Basic Impact Analysis (BIA)

Wasagaming Stormwater Management Project
PRO 827

Riding Mountain National Park

April 2017

Prepared by: Shannon Landels, Resource Management Officer I, RMNP

April 2017

1. PROJECT TITLE & LOCATION

Wasagaming Stormwater Management Project [PRO 827]
Wasagaming, Riding Mountain National Park of Canada, MB
Within Townsite of Riding Mountain National Park

2. PROPONENT INFORMATION

Michael Turko
(Project Manager, Project Delivery Services West- Strategic Policy and Investment Directorate)
145 McDermot Ave; Winnipeg, MB; R3B 0R9
204-983-7834 (office phone); 204-891-7467 (cell phone); michael.turko@pc.gc.ca

Morgan Proven
(Project Lead, Riding Mountain Field Unit)
135 Wasagaming Dr; Box 299; Onanole, MB; R0J 1N0
204-720-8929 (cell phone); morgan.proven@pc.gc.ca

3. PROPOSED PROJECT DATES

Planned commencement:	01-September-2017
Planned completion:	30-November- 2017

4. INTERNAL PROJECT FILE

RMNP000707

5. PROJECT DESCRIPTION

The current storm water system for the Wasagaming Townsite, discharges directly into Clear Lake which has created unacceptable water quality conditions near the outfalls. In addition, there have been incidences of flooding in the Townsite due to insufficient system capacity. The need to address these concerns through a stormwater drainage system project has been included in the Park Management Plan as a way to reduce the pollutants and nutrient loading in Clear Lake as well as to reduce localized flooding.

Upgrades are needed to address health and environmental concerns, as well as, impacts to local businesses. The focus of this project will be on the treatment of stormwater in the system before it reaches the lake. As well, parts of the existing system will be upgraded to increase capacity which must be done in consideration of increased rainfall amounts/ climate change. This will include installation of land drainage sewer to divert some inputs to Ominnik Marsh, oil and grit separators, re-grading of an existing parking area (to be referred to as the Large Parking Lot), construction of a vegetated swale and associated works.

In 2006, Stantec was retained by Riding Mountain National Park (RMNP) to design an upgrade which included a proposal for the addition of a force main, retention pond, land drainage sewers and oil and grit separators. In addition, an environmental assessment was conducted by Hemmera in 2010 based on this design. In 2016, Stantec was asked to update this design to include current rainfall data, confirmation of the capacity of the design and to re-evaluate the retention pond. It was determined that the 2006 design would only have the ability to handle a 1:2

year storm without surcharging of the system, even less with the removal of the retention pond. Based on this information, it has been decided to remove both the retention pond and lift station from the design, divert the Wasagaming Drive land drainage sewer as originally proposed and focus on filtration/treatment of water before it exits the storm water system. This goal will be partially accomplished by the inclusion of multiple oil and grit separators, dry ponds and vegetated swales within this design, and by exploring additional natural captivation/ filtration processes. The future work around Low Impact Development (LID) such as rain gardens, natural retention areas, landscape nods etc. although considered in this assessment for cumulative effects purposes is out of the scope for this BIA and will require its own assessment once design specifics are known.

As outlined in the attached designs (Appendix I: Concept Drawings), the proposed project will include:

- Re-grading of established Large Parking Lot (Fig II)
- Installation of new land drainage sewer (LDS) to connect current LDS on Wasagaming Drive to Ominnik Marsh through the established Large Parking Lot (Fig IV). This would divert approximately 180 m^3 flow during a 10mm storm event up to 1,010 m^3 during a 1:25 year storm from Clear Lake to Ominnik Marsh.
- Installation of associated manholes and catch basins
- Creation of two outfalls into Ominnik Marsh with upwelling trenches and rip rap (Fig III)
- Remove and replace existing LDS on Wasagaming Drive to increase capacity and all associated works (gutter, catch basins etc) (Fig V)
- Installation of LDS to connect 1st Street to Large Parking Lot LDS via a lined swale (Fig VI)
- Installation of three Oil and Grit Stormceptors to filter water before being released into Clear Lake and Ominnik Marsh

This is to be accomplished through the following phases and activities:

Phase and Activities	Details
Staging and Handling of Materials	• Flagging of work limits and designated areas • Equipment storage and refueling • Fuel and hazardous waste storage • Sediment and erosion control to be installed and maintained on site • Spill response readiness • Transport and stockpiling of aggregate base, clay fill and rip rap • Transport and storage of infrastructure to be installed • Stockpiling of topsoil stripped on site
Vegetation Management	• Required for re-grading of Large Parking Lot/ drainage improvement along west edge • Will involve clearing, grubbing and disposal • Some willows to be harvested in advance of construction by Parks staff to replant after re-grading is complete. • Seeding to occur on areas of ground disturbance
Grading	• Topsoil salvage to be performed • Re-grading to facilitate drainage in Large Parking Lot, ditch and swale • Setback from trees and shrubs that are to remain after construction
Excavation and Installation of LDS Works	• Locates of buried services • Topsoil salvage and restoration • Dewatering and control of discharge, fish salvage to be performed at Ominnik outfall if required

	• LDS, Oil and Grit Separators, manholes, catch basins, swale, trenches and outfalls • Rip rap and geotextiles • Backfill and compaction of materials • Work adjacent to potential contaminated soils
Concrete and Asphalt Work	• Patching of asphalt and concrete damaged or removed • Installation of sidewalk, curb and gutters in association with infrastructure
Waste Disposal	• Concrete, asphalt and construction waste to be hauled outside of RMNP • Waste materials (vegetation, soils) to be disposed of outside RMNP • All personal waste to be stored in animal proof containers and removed from site

Operations Phase

After all phases of construction are complete, the Wasagaming Stormwater system maintenance and upkeep will operate similar to pre-project procedures of cleaning and inspection. Additional maintenance may require LDS management through pumping out of surcharge or steaming of frozen lines and cleaning of Oil and Grit Separators via vacuum truck (Stantec 2016).

6. VALUED COMPONENTS LIKELY TO BE AFFECTED

The valued components (VC) to be assessed were chosen based on their potential interaction with the project, as well as, their potential importance to RMNP's partners, stakeholders and community. The VC categories that were selected for evaluation under this project include:

- Air and Noise;
- Soil & Landforms;
  - Contaminated Sites
- Water;
  - Aquatic Habitat
  - Water Quality
  - Hydrology
- Flora;
- Fauna;
  - Species at Risk
- Cultural Resources;
- Visitor Experience and Stakeholders;

SCOPE OF ASSESSMENT

The spatial scope of this assessment includes the areas immediately adjacent to the construction activities as highlighted in Appendix I Fig I (referred to as the Project) and the Wasagaming Townsite in general as illustrated by the catchments areas in Appendix II Fig I. In addition, this assessment will encompass hydrological impacts of the Octopus Creek Watershed as illustrated in Appendix II Fig II, as well as, water quality and aquatic habitat impacts to Ominnik Marsh, Clear Lake and South Lake as they relate to the proposed Project. The scope as defined above will herein be referred to as the Local Study Area.

The temporal scope of the assessment is for the duration of the construction including vegetation establishment, as well as for the operational phase of the system.

EXISITNG CONDITIONS

6.1 AIR & NOISE

In the absence of any close by monitoring stations, air quality is to be evaluated based on the potential existing inputs, including emissions and pollutant sources. The Project area encompasses the town area of Wasagaming, is adjacent to Highway 10 and is in close proximity to resort driven development located at the south boundary of the park. The main source of emissions can be attribute to activities associated with the tourist nature of the area. This includes vehicular traffic, as well as, motorized recreational activities such as boating which occurs on Clear Lake and others such as snowmobiling outside of the park. Air quality can also be temporary affected by wood smoke from camping and fuel management activities. Agriculture is the dominant land use surrounding the south boundaries of the park and Project area with farm equipment and cattle potentially contributing to greenhouse gas emissions.

Noise levels, similar to air quality inputs increase during peak visitor season. During periods of reduced visitation, the small resident population has little to low noise, while during periods of high visitation (May – August) there is potential for increased noise levels attributed to increase vehicular traffic, visitor and commercial use of the Townsite, maintenance or construction activities and special events such as concerts.

The potential emission and noise sources within or adjacent to the spatial scope of the Project include traffic, visitor/recreational activities, construction/ maintenance and special events.

6.2 SOIL & LANDFORMS

The majority of Local Study Area (LSA) is characteristic of an underlying hard, grey, siliceous shale bedrock with deposits of gravel, sand, silt and organics varying in thickness from 40 to 60 m in the area.
The uplands around Clear Lake are comprised of hummocks, ridges and intervening depressions. Soils are primarily characterized as Gray Luvisolic profiles under forested area, Chernozemic profiles in association with grasslands and organic soils. The Townsite of Wasagaming is on well-drained to imperfect orthic gray luvisol soils with moderate to developed areas of slopes. (Lombard North Group 1976; Hemmera 2010)

Contaminated Sites

There are three known contaminated sites within the Project area, two of which lie within the scope of the construction activities:

I. **West Lift Station**

In 1997, a 230L underground fuel storage tank previously used for the lift station was removed from the site. In 2010, AECOM was retained to investigate potential soil and groundwater contamination in the area. None of the samples collected exceeded Soil Quality or Water Quality Guidelines and the site was classified as a Class 3- Low Priority for Action (AECOM 2010a). The area of soil impacts is estimated at 60 m^2 with a volume of 312 m^3 (Appendix III Fig I-II).

The section of LDS between LDS MH4 and Stormceptor SC2 (Appendix I Fig III) has the potential to impact the contaminated soil of the West Lift Station.

II. Townsite Washroom Parking Lot

The Townsite Washroom facility and associated parking lot is located at the corner of Wasagaming Drive and Heritage Lane and is the site of a former service station (Imperial Oil Limited) which shut down in 1974. Although there is little documentation on the storage tank removal from the site, it was determined through several environmental assessments that petroleum hydrocarbon (PHC) contaminated soils existed above guidelines at the site. Investigations showed PHC impacted groundwater, as well as, an estimated 2,147 m^3 of PHC impacted soils (AECOM 2010b).

A Remedial Action Plan was developed and recommended excavation and disposal of a portion of the impacted soil. In 2011, soil was excavated to a depth of 4.5m within 15m of the gift shop building to the south and to a depth of 1.5m for the remainder of the excavation. A liner was installed between the two excavation depths at the north and west walls of the 4.5 m excavation to protect against migration of any PHCs remaining onsite into the 15 m buffer zone of the building. (KGS 2011) (Appendix III Fig III)

The section of LDS between LDS MH4 and Stormceptor SC1 (Appendix I Fig IV) has the potential to impact the remaining contaminated soil of the Townsite Washroom Parking Lot, in particular below the area remediated only to a depth of 1.5 m in the North section of the excavation (Appendix III Fig III).

III. Former Gasoline Service Station, 122 Wasagaming Drive

The former service station is located at 122 Wasagaming Drive on the northeast corner of the intersection of Wasagaming Drive and Buffalo Drive. Contaminated soil and groundwater has been identified and studied at this site which contains ethylbenzene, xylenes, hexane and petroleum hydrocarbon fractions in the soil and hydrocarbon contamination in the groundwater from underground storage tanks (Golder 2013; DST 2014).

Project approval (PRO.1567.01) has been awarded for remediation of this site in the 2017-2018 fiscal year with construction taking place in the fall of 2017. Although construction activities for the Wasagaming Stormwater Management Project do not directly impact this area, cumulative effects from the concurrent remediation work are to be assessed.

6.3 WATER

Aquatic Habitat

The Local Study Area encompasses the Octopus Creek Watershed (OCW), as well as, the Ominnik Marsh, South Lake and Clear Lake water bodies (Appendix II Fig II). The OCW is a sub-basin of the Clear-Lake watershed and encompasses approximately 34.32 km^2, which includes a number of small wetlands and Octopus Lake that drains through Octopus Creek under Highway 10 into Ominnik Marsh (Moore et al. 1997).

Ominnik Marsh, Octopus Creek, South Lake and Clear Lake are the predominate watercourses located within the Project area. Ominnik Marsh is a Y- shaped classic temperate wetland that has been modified through the

construction of a berm to divert flow from its original channel to the Boat Cove to the manmade South Lake Channel that connects it to the north bay of South Lake (Figure 1).

FIGURE 1: *Aerial view of the Ominnik Marsh, South Lake and Clear Lake connection and associated features*

Ominnik Marsh consists of a shallow permanent pond (~ 1.5m in depth) and surrounding emergent wetland vegetation that can have open water at times (Scott et al. 2003; Belke and McGinn 2003). Ominnik Marsh is considered fish bearing exhibiting such species as finescale dace (*Chrosomus neogaeus)*, fathead minnow (*Pimephales promelas)*, brook stickleback (*Culaea inconstans)*, northern pike (*Esox lucius)* and white sucker (*Castostomus commersonii)*. Octopus Creek, which drains into Ominnik Marsh from the south east, is a potentially important spawning and rearing habitat for northern pike from Clear Lake via the South Lake connection (T. Town, personal communication, Mar 2017).

South Lake is a shallow eutrophic lake with a max depth of 1.8 m and encompasses 2.03 km^2, with dense macrophyte and algal growths in the summer months (Thomas 2011). Prior to the manmade channel South Lake did not connect with Ominnik Marsh. There are two bays contained within South Lake; the north bay which connects to the marsh via the manmade channel, and the south bay where there is low probability of water from Ominnik Marsh entering (Scott et al. 2003). The connection between South and Clear Lake is partially blocked by a narrow barrier bar composed of sand which is thought to break open when water levels in South Lake become high (Figure 1: B). South Lake is considered important spawning habitat for northern pike (*Esox lucius)* and known to also host walleye (*Stizoatedion vitreum),* white sucker (*Catostomus commersoni)*, yellow perch (*Perca flavescans)*, as well as, small bodied species such as spottail shiner (*Notropis hudsonius)* (Thomas 2011; Fawcett 2011).

Clear Lake is an oligo-mesotrophic and dimictic lake with complete turn-over occurring each spring and fall. It is 29.22 km^2 and has a max depth of 33m (Thomas 2011). Large bodied fish species documented in Clear Lake included white sucker (*Catostomus commersoni)*, cisco (*Coregonus artedii)*, lake whitefish (*Coregonus clupeaformis)*, northern pike (*Esox lucius)*, yellow perch (*Perca flavescans)*, trout-perch (*Percopsis omiscomaycus)*, lake trout *(Salvelinus namaywsh)* and walleye (*Stizoatedion vitreum)*. Documented small bodied species include

slimy sculpin (*Cottus cognatus)*, johnny darter (*Etheostoma nigrum),* blacknose shiner *(Notropis heterolepis)*, fathead minnow (*Pimcphales promclas)*, and blacknose dace (*Rhinichthys atratulus)* (Cornelsen 2012).

Water Quality

Surface Water

Anthropogenic inputs into the LSA have been the target of past studies of water quality, focusing on nitrogen and phosphorus. Octopus Creek, Ominnik Marsh and South Lake`s relationship and close proximity to Clear Lake allow them the potential to transfer nutrients and affect the water quality of Clear Lake. The maintenance of the ecological integrity of Clear Lake is a primary management concern and is reflected in both the Parks Management Plan (2007) and the Ecosystem Conservation Plan (Moore et al. 1997).

The OCW is the largest sub-basin in the Clear Lake watershed and is predominately outside RMNP's boundaries with the potential to receive varying anthropogenic inputs. Moore et al. (1997) observed the highest ammonium ion, nitrate ion and soluble phosphate concentrations progress through the OCW during the spring freshet and following heavy rainfalls with levels tapering to low towards the end of June. It was also noted that approximately 50% of the ammonium ion and 30% of the soluble phosphate which enter Ominnik Marsh was removed by renewed vegetal growth in late spring and summer of the study.

Belke and McGinn (2003) also conducted a comparison of ammonium, nitrate, nitrite and phosphate ions at Octopus creek by Highway 10 with the levels at the outlet of Ominnik Marsh into the South Lake channel. Data indicated that excess nutrients associated with runoff were successfully taken up and/or diluted to background levels while flowing through Ominnik Marsh, which is consistent with what is generally documented about nutrient uptake by aquatic vegetation in wetlands. Work on better understanding the nutrient budget and flow regimes of the OCW is currently underway by B. Hollier (Brandon University). Preliminary sample results from the 2016 season, show as before a decrease in nutrients exiting Ominnik Marsh (Ominnik Outlet) compared to levels input into the system through the Wasagaming Sewage Lagoon and Octopus Creek (Figure 2a & b). However, the maximum capacity of Ominnik Marsh to sequester nutrients is still unknown.

FIGURE 2a: *Total nitrogen in Ominnik Outlet, Octopus Creek (at Hwy 10 Culvert) and Lagoon (effluent release) samples taken by B. Hollier (unpublished data, 2016)*

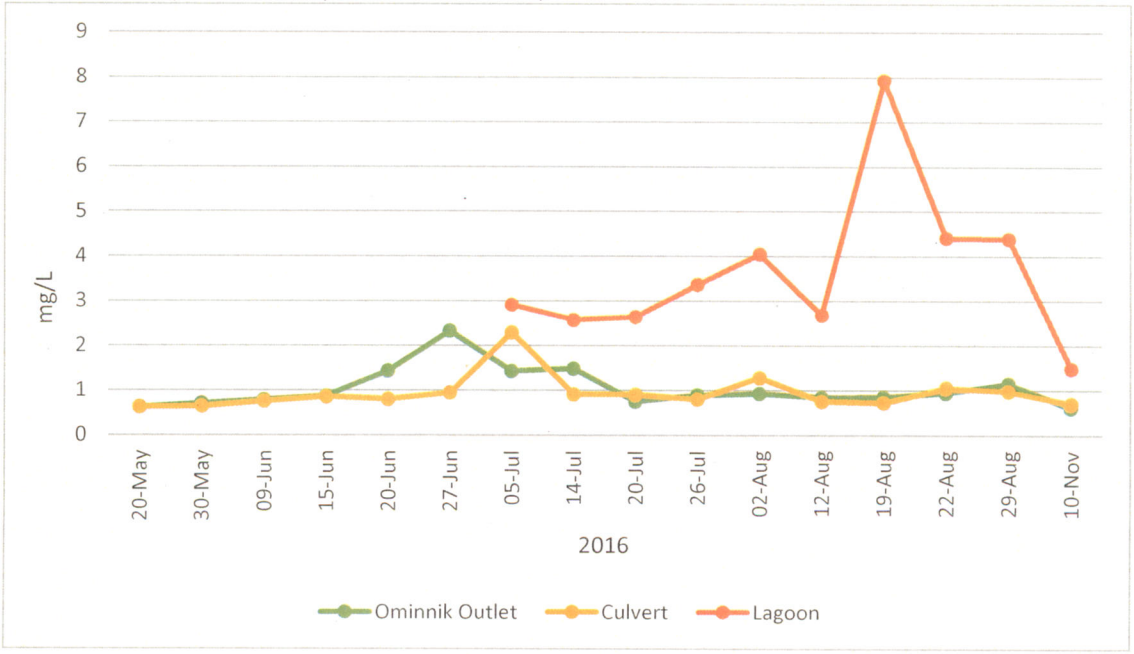
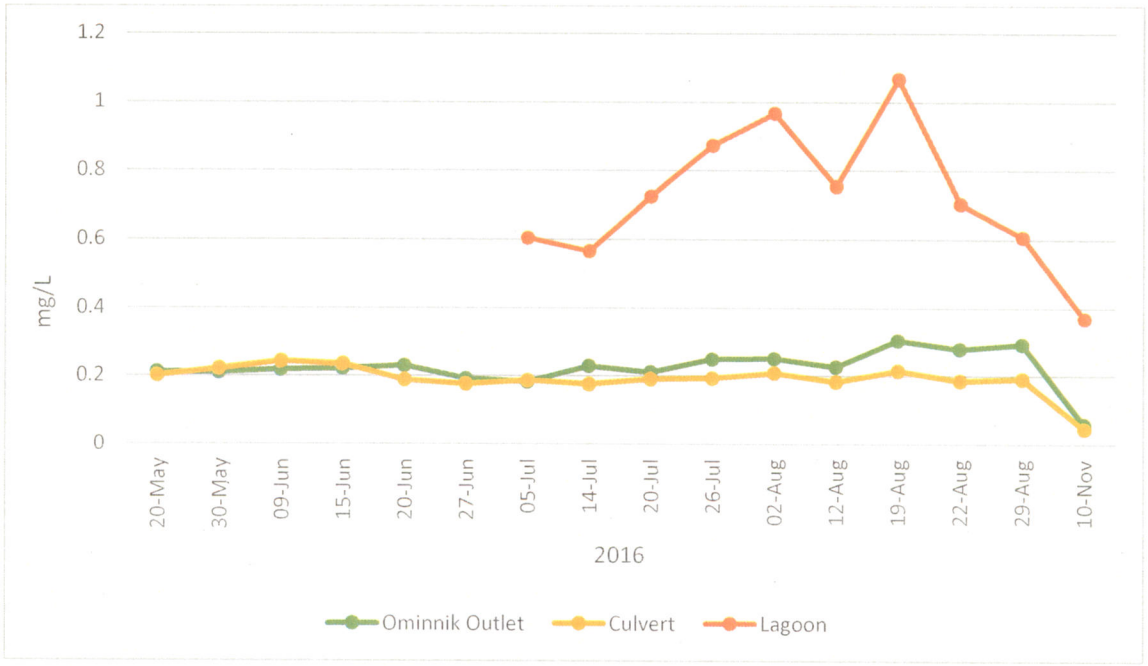


FIGURE 2b: *Orthophosphorus in Ominnik Outlet, Octopus Creek (at Hwy 10 Culvert) and Lagoon (effluent release) samples taken by B. Hollier (unpublished data, 2016)*



Ominnik Marsh receives an effluent flush from the Wasagaming Sewage Lagoon which is a three-celled lagoon system that collects from the town of Wasagaming, as well as portions of the RM of Harrison Park and Elkhorn Resort (south of RMNP boundary). In the 1970's two additional cells were added to the original single cell lagoon and the third cell with a capacity of 27,643 has been released historically in late spring/ early summer into Ominnik Marsh (Figure 1:C). A fluorescent dye study conducted by Scott and Sellers (2005), showed that wastewater did not spend much time in the marsh and instead headed straight to the South Lake Channel, as well the study speculated there was leakage from the cells into the surrounding groundwater. In addition, Belke and McGinn (2003) speculated that there was a leak in the buried force main that ran underneath Ominnik to the wastewater facility. These conditions led to an upgrade of the facility and change in the effluent release regime which is now a continuous trickle from July 1st to October 31st rather than single event with the intent of promoting the release to dissipate into the marsh more. Scott et al (2003), estimated the discharge from the lagoons make up about 10% of the total nitrogen and phosphorus nutrients that exist in the marsh. In addition, the marsh historically received grey water from the old campground which led to the construction of the berm in 1936 to keep this wastewater in the marsh (Hemmera 2010). The potential for cumulative effects exists as a result of historic build up, as well as, continuing sewage inputs into the marsh.

South Lake, unlike Ominnik is noticeably green and turbid from algae blooms and can be categorized as hyper-eutrophic, with the south bay having the poorest water quality. A sediment core study conducted by Scott and Sellers (2005) showed a dominance and persistence of unicellular, colonial Cyanophytes, elevated nutrient concentrations and the presence of microcystins, which are all symptoms of poor health of the south bay. As noted previously, it is thought that there is little to no input from the Ominnik system into this bay and with evidence of significant changes in the algal community occurring within the last 40 years, it is assumed that the nutrient contribution has occurred through groundwater associated with the lagoons or surrounding anthropologically modified land although further study is required (Scott and Sellers 2005; B. Hollier, personnel communication, Mar 2017). Therefore nutritional inputs into the south bay are not expected to be directly influenced by the Project.

Ominnik in comparison had few cyanophytes and low phytoplankton biomass in July and Aug which indicates better system health, however, it should be noted that in September of the study year Euglenophytes increased to nearly 12% indicating an abundant supply of organic N which may hint at deterioration (Scott and Sellers 2005). Enhanced or sustained nutrient loading on a shallow, open water system is often responsible for the major changes in algal communities similar to what was noted of the South Lake south bay in the late 1980s. Nutrient loading into South Lake north bay and Ominnik Marsh has the potential to be impacted by the Project and they could see similar changes in the future if is not carefully regulated and monitored.

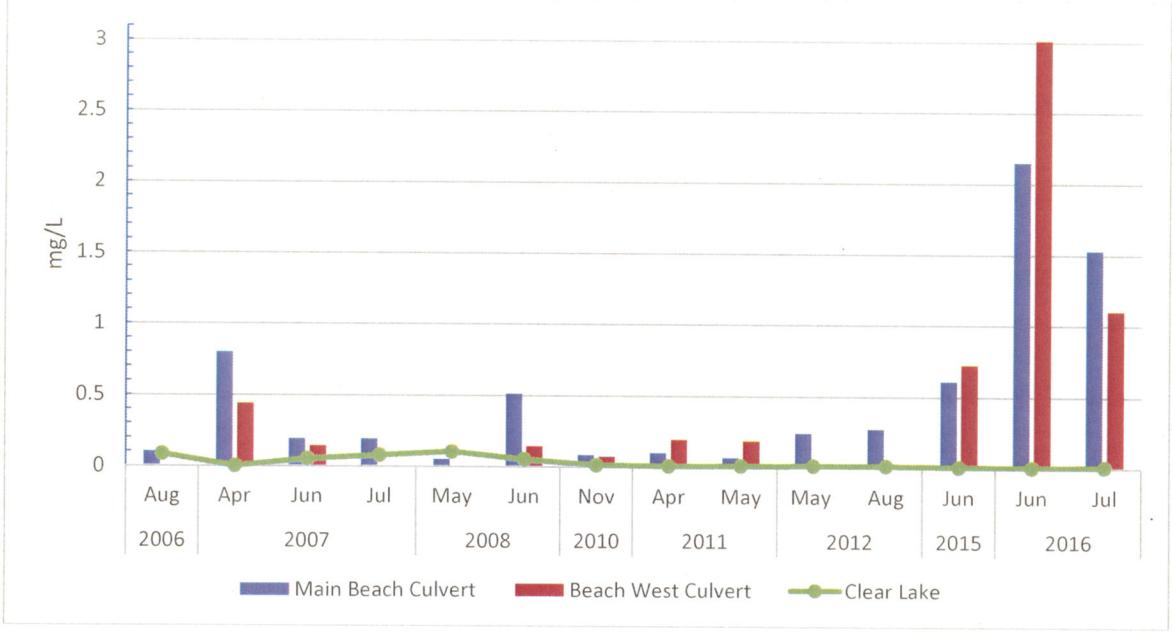
Groundwater

Unlike surface water, groundwater contributions of phosphorus to Clear Lake from the Octopus Creek and South Lake sub-basins is equally distributed throughout the summer including September. Neumann and Curtis (2012) found these sub-basins account for 17-18% of the dissolved phosphorus groundwater inputs into Clear Lake. It was noted that the decay of vegetation in beaver ponds and natural headwater depressions in forested areas was just as prevalent as loading from agricultural and municipal sub-basins.

Stormwater

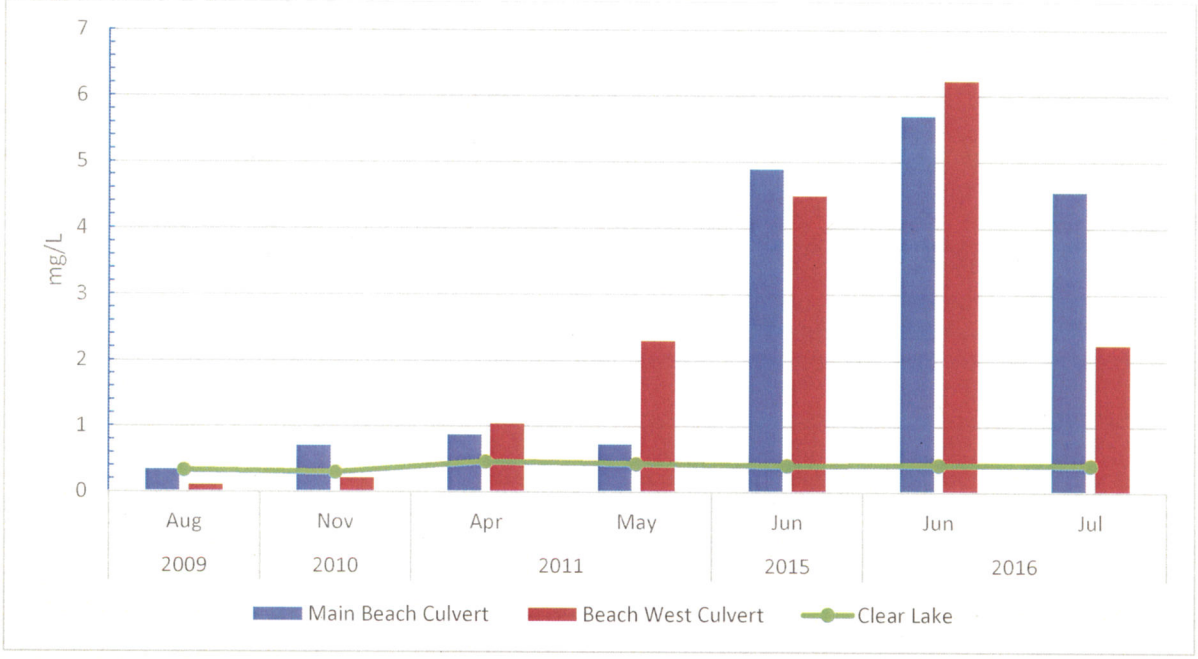
Stormwater runoff can contain a number of contaminants including heavy metals, nutrients, organic material, suspended sediments, pesticides, hydrocarbons, pathogens and salt. The current stormwater system in Wasagaming drains directly in to Clear Lake at two main outflows with no pre-treatment for any contaminates (Figure 1: D). Opportunistic water sampling has occurred since 2006 at these outfall locations during significant storm events. Total nitrogen, total phosphorus and coliforms (fecal, ecoli and total) are the parameters that have been consistently analysed over the years. As illustrated in Figure 3a, levels of total phosphorus entering directly into Clear Lake via the storm outfalls exceed the Canadian Water Quality Guidelines for the Protection of Aquatic Life which lists the desired levels of phosphorus at 0.010 – 0.020 mg/L for a mesotrophic lake and 0.004-0.010 mg/L for an oligotrophic, as well as the levels observed in Clear Lake itself.

FIGURE 3a: *Total phosphorus at Main Beach and Beach West outfalls during storm events, as well as, average total nitrogen per month for Clear Lake at Station 1*



Excluding 2016 data, phosphorus levels were below *Manitoba Water Quality Standards, Objectives, and Guidelines* of 1 mg/L for *Tier I* discharge (wastewater effluent). This is also the level for lagoon discharge determined by the 2006 Environmental Assessment based on the receiving capacity of the Ominnik Marsh system (Wardrop, 2006). Levels of nitrogen (Figure 3b) in the stormwater samples were also more than those observed in Clear Lake, but below *Manitoba Water Quality Standards, Objectives, and Guidelines* of 10 mg/L for *Tier II.* However, control samples (such as stormwater input from a non-anthropologically impacted stream into Clear Lake) have not been taken in relation to this monitoring. Given the ecological importance of Clear Lake, to properly assess these values they should be shown in relation to natural stormwater inputs.

FIGURE 3b: *Total nitrogen at Main Beach and Beach West outfalls during storm events, as well as, average total nitrogen per month for Clear Lake at Station 1*



It should be noted that although levels of nutrients appear to have spiked in the last two years of sampling, this can be contributed to the inconsistency of the sampling method. Factors such as intensity of prior rainfall events and flow through outlet during sampling have not been standardized, therefore these values should be noted simply as a general indicator of nutrient levels in stormwater. Improvements to the stormwater monitoring protocol should be made in order to probably assess impacts in the future.

In comparison, similar levels of nutrients (excluding 2015 and 2016 stormwater sampling) have also been observed in the anthropologically influenced Octopus Creek by B. Hollier and Parks Canada Agency (PCA) staff (Figure 4 a & b). It should be noted these samples were not taken in relation to storm events.

Moore *et al* (1997) noted elevated levels of anthropogenic inputs into Octopus Creek over the more natural control Spruces Creek. Although, conditions surrounding this study have changed (upgrades to waste management for places such as the Elkhorn Resort) it appears that Octopus Creek (Figures 4 a & b) might still shows levels of nutrients above what would be desired for a natural input. Elements of the Project, including the addition of Oil and Grit separators, dry ponds, vegetated swales and the exploration of other natural pre-filtration processes in the future (ie: rain gardens) have the potential to reduce nutrient, coliforms and other contaminate levels in stormwater runoff closer to more natural levels rather than those shown in Octopus Creek.

FIGURE 4a: *Total phosphorus sampled by PCA staff and orthophosphorus by B. Hollier (unpublished data, 2016) for Octopus Creek at Hwy 10 culvert location*

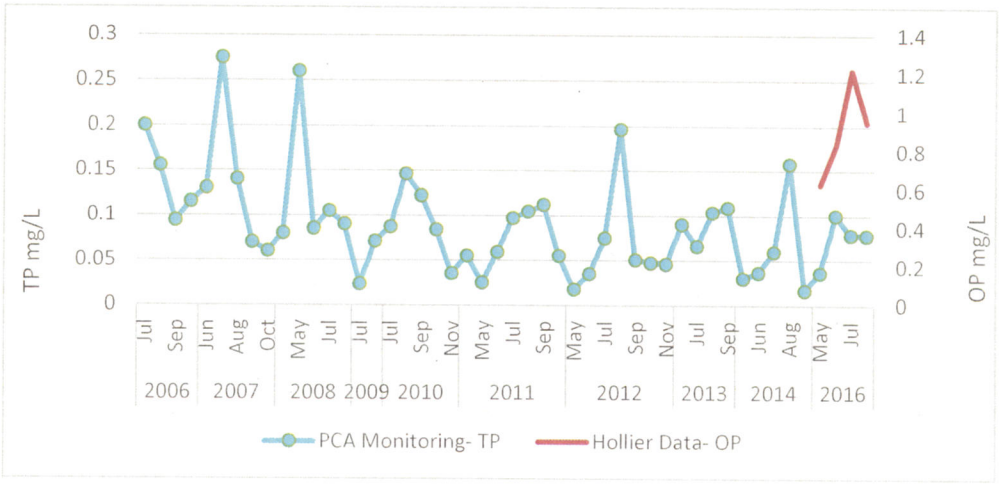
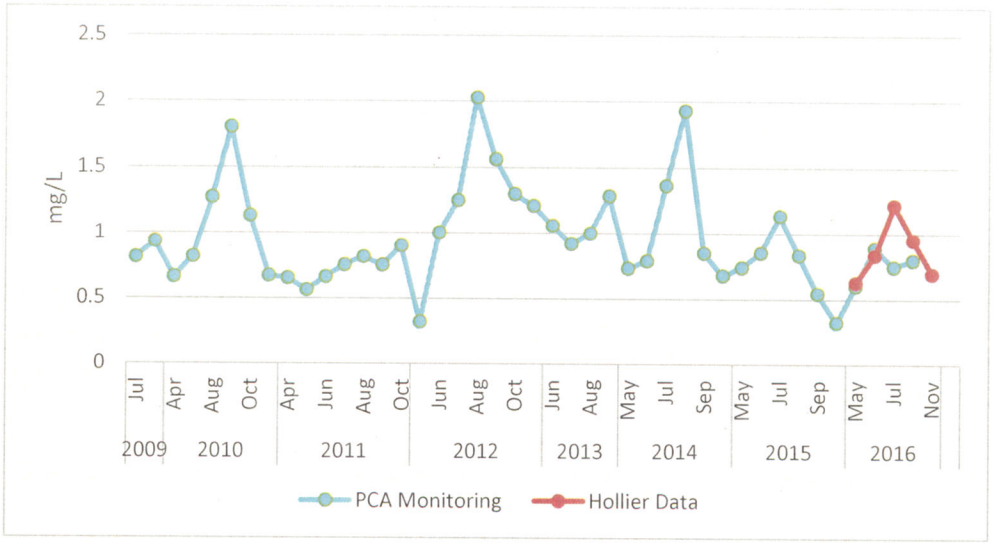


FIGURE 4b: *Total nitrogen sampled by PCA staff and B. Hollier (unpublished data, 2016) for Octopus Creek at Hwy 10 culvert location*



Hydrology

Surface Water

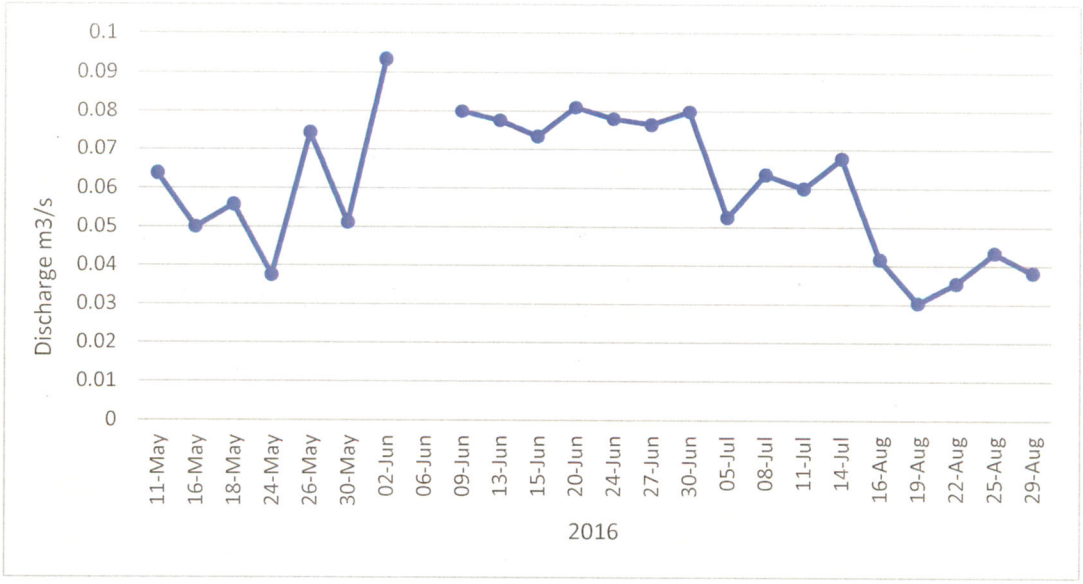
Clear Lake receives water from eleven sub-basins in its watershed (Appendix II Fig II). Rainfall is heaviest in the area due to thunderstorms in late spring, summer and early fall with winter months being the driest (Table 1). Clear Lake normal lake level is 615.300m asl (above sea level) and can fluctuate up to 0.7m each year (Hawryliuk 2005). In some years the spring melt or freshet appears to be responsible for peak levels while in other years summer thunderstorm events are likely to control the peak.

TABLE 1: *Wasagaming Precipitation Data for 2016 and 2006-2015 as taken from Environment Canada historical data for Wasagaming, MB. Accessed on March 25, 2017.*

Precipitation (mm)	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
2016 Total Precipitation	50.4	20.1	36	49.7	38.3	60.2	82.9	79.9	35.2	143.9	16.3	42.9
2016 Extreme Daily	11.5	3.3	11.4	21.4	17.5	13	17.8	20.2	14.3	76.2	8.8	7.5
Total Precipitation Averaged for 2006-2015	24.6	18.9	45.2	38.5	70.5	89.9	66.7	76.0	45.0	46.6	25.1	19.9
Extreme Daily 2006-2015	8.9	8.2	68.3	24.9	46.4	57.7	54.8	41.8	59.3	40.7	15.6	18.6

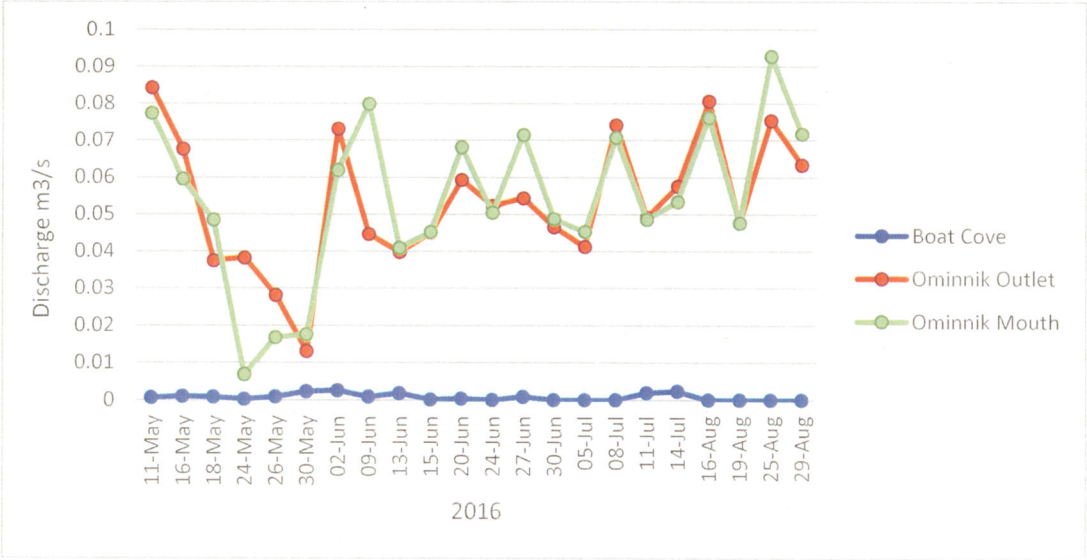
Out of eleven sub-basins, approximately one-third of all surface and groundwater inputs into Clear Lake are contributed by the Octopus Creek and South Lake sub-basins (Neumann and Curtis 2012). Octopus Creek which flows under Highway 10 at the Southgate of RMNP into Ominnik Marsh from the east (Figure 1) is known to have varying flow. Previously flow data was only available for one season in 1995 which showed peak flows during spring freshet (up to ~ 1.2 m3/s) and then a decrease to <0.1 m3/s in June with near trace levels for the remainder of the season (Hawryliuk 2005). Recent field work in the 2016 season has shown similar discharge rates for May to Aug, with one event of a beaver dam breaking (51.08 m3/s) on June 6, 2017 excluded for Figure 5 (B. Hollier, unpublished data, 2016).

FIGURE 5: *Octopus Creek discharge rates at Hwy 10 culvert location as taken by B. Hollier (unpublished data, 2016)*



Belke and McGinn (2003) noted that the berm constructed to divert a portion of Octopus Creek flow into South Lake was successful and only experienced flooding over during peak flow events. This is confirmed by Hollier who did not witnessed water going over the berm during her field work. It is thought that when there is no break in the barrier between Clear and South Lake, it may cause surface water to flow over this berm to Boat Cove. There is also one culvert located inside the berm which does allow for base flow to go through the berm into Boat Cove. However, the preferential path for flow out of Ominnik Marsh is Ominnik Outlet into the South Lake Channel (Figure 6). It is hypothesized that addition of flow to Ominnik Marsh could increase the frequency of connection between South and Clear Lake (Neumann and Curtis 2012).

FIGURE 6: *Ominnik Outlet, Mouth and Boat Cove discharge rates as taken by B. Hollier (unpublished data, 2016)*



Flow out of the South Lake Channel (Ominnik Mouth) to South Lake is low and comparable to flow into the channel (Figure 6). Channel gradients are 0.2% or less and currently has up to six beaver dams which can also be partially responsible for the consistent nutrient levels observed in the channel (B. Hollier, personal communication, Mar 2017). These conditions are similar of other areas of the Octopus Creek Watershed (OCW) which are mud bottom with no significant sediment movement and host numerous wetlands which are thought to provide significant surface water storage and rainfall dampening capabilities (Belke and McGinn 2003).

Groundwater

Although not mutually exclusive, groundwater inputs into Clear Lake from the LSA differ in intensity and seasonal pattern from surface water. Unlike sub-basins along the north and east shores of Clear Lake which show steep slopes, the Ominnik and South Lake sub-basins' groundwater appears to have a mix of flow in and out of Clear Lake. Given the lower hydraulic conductivity of organic wetland sediments and minimal relief, it is believed the groundwater flows from the lake into the area when the lake levels are high and vice versa when the lake levels drop (Neumann and Curtis 2012).

6.4 FLORA

The proposed Project footprint is in the Townsite, including the eastern edge of the Ominnik Marsh and the Large Parking Lot with its adjacent forested and manicured features. Native trees and shrubs, as well as, ornamental landscaped lawns and gardens are mixed together throughout the Townsite and areas proposed for impact such as the Large Parking Lot and Townsite Washroom reflect this mix of plant communities. Willow (*Salix spp)* are the dominate vegetation along the west side of the Large Parking Lot while deciduous/ coniferous species such as white spruce (*Picea glauca)*, aspen *(Populus tremuloides)* and beaked hazel *(Corylus cornuta*) remain on the outskirts representing a native forest with disturbed edges bisected by pathways and infrastructure.

Ominnik Marsh is a clear, very shallow wetland that supports an abundance of emerged and submerged plant growth. Similar to the Large Parking Lot area, mixed wood species exist on the uplands of the marsh while willow *(Salix spp)*, reeds *(Phragmites spp)*, rushes *(Juncus spp.)*and sedges (*Carex*) create a border around with an inner ring of attached cattail *(Typha spp.)*. Detached mobile and stationary cattail is common inside the marsh, as well as, other species such as blue joint grass *(Calamagrostis canadensis)*, marsh marigold *(Caltha palustris)*, duckweed *(Lemnoidea spp.)* and water calla *(Calla spp.)*. The relatively shallow and shelter conditions of Ominnik Marsh

favour submerged species such as pondweed (*Potamogeton)*, *Myriophyllum*, hornworts (*Ceratorphyllum)* and *Chara.* In connection to Ominnik Marsh, the dominant vegetation in the north bay of South Lake is the emergent cattail (*Typha spp.)* while the south bay supports abundant phytoplankton growth but relatively few submerged or emergent plants. (Belke and McGinn 2003; Scott et al. 2003; Scott and Sellers 2005)

There are no Species at Risk Act (SARA), Endangered Species and Ecosystems Act (ESEA) listed, or Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessed vegetation species documented in Riding Mountain National Park or observed in the Project area.

6.5 FAUNA

The Project encompasses habitat that is suitable for and may host an abundance of species present within Riding Mountain National Park. Efforts are to be concentrated on Species of Management Concern (SOMC), which under the scope of this BIA include species listed under the *Species at Risk Act* (SARA), assessed as 'Special Concern', 'Threatened' or 'Endangered' by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or listed under the Endangered Species and Ecosystems Act (ESEA) of Manitoba. Their status, potential for presence near the Project and their inclusion in the VC assessment are summarized in Appendix IV.

SOMC's with moderate to high potential for presence near the Project will be carried forward in the effects analysis. SOMC's with high potential were assessed as such based on the following:

Western Tiger Salamander *(Ambystoma mavortium)* have a confirmed presence in the Townsite, most noticeably congregating in the Old Campground washroom storage rooms during periods of prolonged precipitation.

Snapping Turtle *(Chelydra serpentine*) are confirmed within the Octopus Creek Watershed with one individual observed along Highway 10 close to the Southgate of RMNP (P. Tarleton, personal communication, 2014).

Northern Leopard Frog *(Lithobates pipiens)* have not been visually confirmed within the Ominnik Marsh and has only been noted once calling within the Octopus Creek/ Highway 10 area by a qualified biologist. Given the difficult nature of confirming Northern Leopard Frogs through calls, it is assumed that they are present and likely are underestimated in the Ominnik Marsh system (K. Kingdon, personal communication, Feb 2017).

Western Grebe *(Aechmophorus occidentalis*) have been observed on both Clear and South Lake. It is unsure if nesting takes place on South Lake and/or if the individuals spend time within Ominnik Marsh (K. Kingdon, personal communication, Feb 2017).

Short-eared Owl *(Asio flammeus)* are present within the Local Study Area of the Project. They are consistently observed within the meadows west of the Wasagaming Sewage Lagoon (K. Kingdon, personal communication, Feb 2017).

Chimney Swift *(Chaetura pelagica)* is listed as Schedule 1 Threatened under SARA. A handful of Chimney Swift individuals have been noted for numerous years in the Townsite of Wasagaming (K. Kingdon, personal communication, Feb 2017). There is one confirmed nesting location within a decommission chimney of the RMNP Visitor Center which one breeding pair has utilized over multiple seasons, other nesting locations are assumed but have yet to be discovered.

Barn Swallow *(Hirundo rustica)* are known to nest in and around the Townsite. Although, predominately in association with buildings they have also been observed nesting inside of the Octopus Creek culvert at Highway 10.

Horned Grebe *(Podiceps auritus)* have a confirmed presence within the Local Study Area. They have been observed around and known to nest in South Lake (K. Kingdon, personal communication, Feb 2017).

Little Brown/ Northern Long Eared Myotis *(Myotis lucifugus/ septentrionallis)* are listed as Schedule 1 Endangered under SARA. There are numerous observations of bats within the Townsite, as well as multiple buildings which host roosting individuals (T. Sallows, personal communication, 2016). Although these species has not been identified, given the critical status of the listed ones any unidentified bat is to be assumed and assessed as a species at risk until confirmed otherwise.

Critical Habitat

Riding Mountain National Park currently hosting critical habitat for two species, one of which encompasses the Project location.

Golden-winged Warbler *(Vermivora chrysoptera)* is listed as Schedule 1 Threatened under SARA. The majority of Riding Mountain National Park is listed as critical habitat for Golden-winged Warbler (GWWA) and is noted as one of the last ranges that do not pose the primary threat of hybridization and competition with Blue-winged Warbler *(Vermivora cyanoptera)*. Although the Project lies within a bounding polygon of critical habitat no suitable habitat exists in the Project area. Lack of biophysical attributes required for this species habitat makes their presence unlikely and therefore the Project activities are no expected to impact GWWA individuals or their critical habitat.

6.6 CULTURAL RESOURCES

An archaeological overview assessment (AOA) was requested to review subsurface Project impacts which include areas where directional drilling access pits will be excavated to install pipe and tie in locations. It is thought "the project will have limited potential impact subsurface resources due to a) the primary method of pipe installation is directional drilling that reduces actual surface disturbance; b) the majority of construction work (drilling and re-grading) will take place along existing roads, ditch-lines and established parking areas; c) only one known site (Boat House Site 91K) has been recorded in the Townsite, and this is well to the west of the present project and will not be impacted. Therefore, there is no immediate concern that the horizontal drilling activities will have any potential to impact buried archaeological resources. As the proposed design, methods and area of work will not likely significantly impact previously unknown or significant buried archaeological resources, **an Archaeological Impact Assessment prior to work commencing will not be required**" (Appendix V: Archaeological Overview Assessment).

6.7 VISITOR EXPERIENCE AND STAKEHOLDERS

(Section written by William Tarleton, Visitor Experience Product Development Officer, RMNP, PCA)

The area of work for the Project is within the townsite community of Wasagaming and adjacent to Clear Lake, and as such is likely to have a significant impact on the visitor experience in RMNP during both the construction and operation phases. According to 2009 Parks Canada VIP Reporting data, 98% of all visitors to RMNP spend time in this area, which serves as a seasonal community and staging area for visitation throughout the rest of the park. Improvements to stormwater management infrastructure are anticipated to effect visitor experience outcomes across a wide-range of user profiles; eg., beach and day-use area users, recreational water-craft users and anglers, campers, business owners and employees, shopping and dining guests and special event attendees. Principle among the anticipated effects of this project on visitor experience are impacts to public health and safety outcomes, public perception and accessibility.

Of particular public health concern are the storm drain outfalls located at Wasagaming Beach`s eastern and western ends. After significant rainfall events, these outfalls are known to release a flush of stormwater containing a high content of potentially harmful bacteria. A 100ml sample taken from near the east beach outfall on August 16, 2016 recorded a fecal coliform count of 370 culture forming units. Although these releases are flash events and likely to disperse quickly, a count spike of 370cfu/100mL is significantly close to the maximum single count sample of 400cfu/100mL for recreational contact as outlined in *Guidelines for Canadian Recreational Water Quality* (p. 26, 2012). Sample counts in excess of this threshold may trigger the temporary closure of the Main Beach area, which could have a significant and lasting impact on the public`s perception of risk associated with the recreational use of

Clear Lake. Design elements of the Project, particularly the installation of three Stormcepter Oil and Grit Separators are expected to significantly reduce these kinds of events both at the Main Beach and at Ominnik Marsh, where the floating boardwalk serves as one of RMNP`s most used trails, particularly for school groups visiting Wasagaming.

Overland flooding related to stormwater surcharging presents a significant adverse impact to the experience of visitors in Riding Mountain. Major rainfall events have led to the flooding of businesses along Wasagaming Drive, the closure of campsites in Wasagaming Campground and the diminishing of access to day-use areas as the result of standing water. In addition to closures and the potential for property damage, erosion in Wasagaming by stormwater flooding will continue to deteriorate paths, roads and parking areas which are necessary for safe and comfortable access to public amenities within the townsite.

Public feedback consistently identifies the health and clarity of Clear Lake as contributing significant value to the overall enjoyment of visitation to Riding Mountain. The 2012 *Public Feedback on the Development of a Clear Lake Monitoring Strategy* (Den Otter 2012) outlines the results of community open house consultation re-grading Clear Lake, its use and monitoring. Among the primary 'environmental values to monitor' identified by the public was the effect of shoreline development and activity, including run-off pollution and shoreline erosion. Public feedback also identifies park facilities and infrastructure as having a `low satisfaction rate that did not meet Parks Canada standards` according to visitors (Hooper 2010). Although much of the stormwater system infrastructure in Wasagaming is `unseen` by visitors, visible components are located, or will be located, in high traffic areas and may impact the public perception of infrastructure investment and maintenance in RMNP. Visible components of this project should demonstrate best practices in design and communicate the field unit`s commitment to preserving the ecological integrity of Clear Lake and the *Wasagaming Community Plan* vision of becoming a model community of sustainable development in the region (PCA 2011).

7. EFFECTS ANALYSIS

The Effects Identification Matrix (Appendix VI) was utilized to identify potential interactions between the VCs and the Project as discussed below:

7.1 AIR & NOISE

Air Quality

Construction

- Use of machinery and transportation of materials and equipment will result in emissions and dust mobilization into the air.
- Removal of vegetation will result in a decrease of natural air filtration allowing for further penetration into the surrounding landscape.
- Removal of vegetation and exposure of soils may lead to airborne particles that have the potential to reduce air quality.
- Transportation of fuel and other construction materials creates potential for accidental releases into the atmosphere.

Operation

- Permanent removal of trees and shrubs may result in a decrease of natural air filtration provided by roadside vegetation. Area to be cleared is located at the west end of the existing Large Parking Lot with remaining vegetation between it and cottages above. In addition, willows to be salvaged in advance of construction are to be planted back in the general area as part of a vegetated swale within the upcoming Project 828 Townsite Parking, Street, Trail Paving which encompasses the paving and landscaping of the Large Parking Lot. Every effort will also be made to avoid damage to trees with the installation of Land Drainage Sewers (LDS) as they are to remain after construction. Effects of the vegetation removal on the air quality are expected to be minimal in comparison to the current levels.
- No other impacts to air quality are anticipated during the operation phase of the Project.

Noise

Construction

- Increased traffic and transportation to the Project Area during the construction phase, as well as, use of machinery and equipment will result in temporary increase of noise. Increased noise may negatively impact wildlife by eliciting avoidance behaviours, disturbing nest sites, den sites, feeding areas, or travel corridors.
- Construction related noise has the potential to negatively impact visitor experience within the Townsite, as well as local businesses. Work is to commence in September which is traditionally the end of the busy season within the Townsite and is to be scheduled around special events which potentially could bring the Project in conflict with use of the Townsite.

Operation

- Noise levels are expected to return to pre-construction levels during the operation phase, therefore no impacts are anticipated.

7.2 SOIL & LANDFORMS

Construction

- The use of vehicles, equipment and machinery may result in dust generation or accidental introduction of harmful construction related products due to leaks, spills and poorly maintained vehicles and equipment, causing adverse effects to soils if not properly addressed.
- The use of surfaces outside the pre-existing roadways, work limits and the proposed area of impact for construction activities may result in soil compaction and disturbance.
- Stripping, handling or storing of soils has the potential to result in sediment releases into the nearby Ominnik Marsh and Clear Lake both directly and through stormwater infrastructure, potentially creating harm for fish and fish habitat, wildlife, vegetation and other biota.
- Disturbance of soils may result in the loss of topsoil from improper handling.
- Disturbance to soils (including stripping and compaction) may negatively affect the biota in the immediate vicinity, including vegetation communities, wildlife and invertebrates.

Operation

- An increased need for maintenance to the stormwater infrastructure may lead to increased risk of concentrated sediment/pollutant releases into the system if components are not probably or routinely maintained, especially in the case of the Stormceptor Oil and Grit separators.
- Maintenance activities has the potential to disturb soils and vegetation in the immediate vicinity of infrastructure, as well as accidental leaks or spills from equipment. The potential for these impacts are not expected to increase significantly compared to pre-Project conditions.

Contaminated Sites

Construction

- Work adjacent to contaminated sites has the potential to encounter contaminated soils and groundwater.
- Potential to create preferential pathways during excavation and installation enabling contaminated ground water to come into contact with clean soils or to alter the known areas of contamination.
- Potential to damage the integrity of the liner that separates the two different remediated areas of the Townsite Washroom Parking Lot site which could lead to contaminated leeching into the 15m buffer from the building.
- Concurrent remediation activities at the 122 Wasagaming Drive contaminated site has the potential to cumulatively effect the surrounding area through additional disturbance (noise, soil and landforms, sediment transport etc).

Operation

- Repairs to infrastructure that involve excavation have the potential to come in contact with contaminated soils. If this is to occur, similar effects and mitigations identified in this BIA are to be utilized to assess the impacts.

7.3 WATER

Aquatic Habitat

Construction

- The use, storage, maintenance or refuelling of equipment and machinery near watercourses may result in the accidental introduction of harmful construction related products or debris causing adverse effects to water quality.
- Bare soils areas are subject to precipitation, surface water runoff, and therefore erosion of soil particles which can then be transported into nearby water courses causing adverse effects to biota including fish and fish habitat.

- Temporary clearing of riparian area during installation of Ominnik outfalls may degrade fish habitat through loss of vegetation and erosion of topsoil.
- Fish could be directly harmed during outfall installation/dewatering in Ominnik marsh. Work is to be completed in fall in respect of the spring spawners that may exist in the Ominnik system.
- Fall construction activities connected to the LDS which outfall into Clear Lake have the potential to impact fall spawners who inhabit Clear Lake, in particular Whitefish which use the littoral zone for spawning.
- Construction vehicles, equipment, and personnel working in and around watercourses have the potential to spread harmful aquatic invasive species into water bodies or watercourses.

Operation

- Fish and amphibian habitat may be negatively affected through maintenance activities such as accidental spills or sediment releases from lines.
- Fish and amphibian species may be negatively affected by temperature fluctuations during discharges especially during spawning windows.
- Additional inputs of nutrients into Ominnik Marsh could potentially shift vegetated communities which in turn could have impact on aquatic habitat.
- Additional flow into Ominnik Marsh/ South Lake system could increase the frequency of connection between South and Clear Lake, inhibiting access to important fish spawning habitat in South Lake. As well, increase in water levels could have an impact on the marsh habitat including nesting waterfowl.

Water Quality

Construction

- The upcoming Project 828 Townsite Parking, Street, Trail Paving has the potential for cumulative effects with the Project. The paving of the Large Parking Lot (Appendix I Fig II) and directing of storm runoff towards Ominnik will concentrate stormwater that has traditionally gathered in low lying areas of the parking lot and infiltrated into the ground. However, traditionally the parking lot has been built up by depositing millings annually into sinking areas leading to a significant build-up of this potential contaminate. After the re-grading and paving of the parking lot the potential to transport these contaminates through ground water will be reduced.

Operation

- The operation phase has the potential to negatively impact the water quality of Ominnik Marsh, South Lake and Clear Lake by inputs of storm water and its contaminants. The inclusion of Stormceptor Oil and Grit separators prior to the outfall into Ominnik Marsh and Clear Lake will reduce the effect of contaminates such as total petroleum hydrocarbons (TPH) and total suspended solids (TSS). In addition to their primary oil and grit removable capabilities, these systems also help settle some additional nutrients of concern such as nitrogen and phosphorus. One study showed the systems to be 87% effective at removing TSS, 99% removal of TPH, 43%

removal of total nitrogen (TN) and 11% total phosphorus (Associated Earth Sciences, Inc. 2001). Contaminates and nutrients that do make it past the separators may be retained in the Ominnik Marsh system before reaching Clear Lake, similar to the current filtering of Lagoon and Octopus Creek inputs which are comparable to the recorded stormwater levels. This would be a significant improvement for Clear Lake water quality over the current system, however, the maximum sequestering capacity of Ominnik Marsh without significant habitat change is still unknown. Nutrient loading into South Lake north bay and Ominnik Marsh has the potential to be impacted by the Project and could see similar changes to the South Lake south bay in the future if it is not carefully monitored and regulated.

- The south bay of South Lake exhibits numerous qualities of poor health suspected to be a result of excess nutrient loading. However, given the disconnect from the Ominnik Marsh input and that these qualities are thought to be associated with groundwater influences, the nutritional inputs into the south bay are not expected to be directly influenced by the Project.
- There is potential for remobilization of sediments in Ominnik Marsh at the outfall location that could contain nutrients and other contaminants that have settle over the years in the marsh. The effects of this may be mitigated by two factors. The first is the fact that the flow dye study conducted by Scott and Sellers (2005) showed the inputs from the lagoon to hug the south area of the open water and towards the Ominnik Marsh outlet to South Lake rather than disperse over the marsh. The flow patterns of the marsh would suggest that even with a slower release regime, it is unlikely discharge would flow towards the proposed location of the storm water outlet approximately 650m to the west of the lagoon inlet and through substantially vegetated water. Although sediment has not been tested in this area it can be assumed that the influences of historic build up from sewage inputs would be lesser in this area and not as available for remobilization. Secondly, the design for installation of upwelling trenches at the outfalls will help dissipate energy as it enters the marsh reducing the potential for re-suspension of sediment in the area.
- The current storm water management system allows Clear Lake to receive untreated run off leading to numerous lake and human health concerns. The positive effects of partially redirecting and pre-treating this water before it enters Clear Lake is not only invaluable to the ecological integrity of the lake but a management priority for the park. The operational phase of the Project has the potential to positively impact these priorities significantly. Improvements to the stormwater monitoring should be made to properly assess these impacts.

Hydrology

Construction

- The effects to surface and groundwater during construction activities would be limited to dewatering for excavating/installation. These effects would be temporary and short in duration and not likely to be significant.

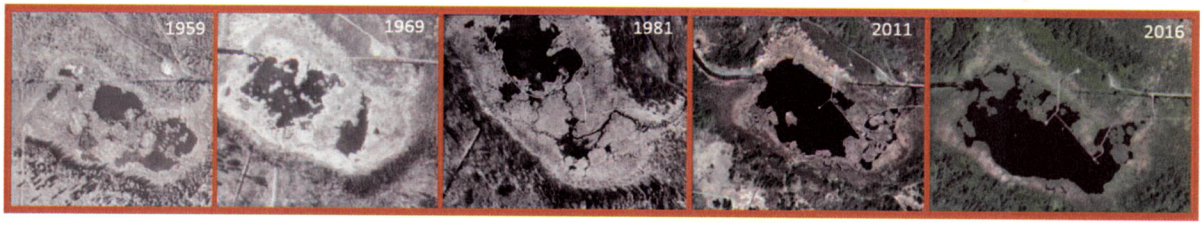
Operation

- Surface hydrology will impacted by diversion of drainage into Ominnik Marsh, changing the flow and storage volumes to and in the associated water bodies.
- Although not mutually exclusive from surface water, significant impacts to ground water flow is not anticipated as a result of the project given the equilibrium characteristics of its relationship with Clear Lake in the sub-basins of Ominnik and South Lake.
- The Project is designed to divert the following volumes of water into Ominnik given the following storm events:

  10mm – 180 m^3
  1:2 year – 540 m^3
  1:5 year – 740 m^3
  1:25 year – 1010 m^3

  This is a reduction by half of the volumes allowed for in the original design prepared by Stantec (2006a) and assessed by Hemmera (2010) as not likely to cause significant adverse effects.
- Additional flow into Ominnik Marsh/ South Lake system may contribute to the frequency of connection between South and Clear Lake and/or cause more frequent overflows of the Ominnik Marsh berm directly into the Boat Cove/ Clear Lake connection. As well additional inputs could lead to impacts on water level in Ominnik Marsh or South Lake, as well as, the ratio of emergent vegetation to open water in the Ominnik Marsh system. As soon below in Figure 7, the area of open water in Ominnik Marsh has increased over the years which could be linked to numerous factors including an increase in volume of water in the Marsh and/or an increase in beaver activity at the Ominnik Marsh outlet into South Lake Channel.

FIGURE 7: *Changes in open water and emergent vegetation cover in Ominnik Marsh pond from 1959-2016*



However further study would be needed to confirm these assumptions. As well it should be noted that there has been no analysis to date on any of these potential impacts and would be needed in order to properly assess them. But given stormwater events are generally short in nature, Hemmera (2010) expected any high volumes experienced in Ominnik Marsh as a result of the Project to disperse over a period of days and was unlikely to cause damage to existing infrastructure such as the boardwalk. It was also proposed by Hemmera (2010) that peak flow from Octopus Creek would differ from peak inputs from the stormwater system. Octopus Creek is thought to experience its greatest flow with spring freshet and taper off to below 0.1 m3/s for the summer months while the stormwater system would receive its greatest inputs during the thunderstorms of the summer (Table 1). This combined with the change in the lagoon release regime which doesn't commence until July, could potentially lessen the impact of additional flow in comparison to all events happening concurrently.

It should also be noted that the volume of water expected to be diverted to Ominnik Marsh is relatively low. A very conservative estimate of water in Ominnik Marsh could be calculated using only the open water area and a depth half of the average reported by Belke and McGinn (2003). At approximately 50,000 m2 and a depth of 0.75 m (volume 37, 500 m3), even the 1:25 year storm (1010 m3) would only account for a 2.7% increase of water. It is unlikely that additional volume contributed by the Project would have significant adverse effects on water levels. However, further investigation into the changing landscape of Ominnik Marsh is still needed and maybe beneficial to explore the addition of infrastructure at the Ominnik Outlet into the South Lake Channel to control discharge and water levels rather than the unpredictable boom and bust of beaver damming activities.

7.3 FLORA

Construction

- Vegetation in the immediate vicinity of construction activities may be negatively affected by dust and debris associated with clearing activities, accidental damage from equipment and accidental spills of harmful substances.
- Permanent removal of shrubs in the proposed clearing areas may cause adverse effects by removing their natural functions and contributions (eg: air and noise filtration, soil stability, water retention and nutrient uptake) to the surrounding environment. This effect will be lessen by the pre-construction salvage of willows in the area and incorporation of them back into the upcoming Project 828 Townsite Parking, Street, Trail Paving to continue performing these functions.
- Temporary loss of marsh edge vegetation in relation to installation of outfalls at Ominnik Marsh.
- Stripping vegetation may negatively affect the biota in the immediate vicinity of the Project works, including vegetation communities, wildlife and invertebrates. Reseeding of disturbed areas with approved seed mixes will limit spread of weed and invasive species.
- Construction vehicles, equipment and materials have the potential to spread harmful invasive plant species throughout the Project Area if not cleaned or sourced appropriately before arriving at site.
- Roots of trees adjacent to excavations that are to remain after construction have the potential to be damaged. Given the close proximity infrastructure and high use of area by people, any damage to roots should be assessed using danger tree criteria and can be deemed unsafe/ recommended for removal as a result.

Operation

- Additional inputs of nutrients into Ominnik Marsh could potentially shift vegetated communities from mixed emergent and submerged plants of the current state to more phytoplankton growth comparable to conditions occurring in the south bay of South Lake.

- Maintenance activities has the potential to disturb soils and vegetation in the immediate vicinity of infrastructure, as well as accidental leaks or spills from equipment. The potential for these impacts are not expected to increase significantly compared to pre-Project conditions.

7.4 FAUNA

Wildlife

Construction

- There is potential for loss of bird nests, which are protected by legislation, if vegetation clearing/ construction activities in vegetated areas is required and occurs during the general bird nesting period (April 15 – August 31). As construction is not anticipated to start until September this is not expected to be a concern.
- Work is to occur outside the peak timing periods for amphibians (April to May for breeding and May to July for larval stages) which will lessen impacts to species such as Northern Leopard Frogs.
- Garbage and waste generated by the construction activities could attract local wildlife.
- Local wildlife may be affected by accidental spill of a harmful substance on-site.
- Temporary loss of marsh edge habitat in relation to installation of outfalls at Ominnik Marsh.
- Potential injury or mortality from collision with equipment or sedimentation/contamination as a result of accidental spills and run off from construction activities.
- Wildlife sensory disturbance during construction activities may cause displacement/ preferred habitat avoidance by wildlife in area. It should be noted that the Project activities take place within the Wasagaming townsite which already has high traffic and activity levels. Therefore an increase in avoidance in the Project area is not expected to increase significantly as a result of the Project and will occur outside of most sensitive timing windows.

Operation

- The removal of vegetation in association with the strip at the west side of the Large Parking Lot has the potential for habitat loss/ fragmentation for wildlife in the surrounding area. This effect will be lessen by the pre-construction salvage of willows in the area and incorporation of them back into the upcoming Project 828 Townsite Parking, Street, Trail Paving to continue performing these functions.
- Pre-project existing conditions of site use and maintenance activities are expected to return to pre-construction levels during the operation phase, therefore no impacts related to these factors are anticipated to increase.
- Additional inputs of nutrients into Ominnik Marsh could potentially shift vegetated communities which in turn could have impacts on wildlife habitat including nesting waterfowl and amphibians. Additional discharges could also affect vegetative communities and habitat through higher water levels.

Species at Risk

- Construction, increased maintenance activities and visitation may lead to harassment, harm or accidental mortality of amphibians, including Northern Leopard Frog or Western Tiger Salamander, individuals or their young especially if migration between habitats occurs over or around construction activities. Accidental spills, leaks or sediment release could impact aquatic habitats.
- Construction activities have the potential to lead to avoidance of foraging area by Little Brown Myotis or Northern Long Eared Myotis, however, work hours are expected to occur predominately during the day, and therefore foraging habitat avoidance is not expected to occur as a result of the Project activities.
- Construction and operation activities have the potential to lead to harassment, harm or accidental mortality of insect species. Permanent removal of vegetation has the potential to remove unknown host plants, however this effect is expected to be low since none have been noted with in the work limits.
- Permanent removal of vegetation within the Project area could have potential adverse effects to the individual SOMC bird species, their nests and their habitat. These potential adverse effects may contravene SARA and include:
    - Permanent habitat loss and/or degradation through vegetation clearing.
    - Harassment, harm or accidental mortality to individuals, nests and their young from construction equipment and activities in area.

  Of the SOMC birds identified for the Project, none would be directly affected by the removal of the vegetation (primarily willows) in the Large Parking Lot as it does not meet their habitat requirements. Effects on these species by the vegetation removal is not anticipated.
- Additional inputs of nutrients into Ominnik Marsh could potentially shift vegetated communities which in turn could have impacts on wildlife habitat including nesting waterfowl and amphibians. Additional discharges could also affect vegetative communities and habitat through higher water levels.

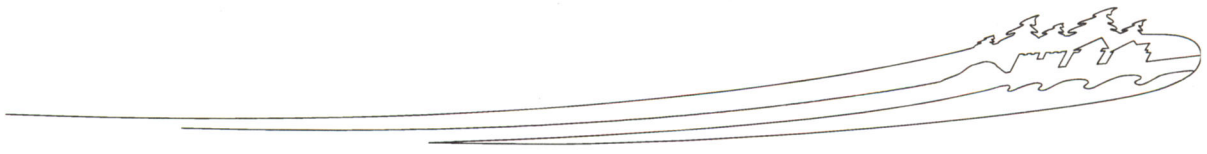
7.5 CULTURAL RESOURCES

Construction

- Disturbance and loss of previously unknown archaeological resources may occur as a result of equipment operation in the area and ground disturbance due to infrastructure installation.
- Potential to encounter previously documented and undocumented *in situ* features and artifacts.

Operation

- No impacts to cultural resources are anticipated for the operational phase of the Project.



7.6 VISITOR EXPERIENCE

Construction

- Construction activities have the potential to cause traffic delays or temporarily block access to areas in the Townsite which could result in negative experience for park visitors and road users. Potential exists for area closures to negatively impact visitor use of existing wayfinding signage to navigate trails, paths and roads in Wasagaming.
- Temporary presence of construction equipment, vehicles, construction waste and personnel in work areas may detract from viewscapes in the townsite, resulting in a negative experience.
- Temporary noise, emissions, dust and debris from construction activities may temporarily affect human health and visitor experience.
- Visitor safety hazards will exist for the duration of construction.
- Construction activities may result in disruption to business operations and localized avoidance of effected business areas by visitors.
- Work is scheduled to commence in September which is traditionally the end of the high visitation season within the Townsite and is to be scheduled around special events which could bring the Project in conflict with use of the Townsite. This will minimize the effects felt by visitors and business owners. Consideration should be given to the likelihood of higher than average visitor attendance to the townsite as the result of free admission for the 2017 season.
- Construction activities taking place within Wasagaming and adjacent to Clear Lake and Ominnik Marsh are likely to take place under substantial visitor scrutiny.
- Delays in the construction schedule of this project have the potential to impact other infrastructure projects with significant VE considerations, in particular Project 828 Townsite Parking, Street, Trail Paving which includes the paving improvements to the Large Parking Lot included in this project.

Operation

- The operation of the upgraded stormwater system will alleviate areas of flooding that have negatively impacted businesses, visitor experience and access to services prior to the Project. In particular drainage in the Large Parking Lot will be improved, allowing for less ponding around vehicles. Increased LDS capacity on Wasagaming Drive will reduce the possibility of businesses flooding as they have in the past due to over strained infrastructure.
- Health and quality of water in Clear Lake, especially in relation to the most populated main beach area, will improve with the pre-treatment of water and diversion to Ominnik Marsh. This will decrease health and safety risks to recreational users of Clear Lake, as well as has the potential to improve aesthetics in swimming area (submerged vegetation growth pronounced in area due to nutrient loading from storm drain).

8. MITIGATION MEASURES

SEE APPENDIX VIII

Appropriate and pertinent mitigation measures have been adapted from *Best Management Practices for Routine Projects in National Park Communities*, as well as, *DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat*.

9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

9 a) Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:

☐ No

☒ Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration).

A community bulletin was released in spring 2016 highlighting important updates and projects in the park that included the Wasagaming Stormwater Management Project. The stakeholder engagement strategy in relation to this project will continue to inform the public (visitors) and stakeholders (in particular business owners) of details of the Project prior to and during construction in 2017-2018. Through a variety of media, this approach will help to alleviate concerns about the impacts of construction, as well as highlight the ecological and water management benefits of the new design.

9 b) Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

☐ No

☒ Yes (describe the process to involve relevant parties and how the results were taken into consideration).

In the spirit of cooperation, Parks Canada Agency (PCA) engages with The Coalition of First Nations with Interest in Riding Mountain National Park through a ministerial agreement to establish the Riding Mountain Forum (RMF). The Coalition is comprised of the Anishinabe communities that regard Riding Mountain as part of their traditional land base. They are: Keeseekoowenin Ojibway First Nation, Rolling River First Nation, Waywayseecappo First Nation, Sandy Bay Ojibway First Nation, Ebb and Flow First Nation, Gambler First Nation and Tootinaowaziibeeng Treaty Reserve. Parks Canada has brought forward an invitation to engage in the Project to the Senior Officials Forum (SOF) because of its connection to the improvement of ecological health of Clear Lake.

To date, Parks Canada has maintained a verbal dialogue with the Forum Coordinator. A letter will be sent out to the Coalition chiefs and councils to gauge their interest on an array of projects and where we can engage with them in appropriate ways. The Stormwater Project effects Clear Lake and KOFN's interests directly.

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

The majority of the Projects effects associated with the construction phase of the Project and are generally temporary in nature and short in duration and are not anticipated to cause residual adverse effects.

Residual effects based on the operations phase of the Wasagaming Stormwater Management Project are concentrated on the potential changes and inputs into the Ominnik Marsh/ South Lake system. The significance of these adverse residual effects were evaluated based on their magnitude, duration/frequency, irreversibility and ecological context. They were also evaluated against:

- The ecological benefit of the improvements to the stormwater inputs into Clear Lake,
- The reduction in human health risk associated with the current stormwater system,
- The additional mitigations worked into the design to alleviate the effects on the marsh,
- The reduced volumes of storm water to be diverted to Ominnik Marsh in comparison to previous designs,
- The capacity and commitment shown over the years to monitor the Ominnik Marsh and stormwater systems,

- And the commitment to further explore low impact development to add additional pre-filtration to run off.

It is anticipated that there will be a net benefit to aquatic resources and overall ecological health of Clear Lake including the public health and visitor experience at the main beach.

If all mitigation measures discussed in the BIA are followed, significant adverse residual environmental effects as a result of the proposed Project activities are not anticipated.

11. SURVEILLANCE

☒ Surveillance is not required

☒ Surveillance is required (provide details such as the proposed schedule and the focus of inspections)

Site visits and surveillance will occur throughout the duration of the Project with focus on species at risk, sediment and erosion control and quality control of the design implementation.

Site visits will be conducted at a minimum of once a week during construction activities.

12. FOLLOW-UP MONITORING

Follow-up monitoring is:

☐ not required

☐ required by legislation or policy (indicate basis of requirement – e.g. required by the *Species at Risk Act*; *Fisheries Act*, or the *Parks Canada Cultural Resource Management Policy*)

☒ required to evaluate effectiveness of mitigation measures and/or assess restoration success

Short term monitoring required will focus on invasive species and removal of erosion and sediment controls once area is determined to be established.

Long term monitoring over the operational lifetime of the system will focus on water quality of stormwater runoff, as well as effects on Ominnik Marsh system. Improvements to the current monitoring should include:

- Standardization of variables such as flow through outfall before sample collected and number/ intensity of rainfall events prior to sampling event,
- Collection of samples from a control site (ie: Spruces Creek) during storm events to better understand natural input levels into Clear Lake, and
- Incorporation into the continuing monitoring of the sites in the Octopus Creek/ Ominnik Marsh/ Boat Cove/ South Lake connection.

13. SARA NOTIFICATION

Notification is:

☒ not required

☐ required under the *Species at Risk Act* (outline the nature of and response to any notification).

14. EXPERTS CONSULTED

Department/Agency/Institution: Parks Canada	Date of Request: 06-Mar-2017
Expert's Name & Contact Information: Joanne Tuckwell	Title: Species Conservation Specialist
Expertise Requested: Species at risk implications	
Response: Provided guidance on GWW critical habitat analysis and review of all SARA components.	

Department/Agency/Institution: Parks Canada	Date of Request: 06-Mar-2017
Expert's Name & Contact Information: Tim Town	Title: Resource Management Officer I, RMNP
Expertise Requested: Aquatic implications	
Response: Fish species in project area and review of Impact Assessment (aquatic effects)	

Department/Agency/Institution: Parks Canada	Date of Request: 01-Jan-2016
Expert's Name & Contact Information: Cam McKillop	Title: Ecologist Team Lead, RMNP
Expertise Requested: Impact Assessment lead for RMNP; Contaminated Sites Lead in RMNP	
Response: Provided guidance on IA pathway, IA review and project design.	

Department/Agency/Institution: Parks Canada	Date of Request: 01-Jan-2017
Expert's Name & Contact Information: Flo Miller	Title: Cultural Resources Management Advisor
Expertise Requested: Cultural Resources Impact Analysis	
Response: Conducting the CRIA and liaison with other members of HCCD with interest in project review.	

Department/Agency/Institution: Parks Canada	Date of Request: 06-Mar-2017
Expert's Name & Contact Information: Les Campbell	Title: First Nations Program Advisor
Expertise Requested: First Nations Interest and Concerns	
Response: Advised on possible First Nations interest and impacts. To assist with information sharing and First Nations involvement.	

Department/Agency/Institution: Parks Canada	Date of Request: 23-Feb-2017
Expert's Name & Contact Information: Ken Kingdon	Title: Project Manager, Resource Conservation
Expertise Requested: Knowledge of species in project area	
Response: Contribution to IA for species observations. Review of IA.	

Department/Agency/Institution: Parks Canada	Date of Request: 26-Oct-2016
Expert's Name & Contact Information: William Tarleton	Title: Visitor Experience Product Development Officer, RMNP
Expertise Requested: Visitor experience implications	
Response: Contribution to IA for visitor experience interest and impacts. Review of IA and project design.	

Department/Agency/Institution: Parks Canada	Date of Request: 01-Oct-2016
Expert's Name & Contact Information: Rae Kingdon	Title: Public Relations and Communications Officer
Expertise Requested: Public Relation and Communication for the Project	
Response: Contribution to IA for communications and public relations.	

Department/Agency/Institution: Parks Canada	Date of Request: 06-Mar-2017
Expert's Name & Contact Information: Brandice Hollier	Title: Masters Student, Brandon University
Expertise Requested: Preliminary data from master project	
Response: Contribution to IA with recent master field work performed in Octopus Creek/South Lake relationship. Review of IA.	

Department/Agency/Institution: Parks Canada	Date of Request: 01-Jan-2017
Expert's Name & Contact Information: Brian Smith	Title: Terrestrial Archaeologist
Expertise Requested: Archaeological Overview Assessment (AOA)	
Response: Conducted the AOA.	

15. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

☒ not likely to cause significant adverse environmental effects.

☐ likely to cause significant adverse environmental effects.

FOR SARA REQUIREMENTS:

☒ There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

16. RECOMMENDATION AND APPROVAL

Prepared by: EIA author (name & position): Shannon Landels, Resource Management Officer I, RMNP	Date: 07-APR-2017
Recommended by: Functional manager of the project (name): Michael Turko, Project Manager, PCA Project Delivery Services	Date: 13 Apr 17
Approved by: Michaela Kent, Riding Mountain Field Unit Superintendent	Date: May 1/17

17. APPENDICES

I: Concept Drawings (Figures I – IV)

II: Spatial Scope of BIA

III: Contaminated Sites Maps

IV: Species of Management Concern with Potential Presence near the Project

V: Archaeological Overview Assessment

VI: Effects Identification Matrix

VII: Critical Habitat Destruction Analysis

VIII: Mitigation Measures

18. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

☐ Project registered in tracking system

☒ Not yet registered *(CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system* ***by the end of April*** *to enable reporting.*

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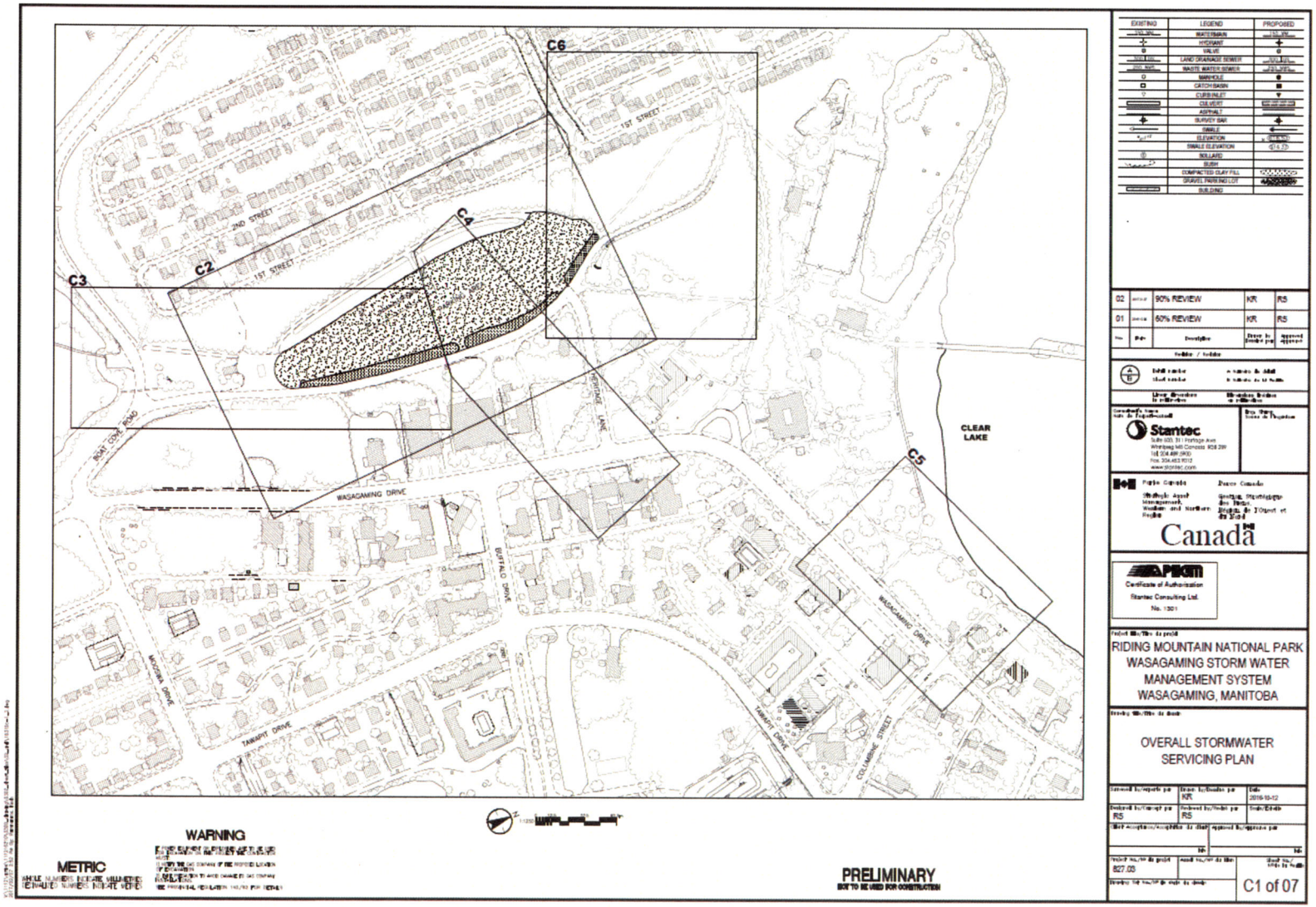
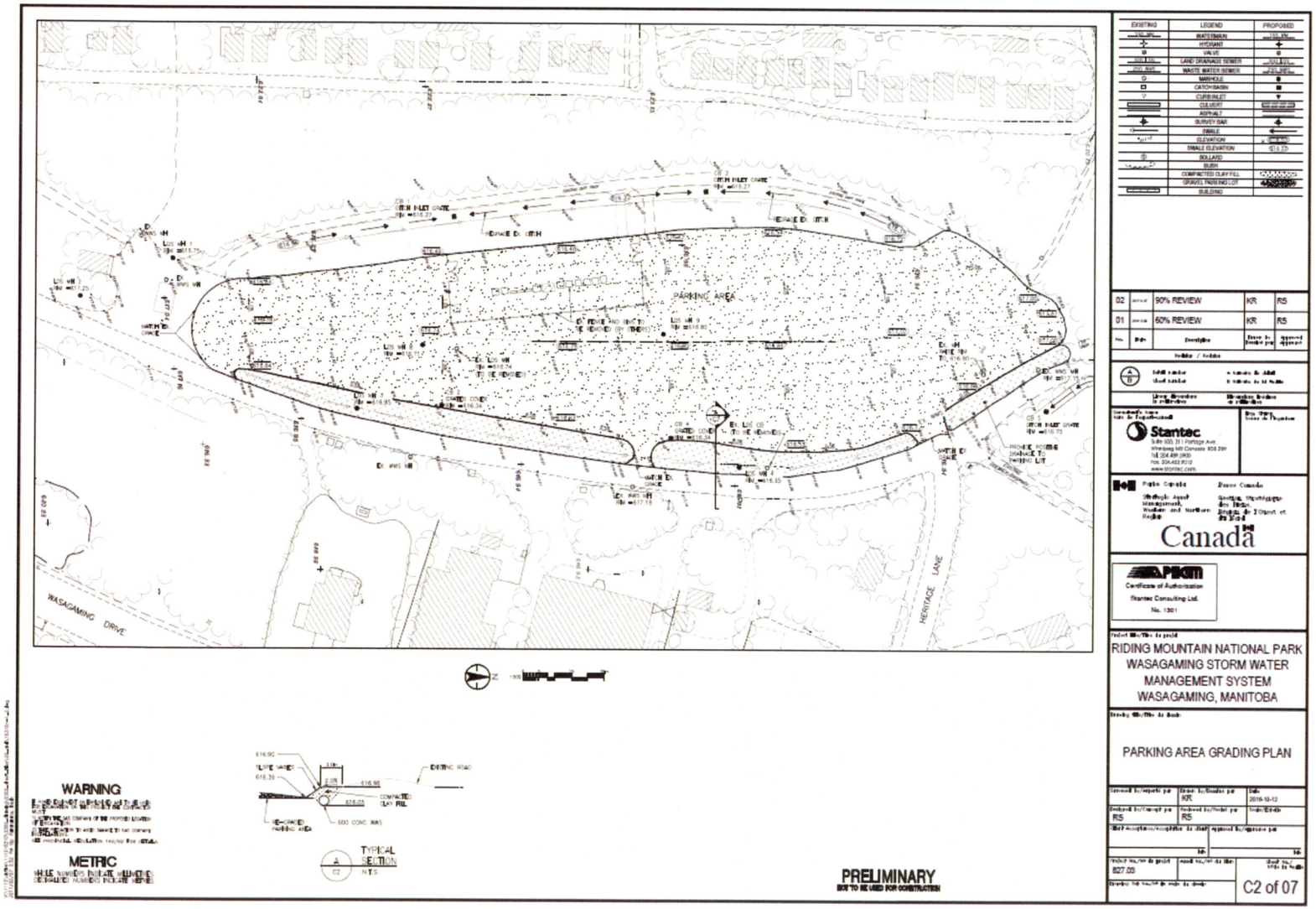
Appendix I: Concept Drawings

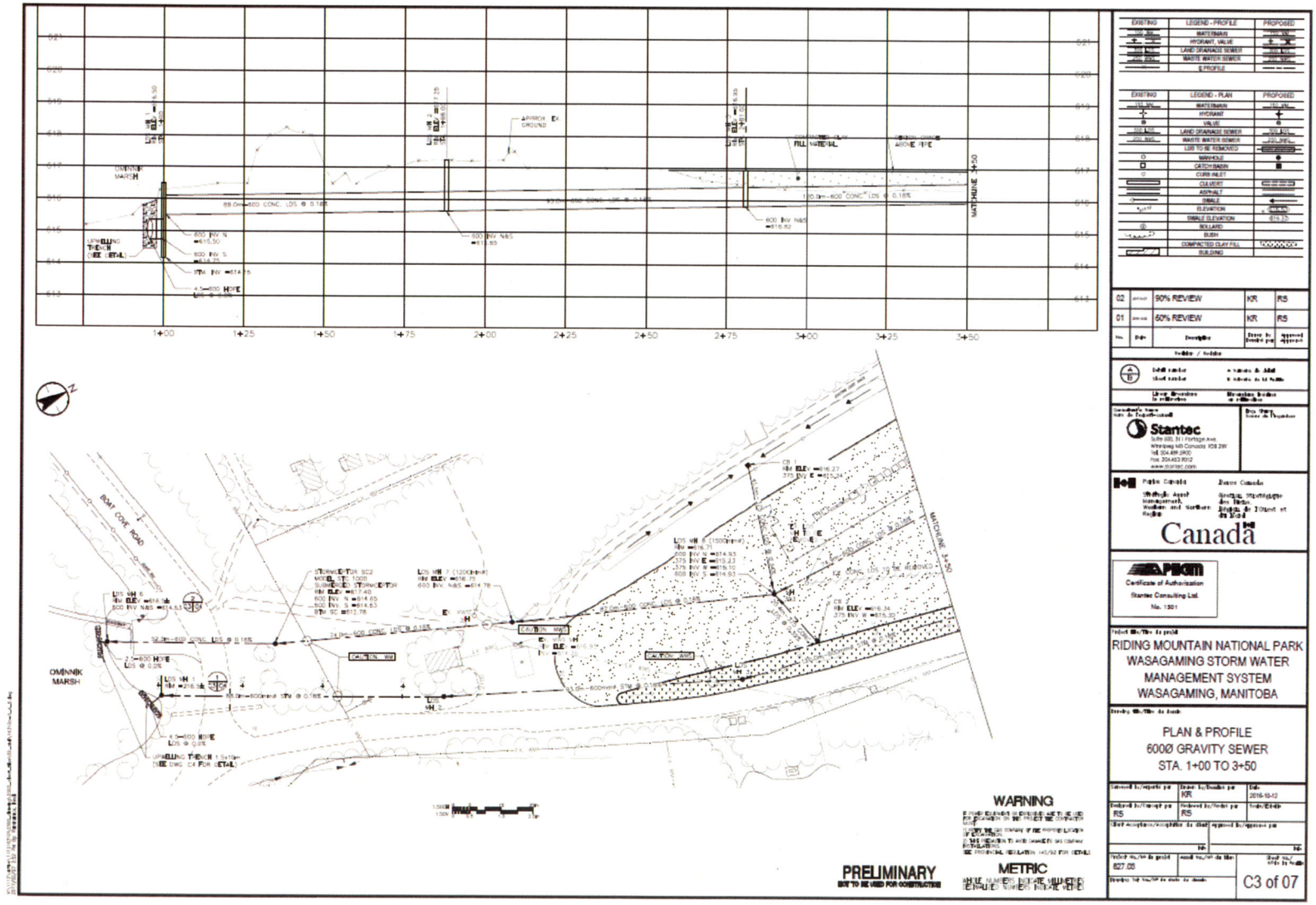
Overall Stormwater Servicing Plan (Fig I)



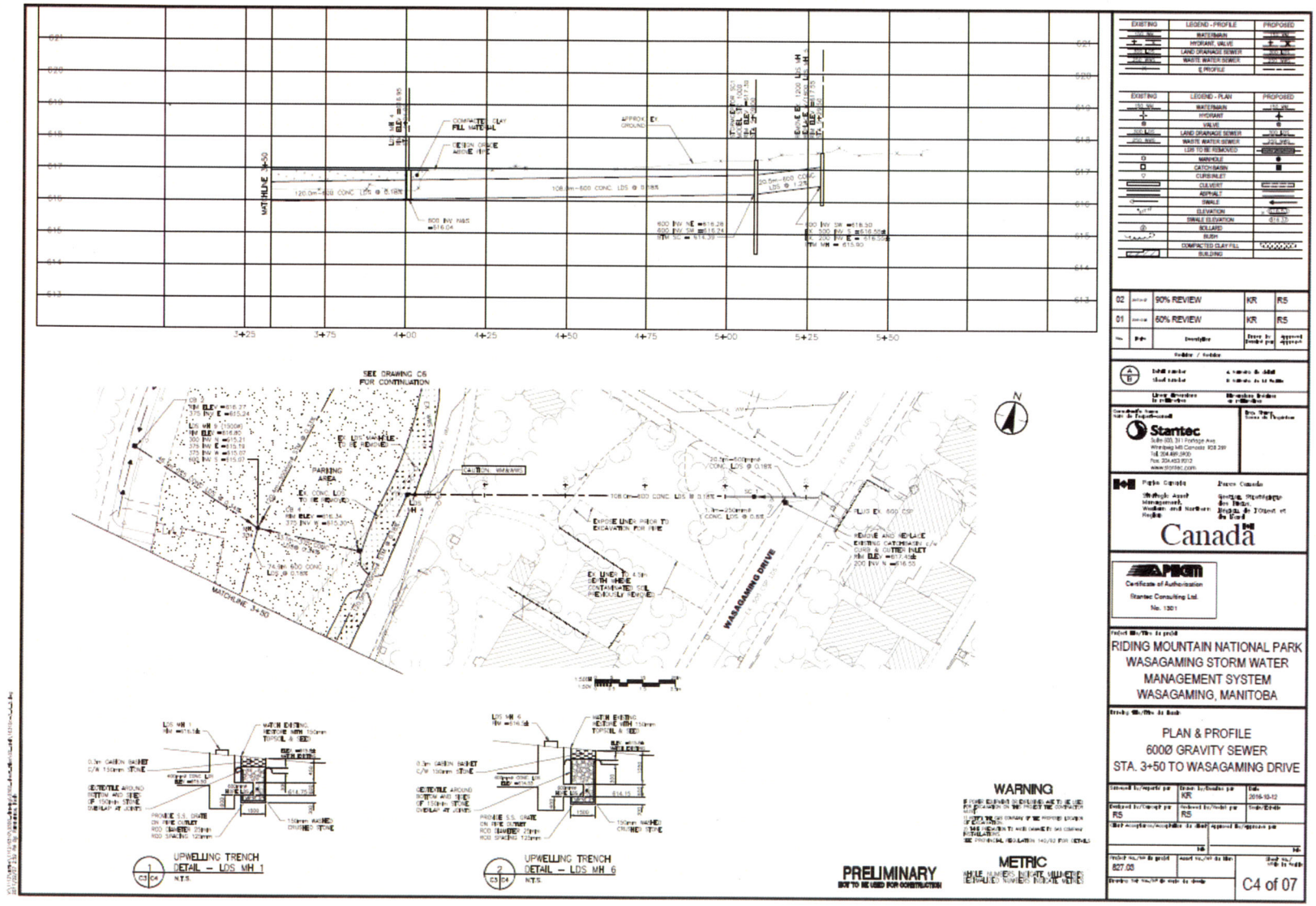
Parking Area Grading Plan (Fig II)



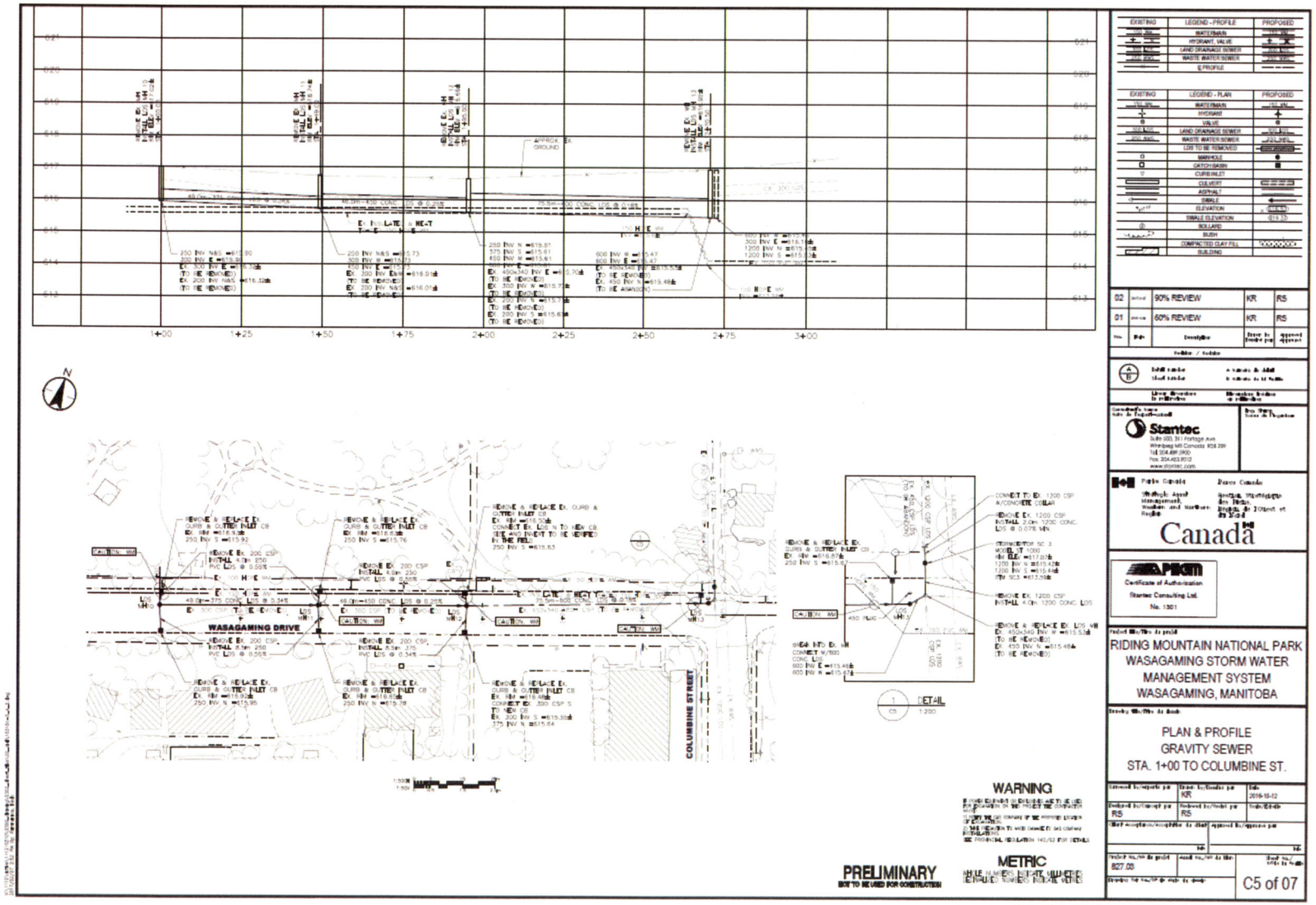
Plan and Profile 600*** Gravity Sewer- STA. 1+00 TO 3+50 (Fig III)



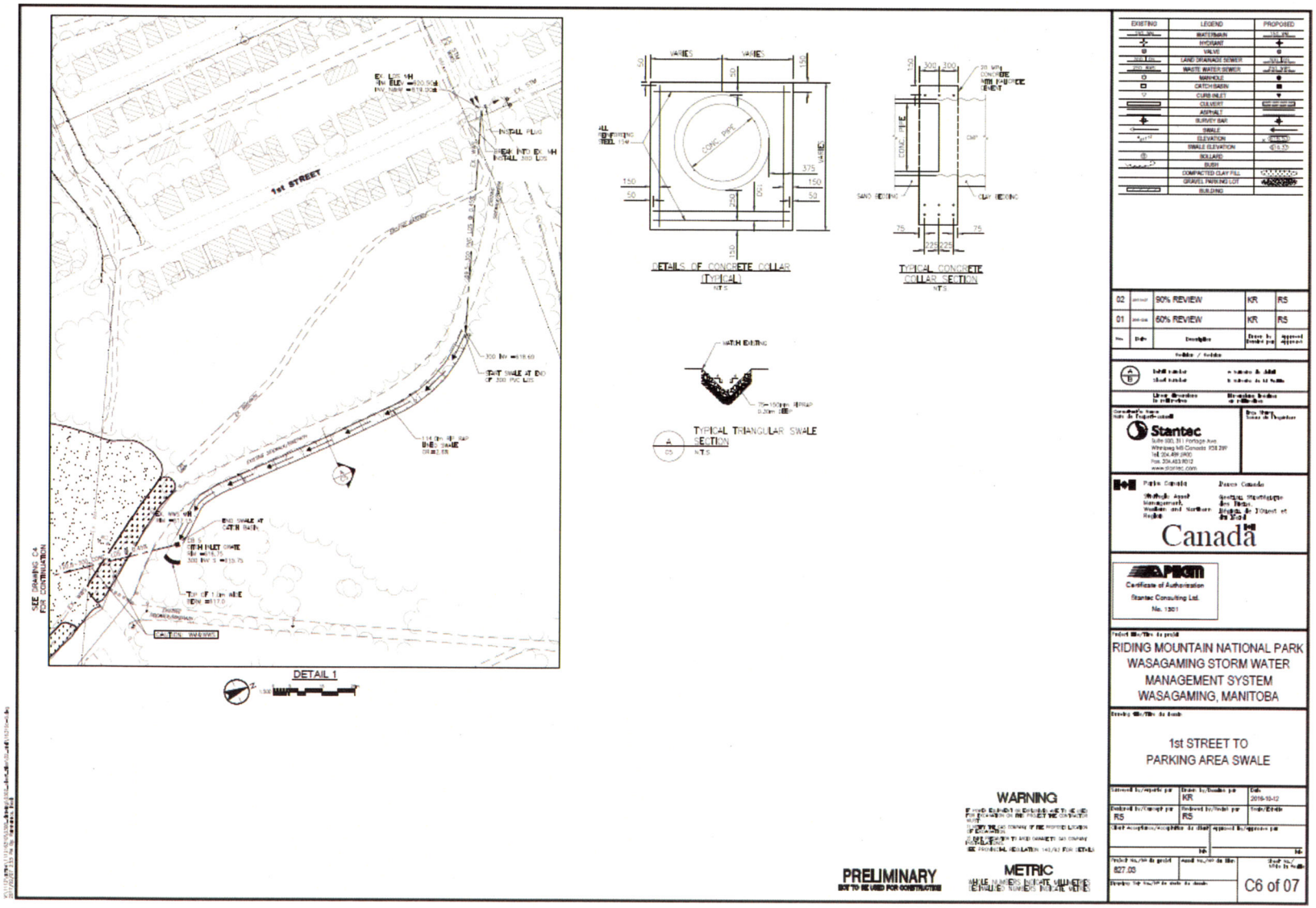
Plan & Profile 600*** Gravity Sewer – STA. 3+50 TO Wasagaming Drive (Fig IV)



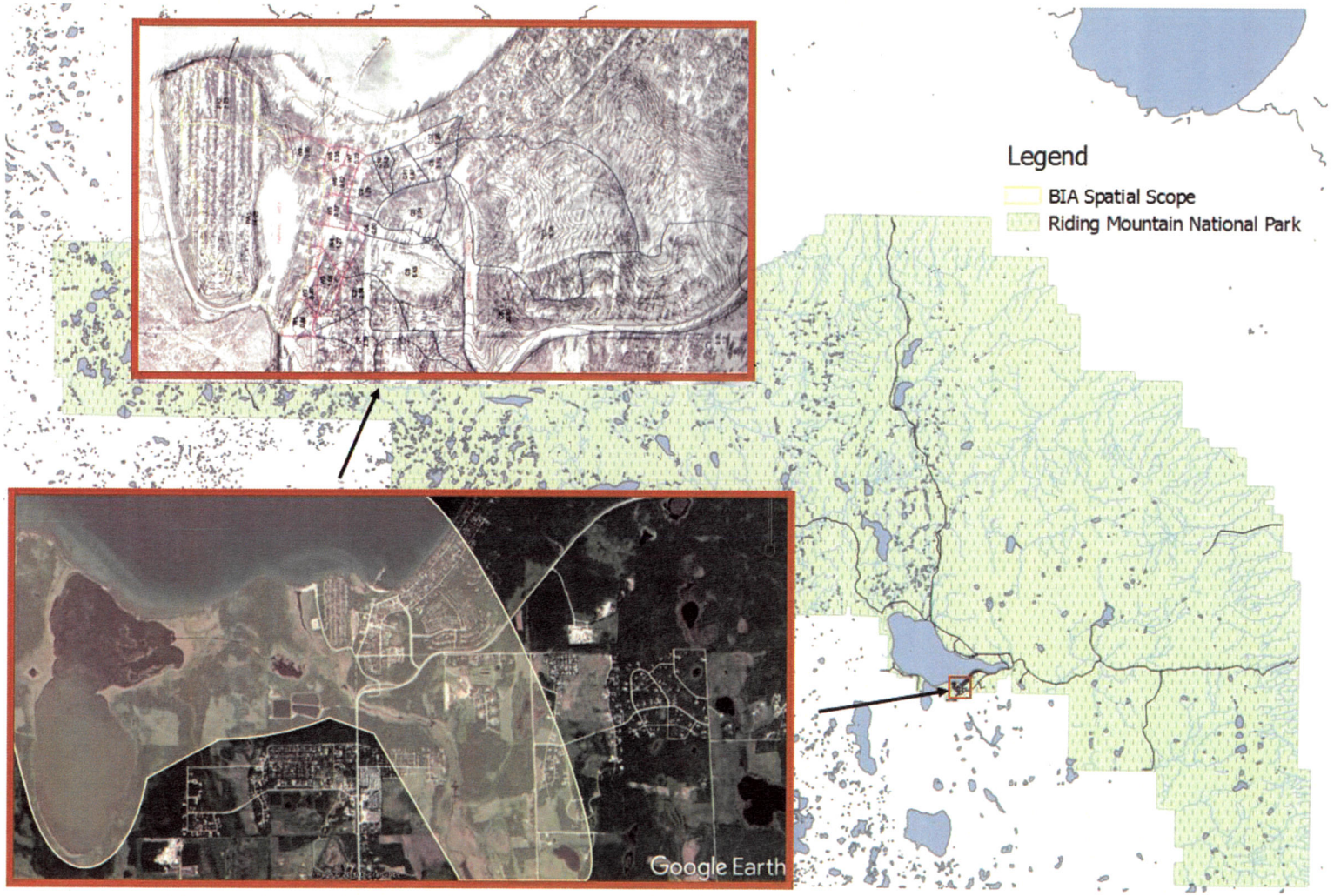
Plan & Profile Gravity Sewer – STA. 1+00 TO Columbine ST. (Fig V)



1st Street to Parking Area Swale (Fig VI)

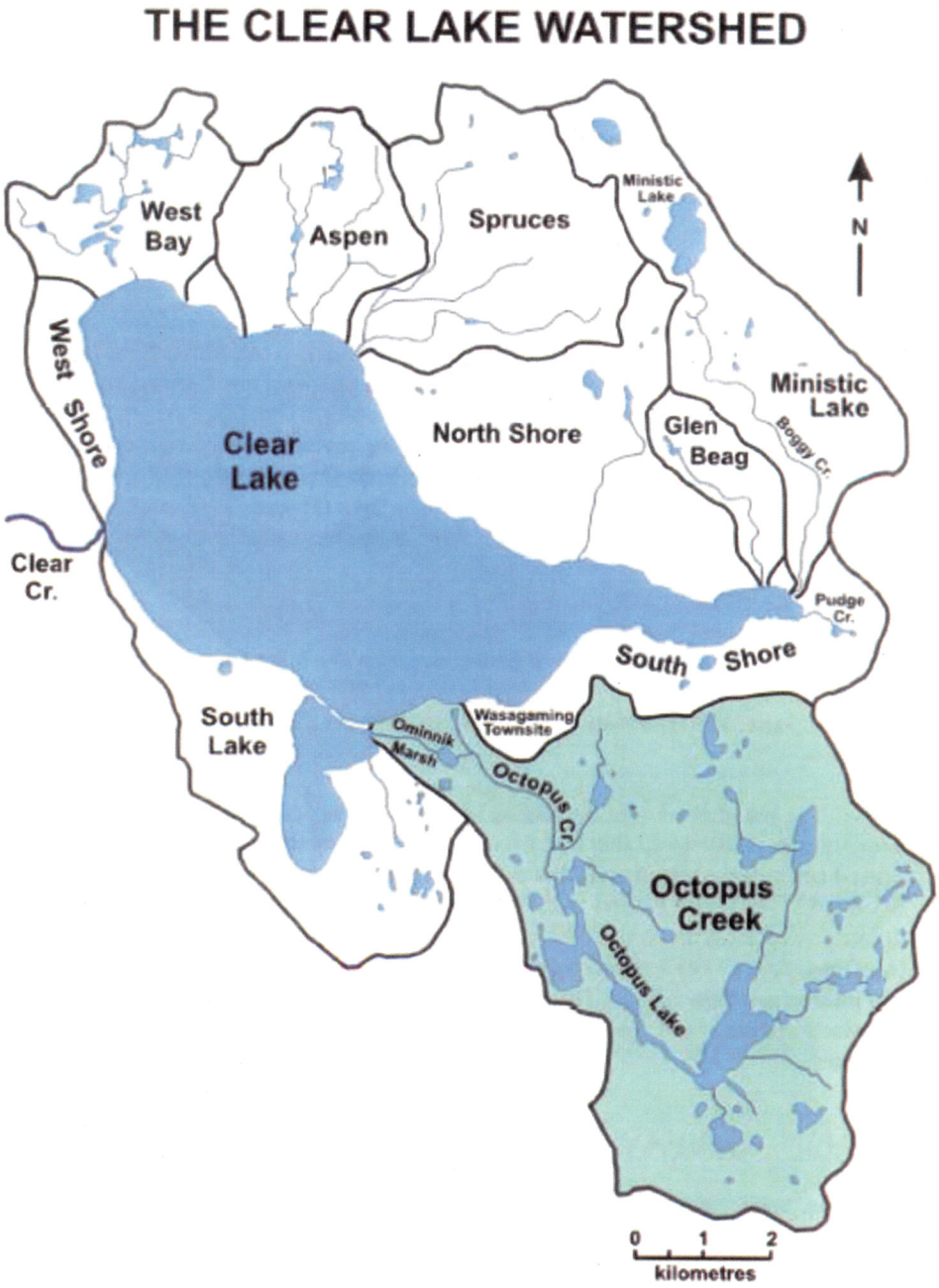


Appendix II: Spatial Scope of BIA (Fig I)



Source (Top Left Figure):
Stantec Consulting Ltd. 2006a. Wasagaming, Manitoba, Riding Mountain National Park: Stormwater Drainage System Design Development Report. Prepared for Public Works and Government Services Canada. File No: 1112-08610. Winnipeg, MB.

Octopus Creek Watershed (Fig II)

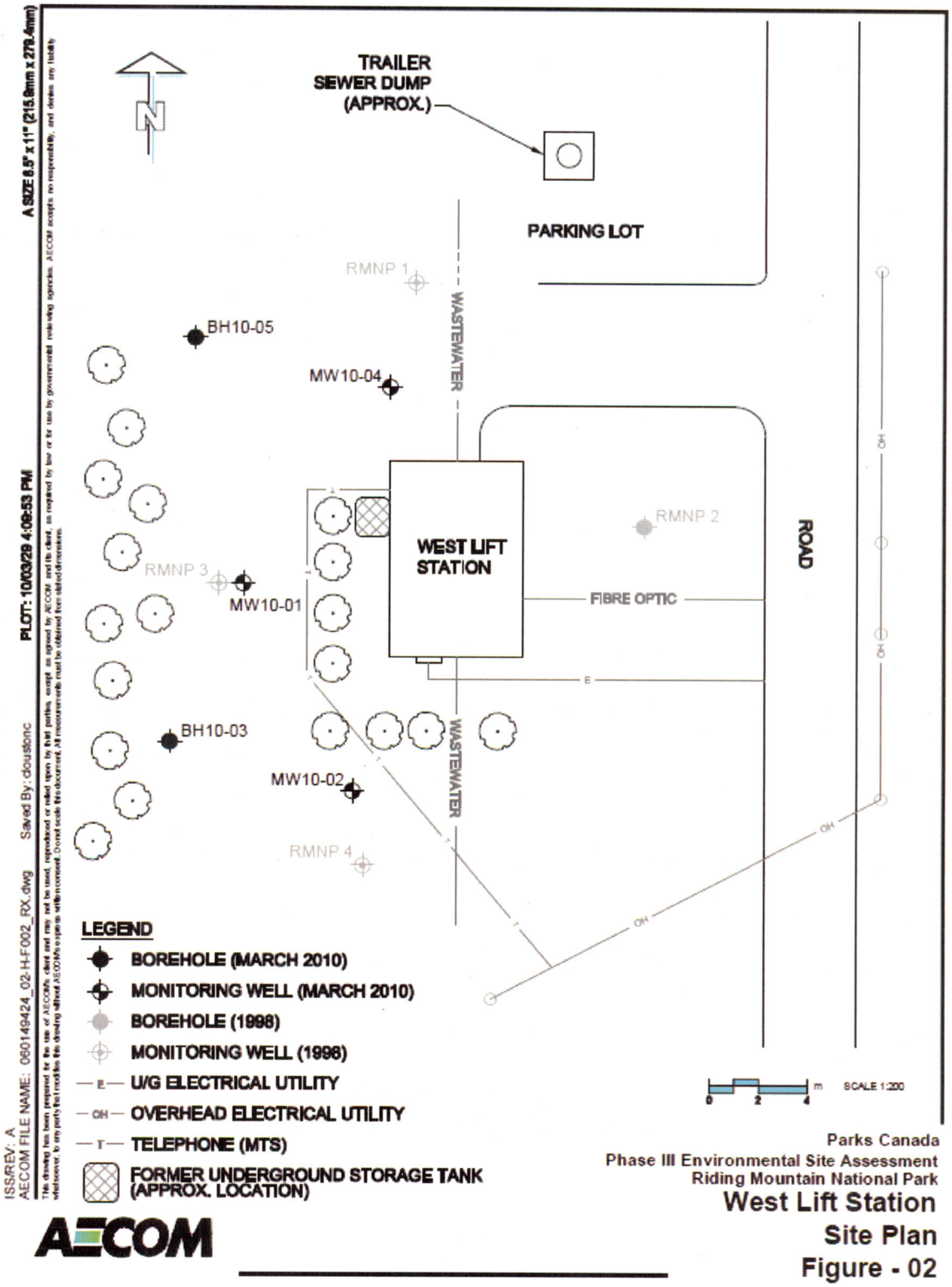


Source:

Moore, K.L., McGinn, R. A. and P. Rousseau. 1997. Spring Freshet Nutrient Loading in Octopus Creek Watershed. Department of Geography, Brandon University. Brandon, MB.

Appendix III: Contaminated Sites Maps

West Lift Station: Site Plan (Fig I)



Source:
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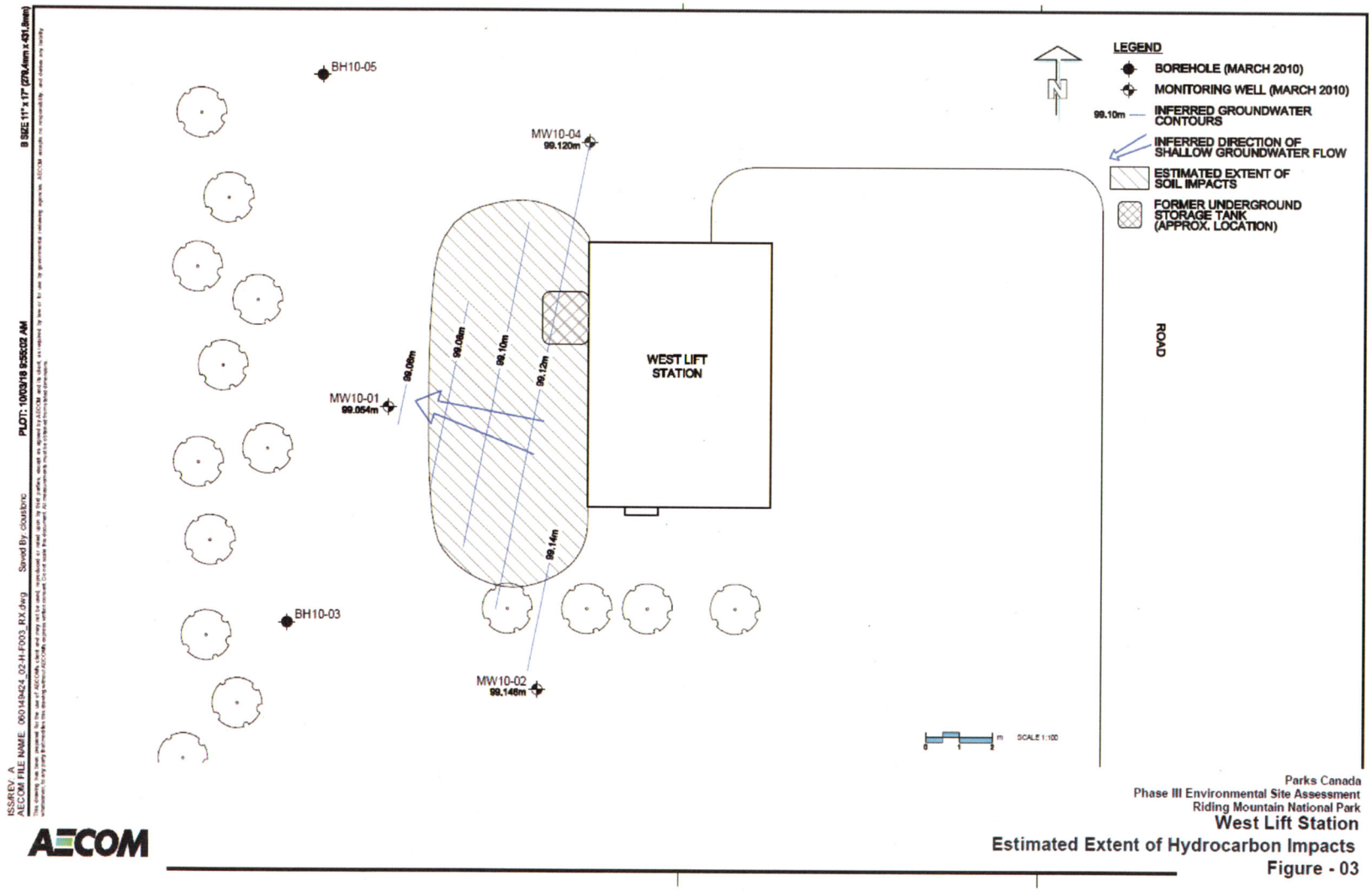
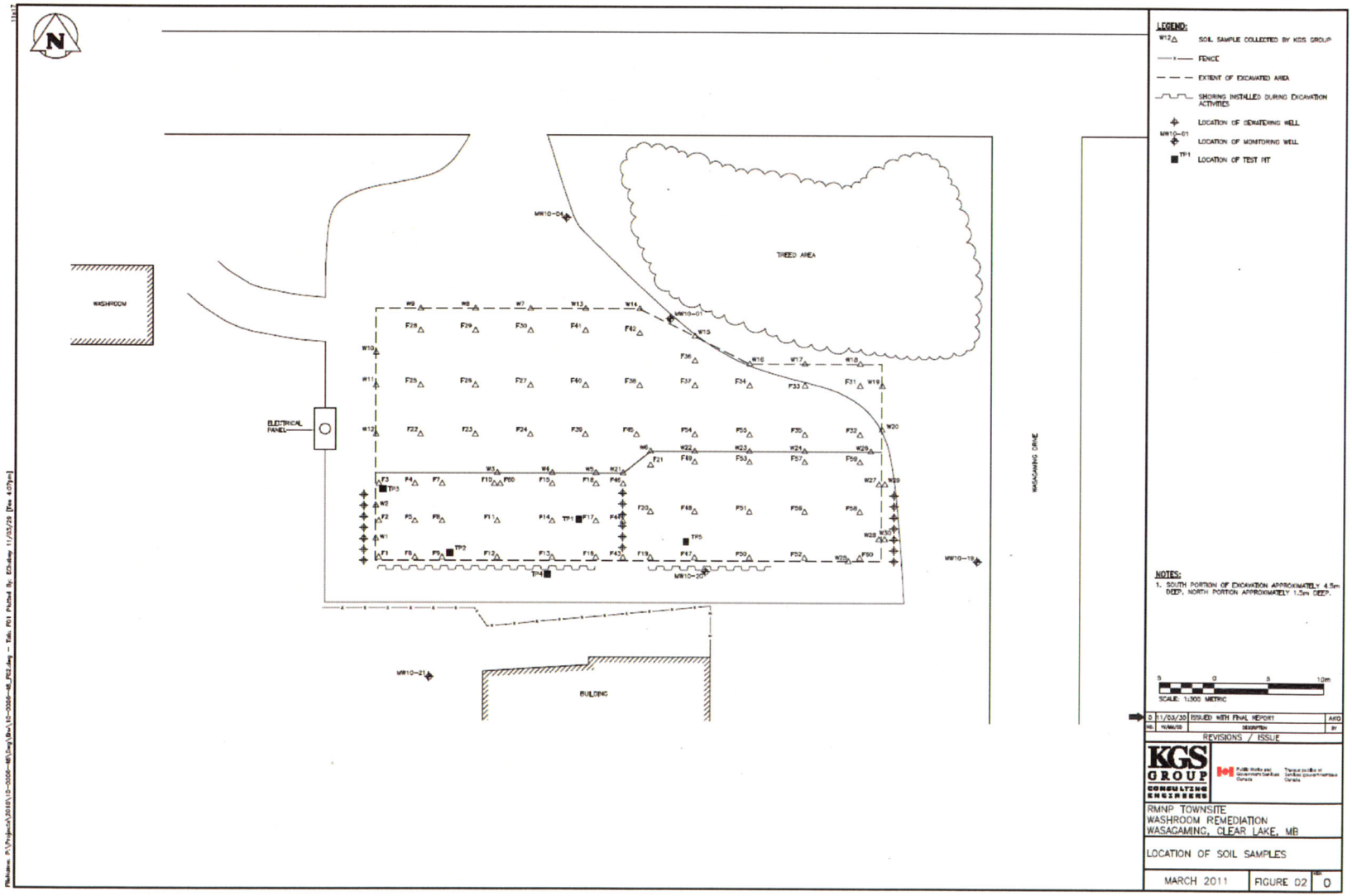
West Lift Station: Estimated Extent of Hydrocarbon Impacts (Fig II)



Townsite Washroom Parking Lot: Remediation (Fig III)



Source:
AECOM. 2010b. Phase III Environmental Site Assessment: Townsite Washroom, Riding Mountain National Park – Wasagaming, Manitoba. Prepared for Parks Canada. Project No: 60149424 (4.2.1). Winnipeg, MB.

Appendix IV: Species of Management Concern with Potential Presence near the Project

Scientific Name	Common Name	COSEWIC Status[1]	SARA Status[2]	ESEA Status[3]	Potential for Presence near Project	Carried Forward in VC Assessment?
Amphibians & Reptiles						
Ambystoma mavortium	Western Tiger Salamander	Special Concern	-	-	High – confirmed presence area (Old Campground)	Yes
Chelydra serpentine	Snapping Turtle	Special Concern	Schedule 1 Special Concern	-	High- confirmed presence in area (Southgate)	Yes
Lithobates pipiens	Northern Leopard Frog	Special Concern	Schedule 1 Special Concern	-	High – audio confirmation in Octopus Creek by Southgate	Yes
Birds						
Aechmophorus occidentalis	Western Grebe	Special Concern	-	-	High – observation in South and Clear Lake	Yes
Ammodramus bairdii	Baird's Sparrow	Special Concern	-	Endangered	Low – found in grasslands with sparse shrubs	No
Anthus spragueii	Sprague's Pipit	Threatened	Schedule 1 Threatened	Threatened	Low – generally found in native, undisturbed grasslands	No
Antrostomus vociferous	Eastern Whip-poor-will	Threatened	Schedule 1 Threatened		Low- found in association with mixed woods near open areas and well drained soils, rare in RMNP	No
Asio flammeus	Short-eared Owl	Special Concern	Schedule 1 Special Concern	Threatened	High – confirmed presence in meadows west of sewage lagoon	Yes
Cardellina canadensis	Canada Warbler	Threatened	Schedule 1 Threatened	Threatened	Moderate – suitable habitat West of Ominnik Marsh	Yes
Chaetura pelagica	Chimney Swift	Threatened	Schedule 1 Threatened	Threatened	High – confirmed presence in Townsite	Yes
Chordeiles minor	Common Nighthawk	Threatened	Schedule 1 Threatened	Threatened	Moderate – found in association with rural and urban habitats/ open areas	Yes
Contopus cooperi	Olive-sided Flycatcher	Threatened	Schedule 1 Threatened	Threatened	Moderate – habitat includes tall trees near swamps, suitable area west of Ominnik Marsh	Yes
Contopus virens	Eastern Wood-pewee	Special Concern	-	-	Low – edges of forest; successional growth	No
Coturnicops noveboracensis	Yellow Rail	Special Concern	Schedule 1 Special Concern	-	Moderate – marshes	Yes
Cygnus buccinator	Trumpeter Swan	-	-	Endangered	Moderate– marshy shores	Yes
Dolichonyx oryzivorus	Bobolink	Threatened	-	-	Moderate – Suitable habitat West of sewage lagoon	Yes
Euphagus carolinus	Rusty Blackbird	Special Concern	Schedule 1 Special Concern	-	Low – migration only	No
Falco peregrinus	Peregrine Falcon	Special Concern	Schedule 1 Special Concern	Endangered	Low – no suitable nesting habitat; rare in park	No
Hirundo rustica	Barn Swallow	Threatened	-	-	High – Suitable buildings/habitat in project area	Yes

Scientific Name	Common Name	COSEWIC Status[1]	SARA Status[2]	ESEA Status[3]	Potential for Presence near Project	Carried Forward in VC Assessment?
Hylocichla mustelina	Wood.Thrush	Threatened	-	-	Low– habitat composition not ideal; avoid fragmented areas; rare in park	No
Ixobrychus exilis	Least Bittern	Threatened	Schedule 1 Threatened	Endangered	Low – although habitat is marshes there is no observations in the Project area; rare in park	No
Lanius ludovicianus	Loggerhead Shrike	Threatened	Schedule 1 Threatened	Endangered	Low – found in agricultural/pasture; open country with short vegetation	No
Melanerpes erythrocephalus	Red-headed Woodpecker	Threatened	Schedule 1 Threatened	Threatened	Moderate – anthropogenic open areas; potential for dead trees	Yes
Phalaropus lobatus	Red – necked Phalarope	Special Concern	-	-	Moderate- wetlands	Yes
Podiceps auritus	Horned Grebe	Special Concern	-	-	High – lakes and wetlands; confirmed presence and nesting on South Lake	Yes
Riparia Riparia	Bank Swallow	Threatened	-	-	Low- lack of vertical banks in immediate area	No
Vermivora chrysoptera	Golden-winged Warbler	Threatened	Schedule 1 Threatened	Threatened	Moderate – within in bounding polygon of critical habitat; no suitable habitat noted in Project area	Yes
Mammals						
Gulo Gulo	Wolverine	Special Concern	-	-	Low – no confirmed sightings in area	No
Myotis lucifugus	Little Brown Myotis	Endangered	Schedule 1 Endangered	Endangered	High – presence of bats in Townsite and roosting in buildings; species unconfirmed so to assume SARA species	Yes
Myotis septentrionalis	Northern Long Eared Myotis	Endangered	Schedule 1 Endangered	Endangered	High – presence of bats in Townsite and roosting in buildings; species unconfirmed so to assume SARA species	Yes
Odocoileus hemionus	Mule Deer	-	-	Threatened	Moderate – not observed in Project area; suitable habitat	Yes
Taxidea taxus taxus	American Badger	Special Concern	-	-	Low – found in non-forested grasslands and shrublands	No
Insects						
Bombus terricola	Yellow-banded Bumble Bee	Special Concern	-	-	Moderate – potential for foraging habitat	Yes
Danaus plexippus	Monarch	Special Concern	Schedule 1 Special Concern	-	Moderate – host plants may be in area	Yes
Hesperia dacotae	Dakota Skipper	Endangered	Schedule 1 Threatened	Threatened	Low – native grassland and upland dry-mixed prairie	No

[1]COSEWIC – Committee on the Status of Endangered Wildlife in Canada (Government of Canada 2016b)

[2]SARA - *Species At Risk Act* (Government of Canada 2002)

[3]ESEA – The Endangered Species and Ecosystems Act (Government of Manitoba 1989)

Appendix V: Archaeological Overview Assessment

Stormwater Management Rehabilitation, Wasagaming Townsite Riding Mountain National Park

Brian Smith (FII)
Terrestrial Archaeology, IAD
February, 2017

Project information

The Riding Mountain Field Unit is proposing to undertake rehabilitation of the Storm Water Management system within Wasagaming townsite, primarily between Clearwater Lake and Ominnik Marsh (Figure 1). The project will include the installation of new infrastructure to redirect the storm water system away from Clear Lake to a catchment basin as well as a treatment system to incorporate filtration, settlement and hydrocarbon / grease interception prior to discharge into wetland. Parts of the existing system will be upgraded to increase capacity. Subsurface project impacts will include areas where directional drilling access pits will be excavated to install pipe and tie in locations (Stantec 2017).

Requested by

Florence E. Miller
Cultural Resources Management Advisor, Cultural Heritage Policies
Parks Canada / Government of Canada
145 McDermot Avenue, Winnipeg, MB., R3B 0R9
flo.miller@pc.gc.ca / Tel: (204) 983-8918

Archaeological Advice

The project will have limited potential impact subsurface resources due to a) the primary method of pipe installation is directional drilling that reduces actual surface disturbance; b) the majority of construction work (drilling and re-grading) will take place along existing roads, ditch-lines and established parking areas; c) only one known site (Boat House Site 91K) has been recorded in the Townsite, and this is well to the west of the present project and will not be impacted. Therefore, therefore there is no immediate concern that the horizontal drilling activities will have any potential to impact on buried archaeological resources. As the proposed design, methods and area of work will not likely significantly impact on previously unknown or significant buried archaeological resources, **an Archaeological Impact Assessment prior to work commencing will not be required.** However the following will be required.

Change of Scope

Any changes to the proposed plans must be submitted to Terrestrial Archaeology for review.

Accidental Finds Protocol

There could be a chance, however low, that features or artifact concentrations are encountered during work activities. If significant features (i.e., previously unknown structural remains and/or high artifact concentrations) or human remains are encountered, work should cease in the immediate area, the work area in relation to the findings photo documented and geo-referenced, and the Parks Canada project manager informed. The project manager should then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance that will in turn determine what will be required to mitigate the chance find.

Parks Canada, Terrestrial Archaeology Representative:

Brian Smith

Parks Canada | Parcs Canada
145 McDermot Ave. | 145, avenue McDermot
Winnipeg, Canada R3B 0R9
brianj.smith@pc.gc.ca
(204) 984-2962
Cell (204) 292-1208

Alternate Terrestrial Archaeology Representative

Donalee Deck

Archaeologist, Archaeology and History Branch
Parks Canada / Government of Canada
145 McDermot Ave., Winnipeg, MB, R3B 0R9
donalee.deck@pc.gc.ca / Tel: 204-984-5823 / Cel: 204-599-7467

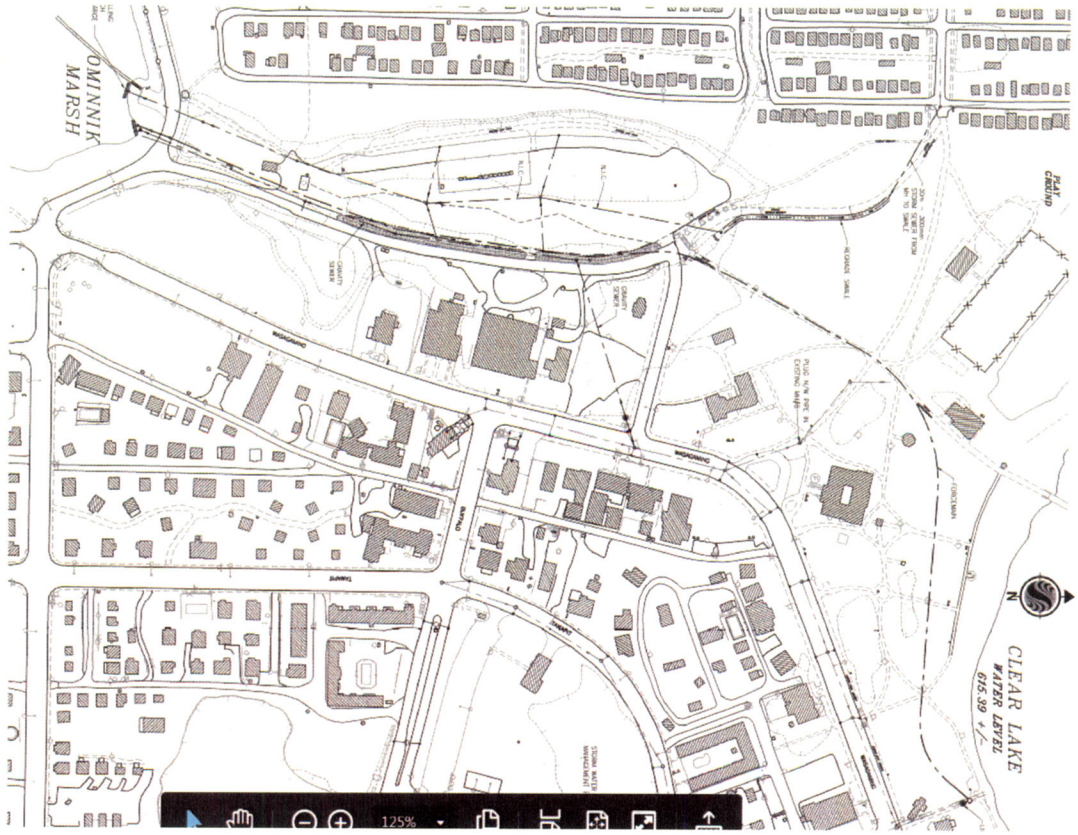


Figure 1 Location of Stormwater upgrade route between Clear Lake and outflow located at Ominnik marsh.

Appendix V: Effects Identification Matrix

Section A *focuses on direct effects of the project and* ***Section B*** *on indirect effects that are caused by changes to the environment.*

A. Direct Effects										
			Valued components potentially directly affected by the proposed project							
			Natural Resources					Cultural Resources		
			Air & Noise	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Archaeological Resources	Built Heritage & Viewplanes
	Phase	Activities							
Project Components	Preparation / Construction	Supply & storage of materials	☒	☒	☒	☒	☒	☐	☐
		Work limits staking	☐	☒	☐	☒	☒	☒	☒
		Staging & laydown	☒	☒	☒	☒	☒	☒	☒
		Disposal of waste	☐	☒	☒	☒	☒	☐	☐
		Transport of materials/ equipment	☒	☒	☒	☒	☒	☐	☒
		Vegetation clearing	☒	☒	☒	☒	☒	☒	☐
		Excavation	☒	☒	☒	☒	☒	☒	☒
		Grading	☒	☒	☒	☒	☒	☒	☐
		Backfilling	☒	☒	☒	☒	☒	☐	☐
		Drainage	☐	☒	☒	☒	☒	☐	☐
		Use of machinery	☒	☒	☒	☒	☒	☒	☒
		Pipe installation	☒	☒	☒	☒	☒	☒	☐
		Planting	☐	☒	☒	☒	☒	☒	☒
		Removal of temporary facilities	☐	☒	☒	☐	☐	☐	☐
	Operation	Use	☐	☒	☒	☒	☒	☒	☒
		Upkeep & maintenance	☒	☒	☒	☒	☒	☐	☒
		Waste Disposal	☐	☒	☒	☒	☒	☐	☐

B. Indirect Effects (all phases)							
		Impacts as a result of changes to the environment					
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:		With respect to visitor experience		
		Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes	Access & services	Recreation & accommod'n opportunities	Safety
Phase	**Natural resource components affected by the project**						
Preparation /construction/ operation	Could impacts to air and noise lead to adverse effects on...	☒	☐	☐	☐	☒	☐
	Could impacts to soils and landforms lead to adverse effects on...	☐	☐	☐	☒	☒	☒
	Could impacts to water (e.g. surface, ground water and water crossings) lead to adverse effects on...	☐	☐	☒	☒	☒	☒
	Could impacts to flora (including SAR) lead to adverse effects on...	☐	☐	☒	☐	☐	☐
	Could impacts to fauna (including SAR) lead to adverse effects on...	☐	☐	☒	☐	☒	☐
	Could impacts to archaeological resources lead to adverse effects on...	☐	☒	☒	☐	☒	☐
	Could impacts to built heritage or viewplanes lead to adverse effects on...	☐	☐	☐	☒	☒	☐

Appendix VI: Critical Habitat Destruction Analysis

Part A - General Information

Date this document was completed:	Where this activity will occur: (i.e., PCA site)	SAR (En, Th, Ex) implicated by this activity:	Title of proposed project (e.g., Trail development in Blue Meadow):	Author of this Document:	Collaborators involved in drafting this document:
03 Mar 2017	Wasagaming Townsite, Riding Mountain National Park	Golden Winged Warbler (*Vermivora chrysoptera)*	Wasagaming Stormwater Management Project	Shannon Landels, Resource Management Officer I	Joanne Tuckwell, Species Conservation Specialist

Part B – Determining whether the proposed activitiy(ies) affects critical habitat

1. **For the implicated SAR listed in Part A, does the proposed activity(ies) affect habitat within a bounding polygon of critical habitat identified in a recovery strategy or action plan?**
   - Keep in mind that, in some cases, activities occurring outside of a bounding polygon can affect habitat within the polygon.

☒ **No.** The proposed activity(ies) will not affect habitat within a bounding polygon of critical habitat. Critical habitat is not affected. No need to continue with analysis. **Check the first box in Part D and attach this analysis form to your assessment document.**

☐ **Yes.** The proposed activity(ies) will affect habitat within a bounding polygon of critical habitat for one or more SAR. **Continue to Question 2.**

Part D – Critical Habitat Destruction Decision

☒ **Project activities do not take place in, or otherwise impact, critical habitat.** There is likely no chance of project activities affecting critical habitat. **Attach this form to your assessment document.**

☐ **No destruction of critical habitat.** Although a small amount of critical habitat is degraded by this activity, the habitat function being impacted is still supported by the critical habitat at the relevant spatial scale for the implicated SAR. Therefore this activity will not destroy critical habitat. **Attach this form to your assessment document.**

☐ **Destruction of critical habitat.** Due to this activity, the function of the habitat being impacted is not supported at the relevant spatial scale for one or more SAR. Therefore this activity will destroy the critical habitat. **SARA Authorization will be required for your proposed project. Complete the SARA-Compliant Authorization Decision Form[1], checking off the "Yes" box in Question 1, Part A of the form. Attach this form to your assessment document.**

[1] http://intranet2/our-work/natural-resource-conservation-branch-test/species-at-risk-program/sara-authorizations/

Appendix VII: Mitigation Measures

(Adapted from Best Management Practices for 'Routine Projects in National Park Communities' and other related mitigations. Additional mitigations from DFO Measures to Prevent)

1 ENVIRONMENTAL BRIEFING/ESO RESPONSIBILITIES

1.1 All staff working on the Project site during the construction phase will attend a preconstruction Environmental Briefing regarding their individual and collective responsibilities to ensure that an avoidable adverse environmental impact does not arise from their activities and/or personal decisions. This includes but not limited to:

- 1.1.1 Confirmation of onsite spill kit locations and capacities
- 1.1.2 Relating pertinent information around SOMC (Species of Management Concern) for the site
- 1.1.3 Relating any wildlife conflict concerns and response measures
- 1.1.4 Review of work limits and any natural or cultural sensitive features
- 1.1.5 Review of Emergency Communications Protocol

1.2 The ESO assigned to the Project will conduct periodic and unscheduled visits to ensure Project operations are being conducted in accordance with identified environmental protection measures. The ESO retains the right to halt work or take control under emergency conditions.

2 SITE PREPARATION

2.1 A Traffic Safety and Management Plan must be submitted detailing any interruptions to traffic

2.2 Staging areas to be restricted to the footprint of the parking lot, existing roads or work limits. Any lay down areas outside of a paved or hardened surface to be staked on site, approved by Project Authority and communicated in an appropriate manner to all crew on site to ensure equipment and materials do not cause disturbance outside of approved areas.

2.3 Work limits will be staked out on site prior to any work. All methods of site staking/ marking to be removed at completion of the Project (eg: flagging tape, stakes etc).

2.4 Work site is to be closed to public during all construction activities and marked with appropriate signage while active construction, repair or maintenance is underway.

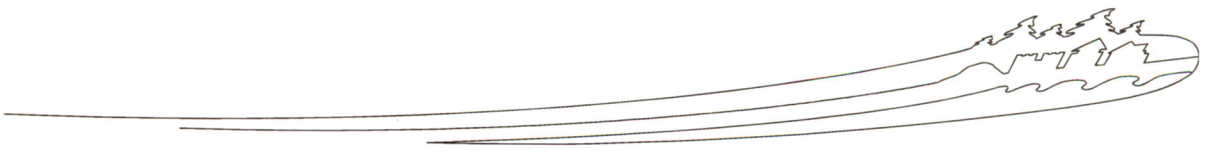
2.5 Willows located along the west side of the Large Parking Lot to be salvaged in advance of construction activities by Parks Staff in order to be replanted in the Project 828 Townsite Parking, Street, Trail Paving.

3 VISITOR SAFETY AND EXPERIENCE

3.1 Ensure that health and safety guidelines are followed during construction and that visitors are notified of activities as appropriate.

3.2 As much as possible, schedule noisy activities to minimise impacts to visitors and local business operations.

3.3 Maintain a clean and organized construction site. All construction waste, accumulated debris, litter and food garbage must be removed at the end of each day.



3.4 As necessary, install wayfinding signage to advise visitors of changes to existing routes of travel along paths, trails and roads as the result of construction area closures.

3.5 Communicate any changes to the Project schedule, activity or location of work to VE staff as soon as possible in order to ensure that necessary public communications and mitigations are completed in a timely fashion.

4 TIMING

4.1 September-March: Vegetation clearing should occur during winter months to reduce bird habitat disturbance and risk to individuals and vegetation. Nest sweeps to be performed by a qualified biologist prior to work if clearing or disturbance to vegetation areas is to be done from April 15 – August 31. Sweeps to be conducted by a qualified biologist.

4.2 Preconstruction amphibian sweeps to be conducted by ESO to detect any Northern Leopard Frog or other species in the proposed areas of impact. Efforts will be concentrated on Ominnik Marsh and west side of the Large Parking Lot.

4.3 Work is limited to within a half hour of sunrise and a half hour before sunset unless otherwise approved by Project Authority to mitigate risk to visitor safety and disturbance to bats.

4.4 Schedule work to avoid wet, snowy or rainy, and windy conditions that may result in increased erosion and sedimentation.

4.5 Soil stripping will be minimized to greatest extent possible and be timed accordingly to ensure limited exposure.

4.6 Fall spawning fish species exist in Clear Lake. Any work after September 15th (Fall Spawning Window) connected to the outfalls into Clear Lake must ensure flushes do not negatively impact fish spawning or eggs. This includes mitigating against sediment transport and large flows of water which would be unnatural for the time of year.

5 SOIL/WATER CONTAMINATION

5.1 If any previously undocumented contamination is found, cease work immediately. Inform the building site supervisor and, if necessary, implement Emergency Response Plan.

5.2 Prepare an appropriate Spill Response Plan. In the event of emergency operations call Emergency Services and/ or Parks Canada resource management staff via RMNP Dispatch at 1-877-852-3100. All spills must be reported (>1L).

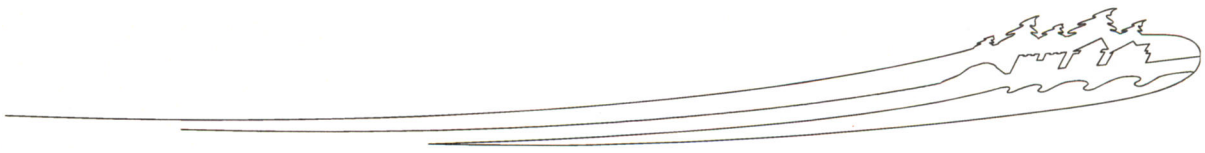
5.3 Have spill containment equipment on hand (with capability to clean up 110% of the site's largest possible fuel / chemical spill) and ensure that all personnel are trained in their use.

5.4 No rock, silt, cement, grout, asphalt, petroleum product, lumber, vegetation, domestic waste, or any deleterious material shall be placed or allowed to disperse into any water course adjacent to the site.

5.5 Excess material to be disposed of outside of RMNP.

5.6 During construction in close proximity to contaminated sites the following best management practices should be adhered to:

5.6.1 The liner installed at Townsite Washroom Parking Lot is to be exposed gently prior to work in the area in order to prevent damage and to identify the different contamination zones.



5.6.2 Soil and groundwater sampling as proximity to known contaminated site increases. Field screening of soil samples may be appropriate.

5.6.3 Appropriate disposal of potential contaminated drill cuttings and/or encountered contaminated soil or ground water as per applicable regulations. All contaminated wastes are to be disposed of at an appropriate facility.

5.6.4 Any soil and/or groundwater field screening/sampling/remediation/disposal is to be supervised and directed by a professional engineer/ geoscientist with appropriate experience in contaminated site management.

6 EROSION AND SEDIMENT CONTROL

6.1 Develop and implement an Erosion and Sediment Control Plan for the site that minimizes risk of sedimentation entering watercourses during all phases of the Project. This plan should include:

- 6.1.1 Installation of effective erosion and sediment control measures before starting work to prevent sediment transport. (ie: straw bales, landscape fabric, sediment fence, etc.)
- 6.1.2 Schedule of regular inspection and maintenance of erosion and sediment control measures and structures during the course of construction.
- 6.1.3 Repairs to erosion and sediment control measures and structures if damage occurs
- 6.1.4 Removal of non-biodegradable erosion and sediment control materials once site is established.

6.2 Use erosion and sediment control products that are

- 6.2.1 Made of 100% biodegradable materials (ie: jute, sisal or coir fiber) when at all possible.
- 6.2.2 Reduce potential for wildlife entanglement.
- 6.2.3 Certified weed free.

6.3 Phase excavation activities whenever possible and restore disturbed areas as soon as possible.

7 STORAGE/HANDLING MATERIALS

7.1 Protect undisturbed land by only stockpiling materials on heavy canvas or polypropylene tarpaulins to protect native vegetation in areas approved for laydown. Excavated materials will not be permitted to damage or bury plant material that is to be retained on the construction site or in adjacent areas.

7.2 Staging areas, transportation or equipment and materials to be restricted to the footprint of the proposed parking lot, existing roads or approved areas.

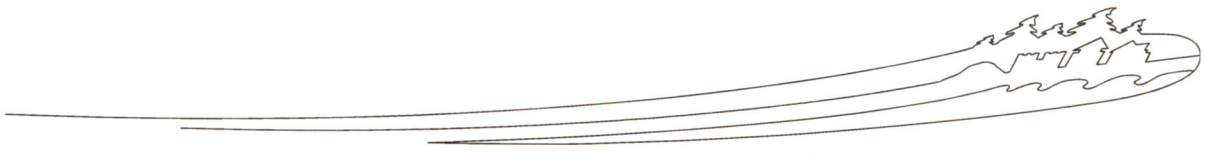
8 EQUIPMENT OPERATIONS AND MAINTENANCE

8.1 Ensure all construction equipment is free of leaks from oil, fuel or hydraulic fuels. It is properly tuned, in good working order and fitted with standard air emission control devices

8.2 Minimize idling of engines at all times.

8.3 Designate refuelling areas at least 100m away from any water body and on hardened surfaces.

8.4 Restrict vehicular travel and other equipment operation to the construction site and approved access routes.



8.5 Minimize construction footprint and avoid disturbance in sensitive areas outside of approved work limits such as Ominnik Marsh.

8.6 Vehicle parking will be restricted to specified areas of the construction site.

8.7 All equipment is to be clean of organic materials and free of invasive species and noxious weeds. Cleaning is to be conducted in an approved location before arrival on site. All equipment that could potentially be in contact with water (ie: hoses, pumps) are to undergo an assessment by the ESO to evaluate potential for equipment to be a vector for invasive aquatic species. If cause for concern is determined by the ESO, any and all equipment that could potentially be in contact with water will be pressure washed or steam cleaned to a temperature and duration specified by the ESO. Procedure is to be observed by ESO or documentation form an approved wash facility is to be submitted prior to arrival to site.

8.8 Operations of equipment within the drip line of trees not scheduled for removal should be limited where at all possible.

9 WASTE MANAGEMENT

9.1 Collect all waste, store appropriately and dispose trade waste and garbage at designated locations. Keep site in a tidy condition.

9.2 All garbage and food must be stored in bear proof bins or inside of vehicles.

9.3 Site to undergo clean up, including removal of general litter, survey stakes and flagging tape at Project completions.

10 CULTURAL RESOURCES

10.1 If significant features (i.e., previously unknown structural remains and/or high artifact concentrations) or human remains are encountered, work should cease in the immediate area, the work area in relation to the findings photo documented and geo-referenced, and the Parks Canada project manager informed. The project manager should then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance that will in turn determine what will be required to mitigate the chance find. (Appendix V: Archaeological Overview Assessment)

10.2 All cultural resources within RMNP are protected under the National Parks Act and Regulations and are the property of Parks Canada. All cultural resources found on the work site shall be reported to the ESO or the Departmental Representative immediately. The contractor and workers shall protect any articles found and request direction from the ESO or the Departmental Representative before work proceeds.

10.3 Any changes to the proposed plans must be submitted to Terrestrial Archaeology for review.

11 WILDLIFE MANAGEMENT

11.1 ESO is to be notified immediately of any dens, litters, nests, carcasses, wildlife encounters (for species of interest as directed by the ESO) or carnivore observations on or around the Project area. Any sensitive features identified may be awarded a setback distance for both physical and auditory disturbance.

11.2 If wildlife is observed at or near the work site, allow the animal (s) the opportunity to leave the work area to the surrounding habitat and away from areas of potential conflict.

11.3 If potentially dangerous wildlife (eg: bear, cougar, wolf, coyote, deer, elk, moose) persistently enter the work area or display aggressive behaviour, notify RMNP Dispatch (1-877-852-3100) immediately and safely evacuate area.

11.4 There will be absolutely no feeding, baiting, or luring of any wildlife. Do not approach or harass wildlife in any way.

12 REMOVAL OF VEGETATION

12.1 Ensure only necessary vegetation is removed and clearing limits delineated with biodegradable flagging tape and / or temporary fences.

12.2 Protect roots of trees not to be removed to the drip line to prevent disturbance or damage. Avoid any unnecessary traffic, dumping and storage of materials over root zone.

12.3 Use appropriate pruning and trimming techniques to avoid a tearing cut that strips bark and makes the tree vulnerable to disease.

12.4 Vegetation cleared is to be removed from site to prevent fuel accumulation for wildfires.

13 LARGE PARKING LOT GRADING

13.1 Soil stripping will be minimized to the greatest extent possible, and topsoil, where present, will be retained to facilitate recovery.

13.2 Gravel to be acquired from a clean source to ensure it is free of invasive or non-native plant species. Source to be inspected and approved prior to use by Resource Conservation staff.

13.3 Minimize grading and excavation on windy days to limit dust production.

13.4 Minimize grubbing and stripping. Care must be taken to ensure trees and roots on the edge of the cleared area are not to be disturbed.

14 OMINNIK MARSH OUTLET INSTALLATION

14.1 Any rock for armouring is to be acquired from a clean source to ensure it is free of invasive or non-native plant species. Source to be inspected and approved prior to use by Resource Conservation staff.

14.2 Fish salvage of all species is to be performed by Parks Canada qualified technicians prior to any work below the high water mark in Ominnik Marsh.

14.3 Minimize duration of in-water work and conduct during periods of low flow. Avoid wet, windy and rainy periods.

14.4 Ensure that building materials used in a watercourse is handled and treated in a manner to prevent the release or leaching of substances into the water that may be deleterious to fish.

14.5 Minimize clearing of riparian vegetation including removal of natural woody debris, rocks and other materials. If removed set it aside and return it to the original location once construction activities are completed where possible.

14.6 Immediately stabilize shoreline or banks disturbed with appropriate sediment and erosion control and native vegetation.

15 SEEDING

15.1 Any materials brought to site (ie: topsoil) is to be approved by the ESO by inspection of vegetation at the source site during the growing season. Material from a source with invasive or non-native plants present is subject to rejection. As an alternative, soil amendments may be used to enhance existing soil on site.

15.2 Any reseeding for ground cover (ie: grass) is to be done with a seed mix approved by the ESO. Seed shall be minimally Certified Canada No. 1 Grade quality seed varieties, in accordance with the Canadian Seeds Act and Regulations, and having a minimum purity of 95% and germination of 80% with a combination of purity and germination that provide a Pure Living Seed of 80%. Seed shall be free of impurities and disease. A seed analysis certificate must be provided to Park Canada Project Authority from an accredited laboratory and must be approved before purchase is finalized and any blending of seed-lots into a mix. Seed shall be free of impurities, disease and invasive or non-native plants.

15.3 Follow up monitoring is to be conducted by Parks Canada for vegetation success and presence of invasive plants.

16 POST CONSTRUCTION MONITORING

16.1 To minimize the establishment and spread of invasive plants, post construction monitoring is to take place by the assigned ESO as recommended.

16.2 Stormwater inputs into Clear Lake have been monitored for ten years with storm discharge monitoring at outlets into Clear Lake. It is recommended that similar monitoring to continue following the construction phase to evaluate the efficiency of the upgraded system. In addition, it is recommended that water quality monitoring of sites in the Octopus Creek/ Ominnik Marsh/ Boat Cove/ South Lake connection continue to be monitored to evaluate the effects of the inputs into Ominnik Marsh. Improvements to the current monitoring should include:

- Standardization of variables such as flow through outfall before sample collected and number/ intensity of rainfall events prior to sampling event,
- Collection of samples from a control site (ie: Spruces Creek) during storm events to better understand natural input levels into Clear Lake, and
- Incorporation into the continuing monitoring of the sites in the Octopus Creek/ Ominnik Marsh/ Boat Cove/ South Lake connection.

17 MAINTENANCE PROTOCOL

17.1 A maintenance protocol is to be developed for the upkeep of the Stormwater Management System.

17.1.1 Schedule of clean out of Oil and Grit separators to ensure they maintain efficiency and don`t overflow.

17.1.2 Routine precautionary maintenance procedures such as washing equipment for invasive species, identifying location of spill kits and proper storage/ disposal of wastes.

17.1.3 Timing and magnitude of line flushing as to not negatively impact fish habitat through temperature fluctuations or sediment transport.