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## **BIBLIOGRAPHY**

### **CITY OF PARKVILLE, PLATTE COUNTY, MISSOURI CITY CODE, LATEST EDITION – CHAPTER 507 –**

<http://www.ecode360.com/27903218>

### **APWA 5600 SPECIFICATIONS –**

<http://kcmetro.apwa.net/chapters/kcmetro/specs/APWA5600.pdf>

### **APWA 5600 SUPPLEMENT(S) -**

[http://www.kcmo.org/idc/groups/publicworks/documents/publicworks/specifications\\_apwa5600supp1.pdf](http://www.kcmo.org/idc/groups/publicworks/documents/publicworks/specifications_apwa5600supp1.pdf)

### **APWA DRAINAGE BMP MANUAL –**

<https://data.kcmo.org/Land-Development/BMP-Manual-APWA-03-2008/y8s3-kjkx>

### **GEOTECHNICAL REPORT –**

Report of Geotechnical Exploration, Bella Vista, Parkville, Latest Edition.

### **GOOGLE MAP –**

<https://maps.google.com/maps?hl=en>

### **FEMA MAP SERVICE CENTER -**

<https://msc.fema.gov/webapp/wcs/stores/servlet/CategoryDisplay?catalogId=10001&storeId=10001&categoryId=12001&langId=-1&userType=G&type=1&dfirmCatId=12009&future=false>

### **UNITED STATES OF AGRICULTURE – NATURAL RESOURCES CONSERVATION SERVICE -**

<http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

### **SOFTWARE PACKAGE -**

Bentley Systems, Inc. Haestad Methods Solution Center, Bentley PondPack V8i

## **GENERAL INFORMATION**

This storm drainage study is being submitted on behalf of Bella Vista at the National for the proposed multi-family residential development located SE of Intersection of Hwy 45 and Lake Crest Lane in Section 26 Township 51N Range 34W, Parkville, Platte County, Missouri which is in the Missouri River Watershed (See Figure 1 of Appendix A for site plan). The purpose of this study is to provide recommendations to ensure that storm water runoff from the proposed development will not have an adverse impact on existing downstream developments. This storm drainage study will examine the existing and proposed conditions at the above referenced site and determine if the proposed improvement adheres to all local, state, and federal requirements including but not limited to the City of Parkville, Missouri Storm Water requirements.

The proposed development consists of approximately 13.62 acres of land disturbance on the 24.87 acre property. The site is bordered by partially developed residential land to the south, public right of way for Highway 45 to the north, commercial property to the east, and a private golf course to the west. The area being studied is currently undeveloped. The project is scheduled to consist of public infrastructure and private development for multi-family residential buildings.

The project site has three (3) major soil types according to the Natural Conservation Service (NRCS) Web Soil Survey and is listed below. The full soils report can be found in Appendix B.

- Knox silty clay loam, 9 to 14 percent slopes, severely eroded
- Snead-Rock outcrop complex, 14 to 30 percent slopes
- Kennebec silt loam, 1 to 4 percent slopes, frequently flooded

## **METHODOLOGY**

This report was prepared in accordance with the provisions of the City of Parkville, Platte County, Missouri City Code, Latest Edition – Chapter 507. The analytical and design criteria used in the study conform to those of “Division V - Section 5600 – Storm Drainage Systems and Facilities” of the American Public Works Association’s “Standard Specifications and Design Criteria” dated February 2006 and all supplements to the APWA Section 5600. Based on these criteria, allowable discharge from the development is based on limiting 100-year (1%), and 10-year (10%) post development discharges to no more than existing discharges from the site for each respective storm.

Stormwater discharges from the site for the existing and proposed watersheds were evaluated using the SCS Technical Release No. 55 per APWA Section 5602.2. Existing times of concentration were determined using Inlet Time and Travel Time equations found in section 5602.7 of APWA Section 5600. A minimum inlet time of five minutes was used when calculated times were under five minutes. Proposed times of concentration were calculated in the same manner.

## **FEMA FLOOD CLASSIFICATION**

The existing site is located outside of the 100-year flood plain. This area lies in Zone X according to the Flood Insurance Rate Map, FIRM 29165C0379C, Map Revised Preliminary September 30, 2010. See Appendix C for a copy of the FIRM. The FIRM identifies Zone X as “Areas determined to be outside the 0.2% annual chance floodplain.”

## EXISTING CONDITIONS

The site consists of property located SE of Intersection of Hwy 45 and Lake Crest Lane in Parkville, Missouri. The proposed disturbed area is located outside of the 100 year flood plain per the FIRM Map. The proposed development routes runoff northwesterly to Walnut Creek. Existing drainage boundaries can be found in Figure 1 of Appendix A. The site is comprised of mostly woods and a small area of brush, weeds, and grass adjacent to Walnut Creek in fair condition in the B and D hydrologic groups. There is existing single family residential that is routed through the site and is included within the design. The existing drainage basin results in an overall curve number of 77. Runoff to the northwest is routed overland and through existing 48" RCP culverts. Existing drainage boundaries can be found in Figure 2 of Appendix A. A brief summary of existing runoff can be found in Table 1.

**Table 1: Existing Drainage Calculations**

Drainage Basin	Area, Acres	Curve Number	Q-10 Year, cfs	Q-100 Year, cfs
Bella Vista	58.69	77	219.85	379.06
Total	58.69	77	219.85	379.06

## PROPOSED CONDITIONS

The proposed project will include the construction of public infrastructure, private roads, public and private utilities, and landscaping. A portion of the property will convey the 100-year design runoff within a private storm sewer system and offsite area upstream of an existing pond which will be modified to a wet detention basin and the remainder will be allowed to be released un-detained. The proposed drainage patterns will vary from the existing drainage boundaries in that more area will be routed to the detention basins which will allow us to over-detain in these drainage basins while allowing the remaining drainage basins to release un-detained. The proposed development and upstream development results in an overall curve number of 81. The site is located outside of the 100-year flood plain for Walnut Creek. Proposed drainage boundaries can be found in Figure 3 of Appendix A. A brief summary of proposed runoff can be found in Table 2.

**Table 2: Proposed Drainage Calculations**

Drainage Basin	Area, Acres	Curve Number	Q-10 Year, cfs	Q-100 Year, cfs
Bella Vista	58.69	81	254.13	563.10
Total	58.69	81	254.13	563.10

## DETENTION ANALYSIS

The proposed project does increase the runoff from the site and the subject site lies above the Missouri River flood boundaries. Therefore, it is our recommendation that detention should be provided on the site. We are proposing that a portion of the site that was not disturbed on the north, west, and middle be routed un-detained, while the remainder of the site and offsite area be routed through an existing pond that is to be modified into a detention basin. Runoff will be routed to the basin within a private storm sewer system and overland for the 100 year event. A brief summary of the proposed detention can be found in Table 3.

**Table 3: Summary of South Detention Basin Design**

Menards	Q-10 Year	Q-100 Year
Drainage Area	58.69 ac	
Curve Number	81	
Undeveloped Discharge	141.69 cfs	233.22 cfs
Undeveloped Peak Hours	12.05 hrs.	12.05 hrs
Developed Discharge	139.45 cfs	234.93 cfs
Developed Peak Hours	12.05 hrs.	12.05 hrs.
Basin Flowline Outflow	864.00	
Storage Volume	0.798	0.987 ac-ft
Storage Elevation	867.29	868.46
Outlet Structure	1 – 2'x5' Area Orifice @ 864.00 6'x6' Riser/Weir @ 866.50	
100-Year Emergency Weir Elevation	869.00	
Basin Top Elevation	870.00	

Table 4 below summarizes the comparison between the existing total runoff and proposed total runoff for each sub-basin for the 10-year and 100-year storm events.

**Table 4: Comparison of Existing and Proposed Peak Flow Release Rate from the Site**

Drainage Basin	Q-10 Year, cfs	Q-100 Year, cfs
Existing Bella Vista	219.85	379.06
Proposed Bella Vista	219.40	366.32

**BMP ANALYSIS**

Worksheet 1 from the MARC BMP Manual was completed for this development and is included in Appendix E. The site requires a Level of Service of 7. BMP stormwater requirements for this site will be met by installing: native vegetation, value rating = 9.25, extended wet detention basin for the 90% Mean Storm, value rating = 5.0, with 1 acre routed to a native swale. Infiltration trenches and native swales will also be installed.

Native vegetation will be preserved and established surrounding the proposed buildings and associated pavements and will have a total planting area of 5.02 acres, with 1 acre routed to an infiltration trench. The extended wet detention basin will be for 7.60 acres in area and will lead to a native swale. There will also be infiltration trenches and a native swale.

The 90% mean storm 40 hour detention design for the 13.62 acres of site disturbance is located in Appendix E. Proposed detention will be provided by a perforated riser for the detention basin.

**CONCLUSIONS AND RECOMMENDATIONS**

The proposed project will cause an increase of runoff after the improvements are made to the site. We are proposing to reduce the 10-Year and 100-Year runoff rates to below existing conditions with two extended dry detention basins. Based on the information provided herein we request your approval of this storm drainage study for Bella Vista at the National.

**Appendix A**  
*Figures*

***Appendix B***  
*Soils Report*

***Appendix C***  
***FEMA – FIRMETTE***

***Appendix D***  
*Detention Analysis*