



Catherine Hill Bay Water Utility

Licence Plan Audit (Stage 2 Scheme)

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Independent Pricing and Regulatory Tribunal

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1. Executive Summary

1.1 Auditor Declaration

This report presents the findings of a Licence Plan Audit of the compliance of Catherine Hill Bay Water Utility Pty Ltd's *Infrastructure Operating Plan*, *Drinking Water Quality Management Plan*, *Recycled Water Quality Management Plan* and *Sewage Management Plan* with the relevant provisions of the *Water Industry Competition Act 2006* and the *Water Industry Competition (General) Regulation 2008* as they relate to the drinking water, sewerage and recycled water schemes at Catherine Hill Bay.

The auditor confirms that:

- the auditor was provided with sufficient evidence on which to base the conclusions reached during the audit;
- the audit findings accurately reflect the professional opinion of the auditor;
- the auditor has conducted the audit, determined the audit findings and prepared this report in accordance with the requirements of the *WIC Act Audit Guidelines*¹ and the provisions of the Audit Deed; and
- the audit findings have not been unduly influenced by the Licensee and/or any of its associates and express the auditor's opinion as to whether the Licensee has met the Licence conditions and regulatory requirements as specified in the scope.

1.2 Major Findings

The Licensee, Catherine Hill Bay Water Utility Pty Ltd, was found to have documented the arrangements in relation to the design, construction, operation and maintenance of the proposed drinking water, sewerage and recycled water schemes in full compliance with the assessed audit criteria. No non-compliances were identified.

1.3 Recommendations

No recommendations have been made as a result of this audit.

Three (3) opportunities for improvement, which the Licensee may wish to consider, are identified in the body of the report.

1.4 Conclusion

In the opinion of the auditors, the Catherine Hill Bay Water management plans (*Infrastructure Operating Plan*, *Drinking Water Quality Management Plan*, *Recycled Water Quality Management Plan* and *Sewage Management Plan*) adequately document the arrangements in relation to the design, construction, operation and maintenance of the Stage 2 drinking water, sewerage and recycled (non-potable) water infrastructure to be operated under Network Operator's Licence No: 16_035. The documented arrangements are adequately compliant with the relevant guidelines, standards and legislative requirements.

¹ IPART, *Audit Guideline; Water Industry Competition Act 2006*, September 2018.

2. Introduction

2.1 Objectives

This report presents the findings of a Licence Plan Audit undertaken for the Independent Pricing and Regulatory Tribunal (IPART) under the provisions of the *Water Industry Competition Act 2006*.

The objective of the audit was to assess compliance of the Licensee, Catherine Hill Bay Water Utility Pty Ltd's (Catherine Hill Bay Water or CHBWU) Licence Plans (*Infrastructure Operating Plan, Drinking Water Quality Management Plan, Recycled Water Quality Management Plan and Sewage Management Plan*) with the provisions of the relevant legislation (the *Water Industry Competition Act 2006* and *Water Industry Competition (General) Regulation 2008*) as they relate to the drinking water, sewerage and recycled water schemes at Catherine Hill Bay. These schemes will be operated pursuant to the conditions of Network Operator's Licence No: 16_035.

It is noted that a separately reported New Infrastructure Audit² was conducted in conjunction with this audit.

2.2 Licensee's Infrastructure, Systems and Procedures

The infrastructure, systems and procedures subject to audit are those related to the drinking water, sewerage and recycled water schemes (the Schemes) that will service "The Beaches" land and housing development at Catherine Hill Bay, approximately 20 kilometres south of Newcastle (refer <http://www.solowater.com.au/schemes/>). At the current stage of development, the Water Industry Infrastructure comprises:

- Stage 1 (which has previously been approved for commercial operation), including:³
 - a potable (drinking) water network that draws water from an existing bulk potable water supply, with an inline chlorine monitoring and dosing system;
 - a pressure sewer collection network, together with an interim pump out tank (for disposal of sewage by road tanker); and
 - a non-potable (recycled) water network, which has initially been charged with potable water via a cross connection from the potable water supply located downstream of the chlorine dosing point.
- Stage 2 (for which approval for commercial operation is now sought and is the subject of this audit), including:
 - a treatment plant for the production of recycled water from sewage;
 - facilities for the on-site storage of recycled water prior to distribution; and
 - on-site drinking water storage and chlorine dosing facility.

Once the Stage 2 infrastructure has been approved for commercial operation, the non-potable water network will be charged with recycled water. Surplus recycled water will be transported offsite until an irrigation system, which will be incorporated as part of Stages 6 and 7 of the land development, is commissioned. The proposed irrigation system will be subject to future audit and approval, and is not included in the scope of this audit.

² Cobbitty Consulting/Water Futures, *Catherine Hill Bay Water Utility; New Infrastructure Audit (Stage 2 Scheme)* (Version 2.0), November 2018.

³ Minister for Energy and Utilities, *Notice of approval to bring new infrastructure into commercial operation*, 27 October 2017.

Catherine Hill Bay Water Utility Pty Ltd (ACN 163 381 922) is the Licensee, holding Network Operator's Licence No: 16_035. As Licensee, Catherine Hill Bay Water will own and/or be responsible for the ongoing operation and maintenance of the drinking water network, sewerage network and the recycled water network (under the Stage 2 arrangements) in accordance with its Licence Plans including:

- Solo Water, *Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2* (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018;
- Solo Water, *Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018;
- Solo Water, *Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018;
- Solo Water, *Catherine Hill Bay Water Utility; Sewage Management Plan; Stage 2* (reference: IMS-ENVM-B-3728-SW) (Revision 2.1), 5 November 2018; and
- other relevant supporting documentation.

It is noted that the *Infrastructure Operating Plan*, *Recycled Water Quality Management Plan* and *Sewage Management Plan* were updated during the audit process to remove reference to the use of recycled water for construction purposes. Whilst it is understood that this use was identified in the management plans submitted with Catherine Hill Bay Water's licence application, it was not reflected in the granted Licence.

2.3 Audit Method

2.3.1 Audit Scope

The audit comprised a Licence Plan Audit conducted pursuant to the *WIC Act Audit Guidelines*.⁴ The specific scope of the audit addressed identified requirements of the *Water Industry Competition (General) Regulation 2008* as they relate to the:

- *Infrastructure Operating Plan* (IOP);
- *Water Quality Plan (drinking water)* (WQP(dw));
- *Water Quality Plan (non-potable water)* (WQP(npw)) and
- *Sewage Management Plan* (SMP).

The audit covered all elements of the Stage 2 scheme arrangements as described in **Section 2.2**, including the Stage 1 (Interim Scheme) arrangements in respect of which the management plans have previously been assessed.⁵ It specifically excludes the proposed irrigation scheme and any associated infrastructure.

2.3.2 Audit Standard

The audit has been undertaken in accordance with the principles/guidance presented in:

- ISO 19011:2011 *Guidelines for auditing management systems*; and
- IPART, *Audit Guideline; Water Industry Competition Act 2006*, September 2018 (WIC Act Audit Guidelines).

⁴ IPART, *Audit Guideline; Water Industry Competition Act 2006*, September 2018.

⁵ Cobbitty Consulting/Water Futures, *Catherine Hill Bay Water Utility; Licence Plan Audit (Stage 1 – Interim Scheme)* (Version 2.0), 16 August 2017.

2.3.3 Audit Steps

The audit has been undertaken generally in accordance with the procedure outlined in the *WIC Act Audit Guidelines*.

Following approval of an *Audit Proposal* by IPART, an *Audit Agenda* and *Information Request* were sent to both the Licensee and IPART approximately one week prior to the audit fieldwork being undertaken. Audit fieldwork comprising a site inspection of existing infrastructure and a desktop audit of relevant documentation/records was undertaken on 18 October 2018. Some additional items of information and/or clarification were requested following the audit fieldwork and subsequently provided.

A draft audit report was prepared and submitted to both the Licensee and IPART on 25 November 2018 for review/comment before being finalised. Catherine Hill Bay Water advised that it had no comments in respect of the draft report; no comment has been received from IPART at the time of finalising the report.

The audit process involved seeking objective evidence that the Licensee had complied with the obligations identified for audit by IPART. Evidence was obtained through interview, review of relevant documentation and records, and site inspection.

2.3.4 Audit Team

The audit was conducted by Jim Sly and Dr Dan Deere, both of whom hold the required Lead Auditor accreditation on IPART's Technical Services and Water Licensing Panel. The two auditors collectively addressed the various components of the audit, as follows:

- Jim Sly – audit team lead and audit of the *Infrastructure Operating Plan* and *Sewage Management Plan* components; and
- Dan Deere – audit of the *Drinking Water Quality Plan* and *Recycled Water Quality Plan* components.





Quality assurance review of the audit reports was undertaken by each auditor reviewing the other auditor's work.

Catherine Hill Bay Water was represented by Rhys Richards (Director), Brad Irwin (Environmental Engineer/New Schemes Manager), Craig Heininger (Water Utility Engineer /Operations Manager), Ronnie Paine (Water and Wastewater Systems Operator) and Ross Pascoe (Site Supervisor). IPART representative Jessica Hanna attended as an observer during the audit fieldwork.

2.3.5 Audit Grades

Audit grades have been awarded in accordance with guidance presented in the *WIC Act Audit Guidelines*. The compliance grades applicable for the purposes of this audit were as identified in **Table 2.1**.

Table 2.1 Audit Compliance Grades

Compliance Grade	Description
 Compliant	Sufficient evidence is available to confirm that the requirements have been met.
 Non-compliant (non-material)	Sufficient evidence is not available to confirm that the requirements have been met and the deficiency does not adversely impact the ability of the Licensee to achieve defined objectives or assure controlled processes, products or outcomes.
 Non-compliant (material)	Sufficient evidence is not available to confirm that the requirements have been met and the deficiency does adversely impact the ability of the Licensee to achieve defined objectives or assure controlled processes, products or outcomes.
 No Requirement	There was no requirement for the Licensee to meet this criterion during the audit period.

2.4 Regulatory Regime

The Catherine Hill Bay Water schemes operate in accordance with the provisions of a Network Operator’s Licence (Licence No: 16_035) issued under the *Water Industry Competition Act 2006* (NSW). Other relevant regulatory instruments and standards/guidelines include:

- *Water Industry Competition (General) Regulation 2008 (NSW)*;
- IPART, *Audit Guideline; Water Industry Competition Act 2006*, September 2018;
- *Australian Drinking Water Guidelines 2011 (as amended 2016)*;
- *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006*;
- *Plumbing Code of Australia*;
- *Plumbing and Drainage Act 2011 (NSW)*; and
- NSW and national water industry and environmental regulations and codes of practice as applicable.

2.5 Quality Assurance Process

The quality of this audit report was assured through a professional review process. The report has been independently reviewed by a Lead Auditor who holds relevant accreditation on IPART’s Technical Services and Water Licensing Panel.

2.6 Audit Findings

Audit findings are summarised in the following **Sections 3 to 6**, and are presented in full detail in **Appendices A to D**.

3. Infrastructure Operating Plan

3.1 Summary of Findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Infrastructure Operating Plan*. Detailed assessment in respect of these clauses is presented in **Appendix A**.

3.2 Review of Actions

The Licensee has not made any suggestions for corrections or clarifications following issue of the draft report and prior to the final report being issued.

3.3 Opportunities for Improvement

The following opportunity for improvement has been identified in respect of the audited *WIC Regulation* clauses related to the *Infrastructure Operating Plan*:

- **OFI-CHB2-LPA.01:** It is suggested that Catherine Hill Bay Water includes more specific details in respect of the continuity of sewerage services in the *Infrastructure Operating Plan* (similar to that provided in respect of the continuity of water supply).

4. Water Quality Plan (Drinking Water)

4.1 Summary of Findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Water Quality Plan (Drinking Water)*. Detailed assessment in respect of these clauses is presented in **Appendix B**.

4.2 Review of Actions

The Licensee has not made any suggestions for corrections or clarifications following issue of the draft report and prior to the final report being issued.

4.3 Opportunities for Improvement

The following opportunities for improvement have been identified in respect of the audited *WTC Regulation* clauses related to the *Water Quality Plan (Drinking Water)*:

- **OFI-CHB2-LPA.02:** It is suggested that Catherine Hill Bay Water considers including a summary of the drinking water CCP details in its *Drinking Water Quality Management Plan*, consistent with the requirements of NSW Health.
- **OFI-CHB2-LPA.03:** It is suggested that Catherine Hill Bay Water revises the identification of “Hazard(s) of Concern” in its CCP tables to distinguish between virus, bacteria and protozoa, thereby making it clear which barriers are effective for each pathogen.

[This OFI is also applicable in respect of recycled water.]

5. Water Quality Plan (Non-potable Water)

5.1 Summary of Findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Water Quality Plan (Non-potable Water)*. Detailed assessment in respect of these clauses is presented in **Appendix C**.

5.2 Review of Actions

The Licensee has not made any suggestions for corrections or clarifications following issue of the draft report and prior to the final report being issued.

5.3 Opportunities for Improvement

The following opportunity for improvement has been identified in respect of the audited *WIC Regulation* clauses related to the *Water Quality Plan (Non-potable Water)*:

- **OFI-CHB2-LPA.03:** It is suggested that Catherine Hill Bay Water revises the identification of “Hazard(s) of Concern” in its CCP tables to distinguish between virus, bacteria and protozoa, thereby making it clear which barriers are effective for each pathogen.
[This OFI is also applicable in respect of drinking water.]

6. Sewage Management Plan

6.1 Summary of Findings

There were no identified non-compliances in respect of the audited clauses of the *Water Industry Competition (General) Regulation 2008* related to the *Sewage Management Plan*. Detailed assessment in respect of these clauses is presented in **Appendix D**.

6.2 Review of Actions

The Licensee has not made any suggestions for corrections or clarifications following issue of the draft report and prior to the final report being issued.


6.3 Opportunities for Improvement

No opportunities for improvement have been identified in respect of the audited *WIC Regulation* clauses related to the *Sewage Management Plan*.

Appendix A Detailed Audit Findings – Infrastructure Operating Plan (IOP)

Detailed audit findings in respect of the *Infrastructure Operating Plan* (IOP) are presented in this Appendix.

Table A.1 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(a) and/or cl.13(1)(a)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(a) and/or cl.13(1)(a)	The IOP indicates the arrangements in relation to the design, construction, operation and maintenance of the infrastructure, including particulars as to the life-span of the infrastructure, the system redundancy built into the infrastructure and the arrangements for renewal of the infrastructure.	 Compliant
Risk	This presents a high operational risk. Knowledge of the capacity and constraints associated with the infrastructure is essential to the effective management of the infrastructure assets in delivering agreed levels of service.	Target for Full Compliance
		Full development of the Infrastructure Operating Plan, including development of an Asset Management Plan and demonstrated implementation of the infrastructure management practices documented therein.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Sewage Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3728-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Pressure Sewer Solutions, <i>Potable Water Reticulation Master Plan Report; Catherine Hill Bay NSW</i> (Revision 3), 24 October 2013. ▪ Pressure Sewer Solutions, <i>Catherine Hill Bay; Pressure Sewerage System Masterplan Report</i> (Revision 3), 24 October 2013. ▪ Pressure Sewer Solutions, <i>Recycled Water Reticulation Master Plan Report; Catherine Hill Bay NSW</i> (Revision 3), 24 October 2013. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2</i> (Revision 2.0), 21 September 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2</i> (Revision 1.0), 19 September 2018. ▪ Witthoft Engineering, <i>Catherine Hill Bay RWTP; Functional Specification; PLC04 – AWTP PLC</i> (Revision 2.00), 15 October 2018. ▪ Solo, <i>Safety, Environment and Quality Regulatory Compliance Document Register</i> (live register with date currency checked noted for each document). 		

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- *Cardno, Solo Water; Catherine Hill Bay Water; Waste Water Treatment Plant; Civil Engineering Design* (Drawing Nos: SW-56-WWTP-WAE-1000 to 1032 (27 sheets)) (Revision X), 28 June 2018.
 - *Solo Water, Catherine Hill Bay; Residential Subdivision – Stage 1; Potable Water, Recycled Water and Pressure Sewer Services* (Drawing Set as issued for construction, including standard drawings).
 - *Service Agreement; For the Provision of Construction Services, Retail Services and O&M Services at the Catherine Hill Bay Development* between Catherine Hill Bay Water Utility Pty Ltd and Solo Water Pty Ltd, dated 5 February 2016.
 - NSW Government, *Network Operator’s Licence No: 16_035* (as issued on 22 March 2016).
 - Solo, *Asset Register* (IMS-GNRL-G-4403), as at 18 October 2018.
 - Solo, *CHB Drawings Register* (IMS-CONT-G-1684-SW) (Issue No: 1.1), September 2018.
-

Summary of reasons for grade

The *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, appropriately indicates the arrangements adopted in relation to the design, construction, operation, maintenance and renewal (life cycle management) of the infrastructure that is the subject of this audit. Accordingly, Catherine Hill Bay Water is considered to have demonstrated full compliance with this obligation.

Discussion and notes

Overview:

The infrastructure that is the subject of this audit comprises the Stage 2 drinking water, sewerage and recycled water infrastructure that will service “The Beaches” development at Catherine Hill Bay. As reported in Section 2.2 (of this report), the infrastructure will comprise:

- Stage 1 (Interim Scheme) infrastructure (in respect of which the management plans have previously been assessed), including:
 - a potable (drinking) water network that draws water from an existing bulk potable water supply, with an inline chlorine monitoring and dosing system;
 - a pressure sewer collection network, together with an interim pump out tank (for disposal of sewage by road tanker); and
 - a non-potable (recycled) water network, which has initially been charged with potable water via a cross connection from the potable water supply located downstream of the chlorine dosing point.
- additional infrastructure that will be incorporated under the Stage 2 Scheme arrangements, including:
 - a treatment plant for the production of recycled water from sewage;
 - facilities for the on-site storage of recycled water prior to distribution; and
 - on-site drinking water storage and chlorine dosing facility.

Infrastructure Design:

The *Infrastructure Operating Plan*⁶ outlines the arrangements in respect of the design of the infrastructure including identification of the area to be serviced, the proposed levels of service (by reference to the *Customer Contract*),⁷ service standards, the basis of the system design, and proposed future extension of the systems. It also identifies planning and design as a key component in relation to asset lifecycle management.⁸

⁶ *Infrastructure Operating Plan*, section 2.

⁷ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

⁸ *Infrastructure Operating Plan*, section 6.1.

The *Infrastructure Operating Plan*⁹ refers to the respective Master Plans (*Drinking Water Master Plan*,¹⁰ *Sewerage Master Plan*¹¹ and *Recycled Water Master Plan*¹²) which provide the design basis for the interim schemes at Catherine Hill Bay, and will also serve as the basis for future system augmentations.

In each case, the Master Plans, which address full uptake of the proposed development at Catherine Hill Bay, identify the design objectives, design standards and anticipated system loading, as well as presenting a concept design the system based hydraulic modelling. The *Drinking Water Master Plan* and *Recycled Water Master Plan* also include standard construction details for items such as scour points, hydrants and property service connections, whilst the *Sewerage Master Plan* provides an outline of the monitoring and control requirements for the pressure sewer system.

In addition to the scheme descriptions provided therein, the *Infrastructure Operating Plan*¹³ refers to the *Drinking Water Quality Management Plan*, *Recycled Water Quality Management Plan* and *Sewage Management Plan* for further details, and to the *Operator's Manual; Distribution System Networks; Stage 2*¹⁴ for plans and layouts of the respective schemes.

The *Infrastructure Operating Plan*¹⁵ also describes the control philosophy, a critical component of the overall design of the system and its subsequent operation, and references a suite of functional specifications. In addition to those available in respect of the Stage 1 (Interim Scheme) arrangements, which included:

- *Functional Specification; Interim Works RTU* (which includes control of the chlorine re-dosing skid and sewage collection tank);
- *Functional Specification; Bulk Potable Water Pump Station*; and
- *Functional Specification; Network Sewage Pump Stations*,

the following, which collectively detail the control arrangements for the treatment plant, are also now in place:

- *Catherine Hill Bay RWTP - Functional Specification D - PLC Standards*;
- *Catherine Hill Bay RWTP - Functional Specification E - SCADA Standards*;
- *Catherine Hill Bay RWTP - Functional Specification F - PLC01 Main PLC*;
- *Catherine Hill Bay RWTP - Functional Specification G - PLC02 MBR PLC*;
- *Catherine Hill Bay RWTP - Functional Specification H - PLC03 RWPWPS PLC*; and
- *Catherine Hill Bay RWTP - Functional Specification I - PLC04 AWTP*.

Review of these functional specifications reveals that they identify appropriate monitoring, control and alarm arrangements for the infrastructure. For example, the *Functional Specification I - PLC04 AWTP*¹⁶ details the arrangements in respect of the advanced water treatment components of the recycled water plant including the UV Feed Pump, UV Disinfection Package Plant, Chlorine Contact Tanks; and Transfer Tank and Pump.

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, clearly outlines the arrangements in relation to design of the infrastructure.

⁹ *Infrastructure Operating Plan*, section 2.4 and 2.5.

¹⁰ Pressure Sewer Solutions, *Potable Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.

¹¹ Pressure Sewer Solutions, *Catherine Hill Bay; Pressure Sewerage System Masterplan Report* (Revision 3), 24 October 2013.

¹² Pressure Sewer Solutions, *Recycled Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.¹³ *Infrastructure Operating Plan*, sections 3.1.2, 3.1.3 and 3.1.4.

¹³ *Infrastructure Operating Plan*, sections 3.1.2, 3.1.3 and 3.1.4.

¹⁴ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.

¹⁵ *Infrastructure Operating Plan*, section 3.1.7.

¹⁶ Witthoft Engineering, *Catherine Hill Bay RWTP; Functional Specification; PLC04 – AWTP PLC* (Revision 2.00), 15 October 2018.

Infrastructure Construction:

The *Infrastructure Operating Plan*¹⁷ outlines the arrangements in respect of asset creation and procurement. This indicates that each new scheme or asset renewal is treated as an individual project, which is delivered in accordance with a defined framework. This framework includes (for example):

- “*Engagement of contractors and suppliers in accordance with a project plan and procurement strategy*”; and
- “*Preparation of commissioning and handover procedures (e.g. Inspection Test plans (ITPs))*).

Implementation of the second of these framework elements ensures that the infrastructure is constructed to the required functional and detailed requirements.

The relevant standards and codes are nominated (albeit at a high level) and arrangements (responsibilities) in respect of compliance with such standards and codes are identified. Reference is made to the *Regulatory Compliance Document Register*,¹⁸ which lists standards, codes and other guidance relevant to design and construction of the infrastructure. Principal amongst these are codes published by the Water Services Association of Australia (WSAA), including:

- *Water Supply Code of Australia*, WSA 03-2012, Sydney Water Edition;
- *Sewerage Code of Australia*, WSA 02-2009 Sydney Water Edition; and
- *Pressure Sewer Code of Australia*, WSA 07-2007.

Review of construction drawings for the Stage 2 civil works¹⁹ (for example) reveals that the designs appear to be compliant with standards. The drawings also reference the relevant standards in relation to materials and construction requirements. In addition to the WSAA Codes, these include (for example) AS 1379 *Specification and supply of concrete*, AS 3798 *Guidelines on earthworks for commercial and residential developments* and AS/NZS 3000 *Electrical installations*.

Review of construction drawings for Stage 1 of the development²⁰ (for example) reveals that the designs appear to be consistent with the arrangements set out in the Master Plans and the identified design standards, thereby providing an appropriate basis for construction of the infrastructure.

The *Infrastructure Operating Plan*²¹ references a *Services Agreement*²² between Catherine Hill Bay Water and Solo Water, which indicates that Solo Water will provide Construction Services in relation to the Catherine Hill Bay infrastructure. Engagement of Solo Water in the management of construction activities is appropriate given that it (Solo Water) is nominated as an “Authorised Person” in the Licence.²³

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, clearly outlines the arrangements in relation to construction of the infrastructure.

Operation and Maintenance of the Infrastructure:

The *Infrastructure Operating Plan* outlines the strategies to be adopted in relation to operation²⁴ and maintenance²⁵ of the infrastructure.

The operational strategy addresses routine and abnormal /unplanned operations; automation of routine operation; staffing; and the need to optimise performance and operating costs. It is proposed to staff the

¹⁷ *Infrastructure Operating Plan*, section 6.2.

¹⁸ Solo, *Safety, Environment and Quality Regulatory Compliance Document Register* (live register with date currency checked noted for each document).

¹⁹ Cardno, *Solo Water; Catherine Hill Bay Water; Waste Water Treatment Plant; Civil Engineering Design* (Drawing Nos: SW-56-WWTP-WAE-1000 to 1032 (27 sheets)) (Revision X), 28 June 2018.

²⁰ Solo Water, *Catherine Hill Bay; Residential Subdivision – Stage 1; Potable Water, Recycled Water and Pressure Sewer Services* (Drawing Set as issued for construction, including standard drawings).

²¹ *Infrastructure Operating Plan*, section 4.2.

²² *Service Agreement; For the Provision of Construction Services, Retail Services and O&M Services at the Catherine Hill Bay Development* between Catherine Hill Bay Water Utility Pty Ltd and Solo Water Pty Ltd, dated 5 February 2016.

²³ NSW Government, *Network Operator's Licence No: 16_035* (as issued on 22 March 2016), tables 1.1, 2.1 and 3.1.

²⁴ *Infrastructure Operating Plan*, section 6.3.

²⁵ *Infrastructure Operating Plan*, section 6.4.

system on a five (5) days per week, normal working hours, basis and to rely on the SCADA system to initiate after-hours intervention.

Catherine Hill Bay Water has adopted a risk-based approach to maintenance, with assets categorised as either:²⁶

- Failure prevention (critical) assets – which attract unacceptable consequences in the event of failure and require a higher level of maintenance. Preventive and corrective maintenance, in conjunction with condition monitoring, is proposed.
- Can operate to fail assets – failure of which will not normally result in unacceptable consequences. These assets are further categorised as key and general equipment; key equipment is often installed in a duty/standby configuration.

The maintenance regime includes a combination of preventive, corrective, breakdown and major periodic maintenance activities.

Reference is made to the *Operator's Manual; Distribution System Networks; Stage 2*,²⁷ *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*²⁸ and a portfolio of documented procedures in relation to both operation and maintenance of the infrastructure; more specific reference to these documents is also made in the *Drinking Water Quality Management Plan*,²⁹ *Recycled Water Quality Management Plan*³⁰ and *Sewage Management Plan*.³¹ Review of these supporting documents as part the New Infrastructure Audit³² conducted in conjunction with this audit revealed that they identify the arrangements and provide appropriate guidance for the operation and maintenance of the infrastructure.

The *Infrastructure Operating Plan* identifies the role of operational staff in operating and maintaining the infrastructure;³³ specific roles and responsibilities are defined³⁴ with specific detail presented in individual position descriptions (which were reviewed in detail as part of the abovementioned New Infrastructure Audit).

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, clearly outlines the arrangements in relation to operation and maintenance of the infrastructure.

Lifecycle Asset Management:

The *Infrastructure Operating Plan*³⁵ outlines the arrangements in relation to the lifecycle management of the assets. In addition to planning and design, asset creation and procurement, and operation and maintenance, each of which has been discussed above, it also addresses Catherine Hill Bay Water's asset renewal and asset information strategies.

The process for the renewal and replacement of assets will take into account industry guidance (as presented in the Water Services Association of Australia (WSAA) Codes) and equipment manufacturers' recommendations, in addition to performance monitoring and condition assessment.³⁶ The expected working life has been identified by asset type (class), and the relationship between assessed condition and remaining life defined (indicatively). Asset age, condition and remaining life have been defined for key equipment assets, noting that at this point in time all assets are new.

²⁶ *Infrastructure Operating Plan*, section 6.4.1.

²⁷ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.

²⁸ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.

²⁹ *Drinking Water Quality Management Plan*, section 2.4.

³⁰ *Recycled Water Quality Management Plan*, section 2.4.

³¹ *Sewage Management Plan*, section 2.4.

³² Cobbitty Consulting/Water Futures, *Catherine Hill Bay Water Utility; New Infrastructure Audit (Stage 2 Scheme)* (Version 2.0), November 2018, table A.3.

³³ *Infrastructure Operating Plan*, section 6.3.2.

³⁴ *Infrastructure Operating Plan*, section 4.1.

³⁵ *Infrastructure Operating Plan*, section 6.

³⁶ *Infrastructure Operating Plan*, section 6.5.

Critical assets have been identified; these include the bulk water pumping station, bulk water transfer main, chlorine dosing systems, potable and recycled water pumping stations, potable water reservoir, recycled water reservoir, permeate reservoirs, MBR and permeate system, the advanced water treatment plant (UV unit and chlorine contact tank), and the pressure sewer main. This selection is considered appropriate.

Although not sighted by the auditors, the *Infrastructure Operating Plan*³⁷ references the *CHB Asset Management Reliability and Renewals Plan*, which sets out an anticipated renewals program over the next 30 years based on expected working lives of the assets.

Asset information is captured in an Asset Register and a set of Main Drawings.³⁸ The Asset Register and associated Maintenance Schedule are detailed in the *Operator's Manual; Distribution System Networks; Stage 2*³⁹ and *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*;⁴⁰ however, a standalone *Asset Register*⁴¹ is also in place. Review (on a sample basis) confirms that the information presented in the Operator's Manuals is consistent with that in the Asset Register; however, the *Asset Register* provides additional information (e.g. size/capacity; installation date; condition; criticality; and maintenance strategy) for use in managing the assets. A summary asset register is also presented in the *Infrastructure Operating Plan*.⁴²

Main drawings, which cover all components of the drinking water, sewerage and recycled water schemes (including the recycled water plant), are listed in the respective *Operator's Manual*;⁴³ they are also listed in a standalone *Drawing Register*.⁴⁴ A review reveals that the two sources are consistent, although the *Drawing Register* provides additional information (e.g. current issue number).

Asset information is also held in the GIS, and Solo Water/Catherine Hill Bay Water is currently in the process of implementing the Maximo enterprise asset management system; completion is expected in late 2018/early 2019.⁴⁵ Maximo will also be used for the management of Catherine Hill Bay Water's maintenance programs.

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, clearly outlines the arrangements in relation to lifecycle management (including renewal) of the infrastructure assets.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

³⁷ *Infrastructure Operating Plan*, section 6.5.3.

³⁸ *Infrastructure Operating Plan*, section 6.6.

³⁹ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018, tables 3.1, 3.2, 3.3, 3.4, 3.5 and 3.6 (Asset Registers); and appendix B (Maintenance Schedule).

⁴⁰ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018, tables 3.1 and 3.2 (Summary Asset Registers); and appendix B (Maintenance Schedule).

⁴¹ Solo, *Asset Register* (IMS-GNRL-G-4403), as at 18 October 2018.


⁴² *Infrastructure Operating Plan*, section 3.1.8 (table 3.1).

⁴³ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018, appendix C (Drawings List – Interim Scheme).

⁴⁴ Solo, *CHB Drawings Register* (IMS-CONT-G-1684-SW) (Issue No: 1.1), September 2018.

⁴⁵ *Infrastructure Operating Plan*, section 6.3.1.

Table A.2 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(b) and/or cl.13(1)(b)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(b) and/or cl.13(1)(b)	The IOP indicates the arrangements in relation to the continued safe and reliable performance of the infrastructure.	 Compliant
Risk This presents a high operational risk. The risk is generally managed by the implementation of an asset management system/framework that outlines the basis for the ongoing management of the infrastructure assets.		Target for Full Compliance Preparation of an Asset Management Plan and supporting procedural documentation and demonstrated implementation of appropriate infrastructure management practices.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator’s Manual; Distribution System Networks; Stage 2</i> (Revision 2.0), 21 September 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator’s Manual; Recycled Water Treatment Plant (RWTP); Stage 2</i> (Revision 1.0), 19 September 2018. ▪ Solo, <i>Catherine Hill Bay Water Utility; Risk Register – Stage 2</i> (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018. 		
Summary of reasons for grade		
The <i>Infrastructure Operating Plan</i> indicates the arrangements in relation to the lifecycle management of the infrastructure, the effective implementation of which will ensure the continued safe and reliable performance of the infrastructure. Referenced documents, including the Operator’s Manuals and a portfolio of more detailed procedures, will support implementation of the arrangements set out in the <i>Infrastructure Operating Plan</i> .		
Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this obligation.		
Discussion and notes		
The continued safe and reliable performance of the infrastructure is dependent upon the implementation of effective operational, maintenance, condition monitoring, and renewal/replacement practices. The lifecycle management of the assets is described at a strategic level in the <i>Infrastructure Operating Plan</i> , ⁴⁶ which outlines Catherine Hill Bay Water’s approach to planning and design, asset creation and procurement, operation and maintenance of the assets, asset renewal and the management of asset information. Each of these elements is discussed in Table A.1.		

⁴⁶ *Infrastructure Operating Plan*, section 6.

As reported in Table A.1, the *Infrastructure Operating Plan*:

- references the *Operator's Manual; Distribution System Networks; Stage 2*,⁴⁷ *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*⁴⁸ and a portfolio of more detailed operation and maintenance procedures, which collectively provide effective guidance for operation and maintenance of the infrastructure;
- identifies the role of operational staff in operating and maintaining the infrastructure;
- describes how performance monitoring and condition assessment will be used in conjunction with asset life expectancies to plan asset renewal and/or replacement; an anticipated 30-year renewal program is in place.

The continued safe and reliable performance of the infrastructure is also dependent upon having a clear understanding of the associated risks. The *Infrastructure Operating Plan*⁴⁹ outlines Catherine Hill Bay Water's approach to hazard identification and risk management. The *Risk Register – Stage 2*⁵⁰ identifies hazards associated with the various components of the system and outlines an appropriate control strategy. Many of the identified hazards/risks relate to infrastructure performance; the risk assessment has contributed to the identification of critical assets (refer Table A.1), for which a more rigorous maintenance regime has been adopted. In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, appropriately outlines the arrangements in relation to continued safe and reliable performance of the infrastructure.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.


⁴⁷ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.

⁴⁸ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.

⁴⁹ *Infrastructure Operating Plan*, section 5.

⁵⁰ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018.

Table A.3 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(c) and/or cl.13(1)(c)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(c) and/or cl.13(1)(c)	The IOP indicates the arrangements in relation to the continuity of the water supply and sewerage services.	 Compliant
Risk	This presents a high operational risk. The risk is generally managed by operating in accordance with agreed protocols for both planned and unplanned service interruptions.	Target for Full Compliance
		Development and implementation of appropriate protocols for both unplanned and planned service interruptions.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Sewage Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3728-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator’s Manual; Distribution System Networks; Stage 2</i> (Revision 2.0), 21 September 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator’s Manual; Recycled Water Treatment Plant (RWTP); Stage 2</i> (Revision 1.0), 19 September 2018. ▪ Solo, <i>Sewer Pipeline Repair</i> (IMS-OPER-D-8308-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>Comms Outage</i> (IMS-OPER-D-8310-SW) (Issue No: 2.0), September 2018. ▪ Solo, <i>Power Outage</i> (IMS-OPER-D-8309-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>Water Pipeline Repair Procedure</i> (IMS-OPER-D-8200-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water has arrangements in place for ensuring (as far as practicable) the continuity of water supply and sewerage services; these arrangements are documented in the <i>Infrastructure Operating Plan</i> and referenced supporting documentation. Furthermore, it has developed protocols (commitments), documented in its <i>Customer Contract</i>, in respect of unplanned and planned service interruptions. These protocols are consistent with industry standards.</p> <p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this obligation.</p>		
Discussion and notes		
<p>The continuity of water supply and sewerage services may be subject to either planned or unplanned interruptions. This is consistent with the servicing provisions for both similar ‘land and housing’ developments and the broader community.</p>		

The *Infrastructure Operating Plan* outlines arrangements in relation to continuity of supply.⁵¹ Arrangements in relation to emergency response and incident management⁵² are also applicable.

Primary risks associated with the continuity of water supply, which includes both drinking water and recycled water supply, under the Stage 2 Scheme arrangements, are identified as:⁵³

- “1. *Bulk, Drinking and Recycled Water Pump Station failure (power failure/ equipment failure).*
2. *Power supply failure at the RWTP and BWPS [Recycled Water Treatment Plant and Bulk Water Pumping Station].*
3. *Process/ equipment failure at the RWTP.*
4. *Bulk Water Transfer Pipeline failure (main break).”*

These risks have been mitigated through a number of controls, including:⁵⁴

- “1. *Remote monitoring and alarm systems through the SCADA system.*
2. *Designated potable water storage reservoir (1 ML) located at the CHB RWTP site with bypass capacity.*
3. *Regular asset inspections, monitoring and asset maintenance in accordance with the Operator’s Manual - Recycled Water Treatment Plant (RWTP) (IMS-OPER-B-1690-SW), Operator’s Manual - Distribution System Networks (IMS-OPER-B-8298-SW) and asset inspection procedures (IMS IMS-OPER-D-8303-SW, IMS-CONT-D-1691-SW).*
4. *In-build system redundancy with the plant configuration where possible to provide back-up capacity.*
5. *Emergency standby generator with auto-changeover switches for the RWTP.*
6. *Provision for the connection of portable generators at the Bulk Water Pump Station (BWPS) and Interim Site.*
7. *Capacity to top-up the recycled water supply with potable water in the event of a RW process failure.*
8. *Contingency planning incorporating the utilisation of bulk potable water tankers to provide continuity of potable water supply in the event of a BWPS failure or main break.”*

Arrangements in relation to the continuity of sewerage services are not specifically described in the *Infrastructure Operating Plan*, although there are references to specific procedures that do address the principal mitigation approach. For example:

- The *Sewage Management Plan* indicates that:⁵⁵

“System redundancy has also been incorporated within the system design to provide sufficient flexibility and process control. This includes the provision of standby pump units for the PSU’s, and additional emergency storage capacity within the PSU wells, Inlet Balance Tank and Emergency Storage Tanks.”

- The *Sewer Pipeline Repair Procedure* indicates that:⁵⁶

“Monitor the sewage level within any PSUs affected by the pipeline repair activities. Should the duration of the expected disruption to facilitate the repair be > 8 hours or the PSU levels reach the ‘High’ level alarm status, arrange for Solo Industrial Services on 1800 7656 47 (1800 SOLO IS) to provide vacuum tanker to empty the PSUs. This will be required to maintain a sewage level within the effected PSU’s to prevent potential overflow.”

Notwithstanding, as an opportunity for improvement (**OFI-CHB2-LPA.01**), it is suggested that Catherine Hill Bay Water includes more specific details in respect of the continuity of sewerage services in the *Infrastructure Operating Plan* (similar to that provided in respect of the continuity of water supply). This opportunity for improvement was previously identified and reported in respect of the Stage 1 (Interim Scheme) Licence Plan Audit.

⁵¹ *Infrastructure Operating Plan*, section 5.3.

⁵² *Infrastructure Operating Plan*, section 5.4.

⁵³ *Infrastructure Operating Plan*, section 5.3.

⁵⁴ *Infrastructure Operating Plan*, section 5.3.

⁵⁵ *Sewage Management Plan*, section 2.4.4.

⁵⁶ Solo, *Sewer Pipeline Repair* (IMS-OPER-D-8308-SW) (Issue No: 1.0), June 2017.

Review of the SCADA system during the audit site inspection, as well as review of functional specifications for the various systems/system components (referenced in Table A.1) reveals that the specified control, monitoring and alarm arrangements are appropriate to ensuring the continuity of services. The *Comms Outage Procedure*⁵⁷ outlines the arrangements, which include on-site monitoring of the Bulk Water Pumping Station, Chlorination Facility, Pressure Sewer Units (PSUs) and Sewage Pump Out Tank, to be implemented in the event of communications failure.

The Operator's Manuals (*Operator's Manual; Distribution System Networks; Stage 2*⁵⁸ and *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*)⁵⁹ and relevant operation and maintenance procedures outline arrangements, including asset inspections, monitoring and asset maintenance activities required to ensure the continued performance of the infrastructure, and therefore the continuity of services (refer Table A.1 and Table A.2). Key procedures for the management of incidents (ensuring continuity of services) are identified in the *Infrastructure Operating Plan*.⁶⁰

The *Power Outage Procedure*⁶¹ details contingency arrangements to be implemented in the event of a power outage. These include:

- Hiring a 3-phase emergency generator to supply the Bulk Water Pumping Station;
- Attending site to ensure that the standby generator at the recycled water plant (operation of which is initiated by an auto changeover switch) has started and is operating correctly;
- Use of a standby generator (single phase) generator located at the recycled water plant to power PSUs on an as-needed basis (additional units to be hired if necessary);
- If necessary, engaging a vacuum truck(s) to empty PSUs on an as needed basis; and
- Active monitoring of all components of the systems either via the SCADA system or manually.

As noted above, the *Sewer Pipeline Repair Procedure* identifies the possible need to use vacuum trucks to empty PSUs. Similarly, the *Water Pipeline Repair Procedure*⁶² identifies the conditions that would lead to arranging for bulk water tanker delivery.

The Operator's Manuals and the relevant procedures include contact details for arranging support, including Coates Hire for generators, Solo Resource Recovery for vacuum trucks (alternative resources are also identified) and Barneys Tank Cleaning or Turners Water Cartage for water cartage tankers. These are also listed in the *CHB Stakeholder Register*.⁶³

The Solo Water *Customer Contract*,⁶⁴ which is referenced under the Levels of Service provisions of the *Infrastructure Operating Plan*,⁶⁵ sets out Catherine Hill Bay Water/Solo Water's commitments to its customers in the event of either planned or unplanned interruptions (as well as other factors that may affect service). These arrangements are generally consistent with the commitment to residential customers in (for example) Hunter Water's Customer Contract.⁶⁶

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, outlines the arrangements in relation to ensuring continuity of the water supply and sewerage services.

⁵⁷ Solo, *Comms Outage* (IMS-OPER-D-8310-SW) (Issue No: 2.0), September 2018.

⁵⁸ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.

⁵⁹ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.

⁶⁰ *Infrastructure Operating Plan*, table 5.1.

⁶¹ Solo, *Power Outage* (IMS-OPER-D-8309-SW) (Issue No: 1.0), June 2017.

⁶² Solo, *Water Pipeline Repair Procedure* (IMS-OPER-D-8200-SW) (Issue No: 1.0), June 2017.

⁶³ Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018.

⁶⁴ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018, section 3.4.

⁶⁵ *Infrastructure Operating Plan*, section 2.2.

⁶⁶ Hunter Water, *Customer Contract 2017-2022*, sections 8.1 and 8.2 (available at: <https://www.hunterwater.com.au/Resources/Documents/Legislation-and-Governance/Operating-Licence-and-Customer-Contract-2017-2022.pdf>).

Recommendations


There are no recommendations in respect of this obligation.

Opportunities for improvement

The following opportunity for improvement has been identified in respect of this obligation:

- **OFI-CHB2-LPA.01:** It is suggested that Catherine Hill Bay Water includes more specific details in respect of the continuity of sewerage services in the *Infrastructure Operating Plan* (similar to that provided in respect of the continuity of water supply).
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Table A.4 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(d) and/or cl.13(1)(d)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(d) and/or cl.13(1)(d)	The IOP indicates the arrangements in relation to alternative water supplies and sewerage services when the infrastructure is inoperable.	 Compliant
Risk This presents a high operational risk. The risk is generally managed by operating in accordance with agreed protocols for both planned and unplanned service interruptions.		Target for Full Compliance Development and implementation of appropriate protocols for both unplanned and planned service interruptions.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018, section 3.4. ▪ IPART, <i>Network Operator's Reporting Manual</i> (Issue No: 6), 29 June 2018. 		
Summary of reasons for grade		
<p>As reported in Table A.3, Catherine Hill Bay Water has arrangements in place for ensuring (as far as practicable) the continuity of water supply and sewerage services; these include arrangements in relation to alternative water supplies and sewerage services when the infrastructure is inoperable. These arrangements are documented in the <i>Infrastructure Operating Plan</i> and referenced supporting documentation.</p> <p>Furthermore, the Solo Water <i>Customer Contract</i> clearly identifies conditions under which Catherine Hill Bay Water/Solo Water may be unable to maintain water supplies or sewerage services. Such conditions are consistent with those identified by other water utilities.</p> <p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this obligation.</p>		
Discussion and notes		
<p>Assessment of the arrangements in relation to alternative water supplies and sewerage services when the infrastructure is inoperable has been largely addressed by the discussion presented in Table A.3.</p> <p>Dependent upon what infrastructure is inoperable, principal responses in the case of inoperable infrastructure would involve:</p> <ul style="list-style-type: none"> ▪ Tankering of water to maintain water supplies; and ▪ Removal of sewage from Pressure Sewer Units (PSUs) using a vacuum truck. 		
Details of these measures are as discussed in Table A.3.		
The Solo Water <i>Customer Contract</i> , ⁶⁷ which is referenced under the Levels of Service provisions of the <i>Infrastructure Operating Plan</i> , ⁶⁸ indicates that in the case of unplanned interruptions: “if necessary and where		

⁶⁷ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.0), July 2017, section 3.4.2.

⁶⁸ *Infrastructure Operating Plan*, section 2.2.

*practical we provide access to emergency supplies of water*⁶⁹. The need to provide alternative sewage services (e.g. temporary toilet facilities) would not normally be deemed necessary given the storage capacity available in the pressure sewer units (PSUs).

The *Customer Contract*⁶⁹ also clearly identifies the conditions under which it may be unable to maintain the supply of drinking water or recycled water, or the provision of sewerage services. These conditions, which are consistent with other water utilities, include:

- planned or unplanned interruptions;
- in the case of water restrictions (for drinking water);
- circumstances in which Catherine Hill Bay Water/Solo Water is entitled to restrict supply/services (which are clearly defined);
- major operational difficulty (for recycled water); and
- events beyond the reasonable control of Catherine Hill Bay Water/Solo Water.

It is noted that Catherine Hill Bay Water has nominated target service standards in relation to infrastructure performance and service interruptions in the *Infrastructure Operating Plan*.⁷⁰ The indicators for which targets have been set are consistent with the *Reporting Manual*;⁷¹ nominated targets have been set relative to the reported performance of NSW Local Water Utilities.

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, outlines the arrangements in relation to alternative water supplies and sewerage services when the infrastructure is inoperable.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

⁶⁹ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018, sections 3.1.1 (drinking water), 3.2.1 (recycled water) and 3.3.1 (wastewater).

⁷⁰ *Infrastructure Operating Plan*, section 2.3 (including tables 2.1, 2.2 and 2.3).

⁷¹ IPART, *Network Operator's Reporting Manual* (Issue No: 6), 29 June 2018, appendix E.

Table A.5 IOP Audit Table – WIC Reg Sched 1 cl.6(1)(e) and/or cl.13(1)(e)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.6(1)(e) and/or cl.13(1)(e)	The IOP indicates the arrangements in relation to the maintenance, monitoring and reporting of standards of service.	 Compliant

Risk	Target for Full Compliance
This presents a medium operational risk in that the Licensee may be unaware that standards of service are not being met in the absence of performance monitoring.	Implementation of appropriate systems to monitor the service delivery performance of the infrastructure.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2* (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Sewage Management Plan; Stage 2* (reference: IMS-ENVM-B-3728-SW) (Revision 2.1), 5 November 2018.
- Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.
- IPART, *Network Operator's Reporting Manual* (Issue No: 6), 29 June 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.
- Solo, *CHB Faults and Issues Register* (IMS-CONT-G-1674-SW), as at 18 October 2018.
- Solo, *CHB Workorder Log* (IMS-CONT-G-1681-SW), as at 18 October 2018.
- Solo, *IPART Reporting Procedure* (IMS-OPER-D-8324-SW) (Issue No: 1.1), March 2018.
- Solo, *CHB Regulatory & Formal Requirements* (IMS-CONT-G-1677-SW) (Issue No: 1.0), April 2017 [updated 16 October 2018].

Summary of reasons for grade

The *Infrastructure Operating Plan* indicates the arrangements in relation to the maintenance, monitoring and reporting of standards of service, which are also clearly documented. Maintenance of standards is reliant on the implementation of relevant operation and maintenance procedures; monitoring and reporting is principally dependent upon the SCADA system and maintenance records.

Accordingly, Catherine Hill Bay Water is assessed as being compliant with this obligation.

Discussion and notes

The *Infrastructure Operating Plan*⁷² references the Solo Water *Customer Contract*⁷³ in relation to the levels of service that will be provided. Target service standards in relation to infrastructure performance, service interruptions, water quality and environmental performance are also nominated in the *Infrastructure Operating Plan*,⁷⁴ which indicates that the targets have been set relative to the reported performance of NSW Local Water Utilities. The indicators for which targets have been set are consistent with the *Reporting Manual*.⁷⁵

Arrangements in relation to the maintenance of service standards (continuity of service) are discussed in Table A.3.

Monitoring (and indeed maintenance) of standards of service are heavily dependent on the SCADA monitoring and control system, the functionality of which (control philosophy) is described in the *Infrastructure Operating Plan*.⁷⁶ Review of functional specifications for the various systems/system components (referenced in Table A.1) reveals that the appropriate parameters in relation to water quality and water consumption (for example) are monitored.

Operational and verification monitoring in respect of water quality is further addressed in the *Drinking Water Quality Management Plan*⁷⁷ and *Recycled Water Quality Management Plan*,⁷⁸ as appropriate, and specific procedures referenced therein. Similarly monitoring in respect of the sewerage system is also addressed in the *Sewage Management Plan*.⁷⁹

The Operator's Manuals set out in detail the arrangements in relation to monitoring of system performance, including parameters reflective of standards of service. The Operator's Manuals (*Operator's Manual; Distribution System Networks; Stage 2*⁸⁰ and *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*)⁸¹ reference the *CHB Faults and Issues Register*⁸² and *CHB Work Order Log*⁸³ as the principal repositories for maintenance records prior to a proprietary asset management system being in place (as reported in Table A.1, implementation of a Maximo enterprise asset management system expected to completed in late 2018/early 2019). It is understood that monitoring of performance in respect of service interruptions is currently based on information derived from these registers; review of these information sources confirms that appropriate information is to be recorded.

The *Infrastructure Operating Plan*⁸⁴ outlines the arrangements in relation to the reporting of standards of service. Principal amongst these is reporting to IPART in accordance with the *Reporting Manual*. Reference is made to the *IPART Reporting Procedure*⁸⁵ and *Regulatory & Formal Requirements Register*⁸⁶ which together document the reporting requirements.

Requirements for reporting to other stakeholders, including NSW Health, are also identified.

In summary, the *Infrastructure Operating Plan*, in conjunction with referenced supporting documentation, outlines the arrangements in relation to the maintenance, monitoring and reporting of standards of service.

⁷² *Infrastructure Operating Plan*, section 2.2.

⁷³ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

⁷⁴ *Infrastructure Operating Plan*, section 2.3 section 2.3 (including tables 2.1, 2.2 and 2.3).

⁷⁵ IPART, *Network Operator's Reporting Manual* (Issue No: 6), 29 June 2018, appendix E.

⁷⁶ *Infrastructure Operating Plan*, section 3.1.7.

⁷⁷ *Drinking Water Quality Management Plan*, sections 2.4.2 and 2.5.1 (respectively).

⁷⁸ *Recycled Water Quality Management Plan*, sections 2.4.2 and 2.5.1 (respectively).

⁷⁹ *Sewage Management Plan*, sections 2.4.2 and 2.5.1.

⁸⁰ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018, section 5.3.

⁸¹ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018, section 5.3.

⁸² Solo, *CHB Faults and Issues Register* (IMS-CONT-G-1674-SW), as at 18 October 2018.

⁸³ Solo, *CHB Workorder Log* (IMS-CONT-G-1681-SW), as at 18 October 2018.

⁸⁴ *Infrastructure Operating Plan*, section 7.

⁸⁵ Solo, *IPART Reporting Procedure* (IMS-OPER-D-8324-SW) (Issue No: 1.1), March 2018.

⁸⁶ Solo, *CHB Regulatory & Formal Requirements* (IMS-CONT-G-1677-SW) (Issue No: 1.0), April 2017 [updated 16 October 2018].

Recommendations

There are no recommendations in respect of this obligation.


Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

Appendix B Detailed Audit Findings – Water Quality Plan (Drinking Water) (WQP (dw))

Detailed audit findings in respect of the *Water Quality Plan (Drinking Water)* (WQP (dw)) are presented in this Appendix.

Table B.1 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 1

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 1. The WQP (dw) shows a commitment to water quality management.	 Compliant
Risk The lack of a water quality policy, up to date and accurate details for regulatory and formal requirements and contact details for stakeholders presents a small operational risk for this scheme.		Target for Full Compliance A water quality policy, an up to date list of regulatory and formal requirements and an up to date list of stakeholders and their contact details.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo, <i>Drinking Water Policy</i>, (IMS-ENVM-A-3729-SW) (Issue No: 1.0), April 2017. ▪ Solo, <i>Quality, Safety and Environmental Aspects Risk Register</i> (IMS-RISK-G-8856-SW), as at 18 October 2018. ▪ Solo, <i>CHB Regulatory & Formal Requirements</i> (IMS-CONT-G-1677-SW) (Issue No: 1.0), April 2017. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018, as at 18 October 2018. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. 		
Summary of reasons for grade		
Catherine Hill Bay Water demonstrated that it has a <i>Drinking Water Quality Policy</i> and up-to-date lists of regulatory and formal requirements and stakeholders in place. It also demonstrated that it has adequately identified and engaged with its principal stakeholders, including NSW Health. Consequently, Catherine Hill Bay Water was considered compliant with this requirement.		

Discussion and notes

Policy:

A *Drinking Water Policy*⁸⁷ is in place and is considered appropriate. The *Policy* was on display in the Catherine Hill Bay Water office at the recycled water plant; it is also included as an appendix to the *Drinking Water Quality Management Plan*.

Catherine Hill Bay Water/Solo Water is a small organisation. Based on the audit interviews and site inspections it was apparent that those involved with the scheme are appropriately informed.

Regulatory and formal requirements:

Catherine Hill Bay Water sets out in detail how it will retain awareness and compliance with its regulatory and formal requirements in its *Drinking Water Quality Management Plan*.⁸⁸ The relevant legislation is identified in the Solo corporate *Quality, Safety and Environmental Aspects Risk Register*.⁸⁹ The regulatory and formal requirements for the Catherine Hill Bay Water scheme are further outlined in the *CHB Regulatory & Formal Requirements Register*.⁹⁰ It is apparent that these registers are maintained up-to-date; for example, the *CHB Regulatory & Formal Requirements Register* was reviewed and updated in respect of the WIC Act Licence requirements on 16 October 2018.

Engaging stakeholders:

Catherine Hill Bay Water has identified its principal stakeholders⁹¹ and engaged with them. There was good evidence of Catherine Hill Bay Water engagement with key stakeholders such as NSW Health, Central Coast Council, Hunter Water and IPART. For instance, Philippe Porigneaux, Environmental Health Manager, NSW Health Hunter New England Population Health, was involved in the scheme risk assessments undertaken in May 2016, May 2017 (12-month review) and July 2018, as well as reviewing multiple scheme documents as part of Catherine Hill Bay Water's ongoing consultation with NSW Health.^{92,93}

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

⁸⁷ Solo, *Drinking Water Policy*, (IMS-ENVM-A-3729-SW) (Issue No: 1.0), April 2017.

⁸⁸ *Drinking Water Quality Management Plan*, section 2.1.3.

⁸⁹ Solo, *Quality, Safety and Environmental Aspects Risk Register* (IMS-RISK-G-8856-SW), as at 18 October 2018.


⁹⁰ Solo, *CHB Regulatory & Formal Requirements* (IMS-CONT-G-1677-SW) (Issue No: 1.0), April 2017 [updated 16 October 2018].

⁹¹ Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018, as at 18 October 2018.

⁹² Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

⁹³ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

Table B.2 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 2

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 2. The WQP (dw) includes an assessment of the water supply system.	 Compliant

Risk	Target for Full Compliance
Failure to adequately describe the system and assess risks could lead to risks being overlooked.	Adequate system description and risk assessment.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018.
- Solo Water, *Process Flow Diagram; Drinking Water Stage 2* (Drawing No: 56-PW-PFD-ST2, Rev 1), 21 August 2017.
- Pressure Sewer Solutions, *Potable Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.
- Drawings No: SW-56-C-LP-1001, 1002 & 1003, *Catherine Hill Bay Residential Subdivision Stage 1; Potable and Recycled Water Layout Plan Work as Executed Sheets 1, 2 & 3*, signed August/September 2015.
- Witthoft Engineering, *Solo Water; Catherine Hill Bay; P&ID Drawings* (Drawings No: SW-56-RWTP-P-0000 to 9200 (16 sheets of various revisions and dated).
- Solo, *Catherine Hill Bay Water Utility; Interim Water Supply Risk Assessment* (IMS-ENVM-3635-SW) (Version 2.1), 6 June 2017.
- Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Drinking Water* worksheet.

Summary of reasons for grade

Catherine Hill Bay Water demonstrated that the *Drinking Water Quality Management Plan* in conjunction with other relevant documentation provides an appropriate assessment of the water supply system. The system arrangement is documented, arrangements are in place for the ongoing monitoring and analysis of source drinking water; and risk assessments have been undertaken by appropriately experienced teams in accordance with the guidance presented in the *Australian Drinking Water Guidelines*.

Accordingly, Catherine Hill Bay Water is assessed to be compliant with this requirement.

Discussion and notes

Water supply system analysis:

The drinking water supply scheme is described in detail in the *Drinking Water Quality Management Plan*.⁹⁴ A process flow diagram is provided both as an appendix in the *Drinking Water Quality Management Plan* and as a standalone document.⁹⁵ The flow diagram is simple, reflects the situation observed on the ground and describes the system in sufficient detail.

The basis of the system design, under which bulk water is supplied by Central Coast Council, is detailed in the *Drinking Water Master Plan*.⁹⁶ The primary components of the system include:

- a bulk potable water pumping station, which draws water directly from the Central Coast Council water supply system;
- a bulk water supply pipeline, through which water is transferred to Catherine Hill Bay;
- a 1 ML drinking water storage tank;
- a drinking water booster pumping station;
- a chlorine monitoring and dosing system; and
- drinking water distribution/reticulation network.

Detailed design drawings of the bulk water pumping station, bulk water pipeline, drinking water storage, and distribution/reticulation network are available.⁹⁷ Detailed arrangement of the booster pumping station and chlorine dosing facility and their relationship to the remainder of the system are shown on the relevant Piping and Instrumentation Drawings (P&IDs).⁹⁸

Assessment of water quality data:

The *Drinking Water Quality Management Plan*⁹⁹ indicates that potable water quality monitoring data from Kanangra Drive Reservoir (the source of supply) has been sourced from Central Coast Council to understand the water quality at the connection point. It further notes that, given the relatively long transfer distance it is evident from the data that there is a need to boost chlorine residual at the Catherine Hill Bay Water scheme as the free chlorine residual from the reservoir is unlikely to be sustained up to the customers' taps.

Catherine Hill Bay Water notes that, although the source water is potable, it will undertake monitoring at the connection point in accordance with its *Water Quality Verification Monitoring Procedure* and *Free Chlorine Field Verification Monitoring Procedure* to ensure supply point compliance.

Hazard identification and risk assessment:

A risk assessment in respect of the Stage 1 (Interim Scheme) was undertaken in May 2016 with a 12-month review and update completed in May 2017. A major review of the risk assessment “to incorporate the MBR/ AWTP, recycled water and onsite storages/ booster systems” was undertaken in July 2018.

The risk assessment team for the Stage 1 (Interim Scheme) assessment included representatives of NSW Health (Philippe Porigneaux, Environmental Health Manager, NSW Health Hunter New England Population Health), Catherine Hill Bay Water/Solo Water and GHD, which is considered adequate. The major review and update in July 2018 was undertaken by representatives of Catherine Hill Bay Water/Solo Water, NSW Health (Hunter New England Population Health) and

⁹⁴ *Drinking Water Quality Management Plan*, section 2.2.1.2.

⁹⁵ Solo Water, *Process Flow Diagram; Drinking Water Stage 2* (Drawing No: 56-PW-PFD-ST2, Rev 1), 21 August 2017.

⁹⁶ Pressure Sewer Solutions, *Potable Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.

⁹⁷ For example: Drawings No: SW-56-C-LP-1001, 1002 & 1003, *Catherine Hill Bay Residential Subdivision Stage 1; Potable and Recycled Water Layout Plan Work as Executed Sheets 1, 2 & 3*, signed August/September 2015.

⁹⁸ Witthoft Engineering, *Solo Water; Catherine Hill Bay; P&ID Drawings* (Drawings No: SW-56-RWTP-P-0000 to 9200 (16 sheets of various revisions and dated).

⁹⁹ *Drinking Water Quality Management Plan*, section 2.2.2.

consultants Witthoft Engineering (electrical, instrumentation and industrial control system solutions) and Aquatis (process technology), which is again considered appropriate given the inclusion of the additional Stage 2 infrastructure.

The risk assessment has been documented in the *Risk Register – Interim Scheme (Sewage)*¹⁰⁰ (Stage 1 assessment) and the *Risk Register – Stage 2*¹⁰¹ (Stage 2 assessment). It is also included as an appendix in the *Drinking Water Quality Management Plan*.

The risk registers detail the identified hazards and the assessed maximum and residual risk (unmitigated and mitigated) based on assessed likelihood and consequence, consistent with the approach detailed in the *Australian Drinking Water Guidelines* (ADWG).

Recommendations

There are no recommendations in respect of this obligation.


Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁰⁰ Solo, *Risk Register – Interim Scheme (Sewage)* (IMS-ENVM-G-3635-SW) (Revision 2.1), 6 June 2017.

¹⁰¹ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Drinking Water* worksheet.

Table B.3 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 3

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 3. The WQP (dw) outlines the preventive measures for drinking water quality management.	 Compliant

Risk	Target for Full Compliance
Failure to adequately define preventive measures and assess residual risks could lead to risks being overlooked.	Adequate definition of preventive measures and residual risk assessment.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018.
- Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Drinking Water* worksheet.
- Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.
- Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.

Summary of reasons for grade

Catherine Hill Bay Water has provided sufficient detail in relation to its drinking water risk management measures (controls) for the supply of potable water. It is noted that bulk potable water will be supplied by Central Coast Council; such bulk water is to be compliant with the requirements of the *Australian Drinking Water Guidelines* (ADWG).

Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.

Discussion and notes

Preventive measures and residual risk assessment:

As reported in Table B.2, Catherine Hill Bay Water will source bulk potable water, which is compliant with the *Australian Drinking Water Guidelines* (ADWG), from Central Coast Council. Notwithstanding, it is incumbent on Catherine Hill Bay Water to ensure that water quality is maintained downstream of the supply point, and the *Drinking Water Quality Management Plan*¹⁰² refers to preventive measures identified through the risk assessment process.

The principal preventative measure incorporated into the design of the Catherine Hill Bay Water drinking water scheme is the free chlorine monitoring and sodium hypochlorite dosing system located at the Catherine Hill Bay Water site. This system automatically monitors and controls the free chlorine concentrations of all water supplied to customers at the point of discharge from the drinking water storage tank located at the recycled water treatment plant.

¹⁰² *Drinking Water Quality Management Plan*, section 2.3.1.

The risk assessment, which is documented in detail in the *Risk Register – Stage 2*¹⁰³ included consideration of preventive measures to mitigate the potential impact of identified hazards and assessed the level of residual risk based on an assessment of likelihood and consequence, consistent with the ADWG guidelines.

Critical control points:

As noted above, the free chlorine monitoring and sodium hypochlorite dosing system has been identified as the principal preventative measure and has been adopted as the critical control point (CCP) for this scheme.¹⁰⁴ This is considered appropriate for a scheme of this nature.

The target criteria and critical limits for the CCP are set out in the supporting *CCP Residual Chlorination Management Procedure*.¹⁰⁵ The identified process limits are as follows:

- Target: 1.5 mg/L;
- Operational/warning limits: < 1.0 mg/L or > 3.0 mg/L and for > 10 minutes; and
- Critical limits: < 0.5 mg/L or > 4.5 mg/L and for > 10 minutes.

Given that the source water is potable water from Central Coast Council (a neighbouring local government water utility), these limits are considered adequate.

With respect to residual chlorine in the network, a target range of 0.2 mg/L to 4.5 mg/L has been set.¹⁰⁶

It is noted that, although reference is made to the relevant procedures, the CCP limits are not documented in the *Drinking Water Quality Management Plan*. In comments provided by NSW Health in respect of the audit scope,¹⁰⁷ it expressed concern that a summary of the CCPs (monitoring, targets and limits) is not included in the *Drinking Water Quality Management Plan*. Accordingly, as an opportunity for improvement (**OFI-CHB2-LPA.02**), it is suggested that Catherine Hill Bay Water considers including a summary of the drinking water CCP details in its *Drinking Water Quality Management Plan*, consistent with the requirements of NSW Health.

NSW Health also noted that all CCPs (for both drinking and recycled water) list “Hazard(s) of Concern” as “Pathogens”, and suggested that the description would benefit by making distinction between virus, bacteria and protozoa in the CCP tables to make it clear which barriers are effective for each pathogen. Accordingly, this has been identified as a further opportunity for improvement (**OFI-CHB2-LPA.03**).

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

The following opportunities for improvement have been identified in respect of this obligation:

- **OFI-CHB2-LPA.02:** it is suggested that Catherine Hill Bay Water considers including a summary of the drinking water CCP details in its *Drinking Water Quality Management Plan*, consistent with the requirements of NSW Health.
- **OFI-CHB2-LPA.03:** it is suggested that Catherine Hill Bay Water revises the identification of “Hazard(s) of Concern” in its CCP tables to distinguish between virus, bacteria and protozoa, thereby making it clear which barriers are effective for each pathogen.
[This OFI is also applicable in respect of recycled water.]

¹⁰³ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Drinking Water* worksheet.


¹⁰⁴ *Drinking Water Quality Management Plan*, section 2.3.2.

¹⁰⁵ Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.

¹⁰⁶ Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.

¹⁰⁷ Email dated 12 October 2018 from NSW Health to IPART (re: *Catherine Hill Bay New Infrastructure Audit*).

Table B.4 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 4

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 4. The WQP (dw) outlines the operational procedures and process control for the scheme.	 Compliant
Risk	Failure to adequately formalise procedures could lead to inconsistent operation and exposes customers to risk of poor quality water being.	Target for Full Compliance
		Adequate detail on operational procedures to protect water quality.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2</i> (Revision 2.0), 21 September 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2</i> (Revision 1.0), 19 September 2018. ▪ Solo, <i>Field Asset Maintenance Procedure</i> (IMS-OPER-D-8326-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>Field Asset Maintenance Checklist</i> (IMS-OPER-F-8329-SW) (Issue No: 1.0), May 2017. ▪ Solo, <i>Catherine Hill Bay; Operations Workflow Checklist</i> (IMS-CONT-G-1683-SW) (Issue No: 1.0), May 2017. ▪ Solo, <i>CCP Residual Chlorination Management Procedure</i> (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018. ▪ Solo, <i>Free Chlorine Field Verification Monitoring Procedure</i> (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>Water Quality Verification Monitoring Procedure</i> (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>Suspected Cross Connection Procedure</i> (IMS-OPER-D-8304-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>GIS Meter Procedure</i> (IMS-OPER-D-8315-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>Asset Inspection Checklist Procedure</i> (IMS-OPER-D-8303-SW) (Issue No: 1.0), June 2017. ▪ Solo, <i>Asset Inspection Checklist Procedure (RWTP)</i> (IMS-CONT-D-1691-SW) (Issue No: 1.0), July 2018. ▪ Witthoft Engineering, <i>Catherine Hill Bay RWTP; Functional Specification; PLC01 – Main PLC</i> (Revision 2.00), 15 October 2018. ▪ Witthoft Engineering, <i>Catherine Hill Bay RWTP; Functional Specification; PLC01 – RWPWPS PLC</i> (Revision 2.00), 15 October 2018. 		

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- Solo, *Corrective Action Request (CAR) Procedure* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.
 - Pressure Sewer Solutions, *Potable Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.
 - Castle Chemicals, *Technical Bulletin Chlor 12 Liquid Chlorine Bleach*, available at http://castlechem.com.au/sds/Chlor12_tb.pdf.
 - Castle Chemicals, *Safety Data Sheet, Chlor 12*, Version 1.2, 14 February 2017.
 - Email from Graham Hatfield of Castle Chemicals to Ross Pascoe of Solo Water with subject “FW: Use of Chlor 12 for Chlorinating Potable water”, dated 5 July 2017.
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Summary of reasons for grade

Catherine Hill Bay Water has outlined its arrangements in relation to operational procedures, operational monitoring and corrective actions. It has also detailed its arrangements for ensuring that equipment capability is maintained and material and chemicals are of the required standard.

Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.

Discussion and notes

Operational procedures:

Catherine Hill Bay Water has developed operational procedures covering the main routine processes required to manage water quality and to undertake corrective actions. These are identified in the *Drinking Water Quality Management Plan*,¹⁰⁸ which also identifies the *Infrastructure Operating Plan* and Operator’s Manuals (*Operator’s Manual; Distribution System Networks; Stage 2*¹⁰⁹ and *Operator’s Manual; Recycled Water Treatment Plant (RWTP); Stage 2*).¹¹⁰

A sample of the referenced procedures were reviewed by the auditors, including:

- *Field Asset Maintenance Procedure*¹¹¹ for general maintenance and associated *Field Asset Maintenance Checklist*;¹¹²
- *Operations Workflow Checklist*;¹¹³
- *CCP Residual Chlorination Management Procedure*;¹¹⁴
- *Free Chlorine Field Verification Monitoring Procedure*;¹¹⁵
- *Water Quality Verification Monitoring Procedure*;¹¹⁶
- *Suspected Cross Connection Procedure*¹¹⁷ for investigating suspected cross connections between potable and recycled water pipes; and
- *GIS Meter Procedure*¹¹⁸ for obtaining accurate meter readings.

The review revealed that these procedures appropriately detail the activities to which each procedure relates.

¹⁰⁸ *Drinking Water Quality Management Plan*, section 2.4.1.

¹⁰⁹ Solo Water, *Catherine Hill Bay Water Utility; Operator’s Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.

¹¹⁰ Solo Water, *Catherine Hill Bay Water Utility; Operator’s Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.

¹¹¹ Solo, *Field Asset Maintenance Procedure* (IMS-OPER-D-8326-SW) (Issue No: 1.0), June 2017.

¹¹² Solo, *Field Asset Maintenance Checklist* (IMS-OPER-F-8329-SW) (Issue No: 1.0), May 2017.

¹¹³ Solo, *Catherine Hill Bay; Operations Workflow Checklist* (IMS-CONT-G-1683-SW) (Issue No: 1.0), May 2017.

¹¹⁴ Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.

¹¹⁵ Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.

¹¹⁶ Solo, *Water Quality Verification Monitoring Procedure* (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018.

¹¹⁷ Solo, *Suspected Cross Connection Procedure* (IMS-OPER-D-8304-SW) (Issue No: 1.0), June 2017.

¹¹⁸ Solo, *GIS Meter Procedure* (IMS-OPER-D-8315-SW) (Issue No: 1.0), June 2017.

Operational monitoring:

Arrangements for operational monitoring are outlined in the *Drinking Water Quality Management Plan*,¹¹⁹ and in more detail in the above referenced Operator's Manuals. Monitoring will primarily be undertaken on-line via the SCADA system, which will provide exception reporting through alarms, but also in accordance with (for example) the *Asset Inspection Checklist Procedure*,¹²⁰ and *Asset Inspection Checklist Procedure (RWTP)*¹²¹ and supporting checklists.

Functional specifications identified in the *Infrastructure Operating Plan*¹²² detail the SCADA monitoring and control arrangements. The *Catherine Hill Bay RWTP - Functional Specification F - PLC01 Main PLC*¹²³ includes details in relation to the chlorine monitoring and dosing system; the *Catherine Hill Bay RWTP - Functional Specification H - PLC03 RWPWPS PLC*¹²⁴ includes details in relation to the potable water pumping station and storage.

Corrective actions:

The *Drinking Water Quality Management Plan*¹²⁵ indicates that corrective actions have been detailed in the operational procedures, where appropriate; for example, in the above referenced *CCP Residual Chlorination Management Procedure*, *Free Chlorine Field Verification Monitoring Procedure* and *Water Quality Verification Monitoring Procedure*. Review of these documents confirms that corrective actions have indeed been documented.

The *Drinking Water Quality Management Plan* also notes that all incidents and non-compliances will be managed in accordance with the *Incident Response and Notification Management Plan* (refer Table B.6), and that reviews will be undertaken for all incidents and improvements initiated via the *Corrective Action Request Procedure*.¹²⁶

Equipment maintenance and capability:

The *Drinking Water Quality Management Plan*¹²⁷ refers to the *Infrastructure Operating Plan* and above referenced Operator's Manuals in respect of the ongoing maintenance and capability of the equipment. Arrangements in relation to design and maintenance of the infrastructure are discussed in detail in Table A.1 and Table A.2.

Materials and chemicals:

Materials:

As discussed in Table A.1, the *Infrastructure Operating Plan*, *Drinking Water Master Plan*¹²⁸ and associated drawings reference the adoption of the Water Services Association of Australia (WSAA) *Water Supply Code of Australia* (WSA 03-2012), the *Plumbing Code of Australia* and AS/NZS 3500 *Plumbing and drainage* as the principal guidance for material standards. These standards in turn cover the need for all materials in contact with drinking water to comply with AS/NZS 4020 *Testing of products for use in contact with drinking water*.

Chemicals:

The only chemical added to this drinking water scheme by Catherine Hill Bay Water is chlorine. The chlorine, identified as "Chlor 12", is supplied by Castle Chemicals as approximately 12% sodium hypochlorite.

¹¹⁹ *Drinking Water Quality Management Plan*, section 2.4.2.

¹²⁰ Solo, *Asset Inspection Checklist Procedure* (IMS-OPER-D- 8303-SW) (Issue No: 1.0), June 2017.

¹²¹ Solo, *Asset Inspection Checklist Procedure (RWTP)* (IMS-CONT-D-1691-SW) (Issue No: 1.0), July 2018.

¹²² *Infrastructure Operating Plan*, section 3.1.7.

¹²³ Witthoft Engineering, *Catherine Hill Bay RWTP; Functional Specification; PLC01 – Main PLC* (Revision 2.00), 15 October 2018.

¹²⁴ Witthoft Engineering, *Catherine Hill Bay RWTP; Functional Specification; PLC01 – RWPWPS PLC* (Revision 2.00), 15 October 2018.

¹²⁵ *Drinking Water Quality Management Plan*, section 2.4.3.

¹²⁶ Solo, *Corrective Action Request (CAR) Procedure* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.

¹²⁷ *Drinking Water Quality Management Plan*, section 2.4.4.

¹²⁸ Pressure Sewer Solutions, *Potable Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.

Review of relevant documentation at the time of the Stage 1 (Interim Scheme) Licence Plan Audit revealed that:

- the product summary for Chlor 12 did not state that it was unsuitable for addition to potable water, nor did it state that it was intended as a drinking water additive;¹²⁹
- review of the Safety Data Sheet did state that it was intended as a “potable water sanitiser”;¹³⁰ and
- the suitability of Chlor 12 for potable water use was further endorsed by a communication between the supplier and Catherine Hill Bay Water¹³¹ that referenced the *Australian Drinking Water Guidelines*.

Therefore, Chlor 12 was considered fit for purpose for the disinfection of potable water.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

¹²⁹ Castle Chemicals, *Technical Bulletin Chlor 12 Liquid Chlorine Bleach*, available at http://castlechem.com.au/sds/Chlor12_tb.pdf.

¹³⁰ Castle Chemicals, *Safety Data Sheet, Chlor 12*, Version 1.2, 14 February 2017.

¹³¹ Email from Graham Hatfield of Castle Chemicals to Ross Pascoe of Solo Water with subject “FW: Use of Chlor 12 for Chlorinating Potable water”, dated 5 July 2017.

Table B.5 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 5

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 5. The WQP (dw) outlines the process for verification of the drinking water quality.	 Compliant
Risk	Inadequate verification presents a risk of ongoing supply of unfit water over the longer term.	Target for Full Compliance A suitable verification program is required to ensure that ongoing monitoring and assurance takes place.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo, <i>Free Chlorine Field Verification Monitoring Procedure</i> (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>Water Quality Verification Monitoring Procedure</i> (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>CCP Residual Chlorination Management Procedure</i> (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018. ▪ Solo, <i>Customer Complaints Procedure</i> (IMS-OPER-D-8313-SW), (Issue No: 2.0), November 2017. ▪ Solo, <i>Incident Response and Notification Management Plan</i> (IMS-AIIR-B-0041-SW) (Issue No: 1.2), June 2017. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. ▪ Solo Water, <i>Incident Response and Notification Management Plan</i> (Issue No: 3.1), November 2018. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), September 2017. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water has provided sufficient detail in relation to its drinking water quality verification, noting that bulk water will be supplied by Central Coast Council. The arrangements include continuous monitoring and top-up dosing to ensure that minimum chlorine residual is maintained, and documented corrective actions to be taken in the event of any non-compliance.</p>		
<p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		

Discussion and notes

Drinking water quality monitoring:

The *Drinking Water Quality Management Plan*¹³² summarises the arrangements for ongoing verification monitoring, and refers to the procedures in accordance with which it is to be undertaken, as follows:

- *Free Chlorine Field Verification Monitoring Procedure*,¹³³
- *Water Quality Verification Monitoring Procedure*,¹³⁴
- *CCP Residual Chlorination Management Procedure*,¹³⁵ and
- *Customer Complaints Procedure*.¹³⁶

The verification monitoring program is considered appropriate for the purposes of this scheme and has been agreed in consultation with NSW Health.^{137,138} Samples are to be collected by an external NATA accredited facility in accordance with the monitoring plan detailed in the *Water Quality Verification Monitoring Procedure*.

Corrective actions or emergency responses following deviations identified due to verification monitoring will follow the agreed protocols.¹³⁹

Customer satisfaction:

The *Drinking Water Quality Management Plan*¹⁴⁰ details the arrangements for monitoring and responding to customer feedback and complaints, which is to be undertaken in accordance with the above referenced *Customer Complaints Procedure*.

Customer complaints can be made via the Solo Water website, by contacting the Solo Water (the Retail Supplier for the scheme) or direct contact with field operations staff. All complaints are entered into an on-line “Smartsheet” system that enables monitoring and tracking; actions taken are also recorded. All complaints are reviewed by the Operations Manager.

Customer service expectations are set out in the *Customer Contract*¹⁴¹ and in a more user-friendly *Home Owner’s Manual*,¹⁴² both of which are available on the Solo Water website.

Short-term evaluation of results:

The *Drinking Water Quality Management Plan*¹⁴³ indicates that all water quality data will be reviewed by the operator and Operations Manager upon receipt, as outlined in the above referenced procedures. All data is stored in the relevant registers (identified in the procedures) and will be reviewed for long term trending, analysis and reporting to management and IPART.

All customer complaints are to be investigated and acted upon in the shortest possible time. Customer complaints and issues will be reported to Solo Water management through monthly, quarterly and annual reporting protocols.

¹³² *Drinking Water Quality Management Plan*, section 2.5.1.

¹³³ Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.

¹³⁴ Solo, *Water Quality Verification Monitoring Procedure* (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018.

¹³⁵ Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.

¹³⁶ Solo, *Customer Complaints Procedure* (IMS-OPER-D-8313-SW), (Issue No: 2.0), November 2017.

¹³⁷ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

¹³⁸ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

¹³⁹ Solo Water, *Incident Response and Notification Management Plan* (Issue No: 3.1), November 2018.

¹⁴⁰ *Drinking Water Quality Management Plan*, section 2.5.2.

¹⁴¹ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

¹⁴² Solo Water, *Catherine Hill Bay; Home Owner’s Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), September 2017.

¹⁴³ *Drinking Water Quality Management Plan*, section 2.5.3.

Corrective action:

As reported in Table B.4, corrective actions will be undertaken in accordance with the operational procedures (referenced above), and all incidents and non-compliances will be managed in accordance with the *Incident Response and Notification Management Plan*.


Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

Table B.6 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 6

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 6. The WQP (dw) includes details on the management of incidents and emergencies.	 Compliant
Risk The absence of an approach for handling incidents and emergencies presents a risk of poor response to incidents arising related to the drinking water supply scheme.		Target for Full Compliance An adequate management plan for incidents and emergencies.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo, <i>Incident Response and Notification Management Plan</i> (IMS-AIIR-B-0041-SW) (Issue No: 3.1), November 2018. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. ▪ Solo, <i>Power Outage</i> (IMS-OPER-D-8309-SW) (Issue No: 1.1), October 2018. 		
Summary of reasons for grade		
Catherine Hill Bay Water has developed an approach to the management of incidents and emergencies, which is documented in the <i>Incident Response and Notification Management Plan</i> and a number of other relevant procedures. An up-to-date <i>Stakeholder Register</i> , which includes NSW Health and Central Coast Water (the bulk water supplier), is in place.		
Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		
Discussion and notes		
Communication:		
As detailed in the <i>Drinking Water Quality Management Plan</i> , ¹⁴⁴ prompt communication and notification is required in the event of any significant water quality incident or emergency situation. Such communication is undertaken in accordance with the <i>Incident Response and Notification Management Plan</i> . ¹⁴⁵		

¹⁴⁴ *Drinking Water Quality Management Plan*, section 2.6.1.

¹⁴⁵ Solo, *Incident Response and Notification Management Plan* (IMS-AIIR-B-0041-SW) (Issue No: 3.1), November 2018.

Catherine Hill Bay Water maintains the *CHB Stakeholder Register*,¹⁴⁶ which has the contact details for all internal and external stakeholders that can be contacted for a variety of reasons. This register is a working document that is updated annually and as notification of any updated contact details is received.

Solo Water also has an SMS notification system that its customers can opt-in to receive SMS notifications and updates on any incidents and emergency events that may occur.

Incident and emergency response protocol:

The *Drinking Water Quality Management Plan* ¹⁴⁷ describes the approach to trigger and respond to drinking water quality incidents with further details being given in a supporting *Incident Response and Notification Management Plan*. This *Plan*, which has been developed in consultation with NSW Health,^{148,149} outlines the response requirements and strategies to a number of pre-planned emergency events. The procedure also provides the notification procedures for contacting NSW Health, Central Coast Council, IPART, the EPA and other stakeholders during such incidents and events.

Catherine Hill Bay Water also has in place a number of procedures to guide operators in the event of system failure or incidents. For example, the chlorine dosing system is dependent on a functional power supply for its operation. Catherine Hill Bay Water has a detailed contingency plan to respond to power outages.¹⁵⁰ The contingency plan entails use of the standby diesel generator located on-site at the recycled water plant (where the chlorination facility is located), operation of which is initiated by an auto changeover switch, to feed in via the uninterruptable power supply in the short term. Contact details are given in the contingency plan for related support services providers as well as Ausgrid.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁴⁶ Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018.


¹⁴⁷ *Drinking Water Quality Management Plan*, section 2.6.2.

¹⁴⁸ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

¹⁴⁹ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

¹⁵⁰ Solo, *Power Outage* (IMS-OPER-D-8309-SW) (Issue No: 1.1), October 2018.

Table B.7 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 7

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 7. The WQP (dw) outlines employee training and awareness requirements.	 Compliant
Risk	Inadequate training and awareness of employees presents a risk of poor management of the drinking water supply scheme.	Target for Full Compliance Adequate training and awareness of employees.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo, <i>Organisational Chart</i> (MS-OPER-G-8321-SW) (Issue No: 1.1), January 2018. ▪ Solo, <i>Planning and New Schemes Manager; Position Description</i> (IMS-HRPR-P-6233) (Issue No: 1.0), July 2017. ▪ Solo, <i>Water and Wastewater Utility Engineer; Position Description</i> (IMS-HRPR-P-6228) (Issue No: 1.0), March 2017. ▪ Solo, <i>Site Supervisor – Solo Water; Position Description</i> (IMS-HRPR-P-6146) (Issue No: 2.0), March 2016. ▪ Solo, <i>Water and Wastewater Systems Operator – Solo Water</i> (IMS HRPR-P-6234) (Issue No: 1.1), January 2018. ▪ Brad Irwin: Curriculum Vitae; Engineers Australia Membership Certificate; and NPER Certificate of Registration. ▪ Craig Heining: Curriculum Vitae; Qualification Certificates; and AWA Membership Certificate. ▪ Alan Irving: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced. ▪ Ross Pascoe: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced. ▪ Ronnie Paine, Curriculum Vitae; and Training Cards/Certification as referenced. 		
Summary of reasons for grade		
<p>The <i>Drinking Water Quality Management Plan</i> outlines the arrangements in relation to employee training and awareness in sufficient detail. Observations made during the audit indicate that key staff members have appropriate skills and experience to undertake the operation and maintenance of the drinking water infrastructure in a safe and effective manner.</p>		
<p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		

Discussion and notes

Employee awareness and involvement:

The *Drinking Water Quality Management Plan*¹⁵¹ indicates that all managers, employees and contractors involved with drinking water quality management will undergo induction and ongoing awareness training for relevant aspects of the Drinking Water Quality Management System relating to their areas of work. Employee involvement will be encouraged through processes and mechanisms including:

- general awareness training;
- specific training in respect of each employee's specific roles;
- regular Toolbox Meetings;
- participation in an incident review and continuous improvement process;
- contributing to continuous improvement by submission of corrective action requests; and
- consultation in respect of proposed future changes and updates to systems and processes.

As reported in Table B.1, the *Drinking Water Policy* was on display in the office at the recycled water plant, and based on the audit interviews and site inspections it was apparent that personnel involved with the scheme are appropriately informed and aware of their obligations in respect of drinking water quality management.

Employee training:

The *Drinking Water Quality Management Plan* indicates that all managers, employees and contractors involved with the scheme will have appropriate experience, qualifications and competencies to undertake the specific job for which they are responsible. Job specific training is to be provided to employees and contractors as required.

The organisational structure in respect of the Catherine Hill Bay Water schemes is shown in the Solo Water (Catherine Hill Bay Water's parent company) *Organisational Chart*.¹⁵² Roles and responsibilities are described in summary form in the *Infrastructure Operating Plan*.¹⁵³

More specific responsibilities associated with particular roles are presented in detailed position descriptions. Review of a sample of position descriptions revealed that they require appropriate skills and experience, as follows:

- Planning and New Schemes Manager – responsibilities include planning new schemes, project and operations management, people management and other company roles. Skills and experience requirements include an engineering degree; a minimum of 10 years water industry experience (specifically in respect of new schemes); knowledge of planning and approval processes; and experience in water and wastewater design, development, construction and operations.¹⁵⁴
- Water and Wastewater Utility Engineer (Operations Manager) – responsibilities include product development design and engineering, project and operations management, people management and other company roles. Skills and experience requirements include an engineering degree; a minimum of 10 years water industry operations experience; and experience in water and wastewater design, development, construction and operations.¹⁵⁵
- Site Supervisor – responsibilities include site management and people management. Skills and experience requirements include a minimum of 2 years' experience in a similar supervisory role.¹⁵⁶

¹⁵¹ *Drinking Water Quality Management Plan*, section 2.71.

¹⁵² Solo, *Organisational Chart* (MS-OPER-G-8321-SW) (Issue No: 1.1), January 2018.

¹⁵³ *Infrastructure Operating Plan*, section 4.1 (table 4.1).

¹⁵⁴ Solo, *Planning and New Schemes Manager; Position Description* (IMS-HRPR-P-6233) (Issue No: 1.0), July 2017.

¹⁵⁵ Solo, *Water and Wastewater Utility Engineer; Position Description* (IMS-HRPR-P-6228) (Issue No: 1.0), March 2017.

¹⁵⁶ Solo, *Site Supervisor – Solo Water; Position Description* (IMS-HRPR-P-6146) (Issue No: 2.0), March 2016.

-
- Water and Wastewater Systems Operator – responsibilities include site management and people management. Skills and experience requirements include trade or technical qualifications applicable to the water industry and a minimum of 5 years' experience in the water industry with a focus on operation and maintenance of water and wastewater systems.¹⁵⁷

Review of the curriculum vitae and other relevant documentation for the incumbents of a selection of the key positions is as follows:

- Planning and New Schemes Manager (Brad Irwin) – an Environmental Engineer with 15 years relevant water industry experience, including the investigation planning and design of water and wastewater systems and integrated water management. Evidence of Engineers Australia (Chartered Professional Engineer) membership and registration on the National Professional Engineers Register was also provided.¹⁵⁸
- Operations Manager (Craig Heining) – a civil engineer with 25 years relevant water industry experience including roles in the development of water and wastewater infrastructure and the operation and maintenance of treatment facilities and other water industry infrastructure. Qualifications include a Bachelor of Engineering (Civil), Certificate III in Industrial Instrumentation and a Water Board Gold Medal Award (UNSW); Craig is also a member of the Australian Water Association.¹⁵⁹
- Site Manager (Alan Irving) – a licensed plumber with almost 40 years' industry experience, including domestic and commercial maintenance and new work, and the construction of sewer and water reticulation infrastructure. Copies of Alan's relevant training cards were provided, including his Plumbing Licence (No: 23847); NSW Fair Trading Supervisor Certificate; Certificate III in Civil Construction (Tunnel Construction); Energy Safe Victoria Restricted Electrical Workers Licence; OH&S Industry Induction and Confined Spaces training.¹⁶⁰
- Site Supervisor (Ross Pascoe) – a licensed plumber with more than 35 years' experience including domestic and commercial plumbing, leading hand on commercial projects and site supervision in relation to water and sewer network construction and treatment plant construction and commissioning. Copies of Ross' relevant training cards were provided, including his Plumbing Licence (No: 26103); NSW Fair Trading Supervisor Certificate; Queensland Building and Construction Commission Plumbing Occupational Licence; WorkSafe Victoria Licence to Perform High Risk Work; Agricultural Chemical User Permit; Equipment Operator OHS Competency Qualification; and OH&S General Induction (WorkCover NSW).¹⁶¹
- Water and Wastewater Systems Operator (Ronnie Payne) – an Environmental Engineer with 13 years' experience in commissioning, operation, maintenance and servicing of both large and small water treatment facilities throughout Australia and the Asia Pacific. Ronnie's multifaceted roles have included construction manager, commissioning engineer, process review engineer, operations team leader, site lead technical advisor, breakdown on-site maintenance specialist, and lead plant operator. Copies of Ronnie's Construction Induction card and certification in relation to confined space entry, working and rescue were provided.¹⁶²

On the basis of the sample of evidence reviewed and discussions with the abovementioned people during the audit fieldwork,¹⁶³ it is apparent that Catherine Hill Bay Water has adequately trained persons to implement the *Drinking Water Quality Management Plan*. Furthermore, there are systems in place to update and maintain that training.

¹⁵⁷ Solo, *Water and Wastewater Systems Operator – Solo Water* (IMS HRPR-P-6234) (Issue No: 1.1), January 2018.

¹⁵⁸ Brad Irwin: Curriculum Vitae; Engineers Australia Membership Certificate; and NPER Certificate of Registration.

¹⁵⁹ Craig Heining: Curriculum Vitae; Qualification Certificates; and AWA Membership Certificate.¹⁶⁰ Alan Irving: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced.

¹⁶⁰ Alan Irving: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced.

¹⁶¹ Ross Pascoe: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced.

¹⁶² Ronnie Paine, Curriculum Vitae; and Training Cards/Certification as referenced.

¹⁶³ Ross Pascoe participated in the Stage 1 audits conducted by Cobbitty Consulting/Water Futures.


Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

Table B.8 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 8

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 8. The WQP (dw) outlines the process for community consultation, awareness and involvement.	 Compliant
Risk Inadequate community consultation, awareness and involvement presents a risk of poor management of the drinking water supply scheme.		Target for Full Compliance Adequate community consultation, awareness and involvement.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo Water website: http://www.solowater.com.au/. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water/Solo Water has provided sufficient detail in relation to its process for community consultation, awareness and involvement. The mechanisms employed are primarily website based, but also include direct contact with Solo Water or field operations staff.</p> <p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		
Discussion and notes		
<i>Community consultation:</i>		
<p>The <i>Drinking Water Quality Management Plan</i>¹⁶⁴ indicates that community consultation has occurred during the project approvals phase, which included IPART placing the Catherine Hill Bay Water proposal on its website for public comment as part of the WICA licence application assessment and approval process.</p>		
<p>From an ongoing perspective, customer feedback and complaints can be made via the Solo Water website, by contacting the Solo Water ((Catherine Hill Bay Retail Supplier and parent company of Catherine Hill Bay Water) call centre or direct contact with field operations staff.</p>		
<i>Communication:</i>		
<p>The <i>Drinking Water Quality Management Plan</i> indicates that Catherine Hill Bay Water customers will be provided information in relation to the drinking water scheme by way of the Solo Water website.¹⁶⁵ A copy of the <i>Drinking Water Policy</i> is available, together with on-line forms that can be used to obtain further information.</p>		

¹⁶⁴ *Drinking Water Quality Management Plan*, section 2.8.

¹⁶⁵ Solo Water website: <http://www.solowater.com.au/>.

The *Customer Contract*¹⁶⁶ and *Home Owner's Manual*¹⁶⁷ also provide information in relation to the drinking water scheme, including details of the service to be provided and customers' obligations in respect of using the service. These documents are also available on the Solo Water website.¹⁶⁸

Information is also provided in the marketing panel of customers' bills and members of the community can contact Solo Water for information either via the website or by telephone.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

¹⁶⁶ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

¹⁶⁷ Solo Water, *Catherine Hill Bay; Home Owner's Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017.

¹⁶⁸ The *Customer Contract* and *Home Owner's Manual* did not appear to be available on the website at the time of the Stage 1 (Interim Scheme) Licence Plan Audit; however, an opportunity for improvement identified at that time has now been addressed.

Table B.9 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 9

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 9. The WQP (dw) outlines the validation process for the scheme.	 Compliant
Risk	Inadequate validation of processes and procedures presents a risk of poor management of the drinking water supply scheme.	Target for Full Compliance
		Adequate methodology for validating processes and procedures to ensure that the system is effective at controlling hazards.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Solo Water and Central Coast Council; Code of Conduct – Interconnections</i> (Rev0), 17 May 2017. ▪ Solo, <i>Water Quality Verification Monitoring Procedure</i> (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>Free Chlorine Field Verification Monitoring Procedure</i> (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>CCP Residual Chlorination Management Procedure</i> (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018. ▪ Solo, <i>Incident Response and Notification Management Plan</i> (IMS-AIRR-B-0041-SW) (Issue No: 3.1), November 2018. ▪ Solo, <i>Customer Complaints Procedure</i> (IMS-OPER-D-8313-SW), (Issue No: 2.0), November 2017. ▪ Solo Water, <i>Commissioning Plan – WWTP/AWTP; Catherine Hill Bay Water Utility</i> (IMS-OPER-B-8356-SW) (Revision 1), 23 February 2018. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water has outlined its approach in relation to the validation of processes. These processes are considered adequate given that potable water compliant with the <i>Australian Drinking Water Guidelines</i> (ADWG) will be supplied by another utility (Central Coast Council) and any treatment to be undertaken by Catherine Hill Bay Water is limited to maintaining residual chlorine levels.</p>		
<p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		

Discussion and notes

Validation of processes:

As previously reported, the source water for the Catherine Hill Bay Water drinking water scheme is to be supplied in bulk from a potable water supply system operated by another utility (Central Coast Council). Under the supply arrangements (draft *Code of Conduct*),¹⁶⁹ the supplied water is to be compliant with the *Australian Drinking Water Guidelines* (ADWG). Notwithstanding, a chlorine monitoring and dosing system will be employed as a preventative measure to ensure that water quality is maintained downstream of the supply point.

Accordingly, validation of the chlorine monitoring and dosing system is required notwithstanding that the process technology is well understood. This is to be undertaken through:¹⁷⁰

- the validation of process performance during commissioning;
- the assessment of water quality data in accordance with the *Water Quality Verification Monitoring Procedure*¹⁷¹ and *Free Chlorine Field Verification Monitoring Procedure*;¹⁷²
- compliance with the *CCP Residual Chlorination Management Procedure*;¹⁷³
- assessment of incidents in accordance with the *Incident Response and Notification Management Plan*;¹⁷⁴
- assessment of customer complaints in accordance with the *Customer Complaints Procedure*;¹⁷⁵
- validation of customer connections through the implementation of new connection procedures; and
- review and performance reporting.

The chlorination system target criteria and critical limits are validated based on the ADWG and as agreed with NSW Health. As reported in Table B.3, these are documented in the *CCP Residual Chlorination Management Procedure*.

Design of equipment:

All equipment has been designed by appropriately qualified water engineering professionals. Process equipment that uses technology proven in the water industry and supplied by reputable manufacturers has been selected for use.¹⁷⁶ All equipment is subject to testing and validation in accordance with the *Commissioning Plan*.¹⁷⁷

Investigative studies and research monitoring:

The *Drinking Water Quality Management Plan*¹⁷⁸ indicates that research and development will be undertaken as required to address identified deficiencies or uncertainties in the drinking water system. Solo Water and Catherine Hill Bay Water staff and contractors will also remain up to date with industry research and technology through their involvement with industry bodies and attendance at industry seminars and conferences. This approach is considered appropriate.

Recommendations

There are no recommendations in respect of this obligation.

¹⁶⁹ Solo Water, *Catherine Hill Bay Water Utility; Solo Water and Central Coast Council; Code of Conduct – Interconnections* (Rev0), 17 May 2017.

¹⁷⁰ *Drinking Water Quality Management Plan*, section 2.9.1.

¹⁷¹ Solo, *Water Quality Verification Monitoring Procedure* (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018.

¹⁷² Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.

¹⁷³ Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.

¹⁷⁴ Solo, *Incident Response and Notification Management Plan* (IMS-AIRR-B-0041-SW) (Issue No: 3.1), November 2018.

¹⁷⁵ Solo, *Customer Complaints Procedure* (IMS-OPER-D-8313-SW), (Issue No: 2.0), November 2017.

¹⁷⁶ *Drinking Water Quality Management Plan*, section 2.9.2.


¹⁷⁷ Solo Water, *Commissioning Plan – WWTP/AWTP; Catherine Hill Bay Water Utility* (IMS-OPER-B-8356-SW) (Revision 1), 23 February 2018.

¹⁷⁸ *Drinking Water Quality Management Plan*, section 2.9.3.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

Table B.10 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 10

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 10. The WQP (dw) outlines the process management of documentation and records as well as the reporting requirements.	 Compliant
Risk Inadequate documentation, records and reporting presents a risk of poor management of the drinking water supply scheme.		Target for Full Compliance Adequate documentation, records and reporting.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo, <i>CHB Free Chlorine Field Verification</i> (IMS-CONT-G-1675-SW) as at 18 October 2018. ▪ Solo, <i>CHB Calibration Register</i> (IMS-CONT-G-1672-SW) as at 18 October 2018. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018. 		
Summary of reasons for grade		
Catherine Hill Bay Water has outlined its arrangements in relation to the management of documentation and records, and complying with its reporting requirements. Appropriate systems are either already in place or currently being implemented.		
Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		
Discussion and notes		
<i>Management of documentation and records:</i>		
The <i>Drinking Water Quality Management Plan</i> ¹⁷⁹ indicates that Solo Resource Recovery, parent company of Solo Water (and in turn Catherine Hill Bay Water) has an integrated management system (IMS) that incorporates quality, safety and environmental management; effective document management is a principal component of such management systems. The IMS is certified to ISO 9001, ISO 14001, AS/NZS 4801 and OHSAS 18001; the Catherine Hill Bay site has recently been added to the certification.		
Solo Water/Catherine Hill Bay Water has a Citrix document management system, which was witnessed live during the Stage 1 (Interim Scheme) Licence Plan Audit. Catherine Hill Bay Water was able to show a list of documents and could ‘click’ on the listed documents to view them. A number of sample documents were selected for viewing; the ‘current’ version of each document sought was available.		
Solo Water/Catherine Hill Bay Water maintains a number of information databases applicable to drinking water quality management, including:		
<ul style="list-style-type: none"> ▪ SCADA system logs, alarms and reports in respect of the operational system that are maintained in the ClearSCADA system; 		

¹⁷⁹ *Drinking Water Quality Management Plan*, section 2.10.1.

-
- Customer complaint ‘Smartsheet’ on-line database; and
 - Various registers, including (for example):
 - *CHB Free Chlorine Field Verification Register*,¹⁸⁰ which is used to capture and monitor records of twice-weekly hand-held free chlorine field verification checks;
 - *CHB Calibration Register*,¹⁸¹ which is used to record all instrument calibrations; and
 - *CHB Stakeholder Register*,¹⁸² which correctly identified NSW Health, EPA and IPART amongst other stakeholders.

As reported in Table A.1, Solo Water/Catherine Hill Bay Water is currently implementing the Maximo enterprise asset management system. This will be used to (in conjunction with the GIS) to record all asset related information, including asset maintenance records.

Reporting:

The *Drinking Water Quality Management Plan*¹⁸³ indicates that internal reports in respect of the Catherine Hill Bay Water scheme will be prepared for Solo Water management on a monthly, quarterly and annual basis. These will provide a summary of performance and the adequacy of the scheme, addressing water quality; customer feedback and complaints; performance against indicators and service standards; non-compliances, corrective actions and emergency events; and recommendations for improvement.

The annual reports will be prepared in accordance with the Network Operator’s *Reporting Manual* as outlined in the *IPART Reporting Procedure*.¹⁸⁴ Any required incident reporting will be in accordance with the *Incident Response and Notification Management Plan*.¹⁸⁵

Annual reports and water quality monitoring results will be made available to customers and other stakeholders upon request.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

¹⁸⁰ Solo, *CHB Free Chlorine Field Verification* (IMS-CONT-G-1675-SW) as at 18 October 2018.

¹⁸¹ Solo, *CHB Calibration Register* (IMS-CONT-G-1672-SW) as at 18 October 2018.


¹⁸² Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018.

¹⁸³ *Drinking Water Quality Management Plan*, section 2.10.2.

¹⁸⁴ Solo, *IPART Reporting Procedure* (IMS-OPER-D-8324-SW) (Issue No: 1.1), March 2018.

¹⁸⁵ Solo, *Incident Response and Notification Management Plan* (IMS-AIR-B-0041-SW) (Issue No: 3.1), November 2018.

Table B.11 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 11

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 11. The WQP (dw) outlines the process for long-term evaluation of results and the audit of the Plan.	 Compliant
Risk Inadequate long-term evaluation and audit presents a risk of poor management of the drinking water supply scheme.		Target for Full Compliance Adequate long-term evaluation and audit.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo, <i>Internal Audit Procedure</i> (IMS-COMP-D-0835) (Issue 3.0), November 2018. ▪ Solo, <i>Compliance Calendar</i> (IMS-COMP-G-0832) (Issue 1.0), February 2018. ▪ Solo, <i>Corrective Action Request (CAR)</i> (IMS-COMP-D-0817) (Issue No: 4.1), June 2017. 		
Summary of reasons for grade		
Catherine Hill Bay Water has outlined the arrangements in relation to its long-term evaluation of results and audit of the implementation of the <i>Drinking Water Quality Management Plan</i> . Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		
Discussion and notes		
<i>Long-term evaluation of results:</i>		
The <i>Drinking Water Quality Management Plan</i> ¹⁸⁶ indicates that ongoing review and evaluation of operational performance and monitoring results will be undertaken in the context of the lifecycle management strategies outlined in the <i>Infrastructure Operating Plan</i> . ¹⁸⁷ These reviews will consider:		
<ul style="list-style-type: none"> ▪ water quality monitoring data, both at the point of supply from Central Coast Council and in the downstream (Catherine Hill Bay Water) scheme; ▪ free chlorine characteristics, including residual levels, decay rates and the adequacy of dosing set points; ▪ customer complaints; ▪ incident reports; and ▪ performance trends. 		

¹⁸⁶ *Drinking Water Quality Management Plan*, section 2.11.

¹⁸⁷ *Infrastructure Operating Plan*, section 6.

Audit of drinking water quality management:

The evaluation of system performance will be supported by internal audit of compliance with the provisions of the *Drinking Water Quality Management Plan*. Catherine Hill Bay Water has an *Internal Audit Procedure*,¹⁸⁸ which outlines the procedure for internal auditing of management system process and compliance. Audits are to be undertaken in accordance with a *Compliance Calendar*,¹⁸⁹ and any non-compliances are to be managed in accordance with the *Corrective Action Request (CAR)*¹⁹⁰ procedure.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

¹⁸⁸ Solo, *Internal Audit Procedure* (IMS-COMP-D-0835) (Issue No: 3.0), November 2018.

¹⁸⁹ Solo, *Compliance Calendar* (IMS-COMP-G-0832) (Issue No: 1.0), February 2018.

¹⁹⁰ Solo, *Corrective Action Request (CAR)* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.

Table B.12 WQP (dw) Audit Table – WIC Reg Sched 1 cl.7(1)(a) – ADWG Element 12

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(a)	Element 12. The WQP (dw) outlines a process for review and continual improvement.	 Compliant
Risk An inadequate process for review and continual improvement a risk of poor management of the drinking water supply scheme.		Target for Full Compliance Adequate processes for review and continual improvement.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Drinking Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 2.0), 31 August 2018. ▪ Solo, <i>Corrective Action Request (CAR) Procedure</i> (IMS-COMP-D-0817) (Issue No: 4.1), June 2017. ▪ Solo, <i>Corrective Action Request (CAR) Log</i> (IMS-COMP-G-0818) as at 23 November 2018. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water has outlined the arrangements in relation to management review and continual improvement of the <i>Drinking Water Quality Management Plan</i>. The management review process, which will be focussed on continuous improvement, is clearly defined.</p> <p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		
Discussion and notes		
<i>Review by senior executive:</i>		
<p>The Solo Water executive team will receive and review quarterly and annual reports prepared by the Operations Manager regarding the performance of all Solo Water Schemes including the Catherine Hill Bay Water scheme. As noted in Table B.10, these reports will include recommendations for continuous improvement made by operations staff and the Operations Manager.</p>		
The management review process will include: ¹⁹¹		
<ul style="list-style-type: none"> ▪ review of significant issues; ▪ review of quarterly and annual reports; ▪ review of the outcomes of internal and external audits; ▪ approval of funding and resource allocation for improvement initiatives; ▪ monitoring implementation of the continuous program; and ▪ providing input in relation to the potential impact of any future organisational change. 		

¹⁹¹ *Drinking Water Quality Management Plan*, section 2.12.

Drinking water quality management improvement plan:

Continuous improvements will be managed in accordance with the Solo Water integrated management system using the *Corrective Action Request Procedure*.¹⁹² Opportunities for improvement will be identified from the review of operational data, incident reports, complaints, annual reports and the outcomes of internal and external audits.

The implementation of approved improvements will be managed through the *Corrective Action Request Log*.¹⁹³

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.


¹⁹² Solo, *Corrective Action Request (CAR) Procedure* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.

¹⁹³ Solo, *Corrective Action Request (CAR) Log* (IMS-COMP-G-0818) as at 23 November 2018.

Appendix C Detailed Audit Findings – Water Quality Plan (Non-potable Water) (WQP (npw))

Detailed audit findings in respect of the *Water Quality Plan (Non-potable Water)* (WQP (npw)) are presented in this Appendix.

Table C.1 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 1

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 1. The WQP (npw) shows a commitment to responsible use and management of recycled water quality.	 Compliant
Risk The lack of a water quality policy, up to date and accurate details for regulatory and formal requirements and contact details for stakeholders presents a small operational risk for this scheme.		Target for Full Compliance A water quality policy, an up to date list of regulatory and formal requirements and an up to date list of stakeholders and their contact details.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo Water website: http://www.solowater.com.au/. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017. ▪ Solo, <i>Quality, Safety and Environmental Aspects Risk Register</i> (IMS-RISK-G-8856-SW), as at 18 October 2018. ▪ Solo, <i>CHB Regulatory & Formal Requirements</i> (IMS-CONT-G-1677-SW) (Issue No: 1.0), April 2017. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018, as at 18 October 2018. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. ▪ Solo, <i>Recycled Water Policy</i>, (IMS-OPER-A-8346-SW) (Issue No: 1.0), September 2017. 		
Summary of reasons for grade		
Catherine Hill Bay Water demonstrated that it has a <i>Recycled Water Quality Policy</i> and up-to-date lists of regulatory and formal requirements and stakeholders in place. It also demonstrated that it has adequately identified and engaged with its principal stakeholders, including NSW Health. Consequently, Catherine Hill Bay Water was considered compliant with this requirement.		

Discussion and notes

Responsible use of recycled water:

The *Recycled Water Quality Management Plan*¹⁹⁴ indicates that, in planning and developing the recycled water scheme, it has consulted and engaged with agencies responsible for and with expertise in the protection of public and environmental health. This has included NSW Health, the EPA and Central Coast Council.

Catherine Hill Bay Water is aware of and manages its regulatory obligations (as discussed below) and has processes in place to ensure that it maintains the technical, financial and organisational capacity to provide recycled water services.

The responsible use of recycled water is promoted via the Solo Water website¹⁹⁵ and documentation including the *Customer Contract*¹⁹⁶ and *Home Owner's Manual*.¹⁹⁷

Regulatory and formal requirements:

Catherine Hill Bay Water sets out in detail how it will retain awareness and compliance with its regulatory and formal requirements in its *Recycled Water Quality Management Plan*.¹⁹⁸ The relevant legislation is identified in the Solo corporate *Quality, Safety and Environmental Aspects Risk Register*.¹⁹⁹ The regulatory and formal requirements for the Catherine Hill Bay Water scheme are further outlined in the *CHB Regulatory & Formal Requirements Register*.²⁰⁰ It is apparent that these registers are maintained up-to-date; for example, the *CHB Regulatory & Formal Requirements Register* was reviewed and updated in respect of the WIC Act Licence requirements on 16 October 2018.

Partnerships and engagement of stakeholders:

Catherine Hill Bay Water has identified its principal stakeholders²⁰¹ and engaged with them. There was good evidence of Catherine Hill Bay Water engagement with key stakeholders such as NSW Health, Central Coast Council, Hunter Water and IPART. For instance, Philippe Porignaux, Environmental Health Manager, NSW Health Hunter New England Population Health, was involved in the scheme risk assessments undertaken in May 2016, May 2017 (12-month review) and July 2018, as well as reviewing multiple scheme documents as part of Catherine Hill Bay Water's ongoing consultation with NSW Health.^{202,203}

Engagement with customers and the broader public is achieved principally via the Solo Water website, which provides information in relation to the scheme as well as the opportunity to provide feedback or make a complaint.

Recycled water policy:

A *Recycled Water Policy*²⁰⁴ is in place and is considered appropriate. The *Policy* was on display in the Catherine Hill Bay Water office at the recycled water plant; it is also included as an appendix to the *Recycled Water Quality Management Plan*.

Catherine Hill Bay Water/Solo Water is a small organisation. Based on the audit interviews and site inspections it was apparent that those involved with the scheme are appropriately informed.

¹⁹⁴ *Recycled Water Quality Management Plan*, section 2.1.1.

¹⁹⁵ Solo Water website: <http://www.solowater.com.au/>.

¹⁹⁶ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

¹⁹⁷ Solo Water, *Catherine Hill Bay; Home Owner's Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017.

¹⁹⁸ *Recycled Water Quality Management Plan*, section 2.1.3.

¹⁹⁹ Solo, *Quality, Safety and Environmental Aspects Risk Register* (IMS-RISK-G-8856-SW), as at 18 October 2018.

²⁰⁰ Solo, *CHB Regulatory & Formal Requirements* (IMS-CONT-G-1677-SW) (Issue No: 1.0), April 2017 [updated 16 October 2018].

²⁰¹ Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018, as at 18 October 2018.

²⁰² Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

²⁰³ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

²⁰⁴ Solo, *Recycled Water Policy*, (IMS-OPER-A-8346-SW) (Issue No: 1.0), September 2017.


Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

Table C.2 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 2

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 2. The WQP (npw) includes an analysis of the recycled water system.	 Compliant

Risk	Target for Full Compliance
Failure to adequately describe the system and assess risks could lead to risks being overlooked.	Adequate system description and risk assessment.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018.
- NSW Government, *Network Operator’s Licence No: 16_035* (as issued on 22 March 2016).
- NSW Government, *Network Operator’s Licence No: 16_035* (as issued on 22 March 2016), table 1.3.
- Solo, *Incident Response and Notification Management Plan* (IMS-AIRR-B-0041-SW) (Issue No: 3.1), November 2018.
- Solo, *Sewage Spill Procedure* (MS-AIRR-D-0037-SW) (Issue No: 1.0), June 2017.
- Solo Water, *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply* (Drawing No: 56-RW-PFD-ST1&2-2), 5 November 2018.
- Pressure Sewer Solutions, *Recycled Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013. Drawings No: SW-56-C-LP-1001, 1002 & 1003, *Catherine Hill Bay Residential Subdivision Stage 1; Potable and Recycled Water Layout Plan Work as Executed Sheets 1, 2 & 3*, signed August/September 2015.
- Witthoft Engineering, *Solo Water; Catherine Hill Bay; P&ID Drawings* (Drawings No: SW-56-RWTP-P-0000 to 9200 (16 sheets of various revisions and dated).
- Solo, *Risk Register – Interim Scheme (Sewage)* (IMS-ENVM-G-3635-SW) (Revision 2.1), 6 June 2017.
- Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Recycled Water* worksheet.

Summary of reasons for grade

Catherine Hill Bay Water demonstrated that the *Recycled Water Quality Management Plan* in conjunction with other relevant documentation provides an appropriate assessment of the water supply system. The system arrangement is documented, the intended uses are clear, the receiving environment understood, and risk assessments have been undertaken by appropriately experienced teams in accordance with the guidance presented in the *Australian Guidelines for Water Recycling*.

Accordingly, Catherine Hill Bay Water is assessed to be compliant with this requirement.

Discussion and notes

Source of recycled water, intended uses, receiving environments and routes of exposure:

Source water:

The *Recycled Water Quality Management Plan*²⁰⁵ indicates that the source water will comprise sewage from the Catherine Hill Bay development area. Only one small shop (take away/convenience store) is proposed in the serviced area, so raw sewage is expected to be similar to that of normal domestic grade wastewater.

Intended uses:

The intended of recycled water are identified as Toilet flushing; Laundry washing machine cold water tap; Irrigation of private lots and footpaths; and Outdoor cleaning including bin and car washing and hosing down external paths and walls. These uses are consistent with those permitted by the Licence.²⁰⁶ The *Recycled Water Quality Management Plan* identifies measures that will be implemented by Catherine Hill Bay Water to minimise the likelihood of unintended use.

Receiving environment:

The *Recycled Water Quality Management Plan* notes that the recycled water scheme is located in a relatively sensitive coastal location; however, all recycled water use will occur within the footprint of the Catherine Hill Bay development, away from the identified sensitive receptor areas. The stormwater management system for the development area incorporates features that will aid the containment and management of any potential spills that may occur.

In the unlikely event of any unplanned spillage or main breaks, the incident will be managed in accordance with the *Incident Response and Notification Management Plan*.²⁰⁷ Guidance provided in the *Sewage Spill Procedure*²⁰⁸ is also applicable.

Whilst use of surplus recycled water is planned in the longer term, this does not part of the Stage 2 recycled water scheme.

Recycled water system analysis:

The recycled water supply scheme is described in the *Recycled Water Quality Management Plan*.²⁰⁹ A process flow diagram is provided both as an appendix in the *Recycled Water Quality Management Plan* and as a standalone document.²¹⁰ The flow diagram is simple, reflects the situation observed on the ground and describes the system in sufficient detail.

The basis of the system design is detailed in the *Recycled Water Master Plan*²¹¹ and the process justification for the treatment plant is detailed in the *Recycled Water Quality Management Plan*²¹² (refer Table C.4 and Table C.9 for further discussion). The primary components of the system include:

- a sewage treatment plant that will produce recycled water using Membrane Bioreactor (MBR) technology coupled with Ultraviolet (UV) and Chlorination disinfection;
- a 1ML recycled water storage tank;
- a recycled water pumping station; and
- recycled water distribution/reticulation network.

²⁰⁵ *Recycled Water Quality Management Plan*, sections 2.2.1.

²⁰⁶ NSW Government, *Network Operator's Licence No: 16_035* (as issued on 22 March 2016), table 1.3.

²⁰⁷ Solo, *Incident Response and Notification Management Plan* (IMS-AIIR-B-0041-SW) (Issue No: 3.1), November 2018.

²⁰⁸ Solo, *Sewage Spill Procedure* (MS-AIIR-D-0037-SW) (Issue No: 1.0), June 2017.

²⁰⁹ *Recycled Water Quality Management Plan*, section 2.2.2.

²¹⁰ Solo Water, *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply* (Drawing No: 56-RW-PFD-ST1&2-2), 5 November 2018.

²¹¹ Pressure Sewer Solutions, *Recycled Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.²¹²

²¹² *Recycled Water Quality Management Plan*, appendix C.

²¹² *Recycled Water Quality Management Plan*, appendix C.

Detailed design drawings of distribution/reticulation network are available.²¹³ Detailed arrangements of the treatment plant, storage and pumping station are shown on the relevant Piping and Instrumentation Drawings (P&IDs).²¹⁴

Assessment of water quality data:

As noted above, source water for the recycled water system will comprise mainly residential sewage. As the area from which the sewage will be drawn had not been developed at the time the treatment plant was being designed, Catherine Hill Bay Water has assumed that the source water quality will be “typical municipal sewage” and the treatment plant has been designed on that basis.

The risk of any adverse effects on the treatment process resulting from the illegal discharge of prohibited substances (e.g. the discharge of chlorinated water from swimming pools) will be minimised through community consultation, customer contracts clearly identifying prohibited substances, and sampling.

Hazard identification and risk assessment:

A risk assessment in respect of the Stage 1 (Interim Scheme), under which the recycled water system was charged with potable water, was undertaken in May 2016 with a 12-month review and update completed in May 2017. A major review of the risk assessment “to incorporate the MBR/AWTP, recycled water and onsite storages/booster systems” was undertaken in July 2018.

The risk assessment team for the Stage 1 (Interim Scheme) assessment included representatives of NSW Health (Philippe Porigneaux, Environmental Health Manager, NSW Health Hunter New England Population Health), Catherine Hill Bay Water/Solo Water and GHD, which is considered adequate. The major review and update in July 2018 was undertaken by representatives of Catherine Hill Bay Water/Solo Water, NSW Health (Hunter New England Population Health) and consultants Witthoft Engineering (electrical, instrumentation and industrial control system solutions) and Aquatis (process technology), which is again considered appropriate given the inclusion of the additional Stage 2 infrastructure.

The risk assessment has been documented in the *Risk Register – Interim Scheme (Sewage)*²¹⁵ (Stage 1 assessment) and the *Risk Register – Stage 2*²¹⁶ (Stage 2 assessment). It is also included as an appendix in the *Recycled Water Quality Management Plan*.

The risk registers detail the identified hazards and the assessed maximum and residual risk (unmitigated and mitigated) based on assessed likelihood and consequence, consistent with the approach detailed in the *Australian Guidelines for Water Recycling (AGWR)/Drinking Water Guidelines (ADWG)*.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.


²¹³ For example: Drawings No: SW-56-C-LP-1001, 1002 & 1003, *Catherine Hill Bay Residential Subdivision Stage 1; Potable and Recycled Water Layout Plan Work as Executed Sheets 1, 2 & 3*, signed August/September 2015.

²¹⁴ Witthoft Engineering, *Solo Water; Catherine Hill Bay; P&ID Drawings* (Drawings No: SW-56-RWTP-P-0000 to 9200 (16 sheets of various revisions and dated).

²¹⁵ Solo, *Risk Register – Interim Scheme (Sewage)* (IMS-ENVM-G-3635-SW) (Revision 2.1), 6 June 2017.

²¹⁶ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Recycled Water* worksheet.

Table C.3 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 3

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 3. The WQP (npw) outlines the preventive measures for water quality management.	 Compliant

Risk	Target for Full Compliance
Failure to adequately define preventive measures and assess residual risks could lead to risks being overlooked.	Adequate definition of preventive measures and residual risk assessment.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018.
- Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Recycled Water* worksheet.
- Solo, *RWTP CCP1 – MBR UF Membranes Management* (IMS-GNRL-D-4411-SW) (Issues No: 1.0), August 2018.
- Solo, *RWTP CCP2 – UV Disinfection Management* (IMS-GNRL-D-4412-SW) (Issues No: 1.0), August 2018.
- Solo, *RWTP CCP3 – Chlorine Contact Tank Management* (IMS-GNRL-D-4413-SW) (Issues No: 1.0), August 2018.
- Email dated 12 October 2018 from NSW Health to IPART (re: *Catherine Hill Bay New Infrastructure Audit*).

Summary of reasons for grade

Catherine Hill Bay Water has provided details in relation to the risk management measures (controls) that it will implement in respect of recycled water quality. It has also identified the critical control points (CCPs) that will be used to monitor performance of the multiple barrier treatment process that is to be implemented to achieve the pathogen log removal values required to ensure that the water is compliant with the requirements of the *Australian Guidelines for Water Recycling* (AGWR).

Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.

Discussion and notes

Preventative measures and multiple barriers:

The *Recycled Water Quality Management Plan*²¹⁷ indicates that, during the risk assessment workshop, risk control strategies were developed for each identified risk and the impact of mitigation measure assessed. The control strategy for each risk is documented in the *Risk Register – Stage 2*.²¹⁸

²¹⁷ *Recycled Water Quality Management Plan*, section 2.3.1.

²¹⁸ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Recycled Water* worksheet.

Preventative measures and multiple barriers have been documented in relation to:

- Source water Protection;
- Recycled Water Treatment Plant (RWTP);
- Storage and supply;
- Chlorine residual management;
- Cross connection control;
- Recycled water usage;
- SCADA monitoring, control and alarms;
- Preventative Maintenance;
- Incident response; and
- Surplus recycled water.

Preventative measures/barriers incorporated into the recycled water plant (for example) include:²¹⁹

“Robust and conservatively designed membrane bioreactor with enhanced nutrient removals and disinfection processes.

Use of multiple disinfection barriers and pre-validated disinfection equipment.

SUEZ/ Zenon submerged ultrafiltration membranes that achieve a minimum of 1.93 Log virus removal based on worst case operational testing.

Wedeco LBX400 prevalidated ultraviolet disinfection system sized to achieve a minimum of 3 Log virus removal at 60% UVT and a flows of 5 L/s.

Chlorine Contact Tank conservatively sized to achieve a minimum of 4 log virus removal.

The LRV achieved by the plant exceeds the minimum required under the AGWR (2006).”

The principal risks relating to dual reticulation recycled water schemes are those relating to cross-connections (including misconnections) that could lead to excessive exposure to recycled water. Preventive measures in respect of these risks have been clearly identified.

Critical control points:

Critical control points (CCPs) have been identified for each stage of the recycled water plant treatment process with the claimed log reduction, which is based on pre-validated equipment, identified in each case.

Total log reductions claimed/required are detailed as follows:

Critical Process	Log Reduction Value		
	Virus	Bacteria	Protozoa
Total Claimed	8.93	12	8
Required	6.5	5.3	5.1

Measurement parameters, operational targets and limits, and critical limits for each CCP are documented in the *Recycled Water Quality Management Plan*,²²⁰ as well as the relevant CCP management procedure. The management procedures^{221,222,223} for each stage of the treatment process also outline the procedures to be followed in the event of a CCP limit breach.

²¹⁹ *Recycled Water Quality Management Plan*, section 2.3.1 (table 2.3).

²²⁰ *Recycled Water Quality Management Plan*, section 2.2.2 (table 2.5).

²²¹ Solo, RWTP CCP1 – MBR UF Membranes Management (IMS-GNRL-D-4411-SW) (Issues No: 1.0), August 2018.

²²² Solo, RWTP CCP2 – UV Disinfection Management (IMS-GNRL-D-4412-SW) (Issues No: 1.0), August 2018.

²²³ Solo, RWTP CCP3 – Chlorine Contact Tank Management (IMS-GNRL-D-4413-SW) (Issues No: 1.0), August 2018.

In comments provided by NSW Health in respect of the audit scope,²²⁴ it noted that all CCPs (for both drinking and recycled water) list “Hazard(s) of Concern” as “Pathogens”, and suggested that the description would benefit by making distinction between virus, bacteria and protozoa in the CCP tables to make it clear which barriers are effective for each pathogen. Accordingly, this has been identified as an opportunity for improvement (**OFI-CHB2-PLA.03**) in respect of drinking water (refer Table B.3) and is repeated here in respect of recycled water.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


The following opportunity for improvement has been identified in respect of this obligation:

- **OFI-CHB2-LPA.03:** it is suggested that Catherine Hill Bay Water revises the identification of “Hazard(s) of Concern” in its CCP tables to distinguish between virus, bacteria and protozoa, thereby making it clear which barriers are effective for each pathogen.

[This OFI is also applicable in respect of drinking water.]

²²⁴ Email dated 12 October 2018 from NSW Health to IPART (re: *Catherine Hill Bay New Infrastructure Audit*).

Table C.4 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 4

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 4. The WQP (npw) outlines the operational procedures and process control for the scheme.	 Compliant

Risk	Target for Full Compliance
Failure to adequately formalise procedures could lead to inconsistent operation and exposes customers to risk of poor quality water being supplied.	Adequate detail on operational procedures to protect water quality.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2* (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Operator’s Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Operator’s Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.
- Solo, *Field Asset Maintenance Procedure* (IMS-OPER-D-8326-SW) (Issue No: 1.0), June 2017.
- Solo, *Field Asset Maintenance Checklist* (IMS-OPER-F-8329-SW) (Issue No: 1.0), May 2017.
- Solo, *Catherine Hill Bay; Operations Workflow Checklist* (IMS-CONT-G-1683-SW) (Issue No: 1.0), May 2017.
- Solo, *RWTP CCP1 – MBR UF Membranes Management* (IMS-GNRL-D-4411-SW) (Issues No: 1.0), August 2018.
- Solo, *RWTP CCP2 – UV Disinfection Management* (IMS-GNRL-D-4412-SW) (Issues No: 1.0), August 2018.
- Solo, *RWTP CCP3 – Chlorine Contact Tank Management* (IMS-GNRL-D-4413-SW) (Issues No: 1.0), August 2018.
- Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.
- Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.
- Solo, *Water Quality Verification Monitoring Procedure* (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018.
- Solo, *Suspected Cross Connection Procedure* (IMS-OPER-D-8304-SW) (Issue No: 1.0), June 2017.
- Solo, *GIS Meter Procedure* (IMS-OPER-D-8315-SW) (Issue No: 1.0), June 2017.

-
- Solo, *Corrective Action Request (CAR) Procedure* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.
 - Pressure Sewer Solutions, *Recycled Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.
-

Summary of reasons for grade

Catherine Hill Bay Water has outlined its arrangements in relation to operational procedures, operational monitoring and corrective actions in the *Recycled Water Quality Management Plan*, with additional detail presented in the Operator's Manuals and relevant procedures. It has also detailed its arrangements for ensuring that equipment capability is maintained and material and chemicals are of the required standard.

Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.

Discussion and notes

Operational procedures:

Catherine Hill Bay Water has developed operational procedures covering the main routine processes required to manage water quality and to undertake corrective actions. These are identified in the *Recycled Water Quality Management Plan*,²²⁵ which also identifies the *Infrastructure Operating Plan* and Operator's Manuals (*Operator's Manual; Distribution System Networks; Stage 2*²²⁶ and *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*).²²⁷

A sample of the referenced procedures were reviewed by the auditors, including:

- *Field Asset Maintenance Procedure*²²⁸ for general maintenance and associated *Field Asset Maintenance Checklist*;²²⁹
 - *Operations Workflow Checklist*;²³⁰
 - *RWTP CCP1 – MBR UF Membranes Management*;²³¹
 - *RWTP CCP2 – UV Disinfection Management*;²³²
 - *RWTP CCP3 – Chlorine Contact Tank Management*;²³³
 - *CCP Residual Chlorination Management Procedure*;²³⁴
 - *Free Chlorine Field Verification Monitoring Procedure*;²³⁵
 - *Water Quality Verification Monitoring Procedure*;²³⁶
 - *Suspected Cross Connection Procedure*²³⁷ for investigating suspected cross connections between potable and recycled water pipes; and
 - *GIS Meter Procedure*²³⁸ for obtaining accurate meter readings.
-

²²⁵ *Recycled Water Quality Management Plan*, section 2.4.1.

²²⁶ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018.

²²⁷ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018.

²²⁸ Solo, *Field Asset Maintenance Procedure* (IMS-OPER-D-8326-SW) (Issue No: 1.0), June 2017.

²²⁹ Solo, *Field Asset Maintenance Checklist* (IMS-OPER-F-8329-SW) (Issue No: 1.0), May 2017.

²³⁰ Solo, *Catherine Hill Bay; Operations Workflow Checklist* (IMS-CONT-G-1683-SW) (Issue No: 1.0), May 2017.

²³¹ Solo, *RWTP CCP1 – MBR UF Membranes Management* (IMS-GNRL-D-4411-SW) (Issues No: 1.0), August 2018.

²³² Solo, *RWTP CCP2 – UV Disinfection Management* (IMS-GNRL-D-4412-SW) (Issues No: 1.0), August 2018.

²³³ Solo, *RWTP CCP3 – Chlorine Contact Tank Management* (IMS-GNRL-D-4413-SW) (Issues No: 1.0), August 2018.

²³⁴ Solo, *CCP Residual Chlorination Management Procedure* (IMS-GNRL-D-4414-SW), (Issue No: 1.1), September 2018.

²³⁵ Solo, *Free Chlorine Field Verification Monitoring Procedure* (IMS-OPER-D-8301-SW) (Issue No: 1.1), October 2018.

²³⁶ Solo, *Water Quality Verification Monitoring Procedure* (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018.

²³⁷ Solo, *Suspected Cross Connection Procedure* (IMS-OPER-D-8304-SW) (Issue No: 1.0), June 2017.

²³⁸ Solo, *GIS Meter Procedure* (IMS-OPER-D-8315-SW) (Issue No: 1.0), June 2017.

The review revealed that these procedures appropriately detail the activities to which each procedure relates.

Operational monitoring:

Arrangements for operational monitoring are outlined in the *Recycled Water Quality Management Plan*,²³⁹ and in more detail in the above referenced Operator's Manuals. Monitoring will primarily be undertaken on-line via the SCADA system, which will provide exception reporting through alarms, but also in accordance with (for example) the *Asset Inspection Checklist Procedure*,²⁴⁰ and *Asset Inspection Checklist Procedure (RWTP)*²⁴¹ and supporting checklists.

Functional specifications identified in the *Infrastructure Operating Plan*²⁴² detail the SCADA monitoring and control arrangements. The *Catherine Hill Bay RWTP - Functional Specification G- PLC02 MBR PLC*²⁴³ includes details in relation to the primary treatment, bioreactors, MBR and aeration blowers; the *Catherine Hill Bay RWTP - Functional Specification I - PLC04 AWTP PLC*²⁴⁴ includes details in relation to the UV feed pump, UV disinfection package plant, Chlorine contact tanks, transfer tank and pump.

Operational corrections:

The *Recycled Water Quality Management Plan*²⁴⁵ indicates that corrective actions have been detailed in the operational procedures, where appropriate, and identifies the relevant procedures in respect of:

- RWTP critical control points;
- Water quality monitoring;
- Network free chlorine;
- Cross connection;
- Pipe breaks; and
- Power failure.

These include, for example, the above referenced *RWTP CCP1 – MBR UF Membranes Management*, *RWTP CCP2 – UV Disinfection Management* and *RWTP CCP3 – Chlorine Contact Tank Management* procedures, which relate to the recycled water plant critical control points. Review of these documents confirms that corrective actions have indeed been appropriately documented.

The *Recycled Water Quality Management Plan* also notes that all incidents and non-compliances will be managed in accordance with the *Incident Response and Notification Management Plan* (refer Table C.6), and that reviews will be undertaken for all incidents and improvements initiated via the *Corrective Action Request Procedure*.²⁴⁶

Equipment capability and maintenance:

The *Recycled Water Quality Management Plan*²⁴⁷ refers to the *Infrastructure Operating Plan* and above referenced Operator's Manuals in respect of the ongoing maintenance and capability of the equipment. Arrangements in relation to design and maintenance of the infrastructure are discussed in detail in Table A.1 and Table A.2.

²³⁹ *Recycled Water Quality Management Plan*, section 2.4.2.

²⁴⁰ Solo, *Asset Inspection Checklist Procedure* (IMS-OPER-D- 8303-SW) (Issue No: 1.0), June 2017.

²⁴¹ Solo, *Asset Inspection Checklist Procedure (RWTP)* (IMS-CONT-D-1691-SW) (Issue No: 1.0), July 2018.

²⁴² *Infrastructure Operating Plan*, section 3.1.7.

²⁴³ Witthoft Engineering, *Catherine Hill Bay RWTP; Functional Specification; PLC02 – MBR PLC* (Revision 2.00), 15 October 2018.

²⁴⁴ Witthoft Engineering, *Catherine Hill Bay RWTP; Functional Specification; PLC04 – AWTP PLC* (Revision 2.00), 15 October 2018.

²⁴⁵ *Recycled Water Quality Management Plan*, section 2.4.3.

²⁴⁶ Solo, *Corrective Action Request (CAR) Procedure* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.

²⁴⁷ *Drinking Water Quality Management Plan*, section 2.4.4.

Materials and chemicals:

Materials:

As discussed in Table A.1, the *Infrastructure Operating Plan, Recycled Water Master Plan*²⁴⁸ and associated drawings reference the adoption of the Water Services Association of Australia (WSAA) *Water Supply Code of Australia* (WSA 03-2012), the *Plumbing Code of Australia* and AS/NZS 3500 *Plumbing and drainage* as the principal guidance for material standards.

Chemicals:

The *Recycled Water Quality Management Plan* indicates that all chemicals have been assessed for suitability and that, during operations all chemicals will be provided by approved local suppliers in accordance with the *CHB Receipt and Storage of Chemicals*²⁴⁹ procedure.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²⁴⁸ Pressure Sewer Solutions, *Recycled Water Reticulation Master Plan Report; Catherine Hill Bay NSW* (Revision 3), 24 October 2013.

²⁴⁹ Solo, *CHB Receipt and Storage of Chemicals* (IMS-COMP-D-0861-SW) (Issue No: 1.1), October 2018.

Table C.5 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 5

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 5. The WQP (npw) outlines the process for verification of the water quality.	 Compliant
Risk	Inadequate verification presents a risk of ongoing supply of unfit recycled water over the longer term.	Target for Full Compliance A suitable verification program is required to ensure that ongoing monitoring and assurance takes place.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. ▪ Solo Water, <i>Incident Response and Notification Management Plan</i> (Issue No: 3.1), November 2018. ▪ Solo, <i>Customer Complaints Procedure</i> (IMS-OPER-D-8313-SW), (Issue No: 2.0), November 2017. ▪ Solo, <i>Water Quality Verification Monitoring Procedure</i> (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), September 2017. 		
Summary of reasons for grade		
Catherine Hill Bay Water has appropriately detailed its recycled water quality verification processes. These processes involve the monitoring of water quality data and customer complaints; appropriate corrective actions have also been identified.		
Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		

Discussion and notes

Recycled water quality monitoring:

The *Recycled Water Quality Management Plan*²⁵⁰ details the arrangements for ongoing verification monitoring, which includes:

- Weekly grab samples from the MBR permeate tank, recycled water tank and recycled water network, with laboratory analysis of *E. coli* and Total Coliform, and field analysis of pH, TDS, Turbidity, Free Chlorine and Total Chlorine;
- Monthly grab samples from the MBR permeate tank and recycled water tank for laboratory analysis of BOD, Suspended Solids, Nitrogen (TN, TKN, NO_x,NH) and Phosphorus (TP, PO₄); and
- Six-monthly (winter and summer) grab samples from the recycled water network for detailed laboratory analysis.

Initial process validation is also referenced (refer Table C.9 for further discussion) as well as other operational process verification in accordance with the previously referenced Operator's Manuals and procedures.

The verification monitoring program is considered appropriate for the purposes of this scheme and has been agreed in consultation with NSW Health.^{251,252} Samples are to be collected by an external NATA accredited facility in accordance with the monitoring plan detailed in the *Water Quality Verification Monitoring Procedure*.

Corrective actions or emergency responses following deviations identified through verification monitoring will follow the agreed protocols.²⁵³

Application site and receiving environment monitoring:

The *Recycled Water Quality Management Plan*²⁵⁴ notes that the proposed irrigation scheme in which any surplus recycled water will be used is not yet operational; it will be constructed under future stages of the Catherine Hill Bay development and the subject of future assessment. Until the irrigation scheme is installed and approved for operation, all surplus recycled water will be trucked off-site by an EPA approved transport contractor and disposed of at an EPA licenced wastewater treatment facility.

The *Recycled Water Quality Management Plan* further notes that:

“Monitoring for potential impacts of recycled water usage and irrigation on customer premises is the responsibility of the customer due to the variety in irrigation system and vegetation types etc throughout the community. Solo Water provides general advice to customers on the appropriate uses of recycled water and best practice methods on how recycled water should be used to minimise the potential for impacts.”

Customers are required to notify Solo Water (Retail Supplier) in accordance with the *Customer Complaints Procedure*²⁵⁵ of any impacts suspected to be the result of using recycled water. An initial investigation by Solo Water/Catherine Hill Bay Water will determine the need for any further investigation or monitoring and, if so, specific investigation and monitoring plan will be developed.

Documentation and reliability:

As reported above, the sampling plan is outlined in the *Recycled Water Quality Management Plan*,²⁵⁶ with further detail presented in the *Water Quality Verification Monitoring Procedure*.²⁵⁷

²⁵⁰ *Recycled Water Quality Management Plan*, section 2.5.1.

²⁵¹ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

²⁵² Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

²⁵³ Solo Water, *Incident Response and Notification Management Plan* (Issue No: 3.1), November 2018.

²⁵⁴ *Recycled Water Quality Management Plan*, section 2.5.2.

²⁵⁵ Solo, *Customer Complaints Procedure* (IMS-OPER-D-8313-SW), (Issue No: 2.0), November 2017.

²⁵⁶ *Recycled Water Quality Management Plan*, section 2.5.1 (table 2.7).

The *Recycled Water Quality Management Plan* also references the arrangements in respect of on-line monitoring of both critical control and non-critical process points, as documented in the *Process Control Table*.²⁵⁸

The documented arrangements are considered appropriate.

Satisfaction of users of recycled water:

The *Recycled Water Quality Management Plan*²⁵⁹ details the arrangements for monitoring and responding to customer feedback and complaints, which is to be undertaken in accordance with the above referenced *Customer Complaints Procedure*. All complaints in relation to impacts suspected to be the result of using recycled water will be investigated as reported above.

Customer complaints can be made via the Solo Water website, by contacting the Solo Water (the Retail Supplier for the scheme) or direct contact with field operations staff. All complaints are entered into an on-line “Smartsheet” system that enables monitoring and tracking; actions taken are also recorded. All complaints are reviewed by the Operations Manager.

Customer service expectations are set out in the *Customer Contract*²⁶⁰ and in a more user-friendly *Home Owner’s Manual*,²⁶¹ both of which are available on the Solo Water website.

Short-term evaluation of results:

The *Recycled Water Quality Management Plan*²⁶² indicates that all water quality data will be reviewed by the operator and Operations Manager upon receipt, as outlined in the relevant procedures. All data is stored in the relevant registers (identified in the procedures) and will be reviewed for long term trending, analysis and reporting to management and IPART.

Any excursions from operational targets will be escalated to the Operations Manager as detailed the CCP management and other procedures as appropriate.

Customer complaints are to be investigated and acted upon in the shortest possible time. Customer complaints and issues will be reported to Solo Water management through monthly, quarterly and annual reporting protocols.

Corrective responses:

As reported in Table C.4, corrective actions will be undertaken in accordance with the operational procedures (referenced above), and all incidents and non-compliances will be managed in accordance with the *Incident Response and Notification Management Plan*.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²⁵⁷ Solo, *Water Quality Verification Monitoring Procedure* (IMS-OPER-D-8305-SW) (Issue No: 1.1), October 2018.

²⁵⁸ *Recycled Water Quality Management Plan*, appendix D.


²⁵⁹ *Recycled Water Quality Management Plan*, section 2.5.4.

²⁶⁰ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

²⁶¹ Solo Water, *Catherine Hill Bay; Home Owner’s Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), September 2017.

²⁶² *Recycled Water Quality Management Plan*, section 2.5.5.

Table C.6 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 6

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 6. The WQP (npw) includes details on the management of incidents and emergencies.	 Compliant
Risk The absence of an approach for handling incidents and emergencies presents a risk of poor response to incidents arising related to the recycled water supply scheme.		Target for Full Compliance An adequate management plan for incidents and emergencies.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo, <i>Incident Response and Notification Management Plan</i> (IMS-AIRR-B-0041-SW) (Issue No: 3.1), November 2018. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. ▪ Solo, <i>Power Outage</i> (IMS-OPER-D-8309-SW) (Issue No: 1.1), October 2018. ▪ Solo, <i>RWTP CCP1 – MBR UF Membranes Management</i> (IMS-GNRL-D-4411-SW) (Issues No: 1.0), August 2018. ▪ Solo, <i>RWTP CCP2 – UV Disinfection Management</i> (IMS-GNRL-D-4412-SW) (Issues No: 1.0), August 2018. ▪ Solo, <i>RWTP CCP3 – Chlorine Contact Tank Management</i> (IMS-GNRL-D-4413-SW) (Issues No: 1.0), August 2018. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water has developed an approach to the management of incidents and emergencies, which is documented in the <i>Incident Response and Notification Management Plan</i> and a number of other relevant procedures (for example, the treatment plant critical control point (CCP) management procedures). An up-to-date <i>Stakeholder Register</i>, which includes NSW Health, the EPA and IPART, is in place.</p> <p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		

Discussion and notes

Communication:

As detailed in the *Recycled Water Quality Management Plan*,²⁶³ prompt communication and notification is required in the event of any significant water quality incident or emergency situation. Such communication is undertaken in accordance with the *Incident Response and Notification Management Plan*.²⁶⁴

Catherine Hill Bay Water maintains the *CHB Stakeholder Register*,²⁶⁵ which has the contact details for all internal and external stakeholders that can be contacted for a variety of reasons. This register is a working document that is updated annually and as notification of any updated contact details is received.

Solo Water also has an SMS notification system that its customers can opt-in to receive SMS notifications and updates on any incidents and emergency events that may occur.

Incident and emergency response protocols:

The *Recycled Water Quality Management Plan* ²⁶⁶describes the approach to trigger and respond to recycled water quality incidents with further details being given in a supporting *Incident Response and Notification Management Plan*. This *Plan*, which has been developed in consultation with NSW Health,^{267,268} outlines the response requirements and strategies to a number of pre-planned emergency events. The procedure also provides the notification procedures for contacting NSW Health, the EPA, IPART, other stakeholders and the public during such incidents and events.

Catherine Hill Bay Water also has in place a number of procedures to guide operators in the event of system failure or incidents. For example, the chlorine dosing system is dependent on a functional power supply for its operation. Catherine Hill Bay Water has a detailed contingency plan to respond to power outages.²⁶⁹ The contingency plan entails use of the standby diesel generator located on-site at the recycled water plant, operation of which is initiated by an auto changeover switch, to feed in via the uninterruptable power supply in the short term. Contact details are given in the contingency plan for related support services providers as well as Ausgrid.

As a further example, the critical control point (CCP) management procedures^{270,271,272} for the treatment plant all detail the actions to be taken in the event that a critical limit is breached, which includes implementation of the *Incident Response and Notification Management Plan*.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

²⁶³ *Recycled Water Quality Management Plan*, section 2.6.1.

²⁶⁴ Solo, *Incident Response and Notification Management Plan* (IMS-AIIR-B-0041-SW) (Issue No: 3.1), November 2018.

²⁶⁵ Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018.

²⁶⁶ *Drinking Water Quality Management Plan*, section 2.6.2.

²⁶⁷ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

²⁶⁸ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

²⁶⁹ Solo, *Power Outage* (IMS-OPER-D-8309-SW) (Issue No: 1.1), October 2018.

²⁷⁰ Solo, *RWTP CCP1 – MBR UF Membranes Management* (IMS-GNRL-D-4411-SW) (Issues No: 1.0), August 2018.

²⁷¹ Solo, *RWTP CCP2 – UV Disinfection Management* (IMS-GNRL-D-4412-SW) (Issues No: 1.0), August 2018.

²⁷² Solo, *RWTP CCP3 – Chlorine Contact Tank Management* (IMS-GNRL-D-4413-SW) (Issues No: 1.0), August 2018.

Table C.7 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 7

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 7. The WQP (npw) outlines operator, contractor and end user awareness and training requirements.	 Compliant
Risk Inadequate training and awareness of employees presents a risk of poor management of the recycled water supply scheme.		Target for Full Compliance Adequate training and awareness of employees.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo Water website: http://www.solowater.com.au/. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017. ▪ Solo Water, <i>Building and Connection Process Guide</i> (IMS-OPER-G-8352-SW) (Issue No: 2.0), April 2018. ▪ Solo Water, <i>Standard Conditions for Approval of Building Plans</i> (IMS-OPER-G-8351-SW) (Issue No: 2.0), December 2017. ▪ Solo, <i>Organisational Chart</i> (MS-OPER-G-8321-SW) (Issue No: 1.1), January 2018. ▪ Solo, <i>Planning and New Schemes Manager; Position Description</i> (IMS-HRPR-P-6233) (Issue No: 1.0), July 2017. ▪ Solo, <i>Water and Wastewater Utility Engineer; Position Description</i> (IMS-HRPR-P-6228) (Issue No: 1.0), March 2017. ▪ Solo, <i>Site Supervisor – Solo Water; Position Description</i> (IMS-HRPR-P-6146) (Issue No: 2.0), March 2016. ▪ Solo, <i>Water and Wastewater Systems Operator – Solo Water</i> (IMS HRPR-P-6234) (Issue No: 1.1), January 2018. ▪ Brad Irwin: Curriculum Vitae; Engineers Australia Membership Certificate; and NPER Certificate of Registration. ▪ Craig Heining: Curriculum Vitae; Qualification Certificates; and AWA Membership Certificate. ▪ Alan Irving: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced. ▪ Ross Pascoe: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced. ▪ Ronnie Paine, Curriculum Vitae; and Training Cards/Certification as referenced. 		

Summary of reasons for grade

The *Recycled Water Quality Management Plan* outlines the arrangements in relation to employee training and awareness in sufficient detail. Observations made during the audit indicate that key staff members have appropriate skills and experience to undertake the operation and maintenance of the recycled water infrastructure in a safe and effective manner.

Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.

Discussion and notes

Operator, contractor and end user awareness and involvement:

The *Recycled Water Quality Management Plan*²⁷³ indicates that all managers, employees and contractors involved with recycled water quality management will undergo induction and ongoing awareness training for relevant aspects of the Recycled Water Quality Management System relating to their areas of work. Employee involvement will be encouraged through processes and mechanisms including:

- general awareness training;
- specific training in respect of each employee's specific roles;
- regular Toolbox Meetings;
- participation in an incident review and continuous improvement process;
- contributing to continuous improvement by submission of corrective action requests; and
- consultation in respect of proposed future changes and updates to systems and processes.

As reported in Table C.1, the *Recycled Water Policy* was on display in the office at the recycled water plant, and based on the audit interviews and site inspections it was apparent that personnel involved with the scheme are appropriately informed and aware of their obligations in respect of drinking water quality management.

End user awareness in relation to the recycled water system is provided principally through information available on the Solo Water website,²⁷⁴ from which copies of relevant documentation including (for example) *Customer Contract*,²⁷⁵ *Home Owner's Manual*,²⁷⁶ *Connection Process Guide*²⁷⁷ and *Standard Conditions for Building Plan Approvals*²⁷⁸ can be obtained. Information is also provided in the marketing panel of customers' bills and customers/end users can contact Solo Water for information either via the website or by telephone.

Operator, contractor and end user training:

The *Recycled Water Quality Management Plan* indicates that all managers, employees and contractors involved with the scheme will have appropriate experience, qualifications and competencies to undertake the specific job for which they are responsible. Job specific training is to be provided to employees and contractors as required.

The organisational structure in respect of the Catherine Hill Bay Water schemes is shown in the Solo Water (Catherine Hill Bay Water's parent company) *Organisational Chart*.²⁷⁹ Roles and responsibilities are described in summary form in the *Infrastructure Operating Plan*.²⁸⁰

²⁷³ *Recycled Water Quality Management Plan*, section 2.71.

²⁷⁴ Solo Water website: <http://www.solowater.com.au/>.

²⁷⁵ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

²⁷⁶ Solo Water, *Catherine Hill Bay; Home Owner's Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017.

²⁷⁷ Solo Water, *Building and Connection Process Guide* (IMS-OPER-G-8352-SW) (Issue No: 2.0), April 2018.

²⁷⁸ Solo Water, *Standard Conditions for Approval of Building Plans* (IMS-OPER-G-8351-SW) (Issue No: 2.0), December 2017.

²⁷⁹ Solo, *Organisational Chart* (MS-OPER-G-8321-SW) (Issue No: 1.1), January 2018.

²⁸⁰ *Infrastructure Operating Plan*, section 4.1 (table 4.1).

More specific responsibilities associated with particular roles are presented in detailed position descriptions. Review of a sample of position descriptions revealed that they require appropriate skills and experience, as follows:

- Planning and New Schemes Manager – responsibilities include planning new schemes, project and operations management, people management and other company roles. Skills and experience requirements include an engineering degree; a minimum of 10 years water industry experience (specifically in respect of new schemes); knowledge of planning and approval processes; and experience in water and wastewater design, development, construction and operations.²⁸¹
- Water and Wastewater Utility Engineer (Operations Manager) – responsibilities include product development design and engineering, project and operations management, people management and other company roles. Skills and experience requirements include an engineering degree; a minimum of 10 years water industry operations experience; and experience in water and wastewater design, development, construction and operations.²⁸²
- Site Supervisor – responsibilities include site management and people management. Skills and experience requirements include a minimum of 2 years' experience in a similar supervisory role.²⁸³
- Water and Wastewater Systems Operator – responsibilities include site management and people management. Skills and experience requirements include trade or technical qualifications applicable to the water industry and a minimum of 5 years' experience in the water industry with a focus on operation and maintenance of water and wastewater systems.²⁸⁴

Review of the curriculum vitae and other relevant documentation for the incumbents of a selection of the key positions is as follows:

- Planning and New Schemes Manager (Brad Irwin) – an Environmental Engineer with 15 years relevant water industry experience, including the investigation planning and design of water and wastewater systems and integrated water management. Evidence of Engineers Australia (Chartered Professional Engineer) membership and registration on the National Professional Engineers Register was also provided.²⁸⁵
- Operations Manager (Craig Heininger) – a civil engineer with 25 years relevant water industry experience including roles in the development of water and wastewater infrastructure and the operation and maintenance of treatment facilities and other water industry infrastructure. Qualifications include a Bachelor of Engineering (Civil), Certificate III in Industrial Instrumentation and a Water Board Gold Medal Award (UNSW); Craig is also a member of the Australian Water Association.²⁸⁶
- Site Manager (Alan Irving) – a licensed plumber with almost 40 years' industry experience, including domestic and commercial maintenance and new work, and the construction of sewer and water reticulation infrastructure. Copies of Alan's relevant training cards were provided, including his Plumbing Licence (No: 23847); NSW Fair Trading Supervisor Certificate; Certificate III in Civil Construction (Tunnel Construction); Energy Safe Victoria Restricted Electrical Workers Licence; OH&S Industry Induction and Confined Spaces training.²⁸⁷
- Site Supervisor (Ross Pascoe) – a licensed plumber with more than 35 years' experience including domestic and commercial plumbing, leading hand on commercial projects and site supervision in relation to water and sewer network construction and treatment plant construction and commissioning. Copies of Ross' relevant training cards were provided, including his Plumbing

²⁸¹ Solo, *Planning and New Schemes Manager; Position Description* (IMS-HRPR-P-6233) (Issue No: 1.0), July 2017.

²⁸² Solo, *Water and Wastewater Utility Engineer; Position Description* (IMS-HRPR-P-6228) (Issue No: 1.0), March 2017.

²⁸³ Solo, *Site Supervisor – Solo Water; Position Description* (IMS-HRPR-P-6146) (Issue No: 2.0), March 2016.

²⁸⁴ Solo, *Water and Wastewater Systems Operator – Solo Water* (IMS HRPR-P-6234) (Issue No: 1.1), January 2018.

²⁸⁵ Brad Irwin: Curriculum Vitae; Engineers Australia Membership Certificate; and NPER Certificate of Registration.

²⁸⁶ Craig Heininger: Curriculum Vitae; Qualification Certificates; and AWA Membership Certificate.²⁸⁷ Alan Irving: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced.

²⁸⁷ Alan Irving: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced.

Licence (No: 26103); NSW Fair Trading Supervisor Certificate; Queensland Building and Construction Commission Plumbing Occupational Licence; WorkSafe Victoria Licence to Perform High Risk Work; Agricultural Chemical User Permit; Equipment Operator OHS Competency Qualification; and OH&S General Induction (WorkCover NSW).²⁸⁸

- Water and Wastewater Systems Operator (Ronnie Payne) – an Environmental Engineer with 13 years' experience in commissioning, operation, maintenance and servicing of both large and small water treatment facilities throughout Australia and the Asia Pacific. Ronnie's multifaceted roles have included construction manager, commissioning engineer, process review engineer, operations team leader, site lead technical advisor, breakdown on-site maintenance specialist, and lead plant operator. Copies of Ronnie's Construction Induction card and certification in relation to confined space entry, working and rescue were provided.²⁸⁹

On the basis of the sample of evidence reviewed and discussions with the abovementioned people during the audit fieldwork,²⁹⁰ it is apparent that Catherine Hill Bay Water has adequately trained persons to implement the *Recycled Water Quality Management Plan*. Furthermore, there are systems in place to update and maintain that training.

Training for end users in respect of recycled water is provided through the mechanism referenced above in respect of end user awareness.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

²⁸⁸ Ross Pascoe: Curriculum Vitae; Plumbing Licence; and Training Cards as referenced.

²⁸⁹ Ronnie Paine, Curriculum Vitae; and Training Cards/Certification as referenced.

²⁹⁰ Ross Pascoe participated in the Stage 1 audits conducted by Cobbitty Consulting/Water Futures.

Table C.8 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 8

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 8. The WQP (npw) outlines the process for community awareness and involvement.	 Compliant
Risk Inadequate community consultation, awareness and involvement present a risk of poor management of the recycled water supply scheme.		Target for Full Compliance Adequate community consultation, awareness and involvement.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo Water website: http://www.solowater.com.au/. ▪ Solo Water, <i>Customer Contract</i> (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017. 		
Summary of reasons for grade		
<p>Catherine Hill Bay Water/Solo Water has provided sufficient detail in relation to its process for community consultation, awareness and involvement. The mechanisms employed are primarily website based, but also include direct contact with Solo Water or field operations staff.</p> <p>Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.</p>		
Discussion and notes		
<i>Consultation with users of recycled water and the community:</i>		
<p>The <i>Recycled Water Quality Management Plan</i>²⁹¹ indicates that community consultation has occurred during the project approvals phase, which included IPART placing the Catherine Hill Bay Water proposal on its website for public comment as part of the WICA licence application assessment and approval process. This consultation process will be repeated for any significant changes to the scheme.</p>		
<p>From an ongoing perspective, customer feedback and complaints can be made via the Solo Water website, by contacting the Solo Water ((Catherine Hill Bay Retail Supplier and parent company of Catherine Hill Bay Water) call centre or direct contact with field operations staff.</p>		
<i>Communication and education:</i>		
<p>The <i>Recycled Water Quality Management Plan</i> indicates that Catherine Hill Bay Water customers will be provided information in relation to the recycled water scheme by way of the Solo Water website.²⁹² A copy of the <i>Recycled Water Policy</i> is available, together with on-line forms that can be used to obtain further information. The “FAQs” webpage provides information regarding “Benefits of recycled water”, “What</p>		

²⁹¹ *Recycled Water Quality Management Plan*, section 2.8.

²⁹² Solo Water website: <http://www.solowater.com.au/>.

you can use recycled for” and “What not to do with recycled water”.

The *Customer Contract*²⁹³ and *Home Owner’s Manual*²⁹⁴ also provide information in relation to the recycled water scheme, including details of the service to be provided and customers’ obligations in respect of using the service. These documents are also available on the Solo Water website.²⁹⁵

Information is also provided in the marketing panel of customers’ bills and members of the community can contact Solo Water for information either via the website or by telephone.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

²⁹³ Solo Water, *Customer Contract* (IMS-OPER-G-8299-SW) (Issue No: 1.1), January 2018.

²⁹⁴ Solo Water, *Catherine Hill Bay; Home Owner’s Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017.

²⁹⁵ The *Customer Contract* and *Home Owner’s Manual* did not appear to be available on the website at the time of the Stage 1 (Interim Scheme) Licence Plan Audit; however, an opportunity for improvement identified at that time has now been addressed.

Table C.9 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 9

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 9. The WQP (npw) outlines the validation, research and development processes for the scheme.	 Compliant

Risk	Target for Full Compliance
Inadequate validation, research and development processes present a risk of poor management of the recycled water supply scheme.	Adequate validation, research and development processes.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2* (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018.
- Aquatis, *LRV justification for the CHB recycled water plant*, undated.
- Solo Water, *Commissioning Plan – WWTP/AWTP; Catherine Hill Bay Water Utility* (IMS-OPER-B-8356-SW) (Revision 1), 23 February 2018.
- Aquatis, *Validation Plan and Validation Results Template*, undated.

Summary of reasons for grade

Catherine Hill Bay Water has outlined its approach in relation to the validation of processes. Pre-validated equipment has been used for each treatment process, and arrangements for site validation/verification have been outlined in the *Commissioning Plan* and *Validation Plan*. Catherine Hill Bay Water has also outlined a more holistic approach to ongoing validation of system performance, which is supported.

Design of infrastructure by appropriately qualified personnel in accordance with industry standards provides the basis for continuing reliability.

Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.

Discussion and notes

Validation of processes:

As reported in Table C.3, Catherine Hill Bay Water has used pre-validated equipment for each treatment process. The basis of that validation is detailed in the *LRV justification for the CHB recycled water plant*²⁹⁶ report.

The *Recycled Water Quality Management Plan*²⁹⁷ outlines the arrangements for the validation of treatment processes during commissioning. Such validation is to be undertaken in accordance with following, which detail appropriate arrangements:

- *Commissioning Plan*;²⁹⁸

²⁹⁶ Aquatis, *LRV justification for the CHB recycled water plant*, undated (refer appendix C to the *Recycled Water Quality Management Plan*).

²⁹⁷ *Recycled Water Quality Management Plan*, section 2.9.1.

²⁹⁸ Solo Water, *Commissioning Plan – WWTP/AWTP; Catherine Hill Bay Water Utility* (IMS-OPER-B-8356-SW) (Revision 1), 23 February 2018.

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- *Validation Plan and Validation Results Template*;²⁹⁹ and
 - Process monitoring as outlined in the *Process Control Table*.³⁰⁰

Apart from validation of the treatment process, the *Recycled Water Quality Management Plan* also identifies other areas of focus considered necessary for ongoing validation of system performance, including:

- Assessment of water quality data;
- Compliance with CCP management procedures;
- Assessment of incidents as they arise;
- Assessment of customer complaints;
- Validation of customer connections; and
- Review and performance reporting.

Procedures relevant to each of these areas of focus have been identified.

This holistic approach to process validation is supported.

Design of equipment:

All equipment has been designed by appropriately qualified water engineering professionals. Process equipment that uses technology proven in the water industry and supplied by reputable manufacturers has been selected for use.³⁰¹ All equipment is subject to testing and validation in accordance with the above mentioned *Commissioning Plan*.

Investigative studies and research monitoring:

The *Recycled Water Quality Management Plan*³⁰² indicates that research and development will be undertaken as required to address identified deficiencies or uncertainties in the recycled water system. Solo Water and Catherine Hill Bay Water staff and contractors will also remain up to date with industry research and technology through their involvement with industry bodies and attendance at industry seminars and conferences. This approach is considered appropriate.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.


²⁹⁹ Aquatis, *Validation Plan and Validation Results Template*, undated (refer appendix C to the *Recycled Water Quality Management Plan*).

³⁰⁰ *Recycled Water Quality Management Plan*, appendix D.

³⁰¹ *Recycled Water Quality Management Plan*, section 2.9.2.

³⁰² *Recycled Water Quality Management Plan*, section 2.9.3.

Table C.10 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 10

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 10. The WQP (npw) outlines the process for management of documentation and records as well as the reporting requirements.	 Compliant
Risk	Inadequate documentation, records and reporting presents a risk of poor management of the recycled water supply scheme.	Target for Full Compliance Adequate documentation, records and reporting.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo, <i>CHB Free Chlorine Field Verification</i> (IMS-CONT-G-1675-SW) as at 18 October 2018. ▪ Solo, <i>CHB Calibration Register</i> (IMS-CONT-G-1672-SW) as at 18 October 2018. ▪ Solo, <i>CHB Stakeholder Register</i> (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018. 		
Summary of reasons for grade		
Catherine Hill Bay Water has outlined its arrangements in relation to the management of documentation and records, and complying with its reporting requirements. Appropriate systems are either already in place or currently being implemented.		
Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		
Discussion and notes		
<i>Management of documentation and records:</i>		
The <i>Recycled Water Quality Management Plan</i> ³⁰³ indicates that Solo Resource Recovery, parent company of Solo Water (and in turn Catherine Hill Bay Water) has an integrated management system (IMS) that incorporates quality, safety and environmental management; effective document management is a principal component of such management systems. The IMS is certified to ISO 9001, ISO 14001, AS/NZS 4801 and OHSAS 18001; the Catherine Hill Bay site has recently been added to the certification.		
Solo Water/Catherine Hill Bay Water has a Citrix document management system, which was witnessed live during the Stage 1 (Interim Scheme) Licence Plan Audit. Catherine Hill Bay Water was able to show a list of documents and could ‘click’ on the listed documents to view them. A number of sample documents were selected for viewing; the ‘current’ version of each document sought was available.		
Solo Water/Catherine Hill Bay Water maintains a number of information databases applicable to recycled water quality management, including:		
<ul style="list-style-type: none"> ▪ SCADA system logs, alarms and reports in respect of the operational system that are maintained in the ClearSCADA system; 		

³⁰³ *Recycled Water Quality Management Plan*, section 2.10.1.

-
- Customer complaint ‘Smartsheet’ on-line database; and
 - Various registers, including (for example):
 - *CHB Free Chlorine Field Verification Register*,³⁰⁴ which is used to capture and monitor records of twice-weekly hand-held free chlorine field verification checks;
 - *CHB Calibration Register*,³⁰⁵ which is used to record all instrument calibrations; and
 - *CHB Stakeholder Register*,³⁰⁶ which correctly identified NSW Health, EPA and IPART amongst other stakeholders.

As reported in Table A.1, Solo Water/Catherine Hill Bay Water is currently implementing the Maximo enterprise asset management system. This will be used to (in conjunction with the GIS) to record all asset related information, including asset maintenance records.

Reporting:

The *Recycled Water Quality Management Plan*³⁰⁷ indicates that internal reports in respect of the Catherine Hill Bay Water scheme will be prepared for Solo Water management on a quarterly and annual basis. These will provide a summary of performance and the adequacy of the scheme, addressing recycled water quality; customer feedback and complaints; performance against indicators and service standards; non-compliances, corrective actions and emergency events; and recommendations for improvement.

The annual reports will be prepared in accordance with the Network Operator’s *Reporting Manual* as outlined in the *IPART Reporting Procedure*.³⁰⁸ Any required incident reporting will be in accordance with the *Incident Response and Notification Management Plan*.³⁰⁹

Annual reports and water quality monitoring results will be made available to customers and other stakeholders upon request.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

³⁰⁴ Solo, *CHB Free Chlorine Field Verification* (IMS-CONT-G-1675-SW) as at 18 October 2018.

³⁰⁵ Solo, *CHB Calibration Register* (IMS-CONT-G-1672-SW) as at 18 October 2018.


³⁰⁶ Solo, *CHB Stakeholder Register* (IMS-CONT-G-1679-SW) (Issue No: 1.1), September 2018.

³⁰⁷ *Recycled Water Quality Management Plan*, section 2.10.2.

³⁰⁸ Solo, *IPART Reporting Procedure* (IMS-OPER-D-8324-SW) (Issue No: 1.1), March 2018.

³⁰⁹ Solo, *Incident Response and Notification Management Plan* (IMS-AIIR-B-0041-SW) (Issue No: 3.1), November 2018.

Table C.11 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 11

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 11. The WQP (npw) outlines the process for long-term evaluation of results and the audit of the documentation.	 Compliant
Risk Inadequate long-term evaluation and audit presents a risk of poor management of the recycled water supply scheme.		Target for Full Compliance Adequate long-term evaluation and audit.
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Infrastructure Operating Plan; Stage 2</i> (reference: IMS-OPER-B-8297-SW) (Revision 2.1), 5 November 2018. ▪ Solo, <i>Internal Audit Procedure</i> (IMS-COMP-D-0835) (Issue No: 3.0), November 2018. ▪ Solo, <i>Compliance Calendar</i> (IMS-COMP-G-0832) (Issue 1.0), February 2018. ▪ Solo, <i>Corrective Action Request (CAR)</i> (IMS-COMP-D-0817) (Issue No: 4.1), June 2017. 		
Summary of reasons for grade		
Catherine Hill Bay Water has outlined the arrangements in relation to its long-term evaluation of results and audit of the implementation of the <i>Recycled Water Quality Management Plan</i> . Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		
Discussion and notes		
<i>Long-term evaluation of results:</i>		
The <i>Recycled Water Quality Management Plan</i> ³¹⁰ indicates that ongoing review and evaluation of operational performance and monitoring results; and operational performance data against key performance indicators, target level of service standards and other benchmarking indicators, will be undertaken in the context of the lifecycle management strategies outlined in the <i>Infrastructure Operating Plan</i> . ³¹¹		
Comparison against industry benchmarks is considered appropriate basis for assessing performance. It is noted that Catherine Hill Bay Water’s service and performance standards are measured using NWI, NSW DPI and IPART indicators are documented in the <i>Infrastructure Operating Plan</i> . ³¹²		
The outcomes of the ongoing review and long-term evaluation of results will be incorporated into the internal and external reports referenced in Table C.10.		

³¹⁰ *Recycled Water Quality Management Plan*, section 2.11.1.

³¹¹ *Infrastructure Operating Plan*, section 6.

³¹² *Infrastructure Operating Plan*, section 2.3.

Audit of recycled water quality management:

The evaluation of system performance will be supported by internal audit of compliance with the provisions of the *Recycled Water Quality Management Plan*. Catherine Hill Bay Water has an *Internal Audit Procedure*,³¹³ which outlines the process for internal auditing of management system process and compliance. Audits are to be undertaken in accordance with a *Compliance Calendar*,³¹⁴ and any non-compliances are to be managed in accordance with the *Corrective Action Request (CAR)*³¹⁵ procedure.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement


No opportunities for improvement have been identified in respect of this obligation.

³¹³ Solo, *Internal Audit Procedure* (IMS-COMP-D-0835) (Issue No: 3.0), November 2018.

³¹⁴ Solo, *Compliance Calendar* (IMS-COMP-G-0832) (Issue 1.0), February 2018.

³¹⁵ Solo, *Corrective Action Request (CAR)* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.

Table C.12 WQP (npw) Audit Table – WIC Reg Sched 1 cl.7(1)(b) – AGWR Element 12

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.7(1)(b)	Element 12. The WQP (npw) outlines a process for review and continual improvement.	 Compliant
Risk	Target for Full Compliance	
An inadequate process for review and continual improvement a risk of poor management of the recycled water supply scheme.	Adequate processes for review and continual improvement.	
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Recycled Water Quality Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3727-SW) (Revision 1.1), 5 November 2018. ▪ Solo, <i>Corrective Action Request (CAR) Procedure</i> (IMS-COMP-D-0817) (Issue No: 4.1), June 2017. ▪ Solo, <i>Corrective Action Request (CAR) Log</i> (IMS-COMP-G-0818) as at 23 November 2018. 		
Summary of reasons for grade		
Catherine Hill Bay Water has outlined the arrangements in relation to management review and continual improvement of the <i>Recycled Water Quality Management Plan</i> . The management review process, which will be focussed on continuous improvement, is clearly defined.		
Accordingly, it is assessed that Catherine Hill Bay Water is compliant with this requirement.		
Discussion and notes		
<i>Review by senior managers:</i>		
The Solo Water executive team will receive and review quarterly and annual reports prepared by the Operations Manager regarding the performance of all Solo Water Schemes including the Catherine Hill Bay Water scheme. As noted in Table C.10, these reports will include recommendations for continuous improvement made by operations staff and the Operations Manager.		
The management review process will include: ³¹⁶		
<ul style="list-style-type: none"> ▪ review of significant issues; ▪ review of quarterly and annual reports; ▪ review of the outcomes of internal and external audits; ▪ approval of funding and resource allocation for improvement initiatives; ▪ monitoring implementation of the continuous program; and ▪ providing input in relation to the potential impact of any future organisational change. 		

³¹⁶ *Recycled Water Quality Management Plan*, section 2.12.

Recycled water quality management improvement plan:

Continuous improvements will be managed in accordance with the Solo Water integrated management system using the *Corrective Action Request Procedure*.³¹⁷ Opportunities for improvement will be identified from the review of operational data, incident reports, complaints, annual reports and the outcomes of internal and external audits.

The implementation of approved improvements will be managed through the *Corrective Action Request Log*.³¹⁸

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.


³¹⁷ Solo, *Corrective Action Request (CAR) Procedure* (IMS-COMP-D-0817) (Issue No: 4.1), June 2017.

³¹⁸ Solo, *Corrective Action Request (CAR) Log* (IMS-COMP-G-0818) as at 23 November 2018.

Appendix D Detailed Audit Findings – Sewage Management Plan (SMP)

Detailed audit findings in respect of the *Sewage Management Plan* (SMP) are presented in this Appendix.

Table D.1 SMP Audit Table – WIC Reg Sched 1 cl.14(1)(a)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.14(1)(a)	The Sewage Management Plan, in relation to the conveyance, treatment and disposal of sewage by means of infrastructure, indicates the manner in which the health and ecological assessments will be undertaken and any concerns arising from any such assessment.	 Compliant
Risk	Target for Full Compliance	
Failure to adequately describe the system and assess risks could lead to risks being overlooked.	Adequate system description and risk assessment.	
Evidence sighted		
<ul style="list-style-type: none"> ▪ Interviews with Catherine Hill Bay Water personnel on 18 October 2018. ▪ Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Sewage Management Plan; Stage 2</i> (reference: IMS-ENVM-B-3728-SW) (Revision 2.1), 5 November 2018. ▪ Solo Water, <i>Process Flow Diagram; Stage 1 & 2 Recycled Water Supply</i> (Drawing No: 56-RW-PFD-ST1&2-2), 5 November 2018. ▪ Cardno, <i>Solo Water; Catherine Hill Bay Water; Waste Water Treatment Plant; Civil Engineering Design</i> (Drawing Nos: SW-56-WWTP-WAE-1000 to 1032 (27 sheets)) (Revision X), 28 June 2018. ▪ Drawings No: SW-56-C-LP-2001, 2002 & 2003, <i>Catherine Hill Bay Residential Subdivision Stage 1; Sewer Layout Plan Work as Executed Sheets 1, 2 & 3</i>, signed 9 August 2016. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2</i> (Revision 2.0), 21 September 2018. ▪ Solo Water, <i>Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2</i> (Revision 1.0), 19 September 2018. ▪ Solo, <i>Catherine Hill Bay Water Utility; Risk Register – Stage 2</i> (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018. ▪ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: <i>Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure</i>). ▪ Solo, <i>Risk Register – Interim Scheme (Sewage)</i> (IMS-ENVM-G-3635-SW) (Revision 2.1), 6 June 2017. ▪ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: <i>Revised DWQMP, SMP and INRNP</i>) [also related to the RWQMP]. ▪ Solo Water, <i>Catherine Hill Bay; Home Owner's Manual</i> (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017. ▪ Solo, <i>CCP Raw Sewage Containment Procedure</i> (IMS-GNRL-D-4415-SW) (Issue No: 1.0), August 2018. ▪ <i>Tankering Agreement</i> between Hunter Water Corporation and Solo Resource Recovery, dated 30 October 2018. 		

Summary of reasons for grade

The *Sewage Management Plan* indicates that hazard identification and risk assessment in relation to potential health and ecological impacts has been undertaken in accordance with guidance provided in the *Australian Guidelines for Water Recycling*. A *Risk Register – Stage 2* has been developed with input from NSW Health, which has indicated that it is satisfied with the assessment process and resultant documentation.

Catherine Hill Bay Water demonstrated that risk mitigation measures, identified through the risk assessment process, have been implemented. These are considered appropriate for the Stage 2 scheme arrangements under which the sewage treatment/recycled water plant will be operating.

Accordingly, Catherine Hill Bay Water is assessed to have demonstrated compliance with this obligation.

Discussion and notes

Overview:

The *Sewage Management Plan* has been structured to address the twelve elements of the *Australian Guidelines for Water Recycling*.³¹⁹ Under the Stage 2 and all future scheme arrangements, sewage generated within the area serviced by Catherine Hill Bay Water will be delivered via the pressure sewer network to the Recycled Water Plant for treatment.³²⁰ The *Sewage Management Plan* details the arrangements in relation to the sewage collection system (pressure sewer network) and raw sewage storages (Inlet Balance Tank and Emergency Storage Tank at the treatment plant).

Scheme Description:

The sewerage system is described at an overview level³²¹ and in more detail³²² in the *Sewage Management Plan*. A *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply*³²³ together with layout drawings for the treatment plant site³²⁴ and the reticulation system servicing Stages 1 and 2 of the development³²⁵ provide adequate detail to understand the scope and arrangement of the system.

More specific detail in respect of the sewage collection system is presented in the *Operator's Manual; Distribution System Networks; Stage 2*,³²⁶ whilst details of the raw sewage storages at the treatment plant are provided in the *Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2*.³²⁷

The Stage 2 sewerage system comprises a pressure sewer collection network (which formed part of the Stage 1 scheme arrangements), together with the raw sewage storages at the treatment plant. More specifically, the scheme will comprise:

- Gravity sewers that convey sewage from up to five properties to each Pressure Sewer Unit (PSU).
 - Multiple Pressure Sewer Units (PSUs), which are essentially prefabricated in-ground pits that accommodate duty and standby grinder pumps and provide up to 24 hours storage capacity. Each PSU is fitted with a monitoring and control panel, which is connected to the SCADA system, and is used to control the pumpsets and initiate alarms in response to nominated fault/failure conditions.
 - A low pressure sewer network through which sewage is pumped to the Inlet Balance Tank (Influent Tank) at the treatment plant.
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³¹⁹ NRMCC/EPHC/AHMC, *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)*, 2006.

³²⁰ *Sewage Management Plan*, section 1.1.

³²¹ *Sewage Management Plan*, section 1.3.

³²² *Sewage Management Plan*, section 2.2.

³²³ Solo Water, *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply* (Drawing No: 56-RW-PFD-ST1&2-2), 5 November 2018.

³²⁴ Cardno, *Solo Water; Catherine Hill Bay Water; Waste Water Treatment Plant; Civil Engineering Design* (Drawing Nos: SW-56-WWTP-WAE-1000 to 1032 (27 sheets)) (Revision X), 28 June 2018.

³²⁵ For example: Drawings No: SW-56-C-LP-2001, 2002 & 2003, *Catherine Hill Bay Residential Subdivision Stage 1; Sewer Layout Plan Work as Executed Sheets 1, 2 & 3*, signed 9 August 2016.

³²⁶ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Distribution System Networks; Stage 2* (Revision 2.0), 21 September 2018, section 3.2.

³²⁷ Solo Water, *Catherine Hill Bay Water Utility; Operator's Manual; Recycled Water Treatment Plant (RWTP); Stage 2* (Revision 1.0), 19 September 2018, sections 3.1.2 and 3.1.10.

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- Two emergency storage tanks, each of 50 kilolitres capacity, at the treatment plant. During an extended emergency, the WAS (waste activated sludge) and CIP (clean in place waste) storages can also be used for emergency storage. Raw sewage can also be collected and disposed of by road tanker.

Arrangements for the transport and disposal of the sewage road tanker are discussed in more detail in Table D.2.

Hazard Identification and Risk and Uncertainty Assessment:

Hazard identification and risk assessment is addressed in the *Sewage Management Plan*,³²⁸ which references conduct of a risk assessment workshop during which control strategies were identified and their impact in mitigating risk assessed. Participants at the workshop, which was conducted in accordance with the guidance presented in the *Australian Guidelines for Water Recycling*, included representatives of NSW Health (Hunter New England Population Health), Catherine Hill Bay Water/Solo Water and GHD, which is considered adequate. A 12-month review and update of the risk assessment was undertaken in May 2017 and a minor update was made in June 2017. A major review and update “to incorporate the MBR/AWTP, recycled water and onsite storages/booster systems” was undertaken in July 2018 by representatives of Catherine Hill Bay Water/Solo Water, NSW Health (Hunter New England Population Health) and consultants Witthoft Engineering (electrical, instrumentation and industrial control system solutions) and Aquatis (process technology), which is considered appropriate given the inclusion of the additional Stage 2 infrastructure.

The outcomes of the risk assessment workshop are documented in the *Risk Register – Stage 2*.³²⁹ This indicates that, as reflected in the *Sewage Management Plan*,³³⁰ the principal potential hazards/impacts associated with the scheme include:

- contaminants in the sewage (as discharged by customers);
- sewage overflow/spills at PSUs;
- sewage spills as the result of a sewer main breaks;
- sewage overflow/spills at the Inlet Balance Tank;
- odour emissions;
- vandalism; and
- potential cross connection and or water quality issues during testing and commissioning of the treatment plant.

NSW Health had advised of its satisfaction with the documentation and the consultation process in relation to the Catherine Hill Bay Water schemes prior to commissioning of the Stage 1 (Interim Scheme) infrastructure.³³¹ It is noted that the referenced documentation includes the *Risk Register – Interim Scheme (Sewage)*.³³²

As noted above, a NSW Health representative participated in the July 2018 risk assessment and a copy of the (updated) *Risk Register - Stage 2* was provided to them. Comments were subsequently provided, although these related more specifically to the water quality aspects of the Catherine Hill Bay Water schemes.³³³

³²⁸ *Sewage Management Plan*, section 2.2.5 and 2.3.1.

³²⁹ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Sewerage System* worksheet.

³³⁰ *Sewage Management Plan*, section 2.3.1.

³³¹ Email chain between NSW Health and Catherine Hill Bay Water with entries dated 26 May 2017, 1 June 2017, 8 June 2017, 13 June 2017 and 19 June 2017 (re: *Draft Water Quality Monitoring Procedure and Incident Response and Notification Procedure*).

³³² Solo, *Risk Register – Interim Scheme (Sewage)* (IMS-ENVM-G-3635-SW) (Revision 2.1), 6 June 2017.

³³³ Email from NSW Health to Catherine Hill Bay Water and response both dated 10 October 2018 (re: *Revised DWQMP, SMP and INRNP*) [also related to the RWQMP].

Mitigation Measures:

Risk mitigation measures identified in the *Risk Register – Stage 2*, and which are reflected in the *Sewage Management Plan*, include (for example) the following:

- The *Home Owner's Manual*³³⁴ includes a clear listing of items (including chemicals) that should not be put down the sewer.
- Pressure Sewer Units (PSUs) are fitted with SCADA monitoring and control to ensure sewage levels are appropriately managed, as well as 24 hours storage capacity to accommodate system outages/interruption. Contingency arrangements include the use of vacuum trucks to pump out PSUs in the event of potential overflow.
- Stored sewage levels in the Inlet Balance Tank and Emergency Storage Tanks are monitored via the SCADA system to ensure that there are no overflows. Contingency arrangements are in place for the transport of sewage for offsite disposal if required.
- The stored sewage levels in the PSUs, Inlet Balance Tank and Emergency Storage Tanks have been identified as a critical control points (CCPs), for which target, operational and critical limits, together with corrective/preventative actions, have been nominated in the *Sewage Management Plan*³³⁵ and further documented in the *CCP Raw Sewage Containment Procedure*.³³⁶
- The Inlet Balance Tank and Emergency Storage Tanks Bunding are located within bunded areas at the treatment plant site to contain any spillage. All water (including spilt sewage) captured on the site will be returned to the sewage tank for disposal.
- All odour sources at the treatment plant, including the Inlet Balance Tank, are positively vented via an odour filter. Odour filters have been installed on all air release valves in the pressure sewer network.
- Procedures for response to failure conditions including sewage spill, sewer break, power loss, etc. are referenced in the *Sewage Management Plan*,³³⁷ and are in place (these are discussed in more detail in Table A.3).

Considering the above, it is apparent that appropriate risk mitigation measures have been identified and, based on observations made during the audit site inspections, are in place.

Sewage Quality Monitoring:

The *Sewage Management Plan*³³⁸ indicates that: "... the quality of the raw sewage is expected to be similar to that of normal domestic wastewater with no additional contaminants of concern". Furthermore: "All non-residential lots are required to enter into a Trade Waste Agreement with Solo Water to ensure wastewater is pre-treated to domestic standards prior to being discharged to into the sewerage system". Only one small shop (take away/convenience store) is proposed in the serviced area.

The *Sewage Management Plan*³³⁹ further indicates that:

"Raw sewage monitoring from a sewage quantity and quality perspective is also undertaken for the Recycled Water Treatment Plant and in the Recycled Water Management Plan (IMSQUAL-B-8446-SW)."

It is noted that the *Tankering Agreement*,³⁴⁰ under which sewage is to be discharged to a Hunter Water treatment facility (refer Table D.2 for further discussion) does not require monitoring of sewage

³³⁴ Solo Water, *Catherine Hill Bay: Home Owner's Manual* (IMS-OPER-C-8312-SW) (Issue No: 1.0), July 2017.

³³⁵ *Sewage Management Plan*, section 2.3.2 (table 2.4).

³³⁶ Solo, *CCP Raw Sewage Containment Procedure* (IMS-GNRL-D-4415-SW) (Issue No: 1.0), August 2018.

³³⁷ *Sewage Management Plan*, section 2.4.3 (table 2.5).

³³⁸ *Sewage Management Plan*, section 2.2.3.

³³⁹ *Sewage Management Plan*, section 2.5.1.

³⁴⁰ *Tankering Agreement* between Hunter Water Corporation and Solo Resource Recovery, dated 30 October 2018.

characteristics. Under the terms of the *Agreement*, Solo Resource Recovery (transport agency) is required to report the source of the sewage, and the sewage may be subject to random testing by Hunter Water prior to discharge.

In summary, the *Sewage Management Plan* outlines the arrangements in relation to sewage quality monitoring.

Review of Historical Data and Exceedances:

The *Sewage Management Plan*³⁴¹ indicates that, under the Stage 2 scheme arrangements, sewage monitoring for performance verification purposes will involve the following, which is to be undertaken in accordance with referenced procedures:

- operational monitoring of water levels, pump run hours and alarms using SCADA;
- routine visual inspection of PSUs, storage and the pressure sewer network;
- sewage flow monitoring at the treatment plant inflow flow meter;
- any pump out activities by receipts provided by pump out contractor;
- monitoring of household connections to the sewerage system;
- estimation of L/ET/day in dry and wet weather;
- odour complaint monitoring; and
- environmental monitoring of incidents to demonstrate/verify that the impacts of the incident have ended.

Review of a series of related procedures, referenced in the *Sewage Management Plan*, confirms that appropriate monitoring arrangements are in place. The *Sewage Management Plan*³⁴² also details the arrangements for the long term evaluation and review of performance.

Recommendations

There are no recommendations in respect of this obligation.


Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

³⁴¹ *Sewage Management Plan*, section 2.5.1.

³⁴² *Sewage Management Plan*, sections 2.11 and 2.12.

Table D.2 SMP Audit Table – WIC Reg Sched 1 cl.14(1)(b)

Clause	Requirement	Compliance Grade
WIC Reg Sched 1 cl.14(1)(b)	The Sewage Management Plan, in relation to the conveyance, treatment and disposal of sewage by means of infrastructure, indicates the arrangements for the disposal of waste from the infrastructure.	 Compliant

Risk	Target for Full Compliance
Failure to adequately make arrangements for the disposal of waste from the infrastructure presents a risk to public health and the environment.	Adequate arrangements for the disposal of waste from the infrastructure.

Evidence sighted

- Interviews with Catherine Hill Bay Water personnel on 18 October 2018.
- Site inspection of Stage 2 infrastructure at Catherine Hill Bay on 18 October 2018.
- Solo Water, *Catherine Hill Bay Water Utility; Sewage Management Plan; Stage 2* (reference: IMS-ENVM-B-3728-SW) (Revision 2.1), 5 November 2018.
- Solo Water, *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply* (Drawing No: 56-RW-PFD-ST1&2-2), 5 November 2018.
- Solo, *CCP Raw Sewage Containment Procedure* (IMS-GNRL-D-4415-SW) (Issue No: 1.0), August 2018.
- Solo Resource Recovery, *Terms of Service Agreement*, 15 February 2016 (in relation to liquid waste removal).
- *Tankering Agreement* between Hunter Water Corporation and Solo Resource Recovery, dated 30 October 2018.
- Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018.
- Solo, *Quality, Safety and Environmental Aspects Risk Register* (IMS-RISK-G-8856-SW), as at 18 October 2018.

Summary of reasons for grade

The arrangements in respect of the management of waste streams arising as a result of the conveyance, treatment and disposal of sewage, which for the purposes of the Stage 2 Scheme arrangements include the off-site disposal of sewage in the event of excess flows or under emergency conditions and the management of odours generated by the sewage, are effectively documented in the *Sewage Management Plan* and supporting documentation. Accordingly, Catherine Hill Bay Water is assessed to have demonstrated compliance with this obligation.

Discussion and notes

As reported in Table D.1, the *Sewage Management Plan* and *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply*³⁴³ (which is included as an Appendix to the *Sewage Management Plan*), describe the scope and arrangement of the sewerage system with additional detail provided in other supporting documentation.

As noted, under the Stage 2 and all future scheme arrangements, sewage generated within the area serviced by Catherine Hill Bay Water will be delivered via the pressure sewer network to the Recycled

³⁴³ Solo Water, *Process Flow Diagram; Stage 1 & 2 Recycled Water Supply* (Drawing No: 56-RW-PFD-ST1&2-2), 5 November 2018.

Water Plant for treatment. However, in the event of excess flows or (more likely) under emergency conditions, sewage generated within the scheme may need to be disposed of off-site by road tanker in which case it would be considered as a waste stream.

The *Sewage Management Plan* references the *CCP Raw Sewage Containment Procedure*,³⁴⁴ which details arrangements for the disposal of sewage. This procedure:

- identifies operational and critical limits in respect of tank storage levels for the PSUs, Inlet Balance Tank and Emergency Storage Tanks, together with corrective and preventative actions in each case;
- details the procedures to be followed in the event that off-site disposal is required; and
- references relevant documentation including management plans, operator's manuals, procedures and a form, all of which were in place (and in most cases have been reviewed by the auditor).

Catherine Hill Bay Water also has a *Service Agreement*³⁴⁵ with Solo Resource Recovery (parent company of Solo Water) in relation to the transport and disposal of sewage. Solo Resource Recovery, in turn, has a *Tankering Agreement*³⁴⁶ with Hunter Water for the disposal of sewage into its system.

Odour generated by sewage can also be considered as a waste stream for the purposes of this assessment. This is reflected in the *Sewage Management Plan*,³⁴⁷ which indicates that odour is identified as a hazard in both the *Risk Register – Stage 2*³⁴⁸ and *Quality, Safety and Environmental Aspects Risk Register*.³⁴⁹

Odour complaint monitoring is identified as one of the performance verification measures for the Stage 2 scheme sewage management arrangements,³⁵⁰ thereby providing a mechanism (other than operator observation) to ensure that odours are being effectively managed.

In summary, arrangements in respect of the management of waste streams arising as a result of the conveyance, treatment and disposal of sewage, are effectively documented in the *Sewage Management Plan* and supporting documentation.

Recommendations

There are no recommendations in respect of this obligation.

Opportunities for improvement

No opportunities for improvement have been identified in respect of this obligation.

³⁴⁴ Solo, *CCP Raw Sewage Containment Procedure* (IMS-GNRL-D-4415-SW) (Issue No: 1.0), August 2018.

³⁴⁵ Solo Resource Recovery, *Terms of Service Agreement*, 15 February 2016 (in relation to liquid waste removal).

³⁴⁶ *Tankering Agreement* between Hunter Water Corporation and Solo Resource Recovery, dated 30 October 2018.

³⁴⁷ *Sewage Management Plan*, section 2.3.

³⁴⁸ Solo, *Catherine Hill Bay Water Utility; Risk Register – Stage 2* (IMS-ENVM-G-3761-SW) (Version 3.0), 17 July 2018, *Risk Register Sewerage System* worksheet.

³⁴⁹ Solo, *Quality, Safety and Environmental Aspects Risk Register* (IMS-RISK-G-8856-SW), as at 18 October 2018.

³⁵⁰ *Sewage Management Plan*, section 2.5.

