Everett Heights

Conceptual Stormwater Management Report

Land Use Review
Case File: EA 15-242325

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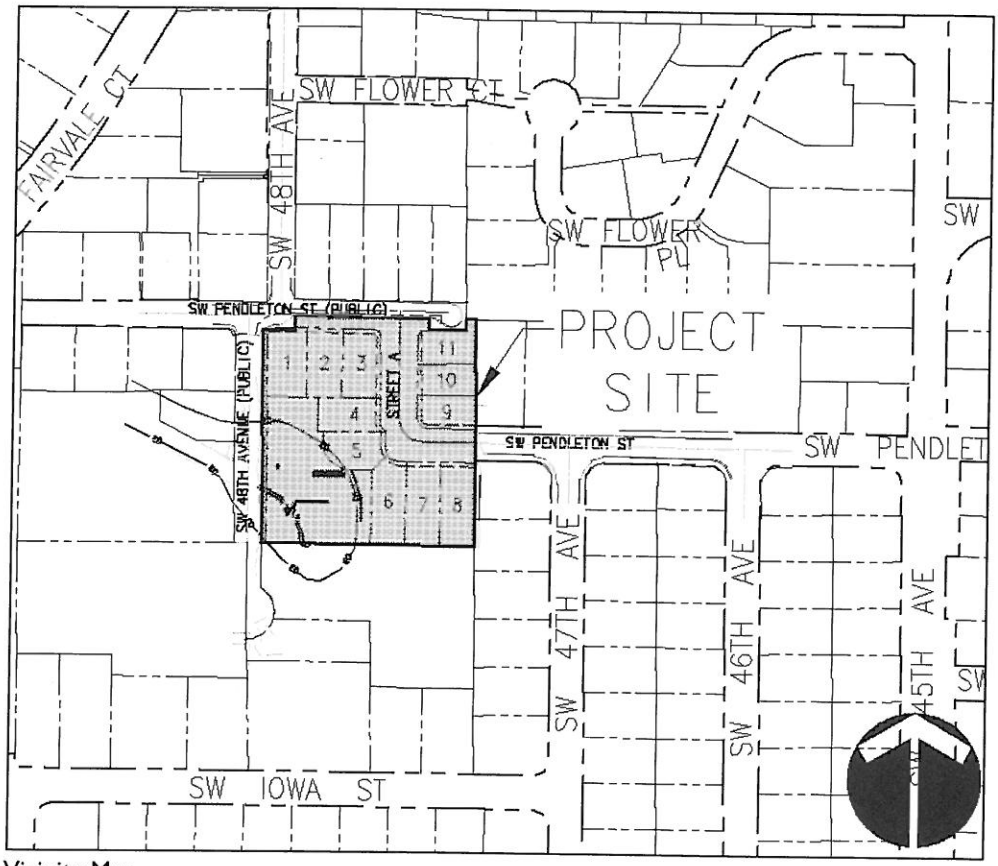
Project Overview and Description

Everett Heights is a proposed residential development located in southwest Portland, Oregon at 5920 SW 48th Avenue. The project site is located east of SW 48th Avenue, south of SW Pendleton Street, and west of the current stub end of SW Pendleton Street (see Vicinity Map). This project will divide the 2.30 acre property into 11 lots, one open space tract, and public right-of-way. The development will result in 11 detached single-family residences, public roadways, landscaping, utilities, and a stormwater management system.

The proposed stormwater management system will include the use of Low Impact Development (LID) planters for water quality and detention, and a piped conveyance system. The proposed stormwater management system will connect into the existing storm sewer to the north along SW Pendleton Street, with the exception of two LID planters which will discharge into the natural drainage in the southwest corner of the site.



Vicinity Map

Existing Conditions

Currently, the northern portion of the property contains a single-family residence, detached garage, and a gravel driveway. The remainder of the property is mostly wooded area, with an unnamed drainageway located in the southwestern portion of the site. Under existing conditions, stormwater from the site drains into the unnamed drainageway and leaves the property through an existing 18-inch diameter culvert beneath SW 48th Avenue (see Figure 1). The property is zoned R7, with an Environmental Conservation (Ec) overlay zone located in the southwestern portion of the site corresponding to the unnamed drainageway.

Proposed Conditions

The proposed Everett Heights subdivision will create or replace approximately 1.09 acres of impervious area in the form of rooftops, sidewalks, and roadways. The proposed stormwater management system will connect into the existing storm sewer to the north along SW Pendleton Street. With the exception of one private LID planter, stormwater from the proposed development will not outfall onsite into the unnamed drainageway.

The conversion of the site from wooded to developed area results in increased runoff flow rates and water quality issues, both of which will be addressed using standards set by the City of Portland's *Stormwater Management Manual* as described below. The proposed stormwater management system will include the use of Low Impact Development (LID) planters for water quality and detention, and a piped conveyance system (see Figure 2).

Methodology

Drainage Basins

The existing drainage basin for the project site is one catchment of 2.30 acres. Existing runoff is diffuse and sheet flows to the southwestern corner of the site. Onsite runoff concentrates in the unnamed drainageway which flows approximately 125 feet through the property until reaching a culvert beneath SW 48th Avenue. The unnamed drainageway is located within an Environmental Conservation (Ec) zoned. Most of the Ec zoned area will remain undeveloped and will be included in the open space tract.

The proposed development will direct most stormwater runoff to the existing storm sewer located to the north in SW Pendleton Street. Water quality treatment and detention of onsite stormwater runoff will be provided using LID planters. A conveyance analysis was performed on the existing storm sewer line in SW Pendleton Street to assess the capacity of the existing system. Additionally, a Flood Hazard Area Analysis was performed to delineate the onsite Flood Hazard Area and to determine the base flood elevation for the onsite unnamed drainageway.

Soils

The Natural Resource Conservation Service (NRCS) online Soil Survey for Multnomah County, Oregon was referenced to determine onsite hydrologic soil groups. The project site primarily consists of cascade-urban land complex soils. The soils are primarily classified as hydrologic soil group (HSG) C. Type C soils have a very slow infiltration rate when thoroughly wet. Type D soils are shown to be located along the unnamed drainageway, which will remain largely undeveloped as an open space tract. Type C soils are located generally within the areas of proposed development. A soil survey map of the proposed site and the soil hydrologic group table are provided in Appendix A.

Geotechnical Investigation

A preliminary geotechnical evaluation of the site was conducted by Hardman Geotechnical Services, Inc. The geotechnical report measured very low infiltration rates (0.1 inch/hour) at the project site. In accordance with the findings of the report, all stormwater facilities will be designed as lined facilities without infiltration.

Stormwater Hierarchy Category

Stormwater infiltration facilities are not an option for this development per the recommendation of the geotechnical investigation, therefore meeting stormwater hierarchy categories 1 or 2 is not feasible. Stormwater hierarchy category 3 will be met as the development will use vegetated facilities to meet pollution reduction and flow control requirements prior to discharging to an offsite drainageway, river, or storm-only pipe system.

LID Planters

LID flow-through planters will be used to provide stormwater pollution reduction and flow control for runoff from developed areas prior to conveyance to an approved outfall location. Private planters were sized with a surface area and storage depth to provide pollution reduction and flow control for roof runoff; exact locations of private planters have not been determined and will be designed as part of the architectural details. Planters will be located either adjacent to the building foundation or as part of the landscaped area. Runoff from private driveways will either runoff into adjacent lawns or into the public right-of-way and have been included as part of the planter sizing for public facilities.

Public planters were sized with a surface area and storage depth to provide pollution reduction and flow control for roadway and sidewalk runoff. Locations of public planters are shown in Figure 2. In areas where there is adjacent parking, the planters have been design to include a three-foot parking egress. Check dams and additional inlets will be used in areas

with steep longitudinal slopes to provide the required planter storage and to ensure that gutter flows will be captured by the inlets.

Analysis

Presumptive Approach for Pollution Reduction and Flow Control

All stormwater facilities were sized using the BES Presumptive Approach Calculator (PAC) ver. 1.2 downloaded September 16, 2014, with built-in design storms for the 2-year, 5-year, 10-year, and 25-year return intervals. The PAC was used for each public facility based on its contributing impervious area. For private facilities, the PAC was used to estimate the necessary facility size to provide stormwater pollution reduction and flow control for roof runoff. Maximum roof areas were estimated based on lot sizes, in accordance with the Portland Zoning Code. Exact locations of private planters are not shown because they will be determined with the architectural design.

After contributing areas were delineated for each facility, the "Catchment Data" worksheet of the PAC was used to calculate peak flow rates for pre-development conditions by determining the appropriate curve number (CN) and time of concentration (Tc). To size the facility, the CN and Tc in the "Catchment Data" worksheet was updated to reflect proposed developed conditions and the facility area and depth in the "Facility Design Data" worksheet was adjusted so that the pollution reduction criteria registered a "PASS" and the 25-year post-developed peak flow was equal or less than the 25-year pre-developed flow. Hydrologic assumptions are described below.

- Pre-developed CN was assumed to be 73; consistent with woods in fair condition on Hydrologic Soil Group C soils (see Appendix A for NRCS Soils Report).
- Due to small catchment areas and steep slopes on the site, pre-developed Tc was assumed to be 5 minutes, the minimum allowable.
- Pre-development drainage basin areas are assumed to be equal to the post-developed impervious areas for the detention analysis, as the post-development impervious area is the area of impact.
- Post-development curve numbers range from 87-98, consistent with developed areas.
- Post-developed Tc was assumed to be five minutes, the minimum allowable.

Appendix B provides the summary results for the onsite LID facilities. Public facilities are summarized in Tables 1A and 2A; private facilities are summarized in Tables 1B and 2B. Private facilities were sized considering maximum building coverage areas based on lot sizes. Tabulated results summarize the facility and flow control performance on a per lot basis; similar lots are described in the Catchment/Facility ID column. PAC output results for private and public LID facilities are provided in Appendices C and D, respectively.

Steep roadway slopes (up to 13 percent) require the use of multiple check dams and inlets within the LID planters to create individual flat bottomed cells which step down with the roadway slope. All of the cells are connected to the same under-drain system, and an overflow structure is to be placed at the lowermost cell. Steep roadway slopes limit the planter storage depth and will require planters to be deeper in some locations. The deepened planters do not require guardrails.

Conveyance

BES conveyance standards require piped storm conveyance systems to be sized to carry a 10-year storm without surcharging, and surface flow channels to be sized to carry a 25-year storm (BES, 2007). Additionally, runoff from the 25-year storm may surcharge a separated stormwater system as long as the hydraulic grade line remains a minimum of 6 inches below the lowest critical elevation identified within the system. The use of the rational method is required for sizing conveyance networks. Because there is flow control being provided by LID planters prior to water entering the conveyance system, the results of the PAC will be used to determine peak conveyance flows for the 10-year and 25-year storm events. Onsite storm sewer conveyance calculations will be provided in the final Everett Heights Stormwater Management Report.

SW Pendleton Street

Stormwater from the proposed Everett Heights development will connect into the existing storm line immediately north of the project site along SW Pendleton Street (see Appendix D and Figure 3). Based on the information provided by the Sewer Assets inventory from Portland Maps, the existing storm line was installed in 1976. A conveyance analysis was performed to assess the capacity of the existing offsite storm sewer pipe using the AutoCAD Civil 3D Hydraflow Storm Sewers Extension (see Appendix D). Based on current BES conveyance standards, the existing offsite storm sewer network does not have adequate capacity under existing conditions. As such, the system is also not sized adequately to accept any additional flows from the proposed Everett Heights development.

The existing pipes along SW Pendleton Street are proposed to be upsized in order to provide sufficient capacity to meet BES standards for conveyance of existing offsite flows as well as the additional flows from the proposed Everett Heights development. The proposed public storm sewer pipes will be sized to carry the 10-year storm without surcharging and provide an emergency escape route by maintaining the hydraulic grade line from the 100-year storm at least 6 inches below the lowest critical elevation.

Emergency Escape Route

BES also requires the identification of a stormwater escape route for the 100-year storm event. The onsite conveyance system and the improved offsite system along SW Pendleton Street will be used as the escape route and will be sized to contain the 100-year storm event, with the hydraulic grade line remaining a minimum of six inches below the lowest critical elevation identified within the system.

Flood Hazard Area Analysis

An analysis was performed to delineate the Flood Hazard Area and determine the base flood elevation for the onsite unnamed drainageway in accordance with Portland City Code Section 24.50.050 (I) – Unidentified Watercourse Flood Zones. The results of the flood hazard area analysis are included in Appendix E of this report.

Engineering Conclusions

Pollution Reduction

LID facilities will meet pollution reduction requirements by filtering storm water through the growing medium mix specified by BES. BES requires all stormwater runoff generated from storms up to the pollution reduction event (Type 1A, 0.83-inch, 24-hour storm event) to be captured and treated. LID facility footprints have been increased to also meet flow control requirements.

Flow Control

The ability to size facilities using the PAC for flow control of all storm return periods of interest is limited. Furthermore, LID facilities do not have flow control structures which can be customized for each of the return periods. As the LID footprint is increased to accommodate flow control volume for the 25-year storm event, the assumed infiltration capacity (2 in/hr) of the growing medium resulted in discharge flows too high to meet the maximum peak flow targets for smaller storms. Based on input from a meeting with BES (October 13, 2014), by demonstrating flow control for the 25-year storm using the PAC, it can be assumed that flow control requirements have been met.

Conveyance

The stormwater conveyance system (pipes, inlets, LID overflows, etc.) will be sized to convey and contain the 10-year event without surcharging, and provide the escape route for the 100-year peak flow.

Discharge

The private LID facility from Lot 4 will discharge into the onsite unnamed drainageway. All other facilities will have piped connections to the proposed storm sewer network located in SW Pendleton Street.

Operations and Maintenance

Proper operation, inspection, and maintenance are essential to ensure the proper function of the proposed stormwater management system over time. The City of Portland has outlined requirements for Operations and Maintenance (O&M) in Chapter 3 of the *Stormwater Management Manual* (BES, 2014). A site-specific O&M Plan is required for stormwater systems designed using the Presumptive Approach. The O&M Plan will be included in the final Everett Heights Stormwater Management Report, describing the function of the stormwater management system, outlining the inspection schedule, describing anticipated maintenance activities, providing an inspection log, and identifying the responsible party. BES also requires the submission of Form 2 – Operations & Maintenance Form for Private Stormwater Management Facilities, a copy of which is included in Appendix F.

References

BES, 2007. *Sewer and Drainage Facilities Design Manual*, City of Portland Bureau of Environmental Services, June 2007.

BES, 2014. *City of Portland 2014 Stormwater Management Manual*, City of Portland Bureau of Environmental Services, January 2, 2014.

NRCS, 2014. NRCS Web Soil Survey, http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm, United States Department of Agriculture Natural Resource Conservation Service.

Figures

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