



Engineering Ltd.

Report for:

CITY OF WINNIPEG

-WATER AND WASTE DEPARTMENT-

WASTEWATER LIFT STATION CONDITION ASSESSMENT PHASE II - 2020

Document IV: Linden Lift Station Assessment



Date: 2021-01-25

City File No.: S-1095

MPE Project No.: 8400-001-02

Proud of Our Past... Building the Future

www.mpe.ca

Corporate Authorization

This report has been prepared by MPE Engineering Ltd. under authorization of The City of Winnipeg. The material in this report represents the best judgment of MPE Engineering Ltd. given the available information. Any use that a third party makes of this report, or reliance on or decisions made based upon it is the responsibilities of the third party. MPE Engineering Ltd. accepts no responsibility for damages, if any, suffered by a third party as a result of decisions made or actions taken based upon this report.

MPE ENGINEERING LTD.

Prepared By:

M. Jason Stusick, P.Eng.
Project Manager

Ryan Ursu, P.Eng.
Mechanical Engineer

Mark Baker, P.Eng.
Structural Engineer

Richard Ofstie, P.Eng.
Electrical Engineer

DRAFT

Table of Contents

Corporate Authorization	i
1.0 Introduction	1
1.1 Background	1
1.2 Limitations.....	1
1.3 Design Standards & Guidelines	1
1.4 Methodology.....	1
1.5 Evaluation Criteria.....	2
1.6 Condition Assessment Forms.....	2
2.0 General Overview	4
2.1 Location.....	4
2.2 General.....	4
3.0 Information and Regulatory Review	6
3.1 Historical Data Review	6
3.1.1 Data Collection.....	6
3.1.2 Record Drawings, Reports, & Manuals	6
3.1.3 Missing Data	6
4.0 Sewage Production	7
4.1 General.....	7
4.1.1 Catchment Area	7
4.1.2 Peaking Factor	7
4.2 Wastewater Flows.....	9
4.2.1 Historical Flows.....	9
4.2.2 Projected Flows	10
5.0 Lift Station Hydraulic & Capacity Review	11
5.1 Background	11
6.0 Facility Condition Assessment	12
6.1 Background	12
6.2 Code Review.....	12
6.3 Site Conditions	13
6.3.1 Site Access and Parking Lot.....	13
6.3.2 Site Grading & Landscaping	13
6.3.3 Fencing and Signage	13
6.4 Foundations	13
6.4.1 Base Slab.....	13
6.4.2 Below Grade Exterior Walls, Columns, and Beams.....	13
6.4.3 Wet Well	13
6.5 Primary Structural Systems	13
6.5.1 Loadbearing Walls, Columns and Beams	13
6.5.2 Trusses, and Joists.....	14
6.5.3 Suspended Floors.....	14
6.6 Secondary Structural Systems.....	14
6.6.1 Stairs, Ladders, Catwalks, Hatches, Rails	14
6.6.2 Interior Walls, Ceilings, Supports, Equipment Bases	14
6.6.3 Finishes	14
6.6.4 Monorails and Hoists	15

6.7	Building Envelope.....	15
6.7.1	Exterior Siding, Windows, Doors	15
6.7.2	Insulation, Vapour Barrier, Interior Liner.....	15
6.7.3	Flashings, Soffits, Sealants, Weather-stripping.....	15
6.8	Roofing	15
6.8.1	Roof Membrane, Insulation, Decking	15
6.8.2	Skylights, Hatches, Penetrations.....	15
6.8.3	Flashings, Trim, Gutters, Downspouts	15
6.9	Building Mechanical	15
6.9.1	Heating.....	15
6.9.2	Interior Plumbing	15
6.9.3	Fire Suppression Systems	16
6.9.4	Gas Distribution	16
6.10	Facility Assessment Cost Summary	16
6.11	Conclusions & Recommendations.....	16
7.0	Mechanical Equipment Condition Assessment	18
7.1	Background	18
7.2	Code Review.....	18
7.3	Pumps.....	19
7.3.1	Vibration and Temperature	19
7.4	Valves	19
7.5	Piping & Fittings	21
7.5.1	Non-Destructive Testing	21
7.5.2	Cathodic Protection	21
7.6	Summary of Condition Assessment	21
7.7	Conclusions	23
7.8	Recommendations	23
7.8.1	Pump and Piping Replacement (0-5 years).....	23
7.9	Improvement Cost Estimates	23
8.0	Electrical Equipment Condition Assessment	24
8.1	Background	24
8.2	Code Review.....	24
8.3	Electrical Service Entrance Equipment.....	25
8.4	Cable and Conduit.....	25
8.5	Motors.....	25
8.5.1	Motor Circuit Analysis/ HIPOT Testing.....	26
8.6	Full Voltage Starters	26
8.7	Transformers, Panelboards, and Distribution Equipment	26
8.7.1	Lighting	27
8.7.2	Emergency Lighting.....	27
8.8	Standby Power Generators and Engines.....	27
8.9	Conclusions	27
8.10	Recommendations	27
8.10.1	Project 1: Install Emergency Lighting (0-5 years)	27
8.10.2	Project 2: Install Manual Transfer Switch (0-5 years).....	27
8.10.3	Project 3: Replace Starter Status Lights and Improper Teck Connector (0-5 years)	28
8.11	Improvement Cost Estimates.....	28
9.0	Controls & Instrumentation Conditions Assessment.....	29

9.1	Background	29
9.2	Control Systems	29
9.2.1	Manual Control	29
9.2.2	Programmable Logic Controllers (PLC) and Remote Telemetry Units (RTU)	29
9.2.3	Human Machine Interface (HMI)	29
9.2.4	Control Panel	30
9.2.5	SCADA	30
9.3	Instrumentation	30
9.3.1	Process Control	30
9.3.1.1	Pumping	30
9.3.2	Gas Monitoring	31
9.3.3	Process Monitoring	31
9.3.4	Building Monitoring	31
9.4	Pump Control Strategy & Reliability Review	31
9.4.1	Sanitary	31
9.5	Conclusions	31
9.6	Recommendations	32
9.6.1	Project 1: Install Building Alarm Instruments (0-5 years)	32
9.6.2	Project 2: Install a Redundant Level Transmitter (0-5 years)	32
9.6.3	Project 3: Install a Wastewater Flow Meter (0-5 years)	32
9.6.4	Project 4: Replace 24V Power Supply (0-5 years)	32
9.7	Improvement Cost Estimates	32
10.0	Dry & Wet Well Ventilation Review	33
10.1	Background	33
10.2	Ventilation Requirement Review	33
10.3	Ventilation Equipment	33
10.3.1	Fans, Blowers, & Blower Heaters	33
10.3.2	Intake and Exhaust Louvres and Dampers	34
10.3.3	Ventilation System Balancing	34
10.4	Odour Control System	34
10.5	Conclusion	34
10.6	Recommendations	34
10.6.1	Dry Well Ventilation System Upgrades (0-5 years)	34
10.7	Improvement Cost Estimates	34
11.0	Recommendations	35
11.1	Recommended Projects	35
11.2	Code Compliance & Safety Concerns	36
Appendix A – Facility Condition Assessment Forms		A
Appendix B – Pump Condition Assessment Forms		B
Appendix C – Electrical & Communication Condition Assessment Forms		C
Appendix D – Pipe Work & Valves Condition Assessment Forms		D
Appendix E – Power Condition Assessment Forms		E
Appendix F – Force main Condition Assessment Forms		F
Appendix G – Design Standards and Guidelines		G

List of Figures

Figure 1.1 – Condition Assessment Form	3
Figure 2.1 – Location Plan.....	5
Figure 4.1 – Subcatchment Area.....	8
Figure 7.1 – Condition Assessment Summary	22

List of Tables

Table 1.1 – Condition Rating Legend	2
Table 2.1 – Linden Lift Station Overview	4
Table 4.1 – Estimated Wastewater Flows.....	9
Table 6.1 – Linden Facility Code Review.....	12
Table 6.2 – Linden Facility Improvement Cost Estimates	16
Table 6.3 – Linden Recommendations	17
Table 7.1 – Linden Lift Station Mechanical Overview.....	18
Table 7.2 – Mechanical Code Review	19
Table 7.3 – Linden Lift Station Pump Condition Assessment	19
Table 7.4 – Linden Lift Station Pump Vibration and Temperature	20
Table 7.5 – Linden Lift Station Valve Condition Assessment.....	20
Table 7.6 – Linden Lift Station Piping Condition Assessment.....	21
Table 7.7 – Mechanical Equipment Improvement Cost Estimates	23
Table 8.1 – Linden Lift Station Electrical Overview.....	24
Table 8.2 – Electrical Code Review	25
Table 8.3 – Linden Lift Station Service Entrance Equipment Condition Assessment	25
Table 8.4 – Linden Lift Station Motor Condition Assessment.....	26
Table 8.5 – Linden Lift Station Motor Starter Condition Assessment	26
Table 8.6 – Transformers, Panelboards, & Distribution Equipment Condition Assessment	27
Table 8.7 – Electrical Equipment Improvement Cost Estimates.....	28
Table 9.1 – Linden Lift Station Controls & Instrumentation Overview.....	29
Table 9.2 – Linden Lift Station Control Panel Condition Assessment.....	30
Table 9.3 – Linden Lift Station Instrumentation Condition Assessment	30
Table 9.4 – Controls & Instrumentation Improvement Cost Estimates.....	32
Table 10.1 – Linden Lift Station Ventilation Overview	33
Table 10.2 – Linden Lift Station Ventilation Requirements	33
Table 10.3 – Linden Lift Station Fan Condition Assessment	33
Table 10.4 – Ventilation System Improvement Cost Estimates.....	34
Table 11.1 – Summary of Recommended Improvements – Linden Lift Station	35
Table 11.2 – Prioritized Projects – Linden Lift Station	36

1.0 Introduction

1.1 Background

MPE Engineering Ltd. (MPE) conducted a visual inspection of the Linden Lift Station on July 16, 2020. City of Winnipeg (CoW) staff accompanied MPE for the duration of the inspection. The purpose of the site inspection was to assess the current condition of the facility and identify components that will require replacement or maintenance. The condition assessment will assist CoW in making informed decisions on short and long-term maintenance requirements of the facilities. The scope of the condition assessment includes the following:

- Detailed assessment of the following **Asset Categories**:
 - Facility (including site, structural, and HVAC systems),
 - Pumps and motors,
 - Electrical and communications,
 - Pipe work and valves,
 - Power, and
 - Force mains.
- Review of code compliance, occupant safety, and accessibility.
- Recommendations and cost estimates for rehabilitation projects.
- Recommendations on any follow up re-inspection work.

This document provides an assessment of the current infrastructure in terms of the performance and condition of individual lift station components, review of lift station components with respect to the latest codes and standards, as well as a hydraulic and capacity review. The assessment identifies components that require replacement or maintenance along with associated estimation of cost.

The assessments were based on **Condition Assessment Forms** that were developed from our site investigations, discussions with Operation Staff, and review of available documents. These forms were used to assign ratings to each component of the lift station in order to develop the cost estimates and recommendations.

1.2 Limitations

Inspections were limited to cursory visual review of lift station components. Analysis of below grade infrastructure that was not accessible has not been included. Buried pipelines were not exposed or reviewed. Assessment of below grade infrastructure has been based on operational comments from City staff and life cycle estimations. Destructive testing methods were not conducted.

1.3 Design Standards & Guidelines

MPE prepared this assessment in accordance to the standards and guidelines listed in **Appendix G**.

1.4 Methodology

The condition assessment consisted of the following:

- Review of available documents and drawings. Documents were reviewed to determine if any previously identified issues were unresolved or remain unaddressed. Drawings were examined in order to understand intent of design, design capacity, and to review component compliance with applicable codes.
- Site inspections of each facility. Qualified personnel conducted inspections. Photographs of each site were taken, and field assessment forms were completed. City of Winnipeg staff accompanied MPE personnel and provided operational information, background, and the history of each facility. Additionally, City staff

identified the areas of operation and maintenance concern.

- Informal interviews with operations staff. Interviews were conducted to collect further information about each site and to identify issues that are of importance to the maintenance staff. Staff members were also able to provide valuable historical information about deficiencies identified at each site.
- Completion of Condition Assessment Forms. The collected information was compiled and reviewed to identify deficient items. A system of rating the condition of each component was developed. Estimated costs for correcting the deficiencies were assigned to each deficiency. Recommendations were developed based on the condition of the component, importance of the component, as well as safety and code compliance. Results were compiled into the Condition Assessment Forms.

1.5 Evaluation Criteria

The Asset Categories identified in Section 1.1 were evaluated based on the following indicators (Likelihood Indicators):

- **Current Physical Condition** – Assesses the actual condition of the component.
- **Fitness for Purpose** – Assesses the component’s ability to consistently deliver the design performance required.
- **Maintenance and Operability** – Assesses whether optimal maintenance and operation practices occur.
- **Third Party and Environmental Damage** – Assesses vulnerability to external hazards.

Note: The “Demand Condition” Indicator, used in previous assessments conducted by CoW, was removed from this assessment and incorporated into Fitness for Purpose.

Table 1.1 provides a general overview of the scoring matrix that was used to assess each component. The scoring criteria was adjusted to suit each asset category, but generally utilized the following format:

Table 1.1 - Condition Rating Legend			
SCORE	5	Emergency / Critical	Component is not functional or is causing an unsafe condition
	4	Poor / Unsatisfactory	Component has extensive deficiencies that may affect plant operations. High level of maintenance may be required
	3	Fair	Component is able to function for its intended use. Additional maintenance may be required
	2	Good	Only minor deficiencies. Routine maintenance should be sufficient for foreseeable future
	1	Excellent	Component is in new condition

1.6 Condition Assessment Forms

The Condition Assessment Forms are the basis of our assessment. The forms compile information gained through site visits, discussions with Operations staff, review of documents, and engineering experience. A sample form is shown in Figure 1.1. Individual assessment forms were generated for each piece of equipment assessed. The completed assessment forms have been appended to this report.

Figure 1.1 – Condition Assessment Form Sample

Project No.: 8400-001-00 Tag: IC_101_Panel Facility: Metcalfe Lift Station Assessment Page 1 of 1		CONTROL PANEL CONDITION ASSESSMENT FORM		Assessor: Richard Ofstie Date: 29-Jun-19		Likelihood Indicator Scores			
SECTION	ITEM	DATA	Current Physical Condition	Fitness For Purpose	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	Assessment Scores	
GENERAL	Location:	Drywell, Main Level	3	1	2013	30	24		
	Description:	IC_101_Panel							
	Function:	Station Monitoring							
	PLC Processor:	SCADAPack 357							
	UPS Protection:	Yes							
	Equipment Visual Inspection: Issues for Discussion:		Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Equipment appears to be in "Good" condition. Equipment is not rated for classified locations. Wiring methods do not follow provided raceway. Panduit cover is removed. No redundancy.			
	Canadian Electrical Code Issues Identified: Issues for Discussion:		Rating 1 (No issues) Rating 3 (Non compliant - current code)	5	0.4	Notes & Comments			
	Control Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	3	0.1	Asset Consideration			
	Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4	Assessor's Rating			
	Controls Functioning as Expected: Issues for Discussion:		Rating 1 (Always) Rating 2 (More than half of time) Rating 3 (Half of the time) Rating 4 (Less often than half) Rating 5 (Never)	1	0.3	RECOMMENDATIONS: Incorporate redundant control for the lift station. Upgrade HVAC system. Install panduit cover.		COST ESTIMATE \$ 45,000.00	
Panel is Appropriately Designed: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	3	0.1	Pre-Established Weighting				
Control Logic is Appropriate for Installation: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.3					
Communications Equipment is Appropriate: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1					
Equipment Remaining Service Life: Issues for Discussion:		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.2					
PHOTOGRAPHS									

2.0 General Overview

2.1 Location

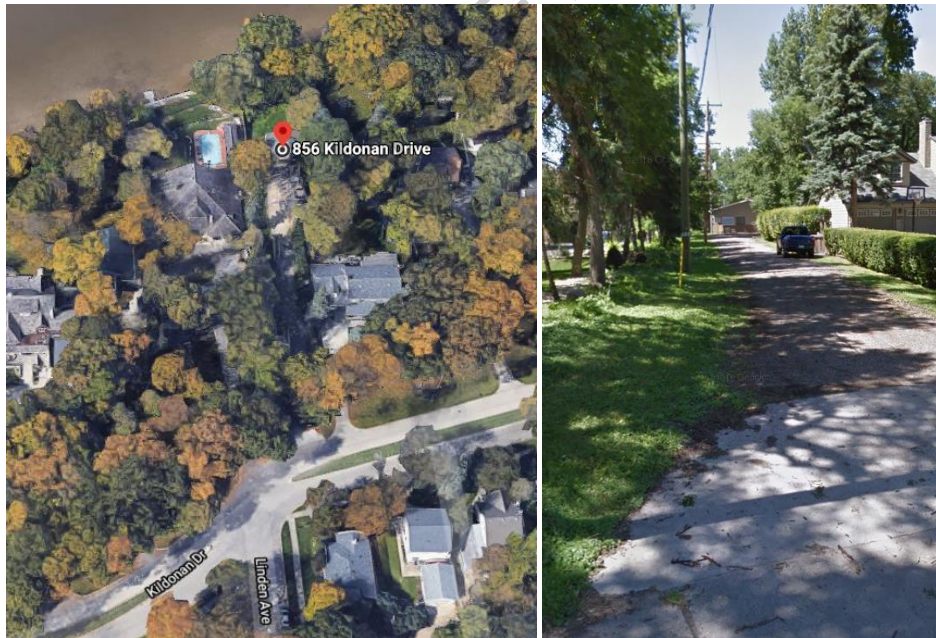
The Linden Lift Station is located at 856 Kildonan Drive near the intersection of Kildonan Dr. and Linden Ave. It has a long driveway with a forestry gate preventing unauthorized vehicle access. The station is a combined sewage lift station and flood pumping station. Assessment of the flood pumping infrastructure is outside of this scope. The station is immediately east of the Red River, adjacent to a concrete outfall structure.

2.2 General

TABLE 2.1: LINDEN LIFT STATION OVERVIEW	
YEAR CONSTRUCTED	1951
LOCATION	856 Kildonan Drive
CONFIGURATION	Wet Well / Dry Well
PUMPING CAPACITY	N/A
TYPE OF PUMPS	Dry Pit Solids Handling
PUMP HORSEPOWER	20 HP
BACKUP GENERATOR	N/A
VENTILATION	Dry Well: Intermittent, Wet Well: N/A

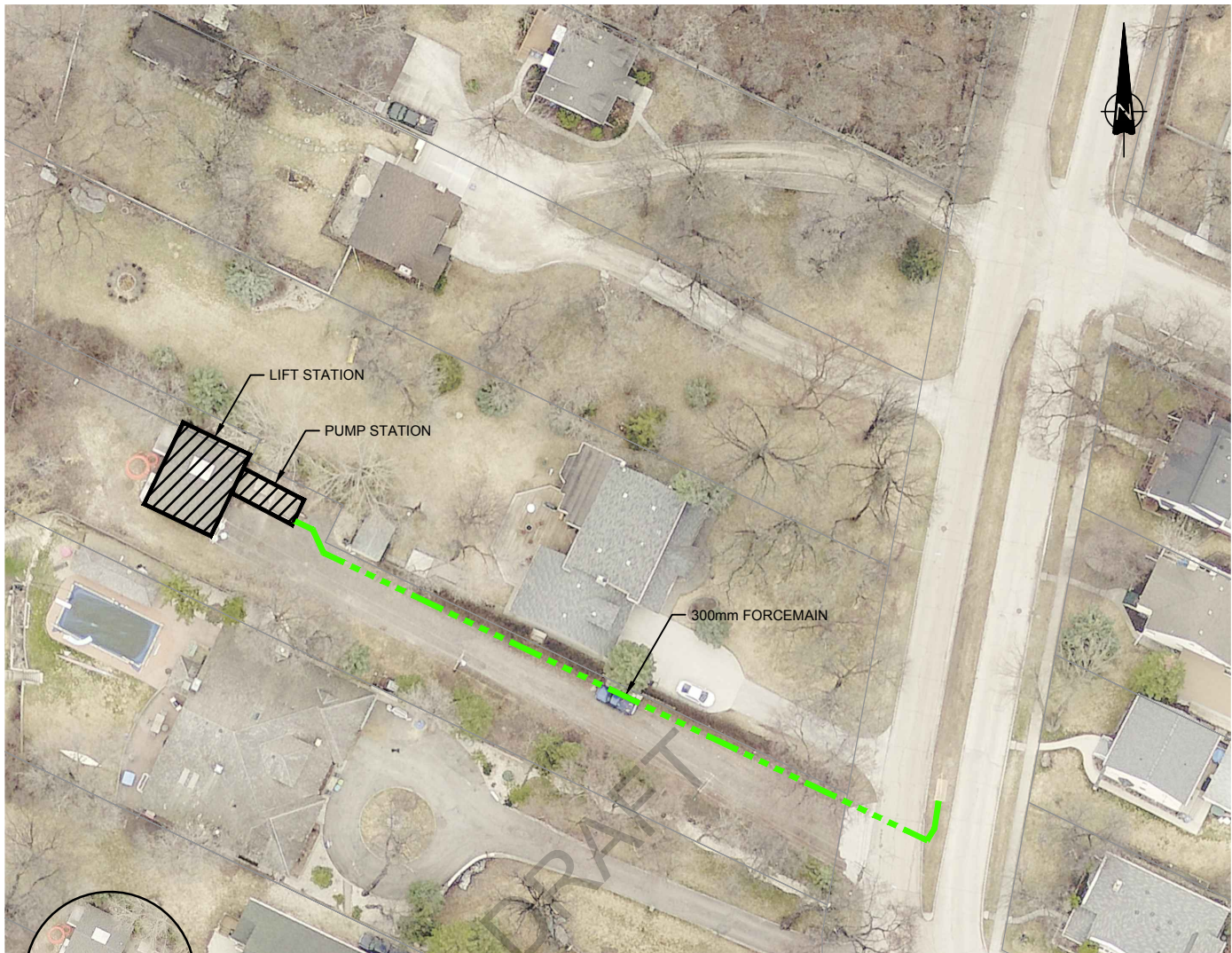


The lift station services a large, primarily residential area. The station is aging and need of renovation and upgrades in order to ensure reliable usage in the future. The electrical station is generally in “Fair” to “Good” condition. The station building and mechanical equipment are



Linden Site Location – Google Earth

Figure 2.1 provides an overall site location plan of the Linden Lift Station facility.



NOTES:
 1. FORCEMAIN ALIGNMENT IS BASED ON OUR INTERPRETATION OF THE DOCUMENTS AVAILABLE TO US AT THE TIME, AND IS INTENDED FOR CONCEPTUAL PURPOSES ONLY.



CITY OF WINNIPEG
 LIFT STATION ASSESSMENTS 2019-2020
 LINDEN LIFT STATION
 LOCATION PLAN

SCALE: 1:750

DATE: OCTOBER 2020

JOB: 8400-001-00

FIGURE: 2.1

3.0 Information and Regulatory Review

3.1 Historical Data Review

3.1.1 Data Collection

The City of Winnipeg records estimated average and peak incoming flow into the Linden Lift Station wet well. Estimated flows were provided by the City of Winnipeg.

3.1.2 Record Drawings, Reports, & Manuals

The following data, plans, reports, and manuals were compiled and reviewed for this report:

- 2016 Comminutor Chamber Piping & Valve Upgrades – Linden Lift Station Layout
- 2016 Comminutor Chamber Piping & Valve Upgrades – Linden Lift Station
- Linden Ave Pumping Station – Sheet 1 of 2
- Linden Ave Pumping Station – Sheet 2 of 2
- Linden Comminutor & Pumping Station – Site Plan & Miscellaneous Details
- LIFT_STN_SERVICE_AREAS.gws – Lift Station Catchment Areas

3.1.3 Missing Data

MPE noted the following missing data:

- The record drawings did not provide dimensional information and network layout.
- Ventilation requirements for the building were assumed based on visual inspection.
- Missing electrical upgrade installation dates.
- Missing nameplate ratings of some electrical equipment, including fan motors, sump pump, and drywell heater.

4.0 Sewage Production

4.1 General

The service area and design flows were generated based on discussion with the City of Winnipeg representatives along with the design criteria presented in the *City of Winnipeg Wastewater Flow Estimation and Servicing Guidelines; 2018*.

4.1.1 Catchment Area

The catchment area for the lift station was provided by CoW from the LIFT_STN_SERVICE_AREAS.gws workspace. Figure 4.1 illustrates the sub-catchment area for the lift station and gives a summary of the establishments that are serviced by the Linden Lift Station.

4.1.2 Peaking Factor

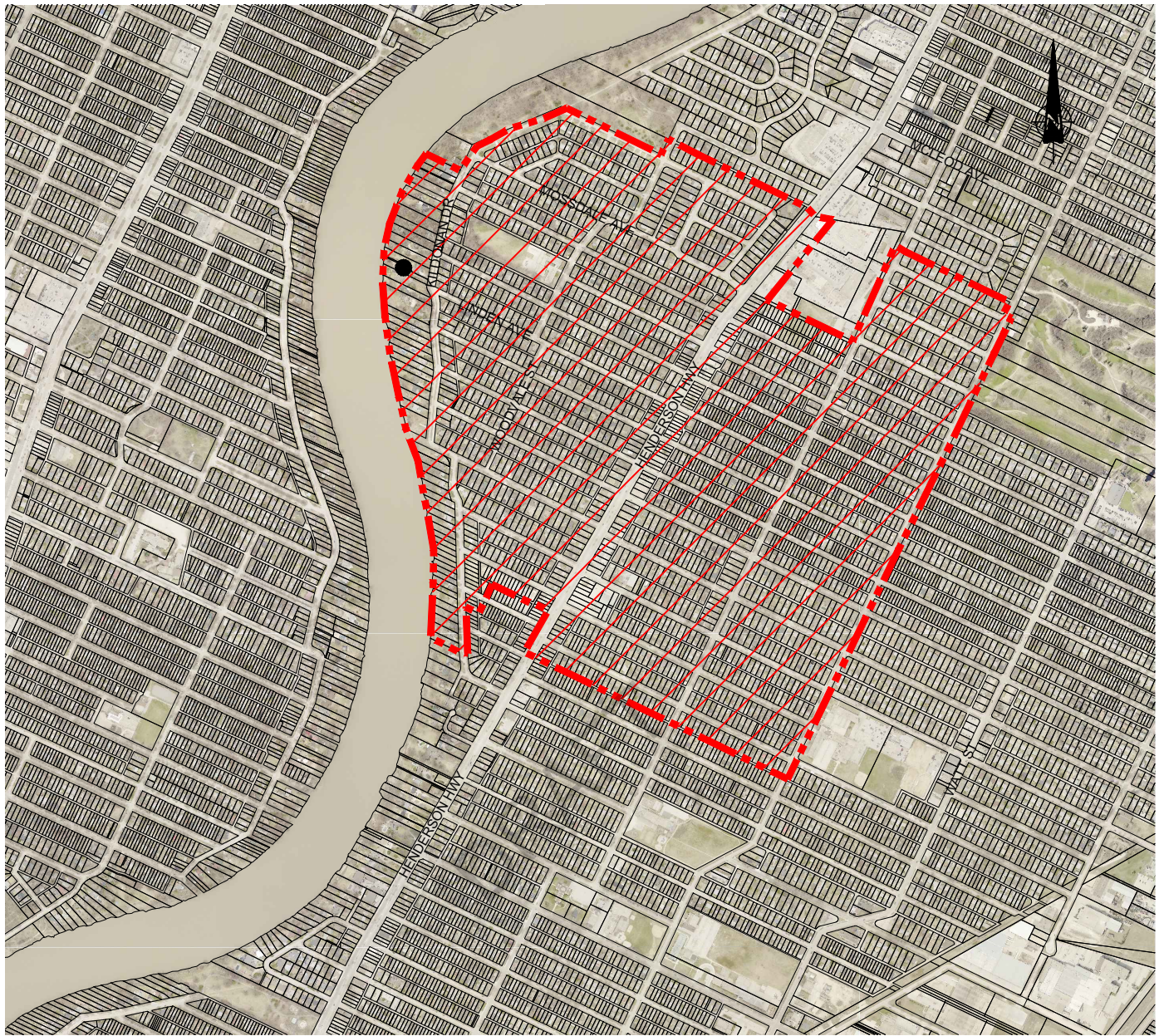
To account for the diurnal fluctuations in sewage flows, peak hourly flows are calculated based on the peaking factor derived from the Harmon equation:

$$\text{Harmon's Peaking Factor} = 1 + 14 / (4 + P^{1/2})$$

where: P = design contributing population in thousands

Linden Lift Station Wet Well





LINDEN	
ROW LABELS	COUNT
APARTMENTS	5
BANK	1
BANQUET/MEETING HALL	1
CHURCH	3
COMMERCIAL MULTI USE	5
COMMUNITY CENTRE	1
CONDO-COMPLEX	1
DETACHED SINGLE DWELLING	1705
DUPLEX	9
MEDICAL OFFICE CLINIC	1
MULTI FAMILY CONVRSN	2
MULTI RES BLDGS	3

LINDEN	
ROW LABELS	COUNT
NGHBRHD SHOP CENTRE	3
OFFICE	7
PUMP/SEWAGE/LIFTSTNS	1
RES SECONDARY UNIT	2
RESTAURANT	3
SCHOOL	12
SIDE BY SIDE	12
STORE	5
SUPER MARKET	1
TRIPLEX	11
VACANT COMMERCIAL	3
VACANT PARK	1

LINDEN	
ROW LABELS	COUNT
VACANT RESIDENTIAL 1	13
VEHICLE SERV RELATED	1
GRAND TOTAL	1802

LEGEND



LINDEN SUBCATCHMENT
AREA=109.67ha (271.01 acres)



LIFT STATION



CITY OF WINNIPEG

LIFT STATION ASSESSMENTS 2019-2020
LINDEN LIFT STATION
SUBCATCHMENT AREA

SCALE: 1:15 000

DATE: SEPTEMBER 2020

JOB: 8400-001-00

FIGURE: 4.1

4.2 Wastewater Flows

4.2.1 Historical Flows

Historical wastewater flow data was not available for the Linden Lift Station. Therefore, the following assumptions have been used to estimate the current and projected ultimate capacities for the facility:

- Land use consists of Single Family Dwellings, Multi Family Dwellings, Light Industrial, Commercial, Parks and Undeveloped Areas.
- Catchment area is approximately 109.7 ha.
- Average dry weather wastewater flow as follows:
 - Residential areas – 270 litres per capita day (Lpcd).
 - Commercial areas – 16,800 L/ha/day.
- Extraneous flow allowance as follows:
 - Groundwater infiltration – 2,200 L/ha/day.
 - Manhole infiltration – 12 L/min/manhole.
 - Residential manhole density – 1.6 manholes/ha.
 - Commercial/industrial manhole density – 1.0 manholes/ha.
 - Weeping tile flow – 4.55 L/min/service connection.
 - Only included in residential areas constructed prior to 1990.
- No anticipated future developments to be serviced by the lift station.

Table 4.1 illustrates the estimated wastewater flows.

DRAFT

TABLE 4.1: ESTIMATED WASTEWATER FLOWS

SUBCATCHMENT DESIGN FLOW								
LAND USE	AREA (HA)	DWELLING DENSITY (DWELLINGS/HA)	DWELLINGS (NO.)	POPULATION DENSITY (PPL/DWELLING)	EQUIVALENT POPULATION	HARMON PEAKING FACTOR	AVERAGE DRY WEATHER FLOW	
							(LPCD)	(L/SEC)
Single Family Dwelling	95.4	12.29	1,172.5	3.05	3,576	-	270	11.2
Multi-Family Dwelling	0.3	74.13	21.2	2.30	49	-	270	0.2
Subtotal	95.7				3,625	3.371	270	11.3
							(L/HA/DAY)	(L/SEC)
Commercial	7.6	-	-	-	-	-	16,800	1.5
Parks & Undeveloped	6.3							
Subtotal	13.9						16,800	1.5
Total:	109.6	-	-	-	-	-	-	12.8
LAND USE	PEAK DRY WEATHER FLOW		EXTRANEOUS FLOW CONTRIBUTIONS				PEAK WET WEATHER FLOW	
			GROUNDWATER	MANHOLE		WEEPING TILE		
	(LPCD)	(L/SEC)	(L/SEC)	(MH/HA)	(L/SEC)	(L/SEC)	(L/SEC)	
Single Family Dwelling	-	-	2.4	1.6	30.5	88.9	-	
Multi-Family Dwelling	-	-	0.0	1.6	0.1	-	-	
Subtotal	910	38.2	2.4	-	30.6	88.9	160.2	
	(L/HA/DAY)	(L/SEC)	(L/SEC)	(MH/HA)	(L/SEC)	(L/SEC)	(L/SEC)	
Commercial	28,100	2.5	0.2	1.0	1.5	-	-	
Parks & Undeveloped								
Subtotal	28,100	2.5	0.2	-	1.5	-	4.2	
Total:	-	40.7	2.6	-	32.1	88.9	164.3	

The estimated average dry weather flow is 12.8 L/sec, the peak dry weather flow is 40.7 L/sec, and the peak wet weather flow is estimated to be 164.3 L/sec.

Flow values were generated based on a high-level assessment and should be further reviewed for any future upgrade or replacement work. As part of future work, flow values should be validated using observed data and/or model generated data. The CoW typically uses a flow multiplication factor of 2.75 for pump design due to existing infrastructure constraints. This may not be sufficient to convey the actual peak flows but should still be reviewed during any future design work.

4.2.2 Projected Flows

No further expansion is anticipated for the catchment area for the lift station.

5.0 Lift Station Hydraulic & Capacity Review

5.1 Background

An accurate hydraulic analysis and sump analysis cannot be completed at this time because the drawings and information required for hydraulic analysis are not available. It is recommended that a hydraulic analysis and sump analysis be completed when the required resources are available.

DRAFT

6.0 Facility Condition Assessment

6.1 Background

The following provides a condition assessment of the building facility for the Linden Lift Station in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that requires replacement, maintenance, or upgrades. A condition rating has been given to the components to identify the condition and cost estimates have been developed. Recommendations have been developed in order to assist CoW in prioritizing future projects. The Condition Assessment Forms have been appended to this report as **Appendix A**.

6.2 Code Review

A review of the Linden Lift Station was undertaken to verify compliance with the National Building Code. Table 6.1 provides a summary of the code review.

TABLE 6.1: LINDEN LIFT STATION - CODE REVIEW			
YEAR CONSTRUCTED	1951		
BUILDING FOOTPRINT AREA (m2)	70		
LOCATION	856 Kildonan Drive		
BUILDING CLASSIFICATION	Combustible / Non-combustible		
ROOFING MATERIAL	Asphalt Shingle		
MAJOR OCCUPANCY CLASSIFICATION	F-3 - Low Hazard Industrial		
OCCUPANT LOADING	5 max.		
ITEM	REQUIREMENT	CODE COMPLIANCE	CODE REFERENCE / NOTES
BARRIER FREE ACCESS	Not Required	N/A	NBC - 3.8- A3.8.1.1
MAIN FLOOR EXITS	N/A	N/A	NBC - 3.4.2.1 (A) - N/A: NBC - 3.4.1.1
TRAVEL DISTANCES	N/A	N/A	NBC - 3.4.2.1 (A) - N/A: NBC - 3.4.1.1
MEZZANINE EXIT	N/A	N/A	NBC - 3.4.2.2 - N/A: NBC - 3.4.1.1
GUARDRAILS	1 kN lateral load	Yes	NBC - 4.1.5.15
IMPORTANCE FACTOR	Post Disaster	No	NBC - 4.1.2
EGRESS PATHS	1100mm min. width	N/A	NBC - 3.4.3.2 - N/A: NBC - 3.4.1.1
MONORAIL CERTIFICATION	Certification	No	ANSI MH27.1, CSA B167-96 - No inspection certification
LADDERS & STAIRS	Compliance with Safety Codes	No	PIP STE05501, NBC
HATCHES	Guardrails & Load Capacity	No	SOR/86-304
SPRINKLER SYSTEM	Not Required	N/A	NBC - 3.2.2
EMERGENCY LIGHTING	Required	No	NBC - 3.2.7.3
EXIT SIGNAGE	Illuminated over door	No	NBC - 3.4.5.1 (2)
SMOKE ALARM	Not Required	N/A	NBC - 3.2.4.11
FIRE ALARM	Not Required	N/A	NBC - 3.2.4
HAZARDOUS SUBSTANCE	CAPACITY (Litres)	REGISTERED	CODE REFERENCE / NOTES
DEISEL (Fuel Oil) - Generator Room		N/A	Registration with Ministry of Environment is not required
DEISEL (Fuel Oil) - Pump Station		N/A	Registration with Ministry of Environment is not required
CHLORINE		N/A	
<i>-Hazardous Substances and Waste Dangerous Goods Regulations recommends registration for tank capacity > 4000 Litres-</i>			
SECURITY	SITE SECURE	BUILDING SECURE	NOTES
PUMP STATION	NO	YES	



6.3 Site Conditions

6.3.1 Site Access and Parking Lot

The station is accessed through a forestry gate by Kildonan Drive. The site is easily accessed with no traffic issues. There is sufficient parking space and the parking lot is in “Good” condition.

6.3.2 Site Grading & Landscaping

No significant ponding or potential for ponding was noted. The site is on the riverbank but appears to have no riverbank stability problems. Some grassy areas are difficult to keep mowed. Trees and vegetation have grown into contact with the structures and should be trimmed back.



6.3.3 Fencing and Signage

Vehicle access is restricted by the gate, but the site is otherwise insecure. Signage identifies the site as a City of Winnipeg facility but does not provide emergency contact information. No vandalism was noted.

6.4 Foundations

6.4.1 Base Slab

The foundation consists of a below grade cast-in-place concrete wet well and dry well. A flood pumping station is also included in the foundation, but this was not assessed as it is outside the assessment scope. The base slab shows minor surface wear and cracking. The finish has worn off. The floor was wet when assessed, and some water was not properly draining to the sump. The base slab is structurally sound.



6.4.2 Below Grade Exterior Walls, Columns, and Beams

Evidence of infiltration through the foundation walls was noted at pipe penetrations near the pumps. Paint is peeling off in some areas. The concrete in the comminutor room has lost surface paste from the previous H₂S environment, though the concrete is still structurally sound. Confined space entry is required for the comminutor room. The foundation walls and beams are in sound structural condition.



6.4.3 Wet Well

The wet well access vault is in functional condition. There is possible damage and infiltration at joints in the access vault. The rim has corroded but does not require immediate replacement.

6.5 Primary Structural Systems

6.5.1 Loadbearing Walls, Columns and Beams

The superstructure walls are structurally sound. Penetrations for piping have been cored through foundation walls.

6.5.2 Trusses, and Joists

The roof structure has been modified to include a hatch. Several top chords have been cut. The girders that support the cut members bear on previous, uncut top chords. These supporting members have not been properly reinforced after the modification and require reinforcing to meet Code requirements. The top chords need to be built up with two additional members on each side.



The roof structure was built without proper hangers. Joist and truss hangers should be installed on all members.

6.5.3 Suspended Floors

The suspended floor has been modified accommodate changes to the pipework. Previous penetrations have been patched and new penetrations have been cut/cored. A structural analysis is recommended to determine if the suspended slab still has adequate load capacity.



6.6 Secondary Structural Systems

6.6.1 Stairs, Ladders, Catwalks, Hatches, Rails



The entry stairs have very narrow treads, creating a tripping/falling hazard. Additionally, the handrails along the stairs do not have sufficient hand clearance to be Code compliant and are unfit for their purpose. Several staircase supports are corroded and should be replaced. The landing at the base of the entry stairs is small, and there is a tripping hazard where the metal grate ends. The grate should be extended over the landing to remove the tripping hazard. The top landing of a lower level staircase is too small to properly operate a door. The landing size should be increased using floor grating to accommodate the door between the lift station and the flood pumping station.

Wood covers are used in floor penetrations. These should be replaced with Code compliant hatches and lids. A hatch to the exterior is covered with a hatch lid and wood boards. Evidence of infiltration was observed.

Several guardrails and handrails lack required hand clearance. Guardrails lack required kickplates, and an opening in a guardrail requires a gate.

6.6.2 Interior Walls, Ceilings, Supports, Equipment Bases

Interior walls are structurally sound. Concrete equipment bases are severely damaged and must be replaced.



6.6.3 Finishes

Most floor and wall finishes are deteriorating and should be replaced.



6.6.4 Monorails and Hoists

Several lifting lugs are bent. Certification for the lifting lugs was not found. Several lifting lug anchors were hidden behind insulation, where condensation is suspected. Condensation could cause corrosion that is hidden by insulation. MPE found no confirmation of monorail certification.

6.7 Building Envelope

6.7.1 Exterior Siding, Windows, Doors

The exterior siding is damaged in several locations. The door and windows are in functional condition.



6.7.2 Insulation, Vapour Barrier, Interior Liner

The superstructure has no insulation, vapour barrier, or interior liner. The insulated lower-level entry structure should be removed, and the entire superstructure should be properly insulated. The lower levels are insulated but lack a vapour barrier and interior liner. A vapour barrier and interior liner should be applied throughout the lift station after the superstructure is insulated.

6.7.3 Flashings, Soffits, Sealants, Weather-stripping

Some flashings are damaged. Soffit, sealants, and weather stripping are functional.

6.8 Roofing

6.8.1 Roof Membrane, Insulation, Decking

The asphalt shingle roof is generally in functional condition. One shingle is missing on the roof ridge. Trees have grown into contact with the roof and may cause damage.

6.8.2 Skylights, Hatches, Penetrations

The roof hatch and other penetrations appear to be well-sealed.

6.8.3 Flashings, Trim, Gutters, Downspouts

There is some minor damage to flashings and soffit. These should be replaced.



6.9 Building Mechanical

6.9.1 Heating

The generator building includes a wall mount electric unit heater that is in “Good” condition. The lift station dry well includes a floor mount unit heater.

6.9.2 Interior Plumbing

The domestic plumbing consists of copper and PVC piping. The plumbing system is used to supply hose bibs in the lift station. The plumbing system is in “Fair” condition.

Drain lines from the building are directed to sumps in the drywell lower level and comminutor chamber lower level. Sump pumps are used to discharge water from the sumps to the wet well. The drainage system is in “Fair” condition.

and no operational concerns were noted.

6.9.3 Fire Suppression Systems

The building has no apparent fire suppression system. It is recommended that a handheld ABC fire extinguisher be installed by the building entrance.

6.9.4 Gas Distribution

There is no gas distribution system in the dry well.

6.10 Facility Assessment Cost Summary

Table 6.2 summarizes the cost estimates and recommended Action time for each recommendation for the Facility Assessment.

TABLE 6.2: LINDEN FACILITY IMPROVEMENT COST ESTIMATES			
Item	Facility Section	Action	Cost
1	Site Conditions	Mid Term	\$ 2,000.00
2	Foundations	-	\$ -
3	Primary Structural Systems	Short Term	\$ 2,000.00
4	Secondary Structural Systems	Short Term	\$ 79,500.00
5	Building Envelope	Mid Term	\$ 29,500.00
6	Roofing	Mid Term	\$ 5,500.00
7	Building Mechanical	Short Term	\$ 500.00
Total:			\$ 119,000.00

The capital costs for the recommended improvements have been **estimated in 2020 dollars**. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. The estimates have been provided to assist CoW with budgetary planning purposes only and should not be used as actual quotes. The cost estimates are exclusive of taxes.

6.11 Conclusions & Recommendations

The major findings of the facility assessment of the lift station are summarized as follows:

- The building roof requires reinforcement and proper joist hangers.
- The ladders, hatches, and guardrails are not Code compliant.
- The superstructure should be insulated and sealed with a vapour barrier.
- The floor and wall finishes should be replaced.
- There is no apparent Fire Suppression System.

A detailed breakdown of the recommendations with associated costs can be found in **Appendix A**. The recommendations are summarized in Table 6.3:

TABLE 6.3: LINDEN RECOMMENDATIONS


COMPONENT	RECOMMENDATION
SITE CONDITIONS	Trim trees and vegetation away from the building
FOUNDATION / WET WELL	
PRIMARY STRUCTURAL SYSTEMS	Install joist hangers on all roof joists Reinforce roof joists supporting the roof hatch
SECONDARY STRUCTURAL MEMBERS	Refinish wall and floor surfaces Certify monorail and lifting hooks Replace concrete equipment bases Extend grate through landing and door to remove tripping hazard Extend small stair landing to make room for door operation Replace corroding stair supports Install kick plates on guardrails where required
BUILDING ENVELOPE	Install insulation, vapour barrier, and liner in the superstructure Remove the insulated stair structure once the superstructure is insulated Repair damaged siding. Install insulating louvres Install vapour barrier and protective liner in substructure
ROOFING	Repair damaged shingles on roof ridge Replace damaged flashings and soffit
BUILDING MECHANICAL	Install handheld fire extinguisher

7.0 Mechanical Equipment Condition Assessment

7.1 Background

This section provides an assessment of the process mechanical equipment in terms of the condition of individual system components and Code and regulation compliance. The assessment identifies existing infrastructure that will require replacement or maintenance. A condition rating and priority has been given to the equipment to identify priority of future upgrades. Recommendations have been developed in order to assist CoW in prioritizing future projects. Detailed assessment forms have been appended to this report as **Appendix B**. A brief mechanical overview of the Linden Lift Station is provided in Table 7.1.

TABLE 7.1: LINDEN LIFT STATION MECHANICAL OVERVIEW		
YEAR CONSTRUCTED	1951	Pumps & Motors: 1959
PUMPING CAPACITY	58.0 L/s	
LOCATION	856 Kildonan Drive	
NUMBER OF PUMPS	Two (2)	
PUMP HORSEPOWER	P-101: 20 HP; P-102: 20 HP	
TYPE OF PUMPS	Dry Pit Solids Handling	
PIPING MATERIAL	Carbon Steel	




The lift station houses sewage pumping equipment and associated piping and valves located in the dry well lower level. The pumps and motors were installed in 1959. Various components such as valves and piping were upgraded in 2012. In 2017, the comminutor chamber piping and valve upgrades occurred. CoW Operations and Maintenance Staff have performed tasks to prolong the usable life of the equipment, including routine servicing, preventative maintenance, and building cleanup. In general, the equipment ranges from “Good” to “Poor” physical condition.

7.2 Code Review

A review of the lift station equipment was undertaken to verify compliance with current ANSI and Hydraulic Institute design standards. Table 7.2 provides a summary of the code review.

TABLE 7.2: MECHANICAL CODE REVIEW			
YEAR CONSTRUCTED	1951	Pumps & Motors: 1959	
LOCATION	856 Kildonan Drive		
PUMPS			
TYPE	Dry Pit Solids Handling		
PUMP LOCATION	Dry Well		
SUCTION SOURCE	Wet Well - Direct Piped		
PIPING			
SUCTION/DISCHARGE DIAMETER	150 mm		
MATERIAL	Carbon Steel		
ITEM	REQUIREMENT	CODE COMPLIANCE	CODE REFERENCE / NOTES
SUCTION INTAKE SUBMERGENCE	250 mm	YES	ANSI/HI 9.8-2012 Section 9.8.7
SUCTION INTAKE FLOOR CLEARANCE	75 mm	N/A	ANSI/HI 9.8-2012 Section 9.8.3.2.3.2
SUCTION INTAKE WALL CLEARANCE	75 mm	N/A	ANSI/HI 9.8-2012 Section 9.8.3.2.3.1
SUCTION BELL	Required	N/A	ANSI/HI 9.6.6-2016 Section 9.6.6.3.6
SUCTION PIPING VELOCITY	2.4 m/s	NO	ANSI/HI 9.6.6-2016 Section 9.6.6.3.1
SUCTION STRAIGHT PIPE LENGTHS	5	YES	ANSI/HI 9.6.6-2016 Section 9.6.6.3.3
PUMP VIBRATION	0.15 in/sec	NO	ANSI/HI 9.6.4-2016 Section 9.6.4.2.5
PUMP TEMPERATURE	160 F	YES	ANSI/HI 9.6.5-2016 Section 9.6.5.2.6
DISCHARGE PIPING VELOCITY	4.5 m/s	YES	ANSI/HI 9.6.6-2016 Section 9.6.6.4.1
VALVES	Isolation / check	YES	ANSI/HI 9.6.6-2016 Section 9.6.6.4.3



The velocity through the suction piping was found to be 3.1 m/s when the pumps are in operation, which exceeds the ANSI/HI recommended maximum velocity of 2.4 m/s. It is recommended that the size of the suction lines be increased during the next major piping upgrade to decrease suction line velocity and improve flow distribution to the pumps.

7.3 Pumps

The Linden Lift Station houses two (2) dry pit solids handling pumps. P-101 and P-102 are equipped with a 20 HP, 575 VAC, 3 phase, 60 Hz electric motor. P-101 and P-102 were installed in 1959 and are used regularly. Operational staff noted that maintenance is difficult on the pumps and temporary pumping is not available.

Overall, the pumps are in “Poor” condition. Table 7.3 provides a summary of the condition of the pumps at the lift station.

TABLE 7.3: LINDEN LIFT STATION PUMP CONDITION ASSESSMENT						
PUMP	DESCRIPTION	MAKE	MODEL	CONDITION	IMPORTANCE	ACTION
P-101	20 HP Dry Pit Solids Handling	Chicago	V0S0MC6	Poor	Important	Short Term
P-102	20 HP Dry Pit Solids Handling	Chicago	V0S0MC6	Poor	Important	Short Term

7.3.1 Vibration and Temperature

MPE collected onsite pump vibration and temperature measurements when the pumps were in operation. Temperature measurements were recorded on the pump motor and volute using an infrared thermometer. Vibration readings were recorded in the x, y, and z axis on the pump motor and volute using a Digital Measurement Metrology Digital Vibration Meter. Table 7.4 provides a summary of the vibration and temperature readings at the Linden Lift Station.

TABLE 7.4: LINDEN LIFT STATION PUMP VIBRATION AND TEMPERATURE					
PUMP		VIBRATION (in/s)			TEMPERATURE (F)
		x	y	z	
P-101					
	Motor	0.15	0.17	0.12	90
	Volute	0.02	0.03	0.02	59
P-102					
	Motor	0.14	0.10	0.05	87
	Volute	0.03	0.03	0.03	59

The temperature readings were found to be within the required tolerances as set out in *ANSI/HI 9.6.5-2009 Rotodynamic Pumps – Guideline for Condition Monitoring*. Pump P-101 motor vibration readings in the y-axis were found to exceed the tolerances as set out in *ANSI/HI 9.6.4-2009 Rotodynamic Pumps for Vibration Measurements and Allowable Values*.

7.4 Valves

The majority of valves are original to the building, with the exception of GAV-103B, GAV-110 and CHV-102, which were installed during the upgrade in 2012, and the gate valve in the comminutor chamber (GAV-201), which was installed in 2017. The manually actuated gate valves that are used for isolation of equipment for maintenance and are

not regularly exercised. The check valves are critical to the operation of the lift station and are exercised regularly through operation. In general, valves are in “Good” to “Poor” condition. Table 7.5 provides a summary of the condition of the valves at the Linden Lift Station.

TABLE 7.5: LINDEN LIFT STATION VALVE CONDITION ASSESSMENT					
VALVE	DESCRIPTION	SIZE	CONDITION	IMPORTANCE	ACTION
GAV-101A	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-101B	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-102A	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-102B	Gate Valve	150 mm	Poor	Intermediate	Short Term
GAV-103B	Gate Valve	150 mm	Good	Intermediate	Long Term
GAV-110	Gate Valve	250 mm	Good	Important	Long Term
GAV-201	Gate Valve	500 mm	Excellent	Important	None
CHV-101	Swing Check Valve	150 mm	Poor	Important	Short Term
CHV-102	Swing Check Valve	150 mm	Good	Important	Long Term

DRAFT

7.5 Piping & Fittings

The Linden Lift Station includes carbon steel piping for conveyance. The pipe flanges are constructed of carbon steel and use a mixture of carbon steel and stainless-steel bolts and nuts. In general, the piping is in “Good” to “Poor” condition. Table 7.6 provides a summary of the condition of the piping at the Linden Lift Station.

TABLE 7.6: LINDEN LIFT STATION PIPING CONDITION ASSESSMENT				
PIPING	MATERIAL	CONDITION	IMPORTANCE	ACTION
Influent Line	Carbon Steel	Excellent	Important	None
P-101 Suction Line	Carbon Steel	Poor	Important	Short Term
P-102 Suction Line	Carbon Steel	Poor	Important	Short Term
P-101 Discharge Line	Carbon Steel	Poor	Important	Short Term
P-102 Discharge Line	Carbon Steel	Poor	Important	Short Term
Discharge Header	Carbon Steel	Good	Important	Long Term

7.5.1 Non-Destructive Testing

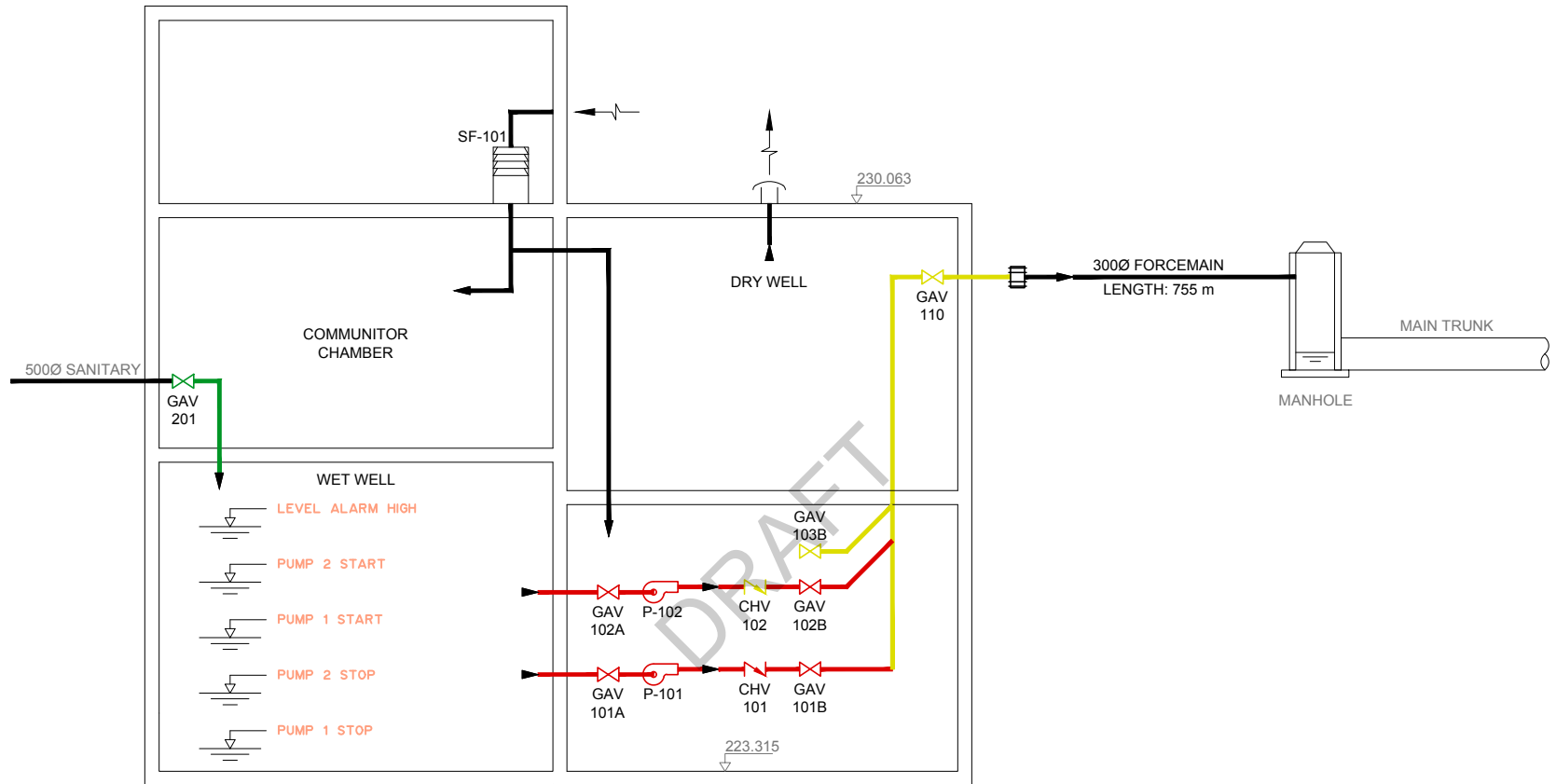
Non-destructive testing was not performed on the piping in the lift station.

7.5.2 Cathodic Protection

The lift station does not include cathodic protection and cathodic protection is not recommended for this station.

7.6 Summary of Condition Assessment

Figure 7.1 provides a graphical summary of the condition assessment of the mechanical components of the Linden Lift Station.



P-101
 - DUTY POINT: 58.04 L/s @ 16.1 m
 - 20 HP, 1180 RPM
 - 575 VAC/3 PH/60 Hz

P-102
 - DUTY POINT: 58.04 L/s @ 16.1 m
 - 20 HP, 1180 RPM
 - 575 VAC/3 PH/60 Hz

LEGEND	
—	POOR
—	FAIR
—	GOOD
—	EXCELLENT



LIFT STATION ASSESSMENTS 2020
 LINDEN
 CONDITION ASSESSMENT SUMMARY

SCALE: NTS

DATE: DEC 2020

JOB: 8400-001-00

FIGURE: 7.1

7.7 Conclusions

The major findings for the Process Mechanical Assessment are summarized as follows:

- The mechanical equipment ranges from “Good” to “Poor” physical condition.
- The pumps and some sections of piping are showing significant signs of corrosion.
- The velocity through the pump suction lines exceeds the ANSI/HI recommended maximum velocity for pump suction piping.
- The pumping system should be upgraded with new equipment.

7.8 Recommendations

7.8.1 Pump and Piping Replacement (0-5 years)

Due to the age and condition of the pumping system, it is recommended that the replacement of the pumps, piping, and valves be completed within the next 5 years.

7.9 Improvement Cost Estimates

The capital costs for the recommended improvements are summarized in Table 7.7. These costs reflect only the cost to address the items listed in the Condition Assessment Forms.

TABLE 7.7: MECHANICAL EQUIPMENT IMPROVEMENT COST ESTIMATES			
ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Short Term	Pump, Piping and Valve Replacement	\$141,000
TOTAL			\$141,000

A larger scale capital project, including the replacement of all pipes, valves, and pumps, would be a more efficient way to replacement the assets in need and to ensure reliability moving forward. A large-scale capital project like this is estimated to cost \$273,000.

The capital costs for the recommended improvements have been *estimated in 2020 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes.


8.0 Electrical Equipment Condition Assessment

8.1 Background

This section provides an assessment of the electrical equipment in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that will require replacement or maintenance. A condition rating and priority has been given to the equipment to identify priority of future upgrades. Recommendations and project timeframes have been developed in order to assist CoW in prioritizing future projects. The Condition Assessment Forms have been appended to this report.

The Linden Lift Station houses electrical equipment such as pumps, motors, and full voltage starters. A portable emergency power generator is not on site but is accessible if needed.

TABLE 8.1: LINDEN LIFT STATION ELECTRICAL OVERVIEW	
YEAR CONSTRUCTED	1951
LOCATION	856 Kildonan Drive
SERVICE	100 A
VOLTAGE	600 VAC
STANDBY GENERATOR SIZE	N/A
NUMBER OF PUMPS	2
PUMP MOTOR HORSEPOWER	20 HP



8.2 Code Review

As part of the condition assessment of the equipment and installation methods at the Linden Lift Station, MPE reviews equipment and installations to assess whether standards set forth in applicable codes and regulations are met. The Canadian Electrical Codes CSA C22.1-15 and NFPA 820 are of particular relevance for wastewater lift station electrical systems. According to the NFPA 820 Table 4.2 Row 17, a below grade or partially below grade wastewater pumping station dry well that is ventilated with fewer than 6 air changes per hour is to be classified as a Zone 2 (or Class 1 Division 2) space. The dry well and above grade building are connected through the dry well access and are therefore considered a single air space. This air space is not ventilated continuously to the minimum standards to achieve an unclassified rating. Currently, the electrical equipment within the station is not rated for use in a Zone 2 space; therefore, it is recommended that the ventilation system should be upgraded to provide the necessary air changes to achieve an unclassified rating. Row 1 of Table 9.1.1.4 in the NFPA 820 requires a minimum of 12 air changes per hour to classify a wet well as a Zone 2 (or Class 1 Division 2) air space. This lift station is unable to meet the required number of air changes per hour and is classified as a Zone 1 air space.

CSA C282 provides the standard for emergency electrical power supplies for buildings where emergency electrical supplies are required by the National Building Code of Canada, or for essential electrical systems such as health care facilities. Emergency power generation is not required at this facility under this definition, and therefore it is not required that this installation adhere to the requirements of the CSA 282 standard. Table 8.2 provides a summary of the code review.

TABLE 8.2: ELECTRICAL CODE REVIEW

YEAR CONSTRUCTED	1951		
LOCATION	856 Kildonan Drive		
WET WELL			
HAZARDOUS LOCATION CLASSIFICATION	Zone 2		
CORROSIVE ENVIRONMENT CATEGORY	Category 2		
DRY WELL			
HAZARDOUS LOCATION CLASSIFICATION	Zone 2		
CORROSIVE ENVIRONMENT CATEGORY	Category 1		
ITEM	REQUIREMENT	CODE COMPLIANCE	CODE REFERENCE / NOTES
EXPLOSION PROOF INSTALLATION	Required	NO	CSA 22.1-15 CEC Section 18, NFPA 820
AIR CHANGES FOR UNCLASSIFIED RATING	6 air changes in dry well	NO	NFPA 820
AIR CHANGES FOR ZONE 2 RATING	12 air changes in wet well	NO	NFPA 820
CORROSIVE ENVIRONMENT WIRING	Required	NO	CSA 22.1-15 CEC Section 22
MINIMUM CLEARANCE	1 m Required	YES	CSA 22.1-15 CEC Section 2-308
MOTOR OVERCURRENT PROTECTION	Motor Breakers Adequate	YES	CSA 22.1-15 CEC Section 28-200
FEEDER OVERCURRENT PROTECTION	Service Breaker Adequate	YES	CSA 22.1-15 CEC Section 28-204
EMERGENCY POWER SUPPLY	Sufficient Capacity	N/A	CSA 22.1-15 CEC Section 46-202
EMERGENCY POWER SUPPLY	Onsite Fuel Storage	N/A	CSA C282 (Not Required)



8.3 Electrical Service Entrance Equipment

The electrical service is 600 VAC, 3 Phase, 100 Amp, 60 Hz service. The lift station service is fed off a splitter from the flood pumping station service. The flood pumping station service is run underground to a service panel from a nearby power pole. The power meter is on the side of the service panel. The distribution equipment is in the main floor of the lift station, along with the service and distribution equipment for the Linden Flood Pumping Station. While both stations are located in the same building, this report is focused on the lift station only and will not be including electrical review of equipment not related to the lift station. The Linden Lift Station electrical equipment consists of disconnects, splitters, and separate starters. Current CoW guidelines prefer the use of an Motor Control Center (MCC) and Breakers. Table 8.3 provides a summary of the condition of the electrical service equipment at the Linden Lift Station.

TABLE 8.3: LINDEN LIFT STATION SERVICE ENTRANCE EQUIPMENT CONDITION ASSESSMENT

DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Service Entrance	600 VAC	Good	Important	Short Term
Lift Station Disconnect	600 VAC (100A)	Good	Important	Long Term

8.4 Cable and Conduit

The wiring style in Linden Lift Station is primarily run using rigid PVC (RPVC) and teck cable. The PVC jacket has been damaged on the dry well heater teck cable, exposing the aluminum sheath. Additionally, an improper wire clamp has been used at the junctionbox that should be replaced with an appropriate teck connector. An RPVC conduit with a hole and teck cable with a damaged plastic sheath are connected to the distribution panel. Conduit and cabling within the dry well do not meet zone 2 requirements nor does it comply with CoW electrical design guide.

8.5 Motors

The lift station is equipped with two (2) dry pit solids handling pumps. Each pump is equipped with a 575 VAC, 3 phase,

20 HP electric motor. The combined lift station and flood pumping station has 3 fan motors: a 3.25 HP Chicago Blower motor, 1.5 HP Northern Blower Motor, and an Alpha Manufacturing motor with no visible nameplate at time of inspection. The pump motors were replaced in 2009 and show only minor signs of corrosion. Overall, the motors are in “Good” condition. Table 8.4 provides a summary of the condition of the motors at the Linden Lift Station.

TABLE 8.4: LINDEN LIFT STATION MOTOR CONDITION ASSESSMENT				
DESCRIPTION	HORSEPOWER	CONDITION	IMPORTANCE	ACTION
P-101 Motor	20	Good	Important	Long Term
P-102 Motor	20	Good	Important	Long Term
Fan Motor 1	3.25	Good	Important	Mid-Term
Fan Motor 2		Good	Important	Mid-Term
Fan Motor 3	1.5	Good	Important	Mid-Term
Sump Pump		Good	Important	Mid-Term

8.5.1 Motor Circuit Analysis/ HIPOT Testing

A motor circuit analysis was not conducted.

8.6 Full Voltage Starters

Each pump is equipped with a Full Voltage Non-Reversing (FVNR) starter. The FVNRs were upgraded with the dry well electrical in 2019 (estimated). The run and fault lights on both starters are not functional. Linden Lift Station’s starters are in “Fair” condition. Table 8.5 provides a summary of the condition of the starters at the Linden Lift Station.

TABLE 8.5: LINDEN LIFT STATION MOTOR STARTER CONDITION ASSESSMENT				
DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Pump 1 FVNR	600	Good	Important	Short Term
Pump 2 FVNR	600	Good	Important	Short Term

8.7 Transformers, Panelboards, and Distribution Equipment

Distribution Equipment within the lift station is fed from a 600VAC feeder that terminates to a fused disconnect. The fused disconnect feeds a splitter which in turn feeds the starters and 120/240 VAC transformer. There are multiple abandoned pipes from the 600V splitter that are not properly capped or sealed. There is an old lighting panel near the pump motor starters that is assumed to be decommissioned, the current 120 VAC distribution panel is located under the lighting transformer. Distribution equipment within the dry well is in “Fair” condition. Table 8.6 provides a summary of the condition of the transformers, panel boards, and distribution equipment at Linden Lift Station.

**TABLE 8.6: LINDEN LIFT STATION TRANSFORMERS, PANELBOARDS, AND DISTRIBUTION EQUIPMENT
CONDITION ASSESSMENT**

DESCRIPTION	RATED VOLTAGE	CONDITION	IMPORTANCE	ACTION
Distribution Panel	120 VAC	Fair	Important	Short Term
Lighting Transformer	600 : 120/240 VAC	Good	Important	Long Term
Transformer Disconnect	600 VAC (30 A)	Good	Important	Long Term

8.7.1 Lighting

Lighting at the lift station complies with the recommended fixtures of LED or F32T8 set forth in the City of Winnipeg Design Guide. However, a fixture in the dry well was missing a bulb.

8.7.2 Emergency Lighting

No emergency lighting was present in the Linden Lift Station. The Winnipeg Design Guide calls for emergency lighting in all facilities. Addition of adequate emergency lighting to each level of the lift station as required is recommended.

8.8 **Standby Power Generators and Engines**

A portable power generator is available if required. There is currently no connection means for standby power. It is recommended that a manual transfer switch be installed for CoW Staff to connect their temporary generator to in the event of a power outage.

8.9 **Conclusions**

The major findings for the Linden Lift Station are summarized as follows:

- In general, the electrical equipment within the Lift Station is in “Good” condition.
- Emergency lighting should be installed.
- The dry well requires a ventilation upgrade for the existing electrical equipment to meet the Canadian Electrical Code.
- The plastic sheath on the dry well heater cabling is damaged. The heater wiring should be made to meet code.
- The unsealed conduit should be properly sealed to meet code.
- A manual transfer switch should be installed.
- Bonding in the lift station has been corroded and should be resistance tested to ensure solid grounding throughout.
- The run and fault status lights on the pump motor starters should be replaced.

8.10 **Recommendations**

8.10.1 Project 1: Install Emergency Lighting (0-5 years)

Install emergency lighting in each level of the lift station in compliance with the City of Winnipeg Design Guide.

8.10.2 Project 2: Install Manual Transfer Switch (0-5 years)

Currently CoW staff connects their temporary generator by terminating directly to the main breaker. This raises safety concerns at exposed live electrical parts while temporary power is connected. It is recommended that the CoW install a manual transfer switch to allow City staff to connect temporary power in a safe and efficient manner.

8.10.3 Project 3: Replace Starter Status Lights and Improper Teck Connector (0-5 years)

The status lights on the pump motor starters are dysfunctional and should be replaced. In addition, the heater feeder cable uses an improper connector that should be replaced with a teck connector.

8.11 Improvement Cost Estimates

The capital costs for the recommended improvements have been estimated and are summarized in Table 8.7. These upgrades will provide long-term benefits to waterworks system operations. The cost estimates include contingency and engineering but do not include taxes.

TABLE 8.7: LINDEN LIFT STATION RECOMMENDED PROJECTS			
Item	Action	Description	Capital Cost
1	Short Term	Install Emergency Lighting	\$1,100
2	Short Term	Manual Transfer Switch	\$8,000
3	Short Term	Replace Starter Status Lights and Teck Connector	\$1,500
Total:			\$10,600

The capital costs for the recommended improvements have been *estimated in 2020 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. Refer to Appendix B for the complete details of the capital cost estimate.

9.0 Controls & Instrumentation Conditions Assessment

9.1 Background

This section provides an assessment of the controls and instrumentation equipment in terms of the condition of individual system components and code and regulation compliance. The assessment identifies existing infrastructure that will require replacement or maintenance. A condition rating and priority has been given to the equipment, identifying future upgrades. Recommendations and project time frames are presented to assist CoW in prioritizing future projects. The Condition Assessment Forms have been appended to this report.

The Linden Lift Station control system consists of Schneider SCADAPack 357, a Rosemount Pressure Based Level Transmitter, and a Precision Digital Level Meter.

TABLE 9.1: LINDEN LIFT STATION CONTROLS & INSTRUMENTATION OVERVIEW	
YEAR CONSTRUCTED	1951
LOCATION	856 Kildonan Drive
LAST AUTOMATION UPDATE	2019 (estimated)
CONTROLLER	SCADAPack 357
PROGRAMMING SOFTWARE	TeleSafe Studio
COMMUNICATION TYPE	Cellular
SCADA SOFTWARE	N/A



9.2 Control Systems

The Linden Lift Station monitoring is handled by the SCADAPack 357 Remote Telemetry Unit (RTU). The RTU is used for monitoring and reporting only. Pump control is performed by a Precision Digital Level Meter programmed to start and stop pumps at specific levels based on the pressure-based level sensor. Currently, the station does not have control redundancy. This has been added in other lift station upgrades and would be an expected upgrade at the Linden Lift Station. Field devices include a level sensor and a flood detection level switch.

9.2.1 Manual Control

Manual controls are located on the main floor of the lift station. Hand-Off-Auto (HOA) switched are located on the front panel of each motor starter. Manual control is achieved by turning the local switch to the Hand position, and the motor becomes locally controlled by operations. Manual controls are functional and in “Fair” condition. Emergency stop buttons are located in the dry well on the wall near each pump motor.

9.2.2 Programmable Logic Controllers (PLC) and Remote Telemetry Units (RTU)

The RTU controller in use at this lift station is a SCADAPack 357 RTU. While this RTU is capable of controlling the equipment at this lift station, it is used to monitor the lift station only, such that the station control is isolated from internet-connected devices. A PLC or RTU controller allows for custom lift station operation that can be programmed by any local integrator as well as the ability to adjust setpoints and operate pumps remotely if used for pump control. Future upgrades should evaluate if these functions are desired. Options for securing communications should also be explored at that time. The condition of the RTU controller is “Good”.

9.2.3 Human Machine Interface (HMI)

Linden Lift Station is not equipped with an HMI.

9.2.4 Control Panel

The RTU control panel is located in the main floor of the lift station and contains the SCADAPack 357 as well as the Precision Digital Level Meter and all of the equipment required for reporting back to the SCADA system at McPhillips Facility. The Control Panel is in good condition. Wiring is mostly run with cable management devices such as Panduit. Terminations are secure, and cabling appears to be in “Good” condition. Wire labelling is applied to both ends of the wire, and device tagging used.

The 24V power supply’s batteries expired in August. The power supply should be replaced.

9.2.5 SCADA

The RTU controller is integrated into the central SCADA application at the McPhillips Facility. Data collected by the RTU is transmitted via cellular communication to the SCADA application.

9.2.6 Communication Hardware

Communications to the Linden Lift Station are accomplished using cellular communication. The station reports alarms to the McPhillips Control Centre SCADA application via the communication link.

Table 9.2 provides a summary of the condition of the control equipment at Linden Lift Station.

TABLE 9.2: LINDEN LIFT STATION CONTROL PANEL CONDITION ASSESSMENT				
CONTROL PANEL	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
Control Panel	Pump Controls and Monitoring	Good	Important	Short Term
Communications Equipment	Cellular Modem	Good	Important	Long Term

9.3 Instrumentation

Instrumentation at the Linden Lift Station includes one Pressure-Based Level Transmitter, and a float level switch. A flow meter should be installed to measure wastewater flow through the lift station. In general, the instrumentation is in “Good” condition. Table 9.3 provides a summary of the condition of the instrumentation at the Linden Lift Station.

TABLE 9.3: LINDEN LIFT STATION INSTRUMENTATION CONDITION ASSESSMENT				
INSTRUMENTATION	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
LT-101	Pressure-Based Level Transmitter	Good	Important	Mid Term
LSHH-101	Float Level Switch	Good	Low	Mid Term

9.3.1 Process Control

9.3.1.1 *Pumping*

The primary process control device used at the Linden Lift Station is a pressure-based level sensor. The level transmitter appears to be in “Good” condition. There is currently no redundancy in case of instrument failure. Pumps start and stop based on the wet well level determined by this device. It is recommended that a redundant level transmitter is installed to mitigate the risk of environmental damage and damage to property resulting from a flood situation.

9.3.2 Gas Monitoring

The Linden Lift Station does not have continuous gas monitoring. Within the lift station, CoW Staff utilize personal gas detection monitors.

9.3.3 Process Monitoring

The wet well level is monitored continuously using the level transmitter. The wet well level is transmitted back to the central SCADA application where they are monitored by operations staff. Issues arising from abnormal values trigger alarms and operations staff are notified to take action. Flow is not monitored at the lift station, so operators have no access to data regarding pump performance and station output.

9.3.4 Building Monitoring

Building alarms, including flood detection, are transmitted back to the central SCADA application. Operators are notified if an alarm condition exists. No heat detector or low building temperature sensor is installed at this station; it is recommended that both devices be installed.

9.4 Pump Control Strategy & Reliability Review

9.4.1 Sanitary

The pump control strategy employed at this station is a basic level-based pump control system. Each pump has a start level and a shut down level that are off set such that the additional pump is enabled as the level becomes higher. Multiple pumps increase system reliability; however, this system operates with only two pumps and does not have complete redundancy.

9.5 Conclusions

The major findings for the controls and instrumentation at Linden Lift Station are summarized as follows:

- The automation platform in use at this lift station does not provide remote set point or remote pump control capability.
- The lack of a redundant level detector presents an environmental risk if the primary level detector fails.
- No heat detectors or low building temperature sensors are installed. A Heat detector with low building temperature sensors would provide advanced warning of fire, along with alleviating the risk of freezing throughout the winter months.
- The lack of a flow meter means operators are missing data on pump performance and station flow output that could be used for preventative maintenance and future planning. Flow meters are standard equipment at Winnipeg lift stations.
- The control panel 24V power supply has expired batteries and should be replaced.

9.6 Recommendations

9.6.1 Project 1: Install Building Alarm Instruments (0-5 years)

A heat detector and low building alarm should be installed to alert operators of fire or freezing conditions at the lift station. The alarms would be transmitted back to central SCADA system allowing operators to be notified and take corrective actions.

9.6.2 Project 2: Install a Redundant Level Transmitter (0-5 years)

There is no redundant level sensor. Lift stations pose an environmental risk if left to overflow and a redundant level sensor would provide some protection from this possibility, such as a primary level sensor failure. It is recommended that an ultrasonic level transmitter be installed in case the lift station experiences an instrument failure.

9.6.3 Project 3: Install a Wastewater Flow Meter (0-5 years)

There is no wastewater flow meter. Installing a flow meter will provide valuable data on pump performance and lift station flow output.

9.6.4 Project 4: Replace 24V Power Supply (0-5 years)

The control panel 24V power supply has expired batteries and should be replaced.

9.7 Improvement Cost Estimates

The capital costs for the recommended improvements have been estimated and are summarized in Table 9.4. These upgrades will provide long-term benefits to waterworks system operations. The cost estimates include contingency and engineering but do not include taxes.

TABLE 9.4: LINDEN LIFT STATION RECOMMENDED PROJECTS			
ITEM	ACTION	DESCRIPTION	COST
1	Short Term	Install Building Alarm Instruments	\$1,400
2	Mid Term	Install a Redundant Level Transmitter	\$16,800
2	Short Term	Install a Wastewater Flow meter	\$16,000
3	Short Term	Replace 24V Power Supply Batteries	\$1,700
Total:			\$35,900

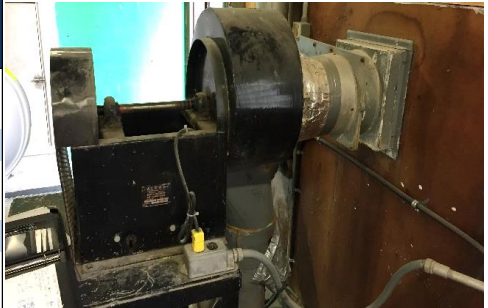
The capital costs for the recommended improvements have been **estimated in 2020 dollars**. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. Refer to **Appendix C** for the complete details of the capital cost estimate.

10.0 Dry & Wet Well Ventilation Review

10.1 Background

The Linden Lift Station dry well ventilation system includes an inline supply fan located in the building main level. The supply fan pulls fresh air from an intake louvre. The ventilation system is used intermittently when the dry well is occupied. There is no permanent wet well ventilation system in place. High levels of corrosion were noted throughout the dry well. No major ventilation upgrades have been carried out at the lift station since its original construction. In general, the equipment shows signs of aging and is in “Poor” condition.

TABLE 10.1: LINDEN LIFT STATION VENTILATION OVERVIEW		
YEAR CONSTRUCTED	1951	Upgrade: 1959
ODOUR CONTROL	No	
DRY WELL		
VENTILATION TYPE	Intermittent	
VENTILATION RATE	251 m ³ /hr	
WET WELL		
VENTILATION TYPE	N/A	
VENTILATION RATE	N/A	



10.2 Ventilation Requirement Review

Table 10.2 provides a summary of the ventilation system at the Linden Lift Station.

TABLE 10.2: LINDEN LIFT STATION VENTILATION REQUIREMENTS						
VENTILATED AREA	VOLUME (m ³)	VENTILATION FREQUENCY	REQUIRED AIR CHANGES PER HOUR	REQUIRED VENTILATION RATE (m ³ /hr)	CURRENT VENTILATION RATE (m ³ /hr)	VENTILATION TYPE
Dry Well	185	Intermittent	30	5,545	251	Supply Fan
Wet Well	74	Intermittent	30	2,214	N/A	N/A

As illustrated in Table 10.2, the dry well and wet well ventilation systems are undersized to meet NFPA 820 and Ten States ventilation requirements of 30 air changes per hour when used intermittently.

10.3 Ventilation Equipment

10.3.1 Fans, Blowers, & Blower Heaters

The supply fan was installed in 1959. MPE tested the airflow from the supply duct using a UEI CFM Anemometer to confirm building airflows. The supply fan is in “Poor” condition. Table 10.3 provides a summary of the condition of the fan at the Linden Lift Station.

TABLE 10.3: LINDEN LIFT STATION FAN CONDITION ASSESSMENT				
EQUIPMENT	DESCRIPTION	CONDITION	IMPORTANCE	ACTION
SF-101	Supply Fan	Poor	Important	Short Term

10.3.2 Intake and Exhaust Louvres and Dampers

The lift station includes a supply louvre in the main level of the building that connects to the supply fan and an exhaust line that penetrates through the roof. The louvre and exhaust line are in “Fair” operating condition.

10.3.3 Ventilation System Balancing

The ventilation system includes ducting for supply and exhaust in the dry well. No concerns were noted with pressurization in the dry well.

10.4 Odour Control System

The lift station is not fitted with an odour control system.

10.5 Conclusion

The major findings for the Ventilation System Assessment are summarized as follows:

- The dry well intermittent ventilation system is undersized for the dry well fresh air requirements.
- There is no wet well ventilation system in place. It is recommended that a portable air supply system continue to be used for the wet well ventilation system.

10.6 Recommendations

10.6.1 Dry Well Ventilation System Upgrades (0-5 years)

In order to provide a ventilation system that meets the required air changes per hour and reduces dry well corrosion and condensation, it is recommended that the existing ventilation system be upgraded to increase the capacity. The upgrades would include installation of blower heater that would connect to the existing ducting entering the dry vault to provide heated fresh air to the spaces to code requirements.

10.7 Improvement Cost Estimates

The capital costs for the recommended improvements are summarized in Table 10.4. These upgrades will provide long term benefits to the sewage works system operations. The cost estimates include contingency and engineering but do not include taxes.



TABLE 10.4: LINDEN LIFT STATION VENTILATION SYSTEM RECOMMENDED PROJECTS

ITEM	ACTION	DESCRIPTION	CAPITAL COST
1	Short Term	Dry Well Ventilation System Upgrades	\$40,000
TOTAL:			\$40,000

The capital costs for the recommended improvements have been *estimated in 2020 dollars*. The cost estimate provided is an opinion of probable cost and is a function of many factors that can change with time and hence must not be relied upon as the actual cost. Construction equipment and methods that are commonly used in the industry are assumed for estimating purposes. Refer to **Appendix A** for the complete details of the capital cost estimate.

11.0 Recommendations

11.1 Recommended Projects

A list of recommended improvements has been prepared. For each recommended item, an “Action” was assigned based on an established methodology indicating the time period when the improvement should be completed.

Through the development of recommendations relative to system improvements or upgrades, projects were identified as either “Maintenance”, “Capital”, or “Study” projects. The differentiation between “Maintenance” and “Capital” projects was established based on our understanding of the scope of the project, project cost, and the assumed ability of CoW to perform the work required utilizing in-house resources. Recommended improvements for the sewage lift station are presented in Table 11.1.

TABLE 11.1: SUMMARY OF RECOMMENDED IMPROVEMENTS - LINDEN LIFT STATION			
Item	Project Type	Action	Cost
Facility Condition Assessment			
Site Conditions	Maintenance	Mid Term	\$2,000
Foundations			
Primary Structural Systems	Capital	Short Term	\$2,000
Secondary Structural Systems	Capital	Short Term	\$79,500
Building Envelope	Capital	Short Term	\$29,500
Roofing	Maintenance	Mid Term	\$5,500
Building Mechanical	Capital	Short Term	\$500
Subtotal:			\$119,000
Mechanical Equipment Condition Assessment			
Pump Replacements	Capital	Short Term	\$76,000
Valve Replacements	Capital	Short Term	\$37,000
Pipe Replacements	Capital	Short Term	\$28,000
Subtotal:			\$141,000
Electrical Equipment Condition Assessment			
Main Service	Capital	Short Term	\$9,100
Motors			
Starters	Capital	Short Term	\$1,000
Panel	Capital	Short Term	\$500
Subtotal:			\$10,600
Controls & Instrumentation Condition Assessment			
Control Panel	Capital	Short Term	\$19,100
Install Building Alarm Instruments	Capital	Short Term	\$16,800
Subtotal:			\$35,900
Dry & Wet Well Ventilation Review			
Dry Well Ventilation System Replacement	Capital	Short Term	\$40,000
Subtotal:			\$40,000
Total			
Total Estimated Cost - All Recommended Improvements:			\$346,500

All recommendations were given an associated cost to implement. Cost estimates provided were based on engineering judgment for the component replacement value, and do not include ancillary costs associated with replacing a component. The cost estimates are intended to be used as a measure of comparing the lift stations and are not intended to be used for budgetary numbers. Actual replacement costs will require further investigation.

11.2 Code Compliance & Safety Concerns

A list of the code compliance and safety concerns for the sewage lift station are presented in Table 11.2.

TABLE 11.2: CODE COMPLIANCE & SAFETY CONCERNS - LINDEN LIFT STATION	
Item Description	Type
Site Conditions	
Foundations	
Primary Structural Systems	
Secondary Structural Systems	
Hand rails lack required hand clearance	Code Compliance
Guardrails lack kickplates and gates	Code Compliance
Stair landing / doorway is too small to allow door operation.	Code Compliance
Wood hatch lids are being used	Code Compliance
Lifting hooks are bent. No certification for lifting hooks or monorail found	Code Compliance
Stair treads are very small. They present a falling hazard	Safety
Lifting hook supports may be corroding behind insulation	Safety
Many stair supports are corroding	Safety
Building Envelope	
Roofing	
Building Mechanical	
No apparent fire suppression system	Code Compliance
Building Ventilation	
Dry well ventilation system is undersized to meet NPFA 820 ventilation requirements.	Code Compliance
Building Electrical	
Installation is not explosion-proof	Code Compliance
Wiring is not rated for corrosive environments	Code Compliance

Appendix A – Facility Condition Assessment Forms

DRAFT

**FACILITY CONDITION ASSESSMENT
 SITE CONDITIONS**



SECTION	ITEM	DATA	ASSESSMENT SCORES				AGE		
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life	
Tag: STR_Site_Conditions	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	2.0	2.4	3.0	N/A	N/A	N/A	
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5	
	Current Physical Condition	A: Site Access Road & Parking Lot: <i>Issues for Discussion:</i> - Condition of surface -potholes, mud, etc. - Proper bollards in place to protect infrastructure Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	2	0.4	NOTES & COMMENTS: Adequate parking and drainage Vehicle entry restricted by a gate at the end of the driveway Signage identifies the facility, but provides no emergency contact information				
		B: Site Grading & Landscaping: <i>Issues for Discussion:</i> - Ponding water on site - Ground sloped away from the building - Condition of vegetation on site - Trees overhanging powerlines or building - Trees blocking sight lines for access / exit Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	2	0.3	No signs of vandalism evident Slope stability at the river should not be an issue No problematic ponding noticed Some grassy areas are difficult to keep mowed Trees and vegetation have grown into contact with the structure and must be cut back				
		C: Fencing & Signage: <i>Issues for Discussion:</i> - Signage in place / visible - Fence and gate condition - Warning signage appropriate Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	2	0.3	Dead vegetation and debris should be cleared from the roof and the top of concrete tanks.				
		D: Site Access Road & Parking Lot: <i>Issues for Discussion:</i> - Sight lines entering and exiting the site - Sufficient parking space - Emergency vehicle accessibility Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	2	0.4	RECOMMENDATIONS: Remove trees and vegetation adjacent to the building Clear debris and vegetation from on top of structures		COST ESTIMATE \$ 2,000.00		
		E: Site Grading & Landscaping: <i>Issues for Discussion:</i> - Suitability of landscaping for the community - Grading sufficient to drain site Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	2	0.2					
		F: Fencing & Signage: <i>Issues for Discussion:</i> - Signage reflect important information, emergency # - Fencing and gate appropriate or needed for security Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.4					
		G: Public and Operator Safety: <i>Issues for Discussion:</i> - Historical safety incidents, or potential conditions - Evacuation of personnel (davit, gear, hatch locations) Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1					
	PHOTOGRAPHS								

FACILITY CONDITION ASSESSMENT FORM
 FOUNDATION



SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE		
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life
Tag: STR_Foundations	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	3.3	3.0	3.0	1951	N/A	N/A
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5
	Current Physical Condition	A: Base Slab: <i>Issues for Discussion:</i> - Cracking, spalling, moisture infiltration - Evidence of settlements - Sump and Pump - Groundwater seepage deterioration - Efflorescence, salts from groundwater Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.3	NOTES & COMMENTS: B: Evidence of moisture infiltration was noted around pipe penetrations in the foundation walls. It is unknown if the problem has been fixed. B: The comminutor room shows loss of surface paste due to the previous H2S environment and erosion from effluent. The concrete is structurally sound. This room requires confined space entry. Small cracks and significant surface wearing was noted on the base slab			
		B: Below Grade Exterior Walls, Columns and Beams: <i>Issues for Discussion:</i> - Cracking, spalling, moisture infiltration - Evidence of movement - Seepage through wet well wall Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.3	The station structure includes a sewage pumping station and flood pumping station. The flood pumping station is not included in the scope. The sump is in functional condition The wet well access vault has some loss of surface paste. Possible infiltration at joints. Minor corrosion on the access vault rim.			
		Wet Wells: <i>Issues for Discussion:</i> - Cracking, spalling, corrosion - Degradation at base of columns - Damage from equipment operation / removal Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.4				
		Base Slab: <i>Issues for Discussion:</i> - Sufficient space for equipment - Floor sloped sufficient to drain Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3	RECOMMENDATIONS: COST ESTIMATE			
		Below Grade Exterior Walls, Columns and Beams: <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.4				
		Wet Wells: <i>Issues for Discussion:</i> - Interference with function or equipment removal Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3				
		Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards - Evacuation of personnel (davit, gear, hatch locations) Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1				
	PHOTOGRAPHS							

FACILITY CONDITION ASSESSMENT FORM
 PRIMARY STRUCTURAL SYSTEMS



SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE			
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life	
Tag: STR_Primary_Str_Systems	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	2.9	2.6	4.0	1951	N/A	N/A	
	Current Physical Condition	A: Loadbearing walls, columns, beams: <i>Issues for Discussion:</i> - Deterioration of concrete - Corrosion of steel (beams, column base, anchors...)	2	0.4	NOTES & COMMENTS: B: The superstructure roof has been modified to include a roof hatch. Several top joists have been cut. The girders that support the cut joists bear on old joists that were not reinforced during the modification. The supporting joists should be tripled (3-2x12) to support the hatch. E: All roof joists have been nailed into end-grain for support. Proper joists hangers should be installed on all top and bottom joists. Several pipe penetrations have been drilled or cut into walls and suspended floors. The suspended slab should be analyzed to confirm that the capacity is still adequate. The superstructure walls appear structurally sound.	RECOMMENDATIONS: Reinforce the joists supporting the roof hatch		COST ESTIMATE \$ 1,000.00	
		B: Trusses and Joists: <i>Issues for Discussion:</i> - Corrosion	4	0.3		Install joist hangers on all joists and trusses		\$ 1,000.00	
		C: Suspended Floors: <i>Issues for Discussion:</i>	3	0.3					
		D: Loadbearing walls, columns, beams: <i>Issues for Discussion:</i> - Suitable access to equipment, levels - Compliance with Codes and Standards	2	0.4					
		E: Trusses and Joists: <i>Issues for Discussion:</i> - Clearance	4	0.3					
		F: Suspended Floors: <i>Issues for Discussion:</i> - Sufficient Space for layout	2	0.3					
		G: Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards - Evacuation of personnel (davit, gear, hatch locations)	3	1					
	PHOTOGRAPHS								

FACILITY CONDITION ASSESSMENT FORM
 SECONDARY STRUCTURAL SYSTEMS



SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE																				
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life																		
Tag: STR_Secondary_Str_Systems	GENERAL	<p>Secondary Structural Components: - Stairs, ladders, handrails, guardrails, catwalks, mezzanines, hatches, davits, support brackets, equipment bases.</p> <p>CODE COMPLIANCE ISSUES: Handrails lack hand clearance. Guardrails lack kickplates and a necessary gate. Stair landing / doorway is too small. Floor openings are covered with wood. Lifting lugs are bent. Lifting lugs and monorail are not certified by a third party.</p> <p>SAFETY ISSUES: Stair treads are very small. Wood hatch lids may float away in flood events. Lifting lug supports may be corroded behind insulation. Many stair supports are corroding.</p>	4.0	3.5	4.0	1951	N/A	N/A																		
	Current Physical Condition	<p>A: Stairs, Ladders, Catwalks, Rails, Hatches: <i>Issues for Discussion:</i> - Corrosion of material, anchors - Hatch seals, operability, locks</p> <p>B: Interior walls, Ceiling, Supports, Equipment Base: <i>Issues for Discussion:</i></p> <p>C: Finishes: <i>Issues for Discussion:</i> - Floor, wall, ceiling paint. Finishes on doors, etc.</p> <p>D: Monorails and Hoists: <i>Issues for Discussion:</i> - Corrosion, anchor bolts, labels - Corrosive atmosphere</p>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.5	<p>NOTES & COMMENTS: A -A hatch to the exterior is covered under the lid with wood boards. There are signs of moisture infiltration through this hatch. -Many stair supports are corroding and must be repaired. B -Equipment bases are severely damaged. C -Foundation slab and wall finishes should all be replaced. D -Several bent lifting lugs were noted. Other lifting lugs had insulation around the base such that any corrosion at the base was not visible. Corrosion due to condensation behind the insulation is suspected. The lugs should be certified by a third party -Monorails should be certified by a third party. E -The entry stairway has very small treads that are a tripping hazard. -The handrail on these stairs is not usable due to the lack of clearance. -The base landing of the entry stairs have a tripping hazard where metal grate ends in a doorway. The landing is too small for the doorway. Users must step off the landing to operate door. -An opening in a guardrail lacks a proper gate. -Many guardrails lack kickplates. -Several wood hatch lids were noted. These should be replaced.</p> <p>RECOMMENDATIONS:</p> <table border="1"> <thead> <tr> <th>RECOMMENDATIONS:</th> <th>COST ESTIMATE</th> </tr> </thead> <tbody> <tr> <td>Refinish all wall surfaces</td> <td>\$ 15,000.00</td> </tr> <tr> <td>Refinish all floor surfaces</td> <td>\$ 15,000.00</td> </tr> <tr> <td>Certify lifting lugs and monorails</td> <td>\$ 1,500.00</td> </tr> <tr> <td>Replace concrete equipment bases</td> <td>\$ 20,000.00</td> </tr> <tr> <td>Extend grate through small landing to remove tripping hazard</td> <td>\$ 5,000.00</td> </tr> <tr> <td>Extend small stair landing to make room for door operation</td> <td>\$ 5,000.00</td> </tr> <tr> <td>Replace corroding stair supports</td> <td>\$ 8,000.00</td> </tr> <tr> <td>Install kick plates and a gate on guardrails where required.</td> <td>\$ 10,000.00</td> </tr> </tbody> </table>			RECOMMENDATIONS:	COST ESTIMATE	Refinish all wall surfaces	\$ 15,000.00	Refinish all floor surfaces	\$ 15,000.00	Certify lifting lugs and monorails	\$ 1,500.00	Replace concrete equipment bases	\$ 20,000.00	Extend grate through small landing to remove tripping hazard	\$ 5,000.00	Extend small stair landing to make room for door operation	\$ 5,000.00	Replace corroding stair supports	\$ 8,000.00	Install kick plates and a gate on guardrails where required.	\$ 10,000.00
	RECOMMENDATIONS:	COST ESTIMATE																								
	Refinish all wall surfaces	\$ 15,000.00																								
	Refinish all floor surfaces	\$ 15,000.00																								
	Certify lifting lugs and monorails	\$ 1,500.00																								
	Replace concrete equipment bases	\$ 20,000.00																								
	Extend grate through small landing to remove tripping hazard	\$ 5,000.00																								
	Extend small stair landing to make room for door operation	\$ 5,000.00																								
	Replace corroding stair supports	\$ 8,000.00																								
Install kick plates and a gate on guardrails where required.	\$ 10,000.00																									
Fitness for Purpose	<p>E: Stairs, Ladders, Catwalks, Rails, Hatches: <i>Issues for Discussion:</i> - Corrosion resistance of material - Suitable access to equipment, levels - Compliance with Codes and Standards</p> <p>F: Interior walls, Ceiling, Supports, Equipment Base: <i>Issues for Discussion:</i></p> <p>G: Finishes: <i>Issues for Discussion:</i> - Floor and wall protection.</p> <p>H: Monorails and Hoists: <i>Issues for Discussion:</i> - Transport of equipment to accessible area - Certificated by others</p>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	4	0.5																						
Safety	<p>I: Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards - Evacuation of personnel (davits, gear, hatch locations)</p>	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	4	1																						
PHOTOGRAPHS																										

FACILITY CONDITION ASSESSMENT FORM
 BUILDING ENVELOPE



SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE		
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life
Tag: STR_Building_Envelope	GENERAL	Building Envelope Components: - Siding, Doors, Windows, Insulation, Vapour Barrier, Liners, Flashings, Soffits, Sealants, Weatherstripping CODE COMPLIANCE ISSUES: SAFETY ISSUES:	3.4	3.0	3.0	1951	25	0
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5
	Current Physical Condition	A: Exterior Siding, Windows, Doors: <i>Issues for Discussion:</i> - Weathering, deterioration - Door swing, seals, locks - Graffiti, vandalism - UV breakdown Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.4	NOTES & COMMENTS: B -The superstructure lacks insulation, a vapour barrier, and interior lining. Insulation is damaged. E -The substructure is lined with insulation, but has no vapour barrier, liner, or protective board. Condensation behind the insulation is suspected. Vinyl siding and some exterior penetrations are damaged. Signs of infiltration through hatch to exterior covered with wood boards Damaged flashings			
		B: Insulation, Vapour Barrier, Interior Liner: <i>Issues for Discussion:</i> - Interior frost, condensation Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.4				
		C: Flashings, Soffits, Sealants, Weatherstripping: <i>Issues for Discussion:</i> - UV breakdown Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.2				
	Fitness for Purpose	D: Exterior Siding, Windows, Doors: <i>Issues for Discussion:</i> - Door size, durability of siding Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	2	0.4	RECOMMENDATIONS: remove small insulated structure around stairs. Install insulation, vapour barrier, and liner to the superstructure.	COST ESTIMATE \$ 17,000.00		
		E: Insulation, Vapour Barrier, Interior Liner: <i>Issues for Discussion:</i> - Adequate insulation, durability of liner Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	4	0.4	Repair damaged exterior siding and install insulating louvres \$ 7,500.00 Install vapour barrier and protective liner in substructure \$ 5,000.00			
		F: Flashings, Soffits, Sealants, Weatherstripping: <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.2				
	Safety	G: Public and Operator Safety: <i>Issues for Discussion:</i> - Potential safety hazards Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1				
	PHOTOGRAPHS							

FACILITY CONDITION ASSESSMENT FORM
 ROOFING



SECTION	ITEM	DATA	ASSESSMENT SCORES			AGE		
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life
Tag: STR_Roofing	GENERAL	CODE COMPLIANCE ISSUES: SAFETY ISSUES:	3.2	3.0	3.0	1951	25	0
			Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5
	Current Physical Condition	A: Roof Membrane, Insulation, Decking: <i>Issues for Discussion:</i> Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.5	NOTES & COMMENTS: A: Roof ridge missing a shingle C: Damaged flashings and soffit Trees have grown into contact with the roof and may cause damage Debris has gathered on the roof and should be cleared			
		B: Skylights, Hatches, Penetrations: <i>Issues for Discussion:</i> Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.3				
		C: Flashings, Trim, Gutters, Downspouts: <i>Issues for Discussion:</i> Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	0.2				
		D: Roof Membrane, Insulation, Decking: <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.5	RECOMMENDATIONS: Repair roof ridge		COST ESTIMATE \$ 500.00	
		E: Skylights, Hatches, Penetrations: <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3	Replace damaged flashings and soffit		\$ 5,000.00	
		F: Flashings, Trim, Gutters, Downspouts: <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.2				
		G: Public and Operator Safety: <i>Issues for Discussion:</i> - Roof Tie-off Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1				
	PHOTOGRAPHS							

**FACILITY CONDITION ASSESSMENT FORM
 BUILDING MECHANICAL**



SECTION	ITEM	DATA	ASSESSMENT SCORES				AGE						
			Current Physical Condition	Fitness For Purpose	Safety	Year Installed	Expected Service Life	Remaining Service Life					
Tag: STR_Building_Mechanical	GENERAL	CODE COMPLIANCE ISSUES: No apparent Fire Suppression System	3.3	3.6	3.0	1959	25	0					
		SAFETY ISSUES:	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5					
	Current Physical Condition	Heating and Ventilation Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	2	0.3	NOTES & COMMENTS: Unit heater replaced recently. No apparently Fire Suppression System.							
		Interior Plumbing: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	3	0.4								
		Fire Suppression Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	5	0.3								
	Fitness for Purpose	Heating and Ventilation Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.3					RECOMMENDATIONS:		COST ESTIMATE	
		Interior Plumbing: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	3	0.4					Install handheld fire extinguisher		\$ 500.00	
		Fire Suppression Systems: <i>Issues for Discussion:</i>	Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	5	0.3								
	Safety	Public and Operator Safety: <i>Issues for Discussion:</i> - Monitors, Alarms	Rating 1: No Public Safety issues Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1								
	PHOTOGRAPHS												

VENTILATION CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA		ASSESSMENT SCORES			AGE		
		Current Physical Condition	Fitness For Purpose	Safety	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Tag: VENTILATION SYSTEM	GENERAL	Ventilation Systems: - Wet Well, Dry Well		4.0	4.0	3.0	1959	25	0
		CODE COMPLIANCE ISSUES: -Dry well ventilation system is undersized to meet NFPA 820 ventilation requirements.							
		SAFETY ISSUES:							
				Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5
		Current Physical Condition	Wet Well Ventilation <i>Issues for Discussion:</i> Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	0	0	NOTES & COMMENTS: No wet well ventilation system.			
			Dry Well Ventilation <i>Issues for Discussion:</i> Rating 1 (Excellent Condition) Rating 2 (Good Condition) Rating 3 (Functional Condition) Rating 4 (Poor Condition) Rating 5 (Not Functional)	4	1	Dry well ventilation system is undersized to meet NFPA 820 ventilation requirements of 30 air changes per hour when used intermittently.			
	Fitness for Purpose	Wet Well Ventilation <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	0	0	RECOMMENDATIONS: Replace Dry Well Ventilation System		COST ESTIMATE \$ 40,000.00		
		Dry Well Ventilation <i>Issues for Discussion:</i> Rating 1 (Excellent - performs for intended purpose) Rating 2 (Good - well suited for intended purpose) Rating 3 (Functional - performs adequately) Rating 4 (Poor - not suitable for intended purpose) Rating 5 (Fail - does not meet any requirements)	4	1					
	Safety	Operator Safety <i>Issues for Discussion:</i> - Monitors, Alarms Rating 1: No safety hazard conditions Rating 3: No record of incidents, possible concerns Rating 5: Historic incidents or probable safety risks	3	1					
	PHOTOGRAPHS								

Appendix B – Pump Condition Assessment Forms

DRAFT

Project No.: 8400-001-02
 Tag: P_101
 Facility: Linden Lift Station
 Assessment Page 1 of 1

PUMP CONDITION ASSESSMENT FORM



Assessor: Ryan Ursu
 Date: 15-Jul-20
 Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: P_101 Description: Dry Pit Solids Handling	GENERAL	Location: Dry Well Lower Level	4.4	3.0	2.7		1959	25	0	
		Type: 20 HP Vertical End Suction								
		Description: Dry Pit Solids Handling								
		Manufacturer: Chicago Pump								
		Model: V050MC6								
		RPM: 1150								
		Rated Voltage: 575 VAC								
	Rated Current: 22 A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5			
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	5	0.2	VIBRATION (in/s) Motor 0.15 0.17 0.12 Volute 0.02 0.03 0.02				
		Equipment Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2	NOTES & COMMENTS: Pump is at the end of its service life. Severe corrosion noted on pump. Temporary pumping is not available.				
		Condition of Pump Accessories: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.1	P-102 is not meeting the published capacity. Pump models are dated and spare parts have to be manufactured.				
		Rebuild Potential of Pump: Issues for Discussion:	Rating 1 (N/A - Pump is New) Rating 2 (Pump Re-Build Feasible) Rating 3 (Pump Rebuild / Replace Equally Feasible) Rating 4 (Approaching End of Useful Life) Rating 5 (At or Surpassed Useful Life)	5	0.2	P-101 and P-102 currently operate at the same time and do not alternate due to leaking through check valve (CHV-101).				
		Occurrence of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	4	0.3	High vibration noted on pump motor.				
	Fitness for Purpose	Design Flow Rate: Issues for Discussion:	Rating 1 (Pump consistently provides design flow rate) Rating 2 (Pump consistently provides +/- 10% of design flow rate) Rating 3 (Pump consistently provides +/- 25% of design flow rate) Rating 4 (Pump performance a potential issue during high flow events) Rating 5 (Pump performance a critical issue)	4	0.2	RECOMMENDATIONS Replace Pump \$ 38,000.00				
		Pump Redundancy: Issues for Discussion:	Rating 1 (100% Redundancy) Rating 3 (50% Redundancy) Rating 5 (No Redundancy, Risk of Critical Failure)	5	0.2					
Appropriate Pump Type for Application: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper pump selection for application, Risk of Critical Failure)	1	0.2						
Available Water Supply for Pumps (If Required): Issues for Discussion:		Rating 1 (Yes) Rating 2 (No - Not required for installed pumping equipment) Rating 3 (Yes - Flow / pressure inadequate for installed pumping equipment) Rating 4 (No - Available source on site but not connected) Rating 5 (No - No available source)	1	0.1						
Pump Capacity: Issues for Discussion:		Rating 1 (Pump has sufficient capacity for current and projected demand conditions) Rating 2 (Pump has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Pump has sufficient capacity) Rating 4 (Pump does not meet current demand condition) Rating 5 (Pump is critically undersized and likelihood of station backup is high)	3	0.3						
Maintainability and Operability		Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.25					
	Piping/Equipment Interference with Pump Removal: Issues for Discussion:	Rating 1 (No interference) Rating 2 (Yes - Some minor piping/equipment interference with pump removal) Rating 3 (Yes - Piping/equipment interference causes minor alteration of work method) Rating 4 (Yes - Piping/equipment interference causes major alteration of work method) Rating 5 (Yes - Piping/equipment interference prevents safe removal of pumps)	2	0.2						
	Provision of Direct Lift Spot for Pump Removal: Issues for Discussion:	Rating 1 (Yes - Accessible unobstructed direct lift spot for pump removal) Rating 2 (Yes - Accessible direct lift spot for pump removal, with minor obstructions) Rating 3 (Yes - Direct lift spot with limited access and minor obstructions) Rating 4 (Yes - Direct lift spot with difficult access and major obstructions) Rating 5 (No provision for direct pump removal)	3	0.1						
	Pumping Equipment Uniformity: Issues for Discussion:	Rating 1 (Yes - All installed pumps are identical model and duty point) Rating 2 (Yes - All installed pumps are identical model with varying duty points) Rating 3 (No - All installed pumps are different models, but same manufacturer) Rating 4 (No - All installed pumps are different models and different manufacturers) Rating 5 (No - Pump record information (design duty point) is not known)	1	0.2						
	Availability of Spare Parts: Issues for Discussion:	Rating 1 (Yes - Spare parts readily available with < 6 week lead time) Rating 2 (Yes - Spare parts readily available with 6-8 week lead time) Rating 3 (Yes - Spare parts readily available with > 8 week lead time) Rating 4 (Yes - Select spare parts available with varying lead times) Rating 5 (No - Spare parts no longer available for this equipment)	5	0.25						
PHOTOGRAPHS										

Project No.: 8400-001-02
 Tag: P_102
 Facility: Linden Lift Station
 Assessment Page 1 of 1

PUMP CONDITION ASSESSMENT FORM



Assessor: Ryan Ursu
 Date: 15-Jul-20
 Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
GENERAL	Location:	Dry Well Lower Level	4.4	3.0	2.7		1959	25	0	
	Type:	20 HP Vertical End Suction								
	Description:	Dry Pit Solids Handling								
	Manufacturer:	Chicago Pump								
	Model:	V050MC6								
	RPM:	1150								
	Rated Voltage:	575 VAC								
	Rated Current:	22 A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	5	0.2	VIBRATION (in/s) Motor 0.14 0.10 0.05 Volute 0.03 0.03 0.03 NOTES & COMMENTS: Pump is at the end of its service life. Severe corrosion noted on pump. Temporary pumping is not available. P-102 is not meeting the published capacity. Pump models are dated and spare parts have to be manufactured. P-101 and P-102 currently operate at the same time and do not alternate due to leaking through check valve (CHV-101).				
		Equipment Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2					
		Condition of Pump Accessories: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.1					
		Rebuild Potential of Pump: Issues for Discussion:	Rating 1 (N/A - Pump is New) Rating 2 (Pump Re-Build Feasible) Rating 3 (Pump Rebuild / Replace Equally Feasible) Rating 4 (Approaching End of Useful Life) Rating 5 (At or Surpassed Useful Life)	5	0.2					
		Occurrence of Maintenance Issues: Issues for Discussion:	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	4	0.3					
		Design Flow Rate: Issues for Discussion:	Rating 1 (Pump consistently provides design flow rate) Rating 2 (Pump consistently provides +/- 10% of design flow rate) Rating 3 (Pump consistently provides +/- 25% of design flow rate) Rating 4 (Pump performance a potential issue during high flow events) Rating 5 (Pump performance a critical issue)	4	0.2					
		Pump Redundancy: Issues for Discussion:	Rating 1 (100% Redundancy) Rating 3 (50% Redundancy) Rating 5 (No Redundancy, Risk of Critical Failure)	5	0.2					
Appropriate Pump Type for Application: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper pump selection for application, Risk of Critical Failure)	1	0.2						
Available Water Supply for Pumps (If Required): Issues for Discussion:		Rating 1 (Yes) Rating 2 (No - Not required for installed pumping equipment) Rating 3 (Yes - Flow / pressure inadequate for installed pumping equipment) Rating 4 (No - Available source on site but not connected) Rating 5 (No - No available source)	1	0.1						
Pump Capacity: Issues for Discussion:		Rating 1 (Pump has sufficient capacity for current and projected demand conditions) Rating 2 (Pump has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Pump has sufficient capacity) Rating 4 (Pump does not meet current demand condition) Rating 5 (Pump is critically undersized and likelihood of station backup is high)	3	0.3						
Fitness for Purpose	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.25	RECOMMENDATIONS Replace Pump					COST ESTIMATE \$ 38,000.00
	Piping/Equipment Interference with Pump Removal: Issues for Discussion:	Rating 1 (No interference) Rating 2 (Yes - Some minor piping/equipment interference with pump removal) Rating 3 (Yes - Piping/equipment interference causes minor alteration of work method) Rating 4 (Yes - Piping/equipment interference causes major alteration of work method) Rating 5 (Yes - Piping/equipment interference prevents safe removal of pumps)	2	0.2						
	Provision of Direct Lift Spot for Pump Removal: Issues for Discussion:	Rating 1 (Yes - Accessible unobstructed direct lift spot for pump removal) Rating 2 (Yes - Accessible direct lift spot for pump removal, with minor obstructions) Rating 3 (Yes - Direct lift spot with limited access and minor obstructions) Rating 4 (Yes - Direct lift spot with difficult access and major obstructions) Rating 5 (No provision for direct pump removal)	3	0.1						
	Pumping Equipment Uniformity: Issues for Discussion:	Rating 1 (Yes - All installed pumps are identical model and duty point) Rating 2 (Yes - All installed pumps are identical model with varying duty points) Rating 3 (No - All installed pumps are different models, but same manufacturer) Rating 4 (No - All installed pumps are different models and different manufacturers) Rating 5 (No - Pump record information (design duty point) is not known)	1	0.2						
	Availability of Spare Parts: Issues for Discussion:	Rating 1 (Yes - Spare parts readily available with < 6 week lead time) Rating 2 (Yes - Spare parts readily available with 6-8 week lead time) Rating 3 (Yes - Spare parts readily available with > 8 week lead time) Rating 4 (Yes - Select spare parts available with varying lead times) Rating 5 (No - Spare parts no longer available for this equipment)	5	0.25						
PHOTOGRAPHS										

Appendix C – Electrical & Communication Condition Assessment Forms

DRAFT

ELECTRICAL SERVICE CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE								
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE						
Equipment Tag: E_Service_101 Description: Service Entrance Equipment	GENERAL	Location: Lift/Flood Station Main Floor	3.1	2.7			2010	40	30						
		Description: Service Entrance Equipment													
		Phase: 3													
		Rated Voltage: 600 VAC													
		Rated Current: 250 A													
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5								
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Wires blackened where exposed. Linden uses splitters and individually mounted devices instead of a MCC. Grounding wire and termination to water main are heavily corroded. Service capacity calculation is slightly over 85%.										
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4											
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1											
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4											
	Fitness for Purpose	Meets City Electrical Design Guide: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	3	0.2	<table border="1"> <thead> <tr> <th colspan="2">COST ESTIMATE</th> </tr> </thead> <tbody> <tr> <td>Manual Transfer Switch</td> <td>\$ 8,000.00</td> </tr> <tr> <td>Emergency Lighting</td> <td>\$ 1,100.00</td> </tr> </tbody> </table>					COST ESTIMATE		Manual Transfer Switch	\$ 8,000.00	Emergency Lighting	\$ 1,100.00
		COST ESTIMATE													
		Manual Transfer Switch	\$ 8,000.00												
		Emergency Lighting	\$ 1,100.00												
		Standby Generator Needed & Present: <i>Issues for Discussion:</i> Rating 1 (Yes / Not needed) Rating 3 (Needed / Portable Generator) Rating 5 (Needed / Not Available)	5	0.2											
Is Main Breaker Present & Appropriate: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (Present, not appropriate) Rating 5 (Not Present)		1	0.05												
Is Grounding System Present & Appropriate: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (Present, not appropriate) Rating 5 (Not Present)		1	0.1												
Is Utility Service appropriate: (600V/3PH) <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.1													
Has the Service Capacity Been Reached? <i>Issues for Discussion:</i> Requires review of service calculation. Rating 1 (Service < 85% capacity) Rating 3 (Service 85% - 99% capacity) Rating 5 (Service > 99% capacity)	3	0.1													
Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.25													
PHOTOGRAPHS															

PANELBOARD CONDITION ASSESSMENT FORM




Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Dist_Panel_101 Description: Distribution Panelboard	GENERAL	Location: Lift/Flood Station Main Floor	3.4	4.0			1999	40	19	
		Description: Distribution Panelboard								
		Manufacturer: Schneider Electric / Square D								
		Model:								
		Phase: 1								
		Rated Voltage: 120								
		Rated Current: 100A								
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Some conduit appears newer than the distribution panel. Two wires exit the panel with no conduit, one RPVC conduit has a hole near the panel, and one of the teck cables has a damaged sheath. Where visible, wires were black with corrosion. Nameplate not visible. Unit installed upside down, does not impact function. No panel schedule. Two open knockouts do not have fillers installed RECOMMENDATIONS: Replace damaged Teck Connector				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i>	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i>		Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	4	0.1						
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4	COST ESTIMATE \$ 500.00					
Meets City Electrical Design Standards: <i>Issues for Discussion:</i>		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	5	0.25						
Has the Capacity been Reached? <i>Issues for Discussion:</i>		Rating 1 (Panel < 70% Full) Rating 2 (Panel < 90% Full) Rating 3 (Panel > 90 Full or Loaded) Rating 4 (Panel Full but not Loaded) Rating 5 (Panel 100% Full or Loaded)	3	0.25						
Fitness for Purpose	Equipment Remaining Service Life: <i>Issues for Discussion:</i>	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.5						
	PHOTOGRAPHS									

TRANSFORMER CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Transformer_101 Description: Lighting transformer	GENERAL	Location: Main Floor, Ceiling	3.0	2.2			1999	40	19
		Description: Lighting transformer							
		Manufacturer:							
		Model:							
		Phase: 3							
		Rated Voltage: 600 VAC: 120/240 VAC							
		Rated kVA: 15							
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
		Equipment Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Installation year estimated.			
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i>	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4				
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1				
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i>	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4				
		Meets City Electrical Design Standards: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.2				
		Current Physical Condition				RECOMMENDATIONS:			
		Fitness for Purpose				COST ESTIMATE			
	Has the Capacity been Reached? <i>Issues for Discussion:</i>	Rating 1 (<75%) Rating 2 (<85%) Rating 3 (<95%) Rating 4 (At capacity) Rating 5 (Above capacity)	1	0.4					
	Equipment Remaining Service Life: <i>Issues for Discussion:</i>	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.4					
	PHOTOGRAPHS								

HEATER CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Heater Description: Electric Heater	GENERAL	Location: Dry Well	3.3	2.5			2010	15	5
		Description: Electric Heater							
		Manufacturer:							
		Model:							
		Rated Voltage:							
		Phase:							
		Rated Current:							
		Rating	Weight	<u>Recommended Frequency of Review:</u> (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Improper connectors. There is a gap in the teck cable sheath. Name plate was not visible.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)		4	0.1						
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		2	0.4						
Fitness for Purpose	Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.5	RECOMMENDATIONS: Replace improper connectors					
	Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	4	0.5						COST ESTIMATE \$ 500.00
PHOTOGRAPHS									

Project No.: 8400-001-02
 Tag: E_Starter_101
 Facility: Lift Station
 Assessment Page 1 of 1

FVNR CONDITION ASSESSMENT FORM



Assessor: Noah Zanyk
 Date: 10-Dec-20

Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Starter_101 Description: Pump 1 FVNR	GENERAL	Location: Lift/Flood Station Main Floor	3.0	1.5			2010	40	30
		Description: Pump 1 FVNR							
		Manufacturer: Eaton - Cutler Hammer							
		Model: CN15GN3							
		Phase: 3							
		Rated Voltage: 600 VAC							
		Rated Horsepower: 26 HP							
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Run and fault lights not functional RECOMMENDATIONS: Replace Status Lights COST ESTIMATE \$ 500.00				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)		1	0.1						
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		2	0.4						
Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)		1	0.25						
Fitness for Purpose	Has the Breaker Capacity been Reached? <i>Issues for Discussion:</i> Review starts per hour vs. recommendation Rating 1 (< 80% rec. starts / hour) Rating 3 (80% - 95% rec. starts / hour) Rating 5 (>95% rec. starts / hour)	1	0.25						
	Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.5						
PHOTOGRAPHS									

FVNR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Starter_102 Description: Pump 2 FVNR	GENERAL	Location: Lift/Flood Station Main Floor	3.0	1.5			2010	40	30	
		Description: Pump 2 FVNR								
		Manufacturer: Cutler - Hammer								
		Model: CN15GN3								
		Phase: 3								
		Rated Voltage: 600 VAC								
	Rated Horsepower: 26 HP	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Run and fault lights not functional.					
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4						
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1						
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		2	0.4							
Fitness for Purpose	Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	RECOMMENDATIONS: Replace Status Lights						
	Has the Breaker Capacity been Reached? <i>Issues for Discussion:</i> Review starts per hour vs. recommendation Rating 1 (< 80% rec. starts / hour) Rating 3 (80% - 95% rec. starts / hour) Rating 5 (>95% rec. starts / hour)	1	0.25						COST ESTIMATE \$ 500.00	
	Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.5							
PHOTOGRAPHS										

MOTOR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Motor_101 Description: P101 Motor	GENERAL	Location: Dry Well	3.1	1.5			2009	40	29
		Description: P101 Motor							
		Manufacturer: Brook Crompton Parkinson Limited							
		Model: K286TC							
		Horsepower: 20 HP							
		Rated Voltage: 575 VAC							
		Phase: 3							
		Rated Current: 22 A							
	RPM: 1150	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone.				
Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)		5	0.4						
Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)		1	0.1						
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		2	0.4						
Fitness for Purpose	Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	RECOMMENDATIONS: COST ESTIMATE					
	Has the Capacity been Reached? <i>Issues for Discussion:</i> Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	1	0.5						
	Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.25						
PHOTOGRAPHS									



MOTOR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Motor_102 Description: P102 Motor	GENERAL	Location: Dry Well	3.2	1.5			2009	40	29
		Description: P102 Motor							
		Manufacturer: Brook Crompton Parkinson Limited							
		Model: K286TC							
		Horsepower: 20 HP							
		Rated Voltage: 575 VAC							
		Phase: 3							
		Rated Current: 22 A							
	RPM: 1150	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone.			
Canadian Electrical Code Issues Identified: Issues for Discussion:		Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Wiring Terminations Visual Inspection: Issues for Discussion:		Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	2	0.1					
Occurrences of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
Meets City Electrical Design Standards: Issues for Discussion:		Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
Fitness for Purpose	Has the Capacity been Reached? Issues for Discussion:	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	1	0.5	RECOMMENDATIONS: COST ESTIMATE				
	Equipment Remaining Service Life: Issues for Discussion:	Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.25					
PHOTOGRAPHS									



MOTOR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Fan_Motor_1 Description: Fan Motor	GENERAL	Location: Lift/Flood Station Main Floor	3.1	1.8			1999	40	19
		Description: Fan Motor							
		Manufacturer: Chicago Blower							
		Model: Vame Axial 36-1/2 W 9							
		Horsepower: 3.25							
		Rated Voltage:							
		Phase:							
		Rated Current:							
	RPM: 701	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Install year is estimated.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	RECOMMENDATIONS: COST ESTIMATE				
		Has the Capacity been Reached? <i>Issues for Discussion:</i> Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	1	0.5					
Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)		4	0.25						
PHOTOGRAPHS									

MOTOR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Fan_Motor_2 Description: Fan Motor	GENERAL	Location: Lift/Flood Station Main Floor	3.2	1.8			1999	40	19
		Description: Fan Motor							
		Manufacturer: Alpha							
		Model: BF 1050							
		Horsepower:							
		Rated Voltage:							
		Phase:							
		Rated Current:							
	RPM:	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Install year is estimated.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	2	0.1					
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
		Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
	Fitness for Purpose	Has the Capacity been Reached? <i>Issues for Discussion:</i> Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	1	0.5	RECOMMENDATIONS: COST ESTIMATE				
Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)		4	0.25						
PHOTOGRAPHS									

MOTOR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: E_Fan_Motor_3 Description: Fan Motor	GENERAL	Location: Lift/Flood Station Main Floor	3.0	1.3			2010	40	30	
		Description: Fan Motor								
		Manufacturer: Northern Blower								
		Model: 7530								
		Horsepower: 1.5								
		Rated Voltage:								
		Phase:								
		Rated Current:								
	RPM: 2885 (Max)	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Install year is estimated.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i>	Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i>	Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
		Meets City Electrical Design Standards: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25					
	Fitness for Purpose	Has the Capacity been Reached? <i>Issues for Discussion:</i>	Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	1	0.5	RECOMMENDATIONS: COST ESTIMATE				
Equipment Remaining Service Life: <i>Issues for Discussion:</i>		Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	2	0.25						
PHOTOGRAPHS										

MOTOR CONDITION ASSESSMENT FORM



SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: E_Sump_Pump_101 Description: Sump Pump	GENERAL	Location: Dry Well	3.0	1.5			2010	15	5
		Description: Sump Pump							
		Manufacturer:							
		Model:							
		Horsepower:							
		Rated Voltage: 120 V							
		Phase: 1							
		Rated Current:							
	RPM:	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Meets City Electrical Design Standards: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.25	RECOMMENDATIONS: COST ESTIMATE				
		Has the Capacity been Reached? <i>Issues for Discussion:</i> Rating 1 (Below service factor) Rating 2 (Occasional within service factor) Rating 3 (Frequent within service factor) Rating 4 (Always Within Service Factor) Rating 5 (> Service Factor)	1	0.5					
Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)		3	0.25						
PHOTOGRAPHS									

Appendix D – Pipe Work & Valves Condition Assessment Forms

DRAFT

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_101A Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.4	3.1	1.6		1959	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: Crane								
		Valve Model: N/A								
		Actuation: Manual Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.2	NOTES & COMMENTS: Severe surface corrosion noted on valve. Valve is at the end of its service life.				
		Valve Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2	The velocity through the gate valve was found to be 3.1 m/s when the pumps are in operation, which exceeds the ANSI/HI recommended maximum velocity of 2.4 m/s.				
Valve Operation: Issues for Discussion:		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3						
Fitness For Purpose	Appropriate Valve Configuration: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 8,000.00			
	Valve Capacity: Issues for Discussion:	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	4	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_101B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.4	2.4	1.6		1959	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: Crane								
		Valve Model: N/A								
		Actuation: Manual Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.2	NOTES & COMMENTS: Severe surface corrosion noted on valve. Valve is at the end of its service life.				
		Valve Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2					
Valve Operation: Issues for Discussion:		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3						
Fitness For Purpose	Appropriate Valve Configuration: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 8,000.00			
	Valve Capacity: Issues for Discussion:	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	3	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_102A Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.4	3.1	1.6		1959	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: Crane								
		Valve Model: N/A								
		Actuation: Manual Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.2	NOTES & COMMENTS: Severe surface corrosion noted on valve. Valve is at the end of its service life.				
		Valve Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2	The velocity through the gate valve was found to be 3.1 m/s when the pumps are in operation, which exceeds the ANSI/HI recommended maximum velocity of 2.4 m/s.				
Valve Operation: Issues for Discussion:		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3						
Fitness For Purpose	Appropriate Valve Configuration: Issues for Discussion:	Rating 1 (Yes) Rating 2 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 8,000.00			
	Valve Capacity: Issues for Discussion:	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	4	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_102B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	3.4	2.4	1.6		1959	25	0	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: Crane								
		Valve Model: N/A								
		Actuation: Manual Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.2	NOTES & COMMENTS: Severe surface corrosion noted on valve. Valve is at the end of its service life.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	4	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 8,000.00			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	3	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_103B Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	1.2	1.0	1.0		2012	25	17	
		Description: Gate Valve								
		Size: 150 mm								
		Valve Make: NIBCO								
		Valve Model: C227								
		Actuation: Manual Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	1	0.2	NOTES & COMMENTS: Minor surface corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	1	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	1	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: GAV_110 Description: Gate Valve	GENERAL	Location: Dry Well Lower Level	1.7	1.0	2.0		2012	25	17	
		Description: Gate Valve								
		Size: 250 mm								
		Valve Make: N/A								
		Valve Model: N/A								
		Actuation: Manual Handwheel								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	2	0.2	NOTES & COMMENTS: Minor surface corrosion noted on valve.				
		Valve Corrosion Noted: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.2					
Valve Operation: <i>Issues for Discussion:</i>		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	2	0.3						
Occurrence of Maintenance Issues: <i>Issues for Discussion:</i>		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3						
Fitness For Purpose	Appropriate Valve Configuration: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE			
	Valve Capacity: <i>Issues for Discussion:</i>	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: <i>Issues for Discussion:</i>	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	2	0.4						
PHOTOGRAPHS										

VALVE CONDITION ASSESSMENT FORM





Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: GAV_201 Description: Gate Valve	GENERAL	Location: Dry Well	1.0	1.0	1.0	2017	25	22	
		Description: Gate Valve							
		Size: 500 mm							
		Valve Make: Clow Valve							
		Valve Model: Series 50							
		Actuation: Manual - Hand Wheel c/w Valve Extension							
		Actuator Make: Rotork							
	Actuator Model: 4A2028P	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	1	0.2	NOTES & COMMENTS: Valve in excellent condition.			
		Valve Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.2				
Valve Operation: Issues for Discussion:		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	1	0.3					
Occurrence of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3					
Fitness For Purpose	Appropriate Valve Configuration: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE		
	Valve Capacity: Issues for Discussion:	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	1	0.7					
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	1	0.6					
	Sufficient Access to Exercise Valve: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4					
PHOTOGRAPHS									

VALVE CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: CHV_101 Description: Check Valve	GENERAL	Location: Dry Well Lower Level	4.8	2.4	1.6		1959	25	0	
		Description: Check Valve								
		Size: 150 mm								
		Valve Make: Val-Matic								
		Valve Model: N/A								
		Actuation: N/A								
		Actuator Make: N/A								
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	5	0.2	NOTES & COMMENTS: Valve is at the end of its service life. Check valve has failed.				
		Valve Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.2	Severe surface corrosion noted on valve.				
Valve Operation: Issues for Discussion:		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	5	0.3						
Occurrence of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	5	0.3						
Fitness For Purpose	Appropriate Valve Configuration: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS: Replace Valve		COST ESTIMATE \$ 5,000.00			
	Valve Capacity: Issues for Discussion:	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	3	0.7						
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6						
	Sufficient Access to Exercise Valve: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4						
PHOTOGRAPHS										



Project No.: 8400-001-02
 Tag: CHV_102
 Facility: Linden Lift Station
 Assessment Page 1 of 1

VALVE CONDITION ASSESSMENT FORM



Assessor: Ryan Ursu
 Date: 15-Jul-20

Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: CHV_102 Description: Check Valve	GENERAL	Location: Dry Well Lower Level	1.5	2.4	1.6		2012	25	17
		Description: Check Valve							
		Size: 150 mm							
		Valve Make: Val-Matic							
		Valve Model: 506A							
		Actuation: N/A							
		Actuator Make: N/A							
	Actuator Model: N/A	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Valve Visual Inspection: Issues for Discussion:	Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	1	0.2	NOTES & COMMENTS: Minor surface corrosion noted.			
		Valve Corrosion Noted: Issues for Discussion:	Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.2				
Valve Operation: Issues for Discussion:		Rating 1 (Yes - Valve functions) Rating 3 (Yes - Functions but with difficulty) Rating 5 (No - Valve inoperable)	2	0.3					
Occurrence of Maintenance Issues: Issues for Discussion:		Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3					
Fitness For Purpose	Appropriate Valve Configuration: Issues for Discussion:	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper valve configuration for application. Risk of Critical Failure)	1	0.3	RECOMMENDATIONS:		COST ESTIMATE		
	Valve Capacity: Issues for Discussion:	Rating 1 (Valve size sufficient for current and projected demand conditions) Rating 2 (Valve size sufficient for current demand conditions with minor surplus) Rating 3 (Valve size sufficient) Rating 4 (Valve size does not meet current demand condition) Rating 5 (Valve is critically undersized and likelihood of station backup is high)	3	0.7					
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6					
	Sufficient Access to Exercise Valve: Issues for Discussion:	Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of valve operation) Rating 4 (No - Access restrictions cause significant alteration of valve operation) Rating 5 (No - Access restrictions prevent safe operation of valve)	1	0.4					
PHOTOGRAPHS									

PIPING CONDITION ASSESSMENT FORM





Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE			
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: P_Influent Description: Influent Line	GENERAL	Location: Dry Well	1.0	1.8	1.0		2017	50	47	
		Description: Influent Line								
		Size: 500 mm								
		Material: Carbon Steel								
		Service: Sewage								
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5				
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	1	0.3	NOTES & COMMENTS: Piping is in excellent condition.					
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.4						
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0						
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3						
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2	RECOMMENDATIONS:						COST ESTIMATE
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1							
Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4							
	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	1	0.6							
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4							
PHOTOGRAPHS										

PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE					
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE			
Equipment Tag: P_P_101_Suction Description: P-101 Suction Line	GENERAL	Location: Dry Well Lower Level	3.4	3.0	1.6		1959	50	0			
		Description: P-101 Suction Line										
		Size: 150 mm										
		Material: Carbon Steel										
		Service: Sewage										
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5						
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.3	NOTES & COMMENTS: <i>Piping is at the end of its service life.</i> <i>Severe Corrosion noted on piping.</i> <i>No flowmeter installed.</i> <i>The velocity through the piping was found to be 3.1 m/s when the pumps are in operation, which exceeds the ANSI/II recommended maximum velocity of 2.4 m/s.</i>							
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4								
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0								
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3								
	Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping							
		Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						COST ESTIMATE		\$ 6,000.00
		Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
		Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	4	0.4								
	Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)		1	0.4									
PHOTOGRAPHS												

PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE				
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Equipment Tag: P_P_102_Suction Description: P-102 Suction Line	GENERAL	Location: Dry Well Lower Level	3.4	3.0	1.6		1959	50	0		
		Description: P-102 Suction Line									
		Size: 150 mm									
		Material: Carbon Steel									
		Service: Sewage									
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5					
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.3	NOTES & COMMENTS: <i>Piping is at the end of its service life.</i> <i>Severe Corrosion noted on piping.</i> <i>No flowmeter installed.</i> <i>The velocity through the piping was found to be 3.1 m/s when the pumps are in operation, which exceeds the ANSI/II recommended maximum velocity of 2.4 m/s.</i>						
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4							
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0							
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3							
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						COST ESTIMATE		\$ 6,000.00
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	4	0.4								
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4								
PHOTOGRAPHS											

PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE					
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE			
Equipment Tag: P_P_101_Discharge Description: P-101 Discharge Line	GENERAL	Location: Dry Well Lower Level	3.4	2.6	1.6		1959	50	0			
		Description: P-101 Discharge Line										
		Size: 150 mm										
		Material: Carbon Steel										
		Service: Sewage										
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5						
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.3	NOTES & COMMENTS: Piping is at the end of its service life. Severe Corrosion noted on piping. No flowmeter installed.							
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4								
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0								
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3								
	Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping							
		Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						COST ESTIMATE		\$ 8,000.00
		Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
		Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	3	0.4								
	Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)		1	0.4									
PHOTOGRAPHS												

PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE				
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Equipment Tag: P_P_102_Discharge Description: P-102 Discharge Line	GENERAL	Location: Dry Well Lower Level	3.4	2.6	1.6		1959	50	0		
		Description: P-102 Discharge Line									
		Size: 150 mm									
		Material: Carbon Steel									
		Service: Sewage									
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5					
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	4	0.3	NOTES & COMMENTS: <i>Piping is at the end of its service life.</i> <i>Severe Corrosion noted on piping.</i> <i>No flowmeter installed.</i>						
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	4	0.4							
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	0	0							
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.3							
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3	RECOMMENDATIONS: Replace Piping							
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2						COST ESTIMATE		\$ 8,000.00
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	3	0.4								
Maintainability and Operability	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4								
PHOTOGRAPHS											

PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE				
			Current Physical Condition	Fitness For Purpose	Maintenance & Operation		YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE		
Equipment Tag: P_Discharge_HDR Description: Discharge Header	GENERAL	Location: Dry Well	1.4	1.8	1.6	2012	50	42			
		Description: Discharge Header									
		Size: 250 mm									
		Material: Carbon Steel									
		Service: Sewage									
	Coating: Epoxy	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5					
	Current Physical Condition	Piping Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 3 (Minor Leaks) Rating 5 (Risk of Critical Failure)	1	0.3	NOTES & COMMENTS: Minor surface corrosion noted on piping.						
		Piping Corrosion Noted: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.4							
		Condition of Potable Water Piping and Backflow <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0							
		Occurrence of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but Occasional) Rating 4 (Frequent) Rating 5 (Constant)	1	0.3							
Fitness for Purpose	Force Main Shut Off Valve: <i>Issues for Discussion:</i> Rating 1 (Yes - Valve functions) Rating 3 (Yes - Valve does not operate) Rating 5 (No)	1	0.3								
	Flow Meter Installed: <i>Issues for Discussion:</i> Rating 1 (Yes - Flow meter is accurate) Rating 3 (Yes - Flow meter not accurate) Rating 5 (No)	5	0.2	RECOMMENDATIONS:					COST ESTIMATE		
	Appropriate Piping Configuration: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper piping configuration for application. Risk of Critical Failure)	1	0.1								
Maintainability and Operability	Piping Capacity: <i>Issues for Discussion:</i> Rating 1 (Piping has sufficient capacity for current and projected demand conditions) Rating 2 (Piping has sufficient capacity for current demand conditions with minor surplus) Rating 3 (Piping has sufficient capacity) Rating 4 (Piping does not meet current demand condition) Rating 5 (Piping is critically undersized and likelihood of station backup is high)	1	0.4								
	Sufficient Access to Perform O&M Activities Safely: <i>Issues for Discussion:</i> Rating 1 (Yes - No access restrictions) Rating 2 (Yes - Some minor access restrictions) Rating 3 (Yes - Access restrictions that cause minor alteration of work method) Rating 4 (No - Access restrictions cause significant alteration of work method) Rating 5 (No - Access restrictions prevent safe completion of O&M activities)	2	0.6								
	Isolation Valves Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	1	0.4								
PHOTOGRAPHS											

Appendix E – Power Condition Assessment Forms

DRAFT

Project No.: 8400-001-02
 Tag: IC_Panel_101
 Facility: Lift Station
 Assessment Page 1 of 1

CONTROL PANEL CONDITION ASSESSMENT FORM



Assessor: Noah Zanyk
 Date: 10-Dec-20

Asset ID:

SECTION	ITEM	DATA	Assessment Scores				Component Age		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: IC_Panel_101 Description: Telemetry Panel	GENERAL	Location: Main Floor	3.2	1.4			2010	25	15
		Description: Telemetry Panel							
		Function: Monitoring							
		PLC Processor: SCADAPack 357							
	UPS Protection: Yes	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Year installed is estimated. 24V DC power supply batteries expired in August. Wiring is loose and falling out of it's panduit at the bottom.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Control Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	3	0.1					
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	Controls Functioning as Expected: <i>Issues for Discussion:</i> Rating 1 (Always) Rating 2 (More than half of time) Rating 3 (Half of the time) Rating 4 (Less often than half) Rating 5 (Never)	1	0.3	RECOMMENDATIONS: 24V Power Supply Batteries Building Alarm Instruments Wastewater Flow Meter		COST ESTIMATE \$ 1,700.00 \$ 1,400.00 \$ 16,000.00		
Panel is Appropriately Designed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)		1	0.1						
Control Logic is Appropriate for Installation: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)		1	0.3						
Communications Equipment is Appropriate: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)		1	0.1						
	Equipment Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.2						

PHOTOGRAPHS



Project No.: 8400-001-02
 Tag: IC_UPS_101
 Facility: Lift Station
 Assessment Page 1 of 1

UPS CONDITION ASSESSMENT FORM

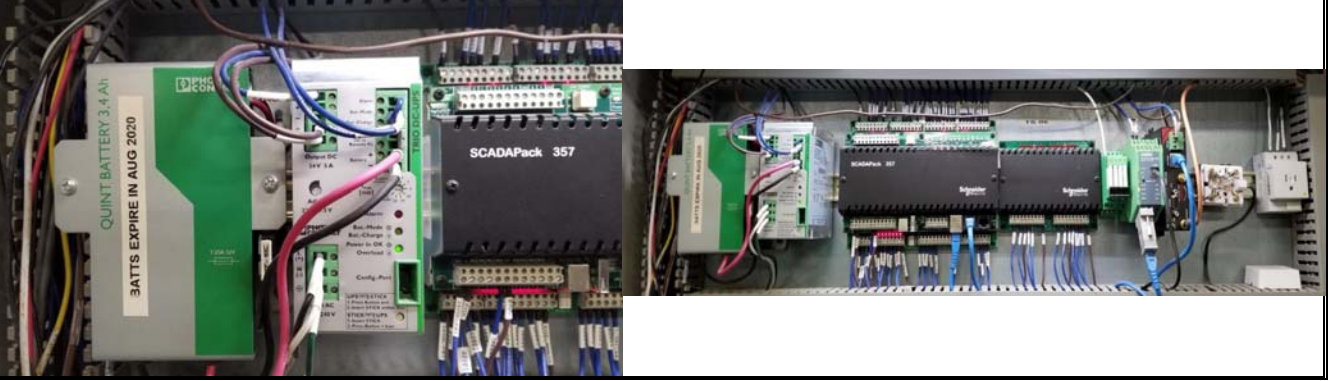


Assessor: Noah Zanyk
 Date: 10-Dec-20

Asset ID:

SECTION	ITEM	DATA	Assessment Scores				Component Age		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: IC_UPS_101 Description: UPS 101	GENERAL	Location: Main Floor	3.0	2.2			2010	15	5
		Description: UPS 101							
		Make: Phoenix Contact							
		Model: Quint Battery 3,4 Ah							
		Rated VA: 240 VA							
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5		
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Year installed is estimated. May have been reused from old panel.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
		Control Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)	1	0.1					
		Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)	2	0.4					
	Fitness for Purpose	UPS system is Present & Designed Appropriately: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.2	RECOMMENDATIONS: COST ESTIMATE				
		UPS External Maintenance Bypass is Installed: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 5 (No)	5	0.1					
		UPS Redundancy is Required / Installed: <i>Issues for Discussion:</i> Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)	1	0.1					
		UPS is Sized Appropriately: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (Load > 80% or Runtime below design guidelines) Rating 5 (Load and Runtime outside guidelines)	1	0.2					
UPS Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)		3	0.4						

PHOTOGRAPHS



**INSTRUMENTATION CONDITION
 ASSESSMENT FORM**



SECTION	ITEM	DATA	Assessment Scores				AGE		
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE
Equipment Tag: IC_Level_Transmitter_101 Description: Level Sensor	GENERAL	Location: Dry Well	3.1	3.0			1999	20	0
		Description: Level Sensor							
		Make: Rosemount							
		Model: 1151 Smart							
		Device Span: 0 - 150 inH2O							
		Input/Output: Input							
		Signal Type: 4-20 mA							
	Rated Voltage: 10.5 - 42.4 VDC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		5			
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	2	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Year installed is estimated. No redundant level sensor.				
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4					
Control Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)		1	0.1						
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		2	0.4						
Instrument/Measurement is Designed Appropriately: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)		1	0.3						
Instrument Redundancy is Required/Installed: <i>Issues for Discussion:</i> Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)		1	0.1						
Fitness for Purpose	Instrument Range is Appropriate: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1						
	Instrument Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	5	0.5						
	RECOMMENDATIONS: Redundant Level Transmitter		COST ESTIMATE \$ 16,800.00						



**INSTRUMENTATION CONDITION
 ASSESSMENT FORM**



SECTION	ITEM	DATA	Assessment Scores				AGE						
			Current Physical Condition	Fitness For Purpose			YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE				
Equipment Tag: IC_Float_101_Flood Description: Flood switch	GENERAL	Location: Dry Well	3.0	2.0			2010	20	10				
		Description: Flood switch											
		Make: FLYGT											
		Model: ENM-10											
		Device Span:											
		Input/Output: Input											
		Signal Type: Discrete											
	Rated Voltage: 250 VAC	Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)			5						
	Current Physical Condition	Equipment Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Like New) Rating 2 (Minor Surface Corrosion) Rating 3 (Surface & Internal Corrosion) Rating 4 (Severe Corrosion) Rating 5 (Safety Concern)	1	0.1	NOTES & COMMENTS: Ventilation does not provide sufficient air changes to qualify for an unrated zone. Year installed is estimated. Redundancy is not required.								
		Canadian Electrical Code Issues Identified: <i>Issues for Discussion:</i> Rating 1 (No issues) Rating 3 (Non compliant - current code) Rating 5 (Non compliant - legacy code)	5	0.4									
Control Wiring Terminations Visual Inspection: <i>Issues for Discussion:</i> Rating 1 (Connections tight, labelled) Rating 2 (Missing Labels) Rating 3 (Loose / Disorganized wiring) Rating 4 (Inappropriate wiring) Rating 5 (Combination of above)		1	0.1										
Occurrences of Maintenance Issues: <i>Issues for Discussion:</i> Rating 1 (None) Rating 2 (Intermittent) Rating 3 (Consistent but occasional) Rating 4 (Frequent) Rating 5 (Constant)		2	0.4										
		RECOMMENDATIONS:								COST ESTIMATE			
Instrument/Measurement is Designed Appropriately: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)		1	0.3										
Instrument Redundancy is Required/Installed: <i>Issues for Discussion:</i> Rating 1 (Yes or Not Required) Rating 3 (Required, non standard) Rating 5 (Required, not installed)		1	0.1										
Fitness for Purpose	Instrument Range is Appropriate: <i>Issues for Discussion:</i> Rating 1 (Yes) Rating 3 (No - current standards) Rating 5 (No - legacy standards)	1	0.1										
	Instrument Remaining Service Life: <i>Issues for Discussion:</i> Rating 1 (> 90% lifecycle remain) Rating 2 (> 75% lifecycle remain) Rating 3 (> 50% lifecycle remain) Rating 4 (> 25% lifecycle remain) Rating 5 (obsolete)	3	0.5										
PHOTOGRAPHS													

Appendix F – Force main Condition Assessment Forms

DRAFT

FORCEMAIN PIPING CONDITION ASSESSMENT FORM



Asset ID:

SECTION	ITEM	DATA	CONDITION RATING				AGE		
			Current Physical Condition	Fitness For Purpose	3rd Party & Environmental Damage	YEAR INSTALLED	EXPECTED SERVICE LIFE	REMAINING SERVICE LIFE	
Equipment Tag: FM_Pipe Description: Sanitary Force Main	GENERAL	Location: Along Linden Avenue to Henderson Hwy	2.8	1.0	2.6	1959	75	14	
		Description: Sanitary Force Main							
		Size: 300 mm							
		Material: Asbestos Cement							
		Service: Sewage							
		Coating: N/A							
		Rating	Weight	Recommended Frequency of Review: (In years, specify between 1-15)		10			
	Current Physical Condition	Force Main Breaks or Leaks in the Past: <i>Issues for Discussion:</i>	Rating 1 (Like New) Rating 3 (Minor Repairs) Rating 4 (Major Repairs) Rating 5 (Risk of Critical Failure)	2	0.6	NOTES & COMMENTS: Force Main crosses a river and is interconnected with the Hawthorne crossing.			
		Force Main Age: <i>Issues for Discussion:</i>	Rating 1 (Less than 10 years old) Rating 2 (Less than 25 years old) Rating 3 (Greater than 25 years old) Rating 4 (Greater than 50 years old) Rating 5 (Greater than 75 years old)	4	0.4				
	Fitness for Purpose	Compatibility with Pumps and Motors: <i>Issues for Discussion:</i>	Rating 1 (Yes) Rating 3 (No - Station still functional) Rating 5 (No - Improper force main selection for application. Risk of Critical Failure)	1	1	RECOMMENDATIONS: COST			
Force Main Attached to a Bridge: <i>Issues for Discussion:</i>		Rating 1 (No) Rating 5 (Yes)	1	0.2					
3rd Party & Environmental Damage	Force Main Near Other Underground Utilities: <i>Issues for Discussion:</i>	Rating 1 (No) Rating 3 (Yes - Minor nearby utilities) Rating 5 (Yes - Major nearby utilities)	3	0.3					
	Force Main Under a River Crossing: <i>Issues for Discussion:</i>	Rating 1 (No) Rating 3 (Yes - location of pipe not an issue) Rating 5 (Yes - location of pipe is an issue)	3	0.5					
PHOTOGRAPHS	DRAFT								

Appendix G – Design Standards and Guidelines

DRAFT

Appendix G – Design Standards and Guidelines

The Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers and Ontario Ministry of the Environment, as stipulated in *Recommended Standards for Wastewater Facilities – 2014 and Design Guidelines for Sewage Works – 2008*, have established standards and guidelines for public sewage works such as gravity sewers, force mains, and sewage pumping stations. The following information summarizes the guidelines and best industry practices as they relate to the components of the sewage pumping facility.

Structures – Regulatory Requirements

Lift station structures should be designed to facilitate removing pumps, monitors, and other mechanical and electrical equipment. In areas where high groundwater conditions are expected, adequate provisions should be made for protection against buoyancy of the lift station structures. Lift station structures should be water tight, protected from physical damage from a 100-year flood, and should remain fully operational and accessible during a 25-year flood. Lift stations are to be designed as “Post-Disaster” buildings under the Manitoba Building Code.

Pumps – Regulatory Requirements

Lift stations shall be designed with multiple pump units, with provision for the peak wastewater design flows to be handled by the remaining pumps in the event of the largest pump being out of service. Pumps handling raw wastewater should be capable of passing particles of a minimum 75 mm in diameter. Minimum pump suction and discharge openings should be 100 mm in diameter. Each pump should have an individual intake with wet well and intake designed to avoid turbulence near the intake and prevent vortexing. In order to minimize hydraulic surges, lift stations should be designed to deliver as uniform a flow as practicable.

Valves – Regulatory Requirements

Suitable shut-off valves should be placed on the discharge lines of pumps. Check valves should be placed between the shut-off valve and the pump on the discharge line of each pump. Check valves should be suitable for the material being handled and shall be placed on the horizontal portion of the discharge piping with the exception of ball check valves, which may be placed in the vertical. Valves should be capable of withstanding normal operating pressure and water hammer. All valves should be operable from floor level and accessible for maintenance.

Wet Wells – Regulatory Requirements

Wet well sizing should take into consideration the design fill time and minimum pump cycle time. The effective volume of the wet well should be based on design average flow and is not to exceed a fill time of 30 minutes unless the facility is designed to provide flow equalization/storage. When selecting the minimum cycle time, the motor manufacturer’s duty cycle recommendations should be utilized. Provisions should be made so that the fill time indicated is not exceeded for initial flows when the anticipated initial flow to the pumping station is less than the design average flow. Pump configurations within the wet well should be designed to avoid settling of solids. The wet well floor should have a minimum slope of 1:1 to the hopper bottom.

Flow Measurement – Regulatory Requirements

All lift stations should be provided with suitable devices for measuring wastewater flow. Large lift stations with peak design flow greater than 50 L/s should be provided with indicating, totalizing, and recording flow measurement devices. Elapsed time meters may be used for lift stations with peak design flow less than 50 L/s.

Electrical Equipment – Regulatory Requirements

Electrical systems and associated components (motors, lights, cable, switchboxes, control circuits, etc.) in lift station wet wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapours are likely to occur in normal operation, should comply with the Canadian Electrical Code requirements for Zone 1 hazardous locations. Equipment located in wet wells should be suitable for use in corrosive conditions and meet the requirements under the Canadian Electrical Code for Category 2 corrosive environments. Electrical systems installed in lift station dry wells, or in enclosed or partially enclosed spaces where hazardous concentrations of flammable gases or vapours are not likely to occur in normal operation, should comply with the Canadian Electrical Code requirements for Zone 2 hazardous locations. Equipment located in dry wells should be suitable for use in corrosive conditions and meet the requirements under the Canadian Electrical Code for Category 1 corrosive environments. If a lift station dry well complies with the ventilation requirements set forth in the NFPA standard 820 to be an unclassified space, the electrical systems installed in dry wells may not be considered a Zone 2 hazardous location.

Alarm Systems – Regulatory Requirements

Alarm systems should be provided for lift stations. Alarms should be in place for cases of high and low liquid levels, power failure, sump pump failure, pump failure, unauthorized entry, or any cause of lift station fault. Lift station alarms should be telemetered to the personnel in charge of operating the lift station. In some cases, audio-visual alarm systems with a self-contained power supply may be installed in lieu of a telemetering system depending on location, station holding capacity, and inspection frequency.

Emergency Operation – Regulatory Requirements

Lift stations should be designed to operate in such a way that equipment failure may not result in the discharge of raw wastewater to any waters and to protect public health by preventing backup of wastewater and subsequent discharge to basements, streets, and other public and private property.

Ventilation – Regulatory Requirements

Ventilation systems shall be designed to function year round, including fresh air intake louvers and openings. To prevent subsequent blockages, screen openings should be sized to avoid build-up of frost during winter months. Ventilation of the wet well may be either continuous or intermittent. If continuous, a minimum of 12 complete air changes per hour is required. If intermittent, a minimum of 30 complete air changes per hour during the period of occupancy is required. Fresh air should be forced into wet wells by mechanical means at a point about 30 cm above the expected high liquid level, with provision for emergency automatic blow-by to elsewhere in the wet well, should the fresh air outlet become submerged. Provision should be made in the lift station system design to verify that the ventilation fan is operational and the air change capacity is achieved.

Ventilation of the dry well may be either continuous or intermittent. If continuous, a minimum of 6 complete air changes per hour are required. If intermittent, a minimum of 30 complete air changes per hour during the period of

occupancy are required. Positive pressure ventilation is recommended and the system is to avoid dispensing contaminants throughout other areas of the lift station.

Provision for heating of intake air is recommended. Switches for the operation of ventilation equipment are to be plainly identified and located within arm's reach of the lift station entry way. All intermittently operated ventilation equipment should be interconnected with the lighting system.

Force main – Regulatory Requirements

The minimum pipe diameter for a force main should not be less than 100 mm. Velocities less than 0.6 m/sec (2 ft/sec) and greater than 1.6 m/sec (5.2 ft/sec) are not recommended. Above 3.0 m/sec pipe scouring can damage the walls of the pipe. Below 0.6 m/sec solid particles can separate from the wastewater and settle to the bottom of the pipe, which can obstruct the pipe flow over time. Total retention time in a force main should be kept under 4 hours to avoid anaerobic fermentation and the resultant production of odorous, hazardous, and corrosive gases.

Sewer – Regulatory Requirements

It is recommended that no gravity sewer conveying raw sewage should be less than 200 mm in diameter. Sanitary sewers should be designed and constructed with such slopes to give a mean velocity of not less than 0.6 m/s (2 fps) during average flow conditions with due consideration given to actual depth of sewage flowing in the pipe. Slopes slightly less than those required for 0.6 m/s (2 fps) may be considered if the depth of flow will be 0.3 of the diameter or greater for design average flow, and provisions can be made for frequent cleaning. Manholes should be installed at the end of each line and at all changes in grade, size, or alignment. Manhole spacing should not exceed 120 m for sewers 380 mm (15 inches) in diameter or less. The sewer shall be installed at no less than 600 mm below a water line if installed in the same trench and the horizontal separation distance is a minimum of 300 mm. Best industry practices are to maintain a minimum of 3 meters separation distance between water and sewer lines and a separation distance of 300 mm when crossing with the water line above.

Design Standards & Guidelines

- MPE prepared this assessment in accordance to the following standards and guidelines as a minimum:
- City of Winnipeg Design and Development Standards Manual, 2017
- City of Winnipeg Sewage Works Control Bylaw (Bylaw No. 5115)
- City of Winnipeg Standard Construction Specifications and Drawings, Roadways, Water, and Sewer
- The Waterworks and Sewage Works Regulations, 2015
- The Environmental Management and Protection Act, 2002
- Water Security Agency, Sewage Works Design Standard (EPB 503), Nov. 15, 2012
- AWWA M11 – Steel Pipe – A Guide for Design and Installation
- AWWA M23 – PVC Pipe: Design and Installation
- AWWA M55 – PE Pipe: Design and Installation
- ANSI/HI – 1.3, 1.4, 1.6, 9.1-9.5 Standards for Centrifugal Pumps
- ANSI/HI – 9.6.4 Rotodynamic Pumps for Vibration Measurements & Allowable Values
- ANSI/HI – 9.6.5 Rotodynamic Pumps – Guideline for Condition Monitoring
- ANSI/HI – 9.6.6 Rotodynamic Pumps for Pump Piping
- ANSI/HI – 9.8 Pump Intake Design
- ANSI/HI – 11.6-2012 Rotodynamic Submersible Pumps: for Hydraulic Performance

- ASME/ANSI B16.5 – 2013
- ANSI – Applicable Standards
- ASTM – Applicable Standards
- AMSE – Applicable Standards
- AWWA – Applicable Standards
- Saskatchewan Plumbing and Drainage Regulations
- Canadian Standards Association (CSA)
- National Sanitation Foundation (NSF)
- Canadian Electrical Code (CEC)
- Institute of Electrical and Electronic Engineers (IEEE)
- Electrical and Electronic Equipment Manufacturers Association of Canada (EEMAC)
- National Building Code of Canada
- National Plumbing Code of Canada
- Canadian Standards Association (CSA) Natural Gas and Propane Installation Code CSA B149.1
- American Society of Heating, Refrigeration & Air Conditioning Engineers (ASHRAE)
- ACI, Requirements for Assessment, Repair, and Rehab of Existing Concrete Structures (ACI 562M-16)
- ACI, Metric Building Code Requirements for Structural Concrete and Commentary (ACI 318M-14)
- ACI, Code Requirements for Environmental Engineering Concrete Structures (ACI 350-06)
- Process Industry Practices, Fixed Ladders and Cages (PIP STF05501)
- National Fire Code of Canada
- NFPA 820
- The Uniform Building & Accessibility Standards Regulations of Saskatchewan
- The Occupational Health and Safety Act