The City of Winnipeg
Water And Waste Department

FLOOD PUMPING STATION CONDITION ASSESSMENT

APPENDIX B5
BANNATYNE FLOOD PUMPING STATION - FINAL REPORT
DECEMBER 2006

KGS GROUP

KONTZAMANIS ▪ GRAUMANN ▪ SMITH ▪ MACMILLAN INC.
CONSULTING ENGINEERS & PROJECT MANAGERS

SUMMARY

The Bannatyne Flood Pump Station (FPS) is located in a commercial area at the end of Bannatyne Avenue on the west side of the Red River. The station superstructure is a small to medium sized 42 m^2 building. The building structure consists of loadbearing wood framed walls and a flat wood framed roof supported by the exterior walls. The exterior wall finish is face brick veneer. The interior wall surfaces are covered with unfinished hardboard paneling. The entry door is a solid core wood unit in a wood frame. The building appears to be as originally constructed in 1951 and is generally in fair condition.

There are four separately coupled, overhung impeller centrifugal pumps installed in the FPS drywell (P5 – 14", 45HP, P6 - 20", 100HP, P7 – 24", 125HP, P8 – 24", 125HP). These pumps start and stop in sequence based on the level in the wetwell as determined by the bubbler level control system. This station is serviced with a drywell electric resistance unit heater and drywell pressurization fan. The main floor of this station is provided with an 11 000 cfm permanent cooling fan (Photo B5-1). Several mechanical upgrades are recommended for this FPS over the next 10 years. A new drywell ventilation system is proposed for this FPS and the pump bushing clearance on P8 should be assessed and corrected. A new corrosion and wear-resistant coating system is recommended for the drywell's pumps, piping and lineshafts. This station will also benefit from a proposed on-going Ultrasonic Test Program and a Vibration Testing/Thermal Scanning Program.

The Bannatyne Avenue FPS is classified as having a low risk of failure. There is no visual evidence of slope instability at the site and an existing riprap erosion protection blanket in place along the shoreline extending upstream and downstream of the station. Visual inspection of the riverbank stability conditions plus internal inspection of the outfall pipe should be at the site every five years.

The station substructure appears to be as originally constructed in 1951 and is generally in a good/fair condition. The pump bases are in a fair condition as some have major spalling and exposed reinforcement. The discharge box walls and roof are in a poor condition. The flap gate, frame & thimble were installed in 1996 (flap was refurbished) and are in a good/fair condition.

The slide gate, frame and thimble were installed in 1996 and are in a good condition (Photo D5-21). The gate chamber concrete is in a good condition.

The recommended upgrades and their estimated costs have been compiled by discipline; Building and Site, Mechanical, Geotechnical, Sub-Structure & Gates and Electrical. All of the costs shown are in 2005 dollars and have not been adjusted for price escalation during the upgrade program (i.e. the 11 to 50 year cost estimates are still in 2005 dollars). These estimates include engineering, administration and contingencies. The recommended upgrades have been prioritized by the following categories:

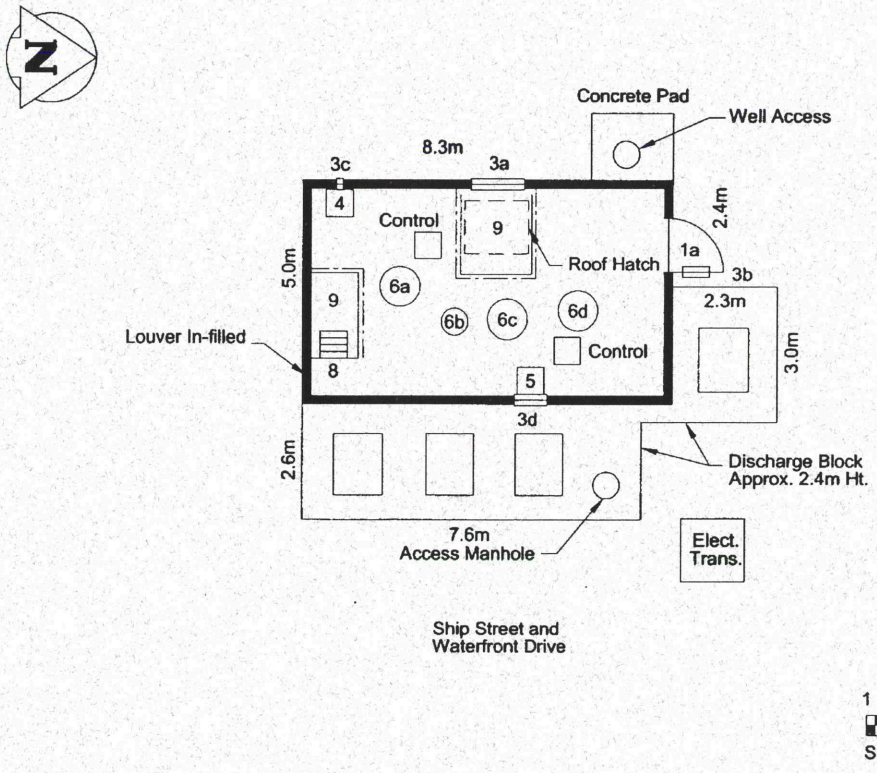
- 0 to 5 year implementation
- 6 to 10 year implementation
- Future upgrades (i.e. 11 to 50 years)

Total estimated costs for this station are as follows:

- 10 year $803,670
- 11 to 50 year $185,675

KEY STATION DATA

BUILDING PLAN



BANNATYNE FLOOD PUMP STATION SITE INSPECTION
KEY STATION DATA

ITEM DESCRIPTION	ITEM NO.	WIDTH (mm)	HEIGHT (mm)	COMMENTS
Station Data				
Door	1a	1220	2120	
	1b	-		
	1c	-		
Window	2a	-		
	2b	-		
	2c	-		
Louver/Vent	3a	1200	900	Aluminum angle
	3b	600	290	
	3c	150	200	
	3d	750	750	Aluminum angle
	3e	-		
	3f	-		
	3g	-		
Fan (Dry Well)	4	-		Drywell ventilation rate 0 estimated at 700 cfm or 6 air changes per hour
Fan (Cooling)	5	-		Permanent cooling fan – estimated at 11 000 cfm

ITEM DESCRIPTION	ITEM NO.	WIDTH (mm)	HEIGHT (mm)	COMMENTS
Station Data				
Pump	6a	-		P7 – 24", 125 HP
	6b	-		P5 - 14", 45 HP
Pump (cont)	6c	-		P6 – 20", 100 HP
	6d	-		P8 – 24", 125 HP
Stair	7	-		
Ladder	8	-		
Floor Hatch	9	-		1800 x 1600
Flap Gate	10	1524	Round	Gate Chamber between Ship Street and Waterfront Drive
Slide Gate	11	1524	1524	Gate Chamber between Ship Street and Waterfront Drive
Level Control System	12			Bubbler
Other Relevant Data				
Year Built				1951
Modifications				1996 - New Gate Chamber, Slide & Thimble
				1996 - Refurbished Flap & New Thimble
Location				End of Bannatyne Avenue
Tributary				Red River
Building Area				
Wall Framing				Wood frame
Wall Finish (exterior)				Painted wood siding
Roof Framing				Wood frame
Roof Slope				Flat
Roofing Type				Built-up roof
Windows				Yes
Renovation Status				Scheduled for near future
Vandalism (type & frequency)				
Substructure				Rectangular drywell, 1 level of concrete beams
Pipes - Outfall Pipe		1524 mm diameter		
Pipes – FPS Pipe				Combined with sewer outfall
Geotechnical Assessment Rating				Low Risk
River Meander Pattern				Outside Bend
Bank Slope				10H:IV
Surface Drainage				Positive
Existing Bank Works				Limestone Riprap
Erosion Conditions				Minor
Bank Stability Condition				No evidence of overall instability at FPS.

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- Condition Assessment – Photos, Data Collection Sheets and Test Results

C. Geotechnical
- Condition Assessment – Photos, Data Collection Sheets and Test Results

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1.0 INTRODUCTION

The Bannatyne Flood Pump Station (FPS) is located in a commercial area at the end of Bannatyne Avenue on the west side of the Red River. The Photos (as referenced throughout this report) can be found in each of the listed Annexes section, by department, at the end of this report. A building plan, site location plan and station isometric are provided in the summary section of this report, pages iii, v and vi respectively.

The station superstructure is a small to medium sized 42 m^2 building. The building structure consists of loadbearing wood framed walls and a flat wood framed roof supported by the exterior walls (Photo A5-8). The exterior wall finish is face brick veneer. The interior wall surfaces are covered with unfinished hardboard paneling. The entry door is a solid core wood unit in a wood frame. Existing windows in the station have been in-filled with painted plywood panels. The roofing consists of a felt and gravel built-up roof with galvanized metal flashings and concrete parapet caps. The station building is not insulated.

Bannatyne FPS is a typical Flood Pumping Station complete with four separately coupled, overhung impeller centrifugal pumps installed in its drywell (P5 – 14", 45HP, P6 – 20", 100HP, P7 – 24", 125HP, P8 – 24", 125HP). The station is serviced with a drywell electric resistance construction heater and drywell pressurization fan. This is not a combination sewage / flood pumping station, rather Bannatyne sewage pumping station is located separate from the FPS but on the same city street right-of-way.

The site is located at the beginning of an outside bend on the west bank of the Red River at Bannatyne Avenue and Waterfront Drive. The building is located west of Waterfront Drive approximately 38 m from the top of bank at its closest point.

The substructure consists of a formed concrete wet well, dry well and discharge box. The rectangular dry well is 6.2 m in depth and has a relatively large footprint area of 41 m^2. Immediately downstream of the station is a concrete gate chamber which houses a cast iron flap gate and slide gate. The gate chamber is linked to an outfall pipe that leads to the Red River. The chamber and gates were most recently modified in 1996. At this time a new gate chamber was installed with a new slide gate, frame and thimble. The existing flap gate was

refurbished and then installed upstream of the slide gate thimble on a new thimble. The gates installed at the Bannatyne FPS are small relative to other typical flood pumping stations.

This report describes the results of the condition assessment and the recommended upgrades to extend the life of the project for 50 years. Implementation strategies for these upgrades are described in the main report.

2.0 CONDITION ASSESSMENTS

2.1 BUILDING AND SITE CONDITION ASSESSMENT

2.1.1 Building Superstructure

The building appears to be as originally constructed in 1951 and is generally in fair condition.

Exterior

With the exception of some moisture staining on the exposed roof framing and the interior wall paneling the structure appears to be sound. The exterior face brick is generally in fair condition. In general the exterior brick veneer is in fair condition. A few exterior bricks are broken and some joints require repointing. The recent removal of some Hydro equipment has left the north south east west wall with a number of holes and a few damaged bricks. Some brick is below grade level on the west side due to poor site grading but no adverse effects are noticed.

Roof

The felt and gravel built-up roofing is in poor condition, and is nearing the end of its life. Most of the roof was covered with water and had small vegetation growing on it (Photos B5-5 & B5-6). The roof is drained by a single overflow scupper.

Doors

The wood entry door and frame are worn, rotted and in poor condition.

Windows

Existing window units have been removed and in-filled with wood framing and painted plywood sheathing.

Aesthetics

Aesthetically the station building appears somewhat dated and neglected compared to the surrounding community. In general the station building is structurally sound but its visual appearance is poor, due in combination to age and general neglect.

2.1.2 Interior Features / Safety Issues

Permanent steel guardrails are provided around the main floor equipment hatches (Photo A5-7). A galvanized steel stair, with intermediate landings provides access to the drywell below (Photos A5-9 & A5-10). The stairs are steep but allowable by code for service areas. Due to the installation of the foamed plastic insulation around the top of the drywell there is no hand clearance along the stair handrails at these locations creating an unsafe condition when using the stair. The height of the guardrails around the intermediate landings is approximately 900 mm (less than the 1 070 mm required by the current Manitoba Building code), and only a top rail is provided.

The drywell ceiling and the upper 2400mm of the drywell walls are lined with 50mm of flammable foamed plastic insulation (extruded polystyrene – STYROFOAM) which is a potential fire/safety hazard (Photos A5-9 & A5-10).

2.1.3 Building Site and Security

Driveway

The building is surrounded by a combination of asphalt paving and gravel. A small gravel parking area is provided just off the street next to the building.

Fencing

Fencing on the site consists of concrete filled steep pipe posts with chains and a stained wooden fence.

Grade

With the exception of the west side where the asphalt paving is higher than the building floor, most of the building is approximately 150 mm above grade.

Security

The site is completely open. Existing fencing is primarily ornamental and provides no deterrent to unauthorized access to the site. The site is somewhat illuminated at night by a combination of a number of street and parking lot lights. Graffiti is an occasional problem at this station. Other than normal wear and tear, there are no signs of damage due to vandalism.

2.2 MECHANICAL CONDITION ASSESSMENT

2.2.1 General

There are four separately coupled, overhung impeller centrifugal pumps installed in the FPS drywell. This station is serviced with a drywell electric resistance unit heater and drywell pressurization fan. The main floor of this station is provided with an 11 000 cfm permanent cooling fan (Photo B5-1).

2.2.2 Ventilation

Drywell Ventilation

The existing drywell ventilation fan is intended for protection of occupants from contaminated air only and is located on the building's main floor. This single-speed 700 cfm fan is operated only when personnel are present in the drywell. An intake duct draws air from outside through a louver and transfers it via discharge ductwork to a location above the drywell floor. Since there is no direct extraction of contaminated air from the drywell floor, this arrangement is only diluting the air in the drywell, not providing direct air changes. The air change rate is therefore less than six Air Changes per Hour (ACH). The City of Winnipeg Water and Waste Department has established the requirement to provide ventilation for personal protection in FPS drywells at 15 ACH. A more reliable method for ensuring a consistent 15 ACH is to provide two fans for

drywell ventilation. One fan and duct would supply air to the top of the drywell while the other fan and duct would exhaust air from the bottom of the drywell.

Main Floor Cooling Ventilation

This FPS is equipped with an 11 000 cfm cooling fan to remove the heat generated by the FPS motors and switchgear when flood pumps are in operation. This cooling fan is oversized but should remain at this FPS.

2.2.3 Piping

Shaft Seal Water Piping and Valves

The shaft seal water line provides water to the packing gland for cooling and lubrication. This station's shaft seal water line has been converted over to PVC for the most part; however, some copper piping is still present on the main line and where the line ties-in to the pump seal water connections. The copper piping is badly corroded where the pipe penetrates the drywell wall (Photo B5-2). The shaft seal water line valves are all in very good condition (Photo B5-3). Corroded piping should be considered for replacement.

Flood Pump Piping

The suction lines of all four pumps are corroded and are losing their protective paint. However, ultrasonic tests performed on other FPS constructed in this era indicated that the original cast iron suction lines had sufficient thickness such that the extent of external surface corrosion loss here would be considered acceptable. Further details on the ultrasonic test procedure and the analysis of the ultrasonic data are contained in the Summary Report. Since no comment can be made on the piping's internal condition, ultrasonic testing should be performed to confirm this assumption.

The discharge piping at this FPS runs vertically towards the top of the drywell and exits the drywell just below the ceiling level. Minor surface corrosion is present on the flood pump discharge side of Pump 7 and the paint is flaking off.

Some surface corrosion is present on the suction side flange hardware and the victaulic coupling of Pump 5 (Photo B5-4). However, the corrosion on these components is not advanced enough to warrant consideration for replacement.

There are no previous or current ultrasonic test results for this station's piping.

2.2.4 Pumps

There are four separately coupled, overhung impeller centrifugal pumps installed in the FPS drywell (P5 – 14", 45HP, P6 - 20", 100HP, P7 – 24", 125HP, P8 – 24", 125HP). These pumps start and stop in sequence based on the level in the wetwell as determined by the bubbler level control system.

Pump 5 is shown in Photo B5-5. A concern for this pump that the pump bowl paint is flaking due to corrosion on and around the bearing cover (Photo B5-6) and down the side of the pump bowl to the pump suction (Photo B5-7).

Pumps 6,7, and 8 are shown in Photos B5-8, B5-9, and B5-10, respectively. There are no areas of concern for these pumps; the pump casing, the packing gland cover and its nuts and studs, and the bearing cover's nuts and studs are all in good condition.

The corroded surfaces should be sandblasted and re-painted. All other components not addressed above as areas of concern are considered to be in acceptable condition, this assessment should be re-evaluated in another 8 to10 years.

Vibration testing was performed at this FPS in April 2005. The results from these tests indicated that that the pump bushing clearance on Pump 8 needs to be assessed and corrected. For further details on the vibration test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

2.2.5 Line Shaft Assemblies

From the vibration tests performed at this FPS in April 2005, it was found that the line shaft assembly is in good condition for all four pumps. For further details on the vibration test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

2.3 GEOTECHNICAL CONDITION ASSESSMENT

2.3.1 Existing Site Conditions

The Bannatyne Flood Pumping Station is located at the beginning of an outside bend on the west bank of the Red River at Bannatyne Avenue and Waterfront Drive. The building is located west of Waterfront Drive approximately 38 m from the top of bank at its closest point. The overall riverbank slope is approximately 10H:1V down to the Regulated Summer River Level (RSRL). There is a timber retaining wall located at the bottom of the slope, as shown on Photo C4-1. The wall appeared to be in good condition with no evidence of leaning or other distress.

Beyond the limits of the retaining wall an extensive limestone riprap erosion protection blanket was in place along the shoreline extending a significant distance upstream and down stream of the station. The riprap ranged in size from 50 to 450 mm in diameter with a D_{50} of 300 mm and appeared to be sound and intact rock, as shown on Photo C4-2. There was no evidence of overall riverbank instability at the site.

Note: As noted in Section 2.3.3 below, the outfall pipe was relined and no internal inspection of the pipe was performed as part of this study.

2.3.2 Historic Bank Performance

Aerial Photography

1988, 1992, 1998 – There was no evidence of overall bank instability at the FPS site. Ongoing shoreline erosion was apparent between the Ordinary High Water Mark (O.H.W.M) and RSRL upstream and downstream of the timber retaining wall. On the 1988 photos there were several felled trees along the shoreline immediately upstream of the retaining wall. The bank was covered with grass and mature trees.

Existing Records

There were no existing records for the Bannatyne Station within the City of Winnipeg Records Summary Waterway Report dated 1993.

In 2002/03 an extensive limestone riprap erosion protection blanket was installed along the west riverbank extending from the McDermot Avenue to May Street as part of the Waterfront Drive construction project. This work included placement of riprap along the FPS shoreline at Bannatyne Avenue.

In 2002 the outfall pipe extending from the station to the river edge was relined. Details of the work are outlined City of Winnipeg As-Build Drawing LD-2720.

2.3.3 Geotechnical Assessment Rating

The Bannatyne Avenue FPS is classified as having a **low risk of failure.** The risk of failure criteria is described in the Summary Report. There is no visual evidence of slope instability at the site and an existing riprap erosion protection blanket is in place along the shoreline extending upstream and downstream of the station. The riprap was placed in 2001 as part of the Waterfront Drive construction project. At the time of the inspection the riprap appeared to consist of relatively sound and intact rock but some degradation of the quality of the stone should be anticipated during the next 50 years.

Based on City of Winnipeg As-Built Dwg. No. P-3212-01 the existing riprap blanket does not extend within the cove cut into the shoreline at the base of timber retaining wall. The river bottom in the area could be subjected to future erosion and down cutting from discharge out of the outfall pipe. During the last 50 years since the original station construction erosion below the outfall pipe has not been identified as a problem and we do not anticipate any significant erosion or detrimental impact on riverbank stability in the future. However periodic inspection of the riverbed below the pipe outlet should be performed during the remaining life of the station. If significant down cutting or undermining of the pipe is observed then placement of rockfill riprap below the pipe outlet should be performed. In addition, it is likely that replacement of the timber

retaining wall located at base of the slope will require replacement during the remaining life of the station.

2.4 SUBSTRUCTURES AND GATES CONDITION ASSESSMENT

2.4.1 Substructure

The station substructure appears to be as originally constructed in 1951 and is generally in a good/fair condition. The main floor slab is good with some minor hairline cracks. There are some minor vertical cracks (1/32") on the interior of the walls. The interior wall has been patched at multiple locations. The plywood hatch cover is worn but generally is good. The precast concrete panels have some minor spalling along the edges. The lifting handles are functional.

The dry well concrete beams and shaft guide mounts are in a good condition. The surface of the shaft mount base plates is lightly corroded. The concrete beams have been patched at multiple locations along the bottom and sides but these repairs appear to be performing well (Photo D5-6). There is a significant amount of horizontal cracking on all walls around the perimeter of the dry well. White residue (efflorescence) and staining is evident along cracks indicating past seepage and corrosion of wall reinforcement (Photo D5-9). There is evidence of previous crack injections and patching.

The floor has minor hairline cracks but is generally good. The pump bases are in a fair condition as some have major spalling and exposed reinforcement that is corroding (Photo D5-12). There is also some grout shoulder spalling below many of the bases. Two bases have loose shims and spalled off grout, which has resulted in gaps between the base plate and concrete pedestal (Photo D5-11).

The discharge box walls and roof are in a poor condition. There are multiple large horizontal & diagonal cracks on the interior and exterior of the walls and roof (Photo D5-14). It appears that some of the larger cracks have been patched in the past. There are also major moisture accumulations at the top of the exterior wall (inside surface). The roof concrete in this area is

extremely deteriorated, particularly around the roof hatch. The supporting angles along the perimeter of the roof hatch opening have lost most of their embedment (Photo D5-17).

This wetwell could not be dewatered and therefore it was not inspected. Average conditions and upgrade costs have been assumed.

2.4.2 Gates

Flap Gate

The flap gate & thimble were installed in 1996 (flap was refurbished) and are in a good/fair condition. Minor corrosion is beginning on the surface of the gate stiffeners (Photo D5-19). There appears to be significant lateral play in the hinges. The gate seating face is relatively smooth and without significant corrosion but there appears to be a small gap when in the gate is in the closed position.

Slide Gate

The slide gate and thimble were installed in 1996 and are in a good condition (Photo D5-21). The slide gate is lightly corroded at the edges of the stiffeners but there is no significant section loss. The gate seating face is smooth without corrosion.

The slide gate was operated to monitor the travel during the inspection and the gate lowered smoothly. The operator shaft and guide mounts are in a good condition as well as the gate chamber concrete.

2.5 ELECTRICAL CONDITION ASSESSMENT

2.5.1 General

The KGS Report, "Flood Control Adequacy Review Study", looked at 14 representative stations and examined the following electrical aspects of the flood pump stations. The study determined the existing motors, motor starters, main distributors, pump controls and SCADA System equipment were in acceptable condition and do not require major upgrade.

Main Service

The main service (Manitoba Hydro) was found to be of adequate capacity. The only issue was the need for refurbishment of the ITE breakers. The breakers require refurbishment based on testing results (see Appendix F, ITE Breaker Investigation)

Flood Pump Motor Starters

The motor starters for the pumps were also found to be in good condition and to provide reliable service. Although they are old, the are of heavy duty construction and experienced very little hours of use due to the nature of the FPS and spare parts are still available. Accordingly no remedial action is required for the starters.

Flood Pump Motors

The report determined that the flood pump motors were also judged to be in acceptable condition with no major remedial action required. WWD has an ongoing program to upgrade the motor insulation on selected stations. Where moisture is present the existing insulation absorbs the moisture and reduces the motor insulation values. This requires drying out in the spring before use. The motors are removed and refurbished with a better quality insulation system. The costs for this ongoing program are not included in these estimates.

Flood Pump Controls

The report determined the existing bubbler or ultrasonic level control systems were in adequate condition and did not require any major upgrade.

The dial up SCADA system was judged to be in good condition. WWD is considering a major upgrade of its' SCADA system and the costs and scope would be handled as a separate project.

2.5.2 Lighting

The interior lighting consists of incandescent bulb fixtures. These fixtures are not used frequently and as such would not normally be replaced on an energy conservation basis. There is, however, generally insufficient lighting in the drywell of the station. This is normally supplemented with trouble lights for specific tasks. The fixtures throughout the interior should generally be upgraded to modern sealed fluorescent fixtures. This will provide quality light with minimal maintenance and no requirements to connect extra lighting.

There is currently no exterior lighting. An upgraded facility would typically have several High Pressure Sodium (HPS) fixtures controlled via a photocell. This allows good security lighting for the building and generally low maintenance. Generally this building would have architectural exterior fixtures given its finish.

2.5.3 Controls

The bubbler level control, which starts and stops the pumps, performs well and no significant problems have been encountered.

An RTU Communicates over a telephone line to the WWD SCADA Center. The FPS is polled in a regular schedule (8-15 min.) and reports back on an "exception" or "change of state" basis.

3.0 RECOMMENDED UPGRADES AND ESTIMATED COSTS

Recommended upgrades for each of the assessment areas; building and site, mechanical, geotechnical, substructure and gates, and electrical are described in Sections 3.1, 3.2, 3.3, 3.4 and 3.5 below. Estimated costs for the recommended upgrades and the basis for the estimates are summarized in Section 3.6 and the Detailed Cost Estimates are shown on Table B5.1.

3.1 BUILDING AND SITE RECOMMEDED UPGRADES

The following repairs and upgrades are recommended, to accommodate the Mechanical upgrades, ensure uninterrupted performance of the station, extend the functional life of the station, and when possible reduce the level of upkeep maintenance required. Due to its prominent location on Waterfront Drive, outdated appearance and deteriorated condition ***this station has been previously scheduled for a major aesthetic upgrade by the City of Winnipeg***. Criteria for the aesthetic upgrading is described in the Summary Report.

1. **Major Aesthetic Upgrade** – In general this would include the replacement of all externally visible building components. In this case it would likely involve some attempt to conceal or reconfigure the discharge blocks in such a way as to integrate them into the overall redesign of the building exterior. Due to the prominent location of the station an exterior finish material such as brick and or stone would likely be considered. The station roof would be completely reconfigured and refinished. The allowance would also include for the reworking and upgrading of the entire building site. The value of the allowance is at the high end of upgrade allowances for the stations and is based on the actual construction cost of the recent Galt Avenue FPS upgrade.

2. ***Wall Opening(s) for Ventilation Upgrade*** - Rework existing exterior wood framed wall and exterior finish to facilitate the installation of cooling fan(s) and ventilation louver(s) as specified by Mechanical. See Mechanical section for ventilation requirements and associated costs to do this work.

3. ***Insulation Protection*** - Install an approved thermal barrier over existing foamed plastic insulation in drywell.

4. ***Drywell Access Stair Safety Upgrade*** - Install bolt-on intermediate rail to stair landing guardrails in drywell.

3.2 MECHANICAL RECOMMENDED UPGRADES

3.2.1 General

This FPS would benefit from several mechanical upgrades. The following sections provide basic descriptions of these recommended measures. Criteria and background information regarding the rationale for the proposed upgrade measures are contained in the Summary Report.

3.2.2 Ventilation

Drywell Ventilation

To bring the FPS into compliance with the WWD-specified criteria of 15 Air Changes per hour drywell ventilation rate, the existing ventilation arrangement will have to be revised. An arrangement that discharges approximately 1 800 cfm at ceiling level of the drywell and extracts at 1 900 cfm near the floor of the drywell would offer the most effective air transfer. This simultaneous supply and exhaust arrangement ensures that air changes are made at a known rate. A single fan arrangement can only dilute contaminated air, rather than provide direct air changes.

Both fans would be installed near the top of the building's exterior wall on the main floor of the FPS. The supply fan would draw air in through a louver and transfer it through ductwork to discharge the air at the top of the drywell. The exhaust duct would be located with its intake end 2 ft. above the drywell floor and its discharge louver on the FPS main floor wall. The station's existing drywell pressurization fan is undersized at 700 cfm and therefore would be removed from service.

Main Floor Cooling Ventilation

This station is equipped with an adequate 11 000 cfm cooling fan that provides station cooling during 90°F outdoor air temperatures and when all four pumps are running.

3.2.3 Piping

Shaft Seal Water Piping and Valves

1. **Convert Copper Piping to PVC** – Aside from the copper piping at the entry point to the drywell and where the line ties-in to the pumps, the shaft seal water line has already been converted over to PVC.

2. **Replace Existing Valves** – The main line valves (strainer, check, solenoid, PRV, and gate valves) and the valves (swing check and gate valves) on the branch lines to the pumps do not need to be replaced. Although this conclusion is not anticipated to change, the condition of these valves and their potential need for replacement should be re-evaluated in 8 to10 years.

3. **Replace Copper Pipe at Drywell Entry Point** – The copper shaft seal water piping at the entry point to the drywell should be replaced to prevent it from further surface corrosion resulting in loss of base material and structural integrity.

4. **Replace Copper Pipe at Tie-in to Pump(s)** - The sections of the copper shaft seal water line that tie-in to the pumps do not need to be replaced. Although this conclusion is not anticipated to change, the condition of this piping and its potential need for replacement should be re-evaluated in 8 to10 years. If this section of pipe ever needs to be replaced, it cannot be converted to PVC since it threads directly into a FNPT port on the pump.

Flood Pump Piping

1. **Replace Flood Pump Pipe Victaulic Couplings and/or Flange Nuts and Studs** – None of the suction or discharge side victaulic couplings or flange couplings' nuts and studs on any of the pumps need to be replaced. Although this conclusion is not

anticipated to change, the condition of these components item and their potential need for replacement should be re-evaluated in 8 to10 years.

2. **Discharge Pipe Replacement** – Ultrasonic testing was not performed at this FPS in 2005. Based on visual inspection of the external surface, the piping at this FPS appears to be in satisfactory condition. An ultrasonic testing program is recommended to allow confirmation of the above conclusion.

3.2.4 Flood Pumps

Bearing Cover Hardware Replacement

The nuts and studs securing the bearing covers do not need to be replaced. Although this conclusion is not anticipated to change, the condition of this hardware and its potential need for replacement should be re-evaluated in 8 to10 years.

Packing Gland Cover Hardware Replacement

The nuts and studs securing the packing gland covers do not need to be replaced. Although this conclusion is not anticipated to change, the condition of this hardware and its potential need for replacement should be re-evaluated in 8 to10 years.

Packing Gland Cover Replacement

The packing gland covers on the pumps do not need to be replaced. Although this conclusion is not anticipated to change, the condition of these covers and their potential need for replacement should be re-evaluated in 8 to10 years.

Pump Bushing Clearance Assessment

Vibration testing was performed at this FPS in April 2005. The results from these tests indicated that that the pump bushing clearance on Pump 8 needs to be assessed and corrected. For further details on the vibration test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

3.2.5 Line Shaft Assemblies

Vibration testing was performed at this station in April 2005. Based on this testing it was found that the line shaft assembly is in good condition on all four pumps. For further details on the vibration test results please refer to "Pump Shaft Vibration Testing Report – Interim Report" in Appendix C.

3.2.6 Sandblasting and Painting

As a minimum, the remaining copper pipe should be monitored for corrosion, although surface cleaning and painting of the piping would provide better long-term protection. Sandblasting and repainting of all the flood pumps, line shafts, suction and discharge piping corroded surfaces should be performed to extend the life of these components.

PPG Phillips and Carlson Sandblasting were asked to provide information on the ideal coating system that would provide a tough, long-lasting, corrosion resistant finish for these items. They have recommended that the following process and materials be utilized:

1. Initial stripping with paint stripper to remove as much lead based paint as possible. This should reduce the lead hazard enough that sandblasting could be done without the spent blast media being considered hazardous waste.
2. Sandblast any residual material to clean surfaces to base metal.
3. Apply one coat of zinc rich primer.
4. Apply one coat of high build epoxy primer.
5. Apply top coat.

Scaffolding or other means of providing access to line shafts and piping at higher levels will have to be setup as part of this work.

3.2.7 Monitoring

Ultrasonic Testing

Ultrasonic testing of the flood pumps' suction and discharge piping should be performed. This testing will have the dual benefit of detecting any immediate problems as well as establishing a baseline for future test reference. Scaffolding is required since the discharge piping exits the drywell high above the floor. Since sandblasting and painting is also recommended at this FPS, as described in Section 3.2.6, ultrasonic testing should be performed after the piping has been stripped and before it is repainted. This will require additional coordination between the painting contractor and the ultrasonic testing firm, but it avoids the unnecessary expense of stripping limited sections of piping only to return to strip the entire surface once painting is to be performed.

In addition to the initial test that has been suggested above, an ongoing ultrasonic testing program should be initiated that has this FPS re-tested every 8 to10 years.

Vibration Testing and Thermal Scanning

Vibration testing and thermal scanning was performed at this FPS in April 2005 to detect any immediate problems and establish a baseline that future monitoring can be compared against. Vibration testing tends to reveal mechanical problems such as misaligned shafts and bearing faults. Thermal scanning will expose electrical issues that result in hotspots in the electrical components' infrared signature. These two measures are ongoing as a part of the work program by KGS Group with the assistance of Motor Check Canada. Vibration Testing and Thermal Scanning are typically conducted during the same site visit.

In addition to the initial test has been completed, an ongoing vibration testing and thermal scanning program should be initiated that has this FPS re-tested every 8 to10 years.

3.2.8 Miscellaneous

On Pump 5, the nuts and studs securing the packing gland cover should be tightened to prevent further leakage.

3.3 GEOTECHNICAL RECOMMENDED UPGRADES

3.3.1 0 to 10 Year Upgrades

A detailed visual inspection of riverbank stability conditions, river bottom below the outfall pipe, and internal inspection of the outfall pipe should be performed at the site every five years. The results should be documented and stored in a database maintained by the City.

3.3.2 Future (11 to 50 Year Upgrades)

The existing timber retaining wall along the shoreline will likely require replacement during the 50 year life extensive of the station. Based on the existing condition of the wall this will not likely be required within the next 10 years. We anticipate the existing handrail can be sand blasted and repainted for reuse as part of any future work.

3.4 SUBSTRUCTURE AND GATES RECOMMENDED UPGRADES

The following repairs and upgrades are recommended within the next 10 years to extend the functional life of the station. Criteria and background information related to the various recommended upgrades are described in the summary report. The estimated cost of the upgrades and their relative priority are summarized in Table B5.1.

1. ***Grade Beams*** **-** Remove loose deteriorated concrete on spalled surfaces and along structural cracks. Inject structural cracks with epoxy resin and patch all repair areas with grout.

2. ***Hatch Covers*** - No repairs required.

3. ***Dry Well Beams*** - No repairs required.

4. ***Dry Well Walls*** - Remove loose deteriorated concrete at spalled locations and along structural cracks. Inject structural cracks with epoxy resin and patch all repair areas with grout.

5. ***Dry Well Floor*** - No repairs required.

6. ***Pump Bases*** - Remove loose deteriorated concrete at spalled locations on pedestals. Sandblast any exposed reinforcing steel and then patch repair areas with grout. Remove and replace any loose or fractured base plate grout.

7. ***Discharge Box*** - Remove loose deteriorated concrete at spalled locations and along structural cracks. Sandblast any exposed reinforcing steel and then patch repair areas with grout. Inject structural cracks with epoxy resin and patch with grout. Remove any accumulated debris from the floor slab area. Install new vents or re-open existing vents at the top of the exterior concrete walls to improve air circulation and reduce condensation on the interior surface of the walls. Removable covers could be installed over the vents to control odours during summer months as required.

8. ***Stoplogs & Guides*** – No repairs required.

9. ***Flap Gate & Thimble*** – No repairs required.

10. ***Slide Gate & Thimble*** - No repairs required.

11. ***Gate Chamber Concrete*** - No repairs required.

12. ***Access Platforms*** - Install a new structural steel platform/catwalk to access the pump shaft guide mounts for regular mechanical maintenance. The platforms will be located at the level of the existing intermediate concrete support beams and will be accessed from the existing stairway/ladder. Platforms will have a grated surface wide enough for one maintenance worker and will be equipped with standard handrails on each side.

13. ***Additional Unidentified Scope Items*** – Provide an allowance for miscellaneous structural items that may arise during the implementation of the upgrade program.

A brief inspection of the gates should be performed annually as part of the department's regular gate maintenance program. Specifically the condition of the anchor bolts and wedge bolts should be monitored and any sheared bolts replaced. Any accumulated debris that may interfere with the operation of the gates should be removed. A detailed condition assessment of the gates and substructure should be performed every 10 years for the remaining life of the station. An allowance for future upgrade costs beyond the initial 10 year program has been included in the tables.

3.5 ELECTRICAL RECOMMENDED UPGRADES

The interior lighting should be acceptable for at least ten years. Architectural exterior lighting may be added for security of the station. An allowance has been made to replace all lighting over the 50 year span as this typically exceeds the life-span of lighting fixtures.

An allowance has been made to refurbish the ITE breakers.

An allowance has been made for minor electrical items which will arise over the years (Minor conduit replacement etc.)

Electrical Costs associated with the mechanical items such as improved ventilation are included in the mechanical cost estimates.

There is no cost considered for thermal scanning, as costs for this task have been included with mechanical estimates and when performed on a regular basis should help avoid other larger electrical costs.

3.6 TOTAL ESTIMATED UPGRADE COSTS AND PRIORITIES

3.6.1 Total Estimated Costs

The recommended upgrades, as shown in Table B5.1 and their estimated costs have been compiled by discipline; Building and Site, Mechanical, Geotechnical, Sub-Structure & Gates and Electrical. All of the costs shown are in 2005 dollars and have not been escalated for future costs (i.e. the 11 to 50 year cost estimates are still in 2005 dollars). These estimates include engineering, administration and contingencies. The recommended upgrades have been prioritized by the following categories:

- 0 to 5 year implementation
- 6 to 10 year implementation
- Future upgrades (i.e. 11 to 50 years)

Table B5.1 shows the estimated costs and priorities for the next 10 years (i.e. 2006 to 2016) as well as the cost estimated for the remaining 50 year life of the stations (i.e. 11 to 50 years). Total estimated costs for this station are as follows:

- 10 year $803,670
- 11 to 50 year $185,675

Priorities of very high, high, medium and low have been assigned to the 10 year cost estimates. These are shown on the cost estimate sheets and reflect the relative urgency of each of the work items. Items assigned a very high priority should be completed as soon as possible, high

priority items within the next 1 to 3 years and medium priority items within the next 4 to 7 years. Low priority items should be addressed within the next 10 years.

In some cases, the future upgrades have been assigned a probability to reflect the uncertainty associated with the future need to undertake the work scope. The rationale for assigning probabilities to the future upgrades is described above and in the Flood Pumping Station Summary Report.

The future costs and their associated probabilities (where applicable) are shown in Table B5.1 for each of the individual station cost estimates.

3.6.2 Basis of Cost Estimate

Building/superstructure costs are based on a combination of contractor estimate, past experience and recent tendered prices for similar work by the Water and Waste Department at the Flood Pump Stations.

Estimated mechanical costs include all labour and materials necessary to complete the work described for each item. Construction labour rates of $50/hour have been applied in most cases with the exception of items such as Ultrasonic Testing and Sandblasting/Painting where labour has been rolled into a lump sum cost estimate provided by a contractor.

Geotechnical costs are based on recent construction tenders received for similar work and KGS Group experience in completing numerous riverbank monitoring and stabilization projects in Winnipeg. Similarly, substructure and gate cost estimates are based on contractor input, recent similar WWD project tender pricing, supplier quotations and KGS experience.

Cost associated with the substructure and gate upgrades are based on recent similar work by WWD, discussion with contractors familiar with work of this nature, supplier quotations and KGS Group experience.

Electrical cost estimates are based on engineering experience and costs provided by ABB.

An allowance of 20% of the total estimated construction costs for Engineering and Administration have been included. This estimate allows for final design work such as drawing production (where necessary) as well as materials or equipment selection and specification. Contract Administration and technical assistance during the initial implementation phase are also included in this engineering allowance.

A 20% contingency has been considered in the estimate since the details of each implementation item are preliminary and could be affected by complications in the field and/or cost fluctuations of materials, equipment and labour. As well the contingency reflects the preliminary nature of the estimate at this stage and the fact that additional, minor, scope items will likely be added at the final design stage.

4.0 REFERENCES

4.1 REFERENCE REPORTS

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2. A. Dean Gould ITL, 1980, Appendix 3 Report on Riverbank Stability at the Proposed Outfall in St. John's Park for the St. John's/Polson Sewer Relief Project Phase 1.

3. A. Dean Gould, P.Eng., January 1988, Report on Riverbank Stability Analysis Newton Avenue Outfall.

4. Baracos and Marantz, December 1956, Soil Mechanics Investigation Proposed Ash Street Pumping Station.

5. City of Winnipeg – Works & Operations Division, 1986, Basement Flooding Relief Program Review.

6. City of Winnipeg, 1989, City of Winnipeg Instruction Manual of Operations for Flood pumping Station (Orange Book).

7. Dillon Consulting Limited, 1983, Winnipeg Flood Protection – Volume 1 (High River Levels – Engineering Review).

8. Dyregrov & Burgess, August 1986, Geotechnical Report Cockburn Flood & Wastewater Power Station.

9. Geotewan Engineer, July 28, 1989, Geotechnical Investigation Hart Wastewater Pumping Station Upgrading.

10. Hardy BBT Limited, October 1991, Riverbank Pathway Between Mostyn Park & Cornish Avenue Geotechnical Feasibility Study.

11. KGS Group Letter/Report, June 29, 1989, Assiniboine River Walkway Geotechnical/Hydraulic Feasibility Study.

12. KGS Group Letter/Report, September 16, 2004, Proposed Transformer Installation Aubrey Street FPS Geotechnical Investigation and Riverbank Stability Assessment.

13. KGS Group Report, December 2003, 2003 Outfall Maintenance Program Dumoulin Outfall RR-58 Geotechnical Evaluation.

14. KGS Group, 2002, City of Winnipeg Flood Manual "Flood Pump Station Overview Report" (Appendix E) and data Sheets included in Appendix F.
    - Flood Pump Stations – Metric Geodetic – Baseline Data – Control Elevations
    - Flood Pump Stations – Metric Geodetic – Baseline Data – Station Elevations

- Flood Pump Stations – Metric Geodetic – Baseline Data – Pumps
- Flood Pump Stations – Metric Geodetic – Baseline Data – Outfall & Miscellaneous

15. KGS Group, Report, December 2004, Granite Curling Club Riverbank Stability Evaluation.

16. KGS Group, Report, June 29, 1990, Jessie FPS Riverbank Stability Study and KGS Group, Report, October 1991, Functional Design Report.

17. Templeton Engineering Company, March 1975, Riverbank Stability Study at the Proposed Hawthorne Outfall Replacement

18. UMA Engineering, December 1980, Geotechnical Evaluation for Slope Stabilization at Mager Drive.

19. UMA Engineering, December 1995, Geotechnical Investigation for North West District Outfall Restriction St. John's Avenue Outfall.

20. UMA Engineering, February 1986, Report on Proposed Outfall Repairs at Cornish Avenue & Clifton Avenue Sites.

21. UMA Engineering, January 1989, Report on Geotechnical Investigations for the Polson Avenue and Armstrong Avenue Outfalls.

22. UMA Engineering, March 1991, Geotechnical Investigation for the Syndicate Street Outfall.

23. UMA Engineering, March 1991, Geotechnical Investigations for Selkirk Avenue Outfall.

24. UMA Engineering, May 1990, City of Winnipeg Waterworks, Waste and Disposal Department Lyndale Drive Slope Stability Study.

25. UMA Engineering, September 1990, Mager Drive Pumping Station Preliminary Slope Stability Investigation.

26. UMA Letter Report, January 30, 1992, Selkirk FPS

27. UMA Letter Report, July 25, 1991, Selkirk FPS

28. UMA, January 1993, Jefferson Avenue Outfall

4.2 REFERENCE DRAWINGS

Author	Title	Year	Drawing
Greater Winnipeg Dyking Board	Bannatyne Ave. Pumping Station Sheet 1 of 3	1951	5-SD-10-1, File #SP10563
Greater Winnipeg Dyking Board	Bannatyne Ave. Pumping Station Sheet 2 of 3	1951	5-SD-10-2, File #SP10564
Greater Winnipeg Dyking Board	Bannatyne Ave. Pumping Station - Sewer Connections Sheet 3 of 3	1951	5-SD-10-3, File #SP10565
The City of Winnipeg, Works and Operations Division	Bannatyne Flood Station-Automatic Level Control Schematic Diagram & Alarm Panel Layout	1987	10-FS-Q-1
The City of Winnipeg, Works and Operations Division, Water and Waste Department	Bannatyne Flood Pumping Station - Gate Chamber Site plan	1996	LD - 1545
The City of Winnipeg, Works and Operations Division, Water and Waste Department	Bannatyne Flood Pumping Station - Gate Chamber	1996	LD - 1546
The City of Winnipeg, Works and Operations Division, Water and Waste Department	Bannatyne Flood Pumping Station - Access Hatch and Ladder Details	1996	LD - 1547

ANNEX A5
BUILDING AND SITE
PHOTOS

PHOTO A5-1

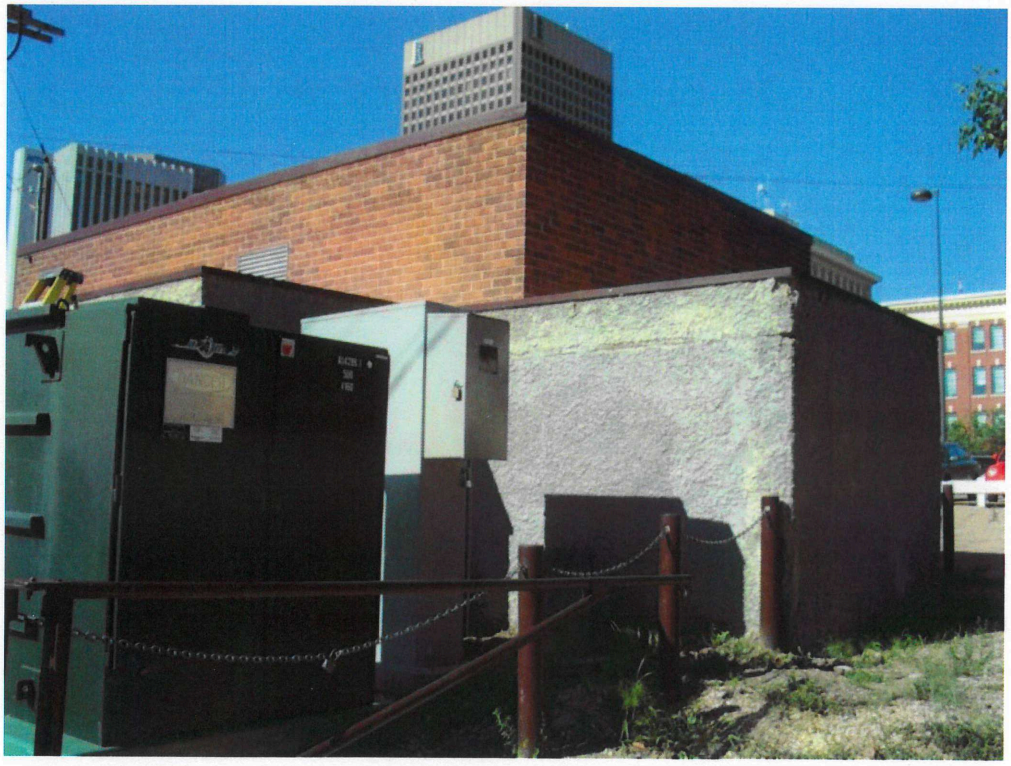
NORTHWEST CORNER - DISCHARGE BLOCK (LEFT)

PHOTO A5-2

SOUTHWEST CORNER - HYDRO AREA (REMOVED)

PHOTO A5-3

EAST SIDE - DISCHARGE BLOCK



HOTO A5-4

NORTHEAST CORNER - TRANSFORMER AND DISCHARGE BLOCK

PHOTO A5-5

ROOF - LOOKING SOUTH - VEGETATION / PONDING

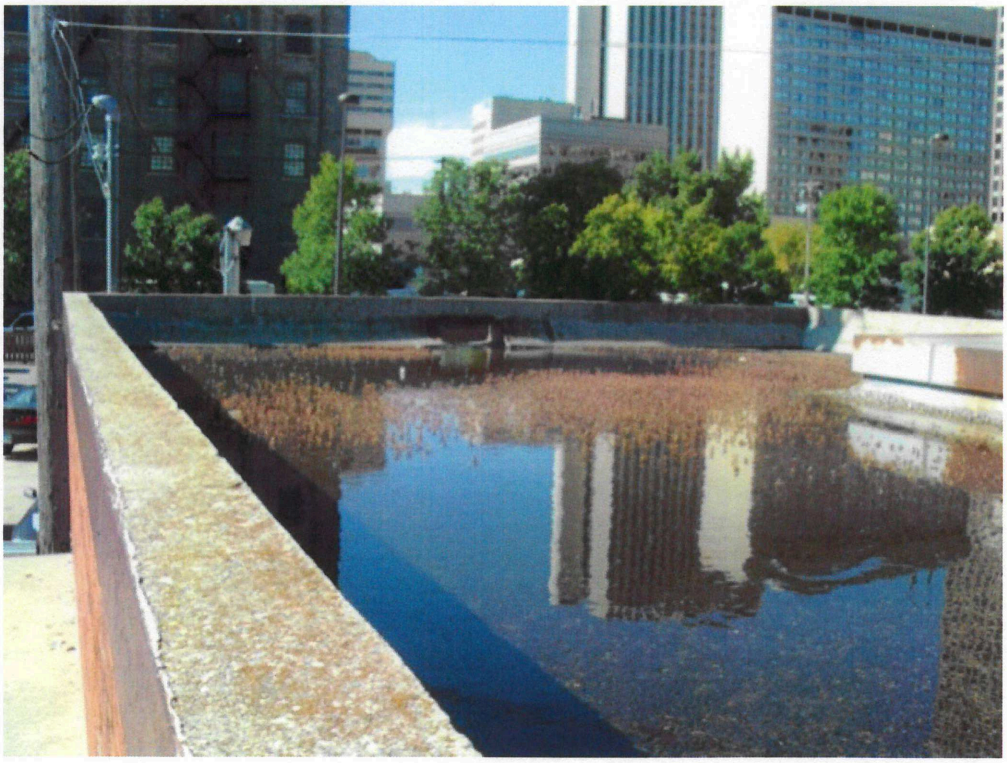


PHOTO A5-6

ROOF - LOOKING SOUTHWEST (AGING WALL CAP)

PHOTO A5-7

BUILDING INTERIOR - GRAURDRAIL AROUND FLOOR HATCH

PHOTO A5-8

WOOD FRAMED ROOF STRUCTURE

PHOTO A5-9

DRYWELL - ACCESS STAIR (STEEP)

PHOTO A5-10

DRYWELL ACCESS STAIR - REDUCED HANDRAIL CLEARANCE. AT FOAMED PLASTIC INSULATION

ANNEX A5
BUILDING AND SITE
DATA COLLECTION SHEETS
AND TEST RESULTS

FLOOD PUMP STATION SITE INSPECTION
BUILDING SUPERSTRUCTURE & BUILDING SITE
DATA COLLECTION SHEET

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sep-04
INSPECTOR: R. Nickel, KGS Group

BUILDING SUPERSTRUCTURE

EXTERIOR WALLS

General Description	Wood Frame
Insulation	Not Insulated
Wall Thickness	250mm
Wall Height (Interior)	3050mm

Construction (Exterior to Interior)

100mm clay face brick veneer
Building paper
20mm wood sheathing
38x89 wood studs @ 400 o/c
20mm wood sheathing
Waxed paper vapour barrier
3mm hardboard

Condition (General)	Good
Condition (Ext. Finish)	Fair
Condition (Int. Finish)	Fair / Unfinished

Comments

1. Little evidence of moisture staining on interior
2. South side exterior has holes and minor damage due to previous removal of hydro equipment area enclosure

ROOF

General Description	Wood Framed
Roof Slope	Flat
Insulation	Unknown (minimal insulation if any)

Construction (Exterior to Interior)

Felt & gravel built-up roof
20mm wood sheathing
38x286 wood joists @ 400 o/c (maximum) - clearspan

Condition (General)	Good
Condition (Int. Finish)	Good/ Unfinished / Open

Comments

1. Structure in good condition

Roof Weather Barrier	Felt & Gravel - Built Up Roof
Last Replacement	Unknown
Condition (General)	Poor / Replace
Comments	1. 40mm of water over east half of roof 2. badly silted with vegetation growing on roof 3. No evidence of leaking on interior
Overhang (Width)	None
Soffits	None
Soffit Finish	n/a
Condition (General)	n/a
Condition (Finish)	n/a
Comments	
Fascia & Trim	Concrete cap
Finish	Painted face
Condition (General)	Poor
Condition (Finish)	Good
Comments	1. Cast-in place galvanized counter flashings rusting
Roof Drainage Control	Overflow Scupper
Material	Formed Galvanized Steel Sheet
Finish	Paint
Condition (General)	Fair
Condition (Finish)	Fair
Comments	

EXTERIOR DOORS

Door Construction	Wood (solid core)
Door Finish	Paint
Frame Construction	Wood
Framing Finish	Paint
Condition (General)	Poor / Replace
Condition (Finish)	Fair
Comments	1. Basic original hardware 2. Frame rotted at bottoms, door sticks at bottom and side 3. Plywood face layer rotted at ventilation louver

FLOOD PUMP STATION SITE INSPECTION
BUILDING SUPERSTRUCTURE & BUILDING SITE
DATA COLLECTION SHEET

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sep-04
INSPECTOR: R. Nickel, KGS Group

WINDOWS

General Description	None
Window Glazing	n/a
Framing Construction	n/a
Framing Finish	n/a
Condition (Glazing)	n/a
Condition (Framing)	n/a
Condition (Framing Finish)	n/a

Comments

1. Glazing panels filled in on west side with painted plywood on 38x89 wood framing (exposed on interior)
2. Concrete trim on exterior side

INTERIOR WALLS

General Description	None
Construction (Exterior to Interior)	
Condition (General)	n/a
Condition (Finish)	n/a

Comments

INTERIOR DOORS

Door Construction	None
Door Finish	n/a
Frame Construction	n/a
Framing Finish	n/a
Condition (General)	n/a
Condition (Finish)	n/a

Comments

FLOOD PUMP STATION SITE INSPECTION
BUILDING SUPERSTRUCTURE & BUILDING SITE
DATA COLLECTION SHEET

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sep-04
INSPECTOR: R. Nickel, KGS Group

INTERIOR FEATURES / SAFETY ISSUES

Stairs	1. Galvanized ships ladder with grating on intermediate platforms
Handrails	1. Top handrail only at 900mm above platforms - no kickplate 2. No hand clearance along foamed plastic insulation
Ladders	
Guardrails	1. Painted steel guardrails around floor equipment hatches and drywell access.
Floor Hatches	
Foamed Plastic Insulation	1. 50mm extruded polystyrene insulation at drywell ceiling and upper 2.4m of upper walls. Fire hazard - high flame spread rating.
Other	

BUILDING SITE AND SECURITY

SITE PAVING

Driveway Construction	None
Condition	n/a
Sidewalk Construction	None
Condition	n/a
Width x Length	n/a
Comments	1. 2.0m x 1.5m concrete entry pad in good condition

SITE DRAINAGE Fair

Comments

1. Grade at bottom of brick at gravel parking lot on west side - no evidence of moisture damage
2. Main floor approximately 150mm above grade on other sides

FENCING

Fencing Function(s)	Ornamental and Parking Control
Fencing Construction	Wood
Fencing Finish	Stained
Condition (General)	Fair
Condition (Finish)	Poor
Height x Length	1.2m high - east and north sides

Comments

1. Ownership of fence in question
2. 10 concrete filled painted pipe bollards with some chain between
3. Pipe gate

GENERAL SECURITY & VANDALISM

General Site Security: Open site

Exterior Lighting

Fixture Locations	Street
Site Lighting Levels	Fair
Control	n/a

Comments

1. Various street lights - at east access road, west and south parking lot lighting, and north on Bannatyne

Evidence of Graffiti

1. Yes

Evidence of Damage

1. No, just normal wear and tear

Comments

FLOOD PUMP STATION SITE INSPECTION
BUILDING SUPERSTRUCTURE & BUILDING SITE
DATA COLLECTION SHEET

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sep-04
INSPECTOR: R. Nickel, KGS Group

GENERAL COMMENTS

1. This station is scheduled for renovation to suit waterfront drive development. Plans to be confirmed.

2. Cement parging and some concrete on discharge blocks deteriorated

ANNEX B5
MECHANICAL
PHOTOS

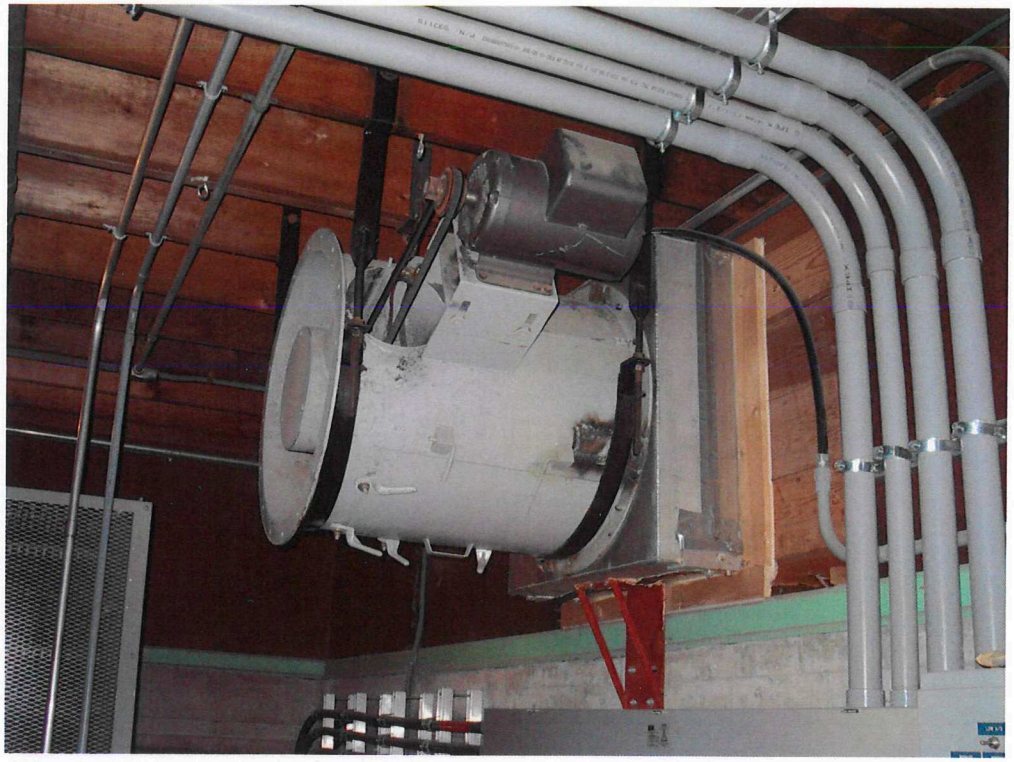


PHOTO B5-1

COOLING FAN

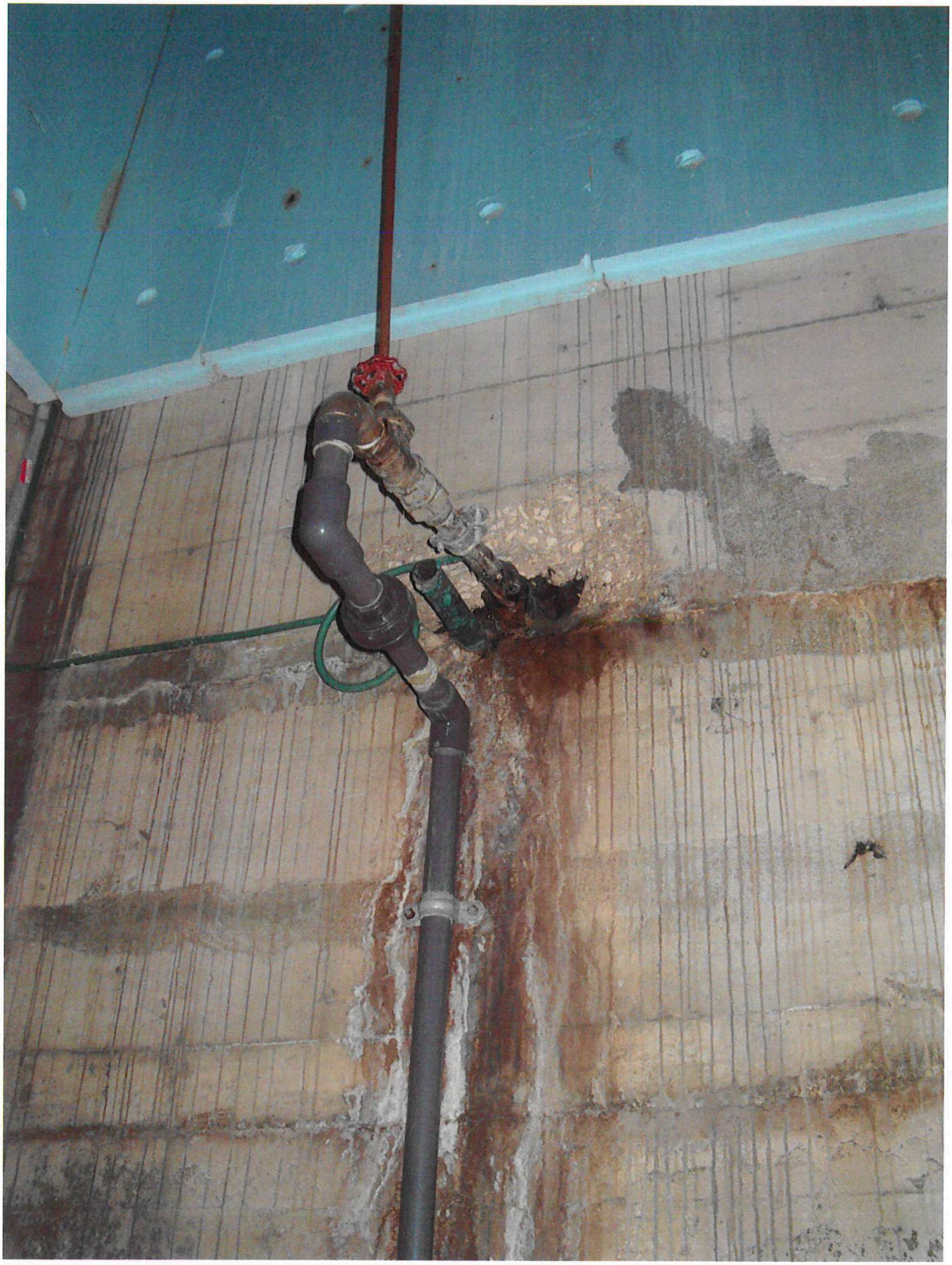


PHOTO B5-2

SHAFT SEAL WATER LINE PENETRATING DRYWELL - CORROSION ON COPPER PIPING

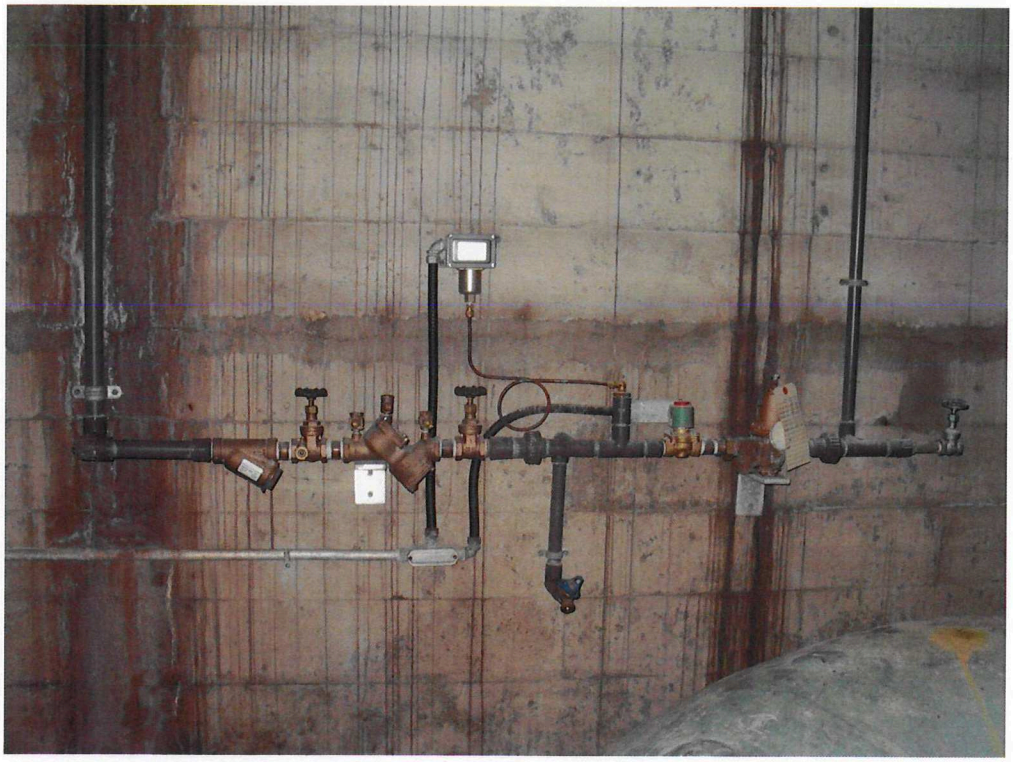


PHOTO B5-3

SHAFT SEAL WATER MAIN LINE VALVES

PHOTO B5-4

CORROSION ON PUMP 5 SUCTION LINE

PHOTO B5-5

PUMP 5

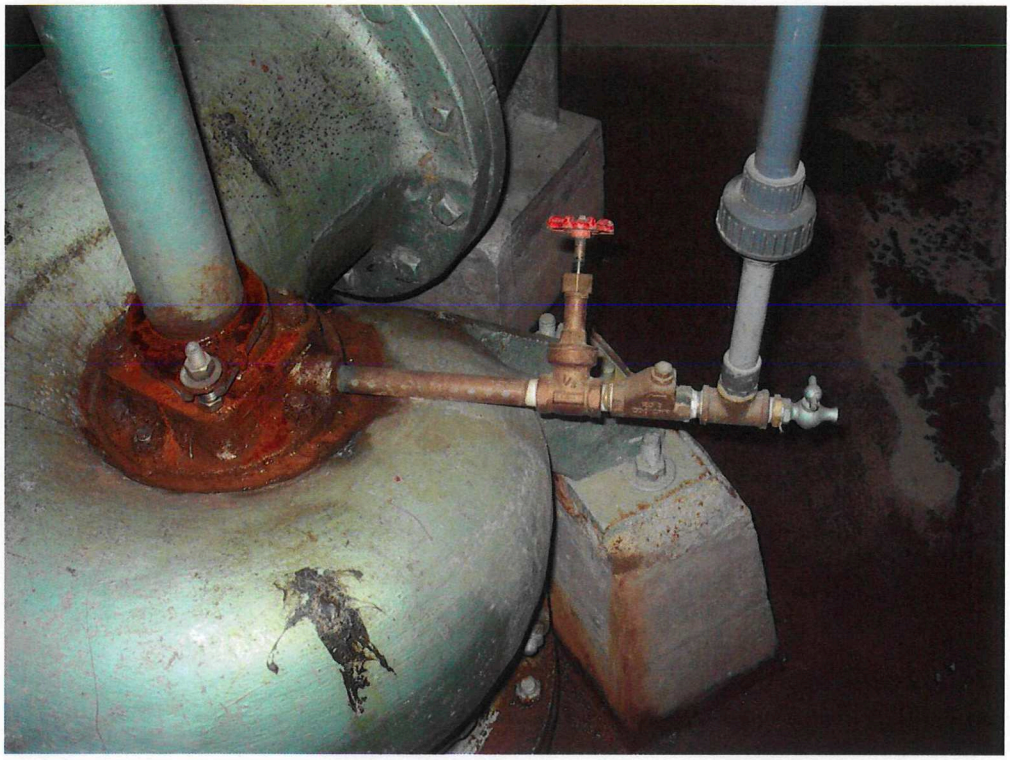


PHOTO B5-6

PACKING GLAND COVER ON PUMP 5 - CORROSION DUE TO LEAKING PACKING GLAND

PHOTO B5-7

PUMP 5 CASING - CORROSION DOWN THE SIDE OF BOWL

PHOTO B5-8

PUMP 6

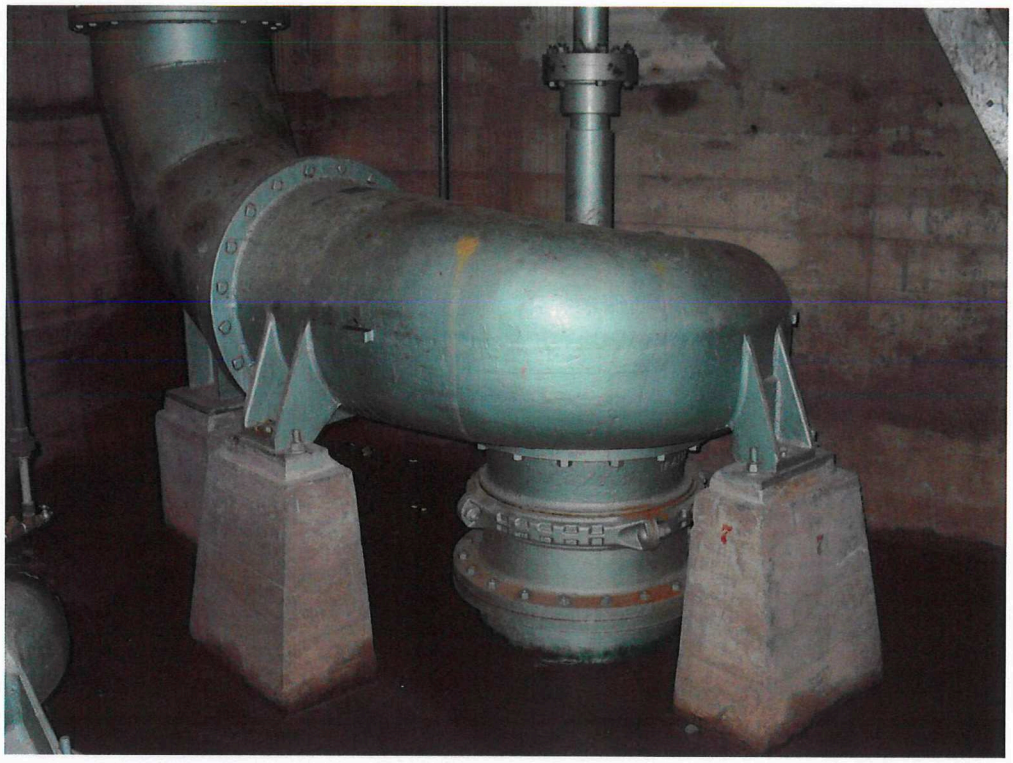


PHOTO B5-9

PUMP 7

PHOTO B5-10

PUMP 8

ANNEX B5
MECHANICAL
DATA COLLECTION SHEETS
AND TEST RESULTS

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sept-2004
INSPECTOR: H. Williams, KGS Group

HVAC EQUIPMENT
Main Floor Cooling Fan

FAN DATA

Tag		
Make		
Model No.		
Size	24"	
Arrangement		
Airflow		CFM
Pressure		in. w.g.
RPM		
Serial No.		
Date of Manufacture	June 10, 1996	
Type		
Drive	Belt	
Acoustic Lining	No	
Exhaust Orientation	Side wall towards parking lot	
Installation Type	Permanent	

Comments / Condition Assessment

- Points towards Waterfront drive.
- Moderately loud but not a nuisance until directly next to station.

FAN MOTOR DATA

Tag		
Make	Baldor Industrial Motor	
Model No.	L1410T	
Serial No.	F694	
HP	5	HP
RPM	1785	rpm
Volt	208-230	V
Phase	1	Ph.
Current Draw	25-28	amp
Freq.	60	Hz
Frame	184T	

Comments / Condition Assessment

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sept-2004
INSPECTOR: H. Williams, KGS Group

HVAC EQUIPMENT
Drywell Ventilation / Pressurization Fan

FAN DATA

Tag		
Make	Acme Fan and Blower	
Model No.	OB-18	
Size		
Arrangement		
Airflow		CFM
Airflow		Air Changes per Hour
Pressure		in. w.g.
RPM		
Serial No.	B-584	
Date of Manufacture		
Type		
Drive	Direct	
Discharge Duct Dimensions	8.5"x6" then 8" diameter	
Suction Duct Dimensions	8	inch diam.

Comments / Condition Assessment

FAN MOTOR DATA

Tag		
Make	Emerson	
Type		
Model No.	563 KZ SRF-7684	
Serial No.		
Catalog No.		
HP	1/3	HP
RPM	1725	rpm
Volt	115	V
Phase	1	Ph.
Freq.	60	Hz
Current Draw	5.4	amps
Frame		
Max. Amb.	40	deg. C

Comments / Condition Assessment

- Service Factor = 1.0
- Cont. rating

DRYWELL SIZE

Height	19.3	ft.
Length	25	ft.
Width	15	ft.
Diameter		ft.
Volume	7250	ft^3

HVAC EQUIPMENT
Heating

DRYWELL HEATER

Tag		
Make		
Model No.		
Serial No.	OCC4800	
Input	4.8	kW
Output		kW
Volt	240	V
Phase	1	Ph.
Freq.	60	Hz
Current Draw	20	amps
Date	May 3, 2001	

Comments / Condition Assessment

- No corrosion on aluminum fan blades.
- Some surface corrosion on heating coil.

MAIN FLOOR HEATER

Tag		
Make		
Model No.		
Serial No.		
Input		kW
Output		kW
Volt		V
Phase		Ph.
Freq.		Hz
Current Draw		amps
Date		

Comments / Condition Assessment

- No main floor heater at this station.

PIPING
Shaft Seal Piping
(see data summary for condition ratings)

Main or Pump Branch Service	Pipe Size [inch]	Pipe Condition	Valve Condition	Paint Condition	Joint Condition
Main	1"	Surface corrosion where pipe meets drywell wall.	Good	Copper (unpainted)	Threaded in good condition.
Main	1"	Good	None	PVC	Cement in good condition.
Main	1"	Good	Strainer, gate valve, solenoid valve and check valve in good condition. Mild surface corrosion on pressure reducing valve.	Copper (unpainted)	Threaded teflon in good condition.
Main	¾"	Good	None	PVC	Cement in good condition.
Branch to Pumps 5,6,7,8	¾	Good	None	PVC	Cement in good condition.
Branch to Pumps 6 and 8	½	Good	Gate and check valves in good condition.	Copper (unpainted)	Threaded teflon in good condition.
Branch to Pump 5	½	Good	Gate and check valves in good condition.	Copper (unpainted)	Corrosion where piping connects to packing gland.
Branch to Pump 7	½	Minor surface corrosion.	Good	Copper (unpainted)	Threaded teflon in good condition.

Comments

- Monitor 1" pipe that penetrates drywell wall - corrosion is beginning (note rest of pipe is PVC).
- Repair of packing gland leak at branch 5 will lengthen the life of the pipe connection at the packing gland.

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
DATA COLLECTION SHEET

FPS NAME: Bannatyne
INSPECTION DATE: 8-Sept-2004
INSPECTOR: H. Williams, KGS Group

Flood Pump Piping
(see data summary for condition ratings)

Pump Tag	Pipe Size [inch]	Pipe Condition	Valve Condition	Paint Condition	Joint Condition
5 Suction	14"	Corrosion due to leaky packing gland.	N/A	Flaky due to corrosion. Paint is separating at base.	Victaulic coupling is corroding especially where the packing gland drips.
5 Discharge	14"	Good (see comment 1).	N/A	Good.	Good
6 Suction	20"	Good, minor corrosion at the floor.	N/A	Good, separating at base.	Very minor surface corrosion at victaulic coupling.
6 Discharge	20"	Good (see comment 1).	N/A	Good	Good
7 Suction	24"	Good, minor corrosion at the floor.	N/A	Good, separating at base.	Minor surface corrosion at victaulic coupling.
7 Discharge	24"	Good, minor corrosion on top of pipe (see comment 1).	N/A	Minor flaking where the rust is.	Good
8 Suction	24"	Good, minor corrosion at the floor.	N/A	Good, separating at base.	Very minor surface corrosion at victaulic coupling.
8 Discharge	24"	Good (see comment 1).	N/A	Good	Good

Comments

1. Minor surface corrosion on underside of discharge pipes at high level where pipe penetrates drywell wall.

FLOOD PUMP SYSTEMS

PUMP DATA

Tag	5			
Make	Dominion Propeller Pump/Manitoba Bridge and Engineering Works			
Model No.				
Order No.				
Size	14"			
Arrangement				
Flow		gpm		
TDH		ft		
RPM				
Serial No.	315-2			
Date of Manufacture	August 27, 1951			
Type	Vertical			
Shaft Seal Packing Material				

Comments / Condition Assessment

- Packing gland has a slight leak, causing stuffing box cover to rust, along with the nuts, bolts and the side of the bowl down to the pump suction.
- Leak on top of this pump should be repaired to prevent further corrosion.
- Needs a cleaning and new paint at stuffing box cover.

PUMP MOTOR DATA

Tag	5			
Make	English Electric Co. of Canada Ltd.			
Model No.				
Type	V			
Serial No.	183003			
HP	45	HP		
RPM	1170	rpm		
Volt	550	V		
Phase	3	Ph.		
Freq.	60	Hz		
Current Draw	42.5	amp		
Amps per Terminal		amp		
Frame	118-1D			
Temp. Rise	40	deg. C		
Brg PE/Drive end Grease	7315	every	12	months
Brg OE/Opposite end Grease	77312	every	12	months
Duty	Cont.			
Duty		% load every		hours

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
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FPS NAME: Bannatyne
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FLOOD PUMP SYSTEMS

PUMP DATA

Tag	6			
Make	Manitoba Bridge and Engineering Works			
Model No.				
Order No.				
Size	20"			
Arrangement				
Flow		gpm		
TDH		ft		
RPM				
Serial No.	6-20-4			
Date of Manufacture	August 21, 1951			
Type	Vertical			
Shaft Seal Packing Material				

Comments / Condition Assessment

- Stuffing box cover has only very minor corrosion, as do nuts and bolts.
- No leak of packing gland.

PUMP MOTOR DATA

Tag	6			
Make	English Electric Co. Ltd.			
Model No.				
Type	V			
Serial No.	183015			
HP	100	HP		
RPM	875	rpm		
Volt	550	V		
Phase	3	Ph.		
Freq.	60	Hz		
Current Draw	95	amp		
Amps per Terminal		amp		
Frame	124			
Temp. Rise	40	deg. C		
Brg PE/Drive end Grease	6320	every	12	months
Brg OE/Opposite end Grease	7320	every	12	months
Duty	Cont.			
Duty		% load every		hours

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
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FLOOD PUMP SYSTEMS

PUMP DATA

Tag	7			
Make	Manitoba Bridge and Engineering Works			
Model No.				
Order No.				
Size	24"			
Arrangement				
Flow		gpm		
TDH		ft		
RPM				
Serial No.	7-24-3			
Date of Manufacture	August 27, 1951			
Type	Vertical			
Shaft Seal Packing Material				

Comments / Condition Assessment

- Stuffing box cover has only very minor corrosion, as do nuts and bolts.
- No leak of packing gland.

PUMP MOTOR DATA

Tag	7			
Make	English Electric Co. of Canada Ltd.			
Model No.				
Type				
Serial No.	183026			
HP	125	HP		
RPM	695	rpm		
Volt	550	V		
Phase	3	Ph.		
Freq.	60	Hz		
Current Draw	126	amp		
Amps per Terminal		amp		
Frame	V-125.5-A			
Temp. Rise	40	deg. C		
Brg PE/Drive end Grease	6320	every	12	months
Brg OE/Opposite end Grease	926710/40	every	12	months
Duty	Cont.			
Duty		% load every		hours

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
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FPS NAME: Bannatyne
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FLOOD PUMP SYSTEMS

PUMP DATA

Tag	8	
Make	Manitoba Bridge and Engineering Works	
Model No.		
Order No.		
Size	24"	
Arrangement		
Flow		gpm
TDH		ft
RPM		
Serial No.	8-24-3	
Date of Manufacture	August 27, 1951	
Type	Vertical	
Shaft Seal Packing Material		

Comments / Condition Assessment

- Very little corrosion since paint is protecting stuffing box cover, nuts and bolts.
- No leak at packing gland.

PUMP MOTOR DATA

Tag	8			
Make	English Electric Co. of Canada Ltd.			
Model No.				
Type				
Serial No.	183031			
HP	125	HP		
RPM	695	rpm		
Volt	550	V		
Phase	3	Ph.		
Freq.	60	Hz		
Current Draw	126	amp		
Amps per Terminal		amp		
Frame	V-125.5-A			
Temp. Rise	40	deg. C		
Brg PE/Drive end Grease	6320	every	12	months
Brg OE/Opposite end Grease	926710/40	every	12	months
Duty	Cont.			
Duty		% load every		hours

Comments / Condition Assessment

FLOOD PUMP SYSTEMS
Wetwell Level Control System

Type	Bubbler			
Compressor Make	Sanborn Manufacturing Co.			
Model No.	34A50-10			
Serial No.	18544			
Motor HP	½			
Motor RPM	875			
Date of Manufacture				
Airflow	3.4	Scfm @		psi
Max. Pressure		Psig		
Ultrasonic Controller Make				
Tag				
Model No.				
Serial No.				
Date of Manufacture				
Level Transmitter Make	Fisher-Rosemount			
Tag	CF-1/3-LT			
Model No.	823DP-13515M2			
Serial No.				
Calibration	4 mA = 0 " H_2O		20mA = 120 " H_2O	
Output				
Supply		VDC max.		
Max. W.P.	3000	Psig		
Pressure Switch Make	United Electric Controls			
Tag	CF-113-PSL			
Model No.	S156			
Type	J6X			
Serial No.	M-35350			
Range		psi		
Differential	0.2-0.8	psi		
Supply	15	amps	125/50	AC
Enclosure Type	4			
Constant Differential Relay Make				
Tag	M019930			
Model No.	62VA			
Pressure Reg. Valve Make	Ashcroft Type 67AF R-SPCE			
Tag				
Model No.				
Serial No.				
Range		psi	recommended	
Range		psi	actual	

Comments / Condition Assessment

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
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FPS NAME: Bannatyne
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PHOTOS

	Acquired
DRYWELL PHOTOS	
Drywell Heater & Elec. Connection	✓
Sump Pump Connection in Drywell	✓
Drywell Ventilation Fan Discharge Duct	✓
Drywell Overall Shot from Bottom of Well	✓
Drywell Overall Shot from Top of Well	✓
Drywell Insulation	✓
Drywell Lighting	✓
Pump(s)	✓
Pump Suction(s)	✓
Pump Discharge(s)	✓
Shaft Seal Main Piping	✓
Shaft Seal Branch Piping to Pump(s)	✓
Shaft Seal Branch Piping at Packing Gland(s)	✓
Electrical Conduit Condition	✓
Wall Condition	✓
Floor Condition	✓
Bearings	✓
Guardrail / Ladder	✓
MAIN FLOOR INDOOR PHOTOS	
Cooling Fan & Motor	✓
Cooling Fan Ductwork	✓
Drywell Ventilation Fan & Motor	✓
Drywell Ventilation Ductwork	✓
Main Floor Heater	—
Motor(s)	✓
Motor Shaft Connection(s) to Pump	✓
Distribution Panel Schedule	✓
Interior Lighting	✓
Bubbler or Ultrasonic Control	✓
General Telephone Entrance	✓
Interior Shots Summarizing All Walls	✓
Interior Shot of Ceiling / Roof Structure	✓
OUTDOOR PHOTOS	
Overall "Title Page Shot" of Exterior	✓
Exterior Shots Summarizing All Walls	✓
Exterior Shots Summarizing Station Surroundings	✓
Exterior Shots (from ladder) of Flat Rooftop	✓
Typical Exterior Light	—
Air Intakes	✓
Padmount / Poletop Transformer	✓

FLOOD PUMP STATION SITE INSPECTION
MECHANICAL EQUIPMENT AND SYSTEMS
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FPS NAME: Bannatyne
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FPS NAME: BANNATYNE	MAIN PUMP	5	6	7	8	#	#	TOTAL / SUMMARY (NOT INCL. D/W)	COMMENTS
MOTOR HP		45	100	125	125			395	HP
PACKING GLAND COVER		C2	C1	C1	C1			C1-C2	Repair packing gland leak at P5 to extend life of shaft seal piping connection.
PACKING GLAND COVER NUTS & BOLTS CORROSION		C1	C1	C1	C1			C1	
BEARING COVER NUTS & BOLTS CORROSION		C3	C1	C1	CO			C0-C3	
SHROUD NUTS & BOLTS CORROSION		NA	NA	NA	NA			NA	
PUMP BOWL PAINT		P3	P1	P1	P1			P1-P3	
FLOOD PUMP PIPING									
SUCTION									
MATERIAL		D.I.	D.I.	D.I.	D.I.			D.I.	
CORROSION		C2	C2	C2	C2			C2	
PAINT		P3	P2	P2	P2			P2-P3	
DISCHARGE									
MATERIAL		C.S.	C.S.	C.S.	C.S.			C.S.	
CORROSION		C1	C1	C2	C1			C1-C2	
PAINT		P1	P1	P2	P1			P1-P2	
JOINT CORROSION									
SUCTION PIPE FLANGED		C3	C1	C1	C1			C1-C3	
SUCTION PIPE VICTUALIC		C3	C1	C1	C1			C1-C3	
DISCHARGE PIPE FLANGED		C0	C0	C2	C0			C0-C2	
DISCHARGE PIPE VICTAULIC		N.A.	N.A.	N.A.	N.A.			N.A.	
SHAFT SEAL WATER PIPING									
PIPING									
MATERIAL	PVC / CU	PVC / CU	PVC / CU	PVC / CU	PVC / CU			PVC / CU	Monitor 12" long shaft seal piping that penetrates drywell wall, corrosion is progressing. Only other Cu pipe is a small portion within the main line valve cluster and at final tie-ins to pumps.
CORROSION	C4	C1	C1	C1	C1			C1-C4	
PAINT	PVC / CU	PVC / CU	PVC / CU	PVC / CU	PVC / CU			PVC / CU	
JOINTS									
TYPE	THRTEF / CEM	THRTEF / CEM	THRTEF / CEM	THRTE F / CEM	THRTE F / CEM			THRTEF/CEM	
CORROSION	C1	C3	C2	C1	C2			C1-C3	
CONDITION	J1	J3	J2	J1	J2			J1-J3	
VALVES									
CONDITION	C1	C0	C0	C1	C0			C0-C1	

FLOOD PUMP STATION SITE INSPECTION
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JOINT CONDITION DEFINITIONS	JOINT TYPES	MATERIALS	CORROSION DEFINITIONS	PAINT CONDITION DEFINITIONS
J0 - Joint is like new, excellent seal	VIC - Victaulic Coupling	D.I. - Ductile Iron	C0 - No Corrosion - Surface is in like new condition	J0 - Joint is like new, excellent seal
J1 - Joint is good but not optimal	FLG - Flanged Connection	C.S. - Carbon Steel	C1 - Very minor surface corrosion - Cross section is barely affected but minor corrosion is visible	J1 - Joint is good but not optimal
J2 - Joint seal (solder/cement/teflon/threads) is slightly worn, corroded or damaged	THR - Threaded	Cu - Copper Pipe / Tubing	C2 - Minor Surface Corrosion - Cross section is slightly affected, corrosion is visible.	J2 - Joint seal (solder/cement/teflon/threads) is slightly worn, corroded or damaged
J3 - Joint seal (solder/cement/teflon/threads) is visibly worn, corroded or damaged, but not leaking	THR/TEF - Threaded w/ Teflon Tape	PVC - PVC Pipe	C3 - Surface Corrosion - Cross section is affected, corrosion is clearly visible.	J3 - Joint seal (solder/cement/teflon/threads) is visibly worn, corroded or damaged, but not leaking
J4 - Joint condition may be the cause of periodic leakage	SOL - Soldered	RR - Red Rubber Hose	C4 - Advanced Surface Corrosion - Cross section is decreasing, structural integrity is still acceptable.	J4 - Joint condition may be the cause of periodic leakage
J5 - Joint has a definite small leak	CEM - PVC Cement		C5 - Heavy Surface Corrosion - Due to loss of base material, structural integrity is questionable.	J5 - Joint has a definite small leak
J6 - Joint has a definite large leak	CLMP - Double Hose Clamp		C6 - Extreme Surface Corrosion - Major corrosive loss with rust-through at a minimum of one location.	J6 - Joint has a definite large leak