Kooragang Water Pty Ltd

WIC Act licence application

13 April 2022

Attachment 20:

AquaNet Retail Supply Management Plan

AquaNet Sydney Pty Ltd

ACN 131 235 124

RRWS-IMS-DOC-001
Retail Supply Management Plan

Version No	Version Date	Approved By	Status	Next Revision Date
0.1	30 April 2020	N/A	Draft	N/A
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Document Owner: Risk and Compliance Officer

Document Reviewer: General Manager – Operations and Growth

Document Approver: CEO

Contents

1. Introduction

AquaNet Sydney Pty Ltd ('**AquaNet**') holds Retail Supplier's Licence number 10_01R issued under the *Water Industry Competition Act 2006* (NSW) ('**WICA**') under which it supplies high quality recycled water from the Rosehill Recycled Water Scheme ('**Rosehill Scheme'**). This document, AquaNet's Retail Supply Management Plan ('**Retail Plan**'), has been developed to satisfy the requirements of the *Water Industry Competition (General) Regulation 2008* (NSW).

The Retail Plan provides:

- an overview of the Rosehill Scheme including the contractual structure under which it operates;
- a summary of the contractual arrangements that AquaNet has entered into with Sydney Water Corporation ('**Sydney Water**') and Customers for the supply of recycled water, and in particular the supply priority and interruptibility provisions of those arrangements;
- a summary of the events that could cause a supply interruption, the likelihood, and how AquaNet will manage such events; and
- a description of the arrangements that AquaNet has in place to manage compliance with specified codes.

1.1 Rosehill Scheme Overview

AquaNet is the retail supplier of the Rosehill Scheme. The Rosehill Scheme involves:

- extracting secondary treated effluent from Sydney Water's Liverpool to Ashfield Pipeline ('**LAP**');
- treating the effluent to produce high quality recycled at the Fairfield Advanced Water Treatment Plant ('**Plant**'); and
- transporting recycled water from the Plant, through a distribution network ('**Network**') to customers in the Fairfield, Cumberland, and Parramatta local government areas ('**Customers**').

The scope of the Rosehill Scheme is shown in **Annexure A**.

The Rosehill Scheme is underpinned by a 20-year Project Agreement between AquaNet and Sydney Water and is capable of delivering up to 25 million litres of recycled water per day to Customers.

Under the Project Agreement, AquaNet delivers recycled water to Sydney Water for the sale to its own customers ('**Foundation Customers**'). Sydney Water has retail contracts with the Foundation Customers. Sydney Water supplies up to 32ML/d of treated effluent (according to an effluent specification in the Project Agreement) to the Plant from the LAP. AquaNet may sell any water in excess of that required to supply the Foundation Customers directly to its own customers ('**Non-Foundation Customers**').

AquaNet owns the Plant and has entered into an Operation and Maintenance Agreement with Veolia Water Australia Pty Ltd ('**Veolia**') who is responsible for maintaining and operating the Plant.

AquaNet and its sister company, Rosehill Network Pty Ltd ('**Rosehill Network**'), have entered into a Pipelines Agreement whereby Rosehill Network constructed and owns the Network. Rosehill Network has entered into an Operation and Maintenance Agreement with Veolia who is responsible for maintaining and operating the Network.

Both Rosehill Network and Veolia hold Network Operator Licences under WICA.

The contractual structure of the Rosehill Scheme is depicted in **Annexure B**.

AquaNet and Rosehill Network are both part of the Water Utilities Australia group of companies ('**WUA**') and through its various subsidiaries, WUA provides the resources, skills and expertise required for AquaNet and Rosehill Network to deliver the Rosehill Scheme.

2. Recycled Water Supply Arrangements

The sale of water to Sydney Water for supply to Foundation Customers is governed by the Project Agreement between AquaNet and Sydney Water. AquaNet also supplies its own direct customers in accordance with recycled water supply agreements ('**Supply Agreements**') between AquaNet and Non-Foundation Customers.

2.1 Project Agreement

Under the terms of the Project Agreement, the Foundation Customers have priority with respect to recycled water supply and are entitled to peak day demand for up to three consecutive days. After three consecutive peak days of usage Foundation Customers are only entitled to the average day demand for the next three days to allow the recycled water storages to be recharged.

Recycled water supply to Foundation Customers under the Project Agreement must be in accordance with the Recycled Water Quality Specification ('**Specification**').

The Project Agreement provides for two alternative potable water supply options:

1. Top-up potable water which is available for supply into the Rosehill Scheme Network at the Fairfield, Woodville and Rosehill reservoirs; or

2. Back-up potable water supplied at the customer sites through a break tank or a three way valve at the customer meter.

In all cases potable water is supplied by Sydney Water. AquaNet or its subcontractors will purchase top-up potable water and Foundation Customers will purchase back-up potable water.

Foundation Customer meter reading, billing and communication is the responsibility of Sydney Water under the Project Agreement.

The Project Agreement also includes Operational Protocols which set out the requirements and obligations of AquaNet in providing routine and event based communications regarding:

- Notifications of interruption of recycled water supply;
- Notifications of interruption of demand for recycled water;
- Notifications of shortfall in demand for recycled water;
- Notifications of shortfalls in recycled water supply;
- Monitoring the operation of Foundation Customer valves and supervisory equipment; and
- Access to Foundation Customer Sites.

2.2 Supply Agreements

At present, AquaNet only supplies commercial and industrial Non-Foundation Customers from the Rosehill Scheme under the terms of a Supply Agreement. The Supply Agreement incorporates interruptible supply of recycled water meeting the Specification. Non-Foundation Customers enter into

Supply Agreements with AquaNet on an optional basis with agreements subject to commercial negotiation.

Under the terms of all Supply Agreements, recycled water supply is on an interruptible basis. This is a core requirement due to:

1. Foundation Customers having supply priority under the Project Agreement; and

2. The delivery of recycled water being subject to factors outside the control of AquaNet.

All recycled water supply under the Supply Agreements will be in accordance with the Specification.

Non-Foundation Customers make their own arrangements with Sydney Water for a potable water supply for circumstances where recycled water supply is unavailable or curtailed.

AquaNet will interrupt recycled water supply if any of the following circumstances occur:

- Interruption of supply is necessary to meet Foundation Customer supply obligations;
- Recycled water does not meet the Specification;
- The customer has breached a condition of the Supply Agreement such that further supply of recycled water presents a risk to human health, the environment or Rosehill Scheme facilities;
- An emergency or force majeure event;
- Recycled water is unable to be delivered (this can result from problems in effluent supply, operation of the plant or operation of the Network); or
- Any material change in circumstance such that supply of recycled water presents a risk to human health, the environment, operation of Rosehill Scheme facilities or would result in a breach by AquaNet of any law or approval.

If supply is interrupted, customer obligations to pay for recycled water are suspended.

In the event of operational issues, AquaNet will maintain supply provided that storages in the Rosehill Scheme are sufficient to supply Foundation Customer demand while maintaining supply.

AquaNet is responsible for meter reading and billing in respect of Non-Foundation Customers.

Operational Protocols form part of the Supply Agreements and set out the requirements and obligations of AquaNet and the Non-Foundation Customer to provide routine and event based communications relating to:

- Data exchange;
- Monitoring and recording of Recycled Water in accordance with the Specification;
- Notifications of interruption of supply;
- Notifications of interruption of demand;
- Notifications of shortfall of supply;
- Notifications of shortfall of demand;
- Out of Specification events and the operational response to an out of Specification event;

- Operation of the customer valves and supervisory equipment; and
- Access to the Site by AquaNet.

3. Probability of Supply Interruptions

3.1 Interruption Due to Demand Exceeding Availability

The Rosehill Scheme has been designed with sufficient capacity to meet Foundation Customer peak demand with capacity for sale to other customers in the event that it is not required by the Foundation Customers. It is therefore reasonable to expect that there will be some level of supply interruption to Non-Foundation Customers.

The design of the Rosehill Scheme provides for potential expansion of the Plant from 20ML/day to 25ML/day. AquaNet will make a commercial decision as to the viability of initiating this expansion by monitoring the level of interruption that occurs as demand grows.

Top-up Water (see section 2.1) will not be used to maintain supply to Non-Foundation Customers as the Top-up water costs more than the revenue that would be lost by AquaNet interrupting supply.

Recycled Water is sold to Foundation Customers and AquaNet customers at 90% of the potable water price.

3.2 Risk Assessment

AquaNet convened a series of Risk Assessment and Critical Control Point workshops in September / October 2010 to identify and establish processes to mitigate any outstanding health and environmental risks and ensure that interruptions are minimised. Workshop participants included representatives from AquaNet, Veolia, Sydney Water, IPART and NSW Department of Health.

The methodology used for Hazard Assessment and Risk Management was in accordance with Veolia Document ***PRO-263-5 Risk Management Procedure***, which is based on *AS4360*, the Australian Standard for risk management.

Output from the workshops included a detailed risk assessment and confirmation of the Rosehill Scheme critical control points.

3.3 Interruption Due to Incidents or Operational Problems

Design of the Rosehill Scheme includes a level of redundancy to ensure that the Network and Plant can operate reliably and loss of supply due to operating problems will be rare. The following design principles have been incorporated into the Rosehill Scheme:

- Pumping stations have been designed with 30% redundancy at full flow and 50 to 100% at lower flows;
- Reservoir locations have been selected such that supply can be maintained for a period of hours during pumping station failure via gravity feed;
- Allowance has been made to connect a temporary generator at both Fairfield and Rosehill in the event of a long term power outage;
- The Plant has full redundancy in the major process trains (i.e. pumps, ion exchange, Micro Filtration Units and Reverse Osmosis Units); and
- The Plant includes a 3ML of storage for secondary treated effluent to smooth out supply fluctuations.

The Scheme is monitored on a 24 hour basis 7 days per week with early warning alarms and equipment condition tested through monitoring of key parameters.

Early warning alarms allow the operators to identify and follow any short term trend and take appropriate corrective action to rectify any recycled water quality or supply issues and avoid interruption to supply.

Maintenance regimes have been put in place by Veolia to ensure that the Rosehill Scheme operates continually and reliably. Planned maintenance that necessitates a partial or full shutdown of equipment will be scheduled in periods of low demand so that supply can be maintained wherever possible.

To the extent that there are interruptions due to operating problems, these issues will be temporary and corrected by Veolia as specified in the Infrastructure Operating Plan.

In the event that the Network or Plant is damaged by any party or a Force Majeure event, then supply may need to be interrupted while the damage is repaired. Reasonable precautions have been taken to prevent such occurrences such as condition monitoring, network surveillance and site security.

3.4 Interruption Due to Effluent Supply

In the event that Sydney Water is unable to provide sufficient effluent to maintain full plant operation or the quality of the effluent falls outside agreed parameters, an Effluent Event will be triggered under the Project Agreement and Sydney Water will provide Back-up or Top-up potable water as an alternative. The probability of an Effluent Event occurring is outside the control of AquaNet.

3.5 Interruption Due to Recycled Water Quality

The Plant has been designed such that it can operate reliably and consistently supply recycled water to the required Specification so that interruption due to quality issues will be rare. In the event that there is an off-specification event, production and/or deliveries will be shut down rather than supply off-specification recycled water to Foundation Customers or AquaNet customers. To the extent that there are interruptions due to quality problems, these issues will be temporary and corrected by Veolia as specified in the WUA Document ***RRWS-IMS-DOC-003 Water Quality Management Plan***.

Recycled water quality is monitored continuously at various points throughout the Rosehill Scheme including at the extremities of the Network. Recycled water from the Plant that does not meet the Specification will not be permitted to enter the Network, and in the event that water in the Network is out of Specification then the water will be disposed of through the various scour points. It will not be supplied to customers.

3.6 AquaNet Financial Viability

The Rosehill Scheme is supported by a 20 year Project Agreement with Sydney Water under which AquaNet will receive an ongoing revenue stream from sale of recycled water to Foundation Customers.

The revenue stream provides for:

- Purchase of treated water from Veolia under the Plant Agreement;
- Operating costs of AquaNet and the recycled water distribution network; and
- A return on invested capital.

Project expansion will occur when sufficient market is secured to justify the incremental capital and operating costs of the expansion.

The financial structure of the Rosehill Scheme is such that the risk of financial failure for AquaNet is low. If financial failure were to occur, customers could revert to their potable water back-up supplies or the Minister could appoint a Retailer of Last Resort as provided for in the WICA.

4. Alternative Supplies of Water

In the event that recycled water supply is interrupted, customers will not be left without sufficient water. If the Rosehill Scheme is producing insufficient recycled water to meet demand, supplies of potable water (in the form of Top-up water and Back-up water purchased from Sydney Water) are available to maintain water supply to Foundation Customers.

Non-Foundation Customers are supplied on an interruptible basis and make their own arrangements to manage interruptions to supply of recycled water by arranging back-up potable water supply from Sydney Water.

AquaNet can purchase Top-up potable water subject to limits specified in the Project Agreement, to meet Foundation Customer supply obligations. Those limits are:

- 3% of total Rosehill Scheme recycled water volume from April to September; and
- 7% of total Rosehill Scheme recycled water volume from October to March.

There is no limit on the use of Back-up potable water by Foundation Customers under the Project Agreement.

AquaNet's sole source of income is from the delivery and sale of recycled water. AquaNet therefore has a strong incentive maintain supply of recycled water and minimise the use of potable water.

5. Compliance

WUA manages risk and compliance through an integrated management system ('**IMS**'). WUA's IMS is a centralised system which combines the elements of a quality management system, work health and safety management system and an environmental management system. WUA's IMS is third party certified to the requirements of:

- AS/NZS ISO 9001, Quality Management Systems;
- AS/NZS 4801, Occupational Health and Safety Management Systems; and
- AS/NZS ISO 14001, Environmental Management Systems.

As a member of WUA, the policies, procedures and controls of the IMS apply to AquaNet.

The values, principles, standards and norms of behaviour of WUA are detailed and communicated to employees, contractors and business partners in a variety of ways. At the most fundamental level, WUA expects its employees, contractors and business partners to act with honesty and integrity, be ethical and act in caring and respectful way towards each other, our customers, the community, and the environment.

The Board of WUA has approved two key policies relating to WUA's values and principles which relate to sustainability, workplace safety, quality of products and the protection of the environment. These are the WUA Documents, ***WUA-IMS-DOC-003 Sustainability Policy*** and ***WUA-IMS-DOC-001 Quality, Health, Safety and Environment Policy***.

The Audit, Risk & Compliance Committee ('**ARCC**') of WUA has been established by the WUA Board to provide an objective review of the effectiveness of WUA's financial reporting and risk management framework. The principal role of the ARCC is to assist the Board in fulfilling its corporate governance

and oversight such as: health and safety, financial reporting; financial condition; internal controls; internal and external audit; risk management compliance; insurance; and sustainability.

5.1 Code of Practice for Customer Complaints

The WUA Document, ***RRWS-IMS-DOC-004 Code of Conduct for Customer Complaints*** has been developed by AquaNet and is consistent with the Australian Standard for complaints handling *AS ISO 10002—2006*.

The Code of Conduct for Customer Complaints specifies the process by which AquaNet will respond customer or community complaints, contact details and how the complaint can be escalated if necessary.

The Code of Practice for Customer Complaints is available on the AquaNet website and customers will be made aware of the Code prior to commencement of supply of recycled water.

AquaNet will abide by the Code of Conduct for Customer Complaints.

5.2 Code of Conduct for Debt Recovery

The WUA Document ***RRWS-IMS-DOC-005 Code of Conduct for Debt Recovery*** has been developed by AquaNet and is consistent with the terms of the recycled water supply agreements between AquaNet and its customers.

The Code of Conduct for Debt Recovery specifies steps that AquaNet will take in relation to overdue bills, unpaid bills and disputes. A short term payment plan will be available for customers suffering financial hardship.

The Code of Practice for Debt Recovery is available on the AquaNet website and customers will be made aware of the Code prior to commencement of supply of recycled water.

AquaNet will abide by the Code of Conduct for Debt Recovery with all customers.

5.3 Marketing Code of Conduct

The Marketing Code of Conduct published by the NSW Government specifies how marketers must conduct themselves when they deal with small retail customers. A person is a small retail customer in relation to water supply if the maximum rate at which water is supplied, pursuant to one or more water supply contracts, to all premises that the person owns, leases or occupies is less than 15 megalitres per year.

Rosehill Scheme water is highly treated and can cause accelerated corrosion in materials normally used for water reticulation such as cast iron, copper and concrete. Special materials must be used to handle the water or it must be treated further if standard materials are used. In either case, the cost and inconvenience of these options is likely to make Rosehill Scheme water unattractive for individual small customers.

Of the industrial, commercial and local government customers and potential customers that AquaNet presently deals with, only some local government irrigation sites and two to three line of main industrial users are small retail customers. AquaNet has no plans to market directly to residential customers.

If the Rosehill Scheme is extended to supply new developments, for example through dual pipe systems, then AquaNet's present plan is to supply other retailers on a wholesale basis for onward supply to customers in those developments.

AquaNet will develop the recycled water market through one to one business to business communication such as meetings, phone calls and emails.

AquaNet will also maintain an internet site with information on the Rosehill Scheme and the benefits of recycled water use. Customer events will occasionally be held and will be by invitation.

AquaNet will abide by the NSW Government Marketing Code of Conduct in communication with small customers.

5.4 Transfer Code of Conduct

The NSW Government Transfer Code of Conduct describes the arrangements that apply when a customer of any size is transferred from one licensed retailer supplier to another or to a public water utility, or from a public water utility to a licensed retail supplier. The Code imposes obligations on both the incoming and outgoing retailer, and the network operator.

At present Sydney Water and AquaNet are the only retailers that will be supplying water from the Rosehill Scheme and that situation is unlikely to change in the foreseeable future.

6. Implementation and Review

AquaNet will:

- ensure that this Plan is fully implemented and regularly reviewed according to the guidelines below;
- supply recycled water in accordance with the terms of the Project Agreement and Supply Agreements; and
- provide routine and event based communications in accordance with the agreed operational protocols.

This Plan will be reviewed on direction of the Minister or if any of the following circumstances occur:

- AquaNet enters into arrangements to supply Small Retail Customers;
- There is a change to the terms of the Supply Agreements that represents a material change to this Plan; or
- A change is required as the result of a change in law.

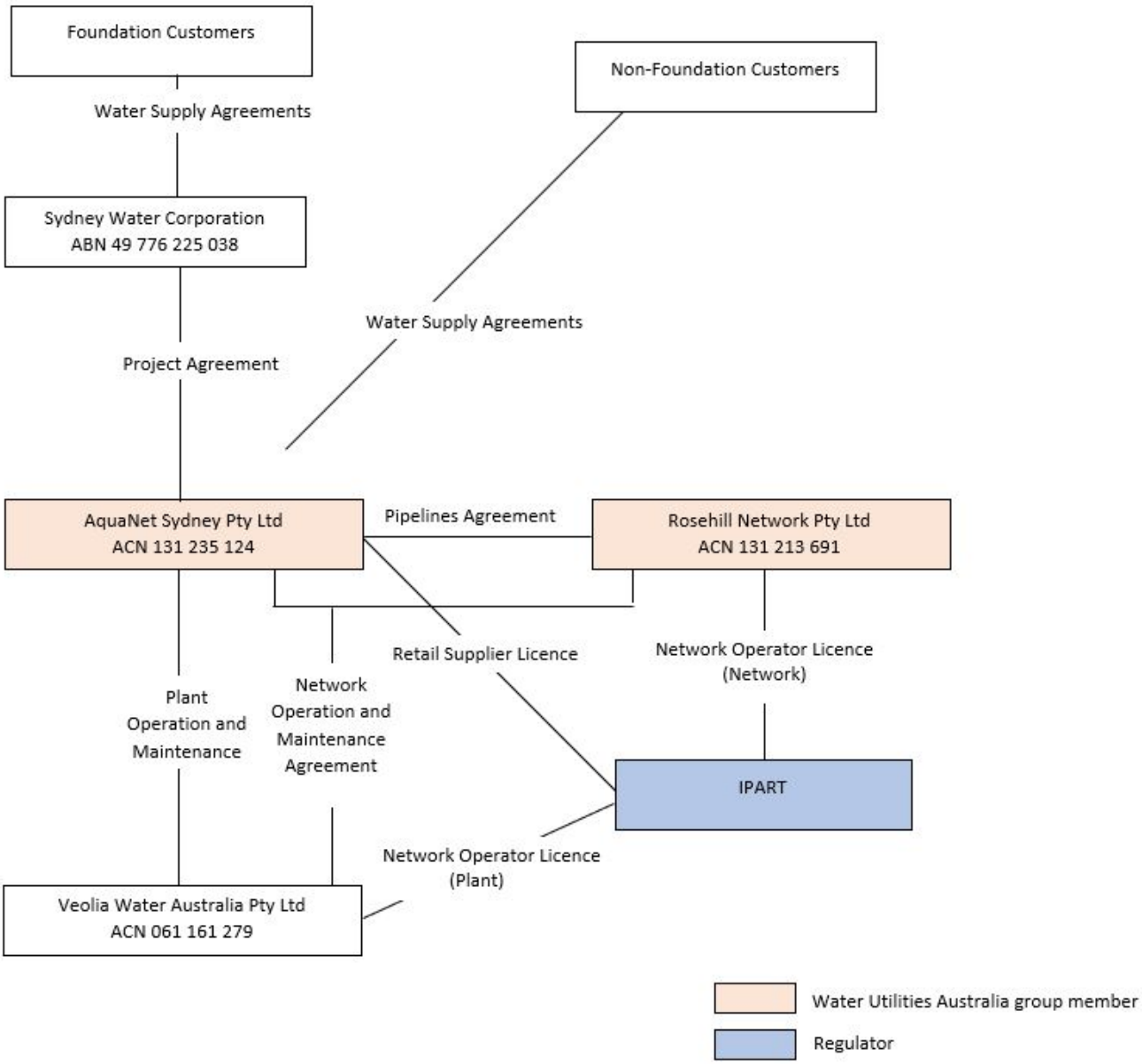
The Codes of Practice for customer complaints or debt recovery will be reviewed if:

- There is a change to the WICA regulations or other law that has a material effect on the codes;
- There is a material change to the terms of the Supply Agreements; or
- There is a material change to AquaNet processes.

If the Plan or Codes of Practice are updated as a result of the above processes, an updated copy will be provided to IPART and when agreed, posted on the AquaNet website with copies provided to the ombudsman and the Minister.

Annexure A – Overview of the Rosehill Scheme

Annexure B – Rosehill Scheme Contractual Framework



Kooragang Water Pty Ltd

WIC Act licence application

13 April 2022

Attachment 21:

Suez Retail Supply Management Plan

Note:

Suez's Recycled Water Management Plan (RWMP) for the KIWS forms a part of the SUEZ group's overall management plan framework for the operation of its sustainable water network providing recycled water to industrial customers in the Mayfield/Kooragang Island areas (the "Services"). The RWMP is intended to provide an overview of the KIWS recycled water treatment scheme as well as to set out how SUEZ operates the AWTP in line with its obligations under the *Water Industry Competition Act (NSW)* (WICA). The document represents a consolidated RWMP that integrates the following WICA Licence Plans:

- Water Quality Plan (non-potable water).
- Infrastructure Operating Plan.
- Retail Supply Management Plan (non-potable and potable water).

Recycled Water Management Plan

Kooragang Industrial Water Scheme

Document #. 110-SE-OM-000-MP-002 (8)

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Key Words

Water Industry Competition Act

WICA

Recycled Water

Recycled Water Management Plan

Asset Management Plan

Kooragang Industrial Water Scheme

Review and Document Control

VERSION	CHANGE	ISSUED	REVIEWED	AUTHORISED	DATE ISSUED
1	First draft by Dan Deere	11 August 2016	Peter Segura	N/A	N/A
2	Review by PS (SUEZ)	15 August 2016	Dan Deere	N/A	N/A
3	Updated draft by Dan Deere	30 August 2016	Peter Segura	N/A	N/A
4	Review by PS (SUEZ)	30 August 2016	Dan Deere	Peter Segura	31 August 2016
5	Working draft by Dan Deere	4 March 2017	Dan Deere	Peter Segura	6 March 2017
6	Working draft by Dan Deere	30 April 2017	Dan Deere	N/A	N/A
7	Final draft by Dan Deere	3 May 2017	Peter Segura	Peter Segura	
8	Review by DoH	30 June 2017	Peter Segura	Peter Segura	30 June 2017

Related Documents

DOCUMENT NAME	REFERENCE NUMBER
SUEZ WTS Online integrated management system	IMS
SUEZ WTS Omega Processes which define the higher level group policies, processes and associated procedures.	OMEGA
Asset Management – Management Systems - Requirements	ISO55001: 2014
KIWS Asset Criticality Review	20160623-ZAM-V1
KIWS Renewals Plan	20160628-ZAM-V
Australian Guidelines for Water Recycling 2006	AGWR

Acronyms and Abbreviations

AGWR	Australian Guidelines for Water Recycling (2006)
AWTP	Advanced Water Treatment Plant
BOD	Biological Oxygen Demand
CCD	Customer Commercial Development
CCP	Critical Control Point
CCT	Chlorine Contact Tank
CIP	Clean in Place
CMMS	Computerised Maintenance Management System
Ct	Concentration x contact time (dose of disinfectant)
DALY	Disability-adjusted life year
DECC	Department of Environment Climate Change
DoH	NSW Department of Health
DWE	Department of Water and Energy
EC	Electrical Conductivity
EPA	Environmental Protection Authority
EPL	Environment Protection Licence
EPHC	Environment Protection and Heritage Council
HACCP	Hazard Analysis and Critical Control Point
HWA	SUEZ Australia
HWC	SUEZ Corporation
IOP	Infrastructure Operating Plan
IPART	Independent Pricing and Regulatory Tribunal
KIWS	Kooragang Industrial Water Scheme
KWPL	Kooragang Water Pty Ltd
LP	Low Pressure
LRV	Log_{10} reduction value
MF	Membrane Filtration
MLD	Megalitres per day
MoU	Memorandum of Understanding
MSDS	Material Safety Data Sheet
NATA	National Association of Testing Authorities
NRMMC	Natural Resource Management Ministerial Council
NSW	New South Wales
NTU	Nephelometric Turbidity Units
NWQMS	National Water Quality Management Strategy
OH&S	Occupational Health and Safety
O&M	Operations and Maintenance
PDT	Pressure Decay Test
PLC	Programmable Logical Controller
POEO	Protection of the Environment Operations
QCP	Quality Control Point
RO	Reverse Osmosis
RWMP	Recycled Water Management Plan
RWQMP	Recycled Water Quality Management Plan
SCADA	Supervisory Control And Data Acquisition
SIP	Standard Incident Procedure
SOP	Standard Operating Procedure
TDS	Total Dissolved Solids
TN	Total Nitrogen
TP	Total Phosphorus
TRIM	Tower Records Information Management
TSS	Total Suspended Solids

UV	Ultraviolet
WICA	Water Industry Competition Act (NSW)
WQP	Water Quality Plan (non-potable water)
WSAA	Water Services Association of Australia
WWTW	Wastewater Treatment Works

Table of Contents

Introduction

The Kooragang Industrial Water Scheme (KIWS) advanced water treatment plant (AWTP) is a 9 megalitres per day (MLD) (for Stage 1) membrane filtration (MF) and reverse osmosis (RO) recycling plant commissioned in December 2014, owned by ITOCHU, designed for operation from mid 2017 by SUEZ under a 15-year operations and maintenance (O&M) contract.

The AWTP processes treated secondary effluent from Hunter Water Corporation's Shortland Wastewater Treatment Works (WWTW) that would otherwise be directed for marine discharge, therefore reducing the volume of treated effluent discharged into the natural environment and reducing the demand on the potable water system for industrial water uses.

Management Commitment

SUEZ endeavours to manage recycled water delivery processes efficiently, effectively and in a manner that protects human and environmental health. By ensuring this, SUEZ is able to provide recycled water that is safe and meets the expectations of customers, the Network Operator's Licence, customer contracts and other relevant regulatory requirements.

In line with SUEZ's Network Operator's Licence recycled water is supplied according to the *Australian Guidelines for Water Recycling: Managing Health and Environmental risks (Phase 1)* (AGWR; EPHC, NRMMC & NHMRC; 2006) as well as any additional requirements set by NSW Health and the Environmental Protection Authority (EPA) and overseen by the Independent Pricing and Regulatory Tribunal (IPART).

Purposed of the Recycled Water Management Plan

This Recycled Water Management Plan (RWMP) for the KIWS forms a part of the SUEZ group's overall management plan framework for the operation of its sustainable water network providing recycled water to industrial customers in the Mayfield/Kooragang Island areas (the "Services"). The RWMP is intended to provide an overview of the KIWS recycled water treatment scheme as well as to set out how SUEZ operates the AWTP in line with its obligations under the *Water Industry Competition Act (NSW)* (WICA). The document represents a consolidated RWMP that integrates the following WICA Licence Plans:

- Water Quality Plan (non-potable water).
- Infrastructure Operating Plan.
- Retail Supply Management Plan (non-potable and potable water).

Structure of the RWMP

The RWMP summarises the scheme and explains how its commercial operation complies with its WICA obligations. The document brings together the scheme's obligations and includes a detailed assessment of the recycled water treatment process and identifies the current monitoring and control that is necessary to produce recycled water of an appropriate quality for the proposed end users. This document along with its associated appendices is intended to provide effective management tools that will instil confidence in operators, regulators, stakeholders and customers.

Water Quality Plan (non-potable water)

The Natural Resource Management Ministerial Council (NRMMC), Environment Protection and Heritage Council (EPHC) and National Health and Medical Research Council (NHMRC) released the AGWR in November 2006 under the auspices of the National Water Quality Management Strategy (NWQMS). The AGWR provides guidance on best practices for water recycling operations and is designed to be an authoritative reference for the supply, use and regulation of recycled water schemes. The AGWR provides guidance on how recycling can be safely and sustainably achieved to provide water for agriculture, fire control, municipal, residential and commercial property as well as industry.

This document is structured around each of the 12 elements in the management system framework specified in the AGWR (AGWR Framework). In this way the RWMP wholly incorporates the *Water Quality Plan (non-potable water)* (WQP) Licence Plan as required under WICA.

infrastructure Operating Plan

Compliance with good asset management and operational practices is required under WICA as part of the need to have an *Infrastructure Operating Plan* (IOP) Licence Plan. For convenience, the structure of the AGWR Framework is utilised in setting out this document and references to asset management, operations and IOP elements are made within that context. Specifically this RWMP explains how SUEZ complies with its IOP requirements under WICA under Element 4 of the AGWR Framework, which sets the context for asset and operations management.

Retail Supply Management Plan

Within this RWMP compliance with the requirements of the Retail Supply Management Plan (RSMP) Licence Plan is addressed. For convenience, the structure of the AGWR Framework is utilised in setting out this document and references to retail supply management requirements under WICA are set out following discussion of how SUEZ addresses the 12 elements of the AGWR Framework.

Acknowledgements

SUEZ gratefully acknowledges that this document has drawn from existing management plans and procedures previously held by Hunter Water and drawn up by Hunter Water Australia and HunterH2O. These documents were provided to SUEZ as part of the transfer of the operations and maintenance role. In addition, the document has been developed by SUEZ staff supported by Water Futures and contributed to by much appreciated review inputs from Hunter Water, IPART, Orica and NSW Health staff.

1 ELEMENT 1: Commitment to Responsible Use of the Management of Recycled Water

1.1 Responsible Use of Recycled Water

SUEZ is committed to ensuring that the KIWS scheme is managed based on this RWMP and other site-specific quality planning documents. SUEZ is a global specialist in large-scale water and wastewater operations and has a firm commitment to the responsible supply and use of recycled water. SUEZ brings to the table a wide range of expertise in the development, operation and control of recycled water systems. Areas of expertise include:

- Operation and maintenance of water, wastewater and treatment systems and infrastructure.
- Planning and design of water and wastewater treatment systems as well as associated infrastructure.
- Risk assessment, including comprehensive evaluation of health and environmental hazards.
- Customer relations and commercial agreement management.
- Contract and project management.
- Detailed understanding of plumbing systems and requirements.

In situations where SUEZ do not have personnel with sufficient expertise, or do not have the resources to undertake work, suitably qualified contractors and consultants are engaged to execute tasks on behalf of SUEZ.

1.2 Regulatory and Formal Requirements

SUEZ is regulated by IPART under a WICA Licence. The Network Operator's Licence protects the customer by setting standards of services that SUEZ must meet. Under SUEZ's Network Operator's Licence, recycled water supplied by SUEZ must be supplied according to the AGWR or relevant guidelines specified by NSW Health or EPA. In addition, numerous regulatory and formal requirements relate to recycled water schemes. Regulatory and formal requirements are periodically reviewed as part of the periodic review of this document and in response to advice from regulator and stakeholders. The most pertinent regulatory and formal requirements relevant to the KIWS scheme are summarised in Table 1-1:

Table 1-1. Examples of the most pertinent regulatory and formal requirements.

Document	Notes
Regulations and guidelines	
NSW Government: *Water Industry Competition Act 2006* (NSW) (WICA) and associated supporting regulations, guidelines and amendments.	Third party document
IPART *Incident Notification by Network Operators and Retail Suppliers Water Industry Competition Act 2006 Water — Incident Notification March 2016.*	Third party document
Natural Resource Management Ministerial Council (NRMMC)/Environment Protection and Heritage Council (EPHC)/Australian Health Ministers Conference (AMHC): *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) (2006)*.	Third party document
Australian and New Zealand Environment and Conservation Council (ANZECC)/ Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ): *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)*.	Third party document
NSW Government Office of Environment and Heritage: *Environmental Guidelines Use of Effluent by Irrigation (2004).*	Third party document
Occupational Health and Safety Act 2000 (NSW) and subordinate regulations (Work Cover Act).	Third party document
Relevant Australian Standards and Codes of Practice for the design and installation of recycled water infrastructure (e.g. the relevant Water Services Association of Australia (WSAA) *WSA 03-2011 Water Supply Code of Australia Version 3.1* (as amended)).	Third party documents

Australian Building Codes Board: *Plumbing Code of Australia* (as amended).	Third party document
Licenses	
SUEZ WICA Network Operator's Licence (Licence Number 16_038 signed by the Minister for Land and Water on 12th December 2016).	Filed by SUEZ
SUEZ WICA Retail Supplier's Licence (Licence Number 16_039R signed by the Minister for Land and Water on 12th December 2016).	Filed by SUEZ
Hunter Water's EPA Environment Protection Licence (EPL) for KIWS (No. 1680) (relating to intentional discharges from the Hunter Water Shortland WWTW operated by Veolia).	Third party document
SUEZ's EPA Environment Protection Licence (EPL) for KIWS (No. 20757) dated 6 September 2016 (relating to accidental discharges from the KIWS AWTP operated by SUEZ).	Filed by SUEZ
Agreements	
Hunter Water and KIWSP Operations Protocol Rev N 5 April 2017	Filed by SUEZ
SUEZ *Communication Protocols with Orica Kooragang Industrial Water Scheme Document 110-SE-OM-000-MP-001 Issue date 8 July 2016 Version A01.*	Filed by SUEZ
SUEZ O&M Agreement with Kooragang Water Pty Ltd.	Filed by KWPL
Recycled water customer agreement between Orica and Kooragang Water Pty Ltd.	Filed by KWPL
Non Potable Water Supply Agreement between Kooragang Water Pty Ltd *and Orica* *Schedule E Non Potable Water Specifications* of the above agreement	Filed by KWPL
Potable Water Agreement (Draft v5 dated to 26 April 2016).	Filed by KWPL
Schedule D Proposed Delivery Point of the *Non Potable Water Supply Agreement* (1 August 2011 version) between Kooragang Water Pty Ltd and Orica Australia Pty Ltd.	Filed by KWPL
Supply Agreement (Agreement for the Supply of Treated Effluent and Potable Water) (Version 1 – currently being updated, 17 December 2015) between Hunter Water Corporation and Kooragang Water Pty Ltd. *Schedule 6 Orica Potable Water Delivery Point* of the above agreement *Schedule 7 Treated Effluent Delivery Point* of the above agreement	Filed by KWPL
SUEZ documents	
SUEZ *Recycled Water policy SYS-POL-02* (dated 25 July 2016)	Filed by Suez and given as Appendix A
SUEZ *Hazard Analysis and Critical Control Point (HACCP) Plan* (dated 28 June 2016)	Filed by SUEZ and given as Appendix B
SUEZ *HACCP Review Meeting* (dated 29 July 2016).	Filed by SUEZ and given as Appendix C
SUEZ *HACCP Review Meeting* (dated 13 October 2016).	Filed by SUEZ and given as Appendix C
SUEZ *Recycled Water Quality Monitoring Plan Kooragang Industrial Water Scheme Version A* dated 11 August 2015.	Filed by SUEZ and given as Appendix E
SUEZ *Hunter Treatment Alliance Kooragang Industrial Water Scheme Validation Report Document Number: KI-RT-PT-015* (dated 22 January 2014).	Filed by SUEZ and given as Appendix F

SUEZ *Risk Management and Compliance Framework*	To be filed by SUEZ and given as Appendix G
SUEZ *KIWS Training Matrix*	Filed by SUEZ
SUEZ *KIWS Asset Criticality Review 110-SE-OM-000-RP-001* (dated 23 June 2016)	Filed by SUEZ
SUEZ *KIWS Renewals Plan 110-SE-OM-000-WS-001* (dated 28 June 2016)	Filed by SUEZ
Handed over Hunter Water documents including Functional Description, P&IDs, SOPs and SWMS and either archived if unchanged or converted into SUEZ formats.	Filed by SUEZ
SUEZ *KIWS Asset Register* worksheet	Filed by SUEZ
SUEZ *Quality Policy SYS-POL-01*	Filed by SUEZ
SUEZ *KIWS Asset Management Plan*	Filed by SUEZ
SUEZ *Incident Reporting and Investigation Procedure OHS-005*	Filed by SUEZ
SUEZ *PRO-005 Evaluation of Suppliers*	Filed by SUEZ
SUEZ *F&A-005 Purchasing Specifications*	Filed by SUEZ
SUEZ *KIWS HSE Management Plan Kooragang Industrial Water Scheme (KIWS) Health, Safety & Environment*	Filed by SUEZ
SUEZ *HR-005 Training & Development*	Filed by SUEZ
SUEZ *Documents and Data Control (F&A-001)*.	Filed by SUEZ
SUEZ *Record and Archives (F&A-002)*	Filed by SUEZ
SUEZ *Auditing SYS-005*	Filed by SUEZ
SUEZ *Management of Quality, Safety and Environmental Hazards SYS-008*	Filed by SUEZ
SUEZ "site-specific procedure for chemical receipt" (referenced on Page 29 of the RWMP)	Filed by SUEZ
Relevant policies and procedures contained within Suez's IMS and Intranet system.	Filed by SUEZ

In relation to the scheme-specific requirements the Contract Manager (Peter Segura) will ensure awareness and currency of regulatory and formal requirements.

In relation to broad corporate governance, SUEZ has an internal risk and audit team that looks at governance and financial management.

1.3 Partnerships and Engagement of Stakeholders

There are a number of agencies that are involved with KIWS. These include the following:

- SUEZ globally (as the global parent company of the O&M contractor, SUEZ).
- Kooragang Water (as the asset owner).
- Orica (as the recycled water customer).
- EPA (as the environmental regulator and advisor).
- NSW Health (as the health stakeholder and advisor).
- IPART (as the overarching regulator and advisor).
- Local Government (as the local government regulator and advisor).

Details of the key stakeholders' relevant roles and responsibilities are listed in Table 1-2. The key relationships are illustrated in **Error! Reference source not found.**. The identified external end user of r

ecycled water (Orica) has entered into an agreement with Kooragang Water Pty Ltd (KWPL). Their responsibilities are identified within that Recycled water customer agreement between Orica and Kooragang Water Pty Ltd. Any future changes to the way in which the water will be utilised by the end users or if additional end users are supplied by KIWS will result in the revision of existing agreements and/or the development of new agreements between end users and KWPL. Ongoing consultation between Orica as the end user of the recycled water from KIWS and SUEZ will occur to maintain end user involvement in the scheme

Table 1-2. Recycled Water Scheme Stakeholders.

Stakeholder	Roles and Responsibilities
NSW Health	Public heath advice
Environmental Protection Authority (EPA)	Regulatory oversight and advice - environment
Independent Pricing and Regulatory Tribunal (IPART)	Regulatory oversight and advice – pricing and reporting. SUEZ Network Operator's Licence
SUEZ	KIWS operator
Kooragang Water Pty Ltd	KIWS Owner
Orica	Usage of recycled water Management of on-site delivery infrastructure Ensuring recycled water is used as per agreement with SUEZ
Hunter Water Corporation	Raw water supplier of partially treated sewage effluent to the KIWS AWTP

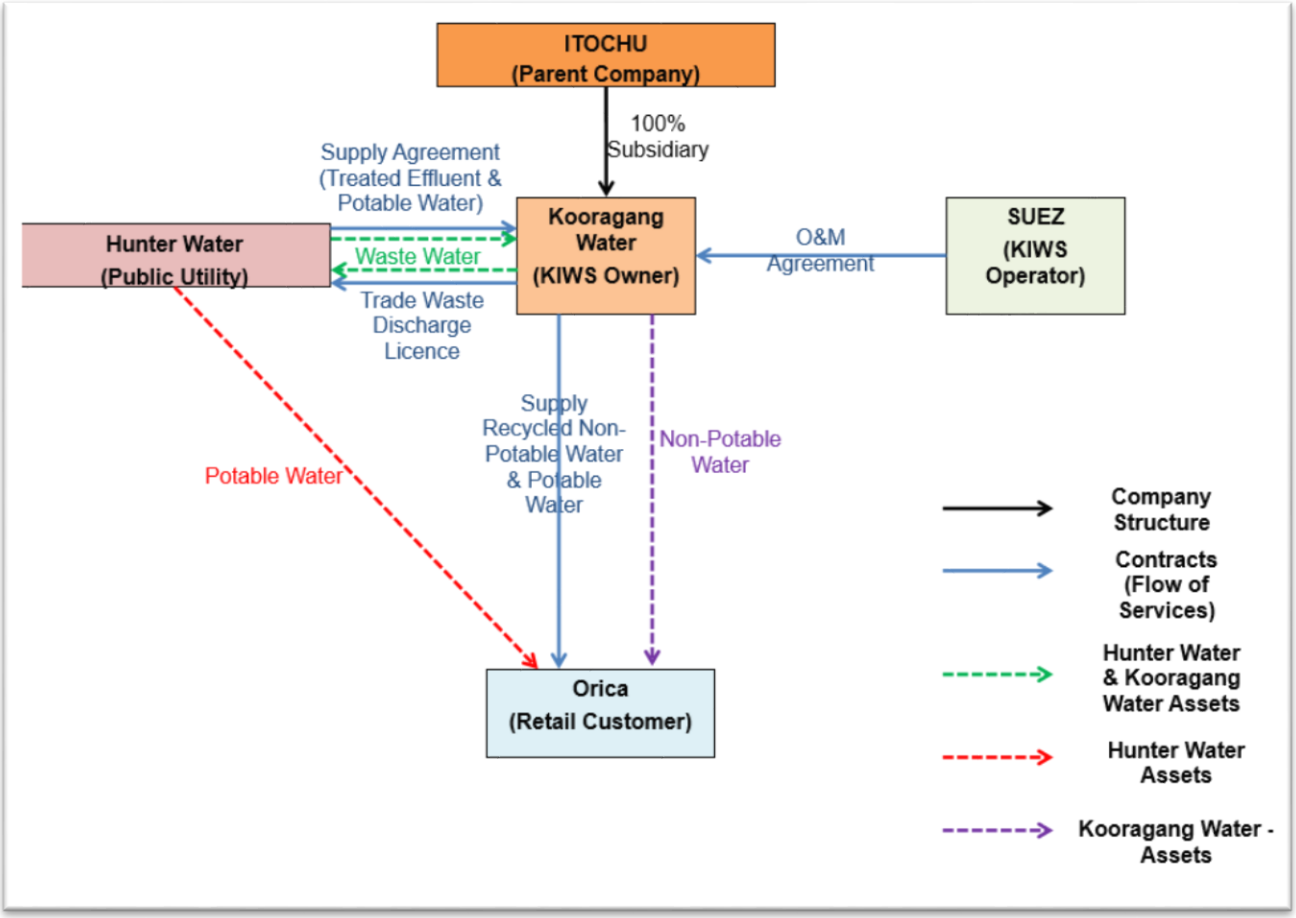


Figure 1-1 Contract Structure and Assets

1.4 Recycled Water Policy

A Recycled Water Policy has been completed by SUEZ based on the example given in the AGWR (*SUEZ Recycled Water policy SYS-POL-02* and dated 25 July 2016). The Policy is attached to this document, as Appendix A. The policy has been signed off by the CEO of the Water and Treatment Solutions business. Relevant SUEZ staff are made aware of this Policy through SUEZ's promotion of its policies within its induction program. In addition, SUEZ has a more general Quality Policy (*Quality Policy SYS-POL-01*). The policies outline SUEZ's commitment to supporting and promoting responsible use of recycled water as well as the application of a management approach that consistently meets the AGWR and good quality management.

1.5 Responsibility matrix

With SUEZ, Table 1-3 summarises how specific obligations set out in this document are allocated, coordinated and managed by nominated SUEZ personnel.

Table 1-3. Licence Plan and WICA SUEZ personnel responsibility matrix.

Obligation	Role	Incumbent
Quality systems and regulatory compliance		

Obligation	Role	Incumbent
Registration and auditing of the KIWS site under the SUEZ Integrated Management System covering ISO9001, ISO 14001, ISO18001 and AS4801.	HSEQ Systems Manager, Water and Treatment Solutions, SUEZ.	Peta Rogers
Liaison with IPART and scheme auditors in relation to WICA licensing and auditing and maintaining currency of the RWMP.	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Maintaining awareness of regulatory and formal requirements pertaining to the AWTP.	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Maintaining the EPA POEO Licence for the scheme.	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Contracts with customers and supplies		
Disputes and higher level legal matters and forming contracts	SUEZ Senior Legal Counsel	Mike Krsticevic
Management of the contracts held between KWPL and the customer and Hunter Water	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Human resources management		
Site-specific KIWS plant induction for new staff	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Identification of training needs and maintenance of the *KIWS Training Matrix* for the KIWS plant operators	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Provision of information on training courses attended and certifications provided to HR for HR to record	All SUEZ staff	All staff
Maintenance of records of training completed	SUEZ Human Resources	All HR staff
Ensuring required training is kept up to date	SUEZ Human Resources	All HR staff
Following up and evaluating training provided	SUEZ Human Resources	All HR staff
Notification and response		
Notification of water quality verification monitoring results to SUEZ KIWS AWTP Operators	Laboratory Services Provider	ALS
Notification of the customer (Orica) of water quality verification monitoring exceedances	SUEZ KIWS AWTP Operators	All operators
Notification of the supplier (Hunter Water Corporation) of water quality verification monitoring exceedances	SUEZ KIWS AWTP Operators	All operators
Notification of the regulator (IPART) of water quality verification monitoring exceedances	SUEZ KIWS AWTP Operators	All operators
Notification of other stakeholders (e.g. NSW Health or EPA) of water quality verification monitoring exceedances.	SUEZ KIWS AWTP Operators.	All operators
Meetings and reporting		
Complete and submit the Annual Compliance Report to IPART before 31 August each year.	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Monthly and annual reports internally and to Orica and Hunter Water.	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura

Obligation	Role	Incumbent
Maintaining relationships with key stakeholders including holding annual meetings with Orica and Hunter Water.	SUEZ KIWS Transition Manager/Contract Manager	Peter Segura
Scheme operations and maintenance		
Operation of the scheme and compliance with operational procedures and HACCP Plan.	SUEZ KIWS AWTP Operators	All operators
Scheme asset management		
Asset management of the scheme and compliance with asset management and maintenance schedules.	SUEZ KIWS AWTP Operators	All operators
Verification		
Water quality verification sampling and analysis.	Laboratory contractor	ALS

2 ELEMENT 2 – Assessment of the Recycled Water System

2.1 Source of Recycled Water, Intended Uses, Receiving Environments and Routes of Exposure

2.1.1 Source water

SUEZ is responsible for the operation of the KIWS at Mayfield West, Newcastle which includes the Mayfield West AWTP and the reticulation system that delivers the recycled water to customers. Prior to reaching SUEZ, and before being covered within the scope of this RWMP, it is acknowledged that recycled water is sourced from the Shortland WWTW that is owned by Hunter Water and operated and maintained by Veolia.

Shortland WWTW accepts wastewater from the communities of Sandgate, Shortland, Birmingham Gardens and Maryland. Shortland's catchment alone can only supply ≈6 MLD of wastewater which is why effluent from another catchment is also diverted to Shortland WWTW to supplement flows.

Influent entering the system is partly residential (domestic) whilst some wastewater comes from the University of Newcastle and Saint Joseph's Nursing Home at Sandgate. Industrial sewage is supplied from Kooragang Island, the Steel River Project and intakes of high strength waste from Steggles Potatoes. Storm flows enter from the Wallsend Storm Flow pumping station and can contribute to the total flows.

There are small commercial flows from retail outlets, hotels and small automotive repair garages (trade waste). Trade waste controls are managed by Hunter Water.

Given the implemented trade waste controls, loads discharged by trade waste customers and dilution effects over catchments, the final concentration of most substances measured at the inlet of Shortland WWTW would not differ substantially from those found in domestic sewage.

The Shortland WWTW currently treats 12.6 MLD (average dry weather flow) and can handle wastewater from a population equivalent to 32,000 people (12.6 MLD). The ultimate capacity of the scheme over the longer term is estimated at up to 16.8 MLD if both the Shortland WWTW and the KIWS AWTP are upgraded.

At present the supply arrangements between Hunter Water and KIWS are being finalised under the *Supply Agreement (Agreement for the Supply of Treated Effluent and Potable Water HWC and WPTL (ITOCHU Corporation)* (Version 1, Dec 17 2015).

2.1.2 Intended Uses

Recycled water from KIWS is supplied to Orica. The customer end uses for the recycled water are summarised in Table 2-1. The Table also notes the on-site uses of recycled water although these are not directly relevant to the WICA Network Operator's Licence which covers the commercial provision of water to Orica.

SUEZ will maintain records of its users, in this case just Orica, albeit complying with the requirements of privacy legislation.

- Table 2-1: Uses of Recycled Water

Category of Use	Customer	End Use
Industrial Use (Unrestricted)	Orica	Process water
AWTP on site reuse	Self (SUEZ, operator of KIWS)	On site plant uses, e.g. hose down, chemical dosing

2.1.3 Routes of exposure

Potential routes of exposure for each of the intended end-uses are listed in Table 2-2.

- Table 2-2: Routes of Exposure

Intended End Use	Route of Exposure
Industrial Use (Unrestricted)	Ingestion of water from sprays Inhalation of water from sprays during operation/maintenance of processes Contact with water from sprays during operation/maintenance of processes
AWTP on site reuse	Ingestion of water from sprays Inhalation of water from sprays during operation/maintenance of processes Contact with water from sprays during operation/maintenance of processes

2.1.4 Receiving environments

The intended uses of KIWS product water do not include discharge to the environment. Discharge to the Hunter River will only occur as overflows when the raw water tank and the product water tank are full or RO permeate has not met the disinfection specifications and can't be supplied to the end user. These flows are of the same or better quality than the existing discharge of secondary effluent to the Hunter River from Shortland WWTW. The normal discharges from Shortland WWTW are managed under the EPA POEO licence for the Shortland WWTW (Licence Number 1680). In addition, of relevance to WICA, a KIWS AWTP EPA POEO licence is in place to permit accidental or emergency discharges from the KIWS AWTP of up to 100 ML per year (Licence Number 20757).

The end use and application of recycled water is under the control of the customer (Orica). Additionally, the receiving environments and potential hazards were taken into consideration during the risk assessment process, as described in Section 2.4.

2.1.5 Inadvertent or unauthorised use

Within the risk assessment process detailed in Section 2.4 inadvertent and unauthorised use on site was considered, analysing the likelihood of occurrence and potential impact. Response to inadvertent or unauthorised use is also covered in the HACCP Plan that is given in Appendix B.

2.2 Recycled Water System Analysis

2.2.1 Flow through KIWS

The design flows and loads adopted for the concept design of the KIWS are summarised in Table 2-3.

- Table 2-3: Design flows through KIWS

Parameter	Unit	Initial Capacity (Stage 1)	Ultimate Capacity (Stage 2)
Influent flows	MLD	12.8	16.8
Production Capacity	MLD	9	12
Losses (incl. backwashing of auto strainers, MF and RO systems)	MLD	3.8	4.8

2.2.2 Treatment Process

The treatment processes performed at KIWS are described in detail in the following sections.

Chloramine Dosing

Chlorine is dosed at Shortland WWTW. However, chlorine can be hazardous to RO membranes. Therefore, chloramine dosing occurs upfront of the auto strainers. Carrier water is added to each separate chemical (i.e. sodium hypochlorite and aqueous ammonia). These two streams are combined in a static mixer, located within the Aqueous Ammonia chemical bund, to form chloramines. The intention is to always maintain a free

ammonia residual through the plant to ensure that there is no free chlorine in the raw water, which would oxidise the RO membranes.

Purpose: To prevent microbiological growth through the plant and ensure that there is no free chlorine in the system that may damage RO membranes.

Auto Strainers

The auto strainers are Amiad EBS model type with 300 µm weave wire screens, which backwashes periodically based on a differential headloss across the screens or on time. Once initiated the auto strainer operates continuously to screen incoming flows. The backwash process occurs twice per day and produces approximately 420 L per backwash but is dependent on operating pressures and solids content of the incoming effluent.

Purpose: To provide physical protection for the MF system.

Microfiltration

The MF plant is a Pall Microza MF system with a nominal pore size of 0.1 µm. It consists of three trains each with a maximum continuous feed flow of 16.3 L/s (total 49 L/s), which will be increased to 21.6 L/s (total 65 L/s) with the addition of membrane modules to achieve ultimate capacity in Stage 2.

Periodically the MF system carries out a backwash cycle to remove the captured suspended solids from the membrane surface and diverts them to the backwash handling system for disposal off site. The MF backwash process uses MF filtrate which is stored in the MF backwash tank with a storage capacity of 10 kL.

Purpose: Removal of pathogens and suspended solids

Reverse Osmosis

The RO process consists of four (4) trains (single pass, two stages) that are fed from the RO feed water tank via cartridge filters. Antiscalant and sulphuric acid are dosed downstream of the Low Pressure (LP) feed pumps to protect the RO membranes from scale-forming compounds and improve performance. Citric acid and hydrochloric acid, caustic soda and a RO proprietary cleaning agent are used for chemical cleaning of the membranes, also referred to as a Clean in Place (CIP) and maintenance cleans.

Purpose: Removal of dissolved salts, pathogens and all other particulates.

Degas Tower

RO permeate enters the Degas Tower at a high level and is distributed across the footprint area of the tower by way of a trough distribution system before dropping through the tower under gravity. Air introduced into the tower at low level, passes up through the RO permeate. Internal packing media within the tower assists in maximising the exposure of permeate with air to ensure CO_2 is brought out of solution and released as a gas.

Purpose: To remove CO_2 from the RO permeate.

Chlorination

Sodium hypochlorite is dosed into the feed main upstream of the chlorine contact tank (CCT). The main chlorination step occurs within the CCT. The contactor is a 700 kL tank, providing a hydraulic retention time (HRT) of 112 minutes at Stage 1 maximum design flow and 84 minutes at Stage 2 maximum design flow.

The aim of the CCT is to achieve 4 Log virus reduction by chlorine inactivation. The required dose or Ct (disinfectant concentration x contact time) for chlorine inactivation of coxsackie B5 virus is 11 mg.min/L at a pH of less than 7.5 with a water temperature of greater than 10°C (Keegan et al., 2012). This increases to 27 mg.min/L for a pH of up to 9.0 with the control system adjusting the target based on the pH measured.

Purpose: Inactivation of pathogens (viruses and bacteria) and prevention of algal and biological growth in storage and distribution system

2.2.3 On-site Storage

Product Water Tank

The product water tank provides 4.2 ML storage equating to approximately 12 hours hydraulic retention time at Stage 1, and 9 hours at Stage 2, under average flow conditions of 139 L/s. A magnetic flow meter is located on the outlet to the product water tank to accurately record flows to the end user.

2.2.4 Distribution

On-site Service Water

A service water system is provided using product water stored in the product water tank. Two vertical multistage centrifugal pumps operate on variable speed drives in a duty/standby configuration. The service water system provides water for the following applications:

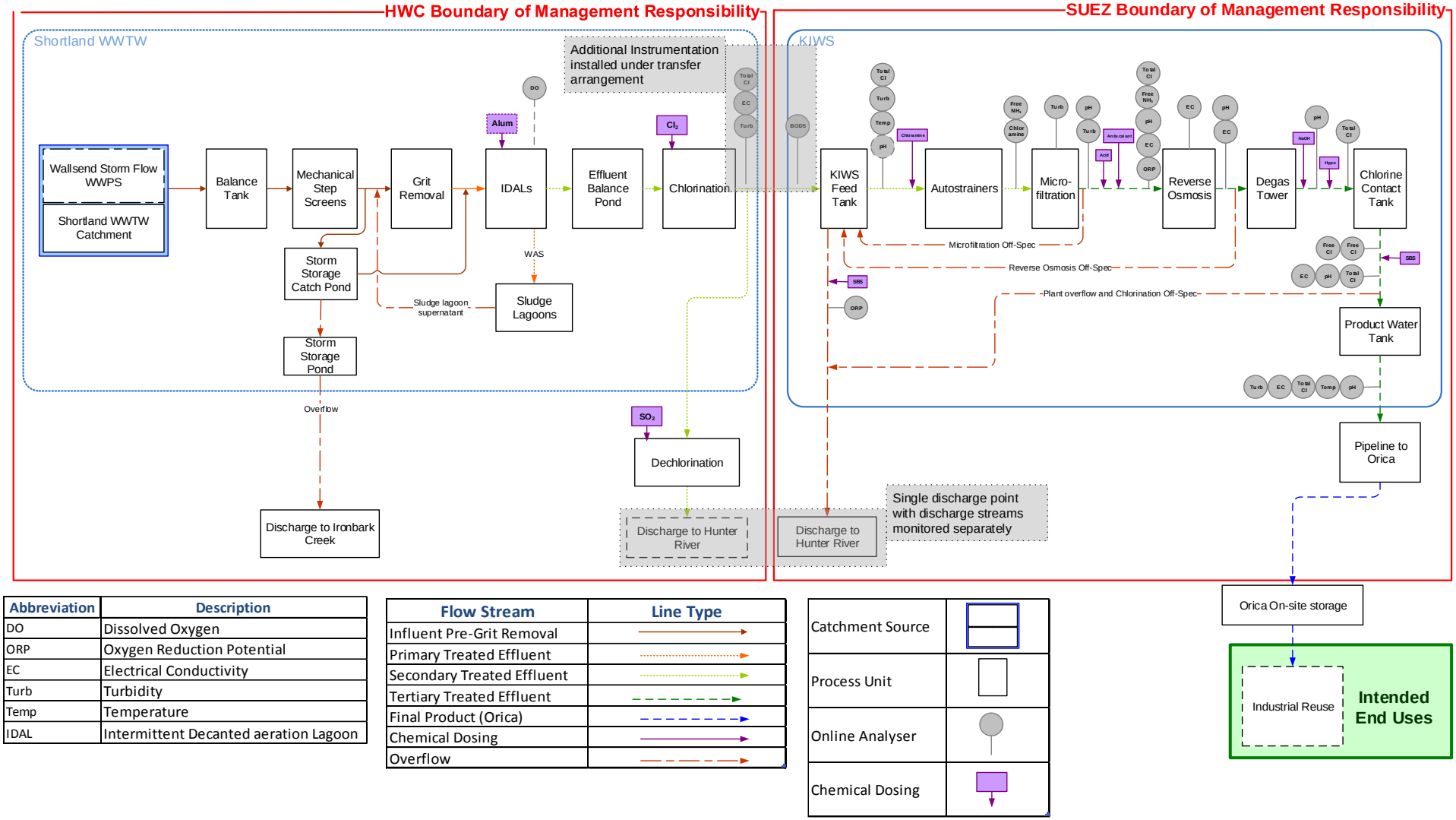
- Carrier water for the sulphuric acid dosing
- Carrier water for the chloramine dosing using aqueous ammonia
- Carrier water for the chloramine dosing using sodium hypochlorite
- Hose reels for wash down

Product Water Pumps

The product water pumps transfer water from the product water tank to the end user, Orica, and are located outside adjacent to the Product Water tank. The product water pumps have on-line redundancy with a duty/ stand-by arrangement and are fitted with variable speed drives to enable a level set point to be maintained within the Orica tank.

Transfer Pipeline to Orica

Recycled water is transferred from the product water tank to Orica via an 8 km pipeline of a nominal diameter of 400 mm.



Abbreviation	Description
DO	Dissolved Oxygen
ORP	Oxygen Reduction Potential
EC	Electrical Conductivity
Turb	Turbidity
Temp	Temperature
IDAL	Intermittent Decanted aeration Lagoon

Flow Stream	Line Type
Influent Pre-Grit Removal	
Primary Treated Effluent	
Secondary Treated Effluent	
Tertiary Treated Effluent	
Final Product (Orica)	
Chemical Dosing	
Overflow	

Catchment Source	
Process Unit	
Online Analyser	
Chemical Dosing	

- Figure 2-1 Recycled water system flow diagram showing KIWS (the subject of this RWMP), Shortland WWTW and Orica. The *Hunter Water and KIWSP Operations Protocol Rev N 5 April 2017* refers to the instruments and quality control associated with those.

2.2.5 Water Quality Objectives

Legislation and Guidelines

EPA Environment Protection Licence (EPL) Nos. 1680 and 20757 govern overflows and discharges from KIWS. The AGWR set the level of treatment needed to address the public health and quality issues associated with providing recycled water fit for the end uses as described in Table 2-1.

The Australian and New Zealand Environment and Conservation Council (ANZECC) *Guidelines for Fresh and Marine Water Quality (2000)* and the DECC (now EPA) *Use of Effluent by Irrigation Environmental Guidelines (2004)* discuss water quality in the context of irrigation for agricultural use. These guidelines have been considered in developing the water quality objectives applied to the KIWS recycled water scheme.

Target and Claimed Log Reduction Values

The overall log reduction targets for the scheme were calculated at an Exposure Workshop held in May 2008 between representatives from Hunter Water Corporation, the end user (Orica) and water treatment and recycled water professionals. At the workshop the expected exposure of employees to recycled water whilst undertaking specific tasks was identified and quantified. Risks were estimated in disability-adjusted life years (DALYs) given those exposures. Pathogen $\log_{10}$ reduction value (LRV) targets were set for viruses, protozoa and bacteria such that the risk to worker health would not exceed the one in one million health-based target given in the AGWR.

From the results of the workshop it was determined that the most exposed group at Orica would be the Nitrate Plant operators and using this highest calculated exposure, the minimum pathogen LRV from raw effluent required to provide a 'fit for purpose' final product for this group were calculated (Table 2-4). Based on validation of process treatment units at KIWS the following log reduction values are being claimed for each process. Table 2-5 also summarises the target LRVs which shows that there is a margin of safety between those target LRVs, required for the scheme, and the claimed LVRs that are attributed to the treatment processes. Refer to Section 9.1 for the information pertaining to the validation of the processes for the achievement of the stated LRVs.

- Table 2-4: Target pathogen LRVs for KIWS

Pathogen	**Target LRV**
Virus	5.1
Protozoa	3.6
Bacteria	3.8

- Table 2-5: Summary of the Claimed and Target Log Reduction Values

Pathogen	**Virus**	**Protozoa**	**Bacteria**
Target LRV	**5.1**	**3.6**	**3.8**
Process			
Microfiltration	0.5	4	4
Reverse Osmosis	1	1	1
Chlorination	4	0	4
Total Claimed LRV	**5.5**	**5**	**9**

Water Quality Requirements

To demonstrate that treatment is operating effectively and continues to meet quality standards, the recycled water must meet the key parameters as described in the following sections. Additional treated water targets

for the KIWS as agreed with Orica (in May 2008), are summarised in Table 2-6. These targets have continued to be used as a basis to identify process risks with the proposed scheme. The target water quality is achieved at the outlet of the product water pumps.

- Table 2-6: Water Quality Target Summary Values for KIWS

ID #	Assessable Parameter	Units	50%ile	90%ile	Max
1	TDS	mg/L		<50	
2	Chloride	mg/L		<15	
3	Calcium	mg/L		<5	
4	pH	mg/L		5.5 - 7.5	
5	Total Hardness	mg/L $CaCO_3$		<10	30
6	Alkalinity	mg/L $CaCO_3$		<20	
7	Total Silica (SiO_2)	mg/L		<2	
8	Iron	mg/L		<0.015	
9	Copper	mg/L		<0.05	0.1
10	Total N	mg/L N	<1.8	<2.5	
11	Ammonia (free)	mg/L N		<0.5	
12	Faecal Coliforms	cfu/100mL		Not Detectable	
13	Somatic Coliphage	-		Not Detectable	
14	*Cryptosporidium*	oocysts/50 L		Not Detectable	
15	TOC	mg/L C		<1	
16	Total Phosphorus	mg/L P		<0.05	
17	TSS	mg/L		<2	
18	Chloramine	mg/L		<0.5	1
19	Aluminium	mg/L		<0.1	
20	Temperature	°C		<27	27
21	Potassium	mg/L		<3	
22	Zinc	mg/L		<0.2	
23	Fluoride	mg/L		<0.1	
24	Sulphate	mg/L		<5	
25	Carbon dioxide	mg/L		<5	
26	Sodium	mg/L		<15	
27	Hexavalent Chromium	mg/L		<0.002	
28	Arsenic	mg/L		<0.002	

Review Requirements

Should SUEZ need to significantly modify the treatment process or the customers wish to change their intended recycled water end uses, a review of the recycled water system will be undertaken.

2.3 Assessment of Recycled Water Quality Data

To inform the recycled water quality risk assessment and design of KIWS, data from the Shortland WWTW was reviewed. During operation, water quality data is collected within the SCADA system (Shortland WWTW and KIWS). This data is reviewed over time and after specific events (e.g. wet weather) to assess the reliability of the plant and to determine whether improvements and/or process optimisation is required.

By assessing data, the trends of each parameter over an extended period of time can be shown. This allows for trend analysis to occur and the effects of rainfall and seasonal effects can be seen. From trend analysis, management practices can be altered so that peak conditions can be allowed for, such that there is minimal impact on end-users or the environment.

Data generated from ongoing verification and operational monitoring is reviewed annually or as required to assess the following factors in relation to the recycled water scheme:

- To account for changes in the end uses or treatment process
- To analyse trends that may indicate cumulative changes in influent and effluent water qualities and/or preventative measure treatment efficacy
- To investigate potential seasonal variations or cumulative effects on water quality to optimise the treatment process throughout the year

2.4 Hazard Identification and Risk Assessment

Effective risk management involves the identification and analysis of all potential hazards and hazardous events. A HACCP Plan was originally drafted following a risk assessment workshop held on 10 August 2012. The workshop at the time was aimed at determining the potential hazards and preventative measures in place for the KIWS – when the scheme was owned and operated by Hunter Water. From the workshop the original HACCP Plan and Report was produced.

The HACCP Plan was updated by SUEZ during June 2016 during which a risk assessment was undertaken to assess the specific risks to the end users as summarised in the Hazard Analysis and Critical Control Point (HACCP) Plan. The results of this assessment are given as Appendix B to this RWMP which contains the following information relevant to this element:

- The approach used to hazard identification and risk assessment.
- The identification and documentation of hazards and hazardous events for each component of the scheme including inadvertent and unauthorised use or discharge.
- Estimation of the level of risk of each identified hazard to determine significant risks.
- Documentation of risk management priorities.
- Evaluation of the main sources of uncertainty.
- Review requirements.

The HACCP Plan was independently reviewed and updated during both July and October 2016 (the minutes of those review meetings are given as Appendix C). During those reviews the workshops considered the potential hazards and preventative measures in place for the KIWS based on the same methodology used during the original HACCP assessment. One of the outcomes of that meeting was that it was considered that there would be the opportunity to remove the overflow CCP (CCP 5) from the RWMP in due course.

3 ELEMENT 3 – Preventative Measures for Recycled Water Management

3.1 Preventative Measures and Multiple Barriers

Based upon the system specific hazard identification performed at the risk assessment and HACCP workshop, control measures were identified to ensure that the level of protection to control identified hazards would be proportional to the associated risk. Based upon the implementation of the preventative measures residual risk was estimated.

The HACCP Plan and Report located in Appendix B summarises the process utilised to identify control measures and estimate residual risk. It also documents the outcomes of the workshop, including each hazard/risk and its associated control measures.

3.2 Critical Control Points

A critical control point (CCP) is defined as an activity or process where control can be applied and is essential for preventing hazards that represent high risks or can reduce them to acceptable levels. As per the AGWR, CCPs require the following:

- Operational parameters that can be monitored and for which critical limits can be set to define effectiveness.
- Operational parameters that can be monitored frequently to reveal any failures in a timely manner.
- Procedures for corrective action that can be implemented in response to deviation from critical limits.

A Quality Control Point (QCP) is a point, step or procedure that is not classified as a Critical Control Point because it is a management process step rather than an operational control or an operational process step, which has a limited capacity to be monitored and/or corrective action taken in a timely manner.

The identification of CCPs and QCPs for KIWS was performed during the risk assessment and HACCP workshop. Five CCPs and two QCPs were identified:

- CCP1 – Shortland WWTW (outside the scope of this RWMP and covered under Hunter Water's RWMP).
- CCP2 – Microfiltration (a CCP to yield low enough turbidity over the whole process).
- QCP1 – Microfiltration (a QCP to yield turbidity low enough over individual trains).
- CCP3 – Reverse Osmosis (a CCP to yield low enough Electrical Conductivity (EC) over the whole process).
- QCP2 – Reverse Osmosis (a QCP to yield low enough Electrical Conductivity (EC) over individual trains).
- CCP4 – Chlorination (a CCP to provide adequate chlorine dose)
- CCP5 – Dechlorination (an environmental CCP related to overflow to the Hunter River and this may be removed in due course as overflow is not a necessary condition).

The identification process utilised is documented in the HACCP Report located in Appendix B.

SUEZ may look to modify the CCP list to create three rather than five CCPs. The intent is to have the microfiltration, reverse osmosis and chlorination processes as the three CCPs. The Shortland WWTW is outside of SEUZ's control and is not a CCP within this RWMP. The dechlorination is a QCP for environmental discharge rather than a health-related CCP.

3.2.1 Mechanisms for Operation Control

As part of the process to identify CCPs and to reliably achieve the required water quality operational limits were set for each CCP. The two types of limits set are categorised as critical limits and target criteria. Critical limits and target criteria are defined as follows:

- ***Critical limits*** – a prescribed tolerance that distinguishes acceptable from unacceptable performance; deviation from a critical limit represents a loss of control of a process and indicates there may be an unacceptable environmental or health risk.

- ***Target criteria*** – aim to prove an early warning that a critical limit is being approached; are more stringent that critical limits to that corrective action can be instituted before an unacceptable health or environmental risk occurs.

Critical limits and target criteria for each identified CCP are documented in the HACCP Plan and Report located in Appendix B and summarised in Table 4-1.

4 ELEMENT 4 – Operational Procedures and Process Control

4.1 Operational Procedures

4.1.1 Identify procedures for processes and activities

Hunter Water has provided its KIWS Operations Manual for the AWTP along with the associated Computer-aided Design (CAD) drawings, electrical drawings, Piping and Instrumentation Diagrams (P&IDs), Standard Operating Procedures (SOPs) and Safe Work Methods Statements (SWMS) for the site. Suez was provided with these documents including the relevant Functional Description, P&IDs, SOPs and SWMS.

4.1.2 Document procedures and compile an operations manual

SUEZ has converted the Hunter Water documents into its own format or archived them unchanged, as appropriate. As part of that process SUEZ operators have inspected the AWTP and checked the CAD drawings, electrical drawings, P&IDs, SOPs and SWMS to flag any required updates. If and when updated these documents are updated to SUEZ drawings but will otherwise be left as they are. Particular attention has been given to checking and verifying details of the CCPs during those reviews.

Hard copies of drawings and P&IDs will be placed in the Control Room and electrical drawings will be placed in the Switch Room. In addition, all documents will be stored and managed within the SUEZ Integrum document and records management system (see Element 10).

As part of taking over the AWTP, SUEZ has a “Go Live” plan. A key part of that plan involved SUEZ rebuilding the SCADA system, as the existing system won’t be available to SUEZ. Screen grabs from the existing SCADA system were provided as has access to the current SCADA system which helped SUEZ, with support from Schneider, set up a mimic duty and standby SCADA system ready to migrate to its own SCADA system when it takes over the AWTP.

4.2 Operational Monitoring

The AGWR defines operational monitoring as routine monitoring of control parameters identified within the treatment systems and recycled water usage steps, to confirm that processes are under control. Operational monitoring is designed to provide advance warning that systems may be deviating from a point where control may be lost.

Operational monitoring occurs at intervals more frequent than the time that it takes to carry out appropriate corrective responses. Operational monitoring systems include online monitoring devices in order to allow for alarmed interlocks with process equipment and alarm monitoring for rapid response through the plant PLC. Regular observations are used for monitoring the status of equipment and systems at the site that do not have PLC monitoring.

Operational monitoring incorporates notification of SCADA alarms and faults, which are reported on the local SCADA and via 24 hour monitoring. SUEZ software monitors plant performance more generally. Alarms generated through SCADA have priorities assigned to each fault based on the requirement to maintain effluent quality and plant operation. The KIWS plant spreadsheet assists operations staff to interpret data and trends in effluent quality and equipment operation and therefore is used to highlight gradual deviations from the normal operation of the plant for action.

Table 4-1 provides a summary of SUEZ’s operational monitoring activities for the KIWS.

Table 4-1: Summary of Critical Control Point Operational Monitoring Activities for KIWS. This has been checked as part of SCADA migration and will be checked again on the day of handover.

Process or Step to be monitored		Parameter to be monitored	Monitoring location	Frequency	Unit	Control Limits		Corrective Action(s) – to be applied when Critical Limits are exceeded.
						Alert Limit	Critical Limit	
Membrane filtration		Turbidity	Combined permeate	Continuous Online	NTU	> 0.10 NTU for > 15 min	> 0.15 NTU for > 40 min	• Verify combined turbidity meter result and calibrate meter if required • Shut down entire MF system and investigate output from individual trains • Undertake a PDT on each MF train and view the process to identify any module faults. • Isolate and repair any leaking valves • Isolate and repair any identified membrane faults (broken fibres, o-rings)
		Turbidity	Individual trains	Continuous Online	NTU	> 0.20 NTU for > 10 min	> 0.3 NTU for > 20 min	• Verify individual turbidity meter result and calibrate meter if required • Investigate and isolate individual train/s if they are exceeding the turbidity limit using online turbidity meter on individual trains • Undertake a PDT on each MF train and view the process to identify any module faults. • Isolate and repair any leaking valves • Isolate and repair any identified membrane faults (broken fibres, o-rings)
		Pressure Decay Rate	Membrane skid	Daily online	kPa/5 min	PDT > 5 kPa	PDT > 7 kPa for three consecutive tests OR PDT > 10 kPa for an individual test	• Shut down MF system following a critical failure • Isolate train that is exceeding PDT value • Repeat PDT and view the process to identify any module faults. • Isolate and repair any identified membrane faults (broken fibres, o-rings) • Isolate and repair any valve leaks

Process or Step to be monitored		Parameter to be monitored	Monitoring location	Frequency	Unit	Control Limits		Corrective Action(s) – to be applied when Critical Limits are exceeded.
						Alert Limit	Critical Limit	
Reverse Osmosis		Electrical Conductivity	Combined permeate	Continuous Online	µS/cm	> 40 µS/cm for > 30 min	> 70 µS/cm for > 60 min	• Investigate the EC of the individual trains • Investigate whether there has been a chemical clean or module replacement • Take samples and verify the feed and permeate EC meters, calibrate/replace if required • Shutdown train/s that have high permeate EC and investigate cause • Check delivered maintenance equals planned maintenance • Check dosing of acid and antiscalant • Check the performance of each train, are the trains highly fouled and in need of chemical cleaning?
			EC of the combined permeate compared to the EC of the feed to calculate the Log reduction of EC over RO process	Continuous Online	%	< 94% reduction in EC for > 30 min (94% is equivalent to an LRV of 1.22)	< 90% reduction in EC for > 60 min (90% equivalent to an LRV of 1.0)	
Chlorination System		Ct	CCT outlet	Continuous Online	mg•min/L	< 13 mg.min/L (pH < 7.5) for > 5 min < 30 mg.min/L (pH > 7.5 and < 9.0) for > 5 min	< 11 mg.min/L (pH < 7.5) for > 20 min < 27 mg.min/L (7.5 < pH < 9) for > 20 min	• Divert off-spec water, continue to operate to bring plant back into control • Investigate and verify the chlorine meter readings and calibrate/replace if required • Investigate and verify the pH meter readings and calibrate/replace if required • Investigate the chlorine dosing system operation and control • Investigate set-points and upstream operations than could influence pH and chloramine dosing levels.
		pH	CCT outlet	Continuous Online	pH units	> 7.5 for > 30 min	> 9 for > 10 min	
		Temperature	CCT outlet	Continuous Online	°C		< 10 for > 10 min	

4.3 Operational Corrections

4.3.1 Procedures for Corrective Action

Table 4-1 provides a summary of SUEZ's operational corrections. Should conditions mean that final effluent quality is not suitable for use contact will be made with the recycled water customers and supply of recycled water ceased until recycled water quality has returned to acceptable limits.

Procedures for corrective action have been developed in conjunction with the development of critical and target limits for the CCPs.

4.3.2 Establish rapid communication systems to deal with unexpected events

SUEZ plant operators/technicians monitor plant operations and alarms via mobile IT platforms such as SCADA alarms and remote operating programs and devices (laptops/iPads). In that way SUEZ staff can monitor and respond to the SCADA alarms in response to critical or unexpected events.

If recycled water is potentially unsuitable for use, the recycled water customer will be informed and recycled water supply will be ceased. The customer will be notified once recycled water is again suitable for use.

If the quality of recycled water delivered to the customer reaches a level that may present a risk to public or environmental health, an incident will be declared and the customer, as well as IPART, NSW Health, EPA and/or Hunter Water, (as applicable), will be notified immediately, as discussed in Element 6. These notification procedures are outlined in SUEZ's *Communication Protocols with Orica Kooragang Industrial Water Scheme Document 110-SE-OM-000-MP-001 Issue date 8 July 2016* with Orica as well as the *Hunter Water and KIWSP Operations Protocol Rev N 5 April 2017*.

4.4 Equipment Capability and Maintenance

Operational procedures and SCADA ensure that equipment performance is continuously monitored and failures can be detected promptly. The control logic for the KIWS is designed to provide sufficient functionality in order to reduce the risk of sending recycled water of an inappropriate quality to the reuse scheme and equipment has sufficient flexibility and process control.

There are also a number of points where redundancy has been built into the system to provide reliability during unforeseen breakdowns or hazardous events. For example the following have been implemented:

- Duty/standby arrangements for pump facilities and auto strainers.
- Enough capacity in the MF system and RO systems for continuous operation when one skid is offline.
- The option to provide potable water to the customer if the AWTP cannot provide sufficient fit-for-purpose water.

The site is fed by two transformers although there is no redundancy and SUEZ would only be able to operate critical parts of the plant in the event that one transformer were lost. There is a program in place for load shedding and the option of operating in batch mode if required. There is only very limited space for overflow storage on site. However, the AWTP can stop receiving treated effluent from the WWTW by putting the raw water tank offline. Alternatively, the AWTP can overflow to the river under the SUEZ *EPA Environment Protection Licence (EPL) for KIWS (No. 20757) dated 6 September 2016* relating to accidental discharges from the KIWS AWTP operated by SUEZ.

4.4.1 Asset Management Plan

SUEZ has developed the *KIWS Asset Management Plan* (AMP). The AMP is subjected to annual review and within that process the condition of assets is assessed and the plans for the management and maintenance of those assets is refined. General information on asset condition is provided from periodic asset condition assessments that are scheduled under the computerised maintenance management system (CMMS) "INfOREAM".

The AMP has been informed by the *KIWS Asset Criticality Review 110-SE-OM-000-RP-001* that involved an assessment of risk related to asset failure and identification of asset criticality. The Review considered the estimated frequency and severity of asset failure. Severity considered the impact of asset failure on safety, process (quality and quantity) and environment as well as cost. The Review considered the mitigation of those risks through preventive maintenance processes at defined frequencies and/or the maintenance of an

inventory of potentially necessary critical spare parts. The document considers the system redundancy built into the infrastructure.

At the more detailed level, asset maintenance and management is supported by the INfOREAM system that lists specific assets, their general descriptions and properties (such as material, size, age, capacity) and preventive maintenance arrangements and schedules. The CMMS generates reminders and alerts to undertake tasks, produces work orders and supports tracking and recording of works completed and resources allocated against the work order. The maintenance procedures are linked to asset life cycle optimisation, safe and reliable performance of the infrastructure, service criticality and business risk. Actions scheduled in INfOREAM include reactive, preventive and predictive maintenance.

Over the longer term, the *KIWS Renewals Plan 110-SE-OM-000-WS-001* has been developed to cover the infrastructure over the 15 year life of the contract. The Plan considered major asset maintenance and replacement to ensure good long-term plant condition and performance over time. The Plan considered estimated lifespan of critical assets, condition assessment and works management as well as renewal of the infrastructure or run-to-fail options. A schedule of capital works for asset renewal, replacement and development has been included. Costings have been forecast over the future 15-year life-cycle covering capital (replacement), operations, maintenance and management and administration expenditure.

SUEZ assesses its performance internally with respect to KPIs for completion rate of tasks. The asset maintenance and management schedules are reviewed periodically to respond to experience with the system through a continuous improvement process.

Interface points between KIWS and Hunter Water Corporation or Orica infrastructure are set out in the contracts. This includes:

- *Schedule D Proposed Delivery Point* of the *Non Potable Water Supply Agreement* (1 August 2011 version) between Kooragang Water Pty Ltd and Orica Australia Pty Ltd.
- *Schedule 6 Orica Potable Water Delivery Point* and *Schedule 7 Treated Effluent Delivery Point* of the *Supply Agreement (Agreement for the Supply of Treated Effluent and Potable Water) (Version 1 – currently being updated, 17 December 2015)* between Hunter Water Corporation and Kooragang Water Pty Ltd.

4.4.2 Infrastructure documentation

In relation to the records of the design and construction drawings and particulars, Hunter Water has provided the KIWS CAD drawings, electrical drawings, P&IDs and *Functional Description*. Downer has provided the *Electrical Manual*. These documents were checked and updated by SUEZ and converted to SUEZ format where appropriate, or archived in their existing format. These documents include the locations of secondary infrastructure as well as alternative sources of water and alternative infrastructure, where relevant.

4.4.3 Equipment Inspection and Maintenance Schedule

SUEZ has scheduled electrical and mechanical maintenance for KIWS equipment. These schedules are stored within the maintenance module of SUEZ's INfOREAM CMMS. Maintenance schedules are completed by field staff and recorded within the CMMS. Equipment is monitored operationally 24/7 via SCADA, and a priority alarm system is in place to inform required parties of the criticality of system failure.

Onsite equipment is monitored by KIWS operators as a part of daily operating procedures as outlined for each piece of equipment detailed in the asset register and within the CMMS maintenance schedule. Instruments are calibrated regularly based on manufacturer's instructions and the CMMS maintenance schedule.

4.5 Materials and Chemicals

Chemicals used at KIWS are obtained through a purchasing contract from quality assured suppliers. This ensures that plants have a reliable supply of quality chemicals and are matched to batch numbers. These contracts are managed by a specialised contracts and procurement group within SUEZ.

Chemical levels are monitored by operators and are ordered through the purchasing contract on an as needs basis.

SUEZ maintains a detailed dangerous goods register that contains the quantities of chemicals stored at each site, detailed risk assessments for the storage facility including the required actions of operators and personnel.

SUEZ has a full procurement management process that includes *PRO-005 Evaluation of Suppliers* and *F&A-005 Purchasing Specifications*. The latter covers requirements for chemicals received to be supplied with an appropriate materials safety data sheet (MSDS), to be inspected upon receipt and to be managed on site with reference to site-specific procedures.

SUEZ has developed a site-specific procedure for chemical receipt.

5 ELEMENT 5 – Verification of Recycled Water Quality and Environmental Performance

Verification is the application of methods, procedures, tests and other evaluations, in addition to laboratory and online analytical monitoring to determine whether a recycled water management system is performing as intended and meeting associated quality targets. Verification monitoring will assess the overall performance of the recycled water treatment process at KIWS and the quality of recycled water against the targets and criteria established in this document.

The following activities are undertaken to assess the effectiveness of documented processes in demonstrating compliance with the water quality objectives:

- Recycled water quality monitoring
- Short-term evaluation of results
- Documentation and reliability
- Monitor customer satisfaction
- Implement corrective actions when required.

Verification monitoring provides an opportunity for a detailed review of data collected over time and the effectiveness of relevant management procedures. The outcomes of the verification monitoring process may include the identification of treatment stages that may not be performing at the required standard, re-defining critical or control limits and revising or improving management processes.

5.1 Recycled Water Quality Monitoring

5.1.1 Recycled Water Quality Monitoring Plan

Verification monitoring of recycled water quality confirms that the product delivered by KIWS is meeting water quality objectives. Verification monitoring includes monitoring of microbial indicators as well as selected chemical parameters.

SUEZ has drawn from the Hunter Water *Recycled Water Quality Monitoring Plan for KIWS* to develop a SUEZ *Recycled Water Quality Monitoring Plan Kooragang Industrial Water Scheme Version A* dated 11 August 2015 (given as Appendix E to this RWMP). There may be room to improve and optimise that monitoring in due course. The Monitoring Plan includes a table of what is tested and how often and sets out the concentration limits for parameters monitored.

5.1.2 Laboratory accreditation

A laboratory accredited for the specified tests by the National Association of Testing Authorities (NATA), which at the time of writing is the local ALS laboratory, carries out analyses undertaken as part of water quality verification monitoring.

5.2 Satisfaction of Users of Recycled Water

SUEZ recognises that customer satisfaction is essential for the success of recycled water schemes, and customer complaints and enquiries need to be resolved in a timely and appropriate manner. SUEZ reviews satisfaction levels as part of SUEZ's monthly reports and 6-monthly reports and visits the recycled water customer every 6 months. Complaints received by SUEZ will be utilised constructively to continuously improve their service provision and to identify any problems that need to be addressed with regards to the provision of recycled water from KIWS.

5.3 Short Term Evaluation of Results

The objective evaluation is to verify that the quality of water supplied to the end users conforms to the water quality specification and meets user expectations.

The concentration limits for the monitored parameters is based on *Schedule E Non Potable Water Specifications* of the *Non Potable Water Supply Agreement* between SUEZ and Orica. If a case of non-conformance is identified as a result of the evaluation, the operator will implement immediate corrective actions or incident responses.

A plant datasheet has been developed into which operators will input external laboratory results and other plant-specific information which is then rolled up into monthly and exceedance reports. This process facilitates identification of parameters that are not within target limits. SUEZ's technical support teams, both within Australia and overseas, are able to login to the system in real-time and assist the operators to troubleshoot issues and advise on process improvements.

5.4 Reporting Mechanisms

Verification monitoring results are summarised in the monthly and annual reports on the scheme produced by SUEZ. In addition, the *Annual Compliance Report* to IPART summaries the verification monitoring results.

5.5 Corrective Responses

Corrective responses to non-conformance are to be undertaken by the SUEZ KIWS AWTP Operators. The actual responses will vary depending on the level and type of event. As a minimum, treatment processes will be monitored and inspected to ensure normal operation and, if required, further sampling will be carried out. There may be a review of control measure performance and associated operational monitoring systems should it be deemed necessary.

5.5.1 Response to water quality verification monitoring exceedances

Where verification monitoring results exceed the concentration limits for monitored parameters as specified within the Contract between SUEZ and Orica corrective responses are required. These concentration limits are given in *Schedule E Non Potable Water Specifications* of the *Non Potable Water Supply Agreement* (1 August 2011). The following roles and responsibilities apply:

- The laboratory services provider (ALS) under its contract with SUEZ only has an obligation to notify SUEZ KIWS AWTP operators of all results and are not responsible for notifying third parties.
- Responsibility for reviewing results provided by the laboratory services provider and for identifying exceedances of the data submitted by the laboratory vests in the SUEZ KIWS AWTP Operators.
- Notifications to the customer (Orica), regulator (IPART), supplier (Hunter Water) and other potentially relevant stakeholders (e.g. EPA or NSW Health) are the responsibility of the SUEZ KIWS AWTP Operators.
- It is necessary to respond immediately to significant system failures that pose a risk to public or the environmental or adversely affect recycled water quality for an extended period of time.

5.5.2 Response customer notifications

Corrective responses will be implemented where necessary following reports from Orica to the SUEZ KIWS AWTP Operators. The SUEZ KIWS AWTP Operators are responsible for those responses.

6 ELEMENT 6 – Management of Incidents and Emergencies

6.1 Communication

6.1.1 Define communication protocols with the involvement of relevant agencies

Internal Notifications

Treatment plant operators and team leaders will be responsible for providing notifications to key SUEZ staff in the case of potential incidents, such as:

- Treatment systems exceeding critical limits
- Recycled water quality failure to meet specifications from verification monitoring
- Major equipment breakdown or mechanical failure

External Notifications

Hunter Water, Orica, NSW Health and/or EPA (as appropriate) will be notified if an incident occurs that has the potential to impact the customer, the environment and/or public health as summarised in Table 6-1.

- Table 6-1: Incident notification protocols for the KIWS

NSW Health, IPART, Orica and Hunter Water Notifications	
Event/Water Quality Parameter	**Circumstances**
Any Major or Crisis Recycled Water Incident	Reported incidents of recycled water cross-connection or excessive consumption Reported illness potentially associated with recycled water exposure or consumption
CCP process failure resulting in supplied recycled water not meeting specification	Upon notification that recycled water had been supplied from treatment operations without the critical limits being met
Verification monitoring exceeding health-related requirements for the recycled water	*E. coli* in the final product water (1 org/100mL or greater)
Office of Environment and Heritage, IPART, Orica and Hunter Water Notifications	
Event/Water Quality Parameter	**Circumstances**
Confirmed environmental impact associated with recycled water	This could include events such as: • Confirmed ground water contamination • Long term soil contamination, • Fish kills or damage to aquatic systems • Destruction of vegetation

Notification procedures to Orica are outlined in SUEZ's *Communication Protocols with Orica Kooragang Industrial Water Scheme Document 110-SE-OM-000-MP-001 Issue date 8 July 2016* as well as the *Hunter Water and KIWSP Operations Protocol Rev N 5 April 2017*.

As a minimum notification will take place as follows in accordance with IPART's *Incident Notification by Network Operators and Retail Suppliers Water Industry Competition Act 2006 Water — Incident Notification March 2016*, and utilising Form A of that document as a template for written notification following the verbal notification:

- Orica:

- Immediate phone call to Ammonia Plant Control Room (4908 9329 (Primary), 4908 9300 (Secondary), 1800 789 044 (tertiary)).
- Follow up email to recycled_water@Orica.com.

- IPART:
  - Immediate phone call to Director, Water Licensing and Compliance (02) 9113 7722.
  - Follow up email within 24 hours using Form A to compliance@ipart.nsw.gov.au.
- NSW Health (if health-related):
  - Immediate phone call to NSW Health (Hunter New England Local Health District). Business hours (8:30 am to 5:00pm), Population Health switchboard (02 4924 6477) and request to speak to an Environmental Health Officer. After ours and Public Holidays, John Hunter Hospital switchboard (02 4921 3000) and ask to be transferred to the Environmental Health Officer on-call.
  - Follow up email within 24 hours using Form A to hnelhd-phenquiries@hnehealth.nsw.gov.au.
- EPA (if environmental related):
  - Immediate phone call to 131 555.
  - Written follow up if requested.
- Metropolitan Water Directorate:
  - Immediate phone call to Policy Officer (02) 9372 8521.
  - Follow up email within 24 hours using Form A to wica@waterforlife.nsw.gov.au.
- Hunter Water:
  - Immediate phone call to 1300 657 000.
  - Follow up email to recycledwaternotifications@hunterwater.com.au.
- SafeWork NSW (if occupational health and safety related):
  - Immediate phone call to 131 050.
  - Written follow up if requested.

NSW Health was consulted in relation to the circumstances and manner in which it wishes to be notified of health-related incidents through this document being shared with them for their review and comment.

6.1.2 Develop a public and media communications strategy

It is critical to maintain community confidence and trust during and after an emergency situation, as such communication with the public and media is essential to ensure that correct information is passed to the community and to alleviate any fears. SUEZ has a dedicated communications group that handles external and internal responses (Media and Government Relations member of the Crisis Management Team).

6.2 Incident and Emergency Response Protocols

6.2.1 Define potential incidents and emergencies, and document procedures and response plans

Incidents are defined as occurrences that may affect the environment or human health through surface or groundwater pollution or soil contamination.

Emergencies are occurrences where there is immediate real or potential to:

- Threaten the health and safety of persons
- Damage property
- Damage the environment
- Threaten the service of customers.

6.2.2 Investigate incidents and emergencies, and revise protocols

In the event of an incident or emergency SUEZ is committed to carrying out an immediate investigation covering factors such as:

- What was the initiating cause of the problem?
- How was the problem first identified or recognised?
- What were the most critical actions required?

- What communication issues arose and how were they addressed?
- What were the immediate and longer term consequences?
- How well did the protocol function?

The investigation process will conclude with a debriefing session of all involved staff to discuss performance and address any issues or concerns. Appropriate documentation and reporting of the incident or emergency to relevant stakeholder agencies and the regulator will be undertaken in a report. If deemed necessary appropriate changes to existing protocols will then be made.

These can sit in either the broad corporate procedure or the site-specific plan.

SUEZ adopts a standard reporting procedure for incidents (*Incident Reporting and Investigation Procedure OHS-005*). In addition, SUEZ will notify Orica, IPART, NSW Health and EPA, as required. A series of Incident Management protocols has been developed to guide a number of foreseeable incidents and there is a draft Suez *KIWS HSE Management Plan Kooragang Industrial Water Scheme (KIWS) Health, Safety & Environment* for the site.

7 ELEMENT 7 – Operator, Contractor and End User Awareness and Training

7.1 Operator, Contractor and End User Awareness and Involvement

It is critical to the successful operation of the KIWS that operators and contractors to have sufficient awareness and training regarding the potential consequences of system failures as well as how decisions can affect public and environmental health. It is imperative that operators are also involved in decision-making processes and development of management strategies.

SUEZ is committed to ensuring that operators have a thorough understanding of recycled water quality management. End users are made aware of restrictions on recycled water use, management requirements as well as safe practices through recycled water customer agreements (Recycled water customer agreement between Orica and Kooragang Water Pty Ltd).

7.2 Operator, Contractor and End User Training

SUEZ is committed to ensuring that all staff members are adequately trained and suitably able to carry out their roles. All sections within SUEZ are required to ensure that new employees undertake an induction program that covers (at a minimum) standard safety procedures relevant to their section. This induction includes emergency response/evacuation and where necessary an asset specific induction.

7.2.1 Identification of Training Needs and Resources

With respect to human resources capacity, the plant will be operated by two dedicated operators. In addition, if required, SUEZ can provide operational staff from other plants globally to support short periods of increased demand or to backfill roles during periods of leave or absence.

Training and personnel development needs are identified by SUEZ. If training gaps are identified, comments will be passed through to SUEZ's Human Resources (HR) group so that the appropriate training course can be organised.

All SUEZ water operations staff are required to have (or be working towards) a relevant *Certificate III* (or above) *in Water Operations*. In addition, there are plant-specific training needs identified in the *KIWS Training Matrix* worksheet that summarises the specific expectations for the KIWS AWTP that covers training, competency and certifications related to safety, electrical, quality, water industry training, etc.

For new SUEZ staff there is a standard corporate induction for new employees that includes an induction day as well as on line intranet-based training and face-to-face meetings. Similarly, there is an induction for the KIWS plant for staff that are new to that site. That site-specific induction is provided by the Contract Manager and/or the Site team. Personnel are trained in the operation and maintenance policies and procedures. On an ongoing basis SUEZ has a technical training calendar run from SUEZ's Head Office in Paris and offers internal training on a variety of topics.

7.2.2 Training Documentation

The document *HR-005 Training & Development* procedure formalises the system and provides the training matrix for operators that will run the KIWS AWTP. The operational groups from within SUEZ identify their training needs and supply information on training completed to HR. Then, HR in turn centrally consolidates and records completed training into a spreadsheet. All SUEZ training attendance that is notified to HR is recorded and stored within SUEZ's HR system on that spreadsheet. All training courses are accompanied by a training evaluation form that allows for appraisal of training effectiveness. HR ensures that training and competencies are kept current, where appropriate

8 ELEMENT 8 – Community Involvement and Awareness

8.1 Consultation with users of recycled water and the community

Orica is made aware of its recycled water use obligations through the Recycled water customer agreement between Orica and Kooragang Water Pty Ltd. The agreement is currently being revised by KWPL and Orica and their obligations will be tabled in that document.

8.2 Communication and Education

SUEZ in consultation with Hunter Water Corporation will take part in community education initiatives if so organised by third parties. Since this is an industrial scheme no particular community education is proposed. Nonetheless, as part of the agreement between KWPL and HWC, SUEZ is required to facilitate tours of the plant for HWC and will run its own tours as well.

8.2.1 Information on the Impact of Unauthorised Use

Prevention of unauthorised use of recycled water is achieved via customer agreements that outline how recycled water should not be used. In addition, Suez will undertake annual audits on all recycled water users and any unauthorised use identified will be discussed with the user.

8.2.2 Information on Benefits of Recycled Water

SUEZ in consultation with Hunter Water Corporation will take part in community education initiatives so organised by third parties. Since this is an industrial scheme no particular community education relating to the benefits of recycled water is proposed.

9 ELEMENT 9 – Validation, Research, and Development

Validation is the process used to confirm that specific treatment processes operating at KIWS are capable of achieving the claimed LRV (refer Table 2-4).

9.1 Validation of Processes

9.1.1 Validate Processes to Ensure They Control Hazards Effectively

The design of the KIWS has been validated at a desktop level to ensure that the target recycled water quality criteria will be met. The technologies proposed have been extensively employed and tested on many Australian and International recycled water applications. The validation report (*Hunter Treatment Alliance Kooragang Industrial Water Scheme Validation Report Document Number: KI-RT-PT-015* (dated 22 January 2014)) is located in Appendix F.

9.1.2 Revalidation Requirements

SUEZ is committed to the re-validation of its processes and procedures in the event that conditions within the recycled water system change. This may include the following scenarios:

- Significant changes to influent quality (may be caused by increase in industrial wastewater generators in the catchment).
- Changes to the treatment process.
- Changes to the end product target quality, resulting in a change in process unit performance requirements.
- Changes in legislation, regulations or guidelines governing the reuse of municipal wastewater.

Revalidation will also initiate the requirement for review of this RWMP document and possibly re-auditing under WICA if the change is significant.

9.1.3 Design of Equipment

If future upgrades require the inclusion of new technologies, SUEZ will undertake validation of the new equipment and infrastructure to ensure continuing reliability. SUEZ's validation program will allow for the development of design specifications that will ensure future equipment and upgrades will be capable of meeting intended treatment requirements as well as providing necessary process flexibility and controllability.

9.1.4 Investigation

SUEZ has a global role in the water sector and undertakes its own research and investigations as well as taking part in joint partnerships and collaborations.

10 ELEMENT 10 – Documentation and Reporting

10.1 Management of Documentation and Records

10.1.1 Storage and Management

Documentation pertinent to the management of recycled water quality will be stored within SUEZ's main database (server) and will be referenced and accessed via the Integrated Management System (IMS). SUEZ uses the Integrum document and records management system for control of its documents and records. Integrum houses and provides links to documents and records and explicitly captures information such as version history, approval, responsibility and update. Relevant documents, such as policies, management plans and procedures, are available at all SUEZ facilities via Integrum. An overview of how SUEZ manages its documents and records is given under the procedures *Documents and Data Control (F&A-001)* and *Record and Archives (F&A-002)*.

SUEZ has developed a *KIWS HSE Management Plan Kooragang Industrial Water Scheme (KIWS) Health, Safety & Environment* document that provides the overarching summary of how the quality system, documents and records relating to health, safety and environment are managed for the site.

SUEZ has an Integrated Management System (IMS) that is accredited to ISO9001, ISO14001, ISO18001 and AS4801. KIWS is covered within those systems.

Older versions of documents are retained for the records, such as older MS Word format HACCP plans and previous Recycled Water Quality Management Plan drafts.

10.1.2 Review

Documents referenced within the Integrum system can be scheduled for periodic review. The next review date is captured within Integrum, which in turn issues email notifications as reminders to the party responsible for the document and its review. The frequencies of review are scheduled in accordance with risk.

For KIWS, documentation relating to recycled water systems, including asset management systems, will be regularly reviewed and revised to ensure that they reflect changing circumstances.

10.2 Reporting

10.2.1 Internal Reporting

For KIWS SUEZ prepares monthly Internal reports covering compliance with the WICA Network Operator's Licence, customer agreements, performance evaluation and any operational anomalies or issues that occur during that period.

10.2.2 External Reporting

SUEZ reports to IPART on an annual basis as required under the IPART Reporting Manual.

11 ELEMENT 11: Evaluation and Audit

11.1 Long-Term evaluation of results

In accordance with the IPART Reporting Manual, the Annual Compliance Report covering the previous financial year (i.e., ending 30 June each year) will be submitted to IPART before 31 August each year. The Report provides a summary of the results achieved during the previous year. This helps to illustrate.

- Performance against numerical guideline values for verification monitoring results, regulatory requirements or agreed levels of service.
- Emerging issues and trends.
- Priorities for improving process performance and recycled water quality management.

11.2 Audit of Recycled Water Quality Management

Internal and external audits take place as part of SUEZ's internal audit program in accordance with procedure *Auditing SYS-005.* This auditing is essential for ensuring that SUEZ and recycled water users meet their obligations.

The audits cover compliance with the ISO 9001, ISO 4801, ISO 14001 and ISO 18001 management systems that cover quality, environment and safety. Annual external audits of SUEZ take place although any one site, such as KIWS, might not be picked every year, depending on the schedule. The schedule for KIWS is to be determined at the time of writing. The KIWS site is yet to be added to the list of externally audited sites at the time of writing but it will be added in due course. The first external certification audit of the KIWS site is anticipated before end 2018, depending on progress.

The periodic auditing schedule includes internal auditing against this document. In addition, this Licence Plan document is subject to external audits by IPART WICA auditors – probably on an approximately annual basis, at least initially.

ISO system and Licence Plan IPART audit reports are issued to the CEO of the SUEZ Water and Treatment Solutions business. Results of the ISO audits are displayed at SUEZ offices via its audit certificates. The results of IPART's Licence Plan audits are available on their website (www.ipart.nsw.gov.au).

12 ELEMENT 12: Review and Continuous Improvement

12.1 Review by senior managers

Continuous improvement and review is currently facilitated through review of performance and audit reports as well as annual meetings between SUEZ, Hunter Water and Orica to discuss the scheme operation.

12.2 Recycled Water Quality Management Improvement Plan

The RWMP is subject to periodic improvement and update. It is intended that the RWMP will be updated in response to findings from periodic reviews of performance and in response to changes in circumstances that require improvements to the scheme.

At the time of writing the KIWS AWTP is just being taken over by SUEZ. The *Recycled Water Quality Management Improvement Plan* (or equivalent) will be developed either as part of this document or through incorporation into existing SUEZ management planning documents.

Continuous improvement and review in relation to water quality and infrastructure operation is currently facilitated through review of performance and audit reports as well as annual meetings between SUEZ, Hunter Water and Orica to discuss the scheme operation.

13 Retail Supply Management Plan

13.1 Levels of service

With respect to levels of service Suez will initially take over the existing Orica-HWC supply contracts without rebadging or modifying them as follows:

- *Non Potable Water Supply Agreement* (1 August 2011).
- *Potable Water Agreement* (Draft v5 26 April 2016).

Both agreements will be reassigned as being between Kooragang Water Pty Ltd and Orica Australia Pty Ltd.

13.2 Non potable water

With respect to the *Non Potable Water Supply Agreement* (1 August 2011), four main schedules provide the details relevant to the Retails Supply Management Plan (RSMP) under WICA:

- *Schedule B Contract quantities of Non Potable Water from the Term*
- *Schedule C Charges*
- *Schedule D Proposed Delivery Point*
- *Schedule E Non Potable Water Specifications*

With respect to uses, the agreement only permits the non-potable water (recycled water) to be used for *Permitted Uses* in the operation of Orica's Kooragang Plant.

With respect to alternative supplies, potable water is supplied as the alternative back up and indeed the site was originally fed by potable water exclusively until the KIWS was set up. Therefore, it is recognised that the potable water supply has sufficient capacity to provide a backup or replacement to the recycled water supply if required.

13.3 Potable water

For potable water Suez is only responsible for the billing, not for any form of infrastructure. Therefore, potable water is not discussed in the RWMP other than in relation to billing. Hunter Water will own, operate and manage the potable water supply infrastructure and Orica will manage its own water reticulation system.

With respect to the *Potable Water Agreement* (Draft v5 26 April 2016), four main schedules provide the details relevant to the RSMP under WICA:

- *Schedule 1 Contract quantities of Treated Effluent for the Term*
- *Schedule 3 Treated Effluent Quality Specifications*
- *Schedule 6 Orica Potable Water Delivery Point*
- *Schedule 7 Treated Effluent Delivery Point*

13.4 Risk assessment

As noted under Element 2, a risk assessment has been undertaken to assess risks to the end users as summarised in the HACCP Plan given at Appendix B to this RWMP. The HACCP Plan was independently reviewed and updated by SUEZ during July and October 2016 and the minutes of those review meetings are given as Appendix C. On a regular basis, and/or needs basis when a change is required, Suez will review and update its risk assessments. In doing the SUEZ *Management of Quality, Safety and Environmental Hazards SYS-008* procedure will be used to inform this process. This process will consider the events and circumstances that could adversely affect SUEZ's ability to supply recycled water. The approach and methodology used will document a list of events, circumstances and the probability of their occurrence. The arrangements and measures to be taken to prevent the occurrence, or minimise the effect, of any such event or circumstance that could adversely affect SUEZ's ability to supply water will be summarised. Significant risks and priorities for the management of those events or circumstances that could adversely affect SUEZ's ability to supply water will be noted. The major sources of uncertainty associated with each event or circumstance will be evaluated and actions will be considered to reduce uncertainty.

13.5 Customer service

13.5.1 Contact

SUEZ will provide customer contact services and support through the dedicated phone numbers as per the detailed *Communication Protocols with Orica Kooragang Industrial Water Scheme Document 110-SE-OM-000-MP-001 Issue date 8 July 2016* and *Hunter Water and KIWSP Operations Protocol Rev N 5 April 2017.*

13.5.2 Enquiries and complaints

SUEZ's Customer Complaints procedures are consistent with the Australian Standard for complaints handling AS ISO 10002—2006. SUEZ is committed to treating complaints promptly, fairly, equitably, confidentially and professionally and it is SUEZ group's intention to incorporate and implement the relevant water industry code of conduct once is it finalised.

NSW Health was consulted in relation to the circumstances and manner in which it wishes to be notified of health-related enquiries and complaints as discussed in Section 6.2.1 of this document.

13.5.3 Missed Payment and Debt Recovery Code of Practice

SUEZ is committed to assisting Customers in relation to timely bill payment but recognises there may be circumstances where timely payment is compromised (including financial hardship and other factors beyond a Customer's control).

SUEZ has developed a procedure for *Missed Payments and Debt Recovery* and has a standard debt recovery processes in place within its accounts receivables area. The procedure specifies steps that SUEZ will take in relation to overdue bills, unpaid bills and disputes. For instance, a short-term payment plan will be available for Customers suffering financial hardship.

In no event will the service to a Customer be disconnected as a result of non-payment. In exceptional cases, such as wilful damage to our recycled water supply system or a serious health or environmental risk caused by any substance identified in our recycled water, SUEZ reserves its right to either manage the delivery of Services. If SUEZ restricts the supply of Services, it will provide the Customer with reasonable notice that it intends to restrict supply.

The *Non Potable Water Supply Agreement* (1 August 2011) includes a dispute resolution clause (Clause 24).

SUEZ will comply with relevant codes of practice relating to the handling of customer complaints and debt recovery as well as the *Marketing Code of Conduct* and the *Transfer Code of Conduct* as those codes are developed. In the interim, agreements with Hunter Water and Orica will meet the intent of such codes by setting out the relevant arrangements. For instance, in working with Hunter Water, the *Hunter Water and KIWSP Operations Protocol Rev N 5 April 2017* has been developed in lieu of a code of conduct.

Continuous improvement and review in relation to retail management is currently facilitated through review of performance and audit reports as well as annual meetings between SUEZ, Hunter Water and Orica to discuss the scheme operation.

13.6 Incident Identification and Responses

SUEZ is committed to the uninterrupted supply of recycled water to its Customers to the extent practically achievable. The KIWS has been designed to ensure that in the event of any incident the chance of interruption to the supply of its recycled water is minimised by virtue of providing potable water.

SUEZ has identified those incidents, which may occur below; it has assessed the probability of their occurrence and has listed its response. SUEZ is committed to minimising any inconvenience to the Customer in the event of the occurrence of any incident.

13.6.1 Interruption Due to Incidents or Operational Issues

Design of the treatment Plant at Mayfield (comprising the network system infrastructure) includes a level of redundancy to ensure that it can operate reliably and loss of supply due to operating issues will be rare. The recycled water facility has full redundancy in the major process trains, such as pumps, tanks and membranes. The network delivery system includes a 4 ML recycled water storage tank to smooth out supply fluctuations.

The KIWS is monitored on a 24-hour, 7-day/week basis with early warning alarms and equipment condition tested through monitoring of critical control points. Early warning alarms allow the operators to identify and follow any short-term trend and take appropriate corrective action to rectify any recycled water quality or supply issues and avoid interruption to supply.

To ensure that the KIWS operates continually and reliably, SUEZ and its suppliers have put maintenance regimes in place. Planned maintenance that necessitates a partial or full shutdown of equipment will be scheduled in periods of low demand so that supply can be maintained wherever possible. To the extent that there are interruptions due to operating issues, these issues will be temporary and corrected by SUEZ as specified in detail under Elements 4 and 6 of this RWMP.

In the event that any party or a force majeure event damages any part of the Plant and/or system, then supply may need to be interrupted while the damage is repaired. However, the backup provision of a potable water supply will be initiated. Reasonable precautions have been taken to prevent such occurrences such as condition monitoring, network surveillance and site security.

13.6.2 Interruptions to Recycled Water Supply

The recycled water facility itself and associated reticulation network infrastructure has been designed such that it can operate reliably and consistently supply recycled water to the required specification so that the probability of interruption due to supply issues is low. The following incidents have been identified as a possible cause for interruption to recycled water supply: nil supply; leakage; and water quality. The probability of each of these incidents has been identified as low.

In each case SUEZ has both systems and redundancy measures in place to prevent or minimise the disruption of supply. Early detection systems include real-time telemetry data, alarms triggered through the SCADA system and notification by Customers. A recycled water event would be triggered and managed as discussed under Section 6 of this RWMP.

Above all, arrangements are in place with Hunter Water Corporation to supply potable water as a backup supply as an alternative to recycled water.

With respect to system redundancy, smaller systems such as pump sets, membranes, disinfection systems analytical instruments etc., have been duplicated. If one unit becomes unavailable, then standby equipment is available to use to keep the process running.

Potable water top-up will be used should the recycled water facility be unable to meet the recycled water demand (e.g. insufficient treated effluent, or facility shutdown). Potable water tops up the recycled water storage tanks and is delivered through the recycled water mains network. Should the recycled water main become unavailable, a maintenance contract with a local contractor is in place to immediately repair the pipes on a 24-hour, 7-day/week basis.

13.7 Retail Compliance

SUEZ recognises that it is obliged to systematically manage and regularly review its risk profile at a strategic, operational, and project level. SUEZ has developed a risk management and compliance framework that determines the process and identifies tools for realising its objectives.

Suez is committed to:

- Conducting all of its business operations and dealings in full compliance with the law; and
- Ensuring that all its employees understand what they must do so that SUEZ achieves full compliance.

In order to deliver on its commitment to full compliance with the law, SUEZ will:

- Establish and maintain governance structures, management systems and controls and reflect the nature of the obligations and associated compliance risks.
- Foster and maintain a culture that values and supports compliance through strong leadership, participation, training and development.
- Monitor the regulatory environment and record and administer applicable obligations.
- Assign responsibility for managing compliance with every obligation to responsible managers.

- Monitor compliance performance including requiring periodic assurances as to compliance from responsible managers.
- Engage in periodic audits and reviews of compliance and compliance systems that may be self-instigated or required by regulators.
- Coordinate the preparation of both internal and external reports regarding compliance.
- Receive, investigate and respond to complaints and reports of compliance issues.

SUEZ has developed its management infrastructure, operating systems, procedures and policies, to enable it to comply with relevant industry specific regulations and codes. Refer to Appendix G for the SUEZ *Risk Management and Compliance Framework*.

14 References

Keegan, A., Wati, S., Robinson, B. (2012) Chlor(am)ine disinfection of human pathogenic viruses in recycled water (#62M-2114). Prepared by the Australian Water Quality Centre for the Smart Water Fund, Victoria.

15 APPENDIX A: SUEZ's Recycled Water Policy

POLICY

Recycled Water Policy

SUEZ Water & Treatment Solutions (SUEZ) is committed to providing responsible, safe and sustainable recycled water that meets the needs of its customers. SUEZ supports and promotes the responsible use of recycled water and the application of a risk-based management approach that complies with regulatory requirements and consistently meets the *Australian Guidelines for Water Recycling.*

To achieve this we will:

- ensure that protection of public and environmental health is recognised as being of paramount importance.
- maintain communication and partnerships with all relevant agencies involved in management of water resources, including water that can be recycled.
- Consider the needs and expectations of recycled water users, communities and other stakeholders, regulators and employees in the planning process
- Recognise the importance of community consultation in decision-making processes
- use a risk-based approach in which potential threats to water quality are identified and controlled.
- establish regular monitoring of control measures and recycled water quality and establish effective reporting mechanisms to provide relevant and timely information, and promote confidence in the recycled water supply and its management.
- ensure appropriate contingency planning and emergency response plans are in place.
- continually improve our practices by assessing performance against corporate commitments and stakeholder expectations.

SUEZ will implement and maintain recycled water management systems consistent with the *Australian Guidelines on Water Recycling* and compliant with regulatory guidelines to effectively manage the risks to public and environmental health.

All Managers and employees of SUEZ involved in the supply of recycled water are responsible for understanding, implementing, maintaining and continuously improving the recycled water management system in line with this policy.

David Lamy

CEO – Water & Treatment Solutions

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page 1 of 1

16 APPENDIX B: Hazard Analysis and Critical Control Point (HACCP) Plan

1.1 CCP 1 – SHORTLAND WWTW

CCP 1		Shortland WWTW	
Description		The existing activated sludge process at Shortland WWTW provides for removal of solids (including some bacteria and virus that are typically associated with solids), consumption of biologically available organics and removal of phosphorous and nitrogen. It is a pre-treatment for disinfection and the advanced treatment processes at KIWS. The plant is managed using dissolved oxygen (DO), sludge age, settleability and the mixed liquor suspended solids (MLSS).	
Process Inputs		Raw sewage from the Shortland WWTW catchment.	
Hazards		• Failure of alum dosing resulting in an increased concentration of total phosphorus in the effluent • Failure of aeration (blowers) resulting in a failure of the treatment process, including high nitrogen concentration in the effluent	
Control Measures		• Normal operation (monitoring of flows, control of IDAL DO level, control of decant cycle timers, control of sludge wasting, monitoring of alum dosing and final effluent sampling)	
Key Control Measure(s)		• DO (online) in IDALs – DO during aeration cycle • TSS (weekly manual sample currently) in decant and final • Alum flow pump signal / operator daily check • Weekly sampling for ammonia and Total oxidised nitrogen in the decant effluent.	
Critical Limit/Target Limit		**Aeration Cycle Dissolved Oxygen Level (DO)**	**Alum Dosing Rate**
	Target	Less then -0.2 mg/L of DO set-point	Dosing
	Alert	Outside target range for 50% of the aeration cycle	No dosing for 5 days
	Critical	Outside target range for 10 consecutive aeration cycles OR Complete Failure of Aeration System (i.e. no aeration blowers available)	No dosing for 14 days
Monitoring Procedures	**What**	DO concentration in the IDALs during the aeration cycle	Flow monitoring of the alum dose, tank level monitoring and weekly total phosphate testing
	How	DO meters in each of the IDALs	Alum flowmeter, pump operation monitoring, tank level monitoring and grab samples for total phosphate testing.
	When	Continuously during IDAL aeration cycle	Flow and tank level are online and continuous with weekly phosphate testing.
	Where	Access data through SCADA for online DO monitoring (AIT2027/AIT2028/AIT2033/AIT2034)	Access data through SCADA for online flow and pump signal monitoring (PU3904/FIT3904 and PU3905/FIT3905). Lab results from lab and plant data spreadsheet
	Who	Shortland WWTW operator	
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Checklist (Not in order of priority) • Investigate and adjust if required the aeration cycle and DO set points • Investigate Aeration Flow rate and control • Investigate plant flow, scour and MLSS • Increase monitoring for nitrate at Shortland WWTW • Do not accept effluent into the AWTP	
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet	
	Who	Shortland WWTW operator	

1.2 CCP 2 – MICROFILTRATION

CCP 2		Microfiltration	
Process Inputs		The effluent from Shortland WWTW is pumped to KIWS for further treatment.	
Hazards		• ORICA has concentration and load limits that are reported annually to EPA. It is a high priority to reduce the final effluent concentration of certain parameters to avoid ORICA failing their licence or needing to convert to potable water source on regular or prolonged basis. • Failure in MF integrity will affect the quality in the MF filtrate. • Loss of KIWS product water due to failure of the MF process or equipment. • Parameters that are potentially affected by MF process breakdowns are Total Silica, pathogens and Total Suspended Solids (TSS).	
Control Measures		• Flow rate is within design limits • Pressure's are within design limits • Continuous monitoring of turbidity from each of the trains in operation (QCP1) • Membrane Integrity Test (MIT) to confirm membrane integrity. • Weekly monitoring of Total Silica, coliforms and TSS to verify MF product water quality parameters are within design limits.	
Key Control Measure(s)		Online turbidity of combined permeate and MIT monitoring of each train during operation	
Critical Limit/Target Limit		**Turbidity of the combined Permeate**	**Pressure Decay Rate**
	Target	< 0.1 NTU	PDT < 5 kPa in 5 minutes
	Alert	> 0.10 NTU for >15 minutes during production (one or more MF units)	PDT > 7 kPa in 5 minutes
	Critical	> 0.15 NTU for > 40 minutes during production (one or more MF units)	PDT > 7 kPa/ 5min for three consecutive tests OR PDT > 10 kPa/ 5min for an individual test
Monitoring Procedures	**What**	Turbidity of combined permeate	Pressure Decay Test
	How	Turbidity meters	Automatic initiation of Membrane PDT based on a scheduled time and queue or through manual initiation. Unit automatically returns to service
	When	When at least one unit is filtering	Daily
	Where	Online AIT-2115	Online (PIT2221/PIT2321/PIT2421)
	Who	AWTP Operator and automatically through PLC	
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Checklist (Not in order of priority) • Verify combined turbidity meter result and calibrate meter if required • Verify individual turbidity meter result and calibrate meter if required • Investigate recent PDT results from individual trains and isolate any that have poor results • Investigate and isolate individual train/s if they are exceeding the turbidity limit using online turbidity meter on individual trains • Shut down entire MF system • Undertake a PDT on each MF train and view the process to identify any module faults. • Isolate and repair any leaking valves • Isolate and repair any identified membrane faults (broken fibres, o-rings)	
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet	
	Who	AWTP operator	

1.3 QCP 1 – MICROFILTRATION

QCP 1		Microfiltration
Process Inputs		The effluent from Shortland WWTW is pumped to KIWS for further treatment.
Hazards		• ORICA has concentration and load limits that are reported annually to EPA. It is a high priority to reduce the final effluent concentration of certain parameters to avoid ORICA failing their licence or needing to convert to potable water source on regular or prolonged basis. • Failure in MF integrity will affect the quality in the MF filtrate. • Loss of KIWS product water due to failure of the MF process or equipment. • Parameters that are potentially affected by MF process breakdowns are Total Silica, Somatic Coliphage (SC), Faecal Coliform (FC), *Cryptosporidium* and Total Suspended Solids (TSS).
Control Measures		• Flow rate is within design limits • Pressure's are within design limits. • Continuous monitoring of turbidity from each of the trains in operation (Quality Control Points). • Membrane Integrity Test (MIT) to confirm membrane integrity. • Weekly monitoring of Total Silica, SC, FC, *Cryptosporidium* and TSS to verify MF product water quality parameters are within design limits.
Key Control Measure(s)		Online turbidity of combined permeate and MIT monitoring of each train during operation
Critical Limit/Target Limit		**Turbidity of the individual Train Permeate**
	Target	< 0.1 NTU
	Alert	> 0.2 NTU for >10 minutes during production
	Critical	> 0.3 NTU for > 20 minutes during production
Monitoring Procedures	**What**	Monitor turbidity of individual trains to minimise risk of combined permeate
	How	Turbidity meters
	When	Continuously when the unit is filtering
	Where	Online (AIT2022/AIT2302/AIT2402)
	Who	AWTP Operator and automatically through PLC
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Checklist (Not in order of priority) • Shut down MF system • Isolate train that is exceeding turbidity limit using turbidity meter on individual trains • Recalibrate turbidity meter on train(s) that exceeded limit • Perform MIT to assess whether train contains broken fibres • Plug broken fibres • Perform recovery clean, if required
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet
	Who	AWTP operator

1.4 CCP 3 – REVERSE OSMOSIS

CCP 3		Reverse Osmosis	
Process Inputs		The KIWS scheme MF product water is fed to the Reverse Osmosis (RO) system and is free of free chlorine, contains residual chloramine (both monitored online) and is in the normal TDS range. Correct antiscalant and acid dose has been added.	
Hazards		Membrane failure or failure to seal resulting in possible passage of particles containing bacteria, virus and protozoa and allowing solutes to pass through (Chloride, Calcium, silica, iron, copper, magnesium, aluminium, potassium, zinc, fluoride, sulphate, sodium, chromium, arsenic, organic carbon, phosphorous, ammonia and nitrogen)	
Control Measures		• RO flow rate, pH and antiscalant are within design limits • Pressure drop along the vessels is within design limits • Driving forces across membranes are within design limits • Cross flow is within design limits • Membranes chemical cleaning is undertaken within design limits and with approved chemicals • Recovery is kept within design limits • Continuous monitoring of the Electrical Conductivity (EC) from each train (QCP 2).	
Key Control Measure(s)		Electrical Conductivity of the RO system	
Critical Limit/Target Limit		**Electrical Conductivity of Combined Permeate**	**Electrical Conductivity removal across the RO**
	Target	<30 µS/cm	> 96.8 % (~1.5 LRV)
	Alert	> 40 µS/cm for > 30 minutes	< 94% for a period of 30 minutes when in production (~1.2 LRV) to degas tower
	Critical	> 70 µS/cm for > 60 minutes	< 90% for a period of 60 minutes when in production (~1.0 LRV) to the degas tower
Monitoring Procedures	**What**	• EC of the combined RO permeate (for product TDS)	• EC over RO system in terms of LRV = Log_{10} (Feed EC/Permeate EC) (calculated in terms of log reduction as a surrogate for pathogen and virus removal)
	How	• EC analyser on combined RO permeate line	• Online calculation of LRV based on RO feed EC and combined RO permeate EC
	When	• Continuous when permeating	• Continuous when permeating
	Where	• Online (AIT3902)	• Online (AIT3094 - AIT3902)
	Who	AWTP Operator and automatically through PLC	
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Check List (not in order of priority) • Investigate the EC of the individual trains • Investigate whether there has been a chemical clean or module replacement • Take samples and verify the feed and permeate EC meters, calibrate/replace if required • Shutdown train/s that have high permeate EC and investigate cause • Check delivered maintenance equals planned maintenance • Check dosing of acid and antiscalant • Check the performance of each train, are the trains highly fouled and in need of chemical cleaning?	
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet	
	Who	AWTP operator	

1.5 QCP 2 – REVERSE OSMOSIS

QCP 2		Reverse Osmosis
Process Inputs		The KIWS scheme MF product water is fed to the Reverse Osmosis (RO) system and is free of free chlorine, contains residual chloramine (both monitored online) and is in the normal TDS range. Correct antiscalant and acid dose has been added.
Hazards		Membrane failure or failure to seal resulting in possible passage of particles containing bacteria, virus and protozoa and allowing solutes to pass through (Chloride, Calcium, silica, iron, copper, magnesium, aluminium, potassium, zinc, fluoride, sulphate, sodium, chromium, arsenic, organic carbon, phosphorous, ammonia and nitrogen)
Control Measures		• RO flow rate, pH and antiscalant are within design limits • Pressure drop along the vessels is within design limits • Driving forces across membranes are within design limits • Cross flow is within design limits • Membranes chemical cleaning is undertaken within design limits and with approved chemicals • Recovery is kept within design limits
Key Control Measure(s)		• Electrical Conductivity of each RO train permeate
Critical Limit/Target Limit		**Electrical Conductivity of Single RO Train 1st stage**
	Target	<20 µS/cm
	Alert	> 25 µS/cm for > 1 minute (Goes off-spec)
	Critical	> 25 µS/cm for > 15 minutes (Unit shuts down)
Monitoring Procedures	**What**	• EC of the 1st stage RO permeate from a single train
	How	• EC analyser on 1st stage RO permeate line
	When	• Continuous when permeating
	Where	• Online on 1st stage permeate
	Who	Automatically through PLC and/or by operator
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Check List (not in order of priority) • Unit will automatically divert water to off spec and check for 15 minutes, if still >25 then the unit will shutdown. • Check List, not in order of priority. • Shutdown train reduce plant flow • Calibrate EC analyser • Investigate feed water EC • Investigate by testing the EC of water from each pressure vessel in the offending array • Manual check of result with lab EC meter • Check delivered maintenance equals planned maintenance
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet
	Who	AWTP operator

1.6 CCP 4 – CHLORINATION

CCP 4		Chlorination		
Process Inputs		Chlorination is designed to inactivate bacteria and virus in the degassed RO permeate prior to its storage and reuse		
Hazards		• Insufficient contact time leading to insufficient Ct and disinfection. • Chlorine dose too low due to dosing pump failure leading to lower than required chlorine residual and Ct required for adequate disinfection not being met. • Chlorine dose too high due to pump overdosing leading to higher than required chlorine residual in final product and chemical wastage.		
Control Measures		• Flow paced sodium hypochlorite dosing. • High and low level sodium hypochlorite residual alarms. • pH and temperature monitoring upstream of the CCT • Two free chlorine analysers downstream of CCT with discrepancy alarm that will shutdown supply • Bypass to raw water tank until residual C.t returns to above critical limit		
Key Control Measure(s)		Free chlorine residual, temperature, flow and pH monitoring.		
Critical Limit/Target Limit		**C.t**	**pH**	**Temperature**
	Target	> 15 mg.min/L (pH <7.5) > 31 mg.min/L (pH 7.5 tp 9)	7	> 10℃
	Alert	< 13 mg.min/L (pH <7.5) for more than 20 minutes < 30 mg.min/L (pH 7.5 to 9) for more than 20 minutes	> 7.5 for more than 30 minutes	
	Critical	< 11 mg.min/L (pH <7.5) for more than 30 minutes < 27 mg.min/L (pH 7.5 to 9) for more than 30 minutes	< 9 (maximum)	> 10℃ (minimum)
Monitoring Procedures	**What**	Free chlorine monitoring downstream of CCT	pH monitoring downstream of CCT	Temperature monitoring
	How	Calculated in SCADA from online instruments	Online	Online temperature monitor
	When	Continuous when water flowing	Continuous when water flowing	Continuous when water flowing
	Where	Access data through SCADA for online free chlorine monitoring (AIT4520/AIT4521)	Access data through SCADA for online pH monitoring (AIT4538)	Online temperature analyser (TIT4049)
	Who	Operator and automatically through the PLC		
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Check List (not in order of priority) • Divert off-spec water, continue to operate to bring plant back into control • Investigate and verify the chlorine meter readings and calibrate/replace if required • Investigate and verify the pH meter readings and calibrate/replace if required • Investigate the chlorine dosing system operation and control • Investigate set-points and upstream operations than could influence pH and chloramine dosing levels.		
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet		
	Who	AWTP operator		

1.7 CCP 5 – DECHLORINATION

CCP 5		Dechlorination
Process Inputs		Dehlorination is designed to remove total chlorine residual in water to be discharged to the environment.
Hazards		• Insufficient dosing of sodium bisulphite (SBS) leading to discharge of chlorinated water to the Hunter River.
Control Measures		• SBS dosing
Key Control Measure(s)		• ORP analyser
Critical Limit(s)/Target Limit(s)		**ORP**
	Target	250 – 500 mV
	Alert	< 200 or > 500 when discharging for more than 10 minutes
	Critical	< 200 or > 500 when discharging for more than 60 minutes
Monitoring Procedures	**What**	ORP analyser
	How	Online
	When	Continuously when discharging
	Where	Access Data through SCADA for online monitoring (AIT1021)
	Who	KIWS Operator
Corrective Action (Adjustments needed to restore the process to within acceptable quality limits)	**What**	Check List (not in order of priority) • Find source of overflow and rectify • Increase SBS dose. • Investigate SBS dosing system • Undertake a controlled shutdown of the AWTP
	Records	The primary record of an event is the KIWS event list, details may also be recorded in the Operator Log Book, Operator handover report, Laboratory monitoring reports, Plant data spreadsheet
	Who	AWTP operator

17 APPENDIX C: SUEZ 2016 Review of Hazard Analysis and Critical Control Point (HACCP) Plan (HACCP worksheet and July and October 2016 review minutes)

MINUTES

project	KIWS	**venue**	Water Breakout Room, Rhodes
title	HACCP Review Meeting Part 2	**date/time**	29 July 2016/2.00pm
attendees	Peter Segura Veronique Bonnelye Dave Colley Mark Knight Patrick Kang Nick Read	**circulation**	attendees

item	subject	action	due
1	**Review of actions from previous workshop (31 May 2016):**	As noted	ASAP

Hazard Reference	Original Action	Responsibility	Updater		
41	*Evaluate potential of new instrumentation for monitoring and control of CCPs at Shortland WWTW associated with off-specification feed to KIWS during review of Shortland WWTW CCP Plan*	*HWC*	Action remains with HWC. Suez will expect revised RWQMP from HWC in due course. Schedule a review once received.	PS	On receipt of revised RWQMP
44,45,88	*Correct P&ID to show SBS dosing to auto-strainers.*	*SUEZ*	Mark ups from DC complete. Backdrafting held up pending receipt of most recent CAD files (files received were previous revision). Request CAD files from HWC and provide to SUEZ DB when received.	PS	ASAP
50	*Check historical data on MF integrity to validate assumption that the risk of pathogen from concentrate side to product water has been designed out.*	*SUEZ*	Not yet actioned. DC to request data from Veolia.	DC	ASAP
51	*Review training material available on handling of cleaning chemicals*	*SUEZ*	Existing training material is basic and does not address handling of cleaning chemicals in detail. VB to request further training from PALL	VB	ASAP
54	*Check that the available documentation with respect to control of free chlorine upstream of RO is current. If so, prepare RFI to HWC to query why this was not considered / included as part of CCP3 which does not mention SBS dosing, Ammonia dosing or ORP monitoring. Refer section 4.4.2 of supplementary design report*	*SUEZ*	Further review has determined that this is not required as a critical control point, but it is an important quality control measure to protect the RO membranes. A backup ORP instrument is recommended to supplement AIT3096. PS to make recommendation to Itochu and arrange for installation if approved.	PS	ASAP
60	*Check that the available documentation with respect to Total chlorine breakthrough. If necessary, prepare RFI to HWC to query why this was not considered / included as part of CCP5.*	*SUEZ*	High total chlorine does not represent a health hazard, hence this is not considered a critical control point. However it is a contractual quality requirement. DC to check alarm and consequent controls functions in the SCADA/control philosophy.	DC	ASAP
70	*Capture recycled water pipeline maintenance in environmental and asset management plans*	*SUEZ*	To be actioned by PS	PS	ASAP

item	subject			action	due
71- 78	*Refer these hazard items to Orica for comment and confirmation that no changes have taken place which will affect the risk assessment.*	*SUEZ*	Response from Orica is that there have been no changes to use of Recycled Water and they have no comment on current risk assessment. PS to document Orica response in project files	PS*	ASAP
80 & 81	*Evaluate potential of new instrumentation for monitoring and control of CCPs at KIWS influent associated with high salinity and high chlorine discharges to environment*	*SUEZ*	These parameters are not identified as hazards because they are not listed in the discharge license and hence are not considered CCPs. Refer Tables 2 & 3 of supply agreement. Review HWC RWQMP when provided to determine how the quality parameters are addressed.	PS	ASAP
90	*Research process configuration and SOPs to determine means of re-chlorinating product water tank after temporary cessation of supply*	*SUEZ*	Re-chlorination can be achieved with the current plant configuration but no SOP is in place for this operation. SOP to be developed.	PS	ASAP
91	*Capture brine pipeline maintenance in environmental and asset management plans*	*SUEZ*	To be actioned by PS	PS	ASAP
2	**Confirmation of CCPs**				
2.1	The team endorsed the currently identified CCPs and confirmed that the split of responsibility associated with the devolution of the scheme did not require any additional CCPs for the ARWP.			Note	
3	**Review of CCP Thresholds and Actions**				
CCP1	Relates to Shortland WWTP and is not included in this review.				
CCP2	Turbidity and PDT on MF membranes:				
	DC to check manufacturer's recommendations with respect to PDT and confirm the time parameter – e.g. does a decay rate of 5kPA in 5 minutes correspond with a decay rate of 1 kPa/minute?			DC*	ASAP
	PK to review corrective actions and identify order of priorities and edit if required. Also to check that an automatic shutdown of the module is initiated if the PDT reaches the critical point. Not this action extends to QCP1 which addresses individual modules			PK*	ASAP
CCP3	Specific Ec and Ec removal at RO racks				
	VB to review corrective actions and identify order of priorities, and edit if required. Note this action extends to QCP2 which addresses individual racks.			VB*	ASAP
CCP4	Chlorination				
	VB to review corrective actions and identify order of priorities, and edit if required. Diversion of off-spec water should be identified as the primary actions with investigative actions following on.			VB*	ASAP
	VB to check and validate the calculation in SCADA for determination of Ct.			VB*	ASAP
CCP5	De-chlorination				
	Target limits and corrective actions appear appropriate but are to be reviewed for consistency when the new discharge license is issued.			PS	On receipt of discharge license.

item	subject	action	due
4	**Update of HACCP Plan**		
	HACCP Plan to be updated when relevant actions above have been closed out. Refer actions with asterix*	NR	On receipt of confirmed CCP plans
	Meeting closed at 4.30pm		

MINUTES

project	KIWS	**venue**	Water Breakout Room, Rhodes
title	HACCP Review Meeting Part 2 continued (revised)	**date/time**	13 October 2016, 8-9am
attendees	Peter Segura Nick Read Mark Knight (minutes)	**circulation**	Attendees + Veronique Bonnelye + Dave Colley + Patrick Kang + Rami Al Nashi

item	subject	action	due
1	**This meeting was requested by Peter to address advice received from an expert consultant that was engaged by Suez to develop the KIWS Recycled Water Management Plan.** **Actions from previous meeting (29 July 2016) were not reviewed in detail and are not repeated in this meeting minutes.** **To review the required actions from the previous meeting refer to the minutes issued by Nick Read via email on 1 August**	**Note**	**N/A**
2	**Review of CCP Risk Assessment on 13 October 2016**	**Note**	**N/A**
CCP1	Shortland WWTW - No change, HWC responsibility		
CCP2	Microfiltration - No change		
QCP1	Microfiltration - No change		
CCP3	Reverse Osmosis – No change		
QCP2	Reverse Osmosis – No change		
QCP #TBC	Reverse Osmosis – item 54 to become a new QCP (# TBC). Refer to updated HACCP risk assessment for more details		
CCP4	Chlorination - No change		
~~CCP5~~ QCP #TBC	De-chlorination - Relegated to QCP. Refer to updated HACCP risk assessment for more details		
3	**Meeting closed at 9am**		

KOORAGANG INDUSTRIAL WATER SCHEME HACCP RISK ASSESSMENT

Number	Work Shop	Process Step Name	Potential Hazardous Event Description	Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	Controlled Risk			CCP Question				CCP?	Risk Assessment Review 31 May 2016	
					Consequence	Likelihood	Risk Level			Consequence	Likelihood	Risk Level	1	2	3	4		Changes identified?	Description of change/comment/action
1	HACCP Oct 2011	Whole of Sewer Catchment	Reconsidered and remains a valid risk - Illegal dumping occurs yearly from tanker delivery. Continuity of discharge is the consequence on the biological plant.	E/H - Caused by phenolics, aromatic hydrocarbons or toxic heavy metals, leading to pathogens and nutrients and carbonaceous material getting through	3	4	**High**	Yes	Trade Waste Agreements are in place to control this risk. Education of the general public via training, website etc such that they know what shouldn't be put to sewer.	Not Scored		Not Scored	Y	Y	N	N	No	No	
2	Risk Assessment 2009	Whole of Sewer Catchment	Planning permits allow new development into the sewer catchment which mean the plant cannot treat the sewage	M/H/C/P - Excessive loads	Not Scored		Not Scored	Yes	Flow is monitored Section 50 approval required under HWC Act for new developments Plant has EP design well above current inputs	1	1	Low	Y	Y	N	N	No	No	
3	Risk Assessment 2009	Whole of Sewer Catchment	Illegal dumping into the sewer that may influence membrane (fouling, damage) resulting in a health/environmental impact	E/H - Petrochemicals, diesel	Not Scored		Not Scored	Yes	Dilution is an inherent control for small, household scale dumping events Operator observation and response for plant, when plant manned, and pump stations Public reporting of odour leading to response On line detection and response to low DO events On line detection and response at downstream controls on membranes	1	2	Low	Y	Y	N	N	No	No	
4	Risk Assessment 2009	Whole of Sewer Catchment	Illegal dumping that may influence biological treatment leading to poor N and C removal or poor pathogen or hazardous chemical removal for a few weeks or more	E/H - Caused by phenolics, aromatic hydrocarbons or toxic heavy metals, leading to pathogens and nutrients and carbonaceous material getting through	Not Scored		Not Scored	Yes	Dilution is an inherent control for small, household scale dumping events Operator observation and response for plant, when plant manned, and pump stations Public reporting of odour leading to response for some substances On line detection and response to low DO events On line detection and response at downstream controls on membranes	1	3	Low	Y	Y	N	N	No	No	
5	Risk Assessment 2009	Whole of Sewer Catchment	Illegal Dumping that damages end use causing health or environmental impacts	E - Toxic and radiological chemicals, Heavy metals, including Cd and strontium	Not Scored		Not Scored	Yes	Dilution is an inherent control Trade waste controls for known hazardous discharges Sludge would typically concentrate the hazardous chemicals out of the water phase and they are monitored for metals RO would largely reject the hazardous chemicals	1	1	Low	Y	Y	N	N	No	No	
6	Risk Assessment 2009	Whole of Sewer Catchment	Pathogen loading from outbreaks in the catchment leading to levels of pathogens too great to be handled by treatment leading to health impacts for recycled water users	H - Pathogens	Not Scored		Not Scored	Yes	Public health notification and surveillance system would detect the outbreak and lead to review of risks Treatment barriers typically perform better than their worst-case performance so the log credits are typically much greater than the required levels	2	2	Low	Y	Y	N	N	No	No	
7	Risk Assessment 2009	Whole of Sewer Catchment	Endocrine disrupting chemicals getting through the process causing health and environmental effects	EDCs	Not Scored		Not Scored	Yes	Secondary sewage treatment RO treatment End use is not drinking water	1	1	Low	Y	Y	N	N	No	No	
8	Risk Assessment 2009	Whole of Sewer Catchment	Excess household disinfectants and pool chemicals use impacting downstream use	E/H - Bleach	Not Scored		Not Scored	Yes	Dilution is an inherent control for small, household scale dumping events. Operator observation and response for plant, when plant manned, and pump stations. Public reporting of odour leading to response for some substances. On line detection and response to low DO events. On line detection and response at downstream controls on membranes	1	3	Low	Y	Y	N	N	No	No	
9	Risk Assessment 2009	Whole of Sewer Catchment	Tree root control agents having a downstream impact on use	E - Root foam	Not Scored		Not Scored	Yes	End use does not include irrigation Dilution is an inherent control HWC operators oversee the application and control the dose Activity is localised	1	1	Low	Y	N	N	N	No	No	
10	HACCP Oct 2011	General Plant	Failure to implement the controls - risk rises towards inherent risk. Reconsidered to be high risk.	E/H - All	3	3	**High**	Yes	Implementation of RWQMP	Not Scored		Not Scored	Y	N	N	N	No	No	
11	HACCP Sept 2012	General Plant	Analyser Failure/misreading	C, M	4	4	**Very High**	Yes	Daily check by operator. Rotational calibration/maintenance by operators or technicians - maintenance schedule. Chloramine analyser on service agreement. Ability to put plant shut down hold on during calibration.	2	3	Moderate	Y	Y	Y	N	No	No	
12	HACCP Sept 2012	General Plant	Plant shutdown	P, M, C	1	1	Low	No		1	1	Low	N	N	Y	N	No	No	
13	HACCP Sept 2012	General Plant	Lock out under power failure	P	2	1	Low	No		2	1	Low	N	N	Y	N	No	No	
14	Risk Assessment 2009	General Plant	Instrument failure	-	Not Scored		Not Scored	Yes	Covered under supporting programs - O&M and HAZOP			Not Scored	Y	Y	N	N	No	No	
15	Risk Assessment 2009	General Plant	Instrument calibration out of spec	-	Not Scored		Not Scored	Yes	Covered under supporting programs - Calibration program			Not Scored	Y	Y	N	N	No	No	
16	Risk Assessment 2009	General Plant	Global power failure	-	Not Scored		Not Scored	Yes	Covered under supporting programs - O&M and HAZOP			Not Scored	Y	Y	N	N	No	No	

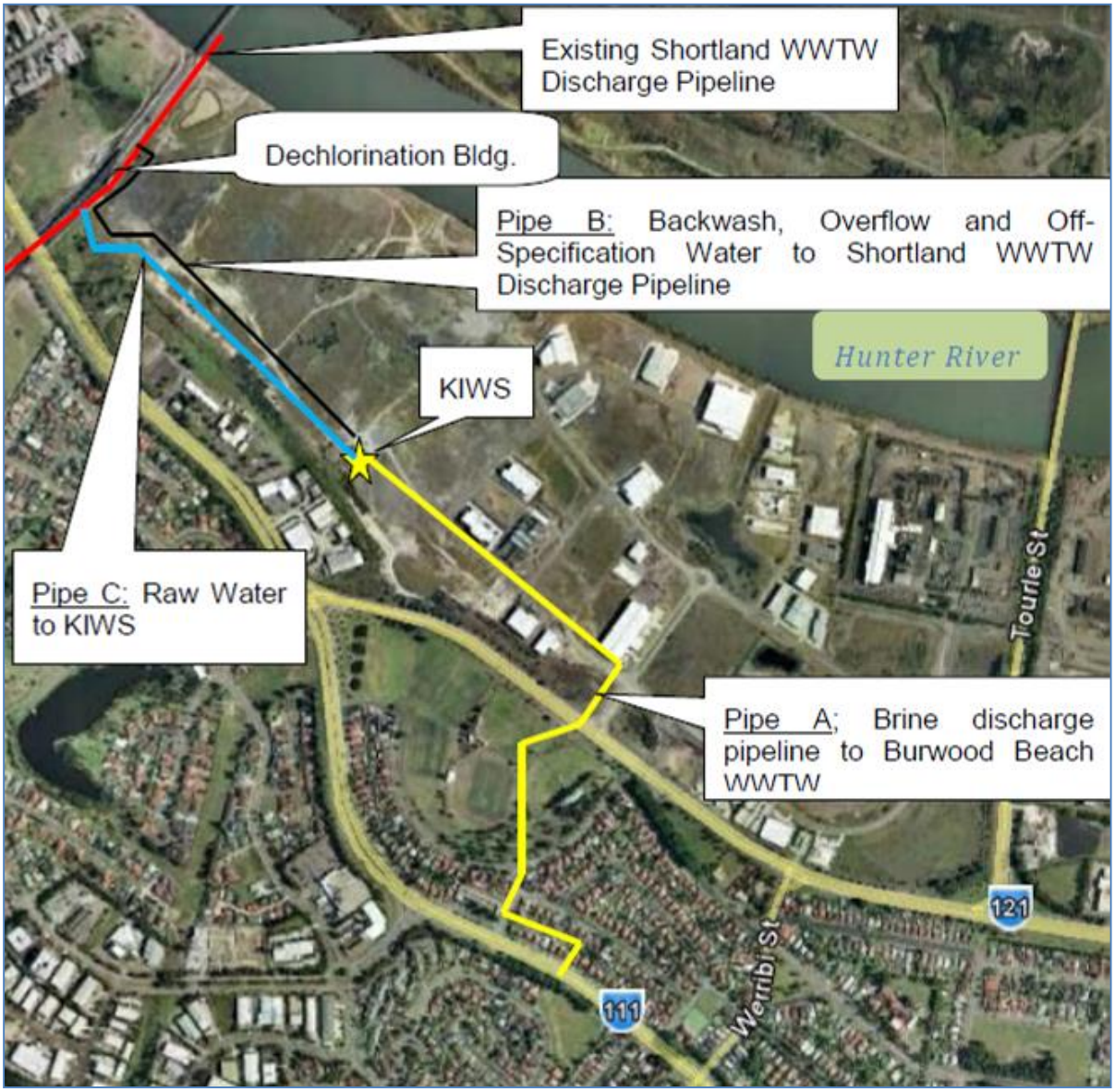
Number	Work Shop	Process Step Name	Potential Hazardous Event Description	Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	Controlled Risk			CCP Question				CCP?	Risk Assessment Review 31 May 2016	
					Consequence	Likelihood	Risk Level			Consequence	Likelihood	Risk Level	1	2	3	4		Changes identified?	Description of change/comment/action
17	Risk Assessment 2009	General Plant	Local power failure to process leading to acute load of excessive contamination reaching WRP	-	Not Scored		Not Scored	Yes	Covered under supporting programs - O&M and HAZOP			Not Scored	Y	Y	N	N	No	No	
18	Risk Assessment 2009	General Plant	Training	-	Not Scored		Not Scored	Yes	Covered under supporting programs - Training			Not Scored	Y	Y	N	N	No	No	
19	Risk Assessment 2009	General Plant	Materials and chemicals	-	Not Scored		Not Scored	Yes	Covered under supporting programs - Materials and chemicals			Not Scored	Y	Y	N	N	No	No	
20	Risk Assessment 2009	General Plant	Chemical quality	-	Not Scored		Not Scored	Yes	Covered under supporting programs - Materials and chemicals			Not Scored	Y	Y	N	N	No	No	
21	Risk Assessment 2009	General Plant	Failure to implement the controls - risk rises towards inherent risk	E/H - All	Not Scored		Not Scored	No	RWQMP PLC & SCADA controls	3	2	Moderate	Y	Y	N	N	No	No	
22	HACCP Oct 2011	Shortland WWTW	Chlorination not sufficient		Not Scored	1	Not Scored	Yes	Monitored daily by the operator. Have Free chlorine analyser at KIWS and topping up pre MF so not an issue really.	Not Scored		Not Scored	Y	N	N	N	No	No	
23	HACCP Oct 2011	Shortland WWTW	Phosphorous levels		Not Scored	1	Not Scored	No	Look at on line "Phosphate" monitor to pre MF	Not Scored		Not Scored		Y	N	N	No	No	
24	HACCP Oct 2011	Shortland WWTW	Poor total N removal due to WWTP operational problems leading to environmental impacts. Reconsidered to be low risk.	E - Nitrogen	Not Scored	1	Not Scored	No		Not Scored		Not Scored	N	N	N	N	No	No	
25	HACCP Oct 2011	Shortland WWTW IDAL	Continuity issue with regards capacity. If 1 IDAL was off line for a few hours 12 MLD could be treated by the other IDAL for a few hours only if an equipment failure occurred.		Not Scored	1	Not Scored	Yes	Redundancy in the equipment, aerators.	Not Scored		Not Scored	Y	Y	N	N	No	No	
26	HACCP Oct 2011	Shortland WWTW Inlet Works	Increased use of the wet weather ponds		Not Scored	1	Not Scored	No	Limitation of the flows due to pump capacity and PLC code. Risk of algae transfer through the plant. Short term loss of capacity of the plant.	Not Scored	2	Not Scored	Y	N	N	N	No	No	
27	HACCP Sept 2012	Shortland WWTW	Alum dosing failure resulting in high TP Total Phosphorous	C	3	3	High	Yes	Alarm on alum dosing pumps - signal from pumps. Another measure to ensure dosing flow is present - operator daily check.	1	3	Low	Y	Y	Y	Y	Yes	No	
28	HACCP Sept 2012	Shortland WWTW	Aeration failure resulting in high TN	C	3	3	High	Yes	Operator monitoring. Online alarms.	1	3	Low	Y	Y	Y	Y	Yes	No	
29	HACCP Sept 2012	Shortland WWTW	Alum dosing failure resulting in poor settleability - high TSS	P	2	3	Moderate	Yes	Alarm on alum dosing pumps - signal from pumps. Another measure to ensure dosing flow is present - operator daily check. Weekly settleability manual sampling/analysis (frequency to be reviewed during commissioning)	1	3	Low	Y	Y	Y	Y	Yes	No	
30	HACCP Sept 2012	Shortland WWTW	Wet weather event causing quality change. TSS will change quickly.	P	3	3	High	Yes	Consider alarm at Shortland WWTW indicating that it is operating in wet weather mode to potentially increase frequency sampling.	1	3	Low	Y	Y	N	N	No	No	
31	HACCP Sept 2012	Shortland WWTW	Decant failure.	P	2	3	Moderate	Yes	Alarms.	1	3	Low	Y	Y	N	N	No	No	
32	HACCP Sept 2012	Shortland WWTW	High DO	C	2	3	Moderate	Yes	Online monitoring. Alarms	1	3	Low	Y	Y	Y	N	No	No	
33	HACCP Sept 2012	Shortland WWTW	Trade waste	C	3	2	Moderate	Yes	DO monitoring. Dilution. Tankers no longer delivering waste to site.	1	2	Low	Y	Y	N	N	No	No	
34	HACCP Sept 2012	Shortland WWTW	Sludge bulking - slow	C,P	2	3	Moderate	Yes	Weekly SVI testing.	1	3	Low	Y	Y	N	N	No	No	
35	HACCP Sept 2012	Shortland WWTW	DO probe failure	C,P	2	3	Moderate	Yes	Two in each tank with discrepancy alarm.	1	3	Low	Y	Y	Y	Y	Yes	No	
36	HACCP Sept 2012	Shortland WWTW	High ammonia resulting in high chlorine demand.	C	2	3	Moderate	Yes	Manual data collection - auto-notification.	1	3	Low	Y	Y	Y	N	No	No	
37	Risk Assessment 2009	Shortland WWTW	Poor total N removal due to WWTP operational problems leading to environmental impacts	E - Nitrogen	Not Scored		Not Scored	Yes	Regulatory controls on HWC and Orica discharges Customer contract controls between HWC and Orica Plant currently operated to remove nitrogen and monitored against that (both process and receiving water monitoring) Some further reduction through RO (~60%)	3	2	Moderate	Y	Y	N	N	No	No	
38	Risk Assessment 2009	Shortland WWTW	Excessive solids carryover or short circuit from decant leading to final recycled water contamination	E/H - Pathogens, solids, metals, etc	Not Scored		Not Scored	Yes	Catch pond to catch over flow On line turbidity at inlet to recycled water plant linked to response in the event of high turbidity Operator observations Membrane processes downstream Head loss and back wash cycle rates	1	1	Low	Y	Y	N	N	No	No	
39	Risk Assessment 2009	Shortland WWTW	PLC fails and doesn't alarm at the same time as a failure	E/H - Pathogens, nutrients	Not Scored		Not Scored	Yes	PLC failure is detected and leads to an alarm in its own right - failsafe design Valve shuts to protect the environment if the PLC or power fails and diverts sewage to the storage ponds	1	1	Low	Y	Y	Y	N	No	No	
40	Risk Assessment 2009	Shortland WWTW and UV system	Bypass of the WWTW so that raw sewage reaches the water recycling plant due to operator error or sabotage leading to health impacts or environmental impacts	E/H - Pathogens, Carbon	Not Scored		Not Scored	Yes	Valves and alarms in place to ensure that only treated secondary effluent is pumped to KIWS.	1	2	Low	Y	Y	N	N	No	No	
79	HACCP Review 2016	KIWS plant influent	High salinity reaching the plant via Shortland WWTW	C	3	4	High	Yes	New instrumentation and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	New instrument will be available for monitoring
80	HACCP Review 2016	KIWS plant influent	High salinity discharge from raw water tank to the environment	E	3	4	High	Yes	New instrumentation and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	New instrument will be available for moniotring. Consequence rating assumes that there is an environmental license limitation on salinity discharge to river - to be checked to confirm that this is a CCP
81	HACCP Review 2016	KIWS plant influent	High chlorine levels that exceeds capacity of plant	C	3	2	Moderate	Yes	New instrumentation and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	New instrument will be available for monitoring

Number	Work Shop	Process Step Name	Potential Hazardous Event Description	Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	Controlled Risk			CCP Question				CCP?	Risk Assessment Review 31 May 2016	
					Consequence	Likelihood	Risk Level			Consequence	Likelihood	Risk Level	1	2	3	4		Changes identified?	Description of change/comment/action
82	HACCP Review 2016	KIWS plant influent	High chlorine discharge from raw water tank to the environment	E	3	2	Moderate	Yes	New instrumentation and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	New instrument will be available for monitoring. Assessment assumes the level of chlorine coming on to plant may exceed capacity of SBS system to neutralise free chlorine
83	HACCP Review 2016	KIWS plant influent	Process upset at Shortland WWTW pushing high TSS on to KIWS, potentially causing blinding of strainers and MF fouling	C, P	3	4	High	Yes	New instrumentation (turbidity) and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	New instrument will be available for monitoring
84	HACCP Review 2016	KIWS plant influent	Process upset at Shortland WWTW pushing high Ammonia to KIWS, potentially causing a requirement to increase chlorine injection and discharge of product water outside of contractual limits for discharge of nitrogen or chloramines	C, P	3	4	High	Yes	Refer Shortland WWTW HACCP for CCP on aeration	3	1	Low	Y	Y	Y	N	No	Yes	Assumes timely communication
85	HACCP Review 2016	KIWS plant influent	Process upset at Shortland WWTW pushing high BOD on to KIWS, potentially causing fouling of membranes and an increase in the required frequency of backwash cycles and potentially a plant shutdown	M, C	3	2	Moderate	Yes	Refer Shortland WWTW HACCP for CCP on aeration, and New instrumentation (BOD) and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	BOD trend can be used to review cause
86	HACCP Review 2016	KIWS plant influent	Process upset at Shortland WWTW pushing high BOD on to KIWS, potentially high BOD discharge from raw water tank to environment	E	3	1	Low	Yes	Refer Shortland WWTW HACCP for CCP on aeration, and New instrumentation (BOD) and alarms and automatic diversion (by Hunter Water) away from KIWS Level monitoring in raw water tank and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	Y	Y	Y	N	No	Yes	BOD trend can be used to review cause
87	HACCP Review 2016	KIWS plant influent	Process upset at Shortland WWTW pushing high Phosphorous to KIWS, potentially causing scaling and increased CIP, and discharge of product water outside of contractual limits	C	2	4	Moderate	Yes	Refer Shortland WWTW HACCP for CCP on allum dosing, and Lab monitoring	2	3	Moderate	Y	Y	Y	N	No	Yes	Assumes timely communication
41	HACCP Oct 2011	KIWS Feed Tank	Online monitoring at the KIWS plant and if out of spec the valve will be closed and out of spec water diverted back to the River.		Not Scored		Not Scored	Yes	Need to determine where the instruments are in relation to the feed tank i.e. before or after the tank. Control measures that are to be implemented will be upstream (at dechlorination building) of the plant bypass Hunter Water to consider new analysers during HACCP review for Shortland Refer to abovementioned risk for influent water	Not Scored		Not Scored	Y	Y	N	N	No	Yes	New instruments will be available for monitoring, these to be considered in HACCP review for Shortland WWTW.
42	HACCP Oct 2011	KIWS Feed Tank	If out of spec water there is a 12 hour storage to Orica and Orica will be notified if this tank goes to Low level such that they can take potable water rather than recycled water.		Not Scored		Not Scored	Yes	Communication with Orica	Not Scored		Not Scored	Y	Y	N	N	No	No	
43	HACCP Oct 2011	KIWS Feed Tank	Turbidity to monitor "Health" of Shortland WWTW		Not Scored		Not Scored	Yes	Turbidity as CCP. Need to assess maintenance requirements and timing of turn around to fix analyser. Review need for spares. Review operational parameters for alarms such that turbidity spikes do not issue an alarm to operators.	Not Scored		Not Scored	N	N	N	N	No	Yes	Instrument availability has been assessed and confirmed as part of SUEZ FMECA.
44	HACCP Sept 2012	Autostrainers	Issues with biological build-up in strainers	P	2	4	Moderate	Yes	Chloramine dosing upstream to minimise fouling. New turbidity instrumentation at the dechlorination building	1	2	Low	Y	N	N	N	No	Yes	Additional instrumentation now available for monitoring
45	HACCP Oct 2011	MF Backwash Return to Shortland WWTW	Concentration of pathogens from KIWS returned back to Shortland WWTW. 4 log of pathogens removed at KIWS are then concentrated up and then returned back to KIWS.				Not Scored	Yes	Backwash returned from KIWS is of better quality than the raw sewage currently received. It can be assumed that Shortland WWTW will continue to reduce pathogens through the biological process. As long as operation remains within design parameters this risk is covered by the existing CCPs and additional instrumentation allows direct monitoring for turbidity, nitrogen and chlorination.	Not Scored		Not Scored	Y	N	N	N	No	Yes	Additional instrumentation is now available for monitoring. Further data should be gathered to confirm treatment efficacy to allow this question to be addressed quanitiatively should it be raised in subsequent reviews. See also item 88.
46	HACCP Sept 2012	Microfiltration	Pathogen breakthrough	M	3	3	High	Yes	Plant shut down. Manual closing of valve so that RO feed tank overflows. MIT	1	3	Low	Y	Y	Y	Y	Yes	No	
47	HACCP Sept 2012	Microfiltration	Membrane Integrity Test (MIT) failure - false negative	P	3	3	High	Yes	Alarms. Run at night. Operator action.	1	3	Low	Y	Y	Y	Y	Yes	No	
48	HACCP Sept 2012	MF Backwash tank	None identified				Not Scored	No		Not Scored	1	Not Scored						No	
88	HACCP Review 2016	MF Backwash tank	Trade waste agreement (new contractual boundary)				Not Scored	No	Auto sampler	Not Scored		Not Scored							Refer discussion against item 45.
49	Risk Assessment 2009	Microfiltration	Membrane integrity failures such as broken fibres, leaky O rings etc, leading to sub-optimal removal of pathogens that results in final water being hazardous to health	H - Pathogens	Not Scored		Not Scored	Yes	Upstream and downstream controls. Parallel systems, more than one membrane skid. Procurement of appropriate parts and fittings. Pressure decay integrity testing to detect these types of failures at regular intervals linked to response, alarm to operator. Filtrate turbidity on line and alarmed leading to response, probably automated shut off. Downstream storage which has dilution and supply continuity/response time benefits	1	2	Low	Y	Y	Y	Y	Yes	No	
50	Risk Assessment 2009	Microfiltration	Backwash water backflow into the product water line	H - Pathogens	Not Scored		Not Scored	Yes	Designed out in this system	Not Scored		Not Scored						No	Check historical data on MF integrity to validate claim.
51	Risk Assessment 2009	Microfiltration	Cleaning chemicals contaminating the product water causing health or environmental impacts	E/H - Possibly hypo, caustic, sulphuric acid, hydrochloric acid, citric acid etc	Not Scored		Not Scored	Yes	Reverse osmosis membranes downstream. CIP is automated EFP and recovery cleans would be automated. Training in relation to chemical controls. pH monitoring downstream with follow-up of alarm limits	1	1	Low	Y	Y	Y	N	No	No	Turbidity and ORP instruments also provide means of monitoring.

Number	Work Shop	Process Step Name	Potential Hazardous Event Description	Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	Controlled Risk			CCP Question				CCP?	Risk Assessment Review 31 May 2016	
					Consequence	Likelihood	Risk Level			Consequence	Likelihood	Risk Level	1	2	3	4		Changes identified?	Description of change/comment/action
52	HACCP Oct 2011	Reverse Osmosis	Cleaning chemicals contaminating the product water causing health or environmental impacts. Reconsidered to be low risk.	E/H - Possible caustic, antiscalants, etc			Not Scored	No	Designed out in this system	Not Scored		Not Scored						No	
53	HACCP Sept 2012	Reverse Osmosis	Pathogen breakthrough	M	3	3	**High**	Yes	Conductivity on each stage. Conductivity on combined flow. Shut down of stage. Manual intervention to determine stage.	1	3	Low	Y	Y	Y	Y	Yes	No	
54	HACCP Sept 2012	Reverse Osmosis	Free chlorine breakthrough upstream of RO	C, P	3	3	**High**	Yes	Ammonia meter - online	1	3	Low	Y	Y	Y	N	No	**Identified but missing as a CCP**	SUEZ to check the available documentation is current. If so, prepare RFI to HWC to query why this was not considered / included as part of CCP3 which does not mention SBS dosing, Ammonia dosing or ORP monitoring. Refer section 4.4.2 of supplementary design report
55	Risk Assessment 2009	Reverse Osmosis	Membrane integrity failures such as tears, leaky O rings etc, leading to suboptimal removal of pathogens that results in final water being hazardous to health	H - Pathogens	Not Scored		Not Scored	Yes	Upstream WWTW, UV, MF and Chloramine and exposure controls. Parallel systems, more than one membrane skid. Procurement of appropriate parts and fittings. Permeate EC on line and alarmed leading to response, probably automated shut off. Downstream storage which has dilution and supply continuity/response time benefits	2	2	Low	Y	Y	Y	Y	Yes	No	From early risk assessment. Details covered in other parts of this risk assessment (multiple barrier approach)
56	Risk Assessment 2009	Reverse Osmosis	Concentrate bleed water flowing into the product water line	H - Pathogens	Not Scored		Not Scored	Yes	Designed out in this system	Not Scored		Not Scored						No	
57	Risk Assessment 2009	Reverse Osmosis	Cleaning chemicals contaminating the product water causing health or environmental impacts	E/H - Possible caustic, antiscalants, etc	Not Scored		Not Scored	Yes	Designed out in this system	Not Scored		Not Scored						No	
89	HACCP review 2016	Microfiltration & Reverse Osmosis	Instrument failure or lost signal	P, C, M	3	3	**High**	Yes	Plant shut-down. Consider multiple instruments/critical spares for critical instrumentation. Sum readings where multiple trains are involved.	2	1	Low	Y	Y	Y	Y	Yes	No	This supports identification of the individual trains as QCPs
58	HACCP Sept 2012	Chlorination	Instrument failure or lost signal	P, C, M	3	3	**High**	Yes	Plant shut-down. Consider multiple instruments/critical spares for critical instrumentation. Sum readings where multiple trains are involved.	2	1	Low	Y	Y	Y	Y	Yes	Yes	The original wording of this suggests that the risk is identified for MF and RO, and not chlorination - hence this has been included in item 89 above.
59	HACCP Sept 2012	Chlorination	Pathogen breakthrough	M	3	3	**High**	Yes	Free chlorine analyser upstream and downstream of CCT. Flow meter upstream of CCT.	2	1	Low	Y	Y	Y	Y	Yes	No	
60	HACCP Sept 2012	Chlorination	Total chlorine breakthrough.	C	2	3	Moderate	Yes	Total chlorine analyser downstream of CCT	2	1	Low	Y	Y	Y	Y	Yes	**Identified but missing as a CCP**	Not mentioned in CCP5 for dechlorination, probably as this is related only to contractual limits? Prepare RFI to HWC
61	HACCP Sept 2012	Chlorination	free chlorine analyser failure	M	2	3	Moderate	Yes	Move one of the two total chlorine analysers to downstream of CCT (change to free chlorine_ - acts as duty/duty analysers. Have discrepancy alarm between two analysers - plant shut down if discrepancy is detected. Operator maintenance of analyser.	2	1	Low	Y	Y	Y	Y	Yes	No	CCP4
62	HACCP Sept 2012	Chlorination	High Ct value - increase in TDS due to increase in chlorine dose	C, P	3	3	**High**	Yes	TDS increase in final product will be minimal. Flow control enabled to reduce chance of requiring increase in hypochlorite dose to meet Ct.	1	3	Low	Y	Y	Y	N	No	No	
63	HACCP Oct 2011	Chemical Dosing	Over dosing of chemicals pre RO have the risk of discharging chlorinated permeate to Hunter River				Not Scored	Yes	Dechlorination on line to Hunter River	Not Scored		Not Scored	Y	N	N	N	No	No	
64	HACCP Sept 2012	Dechlorination	SBS doing affects pH.	C, E	1	2	Low	Yes		1	2	Low	Y	Y	Y	N	No	No	
65	HACCP Sept 2012	Chemical Dosing	Sulphuric acid malfunction causing high pH	C	2	1	Low	Yes	pH monitoring downstream of MF. Caustic dosing downstream. Dosing optional only.	2	1	Low	Y	Y	N	N	No	No	
66	HACCP Sept 2012	Chloramine Dosing	Too high a chloramine concentration leading to environmental (and membrane) impacts. Reconsidered based on design changes.	E - Chlorine or chloramine	3	3	**High**	Yes	Ammonia meter - online to ensure no free chlorine passes through RO membranes. Final disinfection with hypochlorite downstream of RO membranes. Dechlorination available for streams sent to Orica and to the Hunter River.	1	3	Low	Y	Y	N	N	No	No	
67	HACCP Sept 2012	Dechlorination	Chlorinated flows being sent to Hunter River resulting in Hunter Water not meeting license conditions. License to be transferred to Suez	C, E	3	3	**High**	Yes	Dosing and instrumentation provided to dechlorinate off spec water. Free chlorine and total chlorine analysers.	1	3	Low	Y	Y	Y	N	No	No	CCP5.

Number	Work Shop	Process Step Name	Potential Hazardous Event Description	Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	Controlled Risk			CCP Question				CCP?	Risk Assessment Review 31 May 2016	
					Consequence	Likelihood	Risk Level			Consequence	Likelihood	Risk Level	1	2	3	4		Changes identified?	Description of change/comment/action
90	HACCP review 2016	Product water tank	Pathogen regrowth in tank when supply to Orica is not required	M	3	3	**High**	? TBC	SOP - rechlorinate / recycle water in tank	3	1	Low							Research configuration to confirm available controls
68	Risk Assessment 2009	Distribution System	Cross-connections becoming excessive leading to too many people consuming the water as though it were drinking water and suffering health effects	H - Pathogens, Chemicals	Not Scored		Not Scored	Yes	Backflow prevention within the site (HWC) Backflow prevention on site (Orica) There is a break tank air gap top up for the existing fire fighting storage would provide the backup water (Orica) Pressure lower in recycled water lines, not pressurised on site until within tower basis which are fed by air break tanks (Orica) Plumbing modification and control procedure for plumbing works (Orica)	E	2	Moderate	Y	Y	N	N	No	yes	Use of 'E' during earlier risk assessment prevented automatic risk calculation. Consequence unknown No longer applicable
69	Risk Assessment 2009	Distribution System	Use of recycled water for planned flushing leading to environmental impacts	E - Chloramine	Not Scored		Not Scored	Yes	Notify DECC in the event of planned activities. Discharge to less sensitive receiving environments where possible.	3	1	Low	Y	Y	N	N	No	yes	Not applicable
70	Risk Assessment 2009	Distribution System	Discharge of recycled water via bursts, breaks (civil works) and leaks leading to environmental impacts	E - Chloramine	Not Scored		Not Scored	Yes	Minimise discharge of water to the environment where possible through response. Flow meters will alert to sudden flow events due to bursts/breaks. Dial-before-you-dig linked to pipe location maps/GIS Standard operating procedure/response to minimise discharge through isolation valves and repair of fault.	2	2	Low	Y	Y	N	N	No	No	Pipeline maintenance to be captured in environmental and asset management plans
91	HACCP Review 2016	Brine Disposal	Breakage of pressurised underground pipework to manhole E9583	E	3	2	Moderate	Yes	Dial-before-you-dig linked to pipe location maps/GIS Standard operating procedure/response to minimise discharge	3	1	Low	n	n	n	n	No	Yes	New risk identified, capture inspection and maintenance requirements in asset management plan
71	Risk Assessment 2009	End uses	Orica staff not conforming to the end user controls - taking bottles of water home for demin water and then being consumed and causing health effects	H - Pathogens and perception of pathogens	Not Scored		Not Scored	Yes	Education and signage on site. Multiple barrier treatment process with critical limits and automated control and regular testing/verification of delivered water. Not a regular occurrence if it did happen	1	1	Low	Y	Y	N	N	No	Unknown	Refer to Orica for comment
72	Risk Assessment 2009	End uses	Orica staff not conforming to the end user controls - taking undue risks and becoming excessively exposed and causing health effects	H - Pathogens and perception of pathogens	Not Scored		Not Scored	Yes	Site inductions for new staff and contractors coming on site. Operator training. Safety training. Refresher training. Quality of water is high, occasional ingestion wouldn't present an undue risk.	1	1	Low	Y	Y	N	N	No	Unknown	Refer to Orica for comment
73	Risk Assessment 2009	End uses	Off-site uses of recycled water such as tankers taking recycled water away for pressure vessel testing, but being used as drinking water and causing health effects	H - Pathogens and perception of pathogens	Not Scored		Not Scored	Yes	Any consumption event would be likely to be an isolated case if it did occur. Recycled water signage and education. This is a specialist use of the water, not a general water carting use.	1	1	Low	Y	Y	N	N	No	Unknown	Refer to Orica for comment
74	Risk Assessment 2009	End uses - cooling towers	Concentration of hazards in the water due to cycling leading to health or environmental impacts	E/H - Chemicals	Not Scored		Not Scored	Yes	Water supplied has been protected by source controls (Trade Waste) and treatment (IDAL secondary treatment and RO) to reduce chemical concentrations well below levels of concern for health. DECC Licence for water discharged off site (N and P).	2	2	Low	Y	Y	N	N	No	Unknown	Refer to Orica for comment
75	Risk Assessment 2009	End uses - cooling towers	Excessive *Legionella* growth and health effects due to loss of control in response to the change in water quality, both moving to recycled water and changing between potable top up and recycled water in future	H - *Legionella*	Not Scored		Not Scored	Yes	Currently manage *Legionella* so will change the biocide regime if required. Dose chlorine, bromine. Contractor manages this for Orica and does Legionella tests monthly and observes the tower thrice weekly and on line residual for dosing systems.	2	2	Low	Y	Y	N	N	No	Unknown	Refer to Orica for comment
76	Risk Assessment 2009	Multiple Barriers	Multiple barrier process failure leading to pathogens breaking through and causing health effects	H - Pathogens	Not Scored		Not Scored	Yes	Multiple barriers. Downstream barriers often stop operating inherently if upstream barriers fail. Exposure controls. Oversight by regulator and audits. Two separate plants (WWTW, WRP) PLC controls with UPS . Automated monitoring. Manual checks and attendance at plants. Supporting programs (maintenance, training etc.). Verification testing of recycled water quality weekly. HAZOP process to failsafe design where practicable, e.g. loss of power = loss of pumps, interlocks etc. Best practice approach. Proven technologies. Worst-case assumptions used in guidelines and process design and operation. Critical limit monitoring at control points with shut down. Independent monitoring at each control point.	1	2	Low	Y	Y	N	N	No	No	Superseded by subsequent risk assessments
77	Risk Assessment 2009	Storage (2 ML)	Pathogens and slimes growing in reservoir potentially more readily than in drinking water due to higher nutrients	H - Pathogens	Not Scored		Not Scored	Yes	Cooler climate, not at temperature for pathogen regrowth, with higher turnover, so water would not get to 30ºC	Not Scored		Not Scored	Y	N	N	N	No	Unknown	Refer to Orica for comment
78	Risk Assessment 2009	Storage (2 ML)	Ingress of pathogens into reservoir through bird and animal faeces leading to detectable E. coli counts health issues	H - Pathogens	Not Scored		Not Scored	Yes	Storage security and protection including roofing and fencing. End use exposure controls	Not Scored		Not Scored	Y	N	N	N	No	Unknown	Refer to Orica for comment

18 APPENDIX D: KIWS System



19 APPENDIX E: Recycled Water Quality Monitoring Plan for KIWS

RECYCLED WATER
QUALITY MONITORING PLAN

KOORAGANG INDUSTRIAL WATER SCHEME

Rev	Date	Prepared	Reviewed	Approved	Description of Change
A	11/08/2016	Peter Segura	Dan Deere	Peter Segura	First Draft
1	3/07/2017	Peter Segura	Dan Deere	Peter Segura	For Use
Doc. No.		**110-SE-OM-000-IT-001**			

1 Contents

Executive Summary

The Recycled Water Quality Monitoring Plan has been established to outline Suez Water & Treatment Solution's (Suez's) recycled water quality monitoring strategy. The Recycled Water Quality Monitoring Plan is based on monitoring strategies outlined in the 2006 Australian Guidelines for Water Recycling (AGWR) and will be reviewed annually to reflect system changes and updated monitoring requirements.

The Recycled Water Quality Monitoring Plan will support Suez's Recycled Water Quality Management Plan (RWQMP), to create an effective management system, such that the public safety and the environment are protected.

1 Introduction

This Recycled Water Quality Monitoring Plan has been developed as part of Suez's ongoing commitment to ensuring consistently safe recycled water. It outlines Suez's planned recycled water quality monitoring activities, as per requirements of National Water Quality Management Strategy (NWQMS): 2006 Australian Guidelines for Water Recycling (AGWR) - Managing Health and Environmental Risks (Phase 1).

This document acts in support of management strategies established in Suez's Recycled Water Quality Management Plan's (RWQMP). As such it should be read in conjunction with these documents.

2 Background

Protection of public health and the environment by ensuring that recycled water is safe for use is the primary objective of recycled water quality management and treatment at Suez.

The purpose of this plan is to ensure appropriate procedures for monitoring the quality of recycled water are followed. It supports the above objective through proactive monitoring and established controls rather than reliance on reactive monitoring and corrective actions after an excursion event.

Suez's recycled water quality monitoring plan includes the following components:

- Baseline monitoring;
- Validation monitoring;
- Operational monitoring;
- Verification monitoring; and
- Monitoring in response to incidents and emergencies

2.1 Baseline monitoring

Baseline monitoring is used to characterise the hazards present in the source of recycled water and receiving environments. Baseline monitoring also establishes typical concentration levels and how these vary with time and conditions. This information is used as a point of reference for verification monitoring when measuring any potential environmental impacts. It also provides important data for design of recycled water treatment facilities. Baseline monitoring will occur as required.

2.2 Validation monitoring

Validation monitoring is used to determine whether preventative measures (eg. treatment, disinfection) are capable of adequately controlling recycled water quality and exposure levels within the bounds required to achieve health and environmental target criteria specified in the AGWR.

Detailed process validation monitoring will typically be considered during the upgrade of Mayfield West Advanced Water Treatment Plant (MWAWTP) or the implementation of a new recycled water scheme. In such cases detailed monitoring plans will be established for the proposed treatment process covering:

- Monitoring parameters;
- Where applicable, microbial surrogates; and
- Monitoring frequencies and locations

Further validation may be required should significant changes to the treatment process or source water quality occur.

2.3 Operational monitoring

Operational monitoring includes water quality monitoring to assess and confirm the performance of preventative measures throughout the recycled water system, particularly those associated with Critical Control Points (CCPs). Operational monitoring is used to provide advanced warning of potential system instability. Specific operational monitoring requirements can be found in the relevant Recycled Water Quality Management Plans.

Suez uses a Supervisory Control and Data Acquisition (SCADA) system to support our operators by continuous online monitoring of MWAWTP equipment performance and operation. SCADA utilises a three-tiered alarm system that alerts plant operators and/or dispatch (Suez's 24 hour a day monitoring staff) of equipment failure, allowing for appropriate maintenance responses to be initiated. Specific online monitoring of key plant parameters that can affect recycled water quality is also undertaken. Some of these parameters are:

- flow in and out of the plant
- bypassing of the treatment process when effluent quality is outside the agreed specifications
- continuity of the treatment processes, including disinfection and log removal of pathogens

MWAWTP operators also carry out scheduled maintenance and system monitoring tasks, allowing for the identification of potential issues. Operational monitoring samples are collected at various stages of the MWAWTP to access and confirm the performance of the plant.

2.4 Verification monitoring

Verification monitoring is designed to assess the overall compliance of a recycled water system. This is carried out through ongoing sampling to measure the overall performance of the recycled water system, the ultimate quality of recycled water being supplied or discharged and the quality of the receiving environment.

Suez carries out a wide array of monitoring for its MWAWTP to verify plant performance and recycled water quality. Verification monitoring is based on Environment Protection Authority (EPA) licence requirements as well as other key health and environmental parameters related to the recycled water scheme.

All analyses of all samples taken for the purposes of Verification Monitoring are carried out by a laboratory accredited for the specified tests by an independent body that is acceptable to NSW Health, such as the

National Association of Testing Authorities, or an equivalent body. In this case we use [ALS? Newcastle?] for those purposes who are so accredited

2.5 Monitoring in response to incident and emergencies

Following an incident/emergency the protocols for response may include increased and strategic monitoring of recycled water and environmental quality. Suez has the capacity to sample and analyse recycled water quality at short notice.

3 Recycled Water Quality Monitoring

The following sections outline Suez's recycled water quality monitoring.

3.1 Source water

3.1.1 Shortland Waste Water Treatment Works Effluent

Suez will monitor the discharge of Shortland's WWTW to ensure that they are meeting the requirements of Hunter Water Effluent Supply Agreement (HWESA). Sampling consists of an array of parameters, typical parameters include:

- pH
- biological oxygen demand (BOD)
- Free chlorine (Cl^-)
- Conductivity
- Turbidity

Details of monitoring locations and sampling frequencies are detailed in the HWESA.

3.2 Verification monitoring

3.2.1 Regulatory monitoring for EPA compliance

Suez's Mayfield West Advanced Water Treatment Plant must comply with strict licensing arrangements specified by the EPA under the *Protection of the Environment Operations Act 1997*. All licence monitoring results are recorded in a Laboratory Information Management System (LIMS) as well as the plant operational spread sheets. Recycled water quality monitoring data is often linked to the EPA regulatory monitoring sites.

The requirements and monitoring regimes for each EPA licence can be found at the website listed below:

FACILITY	Licence #	link to Licence
Mayfield West Advanced Water Treatment Plant	20757	

3.2.2 **Kooragang Industrial Water Scheme recycled water monitoring**

The routine final quality monitoring carried out at Kooragang Industrial Water Scheme (KIWS) is shown below.

Table 1: KIWS verification monitoring program. Recycled Water Quality Targets.

Treated Water (5TW1808)		
Parameter	**Frequency**	**Orica Agreement * (90th percentile)**
Total Dissolved Solids	Weekly	<50 mg/L
Chloride	Weekly	<15 mg/L
Calcium	Weekly	<5 mg/L
pH	Weekly	5.5 - 7.5
Total Hardness	Weekly	<10 mg/L CaCO3
Alkalinity	Weekly	<20 mg/L CaCO3
Silica	Weekly	<2 mg/L
Iron	Weekly	<0.015 mg/L
Copper	Weekly	<0.05 mg/L
Total Nitrogen	Weekly	<2.5 mg/L
Ammonia	Weekly	<0.5 mg/L
Total Organic Carbon	Weekly	<1 mg/L
Total Phosphorus	Weekly	<0.05 mg/L
Suspended Solids	Weekly	<2 mg/L
Chloroamine	Weekly	<0.5 mg/L
Aluminium	Weekly	<0.1 mg/L
Temperature	Weekly	<27 degrees
Potassium	Weekly	<3 mg/L
Zinc	Weekly	<0.2 mg/L
Fluoride	Weekly	<0.1 mg/L
Sulphate	Weekly	<5 mg/L
Carbon Dioxide	Weekly	<5 mg/L
Sodium	Weekly	<15 mg/L
Chromium (VI)	Weekly	<0.002 mg/L
Arsenic	Weekly	<0.002 mg/L
Somatic coliphage (PFU per 100 ml)	Weekly	Not detectable

Thermotolerant coliforms (CFU or MPN per 100 ml)	Weekly	Not detectable
Clostridium perfringens (CFU per 100 ml)	Weekly	Not detectable

Sources * Orica Agreement

3.3 Recycled water quality monitoring in response to incidents

Suez will undertake appropriate recycled water quality monitoring and assessment in response to recycled water quality incidents should they occur. Sampling and analysis of affected or potentially affected areas of the recycled water supply system is carried out as soon as the situation is assessed with results available in the fastest possible turnaround time.

For some parameters of an acutely health-significant nature, i.e. the three microbial parameters listed at the bottom of table 1, a re-sample will be triggered if detected. If two or more results are recorded sequentially, i.e. in the routine and follow-up sample, or in two sequential routine samples, (even if the intervening follow-up sample to the first positive routine sample is clear), then the supply of recycled water will cease and NSW Health, IPART and Orica will be notified whilst we investigate the problem. In addition, our results will be summarised and reported in our annual report with a simple statement of compliance if all samples are within the agreed limits and an explanation and summary of results that are not in compliance. Similarly, if trigger levels are exceeded as set out in our EPA licence then we will notify IPART and the EPA and, if relevant to public health, NSW Health

3.4 Recycled water reporting

Regular summaries of recycled water quality results are provided to key stakeholders. Incidents and emergencies relating to recycled water are reported as per the Recycled Water Quality Incident Response Plan and procedures.

4 Definitions, acronyms and abbreviations

AGWR	NRMMC/EPHC/AHMC, 2006 **Australian Guidelines** for **Water Recycling**: Managing Health and Environmental Risks (Phase 1)
BOD	**Biological Oxygen Demand**
CCP	**Critical Control Point**
COD	**Chemical Oxygen Demand**
EPA	**Environmental Protection Authority**
EPHC	**Environment Protection and Heritage Council**
Framework	**Framework** for the management of recycled water quality and use (included within the AGWR)
Hunter Water	**Hunter Water Corporation**
IPART	**Independent Pricing and Regulatory Tribunal**
NATA	**National Association of Testing Authorities**
NFR	**Non Filterable Residue**
NHMRC	**National Health and Medical Research Council**
NRMMC	**Natural Resource Management Ministerial Council**
NSW Health	**NSW Health** means Hunter New England Area Health Service and the New South Wales Department of Health
Operating Licence	**Suez Operating Licence** is granted by the State Government and administered by IPART. The Operating Licence is the major consumer protection instrument and prescribes standards of service that must be met in relation to water quality, continuity and pressure.
SCADA	**Supervisory Control and Data Acquisition**
TDS	**Total Dissolved Solids**
TSS	**Total Suspended Solids**
Suez	**Suez Water & Treatment Solutions Pty Ltd**
MWAWTP	**Mayfield West Advanced Water Treatment Plant**

5 References

2000 National Water Quality Management Strategy: Guidelines for Sewerage Systems - Use of Reclaimed Water

Agriculture and Resource Management Council of Australia and New Zealand

Australian and New Zealand Environment and Conservation Council

National Health and Medical Research Council

2003 Environmental Guidelines: Use of Effluent by Irrigation

Environment Protection Authority

Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006

Eraring Agreement, HW2007-2177/7/12

Hunter Water Corporation Operating Licence, 2012-2017

Orica Agreement, HW2007-2177/5.062

Hunter Water Effluent Supply Agreement 2016

6 Document Control

Document Owner: Suez

Document Approver: Suez Transition Manager

Version	Authors Name	Details of change	Approval Date	Approved by	Next Scheduled Review

APPENDIX 1

Insert APPENDIX here

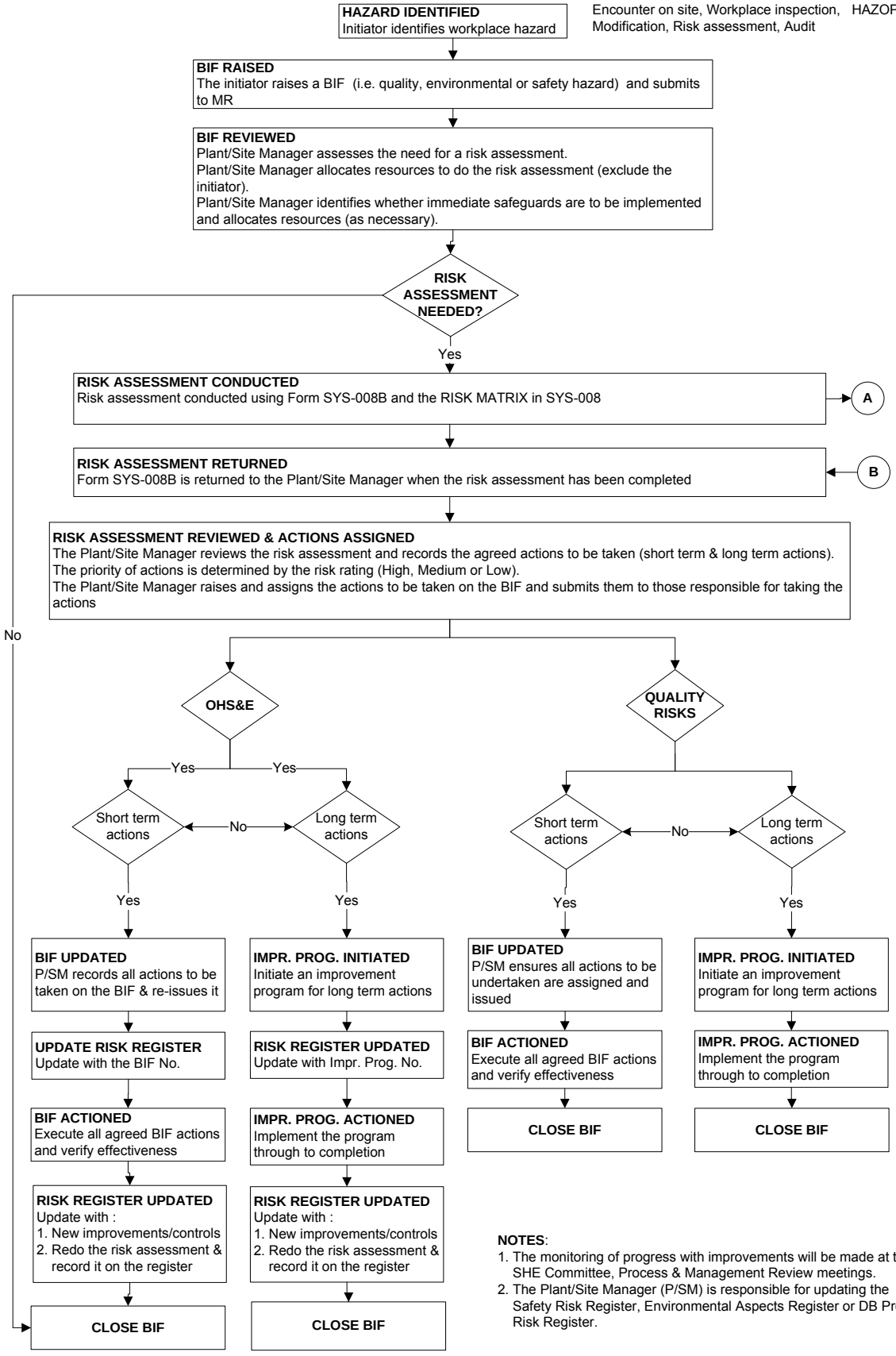
20 APPENDIX F: Validation Report for KIWS

21 APPENDIX G: SUEZ Risk Management and Compliance Framework

MANAGEMENT OF QUALITY SAFETY AND ENVIRONMENTAL HAZARDS

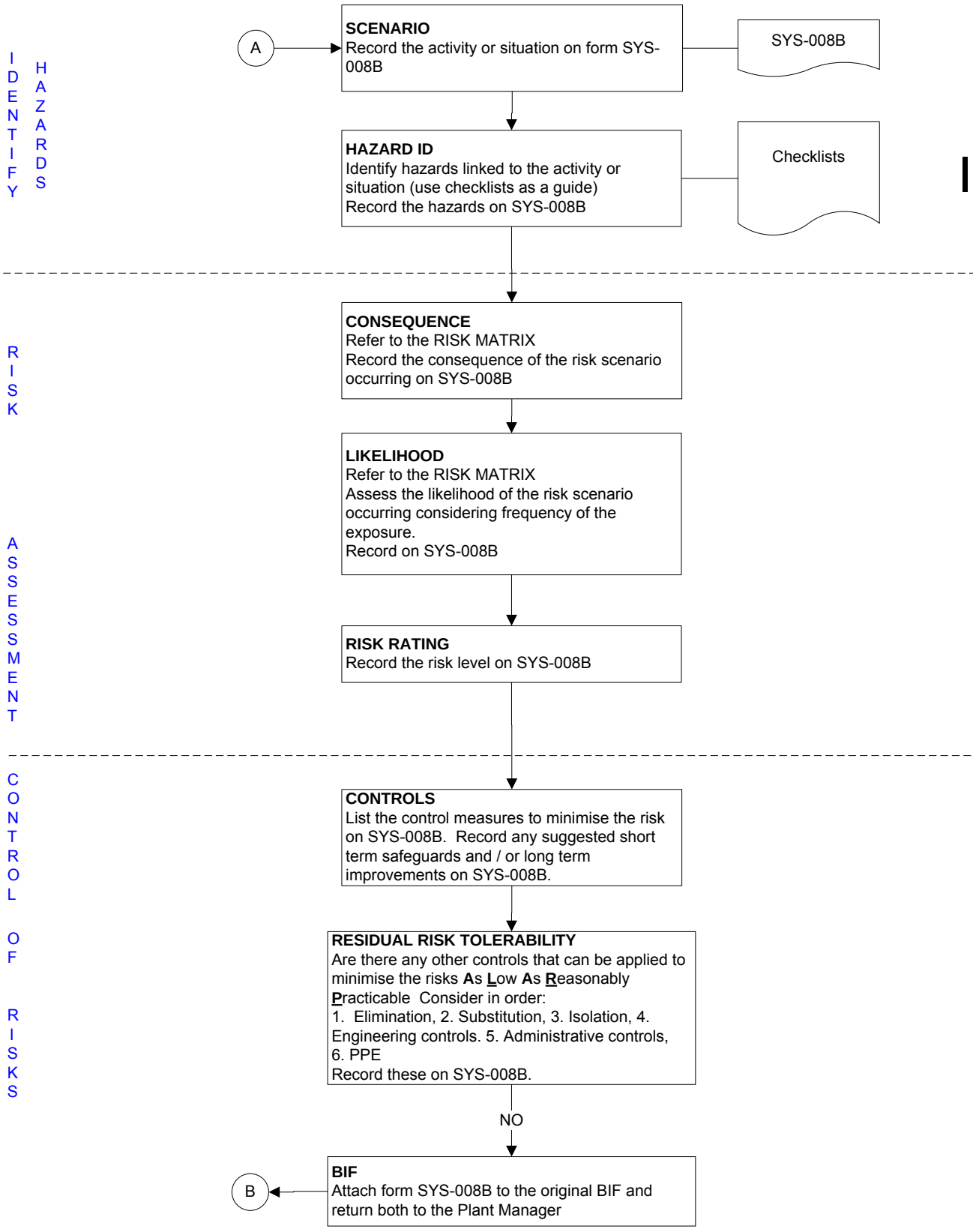
SYS-008

PROCESS FLOWCHART



NOTES:

1. The monitoring of progress with improvements will be made at the SHE Committee, Process & Management Review meetings.
2. The Plant/Site Manager (P/SM) is responsible for updating the Safety Risk Register, Environmental Aspects Register or DB Project Risk Register.


IDENTIFY HAZARDS
A
SCENARIO
Record the activity or situation on form SYS-008B
SYS-008B
HAZARD ID
Identify hazards linked to the activity or situation (use checklists as a guide)
Record the hazards on SYS-008B
Checklists
RISK ASSESSMENT
CONSEQUENCE
Refer to the RISK MATRIX
Record the consequence of the risk scenario occurring on SYS-008B
LIKELIHOOD
Refer to the RISK MATRIX
Assess the likelihood of the risk scenario occurring considering frequency of the exposure.
Record on SYS-008B
RISK RATING
Record the risk level on SYS-008B
CONTROL OF RISKS
CONTROLS
List the control measures to minimise the risk on SYS-008B. Record any suggested short term safeguards and / or long term improvements on SYS-008B.
RESIDUAL RISK TOLERABILITY
Are there any other controls that can be applied to minimise the risks As Low As Reasonably Practicable Consider in order:
1. Elimination, 2. Substitution, 3. Isolation, 4. Engineering controls. 5. Administrative controls, 6. PPE
Record these on SYS-008B.
NO
B
BIF
Attach form SYS-008B to the original BIF and return both to the Plant Manager

MANAGEMENT OF QUALITY SAFETY AND ENVIRONMENTAL HAZARDS

SYS-008

1. PURPOSE

The purpose of this procedure is to ensure that hazards in the workplace are identified and adequately controlled to minimise any risks that they may pose. Risks are those posed to production quality, the health and safety of people or the environment, including the risks of a major incident occurring at a Major Hazard Facility.

2. SCOPE

The procedure shall apply to the identification of hazards and control of risks for any projects (including Major Hazard Facilities), tasks or activities where it is considered that there is likely to be an increase in the level of risk to the production quality, health and safety of people, or the environment.

This will include, but not be limited to:

- Before work practices are changed
- Before new processes, materials or chemicals are introduced
- Before new plant or facilities are commissioned or existing ones are decommissioned
- Before modifications are made to existing plant or equipment
- Before any non-routine or new maintenance activities are commenced (where hazards and risks have not been assessed and documented previously)
- When new hazards or aspects are identified in the workplace
- When additional information concerning an existing hazard or aspect becomes available
- After occurrence of a major accident or near miss
- When legislation requires an assessment be made
- Construction or operational activities involving (i) mobile cranes, (ii) earthmoving equipment, (iii) trenching operations, (iv) confined space entry, (v) work at height or over water, and (vi) any building or structural works

3. REFERENCES

WHS Act 2011 (NSW & QLD)

WHS Regulation 2011 (NSW & QLD)

Managing Risks of Hazardous Chemicals – Code of Practice (SafeWork Australia)

How to Manage Work Health and Safety Risks – Code of Practice (NSW, Qld)

Hazardous Manual Tasks – Code of Practice (NSW)

AS/NZS 4801	OH&S Management Systems
ISO 14001	Environment Management Systems
AM-006	Process or Plant Modification
DB-002	Design Management

ENV-003	Initial Review / Environmental Aspects
OHS-010	Work Clearance
OHS-015	Hazardous Substances and Dangerous Goods
OHS-016	Manual Handling

4. DEFINITIONS

4.1. Hazards

A source or a situation with a potential for harm in terms of product quality, human injury or ill-health, damage to property, damage to the environment, or a combination of these.

4.2. Aspects

In the context of ISO 14001 an Aspect is identified as an environmental hazard in relation to the task performed.

4.3. Health and Safety Representative (HSR)

HSR means the health and safety representative elected under the legislation for the work group of which the worker is a member.

4.4. Impacts

A change to the environment either adverse or beneficial, that results either wholly or partially, from the interaction of the organisation's activities, products or services with the environment.

4.5. Reasonably Practicable

In relation to health and safety means that which is, or was at a particular time, reasonably able to be done in relation to ensuring health and safety, taking into account and weighing up all relevant matters including:

(a) The likelihood of the hazard or the risk concerned occurring, and

(b) The degree of harm that might result from the hazard or the risk, and

(c) What the person concerned knows, or ought reasonably to know, about:

i. The hazard or the risk, and

ii. Ways of eliminating or minimising the risk, and

(d) The availability and suitability of ways to eliminate or minimise the risk, and

(e) After assessing the extent of the risk and the available ways of eliminating or minimising the risk, the cost associated with available ways of eliminating or minimising the risk, including whether the cost is grossly disproportionate to the risk.

4.6. Risks

In relation to any potential hazard, injury or harm the likelihood and consequences of that injury, impact or harm occurring.

4.7. Major Hazard Facility (NSW)

Major Hazard Facility (MHF): Defined in the *WHS Regulation 2011* as a facility:

- at which Schedule 15 chemicals are present or likely to be present in a quantity that exceeds their threshold quantity, or
- that is determined by the regulator under Part 9.2 to be a major hazard facility.

4.8. Major Incident (NSW):

A **major incident** at a MHF (as defined in the WHS Regulation 2011) is an occurrence that:

(a) results from an uncontrolled event at the major hazard facility involving, or potentially involving, Schedule 15 chemicals, and

(b) exposes a person to a serious risk to health or safety emanating from an immediate or imminent exposure to the occurrence.

An occurrence includes any of the following:

(a) escape, spillage or leakage,

(b) implosion, explosion or fire.

5. ACTIONS

5.1. General

The following conditions are primary obligation that shall be implemented at the workplace:

(a) the provision and maintenance of a work environment without risks to health and safety,

(b) the provision and maintenance of safe plant and structures,

(c) the provision and maintenance of safe systems of work,

(d) the safe use, handling, and storage of plant, structures and substances,

(e) the provision of adequate facilities for the welfare at work of workers in carrying out work for the business or undertaking, including ensuring access to those facilities,

(f) the provision of any information, training, instruction or supervision that is necessary to protect all persons from risks to their health and safety arising from work carried out as part of the conduct of the business or undertaking.

5.2. Responsibilities

5.2.1 Plant/Site Manager

The Plant/Site Manager has the overall responsibility for ensuring that hazards are identified and the risks associated with these are assessed and adequately controlled.

5.2.2 Contractors

Contractors performing work on behalf of SUEZ shall conduct hazard identification and risk assessments in relation to the plant they operate and the activities they perform. Such assessments are undertaken as part of the Work Clearance process, *using OHS-010B Work Method Statement / JSEA* (or equivalent) as outlined in *OHS-010 Work Clearance*.

5.2.3 SUEZ Management

Review the adequacy of the systems and control strategies and provide resources to ensure safe working practices and sound environmental management.

5.3. Management of risks

In the management of risks, eliminating or minimising risks to health & safety and the environment should be carried out so far as is reasonably practicable.

The identification of hazards and the management of the risks shall follow a 4 step as follows (see figure below);

1. The identification of hazards,

2. The assessment of risks,
3. The control of risks, and
4. The ongoing monitoring and evaluation of the effectiveness of controls.

Reference: How to Manage Work Health and Safety Risks – Code of Practice (NSW, Qld)

Risks must be managed to ensure the health and safety of workers and other people affected by the conduct of the business or undertaking including visitors and customers at a workplace. Special consideration must be given to vulnerable workers including:

- contractors and shift workers who may not be familiar with the workplace, including the systems of work implemented at the workplace
- new and young workers who may be inexperienced or lack the maturity to recognise risks
- workers with poor literacy skills—if staff can't sufficiently read, write or add, this can affect their ability to understand and follow guidance and instructions and expose them to greater risk
- new or expectant mothers who may be more prone to health-related risks such as physical, biological or chemical risks
- persons with a disability—reasonable modifications to the workplace and work tasks may be required to enable them to work safely.

Consultation with workers, including the HSR, who are directly affected by a matter relating to work health and safety should be conducted when identifying hazards and assessing risks to health and safety and also when making decisions about ways to eliminate or minimise the risks.

Risk assessments that are conducted for Health & Safety and the Environment shall be recorded in *SYS-008D [Plant/Site] Safety Risk Register* or *ENV-003B [Plant/Site] Environmental Aspects Register* respectively (or *SYS-008C DB Project Risk Register* for DB projects).

5.4. Risk Assessment

Risk Assessment Form SYS-008B is to be used for recording risk assessments involving multiple activities. Risk assessments related to health & safety and environment are to be referenced to *SYS-008D [Plant/Site] Safety Risk Register* or *ENV-003B [Plant/Site] Environmental Aspect Registers* respectively (or *SYS-008C DB Project Risk Register* for DB projects).

The Risk Assessment process involves breaking down the task into individual steps and conducting a risk assessment for each. These steps will be individually assessed and recorded on *SYS-008B Risk Assessment Form*.

The hazards associated and the risk level for each step will be recorded. The control measures assessed to minimise the risk will be recorded on *SYS-008B Risk Assessment Form*.

The task analysis will include the hazard identification, risk assessment and identifying controls strategy for safety hazards as well as environmental and quality hazards.

General hazards can be included directly on *SYS-008D [Plant/Site] Safety Risk Register* and/or *ENV-003B [Plant/Site] Environmental Aspect Register* (or *SYS-008C DB Project Risk Register* for DB projects) without the need to use *SYS-008B Risk Assessment Form*.

NOTE: *SYS-008C DB Project Risk Register* is the primary means of documenting and communicating risks identified during the design, construction, commissioning, operation, maintenance and demolition phases. Where a risk remains after the construction and commissioning phase, and can impact upon operation and maintenance or disposal phases of the project, the identified risks and the required risk mitigation measures included in SYS-008C DB Project Risk Register are passed to the Project Manager for inclusion in the Operation & Maintenance (O&M) System Documentation for the project ie. for inclusion in *SYS-008D [Plant/Site] Safety Risk Register* and/or *ENV-003B [Plant/Site] Environmental Aspect Registers* for the SUEZ O&M managed projects.

5.5. Identification of hazards

Hazards can be identified through encounters on the plant, through physical workplace inspections, HAZOP studies, modification planning, risk assessments, injury and incident investigations, consultation with staff and safety audits.

A prompt checklist of hazards is included on form *SYS-008A Hazard Identification Checklist*. Form SYS-008A provides an additional checklist for general plant hazards. For any identified hazardous substances / dangerous or manual handling tasks, the associated hazards should also be assessed using *OHS0-015A Hazardous Substances/Dangerous Goods Risk Assessment* and *OHS-016A Manual Handling Risk Assessment* respectively.

Hazards identified are to be assessed to determine the risks they pose in order that they may be adequately controlled. The assessment and control procedure is described in the process map forming this procedure (refer to *Sec 0 Process Flowcha*rt above). All hazards identified and assessed are to be recorded in *SYS-008D [Plant/Site] Safety Risk* and/or *ENV-008B [Plant/Site] Environmental Aspect Registers* (or *SYS-008C DB Project Risk Register* for DB projects).

5.6. Purchasing specifications

Purchasing specifications must consider the potential for quality and occupational health and safety hazards as well as environmental aspects. These impacts and risks must be considered in addition to the applicable Regulations, Codes of Practice and Australian Standards.

As a minimum the following shall be considered prior to the purchase of goods:

- Material safety data sheet (MSDS) or safety data sheet (SDS) shall be the manufacturer's issue and be provided with the purchase of all chemicals (e.g. process and laboratory chemicals, paints, thinners, fuels, cleaning products, acetylene cylinders) as outlined in procedure *OHS-015 Hazardous Substance / Dangerous Goods*
- Risk assessments from suppliers of all new, used and hired plant.
- Purchasing of office equipment and personal protective equipment (PPE) to comply with Australian Standards.

5.7. Assessment of risks

The risks posed (by the hazards identified) are to be assessed using the 5 x 5 risk matrix as follows (printable version of matrix included on page 12 of this procedure).

CONSEQUENCES						RISK RATING LIKELIHOOD (including consideration to the frequency of the activity)				
COMMERCIAL	**REPUTATION**	**LEGAL**	**ENVIRONMENT**	**HEALTH & SAFETY**	**SEVERITY**	**Very Likely (5)**	**Likely (4)**	**Moderate (3)**	**Unlikely (2)**	**Very Unlikely (1)**
Liquidation	Forced contract termination. Curtailment of Operations	Corporate penalty, Compensation claim, Officer jailed	Catastrophic pollution event, Long term environ damage	Single or multiple fatality, permanent disability or illness	**Catastrophic (5)**	Ex High (25)	Ex High (20)	High (15)	High (10)	Medium (5)
Significant shareholder loss	Extended adverse media, Parliamentary enquiry	Corporate penalty, Compensation claim, Officer fined	Major pollution event, Long term environmental damage	Serious injury or long term illness	**High (4)**	Ex High (20)	High (16)	High (12)	Medium (8)	Medium (4)
Major bottom line impact, Impact future opportunities	Adverse media coverage	Corporate penalty, Compensation claim	Measureable environ damage, Reportable to regulators	Medical treatment with days off (LTI)	**Medium (3)**	High (15)	High (12)	Medium (9)	Medium (6)	Low (3)
Exceeds contingencies, Minor bottom line effect	Complaint in local media	Third party claim less than $50K	Transient pollution event, Not reportable to regulators	Medical treatment with no days off	**Minor (2)**	High (10)	Medium (8)	Medium (6)	Medium (4)	Low (2)
Manage within contingencies, No bottom line effect	Local public complaints, Client dissatisfaction	Insignificant effect	Insignificant environment damage, not reportable	First aid injury – minor cuts, bruises, bumps	**Low (1)**	Medium (5)	Medium (4)	Low (3)	Low (2)	Low (1)

The assessment ratings determine the relative level of risk and priority for action. This is evaluated by assessing the severity (by considering the consequences) and likelihood of each hazard or risk scenario. The likelihood is assessed considering the frequency of activities and hence exposure to the hazard using the following criteria;

Likelihood	Description	Frequency of Occurrence
Very Likely (5)	Event is expected to occur in most circumstances.	Impact is occurring now or could occur in within days or weeks
Likely (4)	Event will probably occur in most circumstances	Balance of probability will occur or could within weeks to months
Moderate (3)	Event might occur at some time.	Could occur within months up to 5 years but a distinct possibility it wont
Unlikely (2)	Event could occur at some time	May occur but not anticipated, could occur within 5 to 20 years
Very Unlikely (1)	Event may occur in exceptional circumstances	Exceptionally unlikely, may occur as a 20 - 100 year event

The assessment rating determines the relative level of risk and priority for action as follows;

Risk Ranking	Action	Action Priority
Extremely High (20 – 25)	Intolerable risk exposure. Site Manager advised. MD and Operations Manager. Risks are beyond effective administrative management and must be avoided by elimination, substitution, isolation or engineering control. Continuously monitored.	Immediate action required.
High (10 – 19)	Intolerable risk exposure. Site Manager advised. Risks are beyond effective administrative management and must be avoided by elimination, substitution, isolation or engineering control	Immediate action required.
Medium (4 – 9)	Tolerable risk exposure. Moderate risk issues that require interaction by Management and Workforce Consultation to control methods of work system design, or construction to reduce the risk to levels that are as low as reasonably practical (ALARP).	Action required as soon as possible
Low (1 – 3)	Generally acceptable risk exposure. The work environment and methodology presents minimal risk to personnel, the environment or production quality. As a risk control measure, staff should be informed that this hazard potential exists. Risk is reduced by using systems of work, with well designed and maintained plant and equipment. Risk is ALARP.	No action required

The controls, risk ratings (inherent and residual), date of assessment and persons assessing the risks are recorded on SYS-008B Risk Assessment form and/or Project Risk Registers (as described in Sec 5.4 Risk Assessment).

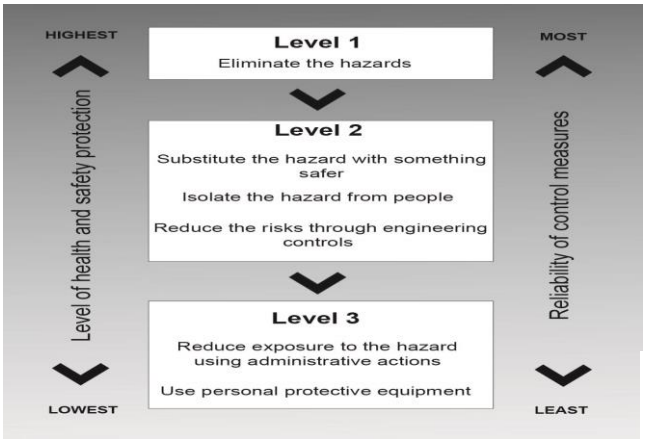
5.8. Control of Risks

Risk minimisation measures are identified through the risk assessment process. These are considered by the Plant Manager/Site Manager. Controls are formulated and applied as described in *Sec 0 Process Flowchart* above.

If any aspect of a work practice or workplace does not comply with all statutory requirements, the breach must be remedied before work can continue. Risks are to be controlled to the lowest level that is reasonable and practicable using the hierarchy of controls (outlined below) to ensure that the residual risk is tolerable, as outlined in Sec 5.7 Assessment of Risks.

Risk management controls should be formulated by referring to Codes of Practice, consulting workers including the Health and Safety Representative (where exists) who are exposed to the hazard, obtaining advice from external specialists and by consulting the relevant government agencies (as necessary). Consultation must be implemented during the stage of identifying hazards, assessing the risks and implementing control measures. Consultation, cooperation, and coordination with other duty holders, so far as is reasonably practicable, are also required.

The ways of controlling risks are ranked from the highest level of protection and reliability to the lowest as shown in the following figure. This ranking is known as the hierarchy of risk control.



Reference: How to Manage Work Health and Safety Risks – Code of Practice (NSW. Qld)

Risk management practices must always aim to eliminate a hazard, which is the most effective control. If this is not reasonably practicable, risk must be minimised by working through the other alternatives in the hierarchy.

The hierarchy of controls is defined as follows:

1. **Elimination.** This is a permanent solution and should be attempted in the first instance. By eliminating a work process, material or equipment item the hazard associated with this item is also eliminated.
2. **Substitution.** This control leads to a lower level of risk by substituting a work process, substance or equipment with one that is less likely to cause injury, illness or property damage.
3. **Isolation.** This involves physically separating the source of harm from people by distance or using barriers.
4. **Engineering controls.** These involve structural change to the work environment. This is conducted by placing a barrier or by interrupting the transmission path between the worker and the hazard. This includes machine guards, isolation or enclosure of hazards, the use of extraction, ventilation as well as manual handling devices.
5. **Administrative controls.** These controls reduce or eliminate exposure to the hazard by adherence to procedures or instructions. These controls may include training, reducing the exposure to a hazard by job rotation, permit to work systems, or simply involve the use of warning signs. Administrative controls are dependent on appropriate human behaviour for success.
6. **Personal Protective Equipment (PPE).** PPE is worn by the worker as a barrier between the hazard and the person. The success of this control is dependent on the protective equipment been worn or being worn correctly and should be seen as the last line of defence.

A control measure to eliminate or minimise risks to health & safety and environment must be maintained and remain:

a) fit for purpose, and

b) suitable for the nature and duration of the work, and

c) installed, set up and used correctly.

5.9. Monitoring and Evaluation

The management of risks is an ongoing activity aimed at continuous improvement. The performance of the integrated (safety, environment, quality) management system (including risk controls) is measured through key performance indicators. Performance is to be reported through the monthly plant operations reports and monitored through the Management Systems Review Committee meetings.

The Plant/Site Manager is responsible for agreeing the controls to be implemented to manage hazards and is also responsible for ensuring that the identified improvement actions are completed on time (refer to *Process Flowchart*). Progress with improvement actions will be reviewed by the plant operations/site team at the SHE Committee meetings.

The controls implemented to manage risks are to be regularly reviewed or, if necessary, revised through the schedule of planned workplace inspections to ensure its effectiveness. The workplace inspections shall include as a minimum a review of all risks identified in the [Plant/Site] Safety Risk and Environmental Aspect Registers (or Project Risk Registers), including the update (if required) of the hazard analysis/risk assessments. The review must include consultation with workers who are directly affected by a matter relating to work health and safety. Record of review of each risk assessment must be maintained.

The control measure review frequency is based on the inherent risk of the parent hazard, with reviews to be undertaken, as a minimum, at the following frequency;

Extremely High and High Inherent Risk (risk score 10 – 25)	: **review annually**
Medium Inherent Risk (risk score 4 – 9)	: **review every 2 years**
Low Inherent Risk (risk score 1 – 3)	: **review every 3 years**

In addition, Risk Assessments must be reviewed and as necessary revised as follows:

i. Whenever there is evidence the risk assessment is no longer valid or the control measure does not control the risk it was implemented to control so far as is reasonably practicable,

ii. Whenever an injury or illness results from exposure to a hazard which the risk assessment relates

iii. A change is proposed in the place of work or in work practices or procedures to which the risk relates

iv. After the occurrence of a major accident or near miss

v. A new relevant hazard or risk is identified

vi. Whenever there is a request from the Health and Safety Representative to review the risk assessment

Risk assessments for major accidents involving Schedule 15 chemicals at MHF sites utilise a semi quantitative approach for fatality risk rather than the qualitative method utilising the 5 x 5 risk matrix outlined in *Sec 5.7 Assessment of Risks*. The risks determined from the qualitative process equate to a risk ranking of Medium (5) –i.e. Very Unlikely (1) with Catastrophic (5) consequences. Reviews of the risk assessments for major accidents detailed in the safety case for MHF sites will be undertaken, as a minimum, at the following frequency:

90% of the cumulative fatality risk	: review every 2 years
Remaining 10% of the cumulative fatality risk	: review every 3 years
Full quantative risk review: every 5 years	: review every 5 years

In addition, the risk assessment for major accidents at MHF's will be reviewed whenever,

i. There is evidence the risk assessment is no longer valid

ii. A significant change is proposed in the facility, or work practices or procedures to which the risk relates.

5.10. Consultation

Consultation with workers, including the HSR, who are directly affected by a matter relating to work health and safety should be conducted when identifying hazards and assessing risks to health and safety and also when making decisions about ways to eliminate or minimise the risks and resulting control measures to be implemented. Consultation, cooperation and coordination with other duty holders, so far as is reasonably practicable, are also required.

5.11. Training

Appropriate and adequate information, training, and supervision shall be provided to all workers (i.e. SUEZ plant technicians, engineers, supervisors etc.) in regards to:

a) the nature of the work carried out by the worker;

b) the nature of the risks associated with the work at the time the information, training or instruction is provided;

c) the control measures implemented;

All SUEZ plant technicians, site engineers and supervisors shall be trained in hazard management. Records of all training shall be kept according to F&A-002 (Records & Archives)

6. FORMS TO BE USED

SYS-008A	Hazard Identification Prompt Checklist
SYS-008B	Risk Assessment Form

7. SITE SPECIFIC DOCUMENTS TO BE DEVELOPED

SYS-008C	DB Project Risk Register
SYS-008D	[Project/Site] Safety Risk Register
ENV-003B	[Project/Site] Environmental Aspects Register

CONSEQUENCES						RISK RATING LIKELIHOOD (including consideration to the frequency of the activity)				
COMMERCIAL	**REPUTATION**	**LEGAL**	**ENVIRONMENTAL**	**HEALTH & SAFETY**	**SEVERITY**	**Very Likely (5)**	**Likely (4)**	**Moderate (3)**	**Unlikely (2)**	**Very Unlikely (1)**
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22 Key Words

Water Industry Competition Act

WICA

Recycled Water

Recycled Water Management Plan

Asset Management Plan

Kooragang Industrial Water Scheme

23 Acronyms and Abbreviations

AGWR	Australian Guidelines for Water Recycling (2006)
AWTP	Advanced Water Treatment Plant
BOD	Biological Oxygen Demand
CCD	Customer Commercial Development
CCP	Critical Control Point
CCT	Chlorine Contact Tank
CIP	Clean in Place
CMMS	Computerised Maintenance Management System
Ct	Concentration x contact time (dose of disinfectant)
DALY	Disability-adjusted life year
DECC	Department of Environment Climate Change
DoH	NSW Department of Health
DWE	Department of Water and Energy
EC	Electrical Conductivity
EPA	Environmental Protection Authority
EPL	Environment Protection Licence
EPHC	Environment Protection and Heritage Council
HACCP	Hazard Analysis and Critical Control Point
HWA	SUEZ Australia
HWC	SUEZ Corporation
IOP	Infrastructure Operating Plan
IPART	Independent Pricing and Regulatory Tribunal
KIWS	Kooragang Industrial Water Scheme
KWPL	Kooragang Water Pty Ltd
LP	Low Pressure
LRV	Log_{10} reduction value
MF	Membrane Filtration
MLD	Megalitres per day

MoU	Memorandum of Understanding
MSDS	Material Safety Data Sheet
NATA	National Association of Testing Authorities
NRMMC	Natural Resource Management Ministerial Council
NSW	New South Wales
NTU	Nephelometric Turbidity Units
NWQMS	National Water Quality Management Strategy
OH&S	Occupational Health and Safety
O&M	Operations and Maintenance
PDT	Pressure Decay Test
PLC	Programmable Logical Controller
POEO	Protection of the Environment Operations
QCP	Quality Control Point
RO	Reverse Osmosis
RWMP	Recycled Water Management Plan
RWQMP	Recycled Water Quality Management Plan
SCADA	Supervisory Control And Data Acquisition
SIP	Standard Incident Procedure
SOP	Standard Operating Procedure
TDS	Total Dissolved Solids
TN	Total Nitrogen
TP	Total Phosphorus
TRIM	Tower Records Information Management
TSS	Total Suspended Solids
UV	Ultraviolet
WICA	Water Industry Competition Act (NSW)
WQP	Water Quality Plan (non-potable water)
WSAA	Water Services Association of Australia
WWTW	Wastewater Treatment Works

24 Related Documents

DOCUMENT NAME	REFERENCE NUMBER
SUEZ WTS Online integrated management system	IMS
SUEZ WTS Omega Processes which define the higher level group policies, processes and associated procedures.	OMEGA
Asset Management – Management Systems - Requirements	ISO55001: 2014

KIWS Asset Criticality Review	20160623-ZAM-V1
KIWS Renewals Plan	20160628-ZAM-V
Australian Guidelines for Water Recycling 2006	AGWR

25 Review and Document Control

VERSION	CHANGE	ISSUED	REVIEWED	AUTHORISED	DATE ISSUED
1	First draft by Dan Deere	11 August 2016	Peter Segura	N/A	N/A
2	Review by PS (SUEZ)	15 August 2016	Dan Deere	N/A	N/A
3	Updated draft by Dan Deere	30 August 2016	Peter Segura	N/A	N/A
4	Review by PS (SUEZ)	30 August 2016	Dan Deere	Peter Segura	31 August 2016
5	Working draft by Dan Deere	4 March 2017	Dan Deere	Peter Segura	6 March 2017
6	Working draft by Dan Deere	30 April 2017	Dan Deere	N/A	N/A
7	Final draft by Dan Deere	3 May 2017	Peter Segura	Peter Segura	
8	Review by DoH	30 June 2017	Peter Segura	Peter Segura	30 June 2017

APPENDIX 1

Insert APPENDIX here

Kooragang Water Pty Ltd

WIC Act licence application

13 April 2022

Attachment 22:

KIWS Operational Risk Assessment

Sort by Residual Risk Level

SITE: Kooragang Industrial Water Scheme (KIWS)
COMPLETED BY: Nadeem Akram, Dave Colley
DATE: 01/10/2020

Risk ID	ACTIVITY / TASK DESCRIPTION	RISK TYPE (HS, E, HSE)	HAZARD / IMPACT	RISK / ASPECT	Inherent Risk Assessment			Control - Heirarchy of Control			Residual Risk Assessment			Significant Risk	Proposed Controls	Proposed Controls Risk Assessment			Compliance Obligations	Comments	Responsibility	Review period months	Last review date	Next review due
					C	L	Risk Level	Level 1 (eliminate)	Level 2 (Substitute/Isolate/Engineer)	Level 3 (Administrate/PPE)	C	L	Risk Level	Yes/No		C	L	Risk Level						
1	Working alone on site	HS	Working alone on site - general activities undertaking high risk work alone	Injury occurs and is not known, injured operator does not receive medical attention immediately	High	Moderate	12 (HIGH)	High risk work not undertaken alone		Working alone procedure SCADA Lone Man operation (OHS/KIWS/009) SYSTEM (SAFEIqTRAC) in place, that will generate alarm to one level up to indicate inactivity	High	Very Unlikely	4 (MEDIUM)	No	NA			#N/A		Site specific SCADA control system in place and working fine.	Plant Manager	12	13/11/2019	13/11/2020
2	Driving off site (pipeline inspections)	HS	road traffic / other road users	vehicle accidents	Medium	Unlikely	6 (MEDIUM)			licensed drivers, vehicle maintained Always wear seatbelt	Medium	Very Unlikely	3 (LOW)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021
3	Offsite asset (dechlorination building) inspection - calibration, check, clean	HS	toxic gas	Working on Veolia site potential toxic gases	Medium	Unlikely	6 (MEDIUM)			Veolia induction (site specific) work only under Veolia permit PPE	Minor	Very Unlikely	3 (LOW)	No	SOP procedure for undertaking work to be created			#N/A			Plant Manager	24	13/11/2019	13/11/2021
4	Chemical deliveries	HSE	Contact with chemicals	injury (chemical burns, asphyxiation) Spills to environment	Catastrophic	Likely	20 (EX HIGH)		Bunding in place Auto cut-off systems spill kits available and stocked chemicals when coming in contact with corrosive chemicals to avoid burns and irritation. Process with procurement for forklift with ibc delivery	PPE Driver inductions / competencies Procedure in place Traffic Management Plan / demarcation and signage Use glasses/face shield, apron and long gloves Safety Showers	Medium	Unlikely	6 (MEDIUM)	No	Dangerous Goods training (SUEZ) - To be completed by all in by Dec 31, 2019	Medium	Very Unlikely	3 (LOW)			Plant Manager	12	13/11/2019	13/11/2020
5	Chemical Batching - RO chemicals	HSE	hazardous chemicals	contact with hazardous chemicals causing injury/illness chemical spill to environment	Medium	Likely	12 (HIGH)	automated system for RO batching - no manual batching		PPE Safety showers and eyewash stations Dangerous Goods training - Internal	Medium	Very Unlikely	3 (LOW)	No	Dangerous Goods training (SUEZ) - To be completed by all in by Dec 31, 2019	Medium	Very Unlikely	3 (LOW)			Plant Manager	12	13/11/2019	13/11/2020
6	Hazardous chemical storage on site	HSE	hazardous chemicals	explosion/fire risk from incompatible chemicals Exposure to hazardous chemicals causing injury or disease	Catastrophic	Likely	20 (EXHIGH)		segregation of incompatible chemicals Appropriate bunding in place fire fighting equipment available and tested	current SDS and RA available (MSDS online) Periodic inspections in EAM (WEEKLY AND MONTLY OPERATIONAL CHECKS)	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
7	breakdown repair on chemical pipelines	HSE	contact with hazardous chemicals	serious injury from contact with chemicals / fumes (chemical burns, asphyxiation) Spills to environment	High	Moderate	12 (HIGH)	90% Chemical piping in pipe-in-pipe. Auto cut-off system in place for H2SO4 system	Spill kits available and stocked Bunding in place	PPE - Dap spray eyewash carry at all times when on site (add into procedures) DG training (SUEZ) - External Training Isolation Procedures safety showers & eye wash stations	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
8	Breakdown of plant due to misoperation	HS	mechanical failure or damage causing plant to fail / not be available for use	Loss of process and ability to treat and provide water	High	Moderate	12 (HIGH)		redundancy in pumps/instruments	Scheduled preventative maintenance checks as part of Asset Management system Asset replacement schedule based on criticality of equipment External contracted services Remote access to Scada - SMS alarming system to monitor Critical spares kept on site	Low	Moderate	3 (LOW)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
9	working at heights to undertake maintenance / checking / inspection or replacement of parts of plant (i.e. membrane replacement)	HS	working at heights	falling from height (potential injury)	Catastrophic	Likely	20 (EX HIGH)		Use of lifting /working platforms (in goood working order) Railings in place for heights areas EWP/Scaffold risk	Work Clearance / working at heights procedure / permit system Work Safely at Heights (External training) Competency requirement to operate lifting equipment clear barricading of work area no working alone at when working at heights	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
10	Confined Space work (during breakdowns)	HS	engulfment/Fumes Asphyxiation	serious injury or fatality from lack of oxygen or hazardous fumes in confined space	Catastrophic	Moderate	15 (HIGH)			WC / PTW / confined space procedure Confined space training (external) Atmospheric testing rescue plans in place PPE confined space labelling/warning Confined Space RA's will be completed when required to enter Confined Space (Pre-completed RA's are unneccessary as confined space entry is not required and also due to the lack of people on site it cannot be done) Confined Space Register	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
11	General site activities	HS	slips, trips, falls	uneven ground, poor maintenance/housekeeping	Medium	Unlikely	6 (MEDIUM)			Grounds maintenance (external or internal) housekeeping	Medium	Very Unlikely	3 (LOW)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021
12	Site Maintenance (Weeding using chemicals)	HSE	hazardous chemicals	contact with hazardous chemicals causing injury spill of hazardous chemicals to surrounds	Minor	Unlikely	4 (MEDIUM)		Hazardous chemicals to be stored appropriately	PPE used	Low	Very Unlikely	3 (LOW)	No				#N/A			Plant Manager	0	13/11/2019	13/11/2019
13	Working in high heat/UV conditions	HS	High Heat / UV	Heat stroke or sunburn to operator	High	Moderate	12 (HIGH)			PPE (brim hats) sunscreen procedure?? no outside work in high temps between 12-3 (sustained work) Electrolyte drinks to be available for Summer months Firstaiders available on site	Minor	Unlikely	4 (MEDIUM)	No	Update UV/Solar radiation procedure to include apps that informs of temperature restrictions / or include in induction? Some guidelines will be good.			#N/A			Plant Manager	12	13/11/2019	13/11/2020
14	Manual handling of stock	HS	Manual Handling of stock as delivered	muscular strains/sprains from incorrect manual handling technique and/or lifting objects which are too heavy	High	Likely	16 (HIGH)		Mechanical lifting device where appropriate (Gantry, trolley, external support i.e. crane, etc)	Hazardous manual handling training Lift with two people policy trolley use	Medium	Unlikely	6 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
15	Hot work	HS	undertaking hot work where there is potential ignition sources	fire/explosion caused by flame/heat	Catastrophic	Moderate	15 (HIGH)		isolated area to undertake hot work (hot work area) Appropriate use of tools where possible	Work Clearance & PTW Appropriate PPE worn at all times Fire extinguisher in place (near work)	Medium	Unlikely	6 (MEDIUM)	No	Screening for separation when undertaking hot work when workshop in place - Welding Shield to be in placed Proper signage	Medium	Unlikely	6 (MEDIUM)			Plant Manager	12	13/11/2019	13/11/2020
16	working with potential biological hazards (diseases)	HS	Biologically active water from Shortland WWTW Chemically active water from RO CIP / MF CIP / Neutralisation pumps	disease or ill health from contact with biological	High	Likely	16 (HIGH)		innoculations in place (in accordance with procedure)	First Aid supplies in control room, main switch and admin Appropriate PPE available and in use - Always use appropriate gloves Trained personnel in Apply First Aid Good hygiene practices in place signage in kitchen to remind workers to wash hands prior to eating	Medium	Unlikely	6 (MEDIUM)	No	Hygeine practices in place (induction) Raw Water handling hazard to be identified on the PTW and Safe work methord statement/JSA during the process	Medium	Very Unlikely	3 (LOW)			Plant Manager	12	13/11/2019	13/11/2020
17	low voltage testing / work	HS	Electricity contact with live equipment	Electric shock, electrocution, burns from live electrical wires	Catastrophic	Likely	20 (EX HIGH)		Isolations in place Use of test equipment to AS	WC / PTW procedures training / competency (LV rescue training) Standby person for live low voltage testing rescue kit available Updated electrical drawings on site (DWD) - check document control???	Catastrophic	Unlikely	10 (HIGH)	No	Register to read Multi Readers (once a year) -	Catastrophic	Unlikely	10 (HIGH)			Plant Manager	12	13/11/2019	13/11/2020
18	RO cartridge filter replacement	HS	pressurised water	Serious injury	High	Moderate	12 (HIGH)		Isolation - Isolate the cartridge filter, then vent off the pressure before starting to open the filter cap	Training in isolation procedures SOP for process	Minor	Very Unlikely	2 (LOW)	No				#N/A				12	13/11/2019	13/11/2020
19	workshop activities using hand held plant, hydraulic (welders, grinders)	HS	Faulty equipment	equipment failure resulting in injury hot work risks (fire)	High	Moderate	12 (HIGH)		Equipment test & Tag 5 inch grinders only	Hot works procedure in place training and competency	Medium	Unlikely	6 (MEDIUM)	No	Contractor rules for round grinders on site, Add to induction,	Minor	Unlikely	4 (MEDIUM)			Plant Manager	12	13/11/2019	13/11/2020
20	working near water	HS	drowning	drowning	High	Moderate	12 (HIGH)	Enclosed tanks	railings for open tanks life buoy near backwash tank	signage Procedure Life saving rule	High	Very Unlikely	4 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
21	Shift work / call outs	HS	fatigue	potential to cause injury and loss of process	High	Moderate	12 (HIGH)		Alarm optimisation - minor not alarmed for call outs (frequency) improved scada access	Fatigue Management procedures rostering additional (3rd) resource for on call (contractor) List of preferred contractors for work call outs	Minor	Moderate	6 (MEDIUM)	No	Fatigue Management guidelines to check with HSEQ dept and develop if not available. (NA)			#N/A			Plant Manager	12	13/11/2019	13/11/2020
22	natural disaster impacting on site	HS	severe storm, earthquake, Bushfires	building damage, chemical leak	High	Moderate	12 (HIGH)			Incident Management Plan Crisis Management Plan Emergency exercises / evacuation Updated PIRMP	High	Moderate	12 (HIGH)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
23	Fire management (chemicals)	HSE	incompatible chemicals and/or ignition sources	fire/explosion caused by chemicals	Catastrophic	Moderate	15 (HIGH)	Facility design separates incompatable chemicals via bunding	fire fighting equipment (test and tag)	Training in using equipment Hot work not conducted in/around chemical areas	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
24	Pollution / chemical leak	E	chemicals	Groundwater / stormwater contamination rupture of tanks overflow of tanks	Medium	Likely	12 (HIGH)	Change process within scada to prevent ability to overflow	bunding Isolations impervious surfaces Stormwater retention basin within the precinct Scada set points for some tanks	Training PTW regular monitoring / inspections/testing of tanks	Medium	Unlikely	6 (MEDIUM)	No	Neutralisation tank - reduce risk by bunding IS REQUIRED. To raise with WUA Review the injection points risks also.	Medium	Unlikely	6 (MEDIUM)			Plant Manager	12	13/11/2019	13/11/2020

Risk ID	ACTIVITY / TASK DESCRIPTION	RISK TYPE (HS, E, HSE)	HAZARD / IMPACT	RISK / ASPECT	Inherent Risk Assessment			Control - Heirarchy of Control			Residual Risk Assessment			Significant Risk	Proposed Controls	Proposed Controls Risk Assessment			Compliance Obligations	Comments	Responsibility	Review period months	Last review date	Next review due
					C	L	Risk Level	Level 1 (eliminate)	Level 2 (Substitute/Isolate/Engineer)	Level 3 (Administrate/PPE)	C	L	Risk Level	Yes/No		C	L	Risk Level						
25	Spill/leak of treated effluent	E	contamination	Groundwater / stormwater contamination	Medium	Likely	12 (HIGH)		Isolations Hydraulic valves in the pipe - PLC control Treated Storage Effluent	regular inspections of valves, pumps, pipes and hoses in EAM WHS Management Plan OHS-015 Hazardous Chemicals and Dangerous Goods	Medium	Unlikely	6 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
26	Contractors working on site	HS	lack of risk i.d	Injuries and accidents due to limited supervision	High	Likely	16 (HIGH)			PTW inductions - Rapid Access system in place-tickets / licences procedures - supervision WIP audits	Medium	Unlikely	6 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
27	Hunter Water site tours - children on site	HS	Children on site	unsupervised children accessing site, potential injuries	High	Likely	16 (HIGH)	Primary School aged children not permitted within site only within the education centre		Supervison by guardian/teacher Walkways/paths tour routes Hunter Water provide appropriate PPE tours not arranged when work on site would propose a risk Hunter Water have site specific risk assesments in place.	Low	Unlikely	2 (LOW)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
28	Working in the laboratory	HS	chemicals working alone	Exposure to chemicals	High	Moderate	12 (HIGH)			DG training Wear appropriate PPE specified by SDS Follow general laboratory procedures Inform another Suez tech when on site training and competency Signage - PPE Spill kits	Low	Moderate	3 (LOW)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
29	Sampling treated effluent	E	lack of maintenance to probes	Incorrect probe reading and potential to compromise water parameters	High	Likely	16 (HIGH)			General maintenance (calibrations, functionality checks, inspections) procedures for calibration	Low	Moderate	3 (LOW)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
30	Use of mobile plant on site (EWP, lifting gear, pallet jack)	HS	unsafe plant	plant misuse, incorrect plant/equipment used for job injuries (crush etc)	High	Likely	16 (HIGH)		Testing & Tag / Maintenance	licences/ tickets procedure / PTW Maintenance on plant PPE	High	Unlikely	8 (MEDIUM)	No	Pallet lifter - add to infor to add to PMs			#N/A			Plant Manager	12	13/11/2019	13/11/2020
31	Mobile scaffold use	HS	working at heights	falling from heights (injury)	High	Likely	16 (HIGH)			PTW Process- exclusion zones	Minor	Very Unlikely	2 (LOW)	No	Inspected to Australian standards requirements			#N/A			Plant Manager	12	13/11/2019	13/11/2020
32	Using ladders on site to access roof	HS	Working at heights	falling from heights (injury)	Catastrophic	Unlikely	10 (HIGH)	Certified attachment points on buildings - check if they are certified points - anchor points with certificates	Preventative maintenance - inspection and testing of ladders	Use of competent persons fall arrest systems Work Clearance / Permit training and competency	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
33	Discharge to environment from site activities	E	ground and air contamination	contamination to ground and/or air from site equipment breakdown resulting in relaease of chemicals or untreated water Incompatable Chemical mixing (Hypo-Acids) creating Chlorine gas	High	Moderate	12 (HIGH)		impervious bund walls for chemical storage areas impervious floor with bund Spill boom guard Isolations in place	regular inspections of valves, pumps, pipes and hoses Dangerous Goods training	Medium	Unlikely	6 (MEDIUM)	No	No buding for the Raw and Treated water?			#N/A			Plant Manager	12	13/11/2019	13/11/2020
34	Discharge to environment from broken piplines	E	ground contamination	contamination to ground from pipelines (Brine)	Catastrophic	Moderate	15 (HIGH)		preventative maintenance Isolations in place	regular inspections of valves, pumps, pipes and hoses	Minor	Unlikely	4 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
35	Site break-in	HS	break-in	security failure. Injury to the intruder	Medium	Moderate	9 (MEDIUM)		locked gates with authorised access only (access control) all access gates locked at all times	Security patrols (night and weekends)	Low	Unlikely	2 (LOW)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021
36	Working in unsafe (natural) conditions	HS	Electrical storms, Heavy rain	injury from inclement weather	Medium	Unlikely	6 (MEDIUM)	Sheltered areas			Low	Very Unlikely	1 (LOW)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021
37	Vehicles on site - traffic management	HS	Moving vehicles	Serious injury	High	Likely	16 (HIGH)		one-way traffic movement	traffic management plan speed limit (8) training (induction) Chemical Delivery Induction	Medium	Very Unlikely	3 (LOW)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
38	Media contact to site	HSE	Media	Damage to Suez brand	Medium	Moderate	8 (MEDIUM)		no worker contact with media without authority	Media policy corporate affairs internal support function	Minor	Very Unlikely	2 (LOW)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021
39	Rodents in Switchroom	HS	Destruction to property	Damage to electrical wiring	Medium	Moderate	8 (MEDIUM)		Rodent traps in switch room	Routine pest management and inspections	Minor	Moderate	6 (MEDIUM)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021
40	Power failure to plant	HSE	Inability to supply treated water	Delayed process to plant	Minor	Unlikely	4 (MEDIUM)			Restart process Crisis management plan in event of long term Business Continuity Plan in place	Minor	Very Unlikely	2 (LOW)	No				#N/A			Plant Manager	0	13/11/2019	13/11/2019
41	Completion of EPL annual return - environmental compliance and meeting all obligations with no non-conformances	E	Licence requirements	Not meeting licence requirements	Medium	Unlikely	6 (MEDIUM)			Plant Manager responsible for Annual return completion Annual return due dates in compliance calendar Annual Compliance Evaluation - Legal council to review	High	Very Unlikely	4 (MEDIUM)	No	Compliance Evaluation completed annually on the licence requirements by HSEQ team	Medium	Very Unlikely	3 (LOW)				24	13/11/2019	13/11/2021
42	Unauthorised access to hazardous energy (Electricity, Compressed Air)	HS	Electricity & other energy sources i.e. compressed air Security control	Exposure to hazardous energy sources	Catastrophic	Likely	20 (EXTREME)		Personal lockout locks switchroom / panels locked access Access restricted for chemical areas (keys required)	OHS-021 Isolation Caution / warning tags OHS-018 Inspection and Testing of Electical Equipment OHS-37D High Voltage Access Permit for Work/Test Electrical competency / licence for all electrical work	High	Unlikely	8 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
43	Working in noisy environments (Switch room and HP RO Feed Pump room)	HS	Hazardous noise	Temporarily or permanent hearing loss	Medium	Moderate	9 (MEDIUM)			Signage for hearing protection PPE - ear protection Noise conservation assessments Health surveillance	Low	Moderate	3 (LOW)	No	quieter equipment selection	Low	Very Unlikely	1 (LOW)			Plant Manager	24	13/11/2019	13/11/2021
44	Falling objects from height (Gantry crane or use of cherry pickers)	HS	Falling objects	Serious injury or death	Catastrophic	Unlikely	10 (HIGH)			**Hard hat to be worn whilst gantry is in operation** Do not walk under gantry crane while in operation (Life saving rule) Barricading when in use Work clearance	High	Very Unlikely	4 (MEDIUM)	No				#N/A			Plant Manager	12	13/11/2019	13/11/2020
45	Smoking on premises	HSE	Fire	Reactant with chemicals and potential to cause fire to property	Medium	Unlikely	6 (MEDIUM)			No smoking on premises (designated outside of plant) No smoking signage	Low	Very Unlikely	1 (LOW)	No				#N/A			Plant Manager	24	13/11/2019	13/11/2021

RISK MATRIX

CONSEQUENCES						RISK RATING LIKELIHOOD (including consideration to the frequency of the activity)				
COMMERCIAL	REPUTATION	LEGAL	ENVIRONMENT	HEALTH & SAFETY	SEVERITY	Very Likely (5)	Likely (4)	Moderate (3)	Unlikely (2)	Very Unlikely (1)
Liquidation	Forced contract termination. Curtailment of Operations	Corporate penalty, Compensation claim, Officer jailed	Catastrophic pollution event, Long term environ damage	Single or multiple fatality, permanent disability or illness	**Catastrophic (5)**	**Ex High (25)**	**Ex High (20)**	**High (15)**	**High (10)**	**Medium (5)**
Significant shareholder loss	Extended adverse media, Parliamentary enquiry	Corporate penalty, Compensation claim, Officer fined	Major pollution event, Long term environmental damage	Serious injury or long term illness	**High (4)**	**Ex High (20)**	**High (16)**	**High (12)**	**Medium (8)**	**Medium (4)**
Major bottom line impact, Impact future opportunities	Adverse media coverage	Corporate penalty, Compensation claim	Measureable environ damage, Reportable to regulators	Medical treatment with days off (LTI)	**Medium (3)**	**High (15)**	**High (12)**	**Medium (9)**	**Medium (6)**	**Low (3)**
Exceeds contingencies, Minor bottom line effect	Complaint in local media	Third party claim less than $50K	Transient pollution event, Not reportable to regulators	Medical treatment with no days off	**Minor (2)**	**High (10)**	**Medium (8)**	**Medium (6)**	**Medium (4)**	**Low (2)**
Manage within contingencies, No bottom line effect	Local public complaints, Client dissatisfaction	Insignificant effect	Insignificant environment damage, not reportable	First aid injury – minor cuts, bruises, bumps	**Low (1)**	**Medium (5)**	**Medium (4)**	**Low (3)**	**Low (2)**	**Low (1)**

Likelihood	Description	Frequency of Occurrence
Very Likely (5)	Event is expected to occur in most circumstances.	Impact is occurring now or could occur in within days or weeks
Likely (4)	Event will probably occur in most circumstances	Balance of probability will occur or could within weeks to months
Moderate (3)	Event might occur at some time.	Could occur within months up to 5 years but a distinct possibility it wont
Unlikely (2)	Event could occur at some time	May occur but not anticipated, could occur within 5 to 20 years
Very Unlikely (1)	Event may occur in exceptional circumstances	Exceptionally unlikely, may occur as a 20 - 100 year event

Kooragang Water Pty Ltd

WIC Act licence application

13 April 2022

Attachment 23:

KIWS Corporate Risk Assessment

Water Utilities Australia - Kooragang Industrial Water Scheme Top 10 Management Risks													
Rank	**ID**	**Risk**	**Impact**	**Inherent Risk Assessment** (without controls)			**Current Controls**	**Actual Risk Assessment** (with controls)				**Mitigation Plan**
		(condition that could occur (either threat or opportunuity))	(What is the likely result, loss, gain)	**Likelihood**	**Consequences**	**Risk Level**	(Current Controls/Treatments)	**Likelihood**	**Consequences**	**Risk Level**	**Acceptable Y/N**	(Future Controls/Treatments)
1	A	Sole customer (Orica) closing Kooragang plant	Loss of revenue	3	5	15	Contract with notificaiton provisions and Take or Pay.	3	5	15	N	Additional Customer investigations.
2	B	Interruption of supply impacting customers	Time and resources, reputational damage, increased scrutiny of regulators	4	3	12	Maintenance Program, Rapid Response and Insurance.	3	3	9	N	Investigate redundancy.
2	C	Insufficient WUA resources to effectively manage KIWS business	Loss of oversight, Increased costs,	3	3	9	PMG, Forward planning.	3	3	9	N	Planning for NSW regional manager.
4	D	Customers not paying invoices	Loss of revenue, cashflow issues	2	4	8	Contract and business critical nature of water.	2	4	8	Y	
5	E	SUEZ not providing services to required standard	Reputational damage	3	3	9	O&M agreement KPI & abatements, Potential impact on SUEZ reputation	2	3	6	Y	
5	F	Systems not performing as planned	Time, incorrect information, reputational damage	3	3	9	Communication Protocol, PMG, O&M Agreement	2	3	6	Y	
5	G	Failure of IT hardware	Inefficiency of staff, increased costs, Loss of operation	3	3	9	SUEZ systems, Rapid Response	3	2	6	Y	
5	H	Increase costs not being passed through	Reduction in margin	2	3	6	O&M agreement with SUEZ with fixed fee component. Long term Electricity and chemical contracts.	2	3	6	Y	
5	I	Delays in sending invoices	Cashflow issues	3	2	6	Contract timeframes for preparation of invoice, management oversight	3	2	6	Y	
10	J	Deuteriation of Hunter Water or Orica relationship	Reputational damage, inability to grow business	3	2	6	Regular contact, Management oversight	2	2	4	Y	
10	K	IPART price determination lowers Hunter Waters Potable price	Reduction in ORICA price, Loss of Revenue	1	4	4	N/A	1	4	4	Y	
10	L	Community perceptions of recycled water being negative	Reputational damage, inability to grow business	2	2	4	Relationship with Hunter Water, Hunter Water Education program,	2	2	4	Y	
10	M	Loss of data	Inability to function, time and resources to recover	2	2	4	SUEZ systems and back ups	2	2	4	Y	

E – Extreme risk – detailed action plan required
H – High risk – needs senior management attention
M – Medium risk – specify management responsibility
L – Low risk – manage by routine procedures

High or **Extreme** risks must be reported to Senior Management and require detailed treatment plans to reduce the risk to **Low** or **Medium**.

	Consequence				
People	Injuries or aliments not requiring medical treatment.	Minor injury or First Aid Treatment Case.	Serious injury causing hospitalisation or multiple medical treatment cases.	Life threatening injury or multiple serious injuries causing hospitalisation.	Death or multiple life threatening injuries.
Environment	Minor environmental consequence (minor spill)	Environmental nuisance (unsightly or offensive condition caused by pollution)	Material environmental harm (actual or potential harm that is not trivial)	Serious environmental harm (actual or potential harm that is of a high impact or on a wide scale)	High level serious environmental harm (serious environmental harm that affects the wider community)
Reputation	Internal Review	Scrutiny required by internal committees or internal audit to prevent escalation.	Scrutiny required by external committees or Auditor General's Office, or inquest, etc.	Intense public, political and media scrutiny. E.g.. Front page headlines, TV, etc.	Assembly inquiry or Commission of inquiry or adverse national media.
Business Process & Systems	Minor errors in systems or processes requiring corrective action, or minor delay without impact on overall schedule.	Policy procedural rule occasionally not met or services do not fully meet needs.	One or more key accountability requirements not met. Inconvenient but not client welfare threatening.	Strategies not consistent with Government's agenda. Trends show service is degraded.	Critical system failure, bad policy advice or ongoing non-compliance. Business severely affected.
Financial	1% of Budget or <$5K	2.5% of Budget or <$50K	>5% of Budget or <$500K	>10% of Budget or <$5M	>25% of Budget or >$5M

		Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
		1	**2**	**3**	**4**	**5**
Likelihood	**Almost Certain**	5-M	10-H	15-H	20-E	25-E
	Likely	4-M	8-M	12-H	16-H	20-E
	Possible	3-L	6-M	9-M	12-H	15-H
	Unlikely	2-L	4-M	6-M	8-M	10-H
	Rare	1-L	2-L	3-L	4-M	5-M

	Probability:	**Historical:**	
Likelihood	>1 in 10	Is expected to occur in most circumstances	5
	1 in 10 – 100	Will probably occur	4
	1 in 100 – 1,000	Might occur at some time in the future	3
	1 in 1,000 – 10,000	Could occur but doubtful	2
	1 in 10,000 – 100,000	May occur but only in exceptional circumstances	1

Adapted from Standards Australia Risk Management AS/NZS 4360: 2004

Kooragang Water Pty Ltd

WIC Act licence application

13 April 2022

Attachment 24:

KIWS HACCP Risk Assessment

	Workshop at which this risk was first added	2021 Revised Area of responsibility	Process Step Name	Potential Hazardous Event Description	C=chemical; P=physical; M=microbial; E=environmental; H=Health					Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	Uncontrolled Risk			2021 Revised Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	Controlled Risk			2021 Revised Controlled Risk			CCP Question				CCP?	Uncertainty 30 July 2018		Risk Assessment Review 31 May 2016		Risk Assessment Review December 2021	
					C	P	M	E	H		Consequence	Likelihood	Risk Level	Consequence	Likelihood	Numerical risk			Consequence	Likelihood	Risk Level	Consequence	Likelihood	Numerical risk	1	2	3	4		Significant uncertainty identified	Description of uncertainty/comment/action	Changes Identified	Description of change/comment/action	Changes Identified	Description of change/comment/action/Uncertainty
79	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	High salinity reaching the plant via Shortland WWTW	C					C	3	4	High	3	4	12	Yes	New instrumentation and alarms and automatic diversion (by Hunter Water) away from KIWS. Conductivity meter installed at Dechlorination building (before KIWS raw water tank) with automatic shutdown of supply if TDS high. Hunter Water controlled system	3	1	Low	3	1	3	Y	Y	Y	N	No	No		Yes	New instrument will be available for monitoring	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
81	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	High chlorine levels that exceeds capacity of plant	C					C	3	2	Moderate	3	2	6	Yes	New instrumentation and alarms and automatic diversion (by Hunter Water) away from KIWS. Chlorine meter installed at Dechlorination building (before KIWS raw water tank). Total Chlorine is measured on wet-rack 2 after SBS dosing 5mg/l	3	1	Low	3	1	3	Y	Y	Y	N	No	No		Yes	New instrument will be available for monitoring	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
82	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	High chlorine discharge from raw water tank to the environment				E		E	3	2	Moderate	3	2	6	Yes	New chlorine instrumentation and alarms and automatic diversion away before receival at KIWS as well as SBS dosing at the KIWS to remove chlorine post-raw water tank - both for pre-MF protection and for discharge to river (under Suez EPL)	3	1	Low	3	1	3	Y	Y	Y	N	No	No		Yes	New instrument will be available for monitoring. Assessment assumes the level of chlorine coming on to plant may exceed capacity of SBS system to neutralise free chlorine	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
83	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high TSS on to KIWS, potentially causing blinding of strainers and MF fouling	C	P				C, P	3	4	High	3	4	12	Yes	New instrumentation (turbidity) and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	3	1	3	Y	Y	Y	N	No	No		Yes	New instrument will be available for monitoring	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
84	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high Ammonia to KIWS, potentially causing a requirement to increase chlorine injection and discharge of product water outside of contractual limits for discharge of nitrogen or chloramines	C	P				C, P	3	4	High	3	4	12	Yes	Shortland WWTW is a HWC Controlled System There is an Ammonia analyser for process optimisation at Wetrack 2 (post-raw water)- but there is potential for this analyser to be used for plant protection	2	5	Moderate	2	5	10	Y	Y	N	N	No	No		Yes	Assumes timely communication	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
85	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high BOD on to KIWS, potentially causing fouling of membranes and an increase in the required frequency of backwash cycles and potentially a plant shutdown	C		M			M, C	3	2	Moderate	3	2	6	Yes	Shortland WWTW is a HWC Controlled System. New instrumentation (BOD) and alarms and automatic diversion (by Hunter Water) away from KIWS	3	1	Low	3	1	3	Y	Y	N	N	No	No		Yes	BOD trend can be used to review cause	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
86	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high BOD on to KIWS, potentially high BOD discharge from raw water tank to environment				E		E	3	1	Low	3	1	3	Yes	Shortland WWTW is a HWC Controlled System. New instrumentation (BOD) and alarms and automatic diversion (by Hunter Water) away from KIWS Level monitoring in raw water tank and automatic diversion (by Hunter Water) away from KIWS. This allows offspec influent to be discharged by HWC to the Hunter River under their Shortland WWTW EPL	3	1	Low	3	1	3	Y	Y	N	N	No	No		Yes	BOD trend can be used to review cause	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
87	HACCP Review 2016	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high Phosphorous to KIWS, potentially causing scaling and increased CIP, and discharge of product water outside of contractual limits	C					C	2	4	Moderate	2	4	8	Yes	Shortland WWTW is a HWC Controlled System. Laboratory monitoring. Contractual arrangements and communication program in place	2	3	Moderate	2	3	6	Y	Y	N	N	No	No		Yes	Assumes timely communication	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
93	Risk Assessment 2021	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high Turbidity on to KIWS, out of specification influent for NCIG supply		P	M			P- Turbidity above CCP resulting in out of spec conditions for NCIG, potential for higher pathogen levels (M)				4	4	16	Yes	Current KWIS MF feedline (post MF feed tank) turbidity meter to be the location of the new CCP. CCP to have alarmed at alert levels and interlock at critical limit to cease supply to NCIG. Contractual conditions on the supply of effluent from HW (Shortland WWTW) to KIWS, HW have diversions at Shortland (prior) to KWIS supply (discharge to Hunter River via dechlorination facility). Compliance with the contractual requirements is a significant aspect and importance for Hunter Water (contract financial implications).				4	2	8	Y	Y	Y	Y	Yes	No				Yes	There are alarms and controls on the inlet turbidity to the MF, these are to be interlocked on the NCIG supply (to be installed). When determining when to reinstate supply after quality is compliant, there needs to be consideration of the hydraulic detention time within KWIS system, tanks and pipelines, include NCIG offtake point/line, to ensure there is adequate delay to allow inspec RW to reach NCIG (using Orica's typical usage as 'flush' volume). NSW Health is to review and confirm on CCP and proposed monitoring which is the basis of the proposed control for this risk assessment. Risk has been revised based on that the CCP and LRV claim will meet satisfaction by NSW Health, this to be confirmed by further discussion following workshop. NCIG to have undergoing consultation with NSW

41	HACCP Oct 2011	WUA/SUEZ	KIWS Feed Tank	Online monitoring at the KIWS plant and if out of spec the valve will be closed and out of spec water diverted back to the River. This is then an off-spec discharge by KIWS under the Suez EPL - i.e. at the KIWS plant and different from the HWC influent control							3	3	High	3	3	9	Yes	Control measures have been implemented with analysers upstream (at dechlorination building) of the plant bypass Refer to abovementioned risk for influent water	3	1	Low	3	1	3	Y	Y	N	N	No	No		Yes	New instruments will be available for monitoring, these to be considered in HACCP review for Shortland WWTW.	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
42	HACCP Oct 2011	WUA/SUEZ	KIWS Feed Tank	If out of spec water there is storage and Orica & NCIG will be notified if this tank goes to Low level such that they can take potable water rather than recycled water. Supply Agreements with Orica and NCIG require backup supply of potable water in event of recycled water outage.							1	4	Low	2	3	6	Yes	Communication with Orica & NCIG. Both have potable water backup supply	2	3	Low	2	3	6	Y	Y	N	N	No	No		No		yes	Updated to include NCIG as part of the risk line
44	HACCP Sept 2012	WUA/SUEZ	Autostrainers	Issues with biological build-up in strainers		P				P	2	4	Moderate	2	4	8	Yes	Chloramine dosing upstream to minimise fouling. New turbidity instrumentation at the dechlorination building	2	2	Low	2	2	4	Y	N	N	N	No	No		Yes	Additional instrumentation now available for monitoring	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
45	HACCP Oct 2011	WUA/SUEZ	MF Backwash Return to Shortland WWTW	Concentration of pathogens from KIWS returned back to Shortland WWTW. 4 log of pathogens removed at KIWS are then concentrated up and then returned back to Shortland WWTW.		P				P			Not Scored	2	5	10	Yes	Updated 13/12/2021 - Backwash returned from KIWS is of better quality than the raw sewage currently received and Hunter Water trade waste agreements address this risk. It can be assumed that Shortland WWTW will continue to reduce pathogens through the biological process. As long as operation remains within design parameters this risk is covered by the existing operations at Shortland WWTW (managed by Hunter Water), contractual supply agreement and CCPs at KIWS. Online monitoring at the effluent after Shortland prior to KIWS, contractual conditions and diversion in place (to Hunter River) if effluent quality conditions are not met.	Not Scored		Not Scored	2	2	4	Y	N	N	N	No	No		Yes	Additional instrumentation is now available for monitoring. Further data should be gathered to confirm treatment efficacy to allow this question to be addressed quantitatively should it be raised in subsequent reviews. See also item 88.	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
46	HACCP Sept 2012	WUA/SUEZ	Microfiltration	Pathogen breakthrough			M			M	3	3	High	3	3	9	Yes	Plant shut down. Manual closing of valve so that RO feed tank overflows. MIT, turbidity monitoring . Maintenance management plan implemented	3	2	Low	3	2	6	Y	Y	Y	Y	Yes	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
47	HACCP Sept 2012	WUA/SUEZ	Microfiltration	Membrane Integrity Test (MIT) failure - false negative		P				P	3	3	High	4	3	12	Yes	Alarms. Skid shutdown interlock.	4	2	Low	4	2	8	Y	Y	Y	Y	Yes	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
53	HACCP Sept 2012	WUA/SUEZ	Reverse Osmosis	Pathogen breakthrough			M			M	3	3	High	4	3	12	Yes	Conductivity on each stage on SCADA. Conductivity and LRV on combined flow. Shut down of stage.	4	2	Low	4	2	8	Y	Y	Y	Y	Yes	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
54	HACCP Sept 2012	WUA/SUEZ	Reverse Osmosis	Free chlorine breakthrough upstream of RO	C	P				C, P	3	3	High	3	3	9	Yes	ORP meter - online Free Ammonia meter - online Chloramine meter - online Shutdown interlock in control system	3	2	Low	3	2	6	Y	Y	Y	N	No	No		Yes	SUEZ to check the available documentation is current. If so, prepare RFI to HWC to query why this was not considered / included as part of CCP3 which does not mention SBS dosing, Ammonia dosing or ORP monitoring. Refer section 4.4.2 of supplementary design report	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
94	Risk Assessment 2021	WUA/SUEZ	Reverse Osmosis	Calcium breakthrough indicating that there could be potential for Pathogen breakthrough and out of spec Recycled Water for NCIG supply.		P	M			P- Calcium ion removal above CCP resulting in out of spec conditions for NCIG, potential for higher pathogen levels (M)				4	3	12	Yes	Conductivity on each stage on SCADA. A Conductivity (percent removal) alarm trigger to be within SCADA on combined permeate. QCP 2 on conductivity of Stage 1. If trigger level exceeded on CCP operator to undertake onsite calcium testing to confirm Ca ion removal. If Calcium removal is less than critical limit (out of spec), supply to NCIG ceased. Verification weekly Calcium testing on raw and final water to demonstrate ongoing 1.5log10 removal. If removal is less, supply to cease to NCIG until system performance is investigated and reliable performance can be achieved. This is a firefighting requirement, NCIG onsite use to be managed through NCIG. Likelihood of exceedance of Ca and fire occurring is considered to be lower (similar to a multibarrier failure)				4	2	8	Y	Y	Y	Y	Yes	No				Yes	When determining when to reinstate supply after quality is complaint, there needs to be consideration of the hydraulic detention time within KWIS system, tanks and pipelines, include NCIG offtake point/line, to ensure there is adequate delay to allow inspec RW to reach NCIG (using Orica's typical usage as 'flush' volume). NSW Health is to review and confirm on CCP and proposed monitoring (calcium and EC online and Ca bench monitoring program) which is the basis of the proposed control for this risk assessment. Risk has been revised based on that the CCP and LRV claim will meet satisfaction by NSW Health, this to be confirmed by further discussion following workshop. NCIG to have undergoing consultation with NSW Fire & Rural Fire (NCIG to review Pre-Incident Plan (PIP) regarding fire event).
89	HACCP review 2016	WUA/SUEZ	Microfiltration & Reverse Osmosis	Instrument failure or lost signal	C	P	M			P, C, M	3	3	High	3	3	9	Yes	Plant shut-down. Criticality review completed. Appropriate spares now carried.	4	2	Low	3	2	6	Y	Y	N	N	No	No		No	This supports identification of the individual trains as QCPs	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
59	HACCP Sept 2012	WUA/SUEZ	Chlorination	Pathogen breakthrough			M			M	3	3	High	4	3	12	Yes	Free chlorine analyser upstream and downstream of CCT. Flow meter upstream of CCT. Temperature and pH included to set the CT target. CT target set to ensure adequate pathogen removal	4	2	Low	4	2	8	Y	Y	Y	Y	Yes	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
60	HACCP Sept 2012	WUA/SUEZ	Chlorination	Total chlorine breakthrough in product water tank	C					C	2	3	Moderate	3	3	9	Yes	Total chlorine analyser downstream of CCT Shutdown interlocks in place.	2	1	Low	3	2	6	Y	Y	Y	N	No	No		No	Not mentioned in CCP5 for dechlorination, probably as this is related only to contractual limits? Prepare RFI to HWC.	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
61	HACCP Sept 2012	WUA/SUEZ	Chlorination	Free chlorine analyser failure			M			M	2	3	Moderate	3	3	9	Yes	Duty/duty analysers. Program discrepancy alarm between two analysers - plant shut down if discrepancy is detected. Operator maintenance of analyser.	2	1	Low	3	2	6	Y	Y	N	N	No	No		No	CCP4	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
62	HACCP Sept 2012	WUA/SUEZ	Chlorination	High Ct value - increase in TDS due to increase in chlorine dose	C	P				C, P	3	3	High	3	2	6	Yes	TDS increase in final product will be minimal. Flow control enabled to reduce chance of requiring increase in hypochlorite dose to meet Ct.	1	3	Low	3	1	3	Y	Y	Y	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
63	HACCP Oct 2011	WUA/SUEZ	Chemical Dosing	Over dosing of chemicals has potential to discharge chlorinated permeate to Hunter River.	C	E				C, E	3	1	Low	3	1	3	Yes	Dechlorination on line to Hunter River	3	1	Low	3	1	3	Y	N	N	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA prior to the workshop
64	HACCP Sept 2012	WUA/SUEZ	Dechlorination	SBS doing affects pH.	C	E				C, E	1	2	Low	1	2	2	Yes		1	2	Low	1	2	2	Y	Y	Y	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
65	HACCP Sept 2012	WUA/SUEZ	Chemical Dosing	Sulphuric acid malfunction causing high pH, potential damage to RO membranes.	C					C	2	1	Low	3	3	9	Yes	pH monitoring downstream of MF.	2	1	Low	3	1	3	Y	Y	N	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
90	HACCP review 2016	WUA/SUEZ	Product water tank	Pathogen regrowth in tank when supply to Orica is not required			M			M	3	3	High	2	3	6	Yes	SOP - dechlorinate / recycle water in tank. Chlorine analysers. Tank inspections. Meeting requirements of customer. Water quality is very pure limiting regrowth potential.	3	1	Low	2	1	2	N	N	N	N	No	No			Research configuration to confirm available controls	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop

92	HACCP Review 2018	WUA/SUEZ	Distribution System	Ingress of ground water into distribution pipe	C	P	M			C, M, P	2	1	Low	2	1	2	Yes	Pressurised pipe. Flow meters with discrepancy monitoring will alert to sudden flow events due to bursts/breaks. Fusion welded polypipe.	2	1	Low	2	1	2	N	N	N	N	No	No				yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
70	Risk Assessment 2009	WUA/SUEZ	Distribution System	Discharge of recycled water via bursts, breaks (civil works) and leaks leading to environmental impacts				E		E - Chloramine	2	2	Low	2	2	4	Yes	Minimise discharge of water to the environment where possible through response. Flow meters with discrepancy monitoring will alert to sudden flow events due to bursts/breaks. Dial-before-you-dig linked to pipe location maps/GIS Standard operating procedure/response to minimise discharge through isolation valves and repair of fault. Fusion welded polypipe.	2	1	Low	2	1	2	Y	Y	N	N	No	No		No	Pipeline maintenance to be captured in environmental and asset management plans	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
95	2021	WUA/SUEZ	Distribution System	Discharge of recycled water via bursts, breaks (civil works) and leaks leading to environmental impacts				E		E - Chloramine				2	2	4	Yes	The main 'Orica' supply line to be utilised to supply NCIG.NCIG additional tee piece to NCIG supply point is only a minor addition to the overall pipeline. Risk level seen as equivalent.				2	1	2										yes	Updated to include NCIG conneciton to 'Orica' main line
91	HACCP Review 2016	WUA/SUEZ	Brine Disposal	Breakage of pressurised underground pipework to manhole E9583				E		E	3	2	Moderate	3	2	6	Yes	Dial-before-you-dig linked to pipe location maps/GIS Standard operating procedure/response to minimise discharge	3	1	Low	3	1	3	n	n	n	n	No	No		Yes	New risk identified, capture inspection and maintenance requirements in asset management plan	yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
10	HACCP Oct 2011	WUA/SUEZ	General Plant	Failure to implement the controls - risk rises towards inherent risk. Reconsidered to be high risk.				E	H	E/H - All	3	3	High	3	3	9	Yes	Implementation of RWQMP. SUEZ is a national highly credentialled operator, O&M Contract requires compliance with licenses, on-going auditing of License conditions, monitoring of contract performance by WUA.	3	1	Low	3	1	3	Y	N	N	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
11	HACCP Sept 2012	WUA/SUEZ	General Plant	Analyser Failure/misreading	C	P	M			C, M	3	3	High	3	3	9	Yes	All analysers were serviced upon handover. Laboratory equipment was replaced. The laboratory manual was added. The analyser service is now managed by the maintenance system. Daily check by operator. Rotational calibration/maintenance by operators or technicians - maintenance schedule. Chloramine analyser on service agreement. Ability to put plant shut down hold on during calibration.	1	3	Low	3	1	3	Y	Y	Y	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
12	HACCP Sept 2012	WUA/SUEZ	General Plant	Plant shutdown	C	P	M			P, M, C	1	1	Low	1	3	3	No	Customers has alternative water (potable supply). Diesel flush pump available to flush and protect RO membranes.	1	1	Low	1	3	3	N	N	Y	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
13	HACCP Sept 2012	WUA/SUEZ	General Plant	Lock out under power failure		P				P	2	1	Low	2	1	2	No		2	1	Low	2	1	2	N	N	Y	N	No	No		No		yes	Risk was reviewed and score converted to WUA corporate risk definitions and framework (see supporting risk definitions tab). This was undertaken by WUA piror to the workshop
14	Risk Assessment 2009	WUA/SUEZ	General Plant	Instrument failure potential quality and CCP breach, out of spec RW supplied to customers			M		H	-	Not Scored		Not Scored	4	3	12	Yes	13/12/2021 - Preventative maintenance and routine operational checks. If instrumentation fails plant should shutdown that section of the plant. MF valves can't be put in manual mode and run. RO will alarm if valves are left in manual mode. Overall alarms if valves are detected in the wrong position if	Not Scored		Not Scored	4	2	8	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed
15	Risk Assessment 2009	WUA/SUEZ	General Plant	Instrument calibration out of spec, potential quality and CCP breach, out of spec RW supplied to customers			M		H	-	Not Scored		Not Scored	4	4	16	Yes	13/12/2021 - Preventative maintenance and routine operational checks . Calibration scheduling has been based on historical reliability of instruments. Comparison of online results compared to laboratory results to verify results or provide indication that calibration may be required	Not Scored		Not Scored	4	2	8	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed
16	Risk Assessment 2009	WUA/SUEZ	General Plant	Global power failure, supply can't be provided. Not a quality or health concern		p				-	Not Scored		Not Scored	1	3	3	Yes	Customers has alternative water (potable supply). Diesel flush pump available to flush and protect RO membranes.	Not Scored		Not Scored	1	3	3	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed
17	Risk Assessment 2009	WUA/SUEZ	General Plant	Local power failure at Shortland WWTW leading to acute load of excessive contamination, getting to KWIS.						-	Not Scored		Not Scored	4	3	12	Yes	13/12/2021 - If communication signal is lost from Shortland WWTW/ Dechlor the supply to KIWS won't be provided. If power and communications are in place and effluent is out of spec, the current online instruments at the dechlor will divert to Hunter River. If KIWS experiences power outage, KIWS inflow valves fail closed, preventing supply. In case of no supply customers have potable water backup as per risk line (16).	Not Scored		Not Scored	4	2	8	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed
18	Risk Assessment 2009	WUA/SUEZ	General Plant	Under training of staff causing incompetent operations of KWIS, potential to supply off spec Recycled Water to customers			M		H	-	Not Scored		Not Scored	4	3	12	Yes	13/12/2021 - Design of the plant has assisted in engineering out a number of operational risks. SUEZ Training program, required to have Cert III in water operations. Operational staff redundancy within SUEZ locally as well as national and international resources pool. WUA also have contractual oversight to ensure that training and operational qualifications is undertaken by SUEZ	Not Scored		Not Scored	4	2	8	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed
19	Risk Assessment 2009	WUA/SUEZ	General Plant	Materials and chemicals used in process do not meet requirements (or wrong chemicals are used) and create Recycled Water out of specification			M		H	-	Not Scored		Not Scored	4	3	12	Yes	13/12/2021 - SUEZ chemical supply contracts. CoC documentation is collected on delivery. SUEZ induction to educate delivery drivers on unloading locations, Chemical inspection sheet completed with each delivery. Chemical receival areas labelled and signposted. Original plant material requirements, procurement process in place to ensure compatibly materials are installed. WUA also have contractual oversight to ensure that supply and procument undertaken by SUEZ meets requirements.	Not Scored		Not Scored	4	2	8	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed
20	Risk Assessment 2009	WUA/SUEZ	General Plant	Chemical quality, covered in line item 19						-	Not Scored		Not Scored			0	Yes	13/12/2021 - Item considered as part of risk line 19	Not Scored		Not Scored	Not Scored	0	Not Scored	Y	Y	N	N	No	No		No		yes	Item considered as part of risk line 19
21	Risk Assessment 2009	WUA/SUEZ	General Plant	Failure to implement the controls - risk rises towards inherent risk				E	H	E/H - All	Not Scored		Not Scored	4	5	20	No	13/12/2021 - Plant design, PLC & SCADA controls, provides a level of 'engineering out' a number of risks. SUEZ and WUA have good understanding of RWQMP, SUEZ have international experience in water and recycled water management. WICA licencing and auditing requirements provides additional	3	1	Low	4	2	8	Y	Y	N	N	No	No		No		yes	Item scored, controls reviewed

	Workshop at which this risk was first added	2021 Revised Area of responsibility	Process Step Name	Supplied RW meets contractual quality requirements	Potential Hazardous Event Description	C	P	M	E	H	Further Comments/Description: C=chemical; P=physical; M=microbial; E=environmental; H=Health	2021 Revised Uncontrolled Risk			Do control measures exist for this Hazard? (yes/no)	Control Measures to be Considered	2021 Revised Controlled Risk			Description of uncertainty/comment/action
												Consequence	Likelihood	Numerical risk			Consequence	Likelihood	Numerical risk	
NCIG 1.01	Risk Assessment 2021	NCIG	End uses - dust suppression	YES	Off-site spray drift exposing public to recycled water. Key area of focus is public roads and shared areas. Industrial neighbours to the East. Inhalation risk to public receptors. Spray drift has been known to occur during high wind conditions, North-West direction. Risk has been assessed with RW in specification to NCIG requirements, as result health impact is considered to be lower (compared to risk line NCIG 1.02) . General note that the water used within the raw water supply is also shandy of stormwater and potable water. Risk assessment scope is limit to RW supply, and risk assessment considers all RW is being used as raw water.					H	H - Pathogens	3	4	12	Yes	Buffer distance in place ~ 65m from Cormorant Road, 165m to eastern neighbour. Cormorant road includes mounding and vegetation barriers. Currently an interlock system (Integrated Dust System) which has interlocks based on wind conditions direction and wind speed in place to prevent offsite spray drift of raw water. Site is fully fenced, secured sites, no general public access. Conveyor over Cormorant Road is fully sealed preventing any RW dripping onto the road. Sprays are NOT designed to produce fine mist fog, designed to create water droplets to wet the stockpiles. Only controlled access on site, inductions to inform visitors of Recycled Water. Irrigation system in visitor area only on potable	3	2	6	**ALL ACTIONS RAISED IN THIS RISK ASSESSMENT to be included in NCIG RWQMP.** NCIG to follow up on the history of spray drift impacts, current controls (IDS), and complaints management system. NCIG to provide Buffer distances to public roads. NCIG to provide relevant public health risk information from internal RW risk assessment (GHD report)
NCIG 1.02	Risk Assessment 2021	NCIG	End uses - dust suppression	NO	Off-site spray drift exposing public to recycled water. Key area of focus is Public roads and shared areas. Inhalation risk to public receptors, during high wind conditions, North- West direction. Neighbours to the East. RW out of specification to NCIG requirements, health impact is considered to be higher . Noting that the water used within the raw water supply is also shandy of stormwater and potable water. Risk assessment scope is limit to RW supply impacts considering all RW is being used as raw water.					H	H - Pathogens	4	2	8	Yes	Buffer distance in place ~ 65m from Cormorant Road, 165m to eastern neighbour. Cormorant road includes mounding and vegetation barriers. Currently an interlock system (Integrated Dust Management System; IDMS) which has interlocks based on wind conditions direction and wind speed in place to prevent offsite spray drift of raw water. Site is fully fenced, secured sites, no general public access. Conveyor over Cormorant Road is fully sealed preventing any RW dripping onto the road. Sprays are NOT designed to produce fine mist fog, designed to create water droplets to wet the stockpiles, droplet reduces spray drift potential.	4	1	4	As per risk line NCIG 1.01
NCIG 1.03	Risk Assessment 2021	NCIG	End uses - fire fighting	NO	RW doesn't meet quality requirements, fire fighters exposed to higher pathogen loading. Depending on the level of out of Spec quality could impact on consequence, precautionary approach to take Level 4 consequence					H	H - Pathogens	4	2	8	YES at KWIS	Previous controls at KWIS treatment plant to prevent RW becoming off-spec (this has considered in the likelihood rating) and communication protocol & fire fighters Pre Incident Plan (PIP). Fire fighting is an unlikely event in its own occurrence.	4	2	8	This risk is based on current operations of the KIWS and current fire fighting system. Fire protocols are to be reviewed considering the addition of RW. NCIG to consider Recycled Water signage on the fire hydrants. Communication is ongoing between NCIG and Fire (NSWFire and Rural). Review actions associated with WUA Risk Assessment line item 94
NCIG 1.04	Risk Assessment 2021	NCIG	Back flow to potable water supply	YES	Backflow of RW supply from NCIG, contaminating potable water main (Hunter Water Main), causing wider illness/infection in the community. For this risk line, the Recycled Water would be in spec and meeting contract quality requirements.					H	H - Pathogens	4	2	8	YES	Airgap in the potable water line to the raw water supply tanks. Site has backflow in place on main potable water line, this backflow device was installed by Hunter Water based on existing Hunter Water risk rating of the site risks to potable water. RPZ on potable water meter. Hunter Waster have inspection program on Hunter Water Backflow prevention devices. Hunter Water has been engaged regarding this project and have been on the proposed recycled water supply to NCIG. NCIG have asset maintenance programs in place which will cover the recycled water infrastructure.	4	1	4	WUA to have further engagement with HW to discuss the RW supply and highlight the current backflow arrangement with plumbing team (group that manage the backflow devices) and the proposed RW supply.
NCIG 1.05	Risk Assessment 2021	NCIG	NCIG internal site cross connection/backflow contaminating potable water onsite	YES	Internal cross connection, (e.g. inappropriate plumbing connection) of potable water lines within NCIG which could lead to visitors (public) being exposed to RW. In spec RW.					H	H - Pathogens	4	3	12	YES	NCIG controlled site, only authorised maintenance work. Plumbers to be inducted, signage, pipeline drawings, asset management. NCIG work permit system required. NCIG change management control procedure.	4	2	8	NCIG to review piping labelling of existing raw water and signage requirements for Recycled Water. NCIG to update site induction & training. NCIG to consider an annual cross connection check, (turn off the water main and check potable water taps), taking into consideration NCIG current plumbing checks/procedures.
NCIG 1.06	Risk Assessment 2021	NCIG	NCIG storage and network	NO	Storage tanks integrity breach leads to contamination of the supply creating out of spec conditions which escalate health risk which has been rated in previous items					H	H - Pathogens	4	4	16	YES	NCIG Asset Management and Maintenance System. NCIG inspection program for the current raw water tanks. Design of the tanks undertaken by specialist engineers to reduce contamination likelihood	4	2	8	NCIG RW infrastructure to be added to NCIG's asset management and maintenance program once constructed.
NCIG 1.07	Risk Assessment 2021	NCIG	NCIG storage and network	YES	Storage overflow/break in RW supply line from metering point (onsite at NCIG) - Recycled water continues to be supplied creating an overflow. Potential for uncontrolled release into the environment.				E		E - onsite spill	3	4	12	yes	NCIG has undertaken a design HAZOP RW supply pipeline (on NCIG site) will have differential flow monitoring to detect water loss on NCIG site, to be integrated into NCIG control system (currently in place). Storage tank has emergency overflow back into NCIG clear water pond. Storage buffer tank to be installed with level sensors (current large raw water tanks also have level sensor and emergency overflow). NCIG Pollution Incident Response Management Plan (PIRMP) is currently in place, is to be updated to include recycled water.	2	2	4	RW supply pipeline (on NCIG site) will have differential flow monitoring to detect water loss on NCIG site, to be integrated into NCIG control system (currently in place). Storage buffer tank to be installed with level sensors and emergency overflow. Update PIRMP to include recycled water risks. Note on risk ranking - Consequence was reduced in the mitigated risk, as the controls will control/reduce the amount of RW potentially discharged which reduces the overall impact (consequence) on the environment.
NCIG 1.08	Risk Assessment 2021	NCIG	NCIG storage and network	YES	Slimes/algae growing in ponds & tanks potentially more readily than in storm water due to higher nutrients from RW. Onsite issue only, not external environmental impact. External environment impact is a multiple failure scenario and is considered only a remote eventuality. This is the incremental risk above the current situation without RW.		P		E		P - High solids E - onsite pond conditions	2	3	6	Yes - monitoring and reactive control, not precautionary controls	NCIG have undertaken a Review of Environmental Factors (REF) for the project, which included a water quality assessment. NCIG operational water management plan currently in place (to be updated to include RW). NCIG water quality monitoring program, NCIG environmental inspections. NCIG water storage ponds are **not** intended to be the main storage for RW, only minor portion expected to be present at any one time in the stormwater network. Will be diluted with stormwater runoff.	2	2	4	NCIG operational water management plan currently in place, to be updated to include RW.

	Responsible Party	Process Step	Potential Hazardous Event Description	Revised Controlled Risk	Actions
93	WUA/SUEZ	KIWS plant influent	Process upset at Shortland WWTW pushing high Turbidity on to KIWS, out of specification influent for NCIG supply	8	There are alarms and controls on the inlet turbidity to the MF, these are to be interlocked on the NCIG supply (to be installed). When determining when to reinstate supply after quality is complaint, there needs to be consideration of the hydraulic detention time within KWIS system, tanks and pipelines, include NCIG offtake point/line, to ensure there is adequate delay to allow inspec RW to reach NCIG (using Orica's typical usage as 'flush' volume). NSW Health is to review and confirm on CCP and proposed monitoring which is the basis of the proposed control for this risk assessment. Risk has been revised based on that the CCP and LRV claim will meet satisfaction by NSW Health, this to be confirmed by further discussion following workshop. NCIG to have undergoing consultation with NSW Fire & Rural Fire (NCIG to review Pre-Incident Plan (PIP) regarding fire event)
94	WUA/SUEZ	Reverse Osmosis	Calcium breakthrough indicating that there could be potential for Pathogen breakthrough and out of spec Recycled Water for NCIG supply.	8	When determining when to reinstate supply after quality is complaint, there needs to be consideration of the hydraulic detention time within KWIS system, tanks and pipelines, include NCIG offtake point/line, to ensure there is adequate delay to allow inspec RW to reach NCIG (using Orica's typical usage as 'flush' volume). NSW Health is to review and confirm on CCP and proposed monitoring (calcium and EC online and Ca bench monitoring program) which is the basis of the proposed control for this risk assessment. Risk has been revised based on that the CCP and LRV claim will meet satisfaction by NSW Health, this to be confirmed by further discussion following workshop. NCIG to have undergoing consultation with NSW Fire & Rural Fire (NCIG to review Pre-Incident Plan (PIP) regarding fire event).
NCIG 1.01	NCIG	End uses - dust suppression	Off-site spray drift exposing public to recycled water. Key area of focus is public roads and shared areas. Industrial neighbours to the East. Inhalation risk to public receptors. Spray drift has been known to occur during high wind conditions, North- West direction. Risk has been assessed with RW in specification to NCIG requirements, as result health impact is considered to be lower (compared to risk line NCIG 1.02) . General note that the water used within the raw water supply is also shandy of stormwater and potable water. Risk assessment scope is limit to RW supply, and risk assessment considers all RW is being used as raw water.	6	ALL ACTIONS RAISED IN THIS RISK ASSESSMENT to be included in NCIG RWQMP. NCIG to follow up on the history of spray drift impacts, current controls (IDS), and complaints management system. NCIG to provide Buffer distances to public roads. NCIG to provide relevant public health risk information from internal RW risk assessment (GHD report)

NCIG 1.02	NCIG	End uses - dust suppression	Off-site spray drift exposing public to recycled water. Key area of focus is Public roads and shared areas. Inhalation risk to public receptors, during high wind conditions, North- West direction. Neighbours to the East. RW out of specification to NCIG requirements, health impact is considered to be higher . Noting that the water used within the raw water supply is also shandy of stormwater and potable water. Risk assessment scope is limit to RW supply impacts considering all RW is being used as raw water.	4	As per risk line NCIG 1.01
NCIG 1.03	NCIG	End uses - fire fighting	RW doesn't meet quality requirements, fire fighters exposed to higher pathogen loading. Depending on the level of out of Spec quality could impact on consequence, precautionary approach to take Level 4 consequence	8	This risk is based on current operations of the KIWS and current fire fighting system. Fire protocols are to be reviewed considering the addition of RW. NCIG to consider Recycled Water signage on the fire hydrants. Communication is ongoing between NCIG and Fire (NSWFire and Rural). Review actions associated with WUA Risk Assessment line item 94
NCIG 1.04	NCIG	Back flow to potable water supply	Backflow of RW supply from NCIG, contaminating potable water main (Hunter Water Main), causing wider illness/infection in the community. For this risk line, the Recycled Water would be in spec and meeting contract quality requirements.	4	WUA to have further engagement with HW to discuss the RW supply and highlight the current backflow arrangement with plumbing team (group that manage the backflow devices) and the proposed RW supply.
NCIG 1.05	NCIG	NCIG internal site cross connection/backflow contaminating potable water onsite	Internal cross connection, (e.g. inappropriate plumbing connection) of potable water lines within NCIG which could lead to visitors (public) being exposed to RW. In spec RW.	8	NCIG to review piping labelling of existing raw water and signage requirements for Recycled Water. NCIG to update site induction & training. NCIG to consider an annual cross connection check, (turn off the water main and check potable water taps), taking into consideration NCIG current plumbing checks/procedures.
NCIG 1.06	NCIG	NCIG storage and network	Storage tanks integrity breach leads to contamination of the supply creating out of spec conditions which escalate health risk which has been rated in previous items	8	NCIG RW infrastructure to be added to NCIG's asset management and maintenance program once constructed.
NCIG 1.07	NCIG	NCIG storage and network	Storage overflow/break in RW supply line from metering point (onsite at NCIG) - Recycled water continues to be supplied creating an overflow. Potential for uncontrolled release into the environment.	4	RW supply pipeline (on NCIG site) will have differential flow monitoring to detect water loss on NCIG site, to be integrated into NCIG control system (currently in place). Storage buffer tank to be installed with level sensors and emergency overflow. Update PIRMP to include recycled water risks. Note on risk ranking - Consequence was reduced in the mitigated risk, as the controls will control/reduce the amount of RW potentially discharged which reduces the overall impact (consequence) on the environment.
NCIG 1.08	NCIG	NCIG storage and network	Slimes/algae growing in ponds & tanks potentially more readily than in storm water due to higher nutrients from RW. Onsite issue only, not external environmental impact. External environment impact is a multiple failure scenario and is considered only a remote eventuality. This is the incremental risk above the current situation without RW.	4	NCIG operational water management plan currently in place, to be updated to include RW.

Consequence Definitions

		SUEZ (HAZARD ANALYSIS & CRITICAL CONTROL POINTS (HACCP) PLAN REVIEW 2018, SUEZ)		WUA (Used in 2021 Risk Assessment)	
		Public Health/Water Quality	**Environment**	**People**	**Environment**
5	**Extreme**	Major health impact for large population (e.g. 2000 people); Permanent damage to people's health; Suspension or cessation of activity / shutdown ordered.	Off-site toxic release with major detrimental effect; Alteration to biological or biochemical systems	Death or multiple life threatening injuries	High level serious environmental harm (serious environmental harm that affects the wider community)
4	**High**	Health outbreak on a small scale (e.g. single suburb); No long-term health effects; Formal warning from investigator, external investigation initiated.	Off-site toxic release with long term impacts	Life threatening injury or multiple serious injuries causing hospitalisation	Serious environmental harm (actual or potential serious environmental harm that is of a high impact or
3	**Medium**	No health impacts; Aesthetic impact affecting a large population; Minor regulation breach (non-technical).	Off-site release with short term impact	Serious injuries causing hospitalisation or multiple medical treatment cases	Material environmental harm (actual or potential serious environmental harm that is not trivial)
2	**Low**	No health impacts; Aesthetic impact contained to a localised area; Minor regulation breach of a technical nature (no action or fines	Onsite release; Possible outside assistance required	Minor injury or 1st Aid Treatment Case	Environmental nuisance (unsightly or offensive condition caused by pollution)
1	**Insignificant**	Isolated, transient incident; No health impacts and minimal aesthetic impact on a limited area; Minor breach that is reported via an annual return (no action or fines likely).	Contained onsite release, limited or no environmental impact, minimal rate of contamination.	Injuries or aliments not requiring medical treatment	Minor environmental consequence (minor spill)

Likelihood Definitions

		SUEZ (HAZARD ANALYSIS & CRITICAL CONTROL POINTS (HACCP) PLAN REVIEW 2018, SUEZ)		WUA (Used in 2021 Risk Assessment)	
5		Multiple times in a year	Known or expected to happen often	>1 in 10 days	Is expected to occur in most circumstances
4		1 in a year or so	Known to reoccur approximately annually	1 in 10 - 100 days (Up to 3 times a year)	Will probabaly occur
3		1 in 5 years or multiple times over 10 years	.-.	1 in 100 - 1,000 days (up to once in 3 years)	Might occur at some time in the future
2		1 in 10 years or multiple times in 20 years	Could occur 3 or 4 times over my working life	1 in 1,000 - 10,000 days (Up to once in ~ 30 years)	Could occur but doubtful
1		1 in 50 years or less frequent	Remotely possible, but unlikely to occur in my lifetime	1 in 10,000 - 1,000,000 days (> than once in 30 years)	May occur in exceptional circumstances

Risk Matrix

SUEZ (HAZARD ANALYSIS & CRITICAL CONTROL POINTS (HACCP) PLAN REVIEW 2018, SUEZ)	
	Consequence

Likelihood	1	2	3	4	5
1	Low	Low	Low	High	High
2	Low	Low	Moderate	High	Very High
3	Low	Moderate	High	Very High	Very High
4	Low	Moderate	High	Very High	Very High
5	Low	Moderate	High	Very High	Very High

PROPOSED 2021 Risk Matrix (Numerical), Based on WUA

	Consequence				
Likelihood	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

LEGEND

Risk Level	Low	Moderate	High	Very High
Value	1 to 3	4 to 9	10 to 16	20 to 25

Workshop Date	07/12/2021
Location	KWIS (21 Channel Rd, Mayfield West NSW 2304) & via Teams
General Objective/Scope	The objective of the workshop was to review the proposed changes and the current Recycled Water Quality Management Plan update (RWQMP), the major topic areas for the workshop were: •WUA's transfer of the RWQMP as a SUEZ document to become a WUA document •Introduction to the new end user NCIG •The proposed changes to the system to meet NCIG quality requirements •How the supply of effluent from Hunter Water, Shortland WWTW and the current end user arrangement with Orica will remain the same. This workshop and risk review reviewed changes to the current RWQMP, and updating the existing risk assessment based on the changes with the new end user. As a result, the risk assessment will be focused on the operations within the KWIS treatment and reticulation supply to the point of the new end user. This includes public health risks and environmental considerations with the new end user (NCIG) proposed use of RW
Attendance	07/12/2021

Name	Organisation/Representation	Role	Email
Clara Laydon	Hunter H2O	Workshop Facilitator	clara.laydon@hunterh2o.com.au
Rennie Ferguson	Hunter H2O	Project Manager	Rennie.Ferguson@hunterh2o.com.au
Dave Colley	SUEZ	KWIS operations	dave.colley@suez.com
Megan Boardman	SUEZ	KWIS operations	megan.boardman@suez.com
Aaron Arthur	NCIG	NCIG	aarthur@ncig.com.au
Craig Heidenreich	WUA	KWIS management	cheidenreich@wua.com.au
Wade Covey	NCIG	NCIG	wcovey@ncig.com.au
Philippe Porigneaux	NSW Health	Hunter New England LHD	Philippe.Porigneaux@health.nsw.gov.au
Zenah Bradford-Hartke	NSW Health	Water Unit at NSW Health	Zenah.BradfordHartke@health.nsw.gov.au
Daniel Deere	Water Futures	Independent Observer	dan@waterfutures.net.au

Remote session post workshop to review previously unrated KIWS risk line items

Date 13/12/2021

Name	Organisation/Representation	Role	Email
Clara Laydon	Hunter H2O	Workshop Facilitator	clara.laydon@hunterh2o.com.au
Dave Colley	SUEZ	KWIS operations	dave.colley@suez.com
Megan Boardman	SUEZ	KWIS operations	megan.boardman@suez.com
Craig Heidenreich	WUA	KWIS management	cheidenreich@wua.com.au

Remote session post workshop to review NCIG environmental risk lines

Date 16/12/2021

Name	Organisation/Representation	Role	Email
Clara Laydon	Hunter H2O	Workshop Facilitator	clara.laydon@hunterh2o.com.au
Wade Covey	NCIG	NCIG	wcovey@ncig.com.au