Reportable Incident - Final Report

This Final Report is required to be submitted under Reportable Incident regulations 34(4) and 34(5) of the *Petroleum (Environment) Regulations 2016 (the Regulations*).
The final report must include a root cause analysis of the reportable incident that identifies both the immediate and underlying causes of the incident, as well as contributing factors, successful controls and control failures, immediate rectifications, ongoing management or monitoring requirements (as necessary) and systematic corrective actions [DEPWS, 2023]. Where the reportable incident includes actual or potential environmental harm, the final report should also clearly demonstrate:

- what contamination assessments were undertaken, how they were undertaken, and the outcomes of those assessments
- what remediation has been undertaken, and
- what rehabilitation has been undertaken.

If a decision is made to not remediate or rehabilitate an area affected by the reportable incident, the final report must include a clear justification for this decision. Similarly, if no clean-up or rehabilitation is required, the final report should explain why. Lessons learned, and how these will be applied to future activities, should be included in the final report.

Section 1 – Interest Holder Details

For petroleum titles held by multiple interest holders, details must be completed for each interest holder. If insufficient room, please attach information to the form.

	Interest Holder 1	Interest Holder 2	Interest Holder 3	Interest Holder 4
Company Name	Imperial Oil & Gas Pty Limited			
Nominated interest holder for all matters related to Report? **If 'no' each interest holder must sign Declaration and will receive related documents unless designated operator authorised to sign and receive documents**	☒ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Authorisation given to an Operator to submit Report and sign Declaration?	☐ Yes ☒ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Section 2 – Reportable Incident Report Details

EMP Title (petroleum title/s)	2021 – 2025 EP 187 Work Program	**Unique EMP ID**	**IMP 4-3.10**	**Initial report**	☐ Yes ☒ No
Reporting	**Notification Content**	**Date Submitted**	**Recipient**	**Key Stakeholders**	**☒ Yes ☐ No**
Initial Report	Identified dying vegetation in surface drain discharge area.	11/01/2025	DLPE	Yes - Notified	1
Interim report	Results of site investigation and measures taken for containment, isolation and clean up.	**13/03/2025**	DLPE	Yes - Notified	1
Final Report	• Source, nature and extent of material released • Potential Receptors and Pathways analysis • Contamination assessment • Laboratory soil results vs NEPM criteria • Impact assessment • Remediation and Rehabilitation • Summary of Root Cause Analysis • Lessons learned and Controls	-	DLPE	-	1

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

Source of Soil Contamination	The Reportable Incident relates to the unintended release of contaminants, from stored wastewater which is hyper-saline and therefore potentially environmentally hazardous [ANZG, 2018], during the pumping of rainwater off the wastewater tank cover located on EP 187 Carpentaria 2/3/5 well pad in the NT Beetaloo (**Attachment A**). A minimum design freeboard of 1/1,000 year rainfall is required for above-ground wastewater tanks under the Code to prevent overtopping during the Wet Season. By default, *the Code* also requires tanks be covered to prevent rainwater ingress. An investigation into the causes of the saline rainwater	Supporting information attached ☒ Yes ☐ No Attachment A

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

	release was undertaken by the original equipment manufacturer for the wastewater tank system. The investigation revealed failure in the integrity of the tank cover resulted in loss of containment due to a puncture hole, likely caused during field maintenance work on the rainwater solar pump on December 24, 2024. This puncture allowed saline wastewater stored in the tank to seep upwards through the tank cover, due to differences in salt concentration gradient (ionic diffusion), increasing the salinity of the accumulated rainwater on top of the tank cover. To ensure proper functionality, accumulated rainwater must be periodically pumped off the tank cover. Site investigations determined that from December 25, 2024, to January 8, 2025, approximately 5,700 L of brackish (half the salinity of seawater) affected rainwater was slowly pumped off the Tank Cover unintentionally, following rain events, into the surface water erosion sediment control (ESC) drain exiting from the well pad. Rainwater pumping from the tank cover was stopped immediately when vegetation near the ESC drain discharge area adjacent to the well pad southern area boundary was noted to be stressed on January 8, 2025. Affected rainwater that was pooled in the ESC drain was pumped back into the wastewater tank to mitigate further salt contamination. The most salt affected soil area (31 m^2) in the ESC-Drain was scraped up and removed.	
Nature and extent of material or serious environmental harm that the incident caused or could cause **Refer to Section 6.2.2.2 of the** Onshore Petroleum Incident Reporting Guideline	**Nature of Material** The unintentional release was a mixture of rainwater and stored flowback wastewater. Constituents of potential concern (COPC) in the wastewater tank, which comes from the target shale formation as flowback, following previous hydraulic fracturing operations at the well site, are classified as potentially hazardous environmentally. None of the chemicals used in the HF fluid system are considered Persistent, Bioaccumulate or Teratogenic (PBT) under international classification as demonstrated in *IMP4-3 Appendix 06.01 – HF Chemical Risk Assessment*. The assessment showed the potential acute toxicity of the biocide (TTPC) used in the HF fluid system to terrestrial fauna by oral ingestion is similar to NaCl (common salt) The risk to avian fauna at maximum concentration in the HF fluid and the wastewater at the maximum potential TTPC concentration was orders of magnitude less than the threshold hazard quotient of 1. It therefore poses no significant risk to avian receptors that may interact with the fluid. The *CSIRO's Fate of Hydraulic Fluids/Chemicals and Geogenic Hydrocarbons in Surface Facilities and the*	Supporting information attached ☒ Yes ☐ No Attachment E

Section 3 – Reportable Incident Details The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances		
	Subsurface studied the fate of the suite of hydraulic fracturing chemicals used in the Beetaloo, including those chemicals used at EP 187 [CSIRO, & Lupton, 2024]. Water aside, chemicals make up only a small percentage (~1%) of the fracturing fluids, and most are low-risk compounds with a history of safe use in other settings and organic constituents that rapidly biodegrade. Due to the age of the stored wastewater, potentially hazardous chemicals, such as the biocide (TTPC) used in the HF fluid system, are considered to have completely biodegraded in the wastewater tank, based on the CSIRO study and published biodegradation data for TTPC. However, it should be noted that microbial activity does not impact metal or salt concentrations in the stored waste water [CSIRO, & Lupton, 2024]. The source of these elevated salt and metal levels in the wastewater are geogenic solutes from the target shale, which are dissolved in the flowback water. These salts (NaCl primarily) and specific metals (Bo, Sr or Li) were/are contained in the fine clay, which forms the shale (mudstone) at the time of deposition on the seafloor more than a billion years ago and subsequently buried. The concentration of these salts and metals in flowback from the shale is like that found in seawater (see **Attachment D**). There is no evidence that Bo, Sr or Li are toxic to humans, fauna or vegetation under normal environmental exposures and concentrations found in affected rainwater or soil as reflected in water quality guidelines (ANZG, 2018) and national environmental protection measures (NEPM) [ASC NEPM, 1999]. (See **Attachment D** and **Attachment E**). The primary COPC unintentionally released to the environment is sodium chloride (common salt), dissolved in the affected rainwater on the tank cover, and which was approximately half the salinity of sea water.	

Reg 34(3)(b)(ii): Nature and extent of material or serious environmental harm that the incident caused or could cause
Refer to Section 6.2.2.2 of the Onshore Petroleum Incident Reporting Guideline
	Extent of Impact
	• **Volume:** Volume of affected rainwater water released = ~5,700 L.
	• **Area Impacted:** Approximately 356m² (see **Attachment A**), comprised of:
	  ○ **ESC Drain:** ~31m² – based on approximate location of outlet pipe and high-resolution drone imagery of ESC drain.
	  ○ **Vegetated Area:** ~325m²
	• **Duration of the Incident:** December 25, 2024 - January 8, 2025
	• **Release Rate:** <1 LPM
		Supporting information attached
		☒ Yes ☐ No
		Attachment A
		Attachment C

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

Reg 34(3)(b)(ii): Nature and extent of material or serious environmental harm that the incident caused or could cause

Refer to Section 6.2.2.2 of the Onshore Petroleum Incident Reporting Guideline

Environmental Receptors and Potential Impact Pathways

- Dispersion Mechanism: Rainfall (totalling 56 mm during the incident) may have assisted the spread of the saline water over a limited area in the ESC Drain discharge, largely by overland flow across dry, low-moisture soils. No further dispersion has been observed outside of the 356 m² of affected soil area pegged out visually during the site investigation (see **Attachment C**).
- Pathway Constraints: The relatively small volume (~5,700 L) and slow-release rate (<1 L/min) from the tank cover solar pump over the incident period limited the extent of dispersal of saline water across the affected soil area. The area is also constrained by a natural topographic depression in the drain discharge area, minimal slope and confined drainage pathways from the ESC Drain (**Attachment F**). Rapid attenuation of salt contaminant concentrations spatially in affected soil, with reductions of 6–25x observed during site investigation along the ESC drain (see **Attachment D**) minimized further dispersion.
- Groundwater Protection: A thick stratigraphic sequence (approximately 78 m of heavy clay and related materials) between the surface and the regional aquifer on EP 187 effectively (see below) precludes any plausible pathway for groundwater contamination.

1. Receptor Proximity and Ecological Considerations

- The nearest surface water receptor is an ephemeral NT Stream Order 1 drainage line, approximately 450 m down gradient from the affected area (Attachment B). Riparian vegetation for this stream order is directly on the stream bank. The stream was completely dry during the incident period (**Attachment F**).
- The closest domestic or stock bore is more than 2.7 km away.
- The nearest dwelling is about 9 km away.
- The nearest recorded cultural site is more than 10 km away.
- Protected areas (e.g., Limmen National Park, Bullwaddy Conservation Reserve) are located 40–110 km away.
    - Sensitive Flora and Fauna: The incident caused temporary chlorosis (leaf discoloration and necrosis) in affected vegetation – a direct consequence of effects of elevated chloride level

Supporting information attached

☒ Yes ☐ No

Attachment B

Attachment C

Attachment D

Attachment E

Attachment F

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

(see **Attachment F**). The inherent brackish nature of the affected pooled rainwater water rendered it unpalatable to fauna. There are no COPC in the affected rainwater that may pose a risk to fauna (e.g. birds) if it was consumed.

- The area has also been fenced to prevent access from cattle. The vegetation of the Affected Area and the surrounding vegetation is *Chrysopogon fallax* (Ribbon grass). *Sorghum plumosum* (Plume sorghum) and immature *Eucalyptus leucophloia* (Snappy gum). Where native vegetation meets the cleared firebreak of the well pad, immature *Sesbania benthamiana* (Sesbania pea) are present.

2. The ability for spilt material to contaminate groundwater or surface water, and the timeframe over which this could occur

- Groundwater: The aquifer below the well pad is protected and isolated by approximately 78 m of overlying materials, including layers of clay loam, indurated clay, and clay/limestone, that effectively prevent surface contaminants from infiltrating down to the aquifer as determined from water bore drilling logs at the well pad, shown in the table below. Consequently, even if some solutes from the wastewater tank were introduced at the surface, the geophysical setting of heavy clay soils (see water bore stratigraphy table below) means that any significant downward migration would be negligible.

Water Bore Stratigraphy	Red Clay Gravel (mbgl)	Indurated Clay (mbgl)	Limestone Clay (mbgl)	Limestone Aquifer (mbgl)	Standing Water Level (mbgl)
RN 042463	0 - 6	6 - 48	48 - 78	78 - 100	65.5
RN 042464	0 - 6	6 - 48	48 - 78	78 - 106	65.5

- Surface water: Due to the distance of the nearest surface water ephemeral stream, the completely dry conditions of streams in the well pad area, the small volume release, the topographic containment within the ESCP drain discharge area, and rapid dilution (**Attachment D**) and subsequent evaporation observed, no surface water impact occurred.

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

Refer to Section 6.2.4 of the Onshore Petroleum Incident Reporting Guideline **Contamination Assessment**	**Contamination Assessment Undertaken** Water Sampling Affected rainwater samples were collected during site investigation on 16th and 17th January 2025. Samples were taken from the wastewater tank cover and from within the middle pool (see **Attachment C** and **Attachment F**) of the North-South flowing ESC drain prior to the affected rainwater being pumped back into the wastewater tank. Water samples were sent to a NATA-accredited laboratory for analysis in accordance with section C.8 of *the Code* suite of analytes. Surface water sampling, to confirm no offsite impact, in the nearest Stream Order 1 creek line was conducted in a small pool, approximately 1.7 km downstream from the incident area (**Attachment F**) on February 20, 2025. This was the "first flush" of the 2024/2025 Wet Season in this ephemeral stream. Soil Sampling The boundary of the Affected Area and the soil sampling locations are shown in Attachment C. The total area affected by the unintentional release is approximately 356 m^2. The most heavily Affected Area in the ESC-Drain where affected soil was scraped up and removed is approximately 31 m^2 (see **Attachment F**). The Affected Area outside the present well pad boundary firebreak is approximately 325 m^2. Soil samples were taken during site investigation on 16th and 17th January 2025. Samples were collected from 8 sampling points shown in **Attachment C** and 3 sampling points approximately 50 m to the south, east and west of the boundary of the Affected Area. These baseline reference soil samples, collectively called Soil Baseline, provide a measure of the baseline chemical characteristics of the soil. At each sample point, a soil sample was taken at 0 - 10 cm depth and 10 - 30 cm depth in accordance with NEPM and AS 4482.1 [STANDARDS AUSTRALIA, 2005]. Soil samples were sent to a NATA-accredited laboratory for analysis in accordance with section C.8 of *the Code* suite of analytes. Repeat soil sampling was undertaken on April 4, 2025, approximately 10 weeks after the incident, from the 8 sampling points shown in **Attachment C** in the affected soil area. At each sample point, a soil sample was taken at 0 - 10 cm depth and ~ 30 cm depth in accordance with NEPM and AS 4482.1	Supporting information attached ☒ Yes ☐ No Attachment C Attachment F

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

	[STANDARDS AUSTRALIA, 2005]. Soil samples were analysed for EC using a calibrated EC field meter and 1:5 soil-distilled water ratio as per the standard NATA laboratory method referred to as ISO 11265:1994 [ISO, 1994] or AS 1289.4.4.1:1997 [STANDARDS AUSTRALIA, 1997], which is identical.	
Refer to Section 6.2.4 of the Onshore Petroleum Incident Reporting Guideline **Results of Contamination Assessment**	**Results of Contamination Assessment** <u>Rainwater contamination assessment in January 2025</u> The laboratory results for affected rainwater samples collected during site investigation on 16th and 17th January 2025 are shown in the ANZG site investigation screening table found in Attachment D. Forty-eight (48) analytes, including twenty-one (21) metals, were measured in the affected rainwater on the tank cover and in the ESC Drain and compared to Australian New Zealand Water Quality Guidelines (ANZG) default guideline values (DGV) criteria [ANZG, 2018], criteria for further investigations. None of the measured analytes in the affected rainwater in the ESCP drain exceeded the ANZG criteria except for sodium chloride, and consequently electrical conductivity; and also, Boron. Petroleum hydrocarbons, polyaromatic hydrocarbons, phenolic compounds and BTEX were all below detection levels as shown in Attachment D. Average seawater reference values, from which the geogenic solutes were derived in the shale, are also provided in Attachment D. Analytes with elevated levels in the affected rainwater on the tank cover have a similar profile to seawater, including Sodium, Chloride, Boron and Strontium, albeit more diluted in total concentration than seawater. <u>Surface Water assessment in February 2025</u> Results of surface water sampling in the nearest Stream Order 1 creek line on February 20, 2025, following the “first flush” 2024/2025 Wet Season rain in this ephemeral stream gave a field EC = 79 us/cm confirming no effect on surface water. This EC reading was like or lower than EC readings in other creek lines in the surrounding EP187 area.	Supporting information attached ☒ Yes ☐ No Attachment D Attachment E

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

Results of Soil contamination assessment in January 2025

Fifty-six (56) analytes, including thirty-three (33) metals, were measured in the baseline soil and affected soil area and compared to national environmental protection measurement (NEPM) guideline criteria for further investigations. The laboratory results for each of the 56 analytes for baseline soil and affected soil at the 2 soil sampling depths are shown in the NEPM site investigation screening table found in **Attachment E**. None of the measured analytes exceeded the NEPM criteria or other relevant investigation level criteria in the affected soil area except for sodium and chloride (and consequently electrical conductivity). Sodium and chloride are significantly elevated in the hyper-saline wastewater storage tank. No heavy metals (typically metals with a density greater than 5 g/cm^3), such as chromium and vanadium commonly associated with these lateritic soils, exceeded baseline soil values in the affected area.

Results of Soil contamination assessment in April 2025

Repeat soil sampling for Soil EC was undertaken on April 4, 2025, approximately 10 weeks after the incident, from the same sampling points in the affected area shown in **Attachment C**. During the 10-week interval approximately 400 mm of rainfall was recorded at the well pad. This is approximately 60% of the average annual rainfall. The average measured EC (1:5) of the soil samples at <10 cm and 30 cm depths and the corresponding calculated paste extract (ECse) for loam soil is also presented in Attachment E. The average measured EC of the affected soil samples reduced by approximately 70% in the surface (0 – 10 cm) soil and approximately 60% in the deeper (30 cm) soil strata. As a result of this reduction in EC, the affected soil area is now well below the ANZG guideline value for this analyte (see **Attachment E**).

Vegetation Recovery

The brackish rainwater caused chlorosis in the leaves of affected vegetation, leaf browning and leaf drop, as shown in **Appendix F** at the time of the incident. Vegetation recovery in the affected area has shown leaf chlorosis effects on vegetation are temporary in the affected area following seasonal rains which has reduced the salinity of the affected soil in the root zone. There are strong signs of vegetation recovery 1 month after the incident with new leaf and bud growth visible on snappy gum and recovery of tussock grasses in the affected area (**Attachment F**). Imagery of the affected soil area

Section 3 – Reportable Incident Details The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances		
	on April 4, 70 days after the incident show good recovery of leaf foliage on affected trees and emerging tussock grass shoots in the most affected soil area. The pegged boundary of the affected area has also not changed during the recovery period (**Attachment F**).	
Refer to Section 6.2.4 of the Onshore Petroleum Incident Reporting Guideline **Outcomes of Contamination Impact Assessments**	**Contamination Impact Assessment** <u>Soil Contamination</u> Sodium and chloride, and corresponding EC, were the only analytes identified from the NEPM screening suite of fifty-six (56) analytes, including thirty-three (33) metals, that were identified in the affected soil area (**Attachment E**). Soil re-sampling of the affected soil area (**Attachment C**) was conducted in April 2025, approximately 10 weeks after the incident. During this period approximately 400 mm of rainfall occurred at the well pad area. The results show that average soil salinity (EC) in the affected area reduced by 70% and 60% at surface and 30 cm depth, respectively. Both soil strata are now well below the ANZG soil EC guideline value for rural areas (**Attachment E**). <u>Vegetation</u> The salinity effects on vegetation in the affected soil area was due to chlorosis (leaf discoloration and necrosis) in affected vegetation – a direct consequence of elevated chloride in the 325 m^2 affected soil area. The vegetation of the Affected Area is Ribbon grass, Plume sorghum and small Snappy gums. Salinity in the affected area, following the clean-up of the area at the time of the incident (**Appendix F**), has reduced on average by ~70% in surface soils. The effects of chlorosis in the affected soil area are shown to be temporary and existing trees and tussock grass clumps are now recovering as soil salinity has been reduced by seasonal rains. The pegged boundary of the affected area has also not changed during the recovery period (**Attachment F**). <u>Fauna</u> The inherent brackish nature of the affected pooled rainwater water rendered it unpalatable to fauna. The area has also been fenced to prevent access from cattle. There are no COPC in the affected rainwater that may pose a risk to fauna (e.g. birds) if it was consumed.	Supporting information attached ☒ Yes ☐ No Attachment E Attachment F

Section 3 – Reportable Incident Details **The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances**		
	<u>Surface Water</u> There were no impacts to surface water arising from the incident.	

Reg 34(5): The final report must include a root cause analysis of the reportable incident.	**Root Cause Analysis Summary**
	Immediate Cause
	• Saline fluid (~5,700 L) discharged onto 356 m² of vegetated land due to:
	  ○ A 20 mm hole in Tank 2's cover liner, allowing rainwater to mix with stored flowback fluid.
	  ○ Continuous irrigation of the mixed fluid via an earthen channel without retesting.
	Root Causes
	• Design/Installation flaw:
	  ○ Pump placed in an inaccessible location (opposite viewing platform), complicating maintenance.
	  ○ Liner material not resistant to pump movement, leading to tearing during repairs (25–26 Dec).
	Procedural Gaps:
	  ○ No post-maintenance inspection after pump repair.
	  ○ Procedure assumed initial rainwater test (24 Dec) remained valid despite system changes.
	• Inadequate Change Management:
	  ○ Pump repair not treated as a high-risk activity requiring retesting.
	• No Fail-Safe Mechanism
	  ○ Lack of automatic shutoff for high-salinity fluid.
	Contributing Factors
	• Pump placement – accessibility, visibility
	• Pump / lid design
	• Monitoring frequency
		Supporting information attached
		☐ Yes ☒ No

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

Refer to Section 6.2.4 of the Onshore Petroleum Incident Reporting Guideline	**Lessons Learned**
	Critical equipment must be durable and accessible:
	• The pump's poor placement (opposite the viewing platform) and inadequate liner material or padding around pump / hoses led to undetected damage.
	• Going forward:
	  ○ Redesign pump setup to prevent liner stress.
	  ○ Conduct pre-deployment durability testing for new tank systems (liners, pumps).
	
	Single-point testing is insufficient for irrigation of water from tank covers.
	• Over-reliance on the initial rainwater test (24 Dec) failed to detect post-maintenance fluid mixing.
	• Going forward:
	  ○ Update procedure with twice per day testing of EC/pH once irrigation commences and if EC and pH are outside the range of 6-9ph and/or EC exceeds 1,500 µs/cm irrigation is to be stopped and supervisor notified.
	  ○ Investigate automated shutoff valves for high-salinity triggers.
	
	Maintenance activities must trigger formal management of change (MoC) protocols.
	• Pump repair (25–26 Dec) was not treated as a high-risk change, delaying issue detection.
	• Action:
	  ○ Implement MoC requirements for all hardware/process adjustments related to tanks.
	  ○ Implement a pre-work checklist for post-maintenance inspections.
	
	Shared knowledge prevents repeat incidents.
	• This was Imperial's first use of enclosed tanks; best practices are yet to be established in this environment.
	• Action:
		Supporting information attached
		☐ Yes ☒ No

Section 3 – Reportable Incident Details The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances		
	○ Benchmark with industry peers on tank cover designs. ○ Share findings via internal safety alerts and regulator forums.	
Reg 32: New or increased environmental impact or environmental risk Refer to Section 6.2.5 of the Onshore Petroleum Incident Reporting Guideline	**Alignment with approved EMP risk assessment** The incident involved the unintentional slow release (<1 LPM) of approximate total of 5,700 litres of salt affected rainwater to the environment over a period of 2 weeks. Under the approved EMP IMP 4-3 Spill Management Plan (EMP - Appendix 07) spill classification based upon the volume and location of the spill, this volume of release off-site to adjacent area is assessed as Level 3, the highest spill classification category under the plan and is classified as a Reportable Incident under the *Petroleum (Environment) Regulations*. This is consistent with the actions taken since the incident was identified. The outcomes of the contamination assessment are consistent with the approved EMP IMP 4-3 - Risk Assessment matrix (EMP - Appendix 03). The loss of containment in the wastewater tank cover in this scenario is highly restricted and constrained for the following reasons: • There was no possibility of overtopping of the tank during or after the incident due to *the Code* requirement for freeboard design which requires highly conservative wastewater tank design to accommodate 1/1,000 year 90-day rainfall. • Affected rainwater unintentionally released from the mandatory tank cover was approximately half the salinity of seawater. • The release rate of affected rainwater to the environment was very slow, constrained by solar pump capacity design on the tank cover, and estimated at less than 400 litres per day (<1 L per minute). • The dispersion into the receiving environment was constrained spatially due to ESC drain discharge area topography, small volume and dry hot conditions. For these reasons the impact assessment and root cause analysis of the incident due to the loss of containment is aligned with the approved EMP IMP 4-3 Risk Matrix (EMP Appendix 03).	Supporting information attached ☐ Yes ☒ No

Section 3 – Reportable Incident Details The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances		
	• The contamination impact assessment is consistent with Level II - Minor Consequence = Impact on fauna, flora and/or habitat but no negative effects on the ecosystem. Requires immediate regulator notification. • The Level of Risk is assessed as Level 2 = Majority of controls are well designed and address the root cause/s of the risk. Therefore, no changes to the consequence descriptors used in the EMP are necessary.	
Reg 32: New or increased environmental impact or environmental risk **Refer to Section 6.2..5 of the** Onshore Petroleum Incident Reporting Guideline	**New or Increased Environmental Risk** The outcomes of the Root Cause Analysis identified an amendment to the Pump Off Procedure for accumulated rainwater on the tank cover to include daily pH and EC testing during irrigation, a risk assessment and checklist list for pump maintenance. This amendment to the procedure will prevent potential reoccurrence of a similar incident. Therefore, there are no new or increased environmental risks associated with the approved regulated activity under EMP IMP 4-3.	Supporting information attached ☐ Yes ☒ No
Reg 34(3)(b)(iii): Any actions taken or proposed to clean up or rehabilitate an area affected by the incident **Refer to Section 6.2.2.3 of the** Onshore Petroleum Incident Reporting Guideline	**Clean-up Undertaken** Actions taken for clean-up immediately following the incident included: • Rainwater irrigation pumping from the tank cover immediately ceased once vegetation was visually noted to be stressed. • Affected rainwater from the tank cover was pumped back into the wastewater tank. • Affected rainwater within the drainage channel was pumped back into the wastewater tank. • Demarcated and fenced the affected area to monitor whether vegetation impact was expanding. • Excavated the most affected soil (to a depth of about 15 cm) in the ESC drain where the fluid initially pooled, preventing further salt migration. The soil was placed in secure containers on the well pad. • Resampled to assess Soil EC trends in affected area approximately 10 weeks after first soil sampling.	Supporting information attached ☒ Yes ☐ No Attachment F

Section 3 – Reportable Incident Details The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances		
	• Monitored vegetation recovery from effects of leaf chlorosis due to temporary increase in chloride concentration in the soil root zone of affected area.	
Reg 34(3)(b)(iii): Any actions taken or proposed to clean up or rehabilitate an area affected by the incident **Refer to Section 6.2.2.3 of the** Onshore Petroleum Incident Reporting Guideline	**Recovery** Soil testing at the time of the incident found that none of the fifty-six (56) analytes, including thirty-three (33) metals exceeded the NEPM criteria or other relevant investigation level criteria in the affected soil area except for sodium and chloride and consequently electrical conductivity (**Attachment E**). Retesting of the EC soil at sampling points in the affected area (**Attachment C**) 70 days after the incident. The average measured EC of the affected soil samples reduced by approximately 70% in the surface (0 – 10 cm) soil and approximately 60% in the deeper (30 cm) soil strata. As a result of this reduction in EC, the affected soil area is now well below the guideline value for this analyte (see **Attachment E**). Existing vegetation in the affected soil area (immature snappy gums and tussock grass) show good recovery of leaf foliage on affected trees and emerging tussock grass shoots in the most affected soil area. The pegged boundary of the affected area has also not changed during the recovery period (**Attachment F**). Regulatory and compliance requirements mandate that contamination assessment and rehabilitation aligns with NEPM. Based on NEPM guidelines, the soil sampling results 70 days after the incident and clean-up indicate a 70% decrease in soil salinity in the affected soil area and is now well below the guideline values (**Attachment E**). During the 10-week interval approximately 400 mm of rainfall was recorded at the well pad. This is approximately 60% of the average annual rainfall. The recovery of existing vegetation in the affected area (**Attachment F**) 1 month and 70 days after the incident show that the effects of leaf chlorosis, arising from the increase in sodium and chloride in the affected soil was temporary.	Supporting information attached ☒ Yes ☐ No Attachment E
Refer to Section 6.2.4 of the Onshore Petroleum Incident Reporting Guideline	**Rehabilitation** As a result of this investigation and the evidence presented in this report it is concluded that no further remediation or rehabilitation is required in the affected area, and the material can remain in place, for the following reasons:	Supporting information attached ☐ Yes ☒ No

Section 3 – Reportable Incident Details The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances		
What rehabilitation has been undertaken **If a decision is made to not remediate or rehabilitate an area affected by the reportable incident, the final report must include a clear justification for this decision.**	• The source of the contamination in the Tank Cover has been identified and is in repair. • Clean-up of the most affected soil area in the ESC Drain has been completed. • Following 70 days in which ~400 mm rainfall was recorded at the well pad, the salinity of surface (0 – 10 cm) and deeper (30 cm) soil strata is now well below guideline values. • None of the NEPM contaminant guideline values for 58 analytes including 33 metals, are exceeded in the affected soil area. • Existing vegetation in the area (tussock grass and immature snappy gum) in the affected area is showing strong signs of leaf recovery through natural regeneration. • The pegged boundary of the affected area has not changed during the recovery period • All the affected area in vegetation is approved for clearing for the planned well pad expansion under Environmental Management Plan IMP 5-3 Carpentaria Pilot Project (IMP 5-3).	

Reg 34(3)(b)(iv): Any actions taken or proposed to prevent recurrence of an incident of a similar nature
 	
Refer to Section 6.2.2.4 of the Onshore Petroleum Incident Reporting Guideline
	New controls and actions:
	• Redesign Pump System:
	  ○ Relocate pump to an accessible platform with reinforced liner protection.
	  ○ Obtain OEM-engineered drawings to standardize pump setup / installation on all tanks with tank covers.
	• Enhanced Monitoring:
	  ○ Conduct twice per day testing of EC/pH once irrigation commences, and if EC and pH are outside the range of 6-9ph and/or EC exceeds 1,500 µs/cm irrigation is to be stopped and supervisor notified.
	  ○ Investigate installation of automated salinity alarms/shutoffs for fail-safe protection.
	• Strengthen Procedures:
	  ○ Update procedure with twice per day testing of EC/pH once irrigation commences, and if EC and pH are outside the range of 6-9ph and/or EC exceeds 1,500 µs/cm irrigation is to be stopped and supervisor notified.
	  ○ Formalize post-maintenance inspections and accumulated tank cover rainwater protocols.
		Supporting information attached
		☐ Yes ☒ No

Section 3 – Reportable Incident Details

The Reportable Incident relates to the unintended release of contaminants wastewater from Activity - Storage of potentially hazardous substances

	• Management of Change (MoC):
	  ○ Treat maintenance activities as high-risk changes.
	  ○ Implement a checklist for post-repair verification.
	• Long-Term Design Review:
	  ○ Assess leak-proof tank cover alternatives (e.g., double-lined covers, alternative barriers around pumps).
	  ○ Consider a feasibility study to eliminate tank covers because of redundancy due to existing freeboard design required under *the Code* (if agreed).
	• Culture & Communication
	  ○ Issue internal safety alerts to share lessons.	

Section 4 - Declaration

A person with legal authority to sign on behalf of the interest holder, or all interest holders (if more than one), must sign the declaration.

I hereby declare that I:

- am authorised to make this declaration. confirm that, to the best of my knowledge all information provided addresses the relevant matters and is true, correct, complete, and does not contain misleading information
- am aware that it is an offence under section 107 of the *Petroleum Act 1984* to give an authorised person information that I know, or ought to reasonably know, to be false or misleading in a material manner particular
- understand that all information supplied as part of this form, including attachments, may be disclosed publicly in accordance with regulation 35A of the Petroleum (Environment) Regulations 2016, and consistent with the requirements of the Information Privacy Principles (IPPs) in the *Information Act 2002*.

If report being signed by interest holder/s (include attachment if more room is required to complete the below table)

	Interest Holder 1	Interest Holder 2	Interest Holder 3	Interest Holder 4

Company Name	Imperial Oil & Gas Pty Limited			
Signature				
Name (print)	Chris White			
Position	Chief Operating Officer			
Date	11/04/2025			
Email	cwhite@empiregp.net			
If report being signed by Operator on behalf of interest holder/s				
Operator details (if applicable)				
Company Name		**ABN/ACN**		
Signature		**Address**		
Name (print)		**Email**		
Position				

References

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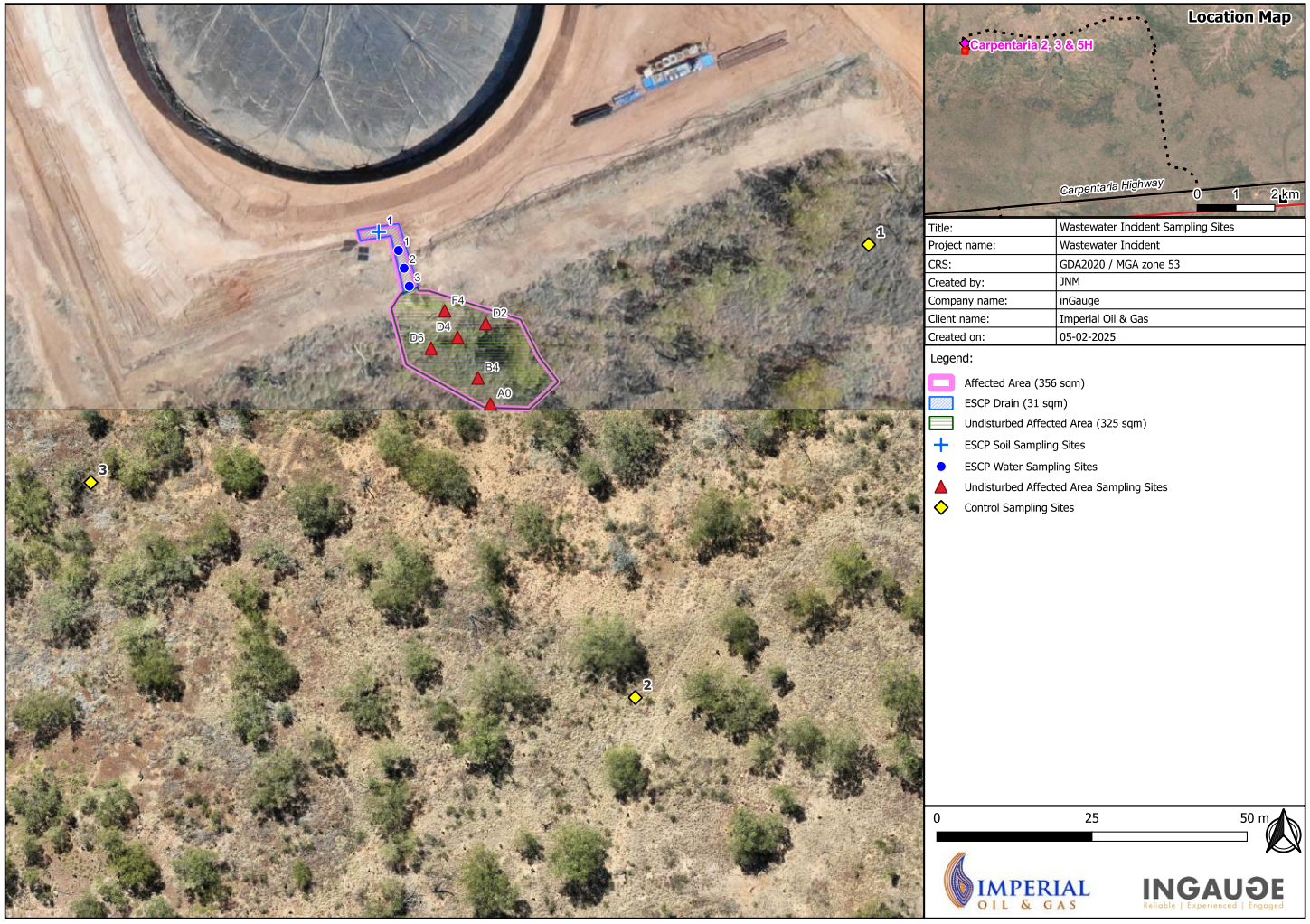
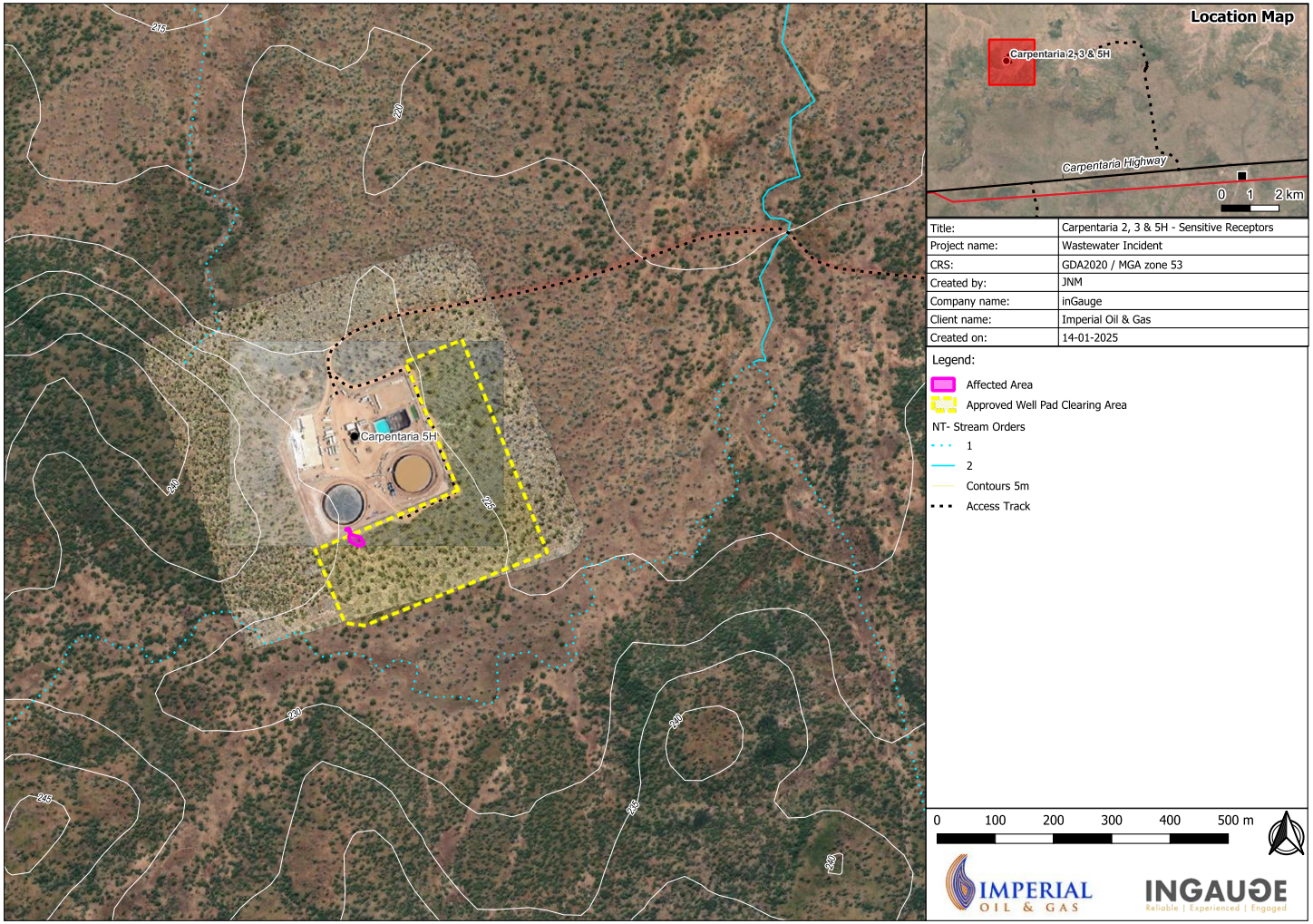
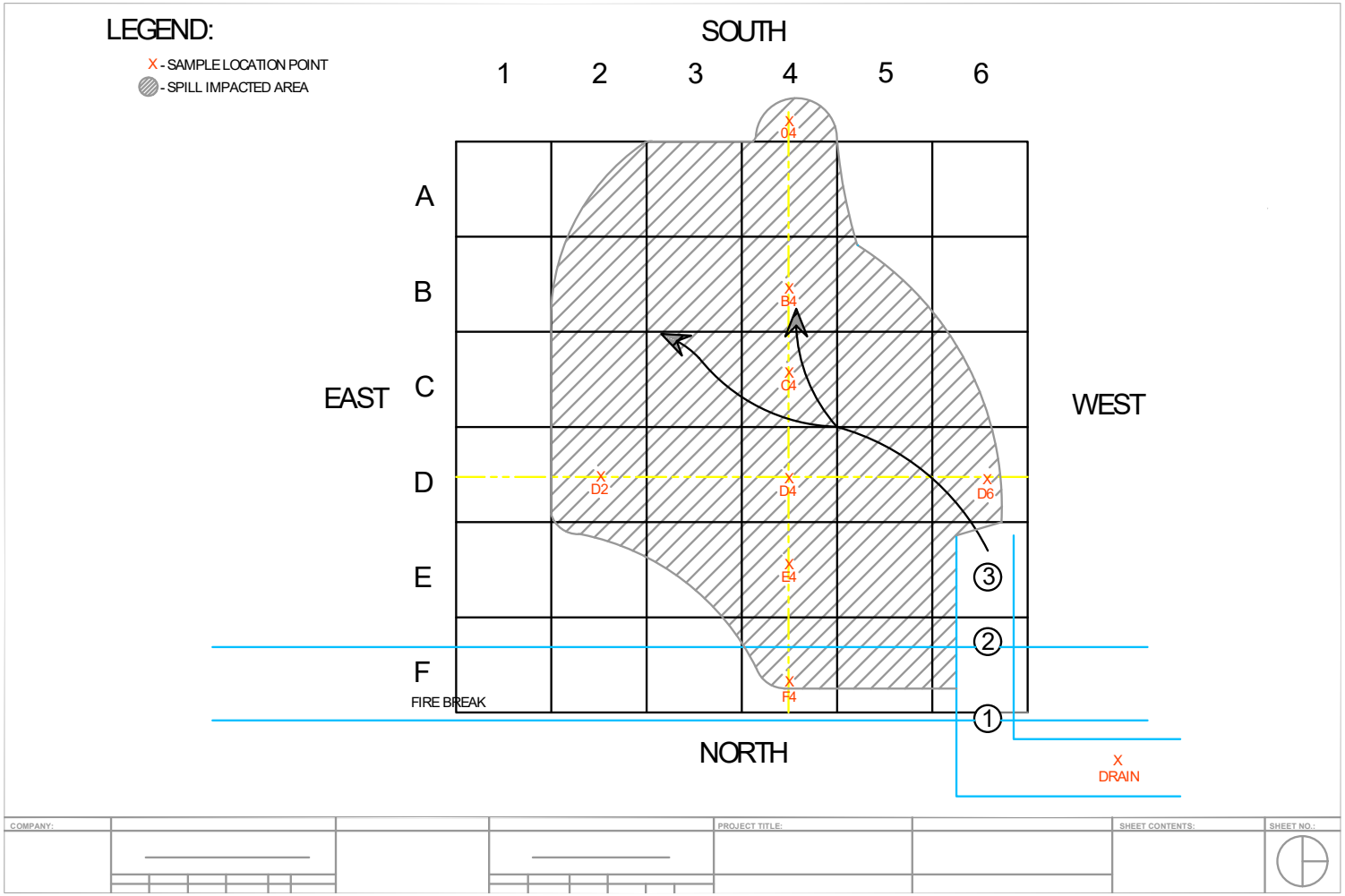
Attachment A – Boundary of Affected Area with Soil and Water Sampling Points



Attachment B – Sensitive Receptors in the Vicinity of the Affected Area



Attachment C – Affected Area Soil Sampling Plan (5 m Grid)



Attachment D – ANZG Further Investigation Screening Table for Affected Rainwater

Water Analyte	Unit	Limit of Reporting	ANZG DGV	Tank Cover	Exceeded	ESC Drain	Exceeded	Seawater Reference
pH Value	pH Unit	0.01	NSL	6.7	NO	7.7	NO	8
Electrical Conductivity	µS/cm	1	1,000	32,800	YES	3,410	YES	50,000
Major Ions								
Chloride	mg/L	1	300	12,400	YES	782	YES	19,000
Sodium	mg/L	1	200	5,730	YES	403	YES	10,800
Calcium	mg/L	1	NSL	2,510	NO	231	NO	400
Magnesium	mg/L	1	200	418	YES	70	NO	1,300
Potassium	mg/L	1	50	64	YES	19	NO	390
Metals (Total)								
Antimony	mg/L	0.001	0.001	ND	NO	ND	NO	0.0002
Arsenic	mg/L	0.001	0.001	ND	NO	ND	NO	0.003
Barium	mg/L	0.001	0.002	270	YES	ND	NO	0.05
Boron	mg/L	0.05	0.007	3.35	YES	0.51	YES	6
Cadmium	mg/L	0.0001	0.0002	ND	NO	ND	NO	0.0001
Chromium	mg/L	0.001	0.001	ND	NO	ND	NO	0.0003
Cobalt	mg/L	0.001	0.001	ND	NO	ND	NO	< 0.0001
Copper	mg/L	0.001	0.0014	0.105	YES	ND	NO	< 0.0001
Iron	mg/L	0.05	0.3	0.22	NO	0.07	NO	< 0.0001
Lead	mg/L	0.001	0.003	ND	NO	ND	NO	< 0.0001
Manganese	mg/L	0.001	2	1.05	NO	0.15	NO	< 0.0001
Molybdenum	mg/L	0.001	0.001	ND	NO	ND	NO	< 0.0001

Water Analyte	Unit	Limit of Reporting	ANZG DGV	Tank Cover	Exceeded	ESC Drain	Exceeded	Seawater Reference
Nickel	mg/L	0.001	0.004	ND	NO	ND	NO	< 0.0001
Selenium	mg/L	0.01	0.005	ND	NO	ND	NO	< 0.0001
Silver	mg/L	0.001	0.001	ND	NO	ND	NO	< 0.0001
Strontium	mg/L	0.001	NSL	156	NO	7	NO	9
Thorium	mg/L	0.001	0.001	ND	NO	ND	NO	< 0.0001
Tin	mg/L	0.001	NSL	ND	NO	ND	NO	< 0.0001
Vanadium	mg/L	0.01	0.01	ND	NO	ND	NO	< 0.0001
Uranium	mg/L	0.001	0.02	ND	NO	ND	NO	0.004
Zinc	mg/L	0.005	0.02	0.08	YES	ND	NO	< 0.0001
Total Cyanide	mg/L	0.004	0.004	ND	NO	ND	NO	< 0.0001
Nutrients								
Ammonia as N	mg/L	0.01	2.2	2.62	YES	0.53	NO	NA
Nitrite as N	mg/L	0.01	10	0.39	NO	0.06	NO	NA
Nitrate as N	mg/L	0.01	50	0.35	NO	0.06	NO	NA
Total Nitrogen as N	mg/L	0.1	1	7.2	YES	1.3	YES	NA
Total Phosphorus as P	mg/L	0.01	0.05	0.43	YES	ND	NO	NA
Phenolic Compounds								
Phenol	µg/L	0.5	0.5	ND	NO	ND	NO	< 0.0001
Pentachlorophenol	µg/L	2	0.04	ND	NO	ND	NO	< 0.0001
Poly Aromatic Hydrocarbons								
Naphthalene	µg/L	1	4.3	ND	NO	ND	NO	< 0.0001
Benzo(a)pyrene	µg/L	0.5	0.0003	ND	NO	ND	NO	< 0.0001
Sum PAH	µg/L	0.5	0.1	ND	NO	ND	NO	< 0.0001
Petroleum Hydrocarbons								

Water Analyte	Unit	Limit of Reporting	ANZG DGV	Tank Cover	Exceeded	ESC Drain	Exceeded	Seawater Reference
C6 - C10 Fraction	µg/L	10	10	ND	NO	ND	NO	< 0.0001
C10 - C16 Fraction	µg/L	50	50	ND	NO	ND	NO	< 0.0001
C16 - C34 Fraction	µg/L	100	100	ND	NO	ND	NO	< 0.0001
C34 - C40 Fraction	µg/L	10	50	ND	NO	ND	NO	< 0.0001
BTEX								
Benzene	µg/L	1	4	ND	NO	ND	NO	< 0.0001
Toluene	µg/L	2	30	ND	NO	ND	NO	< 0.0001
Ethylbenzene	µg/L	2	15	ND	NO	ND	NO	< 0.0001
Total Xylenes	µg/L	2	15	ND	NO	ND	NO	< 0.0001
Sum of BTEX	µg/L	1	10	ND	NO	ND	NO	< 0.0001

NSL – No screening level; **NEPM** - National Environment Protection Measure; **ANZG DGV** - Australian and New Zealand Guidelines Default Value Guideline; **USEPA** - U.S. Environmental Protection Agency; **ND** - No detection; **HIL** – Human Health Investigation Level; **EIL** – Ecological Investigation Level

Attachment E – NEPM Further Investigation Screening Table for Affected Soil

Soil Analyte	Unit	Limit of Reporting	NEPM HIL	NEPM EIL	Other EIL	Source	Baseline Soil (0-10cm)	Affected Area (0-10cm)	Baseline Soil (10-30cm)	Affected Area (10-30cm)	Exceeded
pH Value (1:5)	pH Unit	0.1	NSL	NSL	5.5 - 7.5	ANZG	6.1	5.8	5.8	5.4	NO
Electrical Conductivity (1:5) January 17 2025	µS/cm	1	NSL	NSL	NSL	ANZG	32.0	1939.1	19.0	2380.1	N/A
Electrical Conductivity (1:5) April 5 2025	dS/m	1	NSL	NSL	NSL	ANZG		590.7		909.5	N/A

Soil Analyte	Unit	Limit of Reporting	NEPM HIL	NEPM EIL	Other EIL	Source	Baseline Soil (0-10cm)	Affected Area (0-10cm)	Baseline Soil (10-30cm)	Affected Area (10-30cm)	Exceeded
ECse (calculated - loam) January 17 2025	dS/m	1	NSL	NSL	8	ANZG	0.2	10.7	0.1	13.1	YES (ANZG)
ECse (calculated - loam) April 5 2025	dS/m	1	NSL	NSL	8	ANZG		3.2		5.0	NO
Major Ions											
Chloride	mg/kg	10	NSL	NSL	1,000	ANZG	95.0	5,294.4	75.0	5,768.8	YES (ANZG)
Sodium	mg/kg	50	NSL	NSL	500	ANZG	130.0	2,573.3	70.0	2,961.3	YES (ANZG)
Calcium	mg/kg	50	NSL	NSL	3,000	ANZG	685.0	1,506.7	600.0	1,416.3	NO
Magnesium	mg/kg	50	NSL	NSL	1,500	ANZG	355.0	504.4	416.7	533.8	NO
Potassium	mg/kg	50	NSL	NSL	1,500	ANZG	467.5	518.9	426.7	496.3	NO
Metals (Total)											
Antimony	mg/kg	5	20	20		NEPM	ND	ND	ND	ND	NO
Arsenic	mg/kg	5	100	NSL		NEPM	6.5	7.0	7.0	6.2	NO
Barium	mg/kg	10	NSL	NSL	300	ANZG	37.5	263.3	26.7	205.0	NO
Boron	mg/kg	50	30	40		NEPM	ND	ND	ND	ND	NO
Cadmium	mg/kg	1	20	1		NEPM	ND	ND	ND	ND	NO
Chromium	mg/kg	2	500	50		NEPM	91.8	59.1	86.3	59.1	NO
Cobalt	mg/kg	2	100	50		NEPM	2.5	2.5	ND	3.0	NO
Copper	mg/kg	5	60	60		NEPM	8.8	8.0	8.7	7.6	NO
Iron	mg/kg	50	NSL	NSL		NEPM	66,250.0	49,322.2	65,000.0	52,612.5	NO
Lead	mg/kg	5	300	150		NEPM	15.3	10.3	14.0	11.1	NO
Lithium	mg/kg	0.1	NSL	NSL	50	ANZG	1.6	5.7	1.6	5.3	NO
Manganese	mg/kg	5	NSL	NSL	1,000	ANZG	275.8	124.3	128.0	78.6	NO
Molybdenum	mg/kg	2	NSL	NSL	5	ANZG	ND	2.0	ND	ND	NO

Soil Analyte	Unit	Limit of Reporting	NEPM HIL	NEPM EIL	Other EIL	Source	Baseline Soil (0-10cm)	Affected Area (0-10cm)	Baseline Soil (10-30cm)	Affected Area (10-30cm)	Exceeded
Nickel	mg/kg	2	120	60		NEPM	4.8	4.1	4.3	4.5	NO
Selenium	mg/kg	5	50	NSL	10	ANZG	ND	ND	ND	ND	NO
Silver	mg/kg	2	NSL	NSL	5	ANZG	ND	ND	ND	ND	NO
Strontium	mg/kg	2	NSL	NSL	500	ANZG	10.0	112.6	11.0	106.6	NO
Thorium	mg/kg	0.1	NSL	NSL	12	USEPA	7.3	5.8	8.0	6.7	NO
Tin	mg/kg	5	NSL	NSL	100	ANZG	ND	ND	ND	ND	NO
Vanadium	mg/kg	5	240	50		NEPM	222.3	152.8	218.3	167.0	NO
Uranium	mg/kg	0.1	NSL	NSL	**5**	ANZG	0.9	0.9	0.9	1.0	NO
Zinc	mg/kg	5	7,400	200		NEPM	17.0	13.8	13.7	11.1	NO
Total Cyanide	mg/kg	1	100	10		NEPM	ND	ND	ND	ND	NO
Nutrients											
Ammonia as N	mg/kg	20	NSL	NSL	50	ANZG	ND	30.0	0.0	23.3	NO
Nitrite as N (Sol.)	mg/kg	0.1	NSL	NSL	5	ANZG	0.5	1.0	0.5	ND	NO
Nitrate as N (Sol.)	mg/kg	0.1	NSL	NSL	100	ANZG	1.8	0.6	1.3	0.3	NO
Total Nitrogen as N	mg/kg	20	NSL	NSL	2,000	ANZG	650.0	693.3	543.3	562.5	NO
Total Phosphorus as P	mg/kg	2	NSL	NSL	500	ANZG	222.0	205.6	199.0	208.1	NO
Phenolic Compounds											
Phenol	mg/kg	0.5	50	NSL		NEPM	ND	ND	ND	ND	NO
Pentachlorophenol	mg/kg	2	1	NSL		NEPM	ND	ND	ND	ND	NO
Poly Aromatic Hydrocarbons											
Naphthalene	mg/kg	0.5	20	NSL		NEPM	ND	ND	ND	ND	NO
Benzo(a)pyrene	mg/kg	0.5	1	NSL		NEPM	ND	ND	ND	ND	NO
Total BaP Equivalent PAH	mg/kg	0.5	1	1		NEPM	ND	ND	ND	ND	NO
Petroleum Hydrocarbons											

Soil Analyte	Unit	Limit of Reporting	NEPM HIL	NEPM EIL	Other EIL	Source	Baseline Soil (0-10cm)	Affected Area (0-10cm)	Baseline Soil (10-30cm)	Affected Area (10-30cm)	Exceeded
C6 - C9 Fraction	mg/kg	10	150	200		NEPM	ND	ND	ND	ND	NO
C10 - C14 Fraction	mg/kg	50	1,000	500		NEPM	ND	ND	ND	ND	NO
C15 - C28 Fraction	mg/kg	100	2,500	2,500		NEPM	ND	ND	ND	ND	NO
C6 - C10 Fraction	mg/kg	10	NSL	200		NEPM	ND	ND	ND	ND	NO
>C10 - C16 Fraction	mg/kg	50	NSL	5,000		NEPM	ND	ND	ND	ND	NO
>C10 - C16 Fraction minus Naphthalene (F2)	mg/kg	50	NSL	500		NEPM	ND	ND	ND	ND	NO
BTEXN											
Benzene	mg/kg	0.2	1	NSL		NEPM	ND	ND	ND	ND	NO
Toluene	mg/kg	0.5	300	NSL		NEPM	ND	ND	ND	ND	NO
Ethylbenzene	mg/kg	0.5	300	NSL		NEPM	ND	ND	ND	ND	NO
Total Xylenes	mg/kg	0.5	150	20		NEPM	ND	ND	ND	ND	NO
Sum of BTEX	mg/kg	0.2	NSL	NSL		NEPM	ND	ND	ND	ND	NO
Naphthalene	mg/kg	1	1.7	20		NEPM	ND	ND	ND	ND	NO
Radionuclides											
Gross alpha	Bq/kg	0.05	NSL	1,000		NEPM	0.0	854.4	600.0	692.5	NO
Gross beta	Bq/kg	0.1	NSL	NSL		NEPM	0.0	0.0	0.0	0.0	NO

NSL – No screening level; **NEPM** - National Environment Protection Measure; **ANZG** - Australian and New Zealand Guidelines; **USEPA** - U.S. Environmental Protection Agency; **ND** - No detection; **HIL** – Human Health Investigation Level; **EIL** – Ecological Investigation Level

Attachment F – Site Incident Photos

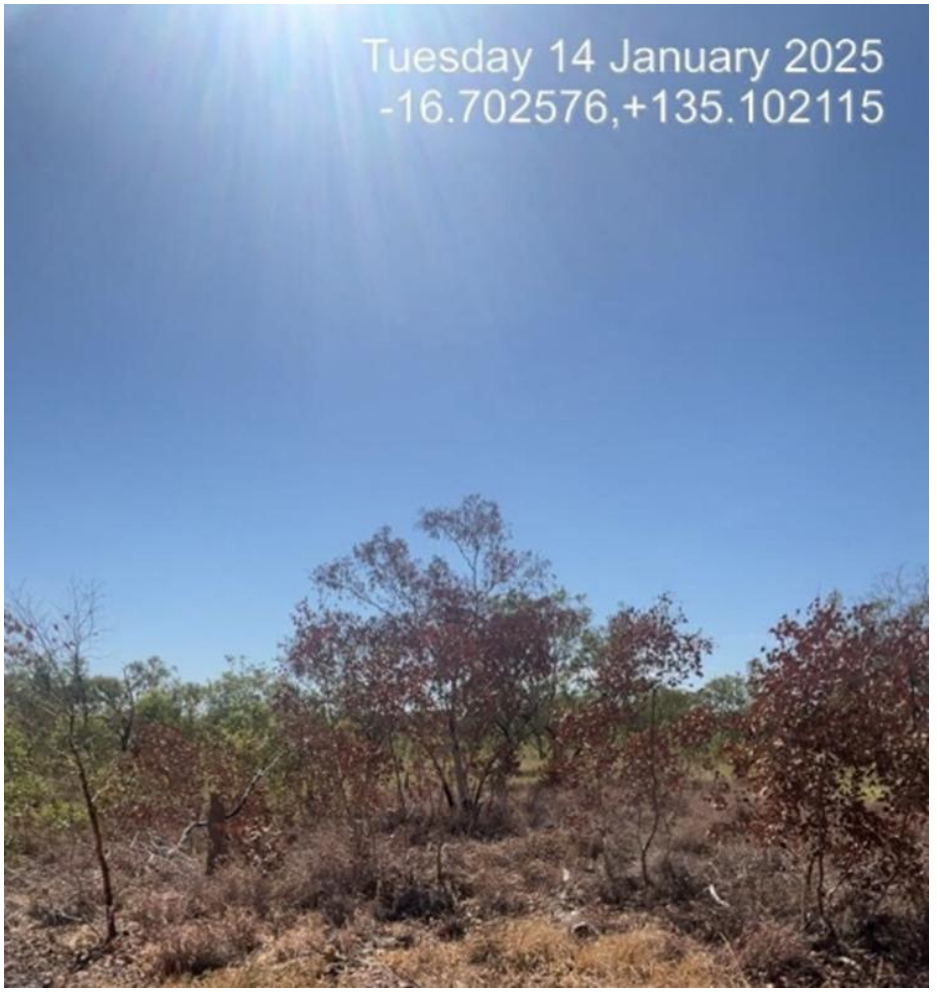
Affected Area in the ESC Drain – 14th January 2025

Cause of Affected Rainwater on Mandatory Tank Cover (tear now covered by patch)

Salt Affected Soil Removed from ESC Drain – 25th January 2025

Soil Affected Soil Stockpiled from ESC Drain

Leaf Chlorosis during January 2025 Incident



Leaf Chlorosis during January 2025 Incident

Stream Order 2 Creek Crossing 1.6 km Downstream from the Affected Area

Leaf Recovery 1 Month after Incident

Leaf Recovery 1 Month after Incident

Tussock grass Recovery 70 days after Incident

Vegetation Recovery 70 days after Incident