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FUNCTIONAL SERVICING REPORT

Submitted to

RIC (Moore Drive) and RIC (Highway 28) Inc.

Kawartha Downs Redevelopment
Water & Wastewater Treatment Servicing Report

Clearford Project EH21-080

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Appendices

1.0 INTRODUCTION

The proposed redevelopment of the Kawartha Downs site is expected to comprise both an expansion to the existing casino and entertainment facilities as well as an adjacent rural, residential subdivision of 517 homes. RIC (Moore Drive) and RIC (Highway 28), the proponents behind the site development proposal, retained Clearford Water Solutions, a division of Clearford Water Systems Inc. (Clearford) to prepare the *functional servicing* plans for the sanitary servicing of the redeveloped site.

The site – presently consisting of the casino, offices, horse racing track, motorized vehicle racing track, and support buildings - is provided with *on-site* water (cistern with hauled water supply) and wastewater sanitary servicing, including a packaged wastewater treatment plant (WWTP) with a rated capacity of sixty cubic metres per day (60 m^3/d) with outlet to discharge the treated effluent via a shallow, subsurface disposal trench.

The existing, packaged wastewater treatment system is approved and can be operated under Environmental Compliance Approval (ECA) no. 2018-5TXLQ5; however, wastewater generated at the site is presently pumped from the equalization tanks and hauled for off-site disposal at a municipal wastewater treatment facility due to the condition of the existing equipment. The existing WWTP will not provide sufficient capacity to service the entirety of the proposed new entertainment complex and homes, and an amended servicing design will be required.

The present on-site systems - including hauled sewage disposal – will continue to provide servicing to the *existing site uses*. An interim servicing plan for the expanded and redeveloped entertainment complex - consisting of a modular, expandable containerized WWTP discharging to a subsurface disposal bed - shall be provided to manage the sanitary flows from the initial expansion of the commercial and entertainment sector and will operate until the residential development and major expansion of the entertainment complex development proceeds.

1.1 Background

The site is located at 1382 County Road 28 Fraserville ON and comprises the casino, racetrack and adjunct buildings, and maintenance facilities as shown in Figure 1.

The L-shaped site is approximately 108 ha (267 acres) and consists of multiple parcels with varying zoning. The northern portion of the site is vacant fields zoned agricultural. The southern and eastern areas include the existing site sanitary infrastructure. The site is bordered by natural core, rural residential, and agricultural areas to the west, hamlet residential and agricultural to the south, County Road 28 to the north and Moore Drive to the east.

The WWTP includes both on-grade, modular and mobile equipment as well as below-grade pre-cast concrete process tanks and a lined, recirculating, tertiary denitrifcation filter cell filled with wood chips and related material. The existing infrastructure is located at the south (rear) side of the casino adjacent to the maintenance buildings. The sanitary servicing area is marked on Figure 2.

The proposed redevelopment is shown in Figures 3 (developable lands) and 4 (site plan). The redesigned entertainment complex includes both a retrofitted casino with an adjoining 200 room hotel and multi-use venue as shown in Figure 5 Figure 5 also indicates the proposed location of the sanitary treatment system (water treatment plant). The site will retain the horse track; however, the centre area of the existing track will be redeveloped to include an outdoor FIFA sized soccer field, an amphitheatre for outdoor concerts and public washrooms. The northeast corner will house a tractor pull and agri-fair area to support the local farming community and history.

The housing development shall be to the west of the entertainment area, and comprises 517 homes. The residential component shall be developed as free hold homes in a conventional, rural subdivision model.

Construction at the site shall initially focus on the redeveloped entertainment sector, followed by the phased construction of the residential development. Communal or decentralized servicing shall be provided for both the entertainment and residential components as the development proceeds.

Figure 1 Existing site layout and configuration.

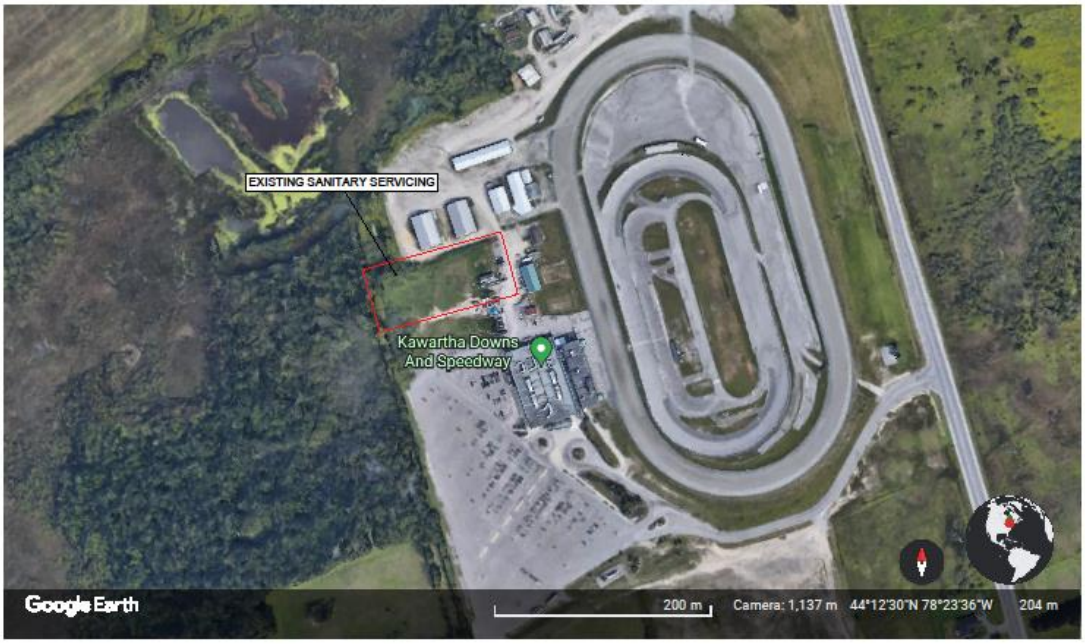


Figure 2 Existing site layout showing sanitary servicing area with disposal trench and subsurface filter.

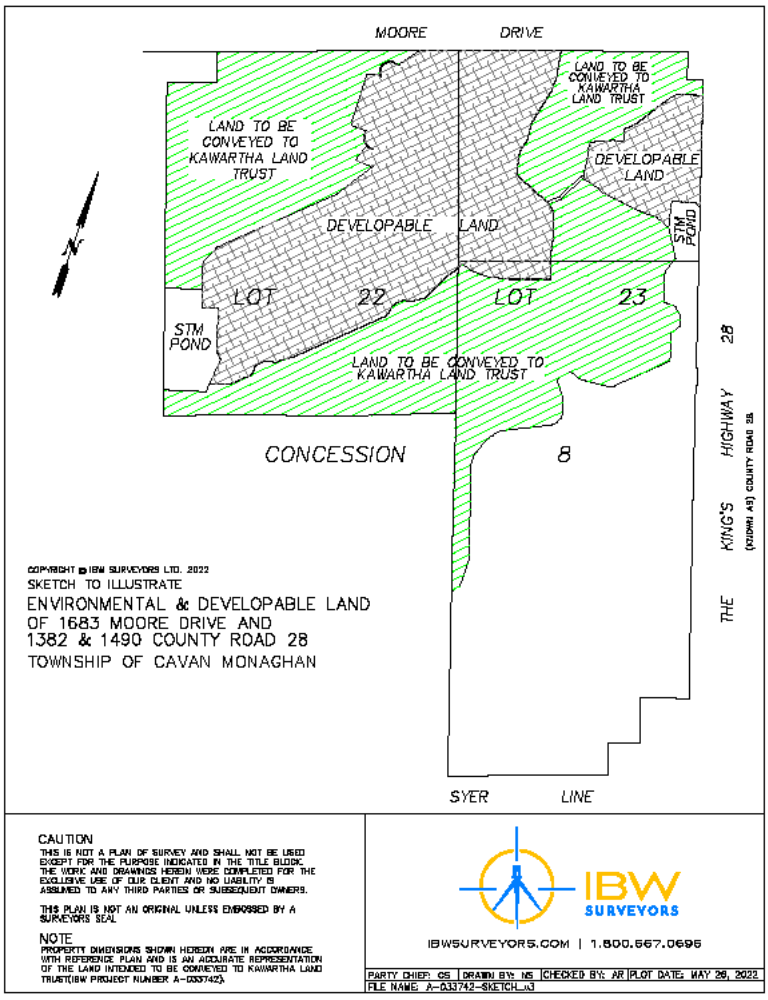


Figure 3 Proposed site plan showing developable and non-developable lands.

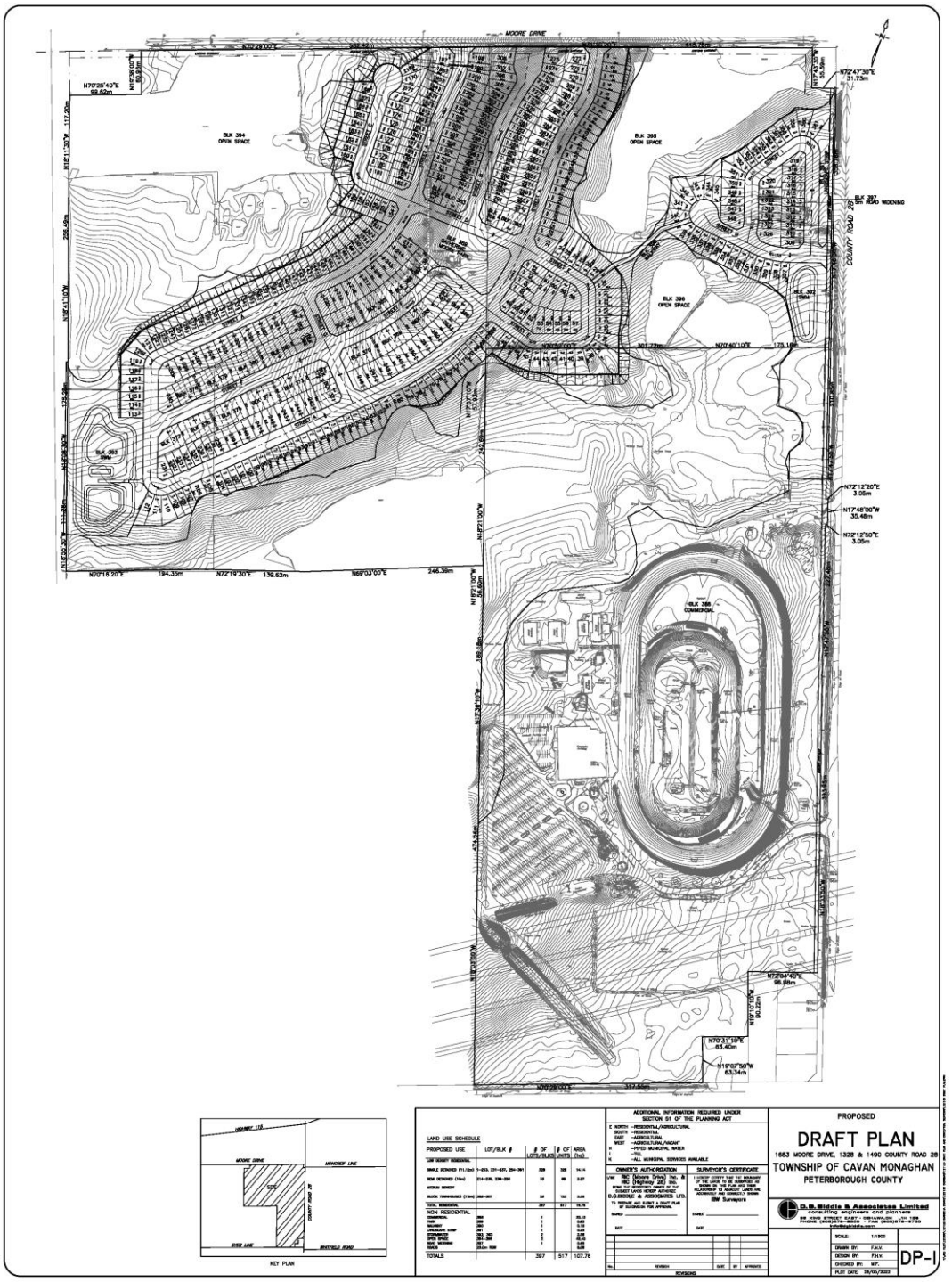


Figure 4 Site plan for Kawartha Downs redevelopment.

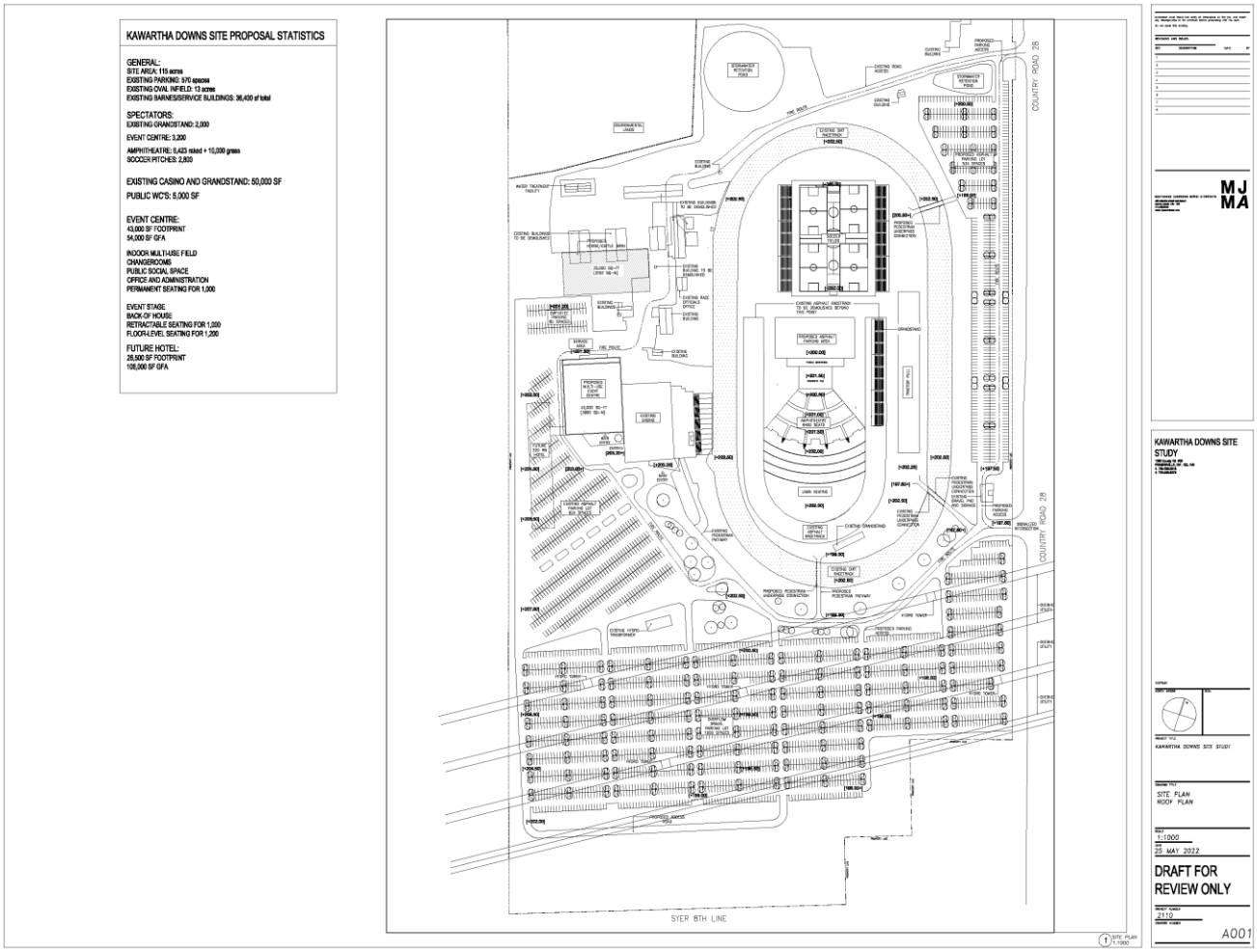


Figure 5 Exploded view Commercial-Entertainment Sector Redevelopment. Note sanitary servicing location.

2.0 SYSTEM DESIGN BASIS

The entertainment venues include multi-use facilities with shared washrooms (casino, park/amphitheatre, soccer field) and a new hotel. The *estimated* sanitary flows from the entertainment facilities are 100 m^3/d (*Wastewater Feasibility Study*, Cambium Inc., 2021).

The residential development shall consist of a mixture of detached single-family homes, semi-detached single-family homes, and townhomes. A total of 517 homes are proposed to be constructed on the site.

All of the above require sanitary servicing, as set out in the following sections.

2.1 Water System Description

2.1.1 Water Supply and Distribution

Cambium Inc. undertook a detailed water servicing feasibility review for the proposed site development in 2021 (Appendix A). Their work included a review of existing on-site wells and nearby production wells, as well as a survey of hydrological and hydrogeological features, to determine if a suitable water supply source could be found on site.

Their conclusion was no suitable on-site supply existed, and off-site supply was recommended.

The Cambium (2021) report noted the Township of Cavan-Monoghan had purchased a property with the intent of increasing the supply of municipal, potable water to the Fraserville settlement area. The subject property is located at 1256 Syer Line, approximately 5km from the Kawartha Downs site. The supply well installed at the Syer Line site in overburden sediments was pumped continuously for 72 hours and provided a potential yield of ~9000L/min based on the pumping rate and extrapolation of *Specific Capacity*.

The proponents for the site development have purchased a property on Moore Road abutting the Syer Line property. This site is provided with wells that are expected to provide similar water quality to that of the Syer Line wells, with potentially higher yield. This supply source is presently undergoing yield testis to determine the safe rate of supply.

The proponents intend to construct an off-site groundwater treatment and supply system, with the *long-term objective* to transfer ownership to the municipality. The groundwater treatment and supply system is expected to consist of treatment in accordance with Schedule 2 of O.Reg 170/03 for a secure groundwater supply, including secondary disinfection; however, due to the long transmission main and expected cyclic demand from the site, on-site storage to provide *maximum day flow* and meet the diurnal peak hour flow requirements *may* be required. This supply may be connected to the proposed future municipal supply from the Syer Line site to ensure a long-term, stable potable water source for the municipal development area and adjoining employment lands.

On-site water distribution shall consist of storage to provide peak hour flows, with jockey/duty pumps to meet low and average day demand flow. Peak hour flow shall be provided using multiple pumps in parallel operation to meet the short duration, diurnal peak increase in water demand. In line instrumentation shall provide continuous monitoring of water quality, pressure and flow.

Water distribution shall be through two (2) main ‘branches’ – branch one will service the entertainment complex and associated facilities through a private plumbing system, while branch two will serve the proposed residential development as a municipal water distribution system (WDS).

The mixed-use water system shall be regulated under the more stringent regime as a municipal residential system, requiring both a municipal water works permit and an Engineering Evaluation Report (EER). The municipal WDS servicing the residential development shall require approvals issued by the Ministry of the Environment, Conservation and Parks (MECP).

2.1.2 Water Design Flow

Potable Water Flows Water

MECP *Guideline D5-5* and the *Design Guidelines for Water Works* (2008) were used to determine the water demand for the site (Table 1).

Residential Units	***Occupancy (pers per unit)***	***Per Cap Flow (l/day)***	***Avg Day Flow (l/d)***	***Avg Day Flow (l/min)***
517	2.4	450	558,360	388
Entertainment	-	-	100,000	69
Total Avg Day Flow	-	-	658,360	457
Peaking Hour				5,500*

**Water Supply Summary*, Cambium Inc. (2021)

Table 1 Water Design Flow Basis

Fire Fighting Water

Fire fighting water for the proposed development shall be provided from on-site storage. MECP *Design Guidelines* recommend storage to meet 25% of the ADF flow plus fire flow requirements. Fire flow requirements vary with municipality; however, the general range is 950 l/min to 1,900 l/min for a minimum duration of 25 min.

Site water storage shall be sized to accommodate the fire fighting requirements for the development. Supplementary fire fighting water shall be available on site via the SWM ponds to provide additional flow, if required.

2.2 Wastewater Collection and Treatment

The proposed site includes a redeveloped entertainment area as well as the residential development. The selected location for the servicing bloc (Figure 3) is adjacent to the maintenance and facilities buildings, separated from the residential development by the wetland area and from the hotel by the adjunct facilities buildings.

Sewage flows are expected to be distributed across the site, and the topography (Figure 4) indicates that sewage collected by gravity will need to be pumped to the communal wastewater treatment facility. Sewage pumping stations shall convey the wastewater from the residential subdivision to the sanitary servicing block, while flows from the entertainment centres shall flow by gravity to the equalization tanks in the treatment system.

Cambium Inc. undertook a detailed wastewater servicing feasibility review for the proposed site development in 2021 (Appendix B). Their work included a discussion of continued use of the existing on-site system, and an expansion of the sub-surface beds to service the entire development. Their conclusion was no suitable on-site area was sufficient to provide sub-surface disposal to service the entirety of the proposed development.

The Cambium (2021) report reviewed a number of options for *on-site treatment systems* including conventional activated sludge (CAS), extended aeration (EA), sequencing batch reactor (SBR), and membrane bioreactor (MBR) systems. All technologies reviewed included tertiary disinfection to reduce effluent *e. coli*. prior to discharge.

A modular, packaged wastewater treatment system was determined to be the *preferred option* to provide sanitary servicing for the site (Cambium 2021). The use of a modular treatment system will provide the ability to scale the treatment to match the build-out of the development, avoiding the problems associated with constructing too large or too small a treatment system while permitting phased development of the site. as well as demonstrating the ability to meet the expected stringent effluent limits associated with the surface water receivers in this area.

The wastewater treatment system shall require an ECA issued by the MECP. Pre-consultation with the MECP and the Otonabee River Conservation Authority (ORCA) is required as part of the planning process, and a request for pre-consultation has been submitted to the MECP on behalf of the proponents. A preliminary walk-down of the site with the MECP to describe the proposed development and the proposed areas for servicing and treatment was held in April 2022.

2.2.1 Effluent Receiver

The increase in site flows associated with the build out of the residential development is expected to require a change in effluent receiver from groundwater to surface water.

There are three (3) potential receivers in close proximity to the site,

- The Otonabee River, approximately 3 km from the proposed WWTP with the effluent forcemain following a municipal road allowance to a shore-based outfall;
- Cavan Creek, a tributary to the Otonabee Rvier, approximately 2 km from the proposed WWTP; and,
- The wetland complex proximal to the site infrastructure.

All three (3) potential receivers outlet to Rice Lake, with both Cavan Creek and the wetland complex discharging to the Otonabee River as an intermediate receiver.

Earlier reports prepared under the Fraserville Master Servicing Plan Environmental Assessment (EA) included earlier work by XCG Ltd. (2006) to determine the assimilative capacity of both Cavan Creek and the Otonabee River at Fraserville. This early work identified expected, stringent limits on both Total Phosphorus (TP) and Total Ammonia Nitrogen (TAN) of 0.1 mg/l and 2 mg/l (summer) and 4 mg/l (winter), respectively.

The receivers all fall under the *Bay of Quinte Remedial Action Plan (BQRAP)* and specifically the Phosphorus Management Plan, which aims to maintain the TP limit for WWTPs discharging to the watershed at 0.1 mg/l. New discharges, which the Site WWTP would qualify as, require availability of TP credits for discharge.

The expected TP loading at full site build out and an effluent limit of 0.1 mg/l is 0.044 kg TP/d under ADF and MDF loading at 0.078 kg TP/d. The loading may be further reduced through a number of actions including but not limited to,

- Recommended effluent limit of 0.08 mg/l, achievable with a '*Best Available Treatment Economically Achievable' (BATEA)* MBR configuration. This change will reduce the ADF loading to 0.035 kg TP/d and MDF loading to 0.06 kg TP/d;
- Discharging through a wetland interim receiver with outlet to a tributary to the Otonabee River will provide additional nutrient uptake before the Otonabee River, reducing the impact on the river, Rice Lake and ultimately the Bay of Quinte; and,
- Re-use of storm water on site to lower off-site discharge and associated TP loading. Beneficial reuse via landscape irrigation and fire water reserve will reduce the volume of water discharged off site and he overall loading of TP discharged to the Bay of Quinte watershed.

The low TP requirement suggests the use of BATEA systems for the on-site wastewater treatment system. MBR technology is considered BATEA with respect to low effluent TP, providing a positive barrier (membrane filtration) to the passage of floc and pin floc generated in the wastewater treatment process. This recommendation differs from the preliminary findings presented by Cambium (2021) which did not recommend MBR systems as a result of expected higher capital and operating costs.

MBR technology lends itself to scaled or phased construction, permitting additional modules to be added as the demand increases with build out of the site. Modular MBR systems provide a relatively small footprint compared to conventional activated sludge (CAS) systems commonly employed in municipal facilities. The ability to realize treatment in a contained, small footprint using modular technology is the recommended servicing option for the site.

The proponents shall make application to the Municipality for the use of existing BQRAP discharge credits, and the proposed WWTP shall be developed and constructed as a municipal facility servicing a municipal subdivision outside of the traditionally serviced area.

2.2.2 Wastewater Flows

The MECP *Design Guidelines for Sewage Works* (2008) was used to provide an estimate of the sewage flows for the residential development (Table 2).

Residential Units	**Occupancy (pers per unit)**	**Per Cap Flow (l/day)**	**Avg Day Flow (l/d)**
517	2.4	275	341,220
Entertainment	-	-	100,000
Total Avg Day Flow	-	-	441,220
Peaking Factor	2	-	782,440

Table 2 Wastewater Design Flow Basis

2.2.3 Wastewater Quality

The *MECP Design Guidelines for Sewage Works* (2008) recommend the following influent quality for the proposed development (Table 3).

Parameter	***Concentration (mg/l)***
$cBOD_5$	150 to 200
TSS	150 to 200
TP	6 to 9
TKN	30 to 40
TAN	20 to 25

Table 3 Literature influent sewage characteristics

Clearford experience as the Operator for *similar communal, residential and commercial developments* suggest the *realized* influent composition will be closer to the values in Table 4.

Parameter	***Concentration (mg/l)***
cBOD5	250 to 325
TSS	300 to 400
TP	12 to 18
TKN	50 to 70

Table 4 Expected influent sewage composition

The earlier assimilative capacity (2006) and effluent criteria imposed for similar mixed-use developments of comparable size discharging to surface water receivers suggest the following effluent limits, subject to confirmation through consultation with the MECP and ORCA. The expected effluent criteria are presented in Table 5.

Parameter	***Limit (Objective) (mg/l)***
$cBOD_5$	5 (10)
TSS	5 (10)
TP	0.08 (0.06)
TAN	2 (summer)/4 (winter) (1 summer/3 winter)
e. coli	100 CFU/100 ml (non-detect)

Table 5 Expected effluent quality limits and objectives

2.2.4 Proposed Site Sewage Works

The site shall ***initially*** be serviced by a single SBR system with integrated denitrification. The system shall mirror the existing system at the site; however, new equipment will be required to ensure it is operable and able to continuously meet the effluent objectives.

The ***expanded site development*** shall be serviced by a modular MBR packaged treatment system (Newterra or equal) and comprised of the following unit operations,

- Screening;
- Equalization/pumping;
- Aeration/biological reduction;
- Chemical addition/coagulation;
- Membrane filtration;
- Disinfection (ultraviolet or equal); and,
- Effluent equalization and discharge pumping.

The wastewater treatment system is expected to be enclosed and provided with odour control due to the proximity to sensitive uses on the site.

Examples of similar operating facilities and environmental approvals in Ontario are provided in Appendix A.

2.3 Summary of Servicing

2.3.1 Water

The proposed site development shall be provided water from an off-site, municipal source supply which provides treatment in accordance with the requirements of Schedule 2 under O.Reg. 170/03. Water shall be provided to the site via a dedicated supply main at a rate matching the ADF demand of 457 l/min.

Water shall be stored on site in dedicated on-grade storage facilities, provided with booster chlorination systems to ensure adequate provision of secondary disinfection and distributed to the development areas by on-site pumping systems with in-line instrumentation to ensure continuous monitoring of water quality, flow and pressure. The distribution pumps shall be sized to meet the expected peak flow requirement of 5,500 l/min.

Firefighting water shall be provided for the site through on-site storage and pumping in the distribution system. Supplementary fire water may be provided through the site SWM storage.

2.3.2 Wastewater

Wastewater generated on site shall be collected by conventional gravity sewers and pumped to the communal wastewater treatment facility by a minimum of two (2) pumping stations.

A modular MBR treatment system with a rated capacity (ADF) of 500 m3/d and peak day capacity of 1,000 m3/d shall be provide to treat the influent sewage to meet the expected effluent limits presented in Table 4.

The treated effluent shall discharge to an interim wetland surface water receiver proximal to the proposed development.

3.0 CONCLUSIONS AND SUMMARY

The proposed Kawartha Downs redevelopment encompasses both an expanded entertainment and commercial sector as well as a new residential development planned for 517 new homes. The site sanitary servicing flows are summarized in Table 6.

	Average Day (m3/d)	Maximum Day (m3/d)	Peak Hour (l/min)
Potable Water	560	1,200	5,500
Wastewater	500	1,000	

Table 6 Summary of servicing flows required.

The site shall be provided with water from an off-site municipal supply. Water shall be stored on site and distributed to the site areas for use via dedicated pumping.

Wastewater shall be collected from site areas and conveyed via pumping stations to a communal wastewater treatment facility. The treatment system shall comprise a modular MBR system, providing BATEA quality effluent to meet the expected stringent discharge limits associated with a surface water receiver and potential 'dry ditch' conditions. The system will discharge treated effluent through a wetland to reduce TP loading on the receiver. Ultimately there is possibility to provide a future forcemain to support discharge directly to the Otonabee River.

The modular treatment system shall be designed with future expansion in mind to potentially provide servicing to adjacent employment lands.

4.0 LIMITATIONS

The conclusions and recommendations (where offered) presented in this servicing report are based, in part, on the findings of reports prepared by Others, and interviews conducted with the proponents. Any conclusions cannot and are not extended to information or records which were not reasonably available, in Clearford's opinion, for direct observation and review.

It should be noted that Clearford is an engineering and operational organization and, therefore, the contents of this report should not be interpreted as providing legal advice, opinions or interpretations.

No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of the Contract, or the conclusions presented.

The conditions at the proposed site were assessed, within the limitations set out above, having due regard for applicable Regulations and procedures as of the date of the inspection, as well as original design drawings and reports where available.

The site history research included obtaining information from third parties and employees or agents of the proponents. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in the report.

This report is for the sole use of the RIC (Moore Drive) and RIC (Highway 28) Inc., to whom it is addressed, unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Clearford accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.

Appendix A 2021 Cambium Report on Water Supply

Appendix B 2021 Cambium Report on Wastewater Treatment

Appendix C Preliminary Design Drawings, Wastewater Treatment System

KAWARTHA DOWNS SITE PROPOSAL STATISTICS

GENERAL:
SITE AREA: 130 acres
EXISTING PARKING: 670 spaces
EXISTING OVAL INFIELD: 13 acres
EXISTING BARNS/SERVICE BUILDINGS: 39,400 sf total

SPECTATORS:
EXISTING GRANDSTAND: 2,200

EVENT CENTRE: 3,230

AMPHITHEATRE: 8,420 raked + 10,000 grass
SOCCER PITCHES: 2,800

EXISTING CASINO AND GRANDSTAND: 60,000 SF

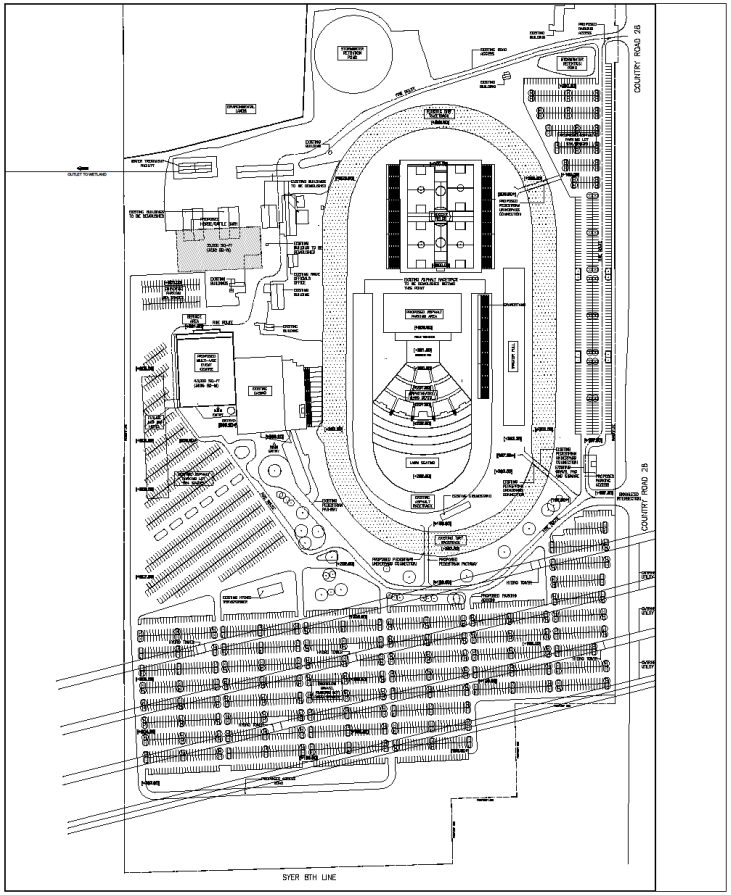
PUBLIC WC'S: 6,000 SF

EVENT CENTRE:
45,000 SF FOOTPRINT
54,000 SF GFA

INDOOR MULTI-USE FIELD
CHANGEROOMS
PUBLIC SOCIAL SPACE
OFFICE AND ADMINISTRATION
PERMANENT SEATING FOR 1,200

EVENT STAGE
BACK-OF HOUSE
RETRACTABLE SEATING FOR 1,200
FLOOR-LEVEL SEATING FOR 1,200

FUTURE HOTEL:
36,000 SF FOOTPRINT
108,000 SF GFA



	DESIGNED BY:	REVIEWED BY:	No.	REVISIONS	DATE dd/mm/yyyy	INITIAL	PROJECT No.	CONTRACT No.	CLIENT: KAWARTHA DOWNS
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							DRAWN BY: PF		
							CHECKED BY:	ISSUE No: 00	
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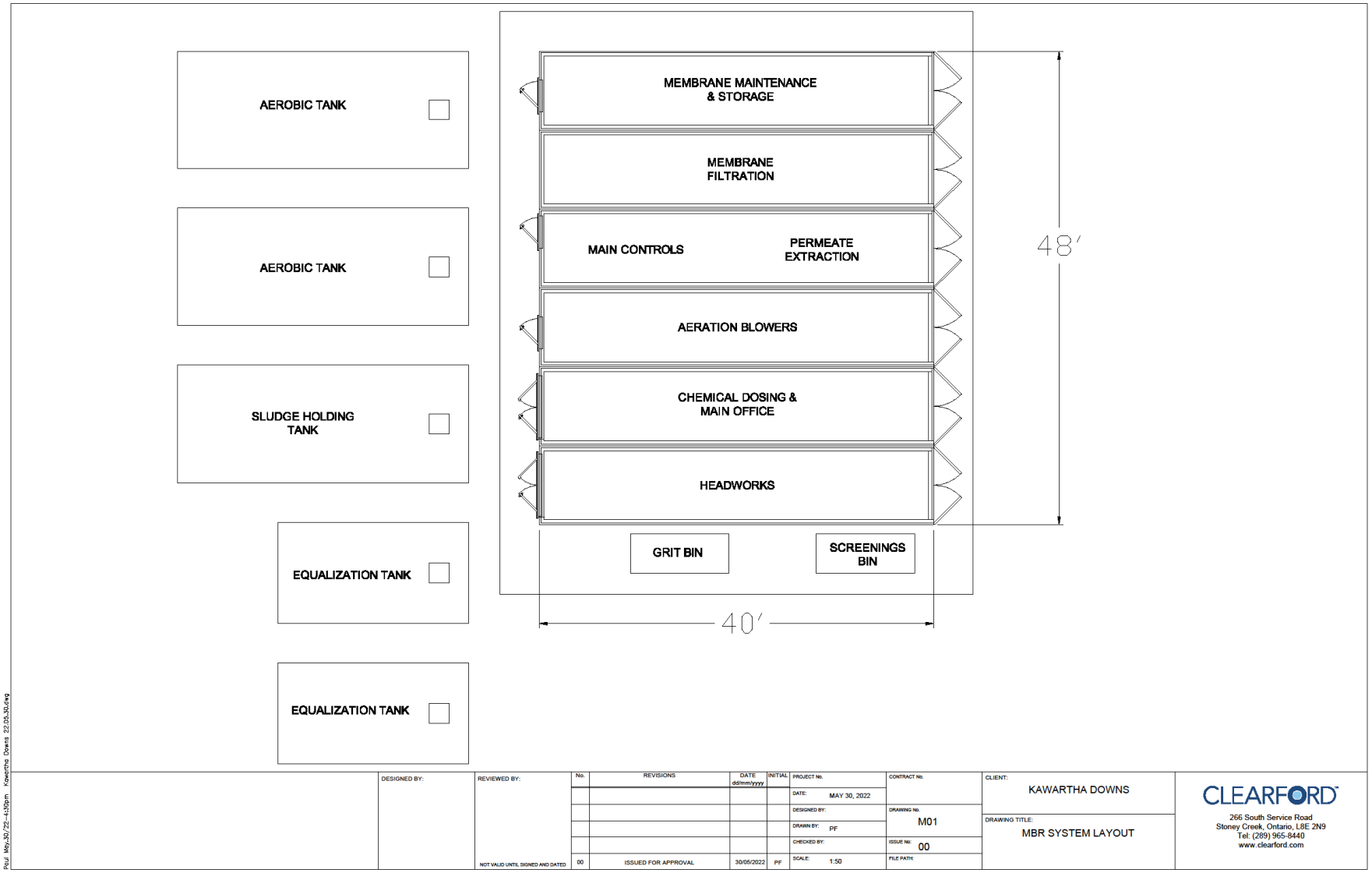
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AERATION BLOWERS
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DRAWING TITLE: MBR SYSTEM LAYOUT
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Appendix D Examples of Similar Facilities and Approvals


Draft Print
11/18/2021 10:07:37 PM
a 500m3 newterra plant
similar to our proposal


newterra
Draft Print
11/18/2021 10:07:37 PM
expandable modular treatment train