

WesCEF - Groundwater Compliance Management Procedure

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1. Introduction

This procedure outlines the management requirements for groundwater encountered during exploration activities. It is designed to address the handling of intercepted groundwater during reverse circulation drilling, with the aim of minimising environmental impacts associated with poor-quality groundwater.

Groundwater extracted during dewatering activities must be managed in accordance with this procedure to ensure that environmental harm does not occur, in accordance with the *Environmental Protection Act 1986* (EP Act).

1.1 Purpose

The purpose of this procedure is to document the process for managing intercepted groundwater as part of exploration drilling, at WesCEF projects. Failure to follow this procedure may result in environmental harm and potential penalties under the EP Act.

1.2 Scope

This procedure details the groundwater management requirements for groundwater extracted during reverse circulation drilling. The procedure outlines all applicable regulations, ensuring responsible water management while mitigating potential environmental impacts from groundwater abstraction and incidental discharge to the environment.

Specifically, this procedure details the following:

1. Applicable legislation.
2. Groundwater management procedures.
3. Roles and responsibilities.
4. Groundwater sampling and analytical requirements.
5. Spill response requirements for saline water.

2. Legislation

WesCEF is required to comply with the EP Act and the *Rights in Water and Irrigation Act 1914* (RIWI Act) when undertaking exploration activities, particularly when operating within proclaimed groundwater areas. Details on these acts and other statutory requirements are summarised below.

2.1 Environmental Protection Act 1986

In relation to exploration drilling at WesCEF projects, the purpose of the EP Act is summarised as follows:

1. **Protect Environmental Values:** Prevent degradation of water quality, soil stability, and biodiversity that could result from saline water discharge or mismanagement.
2. **Regulate Discharges:** Control the release of potentially harmful substances (like saline groundwater) into the environment to avoid pollution or contamination.
3. **Enforce Accountability:** Hold operators responsible for managing environmental risks through approvals, monitoring, and compliance measures.

WesCEF has a duty of care under the EP Act to ensure that environmental harm does not occur as a result of the dewatering of saline groundwater under its exploration programs. If saline water is discharged into the environment without appropriate controls (e.g., evaporation basins or containment), it could increase soil salinity, harm vegetation, or contaminate surface or groundwater resources, constituting environmental harm. This is an offense under the EP Act and penalties may apply.

If dewatering exceeds 50,000 tonnes per year, it is classified as a Category 6 Prescribed Premise under Schedule 1 of the EP Act, requiring a Works Approval and Licence from DWER. As groundwater abstraction volumes from exploration drilling are not expected to exceed this volume, this requirement does not apply.

2.2 State Water Regulatory Framework

Water use, management and rights in WA are governed under the RIWI Act and the *Rights in Water and Irrigation Regulations 2000* (WA) (RIWI Regulations). The RIWI Act and Regulations are administered by DWER. Specifically, the RIWI Act aims to:

1. **Regulate Water Use:** Ensure sustainable and equitable access to water resources (surface water and groundwater) by controlling extraction and use, especially in areas of high demand or environmental sensitivity.
2. **Protect Water Resources:** Prevent over-extraction or degradation of water systems, including aquifers, by requiring licenses and oversight.
3. **Facilitate Management:** Provision of a permitting system for activities like groundwater extraction and bore construction.

Under the RIWI Act, a Licence to Take Water (Section 5C) is required where groundwater is to be abstracted. Exemptions to this requirement apply as follows:

1. The development is situated within a non-artesian (water table) aquifer.
2. Water is extracted exclusively for dewatering to facilitate construction or related activities.

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3. The exemption does not apply to activities involving the extraction of basic raw materials or any action that lowers the natural ground level.
4. The pump rate must not exceed 10 litres per second and must be limited to a period of less than 30 consecutive days.
5. The total volume of water extracted must not exceed 25,000 kilolitres (kL) over the specified period.

Exploration drilling activities conducted across WesCEF mining projects may intersect designated Groundwater Areas; however, the primary objective of these programs is mineral exploration, not groundwater extraction. In instances where groundwater is encountered during drilling, containment sumps are constructed within drill pads to capture any intersected water. No groundwater is used for ancillary activities such as dust suppression.

Other Relevant Regulatory Requirements and Guidance

In addition to the EP Act and State Water Regulatory Framework, the following additional regulations may also apply:

6. *Mining Act 1978 and Mining Regulations 1981* - Requires exploration activities to have approved Programs of Work (PoW) which must address groundwater abstraction needs and management. Section 20(5) requires miners to take all reasonable measures to prevent or reduce environmental damage, including to groundwater systems.
7. *Contaminated Sites Act 2003* - Imposes reporting obligations if drilling or abstraction activities result in contamination. Sections 11 and 12 establish duties to report and remediate contamination that may occur during abstraction processes or from drill sumps.
8. *Environmental Protection (Unauthorized Discharges) Regulations 2004* - Regulates the management of wastewater from dewatering and groundwater abstraction activities during exploration to prevent unauthorized discharges that could contaminate water resources.

3. Procedure

WesCEF's procedure for managing groundwater during exploration drilling is outlined in the following subsections. This should be reviewed and implemented at each drill pad in addition to any requirements specified in the associated PoW.

3.1 Pre-Drilling Preparation

The following tasks should be undertaken prior to commencement of drilling:

1. **Site Assessment:**
 - a. Undertake an assessment to estimate the volume, salinity, and depth of groundwater likely to be encountered.
 - b. Identify any potentially sensitive environmental or social receptors in proximity (within 500 m) of the drill pad as per [WesCEF Exploration Planning Procedure](#) (WCEF-PD-HSE-0039)
 - c. Identify optimum location for sump, with consideration to avoiding surface water flows during storm events and other sensitive receptors. Sump needs to be down gradient from drill collar location
2. **Sump Design and Construction:**
 - a. Estimate the expected groundwater inflow rate and volume based on drilling depth, aquifer characteristics, and drilling duration.
 - b. Design sumps with sufficient capacity to store the maximum anticipated volume, including a 200mm freeboard to account for rainfall or unexpected inflows.
 - c. Construct sumps within the drill pad footprint to minimise disturbance. Spoil material should be stockpiled adjacent to the sump for future use in backfilling and rehabilitating the sump.
 - d. Slope sump walls at a stable angle (e.g., 1:3) to prevent collapse and minimise safety risks, and ensure the base is flat and compacted.
 - e. Where a liner is required, use high-density polyethylene (HDPE) liner or equivalent impermeable material resistant to saline water. Ensure liner extends beyond sump perimeter by at least 500mm and secure liner edges with soil berms or trenching.
 - f. Install wildlife egress points to prevent fauna entrapment.
3. **Discharging to an Existing Pit:**
 - a. Ensure PoW authorises discharge to the selected pit location and verify if any specific requirements exist under the PoW.
 - b. Complete a safety assessment to determine if discharging to the pit can be undertaken safely.
 - c. Use abrasion resistant piping at the pit crest.
 - d. Fit a diffuser at the outlet to minimise erosion and associated instability.
 - e. Anchor piping securely at the pit crest and along its alignment to minimise movement, abrasion and potential whipping when under pressure.

- f. Pumping distances should be kept minimal and remain within line of site of drilling activities such that any issues can be identified early and managed.

3.2 Pumping Operations

The following tasks should be undertaken during drilling and pumping:

1. Monitor pumping rates and sump levels to prevent overtopping of sumps. Ensure a minimum 200 mm freeboard is maintained. Freeboard is the vertical distance between the maximum water level and the top edge in a sump. This buffer zone is crucial for preventing overflow during heavy rainfall or unexpected water inflow, ensuring the safety and stability of the sump structure.
2. Monitor pumping infrastructure to minimise risks of leaks or spills during pumping.
3. Periodically inspect sumps for entrapped fauna.

3.3 Decommissioning

Once drilling operations at a drill pad have concluded, the following tasks should be undertaken:

1. **Water Disposal:**
 - a. Water contained within the sumps should be allowed to evaporate until dry.
 - b. Where water is required to be removed from a sump for off-site disposal, approval should be sought from the Exploration Manager. This will require use of a water cart and disposal within an authorised facility.
2. **Sump Rehabilitation:**
 - a. Once water has evaporated from the sump, liner materials and sediment should be collected and appropriately disposed of in an appropriate landfill.
 - b. Any soil that has been in contact with saline water or any residual sediment should be pushed to the base of the sump prior to backfilling.
 - c. Sumps should be backfilled with the original material stockpiled adjacent to the sump.
 - d. The backfilled sump should be recontoured to match the surrounding topography.
 - e. Finishing works such as topsoil application and seeding should be undertaken in accordance with WesCEF's Exploration Drill Pad Rehabilitation Procedure and the relevant Program of Work.
3. **Bore Rehabilitation:** Rehabilitation of boreholes should be undertaken in accordance with WesCEF's Exploration Management Plan and the relevant Program of Work.

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4. Roles and Responsibilities

All WesCEF employees and contractors involved in the exploration program must comply with the requirements outlined in this procedure, as summarised in Table 1.

Table 1 Roles and Responsibilities for implementing the procedure

Role	Responsibility
Exploration Manager	Accountable for ensuring the requirements of the procedure are met during drilling and exploration activities. Responsible for external incident reporting.
Geologist	Oversight of all aspects covered under this procedure, including pre-drilling preparation, pumping operations, decommissioning requirements, monitoring and internal incident reporting.
Heritage and Environment Advisor	Implementation and maintenance of the Groundwater Management Procedure. Annual Audit of Compliance. Deliver monitoring/reporting data to the appropriate regulatory authority where required.
Drilling Contractors	Implementation of operational controls. Daily inspections. Incident reporting.
All personnel and contractors	Adherence to procedure. Reporting incidents and hazards.

5. Water Sampling and Analysis Requirements

The regional groundwater is described as predominantly hypersaline (>30,000 mg/L Total Dissolved Solid (TDS)). As part of WesCEF's due diligence in undertaking its exploration programs, groundwater samples will be collected and analysed as summarised in this section.

5.1 Standards and Guidelines

The sampling and analysis program will be undertaken with reference to the following standards and guidance documents:

1. Australian Standard (1998) 5667.1 Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (AS 5667.1:1998) (Standards Australia / Standards New Zealand, 1998).
2. AS/NZS 5667.11:1998 Water Quality – Sampling - Guidance on Sampling of Groundwater (Standards Australia / Standards New Zealand, 1998b).
3. Guideline for the Protection of Surface and Groundwater resources During Exploration Drilling (DEMIRS, 2002).

5.2 In-Field Hydrological Data Collection

1. Record all observations and measurements in the field logbook or digital logging system.
2. Ensure drill logs capture all required details as per the Guidelines for the Protection of Surface and Groundwater Resources During Exploration Drilling (2002). These include:
 - a. Aquifer Type – Identify and classify the aquifer encountered.
 - b. Depth to First Water Zone – Measure and record the depth where water is first encountered.
 - c. Depths to Additional Water Zones – Log any subsequent water-bearing zones.
 - d. Lithology and Aquifer Characteristics – Describe the formation, including fracture zones, rock jointing, oxidized zones, or contacts.
 - e. Water Analysis – sampling conducted in accordance with Section 5.3.
 - f. Yields – Measure and record water flow rates.
 - g. Standing Water Levels – Take measurements a few hours after hole completion to record stabilised water levels.
 - h. Hole Completion Details – Document the final state of the hole, including sealing methods (cement plug, bore cap, foamit plug, etc.).

5.3 Sample Collection

A sample of groundwater should be collected prior to completion of drilling activities at the respective drill pad. Samples should be collected in laboratory-sourced sample containers and kept cool as far as practicable prior to sending to the laboratory. Samples should be accompanied by a Chain of Custody form, specifying the analytical requirements as detailed in Section 5.4.

5.4 Sampling Parameters

The recommended suite of analytes is outlined in Table . Laboratories typically offer packaged analytical suites. Selection of a laboratory suite that is broadly comparable to Table is acceptable.

Table 2 Discharged Groundwater Monitoring Parameters

Role	Unit
pH	pH unit
Electrical Conductivity	µS/cm
TDS	mg/L
Major ions: <ul style="list-style-type: none"> • bicarbonate (HCO₃) • carbonate (CO₃²⁻) • calcium (Ca) • chloride (Cl) • nitrate (NO₃⁻) • potassium (K) • sodium (Na) • sulfate (SO₄²⁻) 	mg/L
Dissolved metals and metalloids: <ul style="list-style-type: none"> • arsenic (As) • antimony (Sb) • cadmium (Cd) • chromium (total) (Cr) • cobalt (Co) • copper (Cu) • iron (Fe) • lead (Pb) • magnesium (Mg) • mercury (Hg) • molybdenum (Mo) • nickel (Ni) • selenium (Se) • thallium (Tl) • zinc (Zn) 	mg/L

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5.5 Drilling Program Groundwater Reporting Requirements

In accordance with the Guidelines for Mineral Exploration Reports on Mining Tenements, water related data that was collected during exploration activities must be reported in the annual mineral exploration report.

5.6 Data Management

Laboratory analytical reports should be saved in WesCEF Exploration\General\02. Projects\PROJECT \05 Environment\12 Water for future reference.

Reports should include a reference to the associated program of work to ensure proper documentation and traceability.

6. Saline Water Spill Response Plan

In the event of a spill or uncontrolled release of saline or hypersaline groundwater abstracted during the exploration program, immediate and effective response measures are needed to minimise environmental harm, ensure compliance with regulatory requirements (e.g., EP Act and RIWI Act), and protect environmental receptors such as native vegetation and soil resources. The following procedure outlines the required response.

6.1 Immediate Actions

Immediately following identification of an uncontrolled release of saline groundwater, the following steps should be taken:

1. Cease Operations: Stop the source of the spill or release immediately, if safe to do so (e.g., shut off pumps, close valves, or isolate the affected pipeline).
2. Contain the Spill: Deploy containment measures to limit the spread of saline water. This may include:
 - a. Push up temporary bunding to encircle the spill area.
 - b. Diverting flow away from sensitive areas (e.g., vegetation communities, drainage lines) using trenches and/or bunding.
3. Notify Geologist and Exploration Manager and provide details on the incident.

6.2 Incident Reporting

Once the immediate incident has been contained, appropriate reporting is required:

1. Internal reporting: Record the time, location, estimated volume, and circumstances of the spill. Details should be accompanied by photographic evidence.
2. External reporting: If the spill is considered significant, the incident should be reported to DWER under part V of the EP Act. The Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) should also be notified. The significance of the spill should be determined by the Geologist and/or Exploration Manager, with consideration to the volume of the spill, its extent and whether any environmental values have been impacted (e.g. vegetation).

6.3 Detailed Assessment

A detailed spill assessment should follow the immediate containment of the spill and in parallel to any reporting requirements. The assessment should include:

1. Confirmation of the spill volume.
2. Aerial extent of the spill and surface area.
3. Confirmation of potentially sensitive receptors impacted by the spill.
4. Confirmation on the cause of the spill.
5. Updates or amendments to any internally or externally reported information.

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6.4 Remediation

Using the information gained from the detailed assessment, a site-specific remediation strategy should be developed and implemented. A provisional strategy is provided as follows:

1. Demarcate extent of spill using pegs, flagging tape or spray paint.
2. Scrape and remove heavily impacted soil to an authorised location.
3. Flush lightly impacted areas or areas inaccessible due to vegetation using fresh water, if available. Ensure flow rates do not cause erosion.
4. Scarify remaining surfaces where accessible.
5. Document remediation process, including photographic evidence.
6. Provide DWER and DEMIRS with an updated report, if required.

6.5 Monitoring

Once remediated, a monitoring program should be established for the area to confirm that the remediation efforts have been effective:

1. Visual inspections:
 - a. Visual inspections should be undertaken to confirm that no lasting impacts to vegetation or other receptors have occurred and that the site is recovering per expectations.
 - b. The inspections should include detailed observations supported by photographic evidence.
2. Frequency: The timing and frequency of inspections may vary depending on the extent and nature of the incident, however a typical monitoring schedule is provided as follows:
 - a. 3 months after initial remedial work.
 - b. 6 months after initial remedial work.
 - c. Annual inspections until it can be determined that the site has recovered with no lasting impacts.
3. Maintenance requirements: Where monitoring identifies that the site is not recovering per expectations, additional work may be required. A subsequent review and strategy should be developed and implemented under this scenario. This may include soil testing and the application of gypsum to improve soil conditions.
4. Reporting: Provide DWER and DEMIRS updates as required based on the monitoring results.

6.6 Continuous Improvement

Based on the findings of the incident report, opportunities to minimise the potential for reoccurrence should be identified and implemented.

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7. References

DEMIRS. (2002). *Guideline for the Protection of Surface and Groundwater resources During Exploration Drilling*. Department of Energy, Mines, Industry Regulation and Safety.

Standards Australia / Standards New Zealand. (1998). *S 5667.1 - 1998 Water Quality Sampling - Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples*.