

FINAL

CLEARWATER WRF MASTER PLAN: DATA INVENTORY COLLECTION PLAN

Technical Memorandum

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PREPARED FOR

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1 Introduction

As part of the Water Reclamation Facility Master Plan for the City of Clearwater, Black & Veatch (BV) has been tasked to perform condition assessment inspections at the Northeast Water Reclamation Facility (NEWRF). The condition of the assets will help determine the renewal and replacement projects required over the 30-year master plan planning horizon.

To ensure data collection and condition inspections gather all of the data required, a review of existing design documentation (design drawings, capacity analysis reports, and facility permits) will be conducted and a preliminary asset registry will be developed. In its simplest form, an asset registry is a list of all the assets. The purpose of an asset registry is two-fold, it enables the owner to document needed information for operations and maintenance such as the status, procurement date, location, price, depreciation, and the current value of each asset, and it also serves as the source of truth for documenting condition, criticality, remaining life, and other planning-based metrics.

2 Data Inventory

2.1 ASSET HIERARCHY

Before an asset registry can be properly inventoried and assessed, the structure of the asset registry, known as the Asset Hierarchy, must first be defined. The Asset Hierarchy defines the processes, subprocesses, asset types, and asset classes found at the treatment plant and defines the logical relationships between those components. It also allows for the roll-up of costs, condition, performance, and risk scores by process, subprocess, or asset class. Since an asset hierarchy does not already exist for the NEWRF, an asset hierarchy was created to aid the asset inventory and condition assessment. The following sections summarize the proposed hierarchy.

Proposed Hierarchy: Facility → Process → Subprocess → Class → Asset ID

Example: Northeast WRF → Headworks → Grit Removal → Classifier

2.1.1 Processes and Subprocess

Existing design documentation was reviewed and assessed to develop the first two tiers in the asset hierarchy. Every asset documented in the asset registry will be assigned to its respective process and subprocess. **Table 1** provides a summary of the primary processes (Level 1) and subprocesses (Level 2) found at the NEWRF.

2.1.2 Asset Function/Discipline and Data

All assets at the NEWRF were organized into six functions/disciplines, listed below:

- Buildings
- Civil
- Structural
- Mechanical
- Electrical
- Instrumentation

Each of these asset functions/disciplines has specific attributes that will be recorded during the on-site condition assessment. The same data attribute can be relevant to multiple asset types. In the case of

voltage, it is to be recorded on both Mechanical and Electrical assets. **Table 2** summarizes the data to be recorded for each asset type.

Table 1: Primary Processes and Subprocess at the NEWRF

Level 1	Level 2	Level 2 (Continued)
Headworks	Influent Screening	Grit Removal
	Flow Metering	Gates
	Sampling	
Flow Equalization	Supply	Storage
	Return	
Primary Treatment	Salsnes Belt Filters	
Secondary Treatment (Biological)	Anaerobic	Pumping
	Anoxic	Oxidation
Secondary Treatment (Clarification)	Primary Sludge Pumps	WAS Pumping System
	RAS Pumping System	Scum Pumps (Ejectors) Clarification
Tertiary Filtration	Reject Line	Filter Backwash LS #1
	Filters	Filter Backwash LS #2
	Filter Effluent Pumping	
Disinfection	Sampling	Chlorine Contact Chamber #2
	Chlorine Contact Chamber #1	Chemical Feeds
Effluent	Metering	Plant Reuse Pump Station
	Sampling	High Service Pump Station (Master Reuse PS)
	Storage	
Digestion	Primary Digester (90' dia)	Recirc Pumps
	Secondary Digester (65' dia)	Prog. Digester Transfer Pump
	Heat Exchanger	Aerated Sludge Holding Tanks
Dewatering/Solids Handling	WAS Sludge Thickeners	Centrifuge
	Thickened WAS Sludge Pumping	Belt Filter Press #1
	Filtrate Return LS	Belt Filter Press #2
	Sludge Blending Tanks	Sludge Receiving Station
	Belt Filter Press Sludge Feed Pumps	Sampling Septage Receiving Station
Electrical (By Building/Structure listed in Building Process)	Transformers	Transfer Switches
	Switch Gear	Generators & Fuel Storage
	MCC	PLC
In-Plant Pump Stations	In-Plant PS #1	In-Plant PS #3
	In-Plant PS #2	
Buildings	Headworks Building	Old Lime Treatment Building
	Sludge Processing Building	Chemical Building
	Blower Building	Generator MCC Building
	Sludge Dewatering Building	Admin/Control Building
	Thickener Building	Sand Filter Building
	Sludge Processing Building	North RAS Pump House
	Residuals Building	South RAS Pump House
	North Twin	Internal Recycle PS
South Twin	Reclaimed Water PS	

Table 2: Data to be Collected per Asset Function/Discipline

DATA TO BE COLLECTED	BUILDINGS	CIVIL	STRUCTURAL	MECHANICAL	ELECTRICAL	INSTRUMENTATION
Design Type (Open Text)		■	■	■	■	■
Horsepower (hp) (Motors)				■	■	
Speed (rotations per minute (RPM)) (Motors, Pumps)				■		
Voltage (v) (Motors)				■	■	
Amperage (Amps)					■	
Flow (gallons per minute (gpm) or million gallons per minute (MGD)) (Pumps)		■		■		
Size (e.g., Tank Capacity, Valve Diameter, Floor Area)	■	■	■	■		
Pressure (pounds per square inch (psi)) (Pumps)				■		
Current Status	■	■	■	■	■	■
Manufacturer				■	■	■
Model				■	■	■
Serial Number				■	■	■
Installation Date	■	■	■	■	■	■
Date of Last Major Refurbishment	■	■	■	■	■	■

2.1.3 Asset Classes

An asset class is a group of assets with similar characteristics, expected useful life, and maintenance requirements. **Table 3** summarizes the asset classes identified after a high-level review of available design documentation and their associated function/discipline, outlined in Section 2.1.2, and thus the data attributes that will be collected for them. A facility identification abbreviation (ID Abbreviation) has been created based on the asset classes observed in the NEWRF design documents and will be used when the assets in the design drawings do not have an asset number assigned, or when there are assets identified in the field that were not previously identified as part of the design drawings review. Finally, each ass

et class is classified as to whether or not it will be included as part of the Condition Assessment field visits, and if further explanation or details is required, this information can be found in **Table 4**.

Table 3: Asset Classes, Temporary IDs, and Asset Function/Discipline Assignments

ASSET CLASS	ID ABBREVIATION	ASSET FUNCTION/DISCIPLINE	ASSESSMENT REQUIRED
ACTUATORS	ACT	Mechanical & Electrical	N
AERATOR	AER	Mechanical	Y
ANALYZERS	ANL	Electrical	N
BASINS	BSN	Civil & Structural	Y
BELT FILTER PRESS	BLT	Mechanical	Y
BLOWERS	BLW	Mechanical	Y
BOILERS	BOIL	Mechanical	Y
BUILDINGS	BLD	Buildings & Structural	N - See Table 4
CENTRIFUGE	CEN	Mechanical	Y
CLARIFIER	CLAR	Civil & Structural	Y
CLASSIFIERS	CLS	Civil & Structural	Y
CIVIL-STRUCTURAL	CIV	Civil & Structural	Y – See Table 4
COMPACTORS	CMP	Mechanical	N
COUPLINGS	CPL	Mechanical	N
DRIVE GEARS	DRV	Mechanical	N - See Table 4
ELEC-EQUIPMENT	ELEC	Electrical	Y – See Table 4
FAN	FAN	Mechanical	Y
FILTERS	FLT	Structural & Mechanical	Y
FLUME	FLM	Civil & Structural	N
FUEL STORAGE	FUL	Civil & Structural	Y
GATES	GTE	Mechanical	Y
GENERATORS	GEN	Electrical & Mechanical	Y
GRINDERS	GRN	Mechanical	Y
HEAT EXCHANGER	HEAT	Mechanical	Y
IMPELLERS	IMP	Mechanical	N - See Table 4
INSTRUMENTS	INS	Instrumentation	N
MACERATOR	MAC	Mechanical	N
MCC	MCC	Electrical	Y
METERS	MET	Instrumentation	N
MIXERS	MIX	Mechanical	Y
MOTORS	MTR	Electrical	Y
PROCESS PIPING	PIP	Civil, Structural & Mechanical	Y - See Table 4

ASSET CLASS	ID ABBREVIATION	ASSET FUNCTION/DISCIPLINE	ASSESSMENT REQUIRED
PLC	PLC	Instrumentation	Y
PUMPS	PMP	Mechanical	Y
SAMPLERS	SMPL	Instrumentation	N
SCREENS	SCR	Mechanical	Y - See Table 4
STRAINERS	STR	Mechanical	N
STRUCTURES (others)	STC	Civil & Structural	Y – See Table 4
SWITCHES	SWT	Electrical	Y - See Table 4
SWITCHGEAR	SWG	Electrical	Y – See Table 4
TANKS	TNK	Civil & Structural	Y
TRANSFORMERS	TRN	Electrical	N
VALVES	VLV	Mechanical	Y – Only Critical

Table 4: Specific Asset Class Condition Assessment Details

ASSET CLASS	DETAILS
BUILDINGS	Building inspections and assessments are part of Task 3.10
CIVIL-STRUCTURAL	Will be used to record civil and structural components not discretely named as an asset class. For instance – pipe supports, concrete pedestals, and sidewalks.
DRIVE GEARS	Drive gears will be evaluated and considered with their larger asset unit, for instance, Classifier
ELEC-EQUIPMENT	Will be used to record panels, switches, switch gears, vfd’s, and other common electrical equipment found in control rooms
IMPELLERS	Impellers will be evaluated and considered with their larger asset unit, for instance, Rotary Drum Thickener’s Mixing Chamber
MIXERS	Mixers will be evaluated and considered with their larger asset unit, for instance, Anoxic and Fermentation Basins/Tanks.
PROCESS PIPING	Above-grade pipes will be inspected where possible
PUMP UNITS	Motors and Pumps will be inspected separately, Pump Units are considered combined pump and motor single-units - and will be inspected accordingly
SCREENS	Bar Screens are the only screens to have individual condition assessments performed
SWITCHES & SWITCHGEAR	Switches and Switchgear will be documented as ‘Elec-Equipment’

2.2 PRELIMINARY ASSET REGISTRY

To streamline field inspections and ensure all required assets are captured, a preliminary asset registry will be created and populated ahead of the condition assessment inspections. Utilizing the asset hierarchy components defined in Section 2.1 ‘Asset Hierarchy’, a file geodatabase will be built that contains all stated processes, subprocesses, and asset classes. In addition, the geodatabase will be conf

igured with data fields that support each asset class's attributes with coded domains applied where possible, which allow for dropdowns and ensure data is consistently captured.

The preliminary asset registry will be populated through a desktop review using all existing design documentation. All assets added to the asset registry will be compiled into summary counts per asset class to be reviewed by Public Utilities before commencing the fieldwork.

2.2.1 Asset IDs

If a unique asset ID is provided in the design documentation it will be used, however, if no asset ID is listed in the documentation, a temporary ID will be assigned which will be used throughout the entire condition assessment process. These IDs can be found in **Table 3** and will use the proposed abbreviation followed by a sequential three-digit number. The numbers will start with “-001” and will work up to “-999” for each asset class.

2.2.2 Asset Data Population

While building the preliminary asset registry, users will also document any data for assets that are specifically called out in the documentation such as capacity (e.g., rated flow), amperage, horsepower, and speed to name a few. Available data will be documented in the file geodatabase that will serve as the backbone for the condition assessment inspection.

3 Data Collection

Condition assessment data will be collected in the field using a series of electronic data collection forms for each asset type (Buildings, Civil, Structural, Mechanical, Electrical, and Instrumentation). The forms will be developed utilizing Survey123 Connect, and the mobile app Survey123 will be installed and leveraged by field users on iPads. The forms will be pre-loaded with the preliminary asset registry developed in Section 2.2.

The survey team will be provided copies of the design drawings used to build the preliminary asset registry. This will allow additional context and information for inspectors to ensure that they visit and check off all assets and components to be inspected.

The Survey123 forms will include the following sections.

3.1 ASSET DATA TO BE VERIFIED

Data that will be field verified for each asset includes the following attributes:

- Asset ID
- Facility: All will be NEWRF
- Process: **Error! Reference source not found.**Table 1
- Subprocess: **Error! Reference source not found.**Table 1
- Asset Class: Table 3
- Asset Function/Discipline: Buildings, Civil, Structural, Mechanical, Electrical, Instrumentation

- Description: To be used to describe the physical appearance or physical location, for instance, if there are five blowers in a row, this field could be used to describe if the blower is the 1st, 2nd, 3rd, 4th, or 5th blower to help provide even further clarity about which blower is being inspected)

As an example, below is the general asset identification information for the first of three primary sludge pumping units in the secondary treatment process:

- Asset ID: PMPU-00001
- Facility: NEWRF
- Process: Secondary Treatment (Clarification)
- Subprocess: Primary Sludge Pumps
- Asset Class: Pumping Unit
- Asset Function/Discipline: Mechanical
- Description: From East, first pump in row

NOTE: There will be an option in the Survey123 forms to add a new asset not already identified as part of the Preliminary Asset Registry.

3.2 CONDITION AND PERFORMANCE SCORING

Each asset that has been identified for a condition assessment will receive multiple scores for physical condition and performance. All scores will be graded on a 1 to 5 scale, with 1 being very good and 5 being very poor. The physical condition scores will be based on visual observations and a scoring description for guidance has been developed for each asset type. The other scores are for asset performance and include reliability, operability, capacity, and parts availability and obsolescence. Detailed breakdowns, descriptions, and example photos for each scoring criteria can be found in the accompanying document ‘17-007-UT_408831 Clearwater WRF MP Task 3 Condition Assessment Guide.docx’, though a summary is provided below in Sections 3.2.1 and 3.2.2 because it is the data that will be collected.

3.2.1 Physical Condition Information

Each asset will be scored using a 1-5 scale based on its visual condition, using the definitions in the Condition Assessment Guide for each asset type. These questions will be required to be answered for field inspectors to successfully submit an inspection.

- 1 – Very Good
- 2 – Good
- 3 – Fair
- 4 – Poor
- 5 – Very Poor

3.2.2 Performance Information

The survey team will assess the performance of the assets by interviewing O&M staff either during the field inspections or at the end of each day of inspections. Each asset will be scored using a 1-5 scale for reliability, operability, and obsolescence, and each process scored for capacity, using the definitions in the Condition Assessment Guide. These questions will be required, but additional follow-up may be necessary.

- 1 – Very Good
- 2 – Good
- 3 – Fair
- 4 – Poor
- 5 – Very Poor

4 Quality Control Plan

4.1 FIELD QUALITY CONTROL

At the end of each day, the forms should be reviewed to ensure the information has been entered correctly. This should include:

- Verifying that all assets have been surveyed within the location or process surveyed that day.
- Verifying that all required fields have been completed.
- Verifying that any comments recorded are understandable and relevant.
- Reviewing physical condition scores for outliers. If outliers are found, the reviewer should compare the photos and comments of the asset taken during the assessment.
- Meet with plant staff at the end of the day to discuss asset performance and review scores.

4.2 OFFICE QUALITY CONTROL PLAN

In addition to the daily field quality reviews, a final office review will occur to review the completeness of the asset information collected. Quality checks include:

- Reviewing all inspections for attribute completeness, most importantly for condition scores. These will be flagged and returned to inspectors for correction.
- Reviewing and confirming all inspections have photograph attachments. These will be flagged and returned to inspectors for correction.
- Reviewing the attribution for any 'outliers' that vary from the common scoring and attributes applied to similar assets. These will be flagged and returned to inspectors for clarification.

The field and office quality controls outlined above are specific to the field data collection. Additional quality management activities as part of the overall project quality management plan will be performed for the condition assessment task.