

# WWTP SUBSURFACE LEAK DETECTION INSPECTION & SAMPLING PROCEDURE

Livingstone Beef Processing Facility  
Northern Territory



Australian Agricultural Company Ltd

2018



# Document Control Record

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<b>Document Code:</b>	ENV-EPL-SSLDMP-201801
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<b>Submission Date:</b>	31 <sup>st</sup> March 2018

## DOCUMENT HISTORY

Version	Issue Date	Brief Description	Reviewer/Approver
ENV-EPL-SSLDMP-201801	31 Mar 2018	Document creation	Adrian Doube

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# 1 Introduction

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## 1.1 Purpose

Ensure inspection and sampling methods accurately detect subsurface leak from the WWTP ponds. Also to ensure all sampling is consistent, undertaken in a safe manner and follows best-practice procedures.

## 1.2 Scope

This procedure applies to WWTP subsurface leak detection activities undertaken by AACO Environmental personnel for compliance purposes. WWTP subsurface leak detection monitoring is generally focussed on identifying any contaminants from the WWTP ponds that may have leaked from the ponds as a result of the HDEP liner failure.

This usually includes the visual inspection of pits, pipes and water flows, the measurement of water quality parameters in the field (e.g. pH and electrical conductivity), and the collection of water samples for subsequent laboratory analysis (e.g. nutrients and pathogens).

## 1.3 Definitions and Abbreviations

COC – Chain of Custody form

DO – Dissolved Oxygen

EC – Electrical Conductivity

JSA – Job Safety Analysis

N.A.T.A – National Association of Testing Authorities

ORP – Oxidation Reduction Potential

pH – ranges between 1 and 14 and provides a measure of acidity/alkalinity

PPE – Personal Protective Equipment

QA / QC - Quality Assurance / Quality Control, which may include:

- Duplicate sample – collected during each sampling event (1 duplicate for every 10 sample sites) to detect both natural environmental variation, and any errors from field sampling methodologies.
- Split sample – collected during each sampling event (1 split for every 10 sample sites) and sent to a different laboratory to detect any Lab-based discrepancies.
- Field blank sample - collected during each sampling event to evaluate potential contamination from personnel and/or sampling equipment.

SWL – Standing Water Level; level of groundwater in meters below the ground level (mbgl) or meters below top of casing (mbTOC)

SWQ – Surface Water Quality

TOC – Top of Casing; top of bore casing above ground level

## 1.4 Standards

To ensure the quality and accuracy of measurements, these sampling procedures were developed in accordance with the following standards and guidelines:

- NT Department of Mines and Energy Methodology for the Sampling of Groundwaters, Advisory Note, 2009. Northern Territory Department of Mines and Energy (DME), NT Government, Darwin.
- Australian/New Zealand Standard on Water Quality Sampling - Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS/NZS 5667.1:1998), Standards Australia, New South Wales.
- Australian/New Zealand Standard on Water Quality Sampling – Part 11: Guidance on sampling of groundwater (AS/NZS 5667.11:1998), Standards Australia, New South Wales.
- ANZECC & AMRCANZ 2000, Australian Guidelines for Water Quality Monitoring and Reporting, National Water Quality Management Strategy Paper No 7, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra.
- ANZECC & AMRCANZ 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy Paper No 4, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra.

## 2 Equipment, Safety and Training

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### 2.1 Equipment

The following equipment list is provided for guidance and personnel should consider task-specific sampling requirements when preparing for field sampling:

- Plan showing inspection pits
- Printed Job Safety Analysis (JSA) for the job. This includes all emergency contacts.
- WWTP Subsurface Sampling Field Data Sheet – enough for all sample sites plus some spares – See Appendix A
- Folder/clipboard and waterproof notebook
- Stationary: Pens / pencils, permanent markers for completing sample bottle labelling
- Sample bottles obtained from the relevant Laboratories being used (i.e. usually ALS, Envirolabs or AWQC). Make sure you have the specific bottle types required for each parameter to be tested. Remember also to prepare a full set of sample bottles for duplicate, split, and field blank samples (see definitions above). Also take some spares, especially the glass bottle types.
- Bucket (20 L)
- Hand tools to open inspection pits (if required)
- Gas alert meter
- Torch
- Sample collection tool for collection of samples at depth within the inspection pits
- Calculator
- Eskies with frozen ice bricks
- Calibrated field test meters (pH, EC)
- Calibration solutions and copies of the Calibration Record Sheet (if in field for > 1 day) – See Appendix B for Calibration Record Sheet
- Camera
- Jug(s) for filling sample bottles if unable to fill bottles directly from hose
- Small folding table and shelter
- Tarpaulin to keep all equipment off the ground.
- Decon 90 solution mixed with deionised water (1:20) to clean equipment between sample sites  
Deionised water for collection of field blanks and rinsing equipment between sample sites
- Powder-free gloves
- Spare batteries/charger for camera, GPS, field test meters and dip meter
- Chain of Custody (COC) forms from the relevant Laboratories (i.e. usually ALS, Envirolabs or AWQC); one for bulk of samples and one for Spilt samples
- Plastic sleeves (snap-lock bags) to protect COC forms inside the eskies

- Consignment (Con) Notes for Freight samples to Laboratories pre-filled as much as possible with relevant Account Number, Laboratory Address, Contacts etc
- Tape and security seal for eskies; also stickers such as address label, fragile, keep chilled etc
- Communications equipment (e.g. mobile/satellite phone, radio, EPIRB)
- PPE – see below
- Garbage bag for used filters, syringes, gloves and other general waste generated during sampling.

## 2.2 WHS Requirements

Groundwater sampling tasks must be covered by a specific Job Safety and Environment Analysis (JSEA) relevant to current conditions. Standard sampling considerations are listed in Table 1.

**Table 1: Standard hazard management for groundwater sampling**

Job Steps	Potential Hazards	Hazard Management
Inspection pit sampling	Enclosed space	<ul style="list-style-type: none"> <li>• Do not enter the inspection pit</li> </ul>
	Fall into pit	<ul style="list-style-type: none"> <li>• Do not lean over pit while collecting samples</li> <li>• Ensure stable body position prior to passing collection vessel into the inspection pit</li> </ul>
	Cuts/abrasions	<ul style="list-style-type: none"> <li>• Wear full PPE when performing sampling</li> </ul>
	Tripping / slipping / strains	<ul style="list-style-type: none"> <li>• Use appropriate lifting techniques when opening inspection pits</li> </ul>
	Dehydration / heat exhaustion	<ul style="list-style-type: none"> <li>• Adequate water and electrolyte replacement carried for all personnel</li> <li>• Competent first aid trained person within sampling group</li> <li>• Correct PPE</li> <li>• First aid is readily available</li> </ul>
	Sunburn	<ul style="list-style-type: none"> <li>• Use sunscreen and wear correct PPE (i.e. hat, long sleeves)</li> </ul>

The JSA shall also include details of personal protective equipment (PPE), such as:

- Sturdy boots
- Hat, safety/polaroid sunglasses, sunscreen etc. for sun protection
- Long pants and shirt

## 2.3 Training and Competency

All personnel conducting inspections and water sampling shall be familiar with this SOP and have received field training from experienced personnel or have previous experience in surface water sampling. This includes training in sample collection, using and calibrating field meters.

All personnel conducting water sampling shall have a current first-aid certificate.

## 2.4 Contamination Prevention Precautions

- 2.4.1. Keep hands away from sample bottle openings and the inside of bottle lids. Be aware that sources of contamination include smoking, permanent markers, insect repellent, sunscreen, deodorant, dust and perspiration.



- 2.4.2. Always wear powder free gloves and use new gloves for each sample site.
- 2.4.3. Do not allow the opening of sample bottles and bottle lids to touch the ground.
- 2.4.4. Only clean, sealed and pre-prepared preserved sample bottles obtained from a NATA accredited laboratory (usually ALS) are to be used.
- 2.4.5. Ensure equipment is cleaned thoroughly after each sample site with decon 90 solution (5 %) and rinsed with deionised water.
- 2.4.6. Ensure sample bottles are filled to the top leaving no headspace unless otherwise specified by the laboratory.
- 2.4.7. Do not overfill the bottle, particularly not for sample bottles with preservative.
- 2.4.8. For the bottles containing preservative, after sample collection, put the lid on and shake immediately.
- 2.4.9. After sample collection, ensure all sample bottles are tightly sealed and stored upright in an esky (with ice-bricks) or fridge at <math><4^{\circ}\text{C}</math>. Do not use ice as this can contaminate the samples if they are left in the melted ice water.

## 3 Procedure

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### 3.1 Preparation

- 3.1.1. Prior to undertaking a field sampling trip, ensure that a JSA has been completed and that forecast and current weather conditions (e.g. stream levels, wind, etc.) do not pose a risk to personnel safety and/or obtaining an appropriate sample.
- 3.1.2. Get together all the equipment listed in Section 2.1 (and any additional task-specific equipment) ready to go, ideally packing most of the gear together into a large plastic crate.
- 3.1.3. Bottles may need to be ordered from the laboratory (e.g. ALS, Envirolabs or AWQC). Contact the laboratory for advice on what bottles are required (certain analytes require particular bottles and preservatives).
- 3.1.4. Put together a package of sample bottles for each site (i.e. in a large snap-lock bag), including bottles for duplicates, split samples and blanks.
- 3.1.5. Label each bottle with the site name, or duplicate, split, blank, etc.
- 3.1.6. For metals, tick the box on the bottle label for either *filtered* or *total*, depending on whether sample for metals analysis will be filtered in the field.
- 3.1.7. Calibrate the field test meters (e.g. pH and EC) according to the laminated instruction card provided in the Calibration Folder and/or manufacturer's instructions. Fill out the Calibration Record Form and file in the Calibration Record Sheet Folder. See Appendix B for calibration record sheet.
- 3.1.8. Ensure camera and GPS (if required) are fully charged and have a cleared memory.
- 3.1.9. Depending on the number of sites being sampled, prepare a sufficient volume of Decon 90 solution (i.e. 1:20 Decon:de-ionised water) to use for cleaning sampling equipment in the field.
- 3.1.10. Ensure that ice bricks have been put in the freezer.
- 3.1.11. Print out required number of blank Field Data Sheets (Appendix A), COC forms and maps.
- 3.1.12. Collect ice from cold stores prior to travelling to site

### 3.2 Visual Inspection

- 3.3.1. Open inspection pit covering using appropriate tools if required.
- 3.3.2. Using torch, visually inspect the upper subsurface drainage pipe (shown in red in Figure 1). This pipe will be at a different depth in the inspection pit according to which pit you are inspecting:
  - Pit 1 (SBR) 4.10m below the surface
  - Pit 2 (Decant Basin) – 0.81m below the surface
  - Pit 3 (CAL) – 1.55m below the surface
- 3.3.3. If no water is flowing from the pipe, note this observation in the record sheet and close the inspection pit. No further action is required for the pit. If water is flowing from the pipe, collect samples as outlined below.

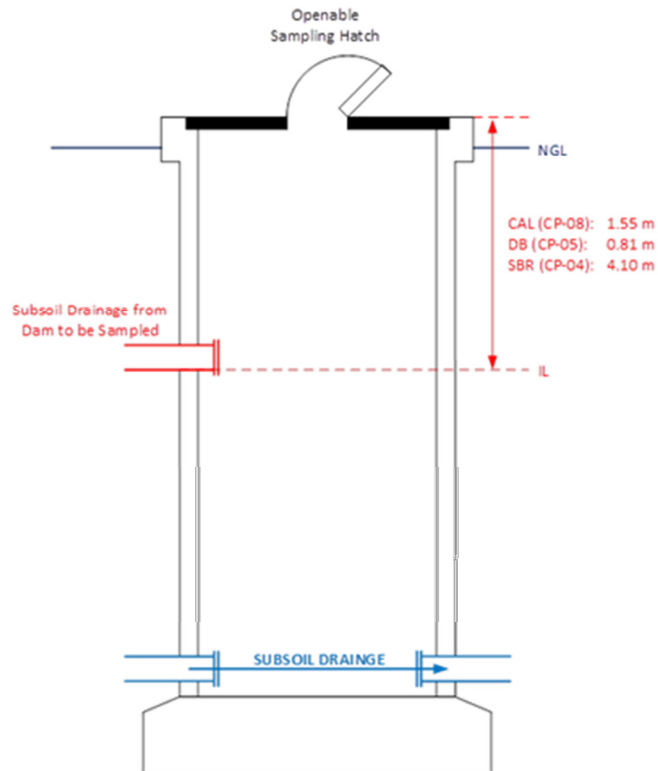


Figure 1: Diagram of Inspection Pit

### 3.3 Sample Collection

- 3.4.1. Wear powder-free gloves
- 3.4.2. Take out the required pre-labelled sample bottles.
- 3.4.3. Ensure when taking lids off that you don't touch the opening of the bottle or contaminate the inside of the bottle lid.
- 3.4.4. Lower the collection device into the pit and fill with water from the Subsoil Drainage from Dam to be Sampled pipe (shown in red in Figure 1).
- 3.4.5. Fill the bottles from the collection device making sure they are completely full with no headspace. Be careful not to overfill bottles which contain preservatives.
- 3.4.6. Once all bottles are filled and tightly capped with lids, place them upright into the esky and store below 4°C.
- 3.4.7. For parameters that are recorded in situ, use either a cleaned jug or the sample collection device.

### 3.4 Collection of Field Blanks, Split Samples and Duplicates

- 3.5.1. To collect a field blank, simply follow the steps outlined in 3.3 above using de-ionised water instead of water from the site being sampled.
- 3.5.2. For split samples and duplicates, repeat all the above steps outlined in 3.3 above at the site(s) chosen for these samples (generally at least 1 in 10 sample sites). Be sure to note collection of these samples on the Sampling Data Sheet otherwise it will not be possible to track which site these samples were collected because the site name is not permitted to be recorded on the bottle.
- 3.5.3. Once sampling is complete, close the inspection pit and clean and pack up field equipment.

### 3.5 Sample Dispatch

- 3.7.1. Once sampling is completed, pack the samples securely in an esky with ice bricks. Ensure that samples have sufficient contact with the ice bricks to stay as cool as possible.
- 3.7.2. Fill out the COC, put in a plastic sleeve (snap-lock bag) and place inside the esky.
- 3.7.3. If required, provide a copy of the COC to the client.
- 3.7.4. Samples must be dispatched to the laboratory within the required holding times, noting that:
  - Samples must be dropped off at the ALS office in Woolner (Unit 4, 16 Charlton Ct) no later than 3pm each day.
  - Sample dispatch on Fridays and Saturdays is not acceptable for sample analysis with short holding times (e.g. microbiological, nutrients) as samples will not be delivered to the labs until Monday morning. Other parameters with longer holding times can be kept in a fridge until dispatch on Sunday or Monday.
- 3.7.5. If sending samples direct to the laboratories:
  - Tape up the esky and put on address label and stickers as appropriate (e.g. fragile, keep chilled etc).
  - Fill out consignment note and stick on esky.
  - Deliver samples direct to freight company or organise pick-up, ensuring that samples will be dispatched in time to meet laboratory holding times (usually by 16:00 on day of sampling for overnight priority service).
- 3.7.6. Remember to also prepare a small esky containing the split sample for sending to a separate laboratory.

## Appendix A Field Data Sheet – WWTP Subsurface Leak Detection

Sample date:	Sampled by:
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	Pit 1	Pit 2	Pit 3	
Water observed	Yes / No	Yes / No	Yes / No	
Odour from pit	None/ Effluent/ Sulphuric/ Stagnant/ Other:	None/ Effluent/ Sulphuric/ Stagnant/ Other:	None/ Effluent/ Sulphuric/ Stagnant/ Other:	
General appearance of water sample (Describe)				
Photograph	Yes / No	Yes / No	Yes / No	
Turbidity				
EC				µS/cm
pH				
Other comments				

Time Lab Samples Delivered:
Comments:

## Appendix B Calibration Record Sheet, Water Sampling Meters

Date:		Calibrated by:					
Probe Calibrated: <small>(Enter ID of each probe)</small>		pH:		EC:		Turbidity:	
<b>Pre-Calibrated Reading:</b>			<b>Post Calibrated Reading (Checking):</b>				
<b>pH</b>							
<b>pH 7.00 Standard:</b>		<b>pH 4.01 Standard</b>	<b>pH 7.00 Standard:</b>			<b>pH 4.01 Standard</b>	
pH:	Temp:	pH:	Temp:	pH:	Temp:	pH:	Temp:
pH readings (circle): <b>Good</b> <b>Some Problems (explain):</b>							
<b>EC</b>							
EC Calibration Solution Used (circle): <b>447µS/cm</b> <b>1413 µS/cm</b> <b>2570 µS/cm</b> <b>12880 µS/cm</b>							
EC µS/cm:	TDS f/L:	Sal ppt:	EC µS/cm:	TDS f/L:	Sal ppt:		
EC readings (circle): <b>Good</b> <b>Some Problems (explain):</b>							
<b>Turbidity</b>							
Turbidity Standard 10 NTU:			Turbidity Standard 10 NTU:				
Turbidity 20 NTU:			Turbidity 100 NTU:		Turbidity 800 NTU:		
Turbidity readings (circle): <b>Good</b> <b>Some Problems (explain):</b>							
Probes require servicing? (e.g. membrane needs changing, probes need to be cleaned or sent away, batteries need replacing)							
						Action (tick): <input type="checkbox"/>	
						Date:	
Any other actions required? (e.g. order more calibrations or DO replacement membrane)							
						Action (tick): <input type="checkbox"/>	
						Date:	
Signature:							