# Sample handling and Storage Requirements for Water and Wastewater Samples

## 1. Purpose

This procedure has been written to provide guidance to persons performing sample handling and storage of water and wastewaters.

## 2. Scope

This procedure applies all persons performing sample handling and storage of waters and wastewaters.

## 3. Responsibility

- Water and Waste Services (A directorate of Mackay Regional Council) Scientific and Analytical Services (SAS) are responsible for performing this SOP.
- Persons responsible must be trained in this SOP.

## 4. Safety

Prepare Job Hazard Analysis (JHA) for all tasks identified to be hazardous. All staff are trained in the Procedure IS-ISPR-210. Obtain a copy of this procedure from the Mackay Regional Council Intranet. Using this procedure fill out the form “Job Hazard Analysis” on the Doc. Code: IS-ISFM-138.

- Wear gloves and follow good hygiene practices when working with sewage samples.
- Avoid working over water where possible.
- Wide Brim Hat, Sunglasses, Sunscreen, Long Pants, and Safety Footwear.

## 5. References

*AS/NZS 5667.1:1998 Water quality – Sampling; Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.*
*AS/NZS 2031. Selection of containers and preservation of water samples for chemical and microbiological analysis.*

*AS/NZS 2031.2 Part 2: Microbiological*
*Scientific and Analytical Services Laboratory Methods Manual.*
*Scientific and Analytical Services Laboratory Calibration and Equipment Manual.*
*Scientific and Analytical Services Laboratory LIMS Manual.*
*Scientific and Analytical Services Safety Policies and Procedures Manual.*

## 6. Definitions

Analyte: The constituent to be analysed
Maximum recommended holding time: The time from when the sample is taken to when the analytical process is commenced.
Sample: A portion, ideally representative, removed from a specified body of water, wither discretely or continuously, for the purpose of examination of various defined characteristics.
Sampling: The process of removing a sample of a body of water for the purpose of examination of various defined characteristics.

## 7. Procedure

### 7.1 Requirements for sampling

The sampling SOPs are used to ensure the correct sample collection vessels are prepared and taken on site with the sampler. Also to ensure all chemicals/preservatives required for sample preservation are taken on site and added to the sample vessel before or after collection.

Containers for general sample collection may be rinsed several times prior to filling with sample to ensure a representative sample is obtained.

For microbiological analyses, sterile sample containers are to be handled using aseptic techniques to ensure no undue contamination. These containers are not to be pre-rinsed.

### 7.2 Sample Preservation - General Requirements

Waters, waste waters, bottom sediments and sludges are susceptible to change to differing extents as a result of physical, chemical or biological reactions which may take place between the time of sampling and analysis. The nature and rate of these changes are often such that, if the necessary precautions are not taken during sampling, transport and storage, the concentrations determined will be different

from those existing at the time of sampling. These changes are often sufficiently rapid to modify the sample considerably in the space of several hours. Certain constituents should be measured in situ or in the field to obtain accurate results. It should be stressed that, particularly if there is any doubt, the laboratory supervisor should be consulted before deciding on the precise method of handling and preservation.

The extent of these changes is dependent on the chemical and biological nature of the sample, its temperature, its exposure to light, the nature of the container in which it is placed, the time between sampling and analysis and the conditions to which it is submitted, e.g. agitation during transport.

Some more specific causes of variations are as follows:
(a) Presence of bacteria, algae and other organisms can consume certain constituents present in the samples. They can also modify the nature of the constituents to produce new constituents. This biological activity affects, for example, the concentrations of dissolved oxygen, carbon dioxide, nitrogen compounds, phosphorus and sometimes silicon.
(b) Certain compounds can be oxidized by the dissolved oxygen contained in the samples or by atmospheric oxygen, (e.g. organic compounds, Fe(II) and sulfides).
(c) Certain substances can precipitate out, (e.g. calcium carbonate, metals and metallic compounds such as Al(OH)3) or be lost to the vapour phase (e.g. oxygen, cyanides and mercury).
(d) The pH, conductivity, carbon dioxide content and similar can be modified by the absorption of carbon dioxide from the air.
(e) Dissolved metals or metals in a colloidal state, as well as certain organic compounds can be irreversibly adsorbed or absorbed by the surface of containers or solid materials in the samples.
(f) Polymerized products can depolymerize and conversely, simple compounds can polymerize.

Numerous investigations which have been carried out in order to recommend methods which will enable samples to be stored without modification of their composition, but it is impossible to give absolute rules which will cover all cases and all situations. In every case the method of storage must be compatible with the analytical techniques which will be used. One object of Table 1 and Table 2 is to describe the most commonly used preservation techniques. However, there should be no significant difference between the results of a determination carried out immediately and the result obtained after preservation. The analyst should verify, taking into account particularly the method of analysis which is intended to be used, whether the suggestions in Tables 1 and 2 are suitable for the sample concerned. For preservation of microbiological samples, reference should be made to AS 2031.2.

## 7.3 Sampling and Storage of Samples for Chemical Analysis

REFRIGERATION OR FREEZING

**General**

The sample should be kept at a temperature lower than that during filling. Refrigeration or freezing of samples is only truly effective if it is applied immediately after the collection of the samples. This necessitates the use of cool boxes or refrigerators at the sampling site.

**Refrigeration**

Refrigeration entails the placement of samples in a refrigerator, using crushed ice in a portable cooler or other device to cool the sample to a temperature of between 1°C and 4°C. In most cases, this is sufficient to preserve the sample during the transport to the laboratory and for a relatively short period of time before the analysis. Refrigeration cannot be considered as a means of long-term storage, particularly in the case of waste water samples.

NOTE: For preservation of microbiological samples reference should be made to AS 2031.2.

**Freezing**

Freezing to a temperature of −20°C allows, in general, an increase in the period of storage. For some analytes, such as nutrients, freezing is the preferred method of preservation.
Do not refreeze samples. Sufficient individual portions should be collected in cases where analyses may be conducted at different times or locations. When thawed, samples should be thoroughly mixed and allowed to reach ambient temperature before any measurements are made.

NOTES:
1 Sample containers, whose contents are frozen as part of their preservation, should not be completely filled.
2 Glass containers are not suitable for freezing. The use of plastic containers is strongly recommended.
3 Quick freezing with dry ice is the most satisfactory procedure.
4.

USE OF PRESERVATIVES

Certain physical and chemical constituents can be stabilized by the addition of chemical compounds. The chemical compounds can be added either—
(a) to the container before the sample is taken (the container should not be rinsed with the sample water if this is the case); or
(b) directly to the sample after it has been taken.

Various chemical compounds, at concentrations equally varied, have been proposed.
Those most commonly used are—
(i) acids;
(ii) basic solutions;
(iii) biocides; and
(iv) particular reagents, necessary for the specific preservation of certain constituents,
e.g. the determination of oxygen, total cyanides or sulfides all require a previous fixation of the sample in the field.

Preservatives should be added in the form of concentrated solutions so that addition of only small volumes is necessary. This enables the corresponding dilution to be disregarded in most cases, otherwise dilution of the sample should be taken into account during the analysis and the calculation of the results.

For some determinations, particularly trace element analysis, it is essential to carry out a blank test to take into account possible introduction by the preservatives of an additional amount of the analytes of interest, e.g. acids can introduce significant amounts of arsenic, lead and mercury. It is also essential that the preservatives do not interfere with the analysis.

REAGENTS

General The following reagents are used for preservation of samples and should only be prepared according to individual sampling requirements in Table 1 or Table 2. Unless otherwise specified, all reagents used should be of at least analytical reagent grade and water should be of at least ISO 3696, Type II purity. Acids referred to in this Standard are the commercially available ‘concentrated’ acids.

Safety considerations It should be remembered that certain preservatives (e.g. acids, mercury (II) chloride, chloroform) need to be used with caution because of the danger involved in their handling. Sampling personnel should be warned of these dangers and the necessary safety procedures.

11.4.3 Solids
11.4.3.1 Ascorbic acid
11.4.3.2 Potassium dichromate (K2Cr2O7)
11.4.3.3 Sodium hydroxide (NaOH)
11.4.3.4 Sodium iodide (NaI)
11.4.3.5 Sodium sulfite (Na2SO3)
11.4.3.6 Sodium thiosulfate (Na2S2O3)
11.4.4 Solutions
11.4.4.1 Zinc acetate solution (10% m/v) Dissolve 10 g of zinc acetate and dilute to 100 mL with water.
11.4.4.2 Orthophosphoric acid (r 1.75 g/mL )
11.4.4.3 Hydrochloric acid (r 1.16 g/mL )
11.4.4.4 Nitric acid (r 1.42 g/mL )
11.4.4.5 Sulfuric acid (r 1.84 g/mL )
11.4.4.6 Sodium hydroxide solution (40% m/v) Dissolve 40 g of sodium hydroxide and dilute to 100 mL with water.
11.4.4.7 Formaldehyde solution (40% v/v).
11.4.4.8 Nitric acid solution (50% v/v)
11.4.4.9 Sodium hypochlorite solution (10% m/v)
11.4.4.10 EDTA solution (2.5% m/v) Dissolve 2.5 g of di-sodium EDTA and dilute to 100 mL with water.
11.4.4.11 Copper-DMP reagent Dissolve 0.15 g of 2,9-dimethyl-1, 10-phenanthroline
hydrochloride (DMP) in water, add 25 mL of copper sulphate solution (2 g/L) and 125 mL of pH 4.8 buffer solution. Dilute to 250 mL with water.

11.5 EXTRACTION For some organic materials, an initial on-site extraction may be advantageous. Alternative procedures such as on-site adsorption techniques or on-site headspace collection may also be employed where appropriate. Samples should be refrigerated until they are analysed. There should be minimal headspace.

11.6 SAMPLING DETAILS FOR INDIVIDUAL DETERMINATIONS

Sample volumes listed in Table 1 and Table 2 represent typical volumes required for an analyst to perform a single determination on the sample. Where more than one method is available for a particular analyte, the sample volumes pertain to the method which requires the maximum sample volume. In some cases, it may therefore be possible to take a smaller volume of sample. Where a preservation procedure requires the addition of acid to a sample, the pH of the raw water should be determined on-site on a separate but representative sample of that water. Additional requirements to those set out in Table 1 and Table 2 may also be necessary depending on the water body sampled, concentration levels present or the analytical methods to be used.

## 11.7 FILTRATION OR CENTRIFUGING OF SAMPLES

Suspended matter, sediment, algae and other microorganisms may be removed, either at the time of taking the sample or immediately afterwards, by filtration through filter paper or membrane filter or by centrifuging. Filtration is not applicable if the filter is likely to retain one or more of the analytes. It is essential that the filter is not a cause of contamination and if necessary washed before use in a manner consistent with the final method of analysis.

NOTE: Analysis may require the separation of 'soluble' and 'insoluble' forms by filtration. The pore size of the filter will affect the analyte distribution. 0.45 µm filters are the most commonly accepted.

**TABLE 1 TECHNIQUES GENERALLY SUITABLE FOR THE PRESERVATION OF WATER SAMPLES—PHYSICO-CHEMICAL AND CHEMICAL ANALYSIS**

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| ***Acidity and alkalinity*** | 500 | P or G | Refrigerate | 24 h | Analyse ASAP, samples should preferably be analysed in the field |
| ***Aluminum*** | 500 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Ammonia*** | 500 | P or G | Refrigerate | 6 h recommended (with a maximum of 18-24 hours) | Unfiltered sample |
| | | | Filter on site (0.45µ) and refrigerate | 24 h | |
| | | | Filter on site (0.45µ) and freeze | 1 month | |
| ***Arsenic*** | 100 | P or G | Acidify with nitric or hydrochloric acid to pH 1 to 2. | 1 month | Hydrochloric acid should be used if the hydride technique is used for analysis |
| ***BOD*** | 1000 | P or G | Refrigerate and store in dark | Within 24 h | Refrigerate <4□C -24 Hrs |

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| ***Bromide*** | 100 | P or G | Refrigerate and store in dark | 1 month | |
| ***Cadmium*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Calcium*** | 100 | P | None required | 1 week | |
| | | | Acidify with nitric acid to pH 1 to 2 and refrigerate | 1 month | Acidification permits the determination of calcium and other metals from the same sample |
| ***Carbon, total organic (TOC)*** | 100 | G, amber with PTFE cap liner | Acidify with phosphoric acid to pH 1 to 2, refrigerate and store in the dark | 1 week | Test should be carried out as soon as possible |
| | | P | Freeze | 1 month | |
| ***Chemical oxygen demand (COD)*** | 100 | P or G | Acidify with $H_2SO_4$ to pH 1 to 2, refrigerate <4□C and store in the dark | 1 week | Glass containers are preferable for samples with COD <5mg/L |
| | | P | Freeze | 1 month | |
| ***Chloride*** | 100 | P or G | None required | 1 month | |
| ***Chlorine -Total & Free*** | 500 | P or G | Keep out of direct sunlight | Analyse ASAP | Analysis should be carried out in the field with in 5 minutes of sample collection |
| ***Chlorophyll*** | 1000 | P or G | Refrigerate | 24 h | Transport in the dark |
| ***Chromium (total)*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Chromium (VI)*** | 100 | P or G | Refrigerate | 24 h | |

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| | | | | | |
| ***Cobalt*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Colour*** | 500 | P or G | Refrigerate and store in the dark | 2 d | Storage of 7 d at RT for drinking water |
| ***Conductivity*** | 100 | P or G | None required | 24 h | Test should be carried out in field for samples of <20µS |
| | | | Refrigerate | 1 month | |
| ***Copper*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Detergents*** | | | | | See surfactants |
| ***DO*** | 300 | P or G | None required | Analyse ASAP | Test should be carried out in field, excessive turbulence should be avoided to minimize oxygen entrainment |
| ***Fluoride*** | 100 | P | None required | 1 month | PTFE containers are not suitable |
| ***Hardness*** | | | | | See Calcium |
| ***Hydro-carbons*** | 100 | | | | See oil and grease |
| ***Iron*** | 500 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Lead*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| ***Magnesium*** | 100 | P | None required | 1 week | Samples with pH> 8 or high carbonate content to be analysed solely for calcium, magnesium or hardness should |
| | | | Acidify with nitric acid to pH 1 to 2, refrigerate | 1 month | Acidification permits the determination of magnesium and other metals from the same sample. |
| ***Manganese*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2. | 1 month | |
| ***Mercury*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 . Take 50 mL add 50 mL HCL, store at room temperature | 1 month | Hydride: |
| ***Mercury*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 and add potassium dichromate to give 0.05% (m/v) final concentration. | 1 month | Hydride: |
| ***Molybdenum*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Nickel*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2 | 1 month | |
| ***Nitrate*** | 250 | P or G | Refrigerate | 24 h | Unfiltered sample |
| | | | Filter on site (0.45µ) and freeze | 1 month | |

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| ***Nitrite*** | 200 | P or G | Immediate analysis | | Analyse as soon as possible after collection |
| | | | Freeze | 2 days | |
| ***Nitrogen, total (TN)*** | 500 | P or G | Refrigerate | 24 h | |
| | | | Freeze | 1 month | |
| ***Nitrogen, total Kjeldahl (TKN)*** | 500 | P or G | Acidify with $H_2SO_4$ to pH 1 to 2 & refrigerate <4°C | 24 h | |
| | | | Refrigerate | 24 h | |
| | | | Freeze | 1 month | |
| ***Oil & Grease*** | 100-120 | Glass, solvent washed | Refrigerate | 24 h | Do not pre-rinse container with sample |
| | | | Acidify with $H_2SO_4$ to pH 1 to 2 & refrigerate | 1 month | |
| ***Pesticides*** | 1000 - 3000 | G, solvent washed with PTFE Cap liner | Refrigerate | 7 d | Do not pre-rinse container with sample |
| ***pH*** | 100 | P or G | Refrigerate | 6 h | Analyse ASAP or Test should be carried out in field |
| ***Phosphate, dissolved*** | 50 | P or G | Filter on site (0.45µ) and refrigerate | 24 h | |
| | | | Filter on site (0.45µ) and freeze | 1 month | |
| ***Phosphorus, total*** | 500 | P or G | Refrigerate | 24 h | |
| | | | Freeze | 1 month | |

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| | | | Acidify with $H_2SO_4$ to pH 1 to 2 & refrigerate <4°C | 1 month | |
| ***Potassium*** | 100 | P | None required | 1 month | |
| | | | Acidify with nitric acid to pH 1 to 2, refrigerate | 1 month | Acidification permits the determination of potassium and other metals from the same sample. |
| ***Radio-nuclotides*** | 1000 | G | Refrigerate | 24 h | |
| ***Selenium*** | 500 | P or G | Acidify with nitric or hydrochloric acid to pH 1 to 2 | 1 month | |
| ***Sodium*** | 100 | P | None required | 1 month | |
| | | | Acidify with nitric acid to pH 1 to 2, refrigerate | 1 month | Acidification permits the determination of potassium and other metals from the same sample. |
| ***Solids, dissolved*** | 500 | P or G | Refrigerate | 24 h | |
| ***Solids, suspended*** | 500 or 1000 | P or G | Refrigerate | 24 h | |
| ***Solids, total*** | 500 | P or G | Refrigerate | 24 h | |
| ***Solids, volatile*** | 500 | P or G | Refrigerate | 24 h | |
| ***Sulfate*** | 200 | P or G | Refrigerate | 1 week | |

| ANALYTE | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| | | | | | |
| ***Sulfide, total*** | 500 | P or G | None required | | Test should be carried out in field |
| ***Surfactants (anionic)*** | 500 | G, rinsed with methanol | Add 40% (v/v) formaldehyde solution to give 1% (v/v) final concentration and refrigerate | 1 month | Glassware must not be detergent washed |
| ***SVOCs*** | 100 | Amber G, and preservative | Refrigerate | 7 d | Do not pre-rinse container with sample |
| ***Tri-halomethanes (THMs)*** | 40 x 2 | Amber G, solvent washed with PTFE Cap liner and preservative | Refrigerate | 7 d | Do not pre-rinse container with sample |
| ***Turbidity*** | 100 | P or G | None required | 24 h | Test should be carried out in field |
| ***Zinc*** | 100 | P or G | Acidify with nitric acid to pH 1 to 2, refrigerate | 1 month | |

Notes: P = plastic containers, eg polyethylene, PTFE, polypropylene, PET and similar; G = borosilicate glass container. Refrigerate = cool to between 1°C and 4°C.

## TABLE 2 TECHNIQUES GENERALLY SUITABLE FOR THE PRESERVATION OF WATER SAMPLES—RADIOCHEMICAL ANALYSIS

| Determinand | Type of container (See Note 1) | Typical volume, mL (See Note 2) | Filling technique Preservation procedures (See Notes 3 and 4) | Maximum recommended holding time | Comment |
|---|---|---|---|---|---|
| Alpha and beta activity (gross) | P or G | 1 000 (ALS with red & green stripe) | Fill container completely to exclude air. Acidify with nitric acid to pH 1 to 2 | 1 month | |
| Uranium | P | Sample volume of between 1 and 5 L | Acidify with nitric acid to pH less than 1 | 2 weeks | |

**WARNING: IT IS ESSENTIAL THAT RADIOACTIVE DUST IS NOT INHALED OR LEFT ON THE BODY OR CLOTHING.**

## 7.4 Sampling and Storage of Samples for Microbiological Analysis

| ANALYSIS | VOLUME REQUIRED (mL) | COLLECTION VESSEL | PRESERVATION | TIME SPAN FOR ANALYSIS | MAXIMUM RECOMMENDED HOLDING TIME |
|---|---|---|---|---|---|
| ***Coliforms, total*** | 220 | Sterile P | If residual chlorine is present, add $Na_2S_2O_3$ | 6 h | Refrigerate <4□C -24 Hrs |
| ***Coliforms, faecal*** | 220 | Sterile P | If residual chlorine is present, add $Na_2S_2O_3$ | 6 h | Refrigerate <4□C -24 Hrs |
| ***Coliforms, E.coli*** | 220 | Sterile P | If residual chlorine is present, add $Na_2S_2O_3$ | 6 h | Refrigerate <4□C -24 Hrs |
| ***Heterotrophic Plate Count*** | 220 | Sterile P | If residual chlorine is present, add $Na_2S_2O_3$ | 6 h | Refrigerate <4□C -24 Hrs |
| ***Pseudomanas*** | 500 | Sterile P | Addition of $Na_2S_2O_3$ is not required | 6 to 12 h | Refrigerate <4□C -24 Hrs |

Notes: P = plastic containers, eg polyethylene, PTFE, polypropylene, PET and similar; G = borosilicate glass container. Refrigerate = cool to between 1°C and 4°C. $Na_2S_2O_3$ Solution 0.1 mL of 3% solution for drinking water samples – in 220 mL will give a final concentration of 9 mg/L in the sample and neutralize up to 2.5 mg/L residual chlorine.

Start microbial examination of a water sample promptly after collection to avoid unpredictable changes. If samples cannot be processed within 1 h after collection, use an iced cooler for storage during transport to the laboratory.

Hold temperature for all stream pollution, drinking and waste water samples is below 10 °C. Refrigerate samples on delivery to the laboratory and commence analysis within 6 h. A maximum recommended holding time is 24 h.

The laboratory is to store the samples refrigerated until ready to analyse, there is no requirement to room to room temperature prior to anaylsis.

## 8. Documentation

Form SAS – 0003016 Checklist of Equipment and Chemicals for Sampling Waste Water

Form SAS – 0003017 Checklist of Equipment and Chemicals for Sampling of Drinking Water

Form SAS – 0003018 Checklist of Equipment and Chemicals for Sampling Environmental Waters – Ambient/Event
Form SAS – 0003019 Checklist of Equipment and Chemicals for Sampling of Seaforth Camping Area – Ground Water and Septics
Form SAS – 0003038 Checklist for Landfill Bore Sampling.

## 9. Reference Personnel

Changes to this document should be referred to:

- Principal Scientist, SAS

## 10. Document History

| Date | Revision Number | Revised by | Authorised by |
|---|---|---|---|
| 24/08/2010 | Issue 3; Rev 0 | Christine Galea | Stuart Boyd |
| 27/07/2013 | Issue 3; Rev 2 | Christine Galea | Stuart Boyd |
| 23/01/2015 | Issue 4 Rev 0 | Christine Galea | Christine Galea |
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