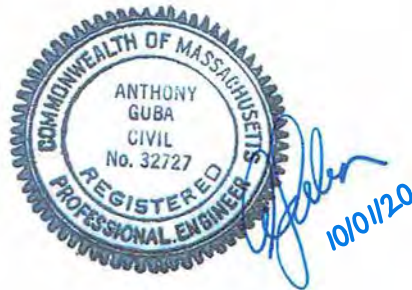


# **STORMWATER** **MANAGEMENT PLAN**

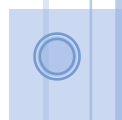
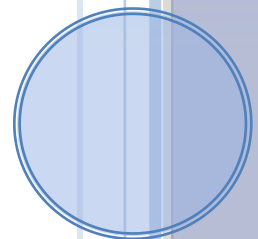
For Proposed Improvements at  
23 Central Street, Newbury, Massachusetts

21 April 2020

Revised 1 October 2020



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## **Executive Summary**

A.L. Prime is proposing to construct a gas station including a convenience store and drive-thru coffee shop at 23 Central Street, Byfield. This is being treated as a new development project.

This report has been revised to address comments made during peer review. The major change is that the drainage analysis now includes areas on the abutting property to the east. All proposed infiltration is now via subsurface structures. Two 450i Stormceptor units have been added to the proposed system.

The location is slightly under one acre and situated just east of the Central Street interchange with Interstate 95. It is zoned Highway Commercial, presently used as residential, and abutted by other residential and commercial uses. The proposed work includes razing the existing improvements and constructing a new store, fueling islands and canopy, underground tanks, utilities, pavement, and landscaping.

Although there is a proposed increase in site impervious, the development includes surface and sub-surface infiltration systems that reduce total site runoff rates and volumes from pre-development existing conditions and provides more than required recharge volume within required drawdown times. The project will incorporate best management practices (BMP) that will promote stormwater recharge and result in Total Suspended Solids (TSS) removal. The proposed improvements comply with all ten MA DEP Stormwater standards.

**The project has been designed to meet or exceed all of the requirements of the *Town of Newbury Stormwater Management, Illicit Discharge and Erosion Control Rules and Regulations* and the *MA DEP Stormwater Standards*.**

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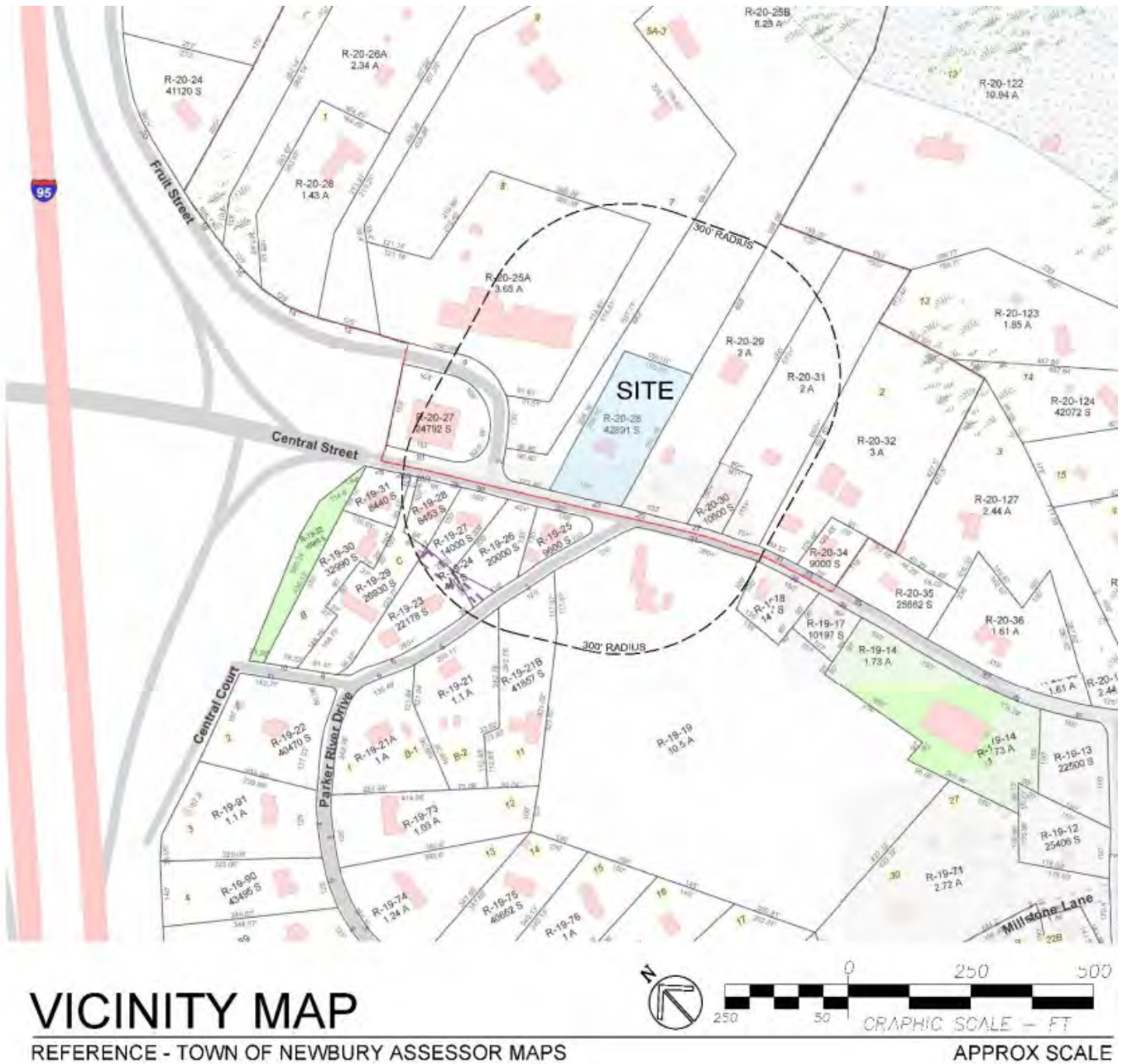
## **EXISTING CONDITIONS**

The subject site is located 23 Central Street, Byfield Massachusetts and is identified as tax assessor parcel-20-0-28. The site contains approximately 0.9 acres, gently sloping to NW and SW from middle of property. Presently it is used as residential, although zoned Highway Commercial. Improvements include a single family home and pavement for access and parking. There are a handful of mature trees and limited landscape, the site is primarily grass and lawn.

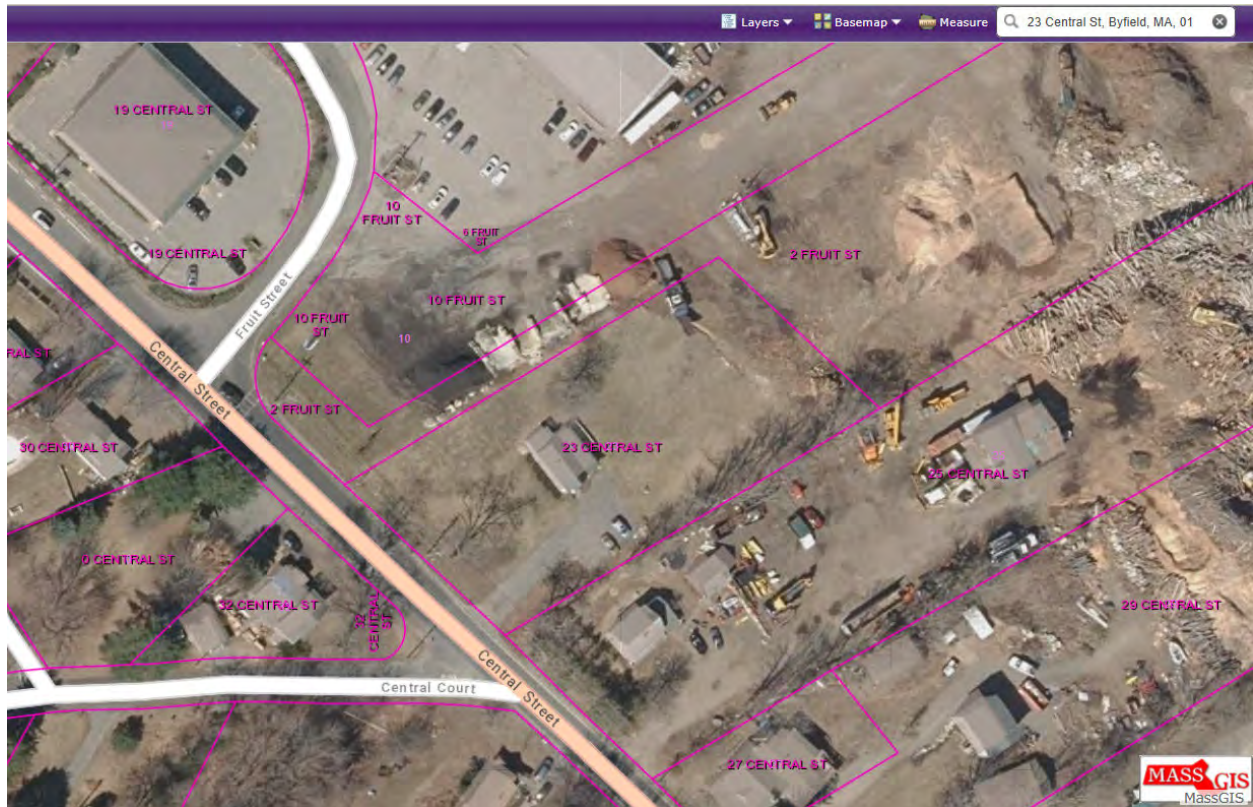
The Natural Resources Conservation Service (NRCS) Soil Map identifies the soil in the parcel area primarily as 651 - Udorthents smooth, normally considered a well-drained to excessively drained soil that has been disturbed. Over a dozen test pits were installed throughout the property to confirm existing subsurface soil conditions as well as the Estimated Seasonal High Groundwater elevation, Soil Suitability Assessments are attached. The Estimated Seasonal High Groundwater (ESHG) was found to be at 24" to 57" below existing grades, at survey elevations between 53.8 and 59.4. Percolation rates of 3 minutes per inch were reported at two test pits seem to correlate the soil classification and well drained characteristics.

Wetlands have been identified to the south of the site but the 100 foot setback buffer doesn't extend to property or proposed work.

## AREA LOCUS MAP

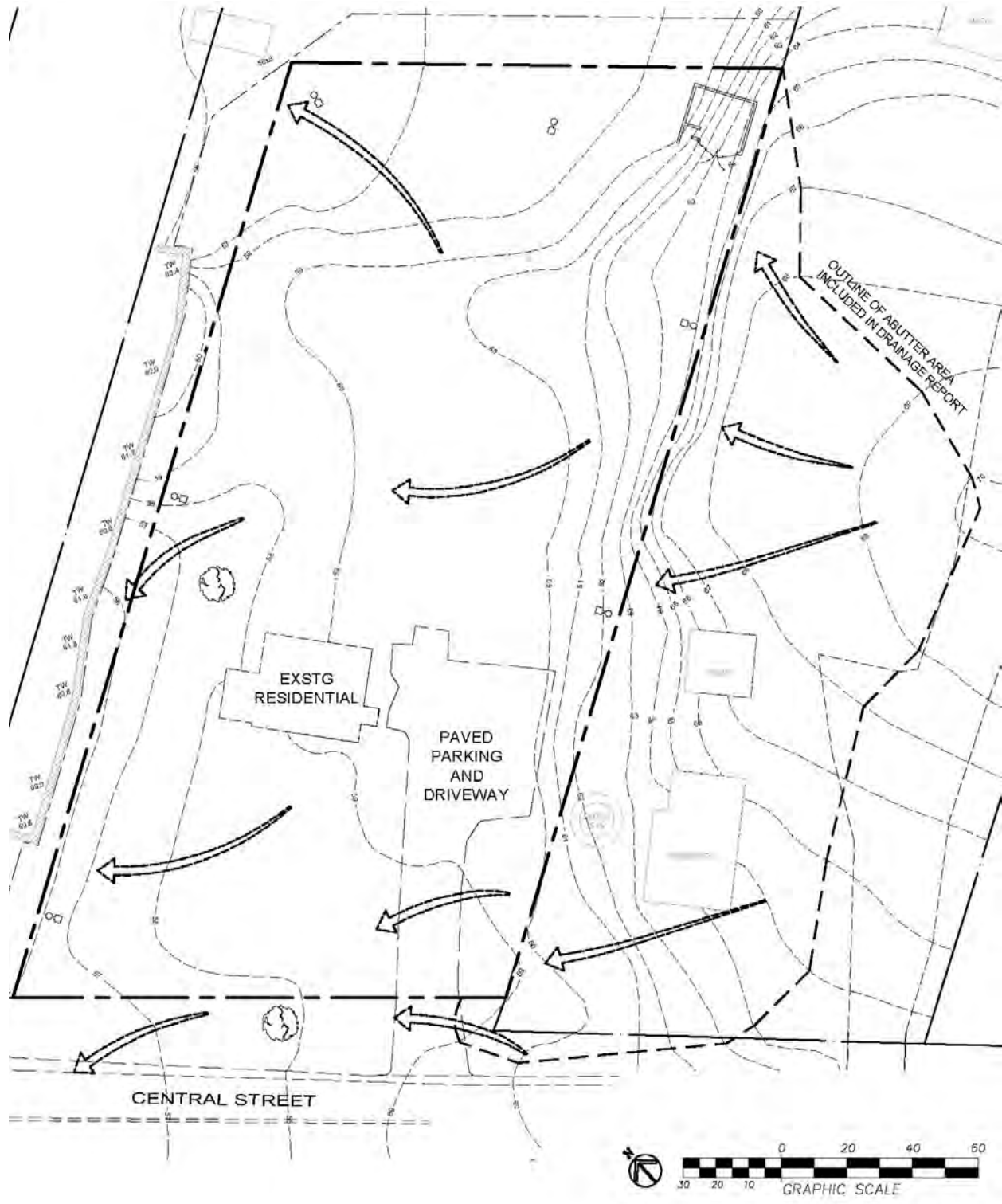


## AREA AERIAL PHOTO





## PRE-DEVELOPMENT EXISTING CONDITIONS PLAN



## **PROPOSED DEVELOPMENT**

This is being treated as a new development project.

A.L. Prime is proposing to construct a gas station including a convenience store and drive-thru coffee shop at 23 Central Street, Byfield. The proposed work includes razing the existing improvements and constructing a new store, fueling islands and canopy, underground tanks, utilities, pavement, and landscaping. The site will be accessed by two driveways on Central Street. The existing septic system will be removed and a new system will be installed.

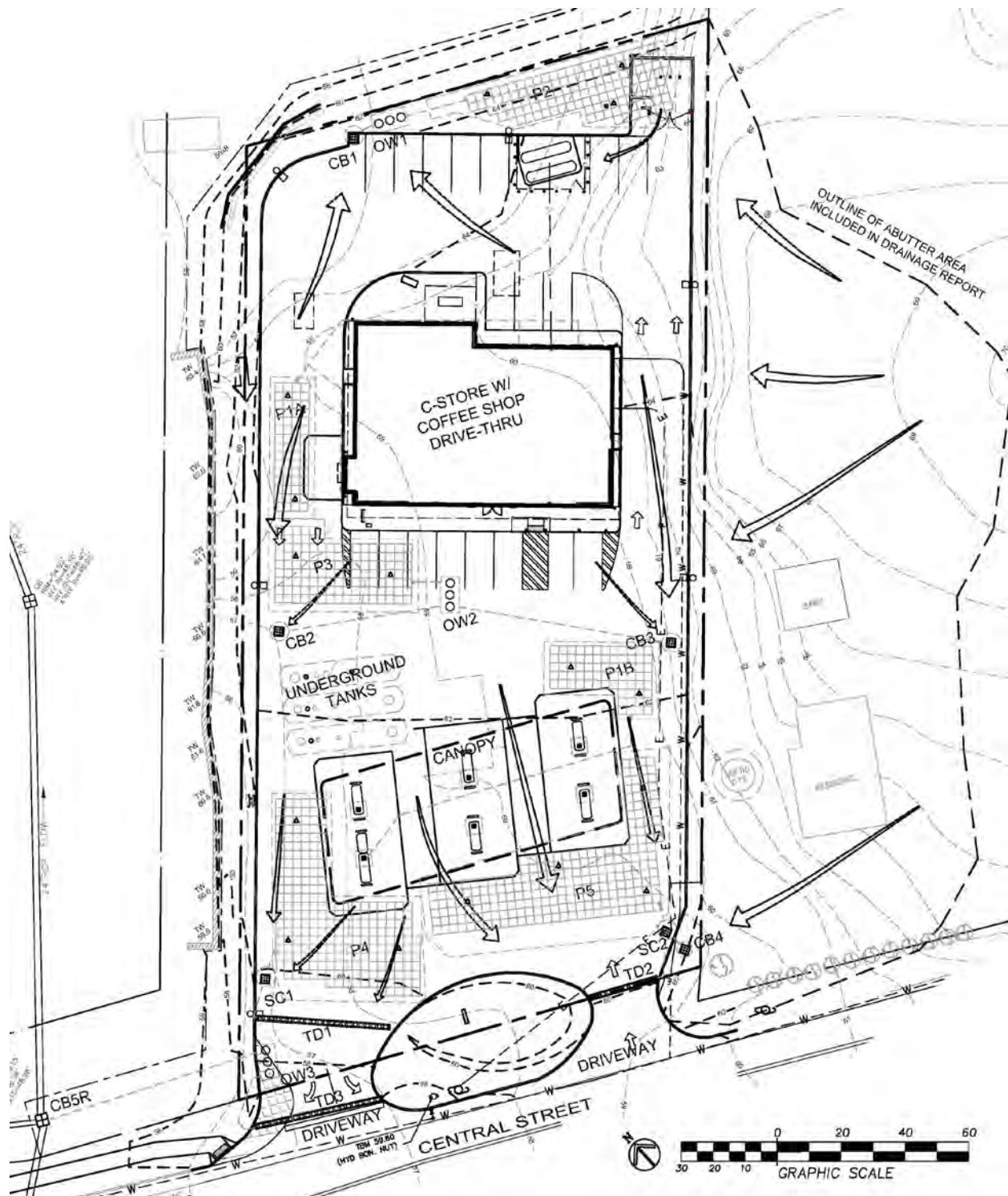
Landscaping will be located along the perimeter of the property and provide screening to the residential use to the east. There is a significant increase in site impervious but all impervious will be captured and infiltrated on site. Runoff will be routed via gutters, downspouts and underground piping from the building roof and canopy to underground infiltration systems. Pavement runoff in the north quarter of the property will be routed by sheet flow to a deep sump catch basin and oil/grit pretreatment structure before discharging to a subsurface infiltration system along the north property line. The quarter of the property alongside the new store will be routed via sheet flow to a similar subsurface system in front of the store via two catch basins tied to a second oil/grit pre-treatment structure. The south front half of the property will be routed via sheet flow to two Stormceptor 450i structures and two trench drains across the driveways. The trench drains and a small catch basin in the landscape area along the front east property line will be routed to the Stormceptor structures and then all will be routed to infiltration systems located in front of the fueling canopy. A small portion of on-site pavement and driveway pavement will be routed through a trench drain in the west driveway to a catch basin on the abutter site to the west within an easement for this piping and for site grading along the north and west property lines.

In accordance with Massachusetts Department of Environmental Stormwater Regulations, site improvements include provisions for the subsurface infiltration that will increase groundwater recharge and reduce rainfall runoff from the site to the abutting roadway and properties to below existing runoff and volumes. All subsurface infiltration from paved areas will be treated by deep sump catch basins and oil/grit separators or through Stormceptor structures to treat the runoff and remove TSS sediments as required by MA DEP Stormwater regulations. The analysis included design storms from 2 year to 100 year.

To mitigate an increase in the amount of impervious area on the site, the project will incorporate subsurface infiltration that reduces flow rates and volumes to below pre-development rates. See the runoff rates table in the following section. The project will incorporate best management practices (BMPs) to promote stormwater recharge and total suspended solids (TSS) removal and increase recharge to groundwater. The project is designed to meet or exceed all requirements of the Massachusetts Stormwater Management Standards as well as the Town of Newbury Stormwater regulations.



## LAYOUT OF PROPOSED DEVELOPMENT



## **STORMWATER RUNOFF ANALYSIS**

Stormwater impacts for the pre-development and post-development conditions were evaluated for the proposed site improvements utilizing HydroCAD stormwater modeling software. Full HydroCad reports and soil evaluation reports are attached.

The site runoff was analyzed for 2, 10, and 100 year 24 hour Storm Event Rainfalls. Cornell Extreme Precipitation Table rainfall distributions used in the analysis are: 2yr – 3.18”; 10yr – 4.90”; and 100yr – 9.10”.

Total Study Area of 66,487 square feet includes 42,891 square feet of the subject property plus off-site driveway area in the ROW abutting the front of the property and 20,566 square feet of the easterly abutter’s land.

A minimum Time of Concentration (Tc) of 6 minutes was used for both the existing and post-development models. All HydroCAD modeling exfiltration rates were set at 1.02 in/hour per MA Stormwater regulations for B Soils (sandy loam). Infiltration rates measured to be 20 in/hr (3min/inch) at during December 2019 perc testing confirm that the site contains soils that are well draining. All on site infiltration rates were set at CN 61 Good for B soil. All off site infiltration rates were set at CN 39 Good for A Soil. All pipe capacities were checked to insure no issue with proposed sizing.

The analysis compares runoff at two points, that flowing to the street and total of all runoff flowing off the site. The majority of the post development runoff is captured and infiltrated on site.

## **STORMWATER STANDARDS**

The proposed development has been designed to incorporate Best Management Practices to comply with all of the Massachusetts DEP Stormwater Standards.

### **LID MEASURES**

For this project, LID techniques considered Best Management Practices according to MA DEP include no disturbance to any Wetland Resource Areas, Subsurface Infiltration, and installation of runoff treatment structures. These measures are designed to manage stormwater within the property bounds to maximize on-site infiltration and reduce runoff. Although certain LID techniques are implemented, this project is not eligible for application of any of the LID Site Design Credits that allow reduction to required recharge.

## STANDARD 1 – NO UNTREATED DISCHARGES

This Standard is met.

There are no new untreated discharges from the site. Runoff from all new impervious surfaces is infiltrated on site. Perimeter runoff from pervious areas will be reduced and is via sheet flow replicating existing pre-development conditions. There is no direct discharge of stormwater to waters or wetlands.

## STANDARD 2 – PEAK RATE ATTENUATION

This Standard is met.

Peak discharge rates were evaluated for the 2-, 10-, and 100-year storm events. Peak discharge rates were evaluated for that runoff directly to the town right of way, Central Street, as well as for total runoff from the site to the Northwest and Southwest corners of the property.

As calculated by Hydrocad modeling, the post-development peak discharge rates and volumes do not exceed pre-development rates for all analyzed storm events per the following comparison table, demonstrating compliance with Standard 2.

<b>Runoff Comparison of Rates and Volumes from Pre to Post Conditions</b>				
	<b>Total Runoff to St</b>		<b>Total Runoff to Offsite</b>	
	<b>Rate</b>	<b>Volume</b>	<b>Rate</b>	<b>Volume</b>
<b>2yr Pre Dev</b>	0.16	0.011	0.66	0.045
<b>2yr Post Dev</b>	0.15	0.007	0.33	0.018
<b>Change</b>	-0.01	-0.004	-0.33	-0.027
<b>% change Pre to Post</b>	<b>-6%</b>	<b>-36%</b>	<b>-50%</b>	<b>-60%</b>
<b>10yr Pre Dev</b>	0.77	0.038	2.97	0.146
<b>10yr Post Dev</b>	0.28	0.013	0.74	0.037
<b>Change</b>	-0.49	-0.025	-2.23	-0.109
<b>% change Pre to Post</b>	<b>-64%</b>	<b>-66%</b>	<b>-75%</b>	<b>-75%</b>
<b>100yr Pre Dev</b>	2.88	0.134	10.91	0.508
<b>100yr Post Dev</b>	0.59	0.03	1.89	0.094
<b>Change</b>	-2.29	-0.104	-9.02	-0.414
<b>% change Pre to Post</b>	<b>-80%</b>	<b>-78%</b>	<b>-83%</b>	<b>-81%</b>

## STANDARD 3 – RECHARGE

This Standard is met.

The proposed on-site subsurface infiltration systems will meet the MA DEP required recharge to the groundwater, will drain fully within 72 hours, does not require capture area adjustment, and are separated from seasonal high groundwater by a minimum of two feet.

For the purpose of this analysis, Recharge Target Depth of 0.6 inches is used to conservatively calculate required recharge and to remain consistent with conservative model using HSG-A for existing conditions and HSG-B for post development conditions.

Required Recharge Volume ( $R_v$ ), is the product of the proposed impervious area multiplied by a Target Depth Factor:

$$R_v = \text{Total Post-Dev Impervious Area (sf)} * 0.6'' \text{ (A-type soils) (in/hr)} * 1/12 \text{ (ft/in)}$$

$$R_v = 40,361 \text{ (sf)} * 0.6 \text{ (in/hr)} * 1/12 \text{ (ft/in)}$$

$$\mathbf{R_v = 2,019 \text{ cubic feet}}$$

Static Volume =  $\sum$  ea system (area\*depth)

$$\begin{aligned} \text{Static Volume} &= P1A(626*5.0)+P1B(704*3.25)+P2(1396*3.7)+P3(1179*5.0)+P4(2136*2.5)+P5(2780*2.95) \\ &= 3,130+2,288+5,162+5,895+5,337+8,201 \end{aligned}$$

Static Volume = 30,016 cubic feet

[Considering Voids only =  $2,482+1,635+3,925+6,627+3,741+5,678 = 24,088 \text{ cf}$ ]

To comply with MA DEP, the site requires a total recharge volume of 2,019 cubic feet. The total volume of the infiltration systems is 24,088 cubic feet and exceeds the required recharge volume. Because the systems are designed to contain the 100 year design storm, they are much larger than required to meet the recharge standard.

Capture Area Adjustment is not required for this system since all impervious area is directed to infiltration BMPs.

The MA DEP Stormwater Handbook requires an analysis to show that the Required Recharge Volume will drain down in less than 72 hours. Drawdown time is calculated by dividing the required storage volume by the permeability rate (Rawls Rate) for the bottom area of the recharge volume. For this study, a Rawls rate of 1.02 is used for all post development calculations. For this calculation, all infiltration areas are summed as a cumulative calculation.

$$T = R_v / K(\text{Rawls Rate}) * (\text{bottom Area} = \sum \text{ea infiltration system})$$

$$T = 2,019 / 1.02 * (626 + 704 + 1396 + 1179 + 2136 + 2780)$$

$$T = 2,019 / 1.02 * (8,821)$$

$$\mathbf{T = 0.224 = 13.5 \text{ minutes}}$$

Time required for Required Recharge Volume drawdown is 14 minutes and meets the maximum 72 hour requirement.

The previous calculation was completed as site aggregate. Calculations were also made for each system individually using the same formulas and method and results are presented in the following table.

### **Required Recharge and Drawdown by Infiltration System**

<b>Pond Type</b>	<b>P1A</b>	<b>P1B</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>P5</b>
<b>impervious catchment area</b>	4845	3568	8390	15994	7464	17395
<b>Rv (Reqd Rech Vol)</b>	<b>242</b>	<b>178</b>	<b>420</b>	<b>800</b>	<b>373</b>	<b>870</b>
<b>SF</b>	626	704	1396	1179	2136	2780
<b>sys height</b>	5.00	3.25	3.70	5.00	2.50	2.95
<b>Provided System Volume</b>	<b>3130</b>	<b>2288</b>	<b>5165</b>	<b>5895</b>	<b>5340</b>	<b>8201</b>
<b>Sys Void only volume</b>	<b>2482</b>	<b>1635</b>	<b>3925</b>	<b>6627</b>	<b>3741</b>	<b>5678</b>
Provided volume exceeds required min recharge volume for all systems						
<b>Drawdown time (hrs)</b>	<b>0.38</b>	<b>0.25</b>	<b>0.29</b>	<b>0.66</b>	<b>0.17</b>	<b>0.31</b>
<b>minutes</b>	23	15	18	40	10	18
Drawdown time for each system is less than maximum 72 hour requirement						

The required recharge volume and drawdown times are met for each system individually as well as looking at the site in aggregate.

All infiltration systems were designed so that the bottom of the system provides a minimum of two feet of separation from the Estimated Seasonal High Groundwater elevation as provided by soil investigations at over a dozen locations throughout the site.

### **STANDARD 4 – WATER QUALITY**

This Standard is met.

The roof area portion of the runoff is considered clean.

Runoff from pavement areas is directed by sheet flow deep sump hooded catch basins, Stormceptor structures, or trench drains and pre-treated by the Stormceptors or precast sediment and oil separator structures before being routed to subsurface infiltration systems.

The Stormceptor STC performance testing indicate 75%-93% TSS removal and 65%-97% Oil or TPH removal and are particularly suited for gas station applications.

The deep sump catch basin and the oil/grit chamber each provide 25% TSS removal resulting in a 44% TSS removal.

<b>Initial Load</b>	<b>BMP</b>	<b>TSS Removal</b>	<b>Remaining TSS Load</b>
1.00	Deep Sump CB (25%)	-0.25	0.75
0.75	Grit/Oil Chamber (25%)	-0.19	0.56

#### **STANDARD 5 – LUHPPL – LAND USE WITH HIGHER POTENTIAL POLLUTANT LOAD**

This Standard is met.

The proposed use includes retail motor fueling and storage which is classified as a LUHPPL. The owner/operator will include design elements and implement operational practices to mitigate the impact of the proposed operation including BMPs as recommended in the MA DEP Stormwater handbook for these types of facilities

An emergency response plan, draft copy attached, will be prepared that designates responsible persons, training for employees, and standard operating procedures for the site. These include measures to protect from delivery overfills and for spill containment.

Other measures included:

- The fueling and tank filling areas will all be paved with minimum six inch concrete and all pavement joints in those areas will be treated with joint sealant
- The entire retail fueling area will have perimeter grooves
- The retail fueling area will be protected from direct rainfall by a canopy
- Stormwater runoff will be collected in hooded deep sump catch basins and routed through oil/grit chambers where floating contaminants and sediment will be removed from the runoff before infiltration
- All site grading is designed to keep runoff from the fueling and tank filling areas within the site property bounds
- Site operations manual will require that the fueling operations are monitored by an attendant, there will be multiple CCTV cameras throughout the fueling area
- Procedures are in place for the station and delivery driver to confirm that the tank ullage is sufficient to accept all fuel deliveries
- The storage tanks will have automatic overfill devices to prevent overfill of the tanks and spill containment equipment to capture any small drips that might occur during connection to the fills
- Emergency response materials such as absorbents are stored on site and personnel are trained on storage location and how to employ the materials
- There are areas designated for the storage of expended response materials and personnel are trained on the proper management of these materials

## **STANDARD 6 – CRITICAL AREAS**

This Standard is not applicable.

This site is not located within a Critical Resource Area. A Resource Area Delineation was completed by Norse Environmental Services confirming that no Resource areas exist on the site. The site is not in a floodplain per FEMA mapping, USGS mapping does not show any perennial streams, and Natural Heritage mapping does not show this site as an area of priority habitat.

A small wetland was located near the intersection of Central Street and Central Court, southeast of the site front property line but separated from the site by roadways. Subsequent survey of the wetland flagging determined that the wetland is located greater than 100 feet from the proposed work.

## **STANDARD 7 – REDEVELOPMENT**

This Standard is not applicable.

The change in use is being considered new development and the project is designed to comply with MA DEP Stormwater Standards as applicable to new development.

## **STANDARD 8 – CONSTRUCTION PERIOD CONTROLS**

This Standard is met.

Please refer to the “Stormwater System Construction Phase Operation and Maintenance Plan” attached as well as the Erosion Control sheet included in the Site Plan set. The site is less than one acre and no site runoff is routed to any surface body of water.

The site contractor and all sub-contractors will be made aware of this plan and the site plan drawings as well as any conditions of the Town of Newbury board or permit approvals and will be responsible for implementation of the construction phase controls.

Erosion Control will be installed at the downgradient limit of all work prior to start of construction and maintained throughout the project. This control will consist primarily of straw wattle staked in place. Construction entrance(s) will be maintained throughout the duration of the project until preparing base for pavement. All disturbed areas will be stabilized immediately to prevent sediment migration in the event of any wind or rain storm. All catch basins on the site or downgradient and potentially subject to runoff from the site will be protected.

## **STANDARD 9 – OPERATION AND MAINTENANCE PLAN**



This Standard is met.

Please refer to the Stormwater System Long Term Operation and Maintenance Plan attached.

Station managers and employees will be trained on the long term system maintenance requirements. Corporate operations personnel will assist with coordination of inspections and system maintenance. A of system maintenance log will be maintained and a sample of the log is included in the plan.

#### **STANDARD 10 – PROHIBITION OF ILLICIT DISCHARGES**

This Standard is met.

The applicant for this project has signed an Illicit Discharge Statement, a copy is attached and includes a site map per MA DEP requirements.

There are no illicit discharges proposed. All illicit discharges to the stormwater management system are prohibited. Employees will be trained on emergency response protocol for any spills; please see “Emergency Response Plan” (draft) attached. There are no connections between the wastewater systems and any stormwater drainage system.