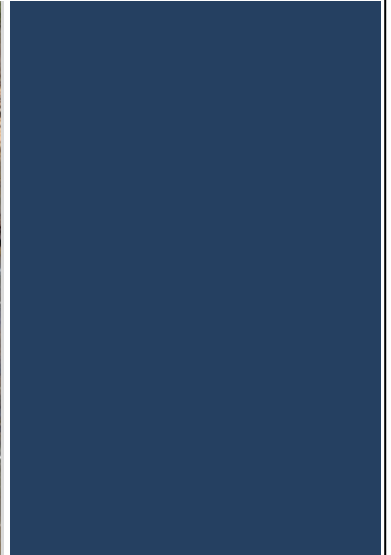




# Standard Operating Procedure: *Surface Water Sampling*



# Document Control Record

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## REVISION STATUS

Revision No.	Description of Revision	Date	Comment	Reviewed By:	Approved By:
0	SOP Re-development	22/04/2011	Major updates and improvement of old SOP	Emma Smith	Ray Hall
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Recipients are responsible for eliminating all superseded documents in their possession.

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# 1 Introduction

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## 1.1 Purpose

To ensure all surface water sampling is consistent, undertaken in a safe manner and follows best-practice procedures in accordance with relevant standards.

## 1.2 Scope

This procedure applies to all surface water sampling undertaken by EcOz personnel, noting that some sampling requirements may vary on a project-specific basis. Surface water quality monitoring is generally focussed on identifying any impacts of runoff from industrial sites (e.g. mining, airports, fuel storage, sewage) on the environmental, cultural and recreational values of the receiving natural waterways.

This usually includes both the measurement of water quality parameters in the field (e.g. temperature, pH, electrical conductivity, dissolved oxygen, ORP and turbidity), and the collection of water samples for subsequent laboratory analysis (e.g. metals, major cations and major anions, hydrocarbons, microbiological, nutrients).

## 1.3 Definitions and Abbreviations

COC – Chain of Custody

DO – Dissolved Oxygen

EC – Electrical Conductivity

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.

SWQ – Surface Water Quality

## 1.4 Standards and other requirements

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

- Australian 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);
- Australian Standard on Water Quality Sampling - Part 4: *Guidance on sampling from lakes, natural and man-made* (AS/NZS 5667.4:1998);
- Australian Standard on Water Quality Sampling – Part 6: *Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998);
- Australian Standard on Water Quality Sampling – Part 10: *Guidance on sampling of waste waters* (AN/NZS 5667.10:1998)
- 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 and Agriculture and Resource Management Council of Australia and New Zealand, 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 and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

Personnel must also ensure that any required permits (e.g. fisheries) and/or land access permissions are obtained prior to undertaking water sampling. These shall be saved in the Vantage VBM Document Management System in folder B0305.

## 2 Equipment, safety and training

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### 2.1 Equipment

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

- Map(s) showing monitoring sites
- GPS – with coordinates uploaded for locating sites
- Any site access or permit requirements such as keys, ID Cards, Contractor Induction Certificates, ASIC, Boat/Vehicle Licence, Indigenous Land Access Permit
- Printed JSEA for the job. This includes all emergency contacts.
- Field Data Sheets – enough for all sample sites – 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.
- Eskies with ice or frozen ice bricks
- Calibrated field test meters (pH, Temperature, EC, DO, ORP, Turbidity)
- Calibration solutions & Calibration Record Sheet (if in field for > 1 day) – See Appendix B for Calibration Record Sheet
- Camera
- Sample pole and jug(s)
- 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
- Syringes and Filters (if sampling dissolved metals)
- Powder-free gloves
- Spare batteries/charger for camera, GPS and field test meters
- 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 Freighting samples to Laboratories (either using Toll, Australian Air Express or TNT depending on the client and sampling location), 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 any other waste generated during sampling.

## 2.2 OH&S requirements

Each surface water sampling task must be covered by a specific Job Safety and Environment Analysis (JSEA) developed in consultation with all field party members. Examples of hazards/risks to be considered must include at least the following:

- Travel: vehicle accident, road conditions (e.g. bogging), mechanical issues (e.g. break-down, flat tyres) & driver fatigue, working from boats/helicopters
- Cuts/abrasions
- Trips/slips/strains
- Crocodiles
- Insect bites/stings etc
- Snakes
- Exposure: dehydration, sunburn
- Environmental impacts such as fuel spills, chemical spills, and waste

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

- Sturdy boots (steel cap if industrial/mine site)
- Hat, safety/polaroid sunglasses, sunscreen etc for sun protection
- Hard hat (if industrial/mine site)
- Long pants and shirt (high-visibility if industrial/mine site)

For safety reasons, field sampling should always be undertaken by at least two personnel and if working in remote areas, the JSEA must include a communications plan and emergency contact details.

The JSEA template is available through the Document Management System (Vantage VBM). Once completed, each JSEA must be read and understood by all field party members and signed off by the Fieldwork Leader / Project Manager, EcOz OH&S Officer and EcOz Manager. All JSEA's are saved in the Vantage VBM project folder B0304.

## 2.3 Training and competency

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

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



## 3 Procedure

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### 3.1 Preparation

- 3.1.1 Prior to undertaking a field sampling trip, ensure that a JSEA has been completed and that forecast and current weather conditions (e.g. stream levels, wind, tides 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 samples for metals analysis will be filtered in the field.
- 3.1.7 Calibrate the field test meters (e.g. pH, EC, Turbidity, DO, ORP) 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 Print out required number of blank Field Data Sheets (Appendix A), COC forms and maps.
- 3.1.11 Ensure that ice bricks have been put in the freezer.
- 3.1.12 Remember to buy ice and put it in the esky on the way out to sampling. Ice is used to cool down the collected samples in the field only (ice bricks used for transport to laboratory)

### 3.2 Travel to sampling site

- 3.2.1 Review JSEA prior to travel to ensure that all safety risks are covered and personnel are familiar with any risks.
- 3.2.2 When undertaking routine surface water monitoring, it is best that at least one of the field team has previous experience sampling all the sites and is aware of the specific location from which samples are to be taken from the drain/pipe/stream etc.



- 3.2.3 The map, photos and marked GPS locations should be used to confirm the correct location. Previous surface water sampling reports also contain photographs that can be utilised to confirm the correct sampling location.

### 3.3 Field observations and in-situ parameters

- 3.3.1 Record on field sheets the date, time, site name/number, sampler's name, and field observations such as weather conditions, water colour, clarity, water depth, flow rate, any obvious pollution (e.g. rubbish, odours, surface films etc), flora/fauna, and any other issues that may affect the samples.
- 3.3.2 Put on gloves.
- 3.3.3 Ideally, in-situ readings (e.g. pH, Temperature, DO, Turbidity, and EC) are collected directly from the waterbody being sampled by immersing the meters in the area to be sampled. However, if safety and/or logistical issues preclude this, field readings may need to be taken from the sampling jug (see 3.3.5 below).
- 3.3.4 Record the in-situ parameters just below the water surface (between 0.2 and 0.5 m depth), depending on water depth. Alternatively, if collecting samples from various depths (e.g. depth profiling), ensure the field meter is lowered to the desired depth.
- 3.3.5 If collecting field readings from the sampling jug, collect a representative water sample using the jug mounted on a sampling pole. Ensure that the jug/sampler is fully immersed and rinsed at least 3 times, tipping the rinse water away from where the sample is to be collected (e.g. on the bank).
- 3.3.6 If sampling flowing waters, ensure that you are standing downstream of where you are sampling so as not to contaminate the sample.
- 3.3.7 Record all the readings on the Field Data Sheet (Appendix A).

### 3.4 Sample collection

- 3.4.1 Ensure gloves are on.
- 3.4.2 Take out the snap-lock bag full of sample bottles for the site and fill in any remaining information on the labels with the permanent marker (e.g. time, name of sampler etc)
- 3.4.3 Unscrew the cap, making sure not to touch the opening of the bottle with your fingers to avoid contaminating the sample. Put the cap upside-down on a clean surface where it won't pick up any contaminants.
- 3.4.4 If safe to do so (i.e. crocodiles), fill the bottles directly from the waterbody being sampled; otherwise use the jug on the end of the pole to collect a water sample representative of the site.
- 3.4.5 Fully immerse the sample bottle or jug in the water and rinse at least 3 times before filling. For sample bottles containing preservatives (e.g. nutrients, VOC hydrocarbons), do not rinse before filling, use the jug to fill these sample bottles.
- 3.4.6 Make sure that you are standing downstream of where you are sampling so as not to contaminate the sample.
- 3.4.7 If using the jug, pour the water into each sample bottle.

- 3.4.8 Fill each bottle to the top leaving no headspace and screw on the cap.
- 3.4.9 For samples requiring field filtering (e.g. dissolved metals), draw some water (as per 3.4.4 above) into a syringe, put a filter on the end of the syringe, rinse the filter by pushing a few drops of the sample through onto the ground, then fill the bottle leaving no headspace. Depending on the size of the syringe, it may be necessary to draw several syringes-full of water to fill the sample bottle.
- 3.4.10 Put all the sample bottles back in the snap-lock bag and immediately place them in the esky on ice.

### **3.5 Collection of field blanks, split samples and duplicates**

- 3.5.1 To collect a field blank, simply follow the steps outlined in 3.4 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 3.4 above at the site(s) chosen for these samples (generally at least 1 in 10 sample sites). Ensure to note collection of these samples on the Field Data Sheet.

### **3.6 Cleaning of field equipment**

- 3.6.1 After sampling each site, rinse all sampling equipment (e.g. jugs) with the pre-mixed Decon 90 solution, followed by deionised water.
- 3.6.2 Dispose of used filters, syringes, and gloves appropriately.

### **3.7 Sample dispatch**

- 3.7.1 Once sampling is completed, pack the samples securely in an esky with ice bricks – note that freight companies generally will not allow ice. 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 Tape up the esky and put on address label and stickers as appropriate (e.g. fragile, keep chilled etc).
- 3.7.5 Fill out consignment note and stick on esky.
- 3.7.6 Prepare a small esky containing the split sample for sending to separate laboratory.
- 3.7.7 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).
- 3.7.8 Note that sample dispatch on Friday and Saturday is not acceptable as samples will not be delivered to labs until Monday morning. Therefore samples for microbiological, nutrients and other parameters with short holding times cannot be collected on Friday or Saturday. Other parameters with longer holding times can be kept in fridge until dispatch on Sunday or Monday.

## Appendix A – Field Data Sheet, Surface Water Sampling

**FIELD DATA SHEET – SURFACE WATER SAMPLING**

PROJECT:		DATE and TIME:		
SITE NUMBER / NAME:				
SAMPLERS NAME:		PHOTO NOs:		
EASTING:		NORTHING:		
<b>GENERAL OBSERVATIONS</b>				
WATER COLOUR		PRESENCE OF AQUATIC FAUNA		
ODOUR		AQUATIC PLANTS		
SURFACE SCUM/ALGAE		EROSION		
RIPARIAN CONDITION		GROSS POLLUTANTS		
<b>WATER CONDITIONS</b>				
APPROX DEPTH OF WATER (m)		WATER FLOW (m/sec)		
<b>WEATHER CONDITIONS</b>				
Cloud cover/ precipitation/ wind conditions:				
<b>FIELD SAMPLES</b>				
Parameter	Unit	Result	Meter Used	Date of calibration
pH				
Temperature				
E.C				
TDS				
Salinity				
D.O				
ORP				
Turbidity				
<b>LABORATORY SAMPLES</b>				
Analytes Requested		Containers Used		QA/QC Samples Collected (circle)
				Duplicate Split Blank

Any other comments or special procedures (see over):

## Appendix B – Calibration Record Sheet, Water Sampling Meters

**CALIBRATION RECORD – WATER SAMPLING METERS**

<b>Date:</b>				<b>Calibrated By:</b>			
<b>Probe Calibrated:</b> <small>(Enter ID of each probe i.e. #1, #2, or #3)</small>		pH:		EC:		DO:	
		Turbidity:					
<b>Pre-Calibration Reading:</b>				<b>Post Calibration 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:
<b>pH readings (circle):</b> <b>Good</b> <b>Some Problems - explain here:</b>							
<b>EC</b>							
<b>EC Calibration Solution Used (circle):</b> <b>447 µS/cm</b> <b>1413 µS/cm</b> <b>2570 µS/cm</b> <b>12880 µS/cm</b>							
EC µS/cm:	TDS g/L:	Sal ppt:	EC µS/cm:	TDS g/L:	Sal ppt:	EC µS/cm:	TDS g/L:
<b>EC readings (circle):</b> <b>Good</b> <b>Some Problems - explain here:</b>							
<b>Turbidity</b>							
Turbidity Standard 10 NTU:				Turbidity Standard 10 NTU:			
Turbidity 20 NTU:		Turbidity 100 NTU:		Turbidity 800 NTU:			
<b>Turbidity readings (circle):</b> <b>Good</b> <b>Some Problems - explain here:</b>							
<b>DO</b>							
<b>Barometric Pressure (mb) entered for DO:</b> <small>Look up on BoM website for your locality</small>				<b>Salinity (ppt) entered for DO:</b> <small>i.e zero if samples will be freshwater or 35 ppt for marine samples</small>			
DO 100% sat:				DO 100% sat:			
<b>DO readings (circle):</b> <b>Good</b> <b>Some Problems - explain here:</b>							
<b>Probes require servicing? (e.g. DO membrane needs changing, probes need to be cleaned or sent away, batteries need replacing)</b>							
						Actioned (tick): <input type="checkbox"/>	
						Date:	
<b>Any other actions required? (e.g. order more calibration solutions or DO replacement membranes)</b>							
						Actioned (tick): <input type="checkbox"/>	
						Date:	

**Signature:**

## Calibration Notes:

- Refer to laminated calibration card (located in calibration record sheet folder) for step-by-step instructions on calibrating each meter.
- Always allow plenty of time for readings to stabilize before calibrating.
- Gently tap the EC probe against side of container or agitate the probe while submerged in the solution to dislodge any bubbles that may be clinging to the probe lens.
- The EC probe will not work properly unless immersed in at least 7cm of water.
- Be careful when taking field measurements as EC probe switches between  $\mu\text{S}/\text{cm}$  and  $\text{mS}/\text{cm}$  without notice – be aware of this when writing down readings!
- Only record the EC reading with flashing  $^{\circ}\text{C}$  symbol. This is the standard at  $25^{\circ}\text{C}$ . Ignore the other one.
- When calibrating pH always calibrate in pH 7.00 solution before pH 4.01 solution.
- The Temperature reading must be stable before calibrating DO 100% sat.
- Ensure no water droplets are clinging to the DO probe before calibrating DO 100% sat.
- If readings are unstable or out of expected range the probes may need cleaning or servicing – see instruction manual on how to clean the EC electrodes, change the DO membrane, clean the pH or turbidity probes.
- Meter instruction manuals are located on water quality meter shelf in storeroom.