DRAINAGE CALCULATIONS AND STORMWATER MANAGEMENT PLAN

For:

PROPOSED MIXED-USE DEVELOPMENT
ASSESSORS PARCEL MAP 29, BLOCK 329, LOT 9
655 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

Located:

655 WASHINGTON STREET
WEYMOUTH, MASSACHUSETTS

Submitted to:

TOWN OF WEYMOUTH

Prepared For:

TRINITY GREEN DEVELOPMENT
180 CANTON AVE.
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TABLE OF CONTENTS

Drainage Calculations and Stormwater Management Plan
Washington Street
Weymouth, Massachusetts

Project Summary

The project proponent, Trinity Green Development, proposes to redevelop 655 Washington Street in Weymouth, Massachusetts consisting of one (1) parcel as shown on the Weymouth Assessor's Map 29, Block 329, Lot 9 comprising of approximately 3.73 acres. The site is located entirely within the Limited Business Zoning District (B-1), and the Commercial Corridor Overlay District (CCOD).

The proposed development will consist of the construction of a four-story approximately 240,000 square foot mixed-use building and site improvement which will consist of the construction of bituminous concrete parking and access driveways, installation of subsurface stormwater management systems, utilities, site grading and professional landscaping.

This report contains stormwater runoff calculations for the pre-development and post-development conditions and includes the sizing of the proposed stormwater best management practices (BMPs). The proposed and existing site conditions are illustrated on the project *site plans* entitled "Site Development Plan, Proposed Mixed-Use Development, (Assessor's Map 29, Block 329, Lot 9, Washington Street, Weymouth, Massachusetts", prepared by McKenzie Engineering Group, Inc. dated January 12, 2021.

Refer to Figure 1- USGS Locus Map for the location of the parcel.

Pre-Development Condition

The parcel is currently developed comprised of The Boston Motel and a substantial amount of bituminous concrete pavement and the southern portion of the site being partially wooded. Developed areas slope towards Washington Street (Route 53) at the northeast property line, while wooded areas have naturally sloping terrain towards wetlands at the northwest property line. The topography of the site ranges in elevation from approximately 103 ft. (NAVD 88) south of the site to an elevation of approximately 89 ft. along Washington Street at the northern portion of the site. Portions of runoff emanating from the site flow in a northeasterly direction to the closed drainage system on Washington Street, and northwesterly to the bordering vegetated wetlands. The limit of bordering vegetated wetland resource area on the site was delineated by Environmental Consulting and Restoration, LLC on October 6, 2020. Refer to Appendix E: - Wetland Delineation Report for supporting data.

A stormwater drainage system currently exists on site which captures runoff from the site, runoff from offsite tributary areas, as well as an inlet pipe from the wetlands located at the northwest property line. The on-site drainage system conveys untreated stormwater to the closed drainage system within Washington Street (Route 53).

The site is located within the Zone X of the Flood Insurance Rate Map, as shown on the current FEMA Flood Insurance Rate Map Panel No. 25021C0229E with an effective date of July 17, 2012. Refer to Figure 2 – FEMA Flood Map.

The soil types as identified by the Soil Survey, Norfolk County, MA prepared by the NRCS Soil Conservation Service (NRCS) are classified as 602-Urban Land, 0 to 15 percent slopes with hydrologic soil group (HSG) A; and 653-Udorthents, sandy with hydrologic soil group (HSG) A. Soil testing conducted by McKenzie Engineering Group, Inc. (MEG) on December 23, 2020 identified the soils to be loamy sand (HSG) B.

Refer to Figure 3 - Soil Map for the NRCS delineation of soil types and Appendix E – Soil Testing Results for supporting data.

In the pre- and post- development stormwater analysis, the watershed area analyzed was approximately 4.79 acres consisting of the subject parcel to be developed and offsite tributary areas to the north and south. The watershed consists of two (2) sub-catchments. Refer to Pre-Development Watershed Delineation Plan WS-1 in Appendix A for a delineation of drainage subareas for the pre-development design condition.

The SCS Technical Release 20 (TR-20) and Technical Release 55 (TR-55) method-based program "HydroCAD" was employed to develop pre- and post-development peak flows. Drainage calculations were prepared for the pre-development condition for the 2, 10, 25 and 100-year, Type III storm events. Refer to Appendix A for computer results, soil characteristics, cover descriptions and times of concentrations for all subareas.

Post-Development Condition

The proposed development will consist of the construction of a four-story approximately 240,000 square foot mixed-use building and site improvement which will consist of the construction of bituminous concrete parking and access driveways, installation of subsurface stormwater management systems, utilities, site grading and professional landscaping. The project will access utility infrastructure located in Washington Street, including water, electric, telephone and cable. The stormwater management system has been designed to fully comply with all standards of the Department of Environment Protection's Stormwater Management Regulations.

Watershed areas were analyzed in the post-development condition to design low impact stormwater management facilities to mitigate impacts resulting from developing the property. The objective in designing the proposed drainage facilities for the project was to maintain existing drainage patterns to the extent practicable and to ensure that the post-development rates of runoff are less than pre-development rates at the design points.

Refer to the Post-Development Watershed Plan WS-2 in Appendix B for a delineation of post-development drainage subareas. The design points for the post-development design conditions correspond to those analyzed for the pre-development design condition.

The proposed system utilizes deep sump hooded catch basins, proprietary pre-treatment units and subsurface infiltration chamber systems. The infiltration systems are designed to accommodate peak flows generated by all storms up to and including the 100-year storm event. Refer to site plans for the drainage system design. All BMPs shall be supported by a comprehensive Construction Phase Pollution Prevention and Erosion Control Plan and Post-Development BMP Operation and Maintenance Plan.

Drainage calculations were prepared by employing the SCS TR-20 Methods for the 1, 2, 10, 25 and 100-year, type III storm events. Refer to Appendix B for computer results.

A comparison of the pre-development and post-development peak rates of runoff indicate that the peak rates of runoff for the post-development condition at all Design Points will be less than the pre-development condition for all storm events.

Stormwater Best Management Practices (BMP's)

Treatment stream for the development shall consist of deep sump hooded catch basins a proprietary pre-treatment unit, and subsurface infiltration tank systems to achieve the required removal of at least 80% of the total suspended solids (TSS) and mitigate the anticipated pollutant loading.

Refer to the TSS Removal Worksheets in Appendix D for TSS removal rates.

Erosion and Sedimentation Controls

Compost filter tube (Silt sock) erosion control barriers will be placed at the limit of work prior to the commencement of any construction activity. The integrity of the silt sock will be maintained by periodic inspection and replacement as necessary. The silt sock will remain in place until the first course of pavement has been placed and all side slopes have been loamed and seeded and vegetation has been established. Refer to the Erosion Control details on the Site Development Plans and BMP Operation and Maintenance Plan for proposed erosion control measures to be employed for the project.

Compliance with Stormwater Management Standards

Standard 1 – No New Untreated Discharges

The proposed development will not introduce any new untreated discharges to a wetland area or waters of the Commonwealth of Massachusetts. All discharges from the site will be treated through proposed stormwater quality controls such as deep sump hooded catch basins, pre-treatment structures and subsurface infiltration tank systems including the establishment of proper maintenance procedures.

Standard 2 – Peak Rate Attenuation

In the pre-development and post-development stormwater analysis, the watershed area analyzed was approximately 4.79 acres consisting of the subject parcel to be developed and offsite tributary areas. Refer to Existing Watershed Delineation Plan WS-1 for a delineation of drainage subareas for the pre-development design condition and refer to Post-Development Watershed Delineation Plan WS-2 for a delineation of drainage subareas for the post-development design condition.

Drainage calculations were performed by employing SCS TR-20 methods for the 1, 2, 10, 25, and 100-year Type III storm events. Refer to Appendix A and B for computer results. All drainage structures will be designed employing the Rational Method and the Mass. DPW Design Manual to accommodate peak flows generated by a minimum of a 25-year storm event or a 100-year storm event where applicable. The stormwater management systems were designed to accommodate peak flows generated by a 100-year storm event.

The peak rates of runoff are as follows:

Pre-Development vs. Post-Development Peak Rates of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CFS	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**	**Exist. (CFS)**	**Prop. (CFS)**
Design Point 1	*0.00*	*0.00*	*0.13*	0.07	*0.43*	0.22	*1.48*	1.01
Design Point 2	*6.04*	*5.72*	*11.40*	10.91	*15.70*	14.55	*24.57*	22.13

A comparison of the pre-development and post-development peak rates of runoff indicates that the peak rates of runoff for the post-development condition will be less than the pre-development condition for all storm events.

Pre-Development vs. Post-Development Volumes of Runoff

Design Point	2 Year Storm **(3.22 Inches)**		10 Year Storm **(4.86 Inches)**		25 Year Storm **(6.15 Inches)**		100 Year Storm **(8.80 Inches)**	
	Exist. (CF)	**Prop. (CF)**	**Exist. (CF)**	**Prop. (CF)**	**Exist. (CF)**	**Prop. (CF)**	**Exist. (CF)**	**Prop. (CF)**
Design Point 1	*136*	*78*	*1,175*	501	*2,542*	1,024	*6,410*	4,160
Design Point 2	*23,457*	*12,537*	*43,977*	28,409	*61,049*	42,395	*97,314*	73,769

Standard 3 – Groundwater Recharge

Runoff will be infiltrated by subsurface infiltration tanks, which will meet the Stormwater Guidelines for infiltration:

- Infiltration structures will be a minimum of four (4) feet above seasonal high groundwater.
- Utilize the "Simple Dynamic" method for sizing the storage volume, which takes into account the fact that stormwater is exfiltrating from the infiltration basin at the same time that the basin is filling.
- Hydraulic conductivity is based on soil data from the Geotechnical Report and values developed from Rawls, Brakensiek and Saxton, 1982, Estimation of Soil Water Properties, *Transactions of the American Society of Agricultural Engineers*, vol.25, no. 5.
- Refer to Appendix D for infiltration and drawdown calculations and Appendix E for soil data.

Groundwater Recharge Volume

Infiltration Tank System	Soil Type	Target Depth Factor (F) (in)	Total Impervious Area (sf)	Required Recharge Volume (cf)[1]	Provided Recharge Volume (cf)[2]
	B	0.35	146,706	4,279	
P-1					7,493
P-2					3,253
P-3					2,176
				4,279 (4,702 ADJ.)	**12,922**

1. Required Recharge Volume = Target Depth Factor x Impervious Area / (d+Kt) (Refer to supplemental calculations in Appendix D)
2. Provided Recharge Volume = Volume Provided from Bottom of System to invert of overflow pipe.

Per Standard 3, if stormwater runoff from less than 100% of the site's impervious cover is directed to the BMP intended to infiltrate the Required Recharge Volume, then the storage capacity of the infiltration BMP needs to be increased so that the BMP can capture more of the runoff from the impervious surfaces located with the contributing drainage area. The impervious cover directed towards the infiltration system is 91.00%; therefore, a capture area adjustment was made. Refer to Appendix D for Capture Area Adjustment calculations.

The infiltration tank systems will provide both water quality treatment and recharge. Per Standard 4, Water Quality, the BMP must be sized to treat or hold the Target Volume, the larger of the Required Water Quality Volume and the Required Recharge Volume. The Required Water Quality Volume is based on the half-inch of runoff and the Required Recharge Volume is based on 0.35-inches (Soil Type B); 0.50 inches if greater than 0.35 inches, therefore the Target Volume is the Required Water Quality Volume of 5,563 cubic feet. Refer to Appendix D supplemental calculations.

The proposed subsurface infiltration chambers and infiltration basin has been designed to completely drain within 72 hours. The drawdown analysis is based on the required recharge volume exfiltrating at the Rawls Rates based on the soil textural analysis conducted at the proposed exfiltration location. Refer to Appendix D for calculations.

Standard 4 – Water Quality

The Long-Term Pollution Prevention Plan has been incorporated into the Post-Development Operation and Maintenance Plan. Refer to Appendix F for BMP Operation and Maintenance Plans.

The stormwater management system design calls for the installation of 4'-deep sump catch basins with hooded outlets to collect runoff from the proposed roadways. Stormwater runoff from roadways will then be routed to proprietary treatment devices and/or a sediment forebay followed by infiltration tanks/basins. Removal rates for all paved surfaces are:

Deep Sump Catch Basins	25%
Proprietary Devices	70% (Per MASTEP Performance Evaluation for First Defense Units) (See Appendix D for Sizing and TSS Removal Charts)
Infiltration Tanks/Basins with Pretreatment/Forebay	80%

The stormwater management system will be designed to be in full compliance with the Standards of the DEP Stormwater Management Policy. A treatment stream consisting of deep-sump catch basins with hooded outlets and proprietary devices will ensure that the 44% TSS removal (total suspended solids) is removed prior to discharge to the infiltration facilities and to ensure that 80% TSS removal is accomplished. The proposed treatment stream will renovate the stormwater and improve the water quality by promoting the settlement of sediments and pollutants before runoff is released into the existing drainage system. Refer to Appendix D for TSS Removal Calculation Worksheets.

The Water Quality Volume (WQV) to be treated is equal to the impervious area draining to the water quality device multiplied by one half inch. The table below shows the volume required and provided with the proposed development. Refer to Appendix D for further calculations.

Water Quality Treatment Volume

Basin	Required WQ Volume (cf)	Proposed WQ Volume (cf)	
P-1	1,007	7,493	Subsurface infiltration system with pre-treatment
P-2	2,666	3,253	Subsurface infiltration system with pre-treatment
P-3	1,889	2,176	Subsurface infiltration system with pre-treatment
	5,563	**12,922**	

Standard 5 – Land Use with Higher Potential Pollutant Loads (LUHPPL)

The proposed project does not include land uses with higher potential pollutant loads. Not Applicable.

Standard 6 – Critical Areas

The proposed project does not discharge to any critical areas. Not Applicable.

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

The proposed project is not a redevelopment project. Not Applicable.

Standard 8 – Construction Period Pollution Prevention and Erosion and Sedimentation Control

The project will require a NPDES Construction General Permit but the Stormwater Pollution Prevention Plan (SWPPP) has not been submitted. The SWPPP will be submitted prior to any proposed construction. A Construction Phase BMP Operation and Maintenance Plan will be provided as a basis for the SWPPP during final design.

Standard 9 – Operation and Maintenance Plan

The Long-Term Operation and Maintenance Plan is provided in Appendix F.

Standard 10 – Prohibition of Illicit Discharges

No illicit discharges are anticipated on site. An Illicit Discharge Compliance Statement will be submitted prior to the discharge of any stormwater to the post-construction best management practices. Measures to prevent illicit discharges will be included in the Long-Term Pollution Prevention Plan.

FIGURE - 1

0 1000' 2000' 2500'

U.S. GEOLOGICAL SURVEY
7.5 X 15 MINUTE SERIES

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USGS LOCUS MAP

655 WASHINGTON STREET
(ASSESSOR'S PARCEL NO. 29-329-9-0)
WEYMOUTH, MASSACHUSETTS

FIGURE - 2

COMMUNITY PANEL NO: 25021C0229E
EFFECTIVE DATE: JULY 17, 2012

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FEMA FLOOD MAP

655 WASHINGTON STREET
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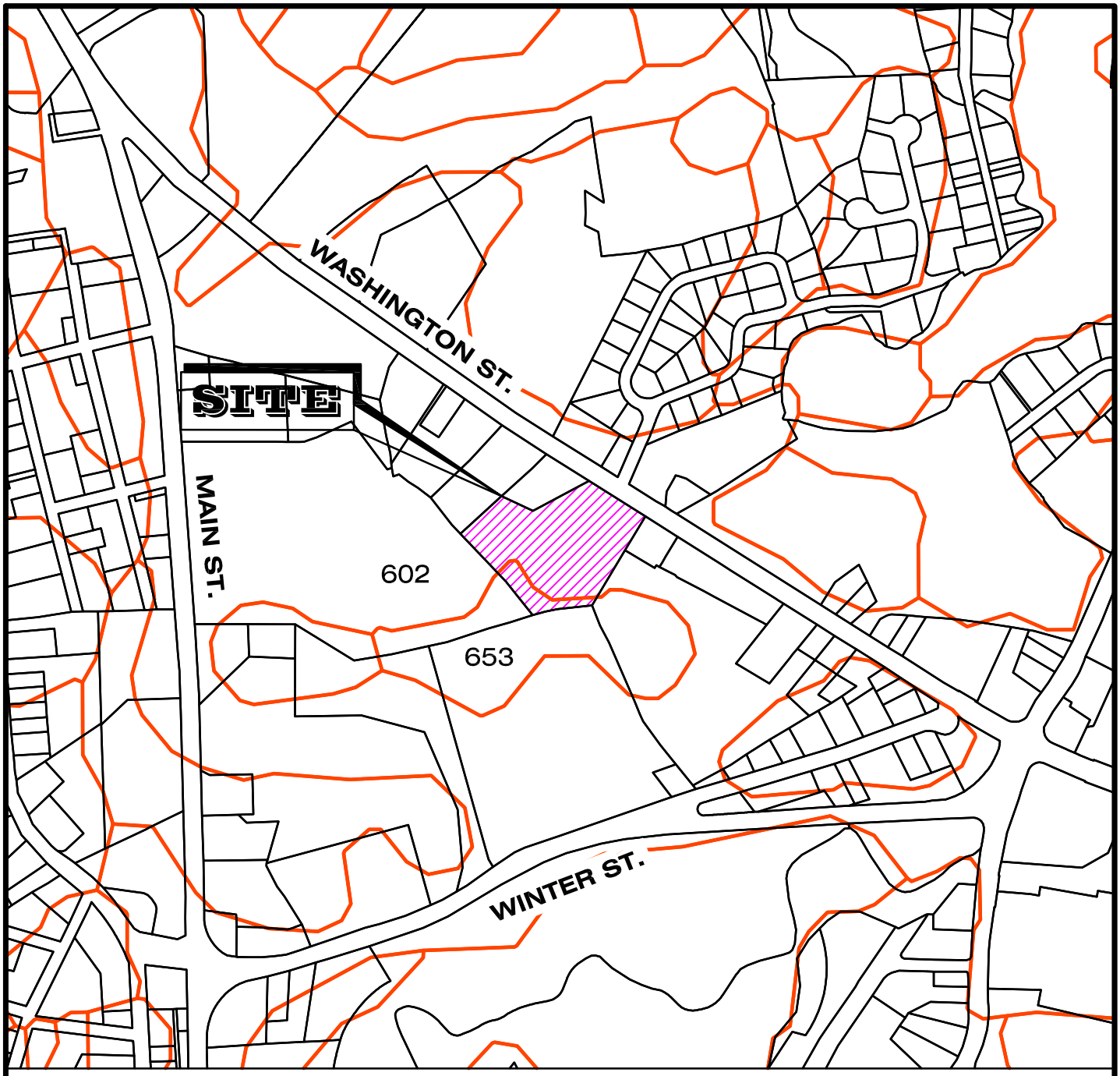
WEYMOUTH, MASSACHUSETTS



SOIL KEY

SOIL CLASSIFICATION	DESCRIPTION	HYDROLOGIC SOIL GROUP
602	URBAN LAND, 0 TO 15 PERCENT SLOPES	A
653	UDORTHENTS, SANDY	A

FIGURE - 3

0 500' 1000' 1125'

NRCS SOIL SURVEY
NORFOLK COUNTY

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NRCS SOILS MAP

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