

July 11, 2018

City of Lee's Summit, Missouri
Public Works Engineering Division
220 SE Green Street
Lee's Summit, MO 64063

RE: PL2018074 The Grove – Mass Grading and Stormwater Plans Review

We have received your comments dated July 10, 2018 for the above referenced project. Our responses follow each comment. The comment responses have been organized by the review section they pertain to.

Engineering Review:

1. Please refer to comment #10 of the applicant letter dated June 19, 2018. The response to comments appears to be directed toward the stilling basin design at the end of the triple culvert, rather than the outlet of the 5x5 RCB beneath Summit St. We saw no changes were made to the design, and are concerned about the effect that a 5x5 box culvert will have at the discharge point, when installed at a slope greater than 4%. This will be flowing supercritical, and a simple MoDOT Type 3 ditch liner is in our opinion not sufficient to manage the energy at the end of this RCB. There may be intervals where the normal pool elevation is lower than normal, and we do not feel the MoDOT Type 3 ditch liner is adequate to absorb the energy of the stormwater discharge. Is there a way to lower the slope of this box culvert to eliminate this concern? What is the rip rap size, and where is the geotextile fabric needed? If you are going to specify "MoDOT Type 3 Ditch Liner", you will need to provide a detail of this feature in the plans, and provide a reference to this detail on the plan view. Finally, what is the proposed grading at the beginning of this box culvert (i.e., near station 2+47)? As shown, it is difficult to determine what the proposed grading will be in this area.

GBA Response: MODOT Type 3 Ditch Liner specifies rip rap gradation, not a rip rap feature. See attached for MODOT ditch liner specifications per MODOT EPG. These have been added to the applicable details on the plans for clarity. Geotextile shown on detail on sheet C5.5. See attached for shear stress calculation at RCB outfall. The shear stress at the RCB outfall, at 4%, is 2.95 PSF, less than the allowable 4.0 PSF for 12" diameter riprap. However, the riprap material has been shown as upsized to MODOT Type 4 Ditch Liner (predominant stone size of 19") for conservative design. The outlet flowline of the RCB is located 1 foot below the permanent pool elevation to increase outlet protection, and help erosion control during drier periods. The proposed grading will be the swale section shown on sheet C4.0. The proposed grade has been added to the profile view for clarity.

2. Please refer to comment #12 of the previous applicant letter. A "MoDOT Type 3 Ditch Liner" is specified, but no such detail is provided in the plans. Geotextile filter fabric was not shown, and must be shown as per City of Lee's Summit requirements. Rip rap size was not specified, and referencing the size in the stormwater report is not sufficient since contractors and inspectors do not read these reports. Finally, MoDOT Type 3 Ditch Liners do not appear to meet the requirements shown on Sheet C4.2. This appears more in line with a MoDOT Type 4 Ditch Liner than a Type 3 Ditch Liner.

GBA Response: Notes specifying MODOT Type 3 Ditch liner gradation requirements, per MODOT EPG Section 609, added to sheet C4.2. MODOT Type 3 Ditch Liner specifies rip rap gradation, not a feature, with a predominant rock size of 12", a max rock size of 20", and a gradation such that no more

than 15% will be less than 4". See attached for MODOT Ditch Liner Gradations. Geotextile construction note added to sheet C4.2.

3. Please refer to comment #16 of the previous applicant letter. Please label the 100 year hydraulic grade line as "clogged condition of primary outlet works - 100 year hydraulic grade line" or equivalent language. In addition, the following questions should be answered prior to consideration of your request to allow for non-gravity flow for the 100 year, clogged condition event: 1) what is the hydraulic grade line within the triple PPP culvert for the un-clogged condition (please show graphically on the profile view, with appropriate notes such as "100 year hydraulic grade line with primary outlet works functioning normally", or equivalent language), 2) are all conditions set forth in Section 5606.3 "Pressure Flow" met, such as the condition that watertight joints capable of withstanding the internal surcharge pressure are being used, appropriate energy losses for bends, transitions, manholes, junction boxes, inlets, and outlets used in the computation of the HGL, and Bernoulli's equation was used in the computations?

GBA Response: Clogged Outlet Emergency Bypass 100-Year HGL added label added to profile views. Unclogged Outlet 100-Year HGL and note added to profile views. All conditions set forth by APWA Section 5603.1 have been met for pressure flow. CulvertMaster and the Bernoulli equation were used for flow calculations per APWA Section 5603.1. The maximum pressure in the culvert will be 4.7 PSI, less than the allowable 10.8 PSI for an ADS water tight pressure rated coupler. These statements have been added to page nine of the stormwater report.

Traffic Review:

1. Provide the advisory speed signs for the TTC on the shoo-fly based on the horizontal radii. The contractor should not be required to assess the appropriate speed from an EPG reference.

GBA Response: Advisory Speed of 15 MPH noted on the plans.

We believe we have addressed all comments on this project. If you have any additional questions or concerns, please feel free to contact us.

Sincerely,

GEORGE BUTLER ASSOCIATES, INC.

Clint Loumaster, P.E.

MODOT DITCH LINERS

by visual inspection. All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

Item	Section
Geotextile Fabric	1011

609.60.2.1 Type 1 Rock Ditch Liner shall consist of material with a predominant rock size of 3 inches, a maximum rock size of 6 inches and a gradation such that no more than 15 percent will be less than one inch.

609.60.2.2 Type 2 Rock Ditch Liner shall consist of material with a predominant rock size of 6 inches, a maximum rock size of 10 inches and a gradation such that no more than 15 percent will be less than 3 inches.

609.60.2.3 Type 3 Rock Ditch Liner shall consist of material with a predominant rock size of 12 inches, a maximum rock size of 20 inches and a gradation such that no more than 15 percent will be less than 4 inches.

609.60.2.4 Type 4 Rock Ditch Liner shall consist of material with a predominant rock size of 19 inches, a maximum rock size of 28 inches and a gradation such that no more than 15 percent will be less than 6 inches.

609.60.2.5 Bedding material shall be used under Type 3 and Type 4 Rock Ditch Liner. Bedding material shall consist of crushed stone or gravel with a gradation consisting of 100 percent passing the 3-inch sieve, 30 to 70 percent passing the 1 1/2-inch sieve and 0 to 15 percent passing the No. 4 sieve.

609.60.3 Construction Requirements. Rock ditch liner shall be placed to the approximate shape and thickness shown on the plans for the specified ditch or as directed by the engineer. The rock shall be dumped on a subgrade of reasonably uniform density and left in a rough condition meeting the approval from the engineer.

609.60.4 Method of Measurement. Rock ditch liner and bedding material will each be measured to the nearest cubic yard of material.

609.60.5 Basis of Payment.

609.60.5.1 If shown on the plans that the material for rock ditch liner is to be obtained from the right of way or other sources furnished by the Commission, the excavating, including all breaking, loading, and hauling, regardless of distance, to the site of the rock ditch liner will be paid for and considered completely covered under such contract items as Class A Excavation, Class C Excavation, Unclassified Excavation, Excavation for Structures or other applicable items. If payment is made under these conditions, separate payment for furnishing rock ditch liner will not be made.

609.60.5.2 If the plans show material for rock ditch liner to be secured from sources cited in Sec 609.60.5.1 and this material is made unsuitable or unattainable by the contractor's operations, the contractor shall provide suitable material and dispose of any surplus material at the contractor's expense.

609.60.5.3 If the contract documents provide for obtaining material from the right of way or other source furnished by the Commission, but all or part of the required quantity of acceptable material is not available, unless the shortage is due to the contractor's operations, payment for such additional rock base material that the contractor will be required to furnish

SUMMIT STREET RCB OUTLET PROTECTION
5' x 5' RCB

25 YEAR STORM → Q = 111.6 CFS

SLOPE = 4.19%

DEPTH OF FLOW = 1.13'

SHEAR STRESS = $(62.4)(0.0419)(1.13) = \underline{2.95 \text{ PSF}}$

→ MAX SHEAR STRESS ALLOWABLE FOR 12" DIA. RIPRAP = 4.0 PSF PER APWA 5607.5

→ SHEAR STRESS EXITING RCB MEETS ALLOWABLE SHEAR STRESS FOR 12" DIA. RIPRAP

→ RIPRAP UPSIZED TO PREDOMINANT ROCK SIZE OF 19" FOR CONSERVATIVE DESIGN.

→ EXIT FLOWLINE OF RCB IS ONE FOOT BELOW NORMAL POOL ELEVATION TO INCREASE OUTLET PROTECTION