

July 25, 2024

To: City of Sidney – Jeff Hintz, Public Works Director

From: Interstate Engineering, Inc. – Tyler J. Lindbloom, EI | Jordan Mayer, PE

Re: Engineering Design Report – Red River Drive Stormwater Passage

Project No. WR24-04-050

To whom it may concern,

Interstate Engineering has reviewed existing stormwater drainage characteristics surrounding the intersection of Red River Drive and Silurian Lane, mainly focused on the southeastern corner of the intersection surrounding the Sidney Millwork Co. (SMC) shop building. The primary items of concern are sedimentation against the northwest corner of the SMC shop and erosion along the ditch flow lines running east and south from this intersection. Areas east of Cambrian Lane and south of the SMC property were not analyzed as part of this scope. The long-term protection of the City roadways and embankments surrounding the SMC property are a primary objective as well in the design of these proposed improvements.



Currently, several inches of sediment deposition exist above the concrete foundation wall of the SMC shop, localized to the northwest building corner. Also, rilling and pronounced flow-line erosion are evident along the road shoulder ditches leaving the intersection in both directions along the building. Acute erosion is evident at the downspouts along the north side of the SMC building as well.

Conveniently, a significant rainstorm occurred the Wednesday prior to the June 3<sup>rd</sup> site visit. This rainstorm, along with the hydrant on the north side of the intersection being recently flowed to observe drainage characteristics along the road curbs, showed no evidence of roadway stormwater drainage contributing to the flows and subsequent erosion/sedimentation occurring along the SMC property. There was no evidence of curb overtopping along the entire project corridor. Furthermore, survey data confirmed the observations made during hydrant flowing; being that the western curb line of Silurian Lane draws curb flow down Silurian Lane rather than across the valley gutter at the Red River Drive – Silurian Lane intersection.

The road shoulders separating the SMC building foundation from the roadway along this corridor are relatively steep - being as steep as 2:1 (H:V). Little to no vegetation exists on these gravel embankments. These factors lead to the road shoulders being prone to erosion. As can be observed in site pictures included herein, several inches of vertical separation exist between the top-back-of-curb and the top-of-gravel against the backside of those concrete curbs along both curb lines. It can be inferred that, over the years since construction of the paved roadway, gravel along those slopes has been washed downslope during rain events and deposited against the sheet metal exterior of the SMC building. In doing so, differential deposition has compromised the uniformity of the ditch flow lines surrounding the intersection. Some evidence of ponding was observed in both the eastward- and southward-flowing ditches (mainly the southward-flowing ditch).



Interstate Engineering has designed drainage flow lines to correct ponding and re-establish consistent drainage along both road shoulders. The eastward ditch has been re-graded to a uniform 2% slope between the building corner and the existing culvert inlet. The southward flow line has been set at a 1.5% slope between the building corner and the driveway for the haul-off dumpster on the southwest corner of the SMC building. This proposed drainage configuration will require some excavation and removal of existing sediment, as would be expected. Currently, 6-8 inches of silt exist against the northwest corner of the SMC shop building. This material must be excavated and removed from site prior to further work taking place. Finished grades for the proposed valley gutter have been provided in the attached construction exhibits.

Interstate Engineering proposes the construction of a modular concrete block retaining wall extending 35 LF in both directions from the Red River Drive – Silurian Lane intersection, as shown in the exhibits included at the end of this report. This retaining wall will act to lessen the shoulder slope through its steepest existing stretch and halt the acute sediment deposition immediately surrounding the northwest building corner. As shown in the included construction exhibits, the retaining wall shall be installed with a perforated pipe drain system to lessen hydrostatic pressures. To further eliminate sedimentation potential, Interstate Engineering proposes a concrete valley gutter be constructed between the bottom of the retaining wall and the foundation wall of the SMC building extending in each direction 45 LF from the northwest building corner. This concrete valley gutter is designed with rebar reinforcement to withstand any potential loading during maintenance operations, as well as resist cracking from shrinkage and freeze-thaw cycles. The valley gutter is generally 10-ft wide with a 2% cross slope and a longitudinal slope of 1.5% and 2% respectively, as previously discussed. As introduced above, the retaining wall drainpipes are intended to daylight into the concrete valley gutter at the



downstream retaining wall extents in either direction. The combination of the retaining wall system and concrete valley gutter will eliminate, or greatly reduce, future erosion and deposition issues. Minor maintenance should be expected on an annual basis.

**DISCLAIMER:** Interstate Engineering states on sheet D-1 of the attached exhibit set that general structural assumptions were made when designing the modular retaining wall as shown. Prior to installation, the project owner shall consult a licensed geotechnical engineer for a final review of applicable design specifications relating to existing soil/loading conditions.

Lastly, two (2) erosion control products have been proposed to resist sediment runoff along the road shoulders, at existing downspout outlets, and at the inlet of the existing culvert under Cambrian Lane along Red River Drive:

A non-vegetated Polypropylene Turf Reinforcement Mat (TRM) is proposed to protect the road shoulders from further erosion/sediment transfer; that product shall be East Coast Erosion Control ECP-3, or an approved equal. ECP-3 is UV-stabilized to withstand long-term outdoor exposure. With proper anchoring and installation, this product is designed to function properly on slopes as steep as 1:1 (H:V). With the proposed slope grading of no more than 2:1 (H:V), this product exhibits a RUSLE Cover Management (C-) Factor of 0.020; which is well below the EPA threshold for "final stabilization" - being a C-factor  $\leq 0.050$ . The RUSLE C-factor is a means of measuring soil loss and, therefore, erosion control effectiveness.

Turf Reinforcement Mat (ECP-3) is proposed at the inlet side of the existing Cambrian Lane CMP culvert. This culvert should first be cleaned of sediment and the inlet side re-graded for uniformity, with the existing flared end section exposed without constriction. The inlet side, as shown on the attached exhibit set, should then be outfitted with a single 8-ft width of ECP-3 TRM extending approximately 15-ft in length upstream of the culvert opening. The TRM should be installed on the upslope along the sides of the culvert to be at least even with the existing top-of-pipe. A 6"x6" key-in trench should be utilized on the upstream end of the TRM length, with a 0.7 staples/yd anchoring scheme generally followed. Two (2) polypropylene-netting excelsior wattles, spaced as shown on the attached exhibit, are also recommended upstream of the existing culvert. This configuration is proposed to halt further siltation within the CMP culvert. The proposed TRM will halt further localized erosion upstream of the culvert while the excelsior wattles will act to decelerate ditch flows and catch silt flowing from further up-ditch prior to it entering the culvert. With this approach, silt may be excavated as needed by hand (upstream of the culvert) rather than requiring a water jet to wash silt from the culvert barrel.



ECP-3 and Excelsior Wattles are proposed in tandem to mitigate downspout outlet scour. Multiple wattle alternatives are acceptable based on supplier availability; more resilient option such as *East Coast Erosion Control ECWattle – 100% Aspen Wood Fibers* will extend the product's life on site. Small patches of ECP-3 are recommended to be installed at the outlets of each SMC roof downspout along the project corridor - because this product is already recommended for larger scale slope stability purposes, it has been adapted for downspout protection based on cost savings and efficiency. These mats are recommended to be cut to 4' W x 5' L

(width being half of an 8' roll) and installed at each downspout within the project area. It is recommended that these small mats be anchored with the manufacturer-supplied staples but without a key-in trench for easier maintenance. For this "as-needed" maintenance, the staples may be pulled, mats removed for minor earthwork, then re-installed re-using both the mat and hardware. To protect the roadway shoulder from downspout scour, as was observed when on site, it is recommended that polypropylene-netting excelsior wattles be installed parallel to the roadway along the slope toe, directly across from the downspout outlet. These wattles will act as a "backstop" to decelerate downspout flows. It is Interstate Engineering's judgement that these downspouts will require maintenance on a more frequent interval than the other measures proposed above.

In the attached exhibits, Interstate Engineering recommends a well-draining stabilized drive approach section. Depending on material availability and pricing, there are multiple comparable alternatives to select from. The goal of this system is to stabilize this driveway, avoiding rutting from tires if driven on when saturated and to eliminate rilling/channelization from shallow concentrate flow through the ditch transporting water north-to-south along the road shoulder. Either an impermeable hard surface driveway (likely reinforced concrete) or a well-draining large aggregate solution will accomplish this. The exhibit set calls for 8 inches of 3-6" crushed angular rock over top of high-strength non-woven geotextile separation fabric. Should this classification of crushed angular rock not be locally available, an 8-inch Polyethylene GeoCell product would act as a good substitute – utilizing a ¾" washed crushed gravel as the fill material and installed over top a geotextile separation fabric per the manufacturer's instructions. Regardless of the selected driveway stabilization alternative, the specified grading in the exhibit set should be met. Should installation of one of these methods not be selected and the owner opt to maintain the existing driving surface, frequent maintenance and re-grading should be expected in this area. Please note that a rounded or semi-rounded aggregate classification will not offer the proper stability to allow vehicle loading on the proposed driveway. If crushed angular rock is not available, opt for another solution.

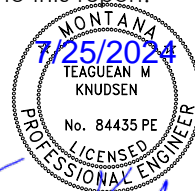
The recommendations contained within the report above were made with considerations to cost and material availability. The extents of fabric placed along the road shoulders could be increased, at additional materials and installation cost, for a more robust erosion control solution. Under the same reasoning, the extents of the concrete valley gutter could also be extended further downstream than is shown in the exhibits; the flow line grading would remain consistent with what is currently specified in the proposed earthen swales. This would come with a greater up-front construction cost but would act to maintain ditch grade more reliably into the future and reduce maintenance costs in the long term. The area of greatest concern surrounds the northwest corner of the SMC building, thus has been the focus of the design recommendations.

Because the recommendations included herein extend onto private property from the City rights-of-way, coordination must be had between the city of Sidney and Sidney Millwork Co. in implementing these improvements. It is Interstate Engineering's understanding that the property owner, being Sidney Millwork Co., shall be responsible for the maintenance of these improvements in their entirety upon completion of construction.

Please contact Tyler Lindbloom with Interstate Engineering for any follow-up items relating to this report.



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