



MORRISON HERSHFIELD

October 2, 2019

MH Ref. No.: 180379100

Wilburt Crain
Crains' Construction
1800 Maberly Elphin Road
Maberly, ON K0H 2B0

Tracy Zander,
ZanderPlan Inc.
40 Sunset Blvd, Unit 40
Perth, ON K7H 2Y4

Dear Mr. Crain and Ms. Zander:

Re: Further Details on Storm Water Management at the Proposed Crains' Leslie Pit

BACKGROUND

Crains' Construction is proposing a Pit Above Water (to be called the Leslie Pit) at 7731 Fernbank Road, Ottawa, Ontario. To that end it is pursuing a license application under the Aggregate Resource Act (ARA) and a Zoning By-Law Amendment by the City of Ottawa. The ARA license application was deemed complete by the Ministry of Natural Resources in their letter of March 04, 2019. The Zoning By-law Amendment proposal was deemed incomplete by the City of Ottawa in their letter of May 2, 2019. Among other things, the City requested "Stormwater Management Report including Grading and Stormwater Management Plans in support of the SWM report for interim and ultimate design". This letter provides further details on storm water management, in the hope that these suffice to meet the City's needs.

DESCRIPTION OF THE PROPOSED DEVELOPMENT

The total area of the property is 72.9 hectare, of which the proposed pit extraction area occupies approximately 38.5 hectares. The development will involve the stripping of sandy loam topsoil, removal of approximately one million cubic metres of sand and gravel, replacement of such with approximately the same volume of clean fill, and re-instatement of the topsoil. The sand and gravel are situated above the water table on a gentle (one percent) bedrock slope grading towards the low point of the property at the western corner. To ensure that the pit will remain "above water" as defined in the provincial process for the licensing of pits and quarries, an approximately 9 hectare area has been set aside in this corner, outside the extraction area. On the site plans, the area is designated as a "Natural Retention Area".

HYDROGEOLOGY STUDY

Morrison Hershfield Limited (MH) was retained by Crains' to complete a hydrogeology and hydrology report (Morrison Hershfield, January 2019) for the ARA License application along with the Zoning By-Law Amendment. For the worst case operational (interim design) scenario that the entire volume of aggregate would be removed from the bedrock surface prior to any replacement with clean fill, the report concluded that the annual volume of surface runoff (as opposed to infiltration) would increase by approximately 230 percent with a commensurate

slight lowering of the water table that would not propagate off the property. Despite these changes, the report concluded that there would be no impacts to water wells, and no impact on the nearby Huntley Wetland. The report commented that the natural retention area will function to mitigate changes in the storm hydrograph. For the rehabilitated (ultimate design) scenario, the report concluded that there would be effectively no change to the water balance.

The hydrogeology study found that there will be no requirement for dewatering, no requirement for a Permit to Take Water (PTTW), and no requirement for an Environmental Compliance Approval (ECA) for a Sewage Works under Section 53 of the Ontario Water Resources Act.

FURTHER DETAILS ON STORM WATER DESIGN

The design of the pit does not include a storm water detention pond with an outlet structure. This is because the on-site “natural retention area” is of a significant size and is expected to provide storage and erosion control. The off-site, downstream ditches and wetlands can accommodate the small changes in flow, and the change in flow will be imperceptible at the nearest downstream culvert beneath Fernbank Road, south of the Stittsville Golf Course. The extraction area represents about 5% of the 1,000 ha catchment area upstream of this culvert.

The hydrogeology report alluded to the fact the natural retention area will encourage groundwater recharge, but this was ignored in the calculations (mainly because the complexity of calculating this groundwater recharge is not warranted considering the situation, and because it was conservative to ignore it). The hydrogeology report did not provide a precise assessment of how the storm hydrograph will change at the outlet to the site. In fact, the difference between the pre-development, operational (interim design), and rehabilitated (ultimate design) scenarios are complex. Further discussion is provided below.

Operational Condition (Interim Design): The timing and peak discharge rate of storm water may somewhat change, since the precise effect on the storm hydrographs will depend on how much of the site is stripped, how much replacement fill is placed, how much ponding volume is available in the natural retention area, and how much infiltration will happen in the natural retention area. While the water balance calculations were made assuming the worst-case scenario that all the aggregate will be stripped prior to the placement of any fill, this is not expected to be the case. In fact, the operator plans to have only a small portion of the site stripped to bare rock at any given time. The other important consideration in considering the timing of water release from the site is that the existing sand and gravel deposit provides very limited residence time for infiltration. The infiltrating water must travel the few metres to the bedrock surface, and then travel laterally over the inclined bedrock surface before discharging to the existing ditch on the west side of the property. Based on an assumed hydraulic gradient and hydraulic conductivity, the residence time is estimated to be in the order of a month (assuming fully unsaturated initial conditions).

Notwithstanding that the timing and peak discharge rate of the release of storm water will change, the volume of release will change very little. This is because the development scenario will not change the size of the catchment area, the slope of the bedrock, or the fact that the bedrock slope directs the water to the ditch rather than to the aquifer below. The quality of the runoff should not worsen and is expected to be reasonably free of pollutants. Any water quality impacts will be mitigated with the filtration effect of the laid topsoil/vegetated area, the adsorption in the soils during infiltration, and the retention time provided in the natural retention area for the settling of suspended solids.

Rehabilitated Condition (Ultimate Design): The runoff response time may somewhat decrease and no change can also be argued as the surface roughness essentially remains the same with the laid topsoil therefore the time of concentration for the post-development runoff hydrograph will ultimately be similar to the pre-development hydrograph. Any increase in overland peak flow rate discharging to the natural retention area is anticipated to be negligible as the discharge rate is ultimately controlled by the surface of the bedrock under the post-development condition. The quality of the runoff will be the same as in the existing conditions.

GRADING AND STORM WATER MANAGEMENT PLANS

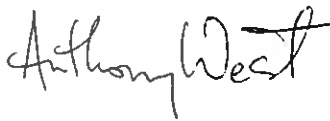
Storm water management at pits and quarries is typically regulated by the Ministry of the Environment Conservation and Parks (MECP). That is, when the design of a pit or quarry incorporates a "sewage works" for management and release of storm water, such a system is approved under Section 53 of the Ontario Water Resources Act. Sewage works requiring an ECA include quarry sumps and systems for treatment of surface discharge at parking lots, processing areas, etc. Typically, an ECA is required to address discharge of water taken under a Permit to Take Water.

In the case of the proposed Leslie Pit, no dewatering or PTTW is required, there will be no hard surfacing of the property, and there will no storm water infrastructure required beyond ditching that is typical for a pit development. For this reason, the grading and storm water management plans are incorporated into the Operational Plan and Rehabilitation Plan for the pit. The operator will use their operational experience and the natural attenuation area to manage water on the site and ensure that the quantity and quality of the water discharging the western corner is acceptable.

CLOSURE

If you have any questions about the content of this report, please contact the undersigned.

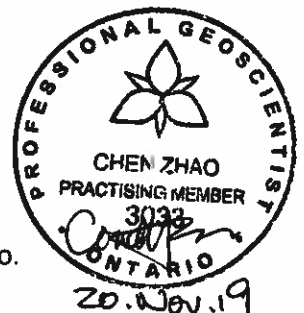
Sincerely,
MORRISON HERSHFIELD



Anthony (Ant) West, Ph.D., P.Eng.
Sr. Env. Eng., Dept. Mgr.



Cindy Zhao, M.A.Sc., P.Geo.
Hydrogeologist



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