

**TOWN OF HARVARD
PLANNING BOARD AGENDA
MONDAY, DECEMBER 4, 2023 @ 7:00PM**

Pursuant to Chapter 2 of the Acts of 2023, An Act Making Appropriations for the Fiscal Year 2023 to Provide for Supplementing Certain Existing Appropriations and for Certain Other Activities and Projects, and signed into law on March 29, 2023, this meeting will be conducted via remote participation. Interested individuals can listen in and participate by phone and/or online by following the link and phone number below.

Hildreth Pro is inviting you to a scheduled Zoom meeting.

Topic: Planning Board

Time: Dec 4, 2023 07:00 PM Eastern Time (US and Canada)

Join Zoom Meeting

<https://us02web.zoom.us/j/82531506312?pwd=QUNJL09jemY5dll6dEVwNzVSa2wvUT09>

Meeting ID: 825 3150 6312

Passcode: 388015

One tap mobile

+13017158592,,82531506312# US (Washington DC)

+13052241968,,82531506312# US

Dial by your location

• +1 301 715 8592 US (Washington DC)

• +1 305 224 1968 US

• +1 309 205 3325 US

• +1 312 626 6799 US (Chicago)

Meeting ID: 825 3150 6312

Find your local number: <https://us02web.zoom.us/u/kb5kopr23>

Public Comment

Old Business:

- a) Ayer Road Vision Plan
- b) Town Center Overlay District
- c) MBTA-3A survey
- d) Proposed Protective Bylaw Multi-family Overlay District
- e) Proposed Changes to Administrative Regulations

New Business:

Housing Production Plan numbers for Subsidized Housing Inventory and potential MBTA-3A impact

2016 Master Plan action items to review & discuss

Master Plan 2026

- Possible Members
- Scope of Master Plan
- Explore potential funding

Public Hearings:

7:30pm

Request for approval of Site Plan Review with a Special Permit at 184 Ayer Road by CS Bailey Landscape, Inc. or other relief as appropriate under M.G.L Chapter 40A, and the "Code of the Town of Harvard" as amended, in the Protective Bylaw Chapter 125-38 and 125-13(T).

The listing of matters are those reasonably anticipated by the Chair which may be discussed at the meeting. Not all items listed may in fact be discussed and other items not listed may be brought up for discussion to the extent permitted by law, also.

- Standard Business:**
- a) Review Metrics
 - b) Board Member Reports
 - Representatives & Liaisons Update
 - Community Matters
 - c) Approve Minutes
 - d) Approve Invoice: UTILE invoice #10178 for \$23,497.50

**NEXT SCHEDULED MEETINGS:
MONDAY, DECEMBER 18, 2023**

AS

The listing of matters are those reasonably anticipated by the Chair which may be discussed at the meeting. Not all items listed may in fact be discussed and other items not listed may be brought up for discussion to the extent permitted by law, also.

Site Plan Approval

Proposed Project:

184 Ayer Road

Harvard, Massachusetts

Map 8/ Parcel ID 41



Date: October 26, 2023

Prepared By: Dillis & Roy Civil Design Group, Inc.
1 Main Street – Suite #1
Lunenburg, Massachusetts 01462

Prepared For: CS Bailey Landscape, INC
19 Whittermore Street
Arlington, MA

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2. Project Narrative
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4. Record Deed/Assessors Card

1.0 Site Plan Application

APPLICATION TO THE HARVARD PLANNING BOARD

Applicants should review the Harvard Protective (Zoning) Bylaw, Chapter 125 of the Code of the Town of Harvard, the Planning Board's Rules and Regulations, Chapter 133 of the Code of the Town of Harvard and the Requirements regarding Driveway Inspections (Chapter 125 of the Protective Bylaw). Copies of the Bylaw may be purchased from the Town Clerk and copies of the Rules and Regulations may be purchased from the Land Use Office. Information is also available online at www.harvard.ma.us. The Rules and Regulations specify the documents that are required as a part of the application. The Application, with certified abutters list and filing fee, must be filed with the Town Clerk.

Name of Applicant: CS Bailey Landscape, INC

Address: 19 Whittemore St. Arlington Phone: _____ Email: _____

Applicant is (check one): Owner _____ Agent _____ Prospective Buyer x

Location of Property: 184 Ayer Road Zoning District: Commercial

Harvard Assessors' Map 8 Parcel 41

Registry of Deeds: Book Number 64869 Page Number 275

Owner's Name: Phoenix-Durango LLC Email: _____

Owner's Address: 345 Main Street, Northborough, MA 01532 Owner's Phone: _____

Seventeen (17) copies of the application must be submitted to the Town Clerk. This application is for:

<input type="checkbox"/> Special Permits*	\$500/required permit
<input type="checkbox"/> Driveway Site Plan	\$180
<input type="checkbox"/> Inspections of Driveways	\$300
<input type="checkbox"/> Approval of Covenant	\$100
<input type="checkbox"/> Wireless Communication Tower	\$2500
<input checked="" type="checkbox"/> Consultant Review Fee**	\$1000
<input checked="" type="checkbox"/> Site Plan Review with a Special Permit	\$180
<input type="checkbox"/> Site Plan Review without a Special Permit	\$500
<input type="checkbox"/> Modification/Extension	½ of original application fee

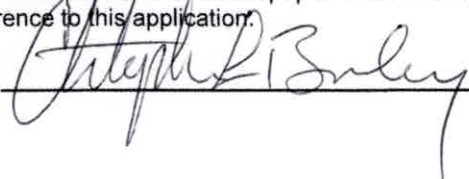
Specific bylaw section(s) you are applying under 125-38 Site Plans 125-23 B(1)

* Unless otherwise specified

** Required with all Special Permit Applications. This is a deposit to cover costs of Planning Board consultants and additional amounts may be required depending on the complexity of the Application. All unused monies will be returned. Please submit "Request for New Vendor" form with application. (Available on line at www.harvard.ma.us under Forms & Documents)

All applications associated with a Wireless Communication Tower requires proof of compliance with § 125-27H(2)

All filing fees are cumulative. All Special Permits and uses subject to Site Plan Approval require Driveway Inspections and written approval by the Planning Board, or its agent, prior to issuance of an occupancy permit or use of the premises (§ 125-31 C) All Shared (common) Driveways require an approved covenant running with the land in accordance with § 125-31 B (4) (b). The applicant will be required to pay a local newspaper of general circulation for the current cost of advertising the hearing. The applicant will be billed directly from the newspaper for the cost of the advertised hearing or all advertising must be paid for in full prior to submittal to the newspaper. The undersigned hereby requests a hearing before the Planning Board with reference to this application.

Signed: 

2.0 Project Narrative (Section 4.1)

2.1 *Project Type*

The proposed project includes the reconfiguration and restriping of the existing parking lot as well as the construction of a gravel pad and storage area. The project also includes the replacement of existing brick walkway in a new location.

2.2 *Site Description*

The project is located at 184 Ayer Road. There's an existing 2,574 SF structure located on the West end of the site. The parking areas to the North, East, and South of the building are paved. An existing sewage disposal system is located to the rear of the structure. The remaining undeveloped East side of the site is heavily wooded.

2.3 *Proposed Project*

The proposed project includes restriping the existing parking lot and removal of the existing excess paved area on the south side of the site. The project will also include the construction of a gravel parking and storage area on the east side of the paved parking area. The existing brick walkway will be replaced by the proposed walkway.

2.4 *Protective Bylaw (250-39) Site standards.* *Except as otherwise specifically provided in this Bylaw, a site for any business use, use subject to special permit (see § 125-46, Special permits), use subject to site plan approval, or other use as may be indicated in this Bylaw shall be developed in accordance with the following site standards and § 125-38, Site plans:*

The following is a description of the project compliance with the applicable Site Plan Approval requirements. Where appropriate, waivers have been requested.

A) Parking and loading.

1) All turnaround, parking, loading, and other traffic areas may be shared between lots, to provide alternative parking configurations and minimize the creation of impervious areas.

No shared parking between adjacent lots is being proposed.

2) Any driveway for traffic access to and from the street shall be designed and maintained for safe, rapid access. Except for driveways that serve primarily residential uses of the type permitted in the AR District, such driveways shall not be used as normal walkways to and from parking areas or as normal loading areas or associated

maneuvering space. For a corner lot the side line of an access driveway shall be at least 100 feet from the side line of the intersecting street.

The proposed project will use the existing driveway entrance from Ayer Road with no proposed modifications.

3) Parking areas shall be subdivided so that such areas shall extend no more than 160 feet along a parking access aisle or other driveway without a green area of width at least 20 feet. Alternatively, such extent shall be no more than 80 feet without a green area of width at least 10 feet

a) To help further to provide safe parking areas, automobile parking area design shall be based on: Parking stalls at least nine by 19 feet; Slant parking only if the aisle is one-way; Parking aisle width of at least 24 feet reducing at 0.2 foot per degree of reduction of angle of parking from 90° to 45° to a minimum aisle width of 15 feet.

Proposed parking stalls have been designed such that they meet the described specifications.

b) Car stops shall be provided: Where intermeshing stalls provide for cars parked end to side; or Where needed to prevent unauthorized vehicular intrusion into green areas.

The proposed parking plan does not include intermeshed stalls nor any instances where there is a significant risk of intrusion into green areas (or into the structure). As such, no wheel stops are proposed.

4) Loading docks and outdoor areas for storage or for overnight parking of trucks or other equipment shall be at the side or rear of any main building.

The proposed outdoor gravel pad and storage area will be located behind the existing structure.

5) Where, however, delivery vehicles will use parking areas, access driveways, turnarounds, and access ramps to loading docks, such facilities shall be designed to accommodate a truck which is eight feet wide with two-foot clearance. Access to streets shall be such that a vehicle with an outer turning radius of 45 feet can make right-hand turns into, and out of, the roadway without encroaching on lanes intended for street traffic moving in the opposite direction.

While there are no proposed loading docks associated with the project, the gravel pad in the rear of the site has been designed to accommodate the turning radius of a WB-67 design vehicle (53' trailer).

B) Standards for driveways. The intent is to make available site standards for driveways which are appropriate to the intensity of actual use. For a driveway which serves

only one- or two-family residences the use of this site standard is required only if it is specifically so stated in § 125-31, Driveways, of this bylaw.

1) Nonresidential driveway standards

(a) Driveways that serve commercial, industrial, or other non-residential uses shall be limited to one entrance and one exit per street. One combined entrance/exit is preferable to facilitate traffic movement; the entrance/exit shall be separated by a traffic island. Where frontage exceeds 400 feet, the Planning Board may approve an additional access. Traffic islands shall contain bricks, stone, or ornamental pavers, and islands may contain other design treatments such as landscaping, fences or low stone walls reflective of Harvard's cultural landscape. The islands shall not impede safe pedestrian crossing and shall meet accessibility standards. Applicants proposing developments that will generate 400 or more trips per day (average daily traffic) based on the most recent Trip Generation Manual of the Institute of Transportation Engineers shall prepare a traffic impact study. A registered professional transportation engineer shall prepare the study, which shall document: Total and peak hour trip generation; Existing and proposed levels of service of the roadway providing access to the site; Projected conditions at the access points to the development; and Mitigation measures that could be taken to reduce the impacts of the proposed project and their estimated cost. These should include capacity enhancements such as added turn lanes, signalization, and improvements to intersections and medians. The traffic study shall make specific proposals for mitigation measures to be implemented by the applicant; said mitigation measures shall be the financial responsibility of the applicant. The potential for driveway connections to neighboring lots must be explored. The study should take into account those improvements that are planned and/or currently implemented by the Town or the state.

As referenced above, there are no proposed changes to the driveway to the site associated with the proposed project. The number of vehicle trips per day is expected to be well below the 400 trip threshold. As such, no traffic study has been prepared or is proposed.

(b) The development shall preserve the buffer strip [see § 125-39C(1)] except for the width necessary to access the parking areas.

Existing buffer strips surrounding the existing parking lot will be preserved. The buffer strip from the parking area to the Route 2 right-of-way will be increased as some existing pavement is being removed in this area.

(c) To reduce turning movements onto main thoroughfares, applicants are encouraged to connect internal roadways with adjacent developments. When

adjacent lots have contiguous frontage, the Planning Board may require such lots to share a single driveway, or that the lots be accessed by an internal service road. Where such sharing cannot be achieved in the short run, the means and location for future long term inter-parcel connections may be required through right-of-way reservation and/or dedication.

No shared parking between adjacent lots is being proposed.

- (d) *Where it is proposed to re-develop property, the Planning Board will evaluate existing access and work with the applicant to re-design curb cuts to improve safety and traffic flow. Where appropriate, the Board may require a reconfiguration to the existing access or the removal of unnecessary driveway openings in favor of fewer access points with a greater level of traffic control.*

It is the applicants intent to use the existing driveway/curb cut in its current configuration.

- (e) *The angle of intersection of the driveway center line with the roadway center line is at least 60° and the transition from driveway to roadway is flared so that vehicles, including an SU30, may make the required turns without leaving the surface of either, or, if lanes are marked, without leaving marked lanes.*

A turning exhibit has been prepared which documents that an SU-30 design vehicle can negotiate the existing driveway entrance.

[1] For the purpose of designing flares, a passenger car has the turning radii of an American Association of State Highway Transportation Officials (AASHTO) passenger car, P20, and a "fire truck" or "moving van" [see § 125-29F(1)(f)] has the turning radii of an AASHO single-unit truck, SU30, with minimum turning radii as follows:

<i>Vehicle</i>	<i>Inside Radius (feet)</i>	<i>Outside Radius (feet)</i>
<i>Car</i>	<i>20</i>	<i>30</i>
<i>Truck</i>	<i>30</i>	<i>45</i>

It is the applicants intent to use the existing driveway/curb cut in its current configuration.

[2] The flare at an intersection of a branch of the driveway is designed so that vehicles may make the required turn. If there is no additional turnaround, the intersection must be constructed so that it can serve as a turnaround for vehicles. Exception: If the lot frontage and the roadway are too narrow to permit an AASHO SU truck to make both turns in a single pass, the driveway layout shall favor the turn from the direction of the fire station, by the most likely route.

It is the applicants intent to use the existing driveway/curb cut in its current configuration.

[3] Plans showing special requirements for driveways connecting with state-maintained ways are available at the district or state offices of the Massachusetts Department of Public Works.

The existing driveway access to Ayer Road is beyond the limits of the State Highway Layout, and is therefore not subject to a MassDOT Highway Access permit.

- (6) *Construction. Driveways and parking areas shall be constructed with crowns and drainage so as to be serviceable in all weather. There shall be a permeable gravel base of which at least eight inches is two feet or more above the level of saturation established by high water table or by drainage. [The need to engineer for water table within one foot of the surface should be anticipated on even apparently high ground in soils described and shown in the 1970 Master Plan (Comprehensive Plan of Development for Harvard) as "Paxton-Woodbridge Association," on account of perched water table.] There shall be in addition a surface layer at least four inches thick of gravel or two inches thick if bituminous paving; greater depths should be used if customary for the purpose for which the driveway or parking lot is intended.*

It is the intent of the project to utilize the existing pavement and make striping improvements. There will be one small are of added pavement to square off the paved parking area which will be offset by the removal of significantly more existing asphalt. Gravel will be placed below the new pavement areas in accordance with this section.

The remaining portions of the site will be constructed as a gravel parking and storage area.

- (7) *Turnarounds. The inside radius of curvature for the surface of a circular driveway or turnaround for use by cars only shall not be less than 20 feet; if for use by trucks as well as cars, 30 feet.*

There is no proposed circular driveway proposed for the project, however, the proposed gravel pad area has been designed to accommodate the required turning radius for a WB-67 design vehicle such that no backing of vehicle onto Ayer road from the driveway will be required.

- (8) *Runout. Except at intersections of its various parts, and at the street, a change in driveway width shall not be more abrupt than one foot in width for each eight feet of length.*

With the exception of the removal of some pavement adjacent to the house, the

existing pavement configuration along the driveway portion of the property is to remain as is.

C. Open areas

a. A buffer strip around the lot perimeter, of width at least 10% of standard lot width or of actual (maximum) lot width, whichever is lesser, shall be left as green area, except to allow for shared parking areas pursuant to § 125-39A(1).

a) Where the access to a lot is too narrow to accommodate the width of the buffer strips along the side lines, said access may be used only for access (including access for utilities), drainage, green area, and a sign near the road.

The is no proposed change to the buffer strip between the existing pavement and Northerly property line.

The proposed gravel pad and storage area has been designed in accordance with the buffer strip requirement. The existing lot width at the rear of the proposed gravel pad is ~189-feet. As such, a buffer strip of at least 19-feet is shown around the proposed gravel pad and storage area.

b) Where lawful preexisting site development without said buffer strip has provided a parking or other traffic area between a building and the street, then along said area the buffer strip width may be reduced to not less than five feet to preserve a traffic area depth of up to 75 feet.

As mentioned, there are no proposed modifications for the existing driveway access to Ayer road or to the parking areas, except for the removal of some existing pavement on the southerly side of the site.

2) All lots developed under the provisions of the commercial uses sections (§§ 125-12, 125-13, and 125-14) shall provide a green area consisting of at least 50% of total lot area. Further, all required setbacks shall be landscaped, planted as green space, or, where feasible, retained in a natural vegetative state.

There is greater than 50% green area on the property currently, and this will be increased with the removal of some pavement on the southerly side of the site.

D) Screening

1) Any lighting shall be arranged to deflect light away from neighboring properties and streets (see § 125-40, Lighting).

There is significant vegetation between the existing parking area and the adject Dunkin site.

2) *Any outdoor area for storage or for utilities shall be screened from view from neighboring properties and streets.*

Green space as referenced above is proposed adjacent to all neighboring properties such that the proposed area will be screened from view.

3) *Any business use shall be screened from view from any neighboring residence in a residential (AR or MR) District, church, school, park, or playground or other public grounds. However, such screening is not required: In a primary (C) business district, parallel to and facing an arterial street; or Where the business building has a lawful existing nonconforming setback from the street or roadway, along the lot frontage.*

The building is located in a Commercial District and is a pre-existing structure adjacent to other Commercial property. As such, no additional screening is proposed.

4) *Where equivalent screening is not already existing, screening shall be by substantially sight-impervious, dense, hardy evergreen plantings or by suitable earthworks, wall, or tight fence, complemented by evergreen plantings. Screening shall be maintained and replaced as needed. Said evergreen plantings may be of less than full height and density initially provided plantings are of suitable character, spacing, and size to give full screening to at least eight feet in height within seven years of site plan approval.*

See comment responses above.

5) *Preferred plantings are Eastern White Pine, Austrian Pine, Canada Hemlock, or Douglas Fir, double row, staggered, four feet or more in initial height, and spaced eight feet or less within each row. Alternates are Spruce (Norway, Black Hills, or Serbian) where limited spread is needed, American Arbor Vitae where soil is wet, and Eastern Red Cedar where soil is dry, all with closer spacing, and a single row of double density where space does not permit a double row. Other plantings may be approved with the advice of a registered landscape architect.*

Refer to the Landscaping Plan for details relative to the proposed plantings at the site.

E) **Fire protection.** *Where the site abuts an area in a W District or an adjacent municipality, development shall provide water supply for fire protection, with suitable access, except where a water hole, pond, hydrant, or other suitable supply already exists within 1,000 feet of each building on the site within the Town of Harvard*

This provision is not applicable to the proposed site.

F) **Drainage.** *Any and all surface water runoff resulting from the development shall be retained within the lot in which it originates or shall be discharged into existing*

identifiable watercourses without material impact on abutting properties. Additionally, Massachusetts Department of Environmental Protection (DE P) Stormwater Best Management Practices and other measures to minimize surface water runoff and improve water quality must be implemented and reflected in documents submitted for site plan approval.

The project includes a stormwater management basin located to the rear of the gravel pad area that will service the site. See drainage report.

G) Sidewalks.

The applicant respectfully requests that the Board Waive the requirement for the construction of sidewalks across the frontage, as the exist ramp from Route 2 is located immediately adjacent to the site. We also note that there are no sidewalk associated with the adjacent development so there is not an immediate opportunity for connected sidewalks in the area.

Special Permit Criteria (Section 125-46 C(1))

Section 125-46 C(1) of the Protective Zoning Bylaw states that:

A special permit shall be authorized only subject to applicable provisions of Section 125-39, Site Standards, and any special requirements for the particular class of special permit and only if, in addition, the authorizing board finds that the granting of the permit:

- a) Will not result in substantial increase of volume or rate of surface water runoff to neighboring properties and streets, and will not result in substantial danger of pollution or contamination of the groundwaters supply, a groundwater absorption area, a well, pond, stream, watercourse, W District, or inland wetland. Any and all surface water runoff resulting from development shall be retained within the lot in which it originates or shall be discharged into existing identifiable watercourses without material impact on abutting properties.*

The proposed project includes the reduction in the amount of paved surface at the site. Additionally, a gravel pad area will be constructed in the rear of the site. A stormwater management system is proposed to ensure that post-developed runoff rates will be reduced to at or below pre-developed levels. A stormwater report documenting compliance with the Massachusetts Stormwater Management Standards has been prepared.

- b) Will, if the use is not agricultural or residential, result in no substantial increase in traffic, compared to refusal of the permit, on any residential street where the premise have access*

No alterations to the existing site access are proposed and a negligible increase in traffic is expected from the proposed use. The site has access on Route 111, which will absorb any minor increase in vehicle trip generation.

- c) *Will be in harmony with the general purpose and intent of the Bylaw, including each purpose stated in 125-1 Purpose, which is pertinent to the particular application.*

See responses to Section 125-1 below.

Protective Bylaw Section 125-1 (Purpose)

To promote the health, safety, convenience, morals, and welfare of its inhabitants, the Town adopts this Bylaw in accordance with the Constitution of the Commonwealth and Chapter 40A and other provisions of the General Laws. With due regard to the characteristics of the different parts of the Town, the Bylaw is designed among other purposes:

- a) *To conserve health*

The proposed commercial use of the property is allowed within the zoning district and will utilize the existing building on the property. No adverse effects on the health of the town are anticipated.

- b) *To secure safety from fire, wind, flood, and traffic*

The proposed project will use an existing commercial building and paved parking area along with a proposed gravel pad storage area. The increase in intensity of the commercial use is not expected to result in an increased risk of fire or wind. Any potential risks from flooding are mitigated through the proposed Stormwater Management System. Traffic impacts are not expected to be significant.

- c) *To preserve and increase the value of land and buildings*

The proposed project involves modifications to an existing building, including landscaping, parking lot striping, a gravel pad storage area, and a new commercial use of the building. It is anticipated that the project will have a positive effect on the value of the land and building which has been unused for a significant period of time.

- d) *To protect the community from the detrimental effects of unsuitable development*

The proposed commercial uses of the property is an allowed use within the Commercial District.

- e) *To preserve and increase the amenities of the Town*

The proposed project will involve the change of use to a Landscaping business increasing the amenities of the Town.

f) *To prevent overcrowding of the land*

The project re-use an existing commercial building and will maintain an open space buffer strip of 10% of the lot width around the entire site. Additionally, the required Green Space percentage on the lot will be exceeded after completion of the project.

g) *To provide for compatibility with individual water supply and sewage disposal systems and their renewal, and with public systems which may become available.*

The existing sewage disposal system and on site well will be utilized for the existing building.

h) *To facilitate future reuse and redevelopment of property*

The proposed project involves the reuse of an existing commercial building.

i) *To provide for safe, rapid traffic flow to, from, and along the streets*

The existing curb cut and site entrance will be used. No modifications are proposed to the site entrance.

j) *To avoid confusing and distracting signs in areas along the streets*

The project will replace the existing sign in the same footprint, with no increase in the square footage of the sign.

k) *To avoid unsuitable traffic on residential streets*

Ayer Road (Route 111) is a major street with capacity to handle the site traffic from the development.

l) *To preserve the streets of the Town as firebreaks*

No modifications to the street or existing site entrance are proposed.

m) *To protect persons and property against the hazards of inundation and pollution*

The project has been designed in accordance with the Massachusetts Stormwater Management Policy which acts to ensure that proposed projects will not contribute to offsite flooding or to generate pollution. The Stormwater Management Report includes a Long Term Pollution Prevention Plan as required by the Policy.

n) *To prevent pollution or contamination of, to conservation, and to protect watercourses, and their adjoining lands, groundwater absorption areas, and the groundwater table on which the inhabitants depend for their water supply*

The renovations to the existing building will have no impact on any watercourses or adjoining lands.

o) To preserve storage areas for seasonal or periodic high waters

The site does not contain any areas mapped as floodplain.

p) To protect ponds from accelerated and excessive plant growth and premature decay into swamps

No ponds exist on the property.

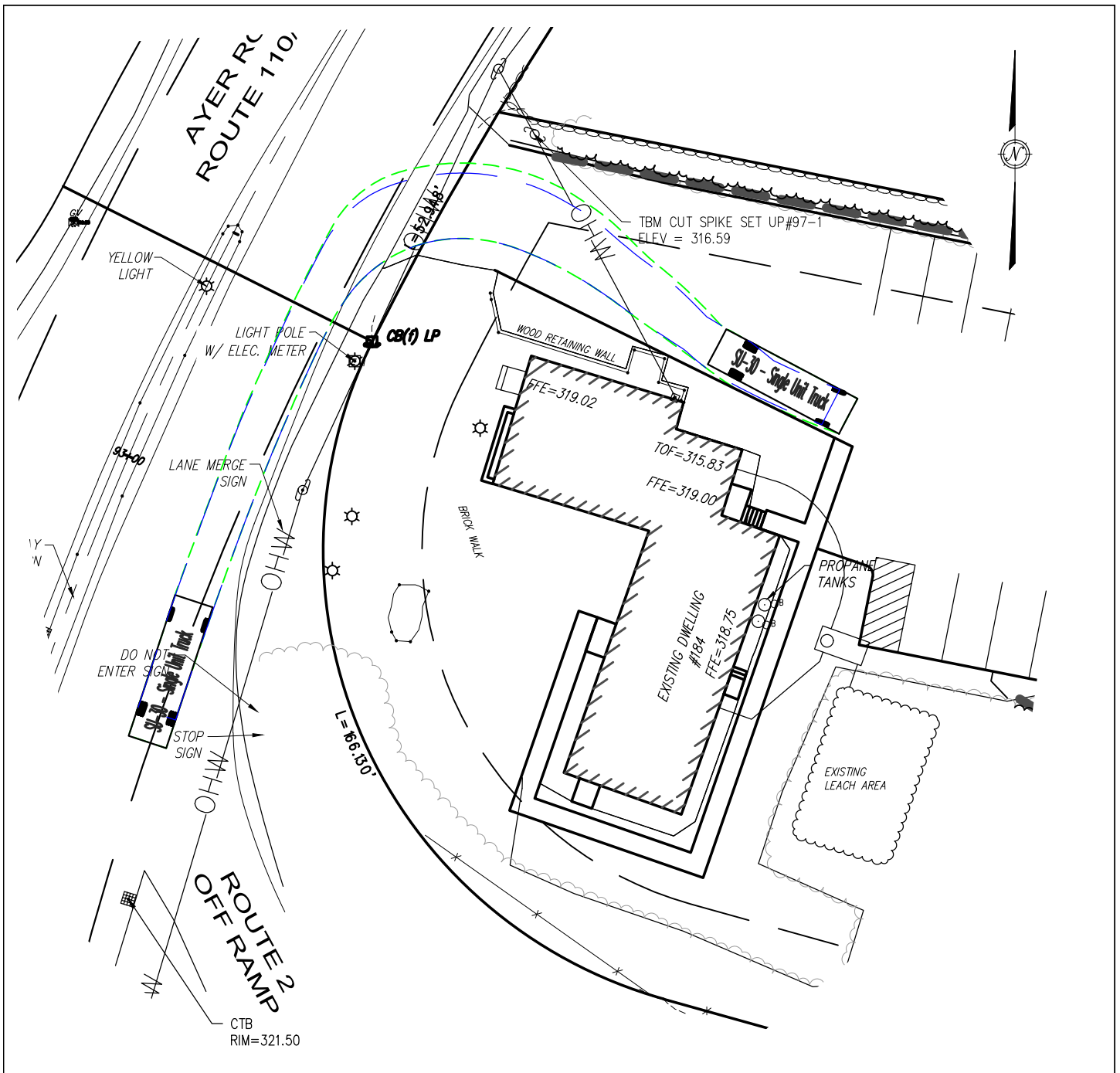
q) To conserve natural conditions and open spaces

The proposed project will maintain an open space buffer strip of 10% of the lot width around the entire site. The project will include invasive species removal and landscaping.

r) To separate and otherwise isolate potentially conflicting property uses.

The proposed uses of the building are allowed per Section 125-13 of the Zoning Bylaw.

3.0 Turning Exhibit Plan



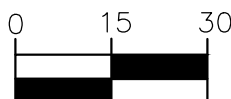
TURNING EXHIBIT PLAN
 184 AYER ROAD
 HARVARD, MASSACHUSETTS
 PREPARED FOR: CS BAILEY LANDSCAPE, INC

LEGEND

PROP. FEATURE	DESCRIPTION
	OUTER TRUCK PATH
	WHEEL PATH



CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
 1 MAIN STREET, SUITE 1 PHONE: (978) 779-6091
 LUNENBURG, MA 01462 www.dillisandroy.com



SCALE: 1" = 30'
 DATE: OCTOBER 26, 2023
 FILE No.: 6932-C

4.0 Record Deed/Assessors Card



2021 00047199

Bk: 64869 Pg: 275

Page: 1 of 3 04/06/2021 01:50 PM WC

MASSACHUSETTS EXCISE TAX
 Worcester District ROD #20 001
 Date: 04/06/2021 01:50 PM
 Ctrl# 221708 18818 Doc# 00047199
 Fee: \$2,964.00 Cons: \$650,000.00

Metropolitan Title Co., LLC
Worcester, MA
mettitleco@gmail.com

QUITCLAIM DEED

12 Lancaster County Road, LLC, a Massachusetts limited liability company with a place of business at 43 Delaney Road, Stow, Massachusetts 01775

for consideration paid and in full consideration of Six Hundred Fifty Thousand and 00/100 (\$650,000.00) Dollars,

grants to Phoenix-Durango LLC, a Massachusetts limited liability company with a principal address at 345 Main Street, Northborough, Massachusetts 01532

with *Quitclaim Covenants*,

the land in Harvard, Massachusetts, with the buildings thereon, situated on the northerly side of Route 110, bounded and described as follows:

Beginning at a point in the easterly side of Route 110, the northwesterly corner of the lot, at corner of land of Thomas J. Diab et ux;

Thence S 78° 48' 30" E by said Diab land and by a wall five hundred thirty-four and 03/100 (534.03) feet to a drill hole in the wall at land of Reggio;

Thence S 12° 10' 30" W by wall and by land of said Reggio two hundred five and 30/100 (205.30) feet to a drill hole in the end of the wall at the northerly side of Route 2;

Thence N 74° 22' 34" W by the northerly side of said Route 2 four hundred sixty-four and 62/100 (464.62) feet to a line bound;

Thence northwesterly and northerly on a curve to the right having a radius of the ninety-four and 24/100 (94.24) feet, a distance of one hundred sixty-six and 13/100 (166.13) feet to a line bound in the easterly side of Route 110;

Thence northwesterly on a curve to the right having a radius of six hundred eighty-one and 52/100 (681.52) feet, a distance of fifty-two and 68/100 (52.68) feet to the point of beginning.

Containing 2.27 acres, more or less.

Being the parcel of land shown on plan S. 720 by Charles A. Perkins Co., Civil Engineers, Clinton, Mass., entitled "Land in Harvard, Mass., surveyed for Thomas J. Diab, September 1956" said plan being recorded with the Worcester District Registry of Deeds, Plan Book 219, Plan 95.

Said premises are conveyed subject to restrictions and easements of record, if any there be, insofar as the same are now in force and applicable; and to the zoning laws and building laws of the Town of Harvard.

For title to Grantor, see deed dated December 30, 2013, recorded with said Deeds in Book 51910, Page 171.

12 Lancaster County Road, LLC is not taxed as a corporation in the current taxable year for federal income tax purposes.

(Signature Page to follow)

IN WITNESS WHEREOF, the said 12 LANCASTER ROAD, LLC, has caused its corporate seal to be affixed hereto and these presents to be signed, acknowledged and delivered in its name and behalf by Thampy Kurian, its Manager, hereto duly authorized this 6th day of April, 2021.

12 LANCASTER ROAD, LLC

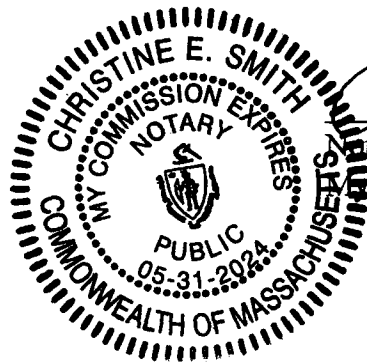
By: *Thampy Kurian*
Thampy Kurian, Manager

COMMONWEALTH OF MASSACHUSETTS

Worcester, ss.

April 6, 2021

Then personally appeared before me, the undersigned notary public, personally appeared Thampy Kurian, proved to me through satisfactory evidence of identification, which was personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily, for its stated purpose, as Manager of 12 LANCASTER ROAD, LLC as aforesaid



Christine E. Smith
Notary Public
Commission Expires: 05-31-2024

PROPOSED COMMERCIAL SITE PLAN

HARVARD, MA

184 AYER ROAD

SHEET INDEX

SHEET NUMBER	SHEET TITLE	LAST REVISED
SHEET C1.0	TITLE SHEET	10/24/2023
SHEET C1.1	EXISTING CONDITIONS PLAN	10/24/2023
SHEET C2.0	LAYOUT & MATERIALS	10/24/2023
SHEET C3.0	GRADING & DRAINAGE PLAN	10/24/2023
SHEET C4.0	LANDSCAPE PLAN	10/24/2023

RECORD INFORMATION

RECORD OWNER:
PHOENIX-DURANGO LLC
345 MAIN STREET
NORTHBOROUGH, MA

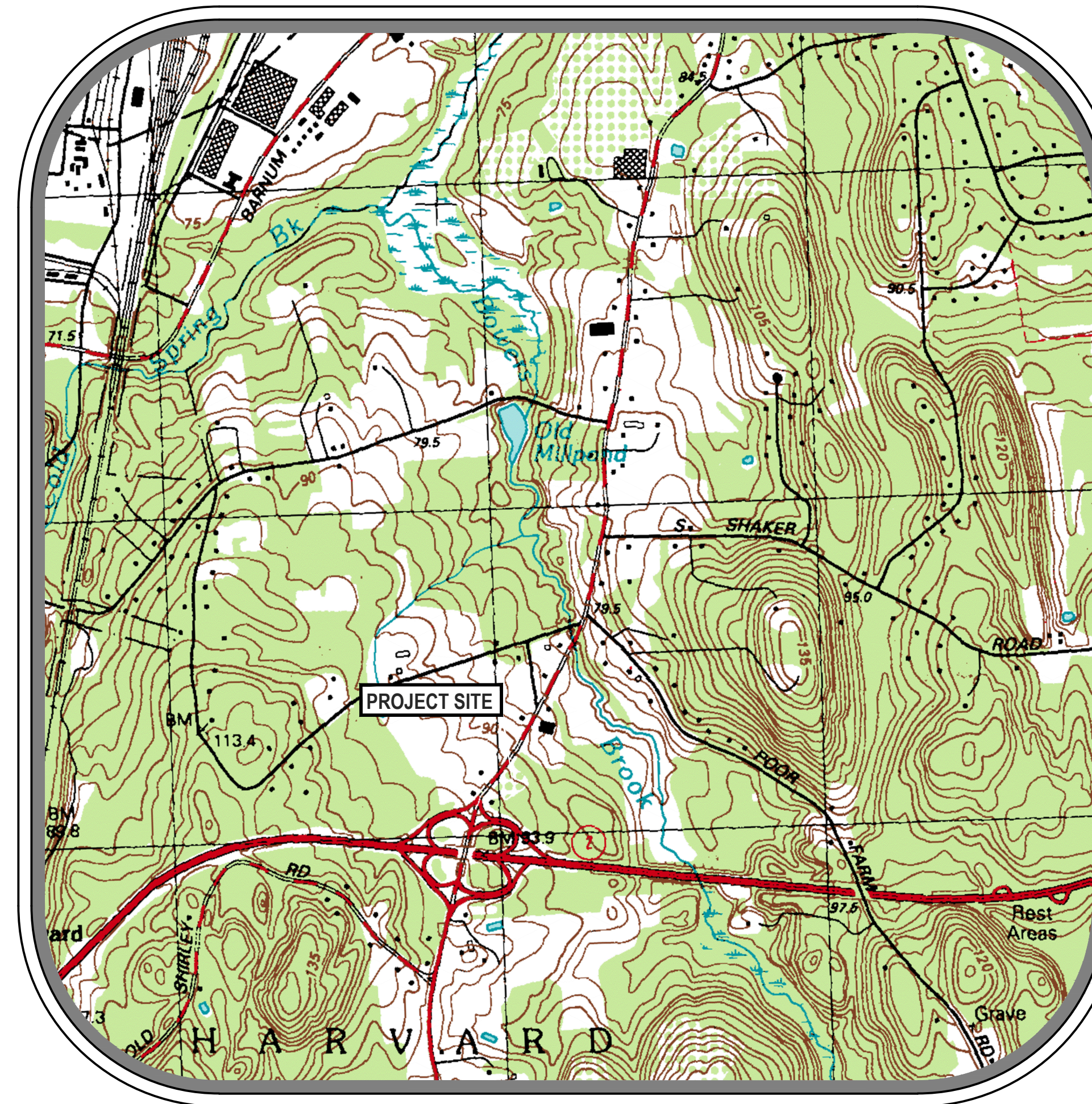
DEED REFERENCE:
BOOK 64869 PAGE 275

PARCEL NUMBER:
008-0041-00

ZONING DISTRICT:
COMMERCIAL

GENERAL NOTES:

- TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN WAS PREPARED BY DILLIS & ROY CIVIL DESIGN GROUP, INC. BASED ON AN ON-THE-GROUND SURVEY PERFORM IN 2022 AND COMPILED INFORMATION FROM THE MASS GIS SYSTEM. WETLAND RESOURCES AREAS WERE DELINEATED BY DILLIS & ROY CIVIL DESIGN GROUP, INC. IN 2022.
- PROPERTY LINE INFORMATION SHOWN ON THIS PLAN WAS PREPARED BY DILLIS & ROY CIVIL DESIGN GROUP, INC. BASED ON AN ON-THE-GROUND SURVEY PERFORM IN 2022 AND RECORDED PLANS AND DEEDS.
- EXISTING UTILITIES SHOWN ON THIS PLAN WERE COMPILED FROM FIELD MEASUREMENT AND RECORD PLANS. THE UTILITIES SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND SHOULD NOT BE ASSUMED TO BE CORRECT NOR SHOULD IT BE ASSUMED THAT THE UTILITIES SHOWN ARE THE ONLY UTILITIES LOCATED ON OR NEAR THE SITE. THE CONTRACTOR SHALL CALL DIG SAFE 1-888-DIG-SAFE PRIOR TO CONSTRUCTION IN ACCORDANCE WITH STATE LAWS.
- THE PROPERTY IS LOCATED WITHIN THE COMMERCIAL ZONING DISTRICT.



LOCUS MAP

SCALE: 1"=1,100'±

LEGEND

EXIST. FEATURE	DESCRIPTION	EXIST. SYM.	DESCRIPTION
	STREAMS/RIVERS		LIGHT POLE
	WETLANDS		TELEPHONE POLE
	LIMIT OF BUFFER ZONE		GUY WIRE
	STONE WALL		HYDRANT
	WATER LINE		SEWER MANHOLE
	EXISTING OVER-HEAD WIRES		WETLAND FLAG
	EXISTING CONTOUR (INDEX)		CATCH BASIN
	EXISTING CONTOUR (INTERMEDIATE)		WATER GATE VALVE
	EXISTING BUILDING/HOUSE		FLAG POLE
	TREE LINE		SHRUB
PROP. FEATURE	DESCRIPTION	PROP. SYM.	DESCRIPTION
	PROPERTY LINE		PROPOSED STORM WATER MANHOLE
	HAYBALES		PROPOSED CATCH BASIN
	PROPOSED WATER LINE		PROPOSED FLARED END SECTION
	PROPOSED SANITARY SEWER		PROPOSED RIPRAP
	PROPOSED STORM DRAIN		STANDARD TREE
	PROPOSED BACK CAPE COD BERM		PINE TREE
	PROPOSED EDGE OF PAVEMENT		SHRUB
	PROPOSED UNPAVED ROAD		
	PROPOSED CONTOUR (INDEX)		
	PROPOSED CONTOUR (INTERMEDIATE)		
	PROPOSED SPOT ELEVATION		
	TREE LINE		

APPROVAL REQUIRED UNDER BOARD
RULES AND REGULATIONS FOR SITE PLAN
APPROVAL AND SPECIAL PERMITS
HARVARD PLANNING BOARD

BEING A MAJORITY
DATE APPROVED: _____
DATE ENDORSED: _____

ISSUED FOR SITE PLAN APPROVAL

PREPARED BY:

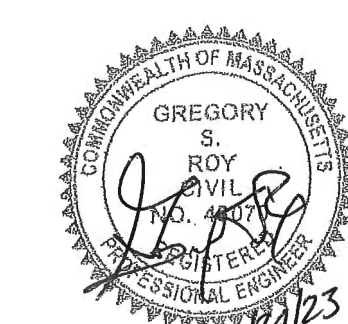
CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
1 MAIN STREET, SUITE 1 LUNENBURG, MA 01462 PHONE: (978) 779-6091 www.dillisoroy.com

OWNER:
PHOENIX-DURANGO LLC
345 MAIN STREET
NORTHBOROUGH MASSACHUSETTS

APPLICANT:
CS BAILEY LANDSCAPE, INC
19 WHITTEMORE SREET
ARLINGTON, MASSACHUSETTS

SCALE: _____

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DATE: 10/24/2023
DESIGN BY: GSR
DRAWN BY: MMK
CHECKED BY: GSR

TITLE SHEET			
184 AYER ROAD			
HARVARD, MASSACHUSETTS			
NO.	DATE	DESCRIPTION	BY

JOB NO. 6632-C
DRAWING NO. 6632-C-TITLE
SHEET NO. **C1.0**

EXISTING CONDITIONS NOTES:

1. TOPOGRAPHIC INFORMATION SHOWN ON THIS PLAN WAS PREPARED BY DILLIS & ROY CIVIL DESIGN GROUP, INC.
2. PROPERTY LINE INFORMATION SHOWN ON THIS PLAN IS THE RESULT OF AN ON-THE-GROUND SURVEY BY DILLIS & ROY AND CONFIRMED WITH RECORD PLANS AND DEEDS FOR THE PROPERTY.
3. THE SITE IS LOCATED WITHIN A ZONE 2 DRINKING WATER SUPPLY PROTECTION AREA.
4. EXISTING UTILITIES SHOWN ON THIS PLAN WERE COMPILED FROM FIELD MEASUREMENT AND RECORD PLANS. THE UTILITIES SHOWN ON THIS PLAN ARE FOR REFERENCE ONLY AND SHOULD NOT BE ASSUMED TO BE CORRECT NOR SHOULD IT BE ASSUMED THAT THE UTILITIES ARE THE ONLY UTILITIES LOCATED ON OR NEAR THE SITE. THE CONTRACTOR SHALL CALL DIG SAFE 1-888-DIG-SAFE PRIOR TO CONSTRUCTION IN ACCORDANCE WITH STATE LAWS.

ZONING INFORMATION:

ZONING:	COMMERCIAL	CONVENTIONAL
AREA	10,000 SF	
FRONTAGE	80'	
FRONT YARD	20'	
SIDE YARD	20'	
REAR YARD	20'	



PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
1 MAIN STREET, SUITE 1 LUNENBURG, MA 01462 PHONE: (978) 779-6091 www.dillisonroy.com

OWNER:
PHOENIX-DURANGO LLC
345 MAIN STREET
NORTHBOROUGH MASSACHUSETTS

APPLICANT:
CS BAILEY LANDSCAPE, INC
19 WHITTEMORE SREET
ARLINGTON, MASSACHUSETTS

SCALE:

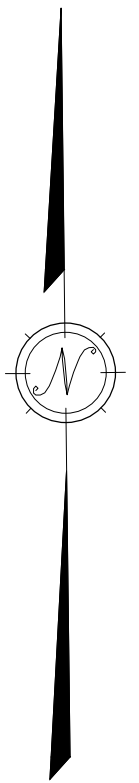
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DATE:	10/24/2023
DESIGN BY:	GSR
DRAWN BY:	MMK
CHECKED BY:	GSR

EXISTING CONDITIONS PLAN 184 AYER ROAD HARVARD, MASSACHUSETTS			
NO.	DATE	DESCRIPTION	BY

JOB NO. 6632-C
DRAWING NO. 6632-C-EXIST
SHEET NO. **C1.0**

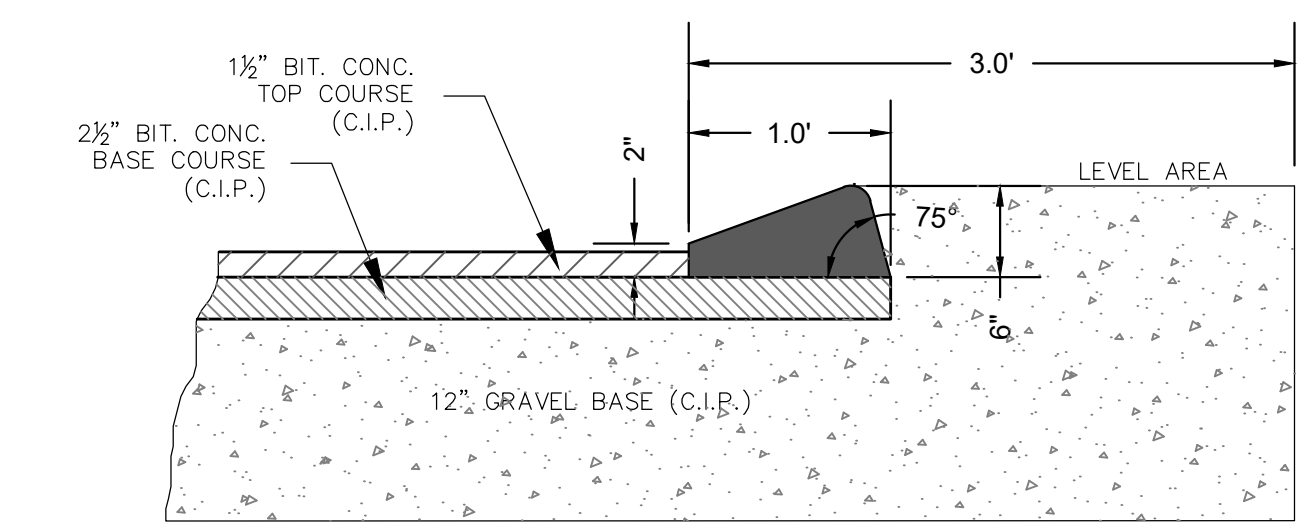


ZONING INFORMATION:

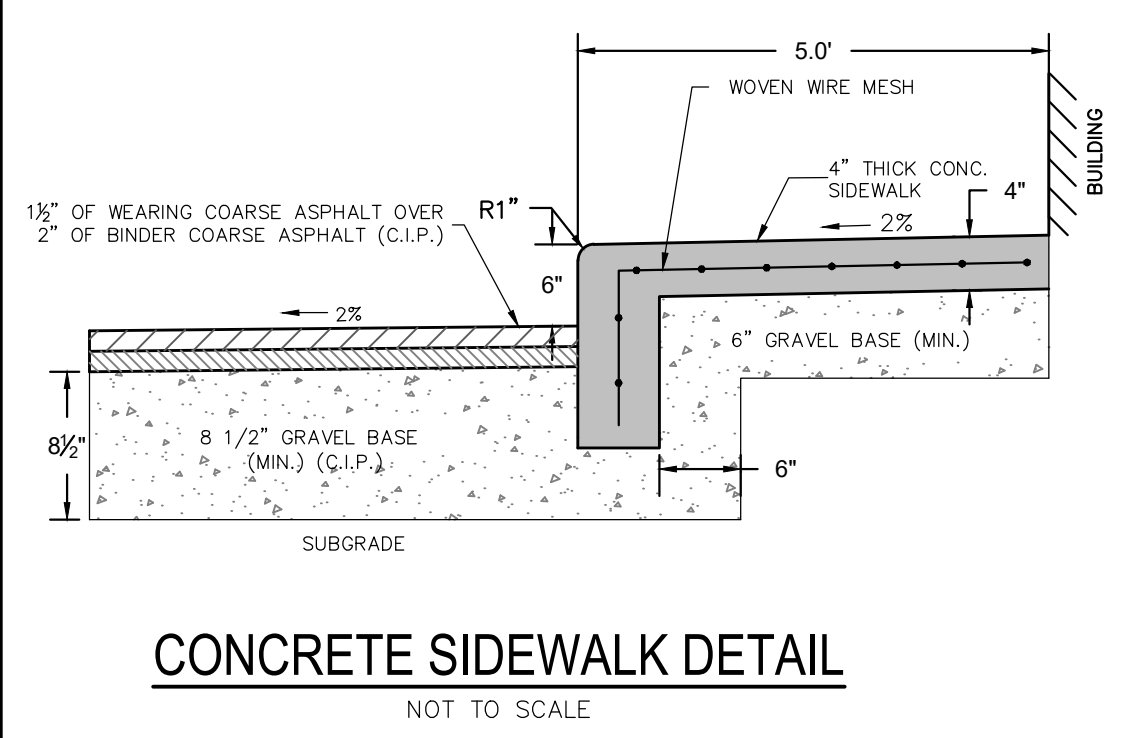
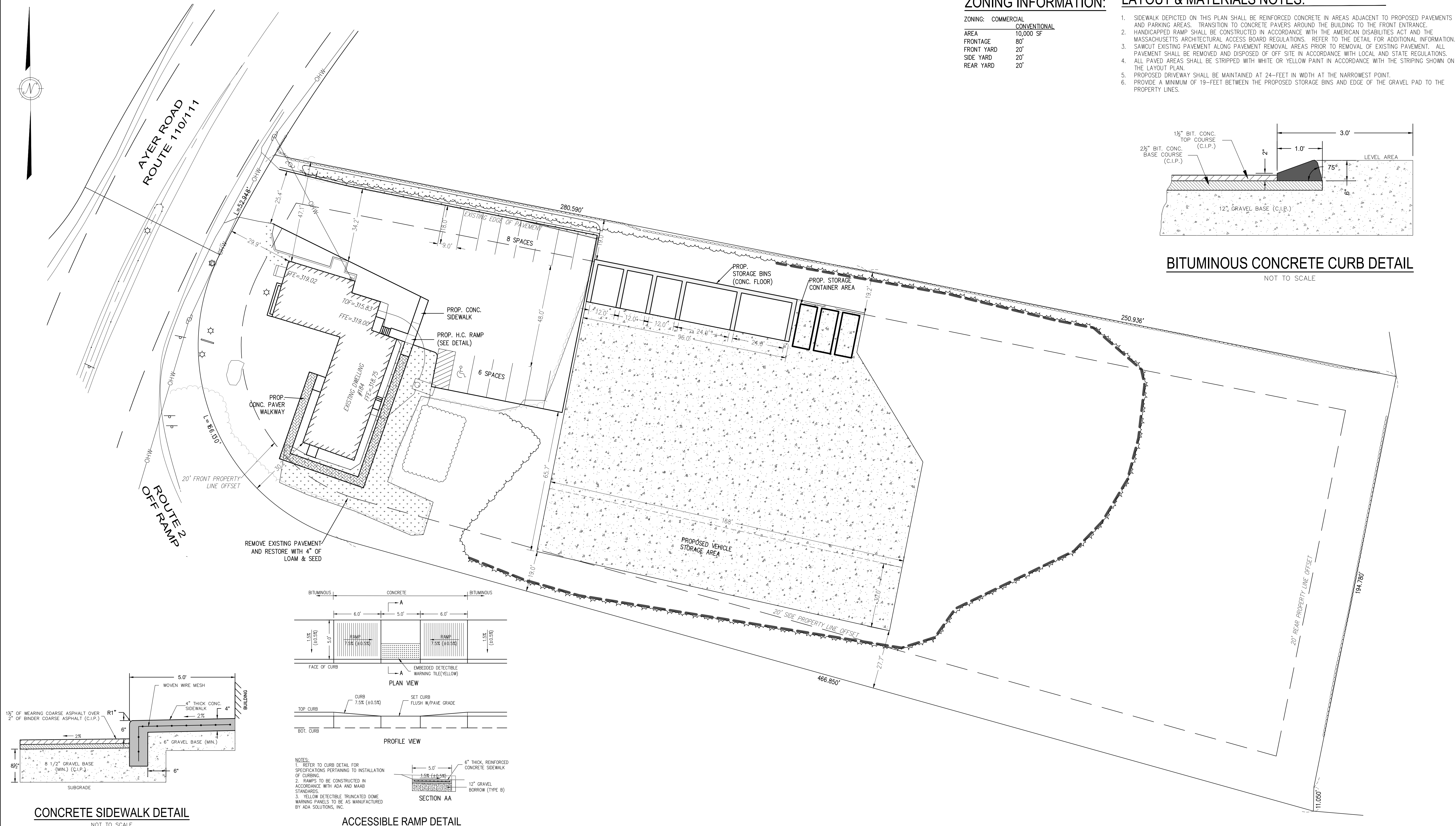
ZONING:	COMMERCIAL CONVENTIONAL
AREA:	10,000 SF
FRONTAGE:	80'
FRONT YARD:	20'
SIDE YARD:	20'
REAR YARD:	20'

LAYOUT & MATERIALS NOTES:

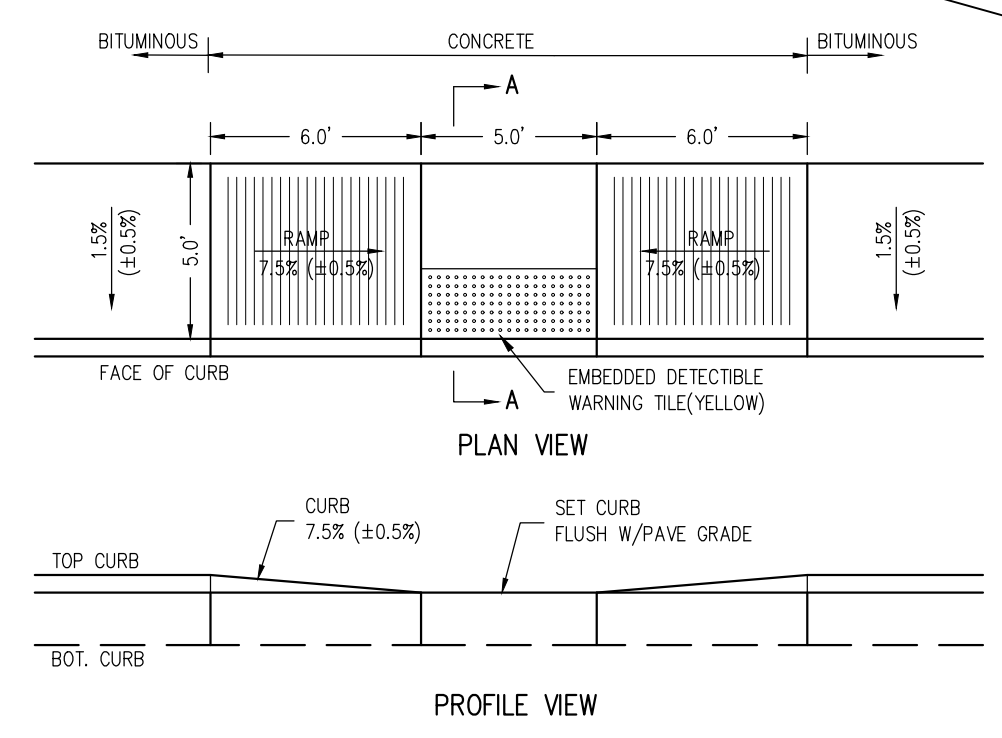
- SIDEWALK DEPICTED ON THIS PLAN SHALL BE REINFORCED CONCRETE IN AREAS ADJACENT TO PROPOSED PAVEMENTS AND PARKING AREAS. TRANSITION TO CONCRETE PAVERS AROUND THE BUILDING TO THE FRONT ENTRANCE.
- HANDICAPPED RAMP SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE AMERICAN DISABILITIES ACT AND THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD REGULATIONS. REFER TO THE DETAIL FOR ADDITIONAL INFORMATION.
- SAWCUT EXISTING PAVEMENT ALONG PAVEMENT REMOVAL AREAS PRIOR TO REMOVAL OF EXISTING PAVEMENT. ALL PAVEMENT SHALL BE REMOVED AND DISPOSED OF OFF SITE IN ACCORDANCE WITH LOCAL AND STATE REGULATIONS.
- ALL PAVED AREAS SHALL BE STRIPPED WITH WHITE OR YELLOW PAINT IN ACCORDANCE WITH THE STRIPING SHOWN ON THE LAYOUT PLAN.
- PROPOSED DRIVEWAY SHALL BE MAINTAINED AT 24-FEET IN WIDTH AT THE NARROWEST POINT.
- PROVIDE A MINIMUM OF 19-FOOT BETWEEN THE PROPOSED STORAGE BINS AND EDGE OF THE GRAVEL PAD TO THE PROPERTY LINES.



BITUMINOUS CONCRETE CURB DETAIL
NOT TO SCALE



CONCRETE SIDEWALK DETAIL
NOT TO SCALE



ACCESSIBLE RAMP DETAIL
NOT TO SCALE

- NOTES:**
- REFER TO CURB DETAIL FOR SPECIFICATIONS PERTAINING TO INSTALLATION OF CURBING.
 - RAMPS TO BE CONSTRUCTED IN ACCORDANCE WITH ADA AND MASS STANDARDS.
 - YELLOW DETECTIBLE TRUNCATED DOME WARNING PANELS TO BE AS MANUFACTURED BY ADA SOLUTIONS, INC.

PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
1 MAIN STREET, SUITE 1 LUNENBURG, MA 01462 PHONE: (978) 779-6091 www.dillisandroy.com

OWNER:

PHOENIX-DURANGO LLC
345 MAIN STREET
NORTHBOROUGH MASSACHUSETTS

APPLICANT:

CS BAILEY LANDSCAPE, INC
19 WHITTEMORE SREET
ARLINGTON, MASSACHUSETTS

SCALE:

1 in. = 20 ft.

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DATE: 10/24/2023

DESIGN BY: GSR

DRAWN BY: MMK

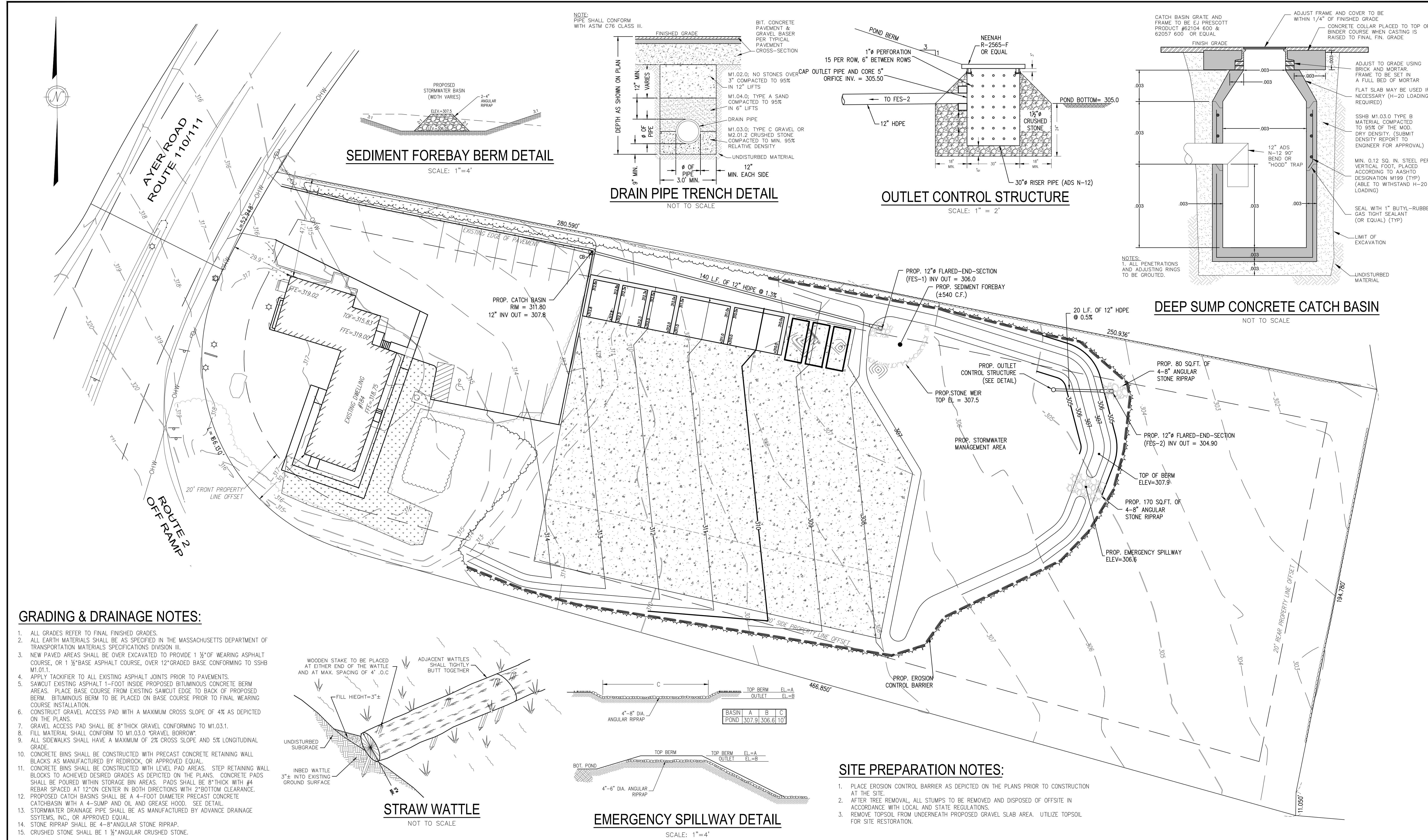
CHECKED BY: GSR

LAYOUT PLAN 184 AYER ROAD HARVARD, MASSACHUSETTS			
NO.	DATE	DESCRIPTION	BY

JOB NO. 6632-C

DRAWING NO. 6632-C-LAYOUT

SHEET NO. **C2.0**

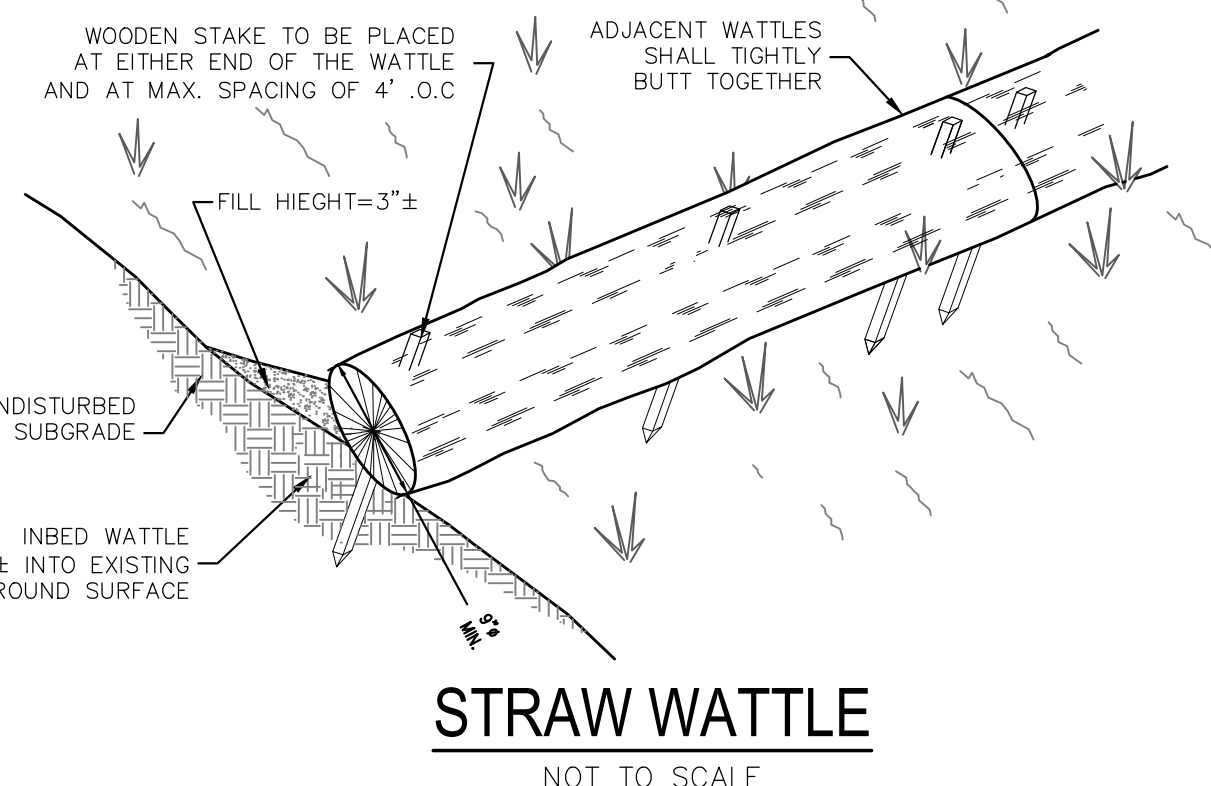


SEDIMENT FOREBAY BERM DETAIL
SCALE: 1"=4'

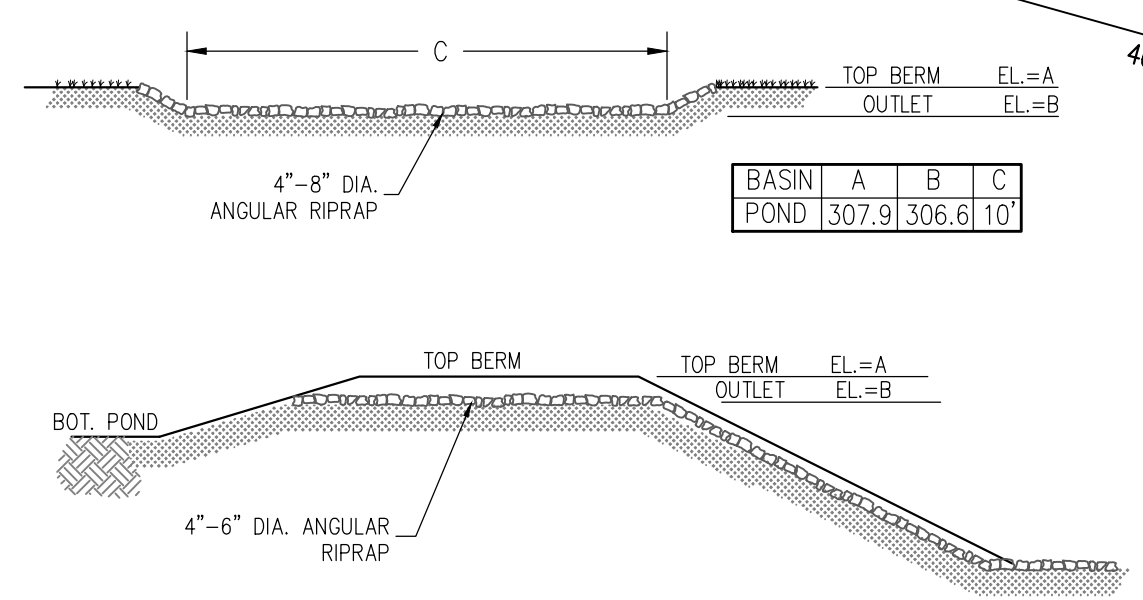
DRAIN PIPE TRENCH DETAIL
NOT TO SCALE

OUTLET CONTROL STRUCTURE
SCALE: 1" = 2'

DEEP SUMP CONCRETE CATCH BASIN
NOT TO SCALE



STRAW WATTLE
NOT TO SCALE



EMERGENCY SPILLWAY DETAIL
SCALE: 1"=4'

GRADING & DRAINAGE NOTES:

1. ALL GRADES REFER TO FINAL FINISHED GRADES.
2. ALL EARTH MATERIALS SHALL BE AS SPECIFIED IN THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION MATERIALS SPECIFICATIONS DIVISION III.
3. NEW PAVED AREAS SHALL BE OVER EXCAVATED TO PROVIDE 1 1/2" OF WEARING ASPHALT COURSE, OR 1 1/2" BASE ASPHALT COURSE, OVER 12" GRADED BASE CONFORMING TO SSHB M1.01.1.
4. APPLY TACKIFIER TO ALL EXISTING ASPHALT JOINTS PRIOR TO PAVEMENTS.
5. SAWCUT EXISTING ASPHALT 1-FOOT INSIDE PROPOSED BITUMINOUS CONCRETE BERM AREAS. PLACE BASE COURSE FROM EXISTING SAWCUT EDGE TO BACK OF PROPOSED BERM. BITUMINOUS BERM TO BE PLACED ON BASE COURSE PRIOR TO FINAL WEARING COURSE INSTALLATION.
6. CONSTRUCT GRAVEL ACCESS PAD WITH A MAXIMUM CROSS SLOPE OF 4% AS DEPICTED ON THE PLANS.
7. GRAVEL ACCESS PAD SHALL BE 8" THICK GRAVEL CONFORMING TO M1.03.1.
8. FILL MATERIAL SHALL CONFORM TO M1.03.0 "GRAVEL BORROW".
9. ALL SIDEWALKS SHALL HAVE A MAXIMUM OF 2% CROSS SLOPE AND 5% LONGITUDINAL GRADE.
10. CONCRETE BINS SHALL BE CONSTRUCTED WITH PRECAST CONCRETE RETAINING WALL BLOCKS AS MANUFACTURED BY REDIROCK, OR APPROVED EQUAL.
11. CONCRETE BINS SHALL BE CONSTRUCTED WITH LEVEL PAD AREAS. STEP RETAINING WALL BLOCKS TO ACHIEVED DESIRED GRADES AS DEPICTED ON THE PLANS. CONCRETE PADS SHALL BE POURED WITHIN STORAGE BIN AREAS. PADS SHALL BE 8" THICK WITH #4 REBAR SPACED AT 12" ON CENTER IN BOTH DIRECTIONS WITH 2" BOTTOM CLEARANCE.
12. PROPOSED CATCH BASINS SHALL BE A 4-FOOT DIAMETER PRECAST CONCRETE CATCHBASIN WITH A 4-SUMP AND OIL AND GREASE HOOD. SEE DETAIL.
13. STORMWATER DRAINAGE PIPE SHALL BE AS MANUFACTURED BY ADVANCE DRAINAGE SYSTEMS, INC., OR APPROVED EQUAL.
14. STONE RIPRAP SHALL BE 4-8" ANGULAR STONE RIPRAP.
15. CRUSHED STONE SHALL BE 1 1/2" ANGULAR CRUSHED STONE.

SITE PREPARATION NOTES:

1. PLACE EROSION CONTROL BARRIER AS DEPICTED ON THE PLANS PRIOR TO CONSTRUCTION AT THE SITE.
2. AFTER TREE REMOVAL, ALL STUMPS TO BE REMOVED AND DISPOSED OF OFFSITE IN ACCORDANCE WITH LOCAL AND STATE REGULATIONS.
3. REMOVE TOPSOIL FROM UNDERNEATH PROPOSED GRAVEL SLAB AREA. UTILIZE TOPSOIL FOR SITE RESTORATION.

PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
1 MAIN STREET, SUITE 1 LUNENBURG, MA 01462 PHONE: (978) 779-6091 www.dillisandroy.com

OWNER:

PHOENIX-DURANGO LLC
345 MAIN STREET
NORTHBOROUGH MASSACHUSETTS

APPLICANT:

CS BAILEY LANDSCAPE, INC
19 WHITTEMORE SREET
ARLINGTON, MASSACHUSETTS

SCALE:

1 in. = 20 ft.

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DATE: 10/24/2023

DESIGN BY: GSR

DRAWN BY: MMK

CHECKED BY: GSR

GRADING & DRAINAGE PLAN
184 AYER ROAD
HARVARD, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

JOB NO. 6632-C

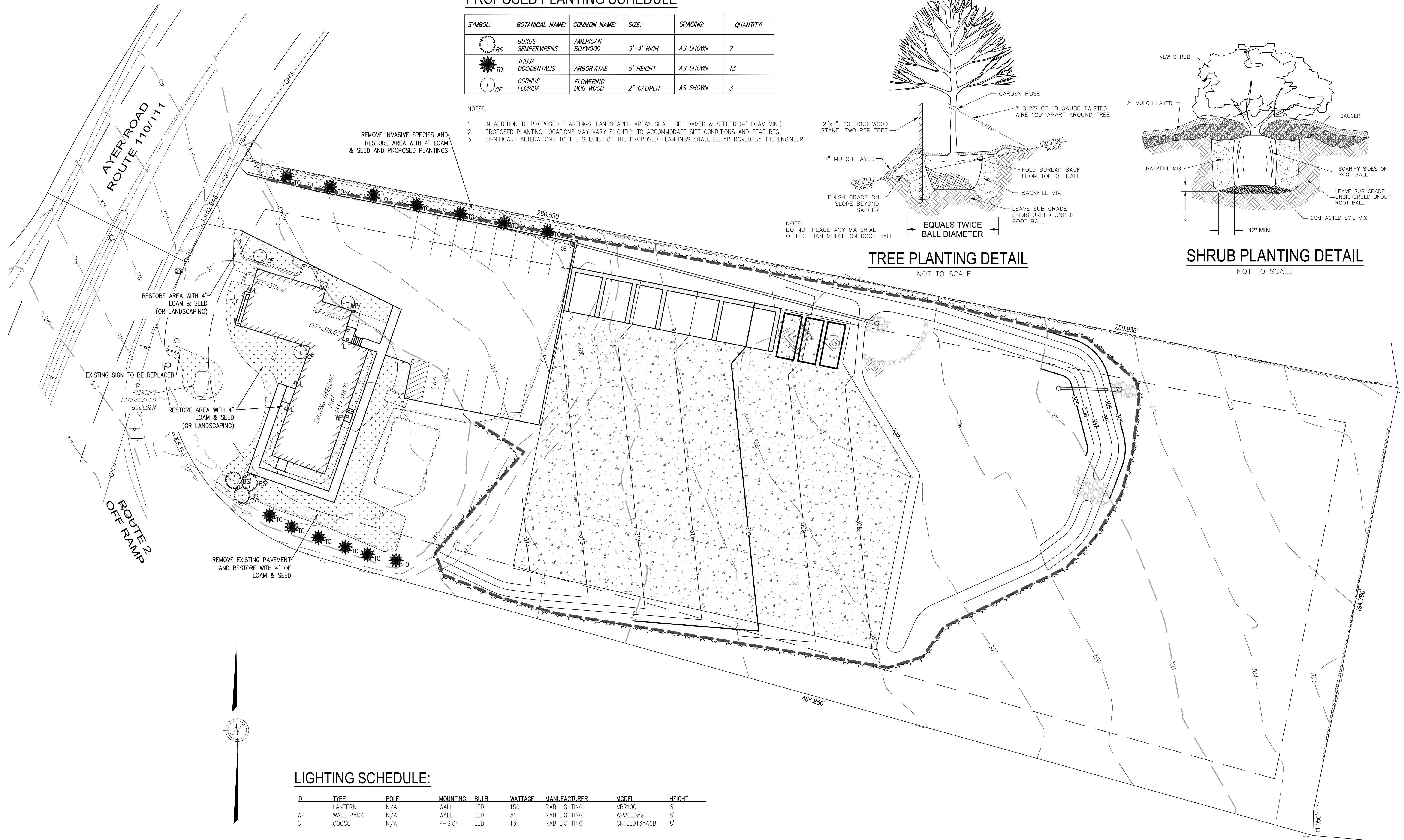
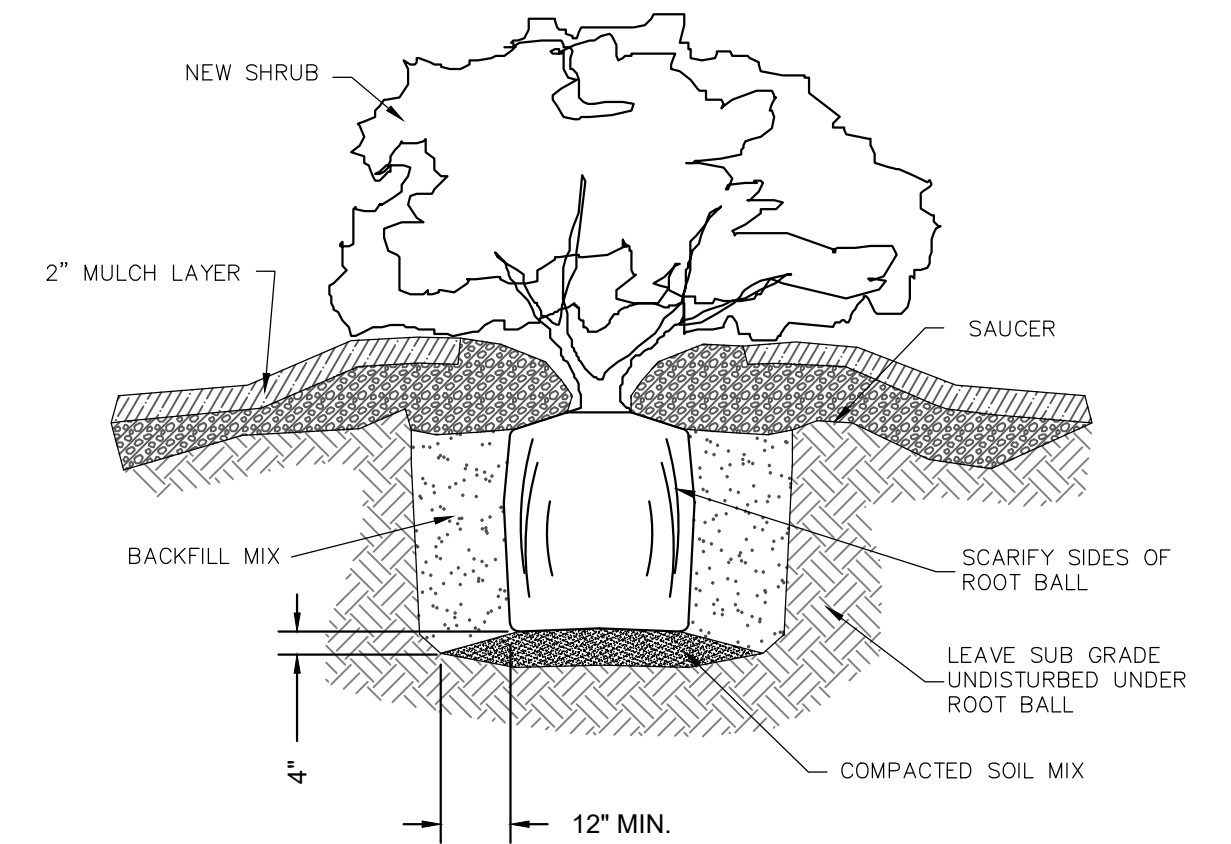
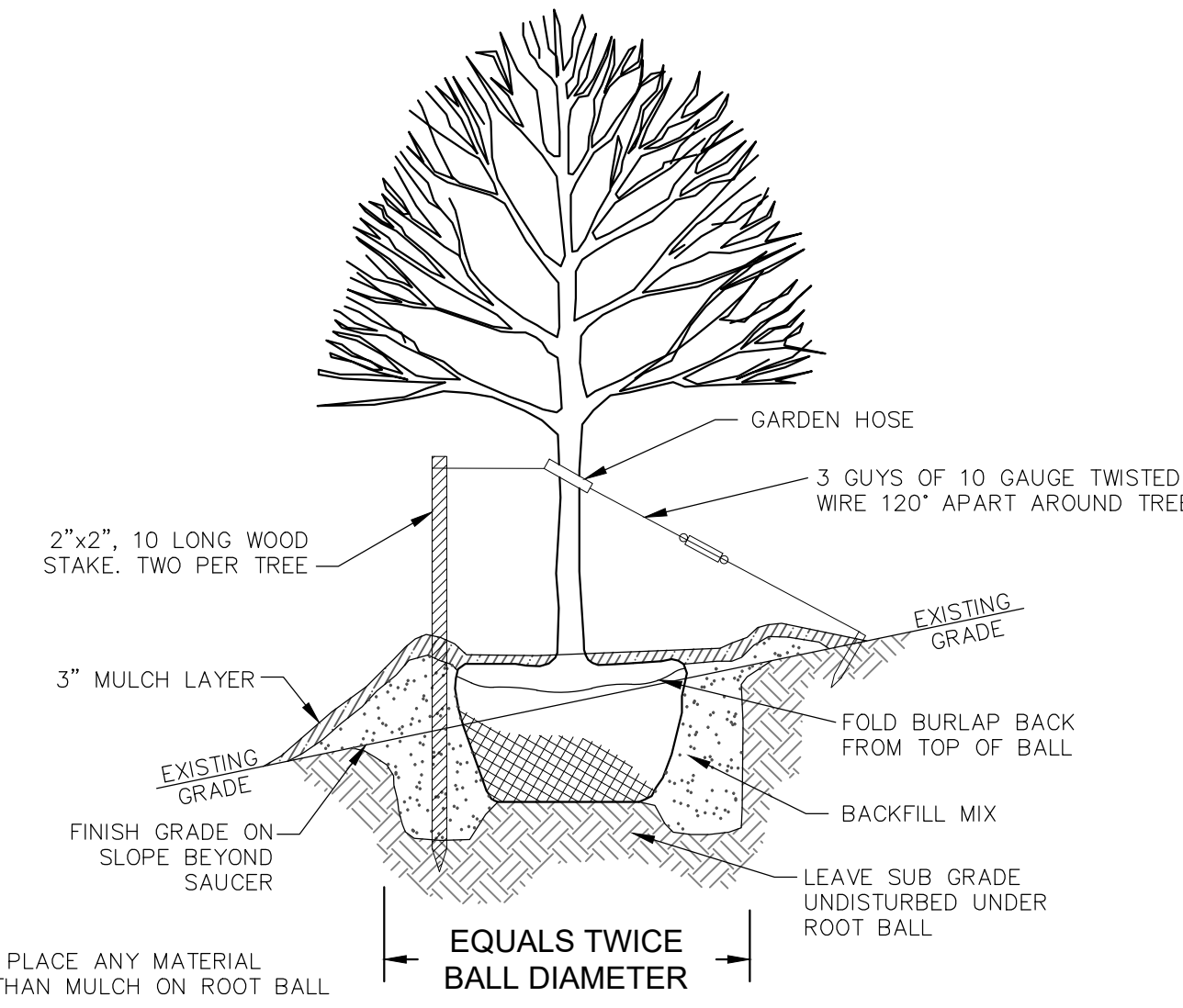
DRAWING NO. 6632-C-GRADING

SHEET NO. **C3.0**

PROPOSED PLANTING SCHEDULE

SYMBOL:	BOTANICAL NAME:	COMMON NAME:	SIZE:	SPACING:	QUANTITY:
BS	BUXUS SEMPERVIRENS	AMERICAN BOXWOOD	3'-4' HIGH	AS SHOWN	7
TO	THUJA OCCIDENTALIS	ARBORVITAE	5' HEIGHT	AS SHOWN	13
CF	CORNUS FLORIDA	FLOWERING DOG WOOD	2" CALIPER	AS SHOWN	3

- NOTES:
- IN ADDITION TO PROPOSED PLANTINGS, LANDSCAPED AREAS SHALL BE LOAMED & SEEDED (4" LOAM MIN.)
 - PROPOSED PLANTING LOCATIONS MAY VARY SLIGHTLY TO ACCOMMODATE SITE CONDITIONS AND FEATURES.
 - SIGNIFICANT ALTERATIONS TO THE SPECIES OF THE PROPOSED PLANTINGS SHALL BE APPROVED BY THE ENGINEER.



LIGHTING SCHEDULE:

ID	TYPE	POLE	MOUNTING	BULB	WATTAGE	MANUFACTURER	MODEL	HEIGHT
L	LANTERN	N/A	WALL	LED	150	RAB LIGHTING	VBR100	8'
WP	WALL PACK	N/A	WALL	LED	81	RAB LIGHTING	WP3LED82	8'
G	GOOSE	N/A	P-SIGN	LED	13	RAB LIGHTING	GNLED13YACB	8'

PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
1 MAIN STREET, SUITE 1 LUNENBURG, MA 01462
PHONE: (978) 779-6091
www.dillisandroy.com

OWNER:

PHOENIX-DURANGO LLC
345 MAIN STREET
NORTHBOROUGH MASSACHUSETTS

APPLICANT:

CS BAILEY LANDSCAPE, INC
19 WHITTEMORE SREET
ARLINGTON, MASSACHUSETTS

SCALE:

1 in. = 20 ft.

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DATE: 10/24/2023

DESIGN BY: GSR

DRAWN BY: MMK

CHECKED BY: GSR

LIGHTING & LANDSCAPING PLAN
184 AYER ROAD
HARVARD, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

JOB NO. 6632-C

DRAWING NO. 6632-C-LAND

SHEET NO. **C4.0**

STORMWATER REPORT

FOR

184 AYER ROAD

IN

HARVARD,
MASSACHUSETTS

PREPARED BY: DILLIS & ROY
CIVIL DESIGN GROUP, INC.
1 MAIN STREET, SUITE 1
LUNENBURG, MA 01462

PREPARED FOR: CS BAILEY LANDSCAPE, INC.
19 WHITTEMORE STREET
ARLINGTON, MA 02474

OCTOBER 24TH, 2023
CDG PROJECT # 6932



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1.0 Project Narrative

1.1 Project Type

The proposed project includes the reconfiguration of the existing paved parking area, and the construction of a gravel pad for additional storage area. The scope of work also includes the removal & replacement of an existing brick walkway around the existing structure.

1.2 Purpose and Scope

This report has been prepared to comply with the requirements of the Stormwater Management Standards incorporated in the Massachusetts Wetlands Protection Act Regulations, 310 CMR 10.00. These standards are intended to promote increased groundwater recharge and prevent stormwater discharges from causing or contributing to the pollution of surface waters and ground waters of the Commonwealth. The standards aim to accomplish these goals by encouraging the greater use of low impact development (LID) techniques and improving the operation and maintenance of stormwater best management practices (BMP).

This report addresses compliance of the proposed development with each of the ten stormwater standards, it provides calculations to support the compliance information, and it provides a Long-Term Pollution Prevention Plan and an Operation and Maintenance Plan for the stormwater management system.

1.3 LID Measures

Care has been taken to lay out the proposed site in a manner that works with existing topography. BMPs, have been specified to manage the stormwater runoff. Stormwater from the proposed impervious surface locations is routed to a stormwater basin via the proposed drainage pipe system. The stormwater basin will reduce run off rates below pre-developed rates while providing water quality pre-treatment by sediment forebays.

1.4 Site Description

The subject property is located at 184 Ayer Road which is shown on assessors Map 8, as Parcel 41. The property is located on the eastern side of Ayer Road (Route 111), at the corner of Route 111 and the Route 2 west off ramp. The property has approximately 2.27 acres of land and contains an existing 2,574 SF structure. The parking areas to the North, East, and South of the building are paved with no identifiable striping. An existing sewage disposal system is located to the rear of the structure. The remaining undeveloped East side of the site is heavily wooded. The natural drainage pattern flows from West to East with no stormwater management devices in place. The stormwater runoff flows overland

from the existing infrastructure towards the western undeveloped portion of the site unattenuated. There are no wetlands or flood plain areas located on site.

The Natural Resource Conservation Service (NRCS) soil survey information indicates that the site is underlain by soil classified as belonging to Hydrologic Soil Group D soils, which is confirmed by soil testing on the site. The soil consists of Woodbridge fine sandy loam.

Group D. Soils have a very low 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 player at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Please refer to Appendix C for further information regarding the soils on-site & existing test hole data.

1.5 Proposed Stormwater Management System

Runoff from the proposed development will be conveyed and treated through a combination of Best Management Practices (BMP's). The following is a brief discussion of each conveyance and treatment BMP proposed.

Deep Sump Hooded Catch Basin

One deep sump hooded catch basin is proposed to convey the runoff from the proposed paved area and roof to the stormwater basin. The catch basin will discharge to the proposed stormwater basin via conventional storm drain.

Stormwater Basin

The stormwater basin is designed to reduce the runoff rates. Due to high groundwater tables on site & HSG D Soils, infiltration cannot be accounted for in the hydrologic design. The basin will discharge via a 12" culvert with a low-flow restriction in the form of an orifice. An emergency spillway has been designed to allow for overflow during sever rainfall events. Riprap will also be installed at the outlet of the basin to control the overflow of stormwater into the adjacent areas and will reduce the potential for scouring. A sediment forebay designed at the entrance of the basin was included to decrease the velocity of flow and increase the settlement of heavy solids prior to the stormwater basin.

1.6 Methods of Analysis

The United States Department of Agriculture Natural Resources Conservation Service (NRCS) soil cover complex methods (TR-20) were employed to compute runoff quantities for the subject property. Watershed analysis demonstrates that natural drainage patterns drain towards Nashua Road (design point). One design point was modeled to analyze the total runoff from the site. HydroCAD 10.0 computer software was employed in this hydrologic analysis.

A comparison of pre- and post-development runoff quantities at the analysis point was performed in order to design a stormwater management system that will limit peak rates of runoff from the development to predevelopment levels for 24-hour rainfall events of 2-, 10-, 25- and 100-year return frequencies.

2.0 Stormwater Standards Compliance

2.1 Standard 1 – Untreated Discharge

The stormwater management system for the proposed development will not result in any new discharges of untreated stormwater to wetland resource areas. Stormwater management structures have been designed such that there is no erosion or scour to wetland resource areas or waters of the Commonwealth.

2.2 Standard 2 – Peak Rate Attenuation

Hydrologic calculations for existing and proposed site conditions are included in Appendices D and E respectively. Calculations for 24-hour rainfall events of 2-, 10-, 25- and 100-year return frequencies are provided. The “Northeast Regional Climate Center – Extreme Precipitation Tables (Cornell)” rainfall rates were used in the hydraulic model. The following table provides a summary of peak rates of runoff related to each of these storms for the design point through which all runoff from the subject property must flow. For all rainfall events considered, the proposed stormwater management system will control runoff from the development such that corresponding peak flows at the design point will be lower than pre-developed rates.

Table 1: Design Point – A (DP-A) Runoff Summary

	Pre-Developed (ft³ / sec)	Post-Developed (ft³ / sec)
<i>Design Point “A”</i>		
2-Year	1.59	1.03
10-Year	3.77	2.25
25-Year	5.68	4.63
100-Year	9.83	9.67

2.3 *Standard 3 – Recharge*

The NRCS soil survey information indicates that the site is underlain by soils classified as belonging to Hydrologic Soil Groups D. The soil testing on-site confirms a high groundwater water table. Due to high groundwater tables on site, infiltration cannot be accounted for in the hydrologic design. Please refer to Appendix C for further information regarding the soils on-site & test hole data.

2.4 *Standard 4 – Water Quality*

TSS removal calculations have been provided (Appendix F) showing that the proposed TSS removal efficiency from the impervious areas will be >80% using the stormwater basin with the sediment forebay for pretreatment.

2.5 *Standard 5 – Land Uses with Higher Pollutant Loads*

The current and proposed uses of the subject site do not constitute land use with higher potential pollutant load, thus Standard 5 does not apply to the proposed project.

2.6 *Standard 6 –Critical Areas*

The proposed project does not contain a stormwater discharge within or near to any of the areas as defined as “Critical Areas” at 314 CMR 9.02 and 310 CMR 10.04.

2.7 *Standard 7 – Redevelopment*

The proposed project does not meet the standards to be considered a Redevelopment project.

2.8 *Standard 8 – Construction Period Pollution Prevention Plan and Erosion and Sediment Control*

The project is subject to the filing of an Environmental Protection Agency Notice of Intent (EPA NOI), and the work will be pursuant to the NPDES Construction General Permit for disturbance to an area greater than 1 acre, a copy of the Stormwater Pollution Prevention Plan (SWPPP) will be submitted prior to construction. The SWPPP will satisfy the Standard 8 Construction Period Pollution prevention.

2.9 *Standard 9 – Operation and Maintenance Plan*

Refer to Appendix G for a complete copy of the Stormwater Operation and Maintenance Plan.

2.10 Standard 10 – Prohibition of Illicit Discharge

An illicit discharge statement will be prepared after approvals are received and prior to construction.

3.0 Appendices

Stormwater Report
184 Ayer Road

October 24th, 2023
CS Bailey Landscape, Inc.

Appendix A - Locus & Flood Map

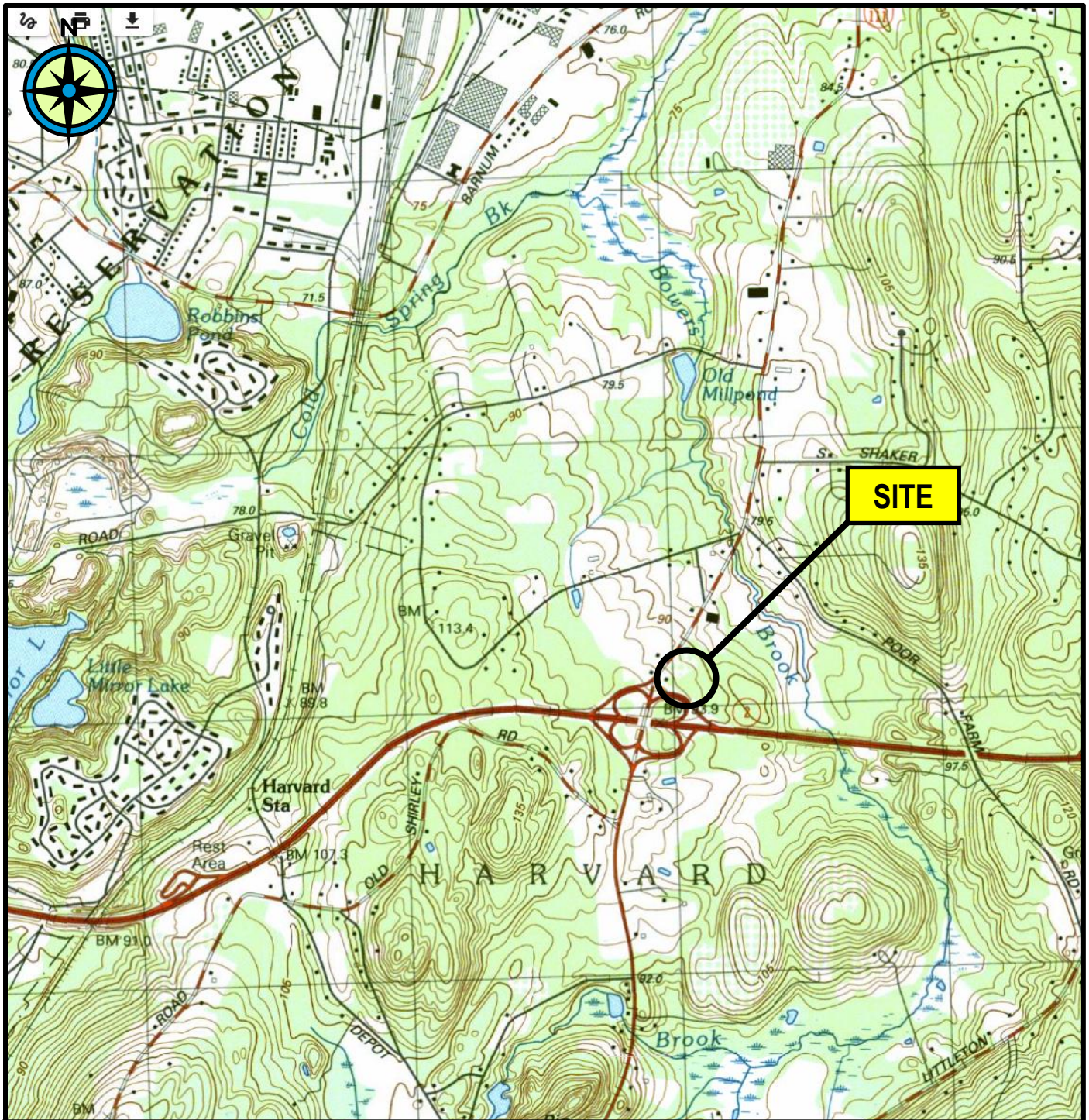


FIGURE 1 – Locus Map

1' = 1000'

Prepared By: Dillis & Roy Civil Design Group, Inc.
 1 Main Street, Suite 1
 Lunenburg, MA 01462

Prepared For: CS Bailey Landscape, Inc.
 19 Whittemore Street
 Arlington, MA 02474

References: Massachusetts Topographic Map

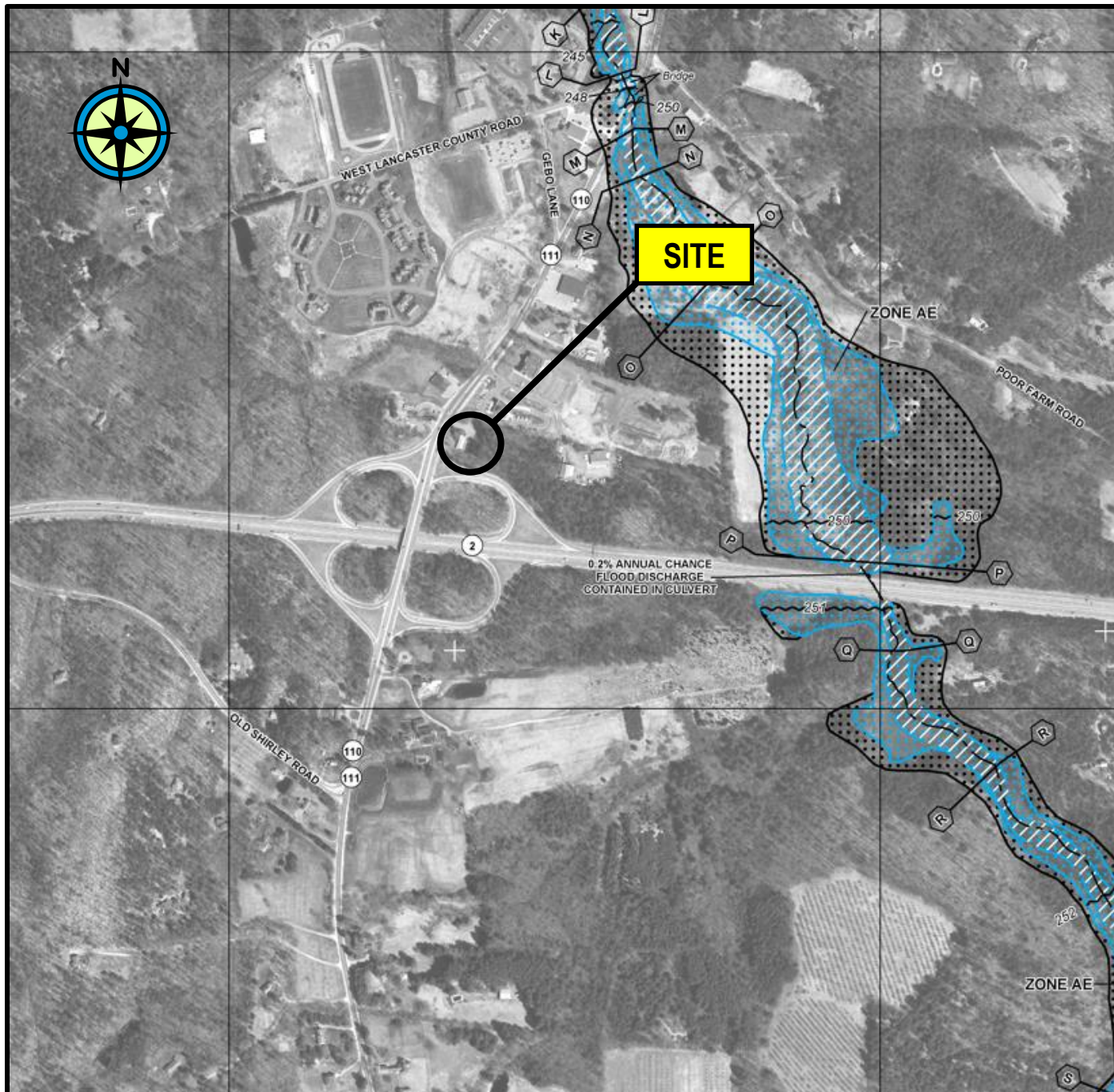


FIGURE 2 – Floodplain Map

1' = 1000'

Prepared By: Dillis & Roy Civil Design Group, Inc.
 1 Main Street, Suite 1
 Lunenburg, MA 01462

Prepared For: CS Bailey Landscape, Inc.
 19 Whittemore Street
 Arlington, MA 02474

References: FEMA Floodplain Map
 Panel : 25027C0314E
 Date : 07/04/2011

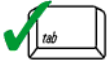
Appendix B - Checklist for Stormwater Report



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.¹ 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 8²
- 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.

¹ 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.

² 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.



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.

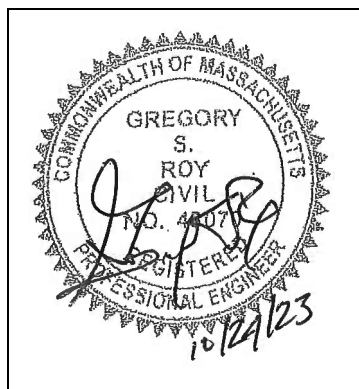
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the 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 Long-term 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



Checklist for Stormwater Report

Checklist (continued)

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.



Checklist for Stormwater Report

Checklist (continued)

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 pre-development 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 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- 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 Dynamic
 - Dynamic Field¹
- 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.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- 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.
- 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.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 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 for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - 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.



Checklist for Stormwater Report

Checklist (continued)

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.



Checklist for Stormwater Report

Checklist (continued)

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

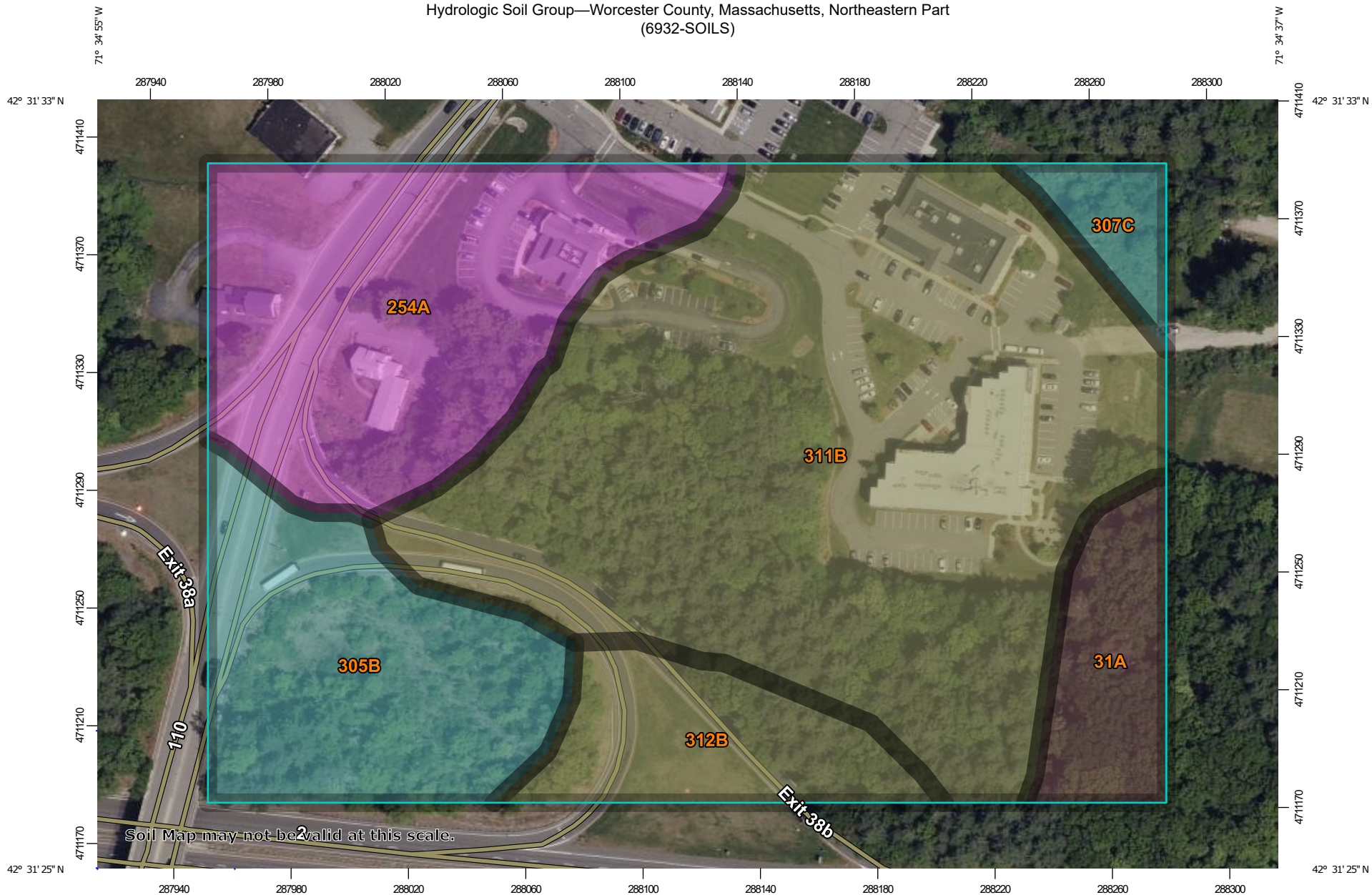
- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance 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

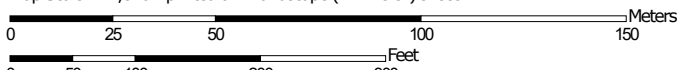
- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Appendix C - Soils Data

Hydrologic Soil Group—Worcester County, Massachusetts, Northeastern Part
(6932-SOILS)




Map Scale: 1:1,840 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Worcester County, Massachusetts, Northeastern Part
 Survey Area Data: Version 18, Sep 10, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	1.0	5.6%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	A	3.6	20.3%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	2.6	14.5%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	0.4	2.4%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	8.8	49.7%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	1.3	7.5%
Totals for Area of Interest			17.6	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.

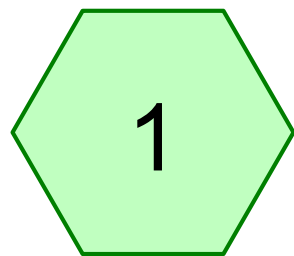
Rating Options

Aggregation Method: Dominant Condition

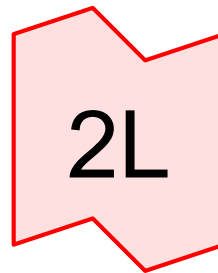
Component Percent Cutoff: None Specified

Tie-break Rule: Higher

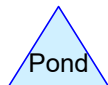
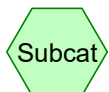
Appendix D - Existing Hydrologic Calculations



PRE-1.A



DP-A



6932-PRE

Type III 24-hr 2-yr Rainfall=3.07"

Prepared by {enter your company name here}

HydroCAD® 10.10-3a s/n 03590 © 2020 HydroCAD Software Solutions LLC

Page 2

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: PRE-1.A

Runoff Area=99,346 sf 15.28% Impervious Runoff Depth=0.85"
Flow Length=595' Tc=14.0 min CN=72 Runoff=1.59 cfs 0.162 af

Link 2L: DP-A

Inflow=1.59 cfs 0.162 af
Primary=1.59 cfs 0.162 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.162 af Average Runoff Depth = 0.85"
84.72% Pervious = 1.932 ac 15.28% Impervious = 0.348 ac

Summary for Subcatchment 1: PRE-1.A

Runoff = 1.59 cfs @ 12.22 hrs, Volume= 0.162 af, Depth= 0.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-yr Rainfall=3.07"

Area (sf)	CN	Description
12,512	98	Paved parking, HSG A
2,668	98	Roofs, HSG A
14,212	30	Woods, Good, HSG A
4,379	39	>75% Grass cover, Good, HSG A
65,575	77	Woods, Good, HSG D
99,346	72	Weighted Average
84,166		84.72% Pervious Area
15,180		15.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0300	0.19		Sheet Flow, Range n= 0.130 P2= 3.07"
0.5	72	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	473	0.0300	0.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.0	595	Total			

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 15.28% Impervious, Inflow Depth = 0.85" for 2-yr event

Inflow = 1.59 cfs @ 12.22 hrs, Volume= 0.162 af

Primary = 1.59 cfs @ 12.22 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

6932-PRE

Type III 24-hr 10-yr Rainfall=4.56"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: PRE-1.A

Runoff Area=99,346 sf 15.28% Impervious Runoff Depth=1.86"
Flow Length=595' Tc=14.0 min CN=72 Runoff=3.77 cfs 0.354 af

Link 2L: DP-A

Inflow=3.77 cfs 0.354 af
Primary=3.77 cfs 0.354 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.354 af Average Runoff Depth = 1.86"
84.72% Pervious = 1.932 ac 15.28% Impervious = 0.348 ac

Summary for Subcatchment 1: PRE-1.A

Runoff = 3.77 cfs @ 12.20 hrs, Volume= 0.354 af, Depth= 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-yr Rainfall=4.56"

Area (sf)	CN	Description
12,512	98	Paved parking, HSG A
2,668	98	Roofs, HSG A
14,212	30	Woods, Good, HSG A
4,379	39	>75% Grass cover, Good, HSG A
65,575	77	Woods, Good, HSG D
99,346	72	Weighted Average
84,166		84.72% Pervious Area
15,180		15.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0300	0.19		Sheet Flow, Range n= 0.130 P2= 3.07"
0.5	72	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	473	0.0300	0.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.0	595	Total			

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 15.28% Impervious, Inflow Depth = 1.86" for 10-yr event

Inflow = 3.77 cfs @ 12.20 hrs, Volume= 0.354 af

Primary = 3.77 cfs @ 12.20 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

6932-PRE

Type III 24-hr 25-yr Rainfall=5.72"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: PRE-1.A

Runoff Area=99,346 sf 15.28% Impervious Runoff Depth=2.77"
Flow Length=595' Tc=14.0 min CN=72 Runoff=5.68 cfs 0.526 af

Link 2L: DP-A

Inflow=5.68 cfs 0.526 af
Primary=5.68 cfs 0.526 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.526 af Average Runoff Depth = 2.77"
84.72% Pervious = 1.932 ac 15.28% Impervious = 0.348 ac

Summary for Subcatchment 1: PRE-1.A

Runoff = 5.68 cfs @ 12.20 hrs, Volume= 0.526 af, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Type III 24-hr 25-yr Rainfall=5.72"

Area (sf)	CN	Description
12,512	98	Paved parking, HSG A
2,668	98	Roofs, HSG A
14,212	30	Woods, Good, HSG A
4,379	39	>75% Grass cover, Good, HSG A
65,575	77	Woods, Good, HSG D
99,346	72	Weighted Average
84,166		84.72% Pervious Area
15,180		15.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0300	0.19		Sheet Flow, Range n= 0.130 P2= 3.07"
0.5	72	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	473	0.0300	0.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.0	595	Total			

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 15.28% Impervious, Inflow Depth = 2.77" for 25-yr event

Inflow = 5.68 cfs @ 12.20 hrs, Volume= 0.526 af

Primary = 5.68 cfs @ 12.20 hrs, Volume= 0.526 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

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Type III 24-hr 100-yr Rainfall=8.08"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: PRE-1.A

Runoff Area=99,346 sf 15.28% Impervious Runoff Depth=4.76"
Flow Length=595' Tc=14.0 min CN=72 Runoff=9.83 cfs 0.906 af

Link 2L: DP-A

Inflow=9.83 cfs 0.906 af
Primary=9.83 cfs 0.906 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.906 af Average Runoff Depth = 4.76"
84.72% Pervious = 1.932 ac 15.28% Impervious = 0.348 ac

Summary for Subcatchment 1: PRE-1.A

Runoff = 9.83 cfs @ 12.20 hrs, Volume= 0.906 af, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.08"

Area (sf)	CN	Description
12,512	98	Paved parking, HSG A
2,668	98	Roofs, HSG A
14,212	30	Woods, Good, HSG A
4,379	39	>75% Grass cover, Good, HSG A
65,575	77	Woods, Good, HSG D
99,346	72	Weighted Average
84,166		84.72% Pervious Area
15,180		15.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	50	0.0300	0.19		Sheet Flow, Range n= 0.130 P2= 3.07"
0.5	72	0.0167	2.62		Shallow Concentrated Flow, Paved Kv= 20.3 fps
9.1	473	0.0300	0.87		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
14.0	595	Total			

Summary for Link 2L: DP-A

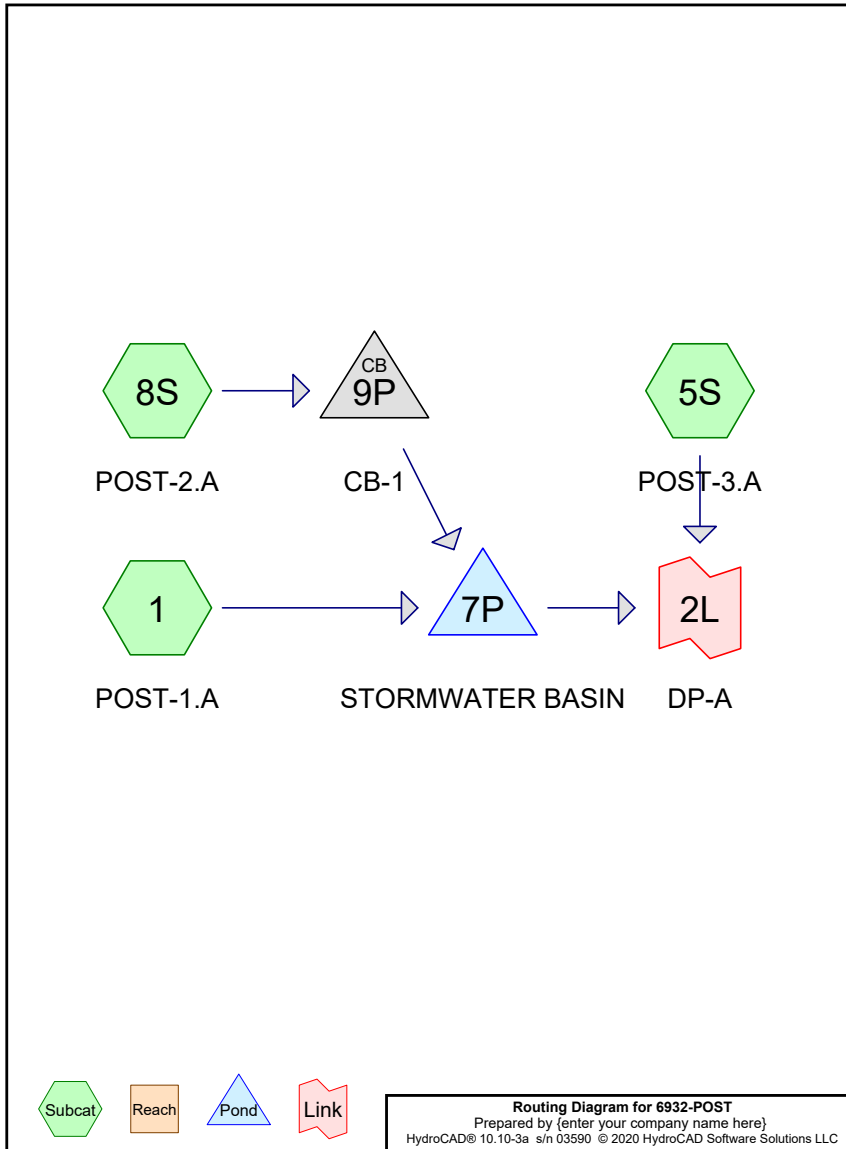
Inflow Area = 2.281 ac, 15.28% Impervious, Inflow Depth = 4.76" for 100-yr event

Inflow = 9.83 cfs @ 12.20 hrs, Volume= 0.906 af

Primary = 9.83 cfs @ 12.20 hrs, Volume= 0.906 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Appendix E - Proposed Conditions Hydrologic Calculations



6932-POST

Type III 24-hr 2-yr Rainfall=3.07"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: POST-1.A	Runoff Area=31,995 sf 0.00% Impervious Runoff Depth=2.23" Tc=6.0 min CN=92 Runoff=1.84 cfs 0.136 af
Subcatchment5S: POST-3.A	Runoff Area=55,100 sf 0.00% Impervious Runoff Depth=0.58" Tc=14.0 min CN=66 Runoff=0.51 cfs 0.061 af
Subcatchment8S: POST-2.A	Runoff Area=12,278 sf 100.00% Impervious Runoff Depth=2.84" Tc=6.0 min CN=98 Runoff=0.82 cfs 0.067 af
Pond 7P: STORMWATERBASIN	Peak Elev=306.39' Storage=3,650 cf Inflow=2.66 cfs 0.203 af Outflow=0.54 cfs 0.192 af
Pond 9P: CB-1	Peak Elev=308.33' Inflow=0.82 cfs 0.067 af 12.0" Round Culvert n=0.012 L=140.0' S=0.0129 '/' Outflow=0.82 cfs 0.067 af
Link 2L: DP-A	Inflow=1.03 cfs 0.253 af Primary=1.03 cfs 0.253 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.264 af Average Runoff Depth = 1.39"
87.64% Pervious = 1.999 ac 12.36% Impervious = 0.282 ac

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Type III 24-hr 2-yr Rainfall=3.07"

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Summary for Subcatchment 1: POST-1.A

Runoff = 1.84 cfs @ 12.09 hrs, Volume= 0.136 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.07"

Area (sf)	CN	Description
6,073	96	Gravel surface, HSG A
17,737	96	Gravel surface, HSG D
8,185	80	>75% Grass cover, Good, HSG D
31,995	92	Weighted Average
31,995		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment 5S: POST-3.A

Runoff = 0.51 cfs @ 12.24 hrs, Volume= 0.061 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.07"

Area (sf)	CN	Description
5,296	30	Woods, Good, HSG A
10,199	39	>75% Grass cover, Good, HSG A
5,119	80	>75% Grass cover, Good, HSG D
34,486	77	Woods, Good, HSG D
55,100	66	Weighted Average
55,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					Direct Entry,

Summary for Subcatchment 8S: POST-2.A

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.067 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.07"**6932-POST**

Type III 24-hr 2-yr Rainfall=3.07"

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Area (sf)	CN	Description
8,903	98	Paved parking, HSG A
707	98	Unconnected pavement, HSG A
2,668	98	Roofs, HSG A
12,278	98	Weighted Average
12,278		100.00% Impervious Area
707		5.76% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 7P: STORMWATER BASIN

Inflow Area = 1.016 ac, 27.73% Impervious, Inflow Depth = 2.40" for 2-yr event
 Inflow = 2.66 cfs @ 12.09 hrs, Volume= 0.203 af
 Outflow = 0.54 cfs @ 12.52 hrs, Volume= 0.192 af, Atten= 80%, Lag= 25.8 min
 Primary = 0.54 cfs @ 12.52 hrs, Volume= 0.192 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 306.39' @ 12.52 hrs Surf.Area= 5,767 sf Storage= 3,650 cf

Plug-Flow detention time= 129.3 min calculated for 0.192 af (95% of inflow)
 Center-of-Mass det. time= 100.7 min (886.2 - 785.5)

Volume	Invert	Avail.Storage	Storage	Description	
#1	305.00'	8,330 cf		Custom Stage Data (Irregular)-Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.00	381	97.0	0	0	381
306.00	3,838	274.0	1,809	1,809	5,610
307.00	9,641	437.0	6,521	8,330	14,839

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	10.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#2	Primary	305.00'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.90 Inlet / Outlet Invert= 305.00' / 304.90' S= 0.0050 ' / ' Cc= 0.90 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#3	Device 2	305.50'	5.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.54 cfs @ 12.52 hrs HW=306.39' (Free Discharge)

1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

2=Culvert (Passes 0.54 cfs of 2.81 cfs potential flow)

3=Orifice/Grate (Orifice Controls 0.54 cfs @ 3.96 fps)

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Type III 24-hr 2-yr Rainfall=3.07"

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Summary for Pond 9P: CB-1

Inflow Area = 0.282 ac, 100.00% Impervious, Inflow Depth = 2.84" for 2-yr event
 Inflow = 0.82 cfs @ 12.09 hrs, Volume= 0.067 af
 Outflow = 0.82 cfs @ 12.09 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
 Primary = 0.82 cfs @ 12.09 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 308.33' @ 12.09 hrs

Flood Elev= 311.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	307.80'	12.0" Round Culvert L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.80' / 306.00' S= 0.0129 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.80 cfs @ 12.09 hrs HW=308.32' (Free Discharge)

1=Culvert (Inlet Controls 0.80 cfs @ 1.94 fps)

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 12.36% Impervious, Inflow Depth = 1.33" for 2-yr event
 Inflow = 1.03 cfs @ 12.26 hrs, Volume= 0.253 af
 Primary = 1.03 cfs @ 12.26 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

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Type III 24-hr 10-yr Rainfall=4.56"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: POST-1.A Runoff Area=31,995 sf 0.00% Impervious Runoff Depth=3.66"
 Tc=6.0 min CN=92 Runoff=2.94 cfs 0.224 af

Subcatchment5S: POST-3.A Runoff Area=55,100 sf 0.00% Impervious Runoff Depth=1.44"
 Tc=14.0 min CN=66 Runoff=1.54 cfs 0.151 af

Subcatchment8S: POST-2.A Runoff Area=12,278 sf 100.00% Impervious Runoff Depth=4.32"
 Tc=6.0 min CN=98 Runoff=1.23 cfs 0.102 af

Pond 7P: STORMWATERBASIN Peak Elev=306.67' Storage=5,534 cf Inflow=4.17 cfs 0.326 af
 Outflow=1.14 cfs 0.315 af

Pond 9P: CB-1 Peak Elev=308.47' Inflow=1.23 cfs 0.102 af
 12.0" Round Culvert n=0.012 L=140.0' S=0.0129 '/' Outflow=1.23 cfs 0.102 af

Link 2L: DP-A Inflow=2.25 cfs 0.466 af
 Primary=2.25 cfs 0.466 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.477 af Average Runoff Depth = 2.51"
87.64% Pervious = 1.999 ac 12.36% Impervious = 0.282 ac

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Type III 24-hr 10-yr Rainfall=4.56"

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Summary for Subcatchment 1: POST-1.A

Runoff = 2.94 cfs @ 12.09 hrs, Volume= 0.224 af, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.56"

Area (sf)	CN	Description
6,073	96	Gravel surface, HSG A
17,737	96	Gravel surface, HSG D
8,185	80	>75% Grass cover, Good, HSG D
31,995	92	Weighted Average
31,995		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment 5S: POST-3.A

Runoff = 1.54 cfs @ 12.21 hrs, Volume= 0.151 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.56"

Area (sf)	CN	Description
5,296	30	Woods, Good, HSG A
10,199	39	>75% Grass cover, Good, HSG A
5,119	80	>75% Grass cover, Good, HSG D
34,486	77	Woods, Good, HSG D
55,100	66	Weighted Average
55,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					Direct Entry,

Summary for Subcatchment 8S: POST-2.A

Runoff = 1.23 cfs @ 12.09 hrs, Volume= 0.102 af, Depth= 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.56"**6932-POST**

Type III 24-hr 10-yr Rainfall=4.56"

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Area (sf)	CN	Description
8,903	98	Paved parking, HSG A
707	98	Unconnected pavement, HSG A
2,668	98	Roofs, HSG A
12,278	98	Weighted Average
12,278		100.00% Impervious Area
707		5.76% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 7P: STORMWATER BASIN

Inflow Area = 1.016 ac, 27.73% Impervious, Inflow Depth = 3.84" for 10-yr event
 Inflow = 4.17 cfs @ 12.09 hrs, Volume= 0.326 af
 Outflow = 1.14 cfs @ 12.44 hrs, Volume= 0.315 af, Atten= 73%, Lag= 21.2 min
 Primary = 1.14 cfs @ 12.44 hrs, Volume= 0.315 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 306.67' @ 12.44 hrs Surf.Area= 7,447 sf Storage= 5,534 cf

Plug-Flow detention time= 121.4 min calculated for 0.315 af (97% of inflow)
 Center-of-Mass det. time= 101.2 min (875.6 - 774.4)

Volume	Invert	Avail.Storage	Storage	Description	
#1	305.00'	8,330 cf		Custom Stage Data (Irregular) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.00	381	97.0	0	0	381
306.00	3,838	274.0	1,809	1,809	5,610
307.00	9,641	437.0	6,521	8,330	14,839

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	10.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#2	Primary	305.00'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.90 Inlet / Outlet Invert= 305.00' / 304.90' S= 0.0050 ' /' Cc= 0.90 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#3	Device 2	305.50'	5.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.14 cfs @ 12.44 hrs HW=306.67' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 0.49 cfs @ 0.69 fps)

2=Culvert (Passes 0.64 cfs of 3.23 cfs potential flow)

3=Orifice/Grate (Orifice Controls 0.64 cfs @ 4.73 fps)

6932-POST

Type III 24-hr 10-yr Rainfall=4.56"

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Summary for Pond 9P: CB-1

Inflow Area = 0.282 ac, 100.00% Impervious, Inflow Depth = 4.32" for 10-yr event
 Inflow = 1.23 cfs @ 12.09 hrs, Volume= 0.102 af
 Outflow = 1.23 cfs @ 12.09 hrs, Volume= 0.102 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.23 cfs @ 12.09 hrs, Volume= 0.102 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 308.47' @ 12.09 hrs

Flood Elev= 311.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	307.80'	12.0" Round Culvert L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.80' / 306.00' S= 0.0129 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.19 cfs @ 12.09 hrs HW=308.46' (Free Discharge)

1=Culvert (Inlet Controls 1.19 cfs @ 2.18 fps)

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 12.36% Impervious, Inflow Depth = 2.45" for 10-yr event
 Inflow = 2.25 cfs @ 12.33 hrs, Volume= 0.466 af
 Primary = 2.25 cfs @ 12.33 hrs, Volume= 0.466 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

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Type III 24-hr 25-yr Rainfall=5.72"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: POST-1.A Runoff Area=31,995 sf 0.00% Impervious Runoff Depth=4.79"
 Tc=6.0 min CN=92 Runoff=3.79 cfs 0.293 af

Subcatchment5S: POST-3.A Runoff Area=55,100 sf 0.00% Impervious Runoff Depth=2.23"
 Tc=14.0 min CN=66 Runoff=2.49 cfs 0.236 af

Subcatchment8S: POST-2.A Runoff Area=12,278 sf 100.00% Impervious Runoff Depth=5.48"
 Tc=6.0 min CN=98 Runoff=1.54 cfs 0.129 af

Pond 7P: STORMWATERBASIN Peak Elev=306.76' Storage=6,197 cf Inflow=5.34 cfs 0.422 af
 Outflow=2.28 cfs 0.411 af

Pond 9P: CB-1 Peak Elev=308.57' Inflow=1.54 cfs 0.129 af
 12.0" Round Culvert n=0.012 L=140.0' S=0.0129 '/' Outflow=1.54 cfs 0.129 af

Link 2L: DP-A Inflow=4.63 cfs 0.647 af
 Primary=4.63 cfs 0.647 af

Total Runoff Area = 2.281 ac Runoff Volume = 0.658 af Average Runoff Depth = 3.46"
87.64% Pervious = 1.999 ac 12.36% Impervious = 0.282 ac

6932-POST

Type III 24-hr 25-yr Rainfall=5.72"

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Summary for Subcatchment 1: POST-1.A

Runoff = 3.79 cfs @ 12.09 hrs, Volume= 0.293 af, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.72"

Area (sf)	CN	Description
6,073	96	Gravel surface, HSG A
17,737	96	Gravel surface, HSG D
8,185	80	>75% Grass cover, Good, HSG D
31,995	92	Weighted Average
31,995		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment 5S: POST-3.A

Runoff = 2.49 cfs @ 12.21 hrs, Volume= 0.236 af, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.72"

Area (sf)	CN	Description
5,296	30	Woods, Good, HSG A
10,199	39	>75% Grass cover, Good, HSG A
5,119	80	>75% Grass cover, Good, HSG D
34,486	77	Woods, Good, HSG D
55,100	66	Weighted Average
55,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					Direct Entry,

Summary for Subcatchment 8S: POST-2.A

Runoff = 1.54 cfs @ 12.09 hrs, Volume= 0.129 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=5.72"

6932-POST

Type III 24-hr 25-yr Rainfall=5.72"

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Area (sf)	CN	Description
8,903	98	Paved parking, HSG A
707	98	Unconnected pavement, HSG A
2,668	98	Roofs, HSG A
12,278	98	Weighted Average
12,278		100.00% Impervious Area
707		5.76% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 7P: STORMWATER BASIN

Inflow Area = 1.016 ac, 27.73% Impervious, Inflow Depth = 4.99" for 25-yr event
 Inflow = 5.34 cfs @ 12.09 hrs, Volume= 0.422 af
 Outflow = 2.28 cfs @ 12.29 hrs, Volume= 0.411 af, Atten= 57%, Lag= 12.1 min
 Primary = 2.28 cfs @ 12.29 hrs, Volume= 0.411 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
 Peak Elev= 306.76' @ 12.29 hrs Surf.Area= 7,994 sf Storage= 6,197 cf

Plug-Flow detention time= 105.6 min calculated for 0.411 af (97% of inflow)
 Center-of-Mass det. time= 90.7 min (859.3 - 768.6)

Volume	Invert	Avail.Storage	Storage	Description	
#1	305.00'	8,330 cf		Custom Stage Data (Irregular)-Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.00	381	97.0	0	0	381
306.00	3,838	274.0	1,809	1,809	5,610
307.00	9,641	437.0	6,521	8,330	14,839

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	10.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#2	Primary	305.00'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.90 Inlet / Outlet Invert= 305.00' / 304.90' S= 0.0050 ' /' Cc= 0.90 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#3	Device 2	305.50'	5.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.27 cfs @ 12.29 hrs HW=306.76' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 1.60 cfs @ 1.02 fps)

2=Culvert (Passes 0.67 cfs of 3.35 cfs potential flow)

3=Orifice/Grate (Orifice Controls 0.67 cfs @ 4.93 fps)

6932-POST

Type III 24-hr 25-yr Rainfall=5.72"

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Summary for Pond 9P: CB-1

Inflow Area = 0.282 ac, 100.00% Impervious, Inflow Depth = 5.48" for 25-yr event
 Inflow = 1.54 cfs @ 12.09 hrs, Volume= 0.129 af
 Outflow = 1.54 cfs @ 12.09 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min
 Primary = 1.54 cfs @ 12.09 hrs, Volume= 0.129 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 308.57' @ 12.09 hrs

Flood Elev= 311.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	307.80'	12.0" Round Culvert L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.80' / 306.00' S= 0.0129 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.50 cfs @ 12.09 hrs HW=308.56' (Free Discharge)

1=Culvert (Inlet Controls 1.50 cfs @ 2.34 fps)

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 12.36% Impervious, Inflow Depth = 3.40" for 25-yr event
 Inflow = 4.63 cfs @ 12.24 hrs, Volume= 0.647 af
 Primary = 4.63 cfs @ 12.24 hrs, Volume= 0.647 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

6932-POST

Type III 24-hr 100-yr Rainfall=8.08"

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Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: POST-1.A Runoff Area=31,995 sf 0.00% Impervious Runoff Depth=7.12"
 Tc=6.0 min CN=92 Runoff=5.51 cfs 0.436 af

Subcatchment5S: POST-3.A Runoff Area=55,100 sf 0.00% Impervious Runoff Depth=4.07"
 Tc=14.0 min CN=66 Runoff=4.65 cfs 0.429 af

Subcatchment8S: POST-2.A Runoff Area=12,278 sf 100.00% Impervious Runoff Depth=7.84"
 Tc=6.0 min CN=98 Runoff=2.18 cfs 0.184 af

Pond 7P: STORMWATERBASIN Peak Elev=306.90' Storage=7,421 cf Inflow=7.69 cfs 0.620 af
 Outflow=5.03 cfs 0.609 af

Pond 9P: CB-1 Peak Elev=308.83' Inflow=2.18 cfs 0.184 af
 12.0" Round Culvert n=0.012 L=140.0' S=0.0129 '/' Outflow=2.18 cfs 0.184 af

Link 2L: DP-A Inflow=9.67 cfs 1.039 af
 Primary=9.67 cfs 1.039 af

Total Runoff Area = 2.281 ac Runoff Volume = 1.049 af Average Runoff Depth = 5.52"
87.64% Pervious = 1.999 ac 12.36% Impervious = 0.282 ac

6932-POST

Type III 24-hr 100-yr Rainfall=8.08"

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Summary for Subcatchment 1: POST-1.A

Runoff = 5.51 cfs @ 12.09 hrs, Volume= 0.436 af, Depth= 7.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.08"

Area (sf)	CN	Description
6,073	96	Gravel surface, HSG A
17,737	96	Gravel surface, HSG D
8,185	80	>75% Grass cover, Good, HSG D
31,995	92	Weighted Average
31,995		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment 5S: POST-3.A

Runoff = 4.65 cfs @ 12.20 hrs, Volume= 0.429 af, Depth= 4.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.08"

Area (sf)	CN	Description
5,296	30	Woods, Good, HSG A
10,199	39	>75% Grass cover, Good, HSG A
5,119	80	>75% Grass cover, Good, HSG D
34,486	77	Woods, Good, HSG D
55,100	66	Weighted Average
55,100		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					Direct Entry,

Summary for Subcatchment 8S: POST-2.A

Runoff = 2.18 cfs @ 12.09 hrs, Volume= 0.184 af, Depth= 7.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.08"

6932-POST

Type III 24-hr 100-yr Rainfall=8.08"

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Area (sf)	CN	Description
8,903	98	Paved parking, HSG A
707	98	Unconnected pavement, HSG A
2,668	98	Roofs, HSG A
12,278	98	Weighted Average
12,278		100.00% Impervious Area
707		5.76% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Pond 7P: STORMWATER BASIN

Inflow Area = 1.016 ac, 27.73% Impervious, Inflow Depth = 7.32" for 100-yr event
Inflow = 7.69 cfs @ 12.09 hrs, Volume= 0.620 af
Outflow = 5.03 cfs @ 12.19 hrs, Volume= 0.609 af, Atten= 35%, Lag= 6.0 min
Primary = 5.03 cfs @ 12.19 hrs, Volume= 0.609 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 306.90' @ 12.19 hrs Surf.Area= 8,958 sf Storage= 7,421 cf

Plug-Flow detention time= 89.5 min calculated for 0.609 af (98% of inflow)
Center-of-Mass det. time= 77.9 min (838.5 - 760.6)

Volume	Invert	Avail.Storage	Storage	Description	
#1	305.00'	8,330 cf		Custom Stage Data (Irregular) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
305.00	381	97.0	0	0	381
306.00	3,838	274.0	1,809	1,809	5,610
307.00	9,641	437.0	6,521	8,330	14,839

Device	Routing	Invert	Outlet Devices
#1	Primary	306.60'	10.0' long x 12.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64
#2	Primary	305.00'	12.0" Round Culvert L= 20.0' CPP, projecting, no headwall, Ke= 0.90 Inlet / Outlet Invert= 305.00' / 304.90' S= 0.0050 ' / ' Cc= 0.90 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#3	Device 2	305.50'	5.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.98 cfs @ 12.19 hrs HW=306.90' (Free Discharge)

1=Broad-Crested Rectangular Weir (Weir Controls 4.27 cfs @ 1.42 fps)

2=Culvert (Passes 0.72 cfs of 3.53 cfs potential flow)

3=Orifice/Grate (Orifice Controls 0.72 cfs @ 5.26 fps)

6932-POST

Type III 24-hr 100-yr Rainfall=8.08"

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Summary for Pond 9P: CB-1

Inflow Area = 0.282 ac, 100.00% Impervious, Inflow Depth = 7.84" for 100-yr event
 Inflow = 2.18 cfs @ 12.09 hrs, Volume= 0.184 af
 Outflow = 2.18 cfs @ 12.09 hrs, Volume= 0.184 af, Atten= 0%, Lag= 0.0 min
 Primary = 2.18 cfs @ 12.09 hrs, Volume= 0.184 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 308.83' @ 12.09 hrs

Flood Elev= 311.80'

Device	Routing	Invert	Outlet Devices
#1	Primary	307.80'	12.0" Round Culvert L= 140.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 307.80' / 306.00' S= 0.0129 1/n Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.12 cfs @ 12.09 hrs HW=308.80' (Free Discharge)

1=Culvert (Inlet Controls 2.12 cfs @ 2.70 fps)

Summary for Link 2L: DP-A

Inflow Area = 2.281 ac, 12.36% Impervious, Inflow Depth = 5.46" for 100-yr event
 Inflow = 9.67 cfs @ 12.19 hrs, Volume= 1.039 af
 Primary = 9.67 cfs @ 12.19 hrs, Volume= 1.039 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Appendix F – Stormwater Calculations

Stormwater Basin

Sediment Forebay Calculations

CALCULATIONS

Required Sediment Forebay vol, Fv:

$$F_v = A_c(\text{cu. ft}) \times 0.1 \text{ inch of impervious area}$$

$$^1 \text{ Imp. area captured by ponds, } A_p = 0.281 \text{ Ac}$$

$$\text{Required Sediment Forebay vol, } F_v = 102 \text{ C.ft}$$

$$\text{Sediment Forebay Volume Provided} = 539 \text{ C.ft}$$

CALCULATIONS

Water Quality Calculation:

$$V_{WQ} = D_{WQ}(\text{ft}) \times A_T(\text{ft}^2)$$

$$\text{Water Quality Depth} = 0.5 \text{ in}$$

$$\text{Water Quality Depth, } D_{WQ} = 0.04 \text{ ft.}$$

$$\text{Total impervious area on site, } A_T = 0.282 \text{ Ac.}$$

$$A_T = 12,284 \text{ ft}^2$$

$$\text{Required Water Quality Volume, } V_{WQ} = 512 \text{ C.ft.}$$

REFERENCES

1 inch depth
Zone II discharges
IWPA discharges
Critical Area
Runoff from LUHPPL
Infiltration rate >2.4 inches/hour
1/2 inch depth
Discharge to other ares
8 inch
9 inch
10 inch
11 inch

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

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 Calculation Worksheet

B	C	D	E	F
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Wet Basin	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal =

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E) which enters the BMP

Appendix G – Construction Period Pollution Prevention

The project is covered under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit, which will be submitted in place of the Construction Period Pollution Prevention Plan, prior to any land disturbance.

Appendix H - Operation and Maintenance Plan

STORMWATER OPERATION & MAINTENANCE MANUAL

FOR

184 AYER ROAD

IN

**HARVARD,
MASSACHUSETTS**

PREPARED BY: DILLIS & ROY
CIVIL DESIGN GROUP, INC.
1 Main Street, Suite 1
Lunenburg, MA 01462

PREPARED FOR: CS BAILEY LANDSCAPE, INC.
19 WHITTEMORE STREET
ARLINGTON, MA 02474

OCTOBER 24TH, 2023

CDG PROJECT #6932

TABLE OF CONTENTS:

1.0 Project Narrative

- 1.1 Overview of Drainage System*
- 1.2 Routine Operation & Maintenance Tasks*
- 1.3 O&M Schedule*

2.0 Appendices

Appendix A – Stormwater Management System Owners/Operators

1.0 Project Narrative

1.1 Proposed Stormwater Management System

The proposed stormwater management system was designed to reduce the peak rate of stormwater leaving the site and increase the water quality. Runoff from the proposed development will be conveyed and treated using sedimentation forebays & an infiltration basin.

Stormwater Basin with Sediment Forebay

One stormwater basin with a sediment forebay will treat the runoff. The volumes of the infiltration basins were designed to reduce runoff rates up to the 100-year storm event and sized to handle the appropriate water quality volume. The sediment forebays are designed to reduce the velocity of flow which will increase the settlement of heavy solids before emptying to the basins.

Deep Sump Hooded Catch Basins

One Deep sump hooded catch basin is proposed to convey the runoff from the proposed impervious areas & roof to the stormwater basin.

1.2 Operation & Maintenance Tasks

The following activities should be performed routinely to allow for proper functioning of the stormwater system. The following are guidelines referring to each major component of the stormwater management system.

1.2.1 Sediment Forebay

A sediment forebay is required as a pretreatment device prior to discharging stormwater to the infiltration basin. It will provide pretreatment by slowing stormwater runoff and increasing settlement of the sediment. The sediment forebay should be inspected monthly and cleaned of accumulated sediment on a quarterly basis. After sediment removal, repair any damaged vegetation by reseeding or resodding. Maintain grass at a height of 4-6 inches.

1.2.2 Stormwater Basin

Stormwater basins are stormwater runoff impoundments that are constructed over permeable soils and require pretreatment from sediment forebays. The basin is located to capture all the runoff from the impervious areas of the site.

Stormwater basins are prone to clogging and failure if proper maintenance is not scheduled. The basin should be inspected at least twice per year or after a major storm event to ensure that the basin is operating as intended. The outlet structures should be inspected for clogging or overflow release velocities that are causing scouring or erosion. The upper stage, side slopes, embankments and emergency spillway should be mowed twice a year.

1.2.3 Stone Rip Rap

The proposed swales have been designed with angular stone riprap. The stone riprap will be placed approximately 1-foot deep over Tencate Mirafi filter fabric.

Rip Rap should be inspected periodically for signs of failure. Such signs would include, undermining, high velocity wear (displacement of stones downstream), sliding, settlement, siltation, etc. Riprap should be repaired immediately upon the observation of such conditions mentioned.

Periodically, rip rap should be cleaned of silt. Siltation will be most prevalent in low velocity areas (such as directly up-stream of outlet control structures). Silt and sediment should be removed from these areas by hand.

O&M Schedule

O&M Task		Monthly	Quarterly	Spring	Fall	2-years	As-required
1.	Stormwater Basin						
	<i>Inspection</i>			x	x		x
	<i>Mowing</i>	3-4 times during the growing season					
	<i>Remove Debris</i>			x	x		x
	<i>Remove Sediment</i>						x
	<i>Re-seed</i>						x
2.	Sediment Forebay						
	<i>Inspection</i>	x		x	x		x
	<i>Mowing</i>	3-4 times during the growing season					
	<i>Remove Debris</i>		x				x
	<i>Remove Sediment</i>		x				x
	<i>Re-seed</i>						x
3.	Stone Rip Rap						
	<i>Inspection</i>			x			
	<i>Remove Debris</i>			x			x
	<i>Remove Silt/Sediment</i>					x	x
	<i>Repair</i>						x

APPENDIX A

1. Stormwater Management System Owners: To be determined
2. Current and future operators: To be determined
3. Emergency contact information: To be determined
4. Change of trustee: To be determined
5. Financial Responsible Party: To be determined
6. Routine Maintenance: To be determined
7. O&M activities: To be determined
8. Record keeping To be determined

Appendix I - Long Term Pollution Prevention Plan

LONG-TERM POLLUTION PREVENTION PLAN

FOR

184 AYER ROAD

IN

**HARVARD,
MASSACHUSETTS**

PREPARED BY: DILLIS & ROY CIVIL DESIGN GROUP, INC.
1 MAIN STREET, SUITE 1
LUNENBURG, MA 01462

PREPARED FOR: CS BAILEY LANDSCAPE, INC.
19 WHITTEMORE STREET
ARLINGTON, MA 02474

OCTOBER 24TH, 2023

CDG PROJECT # 6932

1.0 Summary

This Long-Term Pollution Prevention Plan (LTPPP) has been prepared by Dillis & Roy Civil Design Group, Inc. pursuant to the Massachusetts Stormwater Regulations. The applicant, CS Bailey Landscape, Inc. is proposing the reconfiguration of the existing paved parking area, and the construction of a gravel pad for additional storage area. The scope of work also includes the removal & replacement of an existing brick walkway around the existing structure.

The stormwater management system has been designed in accordance with the Massachusetts Stormwater Regulations to provide pretreatment of the stormwater prior to discharge.

2.0 Spill Prevention Plan

No hazardous materials other than normal cleaning items are expected to be stored on site after the construction period has ended.

It is expected that normal DEP notification procedures would be triggered for major spills such as heating oil or propane and natural gas leaks.

3.0 Stormwater System O&M

A Stormwater Operation & Maintenance plan has been prepared for the proposed stormwater management system. Refer to this document for details pertaining to the required inspections, routine maintenance and operation details including erosion stabilization.

4.0 Fertilizers, herbicides and pesticides

The application of fertilizer, herbicides and pesticides shall be performed in a manner consistent with the industry standards for the application.

No application of chemicals is to be performed within the stormwater management areas on the site.

5.0 Snow/Salt Management

5.1 Snow Plowing

It is expected that the site will be plowed by private personnel. Snow removal contractors shall be directed to stockpile snow to the areas depicted on the attached Site Plans prepared by Dillis & Roy Civil Design Group, Inc. In compliance with Town regulations, snow storage shall be prohibited in areas on or in stormwater systems. It shall not impact the sight lines where driveways

meet public roads.

5.2 *Salt/Sand Usage*

It is expected that sanding and salting will be performed on an infrequent basis during times when unusually icy conditions persist for periods of time.

5.3 *Street Sweeping*

The Stormwater Operation & Maintenance Plan calls for the parking area to be swept in the spring, after the threat of winter precipitation has passed, and in the fall.

6.0 **Waste Management**

6.1 *Solid Waste*

During construction, a dumpster will be located on the site. This area will be the primary area for the on-site storage of solid waste prior to pick-up by a waste management company.

After construction, a dumpster will be located on the site within the proposed dumpster enclosure.

Stormwater Report
184 Ayer Road

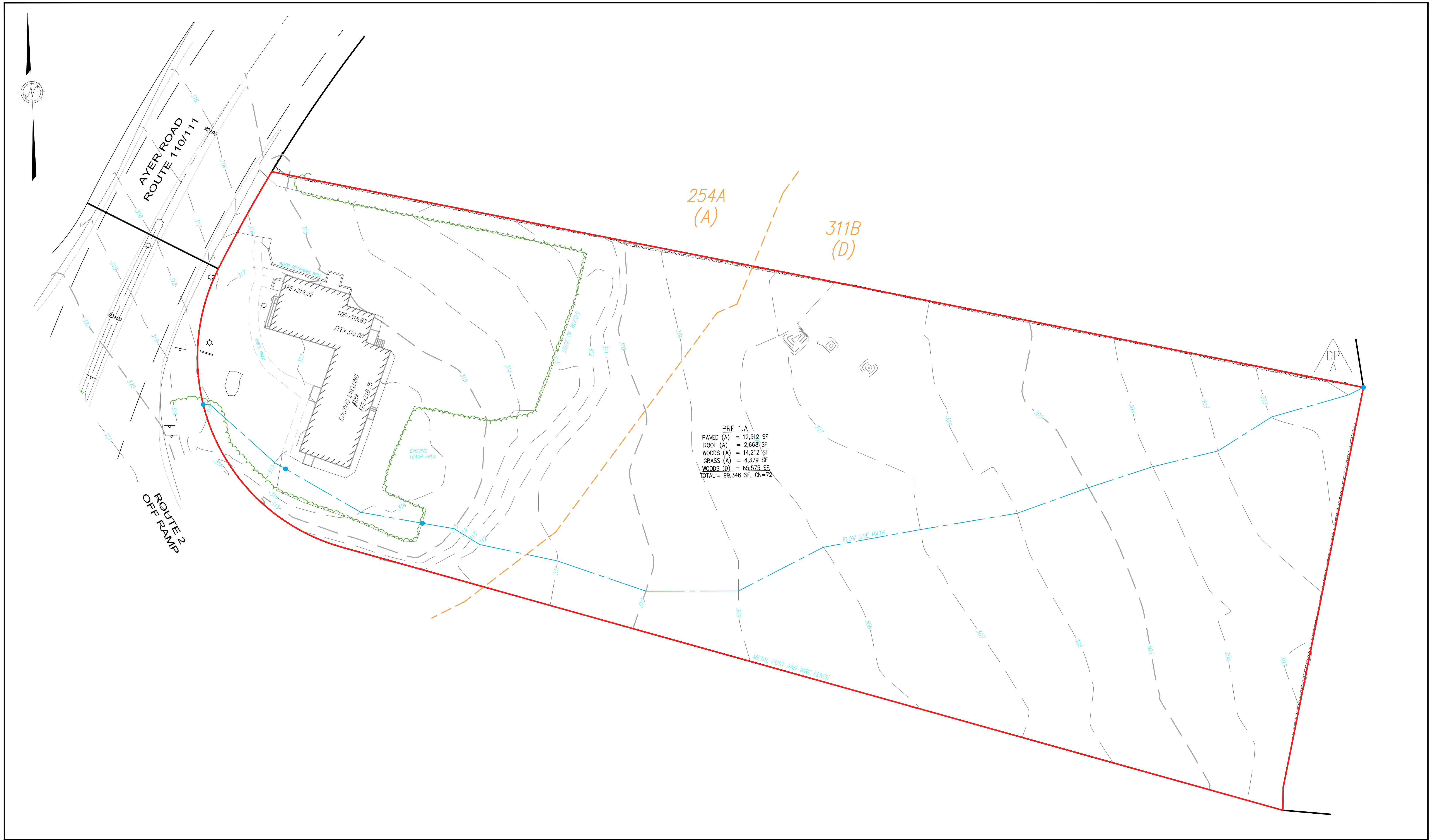
October 24th, 2023
CS Bailey Landscape, Inc.

4.0 Plans

Stormwater Report
184 Ayer Road

October 24th, 2023
CS Bailey Landscape, Inc.

Pre-development Watershed Map



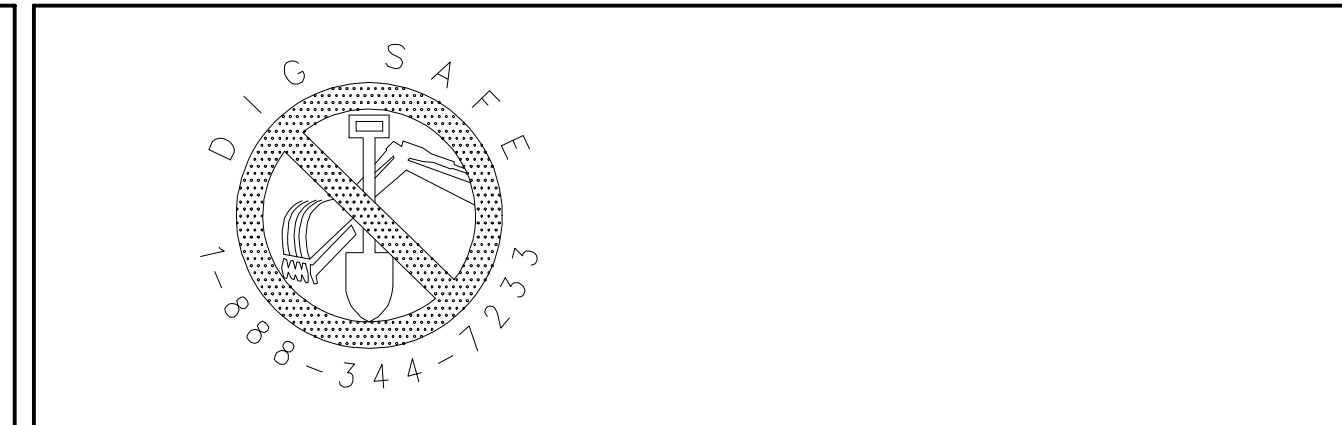
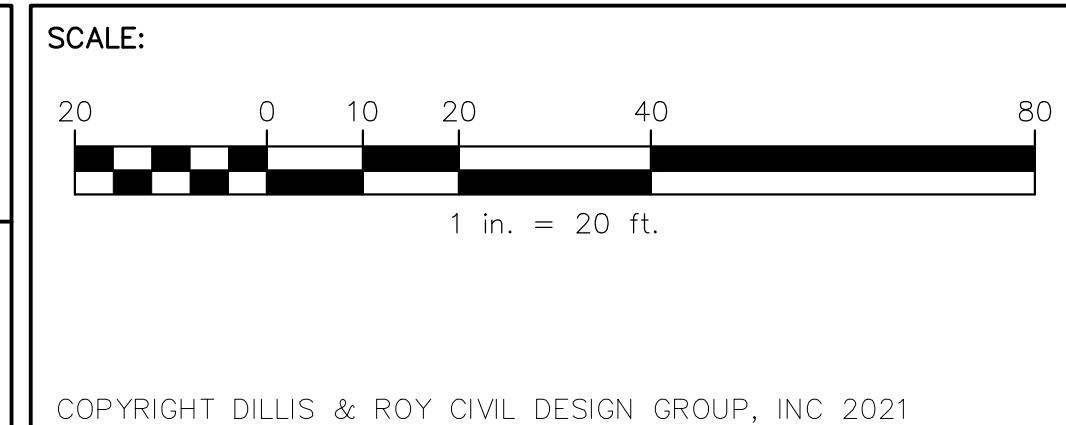
PREPARED BY:

DILLIS & ROY
CIVIL DESIGN GROUP

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 345 MAIN STREET
 NORTHBOROUGH MASSACHUSETTS

APPLICANT: CS BAILEY LANDSCAPE, INC
 19 WHITMORE SREET
 ARLINGTON, MASSACHUSETTS



DATE: 10/24/2023
 DESIGN BY: GSR
 DRAWN BY: MMK
 CHECKED BY: GSR

PRE-DEVELOPED WATERSHED MAP
 184 AYER ROAD
 HARVARD, MASSACHUSETTS

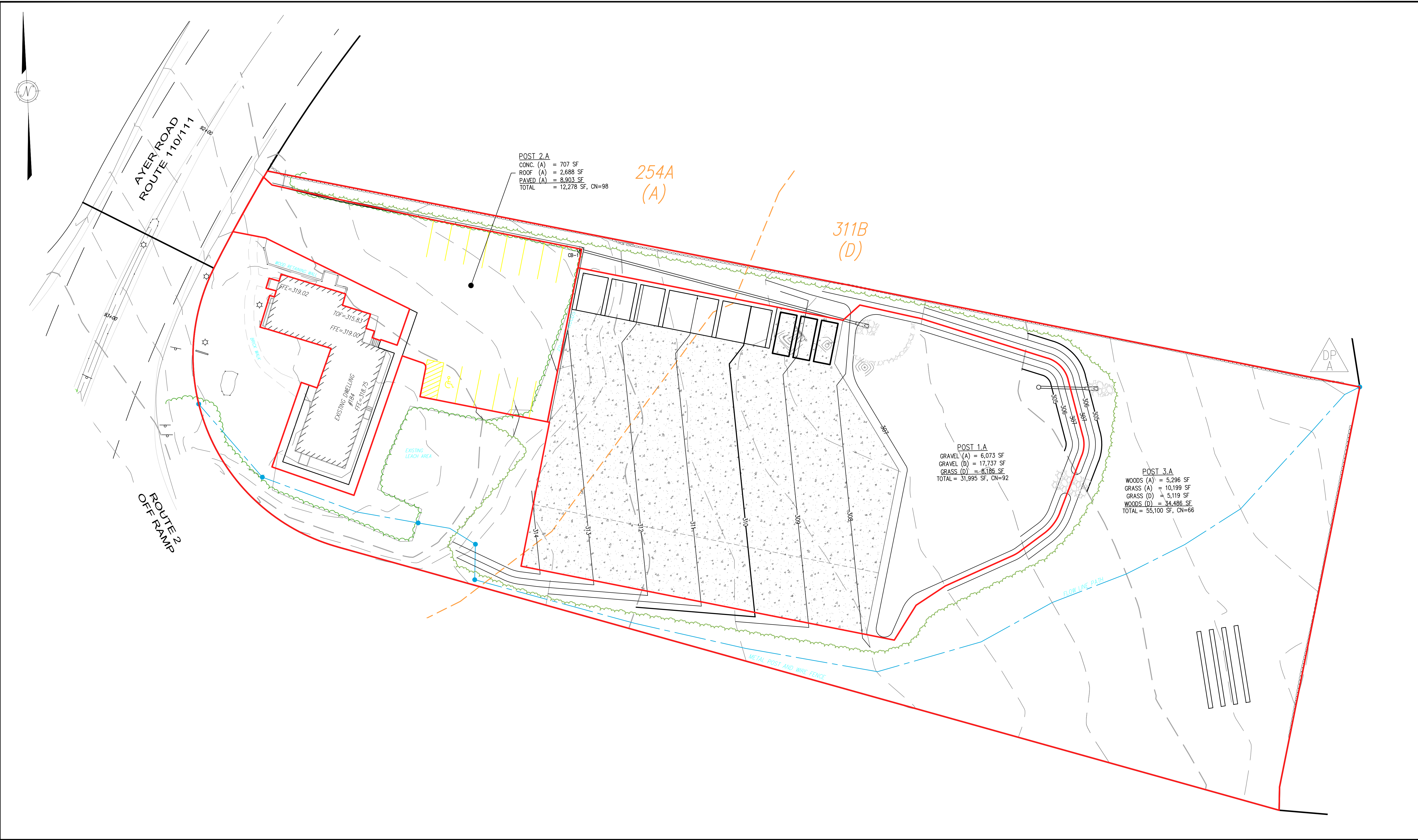
NO.	DATE	DESCRIPTION	BY

JOB NO. 6632-C
 DRAWING NO. 6632-C-DRN
 SHEET NO. DRN

Stormwater Report
184 Ayer Road

October 24th, 2023
CS Bailey Landscape, Inc.

Post-development Watershed Map



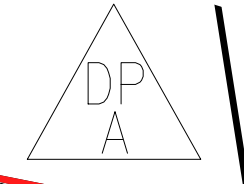
POST 2.A
 CONC. (A) = 707 SF
 ROOF (A) = 2,688 SF
 PAVED (A) = 8,903 SF
 TOTAL = 12,278 SF, CN=98

254A
 (A)

311B
 (D)

POST 1.A
 GRAVEL (A) = 6,073 SF
 GRAVEL (D) = 17,737 SF
 GRASS (D) = 8,186 SF
 TOTAL = 31,995 SF, CN=92

POST 3.A
 WOODS (A) = 5,296 SF
 GRASS (A) = 10,199 SF
 GRASS (D) = 5,119 SF
 WOODS (D) = 34,486 SF
 TOTAL = 55,100 SF, CN=66



PREPARED BY:

DILLIS & ROY
 CIVIL DESIGN GROUP

CIVIL ENGINEERS LAND SURVEYORS WETLAND CONSULTANTS
 1 MAIN STREET, SUITE 1 LUNENBURG, MA 01462
 PHONE: (978) 779-6091
 www.dillisoroy.com

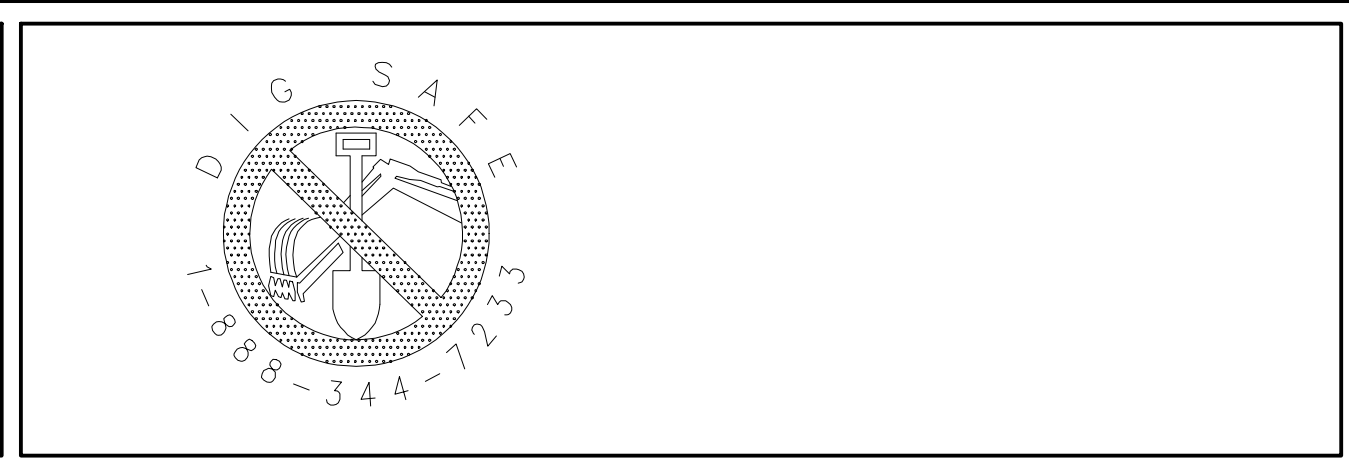
OWNER:
 PHOENIX-DURANGO LLC
 345 MAIN STREET
 NORTHBOROUGH MASSACHUSETTS

APPLICANT:
 CS BAILEY LANDSCAPE, INC
 19 WHITMORE SREET
 ARLINGTON, MASSACHUSETTS

SCALE:

1 in. = 20 ft.

COPYRIGHT DILLIS & ROY CIVIL DESIGN GROUP, INC 2021



DATE:
 10/24/2023

DESIGN BY:
 GSR

DRAWN BY:
 MMK

CHECKED BY:
 GSR

POST-DEVELOPED WATERSHED MAP
 184 AYER ROAD
 HARVARD, MASSACHUSETTS

NO.	DATE	DESCRIPTION	BY

JOB NO.
 6632-C

DRAWING NO.
 6632-C-DRN

SHEET NO.
DRN



MEMORANDUM

DATE: October 31, 2023

TO: Planning Board

FROM: Conservation Commission 

RE: 184 Ayer Road Site Plan Review

The Conservation Commission has no comment in regard to the above-mentioned application. However, as the Agent for the Planning Board's Erosion Control Bylaw (§125-58) I would suggest the following conditions be included in the decision:

- 1) Erosion Control Permit and approved plans shall be posted at the work site over the duration of site disturbance, construction, and post-construction cleanup;
- 2) Siltation barrier shall be the limit of clearing and grading;
- 3) Erosion and sedimentation controls shall be constructed in accordance with §§147-16A(1) Code of the Town of Harvard;
- 4) Erosion control measures shall include the use of, silt fencing, silt sacks, mulches, and/or temporary or permanent cover crops as may be most appropriate for the area. Erosion control measures damaged from heavy rainfalls, severe storms, and construction activity shall be repaired immediately;
- 5) Siltation barrier shall be inspected by the Conservation Agent prior to the commencement of activity;
- 6) Proper re-vegetation techniques shall be employed using native plant species, proper seed bed preparation, fertilizer and mulching to protect germinating plants. Re-vegetation shall occur on cleared sites within seven (7) calendar days of final grading and shall occur during the planting season appropriate to the selected plant species;
- 7) A minimum of four (4) inches of topsoil shall be placed on all areas subject to land disturbance which are proposed to be planted; and
- 8) The siltation barrier shall not be removed until approval is provided by the Conservation Agent.

utile

November 1, 2023

Frank O'Connor
Director of Planning
13 Ayer R.
Harvard, MA 01451

Invoice # 10178

Harvard Ayer Ph2 Vision Plan

Project #2368.1

Design Consulting
October 1 - October 31, 2023

<u>Terms</u>	<u>Project Fees</u>	<u>Expenses</u>	<u>Total Project</u>
Project Not to Exceed	\$150,305.00	\$4,650.00	\$154,955.00

Consulting hours and fee

	<i>Rate (\$/HR)</i>	<i>Hrs</i>	<i>Fee/staff (\$)</i>	
Utile				
Matthew Littell	\$260	11.00	\$2,860.00	
Taskina Tareen	\$160	30.00	\$4,800.00	
Kevin Chong	\$130	31.50	\$4,095.00	
Rahi Patel	\$115	21.00	\$2,415.00	
				\$14,170.00

Consultants	<i>Invoice</i>	<i>Date</i>	<i>Amount</i>	
Nitsch Engineering	83347	12-Oct-23	\$2,027.50	
Nitsch Engineering	83659R	1-Nov-23	\$7,300.00	
				\$9,327.50

Subtotal **\$23,497.50**

Reimbursable Expenses

	<i>Invoice</i>	<i>Date</i>	<i>Amount</i>	
			\$0.00	
Subtotal - Reimbursable Expenses				\$0.00

Total Invoice Amount \$23,497.50

<i>Outstanding Invoices</i>	<i>Invoice</i>	<i>Date</i>	<i>Amount</i>	
			\$0.00	

Total Balance Due \$23,497.50

<i>Billed To Date:</i>	<i>Invoice</i>	<i>Date</i>	<i>Fee Amount</i>	<i>Expenses</i>	<i>Total Invoice</i>
	10071	1-Oct-23	\$21,115.00	\$0.00	\$21,115.00
	10178	1-Nov-23	\$23,497.50	\$0.00	\$23,497.50
			<u>\$44,612.50</u>	<u>\$0.00</u>	<u>\$44,612.50</u>
<i>Balance Remaining:</i>			\$105,692.50	\$4,650.00	\$110,342.50



2 Center Plaza, Suite 430
 Boston, MA 02108-1928
 T: 617-338-0063
 F: 617-338-6472
www.nitscheng.com

Matthew Littell
 Utile, Inc.
 115 Kingston Street
 Boston, MA 02111

October 12, 2023
 Project No: 15585.
 Invoice No: 83347

Project 15585. Ayer Road

Professional Services from August 27, 2023 to September 30, 2023

Task 010 Project Mgmt. & Coordination

Sub-Task 01 Kickoff

Professional Personnel

	Hours	Rate	Amount	
Senior Project Manager				
Alston, Joshua	2.25	250.00	562.50	
Gabriel, Marc	1.00	250.00	250.00	
Project Manager				
Creamer, Brian	2.00	215.00	430.00	
Planning Analyst				
Li, Mengyao	4.50	140.00	630.00	
Totals	9.75		1,872.50	
Total Labor				1,872.50
				Total this Sub-Task
				\$1,872.50
				Total this Task
				\$1,872.50

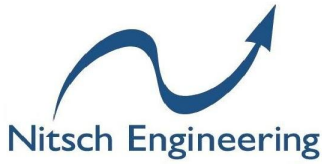
Task 030 Building & Parcel Study

Sub-Task 01 Prototypical/Soft Site Selection

Professional Personnel

	Hours	Rate	Amount	
Planner				
Picard, Sydney	1.00	155.00	155.00	
Totals	1.00		155.00	
Total Labor				155.00
				Total this Sub-Task
				\$155.00
				Total this Task
				\$155.00

Billing Limits	Current	Prior	To-Date	
Total Billings	2,027.50	0.00	2,027.50	
Limit			15,425.00	
Remaining			13,397.50	
				Total this Invoice
				\$2,027.50



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Matthew Littell
 Utile, Inc.
 115 Kingston Street
 Boston, MA 02111

November 1, 2023
 Project No: 15585.
 Invoice No: 83659R

Project 15585. Ayer Road
Professional Services from October 1, 2023 to October 28, 2023

Task 010 Project Mgmt. & Coordination
 Sub-Task 02 Biweekly Coordination Calls

Professional Personnel

	Hours	Rate	Amount	
Senior Project Manager Gabriel, Marc	1.00	260.00	260.00	
Totals	1.00		260.00	
Total Labor				260.00
		Total this Sub-Task		\$260.00
		Total this Task		\$260.00

Task 020 Background Review & Comm Visioning
 Sub-Task 01 Reference Review

Professional Personnel

	Hours	Rate	Amount	
Senior Project Manager Gabriel, Marc	1.00	260.00	260.00	
Project Manager Creamer, Brian	5.00	225.00	1,125.00	
Totals	6.00		1,385.00	
Total Labor				1,385.00
		Total this Sub-Task		\$1,385.00

Sub-Task 02 Stakeholder Interviews

Professional Personnel

	Hours	Rate	Amount	
Project Manager Creamer, Brian	7.00	225.00	1,575.00	
Totals	7.00		1,575.00	
Total Labor				1,575.00
		Total this Sub-Task		\$1,575.00
		Total this Task		\$2,960.00

Project	15585.	Ayer Road	Invoice	83659R
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Task	030	Building & Parcel Study
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Sub-Task	01	Prototypical/Soft Site Selection
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Professional Personnel

	Hours	Rate	Amount	
Planner				
Picard, Sydnie	24.00	170.00	4,080.00	
Totals	24.00		4,080.00	
Total Labor				4,080.00
		Total this Sub-Task		\$4,080.00
		Total this Task		\$4,080.00

Billing Limits	Current	Prior	To-Date	
Total Billings	7,300.00	2,027.50	9,327.50	
Limit			15,425.00	
Remaining			6,097.50	
		Total this Invoice		\$7,300.00

Outstanding Invoices

Number	Date	Balance
83347	10/12/2023	2,027.50
Total		2,027.50