Environmental Commissioning Plan WWTP, Waroona Abattoir

To	Prime Meat co. Pty Ltd	Page	1
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Subject	Environmental Commissioning Plan, WWTP - Waroona Abattoir		
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Table of Contents

1 Introduction

1.1. Purpose of the Commissioning Plan

The purpose of this report is to present the Environmental Commissioning Plan for the Wastewater Treatment Plant, to be submitted to the Department of Water and Environmental Regulation seeking for approval to the Waroona Abattoir Facility at Wagerup, WA. Details in this report present the commissioning requirements for the WWTP aiming to answer DWER requests as per "DWER2020/000095".

This commissioning plan intend to identify and establish the synergetic efforts of the contractors, engineers, equipment suppliers and Prime Meat Co. (PMC) operations staff, for commissioning purposes of the wastewater treatment plant and is prepared addressing the minimum requirements as follow:

- The sequence of commissioning activities to be undertaken, including details on whether they will be done in stages;
- A summary of the timeframe associated with the identified commissioning activities;
- The inputs and outputs that will be used in the commissioning process
- The emissions and/or discharged expected to occur during commissioning
- The emissions and/or discharges that will be monitored and/or confirmed to establish or test a steady-state operation (e.g. identifying emissions surrogates, etc), including a detailed emissions monitoring program for the measurement of those emissions and/or discharges;
- The controls (including management actions) that will be put in place to address the expected emissions and/or discharges;
- Any contingency plans for if emissions exceedances or unplanned emission and/or discharges occur; and
- How any of the above would differ from standard operations once commissioning is complete.

2 Specific tasks to achieve commissioning

2.1. Commissioning tasks

To achieve proposed works the commissioning plan process will include a number of phases to be performed in chronological order as per Figure 1, which will be described in detail in the following sections.

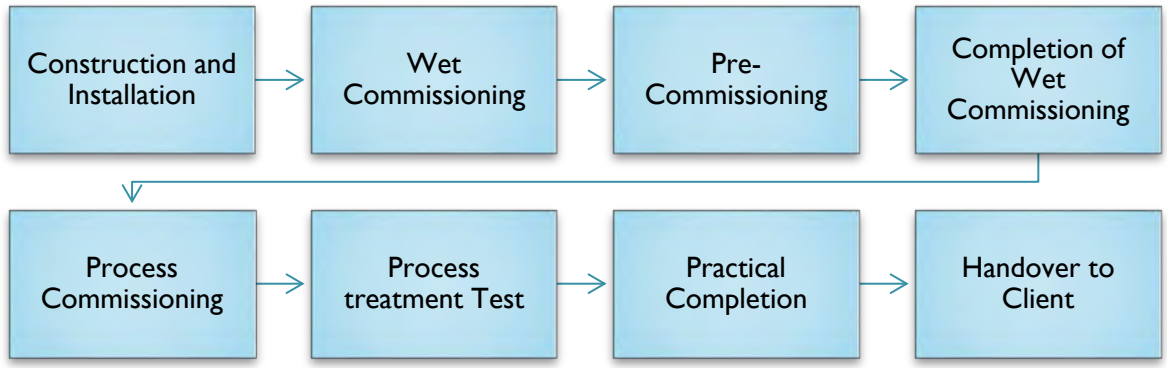

Figure 1. Commissioning Sequence

2.2. Commissioning Objectives

The overall objective of the commissioning stages is to ensure that the wastewater treatment plant and components are complete, operational and will meet both facility operation and minimum DWER requirements. Since the transition from construction to operation of a WWTP requires coordination, cooperation and communication, the goals for transition include:

- Identify and resolve design and construction issues would impact operations
- Compliance with design and any changes and updates included as "as-built"
- Validate operation of package systems and other equipment and instruments via preliminary testing
- Provide training (classroom and hands on) to operators for handover stages
- Ensure integration of communications systems PLC of sub-systems and SCADA in the entire plant
- Validate equipment functionality via wet commissioning
- Control and mitigate any discharge emissions
- Evaluate the performance of the treatment plant during process commissioning stages.

3 Commissioning Team and Responsibilities

3.1 Team

For each organization involved in the commissioning process a representative will be designated to lead the specific process, and the team will include:

Overall

- The Project Planning & Management will be delivered by Tessele Consultants, representing PMC
- The Principal Contractor will be defined after tender and procurement process is completed
- The PMC Representative
- Harvey Water will provide their services for Operation & Maintenance
- The treatment plan designer is Tessele Consultants
- The manufacturers will be appointed once procurement process starts

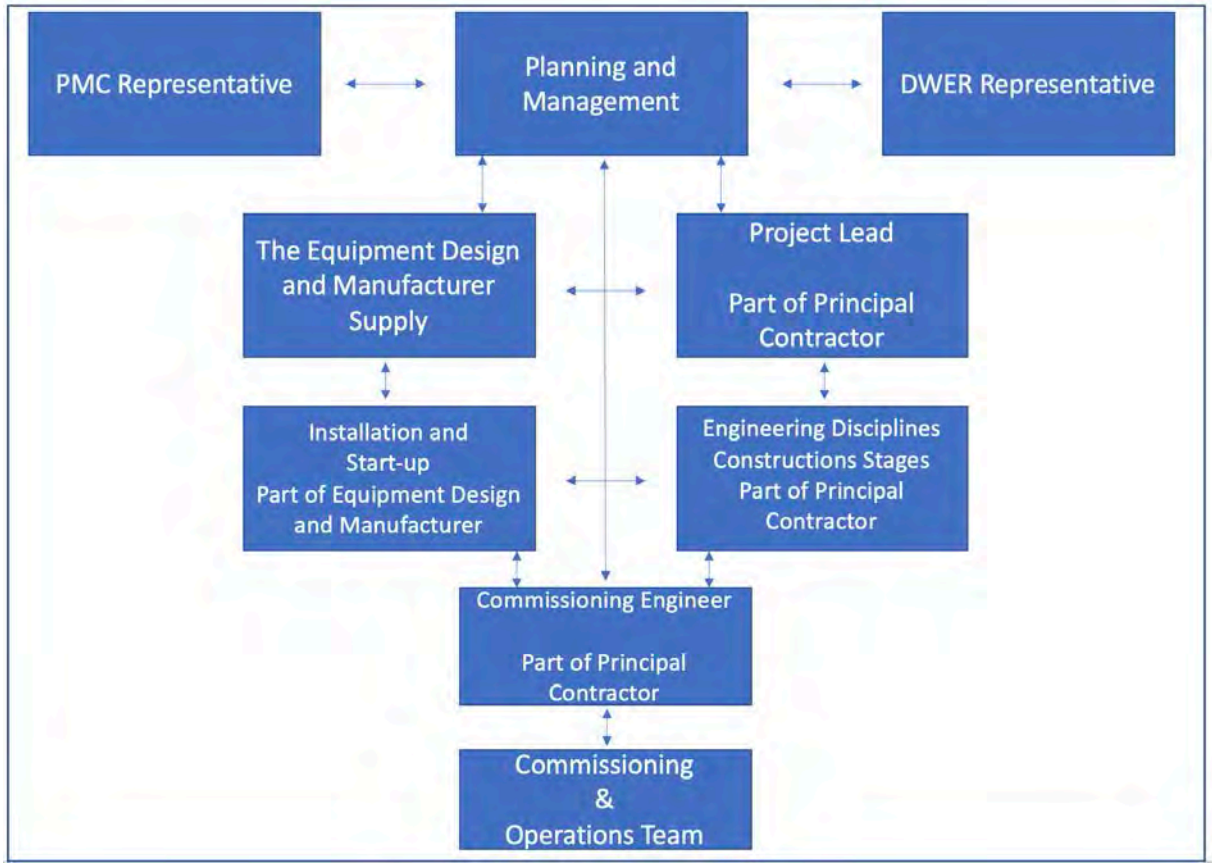

Figure 2. Commissioning Organisation Structure

3.2 Roles and Responsibilities

- The Project Planning & Management – Tessele Consultants
    - Developing the planning for the installation of the wastewater treatment facility, coordinating between suppliers, equipment manufacturers, civil contractors, and operations team during the entire process.
- The Principal Contractor (TBA)
    - Involved in all phases of commissioning, will be responsible to provide support personnel during the commissioning phases. The contract will be also responsible for scheduling manufactures representatives for packaged systems and equipment to be on site as required by the projects specifications. Ensure all test is performed, resolving malfunctions and ensure the WWTP is operating under specification. Ensure all the commissioning documentation, including SCADA, as-built drawings and supporting installation documentation reflect changes occurred during construction and installation. Track all documents produced by manufactures representatives during the commissioning process. Responsible for submitting documents for project planning team to review.
- Harvey Water operations team
    - Harvey Water's operations team will be involved from commissioning stages onwards
- The Equipment Designer and Manufacturers will be responsible for providing technical support during equipment installation and commissioning, supervised by the principal project manager.

3.3 Contractor's Commissioning Plan

The principal contractor which will be responsible for the majority of installation and commissioning work, has to present a detailed commissioning plan including the minimum requirements specified on this report. The commissioning plan has to be presented at least 6 weeks prior the commencement of any commissioning activities, pending on evaluation and approval from the Project Planning & Management Team for the activities to start.

The Plan must include methodology, plan to address set performance criteria, include checks inspections performance tests and other aspects to ensure the system will be complete ad operational according to project specifications. The plan can be divided as follow:

- Overview purpose and scope of commissioning
- Team organisational structure and resourcing, including:
    - Commissioning manager

    - Lead engineers for each engineering discipline, process, civil, mechanical, electrical, control and operation
    - Description of role, responsibilities, allocated hours, qualifications and experience of each commissioning member;
    - Overall organisation chart and communication protocols to apply during testing, commissioning and proof of Performance testing
    - Roles and responsibilities of organizations involved in the commissioning activities and proof of performance testing
- Methodology and tests that will be using during each stage of commissioning, which shall be consistent with approved design and operates according to contracts specifications.
- Prepare a risk management plan, including:
    - Commissioning areas and battery limits
    - Details of Factory acceptance testing (FAT)
    - Details of all site testing, including all site acceptance testing
    - Details of testing including all commissioning stages
    - Details of all Proof of Performance testing, including operating conditions and parameters to be tested ensuring each unit process is tested at specified and critical loads.
- Procedures for all commissioning stages, including:
    - Methodology, sequence, monitoring, acceptance criteria which will be applied to each inspection and test.
    - Fault simulation, shutdown, restart, flow variations, set point variations and associated measures
    - Register testing and inspections in respective check lists.
- Documents of completion of each FAT, including all necessary equipment and package system information
- Undertake and document commissioning risk assessment and workshop
- Commissioning plan Gantt chart including holding points, with detailing program activities and duration
- Commissioning information management register and control to be used
- Other supporting documentation

4 Commissioning Stages and Implementation Schedule

4.1 Stages

The commissioning tasks are divided as per Figure 2. The responsibilities will be further defined according to future contracts and agreements to be in place fir the project.

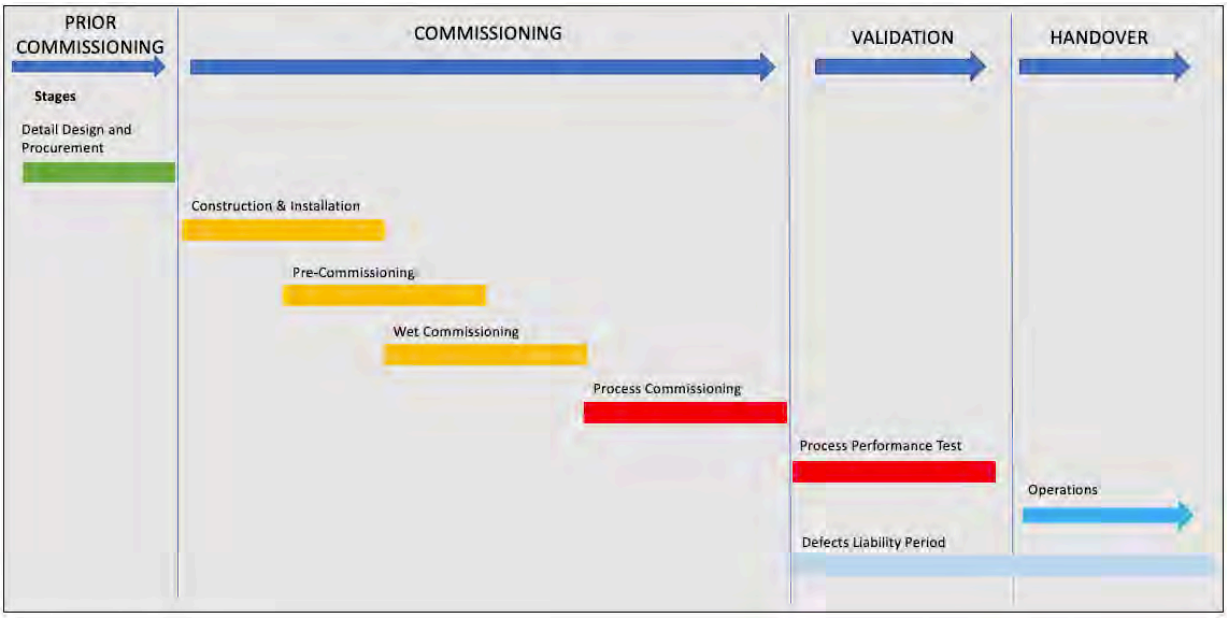

Figure 3. Commissioning Stages Subdivision

Different stages of the commissioning process present interfaces from Construction to Performance tests, for this reason a concise commissioning step is essential to achieve handover stages. Each phase is comprised of sub segments and specific tasks, detailed in the sequence.

4.1.1 Construction and Installation

- Installation construction support
    - Manufacturers shall provide on-site installation and construction support based for package systems
    - Detail design and manufacturers specification shall be provided to Contractor, including details about preparation, rigging and installation for adequate installation of package system and main equipment.

- In case of any deficiencies revealed during installations and acceptance checks, immediately correct it and advise Planning & Management Team of any deficiencies or inconsistencies within installations manuals
- Training of operators to include classroom training (overview of equipment operation, technology, and principles) and on-site hands-off training (process function, system assembly, safety and lock-outs, control system overview). Manufactures representative to supply presentation, study and training materials.

4.1.2 Pre-commissioning

- Overview
  - Pre-Commissioning is the testing of each individual component for correct installation and operation. The pre-commissioning checks include factory works testing and on-site inspections and tests.
  - Pre-commissioning shall ensure that on completion of installation, the works are inspected in a systematic manner, are safely energised and able to be put into operation and that the results of these inspections and tests are suitably recorded. All items of plant and equipment and their ancillaries will be pre-commissioned, and any non-compliance rectified.
  - The pre-commissioning checks will incorporate tests and/ or documentation from the following testing stages:
    - Supplier Factory Works Testing and Inspections;
    - On-site Installation and Pre-commissioning Tests.
  - In most cases pre-commissioning requirements will be satisfied by checks carried out on-site the Principal Contractor, their subcontractors, or by factory acceptance testing (FAT) by the manufacturer.

- Pre-Commissioning Documentation
  - Inspection and Testing Plans (ITP) and / or Inspection and Testing Check Sheets (ITC) shall be used to record the outcome of testing and verification of testing completed during the Pre-commissioning sub-phases.
  - ITPs and/or ITCs shall be prepared for all equipment pre-commissioning checks. All ITPs/ITC's shall be submitted to the Planning & Management Team at least 30 days prior to commencing pre-commissioning for review and approval (as detailed in Section 4.2), including the required Client "Witness" and "Hold points". Commissioning documentation and quality recording requirements are detailed in Section 8 of this Specification.
  - The minimum requirements for pre-commissioning tests are defined in the following sections. The required pre-commissioning checks must be completed and appropriate sections of the Inspection and Testing Plans filled in.

- Factory Acceptance Testing and Inspection

- If suppliers/manufacturers have performed tests and inspections at their factory or on site, records of testing shall be reviewed as part of the pre-commissioning verification.
- The scope of factory acceptance testing, and inspection will be included in the supplier's ITPs.
- The FAT of major items may include but not be limited to:
  - Material tests;
  - Manufacturing tests;
  - Mechanical equipment tests;
  - Electrical equipment tests;
  - Control and monitoring equipment tests.

- On-Site Installation and Pre-Commissioning Tests
  - The on-site testing required during the Pre-commissioning phases is summarised below:
    - Hydrostatic Testing of Structures and Pipes
    - Mechanical equipment checks and testing
    - Electrical equipment checks and testing
    - General Equipment Tests
    - Control equipment checks and testing
    - Calibration tests for instruments and equipment
  - Tests shall be carried out to verify that the plant and equipment will operate under the full range of operating conditions and meet the performance requirements. Loads necessary to facilitate System Commissioning of the plant will be simulated.
  - Inspection and testing for pre-commissioning shall include, where applicable to the equipment item being tested, the following:

Hydrostatic Testing of Structures and Pipes

- Hydrostatic testing of tanks, pipes and other structures will be carried out as a pre-commissioning activity. Filling of structures must be carried out in a controlled and safe manner. Monitoring and recording regimes for the hydrostatic testing must be followed to the satisfaction of the Planning & Management Team.
- Hydrostatic testing of civil structures pipework shall be performed in accordance with design and manufacturers specifications.

Mechanical Equipment Tests

- Mechanical equipment tests include at least the following:
  - Verify factory assembled equipment have not been damaged by installation;
  - All delivery blocks have been removed and equipment ready for operation;
  - Check that equipment is correctly lubricated and lubrication reservoirs charged with suitable lubricant;
  - Check clearance, end play and operation of major bearings;
  - Check alignment of drive systems;
  - Check tightness of all parts;
  - Correct installation of guards, trip wires and other personnel safety equipment;
  - Ensure the system has been cleaned and flushed;

- Test feedback, control and overload equipment, including safety checks;
- Check direction of rotation and performance of electric motors;
- Pre-commissioning runs of rotating equipment;
- Functional tests of equipment;
- Testing and adjustment of safety devices;
- Submission of power factor correction report and other requirements for entire plant;
- Check valve positions;
- Where possible, prime all pumps prior to wet commissioning;
- Check of lifting facilities.

Electrical Equipment Tests

- Electrical equipment tests include at least the following:
  - Point to point tests;
  - Electrical integrity tests, including electrical tests for insulation, earth leakage, resistance to high voltage;
  - Voltage tests;
  - Trip tests;
  - Functional tests;
  - Check of range / settings of equipment.

General Equipment Tests

- General equipment tests include at least the following:
  - Check of completeness of installation;
  - Inspections and where required approvals to ascertain compliance with statutory requirements and regulations;
  - Check of access to valves and equipment;
  - Simulation of fault conditions.

Control Equipment Tests

- Inspection and testing of control equipment for pre-commissioning shall include, where applicable to the equipment item being tested, the following:
  - Check of completeness of installation;
  - Functional testing of control equipment;
  - Calibration tests, where applicable, or calibration certificates;
  - Check of loops, interlocks, inputs, etc.;
  - Check of PLC and SCADA logic;
  - Calibrate and test all instruments and analysers, as addressed below;
  - Simulation of fault conditions.

Calibration of Instruments and Equipment

- The pre-calibration checking of instruments will include confirmation that manufacturing checks have been performed.

- Pre-commissioning instrument and equipment calibration tests will also include the following checks:
  - Check of instrument setup and calibration by comparison with a reference instrument or by direct measurement;
  - Checks that all alarms and control functions are operable and set appropriately;
  - Check of all control and SCADA links, alarms and set points.

4.1.3 Wet Commissioning

- The Wet Commissioning process will follow on from pre-commissioning, once it is verified that all the components of each sub-system have been fully pre-commissioned.
- On completion of the pre-commissioning of sub-system components, the equipment within the sub-system will be set to operate as far as is practicable to confirm reliable operation on either potable water or plant service water.
- Each piece of equipment will be required to operate for a minimum of 48 hrs.
- All necessary temporary equipment including pumps, hoses and temporary control systems required to simulate feed to the plant inlet works shall be provided.
- The following items shall be monitored during the unit test:
  - Process timing sequences will be evaluated and adjusted to suit the dynamic requirements, where possible;
  - Where appropriate, the equipment will be operated in AUTO and be adjusted via the SCADA system;
  - Automatic duty changeover where appropriate;
  - Response to imposed disruptions in operating points and requirements across the full design operating range;
  - Current draw and operational performance of all mechanical equipment;
  - Operation under relevant control modes.
- The components of each system will be brought on-line and tested as a system to confirm that the system performs as required.
- Each process unit shall be tested over its full range of operating conditions. The performance of each process system and sub-system shall be determined so that the system operation can be assessed for compliance with design criteria. Any non-compliance shall be rectified.
- The wet commissioning shall include the following tasks:
  - Adjustment of equipment and control settings;
  - Site Acceptance Testing (SAT) of the PLC/SCADA software;
  - Testing of continuous operation;
  - Modifications and testing as required;
  - The operation of mechanical, electrical and control systems under process conditions that represent the anticipated operating conditions;
  - Plant start-up and shutdown testing;
  - Operation of all auxiliaries / standby equipment;
  - Method of isolation of plant equipment for safe shut down and maintenance procedures including as a minimum HV station and unit that supplies fire protection systems;

    - Demonstration of the operator after hours call out systems.
- The PLC/SCADA SAT shall include:
    - Tuning of control loops;
    - Checking of all interlocks and control logics including any modifications required;
    - Testing of start-up and shutdown of the system.
- Commissioning Workpacks shall be prepared including CMSs, ITPs and ITCs for each Plant sub-system.
- The structure and contents of this commissioning workpack is explained in the section 5 of this Specification, along with documentation and quality recording requirements.
- All Commissioning workpacks shall be submitted to the Planning & Management Team at least 30 days prior the commencement of wet commissioning for review and approval, including the required Client witness and hold points

Equipment Performance Testing

- Equipment performance testing is the process of proving that all supplied equipment meets the requirements of the design or performance guarantees provided by the suppliers. Each major piece of equipment shall undergo a Site Acceptance Test (SAT) to verify that the equipment operates under the full range of operating conditions and meet the performance requirements.
- Detailed testing protocols and acceptance criteria for key equipment shall be developed and agreed with the Planning & Management Team following equipment selection.
- Where equipment warranties or performance guarantees cannot be demonstrated, they will be added to the Defects and Omissions Punchlist and shall be verified during process commissioning. Any non-compliance shall be rectified.

4.1.4 Completion of Wet Commissioning

Upon completion of Commissioning activities, a Defects and Omissions Punchlist shall be generated prior to and maintained throughout the Process Commissioning stages. The list shall include all items that will affect commissioning, operation and handover of the plant.
The recording can be divided into:

- Items to be rectified prior to pre-commissioning
- Items to be rectified prior to Handover
- Items to be rectified prior to Practical Completion

Responsibilities to be defined according to contracts arrangements.

4.1.5 Process commissioning

- Process Commissioning is the process of introducing sewage into the Plant, establishing the biological treatment and testing the operation of overall Plant process.
- Process Commissioning of the Plant shall include the following:
    - Commissioning of the works as a complete process on effluent

- Establishment and stabilisation of the biological treatment process;
- The operation of mechanical, electrical and control systems under process conditions that represent the anticipated operating conditions;
- Plant start-up and shutdown testing;
- Operation of all auxiliaries / standby equipment;
- Final adjustment of equipment and control settings;
- Final tuning of control loops;
- Final checking of all interlocks and control logics including any modifications required;
- Final checking of all equipment and the sewage treatment plant operation;
- Testing of continuous operation;
- Performance testing to establish that the operation of the Plant conforms with the specified requirements and the design intent;
- Preliminary testing to confirm that the Plant is capable of meeting the requirements of the Process Performance Test;
- Final training of operators and demonstration of maintenance activities;

- All relevant information and experiences gained during these tests, including readings such as flow, effluent quality, noise, odour, vibration, power draw, shall be integrated into Unit Process Guidelines (UPGs), Standard Operating Procedures (SOPs), Functional Design Specifications, the Operations and Maintenance Manuals and drawings, including P&I Diagrams.
- A list of control and instrument set points and alarm signal settings which have been determined during the successful operation of the plant will be included in the Functional Design Specifications. A complete list of all the parameters and settings for electrical drives and starters shall also be provided by the principle contractor, indicating where the default value has been changed.
- A Process Commissioning Workpack shall be prepared including a CMS, ITP and ITC similar to those used in wet commissioning to document the Process Commissioning stage. Commissioning documentation and quality recording requirements are detailed in Section 5 of this Specification.

4.1.6 Reactor Start-up

- The process start-up should occur gradually, operating the plant with a lower volumetric flow then maximum capacity designed. The wastewater flow-rate will be depending on the processing capacity of the facility. The facility is expected to achieve maximum wastewater flow rate of ~ 1,600 kL/day, which is equivalent to 4,000 Lamb and 700 Cattle being processed a day. However, at early stages of the abattoir commissioning it is expected the production to start at one quarter of total capacity, which is equivalent to 1,000 heads of lamb per day and 175 cattle per day, resulting in 400 kL of Wastewater. Main points to be considered are discussed as follow:

Seeding the Bioreactor

- The process of initiation/inoculating the bioreactors shall include pre-filling the reactor with water at ~ 30% of tank capacity
- Addition of inoculum (sludge) from local source followed by gradual introduction of the effluent to allow biomass natural growth
- The seed sludge shall be sourced from external WWTP (Waroona Region) and/or from commercial brads, such as Parklink

- To avoid creation of septic environment in the equalization pond, recycling pumps and aerators will be operated.
- Seed sludge from external source, shall be transported via tanker trucks
- Even distribution of sludge inside the reactor shall occur, the MLSS will be monitored over a week, followed by two weeks monitoring of Specific Oxygen Uptake rate (SOUR) to assess microbial activity.

Aeration capacity

- With the plant receiving low lading rates, the aeration capacity shall be controlled accordingly
- The number of aerators and operation frequency will be controlled to achieve adequate DO concentrations.

Managing the Sludge Age

- To maintain the sludge age as per design recommendations the sludge dewatering process shall be controlled and MLSS concentration monitored and adjusted accordingly.

Chemical Dosing

- Dosing pumps will include dosing ranges with capacity of low dosages, avoiding interruptions of the chemicals dosing

Control System

- The supervisory control and data acquisition system (SCADA), is an important tool to control operational parameters of WWTP equipment.
- Commissioning staff and operations team shall be communicated to gradually adjust and change parameters as per system requirements.

4.1.7 Treatment Process Test

- A twenty-eight (60) day Process Performance Test shall be conducted at the end of process commissioning to demonstrate that the plant meets the output specification set out in the section 6. At this time, the operations ownership will be depending on Contractual arrangements. Responsibility for plant performance will stay with the Principal Contractor until the plant performance requirements are met.
- The Treatment Plant Operations Team will generally run the Plant, under the Projects Lead Commissioning Engineer's supervision, following SOPs.
- An Inspection and Test Plan (ITP) shall be prepared for the Process Performance Test prior to the commencement of the test and within the required timing as set out in Section 4.2 of this Specification.
- The ITP shall include:
    - Test Program;
    - Test Standards;
    - Description of instrumentation to be used;
    - Method of data recording.

- A Process Performance Test Report shall be prepared on the completion of the test, outlining the results of all testing and including:
    - Tables, graphs and calculations necessary for interpretation of the results;
    - Comparison of results with guarantee requirements;
    - SCADA printouts detailing any alarms and reliability
    - Discussion on overall performance of equipment.

4.1.8 Practical Completion

- Where the Contractor's responsibility is limited to delivery of a sub-system or system components, practical completion may be achieved upon conclusion of Wet Commissioning of that sub-system. However, where the Principal Contractor is responsible for demonstrating performance of the plant process, practical completion may be achieved upon conclusion of Process Performance Testing.
- Practical completion is subject to provision and acceptance by the Planning & Management Team of all handover deliverables

Work on Equipment after Practical Completion

- Any access to equipment by Contractor personnel after Practical Completion shall be approved by the PMC Project Manager or their representative. Work shall be done in accordance with the Project Safety Management Plan.

4.1.9 Handover

- Final commissioning completion and handover to PMC will occur after successful completion of the Process Performance Test and all commissioning completion criteria, as defined in Section 2.2, have been satisfied.
- Non-Active Operation Training: operators must be trained on complete operation of the WWTP
- Compilation of Handover Deliverables and final Handover to operations team.

4.2 Implementation Schedule

It is proposed the full implementation of the wastewater treatment plant, including adapting/refurbishment of required infrastructure to be incorporate in the treatment process. The following schedule outlines the timeline for implementation (Table 1) and timeframes for submission of major documents and achievement of commissioning milestones timeline for implementation (Table 2).

Table 1. Estimated Project Schedule

Activity	Months

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	Site surveys																					
2	Detailed Design & construction planning																					
5	Major Equipment Procurement																					
6	Engagement of Contractors																					
7	Construction period																					
8	Commissioning																					
9	Performance verification																					

4.2.1.1 Commissioning

A 6-month commissioning period has been anticipated to enable major equipment to be tested and brought online and allow for the biological system to start developing. This will be followed by a 3-month performance verification, whereby the system operation will be adjusted to optimise its performance.

As the WWTP will be developed offline on a brownfield site the interfaces will have to be identified prior commencement of detail design. We have anticipated and see as a major interface:

- Pipeline connections from existing pumping station to the rotary screen to enable flows to be managed between the existing and new treatment processes.
- Upgrade connections for discharge of treated water in the existing water storage tanks.
- Electrical and instrumentation connections

With limited access existing equipment conditions, we cannot foresee issues in the interfaces related to deactivated pumping station, rotary screen, buried pipelines and decommissioned equipment to be removed from site.

5 Information Management and Scope of Commissioning

5.1 Commissioning Documentation and Quality Control

- All commissioning documentation and records for the commissioning of a system shall be contained in that system's commissioning Workpack. The definitions of Commissioning Workpacks for commissioning activities are detailed in this section.
- Commissioning Workpacks shall be submitted to the Planning & Management Team at least 28 days prior to commencing wet commissioning for review and approval, including the required Client witness and hold points.

5.2 Scope of Commissioning

The Table below contains the breakdown of the WWTP major equipment and package systems which are part of the commissioning Workpacks.

Item	Drawing label	Equipment List
1.0		**Pre-Treatment**
1.1	RS.001	Rotary Screen Package
1.2	SC.001	Screw conveyor
2.0		**Pump station package**
2.1	-	Effluent Sump
2.2	-	Submersible Pump
3.0		**Equalization Tank & Emergency Overflow**
3.1	EP.001	Equalization pond
3.2	EP.002	Emergency Pond
3.3	P.001 A/B	Submersible Pump
3.4	SM.001 A/B	Submersible Mixer
4		**Dissolved Air Flotation Package 1**
4.1	DAF.001	DAF unit
		Polymer dosing
		Alkali dosing
		Acid dosing
		Coagulant dosing
		Recirculation pump
4.2	P.002A/B	Centrifugal Pump- Transfer Pump
5		**Reactor**
5.1	RAN.001	Anaerobic Tank
5.2	RAX.001	Anoxic Tank
5.3	M.001 A/B/C	Side wall entry mixer
5.4	RAE.001	Aerobic Tank
5.5	P.003 A/B/C	Centrifugal Pump- Internal Recirculation
5.6	K.001 A/B/C/D/E	Blowers
5.7		Air diffuser
6		**Dissolved Air Flotation Package 2**
6.1	DAF.002	DAF unit
		Polymer dosing

		Coagulant dosing
		Recirculation pump
6.2	P.004 A/B	Centrifugal Pump
6.3	P.005 A/B	Centrifugal Pump-Sludge Excess
7		**Post Treatment/ Polishing/ Storage**
7.1	P.006 A/B	Centrifugal Pump
7.2	T.001	Tank- Buffer for Filtration
7.3	P.007 A/B	Centrifugal Pump- Sludge Excess
7.4	F.001	Multimedia Sand Filter
7.5	Backwash	Storage Tank
7.6	P.008 A/B	Centrifugal Pump-Filtration Feed
7.7	P.009 A/B	Centrifugal Pump-Storage Tanks
7.8	T.002	Tank- Buffer for Ultrafiltration
7.9	F.001	UF - Pre Filter
7. 10	UF. Package	Ultrafiltration system - Skid Mounted
7.11	UV.001	Ultraviolet Disinfection System
7.12	Disinfection Cl	Chlorine Disinfection
7.13	Sodium Hypochlorite	Storage Tank
7.14	T.003	Tank-Treated Water Storage
8		**Sludge Handling**
8.1	SP.001	Screw press pump
8.2	P.015 A/B	Centrifugal Pump
9		**Pump Station package (Effluent Sump)**
9.1	T.006	Effluent Sump for Water Excess return
9.2	P.010 A/B	Submersible Pump
10		**Backup generator**
10.1	G.001	Full package generator
11		**Electrical, Instrumentation & Control**
11.1	-	All electrical and instrumentation components
12		**Piping**
12.1	-	All pipelines and valves

6 Performance Criteria

The performance criteria will be checked via wastewater analysis. The wastewater sample must be conducted in accordance with AS/NZS 5667.10 and the samples shall be submitted and tested by a NATA credited laboratory, for parameters to be measured, unless specified otherwise.

6.1 Inputs and Outputs of the process

The inputs and outputs of the wastewater treatment process to be monitored are located at the entrance and at the outlet of the proposed plant WWTP, specified as per in the Table 3. Flowmeters will be placed at specified point to facilitate and register monitoring.

Table 2. Monitoring of Inputs and Outputs

Input / Output	Parameter	Unit	Averaging Period	Frequency
Input - RS.001 Output - UV.001	Volumetric flow rate (cumulative)	m^3/ day	weekly	continuous

6.2 Expected discharges emissions and monitoring Schedule

To ensure that the wastewater treatment plant achieves efficiency according to design parameter prior to effluent disposal/recycling, the following parameters (Table 4) will be used as performance check; which shall be monitored fortnightly

Table 3. Performance parameters to be monitored

Emission point	Monitoring Point	Parameter	Unit	Frequency
Outlet UV.001	UV.001 flowmeter	Volumetric flow rate	kL/d	Continuous
Outlet UV.001	Treated water outlet	pH	-	Weekly during commissioning period; Monthly when abattoir is operating
		E.Coli	NMP/100mL	
		BOD_5	mg/L	
		Total Dissolved Solids	mg/L	
		Total Suspended Solids	mg/L	
		Total Nitrogen	mg/L	
		Total Phosphorous	mg/L	
		Total Oil and Grease	mg/L	

7 OH&S & Environment

7.1 Safety and Environment

The principal contractor is responsible for maintaining the project Safety by using implementing a Safety management Plan, where the following should be considered:

- Occupational Health and Safety (OH&S) risks associated to the commissioning activities
- Safety Plan and procedures
- Emergency Plan, the be followed in event of emergency
- Isolation Permits, essential for the works to be carried-out
- Environmental Management and measures to avoid any risks and hazardous to the environment.

7.2 Risk Assessment

The purpose of these guidewords is to consider how can these issues lead to or cause hazards in any of the phases of life cycle. The life cycle phases include design, construction and commissioning, operations and maintenance and finally disposal. The aim of SID is to minimise the effect of these hazards by the design where possible.

(Tick ✓ those issues that are applicable - ✕ those that have been discounted)

Note: This is not a complete list of Potential Issues.

Guideword Checklist

7.3 Discharge Controls

Firstly, during the start-up period the effluent which doesn't achieve the expected performance, can be redirected to the treatment plant. The plant shall be operating with ¼ of total capacity and will be able to re-process part of the effluent.

The preliminary design has also considered an emergency pond with capacity of ~ 4,000 KL, which will then be used as contingency measure in case of excess effluent does not achieve expected performance. The storage capacity will be enough for 10 operational days (2 weeks), allowing enough time for process optimisation.

Another control/ contingency is the connection to a third pond via emergency overflow spill way. This pond will be able to hold effluent avoiding discharges to the environment and giving additional time for troubleshooting measures.

8 Commissioning Information Management

The Planning and Project Management team will be responsible for coordination and evaluation of all commissioning information prepared and issued.

9 Handover Deliverables

The Handover deliverable documentation includes:

- Operations and Maintenance Manuals
- Operation training Information
- Asset registration sheets and copied of "As Commissioned" PLC/SCADA software
- Reports from Design and construction phase of the project

The following diagram (Figure 3) contains the handover documentation guidance.

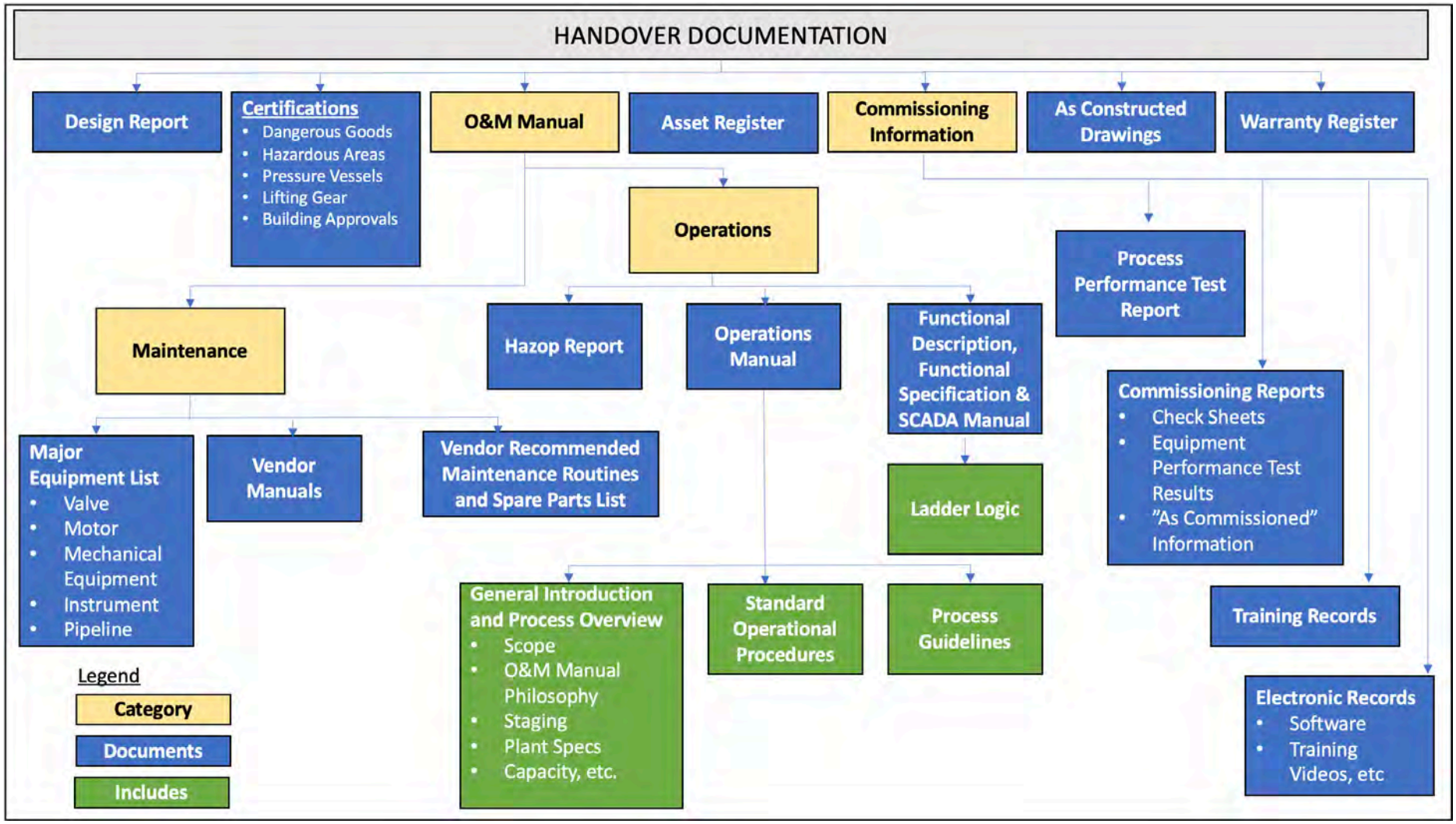

Figure 4. Handover Documentation Guidance

10 References

DWER, 2020. Department of Water and Environmental regulation. Ref: DWER2020/000095

Suggaté, C. 2009. Start-up & commissioning of a low loaded wastewater treatment plant.

UnityWater, 2018. Specification for Commissioning and Handover Requirements for Treatment Plants.

Appendix 1 – Safety in Design Check List

Guideword	Potential Issue	Tick ✓ or ✕ Do not leave blank	
		During Construction	During O&M
Confined space	Are there confined spaces created by the design?	✓	✓
Electrical	Does the design introduce electrical installations and therefore the risk of electric shock?	✓	✓
Excavation: Collapse/ Engulfment	Is there a possibility that risks such as excavation collapse or flooding will be introduced?	✓	✕
Hazardous Substances: Asbestos	Could asbestos be present	TBC	✕
Hazardous Substances: Chemicals/ Dangerous Goods	Does the design use, produce or include the disposal of chemicals?	✓	✓
Hazardous Substances: Other	Exposure to hazardous substances (e.g. bio-waste)	✕	✓
Fall Prevention (Working at heights, falling objects)	Is working at heights an issue for construction or operations/maintenance?	✓	✓
Isolation	Is isolation a significant risk?	✓	✓
Lifting Operations/ Cranage	Are heavy lifts/cranage involved?	✓	✓
Mobile plant and equipment	Is the movement of mobile plant required?	✓	✓
Road Safety including Movement of People and Materials	Is movement of people and vehicles (including those moving materials) a significant source of risk?	✓	✓
Access/egress, access ways, entrances/gates	Is the way people and vehicles enter or exit the site or gain access to individual asset/item a safety issue?	✓	✓
Access covers	Are lid covers appropriate? (Gatic covers used only in traffic areas otherwise lightweight material to reduce manual handling issues)	✕	✕
Adjacent structures	Will structures adjacent to the design affect the design or construction?	✓	✕
Amenities and facilities	Will amenities and facilities be required?	✓	✓
Biological	Does the design use, produce or dispose of substances known to be biological hazards?	✕	✓
Brownfield Sites	Could existing conditions of the site and existing assets affect the safety of personnel and the new assets that are to be constructed or installed?	✓	✓

Guideword	Potential Issue	Tick ✓ or ✕ Do not leave blank	
		During Construction	During O&M
Carcinogens	Does the design use, produce or dispose of substances known to cause cancer?	✓	✓
Commissioning	Could the act of commissioning generate hazards?	✓	✓
Communications, e.g., normal, emergency	Is communication at the site a safety issue including emergency response?	✓	✓
Community/public interaction/access	Is there public access to the site or is there potential community interaction?	✕	✕
Construction method	Does the method of construction introduce hazards (tilt up, deep excavation etc)?	✓	✕
Construction interfaces	Does the proposed construction interface with other operating works?	✓	✓
Contamination	Does existing contamination or that introduced by the design or construction pose a risk?	TBC	✓
Corrosion	Is there a corrosion risk due to either the environment or process?	✓	✓
Dust/fumes/vapours	Could dust, fumes and/or vapours be produced during construction, commissioning or operations?	✓	✓
Emergency Response	Is emergency response a special risk for this project?	✕	✕
Ergonomics	Are there likely ergonomic risks with the design?	✓	✓
Explosion	Does the design include any substances that could lead to explosion, including gases, liquids or dust?	✓	✓
Erosion	Is there a risk of ground erosion or erosion of piping and plant due to industrial process?	TBC	✓
Extreme weather	Is extreme weather a possible factor for the design or construction?	✓	✓
Fire	Does the design include flammable or combustible materials? Is there an offsite fire risk? (e.g. neighbouring bush)	✓	✓
Fixed plant and equipment	Are there any risks introduced associated with the location of fixed plant and equipment?	✓	✓
Fatigue	Does the design introduce potential human fatigue issues?	✕	✕
Flow	Are there any risks introduced associated with flow?	✓	✓
Formwork	Does the design include formwork during construction?	✓	✕

Guideword	Potential Issue	Tick ✓ or ✕ Do not leave blank	
		During Construction	During O&M
External/third party activities	Are there any external/third parties issues, including the need for access by local council, service providers or other agencies?	✕	✕
Guarding/fencing/ security	Are there risks introduced relating to guarding / fencing / barriers and/or security?	✓	✓
Ground conditions	Are ground conditions a risk factor?	TBC	✕
Groundwater	Does groundwater produce the possibility of unstable ground, corrosion of underground assets or structural instability?	TBC	✓
Hot works	Are hot works during construction and operations a potential source of risk?	✓	✕
Inspections	Does the design need to consider the necessity of inspections and allow for access, lighting, guarding, etc?	✓	✓
Instability	Is instability due to structures or geotechnical conditions a risk?	TBC	✕
Interference between trades	Is the interaction between the different trades during construction and operation a risk?	✓	✓
Laydown areas	Are laydown areas a source of risk?	✕	✕
Lifting Devices/ Davits	Are they required?	✓	✓
Lighting	Is there appropriate access to lighting for maintenance?	✕	✓
Live services	Are live services a source of risk?	✕	✓
Location	Is the location of the site itself in relation to the environment and other assets surrounding it a risk?	✕	✕
Maintainability	Is maintainability a risk in this case?	✕	✓
Manual handling	Is manual handling required by the design?	✓	✓
Materials of construction	Are there any special materials of construction issues?	✕	✕
Materials/ Chemicals in Contact with Drinking Water	Are there any new materials or chemicals being used?	✕	✕
Movement of machinery/ contaminants	Is the need to have clear paths for machinery (e.g. elevated work platforms, forklifts, etc) movement a source of risk?	✓	✓

Guideword	Potential Issue	Tick ✓ or ✕ Do not leave blank	
		During Construction	During O&M
Noise	Does the design require noisy processes to be used during operations or construction that may affect personnel or neighbours?	✓	✓
Operations/ interactions	Is there a risk with how the new project interfaces with existing assets?	✓	✓
Operations, including work practices	Does the design introduce new working procedures or practices?	✓	✓
Overhead/ underground services	Does the design potentially interact with existing services?	TBC	✕
Piling	Is piling a likely requirement for construction?	✕	✕
Pollution/ contamination/spills /releases/emissions	Is pollution, contamination, spills, releases, emissions a risk?	✓	✓
Pressure High/Low	Has the design identified processes or the use of plant and/or equipment that have the potential for high or low/negative pressure?	✓	✓
Public interference, Security	Is public interference a significant risk?	✕	✕
Programmable Logic Controllers (PLC)	Does the design include a PLC?	✓	✓
Radiation	Does the design or construction include radioactive material or the generation of x-rays?	✕	✕
Railways	Will construction work occur in close proximity to railways?	✕	✕
Reuse of existing assets	Is the existing asset capable of performing the required function adequately?	✓	✓
Restricted Areas	Are restricted areas identified marked and protected?	TBC	TBC
Safety factor	Is having a sufficient engineering over design factor a requirement in order to manage risk?	✓	✓
Sanitation/hygiene/waste	Is sanitation/hygiene/waste a risk for the project?	✓	✓
Services	Are there services (other than "live services" or overhead/underground – e.g. unused or un-energised) that pose a risk?	TBC	✕
Slips/trips/falls	Check that all requirements have been identified i.e. elevation changes around buildings, cabinets, valves, equipment modules.	✓	✓
Storage	Is there a need for storage?	✓	✓

Guideword	Potential Issue	Tick ✓ or ✕ Do not leave blank	
		During Construction	During O&M
Stored energy (mechanical, electrical)	Does the design include the potential for stored energy?	✕	✕
Start-up/shutdown	Does the method of start-up or shutdown of a process introduce any hazards?	✕	✓
Structures	Does the design incorporate ease of construction and access during operations and maintenance?	✓	✓
Temporary works	Does the design/specification detail temporary works requirements	TBC	✕
Temperature	Is temperature an issue for the design or construction activities?	✓	✓
Unexploded Ordinances (UXO)	Is UXO a risk?	TBC	✕
Vibration	Does the design include significant levels of vibration?	✕	✕
Visibility	Is lack of visibility an issue for the design?	✕	✕
Water	Does the design consider working in or above water during construction and/or O&M?	✕	✕
Waste	Does the design include the potential to generate significant levels of waste?	✕	✓
Workplace conditions, extreme temperatures	Does the site involve special work conditions or extreme temperatures?	✕	✕
Other issues identified			