Olive Wastewater Pumping Station Upgrades
Preliminary Design Report

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TABLE OF CONTENTS

PAGE

TABLE OF CONTENTS (Cont'd)

PAGE

LIST OF PHOTOS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

KGS Group was retained by the City of Winnipeg to provide engineering services related to the inspection and condition assessment of the Olive Street Wastewater Pumping Station, and to provide recommendations for upgrading the station and its systems. In addition some preliminary design work suitable for providing a basis for the detailed design phase was also to be included.

The purpose of this study is to define work that should be completed to provide a comprehensive station upgrade that can provide reliable service for a long time, will be safer to work in, and in which equipment will last longer.

This report is a summary of the condition assessment, recommendations and preliminary design phase work performed as part of this assignment. Section 2 provides a brief background for this study. This is followed by Sections 3 to Section 7 which describe the existing systems, present the assessment of each, then recommendations and preliminary design work performed by structural/architectural, mechanical and electrical/control disciplines. Comments on the Waterways Permit are presented in Section 8. Section 9 presents a summary listing of all work recommended. Section 10 summarizes the costs associated with the recommended upgrades.

2.0 BACKGROUND

The Olive Wastewater Pumping Station, located at 2461 Assiniboine Crescent, is a facility that collects wastewater from the south area of the Strathmillan, Tylehurst and Ainslie Sewer Districts. Flow enters the station wet well from a line approaching from the north (Portage Ave.) and another from the south (Assiniboine Ave.). Two pumps draw flow from the wet wells and charge via a forcemain into an interceptor sewer further west on Assiniboine Crescent from where the sewage continues to flow to the West End Water Pollution Control Centre.

The Station was originally constructed in the mid 1960's and has had minor upgrades over time. But as the station is 50 years old, many of the mechanical, electrical and some structural/architectural components are obsolete or worn out and no longer provide reliable service to current standards. Major upgrades of many components are now required to allow the Station to continue to provide dependable long term service.

3.0 STRUCTURAL - ARCHITECTURAL

KGS Group completed a visual observation of the Olive Wastewater Pumping Station on December 18, 2015. The purpose of the inspection was to complete a condition assessment of the existing structure and to identify items that do not comply with current design standards.

The station has been subdivided into five rooms, listed in order of descending elevation:

- Main Floor/Electrical Room Level (Located above Grade)
- Lower Level 1 – Intermediate Floor (Above Comminutor Chamber)
- Lower Level 1a – Comminutor Chamber
- Lower Level 2 – Motor Room (Located above the Pump Room)
- Lower Level 3 – Pump Room

Note that the Comminutor Chamber and Motor room are located at approximately the same elevation and are separated by a watertight partitioning wall. All levels are connected via 610 mm (2'-0") wide steel stairs. The original design drawings of the station are attached in Appendix A for reference.

3.1 MAIN FLOOR LEVEL

3.1.1 Building Superstructure

Description

The building superstructure has an outer footprint of 6.30 m by 4.82 m (20'-8" by 15'-10"). Detailed drawings of the building superstructure could not be obtained by KGS Group and the details of construction are unknown. Based on stations of similar 1960's vintage, the 300 mm (12") thick wall system is assumed to consist of a concrete block wall, void space and an outer brick façade layer. The interior of the superstructure walls are covered with a foil-faced closed cell foam sheathing product.

The building has two exterior doors: one 1219 mm (4'-0") wide main door on the south side of the building and a secondary 914 mm (3'-0") wide door on the west face of the building. The large door is located in line with the hatch opening to access the motor and pump rooms below grade. According to the operations staff on site during the inspection, material is hoisted down to the motor and pump room using a truck-mounted jib crane through the door opening.

The exterior walls of the superstructure consist of a brick façade, with vinyl siding covering the north and south gables. The roof covering consists of asphalt shingles, with metal soffit and fascia.

Condition Assessment

The building superstructure appears to be in good condition overall with the exception of several pieces of vinyl siding that have fallen off of the south gable of the structure. The exposed plywood does not appear to have suffered any type of deterioration as a result.

The interior sheathing used in the station is not properly protected to provide an adequate fire rating. As indicated in print on the foil facing of the sheathing: "Product will burn if exposed to open flame. Do not leave exposed. The sheathing must be separated from the interior of a building by a minimum of 1/2" gypsum board (15 minute thermal barrier) or product with equivalent thermal properties."

The exterior doors appear to be in good condition with no corrosion. However, the location of the doors will not be functional for the new proposed relocation of the motor and pump room access hatch to the southwest corner of the structure as outlined below and in the mechanical review section.

Recommendations

The missing vinyl siding should be replaced on the gable of the structure to match the existing. If new siding of a matching profile and colour cannot be procured, the entire gable should be re-sided to provide continuity of siding.

If requested by the City, the building roof could be refinished with a more permanent, low maintenance product such as steel roofing.

The interior foam faced insulating panels should be sheathed over with a fire and moisture resistant sheathing product to protect the combustible material and achieve a sufficient fire rating.

The exterior doors will require relocation for the proposed hatch relocations. The current large door on the south face would have to be shifted westward approximately 1400mm (4'-7") to align with the new access hatch to the motor and pump room. The secondary door on the west side of the structure will require relocation to the east wall as the new hatch location will prevent emergency access in the event that the hatch is removed. The existing openings will be sealed by matching the existing wall system. The proposed new door and hatch layout is shown below in Figure 3.1.

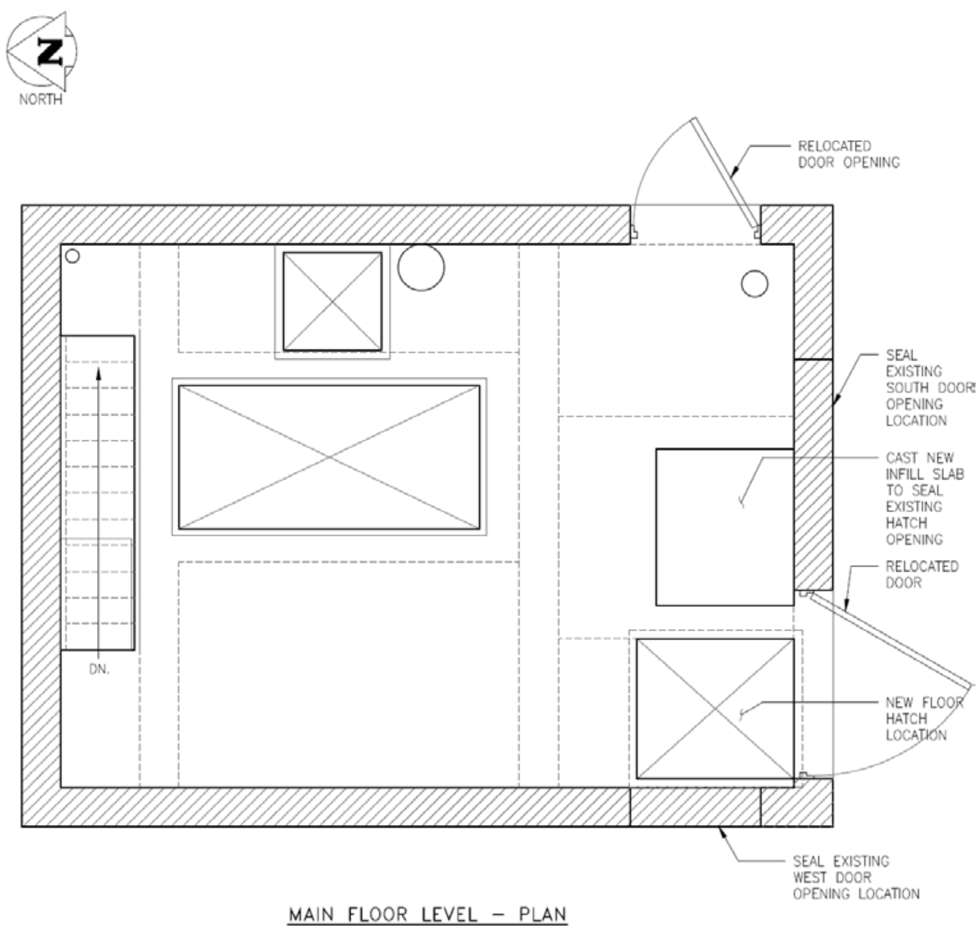


Figure 3.1 – Relocated Door and Hatch Layout

3.1.2 Hatches and Stairwell

Description

The hatch opening in front of the main door accessing the motor and pump room originally consisted of a removable steel plate stiffened with underside-mounted I-beams that rest inside a recessed cast-in-place steel frame. The cover has since been replaced with an FRP grating. The original cast-in-place steel frame with recessed notches remains.

The two hatches on the north side of the main floor accessing the comminutor chamber originally consisted of plywood covers but have since been replaced with aluminum tread plate covers. The aluminum hatches are fabricated with mirror finish tread plate with bolted-on angle stiffeners below. The aluminum hatches do not appear to be a structural fabrication. The space between the angle stiffeners has been filled with an unprotected combustible rigid insulation.

The stairwell opening on the north side of the structure is currently covered by a hinged plywood cover. The railing for the stairwell terminates at the main floor level and there is no guardrail around the perimeter of the stairwell opening.

Condition Assessment

Due to new pump layout considerations, the main hatch above the pump and motor room will require relocation as described in the section above.

The aluminum hatches above the comminutor chamber appear in good condition but are of an uncommon assembly that appears to be of a non-structural grade. In addition, the aluminum hatches project above the concrete floor level and are therefore considered a trip hazard.

Due to the proposed plan to implement closed piping to the comminutor chamber below, the hinged plywood coved on the stairwell will no longer be required to control odors from below.

Recommendations

The existing hatch accessing the motor and pump room will be relocated to the southwest corner of the main floor. This will involve removal of the existing embedded frame, doweling of reinforcing and casting of a new concrete infill slab to abandon the existing opening. An opening would be cut at the new location, with reinforcing installed as required at the free edges of the slab. A new hatch of non-corroding material such as aluminum or FRP should be designed to sit flush with the main floor level as to not create a trip hazard.

New aluminum covers should be designed to sit flush within the floor recesses. New covers should not contain insulating materials as they are not required.

The hinged plywood cover on the stairwell should be permanently removed. A new guardrail should be installed on the south and east edges of the stairwell opening. The existing stair railing should be extended to the main floor level.

3.2 LOWER LEVEL 1

Lower level 1, located above the comminutor chamber, is an intermediate level providing access to both the motor room located one level lower to the west, as well as the comminutor chamber below. The room contains a gate valve operator for the inlet to the comminutor chamber below and an antiquated level sensor.

3.2.1 Concrete Floor and Walls

Description

The substructure is constructed entirely of reinforced concrete. The floor, concrete walls, and underside of the floor above have been painted. Coating details are not shown on the existing drawings and are unknown.

The east and west concrete walls of Lower Level 1 have been covered with the same foil-faced closed cell foam sheathing product as found on the main floor of the station. The north wall is covered with painted plywood that appears to be covering a layer of rigid insulation below.

Condition Assessment

The concrete surfaces in Lower Level 1 appear to be in good condition with no noted deficiencies. The paint is peeling and chipping in several locations on the walls. The floor coating appears to be worn from wear over time.

The foil faced foam insulation sheathing was generally in good condition. Several panels have compromised foil surfaces that have become ripped from contact.

Recommendations

All exposed concrete surfaces should be recoated in Lower Level 1. This would involve sufficient surface preparation typically by either water jetting or mechanical abrasion, followed by recoating with a multi-layer system as recommended by a coating applicator. It is unknown if the existing coatings are lead-based, and it is therefore recommended that existing coatings are tested prior to the design phase to determine if lead paint remediation is required.

Panels of insulation sheathing with portions of damaged foil facing should be replaced with new panels. The east and west walls should be sheathed over with a fire and moisture resistant board to protect the combustible material.

The north wall plywood sheathing should be removed and replaced with the same sheathing as the east and west walls to maintain consistency.

3.2.2 Stairwell, Hatches and Floor Openings

Description

Lower Level 1 contains two sets of structural steel stairs: one ascending the main floor and one descending to the comminutor room. The stairs appear to have been coated in the past with a zinc-rich coating system. Both stairs have appropriate railing and the stair treads consist of diamond plate steel treads. Similar to the Main Floor stair opening, the stair opening to the comminutor room below is covered by a hinged plywood cover, likely installed to inhibit gas and odour from escaping the comminutor room.

There are two hatch openings located in the floor of Lower Level 1 to access to the comminutor room below. Both of the openings are of the same size as the hatches above on the Main Floor Level. There is steel framework located within the larger opening that was previously used to support a comminutor drive motor. The covers on the large opening consist of a combination of two outer plywood covers and a middle metal cover. The plywood covers were found to be sealed to the floor with a type of caulking; likely to form a gas-tight seal from the comminutor chamber below. The smaller hatch was covered with a plywood cover which had also been sealed to the concrete floor with a caulking product.

There are floor openings and penetrations in the Lower Level 1, including two vent penetrations along the east wall. A gate operator is located along the west wall, with associated small floor penetrations.

Condition Assessment

The portions of the stairs accessible during the site inspection appear to be in fair condition with no signs of corrosion or section loss. As access to the comminutor room is limited due to the concentration of hydrogen sulfide gas, the portions of the stairs below the floor of Lower Level 1 were not closely inspected. Based on visual assessment from above, there appears to be a greater level of coating deterioration, however no appreciable section loss appears to have occurred. The hinged plywood cover will not be necessary after the open channel flow in the comminutor channel is encased in piping thus eliminating odour and off-gassing within the station.

The hatch opening covers appear to be in fair condition but are considered trip hazards as they project above the concrete floor level. The sealant detail will no longer be required after open flow is contained in piping to contain the odour and off-gassing within the station.

The floor penetrations show no sign of cracking or distress. The floor openings located below the mechanical level sensor will no longer be required as this equipment will be removed. The floor opening for the current gate operator stem may require relocation based on the location of the new gate.

Recommendations

The stairs should be refinished with a corrosion inhibiting paint system to ensure continued protection. This is envisioned to consist of proper surface preparation, a zinc-rich primer followed by an epoxy coating system. It is recommended that all stairs and railings are painted safety yellow for high visibility.

The hatches should be replaced with corrosion-resistant covers that are recessed into the hatch openings to not create a trip hazard. This may require embedding a new frame within the opening to ensure the new cover is flush with the top of floor.

The floor openings below the existing water powered valve actuator should be abandoned. If required, the gate valve operator opening should be abandoned with a new opening cored to suit the new gate centerline. Small abandoned penetrations should be surface prepared by concrete roughening and filled with non-shrink grout. Larger penetrations require reinforcement to be placed within the opening.

3.3 COMMINUTOR CHAMBER

The comminutor chamber serves as the inlet into the wastewater pumping station. The room contains open channel flow from the west wall, through the comminutor channel into the wet well inlet located on the east wall. The comminutors have since been removed and the wastewater flows unimpeded through the channel. The mechanical section outlines proposed changes to be implemented in the comminutor room. Structural aspects of these changes are discussed below.

Due to high concentrations of hydrogen sulfide gas, inspection of the comminutor chamber was not performed. Observations are based on visual assessment made through open hatches from Lower Level 1.

3.3.1 Concrete Floors and Walls

Description

The walls and floors in the comminutor chambers consist of reinforced concrete. No finishing products or insulation have been installed in this area.

Condition Assessment

The concrete appears in fair condition as observed from lower level 1. Based on observations of other stations exposed to high levels of hydrogen sulfide concentrations, there may be softening of the outer paste of the concrete, particularly if the original concrete was not produced using sulphate resistant cement. It appears that in the past, the water within the comminutor chamber has risen significantly to about halfway up the height of the wall. This has left debris and residue on the walls of the chamber.

The proposed mechanical upgrades within the comminutor chamber include a single closed piping system rather than two channel open flow. This will eliminate any future concrete deterioration from sulphate attack from hydrogen sulfide gases.

Recommendations

It is recommended that the comminutor chamber is fully washed down prior to any work to remove all debris and residue from within the chamber.

Select partial demolition of concrete within the comminutor chamber will be required as outlined in the mechanical section and associated drawings in this report. Modifications of the comminutor concrete should be reviewed in detail, although it is envisioned that these changes will not pose adverse structural deficiencies. All demolition works should ensure that reinforcement is not exposed and properly cut at depth and sealed with grout or mortar patching.

3.3.2 Stairwell, Hatches and Floor Openings

Description

The stairwell in the comminutor chamber connecting to Lower Level 1 was reviewed in Section 3.2 above.

There is an aluminum wet well access hatch located along the east wall, centered below the smaller hatches located on the main floor and lower level 1. The hatch is presumably to access the wet well and consists of a hinged 762mm (2'-6") square portion and removable slotted sections (See existing drawings in Appendix A).

Condition Assessment

The aluminum hatches located along the east wall appear to be in fair condition as observed from lower level 1 above. Due to the high concentrations of hydrogen sulfide gas, it is likely that some corrosion has occurred over the years, particularly to the underside of the hatch cover.

From a safety and health standpoint, this hatch is considered dangerous for man-entry uses. Typical man entry into the wet well would require a worker to be connected to an air supply and also carry a bail-out (back-up) air tank. The restricted size of the opening does not allow for retrieval of a worker wearing such safety equipment. The City indicated that hydro excavation contractors will typically not enter chambers without an alternate means of egress if hydro vac equipment access is through the same standard manhole entry point as worker access. Due to the current layout of the Olive Station wet-well, man-entry and vacuum equipment access to the wet-well is made through a single manhole located to the east of the station.

Recommendations

It is recommended that due to safety related issues, the hatch into the wet well not be used for man access. It should be capped with reinforced concrete. It is further recommended that a 400mm diameter vac pipe access port is cast within the current opening to the wet-well with a blind flange to seal the opening. This port will allow for insertion of vac piping for wet-well cleaning access. This will eliminate the vac pipe access from the exterior manhole and allow it to be used as a worker-entry only opening during the cleaning process.

3.4 LOWER LEVEL 2 – MOTOR ROOM

The motor room is connected via a flight of stairs from Lower level 1. The motor room currently houses the two pump motors, as well as the 355 mm (14”) inclined discharge pipe.

3.4.1 Concrete Floors and Walls

Description

The walls and floors in the motor room consist of painted reinforced concrete. The upper area of the motor room, located directly above the stairs to a depth of approximately 2.44m (8’-0”) below grade is covered in with the same foil-faced closed cell foam sheathing product as found on the Main Floor and Lower Level 1.

Condition Assessment

The concrete surfaces appear to be in overall fair condition with several noted areas of spalling in localized areas on the underside of the ceiling.

The coating applied to the concrete is deteriorating and has worn away from abrasion on the floors, as well as peeling off the walls in several locations.

The foil-faced closed cell foam sheathing appears to be in good condition and is unprotected.

Recommendations

It is recommended that all areas of spalling are repaired using partial depth concrete rehabilitation techniques. This would involve limited chipping to depth to expose reinforcement, followed by surface preparation and recasting of a section of grout or mortar repair product.

The concrete on Lower Level 2 should be repainted similar to the recommendations in Lower Level 1. Again, testing for lead-based coatings is critical to ensure lead remediation is not required prior to recoating.

As recommended on the Main Floor level, all foil-faced closed cell foam sheathing should be covered with a fire and moisture resistant sheathing product to protect the combustible material and achieve a sufficient fire rating.

3.4.2 Stairwell, Hatches and Floor Openings

Description

The stairs descending into the motor room are located on the north side and consist of a 610mm (2’-0”) wide steel stair that is painted with what appears to be a zinc-rich protective coating.

There is a handrail around the opening of the south stairway descending to the pump room at the south end of the motor room. The handrail is painted with the same zinc-rich protective coating as all other handrail and stairs.

A hatch is located directly below the main floor hatch for access to the pump room below. The hatch consists of two removable sections of aluminum grating that sit flush with the surface of the floor concrete on an embedded frame.

A small square opening with a plywood hatch cover is located at the northeast corner of the room. The plywood cover is split into two sides and the sump pump discharge pipe currently runs through the opening and into the north wall to the comminutor chamber.

There are several floor penetrations within the motor room. One large opening is approximately 400mm (1'-4") wide and 1520mm (5'-0") long through which the inclined discharge pipe penetrates through the floor of the motor room. There is currently no kick-plate or preventative obstruction from the opening to prevent falls through the opening. Three circular openings form the shaft penetrations for the drive shafts of the motors that connect to the pumps below. The north-most shaft floor opening is uncovered.

Condition Assessment

Both the stairs at the north end of the motor room and handrail at the south end appear to be in good condition with only minor wearing of the zinc-rich protective paint applied.

The main hatch to the pump room is in good condition but appears to be considerably undersized. The hatch cover was quite flexible and does not meet serviceability design criteria. As outlined in Section 3.1.2, the location of the motor room hatch above is proposed to move to the west, and similarly, the location of the hatch into the pump room will be required to move to the same location in plan. The new location will, however, impact egress from the motor room in the event of the hatch cover being removed and will require an alternate route of egress.

The small hatch at the northeast corner of the motor room appears to be in fair condition. The hatch projects above the floor, however this is not of concern of a trip hazard as the hatch is not located in a walkway area.

The penetrations in the motor room floor all appear to be in good condition with no signs of cracking or distress. The current location of the large pump discharge floor penetration will no longer be required for the new proposed mechanical piping layout.

Recommendations

It is recommended that the stairs along the north side of the motor room and handrail at the south side are refinished and recoated in safety yellow epoxy coating similarly to the stairs located in Lower Level 1.

The current main hatch to the pump room should be abandoned by casting a reinforced infill slab. A new hatch opening should be cut to the west of the current opening. A recessed frame constructed of non-corroding materials such as aluminum and should be installed to ensure a recessed hatch cover. The hatch cover should also consist of non-corroding material such as aluminum grating. A ladder should be installed along the east wall to allow an alternate path of egress in the event that the new hatch is open and blocking the stairwell. This may require partial relocation of the air duct extending from Lower Level 1. A self-closing gate would be required to be installed at the top of stair landing to allow users to exit off of the ladder and onto the stair landing.

The small hatch cover at the northeast corner of the room should be replaced with sections of non-corroding materials such as aluminum grating.

The current large pipe penetration should be abandoned by casting a reinforced concrete infill slab. The location of new piping penetrations should be cored accordingly and reinforced if required using non-corroding external concrete reinforcing.

The three pump penetrations will no longer be in the correct location due to changed pump layouts. The motor shaft penetrations should be abandoned by surface roughening and filling with non-shrink grout. New motor shaft penetrations should be cored and reinforced as required.

3.4.3 Lifting Points

Description

There are currently two lifting points located above the two pumps within the motor room. The lifting hooks consist of U-hooks embedded into the concrete ceiling. The lifting points are rated at 1.5 ton each by MMM Group as part of a lifting device study at the station.

Condition Assessment

The lifting points appear to be in good condition with no signs of distress from overloading. The protective coatings applied to the lifting points appear in good condition with no signs of corrosion. It was observed that due to the lack of information relating to the construction details of the device including embedment depth, the load rating cannot be ensured.

Recommendations

Due to the unavailability of drawings related to the lifting devices, it is recommended that all lifting devices be abandoned and replaced with rated devices with known construction details. It is envisioned to use the installation of lifting hooks using stainless steel epoxy anchors with known tested resistance values provided by chemical anchor product manufacturers. All lifting devices should be located above the proposed locations of the new motors.

3.5 LOWER LEVEL 3 – PUMP ROOM

The pump room is connected via a flight of stairs from Lower level 2 at the south end of the building. The pump room currently houses the two pumps and associated discharge piping.

3.5.1 Concrete Floors and Walls

Description

The walls and floors in the pump room consist of painted reinforced concrete, with similar coatings to those observed on lower levels 1 and 2. The pump intakes penetrate through the east wall of the room into the wet well.

The pumps are currently supported on concrete housekeeping slabs with larger concrete thrust blocks supporting discharge elbows from the pumps.

Condition Assessment

The concrete floors, walls and underside of the motor room floor above appear in good to fair condition. There are several areas of minor surface spalling along the underside of the floor above.

The pump concrete pads appear to be in fair condition. However, due to the proposed new layout of the pumps, this concrete will not be at the correct location for new pumps.

Recommendations

It is recommended that all areas of spalling are repaired using partial depth concrete rehabilitation techniques as previously outlined. All concrete surfaces should also be recoated as outlined above as part of the rehabilitation of Lower Levels 1 and 2.

The existing pump penetrations that sleeve through the east wall into the wet well will have to be demolished and removed to allow for the casting of new piping in the openings.

The existing pump locations will move slightly and require demolition of the pump housekeeping pads as well as pipe thrust blocks. New pump pads and thrust blocks will be required for the new proposed pumping arrangement.

3.5.2 Stairwell, and Floor Openings

Description

The stairs descending into the pump room are located on the south side of the room and consist of a 610 mm (2’-0”) wide steel stair that is painted with what appears to be a zinc-rich protective coating.

A 600 mm (2’-0”) square sump pit is located at the northeast corner of the room and is currently uncovered. Discharge piping from the sump extends upwards vertically into the motor room above.

Condition Assessment

Similar to the other stairs in the station, the stairs to the pump room are in fair condition with minor deterioration of the protective coatings.

The sump pit is uncovered and presents a potential opening hazard to workers in the area.

The City of Winnipeg has indicated that providing alternate means of egress from the pump room in case of an emergency is a priority. Currently, the one exit via the south stairs does not allow a worker at the north end of the room to exit without walking past all equipment in the pump room.

Recommendations

It is recommended that a fixed ladder be installed at the northeast corner of the room at the proposed new hatch location. The ladder would provide an alternate means of egress for personnel in the north end of the motor room in case of an emergency.

3.5.3 Lifting Points

Description

There are currently two lifting points located above the two pumps on the pump room ceiling. The lifting devices consist of a plate with welded loop bolted to the underside of the floor above. The devices are rated at 1.5 ton each by MMM Group as part of a lifting device study at the station.

Condition Assessment

The lifting points appear to be in fair condition with minor signs of coating deterioration and surface corrosion. Similar to the lifting points in the motor room, the pump lifting points lack construction details including embedment depth, and therefore the load rating cannot be ensured.

When pump bearing and impeller assemblies need to be lifted, it can become awkward and unsafe as a lifting point cannot be easily located at the pump center of gravity because the pump shaft is at that location. This necessitates moving the pump sideways from its lifting point during raising and then lowering the pump to floor level. This causes potential swing forces during the pump moving process that could result in potential injury to workers. Installing a lifting system with two beams running across all three pumps, one on each side of the pump shaft can eliminate this problem. Using a pump lifting fixture and two manual hoists, each running along one of the beams, the pump can be raised safely and moved to the open space between two pumps and lowered onto a dolley. From there the pump can be moved to the access hatch location for removal from the station if required.

Recommendations

Due to the unavailability of drawings related to the lifting devices, it is recommended that all lifting devices in the pump room be abandoned and replaced with a rated two beam lifting system with known construction details. The beams would be fastened to the concrete floor above using stainless steel epoxy anchors with known and tested resistance values.

4.0 MECHANICAL – PROCESS PUMPING AND PIPING

4.1 PUMP SUCTION LINES

Description

There are three pump suction lines installed at the pump level. Two are connected to the operational pumps and one is blind flanged and intended for future installation of a third pump.

Assessment

The pump suction wall inserts are cast iron and have corroded significantly over the years. Although they appear to not be leaking from the wet well around the outside seal between the pipe and concrete, it would be best to replace these inserts so as to ensure a complete as new system is provided when upgrades are completed.

The existing suction line wall inserts can be cored out and replaced with new piping along with a water tight resealing detail between the new pipe and existing concrete.

Recommendation

Replace the pump suction lines including the wall inserts to the wet well. In addition, the wet well itself should be thoroughly cleaned to remove grit and other materials that may have collected there over time.

Photo 1 - Pump Suction Wall Insert

4.2 PUMPS

Description

The two existing pumps are vertical line shaft type mounted mounted with pumps on the lower pump level and motors connected by shaft located on the motor floor level above. They are Fairbanks Morse 8" x 10", Figure B5414, with a capacity of 2028 usgpm, at a head of 45 ft. The two pumps are designed to meet the station's summer design capacity. A standby is not currently installed. As part of the station upgrade, the City would like the new pump capacity to be increased by 20% to 2,441 usgpm.

Assessment

The original pumps installed appear to have been replaced in 1983, with the original 50hp motors replaced with the existing 30hp motors which were taken from another station. Impeller and pump casing rings inside the pumps are worn to the point where pump casing opening is required on occasion to remove rags jammed between the impeller and casing.

The City is comfortable working with this style of pump and they have provided reliable long term service. Over the last few years the City has installed new pumps of similar type and configuration in at least 6 other stations. Hence there is commonality of parts and service organizations to deal with.

Alternate pump systems including dry pit submersible and immersible pump systems were considered. The installed cost for these alternate pump systems is approximately the same as the vertical line shaft pumps. Given that the existing line shaft pumps are not causing the City significant operating issues, and they last a long time, it may not be worthwhile to switch to one of these alternate style pumps.

The City has indicated the pump total head will be 45 ft. Therefore the new pumps will require 40 hp motors. This should be confirmed during detailed design.

Photo 2 - One of Two Existing Pumps

Recommendation

It is recommended the pumps be replaced with pumps of similar vertical line shaft configuration and that a third pump be installed as backup should one of the two duty pumps be out of service during the summer season. This approach of installing backup pumps has previously been implemented at other stations.

4.3 PROCESS PIPING AND VALVES

Description

Existing process piping is schedule 40 steel throughout the station. It appears to be original piping with some piping changes made around the pumps when they were replaced with smaller ones in 1983.

Similarly the gate valves and check valves appear to be original and do not appear to have been replaced since then.

Assessment

The piping and valves are well worn and have reached the end of their useful life. On the header connection to the future third pump, a repair clamp has already been installed to stop leakage through the pipe sidewall. This indicates significant wear is underway on the inside of this section of piping.

Although from the outside, the 16” wall insert pipe section leaving the building appears in good condition, the inside of the pipe may have experienced significant corrosion and should be replaced.

An increase in pump capacity of 20% as requested by the City should not require an increase of the existing 12” pump suction or discharge piping sizes.

Photo 3 - Existing Piping

Recommendation

All process piping, including the discharge pipe wall insert, and related valves in the station should be replaced. Schedule 40 steel pipe, painted inside and out with a suitable paint system is recommended. Shut-off valves should be solid or rotating disk, ductile iron flanged or Victaulic coupled gate valves with bronze seats and hand wheel operators. Check valves should be ductile iron, flanged check valves with rubber flappers, position indication and backflow actuators.

4.4 INLET CHANNEL HYDRAULIC SHUT-OFF VALVE

Description

Of the two flow inlets to the station, the south inlet from Assiniboine Ave. enters via the comminutor chamber before entering the wet well. This inlet line has an existing 20” gate valve operated by a water powered actuator installed at the comminutor chamber inlet. It can shut-off flow from this inlet line to the comminutor and wet well areas.

However the inlet line that enters the wet well directly from the north, can still introduce flows to the wet well even with this shut-off valve closed (See Appendix A – Existing drawing S-265 – Site Plan).

Assessment

This shut-off valve and related water operating system are original equipment. This system has reached the end of its useful life. The automatic water operating system is complex and no longer required.

Photo 4 - 20” Comminutor Inlet Valve

Recommendation

The existing valve should be replaced with a new gate valve complete with a manual handwheel operator provided on the floor level above. The handwheel operator should remain on the comminutor motor level above as the comminutor chamber itself remains subject to flooding from the inlet sewer entering the wet well directly from the north.

4.5 COMMINUTOR CHAMBER PIPING

Description

Flow enters the comminutor chamber via a 20” shut-off valve. It then enters open channels that direct flow to two abandoned comminutor openings in the floor. On the comminutor discharge chamber, where it enters the wet well, there is an access hatch which would permit man-access between the comminutor chamber and the wet well. A drawing of the existing comminutor chamber layout is included in Appendix A.

Assessment

The open sewage flow channel in the comminutor chamber is generating significant corrosive off gases that are contributing to corrosion of electrical equipment on the main floor and are creating a safety hazard as well. As a consequence these gases make working in the chamber difficult for operations personnel.

Enclosing the open channel flow inside the chamber in piping would assist in eliminating the off gasses and significantly improve the environment inside the station as a whole. This approach to improving station safety and reducing equipment corrosion has recently been implemented in other sewage pumping stations.

Containing sewage flow inside a pipe addresses part of the off gas containment problem. The sewage channel on the discharge of the comminutor floor openings remain open to the wet well, to the access hatch in the comminutor chamber, and to the two comminutor floor openings. To fully contain the sewage gases, and in addition to piping the sewage flow, the access hatch into the wet well and the two comminutor floor openings would all have to be sealed as well. At the same time the City would like to keep the access hatch operational.

In assessing this existing wet well access opening against current safety standards, it should be noted that it is not a safe way for personnel to move from the station into the wet well. Once lowered down into the opening under tight space constraints, the person has to then move horizontally several feet before he enters the wet well. If there is breathing apparatus or other accessories involved that could catch on the existing structure, this does not appear to be a safe way to enter or exit the wet well. Therefore it is suggested the top of this access opening be closed off with concrete with the 600 waste water piping discharging below into the wet well wall opening.

Piping materials used on previous recent station renovations at the City in this application are Class 52 ductile iron or schedule 80 ASTM carbon steel. In the past they have provided and continue to provide reliable long term service.

Recommendation

After installing a new 20” shut-off valve, run piping from the valve to the wet well inlet channel. A proposed layout for this proposed piping arrangement is shown on Drawing M1.

Concrete demolition will be required to clear the way for the new piping. Also as the 20” valve invert appears to be flush with the bottom of the comminutor channel, some demolition of the chamber floor will also be required to permit installation of the piping without raising the pipe invert above existing inlet piping levels.

The comminutor discharge channels should be filled with concrete to seal the wet well sewage gases from the comminutor chamber. On one of the two comminutor floor openings the top two feet could be left unfilled. This would permit the opening to still seal against wet well gases, and at the same time provide a pit for draining water that may on occasion need to be removed from the comminutor chamber area.

The wet well opening through which the influent sewage flows, should not also be used as an access hatch into the wet well. It is considered an unsafe way to enter or leave the wet well.

4.6 PRELIMINARY PROCESS PIPING LAYOUT

Description

As noted earlier, it is recommended the two existing pumps and related piping system be replaced with a new system. However three pumping systems will be required. In addition the new system will need flow meters to record the flow from each pump.

Assessment

Drawing M2 provides a layout for the proposed pump and piping system. The pump suction piping and pumps themselves would be laid out as per the existing layout as the suction connections essentially do not permit alternatives in this area. Access ports are required on the pump suction elbows to permit hand access to the pump impeller.

The pumps would be followed by check valves in the horizontal position. If installed in the vertical, they could be subject to solids collecting on the downstream side of the valve flapper and thus perhaps affect the valve's performance.

Once the discharge line turns up, pump discharge shutoff valves would be installed. Then following a vertical straight length of pipe, the new flow meters along with downstream isolation valves would be installed on the motor level. The risers would be connected to the side of a horizontal header which would then leave the building at the south end and connect to the existing forcemain.

Installing one flow meter instead of three was considered, but not pursued further as space limitations would make it very difficult to install one magmeter on the combined flow from all three pumps. In addition one flowmeter on each pump will provide a more efficient way to troubleshoot operating issues with individual pumps. This may turn out to be a significant benefit during day to day operation of the station.

Connecting to the side of the header instead of the bottom, will prevent solids from settling and accumulating in the vertical risers of pumps that may be out of service for a while. In order to achieve this side connection arrangement, the pump suction and horizontal discharge sections down in the pump room will have to be shortened in order to provide the necessary space on the motor floor for the riser 90 degree discharge elbows. In addition location of the motors will shift slightly toward the east wall. This should be workable.

Recommendation

Piping should be installed as per the configuration shown on drawing M2.

4.7 DOMESTIC WATER SYSTEM

Description

The existing domestic water supply line to the station enters as copper pipe adjacent to the forcemain exit from the station. Once inside there is a shutoff valve followed by a water meter and backflow preventer. Domestic water piping inside the station is PVC. The system supplies hose reels at each level for station cleaning, the inlet channel hydraulic valve actuator, and the seal water requirements for the two existing sewage pumps.

Assessment

The copper pipe entering the building is quite corroded and requires attention. It has a grounding cable attached. The PVC appears to be holding out well and is easy to work with if changes are required. However changes to the pipe routing will be required as the existing backflow preventer will have to be replaced with a reduced pressure type backflow preventer. In addition it will have to be installed on the main floor level.

The system valves are 50 years old and should be replaced.

Recommendation

The existing domestic water pipe wall insert, where it enters the station should be replaced with a new section of copper pipe. The existing PVC piping inside the station, although in good condition, should be replaced entirely with PVC, copper, Pex, or Wirsbo as the system is relatively small and will require significant rerouting to accommodate the new backflow preventer location requirements and installation of new valves.

4.8 SUMP PUMP DISCHARGE PIPING

Description

The existing pump room sump has a small electric pump plugged into an adjacent outlet. The small diameter PVC discharge pipe runs up to the motor floor, then runs through the comminutor chamber wall before running down to the 20” sewage inlet valve where it discharges down into the open channel downstream of the 20” valve.

Assessment

The piping is in good condition. However as the comminutor area open flow channel will be replaced by closed piping, the pump's current discharge point will have to be changed. It should be piped directly into the new 24" comminutor piping. Piping material should remain PVC.

Recommendation

Reroute the sump pump piping inside the comminutor chamber down into the new comminutor piping.

4.9 TEMPORARY PUMPING

In order to complete the mechanical and electrical works described in this report, a temporary pumping system will have to be provided during construction to maintain sewage pumping service. It is beyond the scope of this project to prepare a temporary pumping plan. However sufficient assessment of this issue has been performed to permit a capital cost allowance to be established for these works.

The logistics for temporary pumping at this station are more complex than for example the Aubrey sewage pumping station. Reasons for the increased complexity include the following.

1. There are two inlets to the station wet well. One enters from the north from the Conway pumping station. A second enters from Assiniboine Ave on the south, and then it enters the comminutor chamber from the west.

2. The 24" Conway station line from the north is a gravity line up to the standard 4ft manhole located just north of the station. It is anticipated that temporary pumps can be installed in this manhole to pump to the station discharge forcemain south of the station.

3. The 24" line from Assiniboine Ave is also gravity to the 4 foot manhole just west of the comminutor chamber. It is anticipated that temporary pumps can be installed in this manhole as well to pump to the station discharge forcemain south of the station.

4. On the forcemain leaving the station, there is no nearby manhole into which temporary flows can discharge. To discharge flow from temporary intercepter pumps into the forcemain, a tie-in to the 18" forcemain leaving the station would likely have to be made.

On a preliminary design basis, the following general works are likely required to provide a reliable temporary pumping system (See existing drawings in Appendix A).

Install two pumps (one standby) in the Conway discharge manhole north of the station. Size the pumps for DWF of 42.8L/s (680 usgpm).

1. Install a plug into the 18” line from the Conway discharge manhole to the wet well to redirect flow from the wet well to the temporary pump.
2. Discharge the pumps into a new tie-in on the 18” forcemain located just south of the station.
3. On the 24” gravity line to the comminutor inlet manhole, install two temporary pumps each sized to pump 31.3L/s (500 usgpm).
4. Pump flow from this manhole to the station discharge forcemain at a new tie-in provided as part of this project.
5. A tie-in to the existing 18” forcemain leaving the station will be required to permit the temporary pumps to pump into it (The size of this existing forcemain would need confirmation as existing drawing show it as both an 18” and 24” diameter). Note the station driveway would have to be removed and then replaced after the forcemain tie-in is completed. Tie-in work would include the following:
    a. Expose the forcemain just outside the station for a distance of about one length of AC pipe. Empty the forcemain in preparation for cutting into the line.
    b. Determine how long it will take to make this tie-in. Then if there is not sufficient storage space in the upstream intercepter piping to provide time to make this tie-in, find a way to dispose of additional sewage flow into the station.
    c. Remove a section of 18” AC forcemain just outside the station and replace it with a new section. Include an 18” shut-off valve to isolate the station piping. Connect an 8” tie-in. Tie two 6” pipes from the two intercepter manholes to the 8” connection to the forcemain. The two temporary pumping system discharge lines would tie into this 8” valve.
    d. Power for the temporary pumps should be available from the station as long as existing pumps are not running when the temporary pumps are running.

Once this forcemain tie-in is completed the existing pumps can be placed back in service and used to continue pumping sewage until the temporary pumping system is complete, proven, and ready to take over. Once the temporary pumps have taken over, remaining work inside the station can begin.

Additional information required to provide a complete verified temporary pumping plan would include the following.

1. What would the night time flows be while the forcemain tie-in work is being completed?
2. How much time can be made available through storage of sewage in the lines feeding the Olive Station, or other means, to permit the 18" forcemain temporary pumping tie-in to be made.

Note during the detailed design phase, additional design work will be required to ensure the systems and methods proposed are achievable, or for that matter if less costly methods can be found.

5.0 MECHANICAL – HVAC SYSTEM

Refer to Appendix B, Drawing M03.

Description

A supply fan located on the main floor, supplies unfiltered, unheated outdoor air throughout the lower levels of the station. This fan is manually operated via a wall switch and can be turned on to clear unsafe gases from the lower levels before personnel are allowed to enter. Ducting carries the outdoor air to different areas of the lower levels. The volume flow of supply air is regulated via manual blast gate dampers. A 200 mm duct then carries the relief air from the lower levels to the outdoors. Air from the comminutor chamber is vented to outdoors directly by a dedicated 100 mm PVC relief vent pipe. No ventilation is supplied to the main floor electrical room.

Photo 5 - Supply Fan Location in Main Floor Electrical Room

Heat is currently provided to the station by portable electric construction heaters plugged into wall outlets. Other than ventilation provided by the existing supply fan, no additional cooling is provided to the station.

Assessment

The volume of air being provided by the existing supply fan is estimated to be 450 L/s (based on size of ducting) and the fan appears to be nearing its end-of-life cycle. The existing ducting appears to be in good condition and the supply duct layout and sizing is appropriate. The relief air ducting, however, is undersized if 6 ACH of ventilation air is desired. The intent is to renovate the comminutor chamber by enclosing the current open sewage channel flow into a piped system. After this renovation is complete, the comminutor chamber can be considered a dry well and therefore all lower levels of the station may be ventilated at 6 ACH with 100% outdoor air during occupancy to maintain unclassified conditions as per NFPA 820.

As per NFPA 820, the supply fan must continuously provide 6 ACH (approximately 405 L/s) of supply air. However during unoccupied times, 75% of this supply air would be recirculated.

The portable construction heaters do not provide a permanent means of heating the station and present a potential tripping hazard with cables running to outlets at foot level. These should be replaced with permanent, hard-wired unit heaters.

As the existing ventilation air provides sufficient cooling for the pump motors, no additional free motor cooling is required. The supply air ducting in the lower levels is in generally good condition and can remain.

Recommendation

The existing supply fan should be replaced. An air filter and an electric duct heater should also be added to provide filtered, heated ventilation air to the station.

A system of motorized dampers, located in the main floor electrical room, is recommended to incorporate a 75% recirculated air option when the station is unoccupied. Occupied and unoccupied ventilation modes would be controlled by interlocking the motorized damper positions with the station’s light switches.

To accommodate the 6 ACH of ventilation air, the relief air ducting from the lower levels and the relief air vent from the comminutor chamber will need to be increased in size.

The existing portable construction heaters should be replaced with permanently installed unit heaters with wall-mounted thermostats in the lower levels and the main floor electrical room. The unit heaters will be sized to maintain a minimum of 5°C indoor space temperature during winter design conditions.

6.0 ELECTRICAL

6.1 ELECTRICAL SERVICE

Description

The existing service is three wire, 200A, 600V. This service is fed from three 37.5kVA utility owned pole mount transformers located on the north side of the station. Currently the service enters the station near the Manitoba Hydro meter on the northern side of the east wall.

Assessment

The service does not meet current Manitoba Hydro customer metering standards, which require all 600V services to be a four wire system. Manitoba Hydro has indicated that work on this station would require a service upgrade to a 4 wire system. The City has indicated a preference to upgrade the service at this time.

An upgrade to a solidly grounded system provides the benefit of simplifying the process of locating a ground fault, and is considered a safer installation as there is no potential for accidental contact with live equipment during a ground fault.

Recommendation

Upgrade the service to a 600V, 200A, four wire system. Relocate the service entrance to the west wall to accommodate the power distribution equipment location as described in Section 6.3.

6.2 ELECTRICAL LOAD ANALYSIS

Description

An electrical load estimate for the current station is listed in Table 1.

Table 1 - Existing Electrical Load Estimate – 600V

Load	Connected (A)	Demand Factor	Load Estimate (A)
Pump: P-L1 – 30HP	29	0.95	27.6
Pump: P-L2 – 30HP	29	0.95	27.6
Supply Fan: SF-L1 – 3/4HP	1.3	0.95	1.2
15kVA Transformer (120/208V Loads)	14.4	0.80	11.5
Total Loads	**73.7**		**67.9**

Assessment

An electrical load estimate based on all the recommendations made in this report is listed in Table 2.

Table 2 - Proposed Electrical Load Estimate – 600V

Load	Connected (A)	Demand Factor	Load Estimate (A)
Pump: P1 – 40HP	41	0.9	36.9
Pump: P2 – 40HP	41	0.9	36.9
Pump: P3 – 40HP	41	0	0
Unit Heater: UH-1 – (3KW)	3.9	0.95	3.7
Unit Heater: UH-2 – (5kW)	4.8	0.95	4.6
Unit Heater: UH-3 – (5kW)	4.8	0.95	4.6
Unit Heater: UH-4 – (3kW)	3.9	0.95	3.7
Electric Duct Heater: HCE-1 – (20kW)	19.2	0.95	18.2
15kVA Transformer (120/208V Loads)	14.4	0.80	11.5
Total Loads	**174**		**119.5**

The demand factor for pump P3 is not listed because one of the pumps will act as a backup to the two duty pumps.

Recommendation

The capacity of the existing service is sufficient to supply the additional loads recommended in this report. Therefore, it is not recommended to increase the service size.

6.3 POWER DISTRIBUTION

Description

Currently, the power distribution is located on the east wall of the main floor electrical room. The equipment includes:

- 200A fused disconnect
- Utility meter
- 600V, 200A, 3W splitter
- Ground fault indicator lights
- Fused disconnects for pumps (60A), for supply fan (15A) and for transformer (30A).
- Soft starters for pumps P-L1 and P-L2
- Full voltage starter for supply fan SF-L1
- 600V-240/120V 15kVA transformer
- 240/120V panel

Currently the equipment is all individually mounted. Wiring between this equipment is TECK90, PVC conduit and in some cases rigid metallic conduit. The current equipment is not hazardous location rated.

Figure 6 - Existing Power Distribution

Assessment

The current distribution system is designed for a 3 wire system. The main fused disconnect and the splitter do not include a lug for a neutral connection point. To terminate the new 4 wire system proposed in section 6.1, the main disconnect and splitter must be replaced. Additionally, the connection points of the main disconnect are highly corroded.

Recommendation

Replace the existing distribution with a 600V Motor Control Center (MCC). An MCC will provide simplified installation, the condensed layout provides a reduced footprint and increased reliability.

The proposed MCC would house the main breakers, soft starters for each pump, breakers for the 600V feeds, surge protection device, transformer and a 120/208V panel. The proposed MCC would have five sections. The estimated footprint of the MCC is 8'-4" in length and 20" deep. There is not sufficient space to place the MCC in the location of the current distribution, however it is recommended to place this proposed MCC along the west wall of the station. As the service is to be upgraded at the time of construction, it is recommended to relocate the service termination point to the west wall at the proposed MCC location. Refer to Figure 7 for details. To achieve this, the RTU panel and associated connections would have to be relocated; this is discussed further in section 7.1.

The new MCC should be fed from the pole mount, Hydro owned transformers. Requirements for the MCC should include:

- 600V, 3ø, 3 wire, with a neutral lug
- Main breaker: 200A, 3ø
- Main bus: 200A minimum, tin plated copper
- Ground bus: copper, tin plated
- Enclosure rating: NEMA 1 gasketted
- Interrupt rating: 10kA rms sym (to be confirmed at detailed design stage)
- Surge protection device
- 1 meter clearance in front of MCC
- Integral three phase voltage monitor connected to the RTU to provide alarm on phase loss or phase imbalance over 10%
- Integral power meter connected to the RTU panel with real time measurements of voltage, current, power, power factor and energy consumption

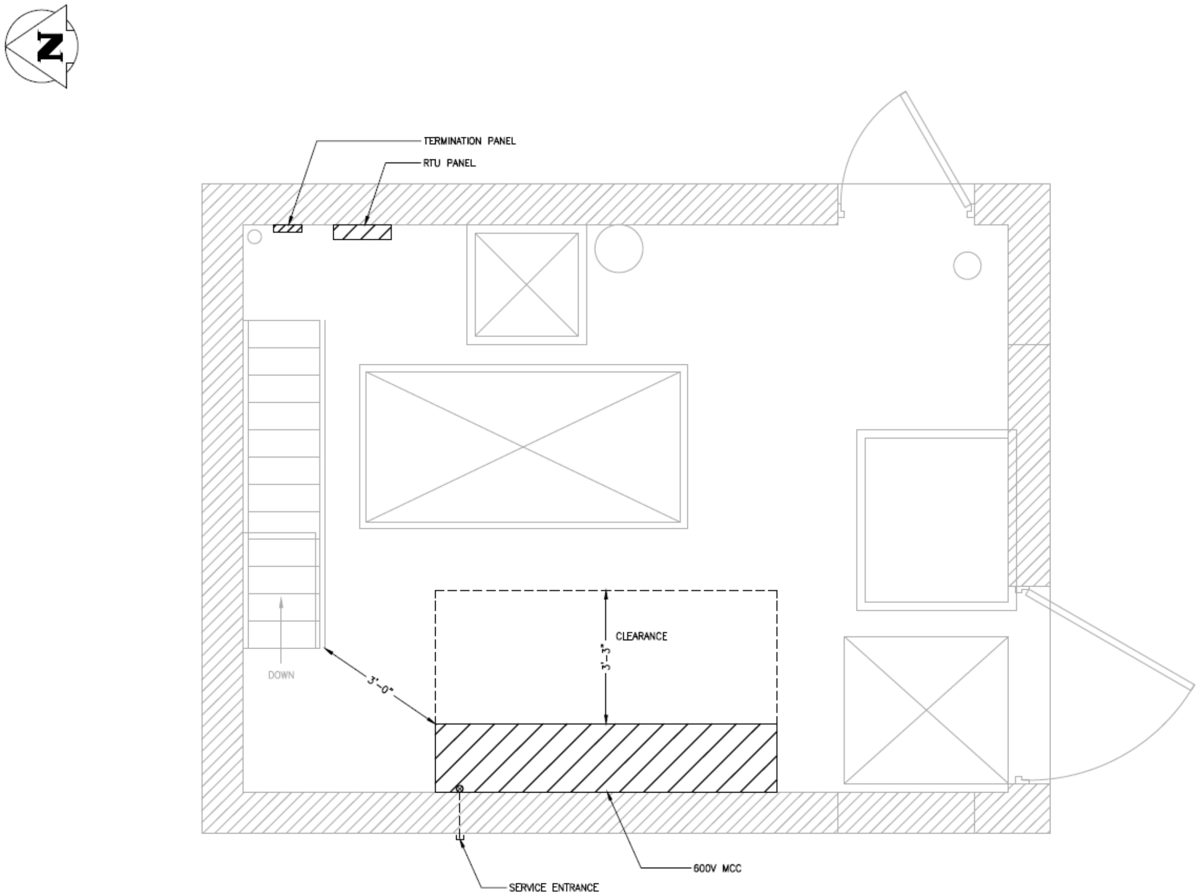


Figure 7 – Main Floor Electrical Equipment Layout

6.4 SEWAGE PUMP MOTOR STARTERS

Description

The existing equipment includes two soft starters for the existing pumps P-L1 and P-L2. The starters are sized for 30 horsepower pumps. The existing soft starters include an integral bypass contactor.

Assessment

The existing motor starters are rated for a 30 horsepower motor and do not have sufficient capacity to power the new 40 horsepower pump motors. A third starter is required for the additional 40 horsepower pump.

Recommendation

It is recommended to replace the existing two (2) 30HP starters with three (3) 40HP soft-starters installed within the MCC. According to the City of Winnipeg Electrical Design Guide, an external bypass starter is required for this application. This should be provided with isolation contactors to allow the motor to start in the event of a failure of the soft-start mechanism. The status of the soft-start should be monitored by the RTU.

The motor starter should also have a manual override to start functionality. The motor starter should include:

- A front door mounted display keypad
- Cooling mechanism
- H-O-A (Hand off auto) switch for selection between bypass/soft-start/off modes.
- Two position selector switch for selection between auto and manual modes.
- Push buttons for manual start and stop functions
- Green pilot light to indicate run status
- Blue pilot light to indicate ready status
- Amber pilot light to indicate soft start failure

6.5 AREA CLASSIFICATION

Description

The electrical equipment currently installed at the station is not rated for use in a classified area. Enclosure ratings of currently installed equipment are Nema1 or Nema12.

Assessment

The proposed supply air system will have six air changes per hour within the station. The changes will be with 100% outdoor air when the station is occupied and 25% outdoor air when the station is unoccupied. Station occupancy will be determined by light switch located near the entrance. This air circulation coupled with closing off the wet well from the remainder of the station provides conditions such that no area classification is required according to NFPA 820.

The proposed piping plan for the station includes completely enclosing the wastewater flow, thereby sealing the comminutor chamber from the corrosive wet well gases.

Recommendation

The station would not be classified as a hazardous area. The comminutor chamber and the lower pump level would be classified as Category 1 wet location.

Area classification recommendation is based on the proposed ventilation design and enclosing the comminutor chamber as recommended in this report. Area classification should be confirmed at the design stage if the ventilation design is altered.

6.6 GROUNDING

Description

The station grounding consists of a bare copper conductor bonded to the potable water service within the station.

Assessment

The station dates back to the 1960s and the condition/existence of ground rods is unknown. The ground conductors within the station are bare copper and appear to be highly corroded due to exposure to the atmosphere within the station.

Recommendation

The scope of work would include three new ground rods on the west side of the station near the new MCC to provide adequate grounding. The grounding wires within the building would be replaced. The new ventilation system proposed for the station along with enclosing flow in the comminutor chamber would limit the rate of corrosion on the bare copper conductors.

6.7 LOW VOLTAGE TRANSFORMER

Description

The existing transformer is single phase, 600-240/120, 15kVA. It is mounted on the east wall of the main floor electrical room. The transformer feeds 120/240V panel PNL-L10. This panel services lighting, receptacles, CSO panel, control panel and heating.

Assessment

The existing transformer has a 240/120V secondary. The existing 240V loads include the heaters, this report recommends replacing the existing heaters with 600V unit heaters. With the heaters replaced there is no requirement for 240V at the station.

The new transformer will feed lighting, receptacles, CSO panel and control panel. 15kVA is sufficient capacity to feed these loads.

Recommendation

Replace the existing transformer with a three phase 600-208/120V 15kVA transformer integral to the MCC. It is recommended to replace the existing transformer because a transformer within the MCC reduces the required wiring on site therefore simplifying installation. Additionally the 120/208V panel fed from the transformer will be within the MCC further reducing the onsite installation time. Transformer should be dry type with copper windings.

6.8 PANELBOARDS - 208/120V

Description

The existing panel board is 240/120V, single phase, 3 wire. The ampacity of the existing panel is not displayed on the nameplate but is estimated to be 100A. Corrosion within the panel is suspected.

Assessment

The panel should be integral to the MCC to reduce installation time on site. The panel should be replaced with a 208V/120V panel.

Recommendation

Install a new 120/208V panel within the MCC. The panel is recommended to be 3 wire, 24 circuit, 100A panel with tin-plated copper bus.

6.9 LIGHTING

Description

The existing interior lighting consists of incandescent luminaires. Current exterior lighting consists of a single LED luminaire. There is no emergency lighting in the station.

Assessment

The City of Winnipeg Electrical Design guide indicates the desired lighting technology for wastewater lift stations is fluorescent. Fluorescent lighting is more efficient than incandescent lighting.

Emergency lighting is required for the station with the exception of the comminutor chamber as this area is rarely occupied.

Recommendation

Replace all interior lighting with fluorescent luminaires. Design to the illumination level listed in Table 3. The existing exterior LED fixture can be reused.

Table 3 - Proposed Lighting

Location	Luminaire Type	Illumination Level (lux)	Voltage (V)
Main Floor	Fluorescent	300-350	120
Lower Level 1	Fluorescent	150-250	120
Motor Room	Fluorescent	150-250	120
Pump Room	Fluorescent	150-250	120
Comminutor Chamber	Fluorescent	100	120
Exterior	LED		120

Install unit battery packs and remote LED heads for emergency lighting. Emergency lighting will be installed on all levels of the station except the comminutor chamber. Emergency lighting layout should be designed such that there is a minimum of 10lux along the path of egress.

Lighting should be switched locally. This will also be used to indicate occupancy of the station; this occupied signal will be used to control the HVAC system. Exterior lighting should be controlled by photocell.

6.10 POWER RECEPTACLES

Description

In the existing facility there are two to three receptacles per level, however some are dedicated to equipment such as the sump pump or space heaters.

Assessment

All new heaters shall be fed from the panel and not from receptacles.

Recommendation

Replace all existing below grade 120V receptacles with GFCI protected receptacles. The receptacles shall be installed with a weatherproof cover. Increase the number of receptacles to three receptacles per level.

6.11 POWER CABLES AND WIRING

Description

The existing wiring is done with a variety of technologies including TECK90, wiring in PVC conduit and wiring in rigid metallic conduit as shown in Figure 6.

Assessment

The addition of the MCC and relocation of the distribution will necessitate replacement of much of the existing wiring. The existing wiring is aged and some is degraded.

Recommendation

Replace all wiring and conduit. It is recommended that the loads at 600V are fed with TECK90 rated for 1000 V. And all 208/120 V loads shall be fed with TECK90 rated for 600V. All cables should be labeled according to the City of Winnipeg Electrical Design Guide.

All cables running in the vicinity of the lifting shaft shall be protected by a covered cable tray from mechanical damage due to items being lifted or lowered. Detailed design to run cables away from lifting shaft.

Unit heaters and new sump pump are recommended to be fed directly from the distribution and not receptacles as is currently done in the station.

6.12 ENGINEERING STUDIES REQUIRED

An arc flash study has been conducted on the current site. An arc flash study is required for any new or replaced equipment. All equipment should be labeled with the correct potential arc energy and required personal protective equipment.

6.13 IMPLEMENTATION REQUIREMENTS

The continuity of service at the Olive Wastewater Lift Station is imperative to prevent sewer backups. Therefore the work must be staged such that any disruption is minimized. To achieve this, a temporary generator would be required. The proposed sequence of operations would include the following steps but may be revised during construction:

1. Install two (2) 15HP temporary pumps in each of the two incoming manholes.
2. Feed the two (2) temporary pumps from the existing distribution using the existing motor starters.
3. Install the MCC on the west wall.
4. Install the new pumps.
5. Test the new pumps and starters using a genset feed to the MCC.
6. Disconnect the genset from the MCC.
7. Feed the existing distribution from the genset.
8. Manitoba Hydro service upgrade.
9. Feed the MCC from the new service.
10. Remove genset, temporary pumps, existing distribution and associated equipment.

7.0 AUTOMATION/CONTROLS

7.1 RTU PANEL

Description

The existing RTU panel is currently located along the west wall of the station main floor electrical room.

The RTU panel consists of a Precision Digital process meter (PD6000-7R4) which receives the analog level signals and based on comparison of the wet well level and the set point controls the pump run condition. The RTU panel also includes a Schneider ScadaPack 357 remote terminal unit (RTU) which functions to monitor all alarm and status signals. The signals are sent to the McPhillips Control Center via a landline modem. The RTU panel contains a 24V uninterruptable power supply.

Assessment

The RTU panel was installed within the last five years. The RTU panel is currently located where the proposed MCC will be placed. With a third pump being added and the panel being relocated, it would be best if the panel were replaced.

Recommendation

The RTU panel must be relocated to allow space for the new MCC within the existing station footprint. It is recommended to relocate the RTU panel to the location of the existing distribution along the east wall. It is recommended the RTU panel be replaced.

The termination panel and all terminating signals will also be moved to the east wall and placed directly adjacent to the new RTU panel location.

An alarm contact must be added to detect failure of power to the supply fan and detect the switch to backup power. This is required for ventilation as per NFPA 820.

7.2 LEVEL SENSORS

Description

The level in the comminutor chamber is monitored with two float level switches. These switches produce a high level alarm and a high-high level alarm.

Within the CSO chamber across the street, there is a hydrostatic level sensor and transmitter located downstream of the flap gate. The gate chamber also contains an inclination transmitter which measures the position of the flap gate. There are two additional hydrostatic level transmitters, these are located upstream of weir 1 and upstream of weir 2 (See existing drawings in Appendix A).

There is a float level switch in the station at the pump level, this sensor detects flooding in the pumprooom and triggers the station flood condition.

The status of these float level switches is wired as digital inputs to the ScadaPack 357.

Assessment

The age and life expectancy of these switches is unknown.

Recommendation

It is recommended to replace all three of these with new float level switches as their age is unknown and predicted life expectancy should match the balance of the station control system.

It is not recommended to replace the hydrostatic level sensors in the CSO chamber.

7.3 PUMP CONTROL

Description

The current method of pump control is to control the pumps based on a level measurement of the wet well. The level is measured with a hydrostatic level transmitter and a 4-20mA signal is sent to a Precision Digital Meter, which compares the current level to the setpoint level and energizes relays to activate the pumps based on that comparison.

Assessment

The current pump control is based on a single measurement. A second level measurement would greatly improve the reliability of the system. The Precision Digital Meter can only receive a single 4-20mA input signal.

Recommendation

It is recommended to provide a redundant measurement of the wet well level, as mentioned in section 7.2, and provide a local switch to select the sensor that will be recognized by the Precision Digital Meter. The status of both level sensors would be monitored and compared in the RTU.

Control of the station is currently done locally and the RTU is used for remote monitoring. The replacement RTU shall be capable of controlling should the station be run in remote mode and should local mode be selected the RTU shall be used for monitoring only.

Interfacing with the RTU panel is recommended to be similar to the existing panel with status lamps for the following conditions:

- Normal Mode
- Local Mode
- RTU Mode
- Test Mode
- UPS Charging
- Pump 1 Running
- Pump 2 Running
- Pump 3 Running

And alarm lamps for the following conditions:

- High wet well
- High-high wet well
- Station flood condition
- 120VAC power failure
- UPS in batter mode/UPS failure

- Pump 1 soft start failure
- Pump 2 soft start failure
- Pump 3 soft start failure
- Pump 1 failure
- Pump 2 failure
- Pump 3 failure
- Wet well level sensor discrepancy

The panel shall also have a switch to toggle between local or remote mode. A second switch shall be provided to toggle between normal and test modes.

It is recommended to monitor the following conditions:

Motor starter I/O:

- Ready status
- Running status
- Soft starter fault status
- Bypass starter overload trip status
- Soft Starter/Bypass mode switch position
- Auto/manual mode switch position
- Motor current

7.4 RTU COMMUNICATION

Description

In the current configuration there is both a landline and wireless modem for communication between the RTU and the McPhilips Control Center.

Assessment

This redundant communication system is a desirable design for a wastewater lift station.

Recommendation

It is recommended to retain this redundancy by including both a landline and wireless modem in the new RTU panel.

8.0 WATERWAYS PERMIT

The proposed work is located within 350 feet of the regulated summer water level of the Assiniboine River and in turn will require that the City (i.e. the Owner) obtain a Waterways Permit from the City of Winnipeg prior to proceeding with the work to ensure the work will not detrimentally impact riverbank stability. The Waterways Application Form, in duplicate, along with the associated permit application fee will form part of the permit application process. A copy of the respective tender package for the work that includes technical specifications and construction drawings must also be forwarded to the Waterways Authority as part of the permit application.

It is not anticipated that the City of Winnipeg Waterways Authority will require a detailed summary geotechnical letter report in support of a Waterways Permit Application as the location of the proposed work is on the north side of Assiniboine Crescent and is sufficiently offset from the riverbank.

9.0 RECOMMENDED WORK SUMMARY

Following is a summary listing of work recommended for this project.

9.1 STRUCTURAL

1. Replace the missing vinyl siding on the gable of the structure to match the existing. If new siding of a matching profile and colour cannot be procured, re-side the entire gable to provide continuity of siding.

2. On the main floor level, lower level 1, and the motor level, sheath over the interior foam faced insulating panels with a fire and moisture resistant sheathing product to protect the combustible material and achieve a sufficient fire rating.

3. Relocate the exterior doors as required to accommodate the proposed hatch relocations. The current large door on the south face would have to be shifted westward. Seal the existing openings by matching the existing wall system. The proposed new door and hatch layout is shown in Figure 3.1.

4. Relocate the existing hatch accessing the motor and pump room to the southwest corner of the main floor. This will involve removal of the existing embedded frame, doweling of reinforcing and casting of a new concrete infill slab to abandon the existing opening. An opening would be cut at the new location, with reinforcing installed as required at the free edges of the slab. A new hatch of non-corroding material such as aluminum or FRP would be designed to sit flush with the main floor level as to not create a trip hazard.

5. On lower level 1, provide new aluminum covers to sit flush within the floor recesses. New covers should not contain insulating materials as they are not required.

6. Remove the hinged plywood cover on the main floor stairwell down to lower level 1. Install a new guardrail on the south and east edges of the stairwell opening. Extend the existing stair railing to the main floor level.

7. Recoat all exposed concrete surfaces in Lower Level 1, motor level, and pump level. This would involve sufficient surface preparation typically by either water jetting or mechanical abrasion, followed by recoating with a multi-layer system as recommended by a coating applicator. Test existing coatings for lead-based paint to determine if lead paint remediation is required.

8. Replace panels of insulation sheathing in lower level 1 that have portions with damaged foil facing. Sheath over the east and west walls with a fire and moisture resistant board to protect the combustible material. Remove the north wall plywood sheathing and replace with the same sheathing as the east and west walls to maintain consistency.

9. Refinish all stairs with a corrosion inhibiting paint system to ensure continued protection. Paint all stairs and railings with safety yellow for high visibility.

10. Replace the lower level 1 hatches with corrosion-resistant covers that are recessed into the hatch openings to not create a trip hazard. This may require embedding a new frame within the opening to ensure the new cover is flush with the top of floor.

11. Abandon the floor openings below the existing water powered valve actuator. If required, abandon the existing gate valve operator opening and replace with a new opening cored to suit the new gate centerline. Small abandoned penetrations should be surface prepared by concrete roughening and filled with non-shrink grout. Larger penetrations require reinforcement to be placed within the opening.

12. Wash down the comminutor chamber prior to any work to remove all debris and residue from the comminutor chamber.

13. Demolish a select portion of concrete within the comminutor chamber as outlined in the mechanical section and associated drawings in this report. Review in detail modifications of the comminutor chamber concrete, although it is envisioned that these changes will not pose adverse structural deficiencies. Ensure all demolition work exposed reinforcement is not exposed and is properly cut at depth and sealed with grout or mortar patching.

14. Abandon the existing hatch from the comminutor chamber to the wet well by filling the space with reinforced concrete.

15. On the motor level and pump level, repair all areas of spalling using partial depth concrete rehabilitation techniques. This would involve limited chipping to depth to expose reinforcement, followed by surface preparation and recasting of a section of grout or mortar repair product.

16. Abandon the current main hatch into the pump room by casting a reinforced infill slab. Cut a new hatch opening to the west of the current opening. Install a recessed frame constructed of non-corroding materials such as aluminum to ensure a recessed hatch cover. The hatch cover should consist of non-corroding material such as aluminum grating.

17. On the motor level, install a ladder along the east wall to allow an alternate path of egress in the event that the new hatch is open and blocking the stairwell. This may require partial relocation of the air duct extending from Lower Level 1. Install a self-closing gate at the top of the stair landing to allow users to exit off the ladder and onto the stair landing.

18. Replace the small hatch cover at the northeast corner of the motor room and replace it with sections of non-corroding materials such as aluminum grating.

19. Abandon the pump discharge piping floor opening in the motor room floor and infill with a reinforced concrete slab. Core and reinforce openings using non-corroding external concrete reinforcing.

20. The three existing pump penetrations will no longer be in the correct location due to changed pump layouts. Therefore abandon the existing motor shaft penetrations by surface roughening and filling with non-shrink grout. Core and reinforce new motor shaft penetrations as required.

21. Remove all motor room lifting devices and replace with rated devices with known construction details. Use lifting hooks with stainless steel epoxy anchors and known tested resistance values provided by chemical anchor product manufacturers.

22. Abandon the pump room lifting devices and replace with a two beam lifting arrangement along with two manual lifting hoists.

23. Demolish the existing pump suction piping penetrations that sleeve through the east wall into the wet well to allow for casting new suction piping in the openings.

24. As the existing pump locations will move slightly and require demolition of the pump housekeeping pads as well as pipe thrust blocks. Provide new pump pads and thrust blocks for the new proposed pumping arrangement.

25. Install a fixed ladder at the northeast corner of the room at the proposed new hatch location.

9.2 MECHANICAL

1. Replace the pump suction lines including the wall inserts to the wet well. In addition, the wet well itself should be thoroughly cleaned to remove grit and other materials that may have collected there over time.

2. Replace existing pumps with similar vertical line shaft configuration units. Add a third pump as backup. Provide seal water as required.

3. Replace all process piping, including the discharge pipe wall insert, and related valves in the station. Paint piping inside and out with a suitable paint system.

4. Replace the existing comminutor chamber inlet valve with a new gate valve complete with a manual handwheel operator provided on the floor level above.

5. Run piping from the new comminutor chamber inlet valve to the wet well inlet channel.

6. Fill the comminutor discharge channels with concrete to seal the wet well sewage gases from the comminutor chamber. On one of the two comminutor floor openings leave the top two feet unfilled and install a sump pump and related piping.

7. Replace the existing domestic water pipe wall insert where it enters the station. Replace the existing PVC domestic water piping and valves inside the station. Install a new backflow preventer on the main floor level.

8. Reroute the pump room sump pump discharge piping to discharge into the comminutor chamber sewage piping.

9. Provide a sump pump in the comminutor chamber.

10. Provide a temporary pumping system with backup capabilities to bypass sewage flow around the station while work inside is being completed.

11. Replace the existing supply fan. Provide an air filter and an electric duct heater to provide filtered, heated ventilation air to the station.

12. Provide a system of motorized dampers, located in the main floor electrical room to incorporate a 75% recirculated air option when the station is unoccupied. Occupied and unoccupied ventilation modes would be controlled by interlocking the motorized damper positions with the station’s light switches.

13. To accommodate the 6 ACH of ventilation air required, increase the size of the relief air ducting from the lower levels and the relief air vent from the comminutor chamber.

14. Replace the existing portable construction heaters with permanently installed unit heaters with wall-mounted thermostats in the lower levels and the main floor electrical room.

15. Provide a fire extinguisher on each floor.

9.3 ELECTRICAL/CONTROLS

1. Upgrade the service to a 600V, 200A, four wire system. Relocate the service entrance to the west wall.

2. Replace the existing distribution with a 600V Motor Control Center (MCC). Install MCC on the west wall of the main floor electrical room. Relocate the service termination point to the west wall. Relocate the RTU panel to the east wall.

3. It is recommended to replace the existing two pump motor starters with three soft-starters installed within the MCC. Provide external bypass starters and isolation contactors. Monitoring status of the new starters within the RTU panel.

4. The station is not classified as a hazardous area. The comminutor chamber and the lower pump level is classified as Category 1 wet location. Area classification is based on the proposed ventilation design and enclosing the comminutor chamber as recommended in this report. Area classification should be confirmed at the design stage if the ventilation design is altered.

5. Install three new ground rods on the west side of the station near the new MCC. Replace ground conductors within the station.

6. Replace the existing transformer with a three phase 600-208/120V 15kVA transformer integral to the MCC. Transformer shall be dry type with copper windings.

7. Install a new 120/208V panel within the MCC. The panel shall be 3 wire, 24 circuit, 100A panel with tin-plated copper bus.

8. Replace all interior lighting with fluorescent luminaires. Install unit battery packs and remote LED heads. Emergency lighting shall be installed on all levels of the station except the comminutor chamber.

9. Replace all existing below grade 120V receptacles with GFCI protected receptacles. The receptacles shall be installed with a weatherproof cover. Increase the number of receptacles to three receptacles per level.

10. Replace all wiring and conduit. All 600V loads shall be fed with TECK90 cable rated 1000V, and all 208/120V loads shall be fed with TECK90 cable rated 600V. All cables shall be labeled according to the City of Winnipeg Electrical Design Guide. All cables running in the vicinity of the lifting shaft shall be protected from mechanical damage by a covered cable tray.

11. The continuity of service at the Olive Wastewater Lift Station is imperative. Ensure a temporary generator is provided and stage work such that disruptions to service are minimized.

12. Provide and install a new RTU panel on the east wall of the main floor electrical room. Relocate all terminations to the new RTU panel location.

13. Provide and install three new float level switches within the comminutor chamber and connect to the new RTU panel.

14. Provide a redundant measurement of the wet well level. Provide a switch local to the RTU panel to select the level sensor measurement that will be recognized by the Precision Digital Meter. Ensure both level sensors are input to the RTU panel.

15. Provide both a landline and a wireless modem in the new RTU panel.

9.4 WATERWAYS PERMIT

1. Submit a Waterways Permit to the City of Winnipeg.

10.0 COST ESTIMATE

Following is a cost estimate for the recommended work.

Table 4 – Cost Estimate

ITEM	DESCRIPTION	COST	SUBTOTAL COST
1.0	**STRUCTURAL**		
1.1	Forcemain and site works	$65,000	
1.2	Structural and building upgrade works	$212,000	
	Structural Subtotal		**$277,000**
2.0	**MECHANICAL**		
2.1	Temporary pumping	$312,000	
2.2	Process pumping system	$545,000	
2.3	Comminutor piping system	$185,000	
2.4	Domestic water, sump pump systems	$35,000	
2.5	Ventilation works	$2,000	
	PST	**$86,300**	
	Mechanical Subtotal		**$1,165,000**
3.0	**ELECTRICAL**		
3.1	Electrical works	$217,000	
3.2	Instrumentation and controls	$149,000	
	PST	**$29,300**	
	Electrical - Subtotal		**$395,000**
	Total Cost - PST included		**$1,837,000**
	Contingency - 15%		**$276,000**
	Total Cost Estimate with Contingency (GST extra)		**$2,113,000**

11.0 STATEMENT OF LIMITATIONS AND CONDITIONS

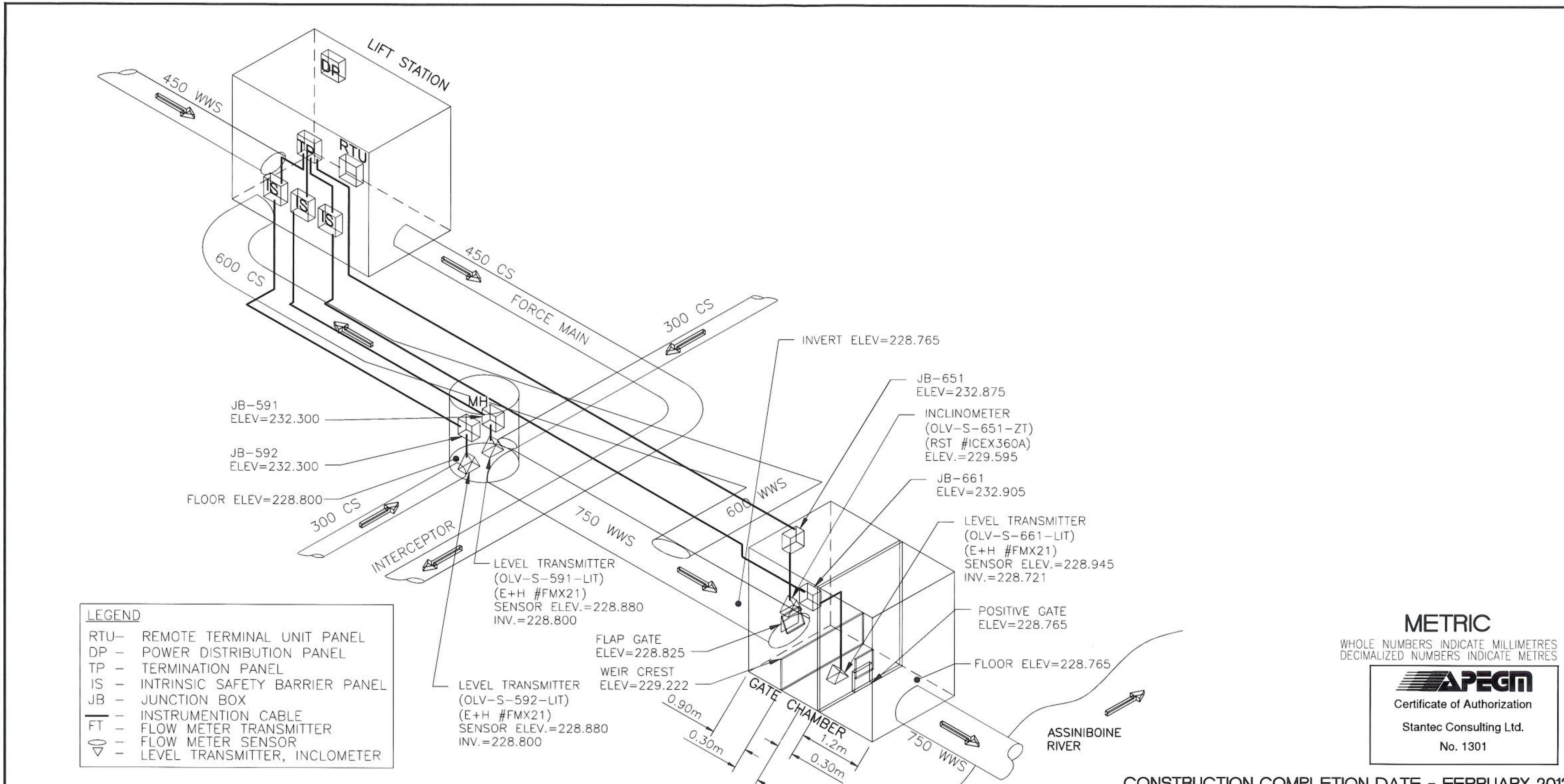
11.1 THIRD PARTY USE OF REPORT

This report has been prepared for The City of Winnipeg to whom this report has been addressed and any use a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

APPENDICES

APPENDIX A

EXISTING STATION DRAWINGS



CONSTRUCTION COMPLETION DATE - FEBRUARY 2013

LOCATION APPROVED
UNDERGROUND STRUCTURES

SUPV. U/G STRUCTURES COMMITTEE — DATE

NOTE:
LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.

B.M. ELEV.

NO.	REVISIONS	DATE	BY
D	AS-BUILT DRAWING	13.05.31	S.T.
C	ISSUED FOR CLIENT REVIEW	13.04.15	J.C.
B	ISSUED FOR CLIENT REVIEW	13.03.21	J.C.
A	ISSUED FOR CLIENT REVIEW	12.07.13	J.C.

Stantec Consulting Ltd.
905 Waverley Street, Winnipeg, Manitoba
Tel 204-489-5900 Fax 204-453-9012

DESIGNED BY	S.T.	CHECKED BY	J.C.
DRAWN BY	B.W.	APPROVED BY	J.C.
HOR. SCALE: VERTICAL:	N.T.S.	RELEASED FOR CONSTRUCTION:	
DATE	2012.06.06	DATE	

ENGINEER'S SEAL
PROVINCE OF MANITOBA
S. TREBIC
MEMBER 21332
REGISTERED PROFESSIONAL ENGINEER

CONSULTANT DRAWING NO.
E-2201

Winnipeg
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

CSO OUTFALL MONITORING
OLIVE STREET
3D ISOMETRIC PLAN

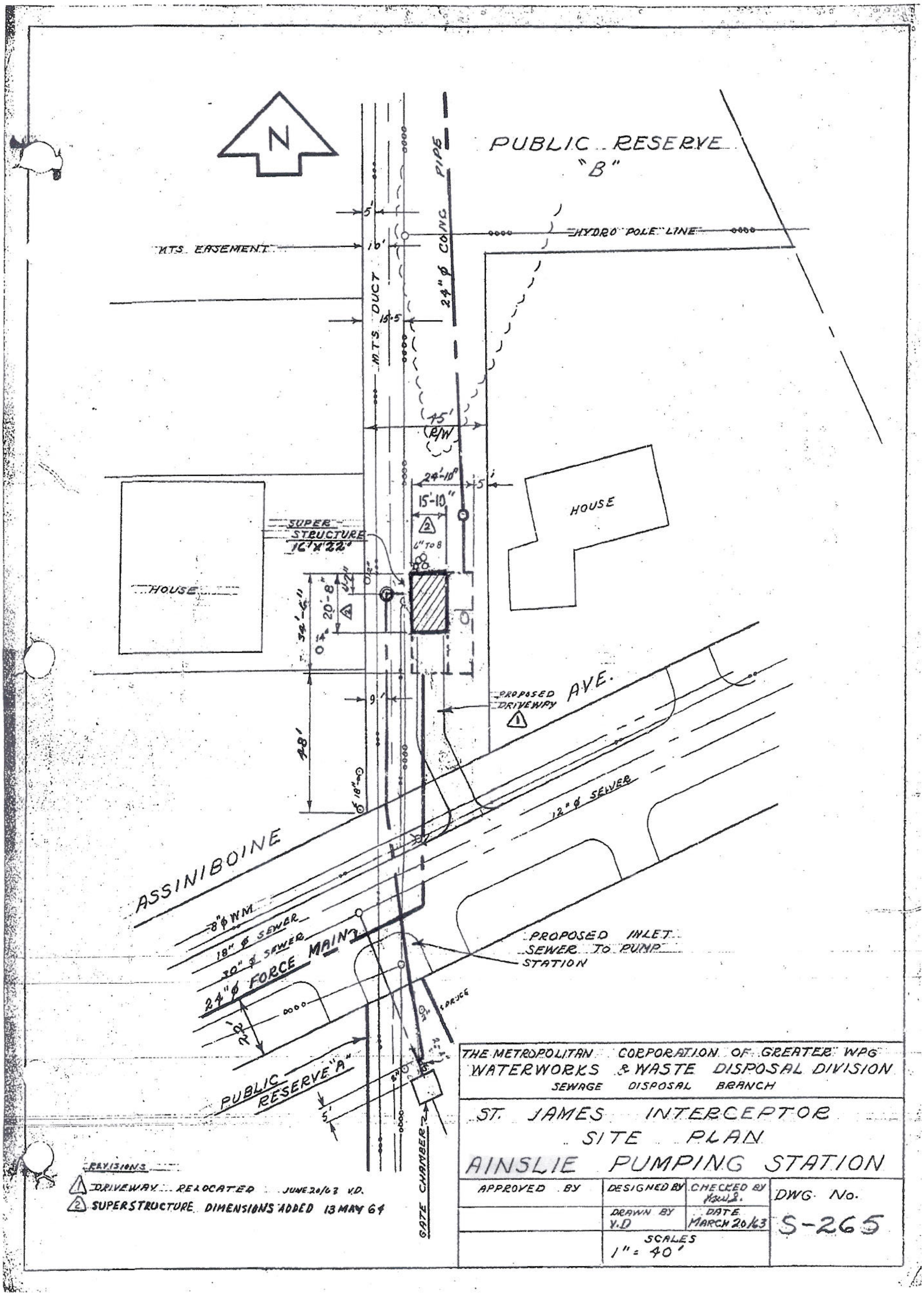
SHEET 1 OF 2

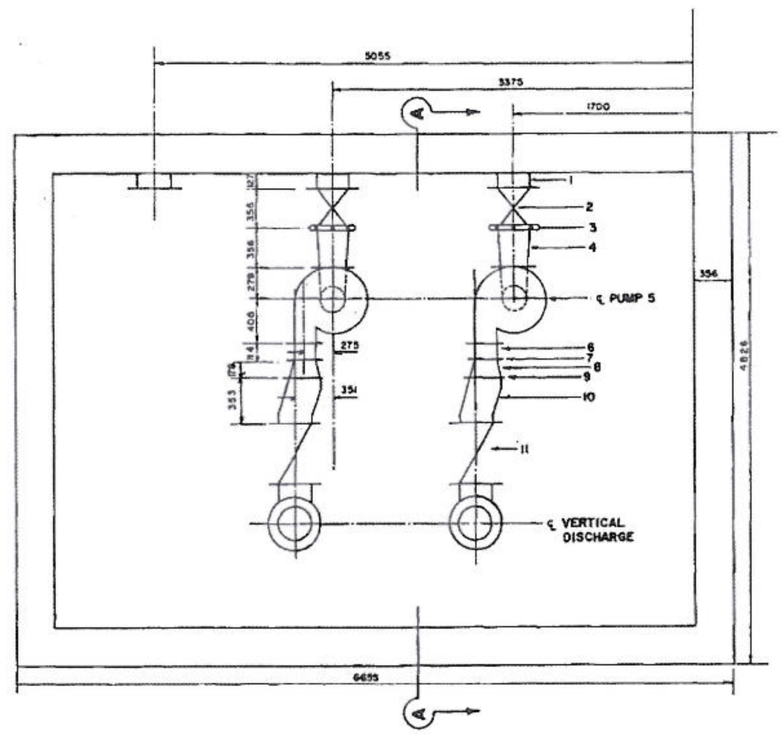
CAD FILE DRAWING NUMBER
13650e-2201-olv.dwg

CITY DRAWING NUMBER
I-0169-A-A0202-001-00

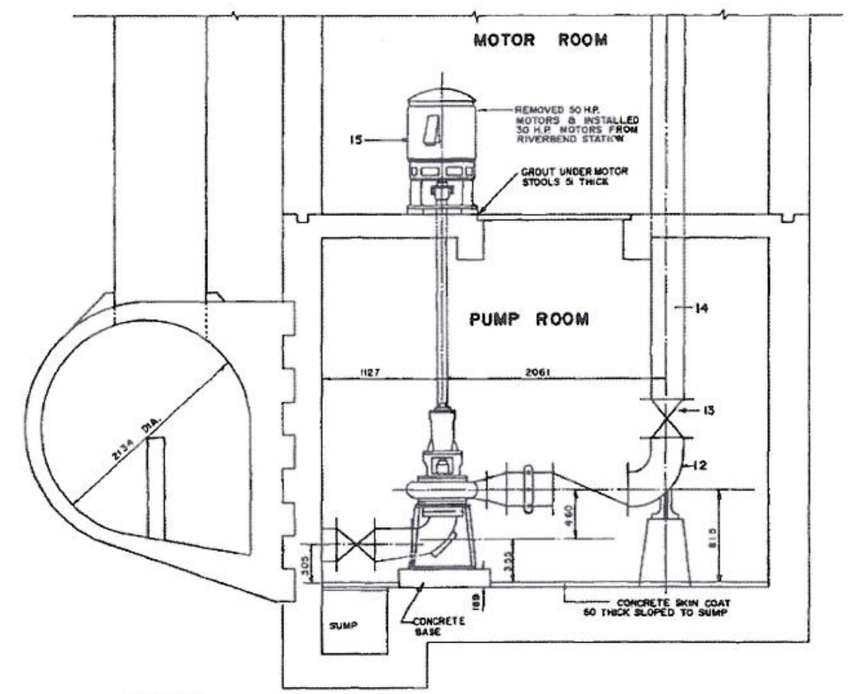
\\CD1201-F02\work_group\1112\active\111213650\0300_drawing\305_record\sheet_files\electrical\Olive (Ainslie)\13650e-2201-olv.dwg
2013/08/22 10:18 AM By: Betker, Kyle

XX / 779


N
PUBLIC RESERVE "B"
HYDRO POLE LINE
24" ø CONC PIPE
M.T.S. EASEMENT
M.T.S. DUCT
5'
10'
15.5
45' R/W
24'-10"
5'
15'-10"
6" TO 8
HOUSE
SUPER STRUCTURE 16'x22'
HOUSE
34'-6"
20'-8"
9'
28'
PROPOSED DRIVEWAY
AVE.
12" ø SEWER
ASSINIBOINE
8" ø W.M.
18" ø SEWER
30" ø SEWER
24" ø FORCE MAIN
PROPOSED INLET SEWER TO PUMP STATION
22'
PUBLIC RESERVE "A"
5'
GATE CHAMBER
REVISIONS
1 DRIVEWAY... RELOCATED JUNE 20/63 V.D.
2 SUPERSTRUCTURE DIMENSIONS ADDED 13 MAY 64
THE METROPOLITAN CORPORATION OF GREATER WPG
WATERWORKS & WASTE DISPOSAL DIVISION
SEWAGE DISPOSAL BRANCH
ST. JAMES INTERCEPTOR
SITE PLAN
AINSLIE PUMPING STATION
APPROVED BY
DESIGNED BY
CHECKED BY
DRAWN BY V.D
DATE MARCH 20/63
SCALES 1" = 40'
DWG. No.
S-265



PLAN VIEW
OLIVE PUMP ROOM



SECTION A-A

MATERIALS SCHEDULE

NO.	QUANTITY	DESCRIPTION	SUPPLIED BY
(1)	3	300 ø CAST IRON SUCTION PIPE TO SUMP (F.E.)	EXIST.
(2)	2	300 ø GATE VALVE (F.E. x VICTAULIC STYLE 44)	EXIST.
(3)	2	300 ø STYLE 44 VICTAULIC COUPLING	EXIST.
(4)	2	300 x 250 ECCENTRIC REDUCER (VICTAULIC STYLE 44 x F.E.)	LYTLE
(5)	2	FAIRBANKS MORSE STYLE 5410 PUMP	BRIER
(6)	2	200 ø SCHEDULE 40 STEEL PIPE (F.E. x F.E.)	CITY
(7)	2	200 ø STYLE 741 VICTAULIC FLANGE	LYTLE
(8)	2	300 x 200 NO. 50 VICTAULIC REDUCER	LYTLE
(9)	2	300 ø STYLE 741 VICTAULIC FLANGE	LYTLE
(10)	2	300 ø SEGMENTALLY WELDED SCHEDULE 40 STEEL PIPE 34° OFFSET BEND (F.E. x F.E.)	LYTLE
(11)	2	300 ø TILTING DISC CHECK VALVE	EXIST.
(12)	2	350 x 300 REDUCING 90° BEND WITH BASE SUPPORT (F.E. x F.E.)	EXIST.
(13)	2	350 ø GATE VALVE (F.E. x F.E.)	EXIST.
(14)	1	350 ø CAST IRON DISCHARGE HEADER	EXIST.
(15)	2	30 H.P. ELECTRIC MOTOR	CITY

F.E. - FLANGED END
LYTLE - LYTLE SPECIALTIES
BRIER - BRIER HYDRAULICS LIMITED

NOTE: NEW MATERIALS SHOWN AS SHADED
ALL FLANGES, 125# STANDARD
ALL GASKETS RUBBERIZED CLOTH 3mm THICK

INSTALLATION BY WATERWORKS, WASTE & DISPOSAL PERSONNEL (JUNE 84)

SEE DRAWING 403 FOR ORIGINAL CONSTRUCTION DETAILS

AS BUILT
N/A — SURVEY | T.W. [signature] — ENGINEERING | Jan 4/85 — DATE

METRIC
WHOLE NUMBERS INDICATE MILLIMETRES
DECIMALIZED NUMBERS INDICATE METRES

NO	REVISIONS	DATE	APP
2.	REVISED TO AS BUILT	01/85	MD
1.	MOTOR STOOLS GROUT DEPTH	02/84	MD

ENGINEER'S SEAL

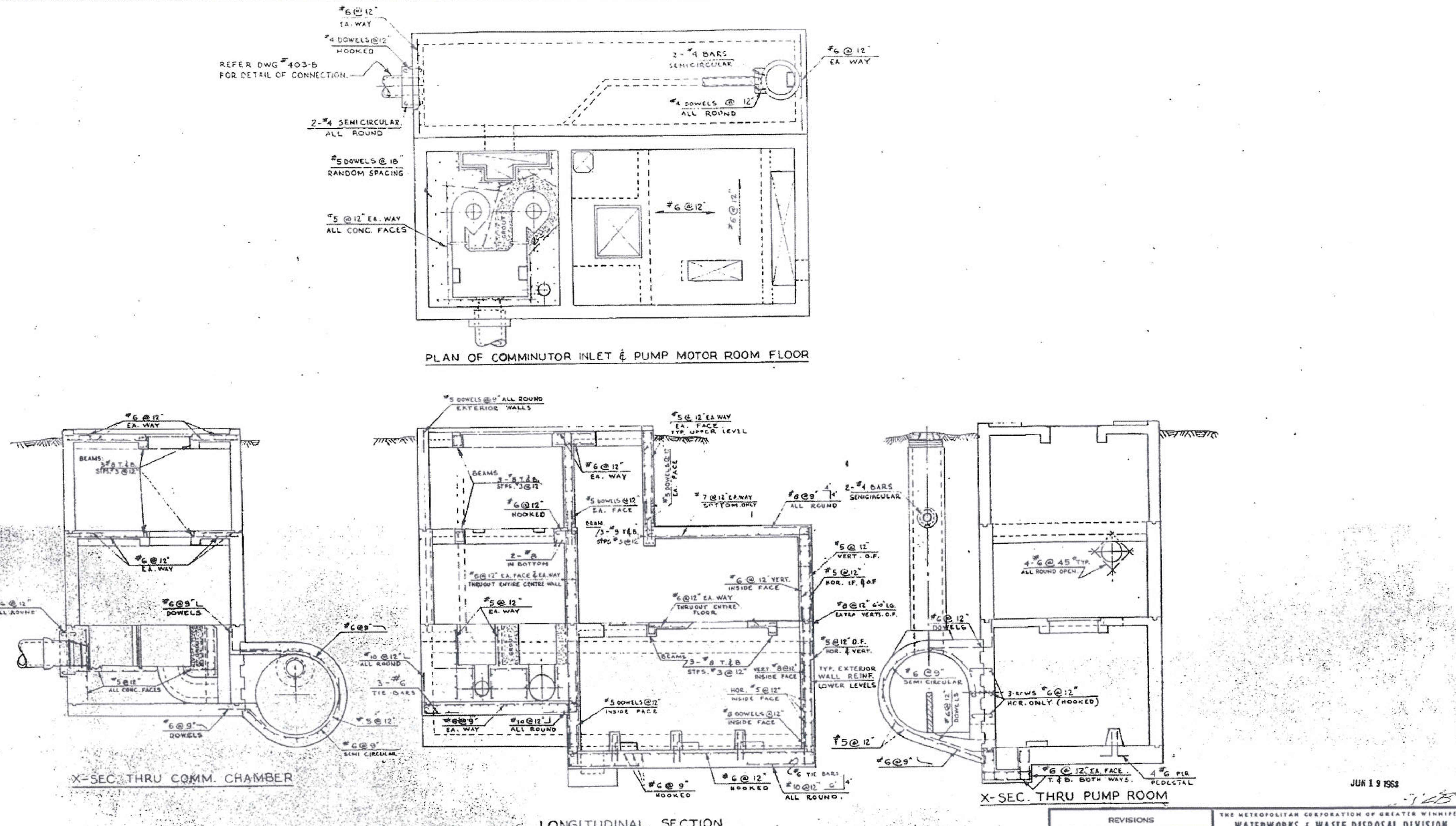
WORKS & OPERATIONS DIVISION
WATERWORKS, WASTE & DISPOSAL DEPARTMENT

DESIGNED BY: T.W. | DRAWN BY: M.B.D.
CHECKED BY: T.W. | DATE: SEPT. 21, 83
APPROVED BY: | DATE:

THE CITY OF WINNIPEG
WORKS & OPERATIONS DIVISION
WATERWORKS WASTE & DISPOSAL DEPARTMENT

OLIVE PUMP STATION
INSTALLATION OF NEW PUMPS AND PIPING

RELEASED FOR CONSTRUCTION: | DATE:
SCALE: 1:30 | DRAWING NO.: 1116



REVISIONS			
NO.	DESCRIPTION	DATE	BY
1			
2			
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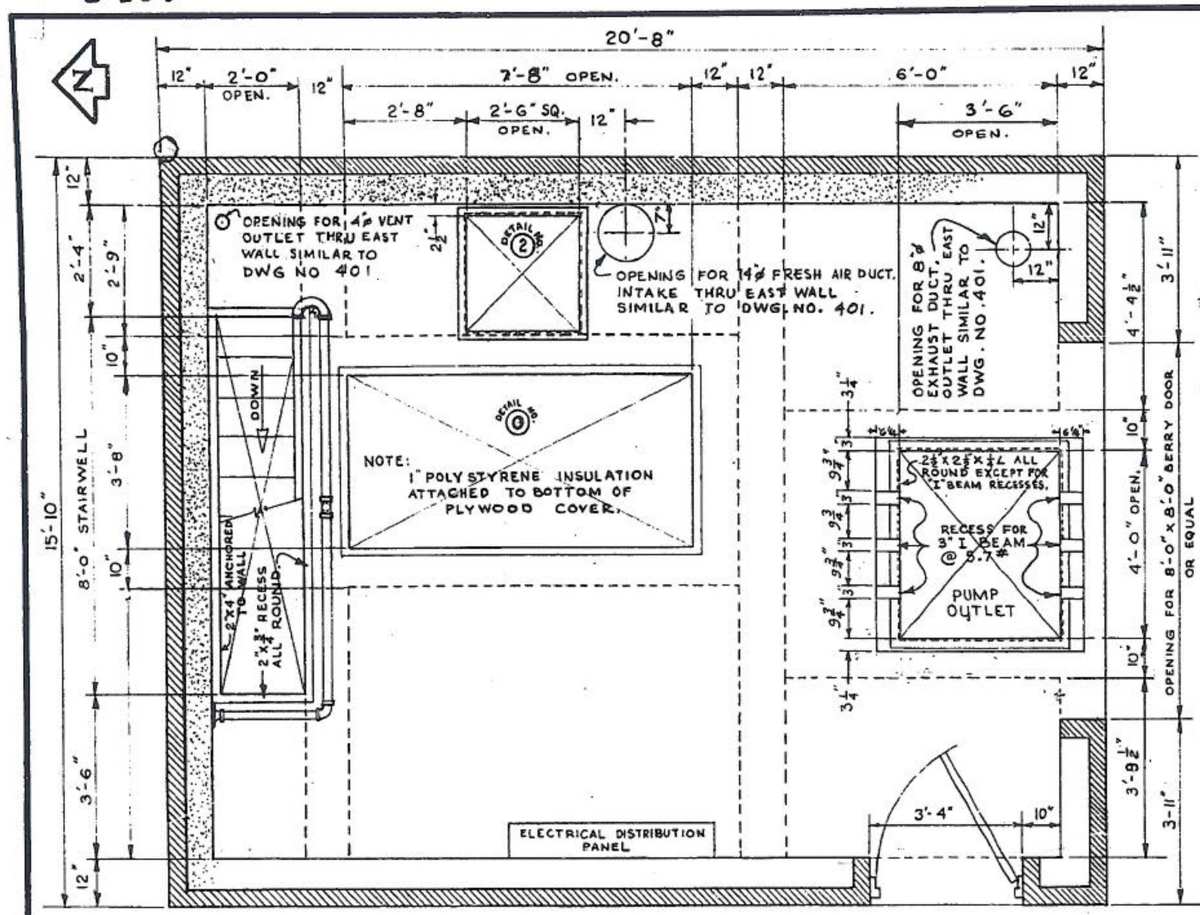
6			
7			
8			

THE METROPOLITAN CORPORATION OF GREATER WINNIPEG
WATERWORKS & WASTE DISPOSAL DIVISION
SEWAGE DISPOSAL BRANCH

ST. JAMES INTERCEPTOR
AINSLIE COMM. & PUMPING STA.
REINFORCING DETAILS

APPROVED BY: CHIEF ENGINEER
DESIGNED BY / CHECKED BY
DRAWN BY: HB
DATE: 19 APR 63
SCALES: 1/4"=1'-0" & AS NOTED.
DRAWING NO. 403-A



SUPERSTRUCTURE FLOOR PLAN

FOR TYPICAL ELEV'S & DETAILS OF SUPERSTRUCTURE REFER TO DWG. NO. 401

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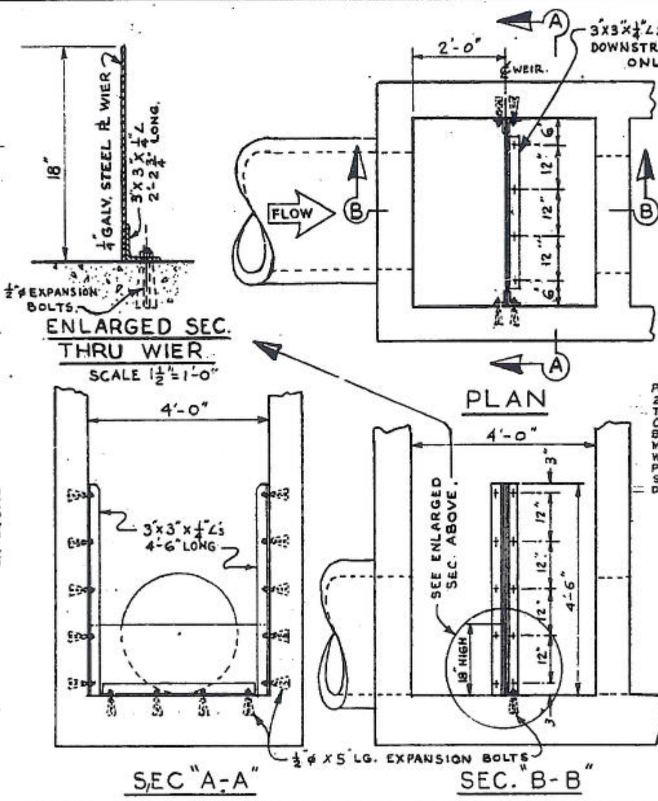
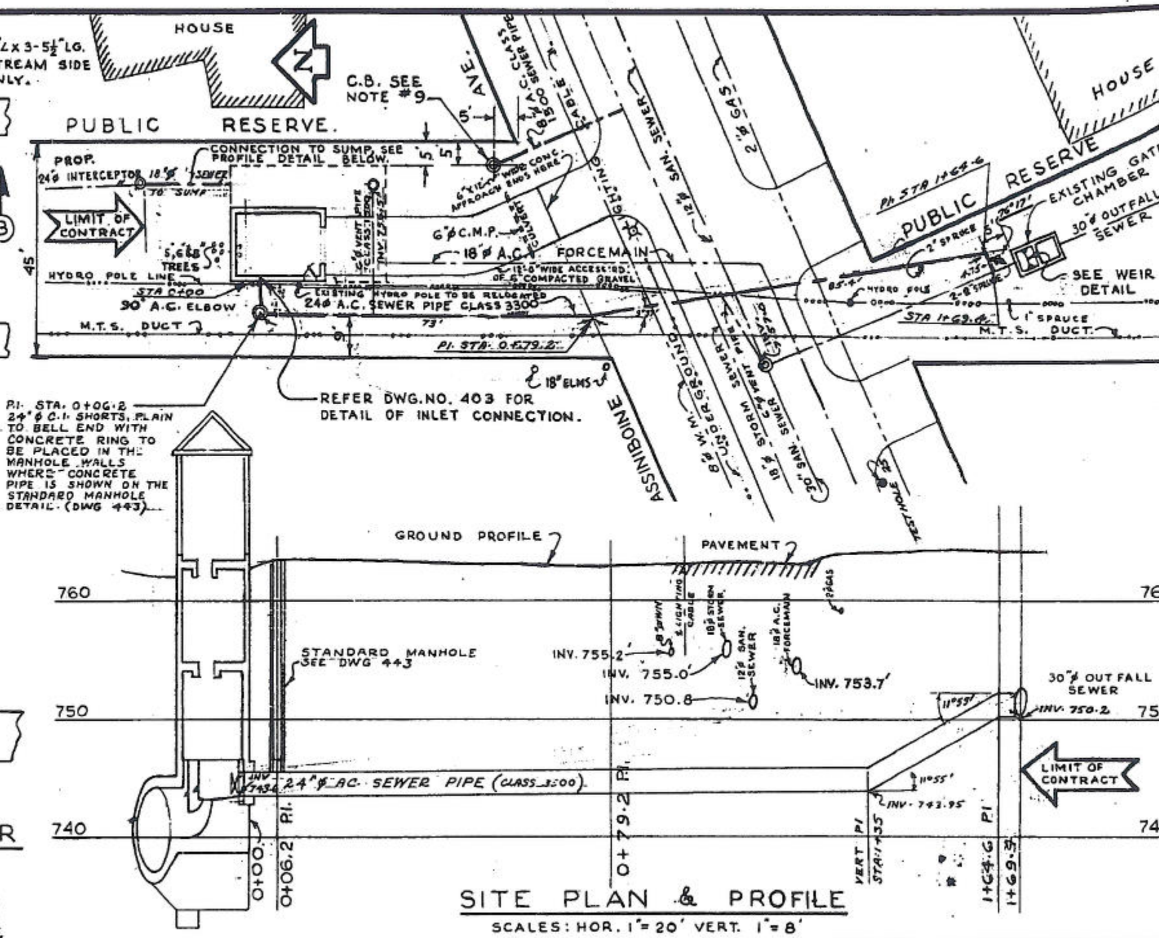


WEIR DETAIL – EXISTING GATE CHAMBER

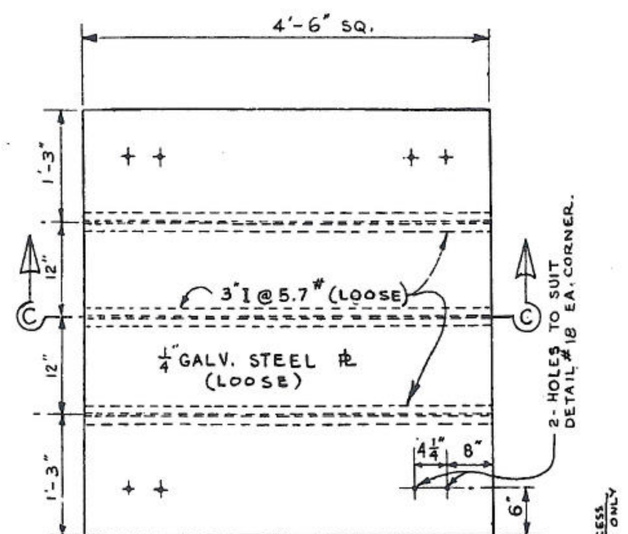
SCALE ½"=1'-0"

NOTE:
SHOULD FLOOR OF GATE CHAMBER BE UNSUITABLE FOR INSTALLATION OF WIER, IT SHALL BE CHIPPED OUT & REPAIRED WITH GROUT TO PROVIDE SUITABLE SEATING SURFACE FOR WEIR.

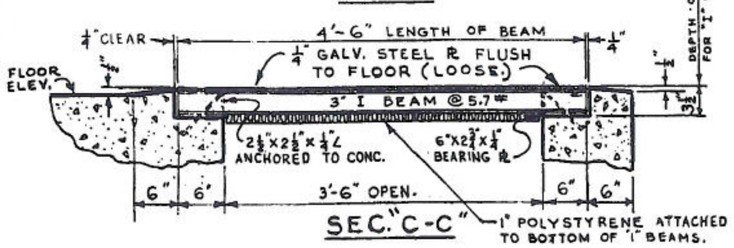


SITE PLAN & PROFILE

SCALES: HOR. 1"=20' VERT. 1"=8'



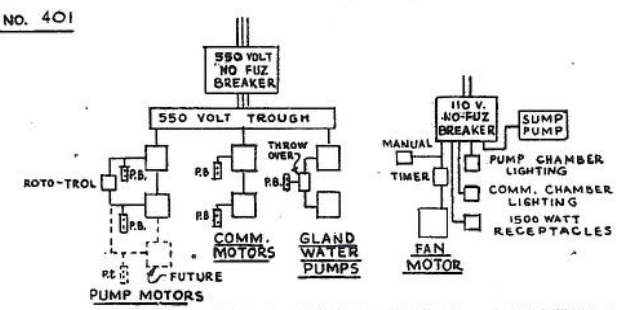
PLAN



SEC."C-C"

PUMP OUTLET COVER DETAIL

SCALE 1"=1'-0"



SCHEMATIC ELECTRICAL DIAGRAM

NOTES

1 FIELD CHECK ALL ELEVATIONS & INVERTS PRIOR TO CONST.

2 HOT GALV. ALL MISC. IRON & STEEL WORK.

3 THE CONTRACTOR SHALL NOTIFY MANITOBA HYDRO 24 HOURS PRIOR TO EXCAVATION.

4 THE CONTRACTOR SHALL TAKE CARE NOT TO DISTURB OR DESTROY ANY SURVEY BARS IN THE VICINITY OF THE WORK. BARS WHICH MUST BE MOVED WILL BE RESET AT THE CONTRACTORS EXPENSE.

5 CONCRETE APPROACH & GRAVELED DRIVEWAY TO BE CONSTRUCTED TO THE SATISFACTION OF THE ENGINEER.

6 THE CONTRACTOR IS REQUIRED TO PRESERVE EXISTING TREES UNLESS SPECIFIED OTHERWISE BY THE ENGINEER.

7 LOCATE FAN DIRECTLY ABOVE OPENING FOR FRESH AIR DUCT PER PLAN ABOVE, WALL MOUNTED SIMILAR TO THAT SHOWN ON DWG. NO 401. FAN & MOTOR TO BE ALPHA # BF 1500 H1 @ 641 R.P.M. OR APPROVED EQUAL.

8 THE CONTRACTOR SHALL BE RESPONSIBLE TO ACQUAINT HIMSELF WITH EXISTING SURROUNDINGS PRIOR TO CONSTRUCTION & TO RESTORE SAME UPON COMPLETION OF CONTRACT.

9 THE CONTRACTOR SHALL PROVIDE A 30"ø PRECAST C.B. WHERE INDICATED ON SITE PLAN, TO BE SET ON A FLOOR SLAB 3'-6" SQ. X 9" THICK WITH #4 REINF. BARS @ 12" EA. WAY. PROVIDE HINGED C.I. HOOD FOR 8"ø OUTLET ON INSIDE OF C.B. USE STD. METRO SEWAGE DISPOSAL BRANCH MANHOLE FRAME & COVER. C.B. TO HAVE GRATED INLETS IN PRECAST BARREL. STD. M.H. STEPS @ 15" C-C. ARE TO BE USED. CONNECT TO 18" STORM SEWER IN ASSINIBOINE AVE.

10 CONTRACTOR WILL GRADE AREA SO THAT SURFACE RUN-OFF WILL DRAIN TO CATCH BASIN.

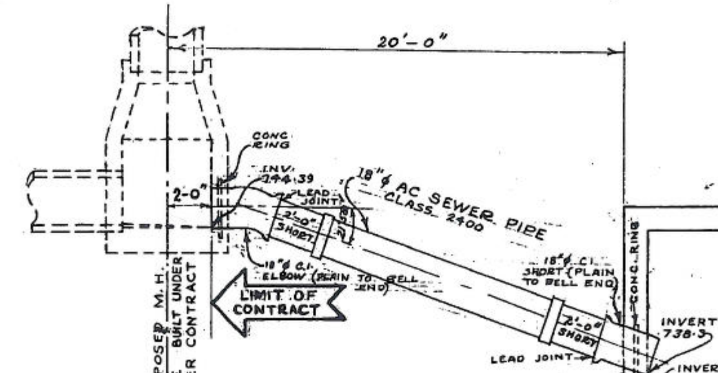
NOTES CONT'D.

11. THE HOLE & TUNNEL METHOD OF CONST. SHALL BE USED IN INSTALLING THE 24"ø INLET PIPE FROM THE 30"ø OUTFALL SEWER TO THE NORTHERLY EDGE OF THE PAVEMENT ON ASSINIBOINE AVE.

12. THE CONTRACTOR SHALL NOTIFY THE MANITOBA TELEPHONE SYSTEM'S BURIED PLANT PROTECTION SERVICE FOR EXACT LOCATION OF UNDERGROUND CABLES & DUCTS, CALL 947-7267 24 HRS. PRIOR TO EXCAVATION.

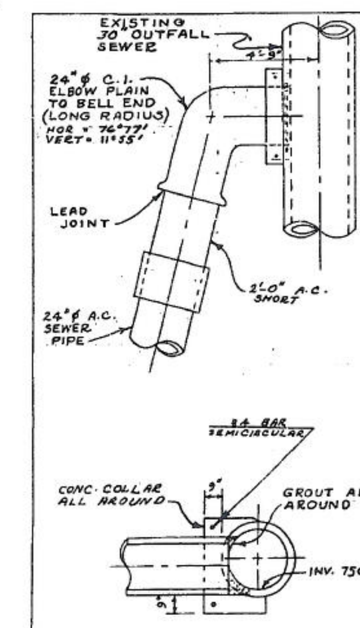
13. A SHORT LENGTH OF PIPE (4' OR LESS) SHALL BE INSTALLED ADJACENT TO ALL C.I. PIPE OR RIGID FITTINGS.

14. ALL MANHOLES CONSTRUCTED AT THIS LOCATION ARE TO HAVE SEALED COVERS. THE STANDARD METRO WASTE DISPOSAL DIVISION MH IS TO BE USED WITHOUT THE HOLES IN THE COVER.



CONNECTION TO SUMP

SCALE ¼"=1'-0"



CONNECTION TO OUTLET

SCALE ¼"=1'-0"

PROVINCE OF MANITOBA
M. W. SLEZAK
REGISTERED ENGINEER

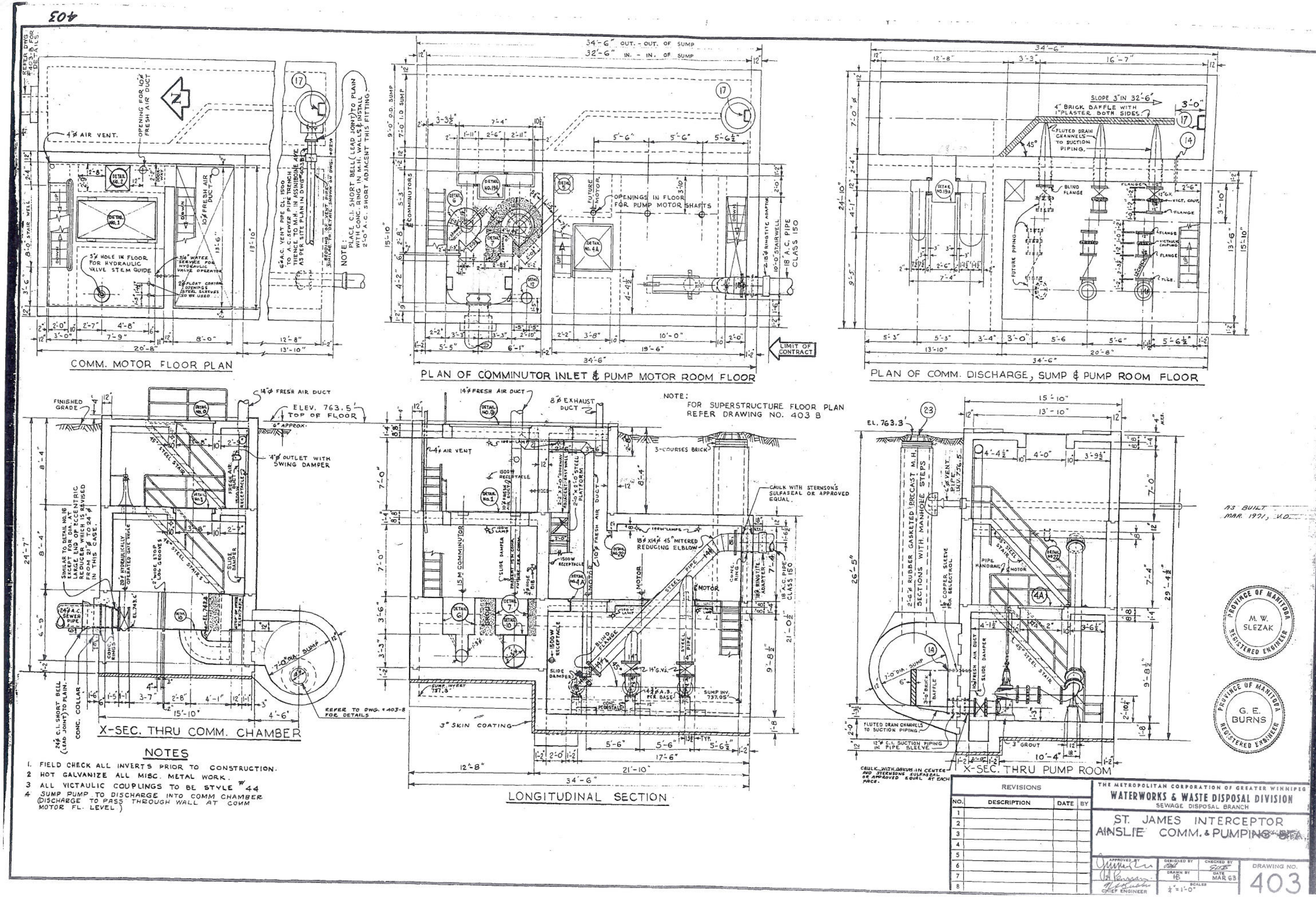
PROVINCE OF MANITOBA
G. E. BURNS
REGISTERED ENGINEER

REVISIONS			
NO.	DESCRIPTION	DATE	BY
1			
2			
3			
4			
5			
6			
7			
8			

THE METROPOLITAN CORPORATION OF GREATER WINNIPEG
WATERWORKS & WASTE DISPOSAL DIVISION
SEWAGE DISPOSAL BRANCH

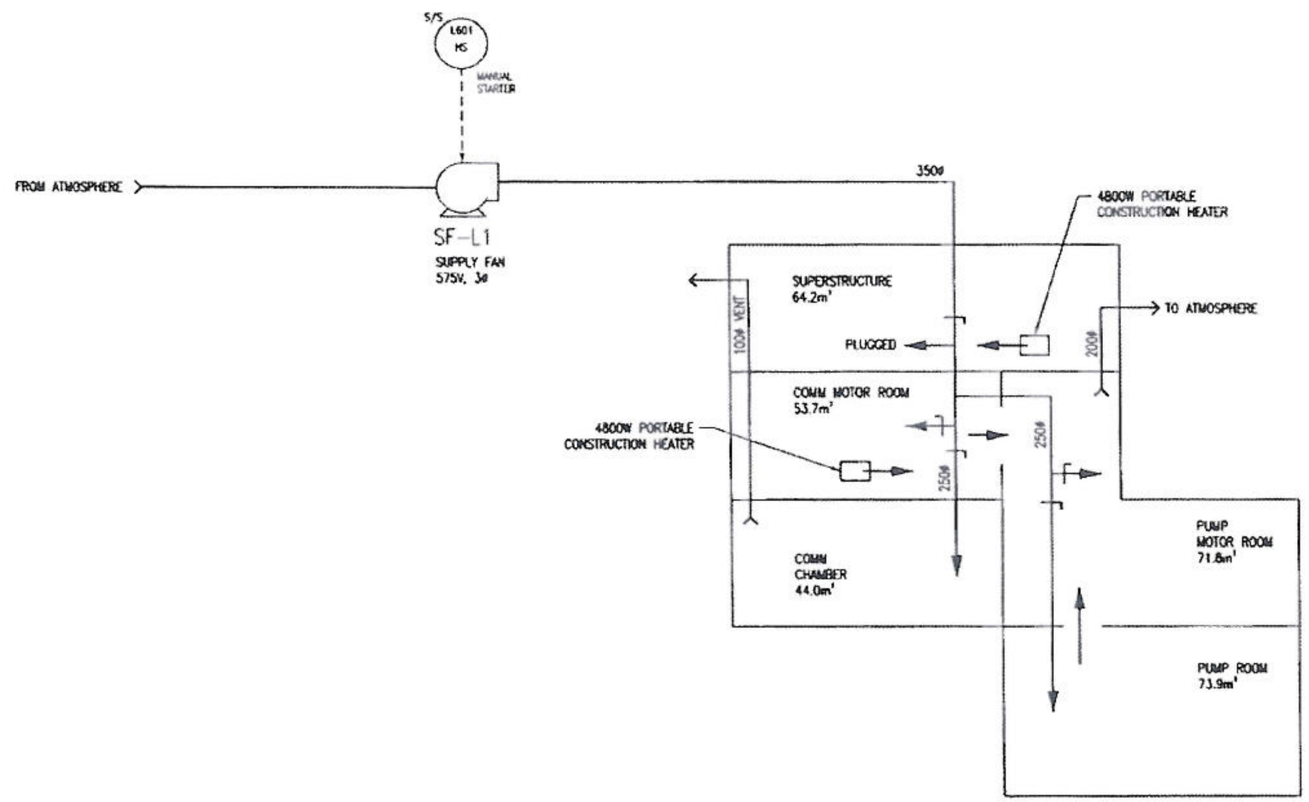
ST. JAMES INTERCEPTOR
AINSLIE COMM. & PUMPING STA.
SUPERSTRUCTURE & MISC. DETAILS

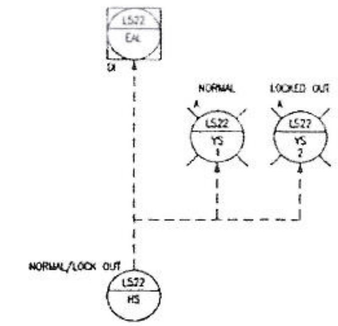
APPROVED BY	DESIGNED BY	CHECKED BY	DRAWING NO.
CHIEF ENGINEER	DRAWN BY HB	DATE MAY 63	403-B
	SCALES AS NOTED		



NOTES

1. FIELD CHECK ALL INVERTS PRIOR TO CONSTRUCTION.
2. HOT GALVANIZE ALL MISC. METAL WORK.
3. ALL VICTAULIC COUPLINGS TO BE STYLE #44
4. SUMP PUMP TO DISCHARGE INTO COMM CHAMBER (DISCHARGE TO PASS THROUGH WALL AT COMM MOTOR FL. LEVEL)





RTU ALARM LOCKOUT

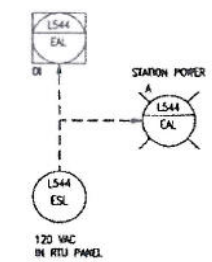
LEGEND:

DEVICE DESCRIPTORS:

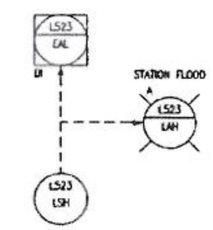
A	AMBER
AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DISCRETE INPUT
DO	DISCRETE OUTPUT
S/S	START/STOP

FUNCTIONAL IDENTIFIERS:

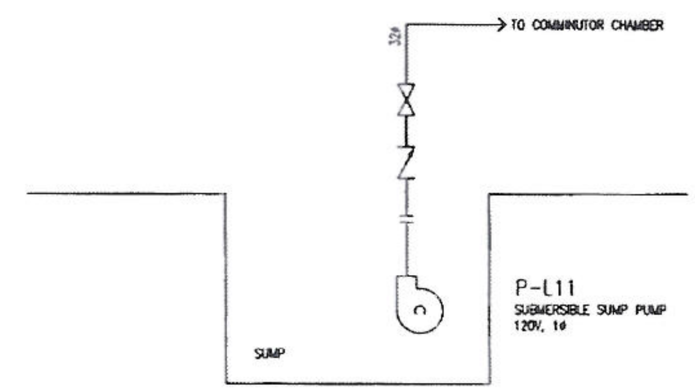
EI	VOLTAGE INDICATOR
ESL	LOW VOLTAGE SWITCH
FI	FLOW INDICATOR
HS	HAND SWITCH
II	CURRENT INDICATOR
KQI	TOTAL RUN TIME
LC	LEVEL CONTROLLER
LIT	LEVEL INDICATING TRANSMITTER
LIY	LEVEL INDICATING RELAY
LSH	LEVEL SWITCH HIGH
LT	LEVEL TRANSMITTER
LY	LEVEL RELAY
MM	MOTOR RUNNING
MN	MOTOR START
PG	PRESSURE GAUGE
PSL	PRESSURE SWITCH LOW
TSH	TEMPERATURE SWITCH HIGH



ELECTRICAL POWER ALARMS



STATION FLOOD ALARM



NOTES:

1. ALL INSTRUMENT IDENTIFIERS HAVE AN OPTIONAL FACILITY PREFIX OF "OLI-". EXAMPLE: OLI-L522-HS
2. ALL INSTRUMENTS SHOWN IN AN AUXILIARY LOCATION ARE IN THE CORRESPONDING SOFT STARTER PANEL.

APEGM
Certificate of Authorization
SNC-Lavalin Inc.
No. 4489

DRAWING NUMBER	REFERENCE DRAWINGS

NO.	REVISIONS	DATE	DESIGN	CHECK
00	ISSUED FOR CITY USE	2012/01/31	-	TMC

SNC-LAVALIN
SNC-LAVALIN INC.

DESIGNED BY: EXISTING	CHECKED BY: T. CHURCH
DRAWN BY: S. FUNK	APPROVED BY: C. REIMER
SCALE: NTS	RELEASED FOR CONSTRUCTION BY:
DATE: 2011/02/17	DATE:
CONSULTANT NO.:	

ENGINEER'S SEAL

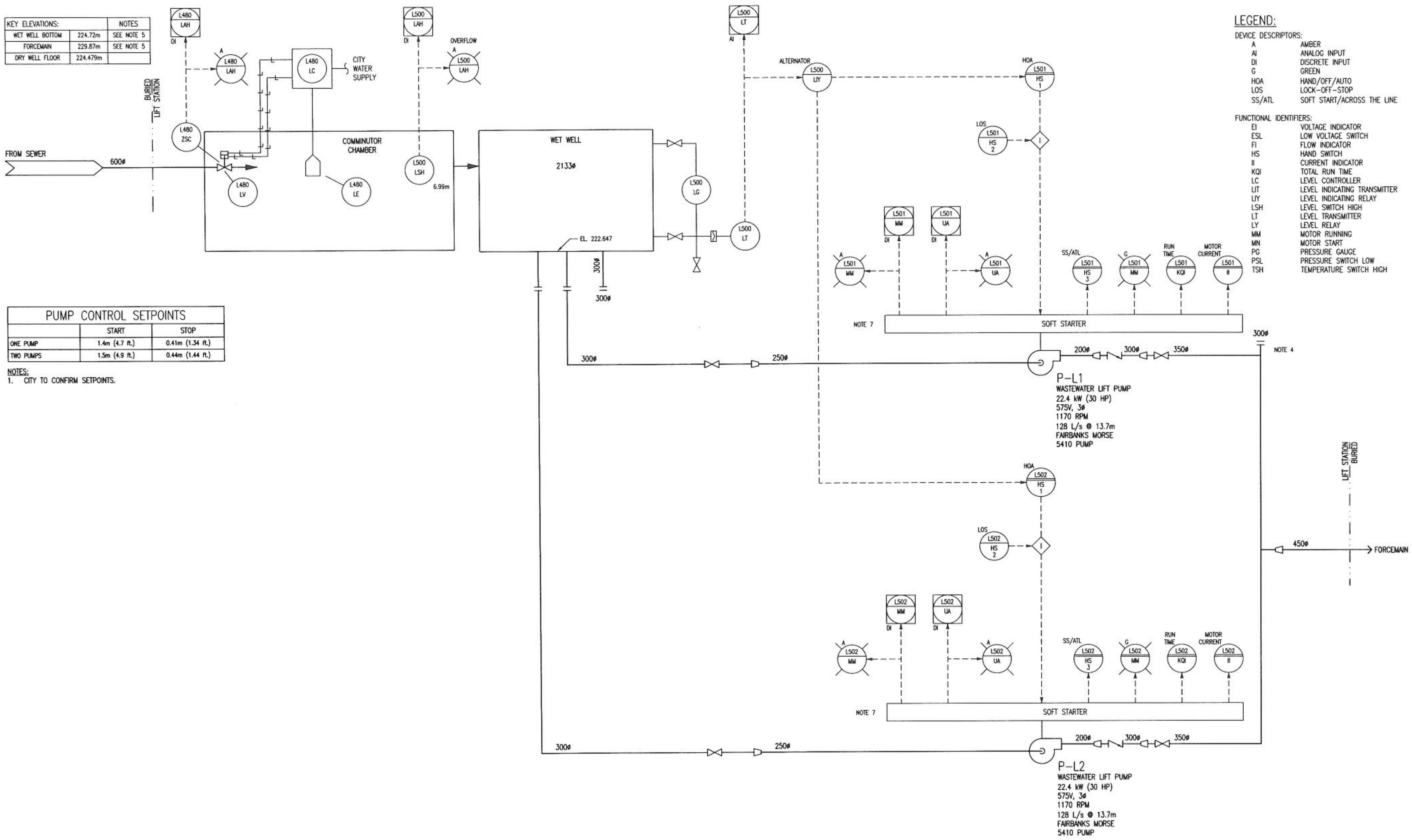
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

OLIVE WASTEWATER PUMPING STATION
PUMPING STATION CONDITION ASSESSMENT PHASE 1
PROCESS & INSTRUMENTATION DIAGRAM
HVAC & MISC

CITY DRAWING NUMBER	SHEET	REV.	SIZE
1-0169L-P0002	001	00	A1

1-0169L-P0002-001-00.dwg

KEY ELEVATIONS:		NOTES
WET WELL BOTTOM	224.72m	SEE NOTE 5
FORCEMAIN	229.87m	SEE NOTE 5
DRY WELL FLOOR	224.479m	



PUMP CONTROL SETPOINTS		
	START	STOP
ONE PUMP	1.4m (4.7 ft.)	0.41m (1.34 ft.)
TWO PUMPS	1.5m (4.9 ft.)	0.44m (1.44 ft.)

NOTES:
1. CITY TO CONFIRM SETPOINTS.

LEGEND:

DEVICE DESCRIPTORS:

A	AMBER
AI	ANALOG INPUT
DI	DISCRETE INPUT
G	GREEN
HOA	HAND/OFF/AUTO
LOS	LOCK-OFF-STOP
SS/ATL	SOFT START/ACROSS THE LINE

FUNCTIONAL IDENTIFIERS:

EI	VOLTAGE INDICATOR
ESL	LOW VOLTAGE SWITCH
FI	FLOW INDICATOR
HS	HAND SWITCH
II	CURRENT INDICATOR
KQI	TOTAL RUN TIME
LC	LEVEL CONTROLLER
LIT	LEVEL INDICATING TRANSMITTER
LIY	LEVEL INDICATING RELAY
LSH	LEVEL SWITCH HIGH
LT	LEVEL TRANSMITTER
LY	LEVEL RELAY
MM	MOTOR RUNNING
MN	MOTOR START
PG	PRESSURE GAUGE
PSL	PRESSURE SWITCH LOW
TSH	TEMPERATURE SWITCH HIGH

NOTES:

1. ALL INSTRUMENT IDENTIFIERS HAVE AN OPTIONAL PREFIX OF "OLI-". EXAMPLE: OLI-L501-HS-1
2. ALL INSTRUMENTS SHOWN IN AN AUXILIARY LOCATION ARE IN THE CORRESPONDING SOFT STARTER PANEL, UNLESS INDICATED OTHERWISE.
3. INLET GATE VALVE CONTROLLER IS DISCONNECTED DURING LOW FLOW CONDITIONS.
4. PIPE PATCH INSTALLED PREVIOUSLY TO PREVENT LEAKING.
5. ELEVATION NOT CONFIRMED BY SURVEYOR.
6. PIPING MATERIALS AND GRADES ARE TO BE CONFIRMED.
7. MOTORS ARE LOCATED ON FLOOR ABOVE PUMPS.
8. THIS DRAWING IS BASED ON LIMITED AVAILABLE DOCUMENTATION AND VISUAL SITE INVESTIGATIONS. ELECTRICAL CONTROL SCHEMATICS WERE NOT AVAILABLE AND THUS SOME OF THE CONTROLS ARE ASSUMED.

DRAWING NUMBER	REFERENCE DRAWINGS

APEGM Certificate of Authorization
SNC-Lavalin Inc.
No. 4489

NO.	REVISIONS	DATE	DESIGN	CHECK
00	ISSUED FOR CITY USE	2012/01/31	-	TMC

SNC·LAVALIN
SNC-LAVALIN INC.
148 Nature Park Way
Winnipeg, MB, Canada R3P 0X7
204-786-8080

DESIGNED BY: EXISTING	CHECKED BY: T. CHURCH
DRAWN BY: S. FUNK	APPROVED BY: C. REIMER
SCALE: NTS	RELEASED FOR CONSTRUCTION BY:
DATE: 2011/02/14	DATE:
CONSULTANT NO.:	

ENGINEER'S SEAL

THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

OLIVE WASTEWATER PUMPING STATION
PUMPING STATION CONDITION ASSESSMENT PHASE 1
PROCESS & INSTRUMENTATION DIAGRAM
WASTEWATER PUMPING

CITY DRAWING NUMBER	SHEET	REV.	SIZE
1-0169L-P0001	001	00	A1

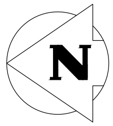
1-0169L-P0001-001-00.dwg

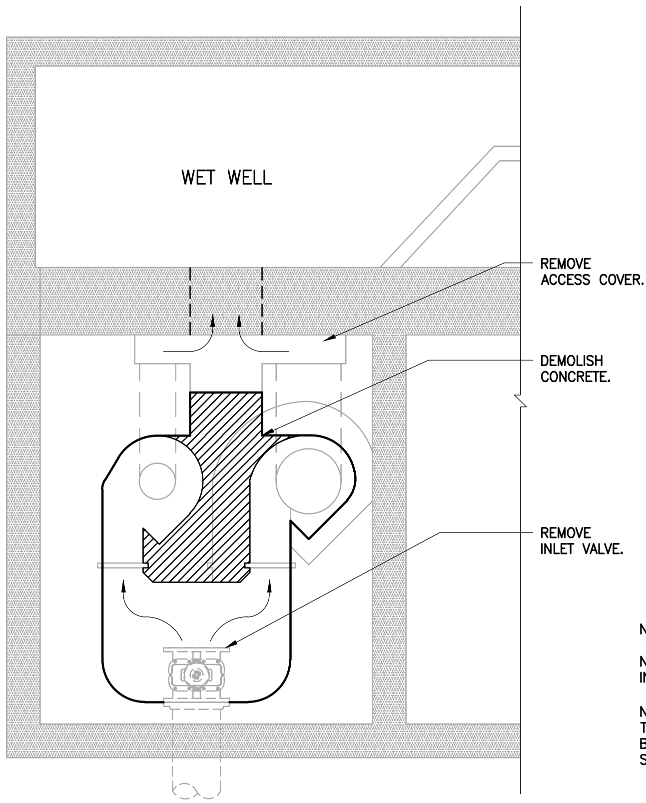
A1 SIZE - 594mm x 841mm

LAST SAVE: 2012/02/02 - 9:57am
PATH: M:\505222\4ENG\4B&C\00 - General DWG\1-0169L-P0001-001-00.dwg

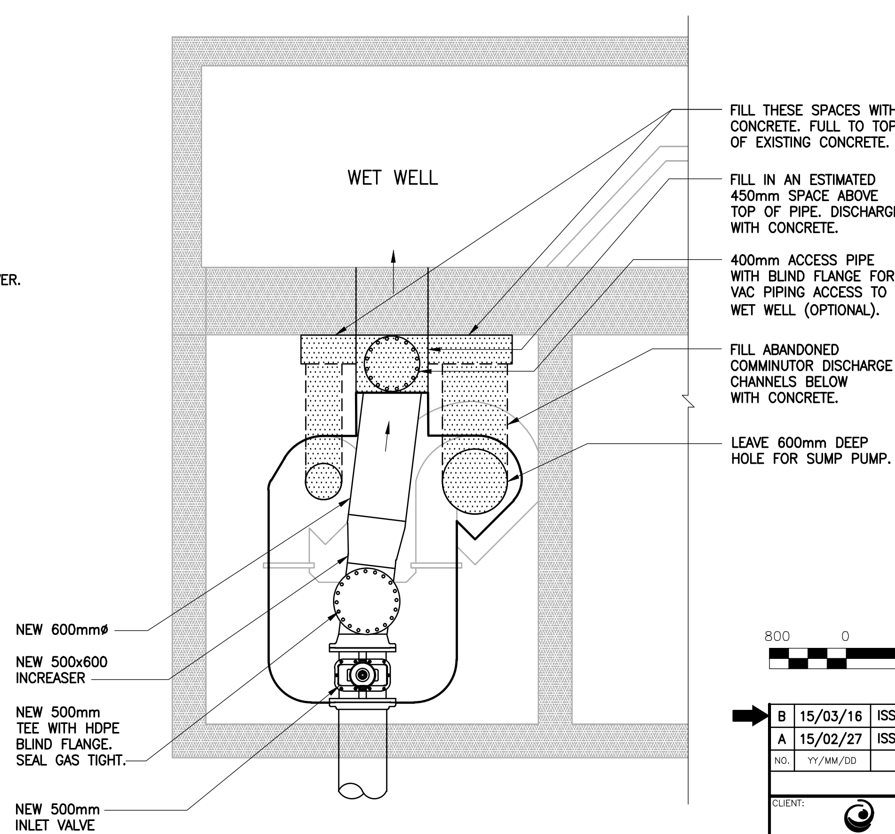
APPENDIX B

NEW DRAWINGS





A DEMOLITION PLAN



B NEW WORKS

LEGEND:

DEMOLITION CONCRETE

NEW CONCRETE

800 0 800 1600 2400 3200

NO.	YY/MM/DD	DESCRIPTION	BY
B	15/03/16	ISSUED FOR FINAL REPORT	RED
A	15/02/27	ISSUED FOR REVIEW	RED

REVISIONS / ISSUE

CLIENT: Winnipeg THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT

PROJECT: OLIVE WASTEWATER PUMPING STATION UPGRADES

DWG. DESCRIPTION: MECHANICAL COMMINUTOR CHAMBER PIPING WORKS

KGS GROUP CONSULTING ENGINEERS

ENG. STAMP

DESIGN BY: RED	DATE (YY/MM/DD): 15/02/27
DESIGN CHECK:	DATE:
DRAWN BY: RP	DATE: 15/02/27
DWG CHECK:	DATE:

DWG. NO. M01 REV: B

FileName: \\k-file-4\p-data\Projects\2014\14-010-045\Dwg\Mech\14-010-045_M01.dwg - lab: M01 Plotted By: RPeralta 15/03/17 [Tue 3:00pm]
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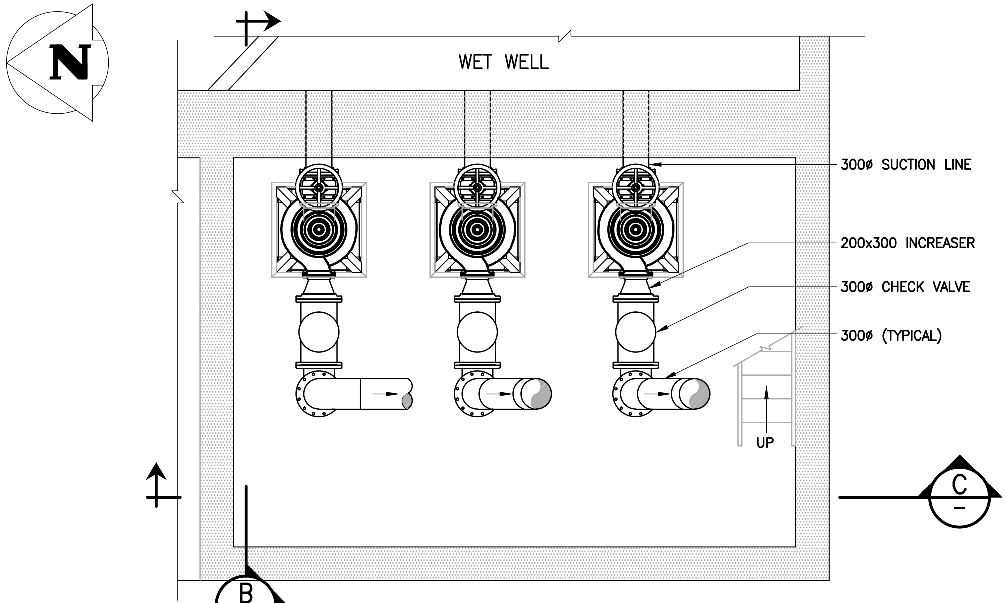
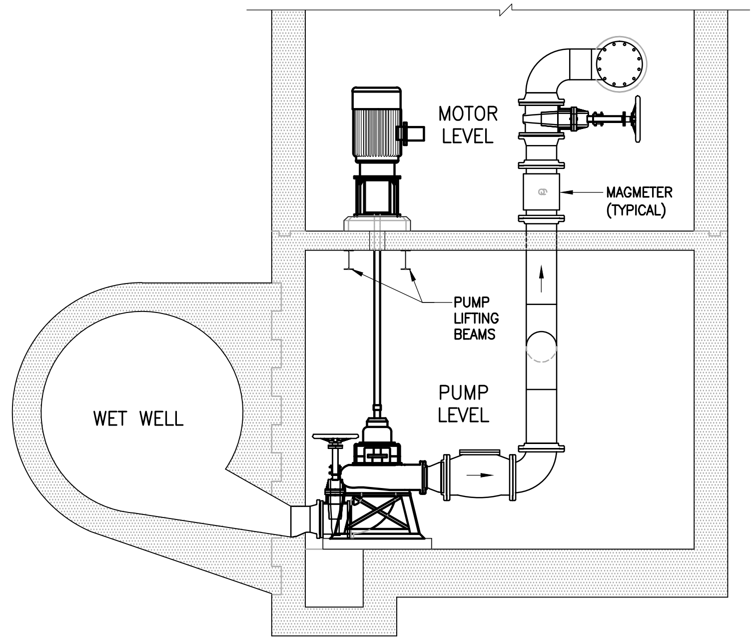
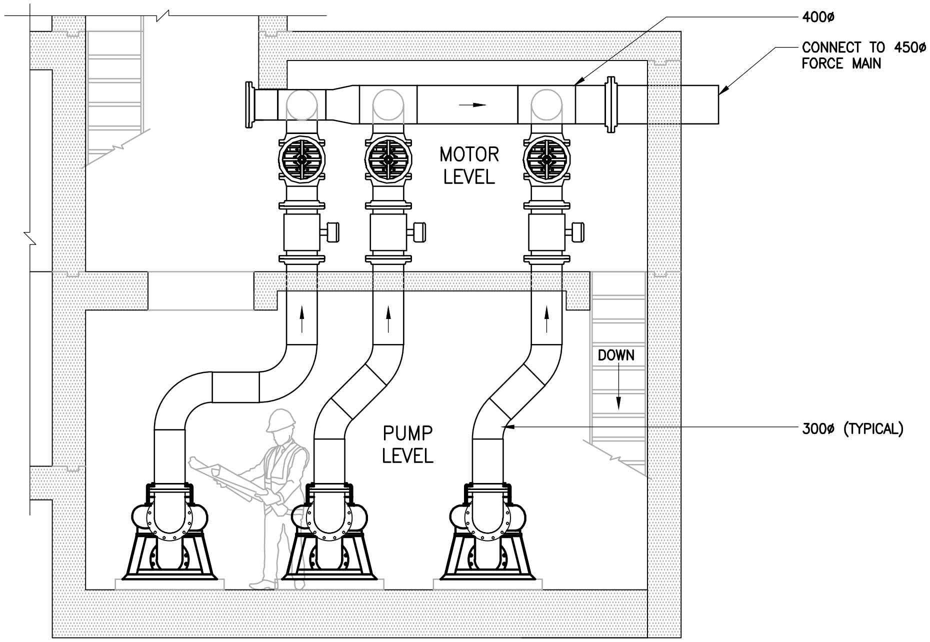
8.5x11



A PUMP ROOM FLOOR LEVEL – PLAN



B SECTION



C SECTION

800 0 800 1600 2400 3200

NO.	YY/MM/DD	DESCRIPTION	BY
B	15/03/16	ISSUED FOR FINAL REPORT	RED
A	15/02/27	ISSUED FOR REVIEW	RED

REVISIONS / ISSUE

CLIENT: Winnipeg THE CITY OF WINNIPEG WATER AND WASTE DEPARTMENT

PROJECT: OLIVE WASTEWATER PUMPING STATION UPGRADES

DWG. DESCRIPTION: MECHANICAL PROCESS PIPING PLAN & SECTIONS

KGS GROUP CONSULTING ENGINEERS

ENG. STAMP

DESIGN BY: RED	DATE (YY/MM/DD): 15/02/27
DESIGN CHECK:	DATE:
DRAWN BY: RP	DATE: 15/02/27
DWG CHECK:	DATE:

DWG. NO. M02 REV: B

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FileName: \\k-file-4\p-data\Projects\2014\14-010-04\Dwg\Mech\14-010-04_M02.dwg - Tab: M02 Plotted By: RPeralta 15/03/17 [Tue 3:02pm]
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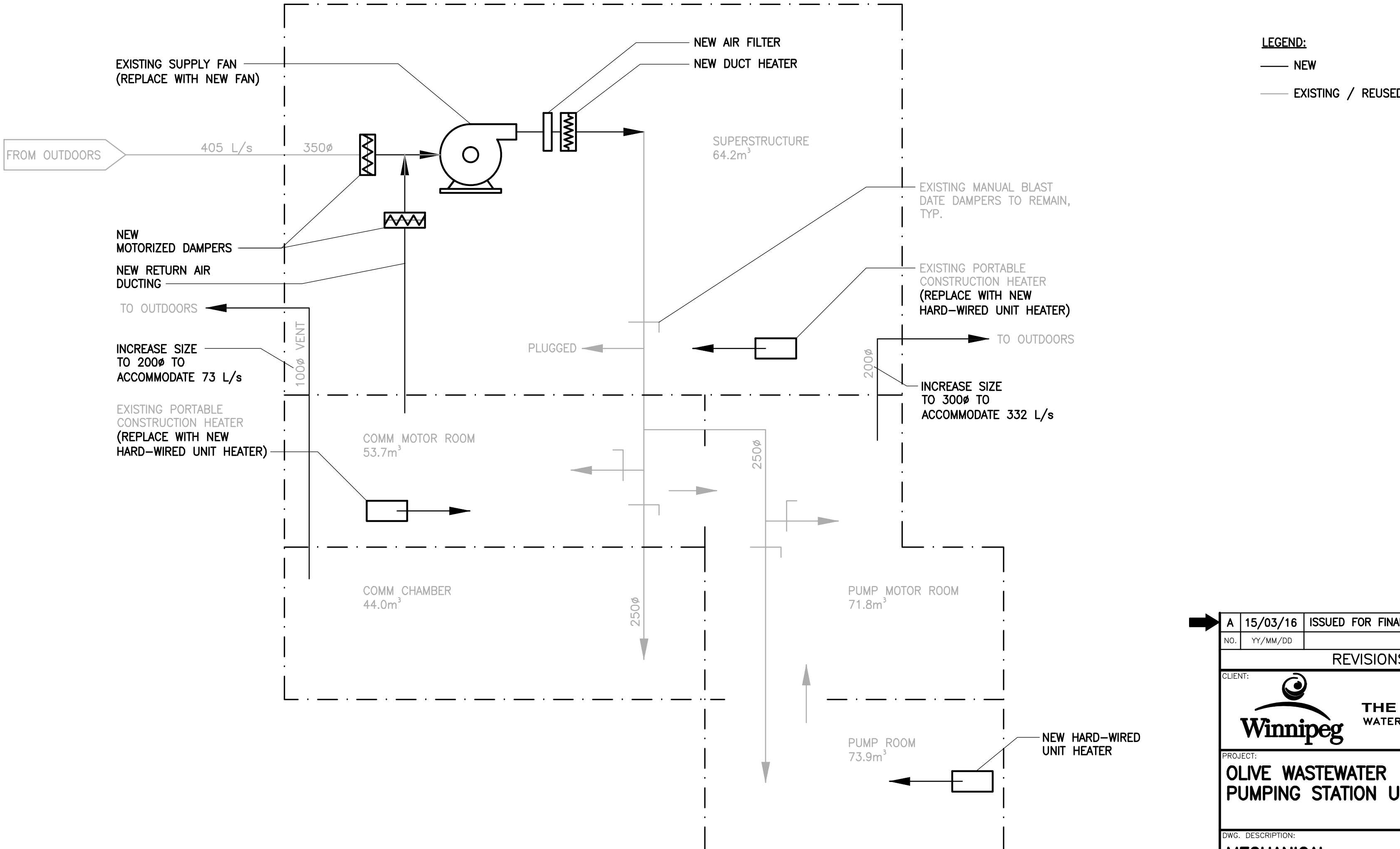
8.5x11



NO.	YY/MM/DD	DESCRIPTION	BY
A	15/03/16	ISSUED FOR FINAL REPORT	DJ

REVISIONS / ISSUE

CLIENT:
Winnipeg
THE CITY OF WINNIPEG
WATER AND WASTE DEPARTMENT

PROJECT:
OLIVE WASTEWATER
PUMPING STATION UPGRADES

DWG. DESCRIPTION:
MECHANICAL
VENTILATION SCHEMATIC

ENG. STAMP

KGS GROUP
CONSULTING ENGINEERS

DESIGN BY: DJ	DATE (YY/MM/DD): 15/01/27
DESIGN CHECK:	DATE:
DRAWN BY: RP	DATE: 15/01/27
DWG CHECK:	DATE:

DWG. NO. M03 REV: A

FileName: \\k-file-4\p-data\Projects\2014\14-010-043\Dwg\Mech\14-010-043_M03.dwg - Tab: M03 Plotted By: RPeralta 15/03/17 [Tue 3:04pm]
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