

Date: Wednesday, March 31, 2021

To: ENGINEERING SOLUTIONS
Matt Schlicht, P.E.
50 SE 30TH ST
LEES SUMMIT, MO 64082

From: Gene Williams, P.E.
Senior Staff Engineer

Application Number: PL2021073

Application Type: Engineering Plan Review

Application Name: Woodland Oaks 1st - Street, Stormwater, and Master Drainage Plan

- The Development Services Department has completed its review of the above-referenced plans, and offers the following comments:
- Revised plans and stormwater study will be reviewed within ten (10) business days of the date received.

Engineering Review - Corrections

1. It would appear the two (2) detention basins should be utilized for temporary sediment collection.
2. It would appear the northeast storm pipe entering the northern detention basin will have a short residence time within the basin due to the proximity to the outlet structure. Can this entrance pipe be moved?
3. Downstream property owner to the west has already been in contact with the City concerning off-site migration of silt, sediment, trash, and other adverse impacts due to the proposed subdivision. Please provide increased diligence in this area, to mitigate the off-site migration of silt, sediment, trash, and to prevent erosion of their property.
4. Spot Elevation Sheet: Why are the items normally seen on a Master Drainage Plan shown on this sheet?
5. Detail 1 on the ADA-accessible ramp sheet shows a turning space adjacent to the curb which is no longer allowed. Provide a new design for the ramp which place the turning space outside this area. We can provide an example if desired.
6. Detail 2 of the ADA-accessible ramp detail proposes a bi-directional ramp at the apex of the curve. This is no longer allowed. A single direction ramp must be provided for each crossing, in alignment with the 5

foot wide ADA-route across the intersection.

7. Detail 4 on the ADA-accessible detail sheet proposes a turning space which does not appear compliant in terms of the turning space. Design slope appear to be greater than 1.5% in the diagonal direction using the diagonal elevation call-outs. Turning spaces must be designed with a slope no greater than 1.5% in any direction, not just two (2) dimensions.
8. ADA-accessible ramp details shall include a dimension between the truncated dome to the back of curb. In no case shall this distance be greater than 5.00 feet.
9. ADA-accessible ramp details shall include design slope call-outs to the second decimal place for all ramps. It appears there were missing slope call-outs, and in some cases, slopes which exceed the 7.50% design running slope were shown.
10. Detail 3 on the ADA-accessible ramp detail sheet shows a turning space which is non-compliant. All turning spaces shall be flat, as defined as less than 1.50% in any direction. A design slope greater than 1.50% appears to be shown as evidenced by the elevation call-outs. Slope call-outs were also missing.
11. Detail 5 on the ADA-accessible ramp detail sheet will be a high-maintenance design, prone to silt and sediment collecting at the bottom of the ramp due to flat slope. The bigger question is why the 7.50% ramp immediately adjacent, followed by the flat slope at bottom? We would suggest lengthening ramp to curb, and reduce the slope to a more accommodating design. It should be noted that truncated domes may be installed within a ramp. They are not required to be installed only in flat areas.
12. Although beneficial to include water and sanitary lines on these plans, please use standard drafting lineweights (e.g., lighter lineweight) to distinguish these features from relevant street and stormwater features covered by these plans. This is especially prevalent on the general stormwater layout sheet.
13. If using rip rap, dimensions, material size, approximate volume, depth, geofabric, and all other necessary information is required to be explicitly shown on one of the plan views (i.e., not in the back of the plan set in table format). Finally, consideration should be given to other energy dissipation measures besides rip rap, especially considering the discharge point will be directed to a property owner with two (2) ponds that need protection.
14. Where pipe is installed in fill, cross-hatching shall be shown on the profile view along with sufficient notes about compacting the fill prior to trenching and installation of pipe. If additional clarification is needed, please contact me. This is the same comment we have provided in the past for different projects where pipe is installed in fill.
15. The discharge at 12-1 onto adjacent property to the west appears to show insufficient energy dissipation. In addition, the bypass channel will tie into this point, and additional design is required to ensure this area is adequately protected from erosion. Recommend a different energy dissipation method and structure

be designed for this critical location. The Federal Highway Administration has examples of field-tested designs which can be utilized for this location.

16. It would appear there are better locations for the discharge point from the southwest detention basin. We would recommend locating the outlet point and associated energy dissipation devices further away from the property line than shown, or provide a different method for energy dissipation than rip rap.
17. Master Drainage Plan was missing from the plan set, although some of the sheets contain the needed information. We are showing a "spot elevation" plan sheet, and a grading plan, but as a document required by Ordinance, must be titled Master Drainage Plan. Please cleanup, because it appears much of the required detail is there, but scattered around throughout the sheets. Other issues with the sheets are the example of circles shown on the spot elevation sheet, with references to another sheet, which do not appear to make sense. (i.e., "see detail sheet C.205). Sheet C.205 contains no details. Finally, cover sheet index does not match what is shown on these sheets. No further review was performed at this time.
18. Plans were missing the detention basin grading sheets, with all required information necessary to construct and inspect these basins. A separate sheet should be provided for each basin. A note shall be provided stating these basins will be constructed with the erosion and sediment control measures. A note shall be provided stating that an as-built and accepted detention basin plan be submitted prior to issuance of a Certificate of Substantial Completion, with as-built storage versus proposed storage.
19. Detention basin outlet structure detail sheets were missing. Anti-clogging measures shall be provided, and we would suggest a re-evaluation of previous anti-clogging measures for these basins, especially in regard to the water quality orifices. Placement of anti-clogging measures on the inside of a confined space may be required, but would require easy access from the top of the structure to rake the perforated riser after rain events.
20. Ensure all sheets match the index on the cover sheet. This would include the sheet name, sheet number, and and sequencing within the plan set. Our copy had issues with the index not matching the subsequent sheets.
21. Storm Line 12 profile view is missing the HGL for the design storms.
22. Some of the discharge points into the two (2) detention basins are shown with excessive slope, which will create supercritical conditions at the point of discharge. Normal procedure is to lessen the slope prior to discharge by installing storm line and box lower, and achieving the "dogleg" effect to create a hydraulic jump within the pipe. Was this evaluated? This will help with water quality, erosion, and maintenance by the HOA.
23. HGLs are shown for storm lines entering detention basins, assuming free release of stormwater into the basins and no submerged pipe. This is an incorrect assumption, since the discharge will be submerged

during detention basin operation during the various storm events. Evaluation and presentation on the profile view, as well as the stormwater calculation sheet is required.

24. A swale plan sheet is required for the swale along the northwest part of the project, either as a separate sheet or on the Master Drainage Plan. Swale start and stop locations should be shown, with cross-sections at an appropriate distance to be determined by the engineer, along with any appropriate flow calculations, depth calculations, and freeboard calculations for the 100 year event.
25. Underdrains are required at the low points, tied to the curb inlets. Please show their location, and specify which method will be used. A chart is presented within the details, but no specific design is called-out on the sheet.
26. Street Profile Views: Were the slopes at stop-controlled intersections coordinated with the ADA-accessible route details? If not, this shall be required. It appears at least two (2) profile views do not match what is shown for the ADA-accessible route at Cherrybark Cir., and Blackwell/Woodland Oak Dr. intersection.
27. Detention Basin (north): Is the receiving storm system able to manage the nominal 100 year storm event without surcharging? Hydraflow Hydrographs does not appear to be capable of making this determination, because it assumes the discharge pipe is flowing freely at the end. If not, are you relying on the emergency spillway to provide this capacity? This may require a waiver to the Design and Construction Manual. Emergency spillways are not designed for the 100 year nominal event, but rather, the clogged condition/zero available storage event.
28. Please verify the 24 inch discharge pipe from the southwest basin is able to convey the 100 year event without utilizing the emergency spillway. The model run appears to confirm, but wanted to ask the question.
29. Due to the critical nature and importance, a separate plan sheet shall be required for the bypass channel. This plan sheet should provide the plan view, profile view, and section view at selected intervals. HGLs shall be shown for the 100 year event, along with design flows before and after development. Design peak flow should slightly decrease, due to the diversion of a portion of the drainage area to the detention basin.
30. There appear to be conflicts with the District water main near the north end of the north detention basin. A pressured water main within a dam is a risky design.
31. The Macro Storm Water Drainage Study was unsealed. It also provided schematic drawings of the outlet structures which did not make it into the plan set. The schematic drawings are incomplete in terms of anti-clogging measures, especially in regard to the 1 inch perforated risers. It also provided details of the dam construction which also did not make it into the plan set.

32. A pavement section view shall be required for the Blackwell Rd./Woodland Oak Dr. segment. It is recommended that at least two (2) typical pavement sections be provided, or one (1) typical section with sufficient notes concerning the variable width based on the plan view.
33. Detail 6 on the ADA-accessible ramp details shows the ramp entering at an angle greater than 90 degrees deflection. The angle shall be 90 degrees or less to avoid the odd turn to align with the ramp.
34. 100 year water surface elevation within each basin shall be shown in numeric and graphic format on the Master Drainage Plan and the Detention Basin plan sheets. It shall include the nominal and 100% clogged/zero available storage conditions.
35. Exhibit within the stormwater study for the north detention basin outlet structure shows an emergency overflow weir, but this would not be considered an emergency overflow weir. If the primary outlet works become clogged, this would not function in the emergency condition since it is a closed top. It also appears the stormwater study did not account for this feature in the pond setup table.
36. Stormwater report: Pond setup tables do not match the exhibit for the outlet structures contained within the report for the following items: 1) emergency spillway for southwest detention basin crest elevation, and 2) 12 inch orifice elevations.
37. Were incoming pipe flowlines (i.e., pipes entering the detention basins) checked to ensure the slopes shown on the detention basin bottoms can be achieved?
38. It appears the majority of the southwest detention basin dam top shall be utilized for the emergency spillway. This is the highest part of the dam considering the height from undisturbed ground to the top of the dam, and not a suitable location for an emergency spillway. This design should be re-evaluated, with a different location which is able to tie into the new bypass channel. Alternatively, the emergency spillway can be incorporated into the primary outlet works. This alternative design would typically include an open top, with a domed grate. It must be sized for the clogged condition/zero available storage event.
39. The emergency spillway is shown across the majority of the north detention basin dam. Please see previous comments concerning this issue. It is recommended that primary outlet works be combined with emergency spillway, if the downstream system can manage the flows.
40. As indicated in the stormwater study, a waiver shall be required for the peripheral areas noted. A separate summary report (in this case, likely a design memo and exhibit) shall be prepared, along with the standard waiver template.
41. A detention basin Operation and Maintenance Manual should be developed prior to completion of the project. This document should be developed for the HOA, and a copy submitted to the City for

concurrence.

42. Technical Release 60 offers various examples of emergency spillway design. It is suggested this document be reviewed prior to a re-design of the emergency spillways. Although TR-60 would not apply to this particular dam, the concepts are relevant. As presently designed, the emergency spillway is the top of the dam for all practical purposes, and is designed to overtop.

Traffic Review - Pending Review Comments

In order to calculate the Engineering Plan Review and Inspection Fee, a sealed Engineer's Opinion of Probable Construction Costs shall accompany your final submittal copies. The itemized estimate (material and installation) shall be sufficiently broken down and shall include the following items, as applicable.

- Public infrastructure, both onsite and offsite.
- Private street construction, including parking lots and driveways.
- Sidewalks located within the right-of-way.
- ADA accessible ramps.
- Sanitary sewer manholes and piping between manholes, including private mains.
- Connection of the building sanitary sewer stub to the public main.
- Waterlines larger than 2 inches in diameter, valves, hydrants, and backflow preventer with vault, if outside the building.
- Stormwater piping greater than 6 inches in diameter, structures, and detention / retention facilities - public or private.
- Water quality features installed to meet the 40-hour extended duration detention requirements.
- Grading for detention / retention ponds.
- Grading to establish proper site drainage.
- Utility infrastructure adjustments to finished grade (i.e. manhole lids, water valves, etc.).
- Erosion and sediment control devices required for construction.
- Re-vegetation and other post-construction erosion and sediment control activities.

Electronic Plans for Resubmittal

All Planning application and development engineering plan resubmittals shall include an electronic copy of the documents as well as the required number of paper copies.

Electronic copies shall be provided in the following formats

- Plats – All plats shall be provided in multi-page Portable Document Format (PDF).
- Engineered Civil Plans – All engineered civil plans shall be provided in multi-page Portable Document Format (PDF).
- Studies – Studies, such as stormwater and traffic, shall be provided in Portable Document Format (PDF).

Please contact me if you have any questions or comments.

Sincerely,

/s/ Gene Williams electronically signed Mar. 31, 2021

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cc: Development Engineering Project File