# MEMO

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| **TO:** | **City of Lee's Summit**<br>Attn: Gene Williams |
| **FROM:** | **Olsson**<br>Terry Parsons, PE |
| **RE:** | Preliminary RCB Sizing - SE Cape Drive Extension |
| **DATE:** | September 8, 2023 |
| **PROJECT #:** | 020-0103 |

## Background

A preliminary hydrologic and hydraulic analysis was performed to determine the culvert sizing for the proposed extension of SE Cape Drive, just south of the East Trails Middle School, in Lee's Summit, MO.

## Hydrologic Analysis

Peak flows to the proposed reinforced concrete box culvert (RCB) were determined using HEC-HMS for a 24-Hour SCS Type II rainfall distribution. Calculations were performed to determine curve numbers and times of concentration for the contributing area to the proposed culvert, which were then used to determine peak flows. For this analysis, the drainage area was split at Bailey Drive. A separate hydrologic analysis was previously completed by Olsson for the East Trails Middle School. This area was separated from the current analysis; peak flows from the previous analysis were added to peak flows from the current analysis to determine overall peak flows to the proposed RCB for the entire contributing drainage area. Table 1 contains a summary of the hydrologic parameters. NRCS rainfall depths for Jackson County, MO were used in this analysis (100-year storm depth = 7.7 inches).

**Table 1. Hydrologic Parameters.**

| Drainage Area | Area (acres) | Curve Number | Time of Concentration (minutes) |
|---|---|---|---|
| N of Bailey Drive | 79.4 | 84 | 17.2 |
| S of Bailey Drive | 96.3 | 78 | 19.4 |
| East Trails Middle School | 30.4 | - | - |
| Total | 206.1 | - | - |

## Hydraulic Analysis

SE Cape Drive is classified as a residential road and has an open channel downstream of the proposed culvert. The minimum design storm capacity for this classification is the 25-year storm, with 7-inches or less of overtopping in the 100-year storm per Table 5601-1 of APWA 5600. For the purposes of this preliminary analysis, the proposed culvert was designed to pass peak flows for the 100-year storm event without overtopping. HY-8 was used to determine a sizing for the proposed culvert, which is a double 10-foot (span) by 5-foot (rise) RCB. Table 2 summarizes the results from the hydraulic analysis.

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**Table 2. Hydraulic Analysis Results.**

| Headwater El. | Return Interval | Peak Flow | RCB Discharge | Control Type |
|---|---|---|---|---|
| 986.1 | 100-year | 1,131 cfs | 1,131 cfs | Inlet |

*Roadway low point elevation = 986.8 feet

# Summary

A preliminary hydrologic and hydraulic analysis was performed to determine a proposed culvert size for the SE Cape Drive Extension project. The resulting configuration is a double 10-foot by 5-foot RCB, which passes the 100-year design storm without overtopping the road. During final design, this analysis should be revisited to confirm appropriate sizing of the RCB and update the analysis to account for any design changes.

Please feel free to reach out to me with any additional questions at jasgian@olsson.com or 913.381.1170.

Thanks,

Terry M. Parsons, PE