BMP			
Non-automated TSS Calculation Sheet						

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed 1. From MassDEP Stormwater Handbook Vol. 1 Version 1, Automated: Mar. 4, 2008

Mass. Dept. of Environmental Protection

#### INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu

2. Select BMP from Drop Down Menu

3. After BMP is selected, TSS Removal and other Columns are automatically completed.

	Location:	Location: Tss Removal - Water Quality unit			
	В	С	D	Е	F
TSS Removal Calculation Worksheet		TSS Removal	Starting TSS	Amount	Remaining
	BMP <sup>1</sup>	Rate <sup>1</sup>	Load*	Removed (C*D)	Load (D-E)
	Water Quality Unit STC 450-i	0.92	1.00	0.92	0.08
		0.00	0.08	0.00	0.08
		0.00	0.08	0.00	0.08
		0.00	0.08	0.00	0.08
		0.00	0.08	0.00	0.08
		Total T	92%	Separate Form Needs to be Completed for Each Outlet or BMP Train	
	Project:	Twelve One-Forty Realty LLC		-	
Prepared By: BRM			*Equals remaining load from previous BMP (E)		
	Date:	5/20/2019	which enters the BMP		
Non-automate	d TSS Calculation Sheet				

Version 1, Automated: Mar. 4, 2008

V

Mass. Dept. of Environmental Protection

must be used if Proprietary BMP Proposed 1. From MassDEP Stormwater Handbook Vol. 1

**Operation and Maintenance Plan** 

### Twelve One-Forty Realty LLC Winchendon, Massachusetts Operation and Maintenance Plan

Twelve One-Forty Realty LLC is responsible for the maintenance and operation of the proposed stormwater collection system including deep sump catch basins, water quality unit, tree box filters and the below grade infiltration basin. The following long term Operation and Maintenance Plan for the project is proposed in accordance with DEP Stormwater Management Standard No. 9 to ensure that the stormwater collection and treatment system operates in accordance with the MADEP Stormwater Management Policy.

## Schedule for Inspection and Maintenance after Construction:

## Stormwater Management System Owner/Operator

- Twelve One-Forty Realty LLC will be the owner and operator of the proposed stormwater collection system on site.
- If the property is sold, a copy of this Operation and Maintenance Plan will be transferred to the new property owners.

## Deep Sump Catch Basins

- Inlets should be cleaned a minimum of four times per year and inspected monthly.
- All sediments and hydrocarbons should be properly handled and disposed, in accordance with local, state, and federal guidelines and regulations.
- Structures should be inspected and maintained according to the manufacturer's recommendation.

## Water Quality Unit

- Structure cover should be inspected monthly for evidence of repair. Verify that inverts are secure and free flowing. Measure depth of sediment below water line.
- Unit shall be cleaned a minimum of twice per year. One of these cleanings to occur before April 15<sup>th</sup> of each year and one shall occur before September 15<sup>th</sup> of each year. Unite must be cleaned with a vacuum pump.
- All liquid, sediment, and hydrocarbons shall be pumped from the sump at least twice per year at intervals corresponding with the unit cleaning.
- All sediment, water and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.
- Refer to water quality unit manufacturers specifications for additional maintenance recommendations.

## Underground Infiltration Basin

- Once constructed, basins will be inspected at a minimum after several storm events for the first year and annually thereafter to confirm drainage system functions as designed. Problems will be addressed immediately.
- System shall be cleaned as required per the manufacturer's recommendations.

## Tree Box Filter

- Once constructed, the tree box filter should be inspected at a minimum after several storm events for the first year and annually thereafter to confirm drainage system functions as designed. Problems will be addressed immediately.
- Surface media should be raked twice a year to maintain permeability.
- The expected tree life is 5-10 years, therefore the sandy soil media should be replaced at the same time.

## *The routine and non-routine maintenance tasks to be undertaken after construction is completed and a schedule for implementing those task*

• A site maintenance log will be kept. This log will record the dates when maintenance tasks were completed, the person who completed the task, and any observations of malfunctions in components of the stormwater management system. A sample maintenance log form is attached.

## Estimated Operations and Maintenance Budget

• Operation and maintenance costs for the project are expected to be approximately \$4,000/year

## Twelve One-Forty Realty LLC Winchendon, Massachusetts Operation and Maintenance Plan

## **Operation and Maintenance Schedule**

Frequency	Date Performed	Comments	Cleaning/ Repair Needed? Yes/No	Date of Cleaning/ Repair	Performed By
Monthly Inspections					
Monthly Inspections Bi-annual Cleaning					
Inspection after each major storm event for the first year, annual after Cleaning as needed					
Inspection after each major storm event for the first year, annual after Cleaning as needed Rake twice a year					
	Monthly Inspections Monthly Inspections Bi-annual Cleaning Inspection after each major storm event for the first year, annual after Cleaning as needed Inspection after each major storm event for the first year, annual after Cleaning as needed	PerformedMonthly InspectionsMonthly InspectionsBi-annual CleaningInspection after each major storm event for the first year, annual after Cleaning as neededInspection after each major storm event for the first year, annual after Cleaning as neededInspection after each major storm event for the first year, annual after Cleaning as needed	Performed         Monthly Inspections         Monthly Inspections         Bi-annual Cleaning         Inspection after each         major storm event for the         first year, annual after         Cleaning as needed         Inspection after each         major storm event for the         first year, annual after         Cleaning as needed	PerformedRepair Needed? Yes/NoMonthly InspectionsMonthly InspectionsBi-annual CleaningInspection after each major storm event for the first year, annual after Cleaning as neededInspection after each major storm event for the first year, annual after Cleaning as needed	PerformedRepair Needed? Yes/NoCleaning/ RepairMonthly InspectionsImage: Constraint of the state of th

Site Maintenance Supervisor:

Date:\_\_\_\_\_

# SAMPLE

Long Term Pollution Prevention Plan

A long term pollution prevention plan is an important element of the routine operation and maintenance of an industrial facility that is designed to reduce or eliminate the creation of pollutants at the source. In addition to the obvious environmental benefits of protecting the natural resources downstream of the facility, maintaining a long term pollution prevention plan will provide for a healthier and safer work environment. The following long term pollution prevention prevent

• <u>Good housekeeping practices:</u>

Maintaining a clean property will prevent or reduce the amount of pollutants in the stormwater runoff discharging from the site. This will be achieved through periodic parking lot sweeping, at the owners discretion, and through catch basin and infiltration basin cleaning as detailed within the sites Stormwater Operation and Maintenance Plan.

- <u>Provisions for storing materials and waste products inside or under cover:</u> Materials will be stored in their appropriate containers and shall be stored under cover or in a secure enclosure to reduce the risk of spills. Waste products will be placed in proper bins until emptied by a licensed solid waste management company.
- <u>Vehicle washing controls:</u>

Vehicle washing will be conducted on paved surfaces where water will be collected in the deep sump catch basins prior to being routed through the underground infiltration basins. The use of environmentally friendly soaps shall be considered for routine use and water hoses with flow control nozzles shall be used to conserve water when not in use.

- <u>Requirements for routine inspections and maintenance of stormwater BMPs:</u> Refer to the maintenance schedule provided in the Stormwater Operation and Maintenance Plan.
- <u>Spill prevention and response plans:</u>

Materials shall be stored in their proper original container in a secure location. No mixing of materials shall occur unless recommended by manufacturer. The manufacturer's recommendations for proper use and disposal should be strictly adhered to. In the case of a spill the manufacturer's method for cleanup shall be followed. The area shall be kept ventilated and personnel handling the cleanup shall wear proper protective clothing. Spills of toxic or hazardous material shall be reported to the appropriate State and/or local authority in accordance with local and/or State regulations.

- <u>Provisions for maintenance of lawns, gardens, and other landscaped areas:</u> Owner will maintain surrounding landscaped area as needed.
- <u>Requirements for storage and use of fertilizers, herbicides, and pesticides:</u> Fertilizers, herbicides and pesticides shall be stored in their appropriate containers in a secure location as described above. Protective clothing shall be used when handled, and quantities shall be applied according to manufacturer's recommendations.

- <u>Pet waste management provisions:</u> Pet waste management is not applicable at this site.
- <u>Provisions for solid waste management:</u> Solid waste material shall be placed in outdoor secure containers until emptied by licensed waste management company.
- <u>Snow disposal and plowing plans relative to Wetland Resource Areas:</u> Snow shall be plowed in accordance with standard operating procedures and stored in designated areas as on site. Snow melt shall be directed to the deep sump catch basins so it is treated prior to reaching the adjacent wetland resource area.
- <u>Winter Road Salt/or Sand Use and Storage restriction:</u> The use of environmentally friendly alternatives to road salt will be considered.
- <u>Street sweeping schedules</u> Street sweeping will occur as needed at the discretion of the owner.
- <u>Provisions for prevention of illicit discharges to the stormwater management system:</u> The Stormwater Management System associated with the development of 10 Gardner Road has been designed such that prior to storm water runoff discharging from the site, it is treated through a series of best management practices. To the Engineer's knowledge, there are no known or designed non-storm water discharges that are or will be connected to the storm water collection system that would convey pollutants directly to groundwater or surface waters.
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to a near critical areas or from LUHPPL: All catch basins shall be equipped with hoods to prevent oils and floatables from discharging from the site. Water quality unit is equipped with oil containment storage volume to prevent oils and floatables from discharging from the site.
- <u>Training for staff or personnel involved with the implementing Long Term Pollution</u> <u>Prevention Plan:</u> Facilities staff will be responsible for implementing the Long Term Pollution Prevention Plan and staff will be trained in accordance with company policy.
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan: Randy Rameau centralmasstree@gmail.com Twelve One-Forty Realty LLC 10 Gardner Road Winchendon, MA Cell: 978-723-2889

**Illicit Discharge Compliance Statement** 

Twelve One-Forty Realty LLC 10 Gardner Road Winchendon, Massachusetts

#### **Illicit Discharge Compliance Statement**

The Stormwater Management System associated with the development of 10 Gardner Road has been designed such that prior to storm water runoff discharging from the site, it is treated through a series of best management practices. To the Engineer's knowledge, there are no known or designed non-storm water discharges that are or will be connected to the storm water collection system that would convey pollutants directly to groundwater or surface waters.

Name: Brian Marchetti, P.E.

Title: Vice President

Burparchits Signature:

Date: 05/20/2019

**MADEP Stormwater Checklist** 



## Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands Program Checklist for Stormwater Report

## A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>&</sup>lt;sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>&</sup>lt;sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



## Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands Program Checklist for Stormwater Report

## **B. Stormwater Checklist and Certification**

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

## **Registered Professional Engineer's Certification**

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Longterm Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

New development

Redevelopment

Mix of New Development and Redevelopment



LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

No disturbance to any Wetland Resource Areas
Site Design Practices (e.g. clustered development, reduced frontage setbacks)
Reduced Impervious Area (Redevelopment Only)
Minimizing disturbance to existing trees and shrubs
LID Site Design Credit Requested:
Credit 1
Credit 2
Credit 3
Use of "country drainage" versus curb and gutter conveyance and pipe
Bioretention Cells (includes Rain Gardens)
Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
Treebox Filter
Water Quality Swale
Grass Channel
Green Roof
Other (describe):

#### **Standard 1: No New Untreated Discharges**

No new untreated discharges

- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



### Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

Calculations provided to show that post-development peak discharge rates do not exceed predevelopment rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24hour storm.

#### Standard 3: Recharge

🖂 So	il Anal	ysis	provided.
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- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.

Static	] Simple D	ynamic
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Dynamic Field<sup>1</sup>

- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

$\boxtimes$	Recharge BMPs have	peen sized to infiltrate	the Required Recharge \	/olume.
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- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - Site is comprised solely of C and D soils and/or bedrock at the land surface
  - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - Solid Waste Landfill pursuant to 310 CMR 19.000
  - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- $\boxtimes$  Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

<sup>&</sup>lt;sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



### Standard 3: Recharge (continued)

The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

#### **Standard 4: Water Quality**

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
- Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
  - is within the Zone II or Interim Wellhead Protection Area
  - is near or to other critical areas
  - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
  - involves runoff from land uses with higher potential pollutant loads.
- The Required Water Quality Volume is reduced through use of the LID site Design Credits.
- Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist (	(continued)

### Standard 4: Water Quality (continued)

The BMP is sized	(and calculations	provided	) based on:
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- The ½" or 1" Water Quality Volume or
- The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

#### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does *not* cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has *not* been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

#### **Standard 6: Critical Areas**

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



# Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

Limited Project
Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
Bike Path and/or Foot Path
Redevelopment Project

- Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has *not* been included in the Stormwater Report but will be submitted *before* land disturbance begins.
- The project is *not* covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

#### **Standard 9: Operation and Maintenance Plan**

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - Name of the stormwater management system owners;
  - Party responsible for operation and maintenance;
  - Schedule for implementation of routine and non-routine maintenance tasks;
  - Plan showing the location of all stormwater BMPs maintenance access areas;
  - Description and delineation of public safety features;
  - Estimated operation and maintenance budget; and
  - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

#### Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted *prior to* the discharge of any stormwater to post-construction BMPs.

Pipe Sizing (Culvert) Calculations

McCar	IcCarty Engineering, Inc. Project: 7			Twelve-One Forty LLC		Proj. No:	211		
Culvert	Flows				10 Gardner R	oad	Date:	5/20/19	
				City: State:	Winchendon MA		Comp: Check :	JLL BRM	
*Shaded	columns	indicate ir	nput valu	es					
	Pa	aved	Unp	aved					
Culvert	AREA	С	AREA	С	COMPOSITE C	TOTAL AREA	TOTAL AREA	Q	Double
ID	(sq. ft)	FACTOR	(sq. ft)	FACTOR		(sq. ft)	(acres)		Grate
DCB 1	33182	0.9	7731	0.3	0.79	40913	0.94	4.6	YES
DCB 2	33182	0.9	0	0.3	0.90	33182	0.76	4.3	YES
DCB 3	36315	0.9	0	0.3	0.90	36315	0.83	4.7	YES
WQ 1	6799	0.9	0	0.3	0.90	6799	0.16	0.9	NO
RL 1	7846	0.9	0	0.3	0.90	7846	0.18	1.0	NO

## Pipe Design Worksheet

Project # /Name: Twelve One-Forty LLC

10 Gardner Road

Calculated By: JLL	Date:	5/20/2019
Checked By: BRM	Date:	5/20/2019

n= 0.01 HDPE Pipe

Culvert	Q	Qsum	Length	Slope	Dia.	Full-Flow Velocity	Full-Flow	Capacity <sup>2</sup>
(ID, Lot #)	(cfs)	(cfs)	(ft.)	(ft./ft.)	(in.)	(fps)	(C	fs)
DCB 1 to DMH 1	4.60		55.6	0.01	12	5.91	4.64	O.K
DCB 2 to DMH 1	4.30		51.4	0.01	12	5.91	4.64	0.K
DMH 1 to DMH 2	8.90	8.90	18.9	0.01	18	7.75	13.69	0.K
DCB 3 to DMH 3	4.70		26.7	0.01	18	7.75	13.69	O.K
RL 1-Pond	1.00		150.2	0.01	12	5.91	4.64	0.K
OCS 1-FES 1*	3.27		83.6	0.01	18	7.75	13.69	O.K
WQ 1-FES 2	0.90		58.7	0.005	12	4.18	3.28	O.K

\* Flows form the 25-year storm event from HydroCAD were utilized

NOAA Atlas 14 Rainfall Data

## **Extreme Precipitation Tables**

## Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	Massachusetts
Location	
Longitude	72.009 degrees West
Latitude	42.666 degrees North
Elevation	0 feet
Date/Time	Fri, 26 Apr 2019 17:05:50 -0400

## **Extreme Precipitation Estimates**

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.29	0.44	0.55	0.72	0.90	1.12	1yr	0.77	1.03	1.29	1.60	1.99	2.48	2.73	1yr	2.19	2.63	3.03	3.73	4.35	1yr
2yr	0.35	0.53	0.66	0.87	1.10	1.37	2yr	0.95	1.24	1.57	1.94	2.39	2.93	3.29	2yr	2.60	3.17	3.68	4.40	5.02	2yr
5yr	0.41	0.63	0.80	1.07	1.36	1.72	5yr	1.18	1.55	1.98	2.44	2.99	3.65	4.15	5yr	3.23	3.99	4.62	5.47	6.17	5yr
10yr	0.46	0.72	0.91	1.24	1.61	2.04	10yr	1.39	1.83	2.36	2.91	3.55	4.31	4.94	10yr	3.81	4.75	5.50	6.44	7.21	10yr
25yr	0.54	0.86	1.10	1.51	2.00	2.56	25yr	1.73	2.28	2.96	3.66	4.45	5.36	6.22	25yr	4.75	5.98	6.92	8.01	8.87	25yr
50yr	0.61	0.97	1.25	1.75	2.37	3.05	50yr	2.04	2.69	3.54	4.37	5.29	6.33	7.42	50yr	5.61	7.13	8.23	9.44	10.38	50yr
100yr	0.70	1.13	1.45	2.06	2.80	3.63	100yr	2.42	3.17	4.21	5.19	6.27	7.49	8.85	100yr	6.63	8.51	9.80	11.14	12.14	100yr
200yr	0.79	1.29	1.67	2.40	3.31	4.32	200yr	2.86	3.75	5.02	6.18	7.45	8.85	10.56	200yr	7.84	10.15	11.67	13.15	14.22	200yr
500yr	0.95	1.56	2.03	2.95	4.14	5.42	500yr	3.57	4.68	6.32	7.78	9.35	11.06	13.35	500yr	9.79	12.83	14.71	16.38	17.52	500yr

## Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.21	0.33	0.40	0.54	0.66	0.90	1yr	0.57	0.88	1.05	1.42	1.75	2.19	2.39	1yr	1.94	2.30	2.25	3.26	3.87	1yr
2yr	0.33	0.52	0.64	0.86	1.06	1.22	2yr	0.92	1.20	1.38	1.77	2.26	2.85	3.19	2yr	2.52	3.07	3.53	4.28	4.89	2yr
5yr	0.38	0.58	0.72	0.99	1.26	1.44	5yr	1.08	1.41	1.62	2.09	2.66	3.41	3.81	5yr	3.02	3.67	4.19	5.03	5.72	5yr
10yr	0.42	0.64	0.79	1.11	1.43	1.62	10yr	1.24	1.59	1.81	2.35	2.98	3.90	4.38	10yr	3.45	4.21	4.73	5.70	6.44	10yr
25yr	0.47	0.72	0.90	1.28	1.69	1.91	25yr	1.45	1.86	2.10	2.73	3.45	4.64	5.22	25yr	4.11	5.02	5.57	6.75	7.53	25yr
50yr	0.52	0.79	0.98	1.41	1.90	2.16	50yr	1.64	2.11	2.36	3.07	3.86	5.33	6.01	50yr	4.71	5.78	6.33	7.66	8.48	50yr
100yr	0.57	0.86	1.08	1.56	2.13	2.44	100yr	1.84	2.38	2.64	3.14	4.34	6.12	6.89	100yr	5.42	6.62	7.24	8.73	9.59	100yr
200yr	0.63	0.94	1.19	1.73	2.41	2.75	200yr	2.08	2.69	2.97	3.41	4.86	7.04	7.93	200yr	6.23	7.63	8.27	9.97	10.89	200yr
500yr	0.72	1.07	1.38	2.01	2.86	3.24	500yr	2.46	3.17	3.45	3.83	5.69	8.55	9.59	500yr	7.56	9.22	9.92	11.94	12.89	500yr

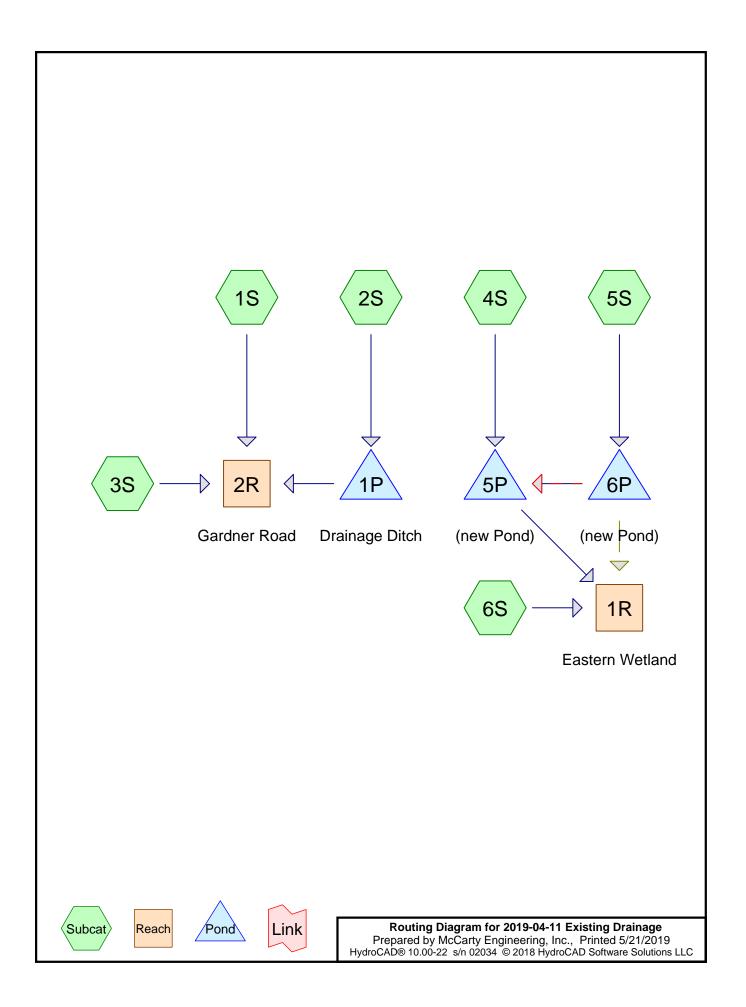
## **Upper Confidence Limits**

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.32	0.50	0.60	0.81	1.00	1.20	1yr	0.86	1.18	1.33	1.69	2.12	2.70	3.00	1yr	2.39	2.88	3.24	4.18	4.76	1yr
2yr	0.36	0.56	0.69	0.93	1.15	1.32	2yr	0.99	1.29	1.48	1.94	2.44	3.06	3.45	2yr	2.71	3.31	3.86	4.59	5.24	2yr
5yr	0.44	0.67	0.83	1.14	1.46	1.72	5yr	1.26	1.69	1.92	2.46	3.05	3.90	4.52	5yr	3.45	4.35	5.07	5.94	6.63	5yr
10yr	0.51	0.79	0.97	1.36	1.76	2.11	10yr	1.52	2.07	2.37	2.99	3.67	4.73	5.59	10yr	4.19	5.37	6.27	7.25	7.94	10yr
25yr	0.64	0.97	1.20	1.72	2.26	2.77	25yr	1.95	2.71	3.11	3.88	4.67	6.08	7.39	25yr	5.38	7.11	8.29	9.41	10.12	25yr
50yr	0.75	1.14	1.42	2.04	2.75	3.41	50yr	2.37	3.33	3.81	4.74	5.60	7.36	9.12	50yr	6.51	8.77	10.22	11.46	12.14	50yr
100yr	0.89	1.34	1.68	2.43	3.33	4.19	100yr	2.87	4.09	4.68	5.94	6.73	8.90	11.27	100yr	7.88	10.84	12.61	13.96	14.58	100yr
200yr	1.05	1.58	2.00	2.89	4.03	5.14	200yr	3.48	5.03	5.75	7.29	8.08	10.77	13.92	200yr	9.53	13.38	15.55	16.99	17.48	200yr
500yr	1.32	1.96	2.52	3.66	5.21	6.74	500yr	4.50	6.59	7.55	9.60	10.30	13.84	18.40	500yr	12.25	17.69	20.48	22.00	22.23	500yr



Appendix B

Existing Conditions HydroCAD Model



2019-04-11 Existing Drainage Prepared by McCarty Engineering, Inc. HydroCAD® 10.00-22 s/n 02034 © 2018 HydroCAD Software Solutions LLC

## Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
0.129	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S)
1.308	96	Gravel surface, HSG A (2S, 4S, 5S, 6S)
1.191	98	Paved parking, HSG A (1S, 2S, 4S, 5S, 6S)
0.180	98	Roofs, HSG A (4S)
1.366	30	Woods, Good, HSG A (2S, 3S, 5S, 6S)
4.175	73	TOTAL AREA

## Soil Listing (all nodes)

Soil	Subcatchment
Group	Numbers
HSG A	1S, 2S, 3S, 4S, 5S, 6S
HSG B	
HSG C	
HSG D	
Other	
	TOTAL AREA
	Group HSG A HSG B HSG C HSG D

**2019-04-11 Existing Drainage** Prepared by McCarty Engineering, Inc. HydroCAD® 10.00-22 s/n 02034 © 2018 HydroCAD Software Solutions LLC

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HSG (acre		HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.12	.000	0.000	0.000	0.000	0.129	>75% Grass cover, Good	1S, 2S,
							3S
1.3	0.000	0.000	0.000	0.000	1.308	Gravel surface	2S, 4S,
							5S, 6S
1.19	0.000	0.000	0.000	0.000	1.191	Paved parking	1S, 2S,
							4S, 5S,
							6S
0.18	0.000	0.000	0.000	0.000	0.180	Roofs	4S
1.3	0.000	0.000	0.000	0.000	1.366	Woods, Good	2S, 3S,
							5S, 6S
4.1	0.000	0.000	0.000	0.000	4.175	TOTAL AREA	

## Ground Covers (all nodes)

# 2019-04-11 Existing Drainage

Prepared by McCarty Engineering, Inc.						
HydroCAD® 10.00-22 s/n 02034 © 2018 HydroCAD Software Solutions LLC						

	Pipe Listing (all nodes)										
	Line#	Node	In-Invert	Out-Invert	Length	Slope	n	Diam/Width	Height	Inside-Fill	
_		Number	(feet)	(feet)	(feet)	(ft/ft)		(inches)	(inches)	(inches)	
	1	6P	1,020.50	1,020.00	33.0	0.0152	0.010	6.0	0.0	0.0	

#### . . . . . . . (-11 **D**!.

Type III 24-hr 2-Year Rainfall=2.93" Printed 5/21/2019 LLC Page 6

HydroCAD® 10.00-22 s/n 02034 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

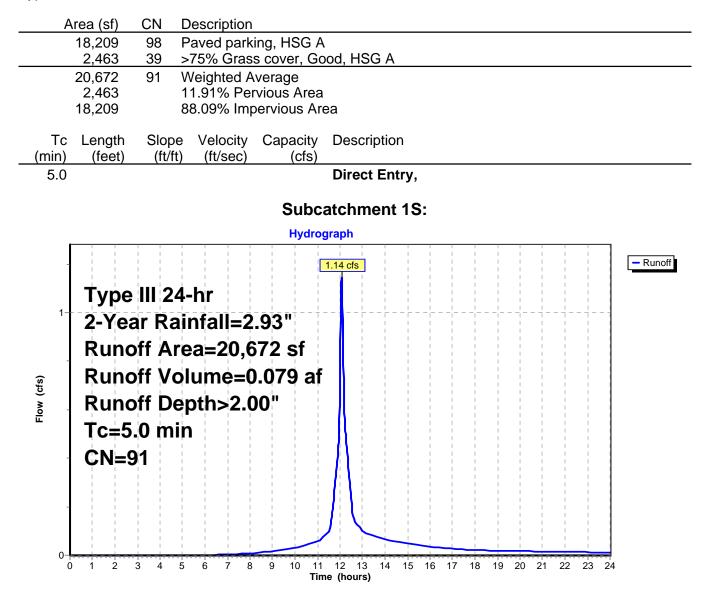
Subcatchment1S:	Runoff Area=20,672 sf 88.09% Impervious Runoff Depth>2.00" Tc=5.0 min CN=91 Runoff=1.14 cfs 0.079 af
Subcatchment2S:	Runoff Area=19,527 sf 26.92% Impervious Runoff Depth>1.39" Tc=5.0 min CN=83 Runoff=0.75 cfs 0.052 af
Subcatchment3S:	Runoff Area=3,337 sf 0.00% Impervious Runoff Depth=0.00" Tc=5.0 min CN=33 Runoff=0.00 cfs 0.000 af
Subcatchment4S:	Runoff Area=17,163 sf 89.05% Impervious Runoff Depth>2.70" Tc=5.0 min CN=98 Runoff=1.16 cfs 0.089 af
Subcatchment5S:	Runoff Area=29,062 sf 23.47% Impervious Runoff Depth>2.38" Tc=5.0 min CN=95 Runoff=1.84 cfs 0.132 af
Subcatchment6S:	Runoff Area=92,083 sf 15.38% Impervious Runoff Depth>0.22" Flow Length=328' Tc=5.1 min CN=57 Runoff=0.20 cfs 0.040 af
Reach 1R: Eastern Wetlar	nd Inflow=2.11 cfs 0.120 af Outflow=2.11 cfs 0.120 af
Reach 2R: Gardner Road	Inflow=1.14 cfs 0.088 af Outflow=1.14 cfs 0.088 af
Pond 1P: Drainage Ditch	Peak Elev=1,022.58' Storage=582 cf Inflow=0.75 cfs 0.052 af Discarded=0.07 cfs 0.043 af Primary=0.27 cfs 0.009 af Outflow=0.34 cfs 0.052 af
Pond 5P: (new Pond)	Peak Elev=1,020.89' Storage=1,165 cf Inflow=2.24 cfs 0.144 af Discarded=0.07 cfs 0.061 af Primary=1.97 cfs 0.081 af Outflow=2.04 cfs 0.142 af
Pond 6P: (new Pond) cfs 0.073 af Primary=0.47 cfs 0.041 af	Peak Elev=1,021.15' Storage=1,610 cf Inflow=1.84 cfs 0.132 af Secondary=0.81 cfs 0.014 af Tertiary=0.00 cfs 0.000 af Outflow=1.39 cfs 0.128 af
Total Duna	ff Area - 1175 as Bunoff Valuma - 0202 of Avarage Bunoff Depth - 112

Total Runoff Area = 4.175 acRunoff Volume = 0.392 afAverage Runoff Depth = 1.13"67.15% Pervious = 2.803 ac32.85% Impervious = 1.371 ac

#### **Summary for Subcatchment 1S:**

Runoff = 1.14 cfs @ 12.07 hrs, Volume= 0.079 af, Depth> 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

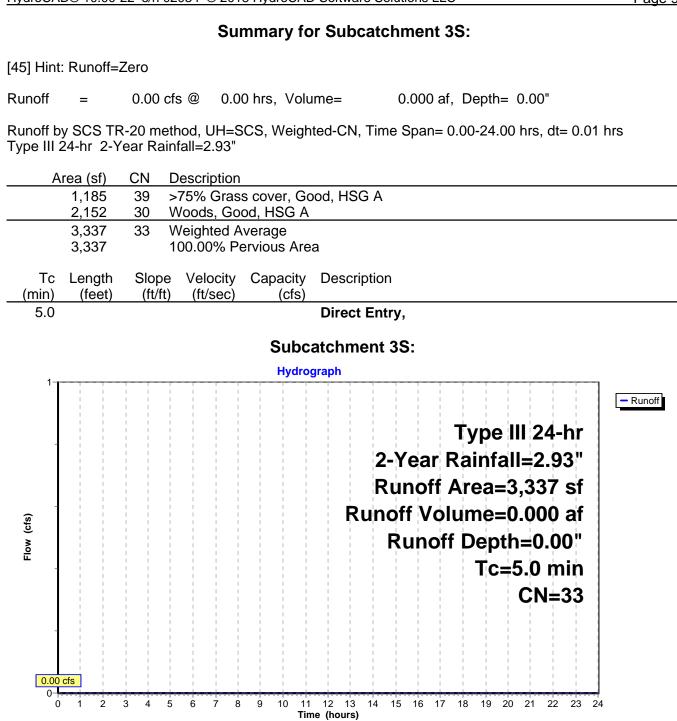


#### **Summary for Subcatchment 2S:**

Runoff = 0.75 cfs @ 12.08 hrs, Volume= 0.052 af, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

Area (sf) CN Description									
5,256 98 Paved parking, HSG A									
10,008 96 Gravel surface, HSG A									
1,971 39 >75% Grass cover, Good, HSG A 2,292 30 Woods, Good, HSG A									
19,527 83 Weighted Average									
14,271 73.08% Pervious Area									
5,256 26.92% Impervious Area									
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)									
5.0 Direct Entry,									
Subcatchment 2S:									
Hydrograph									
0.8									
0.75									
0.7 - Type III 24-hr									
<sup>0.65</sup> 2-Year Rainfall=2.93"									
0.6 0.55 Runoff Area=19,527 sf									
الله معنى المعنى المعنى معنى المعنى الم معنى المعنى المعن									
$ = 0.35 - T_{o} = 5 - 0 m i n - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -$									
0.25 - CN=83									
0.15									
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24									
Time (hours)									



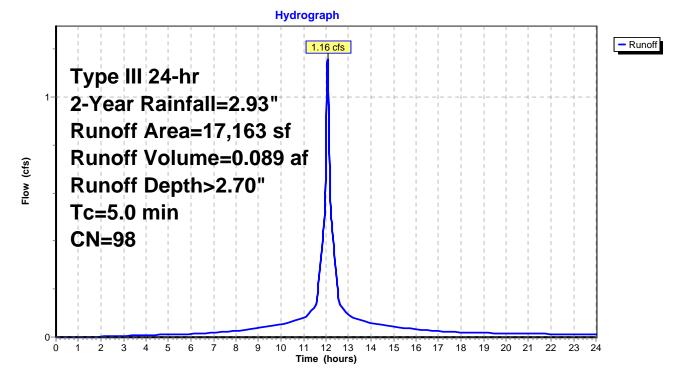
#### **Summary for Subcatchment 4S:**

Runoff = 1.16 cfs @ 12.07 hrs, Volume= 0.089 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

A	rea (sf)	CN I	Description			
	7,846	98 I	Roofs, HSG	βA		
	7,438			ing, HSG A		
	1,879	96 (	Gravel surfa	ace, HSG A	Α	
	17,163	98 \	Neighted A	verage		
	1,879		10.95% Per	vious Area	a	
	15,284	8	89.05% Impervious Area			
Тс	Length	Slope		Capacity	Description	
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)		
5.0					Direct Entry,	
					-	

## Subcatchment 4S:



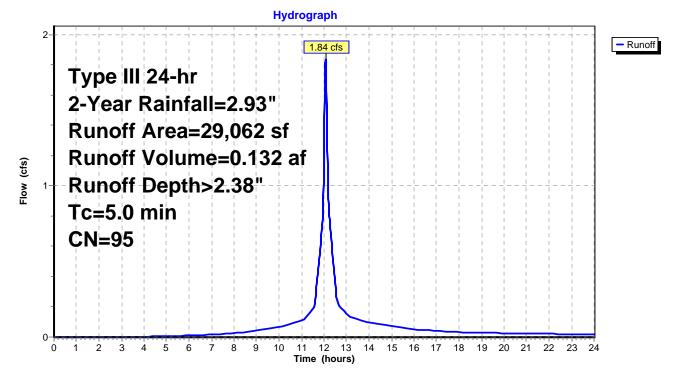
#### **Summary for Subcatchment 5S:**

Runoff = 1.84 cfs @ 12.07 hrs, Volume= 0.132 af, Depth> 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

A	rea (sf)	CN	Description			
	6,820	98	Paved park	ing, HSG A	A	
	21,781	96	Gravel surfa	ace, HSG A	Α	
	461	30	Woods, Go	od, HSG A		
	29,062	95	Weighted A	verage		
	22,242	76.53% Pervious Area				
	6,820		23.47% Impervious Area			
-		~		<b>o</b>		
Tc	Length	Slope		Capacity	Description	
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)		
5.0					Direct Entry,	
					-	

#### Subcatchment 5S:



#### Summary for Subcatchment 6S:

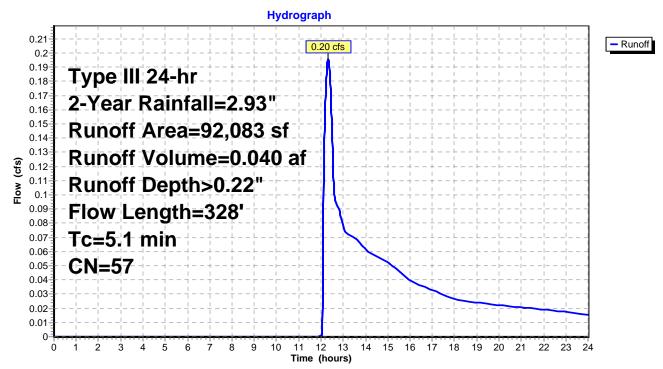
Runoff = 0.20 cfs @ 12.32 hrs, Volume= 0.040 af, Depth> 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

_	A	rea (sf)	CN D	Description		
		14,165	98 F	aved park	ing, HSG A	
		23,327	96 G	Gravel surfa	ace, HSG A	N Contraction of the second seco
_		54,591	30 V	Voods, Go	od, HSG A	
		92,083		Veighted A	0	
		77,918	8	4.62% Per	vious Area	
		14,165	1	5.38% Imp	pervious Are	ea
	_					
	TC	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	2.1	50	0.0270	0.39		Sheet Flow,
						Fallow n= 0.050 P2= 3.00"
	0.8	132	0.0270	2.65		Shallow Concentrated Flow,
						Unpaved Kv= 16.1 fps
	0.1	20	0.5000	3.54		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	2.1	126	0.0400	1.00		Shallow Concentrated Flow,
_						Woodland Kv= 5.0 fps

5.1 328 Total

#### Subcatchment 6S:

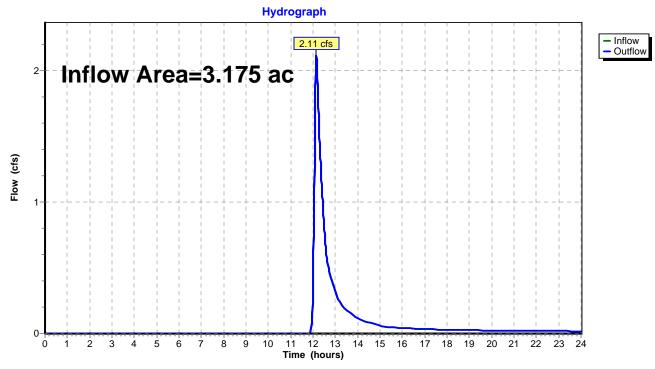


### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	3.175 ac, 26.22% Impervious, Inflow Depth > 0.45" for 2-Ye	er event
Inflow	=	2.11 cfs @ 12.15 hrs, Volume= 0.120 af	
Outflow	=	2.11 cfs @ 12.15 hrs, Volume= 0.120 af, Atten= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



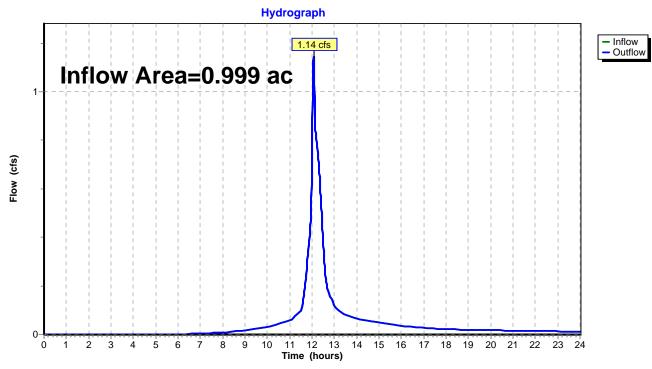
# Reach 1R: Eastern Wetland

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.999 ac, 5	3.90% Impervious	s, Inflow Depth >	1.06"	for 2-Year event
Inflow	=	1.14 cfs @	12.07 hrs, Volun	ne= 0.088	af	
Outflow	=	1.14 cfs @	12.07 hrs, Volun	ne= 0.088	af, Atte	en= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Reach 2R: Gardner Road

#### Summary for Pond 1P: Drainage Ditch

Inflow Area =	0.448 ac, 26.92% Impervious, Inflow De	epth > 1.39" for 2-Year event
Inflow =	0.75 cfs @ 12.08 hrs, Volume=	0.052 af
Outflow =	0.34 cfs @ 12.27 hrs, Volume=	0.052 af, Atten= 55%, Lag= 11.6 min
Discarded =	0.07 cfs @ 12.27 hrs, Volume=	0.043 af
Primary =	0.27 cfs @ 12.27 hrs, Volume=	0.009 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,022.58' @ 12.27 hrs Surf.Area= 1,138 sf Storage= 582 cf

Plug-Flow detention time= 59.8 min calculated for 0.052 af (100% of inflow) Center-of-Mass det. time= 59.2 min ( 894.8 - 835.6 )

Volume	Invert	t Avail.Sto	rage	Storage	Description			
#1	1,022.00	' 1,8	10 cf	Custor	n Stage Data (Pr	ismatic)Listed below (Recalc)		
Elevatio (fee 1,022.0 1,023.0 1,023.0	et) 00 00	Surf.Area (sq-ft) 875 1,330 1,500		c.Store <u>c-feet)</u> 0 1,103 708	Cum.Store (cubic-feet) 0 1,103 1,810			
Device	Routing	Invert	Outle	et Device	S			
#1	Primary	1,022.50'				oad-Crested Rectangular Weir		
#2	Discarded	1,022.00'	Coet <b>2.41</b>	Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64 2.410 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 1,015.00'				
			-					

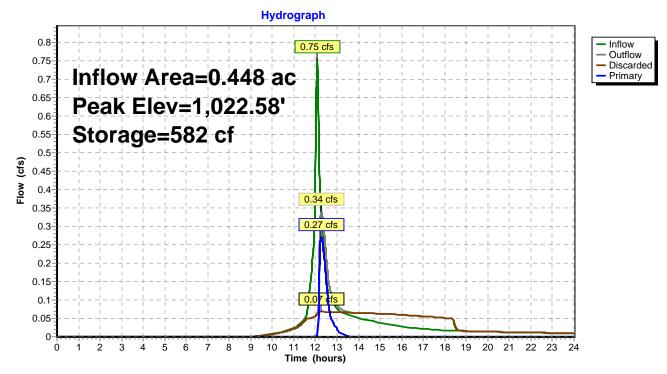
**Discarded OutFlow** Max=0.07 cfs @ 12.27 hrs HW=1,022.58' (Free Discharge) **2=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=0.27 cfs @ 12.27 hrs HW=1,022.58' (Free Discharge) **1=Broad-Crested Rectangular Weir** (Weir Controls 0.27 cfs @ 0.70 fps)

#### 2019-04-11 Existing Drainage

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Pond 1P: Drainage Ditch



#### Summary for Pond 5P: (new Pond)

[79] Warning: Submerged Pond 6P Primary device # 1 INLET by 0.39'

Inflow Area =	1.061 ac, 47.82% Impervious, Inflow De	epth > 1.63" for 2-Year event
Inflow =	2.24 cfs @ 12.11 hrs, Volume=	0.144 af
Outflow =	2.04 cfs @ 12.15 hrs, Volume=	0.142 af, Atten= 9%, Lag= 2.3 min
Discarded =	0.07 cfs @ 12.15 hrs, Volume=	0.061 af
Primary =	1.97 cfs @ 12.15 hrs, Volume=	0.081 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 1,020.89' @ 12.15 hrs Surf.Area= 1,013 sf Storage= 1,165 cf

Plug-Flow detention time= 70.2 min calculated for 0.142 af (99% of inflow) Center-of-Mass det. time= 62.0 min (819.0 - 757.0)

Volume	Invert	Avail.Stor	rage Storage	Description	
#1	1,019.00'	1,87	70 cf Custom	Stage Data (P	rismatic)Listed below (Recalc)
Elevation (feet)	Su	urf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
1,019.00 1,020.00		68 720	0 394	0 394	
1,021.00 1,021.50		1,049 1,315	885 591	1,279 1,870	
Device F	Routing	Invert	Outlet Devices	;	
	Primary Discarded	1,020.50' 1,019.00'	Head (feet) 0. Coef. (English) 2.410 in/hr Ex	20 0.40 0.60 ) 2.68 2.70 2. filtration over	oad-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60 70 2.64 2.63 2.64 2.64 2.63 Surface area Elevation = 1,015.00'

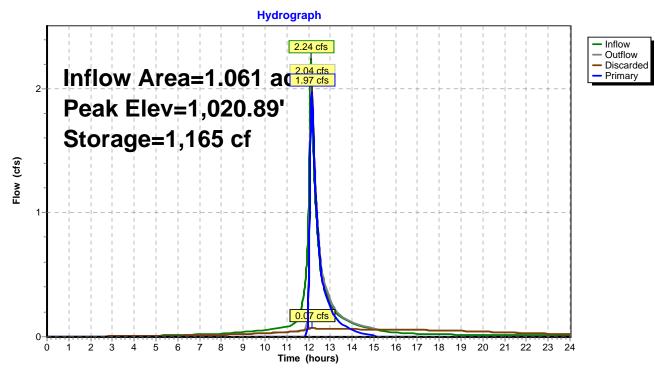
**Discarded OutFlow** Max=0.07 cfs @ 12.15 hrs HW=1,020.89' (Free Discharge) **2=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.97 cfs @ 12.15 hrs HW=1,020.89' (Free Discharge) **1=Broad-Crested Rectangular Weir** (Weir Controls 1.97 cfs @ 1.69 fps)

#### 2019-04-11 Existing Drainage

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Pond 5P: (new Pond)



# Summary for Pond 6P: (new Pond)

Inflow Area =	0.667 ac, 23.47% Impervious, Inflow De	epth > 2.38" for 2-Year event
Inflow =	1.84 cfs @ 12.07 hrs, Volume=	0.132 af
Outflow =	1.39 cfs @ 12.13 hrs, Volume=	0.128 af, Atten= 24%, Lag= 3.8 min
Discarded =	0.11 cfs @ 12.13 hrs, Volume=	0.073 af
Primary =	0.47 cfs @ 12.13 hrs, Volume=	0.041 af
Secondary =	0.81 cfs @ 12.13 hrs, Volume=	0.014 af
Tertiary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,021.15' @ 12.13 hrs Surf.Area= 1,546 sf Storage= 1,610 cf

Plug-Flow detention time= 94.5 min calculated for 0.128 af (97% of inflow) Center-of-Mass det. time= 75.9 min (858.2 - 782.3)

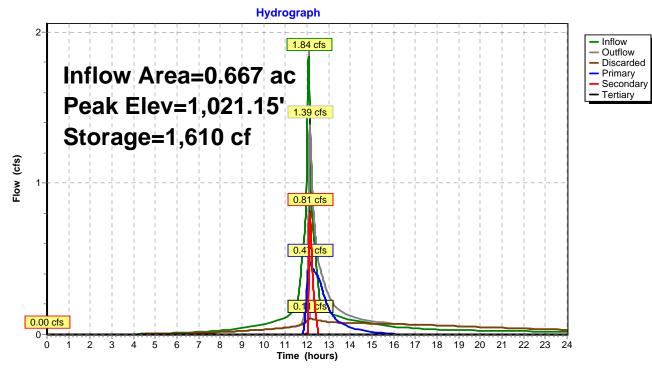
Volume	Invert	Avail.Sto	rage Storage D	escription	
#1	1,019.00'	2,20	07 cf Custom S	Stage Data (Pi	r <b>ismatic)</b> Listed below (Recalc)
Elevetie		<b>rf</b>	In a Chara	Curra Stara	
Elevatio		rf.Area	Inc.Store	Cum.Store	
(fee	1	(sq-ft)	(cubic-feet)	(cubic-feet)	
1,019.0		7	0	0	
1,020.0		688	348	348	
1,021.0		1,385	1,037	1,384	
1,021.5	50	1,906	823	2,207	
<b>D</b> .					
Device	Routing	Invert	Outlet Devices		
#1	Primary	1,020.50'	6.0" Round Cu		
					headwall, Ke= 0.900
					/ 1,020.00' S= 0.0152 '/' Cc= 0.900
					or, Flow Area= 0.20 sf
#2	Secondary	1,021.00'			oad-Crested Rectangular Weir
					0.80 1.00 1.20 1.40 1.60
					70 2.64 2.63 2.64 2.64 2.63
#3	Tertiary	1,021.30'	50.0' long x 5.	0' breadth Bro	oad-Crested Rectangular Weir
			Head (feet) 0.2	0.40 0.60	0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50	4.00 4.50 5	.00 5.50
			Coef. (English)	2.34 2.50 2.	70 2.68 2.68 2.66 2.65 2.65 2.65
			2.65 2.67 2.66	2.68 2.70 2	.74 2.79 2.88
#4	Discarded	1,019.00'	2.410 in/hr Exf	iltration over	Surface area
			Conductivity to	Groundwater	Elevation = 1,015.00'
			-		

**Discarded OutFlow** Max=0.11 cfs @ 12.13 hrs HW=1,021.15' (Free Discharge) **4=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.47 cfs @ 12.13 hrs HW=1,021.15' (Free Discharge) -1=Culvert (Inlet Controls 0.47 cfs @ 2.42 fps)

Secondary OutFlow Max=0.81 cfs @ 12.13 hrs HW=1,021.15' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 0.81 cfs @ 1.05 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,019.00' (Free Discharge) -3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)



# Pond 6P: (new Pond)

2019-04-11 Existing Drainage	Type III 24-hr	1
Prepared by McCarty Engineering, Inc.		
HydroCAD® 10.00-22 s/n 02034 © 2018 HydroCAD Software Solution	ns LLC	

#### Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S:	Runoff Area=20,672 sf 88.09% Impervious Runoff Depth>3.31" Tc=5.0 min CN=91 Runoff=1.85 cfs 0.131 af
Subcatchment2S:	Runoff Area=19,527 sf 26.92% Impervious Runoff Depth>2.56" Tc=5.0 min CN=83 Runoff=1.39 cfs 0.095 af
Subcatchment3S:	Runoff Area=3,337 sf 0.00% Impervious Runoff Depth>0.00" Tc=5.0 min CN=33 Runoff=0.00 cfs 0.000 af
Subcatchment 4S:	Runoff Area=17,163 sf 89.05% Impervious Runoff Depth>4.07" Tc=5.0 min CN=98 Runoff=1.72 cfs 0.134 af
Subcatchment5S:	Runoff Area=29,062 sf 23.47% Impervious Runoff Depth>3.73" Tc=5.0 min CN=95 Runoff=2.81 cfs 0.208 af
Subcatchment6S:	Runoff Area=92,083 sf 15.38% Impervious Runoff Depth>0.76" Flow Length=328' Tc=5.1 min CN=57 Runoff=1.46 cfs 0.133 af
Reach 1R: Eastern Wetland	Inflow=5.13 cfs 0.301 af Outflow=5.13 cfs 0.301 af
Reach 2R: Gardner Road	Inflow=2.87 cfs 0.168 af Outflow=2.87 cfs 0.168 af
Pond 1P: Drainage Ditch	Peak Elev=1,022.70' Storage=728 cf Inflow=1.39 cfs 0.095 af Discarded=0.07 cfs 0.058 af Primary=1.15 cfs 0.037 af Outflow=1.22 cfs 0.095 af
Pond 5P: (new Pond)	Peak Elev=1,021.09' Storage=1,380 cf Inflow=4.02 cfs 0.245 af Discarded=0.08 cfs 0.073 af Primary=3.71 cfs 0.168 af Outflow=3.79 cfs 0.241 af
<b>Pond 6P: (new Pond)</b> af Primary=0.54 cfs 0.068 af S	Peak Elev=1,021.27' Storage=1,794 cf Inflow=2.81 cfs 0.208 af econdary=1.87 cfs 0.043 af Tertiary=0.00 cfs 0.000 af Outflow=2.53 cfs 0.200 af
Total Pupoff	$\frac{1}{2}$ Area = 4.175 ac Punoff Volume = 0.701 af Average Punoff Depth = 2.02

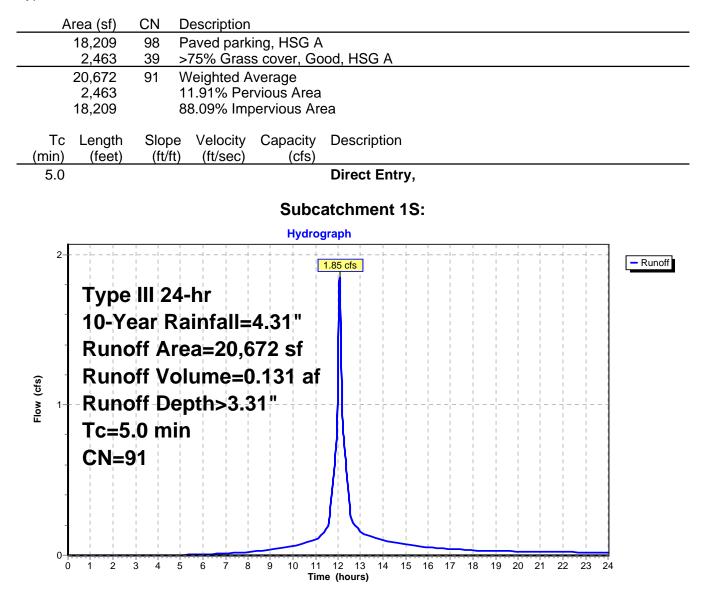
cfs 0.089

Total Runoff Area = 4.175 acRunoff Volume = 0.701 afAverage Runoff Depth = 2.02"67.15% Pervious = 2.803 ac32.85% Impervious = 1.371 ac

#### **Summary for Subcatchment 1S:**

Runoff = 1.85 cfs @ 12.07 hrs, Volume= 0.131 af, Depth> 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"



#### **Summary for Subcatchment 2S:**

Runoff = 1.39 cfs @ 12.07 hrs, Volume= 0.095 af, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

Area (sf)	CN Description
5,256	98 Paved parking, HSG A
10,008	96 Gravel surface, HSG A
1,971 2,292	<ul> <li>39 &gt;75% Grass cover, Good, HSG A</li> <li>30 Woods, Good, HSG A</li> </ul>
19,527	83 Weighted Average
14,271	73.08% Pervious Area
5,256	26.92% Impervious Area
Tc Length (min) (feet)	Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs)
5.0	Direct Entry,
	Subcatchment 2S:
1 1	
10-Yo Runc الله Runc	1.39 cfs       -Runoff         ear Rainfall=4.31"       -Runoff         off Area=19,527 sf       -Runoff         off Depth>2.56"       -Runoff         .0 min

#### **Summary for Subcatchment 3S:**

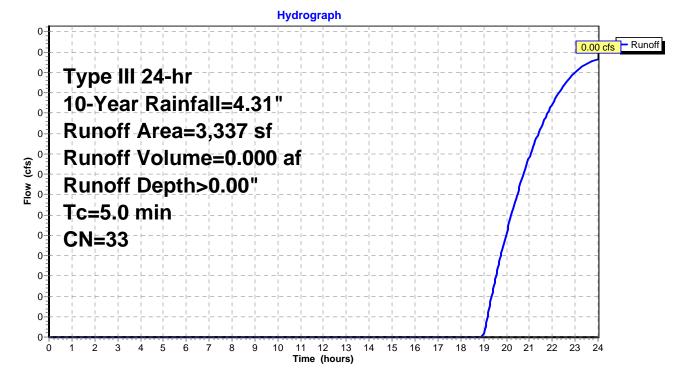
[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

Α	rea (sf)	CN	Description					
	1,185	39	>75% Gras	s cover, Go	ood, HSG A			
	2,152	30	Woods, Go	od, HSG A	۱			
	3,337	33	Weighted A	verage				
	3,337		100.00% Pervious Area					
Tc (min)	Length (feet)	Slop (ft/ft		Capacity (cfs)	Description			
5.0					Direct Entry,			

#### Subcatchment 3S:



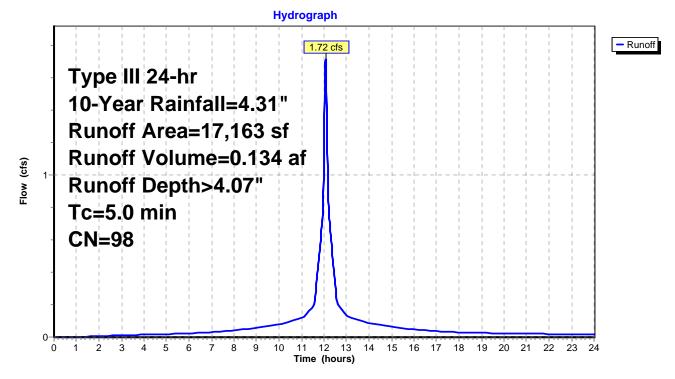
#### Summary for Subcatchment 4S:

Runoff = 1.72 cfs @ 12.07 hrs, Volume= 0.134 af, Depth> 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

Α	rea (sf)	CN	Description		
	7,846	98	Roofs, HSG	βA	
	7,438	98	Paved park	ing, HSG A	
	1,879	96	Gravel surfa	ace, HSG A	
	17,163	98	Weighted A	verage	
	1,879		10.95% Per	vious Area	
	15,284		89.05% Imp	ervious Are	ea
Tc (min)	Length (feet)	Slope (ft/ft		Capacity (cfs)	Description
5.0					Direct Entry,

#### Subcatchment 4S:



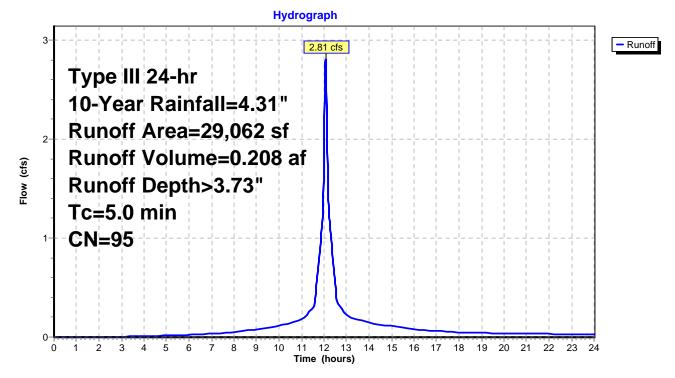
#### Summary for Subcatchment 5S:

Runoff = 2.81 cfs @ 12.07 hrs, Volume= 0.208 af, Depth> 3.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

Ar	ea (sf)	CN	Description		
	6,820	98	Paved park	ing, HSG A	A
2	21,781	96	Gravel surfa	ace, HSG A	Α
	461	30	Noods, Go	od, HSG A	
	29,062	95	Neighted A	verage	
:	22,242	-	76.53% Per	vious Area	a de la companya de l
	6,820		23.47% Imp	pervious Ar	ea
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
5.0					Direct Entry,
					- ·

#### Subcatchment 5S:



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#### Summary for Subcatchment 6S:

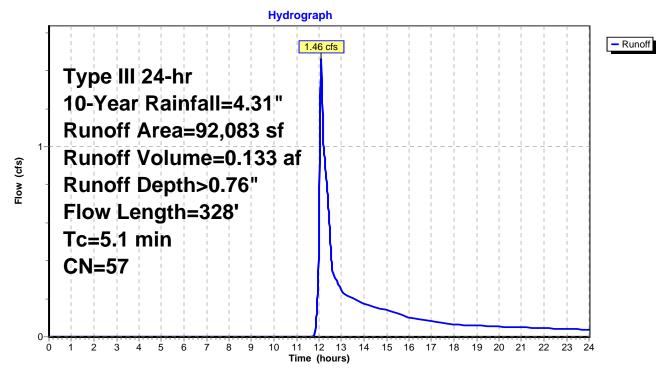
Runoff = 1.46 cfs @ 12.10 hrs, Volume= 0.133 af, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

A	rea (sf)	CN E	Description		
	14,165	98 F	aved park	ing, HSG A	
	23,327	96 C	Gravel surfa	ace, HSG A	N Contraction of the second seco
	54,591	30 V	Voods, Go	od, HSG A	
	92,083	57 V	Veighted A	verage	
	77,918	8	4.62% Per	vious Area	
	14,165	1	5.38% Imp	pervious Ar	ea
_		<b>.</b> .			
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
2.1	50	0.0270	0.39		Sheet Flow,
					Fallow n= 0.050 P2= 3.00"
0.8	132	0.0270	2.65		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
0.1	20	0.5000	3.54		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
2.1	126	0.0400	1.00		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps

5.1 328 Total

### Subcatchment 6S:

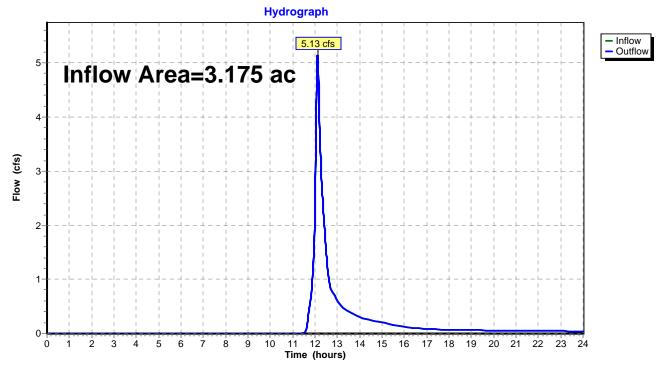


### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Are	a =	3.175 ac, 26.22% Impervious, Inflow Depth > 1.14" for 10-Year e	vent
Inflow	=	5.13 cfs @ 12.11 hrs, Volume= 0.301 af	
Outflow	=	5.13 cfs @ 12.11 hrs, Volume= 0.301 af, Atten= 0%, Lag=	0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



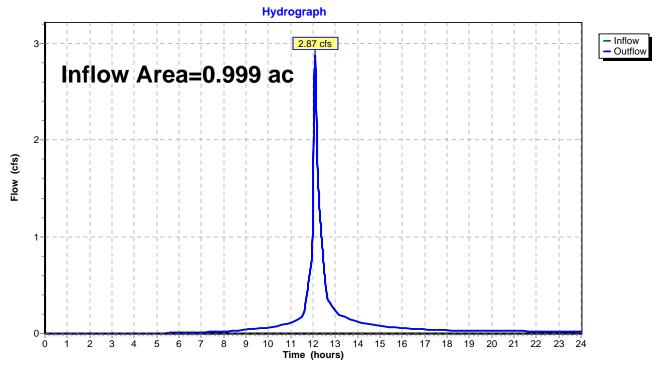
# Reach 1R: Eastern Wetland

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.999 ac, 5	53.90% Imperviou	s, Inflow Depth >	2.02"	for 10-Year event
Inflow	=	2.87 cfs @	12.09 hrs, Volur	ne= 0.168	3 af	
Outflow	=	2.87 cfs @	12.09 hrs, Volur	ne= 0.168	3 af, Atte	en= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



# Reach 2R: Gardner Road

#### Summary for Pond 1P: Drainage Ditch

Inflow Area =	0.448 ac, 26.92% Impervious, Inflow De	epth > 2.56" for 10-Year event
Inflow =	1.39 cfs @ 12.07 hrs, Volume=	0.095 af
Outflow =	1.22 cfs @ 12.12 hrs, Volume=	0.095 af, Atten= 13%, Lag= 2.5 min
Discarded =	0.07 cfs @ 12.12 hrs, Volume=	0.058 af
Primary =	1.15 cfs @ 12.12 hrs, Volume=	0.037 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,022.70' @ 12.12 hrs Surf.Area= 1,195 sf Storage= 728 cf

Plug-Flow detention time= 48.5 min calculated for 0.095 af (100% of inflow) Center-of-Mass det. time= 47.9 min (866.0 - 818.1)

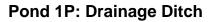
Volume	Invert	t Avail.Sto	rage	Storage	Description	
#1	1,022.00	' 1,8	10 cf	Custom	n Stage Data (Pi	r <b>ismatic)</b> Listed below (Recalc)
Elevatio (fee 1,022.0 1,023.0 1,023.9	et) 00 00	Surf.Area (sq-ft) 875 1,330 1,500		.Store <u>c-feet)</u> 0 1,103 708	Cum.Store (cubic-feet) 0 1,103 1,810	
Device	Routing	Invert	Outle	et Device	S	
#1	Primary	1,022.50'				oad-Crested Rectangular Weir
#2	Discarded	1,022.00'	Coei <b>2.41</b>	f. (Englisł <b>0 in/hr E</b>	n) 2.49 2.56 2. <b>xfiltration over</b>	0.80 1.00 1.20 1.40 1.60 70 2.69 2.68 2.69 2.67 2.64 <b>Surface area</b> Elevation = 1,015.00'

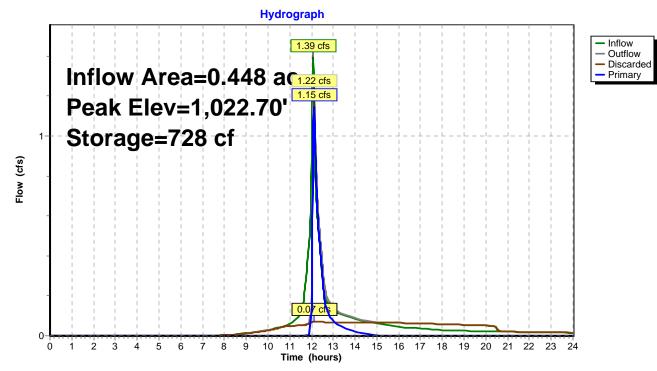
**Discarded OutFlow** Max=0.07 cfs @ 12.12 hrs HW=1,022.70' (Free Discharge) **2=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.14 cfs @ 12.12 hrs HW=1,022.70' (Free Discharge) **1=Broad-Crested Rectangular Weir** (Weir Controls 1.14 cfs @ 1.12 fps)

#### 2019-04-11 Existing Drainage

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#### Summary for Pond 5P: (new Pond)

[79] Warning: Submerged Pond 6P Primary device # 1 INLET by 0.59'[79] Warning: Submerged Pond 6P Secondary device # 2 by 0.09'

Inflow Area =	1.061 ac, 47.82% Impervious, Inflow D	Depth > 2.77" for 10-Year event
Inflow =	4.02 cfs @ 12.09 hrs, Volume=	0.245 af
Outflow =	3.79 cfs @ 12.12 hrs, Volume=	0.241 af, Atten= 6%, Lag= 1.9 min
Discarded =	0.08 cfs @ 12.12 hrs, Volume=	0.073 af
Primary =	3.71 cfs @ 12.12 hrs, Volume=	0.168 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 1,021.09' @ 12.12 hrs Surf.Area= 1,099 sf Storage= 1,380 cf

Plug-Flow detention time= 52.5 min calculated for 0.240 af (98% of inflow) Center-of-Mass det. time= 42.2 min (794.5 - 752.3)

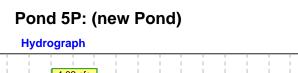
Volume	Inver	t Avail.Sto	rage Storage	Description	
#1	1,019.00	)' 1,8	70 cf Custom	Stage Data (P	rismatic)Listed below (Recalc)
Elevatio	et)	Surf.Area (sq-ft) 68	Inc.Store (cubic-feet) 0	Cum.Store (cubic-feet) 0	
1,020.0	00	720	394	394	
1,021.0	00	1,049	885	1,279	
1,021.5	50	1,315	591	1,870	
Device	Routing	Invert	Outlet Device	S	
#1	Primary	1,020.50'	3.0' long x 2	5.0' breadth Bre	oad-Crested Rectangular Weir
#2	Discarded	1,019.00'	Coef. (English 2.410 in/hr Ex	n) 2.68 2.70 2. <b>xfiltration over</b>	0.80 1.00 1.20 1.40 1.60 70 2.64 2.63 2.64 2.64 2.63 <b>Surface area</b> Elevation = 1,015.00'

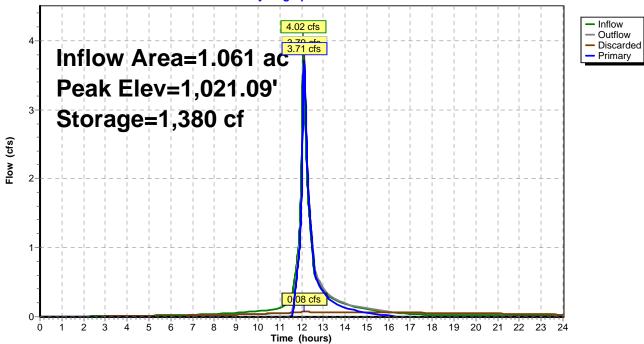
**Discarded OutFlow** Max=0.08 cfs @ 12.12 hrs HW=1,021.09' (Free Discharge) **2=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=3.71 cfs @ 12.12 hrs HW=1,021.09' (Free Discharge) ▲ 1=Broad-Crested Rectangular Weir (Weir Controls 3.71 cfs @ 2.08 fps)

#### 2019-04-11 Existing Drainage

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#### Summary for Pond 6P: (new Pond)

Inflow Area =	0.667 ac, 23.47% Impervious, Inflow De	epth > 3.73" for 10-Year event
Inflow =	2.81 cfs @ 12.07 hrs, Volume=	0.208 af
Outflow =	2.53 cfs @ 12.11 hrs, Volume=	0.200 af, Atten= 10%, Lag= 2.2 min
Discarded =	0.11 cfs @ 12.11 hrs, Volume=	0.089 af
Primary =	0.54 cfs @ 12.11 hrs, Volume=	0.068 af
Secondary =	1.87 cfs @ 12.11 hrs, Volume=	0.043 af
Tertiary =	0.00 cfs @ 0.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,021.27' @ 12.11 hrs Surf.Area= 1,665 sf Storage= 1,794 cf

Plug-Flow detention time= 77.4 min calculated for 0.200 af (96% of inflow) Center-of-Mass det. time= 55.5 min (826.4 - 770.8)

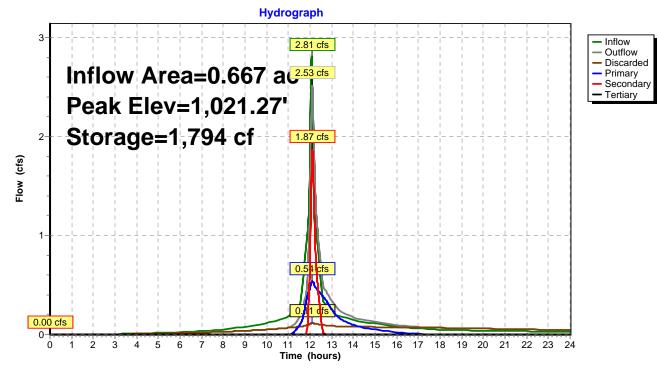
Volume	Invert	Avail.Sto	rage Storage	e Description	
#1	1,019.00'	2,20	07 cf Custor	n Stage Data (P	rismatic)Listed below (Recalc)
Elevatio (fee	•••	urf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
1,019.0	00	7	0	0	
1,020.0	00	688	348	348	
1,021.0		1,385	1,037	1,384	
1,021.5	50	1,906	823	2,207	
Device	Routing	Invert	Outlet Device	es	
#1	Primary	1,020.50'	6.0" Round	Culvert	
			Inlet / Outlet	Invert= 1,020.50	headwall, Ke= 0.900 ' / 1,020.00' S= 0.0152 '/' Cc= 0.900 or, Flow Area= 0.20 sf
#2	Secondary	1,021.00'	5.0' long x 2 Head (feet)	20.0' breadth Br 0.20 0.40 0.60	oad-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60
#3	Tertiary	1,021.30'	<b>50.0' long x</b> Head (feet) 2.50 3.00 3	3 <b>5.0' breadth Br</b> 0.20 0.40 0.60 .50 4.00 4.50 5	70       2.64       2.63       2.64       2.63         oad-Crested Rectangular Weir       0.80       1.00       1.20       1.40       1.60       1.80       2.00         5.00       5.50       70       2.68       2.68       2.65       2.65       2.65
#4	Discarded	1,019.00'	2.65 2.67 2 2.410 in/hr E	.66 2.68 2.70 2 Exfiltration over	2.74 2.79 2.88

**Discarded OutFlow** Max=0.11 cfs @ 12.11 hrs HW=1,021.27' (Free Discharge) **4=Exfiltration** (Controls 0.11 cfs)

Primary OutFlow Max=0.54 cfs @ 12.11 hrs HW=1,021.27' (Free Discharge) 1=Culvert (Inlet Controls 0.54 cfs @ 2.74 fps)

Secondary OutFlow Max=1.87 cfs @ 12.11 hrs HW=1,021.27' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 1.87 cfs @ 1.39 fps)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,019.00' (Free Discharge) -3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)



# Pond 6P: (new Pond)

2019-04-11 Existing Drainage	Type III 24-I
Prepared by McCarty Engineering, Inc.	
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#### Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

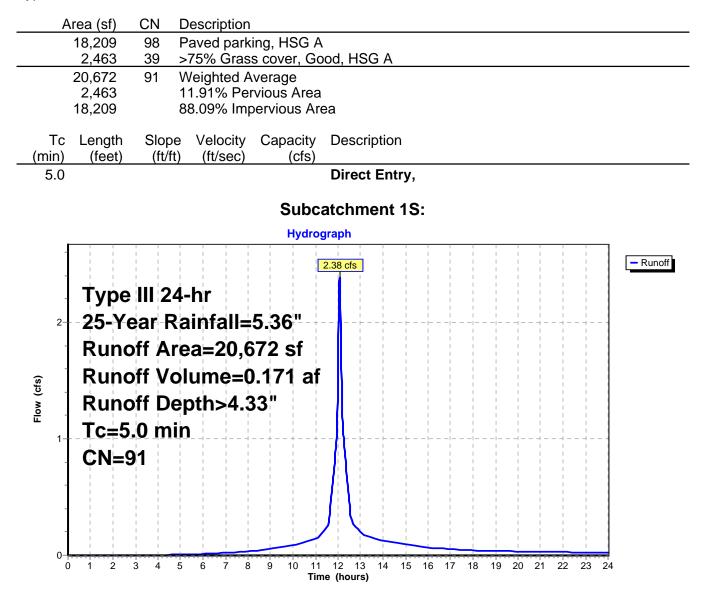
Subcatchment1S:		Runoff Are	ea=20,6			•		Runoff E off=2.38 c	•	
Subcatchment 2S:		Runoff Are	ea=19,5					Runoff E off=1.89 c		
Subcatchment3S:		Runoff /	Area=3,					Runoff E off=0.00 c		
Subcatchment4S:		Runoff Are	ea=17,1					Runoff E off=2.14 c		
Subcatchment5S:		Runoff Are	ea=29,0					Runoff E off=3.54 c		
Subcatchment6S:	F	Runoff Are								
Reach 1R: Eastern Wetla	nd							w=7.78 c w=7.78 c		
Reach 2R: Gardner Road								w=3.96 c w=3.96 c		
Pond 1P: Drainage Ditch	Discarded=0.07 cfs	Peak Ele 0.068 af			•					
Pond 5P: (new Pond)	Discarded=0.08 cfs	Peak Elev 0.080 af								
<b>Pond 6P: (new Pond)</b> ofs 0.098 af Primary=0.56 cfs 0.091 af	Secondary=2.40 cfs	Peak Elev 0.064 af								
Total Punc	off Area - 1 175 ac	Runoff	Volum	0 – 0	065 at	F Avor	ano P		ontl	h – 2 77'

Total Runoff Area = 4.175 ac Runoff Volume = 0.965 af Average Runoff Depth = 2.77" 67.15% Pervious = 2.803 ac 32.85% Impervious = 1.371 ac

#### Summary for Subcatchment 1S:

Runoff = 2.38 cfs @ 12.07 hrs, Volume= 0.171 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"



#### **Summary for Subcatchment 2S:**

Runoff = 1.89 cfs @ 12.07 hrs, Volume= 0.131 af, Depth> 3.50"

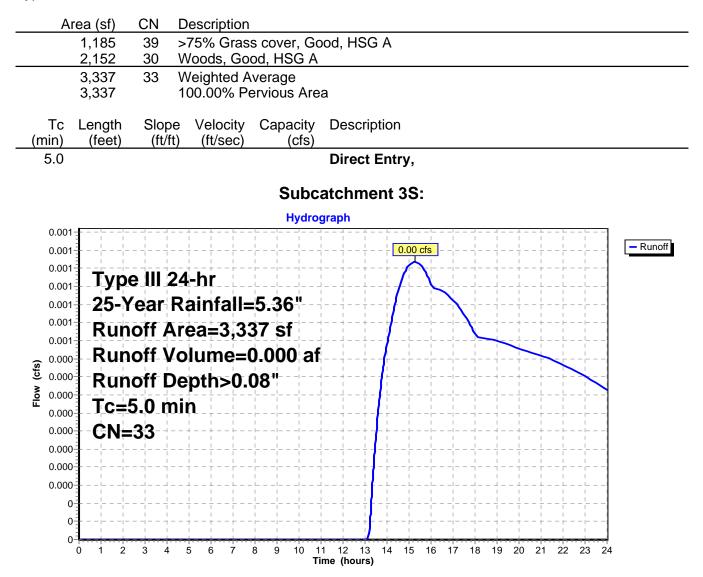
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

Area (sf)	CN Description							
5,256	98 Paved parking, HSG A							
	10,008 96 Gravel surface, HSG A							
1,971 2,292	<ul> <li>39 &gt;75% Grass cover, Good, HSG A</li> <li>30 Woods, Good, HSG A</li> </ul>							
19,527	83 Weighted Average							
14,271	73.08% Pervious Area							
5,256	26.92% Impervious Area							
Tc Length (min) (feet)	Slope Velocity Capacity Description (ft/ft) (ft/sec) (cfs)							
5.0	Direct Entry,							
	Subcatchment 2S:							
	Hydrograph							
25-Ye Runc التق التق التق التق التق التق التق التق	1.89 cfs							

#### **Summary for Subcatchment 3S:**

Runoff = 0.00 cfs @ 15.26 hrs, Volume= 0.000 af, Depth> 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"



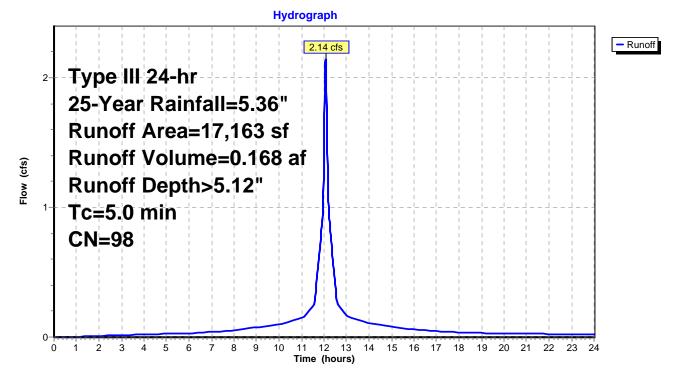
#### **Summary for Subcatchment 4S:**

Runoff = 2.14 cfs @ 12.07 hrs, Volume= 0.168 af, Depth> 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

Α	rea (sf)	CN	Description		
	7,846	98	Roofs, HSG	βA	
	7,438	98	Paved park	ing, HSG A	A
	1,879	96	Gravel surfa	ace, HSG A	Α
	17,163	98	Weighted A	verage	
	1,879		10.95% Per	vious Area	1
	15,284		89.05% Imp	ervious Ar	ea
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description
5.0					Direct Entry,

#### Subcatchment 4S:



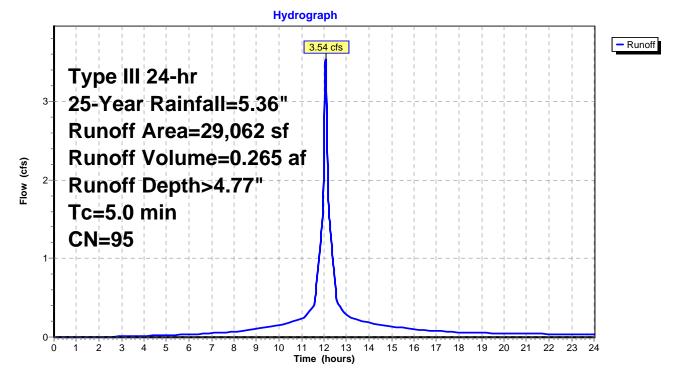
#### **Summary for Subcatchment 5S:**

Runoff 3.54 cfs @ 12.07 hrs, Volume= 0.265 af, Depth> 4.77" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

A	rea (sf)	CN	Description		
	6,820	98	Paved park	ing, HSG A	A
	21,781	96	Gravel surfa	ace, HSG A	Α
	461	30	Woods, Go	od, HSG A	
	29,062	95	Weighted A	verage	
	22,242		76.53% Pei	vious Area	1
	6,820		23.47% Imp	pervious Ar	ea
т.	I an ath	01.000	Valasita.	O an a site	Description
TC	Length	Slope		Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
5.0					Direct Entry,

#### Subcatchment 5S:



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#### Summary for Subcatchment 6S:

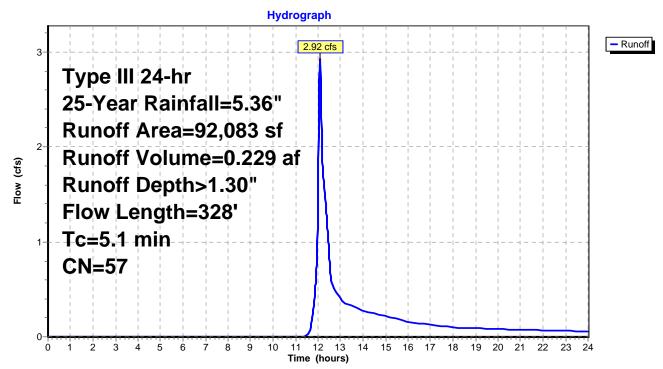
Runoff = 2.92 cfs @ 12.09 hrs, Volume= 0.229 af, Depth> 1.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

	Area (sf)	CN E	Description		
	14,165	98 F	aved park	ing, HSG A	
	23,327			ace, HSG A	
	54,591	30 V	Voods, Go	od, HSG A	
	92,083	57 V	Veighted A	verage	
	77,918	-		vious Area	
	14,165	1	5.38% Imp	pervious Are	ea
-				<b>o</b>	
To	5	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
2.1	50	0.0270	0.39		Sheet Flow,
					Fallow n= 0.050 P2= 3.00"
0.8	132	0.0270	2.65		Shallow Concentrated Flow,
					Unpaved Kv= 16.1 fps
0.1	20	0.5000	3.54		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
2.1	126	0.0400	1.00		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps

5.1 328 Total

#### Subcatchment 6S:

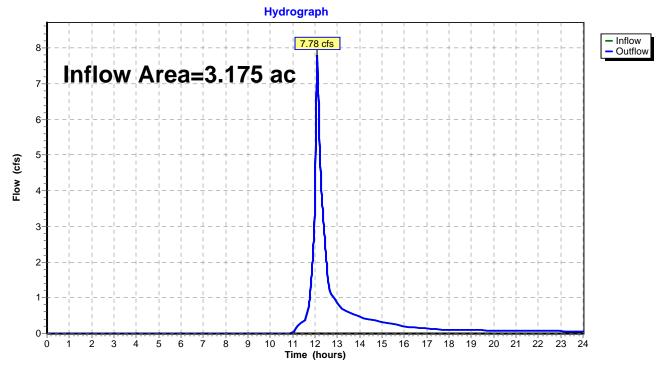


#### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	=	3.175 ac, 2	26.22% Impe	ervious,	Inflow Dep	pth > ´	1.77"	for 25-	Year event
Inflow	=	7.78 cfs @	12.10 hrs,	Volume	= (	0.467 a	f		
Outflow :	=	7.78 cfs @	12.10 hrs,	Volume	=	0.467 a	f, Atte	en= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



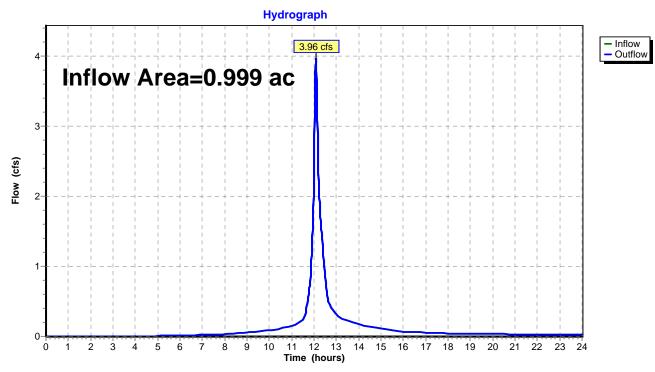
## Reach 1R: Eastern Wetland

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.999 ac, 5	53.90% Impe	ervious,	Inflow De	epth >	2.82"	for 25-	Year event
Inflow	=	3.96 cfs @	12.08 hrs,	Volume	=	0.235	af		
Outflow	=	3.96 cfs @	12.08 hrs,	Volume	)=	0.235	af, Att	en= 0%,	Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



#### Reach 2R: Gardner Road

#### Summary for Pond 1P: Drainage Ditch

Inflow Area =	0.448 ac, 26.92% Impervious, Inflow De	epth > 3.50" for 25-Year event
Inflow =	1.89 cfs @ 12.07 hrs, Volume=	0.131 af
Outflow =	1.75 cfs @ 12.11 hrs, Volume=	0.131 af, Atten= 8%, Lag= 1.9 min
Discarded =	0.07 cfs @ 12.11 hrs, Volume=	0.068 af
Primary =	1.67 cfs @ 12.11 hrs, Volume=	0.063 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,022.76' @ 12.11 hrs Surf.Area= 1,221 sf Storage= 797 cf

Plug-Flow detention time= 43.3 min calculated for 0.131 af (100% of inflow) Center-of-Mass det. time= 42.7 min (851.9 - 809.2)

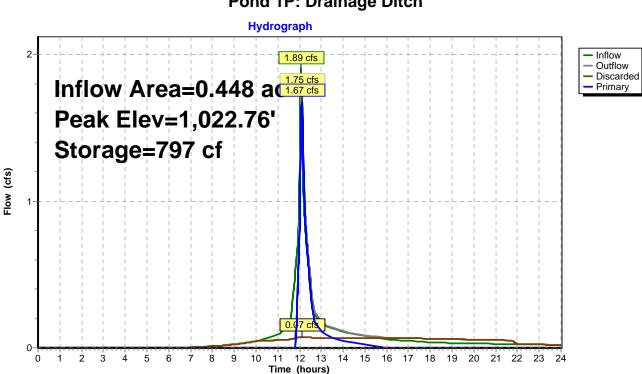
Volume	Invert	Avail.Sto	rage	Storage	Description	
#1	1,022.00'	1,8	10 cf	Custom	N Stage Data (P	rismatic)Listed below (Recalc)
Elevatio (fee 1,022.0 1,023.0 1,023.5	et) )0 )0	urf.Area (sq-ft) 875 1,330 1,500		.Store <u>c-feet)</u> 0 1,103 708	Cum.Store (cubic-feet) 0 1,103 1,810	
Device	Routing	Invert	Outle	et Device	s	
#1	Primary	1,022.50'		<b>U</b>		oad-Crested Rectangular Weir
#2	Discarded	1,022.00'	Coef <b>2.41</b>	. (Englisł <b>0 in/hr E</b> :	n) 2.49 2.56 2. <b>xfiltration over</b>	0.80 1.00 1.20 1.40 1.60 70 2.69 2.68 2.69 2.67 2.64 <b>Surface area</b> Elevation = 1,015.00'

**Discarded OutFlow** Max=0.07 cfs @ 12.11 hrs HW=1,022.76' (Free Discharge) **2=Exfiltration** (Controls 0.07 cfs)

Primary OutFlow Max=1.67 cfs @ 12.11 hrs HW=1,022.76' (Free Discharge) =Broad-Crested Rectangular Weir (Weir Controls 1.67 cfs @ 1.28 fps)

#### 2019-04-11 Existing Drainage

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### Pond 1P: Drainage Ditch

#### Summary for Pond 5P: (new Pond)

[79] Warning: Submerged Pond 6P Primary device # 1 INLET by 0.70'[79] Warning: Submerged Pond 6P Secondary device # 2 by 0.20'

Inflow Area =	1.061 ac, 47.82% Impervious, Inflow De	epth > 3.66" for 25-Year event
Inflow =	5.05 cfs @ 12.08 hrs, Volume=	0.324 af
Outflow =	4.73 cfs @ 12.12 hrs, Volume=	0.317 af, Atten= 6%, Lag= 1.9 min
Discarded =	0.08 cfs @ 12.12 hrs, Volume=	0.080 af
Primary =	4.65 cfs @ 12.12 hrs, Volume=	0.237 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 1,021.20' @ 12.12 hrs Surf.Area= 1,153 sf Storage= 1,494 cf

Plug-Flow detention time= 45.3 min calculated for 0.317 af (98% of inflow) Center-of-Mass det. time= 34.0 min (784.4 - 750.3)

Volume	Invei	rt Avail.Sto	rage Storag	ge Description	
#1	1,019.00	D' 1,8 <sup>-</sup>	70 cf Custo	om Stage Data (Pi	rismatic)Listed below (Recalc)
Elevatio	et)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
1,019.0		68	0	0	
1,020.0	0	720	394	394	
1,021.0	00	1,049	885	1,279	
1,021.5	50	1,315	591	1,870	
Device	Routing	Invert	Outlet Devid	ces	
#1	Primary	1,020.50'	3.0' long x	25.0' breadth Bre	oad-Crested Rectangular Weir
#2	Discarded	1,019.00'	Coef. (Engli <b>2.410 in/hr</b>	ish) 2.68 2.70 2. Exfiltration over	0.80 1.00 1.20 1.40 1.60 70 2.64 2.63 2.64 2.64 2.63 <b>Surface area</b> Elevation = 1,015.00'

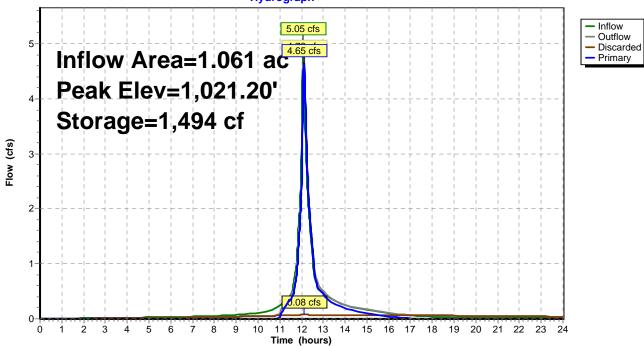
**Discarded OutFlow** Max=0.08 cfs @ 12.12 hrs HW=1,021.20' (Free Discharge) **2=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=4.65 cfs @ 12.12 hrs HW=1,021.20' (Free Discharge) ▲ 1=Broad-Crested Rectangular Weir (Weir Controls 4.65 cfs @ 2.23 fps)

#### 2019-04-11 Existing Drainage

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### Summary for Pond 6P: (new Pond)

Inflow Area =	0.667 ac, 23.47% Impervious, Inflow D	Depth > 4.77" for 25-Year event
Inflow =	3.54 cfs @ 12.07 hrs, Volume=	0.265 af
Outflow =	3.38 cfs @ 12.09 hrs, Volume=	0.255 af, Atten= 4%, Lag= 1.4 min
Discarded =	0.12 cfs @ 12.09 hrs, Volume=	0.098 af
Primary =	0.56 cfs @ 12.09 hrs, Volume=	0.091 af
Secondary =	2.40 cfs @ 12.09 hrs, Volume=	0.064 af
Tertiary =	0.31 cfs @ 12.09 hrs, Volume=	0.001 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,021.32' @ 12.09 hrs Surf.Area= 1,715 sf Storage= 1,875 cf

Plug-Flow detention time= 69.0 min calculated for 0.255 af (96% of inflow) Center-of-Mass det. time= 46.1 min (811.2 - 765.0)

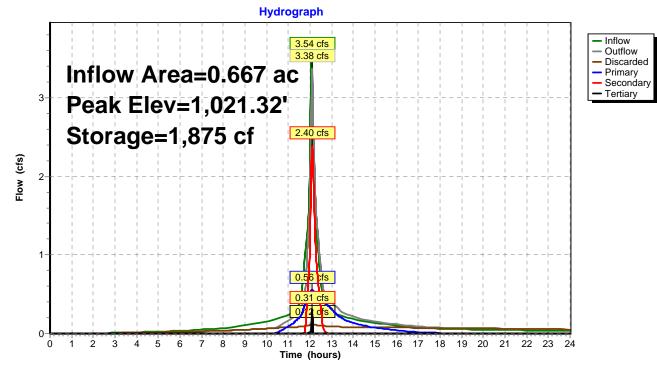
Volume	Inver	t Avail.Sto	rage Stora	ge Description	
#1	1,019.00	' 2,20	07 cf Custo	om Stage Data (P	rismatic)Listed below (Recalc)
Elevatio (fee	•	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
1,019.0	)0	7	0	0	
1,020.0	00	688	348	348	
1,021.0		1,385	1,037	,	
1,021.5	50	1,906	823	2,207	
Device	Routing	Invert	Outlet Devi	ces	
#1	Primary	1,020.50'	6.0" Roun	d Culvert	
	-		Inlet / Outle	et Invert= 1,020.50	headwall, Ke= 0.900 '/1,020.00' S= 0.0152 '/' Cc= 0.900
#2	Secondary	/ 1,021.00'	5.0' long >	20.0' breadth Bro	or, Flow Area= 0.20 sf oad-Crested Rectangular Weir 0.80 1.00 1.20 1.40 1.60
					70 2.64 2.63 2.64 2.64 2.63
#3	Tertiary	1,021.30'			oad-Crested Rectangular Weir
	2				0.80 1.00 1.20 1.40 1.60 1.80 2.00
				3.50 4.00 4.50 5	
			· · ·	,	70 2.68 2.68 2.66 2.65 2.65 2.65
	Discourterd	4 040 00		2.66 2.68 2.70 2	
#4	Discarded	1,019.00'		Exfiltration over	
			Conductivit	y to Groundwater	Elevation = $1,015.00'$

**Discarded OutFlow** Max=0.12 cfs @ 12.09 hrs HW=1,021.32' (Free Discharge) **4=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=0.56 cfs @ 12.09 hrs HW=1,021.32' (Free Discharge) 1=Culvert (Inlet Controls 0.56 cfs @ 2.86 fps)

Secondary OutFlow Max=2.39 cfs @ 12.09 hrs HW=1,021.32' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 2.39 cfs @ 1.51 fps)

Tertiary OutFlow Max=0.24 cfs @ 12.09 hrs HW=1,021.32' (Free Discharge) -3=Broad-Crested Rectangular Weir (Weir Controls 0.24 cfs @ 0.30 fps)



## Pond 6P: (new Pond)

2019-04	-11	Ex	isti	ing	Drair	nage	
-			~				

cfs 0.113

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 Type III 24-hr
 100-Year Rainfall=7.49"

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 ons LLC
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#### Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points Runoff by SCS TR-20 method, UH=SCS, Weighted-CN Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

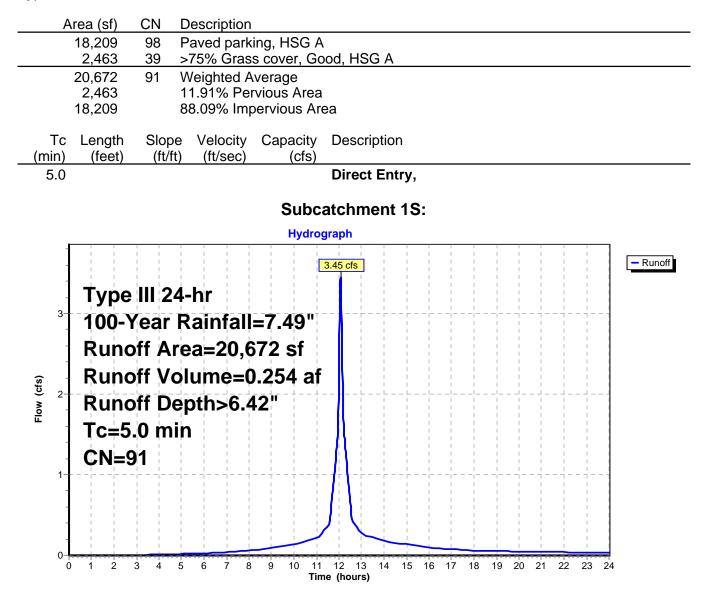
Subcatchment1S:	Runoff Area=20,672 sf 88.09% Impervious Runoff Depth>6.42" Tc=5.0 min CN=91 Runoff=3.45 cfs 0.254 af
Subcatchment 2S:	Runoff Area=19,527 sf 26.92% Impervious Runoff Depth>5.49" Tc=5.0 min CN=83 Runoff=2.92 cfs 0.205 af
Subcatchment3S:	Runoff Area=3,337 sf 0.00% Impervious Runoff Depth>0.49" Tc=5.0 min CN=33 Runoff=0.01 cfs 0.003 af
Subcatchment 4S:	Runoff Area=17,163 sf 89.05% Impervious Runoff Depth>7.25" Tc=5.0 min CN=98 Runoff=3.00 cfs 0.238 af
Subcatchment5S:	Runoff Area=29,062 sf 23.47% Impervious Runoff Depth>6.89" Tc=5.0 min CN=95 Runoff=5.01 cfs 0.383 af
Subcatchment 6S:	Runoff Area=92,083 sf 15.38% Impervious Runoff Depth>2.64" Flow Length=328' Tc=5.1 min CN=57 Runoff=6.52 cfs 0.465 af
Reach 1R: Eastern Wetland	Inflow=13.83 cfs 0.857 af Outflow=13.83 cfs 0.857 af
Reach 2R: Gardner Road	Inflow=6.00 cfs 0.379 af Outflow=6.00 cfs 0.379 af
Pond 1P: Drainage Ditch Discarded=0.0	Peak Elev=1,022.85' Storage=911 cf Inflow=2.92 cfs 0.205 af 08 cfs 0.082 af Primary=2.66 cfs 0.122 af Outflow=2.74 cfs 0.204 af
Pond 5P: (new Pond) Discarded=0.0	Peak Elev=1,021.33' Storage=1,654 cf Inflow=6.40 cfs 0.481 af 09 cfs 0.091 af Primary=5.99 cfs 0.380 af Outflow=6.08 cfs 0.471 af
<b>Pond 6P: (new Pond)</b> 3 af Primary=0.58 cfs 0.140 af Secondary=2.8	Peak Elev=1,021.35' Storage=1,938 cf Inflow=5.01 cfs 0.383 af 33 cfs 0.103 af Tertiary=1.44 cfs 0.012 af Outflow=4.97 cfs 0.368 af
Total Bunoff Area - 4.17	75 as Bunoff Volume - 1 549 of Average Bunoff Donth - 4 45

Total Runoff Area = 4.175 ac Runoff Volume = 1.548 af Average Runoff Depth = 4.45" 67.15% Pervious = 2.803 ac 32.85% Impervious = 1.371 ac

#### Summary for Subcatchment 1S:

Runoff 3.45 cfs @ 12.07 hrs, Volume= 0.254 af, Depth> 6.42" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"



### Summary for Subcatchment 2S:

Runoff = 2.92 cfs @ 12.07 hrs, Volume= 0.205 af, Depth> 5.49"

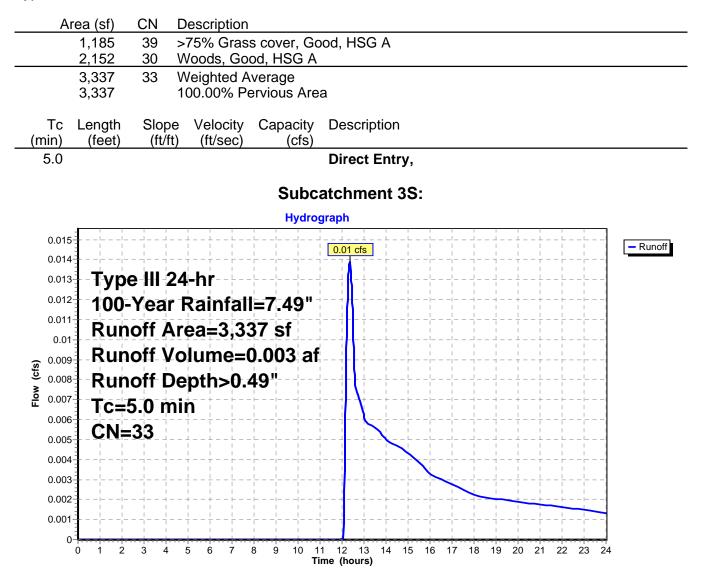
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

Area (sf)CNDescription5,25698Paved parking, HSG A10,00896Gravel surface, HSG A1,97139>75% Grass cover, Good, HSG A2,29230Woods, Good, HSG A	
19,527 83 Weighted Average 14,271 73.08% Pervious Area	
5,256 26.92% Impervious Area	
Tc Length Slope Velocity Capacity Description (min) (feet) (ft/ft) (ft/sec) (cfs)	
5.0 Direct Entry,	
Subcatchment 2S:	
Hydrograph	
3	Runoff
Type III 24-hr 100-Year Rainfall=7.49"	
Runoff Area=19,527 sf	
ਤੂੰ <sup>*</sup> Runoff Volume=0.205 af  Runoff Depth>5.49"	
<sup>™</sup>   Tc=5.0 min	
1	
0 <del>  2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24</del> Time (hours)	

#### **Summary for Subcatchment 3S:**

Runoff = 0.01 cfs @ 12.35 hrs, Volume= 0.003 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"



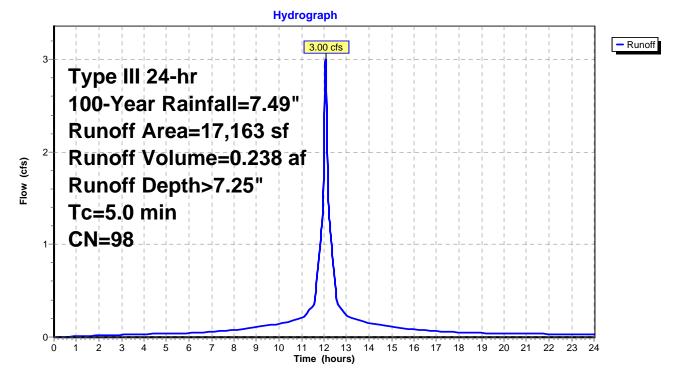
#### **Summary for Subcatchment 4S:**

Runoff = 3.00 cfs @ 12.07 hrs, Volume= 0.238 af, Depth> 7.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

A	rea (sf)	CN I	Description				
	7,846	98 I	Roofs, HSG	βA			
	7,438			ing, HSG A			
	1,879	96 (	Gravel surfa	ace, HSG A	A		
	17,163	98 \	Neighted A	verage			
	1,879		10.95% Pervious Area				
	15,284	8	89.05% Impervious Area				
Т	المربع مرالم	<u>Olana</u>	Mala altri	0	Description		
Tc	Length	Slope		Capacity	Description		
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)			
5.0					Direct Entry,		

#### Subcatchment 4S:



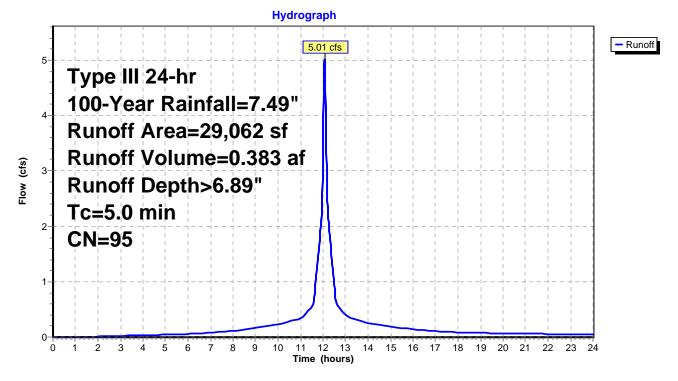
#### **Summary for Subcatchment 5S:**

Runoff 5.01 cfs @ 12.07 hrs, Volume= 0.383 af, Depth> 6.89" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

A	rea (sf)	CN I	Description				
	6,820	98 I	Paved park	ing, HSG A	N Contraction of the second se		
	21,781	96 (	Gravel surfa	ace, HSG A	A		
	461	30 \	Noods, Go	od, HSG A			
	29,062	95 \	Neighted A	verage			
	22,242	7	76.53% Pervious Area				
	6,820		23.47% Impervious Area				
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description		
5.0					Direct Entry,		

### Subcatchment 5S:



#### Summary for Subcatchment 6S:

Runoff = 6.52 cfs @ 12.08 hrs, Volume= 0.465 af, Depth> 2.64"

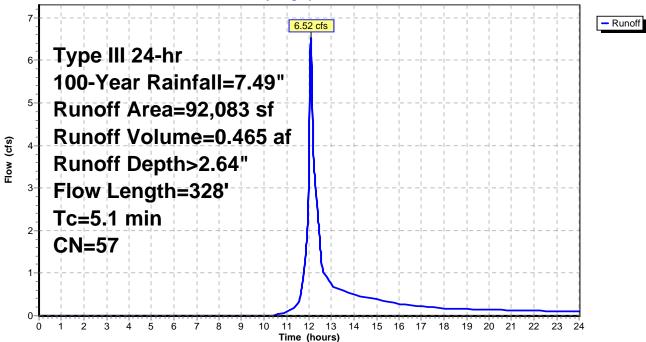
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

Α	rea (sf)	CN E	Description					
	14,165	98 F	Paved parking, HSG A					
	23,327			ace, HSG A	N Contraction of the second seco			
	54,591	<u>    30     </u> V	Voods, Go	od, HSG A				
	92,083	57 V	Veighted A	verage				
	77,918	8	4.62% Per	vious Area				
	14,165	1	5.38% Imp	pervious Ar	ea			
_		<b>.</b> .						
Tc	Length	Slope	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)				
2.1	50	0.0270	0.39		Sheet Flow,			
					Fallow n= 0.050 P2= 3.00"			
0.8	132	0.0270	2.65		Shallow Concentrated Flow,			
					Unpaved Kv= 16.1 fps			
0.1	20	0.5000	3.54		Shallow Concentrated Flow,			
					Woodland Kv= 5.0 fps			
2.1	126	0.0400	1.00		Shallow Concentrated Flow,			
					Woodland Kv= 5.0 fps			

5.1 328 Total

#### Subcatchment 6S:

#### Hydrograph

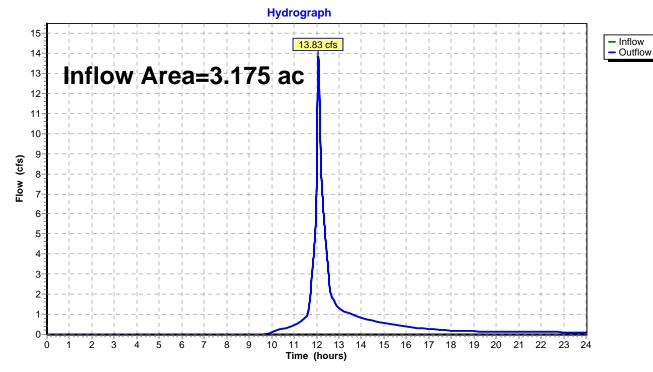


#### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	3.175 ac, 26.22% Impervious, Inflow Depth > 3.24" for 100-Ye	ear event
Inflow	=	13.83 cfs @ 12.09 hrs, Volume= 0.857 af	
Outflow	=	13.83 cfs @ 12.09 hrs, Volume= 0.857 af, Atten= 0%, La	g= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



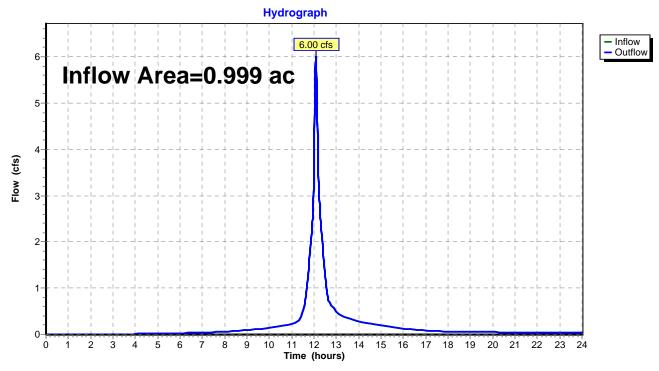
## Reach 1R: Eastern Wetland

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	=	0.999 ac, 5	53.90% Impe	ervious,	Inflow Dep	pth >	4.55"	for 100	)-Year event	
Inflow	=	6.00 cfs @	12.08 hrs,	Volume	= (	0.379 a	af			
Outflow	=	6.00 cfs @	12.08 hrs,	Volume	=	0.379 a	af, Atte	en= 0%,	Lag= 0.0 min	

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



### Reach 2R: Gardner Road

#### Summary for Pond 1P: Drainage Ditch

Inflow Area =	0.448 ac, 26.92% Impervious, Inflow	Depth > 5.49" for 100-Year event	t
Inflow =	2.92 cfs @ 12.07 hrs, Volume=	0.205 af	
Outflow =	2.74 cfs @ 12.10 hrs, Volume=	0.204 af, Atten= 6%, Lag= 1.7 m	nin
Discarded =	0.08 cfs @ 12.10 hrs, Volume=	0.082 af	
Primary =	2.66 cfs @ 12.10 hrs, Volume=	0.122 af	

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,022.85' @ 12.10 hrs Surf.Area= 1,263 sf Storage= 911 cf

Plug-Flow detention time= 38.6 min calculated for 0.204 af (99% of inflow) Center-of-Mass det. time= 35.1 min (831.6 - 796.5)

Volume	Inver	t Avail.Sto	orage	Storage [	Description	
#1	1,022.00	' 1,8	10 cf	Custom	Stage Data (P	rismatic)Listed below (Recalc)
Elevatio (fee 1,022.0 1,023.0 1,023.5	et) 00 00	Surf.Area (sq-ft) 875 1,330 1,500	(cubic	Store <u>-feet)</u> 0 1,103 708	Cum.Store (cubic-feet) 0 1,103 1,810	
Device	Routing	Invert	Outle	t Devices		
#1	Primary	1,022.50'				oad-Crested Rectangular Weir
#2	Discarded	1,022.00'	Coef. <b>2.410</b>	. (English) <b>) in/hr Ex</b> t	2.49 2.56 2. filtration over	0.80 1.00 1.20 1.40 1.60 70 2.69 2.68 2.69 2.67 2.64 <b>Surface area</b> Elevation = 1,015.00'

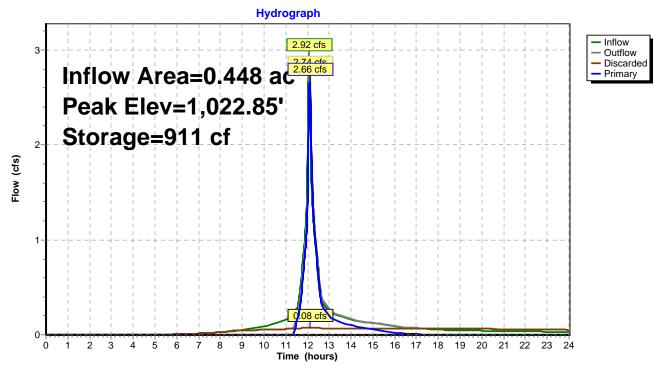
**Discarded OutFlow** Max=0.08 cfs @ 12.10 hrs HW=1,022.85' (Free Discharge) **2=Exfiltration** (Controls 0.08 cfs)

Primary OutFlow Max=2.66 cfs @ 12.10 hrs HW=1,022.85' (Free Discharge) **1=Broad-Crested Rectangular Weir** (Weir Controls 2.66 cfs @ 1.51 fps)

#### 2019-04-11 Existing Drainage

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#### Summary for Pond 5P: (new Pond)

[79] Warning: Submerged Pond 6P Primary device # 1 INLET by 0.83'[79] Warning: Submerged Pond 6P Secondary device # 2 by 0.33'

Inflow Area =	1.061 ac, 47.82% Impervious, Inflow De	epth > 5.44" for 100-Year event
Inflow =	6.40 cfs @ 12.07 hrs, Volume=	0.481 af
Outflow =	6.08 cfs @ 12.10 hrs, Volume=	0.471 af, Atten= 5%, Lag= 1.9 min
Discarded =	0.09 cfs @ 12.10 hrs, Volume=	0.091 af
Primary =	5.99 cfs @ 12.10 hrs, Volume=	0.380 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 2 Peak Elev= 1,021.33' @ 12.10 hrs Surf.Area= 1,225 sf Storage= 1,654 cf

Plug-Flow detention time= 36.3 min calculated for 0.471 af (98% of inflow) Center-of-Mass det. time= 23.6 min (771.8 - 748.2)

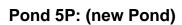
Volume	Invei	rt Avail.Sto	rage Storag	ge Description	
#1	1,019.00	D' 1,8 <sup>-</sup>	70 cf Custo	om Stage Data (Pi	rismatic)Listed below (Recalc)
Elevatio	et)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	
1,019.0		68	0	0	
1,020.0	0	720	394	394	
1,021.0	00	1,049	885	1,279	
1,021.5	50	1,315	591	1,870	
Device	Routing	Invert	Outlet Devid	ces	
#1	Primary	1,020.50'	3.0' long x	25.0' breadth Bre	oad-Crested Rectangular Weir
#2	Discarded	1,019.00'	Coef. (Engli <b>2.410 in/hr</b>	ish) 2.68 2.70 2. Exfiltration over	0.80 1.00 1.20 1.40 1.60 70 2.64 2.63 2.64 2.64 2.63 <b>Surface area</b> Elevation = 1,015.00'

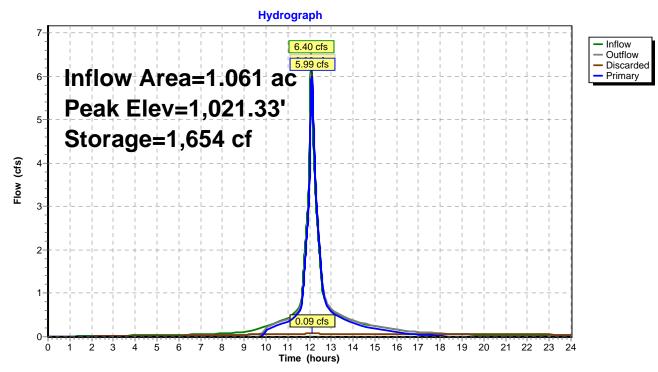
**Discarded OutFlow** Max=0.09 cfs @ 12.10 hrs HW=1,021.33' (Free Discharge) **2=Exfiltration** (Controls 0.09 cfs)

Primary OutFlow Max=5.98 cfs @ 12.10 hrs HW=1,021.33' (Free Discharge) ▲ 1=Broad-Crested Rectangular Weir (Weir Controls 5.98 cfs @ 2.40 fps)

#### 2019-04-11 Existing Drainage

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#### Summary for Pond 6P: (new Pond)

Inflow Area =	0.667 ac, 23.47% Impervious, Inflow I	Depth > 6.89" for 100-Year event
Inflow =	5.01 cfs @ 12.07 hrs, Volume=	0.383 af
Outflow =	4.97 cfs @ 12.08 hrs, Volume=	0.368 af, Atten= 1%, Lag= 0.6 min
Discarded =	0.12 cfs @ 12.08 hrs, Volume=	0.113 af
Primary =	0.58 cfs @ 12.08 hrs, Volume=	0.140 af
Secondary =	2.83 cfs @ 12.08 hrs, Volume=	0.103 af
Tertiary =	1.44 cfs @ 12.08 hrs, Volume=	0.012 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs Peak Elev= 1,021.35' @ 12.08 hrs Surf.Area= 1,753 sf Storage= 1,938 cf

Plug-Flow detention time= 57.3 min calculated for 0.368 af (96% of inflow) Center-of-Mass det. time= 34.1 min (791.2 - 757.1)

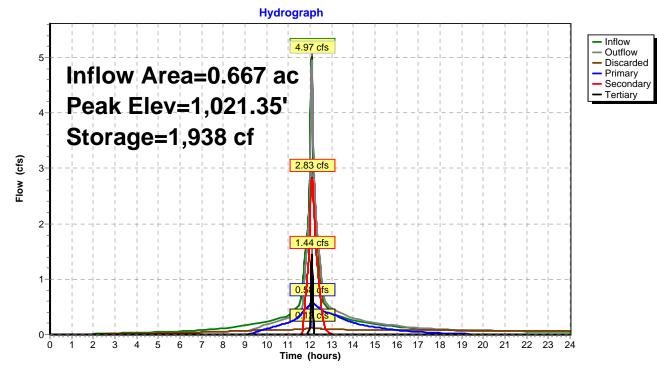
Volume	Invert	Avail.Sto	rage Stora	ge Description
#1	1,019.00'	2,2	07 cf Cust	om Stage Data (Prismatic)Listed below (Recalc)
Elevatio	n Si	urf.Area	Inc.Store	Cum.Store
(fee		(sq-ft)	(cubic-feet)	(cubic-feet)
1,019.0	7	7	0	0
1,020.0		688	348	348
1,021.0	00	1,385	1,037	1,384
1,021.5	50	1,906	823	2,207
Device	Routing	Invert	Outlet Devi	ices
#1	Primary	1,020.50'	6.0" Roun	nd Culvert
	2		L= 33.0' C	CPP, projecting, no headwall, Ke= 0.900
				et Invert= 1,020.50' / 1,020.00' S= 0.0152 '/' Cc= 0.900
	<b>.</b> .			PVC, smooth interior, Flow Area= 0.20 sf
#2	Secondary	1,021.00'	-	c 20.0' breadth Broad-Crested Rectangular Weir
				) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
#3	Tortion	1,021.30'		lish) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63 x 5.0' breadth Broad-Crested Rectangular Weir
#3	Tertiary	1,021.30		) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			( )	3.50 4.00 4.50 5.00 5.50
				lish) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65
				2.66 2.68 2.70 2.74 2.79 2.88
#4	Discarded	1,019.00'		Exfiltration over Surface area
			Conductivit	ty to Groundwater Elevation = 1,015.00'

**Discarded OutFlow** Max=0.12 cfs @ 12.08 hrs HW=1,021.35' (Free Discharge) **4=Exfiltration** (Controls 0.12 cfs)

Primary OutFlow Max=0.58 cfs @ 12.08 hrs HW=1,021.35' (Free Discharge) -1=Culvert (Inlet Controls 0.58 cfs @ 2.95 fps)

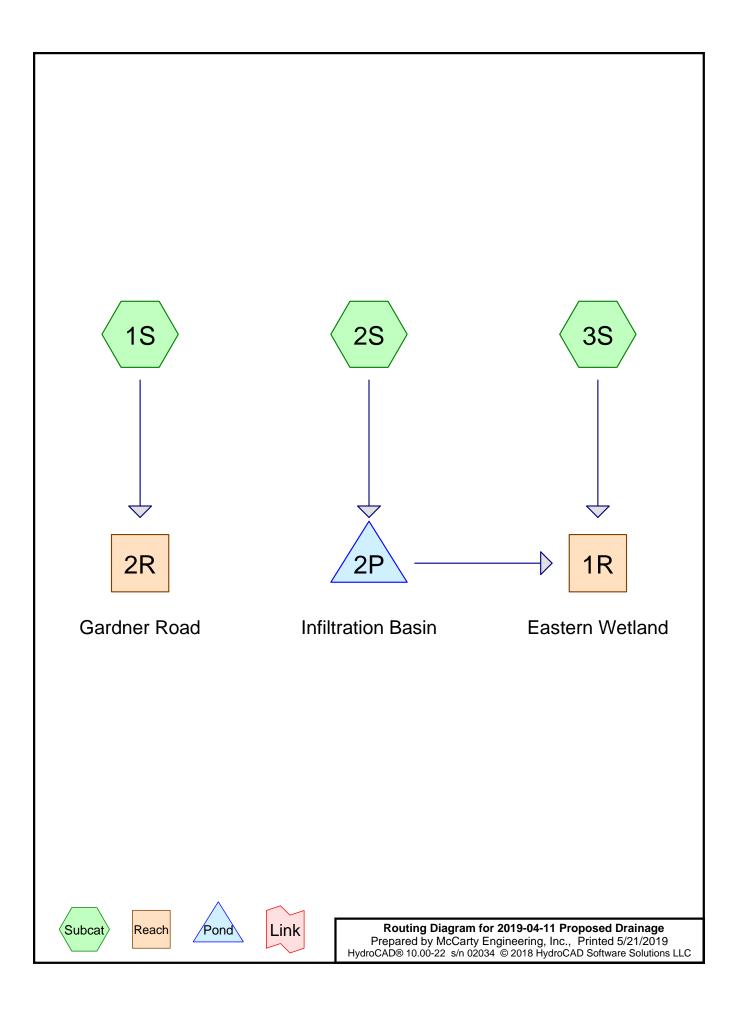
Secondary OutFlow Max=2.83 cfs @ 12.08 hrs HW=1,021.35' (Free Discharge) 2=Broad-Crested Rectangular Weir (Weir Controls 2.83 cfs @ 1.60 fps)

Tertiary OutFlow Max=1.43 cfs @ 12.08 hrs HW=1,021.35' (Free Discharge) —3=Broad-Crested Rectangular Weir (Weir Controls 1.43 cfs @ 0.54 fps)



## Pond 6P: (new Pond)

Proposed Conditions HydroCAD Model



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#### Area Listing (all nodes)

Area	CN	Description
(acres)		(subcatchment-numbers)
0.997	39	>75% Grass cover, Good, HSG A (1S, 2S, 3S)
2.998	98	Paved parking, HSG A (1S, 2S, 3S)
0.180	98	Roofs, HSG A (2S)
4.175	84	TOTAL AREA

## Soil Listing (all nodes)

Area	Soil	Subcatchment
(acres)	Group	Numbers
4.175	HSG A	1S, 2S, 3S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.175		TOTAL AREA

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			Cround C		noucoj		
HSG-A	HSG-B	HSG-C	HSG-D	Other	Total	Ground	Subcatchment
 (acres)	(acres)	(acres)	(acres)	(acres)	(acres)	Cover	Numbers
 0.997	0.000	0.000	0.000	0.000	0.997	>75% Grass cover, Good	1S, 2S,
							3S
2.998	0.000	0.000	0.000	0.000	2.998	Paved parking	1S, 2S,
							3S
0.180	0.000	0.000	0.000	0.000	0.180	Roofs	2S
4.175	0.000	0.000	0.000	0.000	4.175	TOTAL AREA	

#### Ground Covers (all nodes)

## 2019-04-11 Proposed Drainage

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	Pipe Listing (all nodes)									
	Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
_	1	2P	1,011.50	1,010.50	50.0	0.0200	0.010	18.0	0.0	0.0

#### D:..

<b>2019-04-11 Proposed Drainage</b> Prepared by McCarty Engineering, Inc. HydroCAD® 10.00-22 s/n 02034 © 2018 Hyd	Type III 24-hr 2-Year Rainfall= Printed 5/21 roCAD Software Solutions LLC	
Runoff by SCS T	0-48.00 hrs, dt=0.01 hrs, 4801 points R-20 method, UH=SCS, Weighted-CN d method - Pond routing by Stor-Ind method	
Subcatchment1S:	Runoff Area=15,011 sf 71.13% Impervious Runoff Depth Tc=5.0 min CN=81 Runoff=0.52 cfs 0.	
Subcatchment 2S:	Runoff Area=118,255 sf 93.46% Impervious Runoff Depth Tc=5.0 min CN=94 Runoff=7.25 cfs 0.	
Subcatchment 3S:	Runoff Area=48,579 sf 35.46% Impervious Runoff Depth: Tc=5.0 min CN=60 Runoff=0.19 cfs 0.	
Reach 1R: Eastern Wetland	Inflow=0.19 cfs 0. Outflow=0.19 cfs 0.	
Reach 2R: Gardner Road	Inflow=0.52 cfs 0. Outflow=0.52 cfs 0.	
Pond 2P: Infiltration Basin Discarded=0.65	Peak Elev=1,015.42' Storage=8,656 cf Inflow=7.25 cfs 0. cfs 0.516 af Primary=0.00 cfs 0.000 af Outflow=0.65 cfs 0.3	
Total Runoff Area = 4.175	ac Runoff Volume = 0.581 af Average Runoff Depth	= 1.67"

Total Runoff Area = 4.175 acRunoff Volume = 0.581 afAverage Runoff Depth = 1.67"23.88% Pervious = 0.997 ac76.12% Impervious = 3.178 ac

#### **Summary for Subcatchment 1S:**

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.036 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

A	rea (sf)	CN	Description					
	10,678	98	Paved parking, HSG A					
	4,333	39 :	>75% Grass cover, Good, HSG A					
	15,011	81	31 Weighted Average					
	4,333 28.87% Pervious Area							
	10,678 71.13% Impervious Area				rea			
Тс	Length	Slope	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)		(cfs)	Description			
5.0	(1901)	(1414)	(1	(0.0)	Direct Entry,			

#### **Summary for Subcatchment 2S:**

Runoff = 7.25 cfs @ 12.07 hrs, Volume= 0.516 af, Depth= 2.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

Area (sf)	CN	Description	Description					
7,846	98	Roofs, HSC	Э А					
102,678	98	Paved park						
7,731	39	>75% Gras	s cover, Go	ood, HSG A				
118,255	94	Weighted A	verage					
7,731		6.54% Perv	6.54% Pervious Area					
110,524		93.46% lmp	pervious Ar	rea				
Tc Lengt (min) (fee			Capacity (cfs)	Description				
5.0				Direct Entry,				

#### **Summary for Subcatchment 3S:**

Runoff = 0.19 cfs @ 12.13 hrs, Volume= 0.029 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 2-Year Rainfall=2.93"

Ar	ea (sf)	CN	Description					
	17,224	98	Paved park	ing, HSG A	N			
	31,355	39	>75% Gras	s cover, Go	bod, HSG A			
4	48,579	60	Weighted A	verage				
:	31,355		64.54% Per	vious Area	l			
	17,224		35.46% Imp	pervious Ar	ea			
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description			
5.0					Direct Entry,			

#### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	3.830 ac, 76.57% Impervious, Inflo	w Depth = 0.09" for 2-Year event
Inflow	=	0.19 cfs @ 12.13 hrs, Volume=	0.029 af
Outflow	=	0.19 cfs @ 12.13 hrs, Volume=	0.029 af, Atten= 0%, Lag= 0.0 min

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.345 ac, 7	71.13% Impervious, Inflow	Depth = 1.26"	for 2-Year event
Inflow =	0.52 cfs @	12.08 hrs, Volume=	0.036 af	
Outflow =	0.52 cfs @	12.08 hrs, Volume=	0.036 af, Atte	en= 0%, Lag= 0.0 min

#### **Summary for Pond 2P: Infiltration Basin**

Inflow Area =	2.715 ac, 93.46% Impervious, Inflow De	epth = 2.28" for 2-Year event
Inflow =	7.25 cfs @ 12.07 hrs, Volume=	0.516 af
Outflow =	0.65 cfs @ 12.94 hrs, Volume=	0.516 af, Atten= 91%, Lag= 51.9 min
Discarded =	0.65 cfs @ 12.94 hrs, Volume=	0.516 af
Primary =	0.00 cfs @ 12.94 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 1,015.42' @ 12.94 hrs Surf.Area= 9,065 sf Storage= 8,656 cf

Plug-Flow detention time= 109.8 min calculated for 0.516 af (100% of inflow) Center-of-Mass det. time= 109.8 min (898.9 - 789.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,014.00'	8,060 cf	59.00'W x 153.64'L x 3.50'H Field A
			31,726 cf Overall - 11,577 cf Embedded = 20,149 cf x 40.0% Voids
#2A	1,014.50'	11,577 cf	ADS_StormTech SC-740 +Cap x 252 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			12 Rows of 21 Chambers
		10 637 cf	Total Available Storage

19,637 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,011.50'	18.0" Round Culvert
	2		L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 1,011.50' / 1,010.50' S= 0.0200 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	1,015.42'	12.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,016.42'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Discarded	1,014.00'	2.410 in/hr Exfiltration over Surface area
			Conductivity to Groundwater Elevation = 1,009.00'

**Discarded OutFlow** Max=0.65 cfs @ 12.94 hrs HW=1,015.42' (Free Discharge) **4=Exfiltration** (Controls 0.65 cfs)

Primary OutFlow Max=0.00 cfs @ 12.94 hrs HW=1,015.42' (Free Discharge) 1=Culvert (Passes 0.00 cfs of 13.37 cfs potential flow) 2=Orifice/Grate (Orifice Controls 0.00 cfs @ 0.17 fps) -3=Orifice/Grate ( Controls 0.00 cfs)

#### Pond 2P: Infiltration Basin - Chamber Wizard Field A

#### Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

21 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 151.14' Row Length +15.0" End Stone x 2 = 153.64' Base Length 12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 15.0" Side Stone x 2 = 59.00' Base Width 6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

252 Chambers x 45.9 cf = 11,576.9 cf Chamber Storage

31,726.0 cf Field - 11,576.9 cf Chambers = 20,149.1 cf Stone x 40.0% Voids = 8,059.6 cf Stone Storage

Chamber Storage + Stone Storage = 19,636.5 cf = 0.451 afOverall Storage Efficiency = 61.9%Overall System Size =  $153.64' \times 59.00' \times 3.50'$ 

252 Chambers 1,175.0 cy Field 746.3 cy Stone

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<b>2019-04-11 Proposed Drainage</b> Prepared by McCarty Engineering, Inc. HydroCAD® 10.00-22 s/n 02034 © 2018 Hydro	
Runoff by SCS T	0-48.00 hrs, dt=0.01 hrs, 4801 points FR-20 method, UH=SCS, Weighted-CN nd method - Pond routing by Stor-Ind method
Subcatchment1S:	Runoff Area=15,011 sf 71.13% Impervious Runoff Depth=2.38" Tc=5.0 min CN=81 Runoff=1.00 cfs 0.068 af
Subcatchment 2S:	Runoff Area=118,255 sf 93.46% Impervious Runoff Depth=3.63" Tc=5.0 min CN=94 Runoff=11.23 cfs 0.821 af
Subcatchment3S:	Runoff Area=48,579 sf 35.46% Impervious Runoff Depth=0.92" Tc=5.0 min CN=60 Runoff=1.04 cfs 0.085 af
Reach 1R: Eastern Wetland	Inflow=1.96 cfs 0.221 af Outflow=1.96 cfs 0.221 af
Reach 2R: Gardner Road	Inflow=1.00 cfs 0.068 af Outflow=1.00 cfs 0.068 af
Pond 2P: Infiltration Basin Discarded=0.72	Peak Elev=1,016.09' Storage=13,181 cf Inflow=11.23 cfs 0.821 af 2 cfs 0.685 af Primary=1.58 cfs 0.136 af Outflow=2.29 cfs 0.821 af
Total Runoff Area = 4.175	5 ac Runoff Volume = 0.975 af Average Runoff Depth = 2.80"

otal Runoff Area = 4.175 ac Runoff Volume = 0.975 af Average Runoff Depth = 2.80" 23.88% Pervious = 0.997 ac 76.12% Impervious = 3.178 ac

#### **Summary for Subcatchment 1S:**

Runoff = 1.00 cfs @ 12.07 hrs, Volume= 0.068 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

A	rea (sf)	CN	Description					
	10,678	98	Paved park	ing, HSG A	A Contraction of the second se			
	4,333	39	>75% Gras	s cover, Go	bod, HSG A			
	15,011	81	Weighted Average					
	4,333		28.87% Per	vious Area	l			
	10,678		71.13% Impervious Area					
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description			
5.0					Direct Entry,			

#### **Summary for Subcatchment 2S:**

Runoff 11.23 cfs @ 12.07 hrs, Volume= 0.821 af, Depth= 3.63" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

Area (sf)	CN	Description	Description					
7,846	98	Roofs, HSC	A S					
102,678	98	Paved park						
7,731	39	>75% Gras	s cover, Go	ood, HSG A				
118,255	94	Weighted A	verage					
7,731		6.54% Perv	6.54% Pervious Area					
110,524		93.46% lmp	pervious Ar	rea				
Tc Lengt (min) (fee			Capacity (cfs)	Description				
5.0				Direct Entry,				

#### **Summary for Subcatchment 3S:**

Runoff = 1.04 cfs @ 12.09 hrs, Volume= 0.085 af, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 10-Year Rainfall=4.31"

A	rea (sf)	CN	Description		
	17,224	98	Paved park	ing, HSG A	A
	31,355	39 :	>75% Gras	s cover, Go	bod, HSG A
	48,579	60	Neighted A	verage	
	31,355	(	54.54% Per	vious Area	à
	17,224	:	35.46% Imp	pervious Ar	ea
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description
5.0					Direct Entry,

#### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	3.830 ac, 76.57% Impervious, Inflo	ow Depth = 0.69" for 10-Year event
Inflow =	1.96 cfs @ 12.43 hrs, Volume=	0.221 af
Outflow =	1.96 cfs @ 12.43 hrs, Volume=	0.221 af, Atten= 0%, Lag= 0.0 min

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	0.345 ac,	71.13% Impervious, Inflow	v Depth = 2.38"	for 10-Year event
Inflow =	1.00 cfs @	12.07 hrs, Volume=	0.068 af	
Outflow =	1.00 cfs @	12.07 hrs, Volume=	0.068 af, Atte	en= 0%, Lag= 0.0 min

#### **Summary for Pond 2P: Infiltration Basin**

Inflow Area =	2.715 ac, 93.46% Impervious, Inflow	Depth = 3.63" for 10-Year event
Inflow =	11.23 cfs @ 12.07 hrs, Volume=	0.821 af
Outflow =	2.29 cfs @ 12.48 hrs, Volume=	0.821 af, Atten= 80%, Lag= 24.8 min
Discarded =	0.72 cfs @ 12.48 hrs, Volume=	0.685 af
Primary =	1.58 cfs @ 12.48 hrs, Volume=	0.136 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 1,016.09' @ 12.48 hrs Surf.Area= 9,065 sf Storage= 13,181 cf

Plug-Flow detention time= 113.6 min calculated for 0.821 af (100% of inflow) Center-of-Mass det. time= 113.6 min (890.5 - 776.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,014.00'	8,060 cf	59.00'W x 153.64'L x 3.50'H Field A
			31,726 cf Overall - 11,577 cf Embedded = 20,149 cf x 40.0% Voids
#2A	1,014.50'	11,577 cf	ADS_StormTech SC-740 +Cap x 252 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			12 Rows of 21 Chambers
		10 637 cf	Total Available Storage

19,637 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,011.50'	18.0" Round Culvert
	2		L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 1,011.50' / 1,010.50' S= 0.0200 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	1,015.42'	12.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,016.42'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Discarded	1,014.00'	2.410 in/hr Exfiltration over Surface area
			Conductivity to Groundwater Elevation = 1,009.00'

**Discarded OutFlow** Max=0.72 cfs @ 12.48 hrs HW=1,016.09' (Free Discharge) **4=Exfiltration** (Controls 0.72 cfs)

Primary OutFlow Max=1.58 cfs @ 12.48 hrs HW=1,016.09' (Free Discharge) 1=Culvert (Passes 1.58 cfs of 14.72 cfs potential flow) 2=Orifice/Grate (Orifice Controls 1.58 cfs @ 2.80 fps) 3=Orifice/Grate ( Controls 0.00 cfs)

#### Pond 2P: Infiltration Basin - Chamber Wizard Field A

#### Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

21 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 151.14' Row Length +15.0" End Stone x 2 = 153.64' Base Length 12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 15.0" Side Stone x 2 = 59.00' Base Width 6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

252 Chambers x 45.9 cf = 11,576.9 cf Chamber Storage

31,726.0 cf Field - 11,576.9 cf Chambers = 20,149.1 cf Stone x 40.0% Voids = 8,059.6 cf Stone Storage

Chamber Storage + Stone Storage = 19,636.5 cf = 0.451 afOverall Storage Efficiency = 61.9%Overall System Size =  $153.64' \times 59.00' \times 3.50'$ 

252 Chambers 1,175.0 cy Field 746.3 cy Stone

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<b>2019-04-11 Proposed Drainage</b> Prepared by McCarty Engineering, Inc HydroCAD® 10.00-22 s/n 02034 © 2018 Hy	
Runoff by SCS	00-48.00 hrs, dt=0.01 hrs, 4801 points FR-20 method, UH=SCS, Weighted-CN nd method - Pond routing by Stor-Ind method
Subcatchment1S:	Runoff Area=15,011 sf 71.13% Impervious Runoff Depth=3.31" Tc=5.0 min CN=81 Runoff=1.38 cfs 0.095 af
Subcatchment 2S:	Runoff Area=118,255 sf 93.46% Impervious Runoff Depth=4.66" Tc=5.0 min CN=94 Runoff=14.23 cfs 1.055 af
Subcatchment3S:	Runoff Area=48,579 sf 35.46% Impervious Runoff Depth=1.52" Tc=5.0 min CN=60 Runoff=1.89 cfs 0.141 af
Reach 1R: Eastern Wetland	Inflow=4.03 cfs 0.425 af Outflow=4.03 cfs 0.425 af
Reach 2R: Gardner Road	Inflow=1.38 cfs 0.095 af Outflow=1.38 cfs 0.095 af
Pond 2P: Infiltration Basin Discarded=0.7	Peak Elev=1,016.57' Storage=15,959 cf Inflow=14.23 cfs 1.055 af 7 cfs 0.771 af Primary=3.25 cfs 0.284 af Outflow=4.02 cfs 1.055 af
Total Runoff Area = 4.17	5 ac Runoff Volume = 1.291 af Average Runoff Depth = 3.71

otal Runoff Area = 4.175 ac Runoff Volume = 1.291 af Average Runoff Depth = 3.71" 23.88% Pervious = 0.997 ac 76.12% Impervious = 3.178 ac

#### **Summary for Subcatchment 1S:**

Runoff = 1.38 cfs @ 12.07 hrs, Volume= 0.095 af, Depth= 3.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

A	rea (sf)	CN	Description		
	10,678	98	Paved park	ing, HSG A	A Contraction of the second se
	4,333	39	>75% Gras	s cover, Go	bod, HSG A
	15,011	81	Weighted A	verage	
	4,333		28.87% Per	vious Area	l
	10,678		71.13% lmp	pervious Ar	ea
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description
5.0					Direct Entry,

#### **Summary for Subcatchment 2S:**

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Runoff 14.23 cfs @ 12.07 hrs, Volume= 1.055 af, Depth= 4.66" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

Area (sf)	CN	Description				
7,846	98	Roofs, HSC	Э А			
102,678	98	Paved park				
7,731	39	>75% Gras	s cover, Go	ood, HSG A		
118,255	94	Weighted A	verage			
7,731		6.54% Perv	vious Area			
110,524		93.46% Impervious Area				
Tc Lengt (min) (fee			Capacity (cfs)	Description		
5.0				Direct Entry,		

#### **Summary for Subcatchment 3S:**

Runoff = 1.89 cfs @ 12.08 hrs, Volume= 0.141 af, Depth= 1.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 25-Year Rainfall=5.36"

Are	ea (sf)	CN I	Description		
1	7,224	98 I	Paved parki	ng, HSG A	A
3	1,355	39 >	>75% Grass	s cover, Go	bod, HSG A
4	8,579	60 \	Neighted A	verage	
3	1,355	6	64.54% Per	vious Area	ì
1	7,224	3	35.46% Imp	ervious Are	rea
Tc l (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					Direct Entry,

#### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area =	3.830 ac, 76.57% Impervious, Inflo	ow Depth = 1.33" for 25-Year event
Inflow =	4.03 cfs @ 12.35 hrs, Volume=	0.425 af
Outflow =	4.03 cfs @ 12.35 hrs, Volume=	0.425 af, Atten= 0%, Lag= 0.0 min

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Are	a =	0.345 ac, 7	1.13% Impervious	, Inflow Depth = 3.	31" for 25-Year event
Inflow	=	1.38 cfs @	12.07 hrs, Volum	e= 0.095 af	
Outflow	=	1.38 cfs @	12.07 hrs, Volum	e= 0.095 af,	Atten= 0%, Lag= 0.0 min

#### Summary for Pond 2P: Infiltration Basin

Inflow Area =	2.715 ac, 93.46% Impervious, Inflow	Depth = 4.66" for 25-Year event
Inflow =	14.23 cfs @ 12.07 hrs, Volume=	1.055 af
Outflow =	4.02 cfs @ 12.39 hrs, Volume=	1.055 af, Atten= 72%, Lag= 19.4 min
Discarded =	0.77 cfs @ 12.39 hrs, Volume=	0.771 af
Primary =	3.25 cfs @ 12.39 hrs, Volume=	0.284 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 1,016.57' @ 12.39 hrs Surf.Area= 9,065 sf Storage= 15,959 cf

Plug-Flow detention time= 105.3 min calculated for 1.055 af (100% of inflow) Center-of-Mass det. time= 105.3 min (875.9 - 770.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,014.00'	8,060 cf	59.00'W x 153.64'L x 3.50'H Field A
			31,726 cf Overall - 11,577 cf Embedded = 20,149 cf x 40.0% Voids
#2A	1,014.50'	11,577 cf	ADS_StormTech SC-740 +Cap x 252 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			12 Rows of 21 Chambers
		19 637 cf	Total Available Storage

19,637 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,011.50'	18.0" Round Culvert
	-		L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 1,011.50' / 1,010.50' S= 0.0200 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	1,015.42'	12.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,016.42'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Discarded	1,014.00'	2.410 in/hr Exfiltration over Surface area
			Conductivity to Groundwater Elevation = 1,009.00'

**Discarded OutFlow** Max=0.77 cfs @ 12.39 hrs HW=1,016.57' (Free Discharge) **4=Exfiltration** (Controls 0.77 cfs)

Primary OutFlow Max=3.25 cfs @ 12.39 hrs HW=1,016.57' (Free Discharge) 1=Culvert (Passes 3.25 cfs of 15.61 cfs potential flow) 2=Orifice/Grate (Orifice Controls 3.05 cfs @ 3.89 fps) 3=Orifice/Grate (Orifice Controls 0.20 cfs @ 1.32 fps)

#### Pond 2P: Infiltration Basin - Chamber Wizard Field A

#### Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

21 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 151.14' Row Length +15.0" End Stone x 2 = 153.64' Base Length 12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 15.0" Side Stone x 2 = 59.00' Base Width 6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

252 Chambers x 45.9 cf = 11,576.9 cf Chamber Storage

31,726.0 cf Field - 11,576.9 cf Chambers = 20,149.1 cf Stone x 40.0% Voids = 8,059.6 cf Stone Storage

Chamber Storage + Stone Storage = 19,636.5 cf = 0.451 afOverall Storage Efficiency = 61.9%Overall System Size =  $153.64' \times 59.00' \times 3.50'$ 

252 Chambers 1,175.0 cy Field 746.3 cy Stone

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<b>2019-04-11 Proposed Drainage</b> Prepared by McCarty Engineering, Inc HydroCAD® 10.00-22 s/n 02034 © 2018 Hy	
Runoff by SCS	00-48.00 hrs, dt=0.01 hrs, 4801 points TR-20 method, UH=SCS, Weighted-CN nd method - Pond routing by Stor-Ind method
Subcatchment1S:	Runoff Area=15,011 sf 71.13% Impervious Runoff Depth=5.26" Tc=5.0 min CN=81 Runoff=2.17 cfs 0.151 af
Subcatchment 2S:	Runoff Area=118,255 sf 93.46% Impervious Runoff Depth=6.77" Tc=5.0 min CN=94 Runoff=20.26 cfs 1.533 af
Subcatchment3S:	Runoff Area=48,579 sf 35.46% Impervious Runoff Depth=2.96" Tc=5.0 min CN=60 Runoff=3.92 cfs 0.275 af
Reach 1R: Eastern Wetland	Inflow=13.23 cfs 0.894 af Outflow=13.23 cfs 0.894 af
Reach 2R: Gardner Road	Inflow=2.17 cfs 0.151 af Outflow=2.17 cfs 0.151 af
Pond 2P: Infiltration Basin Discarded=0.86 c	Peak Elev=1,017.50' Storage=19,637 cf Inflow=20.26 cfs 1.533 af cfs 0.913 af Primary=10.52 cfs 0.620 af Outflow=11.38 cfs 1.533 af
Total Runoff Area = 4.17	5 ac Runoff Volume = 1.959 af Average Runoff Depth = 5.63"

Total Runoff Area = 4.175 ac Runoff Volume = 1.959 af Average Runoff Depth = 5.63" 23.88% Pervious = 0.997 ac 76.12% Impervious = 3.178 ac

#### **Summary for Subcatchment 1S:**

Runoff = 2.17 cfs @ 12.07 hrs, Volume= 0.151 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

A	rea (sf)	CN	Description					
	10,678	98	Paved park	ing, HSG A	A			
	4,333	39 :	>75% Gras	s cover, Go	bod, HSG A			
	15,011	81	81 Weighted Average					
	4,333	:	28.87% Pervious Area					
	10,678		71.13% Imp	pervious Ar	ea			
Тс	Length	Slope	Velocity	Capacity	Description			
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description			
5.0	(1901)	(1414)	(12000)	(0.0)	Direct Entry,			

#### **Summary for Subcatchment 2S:**

Page 32

Runoff 20.26 cfs @ 12.07 hrs, Volume= 1.533 af, Depth= 6.77" =

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

Area	(sf) C	CN [	Description					
7	,846	98 F	Roofs, HSG	iΑ				
102	,678		Paved park					
7	,731	39 >	-75% Gras	s cover, Go	ood, HSG A			
118	,255	94 \	Weighted Average					
7	,731	6	6.54% Pervious Area					
110	,524	ę	93.46% Imp	ervious Are	rea			
	ength (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	•			
5.0					Direct Entry,			

#### **Summary for Subcatchment 3S:**

Runoff = 3.92 cfs @ 12.08 hrs, Volume= 0.275 af, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs Type III 24-hr 100-Year Rainfall=7.49"

Ai	rea (sf)	CN	Description					
	17,224	98	Paved park	ing, HSG A	A			
	31,355	39	>75% Gras	s cover, Go	ood, HSG A			
	48,579	60	Weighted Average					
:	31,355		64.54% Pervious Area					
	17,224		35.46% Imp	pervious Ar	rea			
Tc (min)	Length (feet)	Slope (ft/ft)		Capacity (cfs)	Description			
5.0					Direct Entry,			

#### Summary for Reach 1R: Eastern Wetland

[40] Hint: Not Described (Outflow=Inflow)

Inflow Are	a =	3.830 ac, 76.57% Impervious, Inflow	v Depth = 2.80"	for 100-Year event
Inflow	=	13.23 cfs @ 12.14 hrs, Volume=	0.894 af	
Outflow	=	13.23 cfs @ 12.14 hrs, Volume=	0.894 af, Atte	en= 0%, Lag= 0.0 min

#### Summary for Reach 2R: Gardner Road

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area	a =	0.345 ac, 7	1.13% Impervious	, Inflow Depth = 5.2	26" for 100-Year event
Inflow	=	2.17 cfs @	12.07 hrs, Volum	e= 0.151 af	
Outflow	=	2.17 cfs @	12.07 hrs, Volum	e= 0.151 af,	Atten= 0%, Lag= 0.0 min

#### **Summary for Pond 2P: Infiltration Basin**

Inflow Area = 2.715 ac, 93.46% Impervious, Inflow Depth = 6.77" for 100-Year event Inflow 20.26 cfs @ 12.07 hrs. Volume= 1.533 af = 11.38 cfs @ 12.17 hrs, Volume= Outflow 1.533 af, Atten= 44%, Lag= 6.2 min = 0.86 cfs @ 12.17 hrs, Volume= Discarded = 0.913 af 0.620 af Primary = 10.52 cfs @ 12.17 hrs, Volume=

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3 Peak Elev= 1,017.50' @ 12.17 hrs Surf.Area= 9,065 sf Storage= 19,637 cf

Plug-Flow detention time= 93.6 min calculated for 1.532 af (100% of inflow) Center-of-Mass det. time= 93.5 min (855.5 - 762.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	1,014.00'	8,060 cf	59.00'W x 153.64'L x 3.50'H Field A
			31,726 cf Overall - 11,577 cf Embedded = 20,149 cf x 40.0% Voids
#2A	1,014.50'	11,577 cf	ADS_StormTech SC-740 +Cap x 252 Inside #1
			Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
			Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap
			12 Rows of 21 Chambers
		10 637 cf	Total Available Storage

19,637 cf Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	1,011.50'	18.0" Round Culvert
	-		L= 50.0' CPP, mitered to conform to fill, Ke= 0.700
			Inlet / Outlet Invert= 1,011.50' / 1,010.50' S= 0.0200 '/' Cc= 0.900
			n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Device 1	1,015.42'	12.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	1,016.42'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600
#4	Discarded	1,014.00'	2.410 in/hr Exfiltration over Surface area
			Conductivity to Groundwater Elevation = 1,009.00'

**Discarded OutFlow** Max=0.86 cfs @ 12.17 hrs HW=1,017.50' (Free Discharge) **4=Exfiltration** (Controls 0.86 cfs)

Primary OutFlow Max=10.51 cfs @ 12.17 hrs HW=1,017.50' (Free Discharge) 1=Culvert (Passes 10.51 cfs of 17.20 cfs potential flow) 2=Orifice/Grate (Orifice Controls 4.75 cfs @ 6.05 fps) 3=Orifice/Grate (Orifice Controls 5.76 cfs @ 3.67 fps)

#### Pond 2P: Infiltration Basin - Chamber Wizard Field A

#### Chamber Model = ADS\_StormTechSC-740 +Cap (ADS StormTech® SC-740 with cap length)

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

21 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 151.14' Row Length +15.0" End Stone x 2 = 153.64' Base Length 12 Rows x 51.0" Wide + 6.0" Spacing x 11 + 15.0" Side Stone x 2 = 59.00' Base Width 6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

252 Chambers x 45.9 cf = 11,576.9 cf Chamber Storage

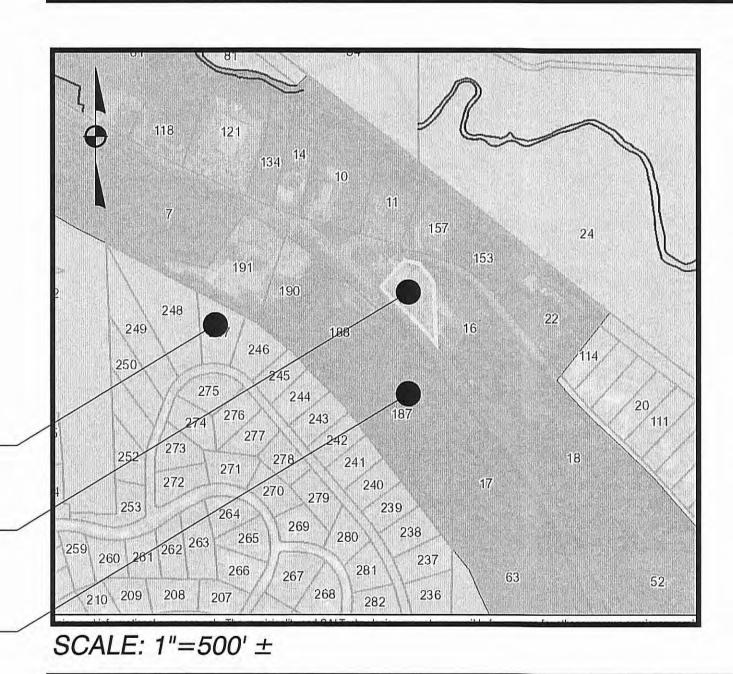
31,726.0 cf Field - 11,576.9 cf Chambers = 20,149.1 cf Stone x 40.0% Voids = 8,059.6 cf Stone Storage

Chamber Storage + Stone Storage = 19,636.5 cf = 0.451 afOverall Storage Efficiency = 61.9%Overall System Size =  $153.64' \times 59.00' \times 3.50'$ 

252 Chambers 1,175.0 cy Field 746.3 cy Stone

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## **R80-RURAL RESIDENTIAL** PROJECT SITE-

## C1-LARGE SCALE COMMERCIAL

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3	Grad
4	Land
5	Con
6	Con
7	Stor

# Site Plan Approval Documents

## Twelve One-Forty LLC

10 Gardner Road, Map 9 Parcels 15&16 Winchendon, Massachusetts 01475

## Applicants:

**Twelve One-Forty Realty** 125 Ellis Road Wesminster, MA 01473 (978) 423-2889

**Civil Engineer** McCarty Engineering, Inc. 42 Jungle Road Leominster, MA 01453 (978) 534-1318

### eet Title

ver Sheet sting Conditions Plan out & Materials Plan ading & Drainage & Erosion Control Plan dscaping Plan nstruction Details nstruction Details rmtech Detail Sheet

ZONING SUMMARY: DIMENSIONAL REQUIREMENTS:

Surveyor: Tauper Land Survey Inc. 710 Main Street Oxford, MA 01537 (508) 987-2266 Construction Manager: Powell Stone & Gravel **133 Leominster Shirley Road** Lunenburg, MA 01462 (978) 537-8100

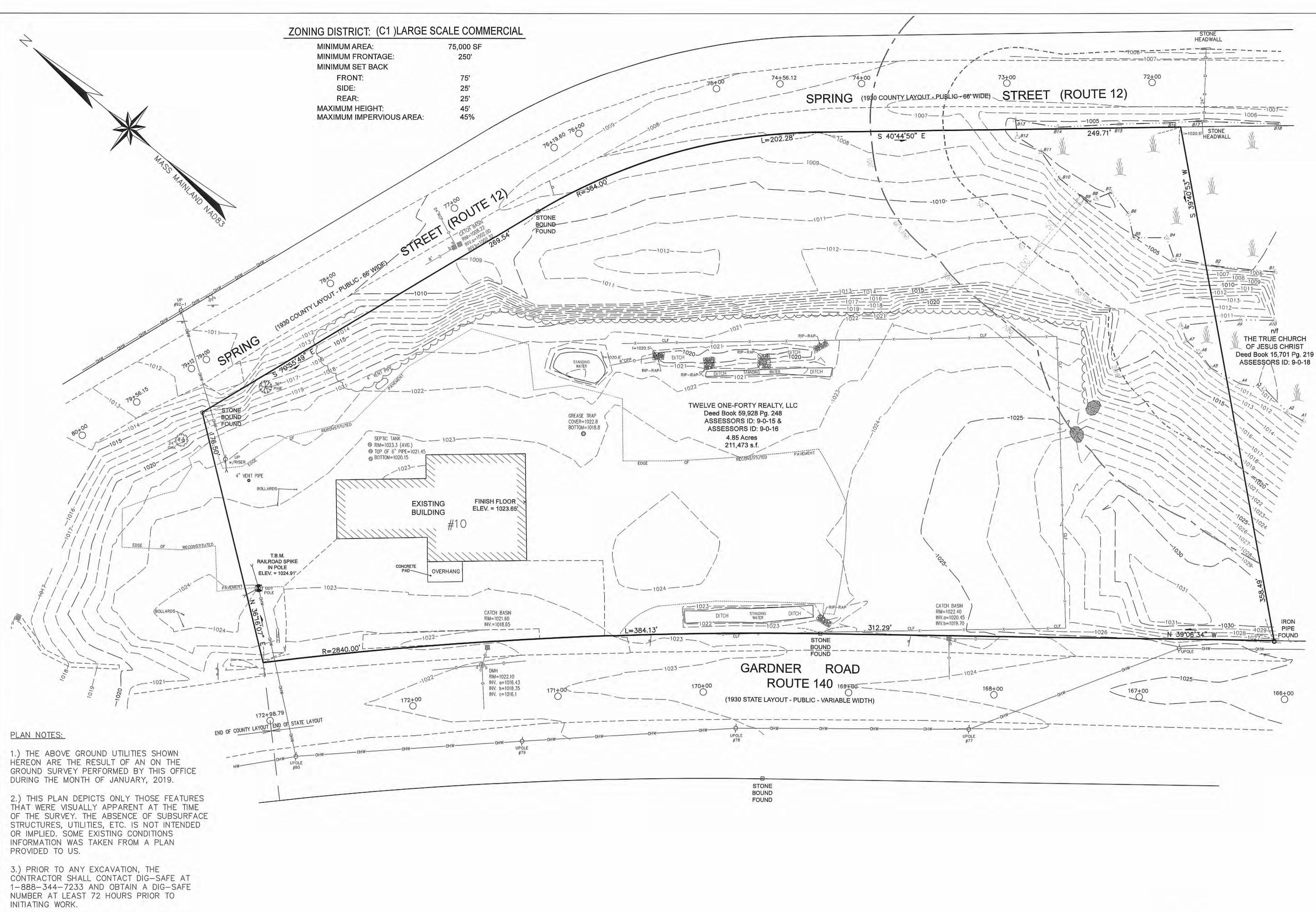
Landscape Architect: Waterman Design Associates 31 East Main Street Westborough, MA 01581 (508) 366-6552

APPROVED BY THE TOWN OF

WINCHENDON PLANNING BOARD

DISTRICT: LARGE SCALE COMMERCIAL (C1) ISE: COMMERCIAL FORESTR' PROVIDED: CONFORMANCE 75,000 SF. 211,473 SF. 250 FT. 696.5 FT. 75 FT. 54 FT. MIN. LOT AREA: MIN. FRONTAGE: MIN. FRONT YARD: 69 FT. MIN. REAR YARD: <45 FT. 45 FT. MAX. IMP. COVERAGE: 45%

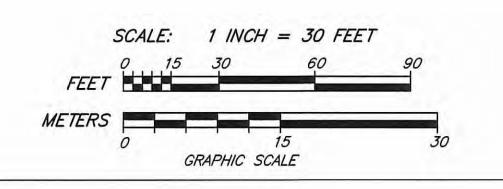
ROUTE 140 AND ROUTE 12



4.) HORIZONTAL DATUM IS MASSACHUSETTS STATE PLANE NAD83.

5.) VERTICAL DATUM IS NAVD88 ESTABLISHED BY RTK OBSERVATIONS

6.) THE LOCUS PROPERTY IS LOCATED IN A ZÓNE C AREA OF MINIMAL FLOODING. SEE FLOOD FIRM MAP 250348 0019 B, PANEL 19 OF 30, DATED JUNE 15, 1982.



0	IRON PIPE FOUND
۲	DRILL HOLE FOUND
	STONE OR CONCRETE MONUMENTS
S	SEWER MANHOLE
Ø	DRAIN MANHOLE
©	ELECTRIC MANHOLE
D	TELEPHONE MANHOLE
$\otimes$	WATER MANHOLE
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	SPOT LIGHT
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MBX 🖸	MAILBOX (MBX)
	BOLLARD
	SHRUBS, BUSHES, ETC.
E as ?	DECIDUOUS TREE
and the second s	CONIFEROUS TREE
△ WF-26	WETLAND FLAG
	BOULDER
VGC	VERTICAL GRANITE CURBING
CNCRB	CONCRETE CURBING
CCB	CAPE COD BERM (BITUMINOUS)
BTCRB	BITUMINOUS CURBING (GENERIC)
SLPGC	SLOPED GRANITE CURBING
EEE	ELECTRIC LINE
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	BORDERING VEGETATED WETLANDS

#### <u>LEGEND</u>

#### OWNER:

TWELVE ONE-ONE FORTY REALTY, LLC #10 GARDNER ROAD WINCHENDON, MA DEED BOOK 59,928 PG. 248 ASSESSORS PARCEL ID: 9-0-15&16

EXISTING CONDITIONS PLAN OF LAND **10 GARDNER ROAD** WINCHENDON, MASSACHUSETTS PREPARED FOR McCarty Companies 42 Jungle Road

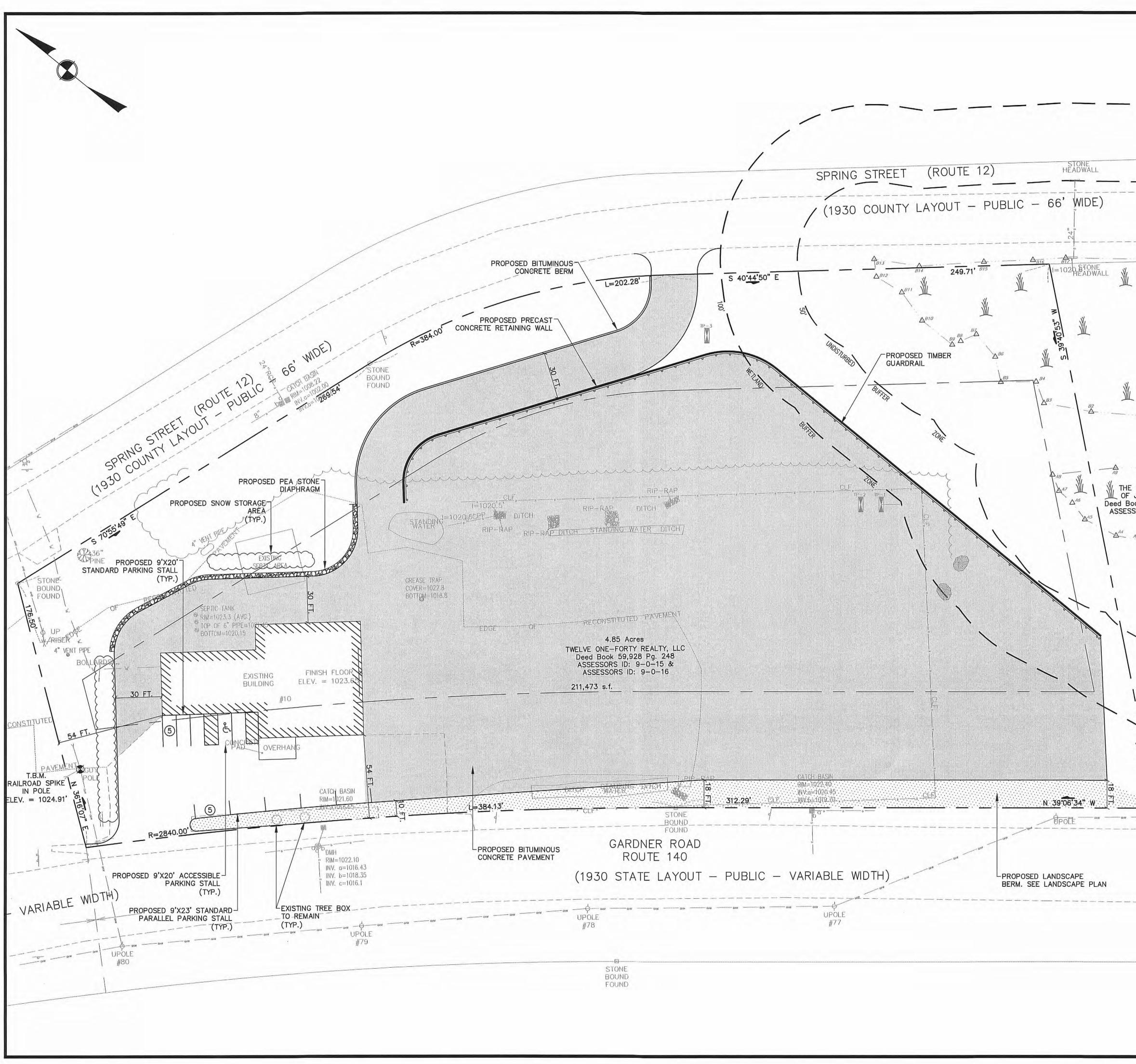
Leominster, MA

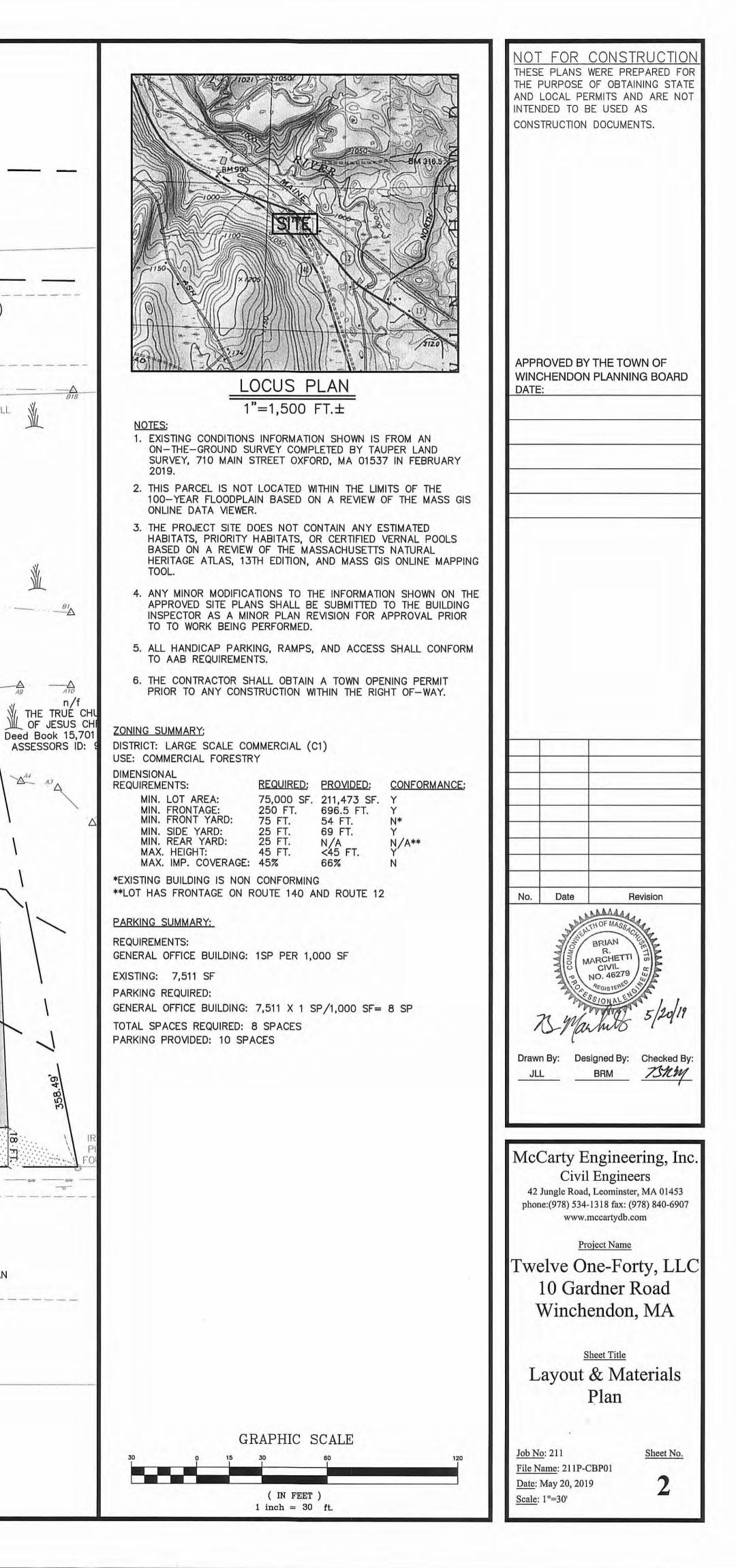
DATE: FEBRUARY 6, 2019 SCALE: 1" = 30' PREPARED BY

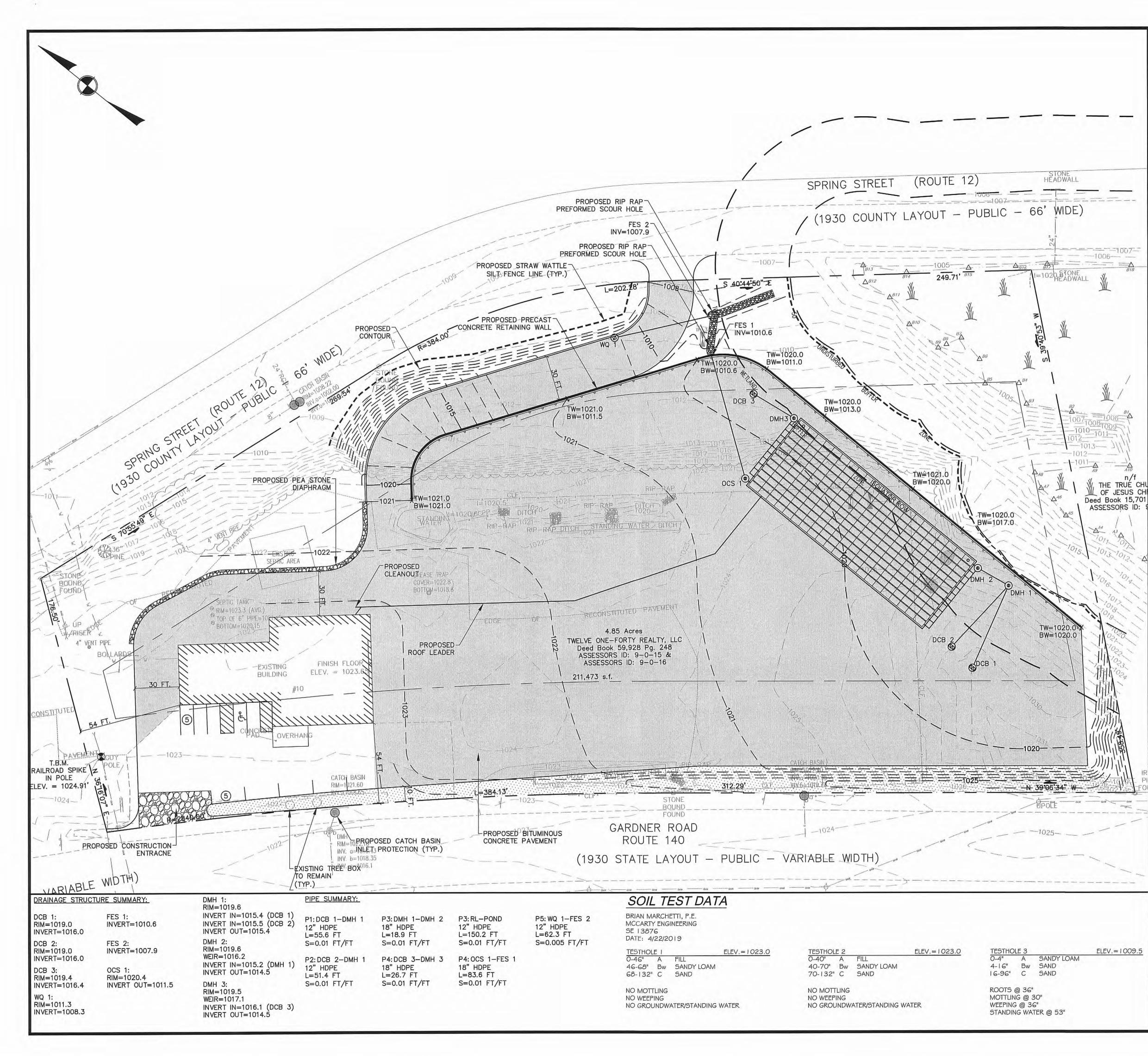


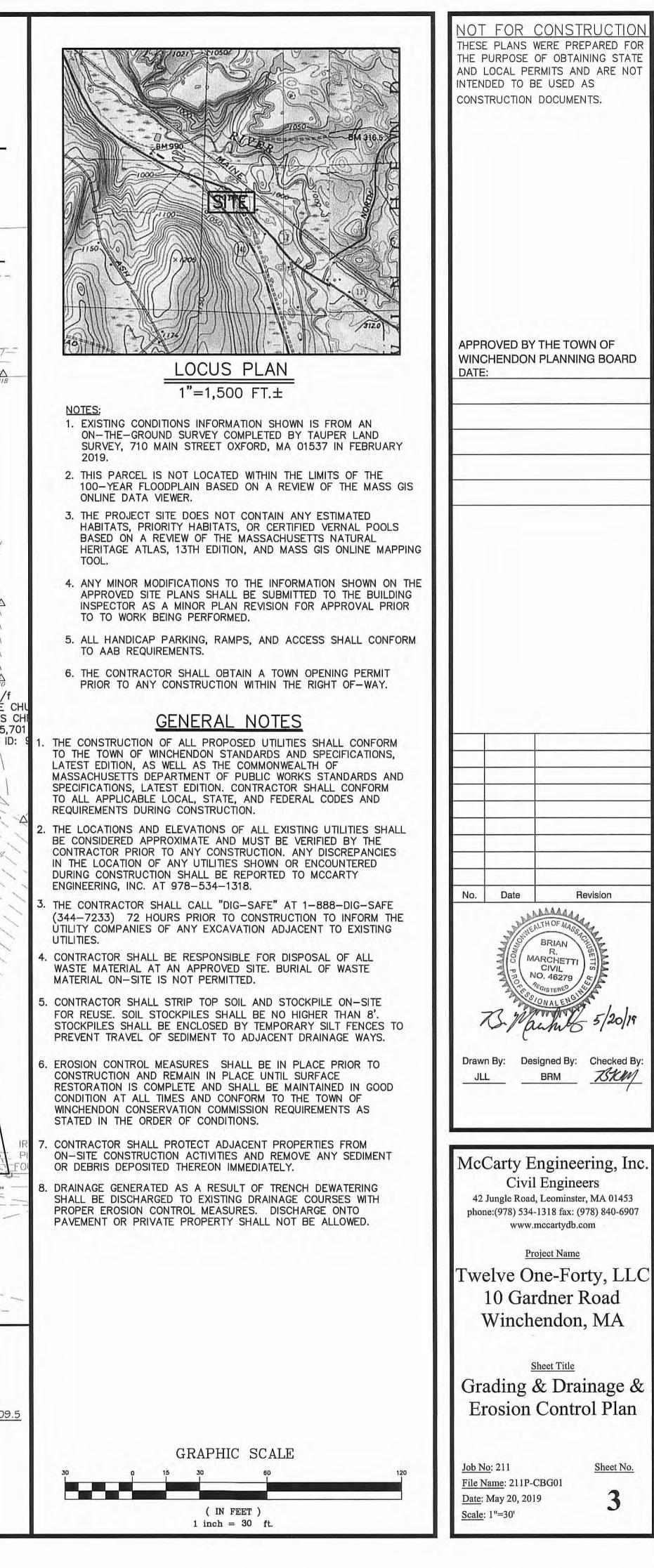
TAUPER LAND SURVEY INC. 710 MAIN STREET, OXFORD, MA 01537 TEL. 508-987-2266 FAX 508-987-2267 DWG: 19-111 OLD SALVADOR JEEP 10 GARDNER RD.dwg

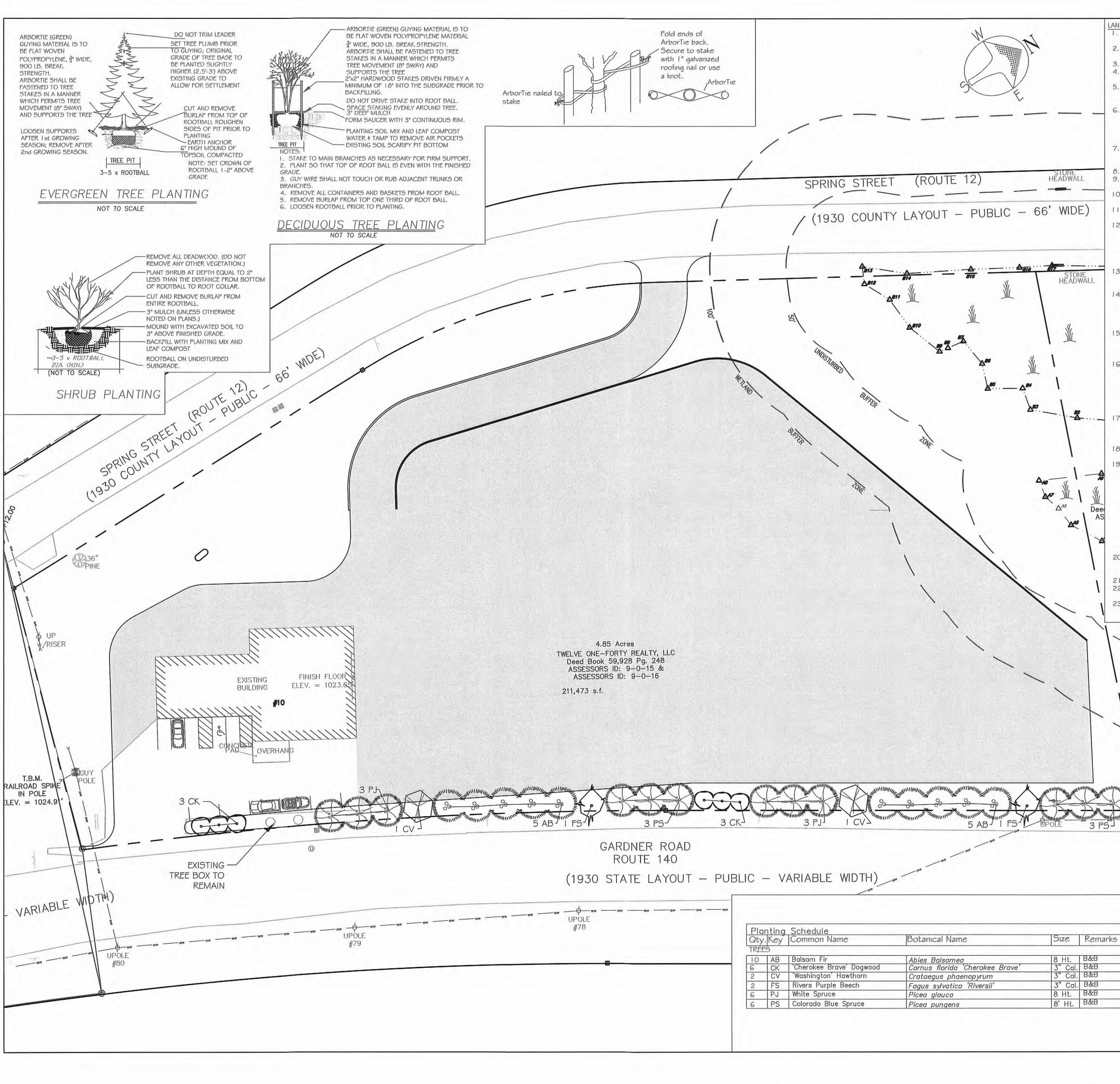












#### ANDSCAPING NOTES . NOTIFY DIG-SAFE AT 1-888-DIG-SAFE AND LOCAL AUTHORITIES PRIOR TO ANY TYPE OF SITE PREPARATION OR CONSTRUCTION. 2. THE CONTRACTOR SHALL SUPPLY ALL PLANT MATERIAL AND MULCH IN SUFFICIENT QUANTITIES TO COMPLETE PLANTING AS SHOWN ON THE DRAWINGS. 3. DRAWING QUANTITIES TAKE PRECEDENCE OVER PLANT LIST QUANTITIES. 4. ALL PLANT MATERIAL SHALL CONFORM TO THE GUIDELINES SET FORTH BY THE AMERICAN NURSERY & LANDSCAPE ASSOCIATION. 5. ALL TREES AND SHRUBS SHALL BE PLANTED WITH THE "BEST FACE" SHOWING. ALL PLANTS SHALL BE BALLED AND BURLAPPED OR CONTAINER GROWN, UNLESS OTHERWISE APPROVED BY THE LANDSCAPE ARCHITECT. ALL CONTAINER GROWN STOCK SHALL BE HEALTHY, VIGOROUS, WELL ROOTED AND ESTABLISHED IN THE CONTAINER IN WHICH THEY ARE GROWING. THEY SHALL HAVE TOPS OF GOOD QUALITY, NO APPARENT INJURY AND BE IN A HEALTHY GROWING CONDITION. A CONTAINER GROWN PLANT SHALL HAVE A WELL ESTABLISHED ROOT SYSTEM REACHING THE SIDES OF THE CONTAINER TO MAINTAIN A FIRM BALL. THE QUALITY OF ALL TREES & SHRUBS IS TO BE NORMAL FOR THE SPECIES. ALL PLANTS LOCUS MAP ARE TO HAVE DEVELOPED ROOT SYSTEMS, TO BE FREE OF INSECTS AND DISEASES AS WELL AS MECHANICAL INJURIES, AND IN ALL RESPECTS BE SUITABLE FOR PLANTINGS. ALL CONIFERS SHALL HAVE DORMANT BUDS AND SECONDARY NEEDLES. CONDITIONALLY APPROVED WHERE SPECIFIED, CALIPER SIZE IS TO BE THE OVERRIDING FACTOR IN TREE SELECTION. PLANNING BOARD CALIPER SIZE SHALL BE MEASURED 12" ABOVE THE ROOTBALL. 10. PLANT SUBSTITUTIONS ARE NOT ALLOWED UNLESS APPROVED BY THE PROJECT LANDSCAPE ARCHITECT. SIGNATURE I. ALL DISTURBED AREAS NOT SHOWN OTHERWISE SHALL BE LOAMED AND SEEDED AND BLENDED INTO EXISTING GRADE AND CONDITIONS. SIGNATURE 12. PRIOR TO INSTALLING ANY PLANT MATERIAL, THE CONTRACTOR SHALL SUBMIT A LOAM SOIL SAMPLE FOR A ROUTINE, ORGANIC, SALTS, AND NITRATE SOIL TEST. UPON THE RESULTS OF THIS TEST, THE SITE CONTRACTOR SHALL AMEND THE LOAM AS SIGNATURE RECOMMENDED. SEND THE SOIL SAMPLE TO THE UNIVERSITY OF MASSACHUSETTS SOIL AND PLANT TISSUE TESTING LABORATORY, WEST EXPERIMENT STATION, 682 NORTH SIGNATURE PLEASANT ST., UNIVERSITY OF MASSACHUSETTS, AMHERST, MA 01003. LAWN SEED MIX SHALL BE THE PREVIOUS YEARS CROP: 35% JEFFERSON KENTUCKY SIGNATURE BLUEGRASS, 35% CARMEN CHEWING FESCUE AND 30% STALLION PERENNIAL RYEGRASS HIS DOCUMENT, AS AN INSTRUMENT OF SERVICE, IS THE SOLE PROPERTY F WDA DESIGN GROUP, INC. ITS USE BY THE OWNER FOR OTHER PROJECTS R FOR COMPLETION OF THIS PROJECT BY OTHERS IS STRICTLY FORBIDDEN. OR APPROVED EQUAL. PLANT AT A RATE OF I LB. PER 150 SQUARE FEET. 14. SLOPE SEED MIX SHALL BE THE PREVIOUS YEARS CROP. PLANT AT A RATE OF I LB. PER TRIBUTION IN CONNECTION WITH THIS PROJECT SHALL NOT BE DNSTRUED AS PUBLICATION IN DEROGATION OF WDA DESIGN GROUP'S 150. SQUARE FEET. SEED MIX SHALL BE STALLION PERENNIAL RYE 10%, CREEPING RED FESCUE 50%, ANNUAL RYE GRASS 15%, JEFFERSON KENTUCKY BLUE GRASS 10%, RED HTS. @2019, WDA DESIGN GROUP, INC. TOP CLOVER 5%, AND LADINO CLOVER 5%, OR APPROVED EQUAL. PLANT AT A RATE OF LB. PER 1505F. 15. THE DETENTION BASIN AND SWALE SEED MIX SHALL BE THE NEW ENGLAND EROSION CONTROL/ RESTORATION SEED MIX BY NEW ENGLAND WETLAND PLANTS INC. 820 WEST STREET, AMHERST, MA 01002, PH-41-\3-549-4000. PLANT AT A RATE OF 1 LB. PER 1,250SF. I.G. LAWN SEED AREAS SHALL BE NOT BE DEEMED ACCEPTABLE UNTIL IN EXCESS OF 90% OF EACH AREA, INDEPENDENTLY, IS GERMINATED, GROWING AND DISPLAYING HEALTHY, UNIFORM GROWTH AND HAS BEEN CUT TWICE. THE SITE CONTRACTOR IS RESPONSIBLE FOR APPLYING AT A MINIMUM I" OF WATER A WEEK UNTIL THE SEEDED AREAS HAVE BEEN ACCEPTED, THE WATERING SHALL OCCUR IN SMALL DOSES. THE SITE CONTRACTOR IS RESPONSIBLE FOR REMOVING ANY WEEDS (CRAB GRASS) WITHIN THE SEEDED AREAS UNTIL THE SEEDED AREAS HAVE BEEN ACCEPTED THE HYDRO SEED SLURRY SHALL BE A WOOD BASED BONDED FIBER MATRIX. THE APPLICATION RATE SHALL BE 2,500-3,000LB. PER ACRE SPRAYED IN A LEAST TWO INITIAL ISSUE DIRECTIONS. DO NOT APPLY HYDRO SEED SLURRY IF RAIN IS EXPECTED WITHIN 12 REV. DATE DESCRIPTION HOURS, AND WHEN TEMPERATURES ARE BELOW 50 DEGREES. 18. PRIOR TO PLANTING, THE LANDSCAPER SHALL REVIEW AND COORDINATE WITH THE SITE UTILITY PLAN AND GRADING PLAN. 19. THE ROOTS OF NEWLY PLANTED TREES AND SHRUBS MUST BE KEPT STEADILY MOIST, AS THE DEVELOPING ROOTS ESTABLISH IN THE NEW SOIL. AT PLANTING, WATER THOROUGHLY TO SOAK THE ROOTS AND TO SETTLE THE NEW SOIL AROUND THE ROOT BALL THE AMOUNT OF SUPPLEMENTAL WATER NEEDED EACH WEEK DURING THE FIRST GROWING SEASON AFTER PLANTING DEPENDS ON RECENT RAINFALL, TEMPERATURE, AND WIND, IF LESS THAN ONE-INCH OF RAIN HAS FALLEN OVER THE PAST FIVE TO SEVEN DAYS, THE NEW PLANTINGS MUST BE WATERED. LAWNS, TREES, AND SHRUBS WATERING SHALL OCCUR AT A MINIMUM OF TWO (2) TIMES A DAY FOR THE FIRST TWO (2) MONTHS ONCE IN THE EARLY MORNING AND THEN THE OTHER IN THE LATE AFTERNOON. IN GENERAL TEN GALLONS OF WATER APPLIED TWICE A WEEK WILL WET A 20"-24" ROOT PREPARED BY: BALL AND PROVIDE THE EQUIVALENT OF ONE INCH OF RAIN FALL. NEW LAWNS SHALL BE WATERED SO THAT IS RECEIVES AT A MINIMUM ONE INCH (1") OF WATER EVERY WEEK. WITHIN THE LANDSCAPE BEDS ADJACENT TO THE BUILDING FOUNDATIONS, NO (HEMLOCK, PINE, SPRUCE, OR CEDAR) MULCH OR OTHER COMBUSTIBLE LANDSCAPE MATERIALS SHALL BE INSTALLED WITHIN 18" OF THE FOUNDATION. 21. ALL LANDSCAPE BEDS SHALL RECEIVE THREE-INCHES OF BARK MULCH 22. LANDSCAPE AREAS SHALL BE DEEP TILLED TO A DEPTH OF TWELVE INCHES TO FACILITATE DEEP WATER PENETRATION. 23. ALL TREE AND VEGETATION REMOVAL SHALL BE IN COORDINATION WITH THE PROJECT LANDSCAPE ARCHITECT. 1 EAST MAIN STREET WESTBOROUGH, MA | 508.366.6552 WDA-DG.COM OWNER: Twelve One-Forty, LLC 10 Gardner Road Winchendon, MA PREPARED FOR: Twelve One-Forty, LLC 10 Gardner Road Winchendon, MA TITLE: LANDSCAPE PLAN 10 Gardner Road Winchendon, MA (WorcesterCounty) PERMITTING SUBMISSION SCALE: 1" = 30' JOB NO .: 1325 DATE: DWN. BY: lcg SHEET:

DATE

DATE

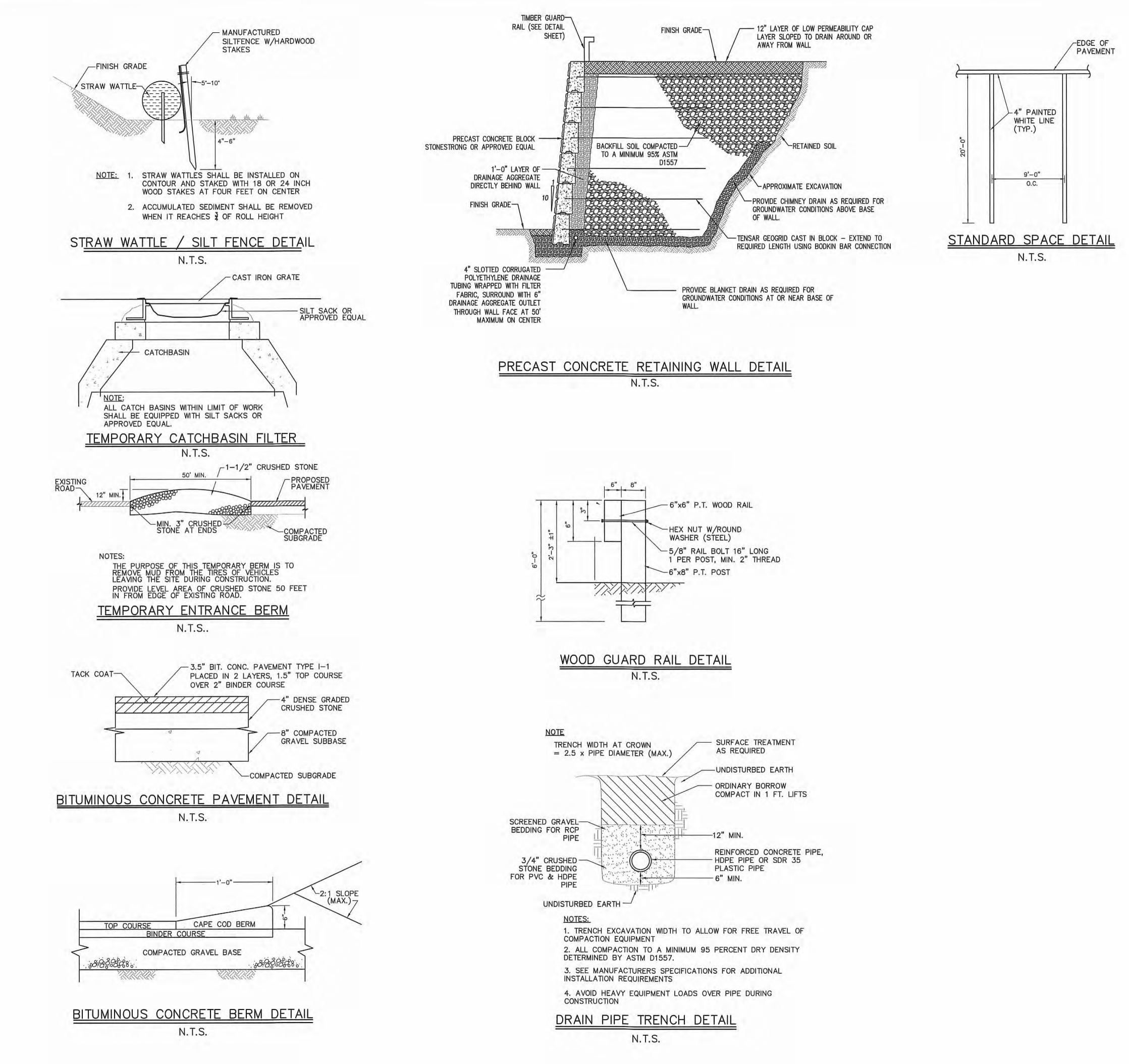
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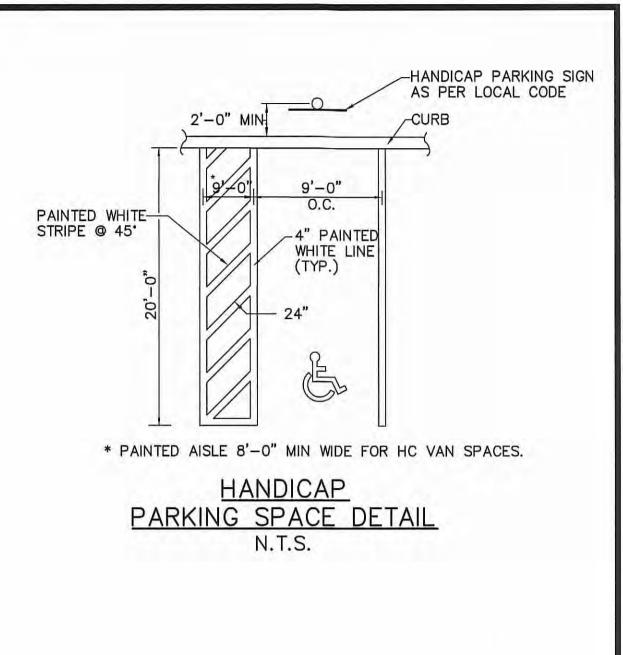
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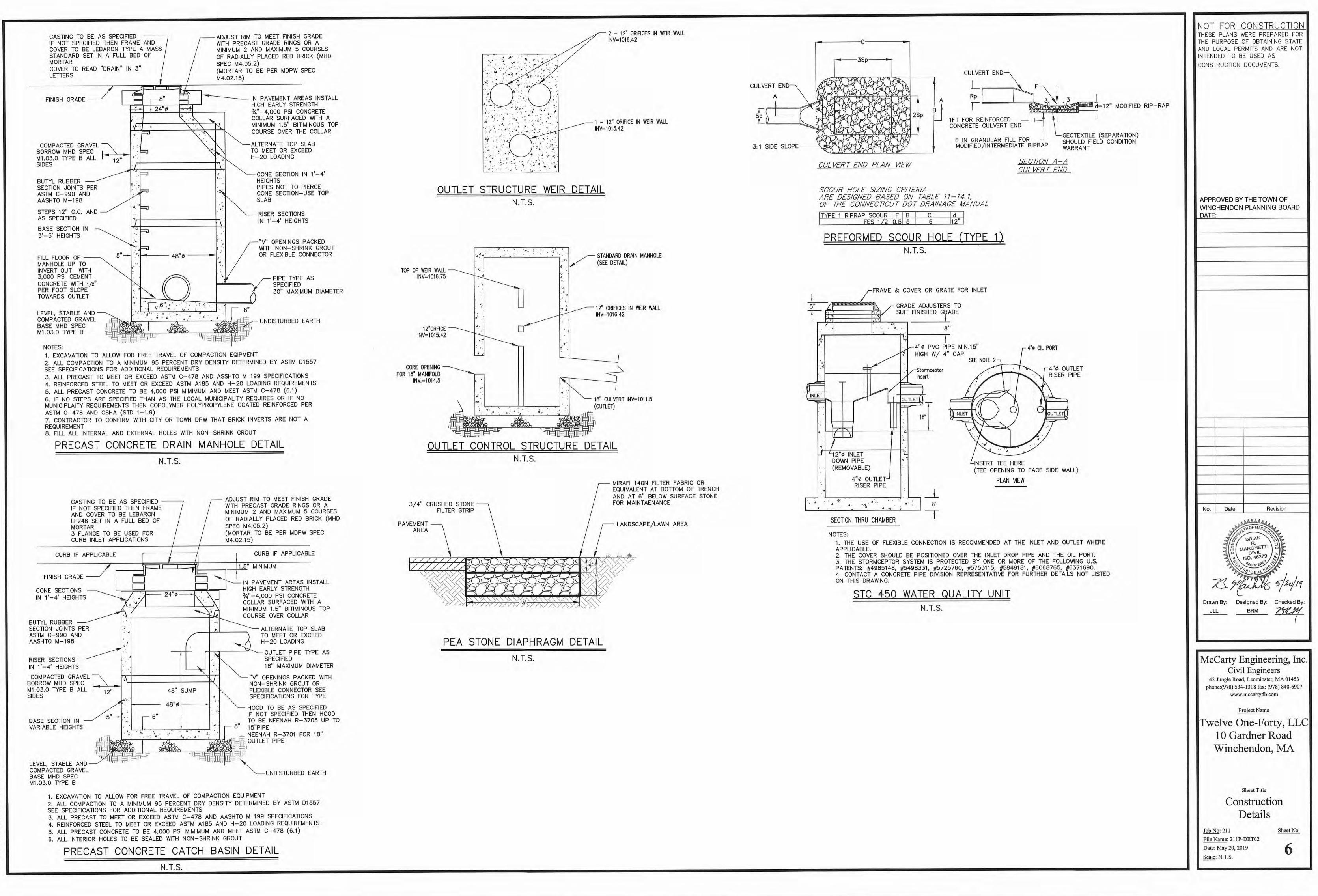
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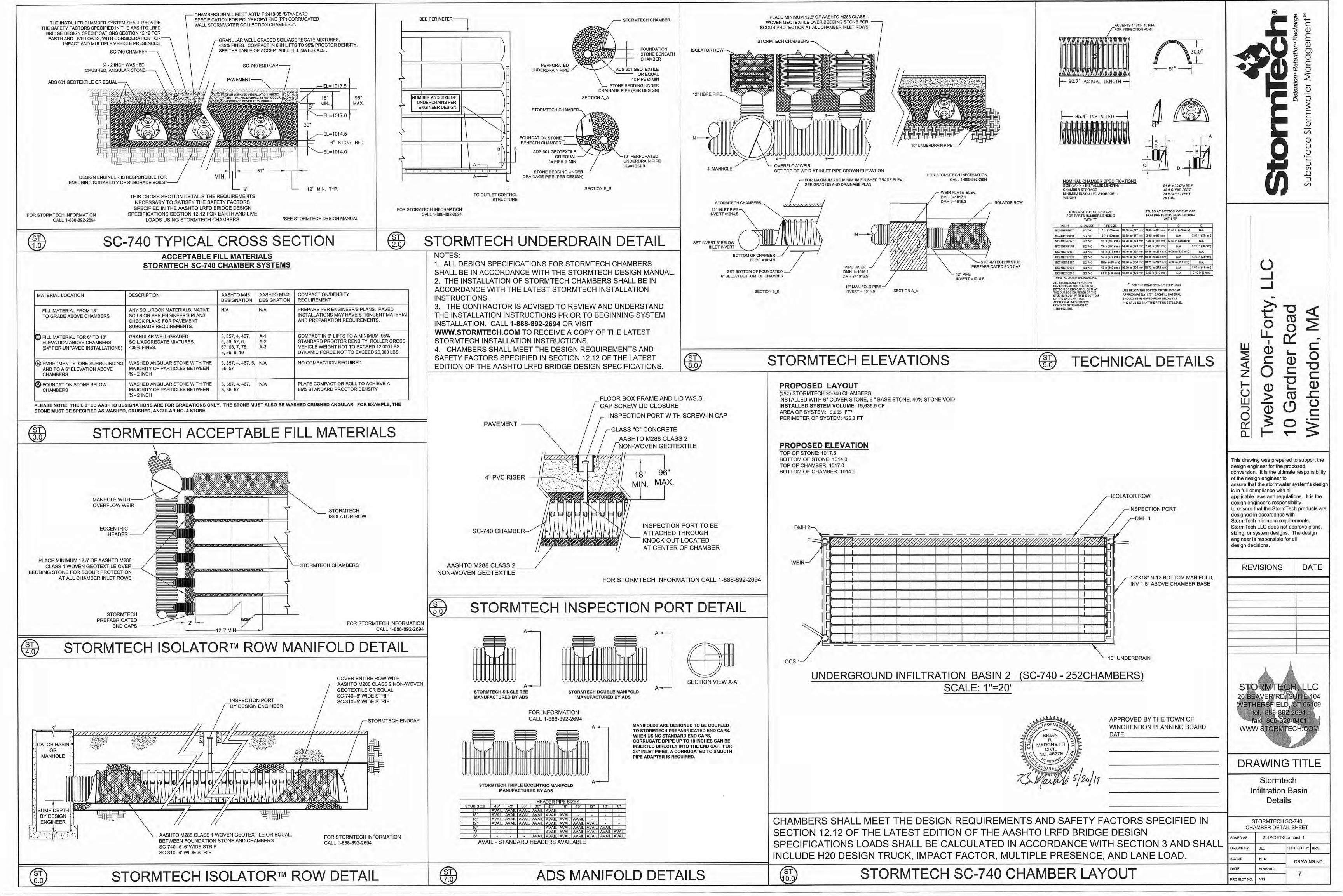




THE PURPOSE OF OBTAINING STATE AND LOCAL PERMITS AND ARE NOT INTENDED TO BE USED AS CONSTRUCTION DOCUMENTS.
APPROVED BY THE TOWN OF WINCHENDON PLANNING BOARD DATE:
No. Date Revision
Drawn By: Designed By: Checked By: JLL BRM ZSYCM
McCarty Engineering, Inc Civil Engineers 42 Jungle Road, Leominster, MA 01453 phone:(978) 534-1318 fax: (978) 840-6907 www.mccartydb.com <u>Project Name</u> Twelve One-Forty, LLC 10 Gardner Road Winchendon, MA
Sheet TitleConstructionDetailsJob No: 211Sheet No.File Name: 211P-DET01Sheet No.Date: May 20, 20195Scale: N.T.S.

NOT FOR CONSTRUCTION THESE PLANS WERE PREPARED FOR







# **Planning Board**

Telephone (978)-297-5419

Regular Meeting/Public Hearing

March 20<sup>th</sup>, 2018 Town Hall 2<sup>nd</sup> Floor Auditorium 109 Front Street, Winchendon, MA 01475

- Present:Vice-Chair Cailte Kelley, Arthur Amenta, & Burton Gould Jr.<br/>Chantell Fleck, Planning Agent<br/>Tracy Murphy, Planning Director<br/>Nancy Sanderson, Recording SecretaryAbsent:Chairman Guy Corbosiero<br/>Mary Chace, Lester Goodrich, Rick Ward, Marc Brouillette, John & Pauline Coderre, &
  - Audrey LaBrie

Materials: Notice of Meeting: March 20<sup>th</sup>, 2019 Agenda

- GIS Map- Marijuana Retail Overlay A-F
- 935 CMR: Cannabis Control Commission
- Letter from Board of Selectmen
- Email from Chief of Police- David Walsh
- Board of Selectmen Policies and Procedures pg. 11-13
- Article 6.12: Medical/Adult Use Marijuana Facilities and the Retail Overlay District
- Letter from Anonymous Resident
- Email from Katherine D. Laughman, Esq.- KP Law
- Draft 5- Article 6.12
- Draft- Article 5.2.8
- Marijuana Forum Questions (Revised) Online Results as of 3/20/18
- Hard Copy Survey Results as of 3/20/18
- Cannabis Control Commission Municipal Guidance
- Winchendon Zoning Map with Proposed Retail Overlay

**6:32PM-** Vice-Chair Cailte Kelley called the Planning Board meeting to order followed by the Pledge of Allegiance to the flag of the United States of America.

**Announcements:** Mr. Kelley announced that anyone is welcome to record the meeting as long as they let the board know. Mr. Corbosiero called in to listen to the meeting.

Public Comments: None.

Planning Board Minutes March 20<sup>th</sup>, 2018 Approval of Minutes: None.

#### 6:37 PM Public Hearing: Medical/Adult Use Marijuana Facilities and the Retail Overlay District Bylaw with Zoning Map and Use Table proposed changes.

Mr. Kelley read the Notice of Public Hearing and called the hearing to order. The timeline for implementation of marijuana for adult use was as followed: November 8, 2016- Question 4 Passed July 28, 2017- Governor signs Chapter 55 of the Acts of 2017 August 1, 2017- Appointment of Cannabis Advisory Board September 1, 2017- Appointment of Cannabis Control Commission December 22, 2017- Announcement of Draft Regulations February 5-15, 2018- Public Hearings February 15, 2018- End of Public Comment Period March 7, 2018- Final Regulations Approved March 23, 2018- Anticipated date the final regulations will be published in the Massachusetts Register April 1, 2018- Applications Scheduled to be Accepted

Mr. Kelley opened the discussion on the draft articles with comments, draft #5. Ms. Murphy stated she added Town Councils comments and recommended the board discussed each Article.

Mr. Gould commented the State just provided further information earlier today and did not give enough time to prepare properly. Unfortunately the topic still needed to be discussed and the board will take that into consideration. Mr. Kelley let the public know they would have a chance to discuss with the board.

Mr. Kelley and the board went through each Article and items with edited and added language.

5.1- Mary Chace came forward and asked to clarify the language regarding retail delivery. Ms. Murphy stated the item prohibiting it contradicted the state law allowing it, so it would be removed.

6.2.2 - Audrey LaBrie came forward and asked if the town plans on limiting other facilities, such as cultivation or just limiting retail facilities (2) and medical (1). The board responded that the limitation is just regarding the retail and medical facilities at the moment.

Ms. LaBrie stated she lives in an R80 zone. In regards to greenhouses, they are typically covered in plastic and do not seem very secure. Mr. Kelley agreed, typically, that normal greenhouses are not exactly secure, but stated that the state regulations for an approved facility are 8 pages long and extremely extensive. He read some of the regulations required regarding security of an approved facility.

John Coderre came forward and asked to clarify the regulations for open-air cultivation. Ms. Murphy stated that as it was written, open-air cultivation would be prohibited in all areas.

Marc Brouillette came forward and stated prohibiting open-air cultivation would make things more difficult and much more expensive for the farmers. The state regulations are in place to help with security and preventing the open-air cultivation would only make it more difficult for the farmers.

Ms. LaBrie stated that Winchendon is a right to farm town and suggested the board look into the language regarding the cultivation. The language as written is not enforceable.

Chantell Fleck commented that bylaws were not meant to be extremely specific.

6.2.4- Regarding D, including YMCA would strictly limit facilities on Central St. Rick Ward came forward and stated he was against any facilities on Central St. The Board of Selectmen, Police, and Town Manager have all responded no to Central St. facilities as well. Mr. Corbosiero stated he was in favor of eliminating 6.2.4 all together. He did not have a problem with having a facility on Central St.

Mr. Coderre came forward and questioned if the board had considered or had an opinion on parking and loitering. Parking is very limited on Central St. and there had been an issue with loitering outside of Cumberland Farms. Mr. Kelley responded that the empty storefronts on Central St. are more of an issue. Local businesses have expressed an interest in having a marijuana facility on Central St. to increase traffic and give an incentive to other businesses to move in the empty storefronts.

Mr. Brouillette came forward and stated he was all for safety especially regarding children. His opinion on Central St. was if it is right down town and near the police station, it is more likely to be patrolled and secure.

Mr. Gould wanted to keep 6.2.4 A-D. Mr. Amenta was still unsure of keeping D. Mr. Corbosiero wanted to eliminate 6.2.4. Mr. Kelley stated due to a lack of consensus, he would like to keep 6.2.4 and present this item at the town meeting as written.

8.2- Mary Chace came forward and had a question regarding special permits. If a business moves, the permit becomes void and the business would have to start the process over.

Mr. Kelley opened up the conversation on amending the Town of Winchendon Zoning Map to include a new Overlay District entitled: Adult Use/Medical Retail Facilities Overlay.

Mr. Gould motioned to continue the hearing to April 3<sup>rd</sup>, 2018 at 6:40PM. Mr. Corbosiero seconded. The board unanimously voted aye. Amenta (V) Could (V) Kelley (V) Corbosiero (V) 4-0

Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0

Mr. Gould motioned to adjourn. Mr. Amenta seconded. The board unanimously voted aye. **Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0** 

Vice-Chair Kelley adjourned the meeting at 9:12PM.

Respectfully submitted:

ianna Roberts

Brianna Roberts, Planning Board Recording Secretary

Planning Board Minutes March 20<sup>th</sup>, 2018 Guy Corbosiero, Chairman

Vice- Chair Cailte Kelley

Art Amenta

Burton E. Gould Jr.



# **Planning Board**

Telephone (978)-297-5419

**Regular Meeting/Public Hearing** 

March 6<sup>th</sup>, 2018 Town Hall 2<sup>nd</sup> Floor Auditorium 109 Front Street, Winchendon, MA 01475

- **Present:** Chairman Guy Corbosiero, Vice-Chair Cailte Kelley, Arthur Amenta, & Burton Gould Jr. Chantell Fleck, Planning Agent
- **Guests:** Christy Kantor, Jason Dodge, David Albrecht, Tina Santos, Wesley Flis, Roger Boucher, Cynthia Boucher, David Brown, Marjorie Brown, Doreen Herr, Carolyn Sellars, Elaine Mroz, Ian Wisuri, Doneen Durling, Al Gallant

# Materials: Notice of Meeting: March 6<sup>th</sup>, 2019 Agenda

- Letter from James Bigwood in regards to the 19 Chestnut St. Elm Tree
- Form A (ANR) & ANR Plan West St., Winchendon Ventures, LLC.
- (Draft 4) Article 6.12-Medical/Adult Use Marijuana Facilities and the Retail Overlay District
  - Winchendon Zoning Map
  - GIS Map- Marijuana Retail Overlay A-E
- Meeting Updates (1/16/18) & Correspondence
- 135 Gardner Road Solar- Email between Borrego Solar and Conservation Committee Building, Planning, and DPW
  - Formal Site Plan Review Modification Packet
  - o Site Use Plans
  - o Layout and Materials Plan
  - o Letter & Articles from Terril & Paulette Davis regarding Solar EMF Hazard
  - o Letter from Whitman & Bingham- in receipt of the Application
  - o Formal Site Plan Review Modification Packet
  - o Email from Wesley Flis (Whitman & Bingham) Peer Review
  - Email to Secretary Matthew Beaton from Carolyn Sellars
- 38 Happy Hallow Rd. Solar Project- Email from DPW & Building Department
  - o Formal Site Plan Review Modification Packet
  - o Site Use Plans
  - o Letter from Whitman & Bingham- in receipt of the Application
- Marijuana Forum Questions

**6:30PM-** Chairman Corbosiero called the Planning Board meeting to order followed by the Pledge of Allegiance to the flag of the United States of America.

**Announcements:** Mr. Corbosiero announced that anyone is welcome to record the meeting as long as they let the board know.

The ZBA is in need of a member and two alternates to complete their board.

Mr. Kelley commented that the Kiwanis was hosting a Country music night at the American Legion, Saturday March 10<sup>th</sup> at 7:00 PM and tickets are \$10 each.

Public Comments: None.

Approval of Minutes: None.

#### 6:35 PM: Public Tree Hearing: 19 Chestnut St.

Mr. Corbosiero read the Public Hearing Notice and called the hearing to order. Al Gallant, tree warden and DPW director, came forward before the board. Mr. Gallant received a letter from James Bigwood, resident of 19 Chestnut St., stating the tree in question was a rare Dutch Elm and not an Oak as printed in the notice. Mr. Gallant commented that he would take responsibility for the error, and after researching, it was found to be an Ash tree. He left it up to the board to decide if the hearing should be postponed and have the public hearing notice reprinted with the correct type of tree. As DPW director, he felt it would be more beneficial for the town to remove the tree and continue construction, as going around it would cost a lot more money. The plan is to replant trees once the construction is complete. There was no public comment.

Mr. Gould motioned to approve the removal of the tree. The board unanimously voted aye. **Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0** 

#### 6:45 PM: Public Hearing: 135 Gardner Rd. Proposed Solar Array

Mr. Corbosiero read the Public Hearing Notice and called the hearing to order. David Albrecht, professional engineer with Borrego Solar, came forward before the board. To update the board on the project, Mr. Albrecht stated they have submitted to the planning board and conservation commission so far. There has been discussion on the wetlands and they will continue to work with the Conservation Commission. Since the project is located off a state highway and they need to make a new driveway, along with exceeding 25 acres of disturbance on the property, they needed to file an environmental notification form with the Massachusetts environmental policy act office (MEPA). The certificate is expected to arrive later in the week.

The project is located on the west side of Old Gardner Rd. at #135. Cindy & Roger Boucher own the land as a living trust. The parcel is approximately 48.5 acres in size with a project size of 26.1-26.2 acres and 19 acres cleared and grubbed. The system would be 5.58 megawatts and surrounded by a 7 ft. chain-link fence. The project exceeded all the setbacks and conforms to the 50 ft. no disturb zone regarding the wetlands.

Wesley Flis, peer review engineer with Whitman & Bingham Associates, came forward before the board. He stated they submitted a peer review letter with about 50 points that needed to be addressed. Mr. Corbosiero asked how many waivers had been requested and Mr. Flis replied about 10-12. Mr. Corbosiero asked for public comments. Cindy Boucher came forward before the board. She stated the access road behind Madison Ave. would be between two stonewalls and not visible once construction is complete. There would also be trees planted as a buffer for the abutting properties.

Carolyn Sellars came forward and stated she wrote a letter addressing her concerns. She hoped the board and solar companies would consider these concerns and adjust accordingly.

Mr. Gould motioned to continue the public hearing to April 3<sup>rd</sup>, 2018 at 6:30 PM. Mr. Kelley seconded. Mr. Corbosiero asked the board if they would like to schedule a site visit. They decided to meet on March 27<sup>th</sup> at 5:00 PM. The board unanimously voted aye.

# Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0

# 7:50 PM: Public Hearing: Happy Hollow Rd. Formal Site Plan Proposed Modification

Mr. Corbosiero read the Public Hearing Notice and called the hearing to order. David Albrecht, professional engineer with Borrego Solar, came forward before the board. The first item for discussion was to request an extension for the original permit. Mr. Albrecht requested the terms to be starting construction by the end of 2018 and have the project mechanically complete by the end of 2019. The next request was to modify adding a battery storage system to the project. Mr. Albrecht showed the board the site plans with the modifications. Mr. Flis stated the footprint hasn't changed, just adding the battery to the project. He brought up the noise concern and Mr. Albrecht responded that it would be enclosed in a storage container and the noise study confirmed it would be below ambient noise to the nearest abutter.

Mr. Corbosiero asked for public comments. Doreen Herr, resident of 42 Happy Hollow Rd., came forward before the board. She had a concern with how close the project will be to her house. Mr. Albrecht showed her the map and explained how far her property would be. She had another question regarding the maintenance of the project and what would happen to the materials if an issue occurred. Mr. Albrecht explained the maintenance would occur on the property and any non-working materials would be taken away. Mr. Corbosiero stated there was also a letter from an abutter concerning electromagnetic frequency (EMF). Mr. Albrecht explained this is generated from anything electric. The inverters release the same amount of frequency as a microwave and with the buffers surrounding the project, there is no safety concern regarding the EMF. Mr. Kelley also added that the supporting documents attached to the letter were from non-reliable sourced websites.

Mr. Kelley motioned to close the public hearing. The board unanimously voted aye. **Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0** 

Mr. Kelley motioned to approve the modifications and to extend the permit to start construction by December 31<sup>st</sup>, 2018, and have the project be mechanically complete by December 31<sup>st</sup>, 2019. **Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0** 

# 8:15-8:20PM Recess

# 8:20 PM: ANR off of West St. - Winchendon Ventures, LCC.

Ian Wisuri, professional land surveyor with Beals and Thomas, came before the board. The ANR was submitted regarding 120 acres located off of West St. This request was to spin off 8 acres (lot 2) as a conveyance for the town. Mr. Gould motioned to approve the ANR and Mr. Kelley seconded. **Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0** 

#### **Old Business:**

#### Marijuana Bylaw: Results of Public Forum & Questions and Draft 4 of Proposed Amendments

Chantell Fleck stated that Tracey Murphy prepared a packet with 5 questions regarding the draft bylaw, the comments received from the public forum, and the survey. Mr. Corbosiero reviewed the questions and comments Ms. Murphy collected.

Christy Kantor came forward before the board. She stated there are around 20 medical dispensaries in Massachusetts. Those are not needed, the recreational is. She asked if the town bylaws would be ready by April 1<sup>st</sup>. The hearing is scheduled for March 20<sup>th</sup> but then it would be sent to the town meeting to vote on. A moratorium was adopted last fall and all plans need to be submitted by June 30<sup>th</sup>.

Christy Kantor and Jason Dodge came forward before the board. They asked if the listed four areas were the only properties going to allow recreational facilities. The board stated yes. They proposed adding 350 Baldwinville State Rd., which is the old Stuff N' Things.

Tina Santos came forward before the board and stated there were several overlays that were mentioned that are not listed in these 4 areas. One of the reasons some favored the Central St. area, was the security and the fact that it would be a lot more local than the other areas, which are on the outskirts. Ms. Santos asked if these 5 questions/comments would be voted on individually or as a whole. They would be sent to the town meeting as a whole but if there were objections and voted on accordingly, one or more could be taken off the list.

The board discussed changing and adding the buffer zones related to schools and public playground and recreational areas. The board decided to bring Central St. to the town meeting, and have two different buffer zones for schools and playgrounds.

Ms. Fleck made note of the requested changes from the board.

Mr. Kelley requested that the board tabled the rest of the business for the night and made a motion to adjourn the meeting. Mr. Corbosiero seconded the motion. The board unanimously voted aye. **Amenta (Y) Gould (Y) Kelley (Y) Corbosiero (Y) 4-0** 

Chairman Corbosiero adjourned the meeting at 9:40PM.

Respectfully submitted:

Rianna Refuts

Brianna Roberts, Planning Board Recording Secretary

Planning Board Minutes March 6<sup>th</sup>, 2018 Guy Corbosiero, Chairman

Vice- Chair Cailte Kelley

Art Amenta

Burton E. Gould Jr.



# **Planning Board**

Telephone (978)-297-5419

**Regular Meeting/Public Hearing** 

April 16<sup>th</sup>, 2019 Town Hall 2<sup>nd</sup> Floor Auditorium 109 Front Street, Winchendon, MA 01475

Present: Chairman Guy Corbosiero, Vice-Chair Scott Robillard, Burton Gould Jr., Arthur Amenta, Joseph Sackett, & Alternate: Lester Goodrich Jr. Alison Manugian, Planning Agent Brianna Roberts, Recording Secretary
 Guests: Eric Las- Beals + Thomas Pob Pichio

Rob Richie Sean Pepper- D.R. Poulin Construction Melinda Westberry- Gagnon Equipment

**Materials:** Notice of Meeting: April 16<sup>th</sup>, 2019 Agenda Sunpin Solar Development, LLC & 185 Baldwinville Rd.:

- Site Plan Application Notice
- Application for Site Plan Approval
- Correspondence from Jean Christy-Tighe & Bond
- Correspondence from Andrew Vardakis- Environment & Infrastructure Solutions
- Correspondence from David Walsh- Winchendon Chief of Police
- Correspondence from Albert Gallant- Public Works Director
- Correspondence from David Koonce- Winchendon Conservation Commission
- Correspondence from Tom Smith- Winchendon Fire Department
- Correspondence from David Koonce- Winchendon Conservation Commission

• Notice of consideration for 185 Baldwinville Rd. Solar Array at 4/16/19 meeting West Street 1 Solar:

- Application for amendment to approved site plan
- Correspondence from Jean Christy-Tighe & Bond

Correspondence from Chris Gagnon- Gagnon Equipment & Parts

Correspondence from Tracy Murphy- Planning Board- expiration of 2yr. extension Planning Board Minutes 3/5/19

Planning Board Minutes 12/18/18

Planning Board Correspondence Summary

**6:30PM-** Chairman Corbosiero called the Planning Board meeting to order followed by the Pledge of Allegiance to the flag of the United States of America.

**Announcements:** Chairman Corbosiero announced the Planning Board is now full with Lester Goodrich as the new alternate member. The public was allowed to record the meeting as long as it was announced to the board.

## Public Comments: None.

**Old Business:** Marijuana Bylaw adjustment. Mr. Corbosiero stepped aside and let Vice-Chair Mr. Robillard take over. He asked Ms. Manugian to explain further. Ms. Manugian stated the adjustment is in regards to Article letter E. The version amended by Town Counsel stated the 500 ft. setback would be "including areas designated for parking" but intent was for "excluding areas designated for parking". The public hearing, verbal vote, and minutes, all state the intended verbiage. Ms. Manugian recommended the board affirm and vote on the intended verbiage.

Mr. Robillard asked the board to entertain a motion to reaffirm the intent of the article. To amend Article 6.2.5 under Article 6.12 to include, no part of the facility/building may lie within the 500' buffer <u>excluding</u> areas designated as parking facilities. Mr. Amenta made the motion and Mr. Sackett seconded. **Robillard (Y) Amenta (Y) Gould (A) Sackett (Y) Goodrich (Y) 4-0-1 Abstention** 

# 6:35PM- Public Hearing: Site Plan Application for a 3.135 MW DC Ground-Mount Solar Development on property located at 185 Baldwinville Rd., (Map 13 Parcel 04).

Mr. Corbosiero called the public hearing to order. The applicant was waiting to meet with the Conservation Committee so he suggested moving the hearing to the second meeting in May. There was no public comment.

Mr. Corbosiero asked to entertain a motion to continue the hearing until May 15<sup>th</sup> 2019 at 6:35PM. Mr. Robillard made a motion and Mr. Amenta seconded. The board unanimously voted aye. **Robillard (Y) Amenta (Y) Gould (Y) Sackett (Y) Corbosiero (Y) 5-0** 

#### Registry of Deeds requested Planning Board membership updated signatures:

Ms. Manugian passed around the annual update to the board members for their signatures.

# Approval of Minutes: 3/5/19 & 12/18/18

Mr. Gould motioned to approve the 3/5/19 minutes as printed. Mr. Amenta seconded. The board unanimously voted aye.

# Gould (Y) Amenta (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0

Mr. Gould motioned to approve the 12/18/18 minutes as printed. Mr. Robillard seconded. The board unanimously voted aye.

# Gould (Y) Amenta (Y) Robillard (Y) Sackett (A) Corbosiero (Y) 4-0-1 Abstention

**Correspondence:** Mr. Corbosiero suggested the board members review the last page in the packet regarding the correspondence.

# 6:46PM- Public Hearing: West. Street 1 Solar (east side of West St.)

Mr. Corbosiero read the Public Hearing Notice and called the Public Hearing to order.

Eric Las, a principal professional engineer with Beals + Thomas, and Rob Richie, there on behalf of the applicant, came forward to present. The hearing was to request adding a 0.5 Megawatt battery storage system on the property. A company based in Westborough, MA develops lithium ion battery storage systems and are currently being used by most solar array projects. The battery storage system would provide energy for 2 hours during peak time, which occurs in the late afternoon, since the peak collecting time is in the early afternoon. It is a self-contained unit distanced over 1200 ft. from West St. The red line under section 4 showed the changes. The drawings have advanced through National Grid and some minor changes to the interconnection poles were made to meet construction requirements. The changes were discussed with the conservation agent and there was no issue. Mr. Las concluded the request and asked the board members if there were any questions.

Mr. Corbosiero asked what the dimensions of the battery system were. Mr. Las stated the system would be placed on concrete footings about 18-24 inches off the ground. The container is 9.5 ft. tall, 53 ft. long, & 8 ft. wide, and white in color.

Mr. Gould stated he lives on West St. and his house is 3,000 ft. from the project. Mr. Gould made a motion to approve the request to add a battery storage system. Mr. Amenta seconded.

Mr. Corbosiero asked if anyone from the public would like to speak on this request. Sarah Monfreda came forward and stated she owns the property around the project, Lot Z- 424 and 430 School Street. She asked a few questions:

- 1. What type of batteries would be in the storage system? Mr. Richie stated Lithium Ion.
- 2. Does the Town of Winchendon have any fire codes regarding this type of battery installation? Is there a fire suppression system? Mr. Richie stated they are UL certified and contain a fire suppression system containing Novec 1230, which is a safe fire suppressant agent. There are also electrical attributes of the system that will shut the system down if there is a concern around temperature. It is monitored 24/7. They are very confident in the safety of this system and have the fire suppressant system there just in case. Mr. Corbosiero stated he does not believe the Town has any regulations with these batteries but noted to address it in the future.
- 3. How close to the property line is the battery storage system? 140 feet.

Mr. Las stated there is a Massachusetts Fire Safety Code, 527 CMR 1.0 Chapter 52, regarding stationary storage battery systems. There are state regulations that have requirements for supervised smoke detection, fire alarm systems, thermal runaway systems, and temperature maintaining operating environment.

Ms. Monfreda walked her property line and noticed grading, dumping, and excavation on her property. She had no knowledge of this until she walked her property line. Mr. Las stated the board had approved the plans in 2017 but then the property owner subdivided the property, and sold to Ms. Monfreda. The previous property owner had accepted these plans as well but Ms. Monfreda was not aware.

# Mr. Corbosiero closed the public hearing at 7:09PM.

The vote had previously been motioned by Mr. Gould and seconded by Mr. Amenta. The board unanimously voted aye.

## Gould (Y) Amenta (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0

## 7:12PM- Public Hearing: West St. 2 Solar (west side of West Street)

Mr. Corbosiero read the Public Hearing Notice and called the public hearing to order.

Mr. Las introduced himself again, as a principal professional engineer with Beals and Thomas. The hearing was to request adding a 0.5 Megawatt battery storage system on the property. In addition, there have been some slight reconfigurations with the utility pole connections. The proposed battery storage system would be on the South side of the project. It would be the same dimensions as the last proposed system for West St. 1 Solar. There would also be planted vegetation for screening purposes.

Mr. Gould motioned to approve adding the battery storage system. Mr. Amenta seconded. Mr. Corbosiero asked for public comments? None.

#### Mr. Corbosiero closed the hearing at 7:17PM

The board unanimously voted aye. Gould (Y) Amenta (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0

# Consider request for extension- of time to complete the proposed project at 504 School Street for Gagnon Equipment and Parts:

Sean Pepper and Melinda Westberry came forward before the board.

Mr. Pepper was there in behalf of Gagnon Equipment and Parts, requesting a 6-month extension. As the applicant continues to move forward with the approval through Conservation, there was a miscommunication with the engineer and information was misconstrued resulting in some erroneous requirements from the reviewing engineer.

Mr. Corbosiero asked if the process with the curb cut had begun. Mr. Pepper stated the applicant is waiting to get through this issue to begin that process.

Mr. Gould moved an extension of 6 months be granted to the applicant and Mr. Amenta seconded. The board unanimously voted aye.

# Gould (Y) Amenta (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0

Mr. Gould moved to adjourn the meeting and Mr. Robillard seconded. The board unanimously voted aye. Gould (Y) Amenta (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0

#### Chairman Corbosiero adjourned the meeting at 7:26PM.

Respectfully submitted:

Brianna Roberts, Planning Board Recording Secretary

Guy Corbosiero, Chairman

Burton Gould

Arthur Amenta

Scott Robillard

Joseph Sackett

Lester Goodrich Jr.



# **Planning Board**

Telephone (978)-297-5419

**Regular Meeting/Public Hearing** 

May 21<sup>st</sup>, 2019 Town Hall 2<sup>nd</sup> Floor Auditorium 109 Front Street, Winchendon, MA 01475

- Present:Chairman Guy Corbosiero, Vice-Chair Scott Robillard, Arthur Amenta, Burton Gould Jr.,<br/>Joseph Sackett & Alternate: Lester Goodrich Jr.<br/>Alison Manugian, Planning Agent
- Materials:Notice of Meeting: May 21st, 2019 Agenda<br/>Site Plan Application: Sunpin Solar Development, LLC 185 Baldwinville Rd.<br/>Public Hearing Notice: Graz Engineering, LLC 20 & 21 Robert's Way<br/>Montachusett Regional Planning Commission (MRPC) Appointment 2019-2020<br/>Planning Board Correspondence Summary- May 21, 2019 Meeting

**6:30PM-** Vice-Chairman Scott Robillard called the Planning Board meeting to order followed by the Pledge of Allegiance to the flag of the United States of America.

Announcements: None.

Public Comments: None.

**6:35PM- Public Hearing Continued:** Site plan application for a 3.135 MW DC Ground-Mount Solar Development on property located at 185 Baldwinville Rd. (Map 13 Parcel 04).

Mr. Robillard stated the company was still waiting on approval from the Conservation Commission and they were not at the meeting to present. He asked the board to entertain a motion to continue the hearing until the next meeting.

Mr. Amenta motioned to continue the hearing on July  $16^{th}$ , 2019 at 6:35P and Mr. Gould seconded. The board unanimously voted aye.

# Amenta (Y) Gould (Y) Goodrich (Y) Robillard (Y) 4-0

The next public hearing was posted for 7:05PM. Since there was time, Mr. Robillard suggested moving on to the next item on the agenda.

Master Plan Committee Appointments: Elaine Mroz, Art Amenta, & Jeff Sylvia.

Ms. Manugian stated they have not been able to contact Jeff Sylvia. If they are able to connect with him, they will schedule his appointment at a later meeting.

Mr. Gould motioned to appoint Elaine Mroz and Art Amenta to the Master Plan Committee. Gould (Y) Goodrich (Y) Robillard (Y) 3-0

## MRPC Representative Annual Appointment: Guy Corbosiero

Mr. Robillard asked the board to entertain a motion to appoint Guy Corbosiero as the MRPC Representative for the year.

Mr. Amenta motioned and Mr. Goodrich seconded. The board unanimously voted aye. Amenta (Y) Gould (Y) Goodrich (Y) Robillard (Y) 3-0

Mr. Robillard stated there was 20 minutes until the next public hearing and called for a recess until 7:05.

#### 6:45PM- Recess

Chairman Guy Corbosiero and Joseph Sackett joined the meeting.

**7:02PM** Mr. Corbosiero called the planning board meeting back to order.

#### Approval of Minutes: None.

#### **Correspondence:**

Gardner Area League of Artists (GALA) - Music & Arts Festival - Entertainment Permit 7/20/19 The Snowbound Club - Entertainment & One Day All Alcohol Licenses (4)

- Outdoor Fundraising Concerts 6/15/19, 7/12/19, 9/21/19
- Tom Fors Memorial Motorcycle Ride 9/15/19

The Dawg Meister - Mobile Food Vendor License Saturdays & Sundays 10A-5P at Glenallen St. & Bike Path Clark YMCA - Summer Solstice Festival & Parade - Entertainment & Parade Permits - 6/15/19

- Road Race 6/15/19 (Part of Summer Solstice Festival) Veterans' Services - Parade Permit Memorial Day Parade - 5/27/19

American Legion Auxiliary - Poppy Sales - Permit 9A-3P - 5/24/19 - 5/25/19

Meeting Notices from Local Communities:

- Gardner ZBA – May 21, 2019 – Special Permit to construct a 2 family home on Green St.

- Special Permit to operate a hide processing plant on Main St.

- Gardner June 3, 2019 Marijuana Establishments Zoning Amendment Hearing
- Templeton Planning Board May 15, 2019 Amendments to Zoning Map

**7:05PM- Public Hearing:** Site plan applications for commercial lots on property located at 20 Robert's Way and 21 Robert's Way (Map 9, Parcels 106 & 383).

Mr. Corbosiero read the public hearing notice and called the public hearing to order.

The company just recently filed their paperwork with the Conservation Commission so the hearing will be continued at a later date once they have their meeting.

Mr. Corbosiero asked the board for a motion to continue the hearing on July 16<sup>th</sup>, 2019 at 6:45PM. Mr. Amenta motioned and Mr. Gould seconded. The board unanimously voted aye. **Amenta (Y) Gould (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0** 

Mr. Gould moved to adjourn the meeting and Mr. Robillard seconded. The board unanimously voted aye. Amenta (Y) Gould (Y) Robillard (Y) Sackett (Y) Corbosiero (Y) 5-0

Chairman Corbosiero adjourned the meeting at 7:09PM.

Respectfully submitted:

lianna Roberts

Brianna Roberts, Planning Board Recording Secretary

Guy Corbosiero, Chairman

Burton Gould

Arthur Amenta

Scott Robillard

Joseph Sackett

Lester Goodrich Jr.

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# **TOWN OF WINCHENDON**



# **Planning Board**

Telephone (978)-297-5419

# **Planning Board Meeting/Public Hearing**

September 4, 2018 Town Hall 2<sup>nd</sup> Floor Auditorium 109 Front Street, Winchendon, MA 01475

Present:Chairman Guy Corbosiero, Burton Gould Jr., Arthur Amenta, and Scott Robillard<br/>Chantell Fleck, Director of Planning & Development<br/>Brianna Roberts, Recording Secretary

Materials: Agenda, September 4, 2018

Call to Order: 6:30 PM Pledge of Allegiance

## Approval of Minutes: None

#### Public comments: No public comments.

Chairman Corbosiero stated there were complaints about early morning noise in regards to construction equipment at the West St. Solar project. He recommended that in the future there should be a time regulation placed into the contracts.

Chairman Corbosiero stated they are not allowed to have a public hearing on an election day, so the hearing needs to be continued at the next scheduled meeting.

**6:35PM**: Mr. Corbosiero called the public hearing on 135 Gardner Rd. to order and asked for a motion to continue the hearing at the next scheduled meeting, September 18<sup>th</sup>, 2018. Mr. Amenta motioned to continue the hearing in regards to 135 Gardner Rd., on September 18<sup>th</sup>, 2018. Mr. Robillard seconded the motion and the Chair voted aye.

#### **Right of First Refusal:**

Lincoln Ave. Map 2 Parcel 64. Mr. Amenta motioned to not exercise the right of first refusal. Mr. Robillard seconded the motion and the Chair voted aye.

Lincoln Ave. Map 2 Parcels 65, 12, & 15.

Mr. Amenta motioned to not exercise the right of first refusal. Mr. Robillard seconded the motion and the Chair voted aye.

> Planning Board Minutes September 4<sup>th</sup>, 2018

Ash St. Map 5C4 Parcel 29 & 17 Hall Rd. Property Map 5D4 Parcel 9 Ash St. Property. Mr. Amenta motioned to not exercise the right of first refusal. Mr. Robillard seconded the motion and the Chair voted aye.

Announcements: None

Old Business: None

Committee/Meeting Updates: None

**Correspondence:** None

**Other Business:** None

Chairman Corbosiero adjourned the meeting at 6:42PM

Respectfully submitted:

Buanna Roberts

Brianna Roberts, Planning Board Recording Secretary

Guy Corbosiero, Chairman

Burton Gould

Arthur Amenta

Scott Robillard

Planning Board Minutes September 4<sup>th</sup>, 2018



Planning Board Correspondence Summary June 18, 2019 Meeting

## Items before the Select Board with Planning Comments/Issues:

• William Ladeau of 15 Linden Street – Taxi/Livery License – Winchendon Select Board Request to operate as a subcontractor for MART out of the above address. Note that all provisions of Article 6.5.3 of the Zoning Bylaws must be met as determined by the Zoning Enforcement Officer.

#### Items before the Select Board with no Planning Comments/Issues:

- Immaculate Heart of Mary Strawberry Festival Winchendon Select Board Request for an Entertainment Permit and Two Special One-Day Beer and Wine Licenses for event to be held on Friday, June 14 – Sunday June 16, 2019
- Daniel Bolton of Hudson MA Solicitation Permit Winchendon Select Board Request for permit to conduct door-to-door sales for Solar On Earth out of Ayer, MA

# **Meeting Notices from Local Communities:**

**Templeton – Planning Board** – May 28, 2019 – Consideration of Site Plan for Seasonal Food Service on parcel at intersection of Gardner and Plant Roads.

**Templeton – Planning Board** – June 11, 2019 – Consideration of Site Plan to add a gravel parking lot at an event pavilion on parcel 2-12.23.

# **Decisions from Local Communities:**

None Received