STORMWATER MANAGEMENT REPORT

FOR

BEACON UNITARIAN UNIVERSALIST CONGREGATION SANCTUARY BUILDING

Block 2608, Lots 1 & 2
City of Summit
Union County, New Jersey

Prepared For:

Beacon Unitarian Universalist Congregation in Summit
4 Waldron Avenue
Summit, New Jersey 07901

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occurring. Because the amount of existing impervious coverage is being decreased under the proposed conditions, the resulting stormwater discharge from the site will also be reduced proportionately. Thereby providing a reduction in the post development runoff from the site. For additional drainage area details, please refer to the Existing and Proposed Drainage Area Maps enclosed in Appendix A.

2.0 BACKGROUND DATA

The reduced rainfall runoff generated by the northern portion of proposed project site will be captured and conveyed through the proposed 12-inch on-site storm drainage systems. The collected stormwater will be discharged into an existing 15-inch storm sewer system located along Waldron Avenue. As the impervious coverage in the south drainage area going to Springfield is being reduced, the proposed runoff from the southern portion of the site will also be reduced proportionally.

Storm runoff generated from the north portion of the site will be captured by the three sub-drainage areas as indicated in the attached proposed storm sewer Drainage Areas Map (refer to Appendix A).

Drainage area 1 contains approximately 0.19 acres and will collect and discharge stormwater runoff from the proposed sanctuary roof and the western portion of the lawn area through a new conveyance system to proposed inlet DI-02.

Drainage area 2 contains approximately 0.13 acres and will collect stormwater from the remainder of the proposed northerly lawn/play area. The collected storm water will discharge to proposed DI-01.

Drainage area 3 contains approximately 0.042 acres and will collect stormwater from a portion of the existing church roof and the proposed breezeway located between the existing church and the new sanctuary. The collected water will discharge to proposed DI-06.

Drainage area 4 - The collected storm drainage from the low building roof on the south side of proposed sanctuary and identified as DI 4 on the proposed storm sewer Drainage Areas Map (refer to Appendix A) contains approximately 0.04 ac. This roof area is being conveyed to an existing inlet located at the northwest corner of Waldon and Springfield Avenues by a proposed 6-inch diameter pipe. The balance of this drainage area will sheet flow to the northerly gutter line in Springfield Ave.

3.0 DESIGN CALCULATIONS

The above described storm drainage systems were analyzed using the gravity pipe flow formula presented below.

3.1. Stormwater Drainage Design

The storm drainage collection system was designed using the following "Rational Formula".

$Q = CiA$

The "Rational Formula" calculates the discharge using the following units of measure.

A. Q = Peak Discharge (CFS)
B. C = Runoff Coefficient
C. i = Rainfall intensity in inches per hour based upon a minimum Time of Concentration (Tc) of 10 minutes
D. A = Area of watershed/drainage sub area in acres

A design storm frequency of 25 years was used to design the on-site stormwater collection and conveyance system. Precipitation data used in the analysis was obtained from the NJDEP *Technical Manual for Stream Encroachment Permits* (Appendix B). This information was used to determine the value of "i" in the Rational Formula. The Manning's roughness coefficient of 0.013 was used for the HDPE and Ductile Iron pipes. A runoff coefficient of 0.95 was utilized for impervious areas. In addition, a runoff coefficient of 0.60 was utilized for landscaped and grass/lawn areas.

Drainage Area Calculation:

North

Impervious areas (Existing & proposed roofs and walks):

0.0415 ac + 0.1149 ac + 0.0163 ac = 0.1727 ac.

Lawn and landscaped areas (Including pervious playground area):

0.1131 ac +0.0702 ac = 0.1833 ac

Total area draining to existing inlet DI-107 = 0.1851+ ac + 0.1294 ac + 0.0415 ac. = 0.356 ac

Composite C = (0.1727 X 0.95 + 0.1833 X 0.60)/ (0.1727 + 0.1833) = 0.77

The 12-inch pipe which connects DI-01 to existing inlet DI-107 is the most critical pipe, because this pipe discharges all runoff from the northern portion of the proposed site to the existing 15-inch storm system in Waldron Avenue.

The pipe capacity:

$V = (1.49 \times r^{2/3} \times s^{1/2}) / N$

V- Average velocity (Ft/S)

r – Hydraulic Radius (Ft) = a/P_w

a – Cross Sectional flow area (Ft^2)
P_w – Wetted perimeter (Ft)
S – Pipe slope (Ft/Ft)
N – Manning's Roughness Coefficient

12" HDPE pipe @ slope =2%, The capacity $Q_{capacity} = V \times A = 5.04$ CFS

Total 25-year Runoff discharge to existing inlet DI-107:
$Q_{25Y} = CIA = 0.77 \times 6.7 \times 0.356 = 1.84$ CFS

$Q_{capacity} > Q_{25Y}$.
The proposed 12-inch storm drainage system can convey the 25-Year design storm from proposed site to the existing 15-inch storm system in Waldron Avenue.

6" storm pipe capacity calculation:

Storm Pipe Calculation (North Drainage area 2, 3)

PIPE	UPSTREAM INLET	DOWNSTREAM INLET	FLOW (CFS)	CAPACITY (CFS)	NOTE
P-D5-D6	DI-5	DI-6	0.081	0.65	Ok
P-D7-D6	DI-7	DI-6	0.27	0.80	Ok

Based on the proposed design, the critical 6"- pipe sections are pipes from inlet DI-5 to DI-6 and pipe from DI-07 to DI-06. The above table indicates that the storm pipes for the north drainage area have the capacity to convey the 25-year design storm.

South

Impervious areas (exist. Roof/walks, brick wall/monument and proposed low roof/walk):
0.0466 ac. + 0.0005 ac. + 0.0699 ac. = 0.117 ac.

Pervious areas: Lawn and landscaped areas:
The combined runoff from the existing and proposed lawn and landscaped areas (0.1086 ac.) will sheet-flow to Springfield Avenue similar to existing conditions.

The proposed low roof (welcome Hall) drainage area is proposed to drain to the existing curb inlet at the northwest corner of Springfield and Waldron.
Total low roof area: 0.0436 ac

C = 0.95

A 6-inch PVC pipe is proposed to connect the low roof to the existing inlet at the northwest corner of Springfield and Waldron Avenues.

The pipe capacity:

$V = (1.49 \times r^{2/3} \times s^{1/2}) / N$

V- Average velocity (Ft/S)

r – Hydraulic Radius (Ft) = a/P_w

a – Cross Sectional flow area (Ft^2)

P_w – Wetted perimeter (Ft)

S – Pipe slope (Ft/Ft)

N – Manning's Roughness Coefficient

Proposed 6" PVC pipe @ slope =3%, The capacity $Q_{capacity} = V \times A = 0.97$ CFS

Proposed Total 25-year Runoff discharge to existing inlet from low roof:

$Q_{25Y} = CIA = 0.95 \times 6.7 \times 0.0436 = 0.278$ CFS

$Q_{capacity} > Q_{25Y}$.

The proposed 6-inch PVC storm drainage pipe can convey the 25-Year design storm from the proposed south roof area (0.0436 ac.) to the existing inlet at NW corner of Springfield and Waldron Avenues.

Storm Pipe Calculation (South Drainage area 4)

PIPE	UPSTREAM INLET	DOWNSTREAM INLET	FLOW (CFS)	CAPACITY (CFS)	NOTE
P-south-roof	Roof Drain	Exist DI at Springfield Ave.	0.278	0.97	Ok

Based on the proposed design, the critical 6"- pipe sections are pipes from proposed southern roof to exist. inlet at intersection of Springfield Avenue and Waldron Ave. The above table indicates that the storm pipes for the south drainage area have the capacity to convey the 25-year design storm.

4.0 CONCLUSIONS

The proposed 6-inch (south) and 12-inch (north) storm drainage systems including the proposed storm sewer and inlets as shown on the accompanying plans have sufficient capacity to collect and convey the stormwater runoff resulting from a 25-year design storm event over the area of the proposed project.

APPENDIX A

EXISTING DRAINAGE AREAS MAP

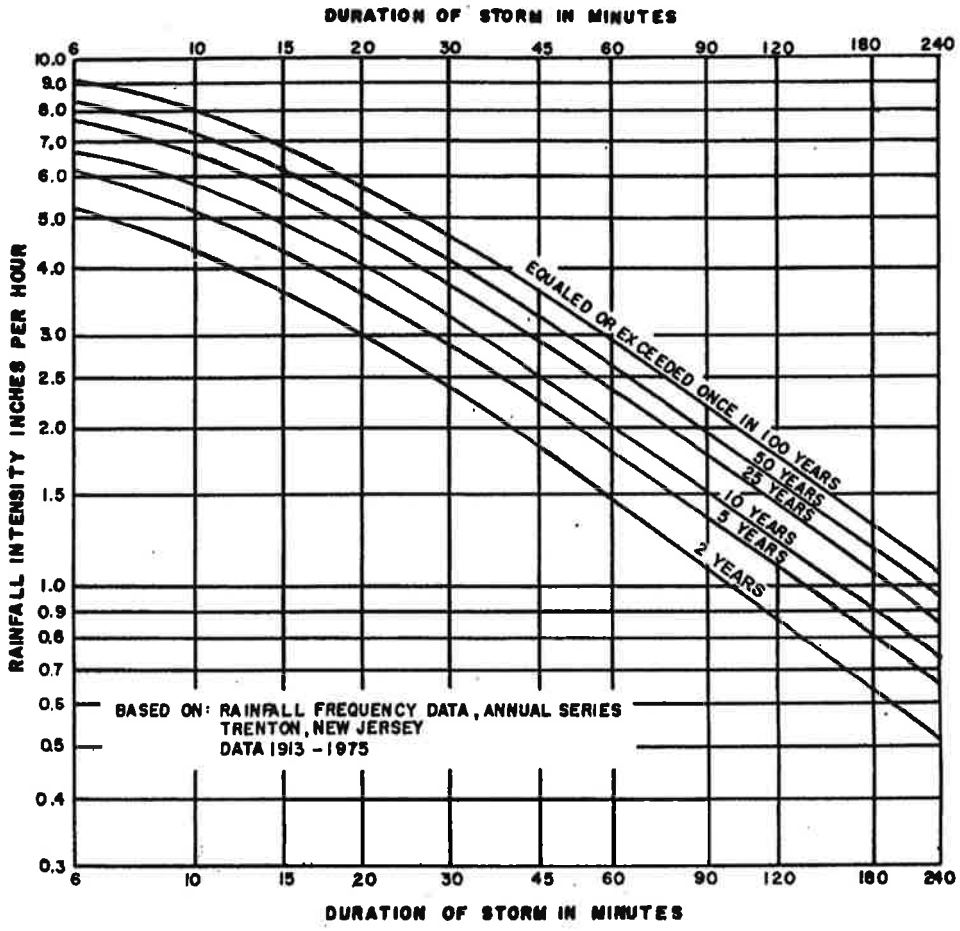
PROPOSED DRAINAGE AREAS MAP

PROPOSED STORM SEWER DRAINAGE AREAS MAP

APPENDIX B

NJDEP RAINFALL INTENSITY CURVE

Figure 5-4: Rainfall Intensity-Duration-Frequency Curves



Note: Adapted from Figure 2.1-2 in the NJDEP *Technical Manual for Stream Encroachment Permits*.