General Project Description and Stormwater Management Calculations

Project: Proposed Commercial & Residential Development
Sproul Road & Reed Road
Marple Township
Delaware County, Pennsylvania

Project Number: PC 141364

Client: Cardinal Crossing Realty Assoc., LP
636 Old York Road, 2nd Floor
Jenkintown, PA 19046

Date: May 15, 2015

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General Project Description/Stormwater Management

GENERAL PROJECT DESCRIPTION

As part of a coordinated development, Cardinal Crossing Realty Assoc., LP is proposing to develop the existing 213 acre site into a proposed mixed-use development consisting of multi-family, and commercial developments. The proposal includes the installation of driveways, utilities, landscaping and stormwater management controls necessary to support the development.

GEOTECHNICAL INVESTIGATION SUMMARY

A geotechnical investigation was prepared by Earth Engineering, Inc. and the results of their testing are outlined in their report, dated November 11, 2014, which is included in an Appendix of this report. In the aforementioned Whitestone Associates, Inc. report, areas of positive infiltration capabilities were not discovered.

STORMWATER MANAGEMENT REQUIREMENTS

This site is subject to the stormwater requirements of the Marple Township SALDO and Chapter 257 of the Marple Township Code of Ordinances - Stormwater Management. Based on the requirements within both of those ordinances, the following requirements were adhered to and for the purpose of discussion, are as follows:

- The subject site is located in Stormwater Management District B-2, Subarea 50, of the Darby-Cobbs Watershed per the Darby and Cobbs Creeks Watershed Act 167 Stormwater Management Plan.

- Per the Stormwater Management District, the following peak rate reductions are required:

Proposed Condition	Existing Condition
2-year	1-year
5-year	2-year
25-year	5-year
50-year	10-year
100-year	100-year

- The following requirements are from the tables provided in the Darby-Cobbs Creeks Watershed Act 167 ordinance:
  - Table F-1 provides PennDOT Region 5 precipication data that is to be used with the Rational equation.
  - Table F-2 lists the runoff curve numbers to be used with the SCS method.
  - Table F-3 lists the Rational runoff coefficients.
  - Table F-4 provides Manning's roughness coefficients for use in the Time of Concentration calculations.
  - Memorandum 1 discusses the appropriateness of using NOAA Atlas 14 to obtain the rainfall data for use with SCS methodology.

- Infiltration requirements per §257-14 of the Marple Township Stormwater ordinance include the following:
  - Subsection B.(2)(a) – the design should first attempt to adhere to the CG-1 requirements of the NPDES permit.
  - Subsection B.(2)(b) – if the CG-1 requirements can't be met, then the following requirement of CG-2 should be met: at least the first one-inch of runoff from new or replacement impervious surfaces shall be infiltrated.
  - Subsection B.(2)(c) – if the requirement of subsection B.(2)(b) can't be met then the following criteria of CG-2 should be met: infiltrate the entire water quality volume and at least the first 0.5 inches of the water quality volume.

- The following are Stream Bank Erosion Requirements from §257-16:

- Subsection A – release the proposed conditions 1-year storm for a minimum of 24 hours from a point in time when the maximum volume of water is stored in the proposed BMP.
- Subsection B – The minimum orifice size is three-inches. If using the three-inches the 24 hour slow release time is not achieved, then calculations need to be provided to determine the orifice size. Gravel filters or other methods are recommended to discharge low-flow rates subject to the Township Engineer's satisfaction.

- Per §257-18.C.(2), for redevelopment sites, the groundcover used in determining the existing conditions flow rates for the developed portion of the site shall be based upon actual land cover conditions. Redevelopment is defined, in part, as "any development that requires demolition or removal of existing structures or impervious surfaces at a site and replacement with new impervious surfaces".

- The following requirements are from Appendix C of the Stormwater ordinance:
  - Table C-1 – Runoff Curve Numbers
  - Table C-2 – Rational Runoff Coefficients
  - Table C-3 – Manning's Roughness Coefficients

- §257-19.C - requires that any drainage conveyance facility and/or channel not governed by Chapter 105 regulations be able to convey runoff from the 25-year storm event. The 100-year event must also be safely conveyed.

- §257-40 requires the following:
  - Subsection B – roof drains shall not be connected to streets, storm sewers, or roadside ditches except on a case-by-case basis as determined by the Township Engineer.
  - Subsection C – roof drains shall discharge to infiltration areas or vegetative BMPs to the maximum extent practicable where advantageous to do so.

PROPOSED STORMWATER MANAGEMENT DESIGN SUMMARY

<u>Point of Interest (POI) #1</u>

Pre-Development

- The drainage area includes the majority of the site, it is considered to be the water that is collected by the two drainage channels on the site that come together in the eastern corner of the property.
- The drainage area land use descriptions include the following:
  - Impervious
  - Impervious (20% as Meadow)
  - Meadow
  - Forest
  - Open Space (in areas of existing development for rate reduction calculations)
- The drainage area has been split into sub areas to better calculate the runoff. The areas are labeled 1a-1i.
- The limits of the drainage areas are the extents of the proposed development.
- Areas of non-disturbance have been removed from the rate reduction by excluding that area in the hydrographs.

Post-Development

- The post-development condition maintains the same runoff discharge location.
- The drainage area land use descriptions include the following :
  - Impervious
  - Meadow
  - Forest
  - Open Space
- Various BMP's have been utilized to infiltrate the volume difference in the 2-year storm.
- Rate reduction has been achieved in each sub area to comply with the township requirements.

Point of Interest (POI) #2

Pre-Development

- The drainage area includes the Northeast portion of the site along I-476, it is considered to be the water that is flowing into a drainage channel off-site.
- The drainage area land use descriptions include the following:
  - Impervious
  - Impervious (20% as Meadow) (for volume reductions)
  - Meadow
  - Forest
  - Open Space (in areas of existing development for rate reduction calculations)
- The limits of the drainage areas are the extents of the proposed development.
- Areas of non-disturbance have been removed from the rate reduction by excluding that area in the hydrographs.

Post-Development

- The post-development condition maintains the same runoff discharge location.
- The drainage area land use descriptions include the following :
  - Impervious
  - Meadow
  - Forest
  - Open Space
- Underground Basins have been utilized to infiltrate the volume difference in the 2-year storm.
- Rate reduction has been achieved to comply with the township requirements.

STORM DRAINAGE

The storm drainage system has been designed to intercept runoff at topographic low points and areas of significant runoff quantities and convey stormwater to the stormwater management basins. StormCAD version Version V8i (SELECT Series 2) has been utilized for designing the storm conveyance system. Conveyance design precipitation amounts are based on NOAA Atlas 14 Philadelphia Shawmont IDF Gage for a 25 year storm events.

In coordination with the Township Engineer, below are the notable requirements of the stormwater ordinance.

- The minimum pipe size is 15".
- The minimum pipe slope is 0.50%.
- The minimum drop across junctions shall be two inches. Crowns need to be matched.
- All storm sewer pipes shall be designed at a minimum to accommodate a 25-year storm.
- The minimum cover over pipes is 1.5' from finished grade to the outside bell of the pipe.

The proposed stormwater management program described above has been designed to comply with the Marple Township Stormwater Ordinance, NPDES Phase II (where applicable) and the Stormwater Management Act of 1978.

Storm Drainage Calculations