

Project Narrative and Stormwater Management Report

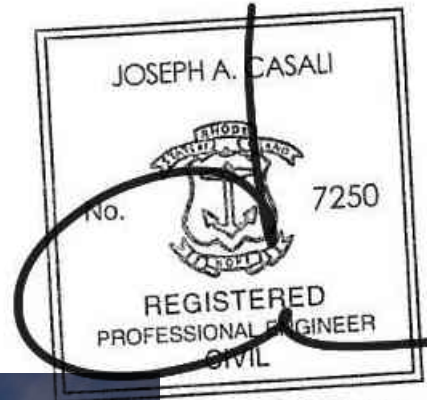
For a Proposed Redevelopment Project

Self-Storage Facility

Located at

**530-532 Wellington Avenue
Cranston, Rhode Island
AP 3, Lot 107**

Prepared for:
CANAM RI LLC
c/o Mr. Mike Jobb
530 Wellington Avenue
Cranston, RI 02910-2950



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Submitted by:

JCE

JOE CASALI ENGINEERING, INC.
CIVIL • SITE DEVELOPMENT • TRANSPORTATION
DRAINAGE • WETLANDS • ISDS • TRAFFIC • FLOODPLAIN
300 POST ROAD, WARWICK, RI 02888
(401) 944-1300 (401) 944-1313 FAX WWW.JOECASALI.COM

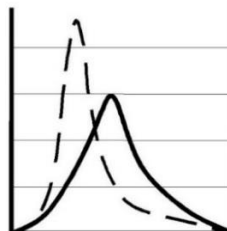


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1 INTRODUCTION

On behalf of our client, CANAM RI LLC, Joe Casali Engineering, Inc. (JCE) has prepared the following Project Narrative and Stormwater Management Report to identify existing conditions and proposed site improvements associated with the proposed redevelopment of a mill complex. The scope includes the redevelopment of the existing mill complex located at 530-532 Wellington Avenue, in Cranston, Rhode Island to a self-storage facility containing approximately 1,191 storage units or various sizes. The subject property can also be identified as Tax Assessor's Plat Map (AP) 3, Lot 107, and has frontage on Wellington Avenue in the City of Cranston.

2 SITE LOCATION AND PHYSICAL DESCRIPTION

According to a July 2023 Class I Property Line Survey performed by Holland E. Shaw, PLS, the total area of the subject property is 237,000 sq. ft. (5.441 acres). The parcel is currently occupied by a mill complex consisting of a series of buildings internally subdivided with multiple varied uses, parking areas, and outdoor storage areas. The majority of the varied uses within the facility have been vacated as of the date of this report. The parcel is accessed via existing curb cuts on Wellington Avenue and Station Street. The subject parcel is bound by multi-family residential properties to the north, an Amtrak Corridor to the east, a vacant lot to the south, and Wellington Avenue and Interstate 95 to the west, as shown below in Figure 1 – Locus Map.

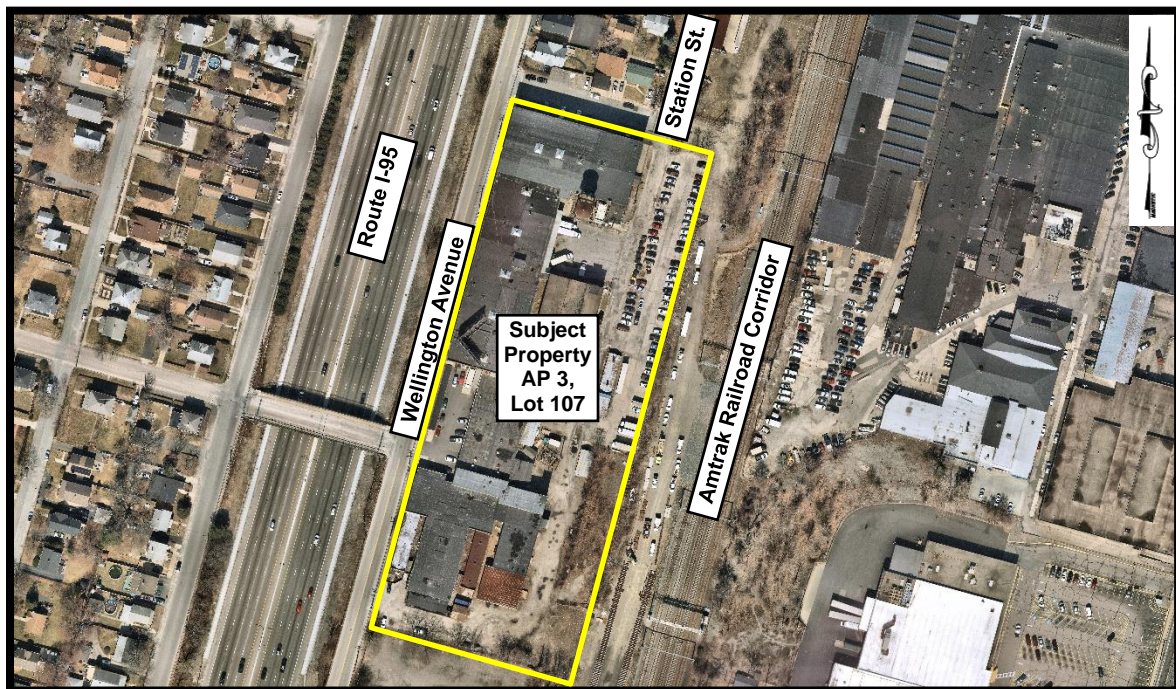


Figure 1 – Locus Map

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2.1 Soil Classification

According to the *Web Soil Survey* (WSS) operated by the US Department of Agriculture Natural Resources Conservation Service (NRCS), produced by the National Cooperative Soil Survey, the soils on the site consist of Udorthents-Urban land complex (UD) and Merrimac-Urban land complex, 0 to 8 percent slopes (MU). UD soils consist of human transported material. These soils have a very low runoff class and belong to hydrologic soil group A. MU soils consist of loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss. These soils are somewhat excessively drained, have a very low runoff class and belong to Hydrologic Soil Group A.

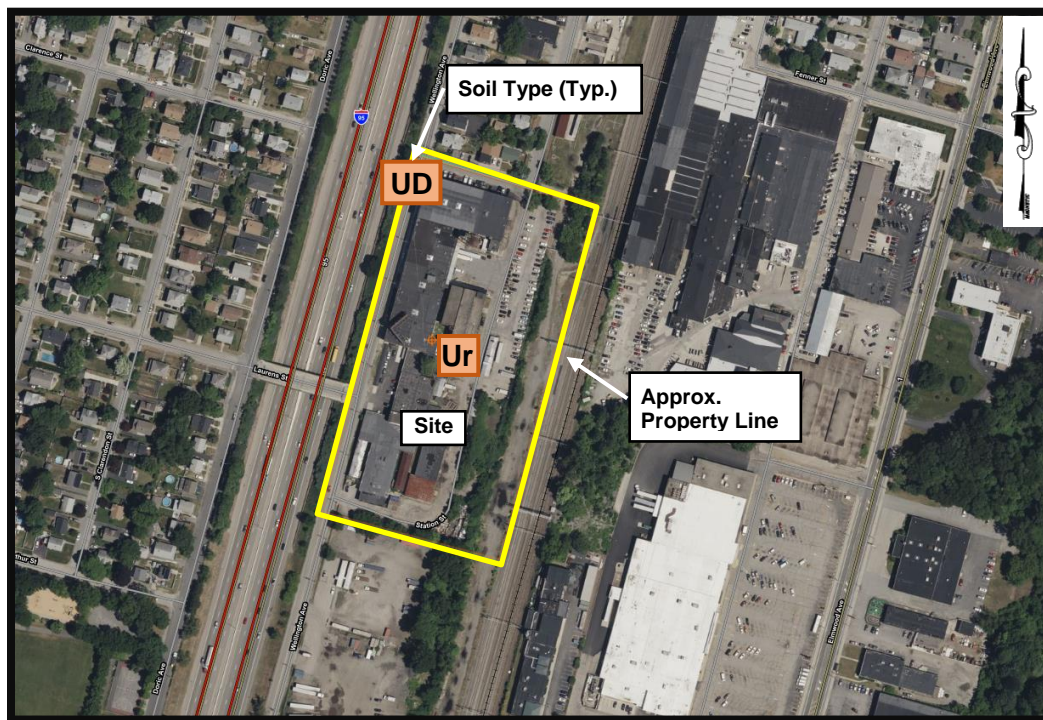


Figure 2 – Soils Map

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Soil evaluations were observed and documented by JCE in July 2024 to determine the depth to the seasonal high groundwater table (SHGWT) and to estimate infiltration capacity of existing in-situ soil for design of stormwater mitigation measures. Three (3) soil evaluation test pits were excavated, to 108-inches below the ground surface. In general, the SHGWT ranged from about 44-inches to 54-inches below the existing ground surface when encountered. Ledge was not encountered. A Soil Evaluation Test Pit Location Plan and Soil Evaluation Test Hole Logs are included in Appendix A.

In addition, multiple groundwater observation wells have been installed throughout the site by various environmental consultants over the course of the last few years. Data from the installation of these wells has also been assessed and incorporated into the design. Groundwater observation well locations are included on the Site Plan prepared by Sage Environmental in Appendix B; logs are included in Appendix A.

2.2 Environmental Considerations

SAGE Environmental (Sage) completed a conducted an American Society for Testing and Materials (ASTM) Phase I Environmental Site Assessment (ESA) in April 2023. Results of the Phase I ESA identified Recognized Environmental Conditions (RECs), which are explained in more detail in the Phase I ESA (can be provided under separate cover) but are generally summarized below.

- REC #1 - Historic and Current Usage of the Site for Manufacturing and Associated Infrastructure: Building occupants have engaged in manufacturing operations, including but not limited to, vinyl coated products, a rubber heel factory, plastics manufacturing, cabinet manufacturing, jewelry manufacturing, upholstery manufacturing, knife manufacturing, a veterinary laboratory, chemical manufacturers (including resin, algacides, germicidal detergents, deodorants, sanitizers, and disinfectants), assayers and refiners of precious metals, electroplating operations, spray coating/spray painting/screen-printing, metal and plastic grinding/sharpening, a brewery, appliance repair, sewing, exercise related businesses, real estate businesses, material rental businesses, storage businesses, educational businesses, janitorial services, electricians, an elevator company, and retail businesses, since the early 1900's. In addition to the former property use, several observations of associated infrastructure and potential for releases of oil and/or hazardous materials (OHM) from these past operations were made during the Phase I. These included potentially leaking electrical transformers, stained soil, drains, sumps, pits, hydraulic equipment, and OHM storage containers.
- REC #2 - Historic Environmental Investigations and Known Release Conditions [Underground Storage Tank (UST)-15319, Leaking Underground Storage Tank (LUST) 0713-LS, State Hazardous Waste Site (SHWS SR-07-1035), and SEMS Archive:
 - UST Summary (RIDEM File Number UST-15319: In general, the Site has had at least 25 underground storage tanks (USTs), ranging in capacity from 500-gallons to 10,000-gallons, and utilized for the storage of gasoline, #6

oil, unspecified fuel oil, mineral oil, aromatic solvents, and plasticizers (converted to water storage in circa 1960). On March 16, 1987, RIDEM issued a Certificate of Closure which stated that all regulated tanks “which existed from May 8, 1985”, “have either been removed or filled in accordance with State UST Regs”. Please note that additional vent pipes were observed, indicating that additional tanks may exist which were previously unidentified.

- LUST Summary (RIDEM Case Number 0713-LS): Two (2) of the USTs, historically utilized for the storage of gasoline and aromatic solvents (i.e., USTs 1 and 9), are documented to have resulted in a release condition to soil and groundwater on the southwest portion of the Site, extending into the municipal right-of-way identified as Wellington Avenue. Contaminants of Concern (COCs) identified in soil and groundwater, at concentrations in excess of the applicable RIDEM criteria, include benzene, toluene, ethylbenzene, and xylenes, and Light Non-aqueous Phase Liquid (LNAPL) (i.e., identified as consisting of a petroleum distillate/paint thinner and/or petroleum with a carbon range of C7 through C18.). The most recent groundwater monitoring event occurred in September 2020. At that time, no LNAPL was detected; however, a sheen was noted on groundwater in each of the four (4) groundwater monitoring wells. According to McPhail Associates, LLC, the plume is/was stable. No groundwater monitoring data from 2022 or 2023 was reported within the RIDEM file and a Letter of Compliance or No Further Action deeming that the release is closed were identified in the RIDEM files. Therefore, the Site may be out of compliance with the RIDEM Regulations.
- State Hazardous Waste Site (SHWS) (SR-07-1035)012/Superfund Enterprise Management System (SEMS)-Archive (RID01201771): In 1986, Rizzo Associates, Inc. conducted a limited subsurface assessment on the Site which identified the following COCs at concentrations in excess of the applicable RIDEM soil and/or groundwater criteria, select polynuclear aromatic hydrocarbons (PAHs). Remediation reportedly included soil excavation and the importation of fill (source of fill material not provided); In circa 1990, the US EPA identified the Site as a potentially hazardous waste site due to activities conducted by Gannon & Scott (RID01201771), a reclaimer of precious metals from plating and stripping solutions from the 1950s through the 1980s. The Site was subsequently investigated on behalf

of the US EPA as part of the Superfund Site Assessment and Removal program which identified the following COCs at concentrations in excess of the applicable RIDEM soil and/or groundwater criteria: select chlorinated VOCs (CVOCs), select PAHS, and toluene. In 2002, the USEPA archived (i.e., removed) from the CERCLIS database and was not a candidate for inclusion on the National Priorities List (NPL) because there was not a drinking water well located in proximity to the Site. As a result, the Site was assigned the status of No Further Remedial Actions Planned (i.e., NFRAP). A NFRAP designation means that no further Federal Superfund Remedial Action was anticipated, under the jurisdiction of CERCLA. Please note that this is not meant to imply compliance with the RIDEM regulations; therefore, the lack of additional assessment and/or remediation due to the above exceedances may represent non-compliance with the RIDEM Remediation Regulations.

- REC #3: Adjoining Land Usage: Based on information provided in the Sanborn Maps, two (2) parcels of land located immediately north of the Site (i.e., 388 and 433 Station Street) were historically utilized for jewelry manufacturing (i.e., 433 Station Street) from circa 1950 through 1972, and a repair shop in circa 1900 (i.e., 388 Station Street which was owned by the New York, New Haven, and Hartford railroad in 1900). No additional information regarding these businesses was obtained during the course of this assessment; however, usage of these properties for jewelry manufacturing and repairs associated with railroad machinery represents a REC.

These locations and conditions are summarized in the Red/Yellow/Green Map, 530 Wellington Ave., Cranston, Rhode Island, prepared by Sage, dated November 21, 2024, included in Appendix B. A Site Investigation Report was filed with RIDEM in August 2024; the development of a Remedial Action Work Plan (RAWP) is in progress.

Based on correspondence between the RI Department of Environmental Management (RIDEM) Office of Water Resources (OWR) and the RIDEM Office of Land Revitalization and Sustainable Materials Management (OLRSSM) in November/December 2024, given the presence of several underground storage tanks on the Southern side of the site along with the existing contamination on the site located to the South (groundwater generally appears to flow towards that site), we understand that the OLRSSM has concerns primarily about the infiltration in the Southeast corner of the site.

Because there is such an extensive history of contamination in this area, it was recommended that the stormwater management design omit infiltration on the Southern end of the site. It is important to note that this will affect the ability to meet groundwater recharge requirements, and a waiver from this requirement is being sought. Details are further discussed in Section 5 below.

2.3 Flood Zone Classification

The site is located on the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map (FIRM) for the City of Cranston, Map Number 44007C0318H, effective date October 2, 2015, as depicted below on Figure 3. The property lies completely within FEMA Flood Zone X, which is defined as areas outside of the 0.2% annual chance floodplain.

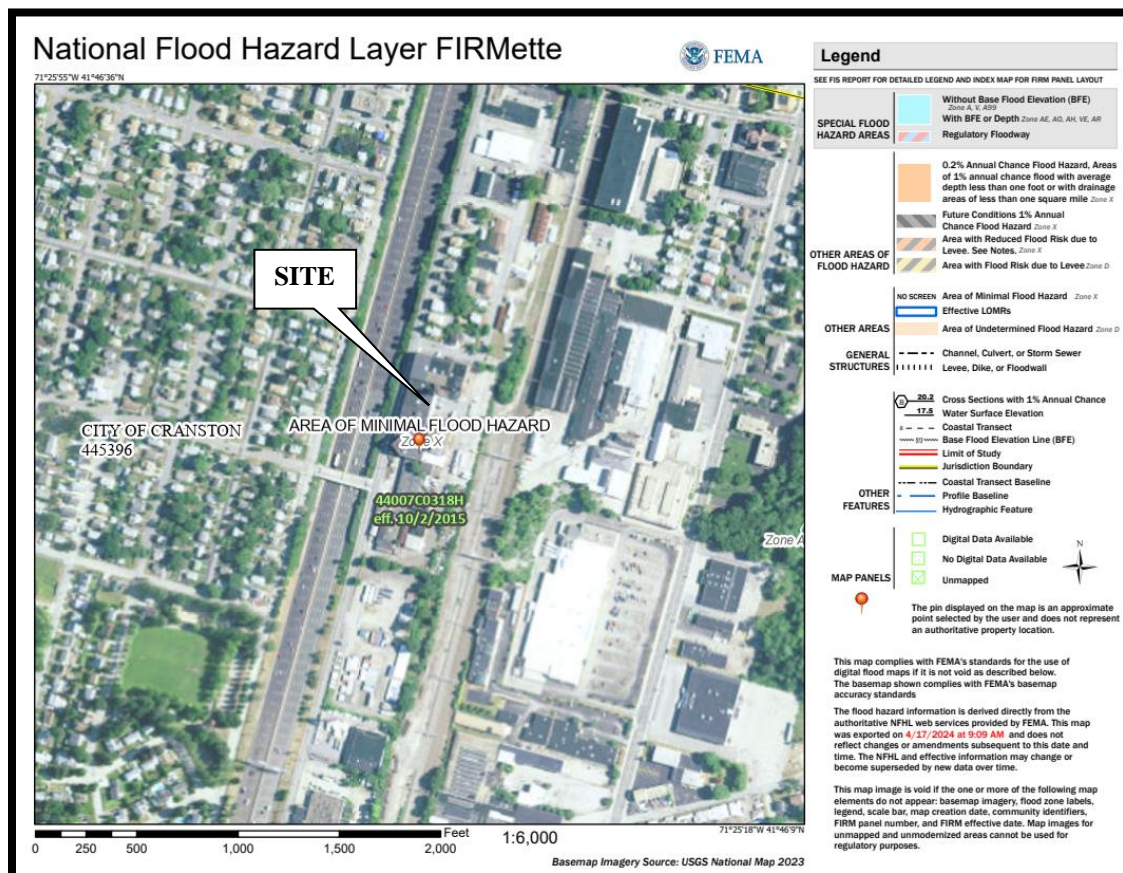


Figure 3 – FEMA Flood Insurance Rate Map

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2.4 Natural Resources

According to the RIDEM Environmental Resource Map, the site is located within the Pawtuxet River Watershed (ID No. 010900040609). Stormwater runoff from the site is

ultimately directed to Fenner Pond (RI0006017L-08) via a buried stream, which ultimately discharges to the Pawtuxet River. Fenner Pond is located on the State of Rhode Island 2022 Impaired Water Report List. The cause of impairment within Fenner Pond is due to the phosphorus levels. There are no total maximum daily loads (TMDL) established at this time. The site is not within any State-designated natural heritage area, unfragmented forest tracts, state, regional, or community greenways and green space priorities. The site does not contain any land in active agricultural use.

2.5 Zoning

The subject property is located within the City of Cranston's General Industry District (M-2). The following are the dimensional requirements for the M-2 zone, along with existing conditions associated with the existing mill complex:

Zoning Criteria	M-2 Requirement	Existing
Min. Lot Area	60,000 SF	237,000 SF
Min. Frontage & Lot Width	200 feet	249 feet
Min. Front Yard Depth	40 feet	0 feet ⁽¹⁾
Min. Side Yard Depth	25 feet	42.6 feet
Min. Rear Yard Depth	30 feet	NA
Maximum Building Coverage	60%	43.8%
Max. Building Height	35 feet	45.1 feet ⁽¹⁾

1. Pre-existing, non-conforming condition.

2.6 Easements

According to a July 2023 Class I Property Line Survey performed by Holland E. Shaw, PLS. Multiple easements exist on site. Two communications easements exist on the northern portion of the site. These easements are referenced in Deed Book 3293, Page's 2 & 19, and Deed Book 5302, Page 54. Also, three sewer easements exist traveling south down the eastern side of the subject property and turning towards Wellington Avenue. These easements are referenced in Deed Book 220, Pages 37 & 38.

2.7 Existing Utilities

Water: Based on a review of existing conditions information obtained from the Providence Water Supply Board (PWSB), a 12-inch asbestos concrete (AC) water main exists within Wellington Avenue, and a 6-inch AC water main exists within Clarence Street. Based on a field review of existing conditions performed by JCE in April 2024, domestic water appears to be provided to the site via a 4-inch cast iron (CI) service from Clarence Street,

and via a 4-inch CI service from Wellington Ave. In addition, fire protection water service appears to be provided to the site via a 6-inch CI service from Clarence Street, and via a 6-inch CI service from Wellington Ave.

Sewer: Based on a review of existing conditions information obtained from the City of Cranston, a 24-inch reinforced concrete sewer main exists within Wellington Avenue and an 8-inch vitrified clay (VCP) sewer main exists within Clarence Street. Based on field investigations performed by JCE in April 2024, it appears that two (2) 6-inch sewer services exist from the existing building(s). An 8-inch VCP conveys effluent from the northern portion of the development to the existing main within Clarence Street; and an 8-inch VCP conveys effluent from the southern portion of the development to the existing main within Wellington Ave.

Gas: Based on a review of existing conditions information from Rhode Island Energy, gas mains exist within Clarence Street and Wellington Avenue. Based on field investigations by JCE in April 2024, it appears that a gas service enters the site from Clarence Street, with multiple meters on the existing building servicing the former tenants.

Electric/Telecommunications: Existing overhead electrical and telecommunication services are provided to the site via the overhead lines along Wellington Avenue, Station Street, and Clarence Street.

Stormwater: Based on field investigations performed by JCE in April 2024, multiple drywells appear to exist throughout the site, particularly within the open space at the eastern portion of the property. Many of these existing structures are deteriorated, filled with debris/sediment, and are likely non-functional. It appears that a series of catch basins are located within the rear portion of the site, which are tied into a 21-inch vitrified clay pipe, which is routed through the property located to the south, ultimately tying into a 4'x4' box culvert (owned by the City of Cranston). Ultimately, the box culvert crosses through the adjacent Johnston Controls property, continuing to the east across Elmwood Avenue, discharging into Fenner Pond.

3 PROPOSED DEVELOPMENT

The Applicant, CANAM RI LLC, is proposing a complete redevelopment of the site to accommodate a self-storage facility. The scope of improvements to the site includes demolition of multiple existing free-standing accessory structures and demolition of portions of the existing main building on the site. The existing main building is proposed to undergo complete interior and exterior renovation, including a small main office at the northeastern corner of the existing complex. The remainder of the facility is proposed to consist of approximately 1,191 variably sized self-storage units.

The main office is proposed to be accessed from Clarence Street / Station Street with a small 3-stall parking area for potential clients. The remainder of the site is fenced off with key card access for self-storage customers. A 3-stall parking lot is proposed adjacent to the entrance from Station Street, which includes one (2) handicap accessible space. This parking area is located outside the perimeter fence line, and its purpose is for potential customers to park and access to the self-storage main office located at the northeast corner of the existing building. Within the site, multiple parking areas are proposed for customer access to loading areas, loading docks, etc. Overall, a total of 56 parking spaces are proposed throughout the site, including two (2) handicap accessible spaces, in accordance with the Americans with Disabilities Act (ADA).

According to the City of Cranston's Zoning Ordinance, there is no specific use within Chapter 17.64 "Off Street Parking" fitting the definition of self-storage facilities. As such, JCE referenced the Institute of Transportation Engineers (ITE) Parking Generation Manual, 5th edition, dated January 2019. The ITE Manual identifies self-storage as "mini-warehouse", land use code 151. Based on the ITE Manual, peak parking demand per 100 storage units ranges from a minimum of 1.05 to a maximum of 2.38. Based on the 1,191 self-storage units proposed, this equates to a parking requirement ranging from 13 to 29 spaces. The currently proposed 56 spaces exceeds the anticipated peak parking demand per the ITE Manual.

Additional site improvements include perimeter fencing, loading dock canopy, a compacted gravel outdoor storage area for RVs, boats, etc., perimeter paved access road for customers and Fire Department access, landscape improvements, and stormwater management improvements.

3.1 Zoning

As previously noted, the subject property is located within the City of Cranston's General Industry District (M-2). The proposed use, self-storage, is allowed by right in the M-2 zone. However, due to the pre-existing non-conformities associated with the existing building, dimensional variances will be required, as summarized in the following table: conditions associated with the existing mill complex:

Zoning Criteria	M-2 Requirement	Existing	Proposed
Min. Lot Area	60,000 SF	237,000 SF	237,000 SF
Min. Frontage & Lot Width	200 feet	249 feet	249 feet
Min. Front Yard Depth	40 feet	0 feet ⁽¹⁾	0 feet ⁽¹⁾
Min. Side Yard Depth	25 feet	42.6 feet	42.6 feet
Min. Rear Yard Depth	30 feet	NA	NA
Maximum Building Coverage	60%	43.8%	42.6%
Max. Building Height	35 feet	45.1 feet ⁽¹⁾	45.1 feet ⁽¹⁾

1. Pre-existing, non-conforming condition.

3.2 Proposed Utilities

Water: Modifications to the domestic and fire protection water services to the development are not anticipated. However, due to the change in use and resulting change in demand, review and approval from the Providence Water Supply Board will be required.

Sewer: Modifications to the existing sewer services are not anticipated. However, due to the change in use and resulting change in flow, review and approval from Veolia Water / Cranston Department of Public Works will be required.

Gas/Electric/Telecommunications: Major modifications to the site's gas and telecommunications services are not anticipated. However, due to the change in use, review and approval from Rhode Island Energy – Gas will likely be required. The proposed development will likely necessitate a new transformer, which will require coordination with Rhode Island Energy – Electric.

Stormwater: The proposed development includes a reduction in impervious area of approximately 2.7-percent, or about 6,500 square feet. In addition, beautification of the site, including placement of new loam and seed as well as landscape plantings, will assist

in providing natural groundwater infiltration and water quality. Environmental assessments have been completed and identify areas on the site where groundwater infiltration is recommended; refer to “heat map” within Appendix B for additional details. The site’s stormwater management system has been designed in accordance with all applicable State and local Standards, improving water quality, groundwater recharge, and reducing peak stormwater runoff rates and total stormwater runoff volumes to the maximum extent practicable.

4 PERMIT REQUIREMENTS

4.1 Local Permit Requirements

4.1.1 City of Cranston Plan Commission

The project team met with the City for a pre-application review of the project in March 2024. The project is considered a Major Land Development, requiring three (3) stages of review, Master Plan, Preliminary Plan and Final Plan with the City Plan Commission. The project received Master Plan approval at the June 6, 2024 City Plan Commission meeting.

4.1.2 Providence Water Supply Board

Due to the change in use and resulting change in demand, review and approval from the Providence Water Supply Board will be required.

4.1.3 Veolia Water/ Cranston Dept. of Public Works

Due to the change in use and resulting change in flow, review and approval from Veolia Water / Cranston Department of Public Works will be required.

4.2 State Permit Requirements

4.2.1 RI Department of Environmental Management

Given the overall area of disturbance associated with development of this site, a submission to the Rhode Island Department of Environmental Management (RIDEM) Office of Water Resources/Stormwater Program is required for a Construction Stormwater Application (CSA). In addition, review and approval will be required by the DEM’s Office of Waste Management for review and approval of the site’s Remedial Action Work Plan (RAWP), Soils Management Plan (SMP), and Environmental Land Usage Restriction (ELUR).

5 STORMWATER MANAGEMENT PLAN

5.1 General

The proposed development is subject to the requirements of the Rhode Island Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8), a recodification of the regulatory portions of the Stormwater Manual implemented by both the Rhode Island Department of Environmental Management (RIDEM) and the Rhode Island Coastal Resources Management Council (CRMC). In general, all stormwater runoff from the eastern portion of the site sheet flows to existing drywells within the site, which conveys stormwater in a southerly direction, routed to existing drainage network to the property to the south. Stormwater from the western portion of the site sheet flows to a series of catch basins located further down Wellington Avenue. Stormwater runoff from the site is ultimately directed to Fenner Pond via a large box culvert.

The site's proposed stormwater management system has been designed to generally mimic existing conditions. The stormwater management design adheres to all State (RIDEM) and local (City of Cranston) standards of attenuation of peak stormwater runoff rates for the 1-, 2-, 10-, 25-, and 100-year storm event, reduction in stormwater volumes leaving the site while promoting groundwater recharge and improving the quality of the stormwater leaving the site.

In addition, the proposed Stormwater Management Plan takes into account that Fenner Pond is listed as impaired for total phosphorus. Overall water quality of the stormwater leaving the site is improved by implementing the use of a pea gravel diaphragm and sediment forebay for pre-treatment of the stormwater and a new sand filter basin to treat for water quality. As previously noted, due to widespread contamination throughout the site, due to the concerns of the RIDEM OWR and OLRSM, the sand filter basin located at the Southern end of the site is proposed to be lined and under-drained to aid in mitigation of the conveyance of potential contaminants off site.

5.2 Standard 1: LID Planning and Design Strategies

Low Impact Development (LID) site planning and design strategies must be used to the maximum extent practicable.

Standard Waived – However, Standard Met

LID practices, which include installation of structural stormwater management systems including a bioretention basin and a lined and under-drained sand filter basin, have been

included in the design. The proposed system will provide the necessary water quality treatment and groundwater recharge to the maximum extent practicable. In addition, the proposed drainage patterns closely mimic that of the existing conditions.

5.3 Standard 2: Groundwater Recharge

Stormwater must be recharged within the same sub-watershed to maintain base flow at pre-development recharge levels to the maximum extent practicable.

Standard Not Met – Waiver Requested

Groundwater recharge will be provided on site through a bioretention basin at the northern end of the site. A sand filter basin is proposed at the southern end of the site which is proposed to be lined and under-drained due to subsurface contaminants in this area of the site. A waiver is being requested from the groundwater recharge requirement due to the extensive subsurface contamination around the site. The groundwater recharge standard has been met to the maximum extent practicable via the implementation of the infiltrating bioretention basin. Natural groundwater recharge is also achieved via the reduction in overall impervious areas throughout the site. As such, the Applicant is respectfully requesting a waiver from this requirement. All calculations were completed in accordance with Section 8.8 of the Stormwater Rules using the following formula:

$$Re_v = (I''') (F) (I) / 12$$

Based on the results of the soil evaluation test pits, a recharge factor of 0.35 was used, associated with Hydrologic Soil Group B.

Table 5.1: Recharge Requirements		
<i>Subwatershed</i>	1A	1B
<i>Treatment System</i>	Bioretention Basin #1	Infiltration Basin #1
<i>Impervious Area (SF)</i>	2,621	43,709
<i>Recharge factor (in)</i>	0.35	0.35
<i>Required Recharge Volume (CF)</i>	76	1,275
<i>Required Recharge Volume @ 50% (CF)</i>	38	637
<i>Provided Recharge Volume (CF)</i>	389	0
<i>Recharge Requirement Met?</i>	Yes	No ⁽⁴⁾

- Notes:
1. Refer to Proposed Watershed Map located in Appendix E for BMP locations.
 2. Based on Routing Analysis of WQv, the entire water quality volume is infiltrated.
 3. Recharge Volumes are calculated as the Static Storage Volume.
 4. Waiver from groundwater recharge requirement requested due to subsurface contamination.

5.4 Standard 3: Water Quality

The stormwater runoff from the site must be treated prior to discharge.

Standard Met

Based on the Stormwater Rules, the site is considered a redevelopment as more than 10,000 sq. ft. of existing impervious area is being improved and 40% or more existing impervious surface coverage exists within the subject parcel. Therefore only 50% of all disturbed impervious areas must be treated for water quality. Stormwater runoff associated with the pavement are treated by the bioretention basin and lined and under-drained sand filter basin. Calculations were completed in accordance with Section 8.9 of the Stormwater Rules.

Tables 2 and 3 below provide sizing calculations for the Water Quality Volume (WQ_v) of the pretreatment area and the treatment area, respectively. The rooftop area is exempt from pre-treatment requirements. Water quality calculations for impervious surfaces are included in Appendix F.

Table 5.2: Pretreatment Requirements		
<i>Subwatershed</i>	1A	1B
<i>Treatment System</i>	Crushed Stone Diaphragm	Sediment Forebay #1
<i>Impervious Area (SF)</i>	2,621	43,709
<i>Water Quality Factor (in)</i>	1.00	1.00
<i>Required Water Quality Volume @50% (CF)</i>	109	1,821
<i>Required Static Volume for Pretreatment (25% of WQ_v)</i>	27	455
<i>Provided Static Storage Volume for Infiltration System (CF)</i>	36	3,314
<i>Pretreatment Requirement Met?</i>	Yes	Yes

Table 5.3: Treatment Requirements		
<i>Subwatershed</i>	1A	1B
<i>Treatment Type</i>	Bioretention Basin #1	Sand Filter Basin #1
<i>Impervious Area (sf)</i>	2,621	43,709
<i>Water Quality Factor (in)</i>	1.00	1.00
<i>Required Water Quality Volume (CF) @50%</i>	109	1,821
<i>Required Static Volume for Treatment</i>	82	1,366
<i>Provided Static Storage Volume for Treatment (CF)</i>	389	4,901
<i>Treatment Requirement Met</i>	Yes	Yes

Notes:

1. Static Storage Volume = Storage volume of system below outlet (for infiltrating practices) or storage volume within basin and sand filter void space (prior to discharge to underdrain).

As shown in Tables 5.1 through 5.3 above, the site's proposed stormwater management system exceeds the requirements of groundwater recharge volume, water quality pre-treatment volume and water quality volume. This is in accordance with the Stormwater Rules and the City of Cranston's standards, and ultimately reduces any instances of untreated stormwater flow towards Fenner Pond.

5.5 Standard 4: Conveyance and Natural Channel Protection

This standard is designed to prevent erosive flow within natural channels and drainage ways.

Standard Waived – However, Standard Met

The proposed site improvements fall under the redevelopment standard, which does not require peak flow mitigation. However, the large reduction in impervious areas throughout the site coupled with the proposed stormwater management BMPs results in reductions in peak stormwater runoff rates and total runoff volumes to all design points through the 100-year design storm. Calculations are provided in Appendices E and G.

5.6 Standard 5: Overbank Flood Protection

Downstream overbank flood protection must be provided by attenuating the post-development peak discharge rate to the pre-development levels for the 1-, 10-, and 100-year, Type III design storm events.

Standard Waived – However, Standard Met

The proposed project is eligible from this requirement because it is a redevelopment. However, the large reduction in impervious areas throughout the site coupled with the proposed stormwater management BMPs results in reductions in peak stormwater runoff rates and total runoff volumes to all design points through the 100-year design storm. Calculations are provided in Appendices E and G.

5.7 Standard 6: Redevelopment and Infill Projects

For redevelopment sites with 40% or more existing impervious surface coverage and infill sites, only Standards 2, 3, and 7-11 must be addressed.

Standard Met

As shown below, the proposed site improvements are not considered a redevelopment:

Existing Site Area	Existing Impervious Area	Percent Impervious	Redevelopment?
237,000 sf	209,137 sf	88.2%	Yes

5.8 Standard 7: Pollution Prevention

All development sites require the use of source control and pollution prevention measures to minimize the impact that the land use may have on stormwater runoff quality.

Standard Met

Soil erosion and pollution control measures including a crushed stone construction access, compost sock and catch basin silt sacks are proposed to be used during construction. A Soil Erosion and Sediment Control Plan (SESCP), has been prepared in accordance with the Manual and has been submitted separately. A long-term Operation and Maintenance Plan (O&M) has been prepared in accordance with the Manual and has been submitted separately.

5.9 Standard 8: Land Uses with Higher Potential Pollutant Loads

Stormwater discharges from land uses with higher potential pollutant loads (LUHPPLs) require the use of specific source control and pollution prevention measures and the specific stormwater BMPs approved for such use.

A stormwater LUHPPL is defined by the following land uses and activities:

1. Areas within an industrial site (as defined in RIPDES Rule 31(b)(15)) that are the location of activities subject to the RIPDES Multi-Sector General Permit (except

- where a No Exposure Certification for Exclusion from RIPDES Stormwater Permitting has been executed);
2. Auto fueling facilities (i.e., gas stations);
 3. Exterior vehicle service, maintenance and equipment cleaning areas;
 4. Road salt storage and loading areas (if exposed to rainfall); and
 5. Outdoor storage and loading/unloading of hazardous substances.

Standard Not Applicable

The subject site does not meet the definition of a LUHPPL, as it does not maintain or require a RIPDES Multi-Sector General Permit.

5.10 Standard 9: Illicit Discharges

All illicit discharges to stormwater management systems are prohibited, including discharges from OWTS, and sub-drains and French drains near OWTSs that do not meet the State's OWTS Rules.

Standard Met

There are no known existing illicit discharges at the site nor are any proposed as part of this project.

5.11 Standard 10: Construction and Erosion Sedimentation Control

Erosion and sedimentation control (ESC) practices must be utilized during the construction phase as well as during any land disturbing activities

Standard Met

Erosion control practices have been employed to avoid and minimize impacts to abutting properties. Detailed notes have been included in the plans to ensure effective implementation of erosion and sedimentation controls, which include a straw wattle/silt fence around the perimeter of the site, Siltsack sediment traps within all catch basins within and adjacent to the site, and a crushed stone construction access at the entrances to the site. The soil erosion and sedimentation control measures will be installed prior to the initiation of construction activities and maintained throughout construction. Once established, these measures will be monitored daily until construction activities are complete. The straw wattle/silt fence line will serve as the strict limits of disturbance for the project. No alterations, including vegetative clearing or surface disturbance, will occur beyond this line. The limits of clearing, grading, and disturbance will be kept to a minimum within the

proposed area of construction. All areas outside of these limits, as depicted on the project site plans, will remain undisturbed, in a completely natural condition.

5.12 Standard 11: Stormwater Management System Operation and Maintenance

The stormwater management system, including all structural stormwater controls and conveyances, must have an Operation and Maintenance Plan to ensure that it continues to function as designed.

Standard Met

A long-term Stormwater Operation and Maintenance Plan has been prepared for the development in accordance with the Manual and is provided under separate cover.

6 DRAINAGE ANALYSIS

6.1 Methodology

The comparative pre- versus post-development hydrologic analysis was performed using the Soil Conservation Service, Technical Release 20 and 55 (TR-20 and TR-55) methodology. The 1-, 2-, 10-, 25-, and 100-year storm events were modeled for a 24-hour, Type III storm utilizing HydroCAD version 10.00. HydroCAD modeling reports for the existing and proposed conditions can be found in Appendices F and H, respectively.

6.2 Existing Conditions

The existing site consists of two (2) watersheds discharging to two (2) off-site design points further described as the existing drainage network (DP1) and the existing drainage inlets within Wellington Avenue (DP2). In general, all stormwater runoff from the eastern portion of the site sheet flows to existing drywells and catch basins within the site, which convey stormwater in a southerly direction to an existing drainage network (DP1). This drainage line is routed through the property to the south, tying into an existing 4'x4' box culvert, owned and maintained by the City of Cranston. Stormwater from the western portion of the site sheet flows to a series of catch basins located further down Wellington Avenue (DP2). These catch basins are also tied into the existing 4'x4' box culvert, owned and maintained by the City of Cranston. This box culvert continues to the east, through the adjacent Johnston Controls property, under Elmwood Avenue, ultimately discharging to Fenner Pond. An Existing Conditions Watershed Map is included in Appendix C.

Design Point 1 – Existing Drainage Network

Watershed 1: Consists of 174,413 sq. ft. of paved parking areas and roofs associated with the eastern portion of the parcel. This watershed area consists mostly of impervious area and has a minimum T_C of 6.0 minutes and a composite CN Runoff Number of 93. Stormwater runoff from this area is collected via a closed drainage system that conveys stormwater runoff in a southerly direction, routed to an existing drainage network to the property to the south, Design Point 1.

Design Point 2 – Existing Drainage Inlets within Wellington Avenue

Watershed 2: Consists of 62,600 sq. ft. of the western portion of the project site. This watershed area consists mostly of impervious areas (pavement and rooftop areas) and has a T_C of 6.0 minutes and a composite CN Runoff Number of 98. Runoff from this area sheet flows towards the existing drainage inlets within Wellington Avenue (Design Point 2).

6.3 Proposed Conditions

In general, the proposed drainage patterns mimic existing conditions, discharging to the same design points as under existing conditions. Water quality is achieved by means of infiltration practices. Stormwater runoff from the eastern portion of the project area is conveyed through proposed drainage infrastructure prior to discharging to the existing drainage network, while the remainder of the western portion of the site will continue to sheet flow to the existing catch basins within Wellington Avenue. These conditions are shown in detail on the Proposed Conditions Watershed Map included in Appendix E.

Design Point 1 – Existing Drainage Network

Under proposed conditions, Watershed 1 is subdivided into two (2) subwatersheds.

Subwatershed 1A: Subwatershed 1A consists of 11,579 sq. ft. of mostly pervious areas. This subwatershed area has a minimum T_C of 6.0 minutes and a composite CN Runoff Number of 79. Stormwater runoff from the parking area sheet flows to a crushed stone diaphragm for pre-treatment and then Bioretention Basin #1 for water quality and groundwater recharge. Excess treated stormwater runoff from this area is collected via an outlet control structure that ties into the existing drainage network that conveys stormwater to the property to the south, Design Point 1.

Subwatershed 1B: Consists of 162,834 sq. ft. of mostly pavement areas and roof areas associated with the project site. This subwatershed a T_C of 6.0 minutes and a composite CN Runoff Number of 90. Stormwater runoff from this area sheet flows to Sediment Forebay #1 for pre-treatment and Sand Filter Basin #2 for water quality treatment. Excess treated stormwater runoff from this area is collected via an underdrain system and outlet control structure that ties into the existing drainage network that conveys stormwater to the property to the south, Design Point 1.

Design Point 2 – Existing Drainage Inlets within Wellington Avenue

Subwatershed 2: Consists of 62,600 sq. ft. of the western portion of the project site. This watershed area remains mostly unchanged; however, elimination of some smaller rooftop areas and paved areas are being converted to grassed/landscaped area are proposed. As such, this watershed area consists mostly of impervious areas (pavement and rooftop areas) and therefore has been assigned a T_C of 6.0 minutes and a composite CN Runoff Number of 94. Runoff from this area sheet flows towards the existing drainage inlets within Wellington Avenue (Design Point 2).

6.4 Results

A runoff analysis of the pre- and post-construction conditions was completed using the TR-20 methodology and is summarized in Table 3 below. Supporting calculations for the pre- and post-construction conditions are included in Appendices F and H respectively.

Table 6.1: Watershed Data

	Area (SF)	CN	Tc (min.)
Exist. Watershed 1	174,413	93	6.0
Exist. Watershed 2	62,600	98	6.0
Existing Totals	237,013	94	--
Prop. Subwatershed 1A	11,579	79	6.0
Prop. Subwatershed 1B	162,834	90	6.0
Watershed 2	62,600	94	6.0
Proposed Totals	237,013	91	--
Delta (Δ)	0	-3	--

Note: Minimum T_c = 6 minutes; Average CN is a weighted average.

As shown in Table 6.1 above, the overall watershed area remains unchanged when comparing existing to proposed conditions. However, due to the decrease in impervious

areas associated with the proposed development, the CN value has been decreased by 3 when comparing existing to proposed conditions.

Table 6.2.1: Peak Discharge (cfs) to Design Point 1

	WQ	1-YR	10-YR	100-YR
Existing Condition	3.62	8.84	17.70	32.69
Proposed Condition	0.12	4.08	15.48	30.13
<i>Delta (Δ)</i>	-3.50	-4.76	-2.22	-2.56

Table 6.2.2: Peak Discharge (cfs) to Design Point 2

	WQ	1-YR	10-YR	100-YR
Existing Condition	1.52	3.66	6.73	11.99
Proposed Condition	1.35	3.29	6.45	11.81
<i>Delta (Δ)</i>	-0.17	-0.37	-0.28	-0.18

As shown in Tables 6.2.1 and 6.2.2 above, the peak stormwater runoff rates realized at Design Point 1 (Existing Drainage Network) and Design Point 2 (existing catch basins within Wellington Avenue) have decreased for all design storm events. This will result in significantly less stress on the public drainage system, specifically the existing 4'x4' box culvert.

Table 6.2.3: Total Runoff Volume (cf) to Design Point 1

	WQ	1-YR	10-YR	100-YR
Existing Condition	8,883	28,609	59,587	114,207
Proposed Condition	6,667	17,050	45,447	98,348
<i>Delta (Δ)</i>	-2,216	-11,559	-14,140	-15,859

Table 6.2.4: Total Runoff Volume (cf) to Design Point 2

	WQ	1-YR	10-YR	100-YR
Existing Condition	5,142	12,883	24,327	44,132
Proposed Condition	3,507	10,751	21,959	41,620
<i>Delta (Δ)</i>	-1,635	-2,132	-2,368	-2,512

As shown in Tables 6.2.3 and 6.2.4 above, the total stormwater runoff volumes realized at Design Point 1 (Existing Drainage Network) and Design Point 2 (existing catch basins within Wellington Avenue) have decreased for all design storm events. This will result in

significantly less stress on the public drainage system, specifically the existing 4'x4' box culvert.

7 CONCLUSIONS


As shown in Sections 4, 5 and 6 above, the proposed improvements have been designed to minimize impacts of the proposed site development by reducing peak stormwater runoff rates for the 1, 10, and 100-year design storm vents while treating for water quality by the installation of BMP's including a bioretention basin and a lined and under-drained sand filter basin.


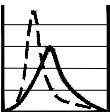
Due to the addition of the bioretention basin and the lined and under-drained sand filter basin, which infiltrate (bioretention only) and detain stormwater, both Design Points experiences reduction in peak stormwater runoff rates and provides water quality for the runoff leaving the watershed. The proposed stormwater management system has been designed to be in compliance with the rules and regulations stipulated in the Stormwater Rules. The stormwater management system as designed will not have any negative impacts to the existing drainage system within the subject property and within Wellington Avenue. In addition, as shown within this report, the WQv design storm is completely infiltrated on-site thereby improving current water quality conditions. Lastly, the proposed Stormwater Management Plan considers the existing TMDL for Fenner Pond by improving the overall water quality through infiltration practices.


Appendix A

Soil Evaluation Test Pit Location Plan and Soil Evaluation Test Pit Logs

prepared by Joe Casali Engineering, dated August 2024

TEST HOLE LOCATION: See Test Hole Location Plan GROUND SURFACE EL. / DATUM: 836.96' / NAVD88 EXCAVATOR TYPE: Mini Excavator OPERATOR: Jim - Dubon Masonry				DATE START/FINISH: July 5, 2024 WEATHER: Sunny, 90 Deg. F EXCAVATOR REACH: Approx. 12-ft JCE REPRESENTATIVE: D. DeCesaris, PE (RI 10162)		TH-1 PAGE 1 OF 1
DEPTH (FT)	SAMPLE TYPE/NO.	LAYER	REMARKS/NOTES	SOIL / ROCK DESCRIPTION	EST. HYDRAULIC CONDUCTIVITY	
1		FILL		(0-2") ASPHALT (2-12") SILTY SAND (SM); Brown, dry, 60% fine to coarse sand, 35% nonplastic fines, 5% fine to coarse gravel. (12-14") ASPHALT (14-24") SILTY SAND (SM); Light brown, dry, 65% fine to coarse sand, 20% fine to coarse gravel, 15% nonplastic fines. <i>USDA Class: Loamy Sand.</i>	N/A	
2				(24-60") SILTY SAND (SM); Brown, dry, 70% fine to coarse sand, 20% nonplastic fines, 10% fine to coarse gravel. <i>USDA Class: Loamy Sand.</i>		
3						
4					HSG B 2.41 in/hr	
5			Pockets of iron oxide staining/mottling observed at 54-inches.			
6		GLACIAL DEPOSITS		(60-108") POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); Light brown, dry to moist, 75% fine to coarse sand, 15% fine to coarse gravel, 10% nonplastic fines. <i>USDA Class: Loamy Sand.</i>		
7					HSG B 8.27 in/hr	
8						
9						
10				Bottom of test hole at 108-inches; excavation backfilled with previously excavated material upon completion.		
11						
12						
13						
NOTES: PROJECT NAME: 530 Wellington Ave, Cranston PROJECT NUMBER: 24-25				SHGWT: 54-inches IMPERVIOUS / LIMITING LAYER: Not encountered <div style="text-align: right;">  </div>		

TEST HOLE LOCATION: See Test Hole Location Plan GROUND SURFACE EL. / DATUM: 836.96' / NAVD88 EXCAVATOR TYPE: Mini Excavator OPERATOR: Jim - Dubon Masonry				DATE START/FINISH: July 5, 2024 WEATHER: Sunny, 90 Deg. F EXCAVATOR REACH: Approx. 12-ft JCE REPRESENTATIVE: D. DeCesaris, PE (RI 10162)		TH-2 PAGE 1 OF 1
DEPTH (FT)	SAMPLE TYPE/NO.	LAYER	REMARKS/NOTES	SOIL / ROCK DESCRIPTION	EST. HYDRAULIC CONDUCTIVITY	
1		FILL		(0-2") ASPHALT (2-32") SILTY SAND (SM); Brown, dry, 65% fine to coarse sand, 35% nonplastic fines, 5% fine to coarse gravel.	N/A	
2						
3		GLACIAL DEPOSITS	Pockets of iron oxide staining/mottling observed at 48-inches.	(32-60") SILTY SAND (SM); Brown, dry, 70% fine to coarse sand, 20% nonplastic fines, 10% fine to coarse gravel. <i>USDA Class: Loamy Sand.</i>	HSG B 2.41 in/hr	
4						
5						
6						
7						
8				(60-108") POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM); Light brown, dry to moist, 75% fine to coarse sand, 15% fine to coarse gravel, 10% nonplastic fines. <i>USDA Class: Loamy Sand.</i>	HSG B 8.27 in/hr	
9						
10				Bottom of test hole at 108-inches; excavation backfilled with previously excavated material upon completion.		
11						
12						
13						
NOTES: PROJECT NAME: 530 Wellington Ave, Cranston PROJECT NUMBER: 24-25				SHGWT: 48-inches IMPERVIOUS / LIMITING LAYER: Not Encountered <div>   </div> <small> JOE CASALI ENGINEERING, INC. CIVIL - SITE DEVELOPMENT - TRANSPORTATION DRAINAGE - WETLANDS - IRDS - TRAFFIC - FLOODPLAIN 300 FIRST ROAD, WARRICK, RI 02886 (401) 846-1300 (401) 846-1313 FAX WWW.JOECASALI.COM </small>		

TEST HOLE LOCATION: See Test Hole Location Plan GROUND SURFACE EL. / DATUM: 836.96' / NAVD88 EXCAVATOR TYPE: Mini Excavator OPERATOR: Jim - Dubon Masonry				DATE START/FINISH: July 5, 2024 WEATHER: Sunny, 90 Deg. F EXCAVATOR REACH: Approx. 12-ft JCE REPRESENTATIVE: D. DeCesaris, PE (RI 10162)		TH-3 PAGE 1 OF 1
DEPTH (FT)	SAMPLE TYPE/NO.	LAYER	REMARKS/NOTES	SOIL / ROCK DESCRIPTION	EST. HYDRAULIC CONDUCTIVITY	
1		FILL		(0-16") ASPHALT MILLINGS	N/A	
2				(16-44") SILTY SAND (SM); Light brown, dry, 70% fine to coarse sand, 15% nonplastic fines, 15% fine to coarse gravel.		
3						
4		GLACIAL DEPOSITS	Pockets of iron oxide staining/mottling observed at 44-inches.	(44-120") SILTY SAND (SM); Dark brown, dry to wet, 70% fine to coarse sand, 25% nonplastic fines, 5% fine to coarse gravel. <i>USDA Class: Loamy Sand.</i>	HSG B 2.41 in/hr	
5						
6			Pockets silt observed within excavation from 44- to 120 inches.			
7						
8			Groundwater penetration observed at 118-inches.			
9				Bottom of test hole at 108-inches; excavation backfilled with previously excavated material upon completion.		
10						
11						
12						
13						
NOTES: PROJECT NAME: 530 Wellington Ave, Cranston PROJECT NUMBER: 24-25				SHGWT: 44-inches IMPERVIOUS / LIMITING LAYER: Not encountered <div style="text-align: right;">  </div>		



SOIL BORING/MONITORING WELL LOG: SE-101(MW)

PROJECT NUMBER: S4504

DRILLING DATE: 5/4/23

LOGGED BY: Matthew Gallup

DRILLED BY: SAGE Envirotech Drilling Services, Inc.

WEATHER CONDITIONS: Cloudy, 50s

SCREENING EQUIPMENT: PID

DRILLING RIG: 3100 GT Truck Rig

DRILL METHOD: Direct Push

SAMPLE METHOD: 5' Macrocore

BORING TOTAL DEPTH: 15'

BORING REFUSAL: No

BORING/MW DIAMETER: 1"

LENGTH OF RISER: 5

LENGTH OF SCREEN: 10

DEPTH (FEET BSG)	DRIVE INTERVAL (FEET BSG)	INCHES RECOVERY	SAMPLE INTERVAL (FEET BSG)	PID (PPMV)	MATERIAL DESCRIPTION <small>(MOISTURE CONTENT, COLOR, DENSITY, CLASSIFICATION, NOTES)</small>	LITHOLOGY GRAPHIC LOG	DTW (FEET BSG)	WELL CONSTRUCTION (VISUAL)	WELL CONSTRUCTION (DEPTH INTERVALS (BSG))
0									
1			0-3	0.1	(0'-3') Light brown, dry, loose, poorly graded, gravelly sands, little or no fines. Top 1' consisted of crushed asphalt.				Filter Pack
2	0-5	36							
3									
4			NR	NR	(3'-5') No recovery.				Bentonite
5									
6			5-8	0.3	(5'-8') Light brown, dry, loose, poorly graded, gravelly sands, little or no fines.				
7	5-10	36							
8							8' ▼		
9			NR	NR	(8'-10') No recovery.				Filter Pack
10									
11									
12									
13	10-15	60	10-15	2.0	(10'-15') Tan, dense, wet, poorly graded, gravelly sands, little or no fines. End of boring and well installed 15' bsg.				
14									
15									

COMMENTS:
THIS BORE LOG IS INTENDED FOR ENVIRONMENTAL NOT GEOTECHNICAL PURPOSES.
NS: Not Sampled; NR: No Recovery; BSG: Below Surface Grade



SOIL BORING/MONITORING WELL LOG: SE-221(MW)

PROJECT NUMBER: S4504

DRILLING DATE: 03/13/2024

LOGGED BY: Matthew Gallup

DRILLED BY: SAGE EnviroTech Drilling Services, Inc.

WEATHER CONDITIONS: 50F Sunny

SCREENING EQUIPMENT: PID

DRILLING RIG: 7822 DT Track Rig

DRILL METHOD: Direct Push

SAMPLE METHOD: 5' Macrocore

BORING TOTAL DEPTH: 15

BORING REFUSAL: No

BORING/MW DIAMETER: 2"

LENGTH OF RISER: 5'

LENGTH OF SCREEN: 10'

DEPTH (FEET BSG)	DRIVE INTERVAL (FEET BSG)	INCHES RECOVERY	SAMPLE INTERVAL (FEET BSG)	PID (PPMV)	MATERIAL DESCRIPTION <small>(MOISTURE CONTENT, COLOR, DENSITY, CLASSIFICATION, NOTES)</small>	LITHOLOGY GRAPHIC LOG DTW (FEET BSG)	WELL CONSTRUCTION (VISUAL)	WELL CONSTRUCTION (DEPTH INTERVALS (BSG))
0								
1	0-2	24	0-2	0.2	(0'-2') Brown, dry, loose, well graded, gravelly sands, little or no fines, with urban fill material consisting of asphalt.			Filter Pack
2								
3			2-4	0.2	(2'-4') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.			
4	2-5	24						Bentonite
5			NR	NR	(4'-5') No recovery.			
6			NS	NS	(5'-6') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.			
7			6-8	0.6	(6'-8') Tan/gray, wet, dense, sand-silt mixtures.			
8	5-10	36						
9			NR	NR	(8'-10') No recovery.			
10								Filter Pack
11			10-13	1.3	(10'-13') Gray, wet, dense, organic silts and organic silty clays of low plasticity.			
12	10-15	48						
13			13-14	0.7	(13'-14') Gray, wet, dense, organic silts and organic silty clays of low plasticity.			
14								
15			NR	NR	(14'-15') No recovery. End of boring at 15' BSG.			

COMMENTS:
THIS BORE LOG IS INTENDED FOR ENVIRONMENTAL NOT GEOTECHNICAL PURPOSES.
NS: Not Sampled; NR: No Recovery; BSG: Below Surface Grade



SOIL BORING/MONITORING WELL LOG: SE-222(MW)

PROJECT NUMBER: S4504

DRILLING DATE: 03/13/2024

LOGGED BY: Matthew Gallup

DRILLED BY: SAGE EnviroTech Drilling Services, Inc.

WEATHER CONDITIONS: 50F Sunny

SCREENING EQUIPMENT: PID

DRILLING RIG: 7822 DT Track Rig

DRILL METHOD: Direct Push

SAMPLE METHOD: 5' Macrocore

BORING TOTAL DEPTH: 15

BORING REFUSAL: No

BORING/MW DIAMETER: 2"

LENGTH OF RISER: 5'

LENGTH OF SCREEN: 10'

DEPTH (FEET BSG)	DRIVE INTERVAL (FEET BSG)	INCHES RECOVERY	SAMPLE INTERVAL (FEET BSG)	PID (PPMV)	MATERIAL DESCRIPTION <small>(MOISTURE CONTENT, COLOR, DENSITY, CLASSIFICATION, NOTES)</small>	LITHOLOGY GRAPHIC LOG	DTW (FEET BSG)	WELL CONSTRUCTION (VISUAL)	WELL CONSTRUCTION (DEPTH INTERVALS (BSG))
0									
1	0-2	24	0-2	0.2	(0'-2') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.				Filter Pack
2									
3			2-4	0.2	(2'-4') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.				
4	2-5	24							Bentonite
5			NR	NR	(4'-5') No recovery.				
6			NS	NS	(5'-6') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.				
7			6-8	0.7	(6'-8') Gray, wet, loose, sand-silt mixtures.		6		
8	5-10	36							
9			NR	NR	(8'-10') No recovery.				Filter Pack
10									
11			10-12	1.4	(10'-12') Gray, wet, loose, sand-silt mixtures.				
12									
13	10-15	48	12-14	3.6	(12'-14') Gray, wet, dense, organic silts and organic silty clays of low plasticity.				
14									
15			NR	NR	(14'-15') No recovery. End of boring at 15' BSG.				

COMMENTS:
THIS BORE LOG IS INTENDED FOR ENVIRONMENTAL NOT GEOTECHNICAL PURPOSES.
NS: Not Sampled; NR: No Recovery; BSG: Below Surface Grade



SOIL BORING/MONITORING WELL LOG: SE-223(MW)

PROJECT NUMBER: S4504

DRILLING DATE: 03/13/2024

LOGGED BY: Matthew Gallup

DRILLED BY: SAGE EnviroTech Drilling Services, Inc.

WEATHER CONDITIONS: 50F Sunny

SCREENING EQUIPMENT: PID

DRILLING RIG: 7822 DT Track Rig

DRILL METHOD: Direct Push

SAMPLE METHOD: 5' Macrocore

BORING TOTAL DEPTH: 20

BORING REFUSAL: No

BORING/MW DIAMETER: 2"

LENGTH OF RISER: 5'

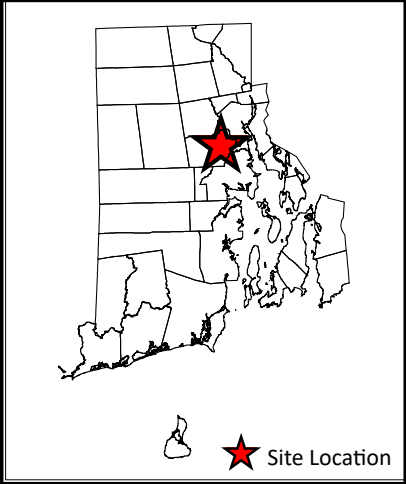
LENGTH OF SCREEN: 10'

DEPTH (FEET BSG)	DRIVE INTERVAL (FEET BSG)	INCHES RECOVERY	SAMPLE INTERVAL (FEET BSG)	PID (PPMV)	MATERIAL DESCRIPTION <small>(MOISTURE CONTENT, COLOR, DENSITY, CLASSIFICATION, NOTES)</small>	LITHOLOGY GRAPHIC LOG	DTW (FEET BSG)	WELL CONSTRUCTION (VISUAL)	WELL CONSTRUCTION (DEPTH INTERVALS (BSG))
0									
1	0-2	24	0-2	0	(0'-2') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.				Filter Pack
2									
3	2-5	24	2-4	0	(2'-4') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.				Bentonite
4			NR	NR	(4'-5') No recovery.				
5			5-6	0	(5'-6') Tan, dry, loose, poorly graded, gravelly sands, little or no fines.				
6			6-7	0.8	(6'-7') Tan, wet, loose, sand-silt mixtures.		6		
7	5-10	24							
8			NR	NR	(7'-10') No recovery.				
9									
10									
11			10-12	2.1	(10'-12') Tan, wet, loose, sand-silt mixtures.				Filter Pack
12	10-15	48							
13			12-14	1.6	(12'-14') Gray, wet, dense, organic silts and organic silty clays of low plasticity.				
14			NR	NR	(14'-15') No recovery.				
15									
16	15-17	36	15-16.5	NS	(15'-16.5') Liner jammed in soil barrel could not sample.				
17			16.5-17	2.6	(16.5'-17') Gray, wet, dense, organic silts and organic silty clays of low plasticity.				
18	17-20	0	NR	NR	(17'-20') Not sampled. Casing drove to 20' to set well. End of boring at 20' BSG.				
19									
20									

COMMENTS:
THIS BORE LOG IS INTENDED FOR ENVIRONMENTAL NOT GEOTECHNICAL PURPOSES.
NS: Not Sampled; NR: No Recovery; BSG: Below Surface Grade

Appendix B

Red/Yellow/Green Map, 530 Wellington Ave., Cranston, Rhode Island
prepared by Sage Environmental, dated November 2024



Red/Yellow/Green Map

530 Wellington Avenue
Cranston, Rhode Island

Date: 11/21/2024

Job #: S4504

Created By: ALM

Legend

- Approximate Site Boundary
- Building
- Green: All RISDISM BMPs Allowed.
- Red: Hard Cap - No Water on the Soil - Lined BMPs Only.
- Approximate Location of SAGE Soil Boring
- Approximate Location of SAGE Monitoring Well (Groundwater Elevation (Feet))
- Approximate Location of Existing Monitoring Well
- Sample Location with Applicable RIDEM Method 1 GB-GWO and/or GB-LC Exceedance(s)

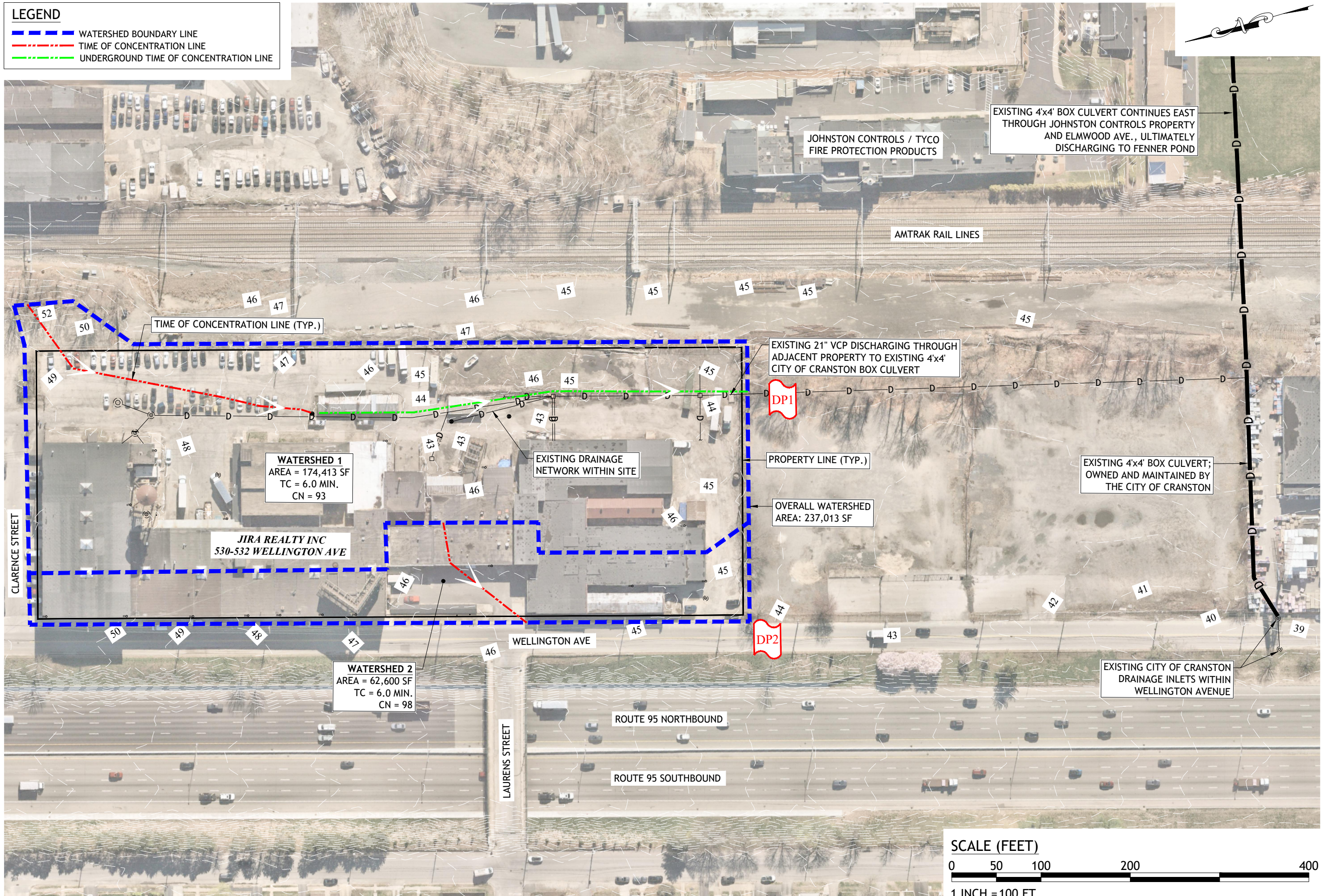
Data Provided by RIGIS
Orthimagery provided by nearmap

Figure

A Terracon Company

Appendix C

Existing Condition Watershed Map



PROPOSED SELF-STORAGE BUILDING
530-532 WELLINGTON STREET
CRANSTON, RHODE ISLAND
AP 3, LOT 107

REVISIONS:	
NO.	DATE DESCRIPTION
1	12/2024 RIDEM RTC

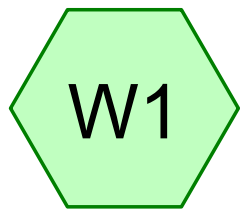
DESIGNED BY:	SD
DRAWN BY:	SD
CHECKED BY:	JAC
DATE:	SEPT. 2024
PROJECT NO:	24-25

STORMWATER
REPORT

**EXISTING
CONDITIONS
WATERSHED
MAP**

Appendix D

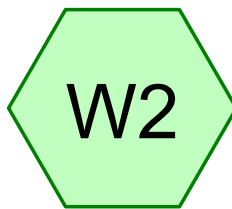
Existing Condition HydroCAD Calculations



Watershed 1



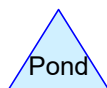
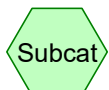
Existing Drainage
Network



Watershed 2



Existing Drainage Inlets
within Wellington Ave



Routing Diagram for Wellington Ave - Existing

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Wellington Ave - Existing

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,140	61	>75% Grass cover, Good, HSG B (W1, W2)
10,752	48	Brush, Good, HSG B (W1)
11,984	82	Dirt , HSG B (W1)
87,754	98	Paved parking, HSG B (W1, W2)
121,383	98	Roofs, HSG B (W1, W2)
237,013	94	TOTAL AREA

Wellington Ave - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=174,413 sf 84.38% Impervious Runoff Depth=1.97"
Flow Length=817' Tc=6.0 min CN=93 Runoff=8.84 cfs 28,609 cf

SubcatchmentW2: Watershed 2

Runoff Area=62,600 sf 98.98% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=98 Runoff=3.66 cfs 12,883 cf

Link DP-1: Existing Drainage Network

Inflow=8.84 cfs 28,609 cf
Primary=8.84 cfs 28,609 cf

Link DP-2: Existing Drainage Inlets within Wellington Ave

Inflow=3.66 cfs 12,883 cf
Primary=3.66 cfs 12,883 cf

Total Runoff Area = 237,013 sf Runoff Volume = 41,492 cf Average Runoff Depth = 2.10"
11.76% Pervious = 27,876 sf 88.24% Impervious = 209,137 sf

Wellington Ave - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1: Watershed 1

Runoff = 8.84 cfs @ 12.09 hrs, Volume= 28,609 cf, Depth= 1.97"

Routed to Link DP-1 : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
74,440	98	Roofs, HSG B
72,735	98	Paved parking, HSG B
10,752	48	Brush, Good, HSG B
11,984	82	Dirt , HSG B
4,502	61	>75% Grass cover, Good, HSG B
174,413	93	Weighted Average
27,238	65	15.62% Pervious Area
147,175	98	84.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
2.1	296	0.0135	2.36		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.7	466	0.0100	4.54	3.56	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
4.3	817	Total, Increased to minimum Tc = 6.0 min			

Wellington Ave - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W2: Watershed 2

Runoff = 3.66 cfs @ 12.09 hrs, Volume= 12,883 cf, Depth= 2.47"

Routed to Link DP-2 : Existing Drainage Inlets within Wellington Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
46,943	98	Roofs, HSG B
15,019	98	Paved parking, HSG B
638	61	>75% Grass cover, Good, HSG B
62,600	98	Weighted Average
638	61	1.02% Pervious Area
61,962	98	98.98% Impervious Area

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

Wellington Ave - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Page 6

Summary for Link DP-1: Existing Drainage Network

Inflow Area = 174,413 sf, 84.38% Impervious, Inflow Depth = 1.97" for 1-Year event
Inflow = 8.84 cfs @ 12.09 hrs, Volume= 28,609 cf
Primary = 8.84 cfs @ 12.09 hrs, Volume= 28,609 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Existing

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Link DP-2: Existing Drainage Inlets within Wellington Ave

Inflow Area = 62,600 sf, 98.98% Impervious, Inflow Depth = 2.47" for 1-Year event
Inflow = 3.66 cfs @ 12.09 hrs, Volume= 12,883 cf
Primary = 3.66 cfs @ 12.09 hrs, Volume= 12,883 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=174,413 sf 84.38% Impervious Runoff Depth=4.10"
Flow Length=817' Tc=6.0 min CN=93 Runoff=17.70 cfs 59,587 cf

SubcatchmentW2: Watershed 2

Runoff Area=62,600 sf 98.98% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=6.73 cfs 24,327 cf

Link DP-1: Existing Drainage Network

Inflow=17.70 cfs 59,587 cf
Primary=17.70 cfs 59,587 cf

Link DP-2: Existing Drainage Inlets within Wellington Ave

Inflow=6.73 cfs 24,327 cf
Primary=6.73 cfs 24,327 cf

Total Runoff Area = 237,013 sf Runoff Volume = 83,914 cf Average Runoff Depth = 4.25"
11.76% Pervious = 27,876 sf 88.24% Impervious = 209,137 sf

Wellington Ave - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W1: Watershed 1

Runoff = 17.70 cfs @ 12.09 hrs, Volume= 59,587 cf, Depth= 4.10"
 Routed to Link DP-1 : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
74,440	98	Roofs, HSG B
72,735	98	Paved parking, HSG B
10,752	48	Brush, Good, HSG B
11,984	82	Dirt , HSG B
4,502	61	>75% Grass cover, Good, HSG B
174,413	93	Weighted Average
27,238	65	15.62% Pervious Area
147,175	98	84.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
2.1	296	0.0135	2.36		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.7	466	0.0100	4.54	3.56	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
4.3	817	Total, Increased to minimum Tc = 6.0 min			

Wellington Ave - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W2: Watershed 2

Runoff = 6.73 cfs @ 12.09 hrs, Volume= 24,327 cf, Depth= 4.66"

Routed to Link DP-2 : Existing Drainage Inlets within Wellington Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
46,943	98	Roofs, HSG B
15,019	98	Paved parking, HSG B
638	61	>75% Grass cover, Good, HSG B
62,600	98	Weighted Average
638	61	1.02% Pervious Area
61,962	98	98.98% Impervious Area

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

Wellington Ave - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Link DP-1: Existing Drainage Network

Inflow Area = 174,413 sf, 84.38% Impervious, Inflow Depth = 4.10" for 10-Year event
Inflow = 17.70 cfs @ 12.09 hrs, Volume= 59,587 cf
Primary = 17.70 cfs @ 12.09 hrs, Volume= 59,587 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Existing

Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Link DP-2: Existing Drainage Inlets within Wellington Ave

Inflow Area = 62,600 sf, 98.98% Impervious, Inflow Depth = 4.66" for 10-Year event
Inflow = 6.73 cfs @ 12.09 hrs, Volume= 24,327 cf
Primary = 6.73 cfs @ 12.09 hrs, Volume= 24,327 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Existing

Type III 24-hr 100-Year Rainfall=8.70"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1: Watershed 1

Runoff Area=174,413 sf 84.38% Impervious Runoff Depth=7.86"
Flow Length=817' Tc=6.0 min CN=93 Runoff=32.69 cfs 114,207 cf

SubcatchmentW2: Watershed 2

Runoff Area=62,600 sf 98.98% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=98 Runoff=11.99 cfs 44,132 cf

Link DP-1: Existing Drainage Network

Inflow=32.69 cfs 114,207 cf
Primary=32.69 cfs 114,207 cf

Link DP-2: Existing Drainage Inlets within Wellington Ave

Inflow=11.99 cfs 44,132 cf
Primary=11.99 cfs 44,132 cf

Total Runoff Area = 237,013 sf Runoff Volume = 158,339 cf Average Runoff Depth = 8.02"
11.76% Pervious = 27,876 sf 88.24% Impervious = 209,137 sf

Wellington Ave - Existing

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Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W1: Watershed 1

Runoff = 32.69 cfs @ 12.09 hrs, Volume= 114,207 cf, Depth= 7.86"

Routed to Link DP-1 : Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
74,440	98	Roofs, HSG B
72,735	98	Paved parking, HSG B
10,752	48	Brush, Good, HSG B
11,984	82	Dirt , HSG B
4,502	61	>75% Grass cover, Good, HSG B
174,413	93	Weighted Average
27,238	65	15.62% Pervious Area
147,175	98	84.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
2.1	296	0.0135	2.36		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
1.7	466	0.0100	4.54	3.56	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Concrete pipe, bends & connections
4.3	817	Total, Increased to minimum Tc = 6.0 min			

Wellington Ave - Existing

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Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W2: Watershed 2

Runoff = 11.99 cfs @ 12.09 hrs, Volume= 44,132 cf, Depth= 8.46"

Routed to Link DP-2 : Existing Drainage Inlets within Wellington Ave

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
46,943	98	Roofs, HSG B
15,019	98	Paved parking, HSG B
638	61	>75% Grass cover, Good, HSG B
62,600	98	Weighted Average
638	61	1.02% Pervious Area
61,962	98	98.98% Impervious Area

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

Wellington Ave - Existing

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Link DP-1: Existing Drainage Network

Inflow Area = 174,413 sf, 84.38% Impervious, Inflow Depth = 7.86" for 100-Year event
Inflow = 32.69 cfs @ 12.09 hrs, Volume= 114,207 cf
Primary = 32.69 cfs @ 12.09 hrs, Volume= 114,207 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Existing

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Link DP-2: Existing Drainage Inlets within Wellington Ave

Inflow Area = 62,600 sf, 98.98% Impervious, Inflow Depth = 8.46" for 100-Year event
Inflow = 11.99 cfs @ 12.09 hrs, Volume= 44,132 cf
Primary = 11.99 cfs @ 12.09 hrs, Volume= 44,132 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

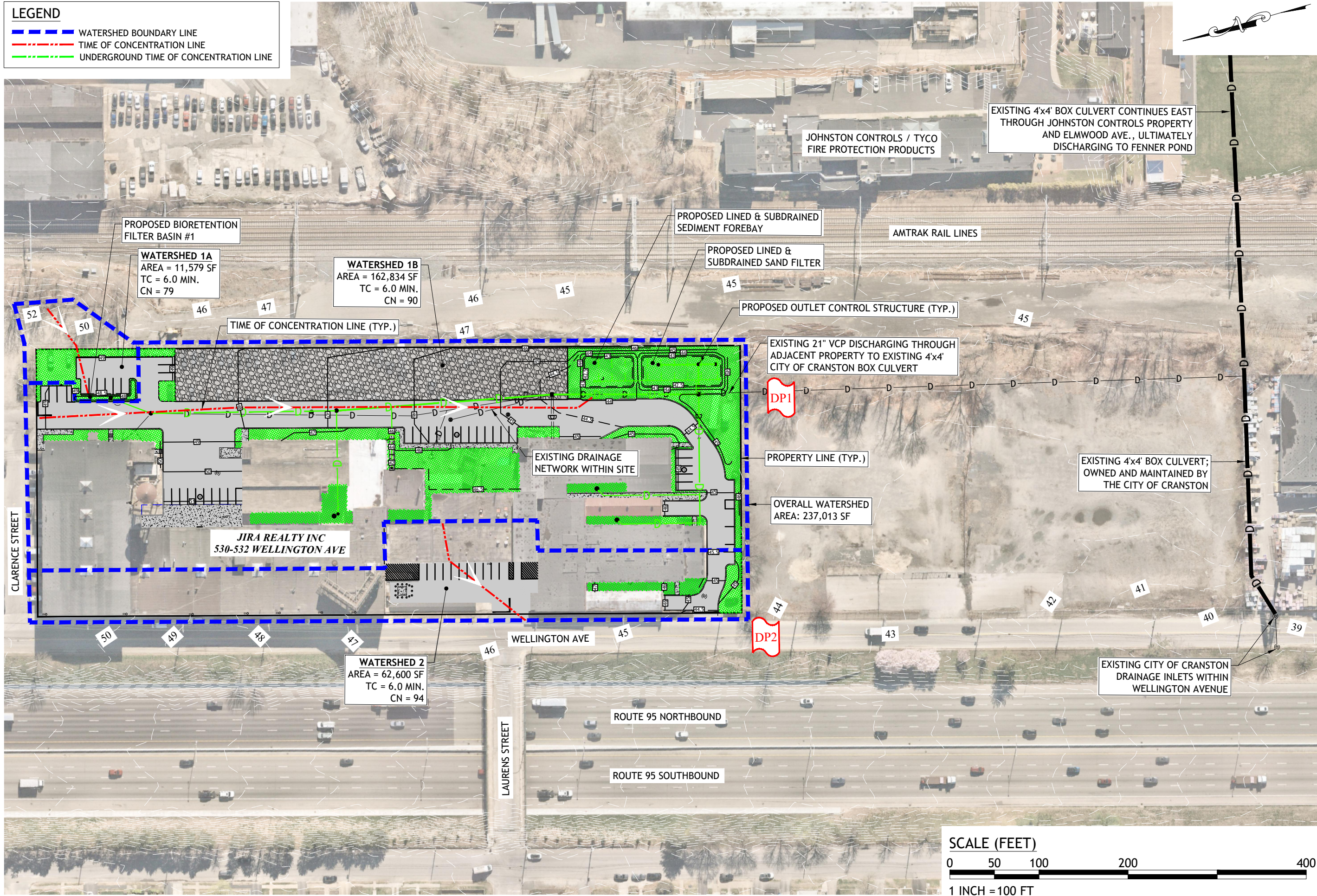
Appendix E

Proposed Watershed Map

Q:\24-25 Mike_Jobb\Drainage\Watershed Maps\Wellington Ave Self-Storage [R1.dwg Dec. 05, 2024 9:54am

LEGEND

WATERSHED BOUNDARY LINE

TIME OF CONCENTRATION LINE

JCE

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300 POST ROAD, WARWICK, RI 02886
(401) 944-1300 (401) 944-1313 FAX WWW.JOECASALI.COM

PROPOSED SELF-STORAGE BUILDING

530-532 WELLINGTON STREET
CRANSTON, RHODE ISLAND
AP 3, LOT 107

REVISIONS:		
NO.	DATE	DESCRIPTION
1	12/2024	RIDEM RTC

DESIGNED BY:	SD
DRAWN BY:	SD
CHECKED BY:	JAC
DATE:	SEPT. 2024
PROJECT NO:	24-25

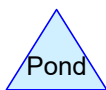
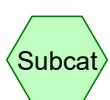
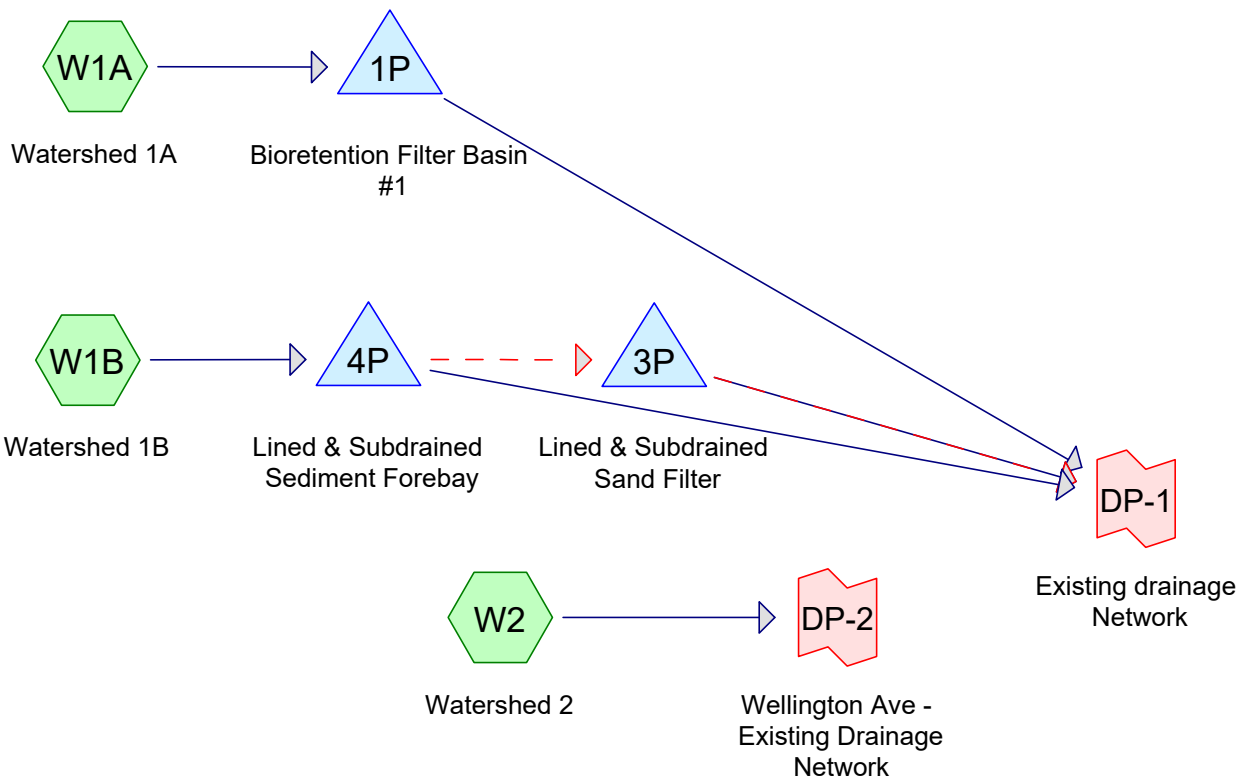
STORMWATER
REPORT

PROPOSED
CONDITIONS
WATERSHED
MAP

SHEET
1 OF 1

Appendix F

Proposed Condition HydroCAD Calculations



Wellington Ave - Proposed R1

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Page 2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
45,774	61	>75% Grass cover, Good, HSG B (W1A, W1B, W2)
26,145	96	Compacted Aggregate , HSG B (W1B)
5,326	82	Dirt , HSG B (W1A)
56,433	98	Paved parking, HSG B (W1A, W1B, W2)
103,335	98	Roofs, HSG B (W1B, W2)
237,013	90	TOTAL AREA

Wellington Ave - Proposed R1

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Type III 24-hr 1-Year Rainfall=2.70"

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Page 3

Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1A: Watershed 1A Runoff Area=11,579 sf 22.64% Impervious Runoff Depth=0.97"
Flow Length=115' Tc=6.0 min CN=79 Runoff=0.29 cfs 940 cf

SubcatchmentW1B: Watershed 1B Runoff Area=162,834 sf 62.68% Impervious Runoff Depth=1.71"
Flow Length=628' Tc=6.0 min CN=90 Runoff=7.31 cfs 23,213 cf

SubcatchmentW2: Watershed 2 Runoff Area=62,600 sf 87.99% Impervious Runoff Depth=2.06"
Tc=6.0 min CN=94 Runoff=3.29 cfs 10,751 cf

Pond 1P: Bioretention Filter Basin #1 Peak Elev=48.16' Storage=319 cf Inflow=0.29 cfs 940 cf
Discarded=0.05 cfs 939 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 939 cf

Pond 3P: Lined & Subdrained Sand Filter Peak Elev=43.59' Storage=5,674 cf Inflow=7.01 cfs 16,205 cf
Primary=0.07 cfs 3,877 cf Secondary=3.94 cfs 8,667 cf Outflow=4.01 cfs 12,545 cf

Pond 4P: Lined & Subdrained Sediment Peak Elev=43.71' Storage=3,956 cf Inflow=7.31 cfs 23,213 cf
Primary=0.07 cfs 4,505 cf Secondary=7.01 cfs 16,205 cf Outflow=7.08 cfs 20,710 cf

Link DP-1: Existing drainage Network Inflow=4.08 cfs 17,050 cf
Primary=4.08 cfs 17,050 cf

Link DP-2: Wellington Ave - Existing Drainage Network Inflow=3.29 cfs 10,751 cf
Primary=3.29 cfs 10,751 cf

Total Runoff Area = 237,013 sf Runoff Volume = 34,904 cf Average Runoff Depth = 1.77"
32.59% Pervious = 77,245 sf 67.41% Impervious = 159,768 sf

Wellington Ave - Proposed R1

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1A: Watershed 1A

Runoff = 0.29 cfs @ 12.10 hrs, Volume= 940 cf, Depth= 0.97"
 Routed to Pond 1P : Bioretention Filter Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
2,621	98	Paved parking, HSG B
5,326	82	Dirt , HSG B
3,632	61	>75% Grass cover, Good, HSG B
11,579	79	Weighted Average
8,958	73	77.36% Pervious Area
2,621	98	22.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
0.9	115	Total, Increased to minimum Tc = 6.0 min			

Wellington Ave - Proposed R1

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W1B: Watershed 1B

Runoff = 7.31 cfs @ 12.09 hrs, Volume= 23,213 cf, Depth= 1.71"

Routed to Pond 4P : Lined & Subdrained Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
58,354	98	Roofs, HSG B
43,709	98	Paved parking, HSG B
* 26,145	96	Compacted Aggregate , HSG B
34,626	61	>75% Grass cover, Good, HSG B
162,834	90	Weighted Average
60,771	76	37.32% Pervious Area
102,063	98	62.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	55	0.0130	1.04		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
4.0	573	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
4.9	628	Total, Increased to minimum Tc = 6.0 min			

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Subcatchment W2: Watershed 2

Runoff = 3.29 cfs @ 12.09 hrs, Volume= 10,751 cf, Depth= 2.06"

Routed to Link DP-2 : Wellington Ave - Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
44,981	98	Roofs, HSG B
10,103	98	Paved parking, HSG B
7,516	61	>75% Grass cover, Good, HSG B
62,600	94	Weighted Average
7,516	61	12.01% Pervious Area
55,084	98	87.99% Impervious Area

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

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Pond 1P: Bioretention Filter Basin #1

Inflow Area = 11,579 sf, 22.64% Impervious, Inflow Depth = 0.97" for 1-Year event
Inflow = 0.29 cfs @ 12.10 hrs, Volume= 940 cf
Outflow = 0.05 cfs @ 12.67 hrs, Volume= 939 cf, Atten= 84%, Lag= 34.3 min
Discarded = 0.05 cfs @ 12.67 hrs, Volume= 939 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 48.16' @ 12.67 hrs Surf.Area= 842 sf Storage= 319 cf

Plug-Flow detention time= 104.2 min calculated for 939 cf (100% of inflow)

Center-of-Mass det. time= 103.6 min (959.0 - 855.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	256 cf	100% Voids (Conic) Listed below (Recalc)
#2	46.00'	252 cf	Amended Soils (Prismatic) Listed below (Recalc)
			764 cf Overall x 33.0% Voids
508 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
48.00	382	0	0	382
48.50	653	256	256	656

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.00	382	0	0
48.00	382	764	764

Device	Routing	Invert	Outlet Devices
#1	Discarded	46.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	48.30'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 12.67 hrs HW=48.16' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.00' (Free Discharge)

↑**2=Orifice/Grate** (Controls 0.00 cfs)

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Pond 3P: Lined & Subdrained Sand Filter

Inflow = 7.01 cfs @ 12.10 hrs, Volume= 16,205 cf
 Outflow = 4.01 cfs @ 12.27 hrs, Volume= 12,545 cf, Atten= 43%, Lag= 9.8 min
 Primary = 0.07 cfs @ 12.27 hrs, Volume= 3,877 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 3.94 cfs @ 12.27 hrs, Volume= 8,667 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 43.59' @ 12.27 hrs Storage= 5,674 cf

Plug-Flow detention time= 174.4 min calculated for 12,545 cf (77% of inflow)

Center-of-Mass det. time= 115.6 min (921.5 - 805.9)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	5,064 cf	100% Voids (Conic) Listed below (Recalc) -Impervious
#2	40.67'	1,706 cf	Sand Filter (Prismatic) Listed below (Recalc) -Impervious
			5,170 cf Overall x 33.0% Voids
#3	40.17'	466 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc) -Impervious
			1,413 cf Overall x 33.0% Voids
		7,236 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	2,825	0	0	2,825
43.00	3,181	1,501	1,501	3,194
44.00	3,960	3,563	5,064	4,001

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	2,825	0	0
42.50	2,825	5,170	5,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	2,825	0	0
40.67	2,825	1,413	1,413

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.45'	30.0" Horiz. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.27 hrs HW=43.58' (Free Discharge)↑**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 8.83 fps)**Secondary OutFlow** Max=3.67 cfs @ 12.27 hrs HW=43.58' (Free Discharge)↑**1=Orifice/Grate** (Weir Controls 3.67 cfs @ 1.18 fps)

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Pond 4P: Lined & Subdrained Sediment Forebay

Inflow Area = 162,834 sf, 62.68% Impervious, Inflow Depth = 1.71" for 1-Year event
 Inflow = 7.31 cfs @ 12.09 hrs, Volume= 23,213 cf
 Outflow = 7.08 cfs @ 12.10 hrs, Volume= 20,710 cf, Atten= 3%, Lag= 0.8 min
 Primary = 0.07 cfs @ 12.10 hrs, Volume= 4,505 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 7.01 cfs @ 12.10 hrs, Volume= 16,205 cf
 Routed to Pond 3P : Lined & Subdrained Sand Filter

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 43.71' @ 12.10 hrs Surf.Area= 6,278 sf Storage= 3,956 cf

Plug-Flow detention time= 113.2 min calculated for 20,710 cf (89% of inflow)
 Center-of-Mass det. time= 61.9 min (875.5 - 813.6)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	3,500 cf	Custom Stage Data (Conic) Listed below (Recalc)
#2	40.67'	1,044 cf	Sand Filter Layer (Prismatic) Listed below (Recalc)
			3,162 cf Overall x 33.0% Voids
#3	40.17'	285 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc)
			864 cf Overall x 33.0% Voids
		4,829 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	1,728	0	0	1,728
43.00	1,987	928	928	1,998
44.00	3,205	2,572	3,500	3,229

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	1,728	0	0
42.50	1,728	3,162	3,162

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	1,728	0	0
40.67	1,728	864	864

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.52'	30.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.10 hrs HW=43.71' (Free Discharge)
 ↑ **2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 8.99 fps)

Secondary OutFlow Max=6.91 cfs @ 12.10 hrs HW=43.71' (Free Discharge)
 ↑ **1=Broad-Crested Rectangular Weir** (Weir Controls 6.91 cfs @ 1.22 fps)

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Type III 24-hr 1-Year Rainfall=2.70"

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Summary for Link DP-1: Existing drainage Network

Inflow Area = 174,413 sf, 60.02% Impervious, Inflow Depth > 1.17" for 1-Year event
Inflow = 4.08 cfs @ 12.27 hrs, Volume= 17,050 cf
Primary = 4.08 cfs @ 12.27 hrs, Volume= 17,050 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

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Summary for Link DP-2: Wellington Ave - Existing Drainage Network

Inflow Area = 62,600 sf, 87.99% Impervious, Inflow Depth = 2.06" for 1-Year event
Inflow = 3.29 cfs @ 12.09 hrs, Volume= 10,751 cf
Primary = 3.29 cfs @ 12.09 hrs, Volume= 10,751 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Proposed R1

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Type III 24-hr 10-Year Rainfall=4.90"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1A: Watershed 1A

Runoff Area=11,579 sf 22.64% Impervious Runoff Depth=2.72"
Flow Length=115' Tc=6.0 min CN=79 Runoff=0.83 cfs 2,620 cf

SubcatchmentW1B: Watershed 1B

Runoff Area=162,834 sf 62.68% Impervious Runoff Depth=3.78"
Flow Length=628' Tc=6.0 min CN=90 Runoff=15.64 cfs 51,292 cf

SubcatchmentW2: Watershed 2

Runoff Area=62,600 sf 87.99% Impervious Runoff Depth=4.21"
Tc=6.0 min CN=94 Runoff=6.45 cfs 21,959 cf

Pond 1P: Bioretention Filter Basin #1

Peak Elev=48.41' Storage=452 cf Inflow=0.83 cfs 2,620 cf
Discarded=0.05 cfs 1,723 cf Primary=0.75 cfs 904 cf Outflow=0.81 cfs 2,627 cf

Pond 3P: Lined & Subdrained Sand Filter

Peak Elev=43.78' Storage=6,383 cf Inflow=15.19 cfs 43,685 cf
Primary=0.07 cfs 4,211 cf Secondary=14.58 cfs 35,235 cf Outflow=14.65 cfs 39,446 cf

Pond 4P: Lined & Subdrained Sediment

Peak Elev=43.83' Storage=4,316 cf Inflow=15.64 cfs 51,292 cf
Primary=0.07 cfs 5,097 cf Secondary=15.19 cfs 43,685 cf Outflow=15.27 cfs 48,782 cf

Link DP-1: Existing drainage Network

Inflow=15.48 cfs 45,447 cf
Primary=15.48 cfs 45,447 cf

Link DP-2: Wellington Ave - Existing Drainage Network

Inflow=6.45 cfs 21,959 cf
Primary=6.45 cfs 21,959 cf

Total Runoff Area = 237,013 sf Runoff Volume = 75,871 cf Average Runoff Depth = 3.84"
32.59% Pervious = 77,245 sf 67.41% Impervious = 159,768 sf

Wellington Ave - Proposed R1

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W1A: Watershed 1A

Runoff = 0.83 cfs @ 12.09 hrs, Volume= 2,620 cf, Depth= 2.72"
 Routed to Pond 1P : Bioretention Filter Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
2,621	98	Paved parking, HSG B
5,326	82	Dirt , HSG B
3,632	61	>75% Grass cover, Good, HSG B
11,579	79	Weighted Average
8,958	73	77.36% Pervious Area
2,621	98	22.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
0.9	115	Total, Increased to minimum Tc = 6.0 min			

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W1B: Watershed 1B

Runoff = 15.64 cfs @ 12.09 hrs, Volume= 51,292 cf, Depth= 3.78"

Routed to Pond 4P : Lined & Subdrained Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
58,354	98	Roofs, HSG B
43,709	98	Paved parking, HSG B
* 26,145	96	Compacted Aggregate , HSG B
34,626	61	>75% Grass cover, Good, HSG B
162,834	90	Weighted Average
60,771	76	37.32% Pervious Area
102,063	98	62.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	55	0.0130	1.04		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
4.0	573	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
4.9	628	Total, Increased to minimum Tc = 6.0 min			

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Subcatchment W2: Watershed 2

Runoff = 6.45 cfs @ 12.09 hrs, Volume= 21,959 cf, Depth= 4.21"

Routed to Link DP-2 : Wellington Ave - Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
44,981	98	Roofs, HSG B
10,103	98	Paved parking, HSG B
7,516	61	>75% Grass cover, Good, HSG B
62,600	94	Weighted Average
7,516	61	12.01% Pervious Area
55,084	98	87.99% Impervious Area

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

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Pond 1P: Bioretention Filter Basin #1

Inflow Area = 11,579 sf, 22.64% Impervious, Inflow Depth = 2.72" for 10-Year event
 Inflow = 0.83 cfs @ 12.09 hrs, Volume= 2,620 cf
 Outflow = 0.81 cfs @ 12.11 hrs, Volume= 2,627 cf, Atten= 3%, Lag= 1.3 min
 Discarded = 0.05 cfs @ 12.12 hrs, Volume= 1,723 cf
 Primary = 0.75 cfs @ 12.11 hrs, Volume= 904 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 48.41' @ 12.12 hrs Surf.Area= 981 sf Storage= 452 cf

Plug-Flow detention time= 73.5 min calculated for 2,617 cf (100% of inflow)

Center-of-Mass det. time= 74.9 min (900.2 - 825.4)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	256 cf	100% Voids (Conic) Listed below (Recalc)
#2	46.00'	252 cf	Amended Soils (Prismatic) Listed below (Recalc)
			764 cf Overall x 33.0% Voids
			508 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
48.00	382	0	0	382
48.50	653	256	256	656

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.00	382	0	0
48.00	382	764	764

Device	Routing	Invert	Outlet Devices
#1	Discarded	46.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	48.30'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 12.12 hrs HW=48.41' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)**Primary OutFlow** Max=0.71 cfs @ 12.11 hrs HW=48.41' (Free Discharge)↑**2=Orifice/Grate** (Weir Controls 0.71 cfs @ 1.07 fps)

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Pond 3P: Lined & Subdrained Sand Filter

Inflow = 15.19 cfs @ 12.10 hrs, Volume= 43,685 cf
 Outflow = 14.65 cfs @ 12.11 hrs, Volume= 39,446 cf, Atten= 4%, Lag= 0.9 min
 Primary = 0.07 cfs @ 12.11 hrs, Volume= 4,211 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 14.58 cfs @ 12.11 hrs, Volume= 35,235 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 43.78' @ 12.11 hrs Storage= 6,383 cf

Plug-Flow detention time= 77.9 min calculated for 39,376 cf (90% of inflow)

Center-of-Mass det. time= 37.0 min (836.4 - 799.4)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	5,064 cf	100% Voids (Conic) Listed below (Recalc) -Impervious
#2	40.67'	1,706 cf	Sand Filter (Prismatic) Listed below (Recalc) -Impervious
			5,170 cf Overall x 33.0% Voids
#3	40.17'	466 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc) -Impervious
			1,413 cf Overall x 33.0% Voids
		7,236 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	2,825	0	0	2,825
43.00	3,181	1,501	1,501	3,194
44.00	3,960	3,563	5,064	4,001

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	2,825	0	0
42.50	2,825	5,170	5,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	2,825	0	0
40.67	2,825	1,413	1,413

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.45'	30.0" Horiz. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.11 hrs HW=43.77' (Free Discharge)↑**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.08 fps)**Secondary OutFlow** Max=14.22 cfs @ 12.11 hrs HW=43.77' (Free Discharge)↑**1=Orifice/Grate** (Weir Controls 14.22 cfs @ 1.86 fps)

Wellington Ave - Proposed R1

Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Pond 4P: Lined & Subdrained Sediment Forebay

Inflow Area = 162,834 sf, 62.68% Impervious, Inflow Depth = 3.78" for 10-Year event
 Inflow = 15.64 cfs @ 12.09 hrs, Volume= 51,292 cf
 Outflow = 15.27 cfs @ 12.10 hrs, Volume= 48,782 cf, Atten= 2%, Lag= 0.6 min
 Primary = 0.07 cfs @ 12.10 hrs, Volume= 5,097 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 15.19 cfs @ 12.10 hrs, Volume= 43,685 cf
 Routed to Pond 3P : Lined & Subdrained Sand Filter

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 43.83' @ 12.10 hrs Surf.Area= 6,439 sf Storage= 4,316 cf

Plug-Flow detention time= 62.2 min calculated for 48,782 cf (95% of inflow)
 Center-of-Mass det. time= 34.7 min (826.1 - 791.4)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	3,500 cf	Custom Stage Data (Conic) Listed below (Recalc)
#2	40.67'	1,044 cf	Sand Filter Layer (Prismatic) Listed below (Recalc) 3,162 cf Overall x 33.0% Voids
#3	40.17'	285 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc) 864 cf Overall x 33.0% Voids
4,829 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	1,728	0	0	1,728
43.00	1,987	928	928	1,998
44.00	3,205	2,572	3,500	3,229

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	1,728	0	0
42.50	1,728	3,162	3,162

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	1,728	0	0
40.67	1,728	864	864

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.52'	30.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.10 hrs HW=43.83' (Free Discharge)
 ↑**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.15 fps)

Secondary OutFlow Max=15.11 cfs @ 12.10 hrs HW=43.83' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 15.11 cfs @ 1.61 fps)

Wellington Ave - Proposed R1

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Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Link DP-1: Existing drainage Network

Inflow Area = 174,413 sf, 60.02% Impervious, Inflow Depth > 3.13" for 10-Year event
Inflow = 15.48 cfs @ 12.11 hrs, Volume= 45,447 cf
Primary = 15.48 cfs @ 12.11 hrs, Volume= 45,447 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Proposed R1

Type III 24-hr 10-Year Rainfall=4.90"

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Summary for Link DP-2: Wellington Ave - Existing Drainage Network

Inflow Area = 62,600 sf, 87.99% Impervious, Inflow Depth = 4.21" for 10-Year event
Inflow = 6.45 cfs @ 12.09 hrs, Volume= 21,959 cf
Primary = 6.45 cfs @ 12.09 hrs, Volume= 21,959 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Proposed R1

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Type III 24-hr 100-Year Rainfall=8.70"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1A: Watershed 1A

Runoff Area=11,579 sf 22.64% Impervious Runoff Depth=6.16"
Flow Length=115' Tc=6.0 min CN=79 Runoff=1.85 cfs 5,947 cf

SubcatchmentW1B: Watershed 1B

Runoff Area=162,834 sf 62.68% Impervious Runoff Depth=7.50"
Flow Length=628' Tc=6.0 min CN=90 Runoff=29.83 cfs 101,709 cf

SubcatchmentW2: Watershed 2

Runoff Area=62,600 sf 87.99% Impervious Runoff Depth=7.98"
Tc=6.0 min CN=94 Runoff=11.81 cfs 41,620 cf

Pond 1P: Bioretention Filter Basin #1

Peak Elev=48.49' Storage=503 cf Inflow=1.85 cfs 5,947 cf
Discarded=0.06 cfs 2,524 cf Primary=1.74 cfs 3,421 cf Outflow=1.79 cfs 5,945 cf

Pond 3P: Lined & Subdrained Sand Filter

Peak Elev=43.96' Storage=7,087 cf Inflow=29.17 cfs 93,505 cf
Primary=0.07 cfs 4,755 cf Secondary=28.25 cfs 84,479 cf Outflow=28.32 cfs 89,234 cf

Pond 4P: Lined & Subdrained Sediment

Peak Elev=43.99' Storage=4,809 cf Inflow=29.83 cfs 101,709 cf
Primary=0.07 cfs 5,693 cf Secondary=29.17 cfs 93,505 cf Outflow=29.24 cfs 99,199 cf

Link DP-1: Existing drainage Network

Inflow=30.13 cfs 98,348 cf
Primary=30.13 cfs 98,348 cf

Link DP-2: Wellington Ave - Existing Drainage Network

Inflow=11.81 cfs 41,620 cf
Primary=11.81 cfs 41,620 cf

Total Runoff Area = 237,013 sf Runoff Volume = 149,276 cf Average Runoff Depth = 7.56"
32.59% Pervious = 77,245 sf 67.41% Impervious = 159,768 sf

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W1A: Watershed 1A

Runoff = 1.85 cfs @ 12.09 hrs, Volume= 5,947 cf, Depth= 6.16"
 Routed to Pond 1P : Bioretention Filter Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
2,621	98	Paved parking, HSG B
5,326	82	Dirt , HSG B
3,632	61	>75% Grass cover, Good, HSG B
11,579	79	Weighted Average
8,958	73	77.36% Pervious Area
2,621	98	22.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
0.9	115	Total, Increased to minimum Tc = 6.0 min			

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W1B: Watershed 1B

Runoff = 29.83 cfs @ 12.09 hrs, Volume= 101,709 cf, Depth= 7.50"

Routed to Pond 4P : Lined & Subdrained Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
58,354	98	Roofs, HSG B
43,709	98	Paved parking, HSG B
* 26,145	96	Compacted Aggregate , HSG B
34,626	61	>75% Grass cover, Good, HSG B
162,834	90	Weighted Average
60,771	76	37.32% Pervious Area
102,063	98	62.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	55	0.0130	1.04		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
4.0	573	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
4.9	628	Total, Increased to minimum Tc = 6.0 min			

Wellington Ave - Proposed R1

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Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Subcatchment W2: Watershed 2

Runoff = 11.81 cfs @ 12.09 hrs, Volume= 41,620 cf, Depth= 7.98"

Routed to Link DP-2 : Wellington Ave - Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
44,981	98	Roofs, HSG B
10,103	98	Paved parking, HSG B
7,516	61	>75% Grass cover, Good, HSG B
62,600	94	Weighted Average
7,516	61	12.01% Pervious Area
55,084	98	87.99% Impervious Area

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

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Pond 1P: Bioretention Filter Basin #1

Inflow Area = 11,579 sf, 22.64% Impervious, Inflow Depth = 6.16" for 100-Year event
 Inflow = 1.85 cfs @ 12.09 hrs, Volume= 5,947 cf
 Outflow = 1.79 cfs @ 12.10 hrs, Volume= 5,945 cf, Atten= 3%, Lag= 0.7 min
 Discarded = 0.06 cfs @ 12.10 hrs, Volume= 2,524 cf
 Primary = 1.74 cfs @ 12.10 hrs, Volume= 3,421 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 48.49' @ 12.10 hrs Surf.Area= 1,030 sf Storage= 503 cf

Plug-Flow detention time= 50.9 min calculated for 5,945 cf (100% of inflow)
 Center-of-Mass det. time= 50.7 min (852.7 - 802.0)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	256 cf	100% Voids (Conic) Listed below (Recalc)
#2	46.00'	252 cf	Amended Soils (Prismatic) Listed below (Recalc)
			764 cf Overall x 33.0% Voids
			508 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
48.00	382	0	0	382
48.50	653	256	256	656

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.00	382	0	0
48.00	382	764	764

Device	Routing	Invert	Outlet Devices
#1	Discarded	46.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	48.30'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.10 hrs HW=48.49' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=1.73 cfs @ 12.10 hrs HW=48.49' (Free Discharge)
 ↑**2=Orifice/Grate** (Weir Controls 1.73 cfs @ 1.43 fps)

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Pond 3P: Lined & Subdrained Sand Filter

Inflow = 29.17 cfs @ 12.10 hrs, Volume= 93,505 cf
 Outflow = 28.32 cfs @ 12.11 hrs, Volume= 89,234 cf, Atten= 3%, Lag= 0.7 min
 Primary = 0.07 cfs @ 12.11 hrs, Volume= 4,755 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 28.25 cfs @ 12.11 hrs, Volume= 84,479 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 43.96' @ 12.11 hrs Storage= 7,087 cf

Plug-Flow detention time= 48.7 min calculated for 89,234 cf (95% of inflow)
 Center-of-Mass det. time= 23.6 min (807.8 - 784.2)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	5,064 cf	100% Voids (Conic) Listed below (Recalc) -Impervious
#2	40.67'	1,706 cf	Sand Filter (Prismatic) Listed below (Recalc) -Impervious
			5,170 cf Overall x 33.0% Voids
#3	40.17'	466 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc) -Impervious
			1,413 cf Overall x 33.0% Voids
		7,236 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	2,825	0	0	2,825
43.00	3,181	1,501	1,501	3,194
44.00	3,960	3,563	5,064	4,001

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	2,825	0	0
42.50	2,825	5,170	5,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	2,825	0	0
40.67	2,825	1,413	1,413

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.45'	30.0" Horiz. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.11 hrs HW=43.96' (Free Discharge)
 ↑**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.31 fps)

Secondary OutFlow Max=27.81 cfs @ 12.11 hrs HW=43.96' (Free Discharge)
 ↑**1=Orifice/Grate** (Weir Controls 27.81 cfs @ 2.33 fps)

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Pond 4P: Lined & Subdrained Sediment Forebay

Inflow Area = 162,834 sf, 62.68% Impervious, Inflow Depth = 7.50" for 100-Year event
 Inflow = 29.83 cfs @ 12.09 hrs, Volume= 101,709 cf
 Outflow = 29.24 cfs @ 12.10 hrs, Volume= 99,199 cf, Atten= 2%, Lag= 0.5 min
 Primary = 0.07 cfs @ 12.10 hrs, Volume= 5,693 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 29.17 cfs @ 12.10 hrs, Volume= 93,505 cf
 Routed to Pond 3P : Lined & Subdrained Sand Filter

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 43.99' @ 12.10 hrs Surf.Area= 6,653 sf Storage= 4,809 cf

Plug-Flow detention time= 36.9 min calculated for 99,022 cf (97% of inflow)
 Center-of-Mass det. time= 22.2 min (795.7 - 773.5)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	3,500 cf	Custom Stage Data (Conic) Listed below (Recalc)
#2	40.67'	1,044 cf	Sand Filter Layer (Prismatic) Listed below (Recalc) 3,162 cf Overall x 33.0% Voids
#3	40.17'	285 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc) 864 cf Overall x 33.0% Voids
4,829 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	1,728	0	0	1,728
43.00	1,987	928	928	1,998
44.00	3,205	2,572	3,500	3,229

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	1,728	0	0
42.50	1,728	3,162	3,162

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	1,728	0	0
40.67	1,728	864	864

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.52'	30.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.10 hrs HW=43.99' (Free Discharge)
 ↑**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.35 fps)

Secondary OutFlow Max=28.81 cfs @ 12.10 hrs HW=43.99' (Free Discharge)
 ↑**1=Broad-Crested Rectangular Weir** (Weir Controls 28.81 cfs @ 2.04 fps)

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Link DP-1: Existing drainage Network

Inflow Area = 174,413 sf, 60.02% Impervious, Inflow Depth > 6.77" for 100-Year event
Inflow = 30.13 cfs @ 12.11 hrs, Volume= 98,348 cf
Primary = 30.13 cfs @ 12.11 hrs, Volume= 98,348 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Wellington Ave - Proposed R1

Type III 24-hr 100-Year Rainfall=8.70"

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Summary for Link DP-2: Wellington Ave - Existing Drainage Network

Inflow Area = 62,600 sf, 87.99% Impervious, Inflow Depth = 7.98" for 100-Year event
Inflow = 11.81 cfs @ 12.09 hrs, Volume= 41,620 cf
Primary = 11.81 cfs @ 12.09 hrs, Volume= 41,620 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Appendix G

Water Quality Calculations

Version: 4/2015

Project NameWellington Ave. Self-Storage

DateDecember 2024

Water Quality Volume Calculation WorkSheet

This worksheet is designed to assist the project engineer with a determination of the required water quality treatment area. The worksheet leads the designer through redevelopment applicability first and then receiving water requirements. This tool is intended to compliment to the Redevelopment Criteria Guidance and the Water Quality Guidance and assist both the designer and the permit application reviewer towards consistent results. Enter information into only the **YELLOW** Boxes.

[Redevelopment Criteria Guidance](#)
[Water Quality Goals "Stormwater Compensation Method"](#)

Step 1 - Determine which office in OWR you are applying to: [Application Guidance](#)

Step 2 - Site Information		value/calculation	units
Total Site Area (total area of project parcels)	TSA	5.44	acres
Total Jurisdictional Wetlands and/or floodplain within the above TSA	JW1	0.00	acres
Existing impervious also within the Jurisdictional Wetlands	-JW2	0.00	acres
Conservation Land within the TSA	CL	0.00	acres
Site Size = (TSA)-(JW1-JW2)-CL		SS=	5.44 acres

Step 3 - Redevelopment Applicability

Total Impervious Area (pre-construction)	TIA=	4.80	acres
% Impervious (if ≥40% - redevelopment standard 3.2.6 applies)		0.88	

REPEAT IF NECESSARY Steps 4, 5 and 6 for EACH Waterbody ID (RIVER-ID as found in the GIS Map Server)

Step 4 - Receiving waterbody information

Waterbody ID or RIVER ID from GIS Map Server	RI0006017L-08 Fenner Pond DP-1
Waterbody Name from GIS Map Server	
Name the sub-watersheds (design-points) contributing to this Waterbody ID	
Is this Waterbody Impaired/TMDL for any Phosphorus, Metals or Bacteria?	YES
Is this Waterbody Impaired for Nitrogen?	NO

Step 5 - Pre-Post Construction Conditions to the Waterbody

Total Pre-Construction Impervious Surface to this Waterbody ID	3.38	acres
Total Disturbed Existing Impervious (DI)	1.77	acres
Total Post-Construction Impervious to this Waterbody ID	3.84	acres
Net Increased Impervious (NII)	0.46	acres

Step 6 - Infiltration and BMP information - Note: Increasing infiltration will likely decrease stormwater treatment area for Metals, Bacteria and Phosporus

I am proposing to infiltrate this percentage WQv to this WBID	29%	%
I am proposing this number of BMP's	2	#

RESULTS - Select the Larger Number of the 2 numbers provided

Applicable Condition	Min Water Quality Treatment Area	Min Treatment w/o WQ consideration
No Impairment or TMDL - New Development		
No Impairment or TMDL - Redevelopment		
Only Phosphorus, Metals or Bacteria Impairment - New Development		
Only Phosphorus, Metals or Bacteria Impairment - Redevelopment	0.79	1.34
Nitrogen Impairment - New Development		
Nitrogen Impairment - Redevelopment		
REQUIRED STORMWATER TREATMENT AREA		1.3 acres

* Enter the name of the STP (both type and label) which has been designed to treat this particular Rev or Rea.

Version: 4/2015

Project NameWellington Ave. Self-Storage

DateDecember 2024

Water Quality Volume Calculation WorkSheet

This worksheet is designed to assist the project engineer with a determination of the required water quality treatment area. The worksheet leads the designer through redevelopment applicability first and then receiving water requirements. This tool is intended to compliment to the Redevelopment Criteria Guidance and the Water Quality Guidance and assist both the designer and the permit application reviewer towards consistent results. Enter information into only the **YELLOW** Boxes.

[Redevelopment Criteria Guidance](#)
[Water Quality Goals "Stormwater Compensation Method"](#)

Step 1 - Determine which office in OWR you are applying to: [Application Guidance](#)

Step 2 - Site Information		value/calculation	units
Total Site Area (total area of project parcels)	TSA	5.44	acres
Total Jurisdictional Wetlands and/or floodplain within the above TSA	JW1	0.00	acres
Existing impervious also within the Jurisdictional Wetlands	-JW2	0.00	acres
Conservation Land within the TSA	CL	0.00	acres
Site Size = (TSA)-(JW1-JW2)-CL		SS=	5.44 acres

Step 3 - Redevelopment Applicability

Total Impervious Area (pre-construction)	TIA=	4.80	acres
% Impervious (if ≥40% - redevelopment standard 3.2.6 applies)		0.88	

REPEAT IF NECESSARY Steps 4, 5 and 6 for EACH Waterbody ID (RIVER-ID as found in the GIS Map Server)

Step 4 - Receiving waterbody information

Waterbody ID or RIVER ID from GIS Map Server	RI0006017L-08 Fenner Pond DP-2
Waterbody Name from GIS Map Server	
Name the sub-watersheds (design-points) contributing to this Waterbody ID	
Is this Waterbody Impaired/TMDL for any Phosphorus, Metals or Bacteria?	YES
Is this Waterbody Impaired for Nitrogen?	NO

Step 5 - Pre-Post Construction Conditions to the Waterbody

Total Pre-Construction Impervious Surface to this Waterbody ID	1.42	acres
Total Disturbed Existing Impervious (DI)	0.29	acres
Total Post-Construction Impervious to this Waterbody ID	1.30	acres
Net Increased Impervious (NII)	-0.12	acres

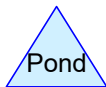
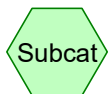
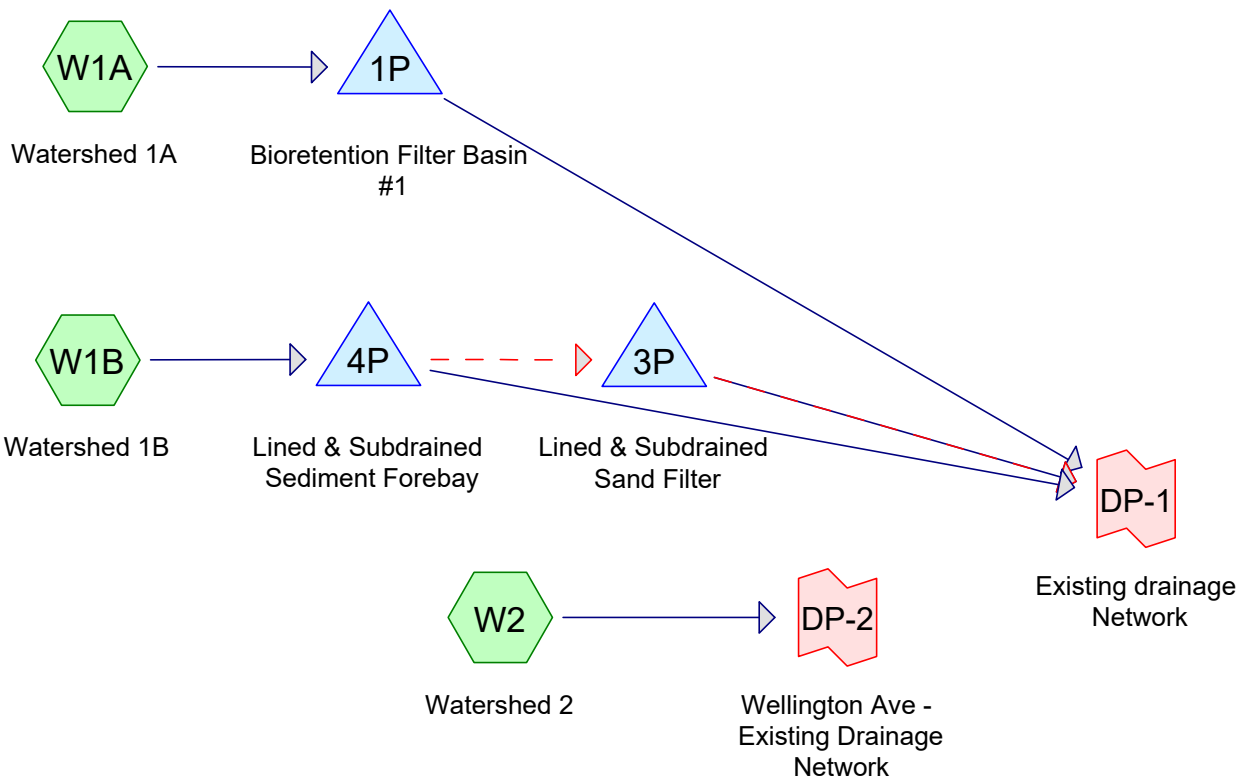
Step 6 - Infiltration and BMP information - Note: Increasing infiltration will likely decrease stormwater treatment area for Metals, Bacteria and Phosporus

I am proposing to infiltrate this percentage WQv to this WBID	0%	%
I am proposing this number of BMP's	0	#

RESULTS - Select the Larger Number of the 2 numbers provided

Applicable Condition	Min Water Quality Treatment Area	Min Treatment w/o WQ consideration
No Impairment or TMDL - New Development		
No Impairment or TMDL - Redevelopment		
Only Phosphorus, Metals or Bacteria Impairment - New Development		
Only Phosphorus, Metals or Bacteria Impairment - Redevelopment	-0.24	0.02
Nitrogen Impairment - New Development		
Nitrogen Impairment - Redevelopment		
REQUIRED STORMWATER TREATMENT AREA	0.0	acres

* Enter the name of the STP (both type and label) which has been designed to treat this particular Rev or Rea.



Wellington Ave - Proposed R1 WQv

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
45,774	61	>75% Grass cover, Good, HSG B (W1A, W1B, W2)
26,145	96	Compacted Aggregate , HSG B (W1B)
5,326	82	Dirt , HSG B (W1A)
56,433	98	Paved parking, HSG B (W1A, W1B, W2)
103,335	98	Roofs, HSG B (W1B, W2)
237,013	90	TOTAL AREA

Wellington Ave - Proposed R1 WQv

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Type III 24-hr WQV Rainfall=1.20"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentW1A: Watershed 1A Runoff Area=11,579 sf 22.64% Impervious Runoff Depth=0.26"
Flow Length=115' Tc=6.0 min CN=73/98 Runoff=0.06 cfs 253 cf

SubcatchmentW1B: Watershed 1B Runoff Area=162,834 sf 62.68% Impervious Runoff Depth=0.65"
Flow Length=628' Tc=6.0 min CN=76/98 Runoff=2.51 cfs 8,822 cf

SubcatchmentW2: Watershed 2 Runoff Area=62,600 sf 87.99% Impervious Runoff Depth=0.87"
Tc=6.0 min CN=61/98 Runoff=1.35 cfs 4,524 cf

Pond 1P: Bioretention Filter Basin #1 Peak Elev=46.28' Storage=35 cf Inflow=0.06 cfs 253 cf
Discarded=0.02 cfs 253 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 253 cf

Pond 3P: Lined & Subdrained Sand Filter Peak Elev=42.16' Storage=1,856 cf Inflow=1.22 cfs 2,493 cf
Primary=0.05 cfs 2,211 cf Secondary=0.00 cfs 0 cf Outflow=0.05 cfs 2,211 cf

Pond 4P: Lined & Subdrained Sediment Peak Elev=43.58' Storage=3,598 cf Inflow=2.51 cfs 8,822 cf
Primary=0.07 cfs 4,457 cf Secondary=1.22 cfs 2,493 cf Outflow=1.29 cfs 6,950 cf

Link DP-1: Existing drainage Network Inflow=0.12 cfs 6,667 cf
Primary=0.12 cfs 6,667 cf

Link DP-2: Wellington Ave - Existing Drainage Network Inflow=1.35 cfs 4,524 cf
Primary=1.35 cfs 4,524 cf

Total Runoff Area = 237,013 sf Runoff Volume = 13,600 cf Average Runoff Depth = 0.69"
32.59% Pervious = 77,245 sf 67.41% Impervious = 159,768 sf

Wellington Ave - Proposed R1 WQv

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Type III 24-hr WQV Rainfall=1.20"

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Summary for Subcatchment W1A: Watershed 1A

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 253 cf, Depth= 0.26"
 Routed to Pond 1P : Bioretention Filter Basin #1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
 Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
2,621	98	Paved parking, HSG B
5,326	82	Dirt , HSG B
3,632	61	>75% Grass cover, Good, HSG B
11,579	79	Weighted Average
8,958	73	77.36% Pervious Area
2,621	98	22.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	55	0.0600	1.92		Sheet Flow, SEG A Smooth surfaces n= 0.011 P2= 3.30"
0.4	60	0.0135	2.36		Shallow Concentrated Flow, SEG B Paved Kv= 20.3 fps
0.9	115	Total, Increased to minimum Tc = 6.0 min			

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Summary for Subcatchment W1B: Watershed 1B

Runoff = 2.51 cfs @ 12.09 hrs, Volume= 8,822 cf, Depth= 0.65"

Routed to Pond 4P : Lined & Subdrained Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
58,354	98	Roofs, HSG B
43,709	98	Paved parking, HSG B
* 26,145	96	Compacted Aggregate , HSG B
34,626	61	>75% Grass cover, Good, HSG B
162,834	90	Weighted Average
60,771	76	37.32% Pervious Area
102,063	98	62.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	55	0.0130	1.04		Sheet Flow, SEG A
					Smooth surfaces n= 0.011 P2= 3.30"
4.0	573	0.0135	2.36		Shallow Concentrated Flow, SEG B
					Paved Kv= 20.3 fps
4.9	628	Total, Increased to minimum Tc = 6.0 min			

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Summary for Subcatchment W2: Watershed 2

Runoff = 1.35 cfs @ 12.09 hrs, Volume= 4,524 cf, Depth= 0.87"

Routed to Link DP-2 : Wellington Ave - Existing Drainage Network

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-28.00 hrs, dt= 0.05 hrs
Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
44,981	98	Roofs, HSG B
10,103	98	Paved parking, HSG B
7,516	61	>75% Grass cover, Good, HSG B
62,600	94	Weighted Average
7,516	61	12.01% Pervious Area
55,084	98	87.99% Impervious Area

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

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Summary for Pond 1P: Bioretention Filter Basin #1

Inflow Area = 11,579 sf, 22.64% Impervious, Inflow Depth = 0.26" for WQV event
 Inflow = 0.06 cfs @ 12.09 hrs, Volume= 253 cf
 Outflow = 0.02 cfs @ 11.90 hrs, Volume= 253 cf, Atten= 67%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.90 hrs, Volume= 253 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 46.28' @ 12.41 hrs Surf.Area= 382 sf Storage= 35 cf

Plug-Flow detention time= 8.2 min calculated for 253 cf (100% of inflow)
 Center-of-Mass det. time= 8.2 min (823.7 - 815.5)

Volume	Invert	Avail.Storage	Storage Description
#1	48.00'	256 cf	100% Voids (Conic) Listed below (Recalc)
#2	46.00'	252 cf	Amended Soils (Prismatic) Listed below (Recalc)
			764 cf Overall x 33.0% Voids
			508 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
48.00	382	0	0	382
48.50	653	256	256	656

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
46.00	382	0	0
48.00	382	764	764

Device	Routing	Invert	Outlet Devices
#1	Discarded	46.00'	2.410 in/hr Exfiltration over Surface area
#2	Primary	48.30'	24.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 11.90 hrs HW=46.03' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=46.00' (Free Discharge)
 ↑**2=Orifice/Grate** (Controls 0.00 cfs)

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Type III 24-hr WQV Rainfall=1.20"

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Summary for Pond 3P: Lined & Subdrained Sand Filter

Inflow = 1.22 cfs @ 12.26 hrs, Volume= 2,493 cf
 Outflow = 0.05 cfs @ 15.01 hrs, Volume= 2,211 cf, Atten= 96%, Lag= 164.9 min
 Primary = 0.05 cfs @ 15.01 hrs, Volume= 2,211 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link DP-1 : Existing drainage Network

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3

Peak Elev= 42.16' @ 15.01 hrs Storage= 1,856 cf

Plug-Flow detention time= 373.8 min calculated for 2,207 cf (89% of inflow)

Center-of-Mass det. time= 358.1 min (1,140.1 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	5,064 cf	100% Voids (Conic) Listed below (Recalc) -Impervious
#2	40.67'	1,706 cf	Sand Filter (Prismatic) Listed below (Recalc) -Impervious
			5,170 cf Overall x 33.0% Voids
#3	40.17'	466 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc) -Impervious
			1,413 cf Overall x 33.0% Voids
		7,236 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	2,825	0	0	2,825
43.00	3,181	1,501	1,501	3,194
44.00	3,960	3,563	5,064	4,001

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	2,825	0	0
42.50	2,825	5,170	5,170

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	2,825	0	0
40.67	2,825	1,413	1,413

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.45'	30.0" Horiz. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 15.01 hrs HW=42.16' (Free Discharge)↑**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 6.71 fps)**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=40.17' (Free Discharge)↑**1=Orifice/Grate** (Controls 0.00 cfs)

Wellington Ave - Proposed R1 WQV

Type III 24-hr WQV Rainfall=1.20"

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Summary for Pond 4P: Lined & Subdrained Sediment Forebay

Inflow Area = 162,834 sf, 62.68% Impervious, Inflow Depth = 0.65" for WQV event
 Inflow = 2.51 cfs @ 12.09 hrs, Volume= 8,822 cf
 Outflow = 1.29 cfs @ 12.26 hrs, Volume= 6,950 cf, Atten= 49%, Lag= 10.1 min
 Primary = 0.07 cfs @ 12.26 hrs, Volume= 4,457 cf
 Routed to Link DP-1 : Existing drainage Network
 Secondary = 1.22 cfs @ 12.26 hrs, Volume= 2,493 cf
 Routed to Pond 3P : Lined & Subdrained Sand Filter

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 43.58' @ 12.26 hrs Surf.Area= 6,113 sf Storage= 3,598 cf

Plug-Flow detention time= 282.1 min calculated for 6,937 cf (79% of inflow)
 Center-of-Mass det. time= 202.2 min (993.2 - 791.0)

Volume	Invert	Avail.Storage	Storage Description
#1	42.50'	3,500 cf	Custom Stage Data (Conic) Listed below (Recalc)
#2	40.67'	1,044 cf	Sand Filter Layer (Prismatic) Listed below (Recalc)
			3,162 cf Overall x 33.0% Voids
#3	40.17'	285 cf	Crushed Stones Layer (Prismatic) Listed below (Recalc)
			864 cf Overall x 33.0% Voids
		4,829 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
42.50	1,728	0	0	1,728
43.00	1,987	928	928	1,998
44.00	3,205	2,572	3,500	3,229

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.67	1,728	0	0
42.50	1,728	3,162	3,162

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
40.17	1,728	0	0
40.67	1,728	864	864

Device	Routing	Invert	Outlet Devices
#1	Secondary	43.52'	30.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Primary	40.17'	1.2" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.07 cfs @ 12.26 hrs HW=43.58' (Free Discharge)

↑**2=Orifice/Grate** (Orifice Controls 0.07 cfs @ 8.82 fps)

Secondary OutFlow Max=1.19 cfs @ 12.26 hrs HW=43.58' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 1.19 cfs @ 0.68 fps)

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Summary for Link DP-1: Existing drainage Network

Inflow Area = 174,413 sf, 60.02% Impervious, Inflow Depth > 0.46" for WQV event

Inflow = 0.12 cfs @ 14.99 hrs, Volume= 6,667 cf

Primary = 0.12 cfs @ 14.99 hrs, Volume= 6,667 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

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Summary for Link DP-2: Wellington Ave - Existing Drainage Network

Inflow Area = 62,600 sf, 87.99% Impervious, Inflow Depth = 0.87" for WQV event

Inflow = 1.35 cfs @ 12.09 hrs, Volume= 4,524 cf

Primary = 1.35 cfs @ 12.09 hrs, Volume= 4,524 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs