FarSight Communal Water System

Conceptual Design Report

Final

Prepared for:

FarSight Homes

RVA 237294

February 25, 2025

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February 25, 2025

FarSight Homes
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Attention: Robert Schickedanz

Dear Sir (Mr. Schickedanz):

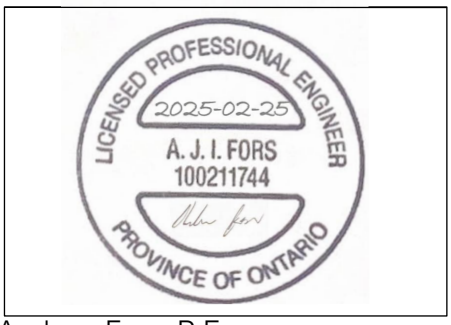
Re: Conceptual Communal Water System Design
Hamlet of Ballantrae, Town of Whitchurch-Stouffville, Ontario

Please find the enclosed copy of the Conceptual Report for the referenced project for your review.

Please do not hesitate to contact the undersigned if you have any questions.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED



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Encls.

HAMLET OF BALLANTRAE, TOWN OF WHITCHURCH-STOUFFVILLE, ONTARIO CONCEPTUAL

COMMUNAL WATER SYSTEM DESIGN

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1.0 INTRODUCTION

R.V. Anderson Associates Limited (RVA) has been retained by FarSight Homes to undertake a Conceptual Communal Water System Design for a water system to support the development of 145 single-family residential lots on a 16-ha parcel in Ballantrae, Ontario.

This report has been prepared to provide a conceptual design for water servicing, including a property layout. It also establishes various key design parameters for the station, including the sizing of major equipment and providing a conceptual site and building layout. It is based on the considerable information available in various reports, studies, plans, and the regulatory framework impacting servicing.

2.0 BACKGROUND

The subject land is located in the southeast quadrant of Aurora Road and Highway 48. The land fronts onto Lakeshore Road, which runs east off of Highway 48, south of Aurora Road. The 16-ha land consists of three parcels with municipal address 5426, 5452 & 5584 Lakeshore Road. The frontage is approximately 580m on Lakeshore Road. Lakeshore Road forms the southerly limit of the land; to the west is developed residential land, and to the north and east are vacant fields. The land is in the Ballantrae Community of the Town of Whitchurch-Stouffville within the Region of York. See Figure 2.1 for the site location.

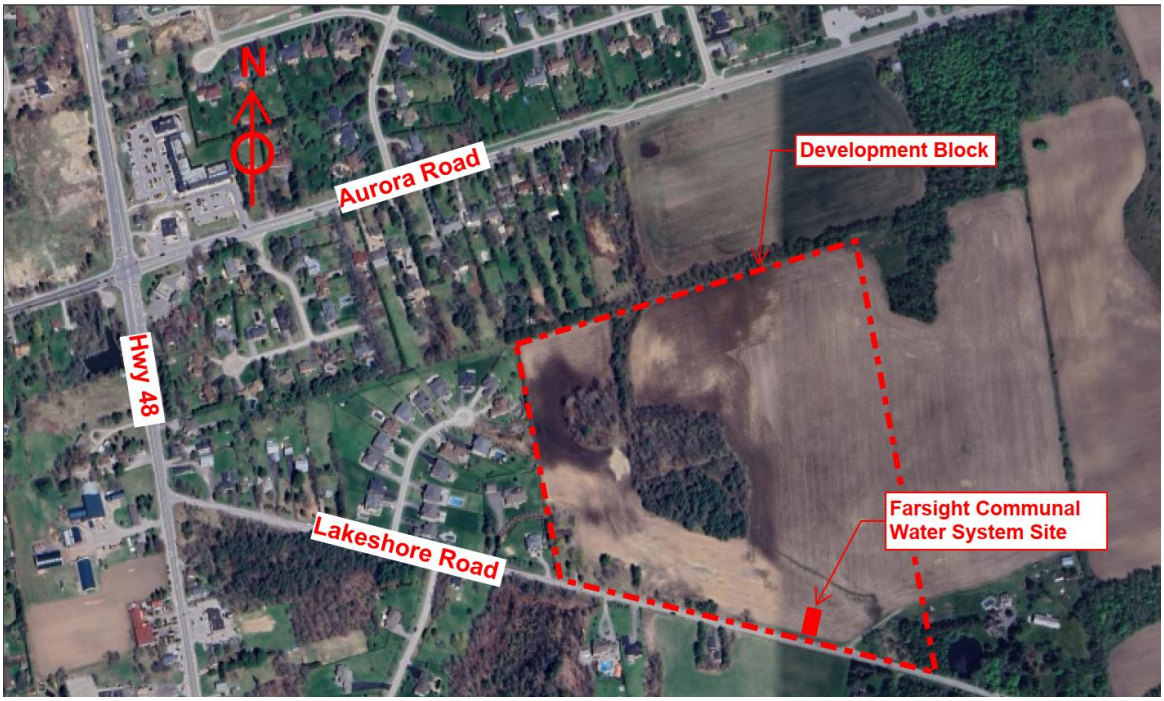


Figure 2.1 - Site Location

The Region of York has jurisdiction over the municipal water supply infrastructure (wells, treatment, and water storage facilities) and the Town of Whitchurch-Stouffville has jurisdiction over the local watermains and allocation of water supply. There is a 300mm diameter watermain within Lakeshore Road along the entire frontage of the subject land. To the north of the subject land is a 250mm diameter watermain along Aurora Road.

The proposed water servicing from a new private communal water supply was selected over a Municipal Water Service due to the water supply and storage service requirements. It is assumed that FarSight will provide operational water supply and services for the facility, not the Region of York, and because of this, not all Region of York Water Standards will need to be met. There is no plan to connect onto the existing watermain on Lakeshore Road.

A Desktop Groundwater Supply Assessment for Hamlet of Ballantrae, Town of Whitchurch-Stouffville, was completed by WSP, which was referenced for groundwater background. This Assessment has been included in Appendix 1.

3.0 GROUNDWATER QUANTITY

The wells will be required to supply an estimated peak hour demand rate of 9.25 L/s with a maximum day demand of 550 m^3/day to support the development of 145 single-family residential lots of approximately 478 people.

Based on the WSP Desktop Groundwater Supply Assessment (July 2024) finding, the Middle Aquifer has a sufficient yield to provide the required 9.25 L/s peak hour demand (PHD) and 550 m^3/day maximum daily demand. The aquifer ranges from the top at 69 to 74 meters below grade surface (mbgs) to the bottom at 99 to 104 mbgs depending on the topography. This results in the theoretical well elevation from top of grade (~330m ASL) to bottom of the well between 261m and 226m ASL. The Lower Aquifer would also be capable of the required yield but would involve increased complexity and cost to access. .

The Town of Whitchurch-Stouffville has adapted OPA 136 for the communities of Ballantrae. As per section 11.7, Water and Wastewater Servicing Strategy and Stormwater Management, all wells shall be completed to a depth below 245 m ASL. Based on this and the aquifer depth, the well-completed depth will be selected from the range of 226 m to 245 m ASL. A section of OPA 136, sections 11.1 and 11.7 have been included in Appendix 2

A Permit to Take Water (PTTW) application in accordance with the Ontario Water Resources Act (OWRA) and the Water Taking Regulations (O.Reg. 387/04) will be required.

Based on the confined nature of the aquifer and the results of previous pumping tests at the municipal wells, impacts to surface water resources, domestic water supply wells, and

shallower groundwater resources are not anticipated. Based on the PHD, the potential for interference with the closest municipal wells located over 800m away would likely be minimal (<1m) and occur only over brief peak periods. As a condition to be satisfied before final subdivision plan approval, this would need to be confirmed with a pumping test and monitoring program to verify planned water-taking impacts on local groundwater and surface water resources

4.0 GROUNDWATER QUALITY

The water quality sampling of the Middle Aquifer indicated that the water meets the ODWS apart from minor aesthetic objectives and would be a suitable source to supply the subdivision. This aquifer is not likely under the influence of surface water and is well protected from surficial sources of contamination, and has low vulnerability, which is advantageous from a source water protection perspective. This is to be confirmed during groundwater pumping tests.

Iron and manganese concentrations in wells PW-1 and PW-2 are anticipated to be slightly above aesthetic exceptions. These issues are common in deep aquifers in the York Region. There is additionally an increasing trend in the concentrations of chloride and sodium at PW-1 and PW-2, which should be considered. Depending on actual measured concentrations, iron and manganese may be acceptable or could be treated with sequestration or oxidation/filtration at the wellhouse. Elevated concentrations of chloride and sodium may cause minor aesthetic issues but are anticipated to be at acceptable levels for a municipal supply. Hardness can be treated by individual residents with household water softeners.

5.0 DESIGN

5.1 Wellhouse

The wellhouse is to be a factory-built, precast building with a basic HVAC system, including two fans and two-unit heaters for the electrical room and treatment room. The wellhouse is conservatively estimated at 17mx13m of space to house the water and sewage systems, electrical and controls, UV treatment, chlorine dosing, hydropneumatics water storage system, and emergency equipment such as an eyewash /shower station and spill kit.

The wellhouse would be classified under OBC Group F, Division 3 (3.2.2.78) and designed as a single-storey “post-disaster” building. The foundation would be designed based on the Geotechnical findings. The envelope would be a factory-built, precast building or brick veneered and the roof can be finished with metal sheeting for greater longevity.

The Electrical Room and Treatment Room would require fire resistance ratings (FRR) of not less than one (1) hour and would ultimately be confirmed with the Township of Stouffville's Building Department.

Building insulation R-values of R-20 are proposed in the exterior wall assemblies and R-30 for the roof, with air/vapour barriers to provide an adequate and cost-effective thermal envelope in accordance with the Ontario Building Code (OBC).

All exterior and interior access doors would be painted hollow metal doors with insulation in the exterior units. The interior walls and ceiling would be painted to provide a bright and dust free environment. The floor would have an epoxy-coated floor finish for durability and chemical resistance.

5.2 Primary and Backup Wells

The proposed objective of this project is to provide water supply capacity by constructing two (2) new municipal wells within the wellhouse property, drilled to approximately 80-85 mbgs and equipped with stainless steel casing. The second well provides system redundancy if one requires maintenance or testing. The wells' exterior locations will provide increased truck accessibility for installation, maintenance, and testing.

The two wells will be equipped with stainless steel pitless adaptors and submersible pumps, each sized to provide the peak 9.25 L/s PHD to the community with the capability of accessing the approximate 80mbg to access the middle aquifer. The pumps will have VFD drives to control flow in the system and use pressure storage tanks for flowrate equalization and improve pumps on/off cycle. The wells would pump water to the nearby wellhouse for disinfection. Submersible pumps are recommended due to their lower capital cost, smaller footprint, and fewer mechanical issues such as priming or cavitation. An example pump for this application has been included in Appendix 3. Final pump selection will be required during the detailed design based on the findings of the drilling test, final wellhouse, and distribution design for elevation and hydraulic data.

Test drilling will be needed on the property to confirm that suitable conditions are present in the aquifer.

5.3 System Pressurization

Hydropneumatics water pressure storage vessels will be selected to provide continuous supply and reduce the pump's start-stop time, prolonging the pump's lifespan. Assuming a one (1) minute minimum run cycle for the pumps and motors, a minimum of 500 liters (150

Gallons) of pressurized functional water storage is required. This value may vary depending on the selected well pumps.

5.4 UV Disinfection

Disinfection is to be used for primary disinfection to achieve a minimum 4-log (99.99%) removal or inactivation of viruses before the water is delivered to the first customer. The UV system will be housed in the wellhouse to treat all flows from either wellhead.

A UV treatment system is preferred due to its typically lower costs than chlorine disinfection. For groundwater that is not under the direct influence of surface water, UV light is acceptable as a primary disinfection process, provided that the UV reactor's 254 nm-equivalent UV pass-through a dose of at least 186 mJ/cm^2 is maintained throughout the lamp's lifetime. A UV treatment system will be selected to meet this requirement and provide 4-log removal for the PHD. No chemically assisted filtration is required as the groundwater is not under the Direct Influence of Surface Water.

UV units must be validated by one of the following protocols, accepted by the MECP:

- United States Environmental Protection Agency (USEPA) UV Disinfection Guidance Manual (UVDGM)
- German Deutscher Verein des Gas- und Wasserfaches (DVGW)
- Austrian Österreichisches Normungsinstitut (ONORM)

Based on RVA's research, the USEPA has only validated Low-Pressure High Output (LPHO) UV lamp technology that applies a UV dose of 186 mJ/cm2 for water treatment to achieve 4-log virus removal.

The UV system, located downstream of the well pumps, will consist of the following components:

- One (1) duty and one (1) standby UV unit, each complete with UV intensity sensor and temperature switch.
- One (1) online UV Transmittance Analyzer
- Two (2) motorized gate valves downstream of each UV unit to control which unit is operational
- Two (2) manually operated gate valves upstream of each UV unit for isolation

The UV system will be fully automated in terms of operation and control. Each UV unit has its own PLC and HMI. Detailed configuration and control are accomplished locally from the UV HMI or through SCADA.

The start-up sequence is as follows:

1. Before the system can operate, the following conditions must be met:
    - No alarms on the required outlet valve (actuator)
    - No alarms on the flow meter(s)
    - No alarms on the UV unit, UV units is in "ready" mode – in remote mode with no major or critical alarms, and cool down is complete.
2. Once these pre-set values (time or intensity, as selected) have been reached the motorized UV influent valve of the duty reactor will open slowly, over an adjustable time period (controlled locally on the actuator) to prevent any water surge or hammer.
3. The well pumps will then be allowed to start up according to the existing control sequence.
4. The flow signal will be used by the UV PLC in combination with the UV intensity sensor included as part of the unit and keyed in or the online UVT signal to modulate the intensity of the lamps to perform dose-pacing.

When the well pumps are called to stop, the UV effluent valve will slowly close, over an adjustable time period on the duty UV reactor.

If the "duty" UV unit fails or generates a high-priority alarm, the reactor and any operating well pump(s) will automatically be shut down. The "standby" unit and well pump(s) will restart according to the above start up sequence.

Duty rotation of the UV units will be manually selected by the operator or automatically by SCADA. If the UV unit is running at the time of duty cycling, the unit will continue to run and duty rotation will be completed after the unit is shut down (and pumps are stopped).

UV disinfection highly depends on the UV transmittance (UVT) of the treated water. UVT data will have to be collected before the UV system can be selected.

UV disinfection will continuously monitor such parameters that allow the operator to determine that the target design 254 nm-equivalent UV pass-through dose or higher is

being delivered and provide annunciated failure alarms when this design dose is not being delivered. Record test results will be recorded and digitally stored onsite.

5.5 Chlorine Feed Pumps (Secondary Disinfection)

While the use of UV light may be acceptable for the purpose of primary disinfection, it does not provide a disinfectant residual. Where the regulation requires the provision of secondary disinfection for a drinking-water system, primary disinfection must be followed by chlorination, which introduces and maintains a persistent disinfectant residual throughout the distribution system.

Sodium hypochlorite (12% concentration) will be injected downstream of the UV reactors, at a dose of 1 to 2 mg/L. The new system will comprise of the following:

- One (1) duty and one (1) standby peristaltic-style chlorine feed pump, each rated at 0.6 L/hour, capable of treating up to 9.25 L/s of water;
- One (1) 300 Liter polyethylene storage tank to provide 1-month of storage, in accordance with MECP guidelines;
- One (1) online chlorine injector and one (1) installed standby;
- One (1) free chlorine analyzer;
- A 100 mm tall concrete curb around the sodium hypochlorite tank to act as leak containment. The containment area would be sized for 110% of the tank storage volume, in accordance with MECP guidelines; and,
- A static mixer installed within the discharge pipe of the station, and upstream of the chlorine analyzer sampling point.

The “duty” sodium hypochlorite feed pump will be started automatically once the well pump(s) are started. The feed pump provides chlorine to an injection point located immediately downstream of the UV reactors.

In the event that the “duty” feed pump fails to start or breaks down, a non-critical alarm will be issued. The “standby” feed pump will then be started. If the “standby” feed pump also fails to start or breaks down, a critical alarm will be issued and the facility will be shutdown.

The dosage rate value of the chlorine feed pump is automatically flowpaced using the totalized flowrate from the flowmeter.

A chlorine analyzer samples the chlorine residual in the discharge header (after the static mixer) and reports it to SCADA. The facility will be shut down if the measured chlorine residual is below or above the desired range (pre-set and adjustable).

5.6 Electrical System

A new power supply must be constructed to power the Pumphouse and Wellhouse. Based on the equipment sizing and quantities for the ultimate station load, the station would require a 100A, 208V, 3 phase service power supply. The major equipment loads for the station include Well Pump 1, Well Pump 2, Sewage Pump 1, Sewage Pump 2, UV system, electric heaters, water heater, air handle unit, chlorine pump 1, chlorine pump 2, lighting, and small power. These need to be taken into consideration for calculating the electrical load.

The electrical power supply will be installed in an underground concrete encased ductbank. This is proposed for the following reasons:

- Improved aesthetics for the overall site.
- Less susceptible to damage due to weather events.

The Electrical Room will house the distribution panel (equipped with an automatic transfer switch), motor starters (soft starters) and lighting panel. In addition, the PLC and the control panels for the UV disinfection equipment and the sewage pumping station equipment will also be located in the Electrical Room. The cabinets will be organized to allow free wall space for future installations.

The diesel generator will be outside, housed in a weatherproof, noise-attenuated enclosure on a concrete pad equipped with a fuel tank sufficiently sized to provide up to 72 hours of power based on the full required load. Upon a power failure from the hydro utility supply, the diesel generator will be started automatically, and an automatic transfer switch will transfer the power supply source from hydro to the genset. The generator will continue to operate for a (pre-set and adjustable) period of time, even if the power returns before that.

The diesel generator will also provide power to the adjacent Sewage Pumping Station system within the same site, as described in the Ballantrae Sewage Pumping Station and Forcemain Conceptual Design Report by RVA.

An uninterrupted Power Supply (UPS) unit would be included in the PLC to maintain power for the panel and select instruments.

The buildings, diesel generator and grounds will be furnished with the appropriate lightning protection and grounding systems to conform with the Electrical Code.

5.7 Instrumentation and Controls

The station will be equipped with a new PLC. Instruments for this station include the following:

- One (1) magnetic flowmeter
- One (1) pressure transmitter on the discharge header
- One (1) UVT (ultraviolet transmittance) analyzer
- One (1) chlorine analyzer
- Two (2) hydrostatic well level sensors
- Building security sensors (door contacts)

System alarms will communicate through a cellular auto-dialer, alarming an operator. Data logging will include well level and pump speed for each well and, flow metering, pressure monitoring, chlorine dosing rate, chlorine concentration, water storage tank pressure, and UV intensity, which will be collected onsite at the wellhouse.

The proposed water supply facility is to be capable of fully automated or manual operation. In automatic mode, the plant will start production based on a low water pressure and stop production when the tank reaches a high pressure. Alternatively, a manual start/stop of the process equipment can be selected.

Under normal operation, one well pump is assigned as “duty” and the other pump will be on “standby” if the first pump fails. However, in the event one pump is taken offline or fails, one pump can continue to operate.

If either one of the duty well pumps fails to start or breaks down during operation, an alarm (critical) will be issued by the auto-dialer. If both well pumps fail to start or break down during operation, a critical alarm will be issued, and the facility will shut down.

If the well level sensor registers a low water level for either well pump, it will shut down the corresponding well pump. A critical alarm will be issued. If both well pumps experience a low water level, the facility will shutdown and a critical alarm will be issued.

A pressure sensor located on the discharge header of the facility will shut down the well pumps in the event that the pressure in the discharge header reaches a high level (pre-set adjustable).

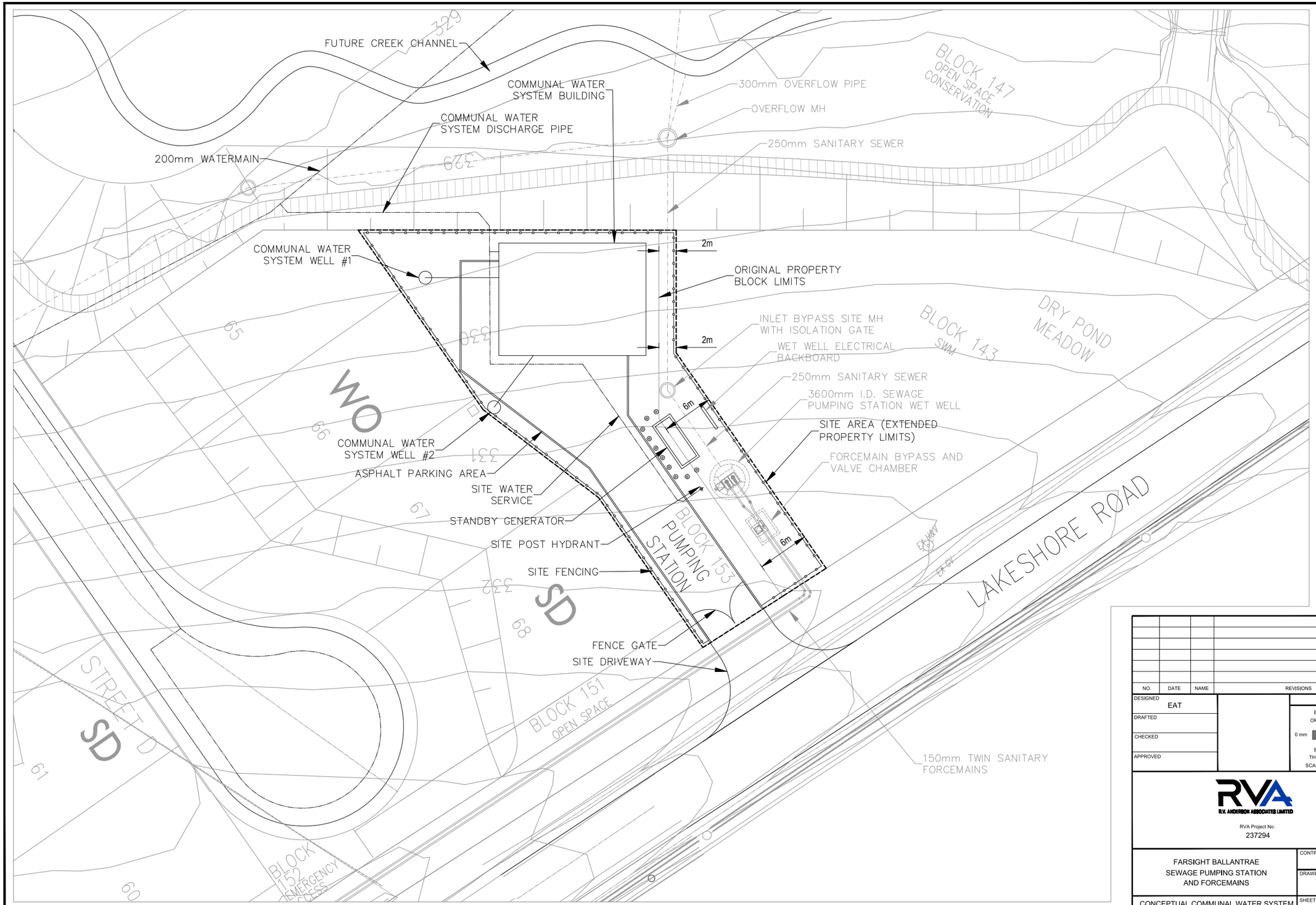
6.0 LAYOUT

6.1 Property Site Plan

The intent is to locate all water supply equipment on the property, including the wellheads, wellhouse, and diesel generator. The sewage pumping station equipment must additionally be located on the property, including the wet well and valve chamber. The sewage wet well must be located a minimum of 15 meters from any of the water wells.

The diesel generator and the electrical room within the wellhouse will act for both the Communal Water Supply System and the Sewage Pumping Station.

The access driveway will be paved with asphalt and built to accommodate chlorine tanker trucks, sewage-hauling trucks, and well-pump servicing cranes. A turnaround has not been included. A fence gate is to be constructed at the driveway entrance leaving sufficient space to park and open the gate. The facility will be fenced, and the building will have no windows for security purposes. Refer to Figure 6.1 for a conceptual design drawing of the site plan.



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R.V. ANDERSON ASSOCIATES LIMITED

RVA Project No.
237294

FARSIGHT BALLANTRAE
SEWAGE PUMPING STATION
AND FORCEMAINS

CONTRACT NUMBER:
DRAWING NUMBER:

CONCEPTUAL COMMUNAL WATER SYSTEM
SITE LAYOUT

SHEET NUMBER
Figure 6.1

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6.2 Discharge Watermain

Water from the two wells will be sent via 100mm PVC pipes to the wellhouse. This pipe size limits the maximum water velocity to 1.18 m/s. The treated watermain will leave the property consisting of a 100mm diameter PVC watermain from the wellhouse, connecting to the proposed 200mm watermain at Lakeshore Road by SKA.

6.3 Fire Protection

The well pumps have not been designed to provide the flow required for fire protection. Additional water storage cisterns have been planned with conventional 150m spacing to provide the additional storage to provide the required 1900 L/min for 30 minutes. Six (6) cisterns of 40 cubic meters have been planned throughout the development. Each cistern will include a 1m diameter manhole to provide access to isolation, check and flow control valves. The cisterns will be equipped with a dry hydrant with connections for fire truck access. This design will require approval by the Municipal Fire Chief. Refer to Appendix 4 for cistern locations and an example cistern.

6.4 Building Floorplan

The proposed building is split into treatment and electrical rooms. The electrical room will house the electrical and control equipment for both the water system and the sewage pumping station, including both MCCs, VFD, HMI, etc. The treatment room will house the ancillary process equipment, including piping, isolation valves, check valves, air relief valves, flow meter, pressure indicators, and sample port. The room will also house the two UV treatment units, the secondary chlorine storage tanks, the chlorine pumping skid, including two chlorine dosing pumps and the hydropneumatics Water Storage Tank.

The watermain will leave the property consisting of a 100mm diameter PVC water main from the wellhouse, connecting to the proposed SKA watermain at Lakeshore Road.

7.0 APPROVALS

The following approvals are required before the facility can be tendered for construction:

- MECP – Category 3 Permit to Take Water (PTTW) Amendment
- MECP – Drinking Water Works Permit (DWWP)
- Region of York Approval

- Lake Simcoe Region Conservation Authority (LSRCA) – Source Protection Plan Update
- Township of Whitchurch-Stouffville – Site Plan Approval / Building Permit
- Hydro One – New Hydro Service Request
- ECA – Air and Noise for the Diesel Generator
- Cistern Approval from the Municipal Fire Chief

On April 5, 2018, the Ministry of the Environment, Conservation and Parks (MECP), posted a new regulation (ERO 013-1840) under the Safe Drinking Water Act that came into effect on July 1, 2018. The key requirements in the regulation include:

- Owners of municipal residential drinking water systems within source protection areas under the Clean Water Act must ensure vulnerable areas around new and expanding drinking water systems are identified and mapped.
- Owners can only apply for a drinking water works permit once they have confirmation from the source protection authority that vulnerable areas are identified and mapped.
- Owners cannot provide water to the public from new or expanding drinking water systems until the local source protection plan has been updated to include these systems and it has been approved.

APPENDIX 1

DESKTOP GROUNDWATER SUPPLY ASSESSMENT

REPORT

Desktop Groundwater Supply Assessment

Hamlet of Ballantrae, Town of Witchurch-Stouffville, Ontario

Submitted to:

Robert Schickedanz

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Submitted by:

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July 2, 2024

Distribution List

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Figure 4 – MECP Water Well Records

APPENDICES

APPENDIX A
Important Information and Limitations of This Report

APPENDIX B
MECP Well Records

1.0 BACKGROUND

WSP Canada Inc. (WSP) was retained by Far Sight Investments Ltd (the "Client") to conduct a desktop preliminary groundwater supply assessment to identify potential groundwater supply options for the proposed development located at 5426, 5452, and 5584 Lakeshore Road, southeast of Ballantrae, within the Town of Witchchurch-Stouffville, Ontario (the "Site"; Figure 1). The proposed development will include 142 single family residential lots (Sabourin Kimble & Associates Ltd., 2021) complete with walking paths and woodlands as shown on Figure 2.

Based on emails from R.V. Anderson dated May 21, 2024 and June 17, 2024, the population of the proposed subdivision will be approximately 468 people, with the wells supplying an estimated peak hour demand rate of 9.25 L/s or 800 m^3/day and an estimated maximum day demand of 550 m^3/day required for the proposed subdivision. This is to be firm capacity, with water to be supplied by two separate supply wells. One well would operate at a time with the other as a back-up.

The wells would require a Category Three Permit to Take Water (PTTW) from the MECP for operation with PTTW limits for the peak hour demand of 9.25 L/s (555 L/min) and for the maximum day demand of 550 m^3/day (550,000 L/day).

This report provides the results of the preliminary groundwater supply assessment and should be read in conjunction with the "Important Information and Limitations of This Report" in Appendix A which forms an integral part of this document. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report. The data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location.

1.1 Scope of Work

The scope of work for the current groundwater supply assessment consisted of:

- Reviewing regional groundwater information, including publicly available drilling and groundwater well records, geological data, topographic mapping, published hydrogeological reports and groundwater taking, and treatment records from nearby municipalities; and
- Preparing a report documenting the findings of the desktop assessment.

We note that this report focuses on the groundwater supply potential of the site and does not include overall hydrogeological and water balance assessment.

2.0 SITE CHARACTERIZATION

2.1 Physiography

Physiographic mapping in the area indicates that the Site lies within the physiographic region of southern Ontario known as the Oak Ridges Moraine (ORM; Chapman and Putnam, 2007). The ORM is a ridge that forms a drainage divide between Lake Ontario and Georgian Bay, extending approximately 160 km from the Niagara escarpment to the Trent River. It is generally sandy, with the areas surrounding Uxbridge being noted to contain thick deposits of lacustrine clay and silt. The overburden in the area of the Site generally consists of eolian deposits of fine to very fine sand and silt (OGS, 2010).

2.2 Topography and Drainage

Based on available topographic mapping of the Site, the ground surface is gently sloping, with elevations ranging from 331 meters above sea level (masl) in the southwest to 334 masl, with topography generally being higher to the north and along the west and east edges of the Site, and lower in the center and to the south of the Site.

The Site is located on the eastern edge of the East Holland River watershed (OMNRF, 2020), and Musselman Lake is located to the southeast of the Site. A drainage ditch with ephemeral flow constructed in the late 1970s to early 1980s (Ages, 2022) flows north to south bisecting the Site adjacent to an unevaluated wetland, considered to be a woodland swamp (Ages, 2022) on the west side of the Site. The ditch flows through another unevaluated wetland, considered to be a marsh (Ages, 2022) within the southern boundary of the Site towards a pond on the south side of Lakeshore Road (Figure 1). Local drainage from the Site flows south towards the East Holland River and regional drainage flows generally to the north towards Lake Simcoe.

2.3 Hydrostratigraphy

The quaternary geology of the area surrounding the Site was described by Golder Associates (2017) based largely on work done by Kassenaar and Wexler (2006) and Gerber and Howard (2000), and is briefly summarized in the following section. The hydrostraigraphy of the area can be separated into the following units:

- Upper Aquitard – Halton Till;
- Upper Aquifer- Oak Ridges Aquifer Complex(ORAC);
- Middle Aquitard- Newmarket Till, channel silts and lacustrine deposits;
- Middle Aquifer- Thorncliffe Aquifer Complex (TAC) and channel aquifer;
- Lower Aquitard- Sunnybrook drift, till and lacustrine deposits;
- Lower Aquifer- Scarborough Aquifer Complex; and
- Older Tills and Bedrock.

Figures 3A to 3C show the inferred regional hydrostratigraphic profiles based on well records in the area.

2.3.1 Upper Aquitard- Halton Till

Recent deposits include glaciolacustrine deposits associated with deposition in glacial lakes, and both recent and older alluvial deposits. The materials can be either aquifers or aquitards, depending on the local composition. Likewise, deposits of surficial glaciolacustrine sand, silt, and clay produce both aquifer and aquitard conditions depending on the composition of the materials encountered. Underlying the surficial recent deposits, the Upper Aquitard consists of Halton Till, that cover a portion of the underlying the ORAC. The Upper Aquitard serves as a confining layer and limits infiltration, protecting the ORAC from sources of contamination at surface. The Upper Aquitard also reduces lateral groundwater discharge from the base of the ORAC and thereby induces downward groundwater movement to deeper hydrostratigraphic units. Based on the inferred geological cross sections presented in Figures 3A to 3C, these units are not present in the vicinity of the Site, however middle and lower aquitards are present as described in Sections 2.3.3 and 2.3.5.

2.3.2 Upper Aquifer- Oak Ridges Aquifer Complex

The ORAC is a regional aquifer system in Ontario that corresponds to the area where the Oak Ridges sediments are deposited and is located at surface in the vicinity of the Site. The ORAC is a significant source of groundwater supply for various uses and provides baseflow to the headwaters of creeks and rivers where the Halton Aquitard is

absent. The ORAC is in some areas separated by silt interlayers, splitting the unit into upper and lower aquifers. The ORAC is reported to have a relatively high hydraulic conductivity of up to 8 x 10^{-5} m/s.

2.3.3 Middle Aquitard- Newmarket Till, channel silts and lacustrine deposits

The Middle Aquitard consists of the Newmarket Till and low permeability deposits. The results of the historical pumping tests and monitoring (Golder, 2017) indicate little to no fluctuation in the ORAC water levels due to pumping of underlying aquifer units, indicating that the Middle Aquitard provides good protection to aquifers within the underlying hydrostratigraphic units. Thickness of this aquitard is reported range between 30 m to 50 m with an estimated vertical hydraulic conductivity of between 5 x 10^{-9} m/s and 1 x 10^{-10} m/s.

2.3.4 Middle Aquifer- Thorncliffe Aquifer Complex and channel aquifer

The Middle Aquifer includes the Thorncliffe Aquifer Complex (TAC) consisting of fine to coarse-grained sediments of the Thorncliffe Formation and channel aquifer sediments. Local sand and gravel deposits within the Thorncliffe Aquifer Complex provide high yield wells. Regionally, the interpreted aquifer thickness of this unit ranges from 30 m – 70 m. Based on the cross sections presented in Figures 3A – 3C, the thickness of the Middle Aquifer in the vicinity of the Site appears to be relatively consistent, ranging from approximately 12 to 20 m based on extrapolation from nearby deep boreholes. The reported hydraulic conductivity of the Middle Aquifer ranges from 3 x 10^{-4} m/s to 1 x 10^{-8} m/s. The Middle Aquifer is a frequent target for municipal supply wells, including the Ballantrae supply wells due to its high yield and the protective Middle Aquitard that overlays it. There are few private wells that draw from this unit, likely due to its relative depth.

2.3.5 Lower Aquitard – Sunnybrook drift, till and lacustrine deposits

The Lower Aquitard separates the Middle and Lower Aquifers. This aquitard demonstrates low permeability, provides some resistance to vertical groundwater movement, and protects the underlying aquifer from potential contaminant movement. It is understood to be generally less than 10 to 20 m thick, but thicker within bedrock valleys (Kassenarr & Wexler, 2006), Which is generally consistent with the cross sections shown in Figures 3A and 3C.

2.3.6 Lower Aquifer- Scarborough Aquifer Complex

The Lower Aquifer Scarborough Aquifer Complex (SAC) consists of fine to coarse-grained sediments associated with the Scarborough Formation. Based on extrapolation from nearby deep boreholes and the cross section presented in Figure 3A, the Lower Aquifer does not appear to be present to the west of the Site, and may have limited areal extent, however Figure 3C indicates that it may be present within the Site itself. The Lower Aquifer is estimated to potentially have a thickness of up to 13 m in the vicinity of the Site. Due to its depth and presence of shallower aquifers, the Lower Aquifer is not exploited extensively for private water supplies.

2.3.7 Older Till and Bedrock

The Lower Aquifer is underlain by over-consolodated fine grained material that is not well represented in well drilling logs and has little bearing on water supplies in the area (Golder, 2017). The overburden at the Site is underlain by shale bedrock of the Georgian Bay Formation (OGS, 2007).

2.4 Groundwater Use

2.5 MECP Well Records

A review was conducted of the Ministry of Environment Conservation and Parks (MECP) water well database within 500 m the Site (Figure 4), and the findings are provided in Appendix B. The MECP database indicates 169 well records are located within approximately 500 m of the Site. Of these, 103 are indicated to have been installed for water supply

purposes, with 94 listed as being for domestic supply purposes, 2 as commercial supply, 2 as water supply for stock, and 3 as public water supply. The public supply wells are noted to not be the current municipal supply wells, and have listed diameters of 51 mm and relatively shallow depths between 13.1 mbgs to 21.9 mbgs. There are 15 records listed as test holes and observation wells, 28 well records listed as abandonments, and another 23 records have no purpose listed. The depth of the listed records range from about 0.9 to 145 meters below ground surface (mbgs). Based on the cross sections presented in figures 3A to 3C, it appears the municipal wells and Ballantrae Golf and Country Club wells are the only water supply wells installed in the Middle and Lower Aquifers in the vicinity of the Site, with the remaining supply wells screened in the ORAC.

The Site lies within the Ballantrae/Musselman's Lake water service area (Figure 1), and residential properties in Ballantrae are connected to the municipal drinking water system. As such, the well records listed as supply wells within the Ballantrae water supply service area are likely no longer be in use.

2.6 Permits to Take Water

A search of the MECP PTTW mapping indicates the presence of two Permits – within 2 km of the Site. The first is for the Ballantrae/Musselman's Lake drinking water system, and the second is for the Ballantrae Golf and Country Club.

The Ballantrae/Musselman's Lake supply wells operate under Permit to Take water (PTTW) No. 3573-CDFQHW. The municipal drinking water system is serviced by three supply wells, PW-1 and PW-2, which were commissioned in the late 1990s near the intersection of McCowan Road and Aurora Road, approximately 2.3 km west of the Site. The PW-1 and PW-2 wells are installed at a depth of 111.86 mbgs and 110.95 mbgs respectively PW-3 was installed in 2013 at a well house adjacent to Whitchurch-Stouffville Fire Station 5-2 (TMIG, 2019), approximately 800 m to the northwest of the Site, at a depth of 108.51 mbgs. Under the PTTW, each well has a maximum daily water taking rate of 2,710 m^3/day (31.4 L/s). Table 1 below summarizes the municipal supply wells.

Table 1: Ballantrae/Musselman's Lake Municipal Supply Wells

Well ID	Permitted Water Taking Rate (m^3/d)	Number of Water Taking Days Allowed (days/year)
PW-1	2,710	365
PW-2	2,710	365
PW-3	2,710	365
PW-4	2,710	365

The Ballantrae Golf and Country Club located approximately 600 m north of the Site and has several pumping wells for dewatering and golf course irrigation. The water taking operates under PTTW No. 3220-BD8HGV and consists of 11 wells. Table 2 below provides pumping information for each well.

Table 2: Golf Course Pumping Wells

Well ID	Listed Purpose	Permitted Water Taking Rate (m^3/d)	Number of Water Taking Days Allowed (days/year)
TW1-03	Golf Course Irrigation	547.2	180
PW-2-98	Golf Course Irrigation	655.2	180
PW5-10	Other - Dewatering	1,310.4	365
TW1-96	Golf Course Irrigation	388.8	180
PW-3-10	Other - Dewatering	1,310.4	365
PW-1-10	Other - Dewatering	1,051.2	365
PW4-10	Other - Dewatering	1,310.4	365
PW-1-03	Golf Course Irrigation	2,174.4	180
PW-1-98	Golf Course Irrigation	720.0	180
PW-2-10	Other - Dewatering	1,051.2	365
TW2-96	Golf Course Irrigation	619.2	180

3.0 DISCUSSION

3.1 Water Quantity

3.1.1 Upper Aquifer

Based on the MECP well records, the wells screened in the ORAC reported static water levels between approximately 2 mbgs and 30 mbgs and pumping rates between 5 L/min and 205 L/min. The ORAC is likely not capable of supporting the water taking rates required to support the planned subdivision.

3.1.2 Middle Aquifer

In the vicinity of the Site, the top of the Middle Aquifer is estimated to range from approximately 69 mbgs to 74 mbgs, with the bottom of the unit ranging from approximately 99 mbgs to 104 mbgs, depending on the topography of the Site. Due to the depth of the Middle Aquifer, there are few private wells that draw from it, and limited well records are available. The pumping rates listed on the well records within the vicinity of the Site completed within the Middle Aquifer range from 25 L/min (0.4 L/s) to 950 L/min (15.8 L/s). The Ballantrae municipal supply wells are also screened in this unit and are noted to have theoretical transmitting capacities between 50.6 L/s (3,036 L/min) to 82 L/sec (4,920 L/min), with permitted pumping rates of approximately 31.4 L/s (1,884 L/min). The static water levels reported in in the municipal wells between January 2019 – July 2023 were reported to range from 10.9 mbgs to 82.3 mbgs (with elevations ranging from 257.8 masl to 321.0 masl; Source: Oak Ridges Moraine Groundwater Program mapping tool).

Based on the available nearby well information, the Middle Aquifer has sufficient yield to provide the 9.25 L/s peak hour demand (800 m^3/day) and 550 m^3/day maximum day demand required by the planned subdivision.

3.1.3 Lower Aquifer

Based on the cross-sections presented in Figures 3A-3C, the top of the Lower Aquifer ranges from approximately 109 mbgs to 114 mbgs, with the base of the aquifer unit ranging from approximately 114 to 119 mbgs depending on the topography of the Site. There are few well records screened across the Lower Aquifer in the vicinity of the Site. Two golf course wells, TW1-03 and PW-1-03 located approximately 600 m to the northeast of the Site were noted to be screened across the Lower Aquifer.

Permitted water taking rates from the Golf Course wells screened in this unit range from 547.2 m^3/day (6.3 L/s) to 2174.4 m^3/day (25.1 L/s).

Based on the available nearby well information, the Lower Aquifer also has sufficient yield the 9.25 L/s peak hour demand (800 m^3/day) and 550 m^3/day maximum day demand required by the planned subdivision.

3.2 Water Quality

3.2.1 Upper Aquifer

Groundwater sampling of the ORAC conducted by International Water Supply (1987) indicated that the Upper Aquifer showed impacts from road salting and septic effluent. The Ontario Provincial Groundwater Monitoring Network (PGMN) has a monitoring well (Well ID W0000071-1, Figure 1) located approximately 2.5 km west of the Site. The monitoring well is screened within the ORAC and is sampled yearly for general chemistry, metals, and major ions. The October 2022 sampling results indicated no exceedances of the Ontario Drinking Water Quality Standards (ODWS) for the analyzed parameters.

The cross-sections presented in Figures 3A – 3C, show that the ORAC is unconfined in the area of the Site and is not protected by the overlying Halton till present in other areas of the ORM, suggesting that it may be more vulnerable to contamination than the deeper aquifer units. Based on the cross sections presented in Figures 3A – 3C the ORAC appears to be separated by a confining layer of ORAC silt into upper and lower aquifers to the west of the Site, and potentially through the Site itself. Several of the records shown on Figure 3C do not show the confining layer, indicating that it may be of limited areal extent and that a hydraulic connection exists between the upper and lower layers.

The noted impacts from septic and road salt in the ORAC indicate an undesirable high vulnerability to surficial contamination and that considerable treatment would be required to ensure safe water supply for the subdivision from this shallower aquifer.

3.2.2 Middle Aquifer

The Middle Aquifer is protected by the overlying Middle Aquitard, and the existing Ballantrae water supply wells take water from this unit. Water quality sampling has indicated the water in this unit meets the ODWS with the exception of minor aesthetic objectives, and would be a suitable source to supply the subdivision.

Water quality in the Middle Aquifer has been demonstrated to meet the Ontario Drinking Water Quality Standards (ODWS), with the exception of iron and manganese concentrations in PW-1 and PW-2 (Stantec, 2010). These exceedances are noted to be aesthetic and not health-related parameters and are common in deep aquifers in York Region (Golder, 2017). An increasing trend in the concentrations of chloride and sodium was also noted at PW-1 and PW-2 (Stantec, 2010). It is noted that both the iron and manganese, as well as the chloride and sodium issues can be readily treated using domestic equipment. PW-3 was shown to meet ODWS for all parameters tested, and

the 2023 Annual Drinking Water System Quality Report for Ballantrae/Musselman's Lake DWS (York Region, 2024) indicated no ODWS exceedances.

3.2.3 Lower Aquifer

As there were few well records screened within the Lower Aquifer the groundwater quality of the Lower Aquifer in the vicinity of the Site is largely unknown.

3.3 Supply Well Location

It is assumed that the supply wells would be installed within the subdivision site itself, with water being pumped from the wells to an adjacent pump-house for disinfection. Consideration should be taken to avoid installing the planned supply wells in a local topographic low to prevent standing water from pooling around the wells, and the wells and pumphouse should be constructed in an easily accessible location for monitoring and maintenance work, potentially within a reserved lot in the subdivision. Test well drilling would be needed on the Site to confirm that suitable conditions are present in the deeper aquifers.

3.4 Potential Impacts

Based on the confined nature of the Middle and Lower Aquifers and the results of the previous pumping tests at the municipal wells described in Golder, 2017, impacts to surface water resources, domestic water supply wells and shallower groundwater resources are not anticipated. A pumping test should be conducted to determine what impacts, if any, the planned water taking has on local groundwater and surface water resources.

Based on the peak hourly demand of 800 m^3/day, potential for interference with the closest municipal wells located over 800 m away would likely be minimal (< 1m) and occur only over the brief periods of these peak or maximum day demands. This would need to be confirmed through installation and test pumping with assessment of drawdown in on-site and off-site monitoring wells. These rates would only be needed during brief peak or maximum day demand periods. A detailed assessment of well interference implications resulting from potential small water level declines at existing permitted water users would need to be completed based on a test pumping and monitoring program.

3.5 Conclusions

Based on a desktop review of available well information, either the Middle or Lower Aquifer are expected to be able to support the peak hour demand of 9.25 L/s (800 m^3/day) or maximum day demand of 550 m^3/day required by the planned subdivision. The required water supply for firm capacity will need two separate supply wells with one well operating at a time with the other as a back-up. An exploratory drilling program will be required at the Site to confirm the capacity of two wells through test drilling and pumping.

Based on the confined nature of the Middle and Lower Aquifers and the results of the previous pumping tests at the municipal wells described in Golder, 2017, impacts to surface water resources and other groundwater users are not anticipated. Based on the peak hourly demands of 9.25 L/s (800 m^3/day) and maximum day demand of 550 m^3/day, potential for interference with the closest municipal wells located over 800 m away would likely be minimal (< 1m) and occur only over the brief periods of these peak hour or maximum day demands. A pumping test including monitoring of on-Site and off-Site wells is recommended to be conducted to determine what impacts, if any, the planned water taking has on local groundwater and surface water resources and to support a Category Three Permit to Take Water with the MECP for the two wells.

If supply wells are installed in the deeper aquifers, they will likely need to be installed at depths on the order of 80 mbgs or greater to target the Middle Aquifer or 110 mbgs or greater to target the Lower Aquifer, depending on ground surface elevation. Both of these aquifers are likely not under the influence of surface water and are well protected from surficial sources of contamination and have a low vulnerability, which is advantageous from a source water protection perspective. Regardless of the low vulnerability of these aquifers, on the Site itself and within a 100 m radius of the wells, an assessment would need to be completed to ensure that no significant threats to drinking water would be created under the Clean Water Act.

4.0 REFERENCES

Ages Comsultants Limited (Ages). (2022). *Environmental Impact Statement, Natural Heritage Evaluation, Farsight Subdivision, Lakeshore Road, Ballantrae, Town of Whitchurch-Stouffville.*

Chapman, & Putnam. (2007). *The Physiography of Southern Ontario.* Ontario Geological Survey.

EarthFX. (2014). *Tier 3 Water Budget and Local Area Risk Assessment for the Region of York Municipal Systems, Risk Assessment Report.*

Golder Associates Ltd. (Golder). (2017). *Ballntrae Water Supply Class Environmental Assessment.*

Kassenarr, J., & Wexler, E. (2006). *Groundwater Modelling of the Oak Ridges Moraine Area: CAMC-YPDT Technical Report #01-06.*

Ministry of Environment Conservation and Parks (MECP). (2008). *Design Guidelines for Drinking-Water Systems.*

Ontario Geologic Survey (OGS). (2007). *Paleozoic Geology of Southern Ontario.*

Ontario Geologic Survey (OGS). (2010). *Surficial Geology of Southern Ontario.*

Ontario Ministry of Natural Resources and Forestry (OMNRF). (2020). *Ontario Watershed Boundaries.*

Regional Municiaplity of York (York Region). (2024). *2023 Annual Drinking Water System Quality Report for Ballantrae/Musselman's Lake DWS.*

Sabourin Kimble & Associates Ltd. (2021). *Farsight Homes Functional Servicing and Stormwater Management Report.*

Stantec. (2010). *Assessmnet of Drinking Water Quality Threats, Municipal Groundwater Supplies.*

The Municipal Infrastructure Group (TMIG). (2019). *Ballantrae Long-Term Water Supply Schedule B Class EA.*

Signature Page

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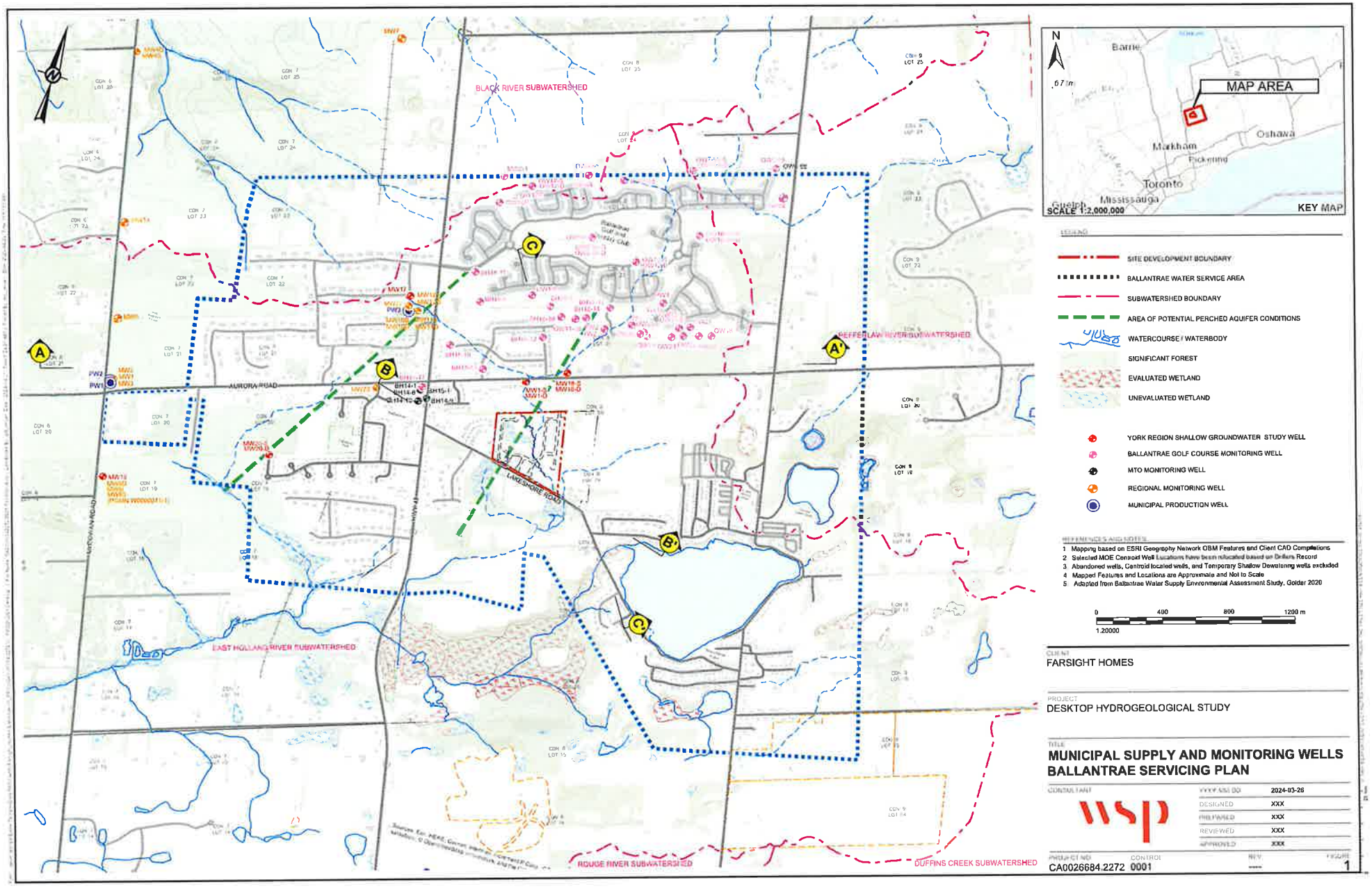
Principal Hydrogeologist

PM/JAP/rk

https://wsponlinecan.sharepoint.com/sites/ca-ca00266842272/shared documents/06. deliverables/water supply investigation-final/ca0026684.2272-r-rev0-far sight ballantrae desktop water supply investigation_02'july'2024.docx

Figures


BLACK RIVER SUBWATERSHED
BEEFTEALAW RIVER SUBWATERSHED
EAST HOLLAND RIVER SUBWATERSHED
ROUGE RIVER SUBWATERSHED
DUFFINS CREEK SUBWATERSHED
AURORA ROAD
LAKESHORE ROAD
MAP AREA
Barrie
Oshawa
Markham
Pickering
Toronto
Mississauga
Guelph
SCALE 1:2,000,000
KEY MAP
SITE DEVELOPMENT BOUNDARY
BALLANTRAE WATER SERVICE AREA
SUBWATERSHED BOUNDARY
AREA OF POTENTIAL PERCHED AQUIFER CONDITIONS
WATERCOURSE / WATERBODY
SIGNIFICANT FOREST
EVALUATED WETLAND
UNEVALUATED WETLAND
YORK REGION SHALLOW GROUNDWATER STUDY WELL
BALLANTRAE GOLF COURSE MONITORING WELL
MTO MONITORING WELL
REGIONAL MONITORING WELL
MUNICIPAL PRODUCTION WELL
REFERENCES AND NOTES
1 Mapping based on ESRI Geography Network OBM Features and Client CAD Compilations
2 Selected MOE Consoid Well Locations have been relocated based on Drillers Record
3 Abandoned wells, Centroid located wells, and Temporary Shallow Dewatering wells excluded
4 Mapped Features and Locations are Approximate and Not to Scale
5 Adapted from Ballantrae Water Supply Environmental Assessment Study, Golder 2020
0 400 800 1200 m
1:20000
CLIENT
FARSIGHT HOMES
PROJECT
DESKTOP HYDROGEOLOGICAL STUDY
TITLE
MUNICIPAL SUPPLY AND MONITORING WELLS
BALLANTRAE SERVICING PLAN
CONSULTANT
wsp
YYYY-MM-DD 2024-03-26
DESIGNED XXX
PREPARED XXX
REVIEWED XXX
APPROVED XXX
PROJECT NO. CONTROL REV. FIGURE
CA0026684.2272 0001 - 1

PLAN LEGEND

DEVELOPMENT BOUNDARY

0 50 100 150 m
1:2500

CLIENT
FARSIGHT HOMES

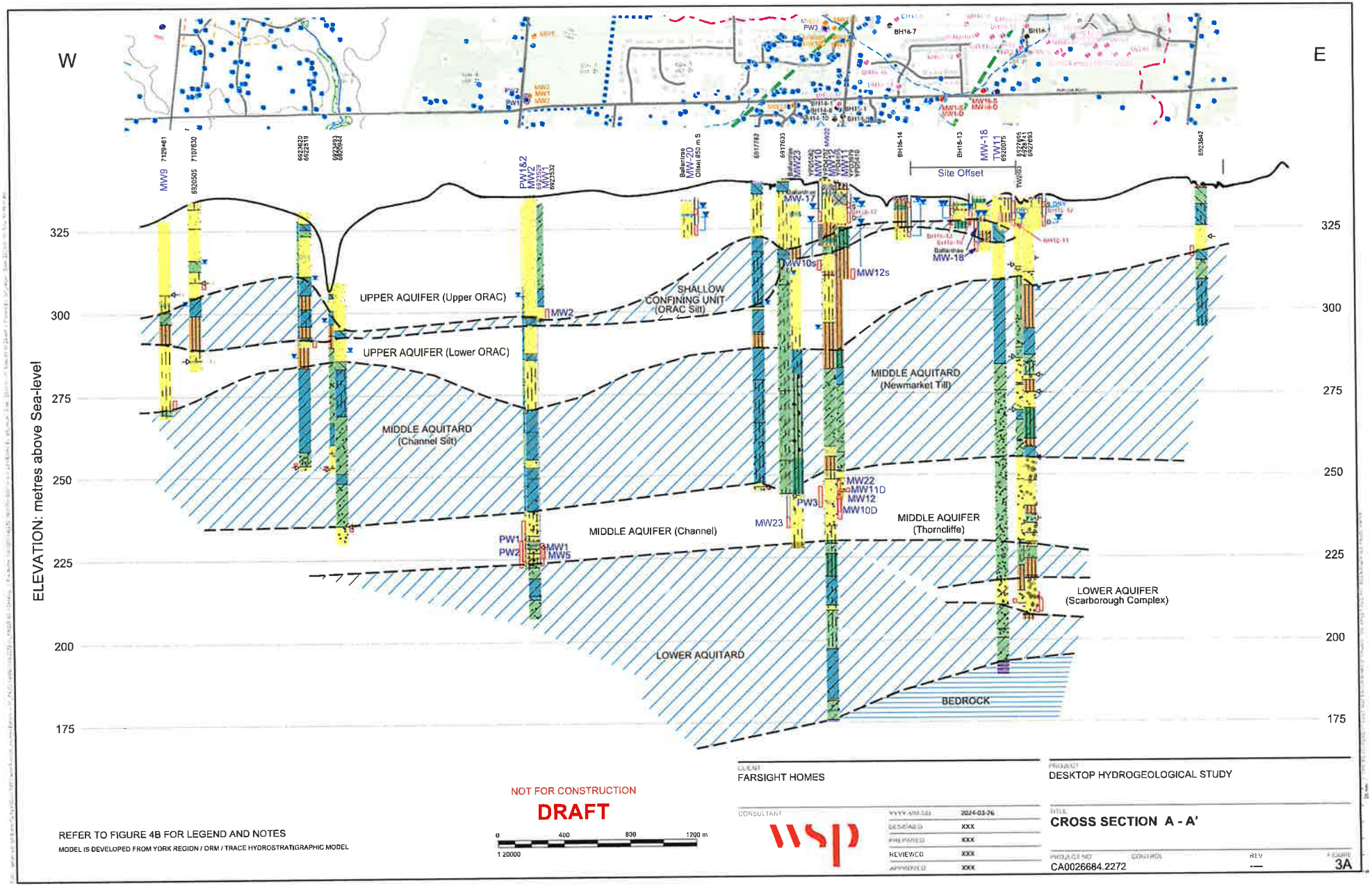
PROJECT
DESKTOP HYDROGEOLOGICAL STUDY

TITLE
PROPOSED DEVELOPMENT PLAN

CONSULTANT
wsp

YYYY-MM-DD	2024-03-26
DESIGNED	
PREPARED	JPR
REVIEWED	PJM
APPROVED	DPD

PROJECT NO CA0026684.2272 CONTROL 0001 REV — FIGURE 2



REFER TO FIGURE 4B FOR LEGEND AND NOTES

MODEL IS DEVELOPED FROM YORK REGION / ORM / TRACE HYDROSTRATIGRAPHIC MODEL

NOT FOR CONSTRUCTION

DRAFT

0 400 800 1200 m

1:20000

CLIENT: FARSIGHT HOMES

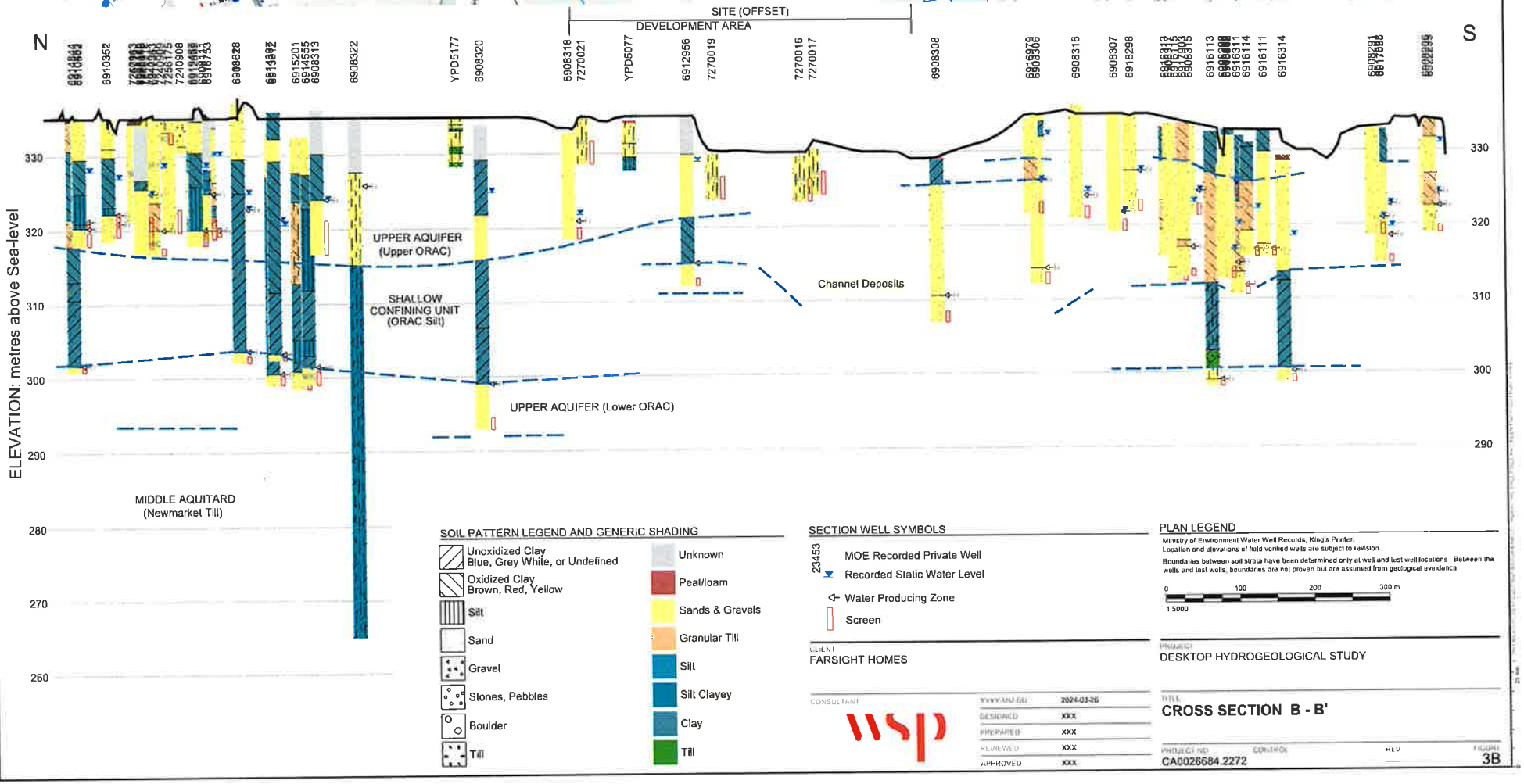
PROJECT: DESKTOP HYDROGEOLOGICAL STUDY

CONSULTANT: WSP

YYYY-MM-DD	2024-03-26
DESIGNED	XXX
PREPARED	XXX
REVIEWED	XXX
APPROVED	XXX

TITLE: **CROSS SECTION A - A'**

PROJECT NO: CA0026684.2272 | CONTROL | REV: — | FIGURE: 3A



SOIL PATTERN LEGEND AND GENERIC SHADING

- Unoxidized Clay, Blue, Grey While, or Undefined
- Oxidized Clay, Brown, Red, Yellow
- Silt
- Sand
- Gravel
- Stones, Pebbles
- Boulder
- Till
- Unknown
- Peat/loam
- Sands & Gravels
- Granular Till
- Silt
- Silt Clayey
- Clay
- Till

SECTION WELL SYMBOLS

- 23453 MOE Recorded Private Well
- Recorded Static Water Level
- Water Producing Zone
- Screen

PLAN LEGEND

Ministry of Environment Water Well Records, King's Printer.
Location and elevations of field verified wells are subject to revision.
Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological evidence.

0 100 200 300 m
1:5000

CLIENT
FARSIGHT HOMES

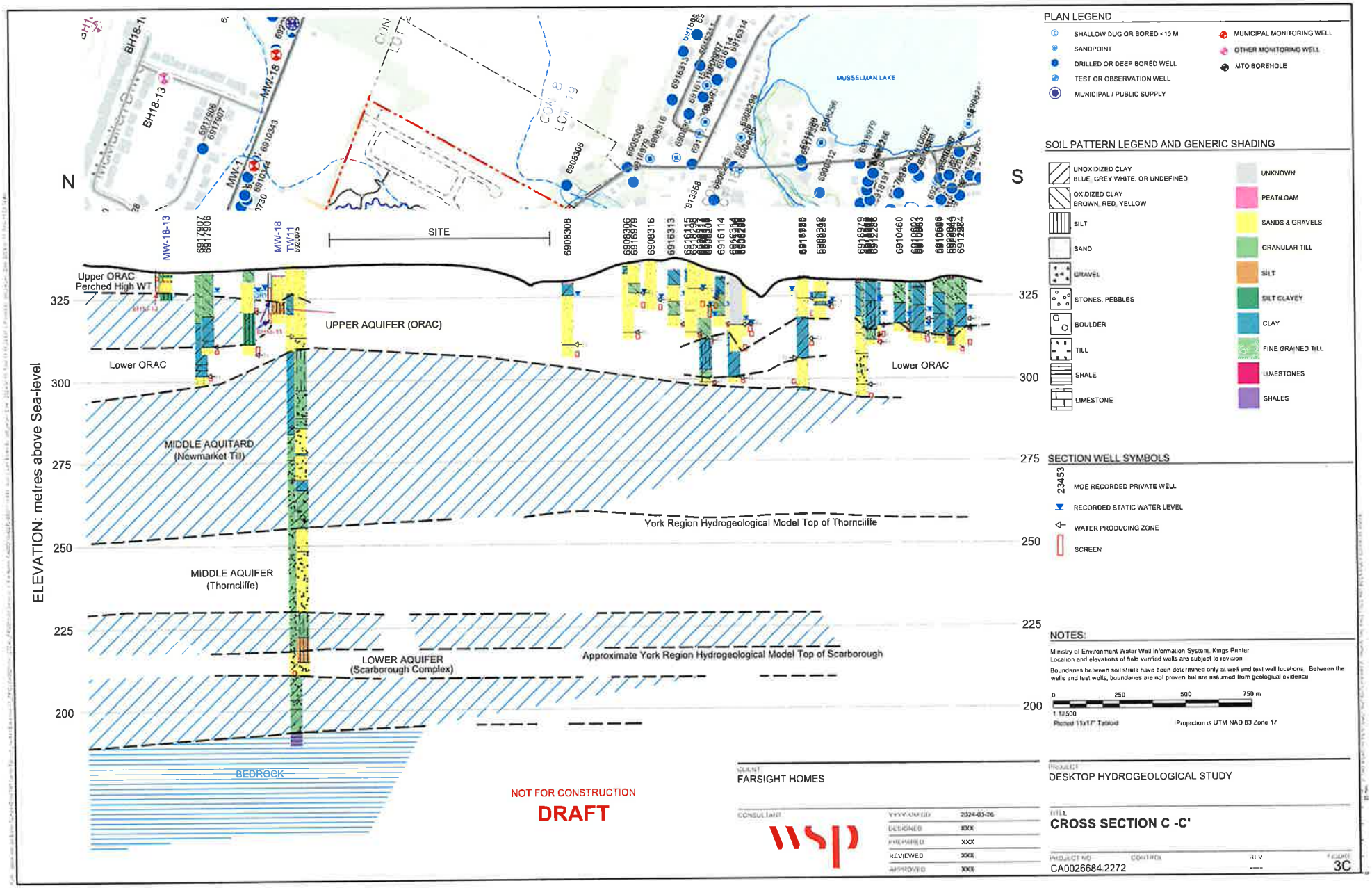
CONSULTANT
wsp

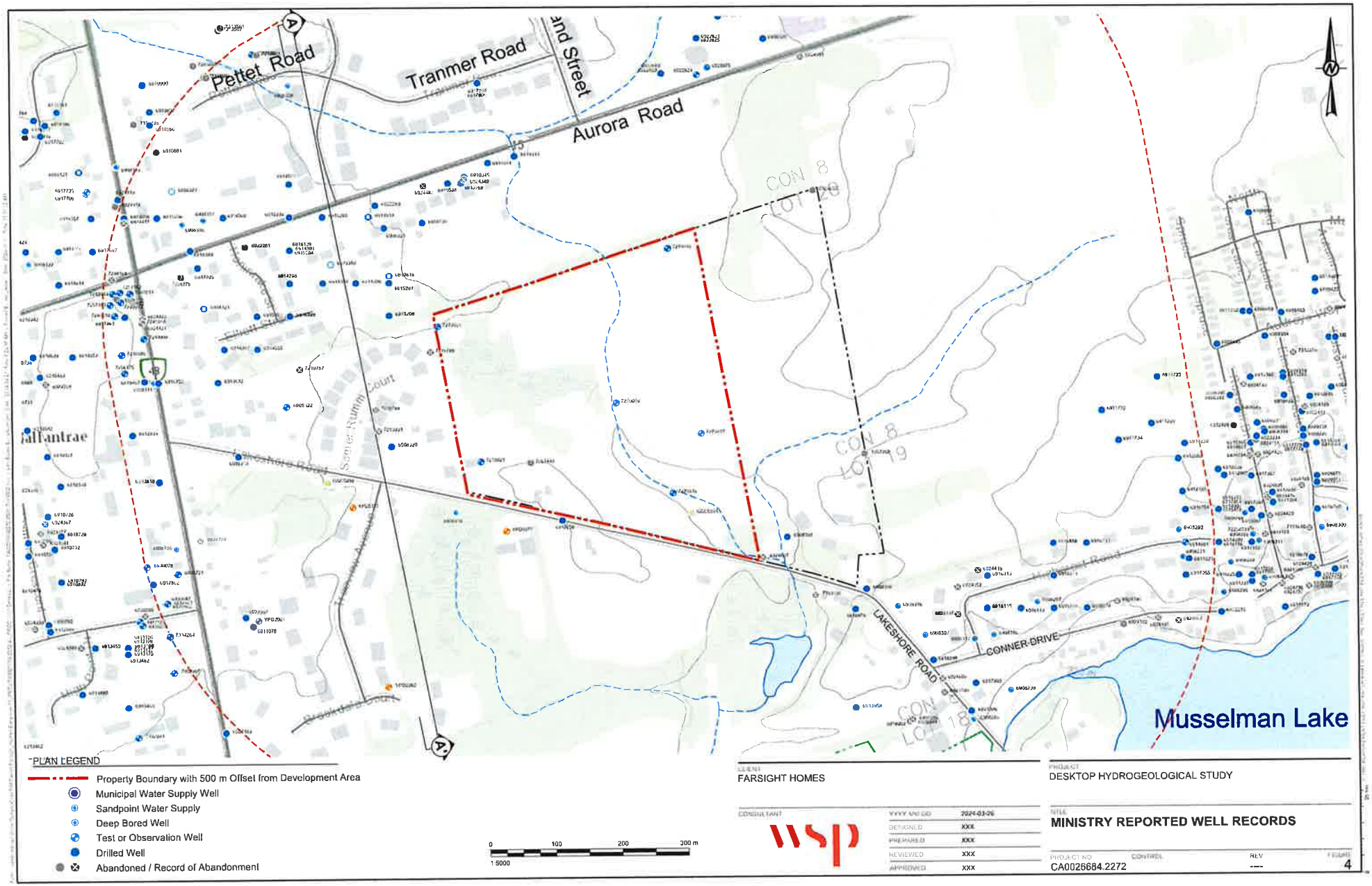
DRAWN	2024-03-26
DESIGNED	XXX
PREPARED	XXX
REVIEWED	XXX
APPROVED	XXX

PROJECT
DESKTOP HYDROGEOLOGICAL STUDY

TITLE
CROSS SECTION B - B'

PROJECT NO. CA0026684.2272 | CONTROL | REV ---- | FIGURE 3B


N
S
SITE
MW-18-13
MW-18
TW11
MUSSELMAN LAKE
CON 8
LOT 19
Upper ORAC
Perched High WT
UPPER AQUIFER (ORAC)
Lower ORAC
Lower ORAC
MIDDLE AQUITARD
(Newmarket Till)
York Region Hydrogeological Model Top of Thorncliffe
MIDDLE AQUIFER
(Thorncliffe)
LOWER AQUIFER
(Scarborough Complex)
Approximate York Region Hydrogeological Model Top of Scarborough
BEDROCK
ELEVATION: metres above Sea-level
325
300
275
250
225
200
PLAN LEGEND
SHALLOW DUG OR BORED <10 M
SANDPOINT
DRILLED OR DEEP BORED WELL
TEST OR OBSERVATION WELL
MUNICIPAL / PUBLIC SUPPLY
MUNICIPAL MONITORING WELL
OTHER MONITORING WELL
MTO BOREHOLE
SOIL PATTERN LEGEND AND GENERIC SHADING
UNOXIDIZED CLAY
BLUE, GREY WHITE, OR UNDEFINED
OXIDIZED CLAY
BROWN, RED, YELLOW
SILT
SAND
GRAVEL
STONES, PEBBLES
BOULDER
TILL
SHALE
LIMESTONE
UNKNOWN
PEAT/LOAM
SANDS & GRAVELS
GRANULAR TILL
SILT
SILT CLAYEY
CLAY
FINE GRAINED TILL
LIMESTONES
SHALES
SECTION WELL SYMBOLS
23453
MOE RECORDED PRIVATE WELL
RECORDED STATIC WATER LEVEL
WATER PRODUCING ZONE
SCREEN
NOTES:
Ministry of Environment Water Well Information System, Kings Printer
Location and elevations of field verified wells are subject to revision
Boundaries between soil strata have been determined only at well and test well locations. Between the wells and test wells, boundaries are not proven but are assumed from geological evidence
0 250 500 750 m
1:12500
Plotted 11x17" Tabloid
Projection is UTM NAD 83 Zone 17
NOT FOR CONSTRUCTION
DRAFT
CLIENT
FARSIGHT HOMES
CONSULTANT
wsp
YYYY-MM-DD 2024-03-26
DESIGNED XXX
PREPARED XXX
REVIEWED XXX
APPROVED XXX
PROJECT
DESKTOP HYDROGEOLOGICAL STUDY
TITLE
CROSS SECTION C -C'
PROJECT NO CA0026684.2272
CONTROL
REV ---
FIGURE 3C


Pettet Road
Tranmer Road
Sunnidale Street
Aurora Road
CON 8
LOT 20
CON 8
LOT 19
CON 8
LOT 18
Saint Rumin Court
Lakeshore Road
LAKESHORE ROAD
CONNER DRIVE
Musselman Lake
N
PLAN LEGEND
Property Boundary with 500 m Offset from Development Area
Municipal Water Supply Well
Sandpoint Water Supply
Deep Bored Well
Test or Observation Well
Drilled Well
Abandoned / Record of Abandonment
0
100
200
300 m
1:5000
CLIENT
FARSIGHT HOMES
PROJECT
DESKTOP HYDROGEOLOGICAL STUDY
CONSULTANT
wsp
YYYY-MM-DD 2024-03-26
DESIGNED XXX
PREPARED XXX
REVIEWED XXX
APPROVED XXX
TITLE
MINISTRY REPORTED WELL RECORDS
PROJECT NO. CA0026684.2272
CONTROL
REV ---
FIGURE 4

APPENDIX A

Important Information and Limitations of This Report

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

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The report is of a summary nature and is not intended to stand alone without reference to the instructions given to WSP by the Client, communications between WSP and the Client, and to any other reports prepared by WSP for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. WSP can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, WSP does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that WSP interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: WSP will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of WSP's report. WSP should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of WSP's report.

During construction, WSP should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of WSP's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in WSP's report. Adequate field review, observation and testing during construction are necessary for WSP to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, WSP's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

APPENDIX B

MECP Well Records

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1907350	8 19	Jun-85	637528 4877208	335.0	35.1 Fr		7.0	23	150	48.8	5457 CT	WS DO	**MOE# 1907350** 0.0 BRWN SAND CLAY 2.4 BRWN CLAY SOFT 11.6 BRWN SILT WBRG 17.1 GREY SILT WBRG 27.4 GREY CLAY SILT WBRG 40.5 GREY SILT GRVL WBRG 50.9 GREY SAND GRVL WBRG 53.3 BRWN SAND GRVL WBRG 55.2
6908106	7 20	Nov-56	636486 4877070	336.5	5.8 Fr	5.8 -1.5	5.8	23	60	5.8	5419 JT	WS DO	**MOE# 6908106** 0.0 MSND 7.3
6908111	7 20	Feb-64	636454 4877321	335.6	10.7 Fr	14.0 -2.7	5.5	14	150	13.7	2204 JT	WS DO	**MOE# 6908111** 0.0 PRDG 7.6 CLAY 8.8 QSND 10.1 CLAY 10.7 FSND 16.8
6908112	7 20	Sep-64	636402 4877454	334.1	9.1 Fr	12.2 -4.3	9.1	23	300		5419 JT	WS ST	**MOE# 6908112** 0.0 PRDR 7.3 BLUE CLAY 8.5 FSND 17.7
6908119	7 21	May-60	636400 4877649	337.7	9.1 Fr	12.2 -3.0	9.1	18	180	9.1	5419 JT	WS DO	**MOE# 6908119** 0.0 PRDG 9.1 FSND 15.2
6908207	8 18	Jun-58	637787 4876982	331.9	6.1 Fr	6.7 -1.5	6.1	23	60	6.1	5419 JT	WS DO	**MOE# 6908207** 0.0 MSND 8.2
6908286	8 18	Aug-48	637597 4876804	333.8	29.6 Fr	30.8 -1.5	30.2	18	240		2204 JT	WS ST	**MOE# 6908286** 0.0 TPSL 0.6 RED CLAY 9.8 BLUE CLAY 29.0 CSND 30.2 CSND GRVL 32.3
6908291	8 18	Oct-61	638008 4877050	333.1	12.2 Fr	13.1 -1.5	12.2	18	180		5419 JT	WS DO	**MOE# 6908291** 0.0 GREY MSND 14.6
6908292	8 18	May-62	638002 4877091	334.7	12.2 Fr	13.4 -1.5	12.2	23	120		5419 JT	WS DO	**MOE# 6908292** 0.0 FSND 14.9
6908295	8 18	Nov-63	637689 4876804	328.9	12.2 Fr	13.1 -1.5	12.2	18	60		5419 JT	WS DO	**MOE# 6908295** 0.0 FSND 14.6
6908298	8 18	Jun-67	637746 4876848	328.0	11.3 Fr	13.7 -1.5	11.3	23	180	11.3	5419 JT	WS DO	**MOE# 6908298** 0.0 MSND 15.2
6908306	8 19	May-62	637529 4877003	335.0	20.7 Fr	21.3 -1.5	2.7	14	240	21.0	2204 JT	WS DO	**MOE# 6908306** 0.0 FSND 0.9 GREY CLAY 3.0 FSND 20.7 MSND 22.9
6908307	8 19	Jun-62	637617 4876932	335.3	13.4 Fr	14.6 -1.5	13.4	23	120		5419 JT	WS DO	**MOE# 6908307** 0.0 FSND 16.2
6908308	8 19	May-64	637410 4877083	329.2	18.6 Fr	20.7 -1.5	3.7	18	240	20.4	2204 JT	WS DO	**MOE# 6908308** 0.0 TPSL 0.3 CLAY 3.7 MSND 18.6 MSND 22.3
6908313	8 20	Mar-65	636581 4877209	336.2	12.2 Fr	14.9 -4.6	12.2	18	360		5419 JT	WS DO	**MOE# 6908313** 0.0 PRDG 6.1 BRWN CLAY 12.2 FSND 19.5
6908315	8 19	Jun-67	637721 4876932	333.8	9.1 Fr	11.0 -1.5	9.1	23	120	9.1	5419 JT	WS DO	**MOE# 6908315** 0.0 MSND 12.5
6908316	8 19	Jul-67	637577 4876976	336.2	12.2 Fr	13.7 -1.5	11.6	18	180	11.6	5419 JT	WS DO	**MOE# 6908316** 0.0 MSND 15.2
6908317	8 19	Jul-67	637692 4876926	333.8	11.6 Fr	12.2 -3.0	11.6	14	240	11.6	5419 JT	WS DO	**MOE# 6908317** 0.0 MSND 15.2

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6908318	8 20	May-50	636909 4877123	332.8	11.9 Fr	12.8 -1.5	11.0	18		13.4	2204 JT	WS DO	**MOE# 6908318** 0.0 CSND 14.3
6908320	8 20	Oct-62	636813 4877223	334.1	35.1 Fr	39.6 -1.5	9.1	14	360		3108 CT	WS DO	**MOE# 6908320** 0.0 PRDG 4.9 CLAY FSND 12.2 FSND 18.3 BLUE CLAY 27.4 CLAY MSND 35.1 BLUE FSND 41.1
6908321	8 20	Nov-62	636804 4877554	334.4	17.4 Fr	14.9 -2.4	7.6	9	60	17.1	1413 CT	WS DO	**MOE# 6908321** 0.0 PRDG 7.6 YLLW CLAY SILT 14.3 RED FSND 17.4
6908322	8 20	Nov-65	636655 4877284	335.0	9.1 Fr		NR				5420 CT	TH NU	**MOE# 6908322** 0.0 PRDG 7.3 BRWN MSND SILT 19.8 QSND CLAY 70.1
6908323	8 20	Jun-65	636531 4877433	333.1	10.4 Fr		10.4	23			4102 BR	WS DO	**MOE# 6908323** 0.0 CSND 10.4 FSND 14.3
6908325	8 21	Apr-53	637380 4877838	332.2	13.7 Fr	11.3 -2.4	8.5	23	120	9.1	1413 CT	WS DO	**MOE# 6908325** 0.0 MSND GRVL 13.7
6908328	8 21	Oct-58	636661 4877769	333.1	10.7 Fr	11.6 -3.0	10.7	18	300	10.7	5419 JT	WS DO	**MOE# 6908328** 0.0 MSND 5.2 CLAY 9.1 MSND 14.6
6908329	8 21	May-59	636484 4877611	333.1	1.8 Fr		1.8	5			4102 BR	WS DO	**MOE# 6908329** 0.0 MSND 1.8 QSND 4.9
6908336	8 21	Aug-65	636499 4877561	333.1	9.8 Fr	8.2 -2.7	4.3	18	180	10.7	2204 JT	WS DO	**MOE# 6908336** 0.0 PRDG 3.7 MSND CLAY 9.8 FSND 11.0
6908337	8 21	Sep-66	636531 4877567	333.1	9.1 Fr	9.8 -1.5	9.1	18			5419 JT	WS CO	**MOE# 6908337** 0.0 FSND 6.1 BLUE CLAY 9.1 FSND 11.3
6910269	8 20	Apr-71	636921 4877621	330.1	9.1 Fr	7.9 -1.2	2.7	23	120	6.1	1413 CT	WS DO	**MOE# 6910269** 0.0 BLCK TPSL MSND 0.3 RED MSND 9.1
6910343	8 20	Jun-71	637002 4877662	333.5	24.7 Fr	22.3 -2.4	6.1	41	120	24.4	1413 CT	WS DO	**MOE# 6910343** 0.0 BRWN MSND CLAY 7.6 BLUE SILT CLAY 21.6 GREY FSND 24.7
6910344	8 20	Jun-71	636962 4877652	333.5	25.3 Fr	22.9 -2.4	6.1	41	120	18.3	1413 CT	WS DO	**MOE# 6910344** 0.0 BRWN MSND CLAY 7.6 BLUE SILT CLAY 22.3 GREY FSND 25.3
6910345	8 20	Jun-71	636926 4877631	333.5	24.4 Fr	21.9 -2.4	6.4	27	120	22.3	1413 CT	WS DO	**MOE# 6910345** 0.0 BRWN MSND CLAY 11.0 BLUE SILT CLAY 21.6 GREY FSND 24.4
6910538	8 20	Sep-71	636901 4877621	333.5	24.7 Fr	25.3 -1.2	6.1	36	150	18.3	1350 CT	WS DO	**MOE# 6910538** 0.0 BRWN MSND 4.9 BRWN CLAY 5.8 BRWN MSND 15.8 GREY MSND 16.5 GREY CLAY GRVL 19.5 GREY MSND 20.1 GREY CLAY 21.0 GREY MSND 23.2 GREY SILT 24.7 BRWN MSND 26.5
6910730	8 20	Oct-71	636861 4877561	334.4	24.4 Fr	25.0 -0.9	6.4	27	200	14.0	1350 CT	WS DO	**MOE# 6910730** 0.0 BRWN MSND 1.2 BRWN MSND CLAY 3.0 BRWN CLAY GRVL 8.5 BRWN FSND 14.9 GREY MSND CLAY 17.4 GREY CLAY 21.0 GREY SILT 24.4 BRWN MSND 25.9

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6910818	8 20	Jul-71	636811 4877481	334.7	6.7 Fr		6.7				5459 BR	WS DO	**MOE# 6910818** 0.0 TPSL MSND 0.3 BRWN FSND CLAY 6.7 BRWN MSND 10.7
6910881	8 21	May-72	636461 4877671	334.1			NR				1413 CT	AS -	**MOE# 6910881** 0.0 BRWN SAND 1.5 BRWN CLAY SAND SILT 5.5 BLUE SAND CLAY 7.0 BRWN CLAY SAND 15.2 BLUE CLAY SAND SILT 23.8
6910886	8 21	May-72	636451 4877711	334.1	26.5 Fr	27.7 -1.8	12.2	18	200	24.4	1350 CT	WS DO	**MOE# 6910886** 0.0 BRWN SAND 2.7 GREY CLAY 7.3 BRWN CLAY SAND 10.1 BRWN SILT 19.5 GREY CLAY SILT 24.7 GREY SILT 25.9 GREY CLAY 27.1 GREY SAND 29.6
6911078	8 19	Oct-72	636601 4876951	335.0	32.9 Fr	30.5 -2.4	6.1	23	120	24.4	1413 CT	WS DO	**MOE# 6911078** 0.0 BRWN SAND 6.1 BRWN CLAY 11.0 GREY CLAY SILT 29.9 GREY SAND 32.9
6911229	8 19	Aug-72	637962 4877252	339.9	19.8 Fr	20.1 -1.5	19.8	27	120		5419 CT	WS DO	**MOE# 6911229** 0.0 SAND 21.6
6911230	8 19	Aug-72	638012 4877222	339.9	18.3 Fr	18.3 -1.5	18.3	23	120		5419 JT	WS DO	**MOE# 6911230** 0.0 CLAY 1.5 SAND 19.8
6911732	8 19	Jul-73	637887 4877272	339.9	21.3 Fr	19.8 -1.5	18.3	23	120	19.8	5419 CT	WS DO	**MOE# 6911732** 0.0 CLAY 1.5 SAND 21.3
6911733	8 19	Jul-73	637972 4877322	339.9	21.3 Fr	19.8 -1.5	18.3	23	120	19.8	5419 CT	WS DO	**MOE# 6911733** 0.0 CLAY 1.5 SAND 21.3
6911734	8 19	Jul-73	637912 4877227	339.9	21.3 Fr	19.8 -1.5	18.3	23	120	19.8	5419 CT	WS DO	**MOE# 6911734** 0.0 CLAY 1.5 SAND 21.3
6911823	8 18	Oct-73	638017 4877047	332.8	10.1 Fr		10.1	18	70		2218 CT	WS DO	**MOE# 6911823** 0.0 BRWN CLAY SAND 2.4 BRWN SAND 6.1 BRWN FSND CLAY 10.1 BRWN FSND 14.3
6912068	8 19	May-74	638002 4877199	338.9	14.0 Fr	18.0 -1.5	14.6	18	100		2218 CT	WS PU	**MOE# 6912068** 0.0 BRWN SAND CLAY STNS 1.5 BRWN SAND 14.0 BRWN SAND 19.5
6912165	8 18	Jun-74	638008 4877149	339.9	17.1 Fr	20.4 -1.5	17.1	23	130		2218 CT	WS PU	**MOE# 6912165** 0.0 BRWN CLAY 1.2 BRWN SAND CLAY 17.1 BRWN SAND 21.9
6912839	7 20	Jul-75	636421 4877242	335.9	15.8 Fr	16.2 -1.8	7.3	27	60	14.0	1350 CT	WS DO	**MOE# 6912839** 0.0 PRDG 1.2 BRWN SAND 5.5 YLLW CLAY SAND 10.1 BRWN SILT SAND CLAY 15.8 BRWN FSND 18.0
6912862	7 19	May-75	636451 4877017	335.0	33.5 Fr	34.4 -3.7	11.0	50	120	27.4	1350 CT	WS DO	**MOE# 6912862** 0.0 BRWN SAND GRVL 1.2 BRWN SAND 3.7 YLLW CLAY 10.1 GREY SILT CLAY 20.7 GREY CLAY 33.5 GREY FSND 38.1
6912956	8 20	Oct-75	637070 4877110	335.0	19.8 -	21.9 -0.9	6.1	68	120	18.3	5459 CT	WS DO	**MOE# 6912956** 0.0 PRDG 5.2 BRWN FSND 13.7 BRWN CLAY SAND 19.8 BRWN FSND 22.9

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6913612	8 20	Sep-76	636551 4877321	335.9	32.6 Fr	32.6 -0.9	15.2	36	120	27.4	5459 CT	WS DO	**MOE# 6913612** 0.0 BRWN CLAY 3.7 BRWN CSND 6.7 BRWN CLAY SAND 24.4 BLUE CLAY 32.6 GREY FSND 33.5
6913618	7 20	Oct-76	636461 4877171	337.1	33.5 Fr	34.1 -0.9	12.2	45	60	30.5	5459 CT	WS CO	**MOE# 6913618** 0.0 BRWN SAND 7.6 BRWN CLAY 12.2 BLUE CLAY SOFT 33.5 BLUE FSND 35.1
6913839	8 20	Jun-76	636781 4877571	334.4	5.5 Fr		4.9				3109 BR	WS DO	**MOE# 6913839** 0.0 TPSL 0.6 BRWN CLAY SNDY 5.5 SAND 6.1 BRWN CLAY SNDY 12.2
6913958	8 18	Apr-77	637512 4876822	331.3	12.2 Fr	14.3 -1.5	11.6				2218 CT	WS DO	**MOE# 6913958** 0.0 BLCK TPSL 0.6 BRWN CLAY STNS 9.1 BLUE CLAY 12.2 BRWN SAND 15.8
6914058	7 21	Aug-77	636411 4877571	335.3	24.4 Fr 18.3 Mn	23.8 -2.4	9.1	9	5999		2341 CT	WS DO	**MOE# 6914058** 0.0 BRWN SAND LOOS 3.7 BRWN SAND CLAY 10.1 BRWN SAND LOOS 20.1 BLUE CLAY DNSE 21.0 BLUE CLAY SNDY SOFT 23.8 BLGR QSND SILT SOFT 27.4
6914298	8 20	Jun-77	636661 4877471	331.9	29.6 Fr	29.6 -1.5	11.6	27	60	27.4	1350 CT	WS DO	**MOE# 6914298** 0.0 BRWN SAND 4.0 YLLW CLAY 8.5 BRWN SILT CLAY 19.8 GREY CLAY 26.2 GREY SILT 28.0 GREY CLAY 29.6 BRWN SAND WBRG 31.4
6914300	8 20	Jul-77	636711 4877471	331.9	32.0 Fr	32.3 -1.2	12.2	23	120	30.5	1350 CT	WS DO	**MOE# 6914300** 0.0 BRWN SAND 4.0 YLLW CLAY 9.1 BRWN SILT CLAY 20.4 GREY CLAY 27.4 GREY SILT 29.3 GREY CLAY 32.0 BRWN SAND WBRG 33.5
6914301	8 20	Jul-77	636661 4877521	331.9	30.5 Fr	30.5 -1.8	11.6	23	150	28.7	1350 CT	WS DO	**MOE# 6914301** 0.0 BRWN SAND 3.7 YLLW CLAY SAND 8.2 BRWN SILT CLAY 20.7 GREY CLAY 27.4 GREY SILT 28.7 GREY CLAY 30.5 BRWN SAND WBRG 32.3
6914306	8 20	Sep-77	636761 4877471	334.7	28.3 Fr	28.7 -1.5	12.5	41	60	22.9	1350 CT	WS DO	**MOE# 6914306** 0.0 BRWN SAND 4.9 YLLW CLAY 10.4 BRWN SILT CLAY 20.4 GREY CLAY 28.3 BRWN SAND 30.2
6914307	8 20	Sep-77	636561 4877371	333.1	32.6 Fr	32.6 -1.5	11.9	32	60	25.9	1350 CT	WS DO	**MOE# 6914307** 0.0 BRWN SAND 6.1 YLLW CLAY 9.4 BRWN SILT CLAY 19.5 GREY CLAY 27.4 GREY SILT 29.3 GREY CLAY 32.6 BRWN SAND 34.1
6914555	8 20	Apr-78	636611 4877371	332.5	31.1 Mn	31.7 -1.8	12.2	18	120	30.5	1350 CT	WS DO	**MOE# 6914555** 0.0 BRWN SAND 5.2 YLLW CLAY SAND 9.8 BRWN SILT CLAY 20.7 GREY CLAY 27.4 GREY SILT 29.6 GREY CLAY 31.1 BRWN FSND WBRG 33.5
6914559	8 21	Jun-78	636661 4877621	332.8	27.7 Fr	27.1 -1.8	12.5	27	60	25.9	1350 CT	WS DO	**MOE# 6914559** 0.0 BRWN SAND 4.6 YLLW CLAY 9.8 GREY SILT CLAY 20.7 GREY CLAY 23.8 GREY SILT 25.0 GREY CLAY 27.7 GREY FSND 29.9

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6914560	8 21	Jun-78	636561 4877571	333.1	28.0 Fr	27.1 -1.8	12.2	23	60	27.4	1350 CT	WS DO	**MOE# 6914560** 0.0 BRWN SAND 4.0 YLLW CLAY 9.1 GREY SILT CLAY 20.7 GREY CLAY 22.9 GREY SILT 24.7 GREY CLAY 28.0 GREY FSND 29.9
6914901	8 18	Jul-78	638012 4877072	333.8	13.1 Fr		NR				1840 -	OW NU	**MOE# 6914901** 0.0 BRWN SAND SILT LOOS 2.7 BRWN SILT CLAY SNDY 4.0 BRWN FSND MSND PCKD 15.2
6915200	8 20	Apr-79	636661 4877421	331.9	31.4 Fr	31.4 -1.8	11.6	32	60	30.5	1350 CT	WS DO	**MOE# 6915200** 0.0 BRWN SAND 5.2 YLLW CLAY 9.4 BRWN SILT CLAY 20.7 GREY CLAY 27.7 GREY SILT 29.6 GREY CLAY 31.4 BRWN FSND VERY 33.8
6915201	8 20	Apr-79	636611 4877421	332.5	31.7 Fr	32.6 -1.5	11.6	45	60	22.9	1350 CT	WS DO	**MOE# 6915201** 0.0 BRWN SAND 4.9 YLLW CLAY 8.8 BRWN SAND SILT CLAY 19.8 GREY CLAY 27.4 GREY SILT 30.5 GREY CLAY 31.7 BRWN SAND 34.1
6915203	8 20	May-79	636711 4877571	331.9	32.9 Fr	32.6 -0.9	12.5	18	60	33.2	1350 CT	WS DO	**MOE# 6915203** 0.0 BRWN SAND 6.7 YLLW CLAY 9.4 BRWN SILT CLAY 21.0 GREY CLAY 32.9 BRWN SAND 34.1
6915204	8 20	Sep-79	636661 4877521	331.9	34.1 Fr	33.8 -1.5	12.8	36	60	30.5	1350 CT	WS DO	**MOE# 6915204** 0.0 BRWN SAND 7.3 YLLW CLAY SAND 9.8 BRWN SILT CLAY 21.3 GREY CLAY 34.1 GREY SAND 36.0
6915206	8 20	Jul-79	636461 4877571	336.8	32.9 Fr	32.6 -1.5	11.0	68	180	19.8	1350 CT	WS DO	**MOE# 6915206** 0.0 BRWN SAND 6.4 YLLW CLAY SAND 9.1 BRWN SILT CLAY 20.7 GREY CLAY SILT 32.9 BRWN SAND 34.7
6915207	8 20	Jul-79	636811 4877471	334.7	29.9 Fr	29.6 -1.2	11.9	45	60	19.8	1350 CT	WS DO	**MOE# 6915207** 0.0 BRWN SAND 5.5 YLLW CLAY SAND 8.8 BRWN SILT CLAY 20.1 GREY CLAY 29.9 BRWN SAND 31.4
6915208	8 20	May-79	636811 4877421	334.7	31.7 Fr	31.7 -1.8	11.9	41	60	25.9	1350 CT	WS DO	**MOE# 6915208** 0.0 BRWN SAND 6.1 YLLW CLAY SAND 9.1 BRWN SILT CLAY 19.8 GREY CLAY 31.7 BRWN SAND 34.1
6915336	8 20	Nov-79	636661 4877571	336.8	32.9 Fr	32.6 -1.5	12.2	36	60	30.5	1350 CT	WS DO	**MOE# 6915336** 0.0 BRWN SAND 5.5 YLLW CLAY SAND 9.8 BRWN SILT SAND CLAY 20.7 GREY CLAY 32.9 BRWN SAND 34.7
6916111	8 18	Nov-81	637862 4877072	332.8	16.2 Fr	16.2 -0.9	NR	23	120	15.8	5457 CT	WS DO	**MOE# 6916111** 0.0 BRWN CLAY SNDY 3.0 BRWN CSND 15.5 BRWN MSND 17.1
6916112	8 18	Nov-81	637812 4877072	332.8	18.0 Fr		12.8	18	120	17.7	5457 CT	WS DO	**MOE# 6916112** 0.0 BRWN CLAY SNDY 2.7 BRWN MSND 16.2 BRWN FSND 18.9

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6916113	8 18	Dec-81	637762 4876972	332.5	33.5 Fr	33.5 -0.9	13.4	18	180	32.6	5457 CT	WS DO	**MOE# 6916113** 0.0 BRWN CLAY SNDY 5.5 BRWN SAND CLAY LYRD 20.4 GREY CLAY SLTY 29.6 GREY CLAY STNS 32.0 GREY FSND SLTY 33.5 GREY FSND 34.4
6916114	8 18	Dec-81	637812 4876972	331.0	14.3 Fr	14.3 -0.9	8.8	27	120	13.7	5457 CT	WS DO	**MOE# 6916114** 0.0 BRWN CLAY 0.6 BRWN CLAY SNDY 5.2 BRWN MSND CLAY LYRD 11.9 BRWN FSND 15.2
6916115	8 18	Jan-82	637712 4876972	333.1	19.5 Fr	19.5 -1.2	11.9	18	180	19.5	5457 CT	WS DO	**MOE# 6916115** 0.0 BRWN CLAY SNDY 3.7 BRWN MSND 12.5 BRWN FSND 18.9 GREY FSND 20.7
6916128	8 20	Jul-81	636661 4877421	331.9	31.4 Fr	31.4 -1.2	13.1	45	60	27.4	1350 CT	WS DO	**MOE# 6916128** 0.0 BRWN SAND 7.9 YLLW CLAY SAND 10.7 YLLW SILT CLAY 20.1 GREY CLAY SILT 28.7 GREY CLAY 31.4 BRWN SAND 32.6
6916129	8 20	Jul-81	636661 4877521	331.9	32.9 Fr	32.6 -0.9	12.8	55	60	24.4	1350 CT	WS DO	**MOE# 6916129** 0.0 BRWN SAND 6.7 YLLW CLAY SAND 10.4 YLLW SILT CLAY 20.7 GREY CLAY 24.1 GREY SILT 25.6 GREY CLAY 32.9 BRWN SAND 33.8
6916311	8 18	Mar-82	637812 4877022	331.9	20.1 Fr	20.1 -1.2	11.9	23	180	19.5	5457 CT	WS DO	**MOE# 6916311** 0.0 BRWN CLAY SNDY 8.8 BRWN SAND CLAY LYRD 18.3 BRWN SAND 21.3
6916313	8 18	Jul-82	637712 4877022	333.1	16.5 Fr	16.5 -0.9	7.6	45	120	13.7	5457 CT	WS DO	**MOE# 6916313** 0.0 BLCK TPSL 0.3 BRWN CLAY 4.6 BRWN CSND 9.8 BRWN SAND CLAY 13.7 BRWN SAND 17.4
6916314	8 18	Jun-82	637862 4876972	329.2	29.0 Fr	29.6 -0.9	10.7	27	60	29.0	3108 CT	WS DO	**MOE# 6916314** 0.0 BRWN TPSL SNDY 0.6 BRWN SAND 15.5 BRWN CLAY SNDY 16.8 BLUE CLAY SNDY 28.7 BLUE SAND 30.5
6916349	8 20	Aug-82	636511 4877521	335.3	32.6 Fr	34.1 -1.2	5.5	45	120	24.4	4743 CT	WS DO	**MOE# 6916349** 0.0 YLLW SAND CLAY 6.4 GREY SAND CLAY SOFT 17.7 YLLW CLAY SOFT 27.4 GREY TILL 32.6 GREY FSND CLN 35.4
6916668	8 18	Jul-82	637812 4877072	332.8			NR	23	180		5419 CT	WS DO	**MOE# 6916668** 0.0 CLAY 2.1 SAND CLAY 13.7 FSND 18.3
6916753	7 20	Jul-83	636461 4877321	335.6	15.5 Fr	15.2 -1.2	5.5	14	60		5457 CT	WS DO	**MOE# 6916753** 0.0 PRDG 1.8 BRWN SAND DRY 9.1 BRWN SAND CLAY 12.2 GREY CLAY LOOS 13.7 GREY SAND CLAY LTCL 15.5 BRWN SAND 16.2
6916754	8 18	Jun-83	638012 4877122	336.5	13.7 Fr		11.0	18	120	13.4	5457 CT	WS DO	**MOE# 6916754** 0.0 BRWN SAND DRY 9.1 BRWN SAND 14.6 BRWN SAND CLAY LOOS 17.7
6916979	8 18	Sep-83	637512 4876972	334.4	8.2 Fr	11.3 -1.5	8.2	23	200		2218 CT	WS -	**MOE# 6916979** 0.0 BRWN SAND 5.5 BRWN FSND CLAY 8.2 BRWN SAND 12.8

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6917055	8 18	Mar-84	638012 4877022	331.9	13.4 Fr	16.2 -0.9	12.2	27	60	15.2	5457 CT	WS DO	**MOE# 6917055** 0.0 BRWN CLAY SNDY 3.7 BRWN SAND 17.1
6917363	7 20	Nov-84	636411 4877421	334.1	14.0 Fr	16.5 -0.9	5.5	14	60	15.8	5457 CT	WS DO	**MOE# 6917363** 0.0 BRWN SAND DRY 10.4 BRWN SAND CLAY 14.0 BRWN FSND WBRG 17.4
6917705	8 20	Nov-85	636522 4877495	335.6		86.0 -1.8	35.1	77	1440	82.3	4816 RC	WS DO	**MOE# 6917705** 0.0 TPSL 0.6 BRWN FSND 8.2 BRWN FSND CLAY 34.7 GREY SAND CLAY DNSE 117.0 MSND CSND 118.9 CLAY 122.2 MSND CSND 122.8 CLAY TILL 125.0
6917903	8 18	May-85	637693 4876859	333.8	16.8 Fr	19.8 -0.9	10.7	45	60	18.3	5459 CT	WS DO	**MOE# 6917903** 0.0 BRWN SAND CLAY 5.2 BRWN SAND 15.8 BRWN SAND CLAY 16.8 BRWN SAND 20.7
6917906	8 21	Oct-85	636947 4877772	333.5	22.9 Fr	24.1 -0.9	6.1	32		22.9	5459 CT	WS DO	**MOE# 6917906** 0.0 BRWN SAND CLAY 13.7 BLUE CLAY SOFT 21.0 BLUE CLAY SAND FSND 22.9 BLUE SAND 25.0
6917907	8 21	Oct-85	636947 4877772	332.2	30.5 Fr	30.8 -0.9	6.7	27		29.0	5459 CT	WS DO	**MOE# 6917907** 0.0 BRWN SAND CLAY 14.3 BLUE CLAY SOFT 26.8 BLUE CLAY SAND 28.7 BLUE CLAY 30.5 BLUE SAND FSND 33.2
6918298	8 18	Aug-86	637629 4876894	335.0	7.6 Fr	11.6 -1.5	7.6	23	150		2218 CT	WS PU	**MOE# 6918298** 0.0 BRWN SAND 7.6 BRWN SAND 13.1
6918902	8 18	Jul-87	637593 4876802	333.8	12.8 Fr	14.9 -1.2	7.6	27	120	14.6	5457 RC	WS DO	**MOE# 6918902** 0.0 BRWN SAND CLAY 5.5 BRWN SAND 16.2
6919467	8 20	Nov-87	636440 4877323	335.6		16.2 -1.5	7.9	27	60	15.2	1350 CT	WS DO	**MOE# 6919467** 0.0 BRWN SAND 4.9 YLLW CLAY 7.6 BRWN SAND 14.0 GREY CLAY 14.6 GREY SILT 15.5 BRWN SAND 17.7
6920075	8 21	Jul-87	637295 4877794	335.0			NR				2801 RC	TH NU	**MOE# 6920075** 0.0 SAND 8.5 BRWN CLAY SOFT 14.6 FSND CSND 25.9 GREY CLAY 51.2 CLAY GRVL HARD 59.1 GRVL CLAY HARD 116.7 GRVL CLAY 124.4 CLAY GRVL 131.7 GRVL CLAY 134.4 CLAY GRVL HARD 141.4 SHLE 145.7
6921193	7 19	Jul-90	636558 4876791	333.8	23.8 Fr	24.4 -0.9	16.8	91	60	21.3	5459 CT	WS DO	**MOE# 6921193** 0.0 BRWN CLAY SAND 4.9 BRWN SAND CSND 6.4 BRWN GRVL CGVL 14.6 BRWN SAND SILT 18.3 BRWN SAND FSND 23.8 BRWN SAND MSND 25.3
6921306	8 18	Nov-11	637686 4876817	331.0	14.6 Fr	20.7 -1.8	13.1	23	150		2218 CT	WS -	**MOE# 6921306** 0.0 UNKN 14.6 BRWN FSND 22.6
6921819	7 21	Dec-91	636402 4877599	336.5	15.2 Fr	15.2 -1.2	8.2	32	1440	13.7	1350 CT	WS DO	**MOE# 6921819** 0.0 BRWN SAND 5.8 YLLW CLAY 8.2 GREY SILT 15.2 BRWN SAND 16.5

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6922280	8 20	May-93	636791 4877588	333.8	27.7 Fr	28.7 -1.8	6.1	91	60	18.3	5459 CT	WS DO	**MOE# 6922280** 0.0 BRWN SAND SILT 5.2 BRWN CLAY SOFT 7.6 BRWN SAND CLAY 10.1 BRWN SAND SILT 21.3 GREY CLAY SOFT 27.7 GREY SAND FSND 30.5
6922281	8 20	Jun-93	636594 4877526	336.8			NR				5459 -	- -	**MOE# 6922281** 0.0
6922367	8 19	Sep-93	636590 4876965	335.9	35.7 Fr	34.4 -1.2	7.0	136	60	30.5	1413 RA	WS DO	**MOE# 6922367** 0.0 BRWN SAND PCKD 3.7 BRWN GRVL SAND LOOS 4.6 GREY CLAY SOFT 7.0 GREY SAND CLAY SILT 23.5 GREY CLAY SILT SOFT 29.9 GREY SAND CLN FSND 35.7
6922603	8 21	Apr-94	637225 4877785	331.3	62.8 Fr	61.6 -1.2	13.7	45	120	57.9	4645 RC	WS DO	**MOE# 6922603** 0.0 BRWN SAND SILT LOOS 4.6 BRWN SILT CLAY SOFT 6.1 BRWN SAND SILT LOOS 16.8 GREY CLAY SILT SOFT 18.3 GREY SILT SAND SOFT 22.9 GREY CLAY SILT SOFT 25.0 GREY SILT SAND SOFT 44.2 BRWN FSND SILT LOOS 51.8 GREY SILT CLAY SOFT 54.9 GREY SILT SAND CLAY 59.4 BRWN GRVL SAND SILT 64.0 GREY SILT GRVL SAND 68.6 GREY CLAY SILT 76.2
6922821	8 21	Jun-94	637279 4877839	331.6	56.7 Fr	55.5 -1.2	10.4	23	180	51.8	4645 RC	WS DO	**MOE# 6922821** 0.0 BRWN FSND SILT 9.1 BRWN SILT CLAY FSND 13.7 BRWN SILT FSND 42.7 BRWN SILT FSND CLAY 45.7 GREY CLAY SILT SOFT 48.8 GREY CLAY SILT 54.9 BRWN GRVL SILT LOOS 56.4 GREY SILT CLAY GRVL 59.4 GREY SILT CLAY SAND 61.6
6922823	8 21	Jun-94	637225 4877785	331.3	63.4 Fr	62.2 -1.5	16.5	55	120	54.9	4645 RC	WS DO	**MOE# 6922823** 0.0 BRWN SAND SILT 4.6 BRWN CLAY SILT 6.1 BRWN SAND SILT 16.8 GREY CLAY SILT LYRD 18.9 GREY SILT SAND CLAY 25.9 GREY SILT SAND 51.8 GREY SILT CLAY 54.9 GREY SILT SAND CLAY 59.4 GREY SILT GRVL 61.6 GREY SAND GRVL SILT 64.0 GREY CLAY SILT SAND 65.5
6922824	8 21	Jun-94	637279 4877783	332.8			NR				4645 RC	OW NU	**MOE# 6922824** 0.0 BLCK TPSL 0.3 BRWN SILT SAND CLAY 1.8 BRWN SILT FSND 9.1
6922825	8 21	Jul-94	637279 4877839	331.6	82.3 Fr	81.1 -1.2	36.0	55	300	79.2	4645 RC	WS DO	**MOE# 6922825** 0.0 BLCK TPSL 0.3 BRWN SILT SAND CLAY 1.8 BRWN SILT FSND 10.7 GREY CLAY SILT LYRD 16.8 GREY SILT FSND CLAY 51.8 GREY CLAY SILT SNDS 57.9 GREY SILT GRVL DRY 61.0 GREY CLAY GRVL SILT 70.1 GREY CLAY DNSE 71.6 GREY SILT SAND CMTD 76.2 GREY CLAY DNSE 79.2 BLCK GRVL SAND SILT 80.5 GREY SILT SAND CLAY 82.3

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6923350	8 20	Aug-95	636723 4877499	335.9			4.9	45	20	8.5	6874 CT	WS DO	**MOE# 6923350** 0.0 BRWN SAND CLN 8.5
6924057	8 18	Jul-97	638000 4876952	331.9			NR				5459 AB	AB NU	**MOE# 6924057** 0.0
6924192	8 18	Dec-97	637917 4876947	328.0			NR				5459 -	- -	**MOE# 6924192** 0.0
6924196	8 18	May-97	637908 4876982	328.9			NR				5459 -	AB DO	**MOE# 6924196** 0.0
6924197	8 18	Dec-97	637970 4876956	331.0			NR				5459 -	AS -	**MOE# 6924197** 0.0
6924337	8 18	Apr-98	637667 4876963	335.9			NR				5459 -	AB -	**MOE# 6924337** 0.0
6924349	7 20	Apr-98	636926 4877627	333.8			NR				5459 -	AB -	**MOE# 6924349** 0.0
6924352	8 18	Apr-98	637667 4877005	336.2			NR				5459 -	AB -	**MOE# 6924352** 0.0
6924418	8 18	Jun-98	637698 4877030	337.4			NR				5459 -	AB -	**MOE# 6924418** 0.0
6924421	8 20	May-98	636438 4877418	335.0			NR				5459 -	AB -	**MOE# 6924421** 0.0
6924422	8 20	May-98	636438 4877418	335.0			NR				5459 -	AB -	**MOE# 6924422** 0.0
6924477	8 21	Jun-98	636411 4877564	337.4			NR				5459 -	AB -	**MOE# 6924477** 0.0
6924482	8 20	Jun-98	636864 4877617	333.1			NR				5459 -	AB -	**MOE# 6924482** 0.0
6924590	8 16	Aug-98	637646 4876845	332.8			NR				5459 -	AB -	**MOE# 6924590** 0.0
6924593	8 21	Aug-98	637436 4877810	335.0			NR				5459 -	AB -	**MOE# 6924593** 0.0
6924606	8 16	Aug-98	637643 4876866	333.5			NR				5459 -	AB -	**MOE# 6924606** 0.0
6924607	8 16	Aug-98	637373 4877052	328.3			NR				5459 -	AB -	**MOE# 6924607** 0.0
6924655	8 20	Oct-98	637453 4877608	335.3	19.2 Fr	16.8 -2.4	11.3	205	60	16.2	1413 RA	WS DO	**MOE# 6924655** 0.0 BRWN SAND PCKD 11.3 BRWN SAND WBRG CLN 19.2
6924724	8 19	Dec-98	636523 4877082	335.9			NR				5459 -	AB -	**MOE# 6924724** 0.0
6924938	7 21	Jul-99	636398 4877589	337.7			NR				1413 -	AB -	**MOE# 6924938** 0.0 GREY CLAY 0.3 GREY 9.4
6924939	7 21	Jul-99	636398 4877589	337.7			NR				1413 -	AB -	**MOE# 6924939** 0.0 GREY CLAY 0.3 GREY 5.8

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
6926030	8 18	Sep-01	637597 4876805	333.8			NR				5459 -	AB -	**MOE# 6926030** 0.0
6930047		Aug-05	636472 4876987	335.9		2.4 -6.1	NR				6032 BR	OW NU	**MOE# 6930047 TAG#A005275** 0.0 BRWN SAND SLTY 8.5 BRWN SAND SLTY 8.5 BRWN SAND SLTY 8.5 BRWN SAND SLTY 8.5 BRWN SAND SLTY 8.5 BRWN SAND SLTY 8.5
6930078	7 19	Mar-06	636442 4877043	335.6		3.0 -3.0	NR				7147 OTH	OW NU	**MOE# 6930078 TAG#A037568** 0.0 BLCK TPSL 0.3 BRWN SAND SLTY 6.1
6930461		Jun-06	636471 4876986	335.9	3.7 Un	4.9 -1.5	NR				6607 -	OW -	**MOE# 6930461 TAG#A043888** 0.0 BRWN GRVL 0.6 BRWN SAND SILT 3.7 BRWN SAND SILT WBRG 6.1 BRWN SILT CLAY 6.4
6930462		Jun-06	636471 4876986	335.9	3.4 Un		NR				6607 BR	AB -	**MOE# 6930462 TAG#A005275** 0.0
6930721		Aug-06	636488 4877032	336.2	3.0 Un	1.5 -3.0	NR				6607 -	OW -	**MOE# 6930721 TAG#A046446** 0.0 BRWN FILL SAND 3.0 BRWN FILL SAND 4.6
7052907	7 19	Nov-07	636481 4876883	335.0		3.0 -3.0	NR				7147 OTH	OW NU	**MOE# 7052907 TAG#A056419** 0.0 BLCK TPSL 0.3 BRWN SAND 5.5 BRWN CLAY 6.1
7193230	8 16	Sep-12	637452 4876994	329.8			NR				4102 -	AB -	**MOE# 7193230** 0.0
7213031	8 20	Nov-13	636794 4877246	334.1			NR				5459 -	AB NU	**MOE# 7213031** 0.0
7217930		Feb-14	636607 4877817	335.3		6.1 -3.0	NR				7472 BR	OW MO	**MOE# 7217930 TAG#A161360** 0.0 BRWN TPSL LOOS 1.5 BRWN FSND PCKD 4.6 GREY FSND PCKD 9.1
7219787		Apr-14	636675 4877340	335.0			NR				7148 -	AB -	**MOE# 7219787** 0.0
7219788		Apr-14	636790 4877278	334.4			NR				7148 -	AB -	**MOE# 7219788** 0.0
7219789		Apr-14	636873 4877365	334.7			NR				7148 -	AB -	**MOE# 7219789** 0.0
7228778		Sep-14	636497 4877481	336.2			NR				6946 -	- -	**MOE# 7228778 TAG#A159028** 0.0
7240908		Apr-15	636440 4877388	335.0		3.0 -1.5	NR				7241 RC	TH TH	**MOE# 7240908 TAG#A180355** 0.0 BRWN SAND GRVL 3.7 BRWN FSND 4.6
7240909		Apr-15	636406 4877363	334.7		1.5 -1.5	NR				7241 DP	- TH	**MOE# 7240909 TAG#A179294** 0.0 BRWN SAND TPSL 1.5 BRWN FSND WBRG 3.0
7240910		Apr-15	636396 4877423	335.0		1.5 -1.5	NR				7241 DP	- TH	**MOE# 7240910 TAG#A180338** 0.0 BRWN SAND TPSL 1.5 BRWN FSND WBRG 3.0
7240911		Apr-15	636419 4877457	335.3		4.6 -1.5	NR				7241 DP	TH TH	**MOE# 7240911 TAG#A180340** 0.0 BRWN FSND 4.0 BRWN FSND WBRG 6.1
7240912		Apr-15	636405 4877444	335.0		4.6 -1.5	NR				7241 DP	OW TH	**MOE# 7240912 TAG#A180341** 0.0 BRWN FSND 4.0 BRWN FSND WBRG 6.1

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
7245058		Jun-15	636437 4877412	335.0		1.5 -3.0	NR				7241 -	AB TH	**MOE# 7245058 TAG#A180355** 0.0
7248168		Jul-15	636392 4877478	335.3			NR				6032 -	AB -	**MOE# 7248168** 0.0
7256175		Dec-15	636410 4877336	335.0		12.2 -3.0	NR				6032 BR	OW MO	**MOE# 7256175 TAG#A194323** 0.0 BRWN SAND 15.2
7257162		Dec-15	636404 4877459	335.0	5.2 Un	3.0 -3.0	NR				7360 BR	OW MO	**MOE# 7257162 TAG#A194001** 0.0 FILL 1.5 SAND 3.0 SAND WBRG 4.6 SAND WBRG 6.1
7261440		Apr-15	637023 4877197	335.0			NR				7383 -	- -	**MOE# 7261440 TAG#A179096** 0.0
7270016		May-16	637238 4877150	329.5		3.0 -3.0	NR				7241 DP	- -	**MOE# 7270016 TAG#A195256** 0.0 BRWN SAND SILT DNSE 6.1
7270017		May-16	637281 4877240	330.4		3.0 -3.0	NR				7241 DP	- -	**MOE# 7270017 TAG#A195257** 0.0 BRWN SAND SILT DNSE 6.1
7270018		May-16	637233 4877521	332.8		3.0 -3.0	NR				7241 DP	- -	**MOE# 7270018 TAG#A195258** 0.0 BRWN SAND SILT DNSE 6.1
7270019		May-16	637153 4877287	329.8		3.0 -3.0	NR				7241 DP	- -	**MOE# 7270019 TAG#A195259** 0.0 BRWN SAND SILT DNSE 6.1
7270020		May-16	636884 4877404	335.0		2.1 -3.0	NR				7241 DP	- -	**MOE# 7270020 TAG#A195260** 0.0 BRWN SAND SILT DNSE 5.2
7270021		May-16	636948 4877199	334.7		3.0 -3.0	NR				7241 DP	- -	**MOE# 7270021 TAG#A195261** 0.0 BRWN SAND SILT DNSE 6.1
7313503		Jun-18	636614 4877816	NR			NR				7610 -	- -	**MOE# 7313503 TAG#A161360** 0.0
7313504		Jun-18	636537 4877782	NR			NR				7610 -	- -	**MOE# 7313504 TAG#A231668** 0.0
7313505		Jun-18	636534 4877782	NR			NR				7610 -	- -	**MOE# 7313505** 0.0
7328902	7 20	Aug-18	636399 4877449	NR			NR				7626 -	- -	**MOE# 7328902 TAG#A243079** 0.0
7334264		May-19	636476 4876937	NR		1.5 -3.0	NR				7323 BR	- TH	**MOE# 7334264 TAG#A236158** 0.0 BRWN SAND WBRG 4.6 GREY SILT CLAY WBRG 6.1
GSC5801		Jan-01	637266 4877120	329.8			NR				- -	- -	**MOE# GSC5801** 0.0 SAND SLTY 0.9
GSC5802		Jan-01	636716 4877169	335.0			NR				- -	- -	**MOE# GSC5802** 0.0 SAND SLTY 0.9
YPD2362		Mar-98	636805 4876859	334.1			NR				- -	- -	**MOE# YPD2362** 0.0 TPSL 0.3 BRWN FSND SLTY LOOS 2.4 GREY SAND 4.6 BRWN CLAY SLTY FSND 6.1 BRWN FSND SILT DNSE 6.7

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
YPD2961		Mar-98	636610 4876959	335.6				NR				-	-	**MOE# YPD2961** 0.0 TPSL 0.3 BRWN FSND SILT 2.4 BRWN SAND SLTY 4.6 BRWN CLAY SLTY 6.1 BRWN FSND SILT DNSE 6.7
YPD5077		Mar-98	636986 4877094	334.4				NR				-	-	**MOE# YPD5077** 0.0 TPSL 0.3 BRWN SAND SLTY 3.0 BRWN SAND SLTY 4.9 BRWN SILT CLYY HARD 6.7
YPD5177		Mar-98	636754 4877131	335.0				NR				-	-	**MOE# YPD5177** 0.0 BRWN SAND SILT 0.9 BRWN SAND SILT 1.5 SILT CLAY 1.8 BRWN SAND SILT 4.0 BRWN CLAY SILT GRVL 4.9 BRWN SAND SILT 6.1 BRWN CLAY SILT GRVL 6.7

QUALITY:

Fr	Fresh
Mn	Mineral
Sa	Salty
Su	Sulphur
--	Unrecorded

TYPE:

WS	Water Supply
AQ	Abandoned Quality
AS	Abandoned Supply
AB	Abandonment Record
TH	Test Hole or Observation

USE:

CO	Comercial
DO	Domestic
MU	Municipal
PU	Public
ST	Stock
NU	Not Used
IR	Irrigation
AL	Alteration
MO	Monitoring
-	Not Recorded

METHOD :

CT	Cable Tool
JT	Jetting
RC	Rotary Conventional
RA	Rotary Air
BR	Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD, subject to Field Verified Location or Improved Location Accuracy.

 Selected information tabulated to metric with changes and corrections subject to Driller's Records.

wsp.com

APPENDIX 2

OPA 136 FOR THE TOWN OF WHITCHURCH-STOUFFVILLE, SECTIONS 11.1 AND 11.7

OPA 136 Town of W.S.

11. BALLANTRAE-MUSSELMAN LAKE AND ENVIRONS SECONDARY PLAN

11.1 PURPOSE

The Ballantrae-Musselman Lake and Environs Secondary Plan Area includes two small existing settlement areas, Ballantrae and Musselman Lake, which are recognized as a settlement area and a hamlet area respectively in the *Oak Ridges Moraine Conservation Plan*, as well as the surrounding rural lands. Its location on the Oak Ridges Moraine and the number of significant environmental features it contains means that it is also an area of environmental sensitivity.

The Ballantrae-Musselman Lake and Environs Secondary Plan provides detailed goals, objectives, principles and policies which are intended to:

i) Provide a strategy for the conservation and enhancement of existing natural systems and features;

ii) Ensure new development occurs in a manner which minimizes any negative impacts on natural systems and features;

iii) Provide a strategy for the enhancement of existing development in a manner which will assist in the resolution of existing environmental concerns; and,

iv) Provide a strategy for completion of development of the residential designated areas and the development of the Highway 48 corridor as the "main street" of the Community of Ballantrae while sill ensuring development reflects the "village" character of the community and its location on a Provincial highway.

etoews@rvanderson.com

11.7 WATER AND WASTEWATER SERVICING STRATEGY AND STORMWATER MANAGEMENT

11.7.1 Existing Water and Wastewater Servicing

11.7.1.1 Existing Water Servicing

The Ballantrae/Musselman Lake Drinking Water System is a municipal water system and serves the Ballantrae and Musselman Lake settlements areas as a result of the contamination of a number of private wells in the area. An Environmental Assessment for the system was approved by the Minister of Environment and Energy in February 1991. Construction of the municipal water supply system began in March 1996 and it was operational as of January 1, 1997.

All existing development in the Ballantrae and Musselman Lake settlements areas shall be connected to the municipal water supply system, subject to the water system capacity availability.

11.7.1.2 Existing Wastewater Servicing

The Ballantrae-Musselman Lake and Environs Secondary Plan Area is primarily serviced by private individual wastewater systems, with the exception of the Ballantrae Golf and Country Club Residential Community which is designated "Ballantrae Residential Golf Course Area" serviced on a private communal wastewater system approved by MECP that is subject to a Municipal Responsibility Agreement with York Region.

11.7.2 Future Water and Wastewater Servicing for the Ballantrae Settlement Area

Future water and wastewater servicing for the Ballantrae Settlement Area will be subject to the partial servicing policies of Section 11.4.2.

11.7.2.1 Water Servicing

All new development shall be connected to the municipal water supply system of the Ballantrae-Musselman Lake Drinking Water System, subject to system capacity availability as determined through the Phase 1 Water Supply Study and as necessary, the Phase 2 Water and Wastewater Study (Sections 11.4.4 and 11.4.5).

The Town shall work with the Region and development community to achieve water conservation in keeping with York Region's Long Term Water Conservation Strategy. At a minimum, new development shall demonstrate water efficiency in its designs,

following the Region's standard under its Long Term Water Conservation Strategy programming.

Individual lot private water servicing shall be permitted where full municipal services are not available, planned or feasible. Individual private water servicing is prohibited on lots that are currently connected to the municipal supply. Establishment of individual private well supplies shall be permitted for developments up to five lots. This applies to proposed developments with wells on each lot or if well supplies are shared between lots.

Construction of private wells must be completed such that the well does not draw water directly or indirectly from any shallow aquifer. All wells shall be constructed to the lower aquifer and in accordance with O. Reg 903 will full annular space grouting. To accommodate for availability and sustainability of the municipal drinking water system, all wells shall be completed to a depth below 245 metres above sea level and well pumps set to the lowest depth allowable based on the well design to mitigate lower groundwater levels related to municipal supply production. Acknowledgement of this policy and proposed construction details shall be provided to the Town as part of a building application or planning approval. York Region may require details on the proposed well supply, at its sole discretion.

For individual lot private well supplies developed as part of a development of greater than five lots, the same conditions above apply and must be demonstrated in a Functional Servicing Report, supported by a hydrogeological assessment to the satisfaction and approval of York Region and the Town, at their sole discretion.

11.7.2.2 Wastewater Servicing

11.7.2.2.1 Infilling and Development Outside the Highway 48 Corridor

Infilling, rounding out and redevelopment of existing lots in the areas designated "Ballantrae Residential Area" on Schedule "E" may be permitted on:

i) Individual private wastewater systems; or,

ii) Communal wastewater systems.

Such development shall only be permitted provided it is demonstrated through appropriate studies to the satisfaction of the Town, York Region, the Ministry of Environment, Conservation and Parks and the Ministry of Natural Resources, as applicable, that the land can be adequately and sustainably serviced.

APPENDIX 3

SUBMERSIBLE PUMP EXAMPLE

Company name:
Created by:
Phone:

Date: 04/11/2024

Qty.	Description
1	**BM 30-14 NBR**

Note! Product picture may differ from actual product

Product No.: 98490837

BM is an encapsulated submersible pump that is suitable for applications where a high pressure is required. Therefore, BM is ideal for water treatment, liquid transfer, pressure boosting and closed circulation systems with a high static pressure.

BM pumps are available in four different versions (standard, N-version, NE-version, and R-version), in various sizes, and with a large variety in the number of impellers.

The range covers BM 3A to BM 215, a total of twelve sizes.

Depending on its size and frequency, a BM pump can reach a flow rate of 265 or 310 m3/h.

BM pumps can increase the system pressure up to 82.7 bar.

The pump is supplied with an asynchronous motor, Victaulic connections, a straight or 90° bent pipe for BM 3A, BM 5A and BM 9 pumps and a straight pipe for BM 18 and above.

The motor is protected by output filters against overvoltage and increased operating temperature.

As a result, BM is very reliable and durable.

The compact design ensures easy maintenance and alignment of the pump.

The stainless-steel pump and motor housing ensure an excellent resistance against different types of liquids. The R-version is designed to be highly efficient against corrosive liquids.

Three different types of asynchronous motors are available for BM pumps: MS 4000, MS 6000 and MMS 8000.

The enclosure class is IP68.

The motor power ranges from 0.75 to 92 kW.

The motor is controlled by a frequency converter and protected by Pt100 sensors.

The frequency converter is sold as a separate accessory and must be purchased along with the pump.

We recommend a Grundfos CUE frequency converter; however, frequency converters from alternative suppliers can be used as well.

Liquid:

Pumped liquid:	Water
Maximum liquid temperature:	104 °F

Technical:

Actual calculated flow:	10.3 l/s
Rated flow:	10 l/s
Resulting head of the pump:	150 m
Rated head:	152 m
Curve tolerance:	ISO9906:2012 3B

Materials:

Pump:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
Impeller:	Stainless steel EN 1.4301 AISI 304

GRUNDFOS

Company name:
Created by:
Phone:

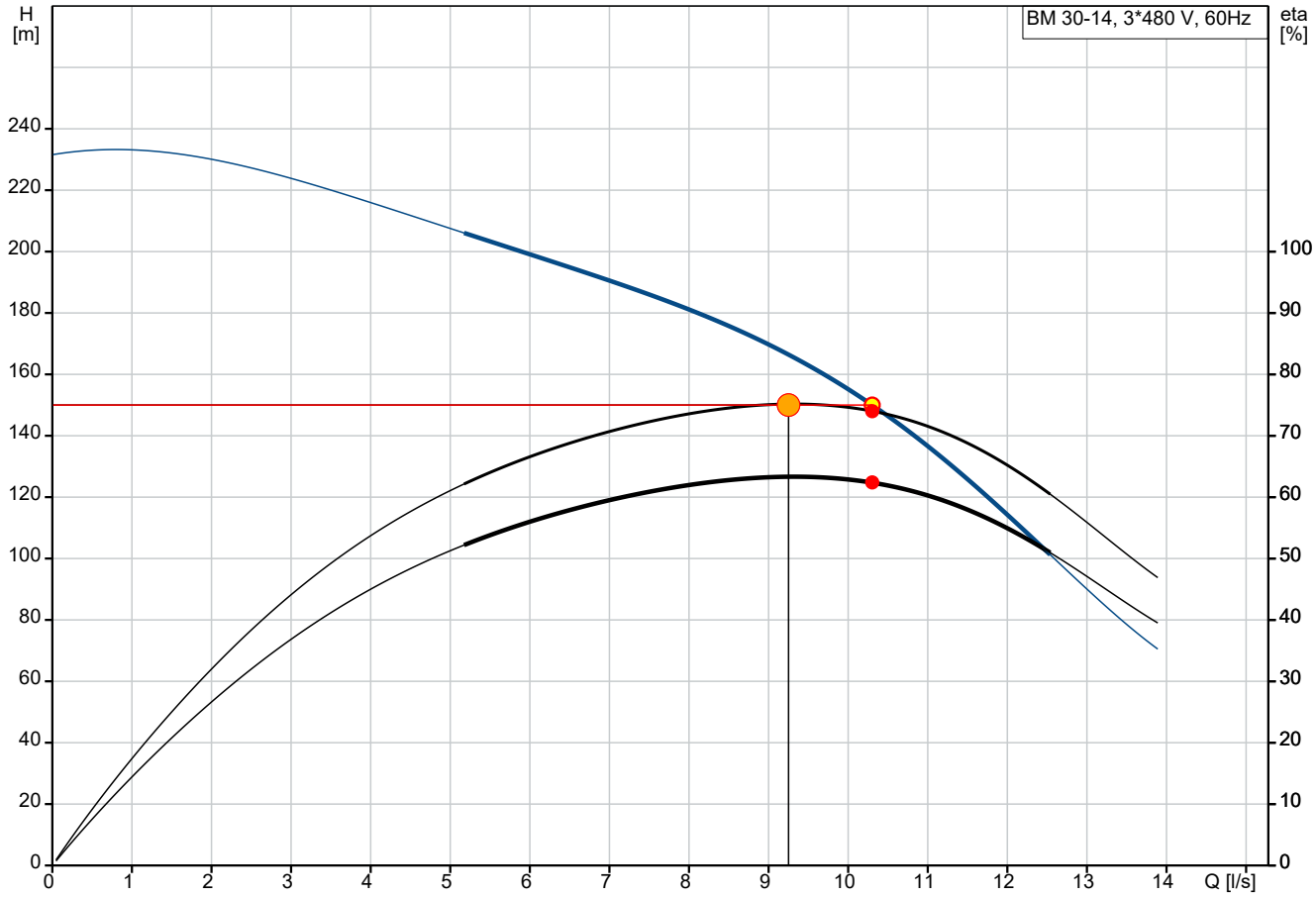
Date: 04/11/2024

Qty.	Description	
1	Motor:	Stainless steel DIN W.-Nr. 1.4301 AISI 304
	Sleeve:	Stainless steel AISI 304 EN 1.4301
	Installation:	
	Maximum operating pressure:	1199.46 psi
	Maximum permissible inlet pressure:	725.19 psi
	Maximum outlet pressure:	1189.31 psi
	Pipe connection standard:	PJE
	Pipe connection:	89 mm
	Electrical data:	
	Rated power - P2:	25 HP
	Mains frequency:	60 Hz
	Rated voltage:	3 x 440-460-480 V
	Service factor:	1.15
	Rated current:	41.0-40.0-39.5 A
	Maximum current consumption:	41 A
	RequestedVoltage:	480 V
	RatedCurrentAtThisVoltage:	40 A
	Starting current:	540-590-620 %
	Cos phi - power factor:	0.85-0.83-0.80
	Start. method:	DOL
	Enclosure class (IEC 34-5):	IP66
	Built-in temp. transmitter:	Y
	Motor No:	78195017
	Others:	
	Minimum efficiency index, MEI ≥:	0.50
	Net weight:	284 lb
	Gross weight:	402 lb
	Shipping volume:	16.8 ft³
	Country of origin:	DK

Company name:
Created by:
Phone:

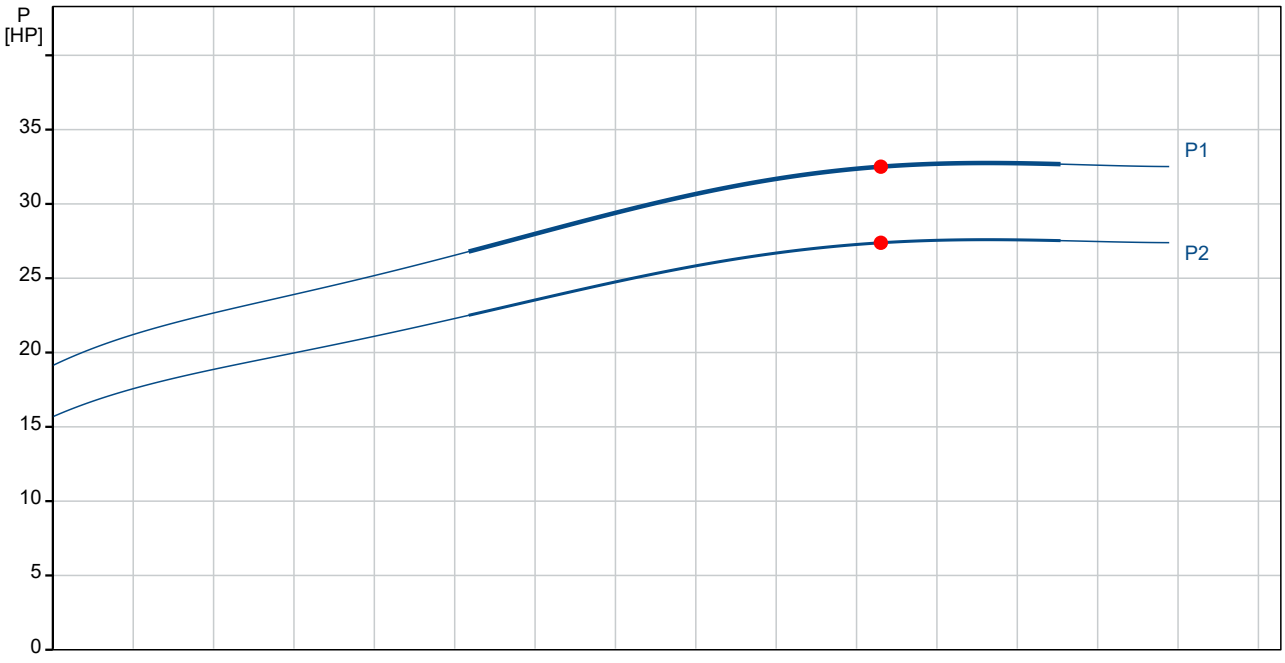
Date: 04/11/2024

98490837 BM 30-14 NBR 60 Hz



Q = 10.3 l/s
Es = 2.4763 Wh/gal
Density = 62.29 lb/ft³
Eta pump+motor = 62.4 %

H = 150 m
Pumped liquid = Water
Eta pump = 74 %

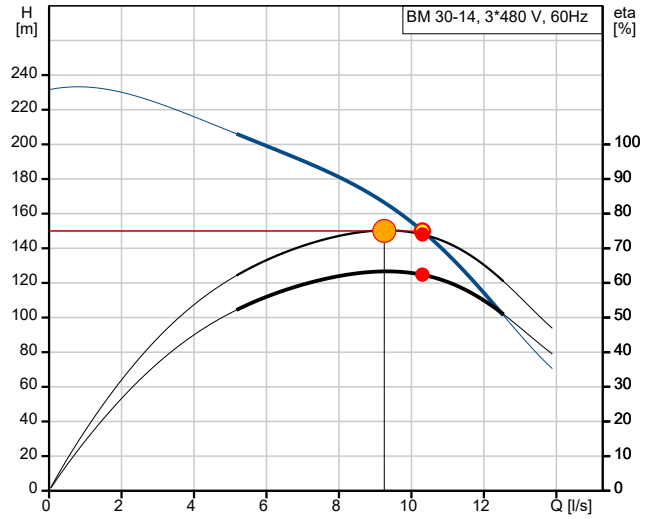


P1 = 24.26 kW
P2 = 27.4 HP

Company name:
Created by:
Phone:

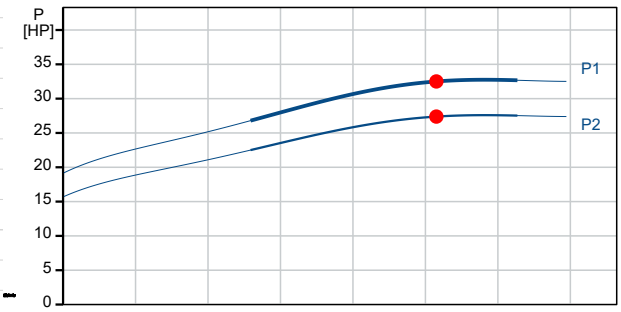
Date: 04/11/2024

Description	Value
General information:	
Product name:	BM 30-14 NBR
Product No:	98490837
EAN number:	5711496030611
Technical:	
Actual calculated flow:	10.3 l/s
Rated flow:	10 l/s
Resulting head of the pump:	150 m
Rated head:	152 m
Stages:	14
Curve tolerance:	ISO9906:2012 3B
Model:	E
Materials:	
Pump:	Stainless steel
Pump:	DIN W.-Nr. 1.4301
Pump:	AISI 304
Impeller:	Stainless steel
Impeller:	EN 1.4301
Impeller:	AISI 304
Motor:	Stainless steel
Motor:	DIN W.-Nr. 1.4301
Motor:	AISI 304
Code for rubber:	NBR
Sleeve:	Stainless steel
Sleeve:	AISI 304
Sleeve:	EN 1.4301
Installation:	
Maximum operating pressure:	1199.46 psi
Maximum permissible inlet pressure:	725.19 psi
Maximum outlet pressure:	1189.31 psi
Pipe connection standard:	PJE
Pipe connection:	89 mm
Liquid:	
Pumped liquid:	Water
Maximum liquid temperature:	104 °F
Electrical data:	
Rated power - P2:	25 HP
Mains frequency:	60 Hz
Rated voltage:	3 x 440-460-480 V
Service factor:	1.15
Rated current:	41.0-40.0-39.5 A
Maximum current consumption:	41 A
Requested voltage:	480 V
Rated current at this voltage:	40 A
Starting current:	540-590-620 %
Cos phi - power factor:	0.85-0.83-0.80
Start. method:	DOL
Enclosure class (IEC 34-5):	IP66
Thermal protec:	EXT.
Built-in temp. transmitter:	Y
Motor No:	78195017
Others:	
Minimum efficiency index, MEI ≥:	0.50
Net weight:	284 lb
Gross weight:	402 lb
Shipping volume:	16.8 ft³
Country of origin:	DK

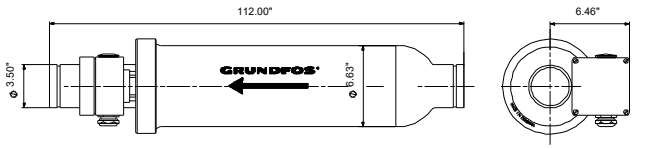


Q = 10.3 l/s
Es = 2.4763 Wh/gal
Density = 62.29 lb/ft³
Eta pump+motor = 62.4 %

H = 150 m
Pumped liquid = Water
Eta pump = 74 %



P1 = 24.26 kW
P2 = 27.4 HP

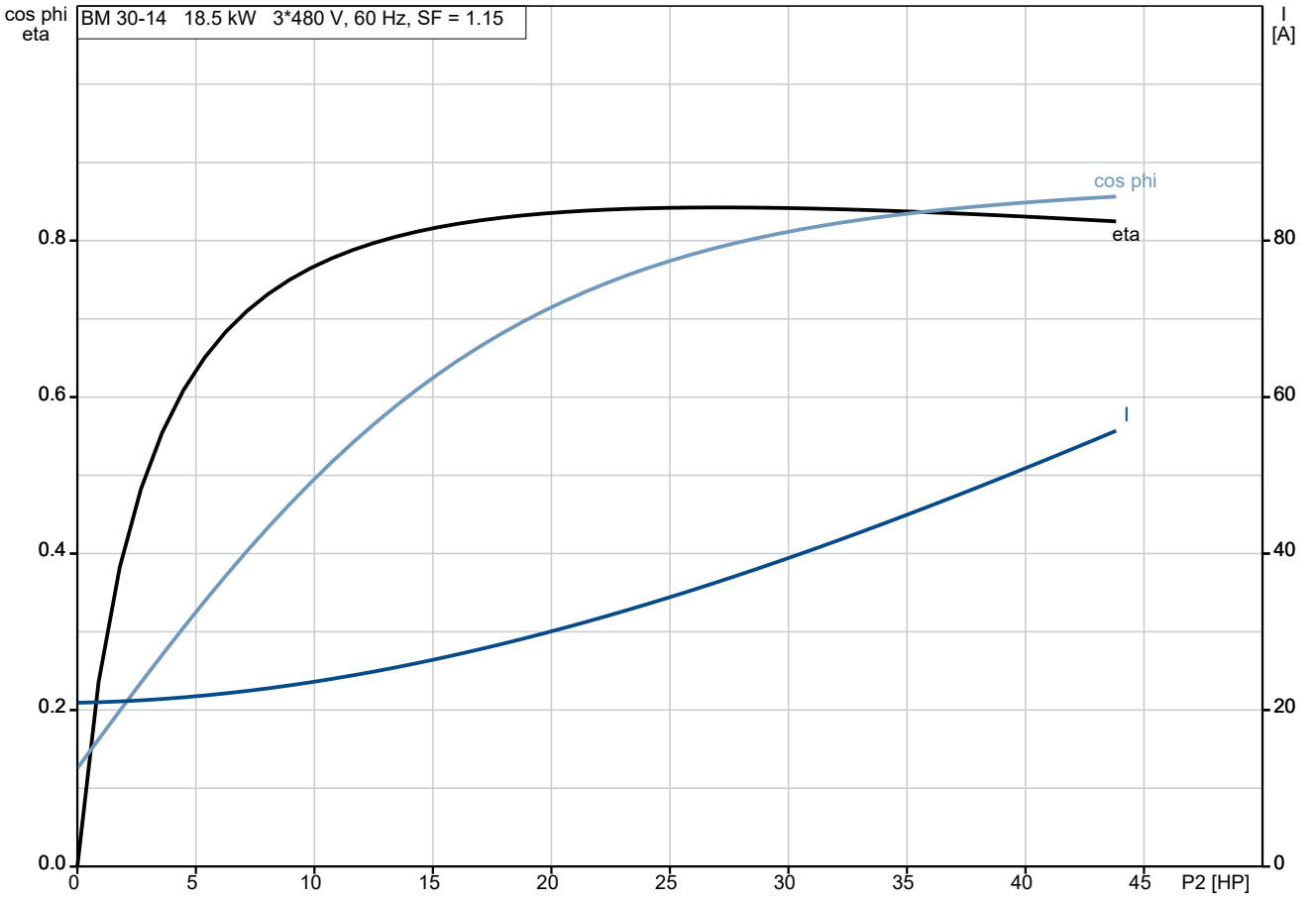


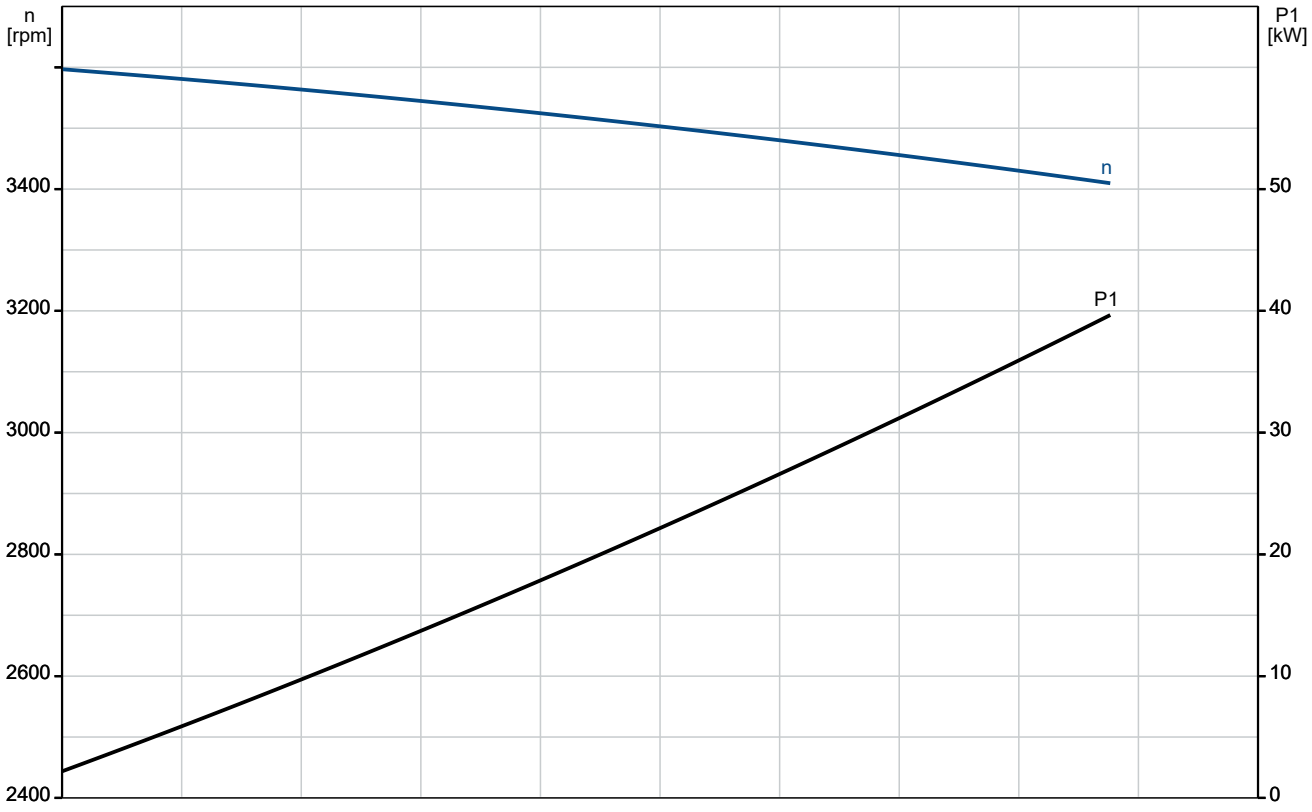
GRUNDFOS

Company name:
Created by:
Phone:

Date: 04/11/2024

98490837 BM 30-14 NBR 60 Hz

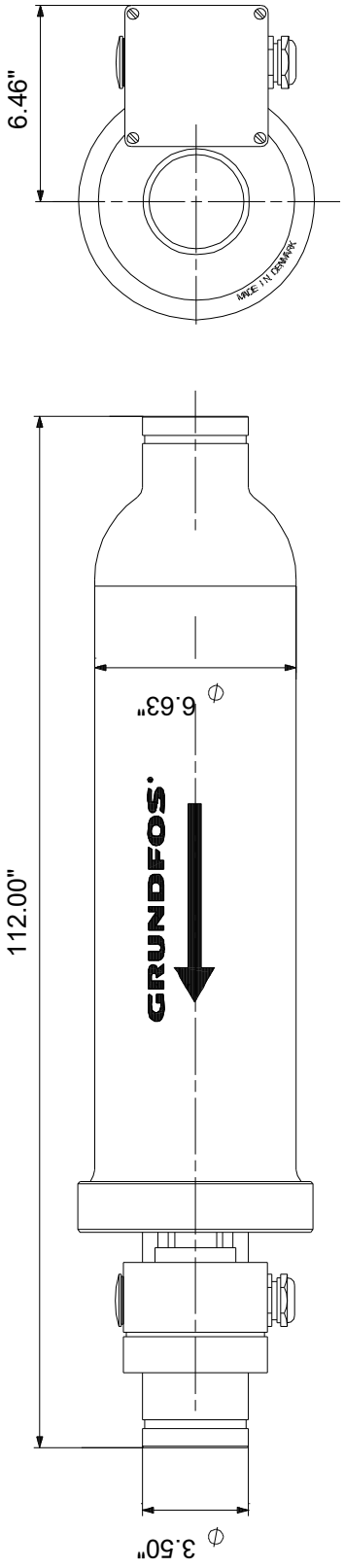




Company name:
Created by:
Phone:

Date: 04/11/2024

98490837 BM 30-14 NBR 60 Hz



Note! All units are in [in] unless others are stated.
Disclaimer: This simplified dimensional drawing does not show all details.

Company name:
Created by:
Phone:

Date: 04/11/2024

98490837 BM 30-14 NBR 60 Hz

Input

Size by	Application
Select application area	Municipal water supply
Select application	Ground water intake
Select type of installation	Submersible in sleeve, closed tank

Your requirements

Variable speed	Yes
Enclosure class	IP20
Control mode	Prop. pressure, ext.
Decrease at low flow	10 %
Allow fixed speed	Yes
Max. water temperature	50 °F
Allowed flow oversize	30 %
Allowed flow undersize	5 %
No of duty points	1

Edit load profile

Load profile	Full load
Operating days per year	365 d
Operation hours per day (low tariff)	10 h

Configuration

Pump material	GG 0.6025 or 1.4301 (AISI 304)

Operational conditions

Frequency	60 Hz
Phase	1 or 3
Voltage	1 x 120 or 3 x 480 V
Starting method 3 phase	Direct on line
Energy price (high tariff)	0.12 CAD/kWh
Energy price (medium tariff)	0.08 CAD/kWh
Energy price (low tariff)	0.04 CAD/kWh
Increase of energy price	6 %
CO2 emission intensity	0.35 lb/kWh
Calculation period	10 years

Life cycle cost

Do you want to make a comparison?	No comparison
How detailed do you want your life cycle cost analysis?	Simple LCC analysis
	Pump A

Hit list settings

Include cheapest solution	Yes
Max. hits per product group	5
Max. hits total	20

Load Profile

	1
Flow (%)	100
Flow (l/s)	9.25
Head (%)	100
Head (m)	150
P1 (kW)	22.66
Eta total (%)	59.9
Time (h/a)	3650
Energy consumption (kWh/Year)	82712
Quantity	1

Sizing result

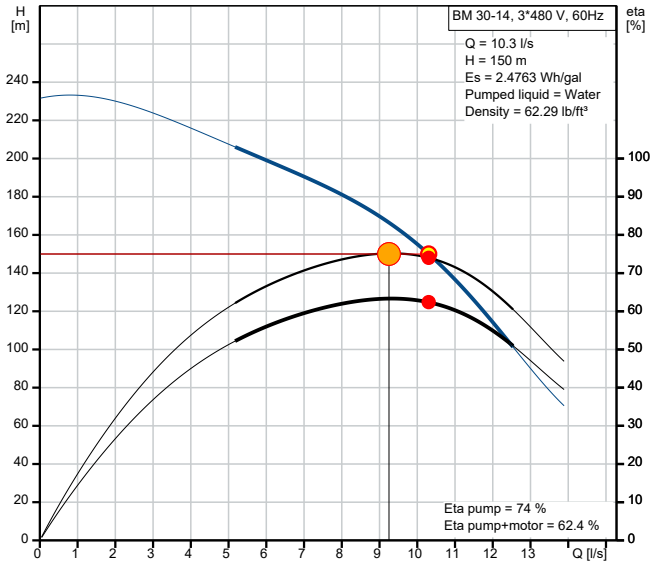
Type	BM 30-14
Tank	833 l
Quantity * Motor	1 * 24.8 HP ,

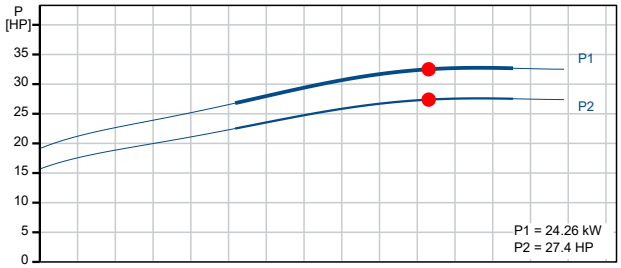
Flow	10.3	l/s (+11%)
H total	150	m
Power P1	24.26	kW
Power P2 required in the duty point	27.4	HP
Current (rated)	39.5	A
Current (actual)	36.7	A
Cos phi (actual)	0.79	
Eta pump	74.0	%
Eta motor	84.2	%
Eta total	62.4	% =Eta pump * Eta motor
Flow total	32112190	US gal/year
Max.pressure	228.54	psi =during operation in the load profile
Spec. energy consumption	2.576	kWh/1000 gal
	3.93	kWh/gal/ft
Energy consumption	82712	kWh/year/Year
CO2 emission:	28800 lb/Year	
Price	On request	
Life cycle cost	CAD 84386	/10Years

Cable losses are not included !
Switching sequence is too high, check tank required on discharge side!

Company name:
Created by:
Phone:

Date: 04/11/2024





APPENDIX 4

FIRE STORAGE CISTERN LOCATIONS AND EXAMPLE


EAST LIMIT OF SUBDIVISION
NORTH LIMIT OF SUBDIVISION
SOUTH LIMIT OF SUBDIVISION
LAKESHORE ROAD
STREET A
STREET B
STREET C
STREET D
STREET E
MANHOLE FOR CONTROL VALVE
WATER STORAGE TANK 5.8x3.0x3.0m (40,000 L)
CHANNEL DESIGN PREPARED BY GEO MORPHIX. REFER TO DRAWINGS GEO-1, GEO-2, DET-1
COMMUNAL WATER SYSTEM BUILDING
COMMUNAL WATER SYSTEM WELL #1
COMMUNAL WATER SYSTEM WELL #2
COMMUNAL WATER SYSTEM SITE
EXISTING WOODLAND
DRAWING MODIFIED BY RVA
BY: etoews 11/14/2024
R.V. ANDERSON ASSOCIATES LIMITED
LEGEND:
PROPOSED WATERMAIN
PROPOSED VALVE & BOX
PROPOSED HYDRANT & VALVE
PROPOSED WATER STORAGE TANK
PROPOSED MANHOLE FOR CONTROL VALVE
SCALE 1:750
FARSIGHT HOMES
PROPOSED WATERMAN SERVICING
SKA SABOURIN KIMBLE & ASSOCIATES LTD. CONSULTING ENGINEERS
PROJECT NUMBER 13:286
FIGURE NUMBER 8
19T(W)–19.001

x6 Cisterns as shown on SKA watermain Service Plan - to be installed in boulevards/streets/lots

40,000 LITRE PRECAST WATER R HOLDING TANK MODEL H40S

WILKINSON HEAVY PRECAST LIMITED

DUNDAS, ONTARIO 905-628-5611

www.wilkinsonheavyprecast.com

CONSTRUCTION DETAILS *

Concrete: 35 MPa at 28 Days, 5 to 8% Air Entrainment.

Reinforcing: 15 M bars at 300 mm centres each way in walls, floor and roof.
Eight extra 15 M bars around each roof access opening.
Minimum cover over reinforcing steel - 25 mm.

Weight:
Top Section 13,300 kg
Bottom Section 16,500 kg
Total 29,800 kg

To additionally Include:
-Risers to grade
-Blast funnel for air
-blast funnel for transfer
-Standpipe with Hydrant connection

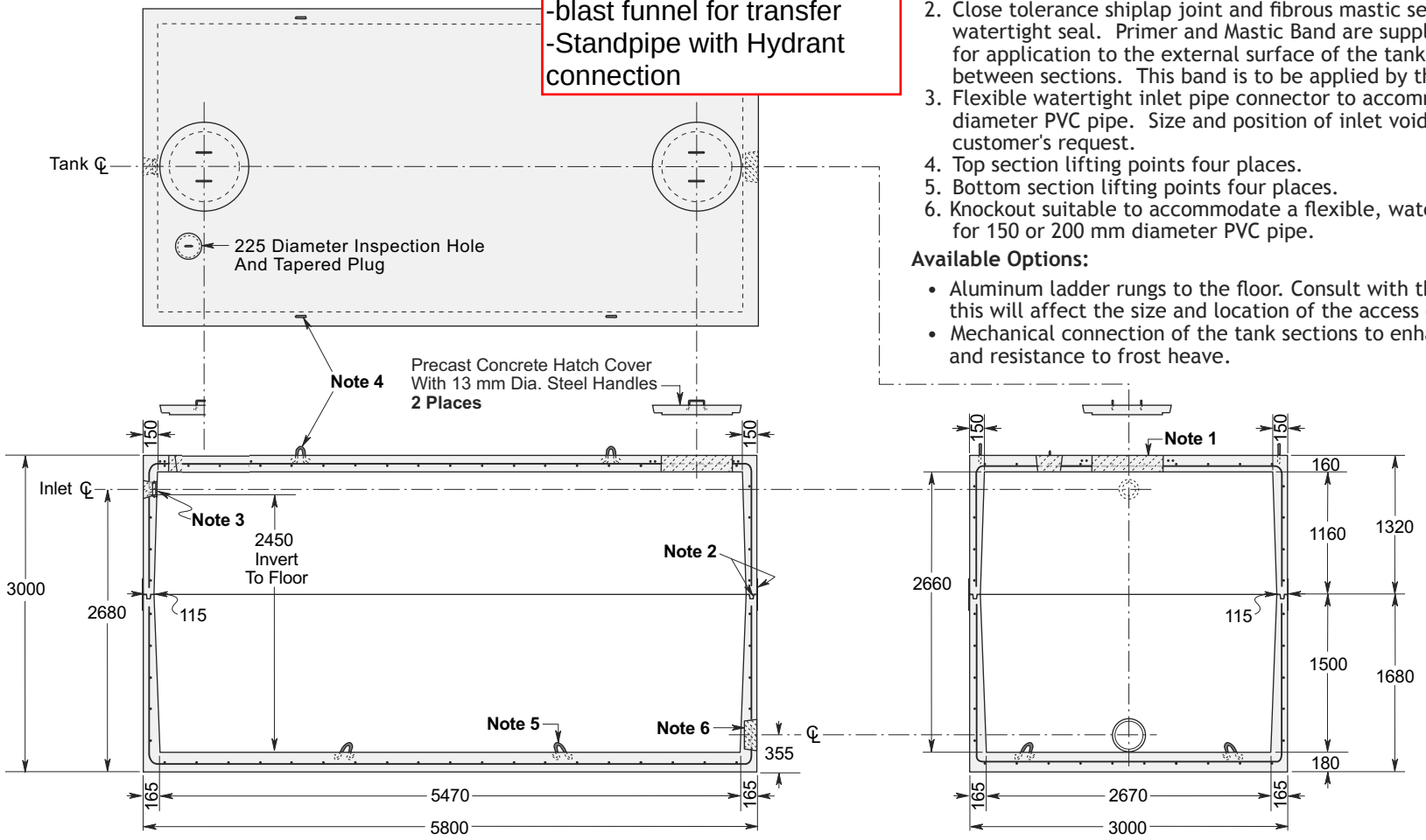
Actual Capacity: 15,068 Litres Per Vertical Metre.
40,082 Litres to Underside of Roof.
37,067 Litres to Invert of Inlet.

NOTES

1. Large 685 mm diameter roof access openings facilitate tank maintenance. Unless otherwise specified/ordered this tank will be shipped with 840 mm diameter concrete hatch covers. Please note that each cover weighs approximately 125 kg and must be handled only with suitable mechanical lifting equipment. See Access Riser section for available options.
2. Close tolerance shiplap joint and fibrous mastic sealant ensures a solid watertight seal. Primer and Mastic Band are supplied with each tank for application to the external surface of the tank over the joint between sections. This band is to be applied by the installing contractor.
3. Flexible watertight inlet pipe connector to accommodate 100 mm diameter PVC pipe. Size and position of inlet void can be modified at customer's request.
4. Top section lifting points four places.
5. Bottom section lifting points four places.
6. Knockout suitable to accommodate a flexible, watertight pipe connector for 150 or 200 mm diameter PVC pipe.

Available Options:

- Aluminum ladder rungs to the floor. Consult with the factory as to how this will affect the size and location of the access opening.
- Mechanical connection of the tank sections to enhance water tightness and resistance to frost heave.



Dimensions in mm
N.T.S.

* Commensurate with a **1.2 Metre** burial over the top slab in firm soil away from any area of vehicular traffic.

For recommended installation procedures refer to Wilkinson Installation Guidelines and Lifting and Assembly Instructions.

WARNING ! IMPROPER INSTALLATION ESPECIALLY IN UNSTABLE SOILS CAN RESULT IN THE STRUCTURAL FAILURE OF THIS PRODUCT

14 April 2011