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Whipple Consulting Engineers, Inc.

MEMORANDUM

TO:	Mike Nilsson – City of Spokane		
FROM:	Todd Whipple, PE		
CC:	File		
DATE:	June 28, 2018		
PROJECT NO:	2025	NAME:	McCarrolls East Addition 2 nd
REGARDING:	Concept Storm Drainage Narrative		

Dear Mike,

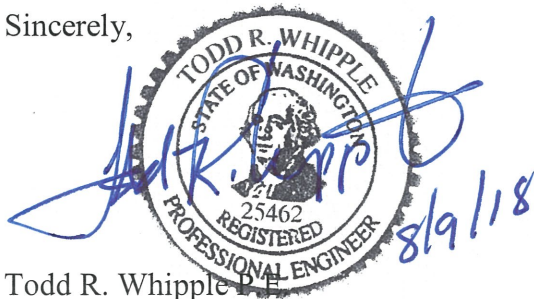
This letter is intended to provide an overview of the impacts from storm drainage created by the proposed development of McCarrolls East Addition 2nd and is an extension of the storm drainage plan for McCarrolls 6th addition. Please see the attached copy of the drainage report of McCarrolls 6th addition for a full analysis.

The stormwater generated onsite currently flows downward towards McCarrolls 6th addition where it is captured by roadside ditches and catch basins. The stormwater is piped to the large existing pond system on the corner of Lowell Ave and Farmdale St where it is disposed of through 3 existing drywells.

The project has 112 lots, 3 new public roads and the extension of Strong Rd. The increase in stormwater run-off and PGIS will be treated by the existing ponds on the corner of Lowell Ave and Farmdale St as allowed and planned for in the McCarrolls 6th addition storm drainage plan. What is not captured by the proposed catch basins and pipes, extending from the two connection points from McCarrolls 6th addition, will run down Strong Rd and be captured by curb inlets/catch basins. There are multiple existing ponds adjacent to Strong Rd that have been oversized to treat stormwater that bypasses the curb inlets and catch basins.

In conclusion of this concept storm drainage narrative the proposed development will comply with the SRSRM for stormwater management, treatment, and discharge.

Sincerely,



Todd R. Whipple

Enc. McCarrolls 6th Addition Drainage Report dated March 12, 2018

STORM DRAINAGE REPORT

FOR

MCCARROLLS EAST 6TH ADDITION

City of Spokane, Washington

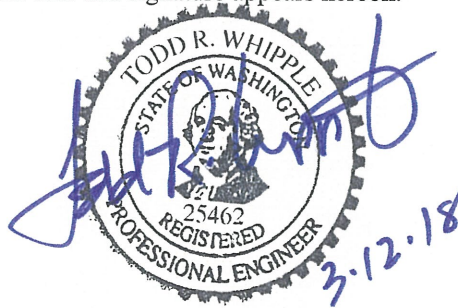
March, 2018

2017-1752

Prepared by:

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This report has been prepared by Justin Penner, EIT of Whipple Consulting Engineers under the direction of the undersigned professional engineer whose seal and signature appears hereon:



Todd R Whipple, P.E.

INTRODUCTION:

The purpose of this drainage report is to identify drainage impacts resulting from the proposed development for the McCarrolls East 6th Addition. Note that this drainage report will utilize and reconfigure the McCarrolls East 5th Addition storm drainage report as necessary. This drainage report will determine the drainage infrastructure improvements that are necessary to control and treat the stormwater runoff from the project site. The report will demonstrate there is no negative impact to the adjacent properties with the proposed development. The proposed project lies within the City of Spokane and will be designed in accordance with the Spokane Regional Stormwater Manual (SRSW). As outlined in the SRSW, treatment methods will be based on equation 6-1c: $V=1133A$.

NARRATIVE:

PROJECT DESCRIPTION:

The proposed project is an addition to an existing residential neighborhood located off of Indian Trail Road. The project proposes to extend Lowell Avenue to Barnes Road, extend Lex Ave to Lowell Ave, extend Derek Ave to Lex Ave, extend Strong Road further to the west and create two new roads, Sylvia Ave and Seminole Ave, between Strong Rd and Derek Ave. The site is currently undeveloped hillside covered in trees and weeds. The proposed development of the site will result in 86 lots, driveways, extension of public streets, and associated onsite storm drainage facilities. The proposed stormwater facilities will adequately collect, treat and discharge the stormwater runoff from the proposed development including future phases. Part of the stormwater for this phase will flow into Pond 4A that was designed in McCarrolls East 4th Addition. It is to be noted that Pond 4A is a system of four (4) hydraulically connected ponds and denoted as 4AA, 4AB, 4AC, and 4AD.

The proposed project site is located within the City of Spokane and lies in the NE $\frac{1}{4}$ of Section 22, T 26 N., R 42 E., W.M. The parcel numbers for the project are currently un-available due to the platting of McCarrolls 5th Addition. A vicinity map is attached in the Appendix.

GEOTECHNICAL INFORMATION:

The existing soils on site “consist of Marble variant sandy loam. The Marble soil is described as a very deep, excessively drained soil that is formed in sandy glacial outwash. Based on our observations, test pit data, laboratory results, and review of geologic maps and data, the on-site soils appear to be consistent with soil mapping.” (Stormwater Management Facility Recommendations McCarrolls 5th Addition) With this information, we have used a design outflow rate of 0.3 cfs for Type 1 drywells and 1.0 cfs for Type 2 drywells. The geotechnical report provided by Allwest Testing and Engineering can be seen in the appendix.

PRE-DEVELOPMENT BASIN INFORMATION:

As shown on the Pre-Developed Basin Map located in the Appendix, the site slopes to the west towards Indian Trail Road and Barnes Road. The southern portion of the site drains to the existing ponds from Phase 5 of the development: any excess flows will continue to drain to the existing 30-inch culvert under Indian Trail Road where it is directed towards the open land between Indian Trail Road and the reclaimed waste facility. The majority of the site to the north currently drains to the existing ponds from Phase 4 of the development; The top upper end of the pre-basins is cut-off by Barnes Road and the existing subdivision on top of 5-mile. It is to be noted that there is an existing gravel road that goes from Indian Trail Road to the top of 5 Mile, Strong Road. Pollution Generating Impervious Surface from this road currently runs off the gravel road into a roadside ditch where it is piped to the bottom of the hill where the water flows into existing catch basins.

Table 1 – Pre-Development Project Site Basin Summary

	Total Basin Area (sf)	Impervious Area (sf)	Pervious Area (sf)
Pre-Basin A	765,243	10,120	755,123
Pre-Basin B	1,016,353	0	1,016,353
Pre-Basin C	634,471	0	634,471
Pre-Basin D	1,168,574	19,600	1,148,974
Pre-Basin E	352,880	33,250	319,630

Refer to basin calculations in Appendix for areas and peak flows for all basins.

POST-DEVELOPMENT BASIN INFORMATION:

The Post-Development stormwater was separated into thirteen (13) major basins with Basin 6A divided into two (2) sub-basins, Basin 6B subdivided into three (3) sub-basins, Basin E is divided into two major sub-basins; Basin 5E and Basin 6E. Basin 5E is existing and is included for completeness. Basin 6E is divided into fourteen sub-basins. The remaining basins are either existing basins or future basins included for completeness. Only basins that are hydraulically connected are used for calculations within this report. The Post-Development basins were determined based onsite grading as well as treatment and discharge pond locations. The sub-basins were created to help size the storm drain pipes and catch basins and/or curb drops. A copy of the basin map is included in the appendix, and a summary is provided in the following table. The basin calculations are provided below for reference purposes and only include basins relevant to the 6th Addition of the McCarrolls project.

While the SRSM requires analysis of the 10 and 25-year storm events, for this project due to its hillside nature, we have provided bowstring calculations and pond sizing for the 100-year event for conservatism.

Table 2 – Post-Development Project Site Basin Summary

	Total Basin Area (sf)	Impervious Area (sf)	Pervious Area (sf)
Basin 6A	203,121	69,303	133,818
Basin 6B	274,438	57,219	217,219
Basin E	928,290	348,946	579,344
Basin G	161,154	71,275	89,879
Basin HE	751,544	0	751,544
Basin IG	483,346	0	483,346
Combined Basins			
Basin E+HE	1,679,834	348,946	1,330,888
Basin G+IG	644,500	71,275	573,225

*Note: subscript letter denotes ultimate pond connection.
Basin names indicate project phase, sub-basin, and pond destination.

Table 3 – Post-Development Project Site Pond Summary

	PGIS Area (sf)	(Method 1133A (ac)) Treatment Area/Volume (square feet/cubic feet)	
		Required	Provided
Basin6 A	43,948	2,286/1,143	8,845/3,847
Basin 6B	38,504	2,003/1,001	2,972/1,401
Basin E	217,126	See Combined Basin	See Combined Basin
Basin G	36,825	See Combined Basin	See Combined Basin
Basin HE	0	See Combined Basin	See Combined Basin
Basin IG	0	See Combined Basin	See Combined Basin
Combined Basins			
Basin E+HE	217,126	11,295/5,647	17,284/8,233
Basin G+IG	36,825	1,916/958	3,196/1,509

Refer to basin calculations in Appendix for areas and peak flows for all basins.

Operational Characteristics:

The stormwater for Basin 6A will sheet flow off the lots and pavement into the gutter where the stormwater will be captured via curb drops and treated/stored within roadside swales. Basin 6A is an expansion of a basin created in phase 4 of McCarrolls and utilizes the swale outlet system installed in phase 4. The outlet system uses catch basins located at the low point of Lowell Ave within the roadside swales to discharge to three (3) existing Type 2 drywells located parallel to Barnes Rd. Please see the Post Basin Map and Bowstring calculation provided in the appendix.

The stormwater for Basin 6B will sheet flow off the lots and pavement into the gutter where the stormwater will be captured via catch basins and pipes that outlet into Pond 6B. As Pond 6B is located just uphill of the recently installed Barnes Road there is an overflow pipe 0.5' above the pond bottom leading from Pond 6B to the Barnes Road Pond. There is an existing Type 2 drywell located in the Barnes Road Pond. Please see the Post Basin Map and Bowstring calculation provided in the appendix.

The stormwater for Basin 5E and 6E will sheet flow off the lots and pavement into the gutter where the stormwater will be captured via the corresponding catch basins and pipes that outlet into Pond 4A. It is to be noted that Pond 4A is divided into four (4) hydraulically connected cells. The cells are denoted as Pond 4AA, Pond 4AB, Pond 4AC, and Pond 4AD. Basin H, will not be developed with this phase, however, any stormwater runoff from this basin will proceed to drain to this system and to Pond 4A. It should be noted, Pond 4A, has been sized to accommodate stormwater runoff from Basin H, in both the pre-developed and post-developed condition.

The stormwater for Basin 6G1 will sheet flow off the pavement into the gutter where stormwater will be captured via the corresponding catch basins and pipes that outlet into Pond G. Once, Pond G reaches a depth of 0.5' it will release to the downstream pond through a culvert and be discharged underground by 2 existing Type 2 drywells in the existing downstream pond.

Flooded Width & Inlet Analysis

A flooded width and inlet analysis was performed only at the worst-case scenario. As established in McCarrolls 4th and 5th addition the worst-case scenario happens on Lowell Ave (Basin 6A) where the grades are the flattest and the largest square footage of pavement drains to one point. For added conservatism it was assumed that all the stormwater is only captured by two curb inlets. Also, a 50% clogging factor was applied since the curb inlets are located in a sump condition. The flooded widths of the curb inlets on opposite sides of the street are 6.19' and 3.69' leaving a 14.12' clear drive aisle. The non-flooded width is greater than 12' therefore acceptable per the SRSM. Calculations in appendix.

$$24' - (6.19' + 3.69') = 14.12'$$

Methodology:

As required by the SRSM, the storm drainage facilities proposed for this site have been sized to attenuate the 10- and 25-year storm events using the Rational Method as outlined in Section 5.5 of the SRSM. Due to the small size of the basins within this analysis, the Rational Method has been used to calculate peak flows and volumes. The peak flows and volumes for these storm events are shown in the calculations that are included within the Appendix of this report.

IT IS IMPORTANT TO NOTE THAT FOR CONSERVATISM, WE HAVE DESIGNED THIS PROJECT AND PROJECT PONDS FOR THE 100-YEAR RATIONAL EVENT DUE TO THE HILLSIDE NATURE OF THIS PROJECT. THIS IS REFLECTED IN THE ATTACHED BOWSTRING CALCULATIONS AND SUBSEQUENT TABLES.

Water Quality Treatment:

The proposed storm drainage ponds have been designed to provide treatment volume based on Equation 6-1c (V=1133A) of the SRSM, as outlined in Section 6.7.1. Once the treated stormwater exceeds a height of 6 inches, it will spill into drywells, where it will be discharged underground.

Critical Areas:

Based on the Critical Area Maps provided by The City of Spokane, (Fema Flood Zone, Erodible Soil, Hazardous Geology, Spokane-Rathdrum Aquifer), there appears to be Hazardous Geology described as Landslide Deposit-Qmw. The items listed above will have no effect on the stormwater facilities for this project.

Down-Gradient Analysis/100 Year Storm Event/Snow Melt Analysis:

A down-gradient analysis is not needed for this site as we have reduced the amount of runoff to the southwest by collecting stormwater in ponds onsite and infiltrating the water into the soil. The ponds have been sized to hold the 100-year storm event. The 100-year bowstrings can be seen in the appendix. If for some reason, the ponds do not hold/store all the stormwater, there are two different places the stormwater will flow too. The north side of Strong Road stormwater will overflow the pond system and enter the Lowell Avenue roadway and travel to the east and cross Indian Trail Road where it will continue to flow down the roadway until it reaches the outflow point at the end of N Greenwood Court. The south side of Strong Road will overflow through a catch basin and flow to the existing 30" culvert under Indian Trail Rd. Since a 100-year storm event is comparable to a snow melt condition, and the ponds can hold/store the 100-year storm event, a snow melt analysis is not required. The storage summary can be seen in table 4.

Results:

As shown in Table 3 within this report we have provided the required treatment volume for the improvements proposed for the development. Table 4 below shows the onsite pond/swale storage summary for the 100-year storm event.

Table 4 – Project Site Pond/Swale Storage Summary

Basin	100-YR Storm	
	Required	Provided
	Vol. (cf)	Vol. (cf)
Basin 6 A	3,088	4,128
Basin 6B	3,315	4,665
Combined Basins		
Basin E+HE	28,173	35,690
Basin G+IG	6,470	7,567

The excess storage from the existing ponds downhill of Pond G will be used to hold the excess stormwater from Pond G. Pond G can hold 5,009 cf.

Perpetual Maintenance of Facilities:

This is a residential development with a public road as access. The ponds will be maintained by the homeowners. The City of Spokane will not be liable for any maintenance or operation of the facilities. A maintenance plan will be provided to the owner if requested. However, the City of Spokane will be responsible for the maintenance of the storm pipe and system.

Offsite Easements:

There are no offsite easements required for this property.

Regional Facilities:

There are no known regional facilities that lie within the project site.

CONCLUSION:

As required by the City of Spokane and the Spokane Regional Stormwater Manual, the onsite storm drainage facilities for this project will adequately collect, treat and discharge stormwater runoff generated by the site during the 10-year storm event. Also, the storm drainage facilities will contain and discharge the 100-year storm under non-frozen conditions. Therefore, this project will have no adverse impact to adjacent and/or downstream properties.

APPENDIX

VICINITY MAP

BASIN MAPS