



Self-Referral to the NTEPA

Carpentaria Pilot Project (CPP)

EP 187

Prepared for Imperial Oil & Gas Pty Ltd.

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Supplemental Documents

- EMP Appendix 00 Environmental Management Plan
- EMP Appendix 01 Environmental Assessment Report
- EMP Appendix 02 Archaeological Survey Report
- EMP Appendix 03 Rehabilitation Plan
- EMP Appendix 04 Weed Management Plan
- EMP Appendix 05 Erosion and Sediment Control Plan
- EMP Appendix 06 Waste and Wastewater Management Plan
- EMP Appendix 07 Spill Management Plan
- EMP Appendix 08 Human Health and Environmental Risk Assessment
- EMP Appendix 09 Emergency Response (Contingency) Plan
- EMP Appendix 10 Stakeholder Engagement
- EMP Appendix 11 Traffic Impact Assessment
- EMP Appendix 12 Bushfire Management Plan
- EMP Appendix 13 Methane Emissions Management Plan

Abbreviations and Units

Abbreviation	Description
a	Annum
AADT	Average Annual Daily Traffic
AAPA	Aboriginal Areas Protection Authority
AHD	Australian Height Datum - equivalent to approximately "mean sea level"
AICS	Australian Inventory of Chemical Substances
ALARP	As Low as Reasonably Practicable
ALRA	<i>Aboriginal Land Rights Act 1976 (Northern Territory)</i>
APGA	Australian Pipelines and Gas Association
APPEA	Australian Petroleum Production and Exploration Association
ASX	Australian Stock Exchange
BACI	Before-After-Control-Impact
BGL (bgl)	Below Ground Level
BoM	Bureau of Meteorology
CBL	Cement Bond Log
CEC	Cation Exchange Capacity
CEO	Chief Executive Officer
CGP	Carpentaria Gas Plant
CLA	Cambrian Limestone Aquifer
CO₂-e	Carbon dioxide equivalent
CoPC	Constituents/Chemicals of Potential Concern
CPESC	Certified Professional in Erosion and Sediment Control
CPP	Carpentaria Pilot Project
D&C	Drilling and Completions
DAWE	Dept of Agriculture, Water and the Environment
DD	Data Deficient

Abbreviation	Description
DDR	Daily Drilling Report
DEPWS	Department of Environment, Parks and Water Security
DFIT	Diagnostic Fracture Injection Test
DIPL	Department Infrastructure Planning Logistics
DITT	Department of Industry, Tourism and Trade
DoEE	Department of Environment and Energy
EC	Electrical Conductivity
EMP	Environmental Management Plan
EP	Exploration Permit
EP Act	<i>Environment Protection Act 2019 (NT)</i>
EPS	Environmental Performance Standards
EPT	Extended Production Test
ERA	Environmental Risk Assessment
ESD	Ecologically Sustainable Development
ESY	Estimated Sustainable Yield
EVNT	Endangered, Vulnerable or Near Threatened
EWCRPERP	Emergency and Well Control Response Plan
GHG	Green House Gas
GIS	Geographic Information System
GISERA	Gas Industry Social and Environmental Research Alliance
GL	Gigalitres (1,000,000,000 litres)
GRF	Gum Ridge Formation
GW	Giga Watt
GWEL	Ground water extraction licence
ha	Hectares
HDD	Horizontal directional drilling
HF	Hydraulic Fracturing

Abbreviation	Description
HFI	Hydraulic Fracturing Inquiry - Report by the Panel of the <i>Scientific Inquiry into Hydraulic Fracturing in the Northern Territory</i> , Chair Hon Justice R. Pepper, 27 March 2018.
HHECRA	Human Health & Environment Chemical Risk Assessment
HSEMS	Health Safety Environment Management System
IADC	International Association of Drilling Contractors
IMS	Integrity Management System
kg	Kilograms
km	Kilometre
KOP	Kick-Off Point
L	Litres
LACA	Land Access and Compensation Agreement
LCG	Land Clearing Guidelines
LoR	Level of Reporting
LWD	Logging While Drilling
m	Metres
MAASP	Maximum Allowable Annular Surface Pressure
MAOP	Maximum Allowable Operating Pressure
MD	Measured Depth
MESP	Maximum Expected Surface Pressure
ML	Megalitres (1,000,000 litres)
mm	Millimetres
MMCF	Million Cubic Feet
MNES	Matters of National Environment Significance
MoC	Management of Change
MPa	Mega Pascal
mRT	Metres Rotary Table, referenced to the rotary table height of the original drilling rig, all wellbore geometry is measured in mRT.

Abbreviation	Description
MVD	Motor Vehicles per Day
MW	Mega Watt
NAFI	North Australia Fire Information
NEPM	National Environment Protection Measure
NGERS	National Greenhouse Energy Reporting Scheme
NHVR	National Heavy Vehicle Regulator
NLC	Northern Land Council
NRM	Natural Resource Management
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NVIS	National Vegetation Information System
OEM	Original Equipment Manufacturer
PBT	Persistent-Bio-accumulative-Toxic
PEGN	Polyethylene gathering network
PER	Petroleum (Environment) Regulations 2016 (NT)
PJ	Peta joule
PL	Petroleum Lease
PM	Project Manager
PM10	Particulate matter with an equivalent aerodynamic diameter of 10 micrometres or less.
PM2.5	Particulate matter with an equivalent aerodynamic diameter of 2.5 micrometres or less.
PMST	Environment Protection and Biodiversity Conservation Act 1999 Protected Matters Search Tool
ppb	Parts per Billion
PPE	Personal Protection Equipment
PPL	Petroleum Pipeline License
ppm	Parts per Million

Abbreviation	Description
PSI	Pounds per Square Inch
ROW	Right of Way
SC	Site Coordinator
SHRR	Significant Hazard Risk Register
SMP	Spill Management Plan
SREBA	Strategic Regional Environmental Baseline Assessment
SRV	Stimulated Rock Volume
SSCC	Sacred Site Clearance Certificate
t	Tonnes
TD	Total Depth
TDS	Total dissolved solids
TEC	Threatened Ecological Communities
TJ	Tera Joule
TO	Traditional Owners
TOC	Total Organic Content
TVD	True Vertical Depth
TVDSS	True Vertical Depth referenced to sea-level (Australian Height Datum)
WAC	Well Acceptance Criteria
WAP	NT Government Georgina Wiso Water Allocation Plan 2023-2031
WBIV	Well Barrier Integrity Validation
WCBD	Well Control Bridging Document
WHS	Water Handling Station
WMP	Weed Management Plan
WOMP	Well Operations Management Plan
WoNS	Weed of National Significance
WWMP	Waste and Wastewater Management Plan

Conversions

Unit	Conversion Equivalence
1 TJ	= 0.001 PJ = 1,000 GJ
1 km²	= 100 ha = 1,000,000 m ²
1 ppm	= 1 mg/L = 1,000 ppb = 0.0001%
1 MPa	= 145.04 psi
1 ML	= 1,000,000 L = 0.001 GL

Definitions

Term	Definition
Activity (may be referred to as “the Activity” in this document)	<p>The Regulated Activity and associated works covered by this report include:</p> <ul style="list-style-type: none"> • Land clearing to establish up to four new well pads out of five locations being considered as well as the potential expansion of the existing well pads at Carpentaria 2/3 and 4. • Clearing for new access tracks, and the expansion of existing landowner tracks. • Clearing for gas and water/wastewater flowlines and a connection to the McArthur River Gas Pipeline (MRGP). • Clearing for up to nine new gravel pits plus the expansion of three existing gravel pits at Carpentaria 1, 2/3 and 4. • Clearing to establish a gas plant, water handling station, campsite, ground water extraction and control monitoring bores, and a communications satellite dish. • Earthworks associated with excavating drilling sumps, turkey’s nests, trenching for gas, and water flowline and MRGP connection. • Construction of new groundwater extraction bores, above ground tanks, the Carpentaria Gas Plant (CGP) (inc. office warehouse, workshop), Water Handling Station (WHS), gas and water/wastewater flowlines. • Drilling hydraulic fracturing completion and workover of up to 10 new wells (including the re-entry of the existing well at Carpentaria 4), and the tie in and testing of up to 10 new wells plus the existing wells at Carpentaria 2/3). • Operation and Maintenance of up to 12 (up to 10 new and 2 existing) gas wells, new and existing well pads, laydown yard and helipad location at Carpentaria 1, groundwater extraction bores, above ground tanks, the Carpentaria Gas Plant (CGP), Water Handling Station (WHS), gas and water/wastewater flowlines and camps (including irrigation of treated sewage effluent and grey water).

Term	Definition
	<ul style="list-style-type: none"> • The storage and transportation of petroleum from up to 12 gas wells through flowlines and gas plant to the MRGP. • The storage, transfer, reuse, use, and disposal of wastewater or hazardous substances via flowline and heavy vehicle. • The recovery of petroleum on an appraisal basis. • Suspension or abandonment of the wells and decommissioning, of facilities.
Appraisal Phase	Petroleum is recovered or produced on an appraisal basis if it is recovered or produced under a process intended to establish the extent and nature of a discovery of petroleum (<i>Petroleum Act 1984 (NT)</i>).
Camp Wastewater	Treated sewage effluent, and greywater (laundry, showers, sink wastes, etc.) from camp and offices.
Clearing	Removal of above-ground vegetation and associated rootstock.
Completions Fluids	Fluid use to control a well during well completion.
CPP Area	Carpentaria Pilot Project Area – the location of the Activity within EP 187.
Decommissioning	The process by which a well is permanently sealed to prevent the flow of fluids into, out of, and along the wellbore at the end of its useful life. The decommissioning of wells includes the use of cement plugs, well monitoring, and site rehabilitation. Also referred to as plug and abandonment.
Drilling by-products	Residual drilling fluids, cuttings, and cement returns.
Drilling Fluid	The mixture of water and additives for drilling purposes (e.g., well control, lubricating the drill bit and removing cuttings).
Environmental Factors	Environmental factors are broad divisions of the environment that may be impacted by the Activity.
Environmental Impact	Has the meaning given in Regulation 3 of the <i>PER</i> : <i>‘Any adverse change, or potential adverse change, to the environment resulting wholly or partly from a regulated activity.’</i>
Environmental Risk	Has the meaning given in Regulation 3 of the <i>PER</i> :

Term	Definition
	The chance of something happening that will have an environmental impact, measured in terms of the environmental consequences and the likelihood of those consequences occurring.
Extended Production Testing	Up to 365 days of flow testing per year (366 in the case of a leap year). for a period of up to an estimated 5 years; duration dependent on time needed to demonstrate commerciality of resource.
HF Flowback Fluid	Fluid that is a mixture of hydraulic fracturing fluid and formation fluid that flows back from the well under controlled conditions following hydraulic fracturing.
Gravel Pit	Location of fill material for construction of infrastructure (e.g., gravel or clay).
Ground Truthing	<p>Field-based assessment of the final proposed locations for ground-disturbing activities, to ensure:</p> <ul style="list-style-type: none"> • The actual riparian zones and the buffers for drainage depressions, and stream orders 1 to 3, and the location and density of hollow-bearing trees and their buffers, are identified and mapped. • The presence/absence of the EPBC listed species identified by the Fauna and Flora division to have a moderate to high likelihood of occurrence, including the presence/absence of Grey Falcon nesting locations, are identified. • The locations of well pads and gravel pits will not require clearing of riparian zones, or their buffers and ensure that there are no active Grey Falcon nesting sites within 300 m.
Indicative	Reflective of the plan but may be adjusted to suit site conditions or program requirements.
Infrastructure Movement Zone	An area to accommodate potential shifts in the Activity locations at the time of clearing. Location adjustments may arise due to changes in the local environment, discussions with local landowners and/or project planning considerations. Locations can be moved or rotated to optimise the flowline network, reduce water run-on or run-off, or to circumvent environmental features, such as habitat trees. Any relocation of infrastructure within this movement zone will be carried out in consultation with a Field Environmental Advisor.

Term	Definition
Operations	In relation land in the CPP Area, means the conduct of the Activity on CPP land up until that land is not required for the ongoing conduct of the Activity or future regulated activities.
Panel	The Panel of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory.
Produced Water	Naturally occurring water that is extracted from the geological formation following hydraulic fracturing.
Referral Document	This Self-Referral to the NT EPA Carpentaria Pilot Project (CPP) EP 187 document.
Referral Form	Referral form - Environment Protection Act 2019 Version 2 8 June 2022 (NT EPA)
Sump	Earthen excavation constructed to contain drilling by-products (drilling cuttings, fluids, cement returns).
The Code	<i>Code of Practice: Petroleum Activities in the Northern Territory 2019 (NT)</i>
Traditional Owner	<p>Has the meaning given in the Aboriginal Land Rights Act 1976 (NT):</p> <ul style="list-style-type: none"> • <i>traditional Aboriginal owners, in relation to land, means a local descent group of Aboriginals who:</i> <ul style="list-style-type: none"> (a) <i>have common spiritual affiliations to a site on the land, being affiliations that place the group under a primary spiritual responsibility for that site and for the land; and</i> (b) <i>are entitled by Aboriginal tradition to forage as of right over that land.</i>
Traversing	Travel and work through the landscape deviating around large trees. The disturbance will be restricted to removal of rocks and fallen branches and of taller grasses and shrubs whilst retaining the rootstock.
Wastewater	<p>Water and wastewater to which Section C.2.1 of <i>the Code</i> applies, being:</p> <ul style="list-style-type: none"> • Water that has been used in or produced from petroleum wells, whether it is being re-used, recycled, treated, or disposed of, and includes flowback fluid, produced water, drilling fluids, completion fluids, well suspension fluids and non-aqueous drilling fluids;

Term	Definition
	<ul style="list-style-type: none"> • “waste material” and material containing “contaminants” as defined in s 4 (1) of the Waste Management and Pollution Control Act 1998 (NT); • Wastewater meeting the definition of “waste” under the Waste Management and Pollution Control Act 1998 (NT); • Water that has been acquired or used in petroleum activities that is being disposed of, (for example, unused volumes of hydraulic fracture fluid or drilling fluid, raw water, or waters described in C.2.1 (a)); and • Residual drilling waste, e.g., muds and cuttings (which may be in a fluid or solid state) in addition to the fluids mentioned in (a) to (d) above; <p>Water and wastewater do not include fluids defined in Section C.2.2 being:</p> <ul style="list-style-type: none"> • recoverable hydrocarbons (e.g., oil, condensate, and natural gas) produced from a well; • acquisition, storage, and disposal of potable water; • stormwater which has not come into contact with petroleum products or wastes on site; • sewage; or • wastewater or waste that is generated from petroleum activities once it leaves the site of an approved petroleum activity.

Publication Statement

The information recorded in the Referral Form that accompanied this document provides a standalone summary of the Activity. The draft Carpentaria Pilot Project (CPP) Environmental Management Plan (EMP) for the Activity referenced in this Referral Document, has also been provided.

Suitably Qualified Person/s

This Referral Document has been prepared with skill and care provided by person/s who have professional qualifications, training, skills, and experience in environment, safety, risk management, petroleum development and operations. The authors' skills and experience provide a high level of confidence in the factual and technical information and the reasonable assessment and solutions to address identified risks in the EMP and this Referral Document.

Table. i Suitably Qualified Person/s

Assessor	Position	Qualification	Years of Experience
Damian Ogburn	Environmental Advisor	PhD Environmental Science	47
Nicholas Fraser	Environmental Engineer	Bachelor of Environmental Engineering (Hons)	9
Peter Shaw	Environmental Specialist	Bachelor of Laws, Bachelor of Science (Hons)	44
Trent Smith	HSE & Compliance Manager	Bachelor of Science	21
Vic Farrington	Environmental Engineer and Scientist	BE(Chem), MAppSc, MBE, Cert. Env Assessment.	44

Referring CPP EMP proposal to the NTEPA

Tier 1 – Assessment by referral information

This Referral Document is being referred as a standard assessment as required by Section 48 (a) of the *Environment Protection Act 2019 (NT)* (EP Act) to the Northern Territory Environment Protection Authority (NT EPA), as the proposed petroleum development may have the potential to have a significant impact on the environment. This Referral Document has been prepared with reference to *Referring a Proposal to the NT EPA: Environmental Impact Assessment Guidance for Proponents* [NT EPA, 2021].

Significant Impact Test

In determining whether a proposal can have a significant impact on the environment the NT EPA may have regard to various matters, including the following:

- Objectives of the EP Act and other NT environmental legislation;
- Value, sensitivity, and quality of the environment that is likely to be impacted (for example, the existing environment as defined by the NT EPA's environmental factors and objectives);
- Extent (intensity, duration, magnitude, frequency, and geographic footprint) of likely impacts;
- Consequence of likely impacts (or change);
- Resilience of the environment to cope with the impacts or change;
- Cumulative impact;
- Connections and interactions between parts of the environment to inform a holistic view of impacts to the environment (for example, closure and rehabilitation, adaptive management, cumulative impacts);
- Level of confidence in the prediction of impacts and the success of proposed mitigation; and
- Stakeholder consultation.

Referral Submission Requirements

NT EPA requires supporting information in the form of a referral report (this Referral Document) and spatial files, to be submitted with the completed Referral Form. The completed Referral Form may be made publicly available following the NT EPA's decision to accept a referral.

The following supplemental PDF files will be submitted:

1. Referral Form (completed and signed by Imperial).
2. Referral Document.
3. **EMP Appendix 00** – Environmental Management Plan (EMP) **EMP Appendix 01** – Environmental Assessment Report.
4. **EMP Appendix 01 – Addendum Significant Impact Assessment**
5. **EMP Appendix 02** – Archaeological Survey Report.
6. **EMP Appendix 03** – Rehabilitation Management Plan.
7. **EMP Appendix 04** – Weed Management Plan.
8. **EMP Appendix 05** – Erosion and Sediment Control Plan.
9. **EMP Appendix 06** – Waste and Wastewater Management Plan.
10. **EMP Appendix 07** – Spill Management Plan.
11. **EMP Appendix 08** – Human Health and Environmental Risk Assessment.
12. **EMP Appendix 09** – Emergency Response (Contingency) Plan.
13. **EMP Appendix 10** – Stakeholder Engagement.
14. **EMP Appendix 11** – Traffic Impact Assessment.
15. **EMP Appendix 12** – Bushfire Management Plan.
16. **EMP Appendix 13** – Methane Emissions Management Plan.

Executive Summary

This Referral Document has been prepared with reference to the NT EPA Guidelines [NT EPA, 2022b] and referred as required by Section 48 (a) of the *Environment Protection Act 2019 (NT) (EP ACT)* (for a standard assessment) to the NT EPA, as a proposed petroleum development in the Beetaloo Sub-basin, that has the potential to have a significant impact on the environment.

The information in the Referral Document is required to:

- Satisfy the NT EPA that further information is not required to complete the assessment process.
- Meet the requirements of the *EP Act*.
- Provide the information required to be considered by the Minister for Environment, Parks and Water Security.

Imperial Oil & Gas Pty Limited (Imperial), is a wholly-owned subsidiary of Empire Energy Group Limited. Imperial holds a 100% working interest in Exploration Permit (EP) 187. Imperial is proposing a program for an ongoing appraisal phase to recover or produce gas on an appraisal basis in its unconventional gas project at EP 187 in the Northern Territory (NT); this Carpentaria Pilot Project (CPP) and its associated works is hereafter referred to as the Activity.

Petroleum is recovered or produced on an appraisal basis if it is recovered or produced under a process intended to establish the extent and nature of a discovery of petroleum (Section 5 (12) *Petroleum Act 1984 (NT)*).

The Activity

The Activity proposed to be conducted in the CCP Area is a Regulated Activity as defined by the *Petroleum (Environment) Regulations 2016 (NT) (PER)* and includes the associated works:

- Land clearing to establish up to four new well pads out of five locations being considered as well as the potential expansion of the existing well pads at Carpentaria 2/3 and 4.
- Clearing for new access tracks, and the expansion of existing landowner tracks.
- Clearing for gas and water/wastewater flowlines and a connection to the McArthur River Gas Pipeline (MRGP).
- Clearing for up to nine new gravel pits plus the expansion of three existing gravel pits at Carpentaria 1, 2/3 and 4.
- Clearing to establish a gas plant, water handling station, campsite, ground water extraction and control monitoring bores, and a communications satellite dish.

- Earthworks associated with excavating drilling sumps, turkey's nests, trenching for gas, and water flowline and MRGP connection.
- Construction of new groundwater extraction bores, above ground tanks, the Carpentaria Gas Plant (CGP) (inc. office warehouse, workshop), Water Handling Station (WHS), gas and water/wastewater flowlines.
- Drilling hydraulic fracturing completion and workover of up to 10 new wells (including the re-entry of the existing well at Carpentaria 4), and the tie in and testing of up to 10 new wells plus the existing wells at Carpentaria 2/3.
- Operation and Maintenance of up to 12 (up to 10 new and 2 existing) gas wells, new and existing well pads, laydown yard and helipad location at Carpentaria 1, groundwater extraction bores, above ground tanks, the Carpentaria Gas Plant (CGP), Water Handling Station (WHS), gas and water/wastewater flowlines and camps (including irrigation of treated sewage effluent and grey water).
- The storage and transportation of petroleum from up to 12 gas wells through flowlines and gas plant to the MRGP.
- The storage, transfer, reuse, use, and disposal of wastewater or hazardous substances via flowline and heavy vehicle.
- The recovery of petroleum on an appraisal basis.
- Suspension or abandonment of the wells and decommissioning, of facilities.

The Activity follows petroleum exploration programs in the CPP Area on EP 187 since 2019. This work included 388 km of 2D seismic acquisition and the drilling of four and Hydraulic Fracturing (HF) of three petroleum wells at three different well pad locations in the CPP Area.

The Activity includes the expansion of the total operational land disturbance footprint by up to ~226 ha (including 21 ha of contingency area for access tracks, flowlines, and pipelines) which is ~0.05% of the 442,700 ha area of EP 187.

The exploration programs generated encouraging results, including an initial production rate of 3 to 3.5 TJ/day per 1,000 m of production hole over a 30-day initial production rate from the Carpentaria-2H well which was drilled into the Middle Velkerri B formation, approximately 1.6 km BGL (below ground level). **Table. ii** shows the gas composition of the horizontal flow tested wells in the CPP. Of note, the formation contains low levels of CO₂.

Table. ii Gas Composition

Gas Composition – Volume %					
Component			Carpentaria-2H		Carpentaria-3H
			Phase 1 2022 Testing	Phase 2 2023 Testing	Phase 2 2023
C1	Methane	Hydrocarbons	83.17	82.80	83.58
C2	Ethane		11.95	12.40	11.54
C3	Propane		1.47	1.50	1.4
C4	Butane		0.30	0.30	0.27
C5+	Pentane and Higher		0.60	0.06	0.06
He	Helium	Inerts	0.16	0.12	0.15
CO₂	Carbon Dioxide		0.88	0.91	0.86
N₂	Nitrogen		2.01	1.91	2.13
Total Gas Composition			100	100	100

Location of the Carpentaria Pilot Project Area

The CPP Area lies wholly within NT Portion 5706, an Indigenous estate for the Mambaliya Rumburriya Wuyaliya Aboriginal Land Trust (the Land Trust). The CPP Area encompasses several cattle agistments under Section 19 *Aboriginal Land Rights (Northern Territory) Act 1976* (Cth) (ALRA) lease holdings, allowing livestock access to grassland, watercourses, and riparian areas within respective Section 19 agistment leasehold areas.

The CPP Area is situated on the southwest flank of EP 187 in the Sturt Plateau bioregion at the crest of the Favenc Range (**Figure. i, Figure. ii - Figure. vii, and Figure 6.2—1**), with a peak elevation of approximately 270 m AHD. The nearest community/town of Cape Crawford is 66 km east, Borroloola is 140 km northeast, Birdum is 190 km northwest, and Darwin is 640 km northwest.

The Carpentaria Highway and McArthur River Gas Pipeline transect the CPP Area from east to west and are generally aligned to each other and follow topographic high points in the local landscape at approximately 250 m AHD. The nearest house is approximately 1.3 km to the east of the CPP boundary on Carpentaria Highway, and approximately 7.5 km away from the proposed Carpentaria Gas Plant.

The environment in the CPP Area is described in the Terrestrial Ecosystems Baseline Report: Strategic Environmental and Baseline Assessment for the Beetaloo Sub-basin (Beetaloo SREBA Report) [Young L et al; DEPWS, 2023].

The CPP Area co-ordinates (shown in **Figure. i**) are listed in **Table. iii**.

Table. iii CCP Area Coordinates

Location Point	Easting*	Northing*
Point 1	517766.6	8148096.18
Point 2	526648.6	8148087.18
Point 3	526613.5	8120581.95
Point 4	508998.6	8120606.61
Point 5	509026.2	8161929.73
Point 6	517778.3	8161924.24

* GDA2020 Zone 53

The layout and location of the Activity footprint is shown in **Figure. ii - Figure. vii**.

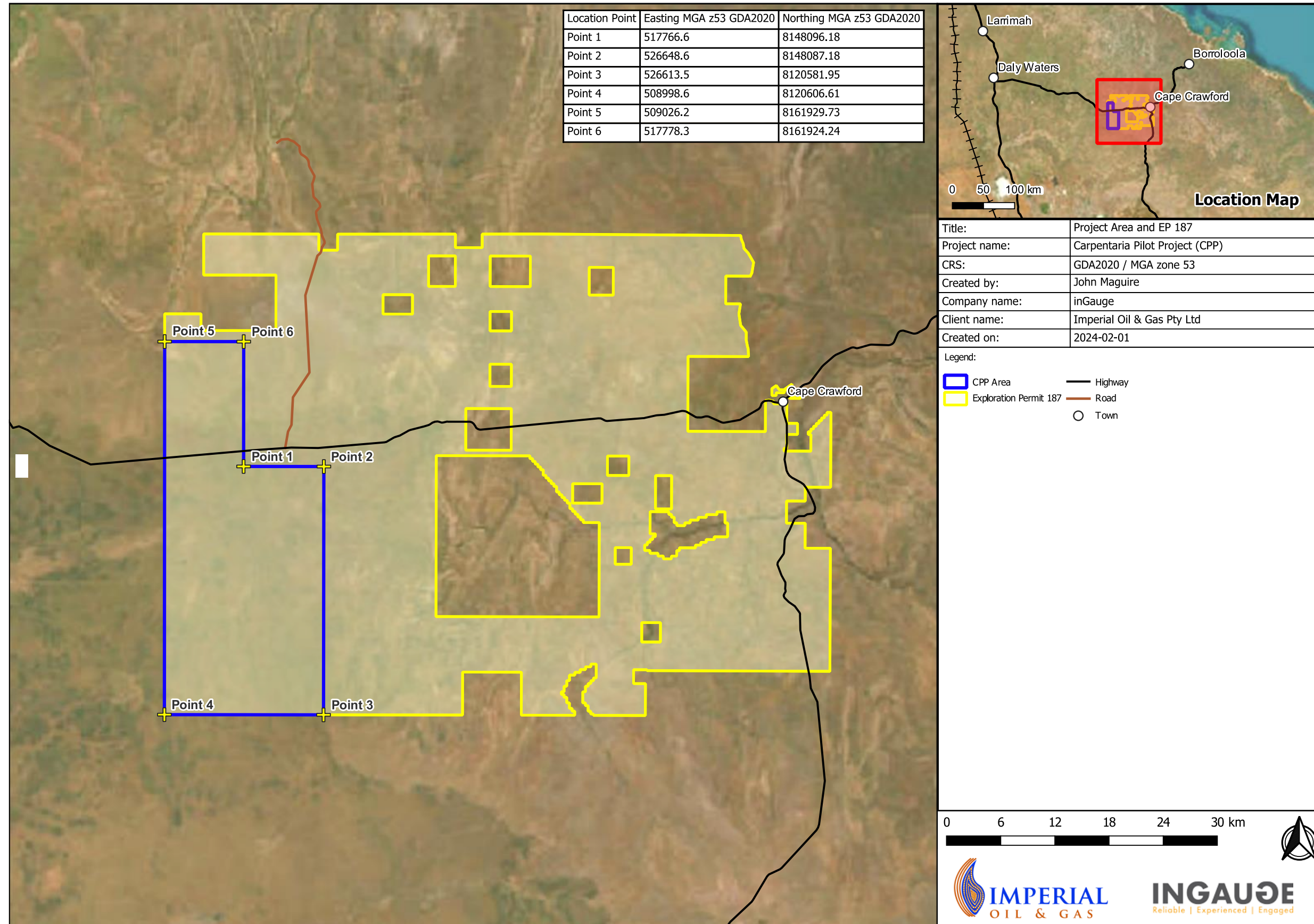


Figure. i Location of EP 187 and the CPP Area

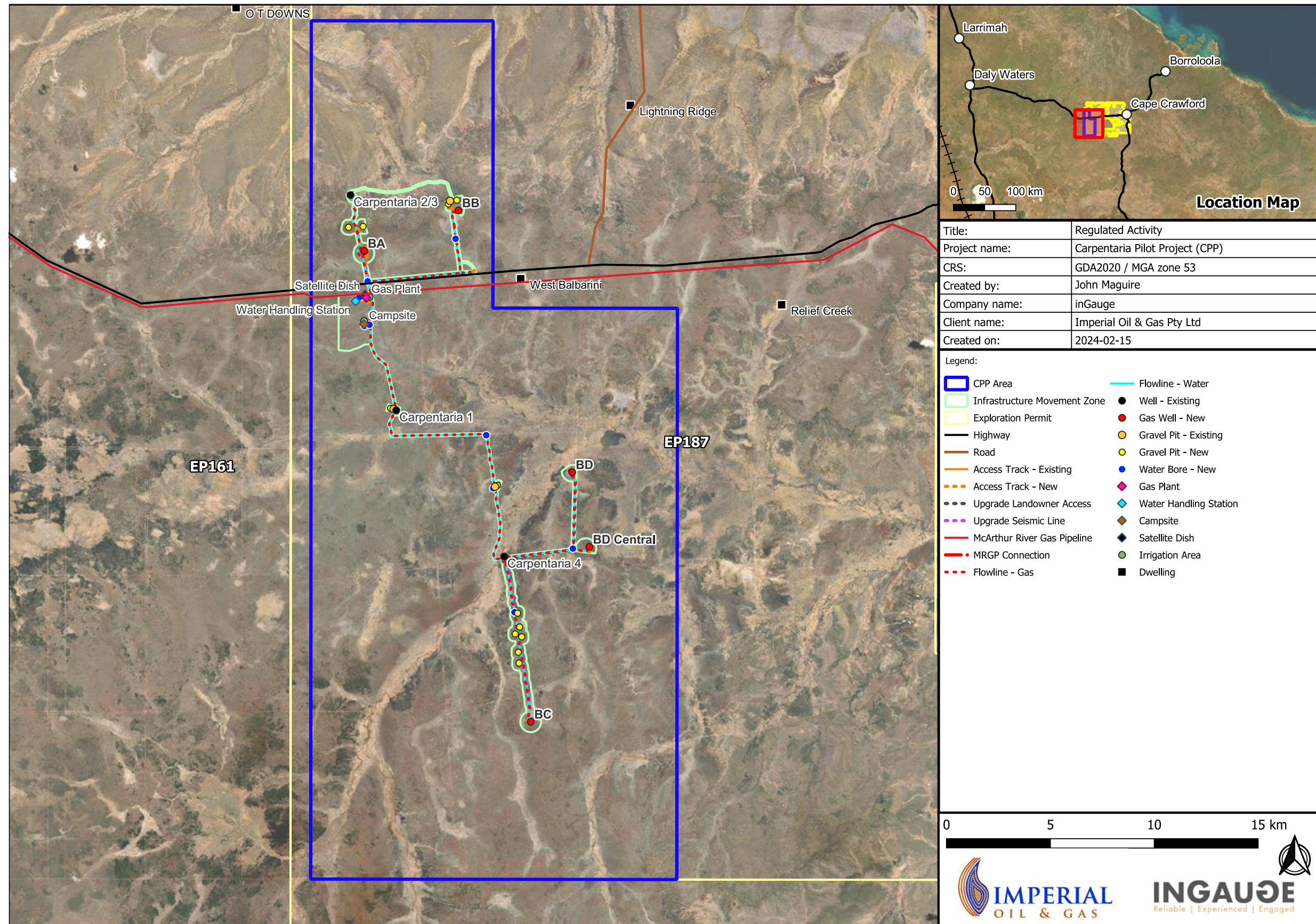


Figure. ii Location and Layout of the Activity (Overview)

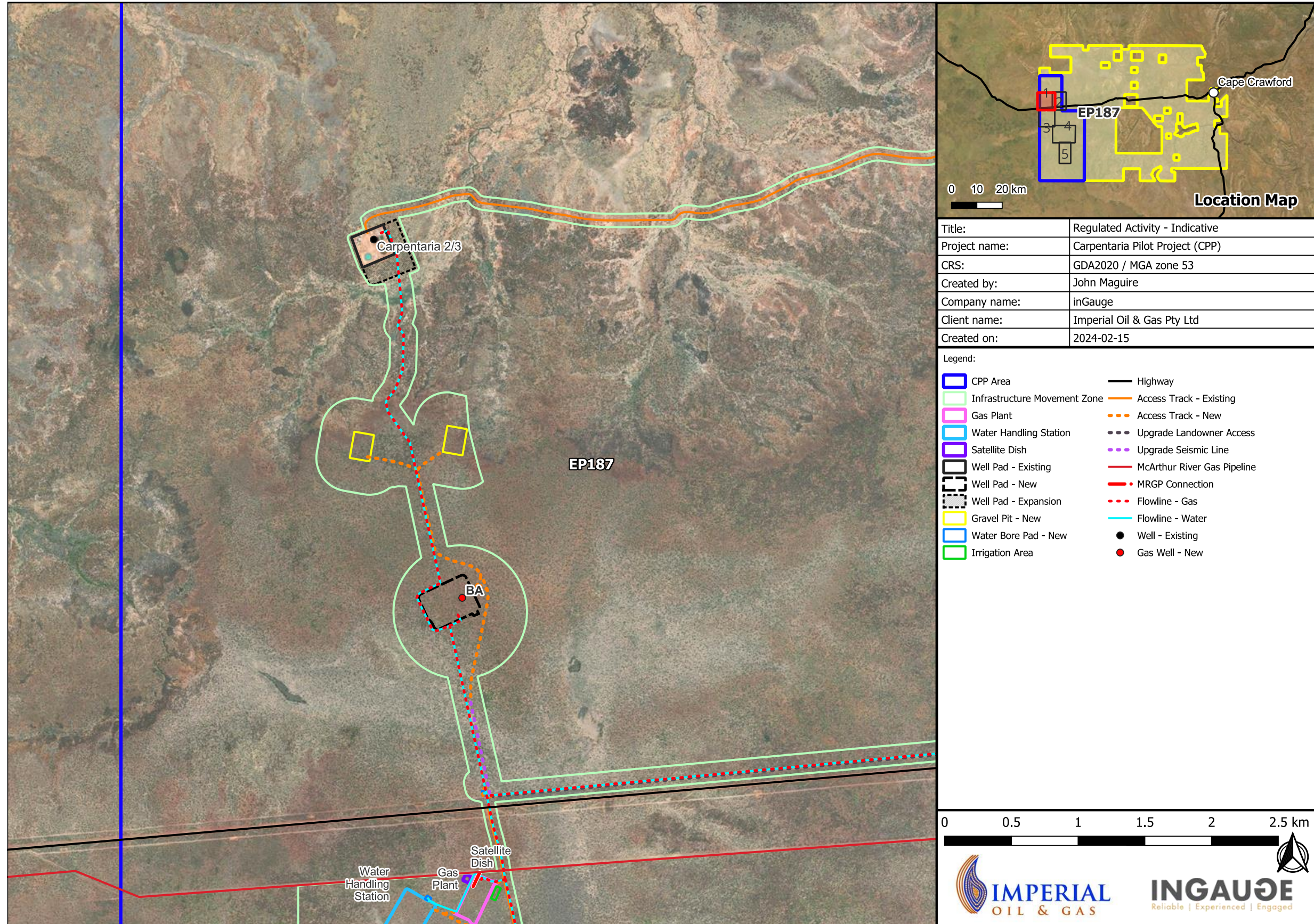


Figure. iii Regulated Activity (Indicative) - Map 1

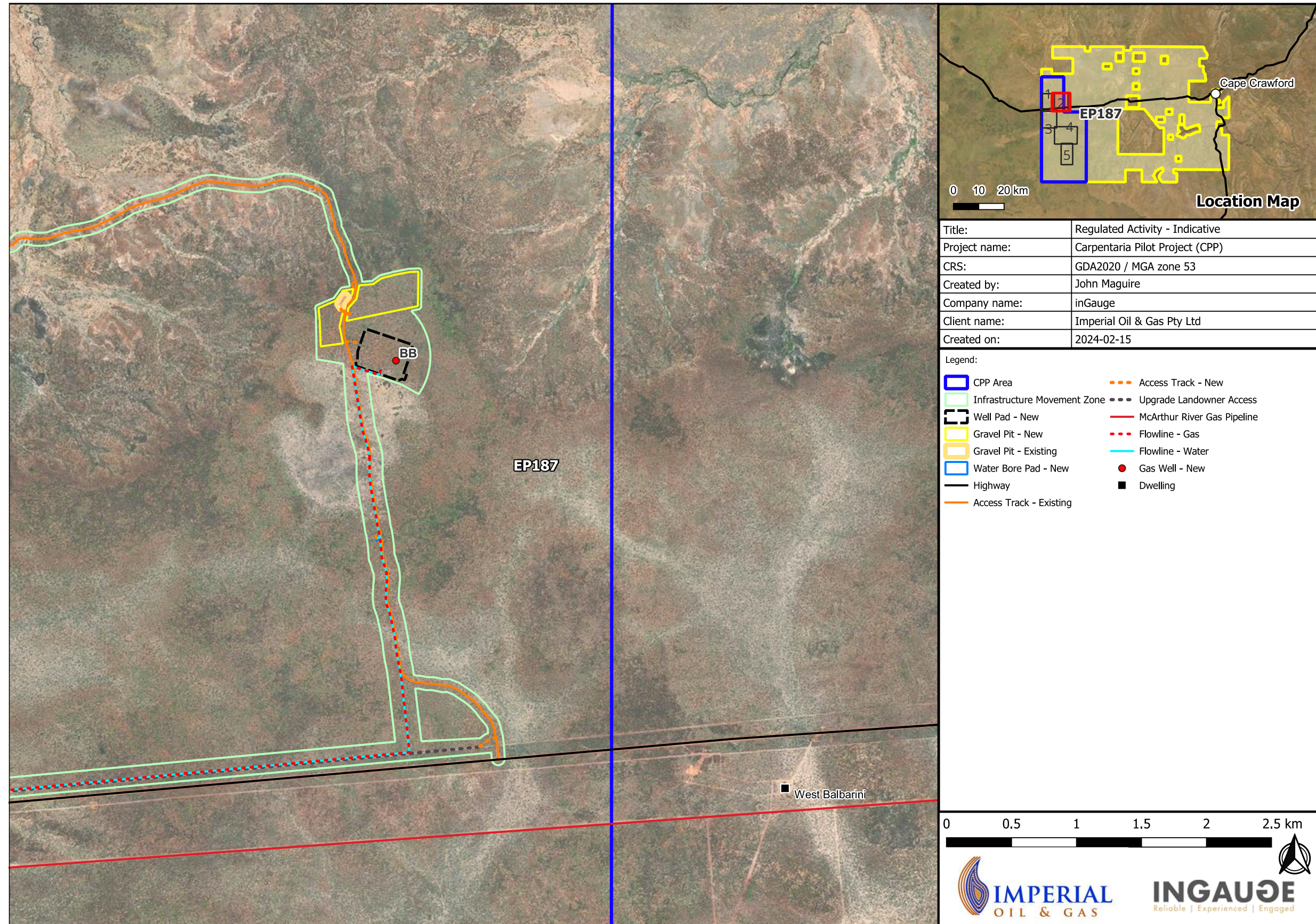


Figure. iv Regulated Activity (Indicative) - Map 2

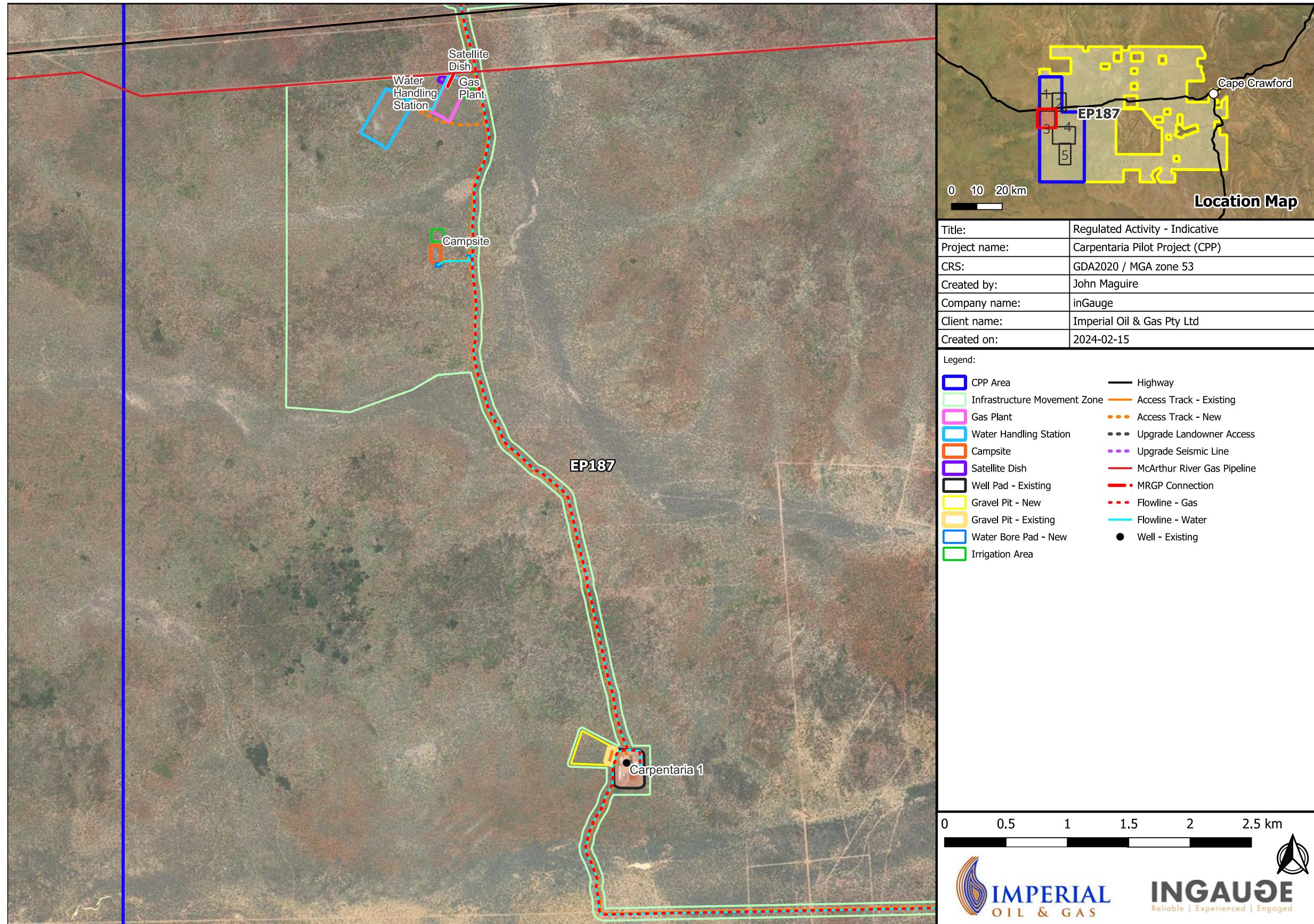


Figure. v Regulated Activity (Indicative) - Map 3

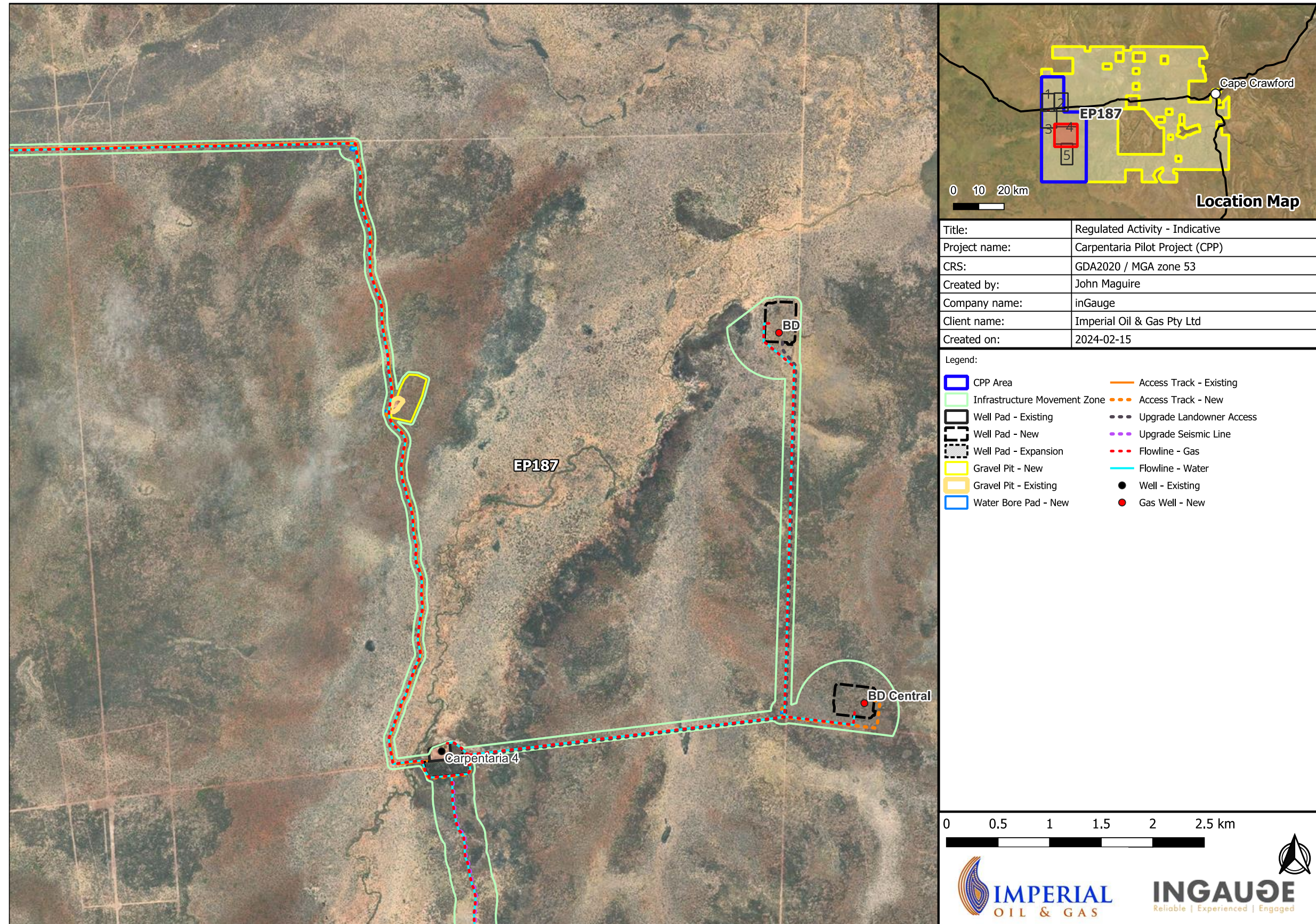


Figure. vi Regulated Activity (Indicative) - Map 4

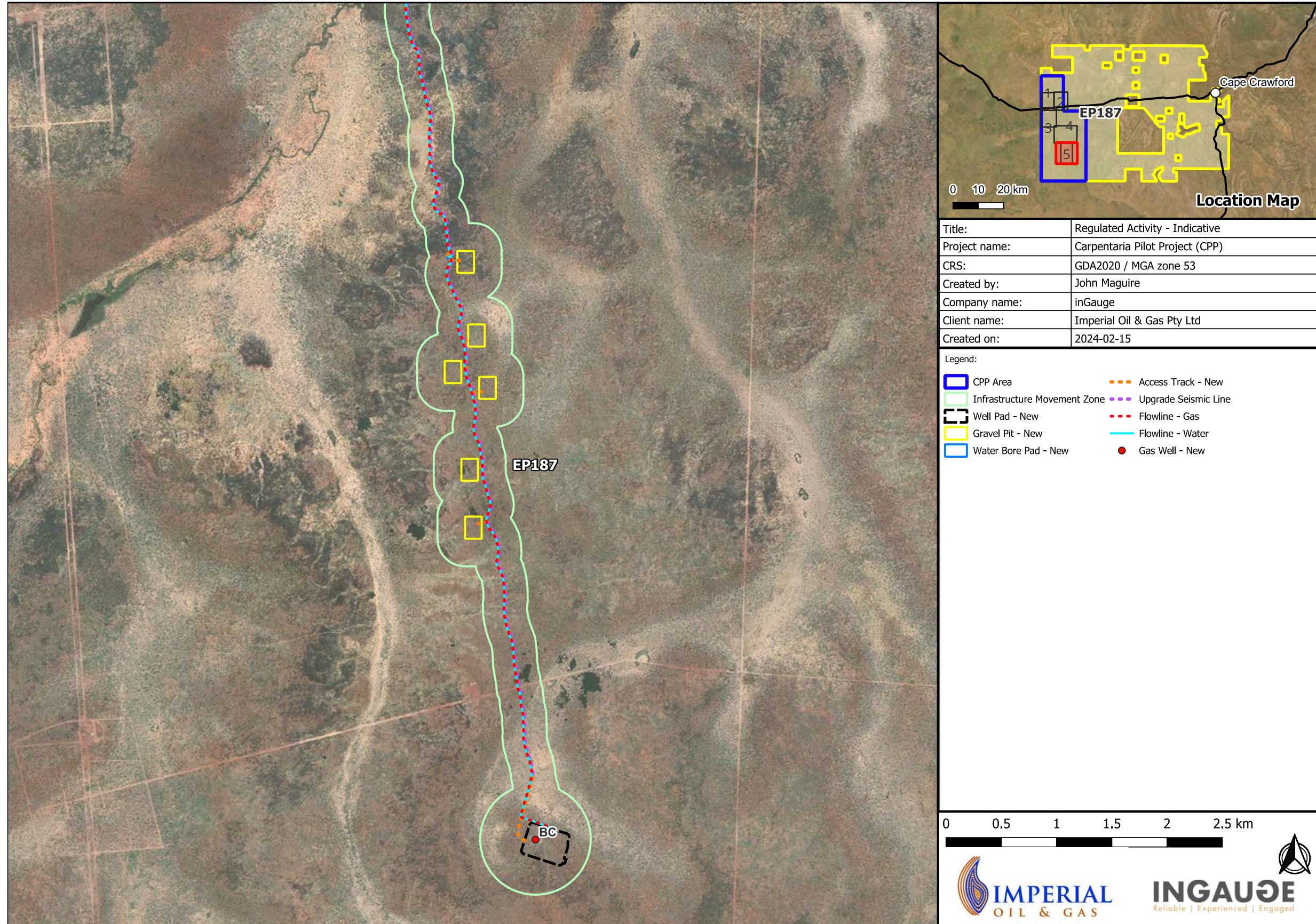


Figure. vii Regulated Activity (Indicative) - Map 5

The CPP Area is in the Australian tropical savannah zone, which occurs at annual rainfall totals greater than 600 mm and extends from the Gulf of Carpentaria in north Queensland, across the northern half of the NT, to the Kimberley region of north-west Western Australia and encompasses the Beetaloo Sub-basin. Australian savannah ecosystems experience one of the most seasonal of the world’s savannah climates.

Approximately 85% of average annual rainfall at the CPP Area occurs between December and March, inclusive. The CPP Area north of the Carpentaria Highway is characterised by open woodland and savannah that is characterised by quartzite outcrops. North of the CPP Area land levels out across black soil plains. The CPP Area south of the Carpentaria Highway has only one significant waterway, Relief Creek.

Summary of Potential Significant Impact

Of the twelve environmental factors identified as potentially being impacted by the proposed Activity (**Section 6**), it is only Atmospheric Processes that are considered to potentially be significantly impacted without exporting appraisal gas (refer **Table. iv**).

However, Imperial will apply to the Minister for Mining and Industry for approval to recover petroleum on an appraisal basis under Section 57AAA of the *Petroleum Act 1984* (NT). If successful, this will allow Imperial to export gas to the McArthur River Gas Pipeline.

Under this scenario, Imperial estimates that its average annual GHG emissions from FY 25 to FY 29, inclusive of those from the Activity, and assuming that gas can be exported rather than flared, is approximately 30,000 tCO₂-e. In no financial year covered by the EMP do the estimated emissions exceed the ‘large greenhouse gas emitters’ Industrial project annual threshold of 100,000 tCO₂.

Table. iv Environmental Factor with Potential Significant Impact

Theme	Environmental Factor	Objective	Potential Significant Impact
Air	Atmospheric Processes	Minimise greenhouse gas emissions to contribute to the NT Government’s goal of achieving net zero greenhouse gas emissions by 2050.	Flaring 25 TJ/day during the appraisal phase would result in approximately 475,000 tCO ₂ -e of Scope 1 emissions annually.

Summary of Environmental Management Measures

This documentation summarises how the proposal has accounted for key principles of environment protection and management (Part 2 of the *EP Act*) including avoidance, minimisation and management measures proposed, and a change climate.

The Activity proposed to be conducted in the CPP Area is a Regulated Activity under the *Petroleum Act*. As such an Environment Management Plan (EMP) has been developed for the Activity, under the *PER* and the *Code of Practice: Onshore Petroleum Activities in the Northern Territory 2019 (the Code)* and is attached to this Referral Document. The EMP is cross-referenced throughout this Referral Document.

The EMP prepared for the Activity includes:

- **Executive Summary**
- **Section 1** – Introduction
- **Section 2** – Legislative Requirements
- **Section 3** – Description of the Activity
- **Section 4** – Description of the Environment
- **Section 5** – Stakeholder Engagement
- **Section 6** – Environmental Risks and Mitigation Measures
- **Section 7** – Environmental Performance Standards & Measurement Criteria
- **Section 8** – Management Plans
- **Section 9** – Implementation Strategy

The EMP's Appendices are as follows:

- **Appendix 01** – Environmental Assessment Report
- **Appendix 02** – Archaeological Survey Report
- **Appendix 03** – Rehabilitation Plan
- **Appendix 04** – Weed Management Plan
- **Appendix 05** – Erosion and Sediment Control Plan
- **Appendix 06** – Waste and Wastewater Management Plan

- **Appendix 07** – Spill Management Plan
- **Appendix 08** – Human Health and Environmental Risk Assessment
- **Appendix 09** – Emergency Response Contingency Plan
- **Appendix 10** – Stakeholder Engagement and Consultation Plan
- **Appendix 11** – Traffic Impact Assessment
- **Appendix 12** – Bushfire Management Plan
- **Appendix 13** – Methane Emissions Management Plan

Analysis of some key environmental and protection management alternatives and measures, to avoid or minimise potential environmental impacts, include but are not limited to:

- Stakeholder Engagement and Consultation and commitment for on-going consultation.
- Site selection of infrastructure informed by field-based ecological and archaeological surveys and desk-top assessments of SREBA vegetation and surface water features, NRM GIS layers, SRTM elevation that has been calibrated in the CPP Area using known benchmarks, such as existing CPP wells AHD Area using known benchmarks, such as existing CPP wells AHD elevations, to develop and interpolated 2 m contour elevation model; predicted flood level, offsets from local infrastructure and existing water bores.
- Use of multi-well pads to minimise the disturbance footprint and resources required to undertake the activity in accordance with ESD principles (*Environment Protection Act 2019 [NT]*).
- Reuse of Hydraulic Flowback water on subsequent wells to reduce groundwater use.
- No Persistent-Bio-accumulative-Toxic (PBT) chemicals potentially harmful to human health to be used in the drilling or hydraulic fracturing works associated with this Activity.
- Groundwater monitoring will be conducted (baseline and ongoing) in compliance with the with *the Code and the Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-Basin [DENR, 2018]*.

The risk assessment in **Section 6** of the EMP demonstrates that Imperial has identified all credible environmental risks associated with the Activity. Imperial is confident that the controls detailed in the risk assessment lower the environmental risks to as low as reasonably practicable (ALARP) and are acceptable.

Residual Significant Impacts

If the Appraisal Phase is not deemed successful, after the conduct of the Activity, the residual environmental impacts will not be significant.

Careful attention in the well pad design and other disturbance areas to the discreet storage of vegetation and topsoil containing high cation exchange capacity (CEC) will enhance native savannah tussock grassland recovery in the rehabilitation of disturbed sites to baseline conditions.

No PBT chemicals of human health concern are proposed for use in the CPP; and overall land clearing, and groundwater extraction will be limited in scope and timeframe in comparison with the provisions for the petroleum industry in the Georgina-Wiso Water Allocation Plan (WAP). The decommissioning of facilities and of petroleum wells is regulated, and Imperial will decommission and rehabilitate the cleared land as per the regulations and Codes in place at the time as reflected in the Rehabilitation Management Plan – **Appendix 03** of the EMP.

Key Conclusions

Conclusions of the EMP referral assessment are as follows:

- The produced CPP gas from previous campaigns has low levels of CO₂ and hydrogen sulphide.
- The Activity is unlikely to have a significant impact on environmental values protected under the *Environment Protection Act 2019 (NT)* if gas produced is recovered on an appraisal basis, rather than flared. This appraisal gas production would be equivalent to approximately 475,000 tCO₂-e/annum, if flared rather than exported to the McArthur River Gas Pipeline.
- Imperial will apply to the Minister for Mining and Industry for approval to recover petroleum on an appraisal basis under Section 57AAA of the *Petroleum Act 1984 (NT)*. If successful, this will allow Imperial to export gas to the McArthur River Gas Pipeline.
- With no flaring of gas, total GHG emissions from the Activity appraisal stage are reduced by more than 90%. Annual average estimated GHG emissions are approximately 30,000 tCO₂-e from FY 2024 through FY 2029 (5-year term of the EMP). In no financial year covered by the EMP do the estimated emissions exceed the 'large greenhouse gas emitters' Industrial Project annual threshold of 100,000 tCO₂-e.
- Imperial will apply for an increased volume of allowable groundwater extraction under GWEL GRF10316 from 85 ML/a up to 750 ML/a. The increased volume is 7.5% of the proposed 10 GL GWEL cap on Beetaloo petroleum production in the Georgina Wiso WAP,

and 0.36% of the WAP ESY of 210 GL/a. In terms of the Georgina Basin, in which the CPP is located, the volume of 750 ML/a is less than 10% of the Georgina petroleum cap of 8 GL/a, and approximately 0.4% of the Georgina ESY of 186 GL/a.

- The Risk Assessment of chemicals to be used in hydraulic fracturing did not identify any PBT chemicals harmful to human health, in terms of documented PBT criteria. In addition, the concentration of CoPC in the HF fluid system is extremely low and potential toxicity effects on local fauna are therefore very low (EMP **Appendix 08** - Human Health and Environment Chemical Risk Assessment).
- Analysis of the HF flowback/water from three previous EP 187 wells indicates compatibility with complete re-use in subsequent HF operations. This reduces the volume of HF flowback fluid disposed offsite. This significantly reduces potential cumulative transport impacts from the Activity, including GHG emissions.
- The key CoPC in HF flowback may be Chlorides, Lithium, Alpha, Phenol, and the Biocide Tributyl Tetradecyl Phosphonium Chloride (TTPC). The ability of these chemicals to cause environmental harm will depend upon their concentration and associated toxicity, and the conditions of the spill event and spill response as outlined in EMP **Appendix 07** Spill Management Plan. The concentration of CoPC in the HF flowback is considered most unlikely to present potential toxicity effects on local fauna (EMP **Appendix 08** Human Health and Environment Chemical Risk Assessment). The HF flowback is also unlikely to be palatable due to elevated salinity, so risks are therefore very low.
- As outlined in HF flowback spill infiltration modelling (EMP **Appendix 07**), predicted soil chloride concentration rapidly attenuates with depth. However, predicted chloride concentration increase in the surface soil may exceed 25 mg/kg at a spill site. The resultant cumulative increase in potential chloride concentrations at a spill site is likely to significantly impact future plant growth without appropriate soil remediation. The proposal to have a central WHS for reuse HF flowback provides a high level of confidence in containment and integrity in managing HF flowback at CPP.
- The use of a buried polyethylene flowlines, constructed in compliance with the *Australian Polyethylene Gathering Network (PEGN) Code* to transfer high volumes of HF flowback between well pads and WHS provides a high level of confidence in containment and integrity in managing HF flowback transfer.
- The site selection process takes into consideration environmental values and includes avoidance of adverse impacts to these values to ALARP; it includes the Activity's principles of Isolation, Containment, Integrity.
- The additional land area to be cleared for the proposed CPP activity is up to approximately 226 ha (including 21 ha of contingency area for access tracks, flowlines, and pipelines) which is approximately 0.05% of the 442,700 ha area of EP 187. The area

of vegetation to be cleared for infrastructure development is considered ALARP and acceptable.

- The area of vegetation to be cleared for infrastructure development is considered ALARP and acceptable.
- The first-year average site labour force is estimated to be 130 personnel; peak site labour force is estimated to be up to about 280 personnel.
- The proposed land disturbance area includes a dedicated campsite south of the Carpentaria Highway and accessed by a private access track. It will not be visible from the highway, other distant light glow visible to any potential night-time highway traffic.
- The present 4-year government program to deliver Carpentaria Highway upgrades [DIPL, 2023] is taking place between chainage 50 km and chainage 109 km east of Stuart Highway 7 days a week between the hours of 6 am to 6 pm. Some night works may be required. Detours and traffic management will be in place at times throughout this program. Construction commenced in early October 2023 and is expected to be completed in late 2024.
- The Activity is an appraisal testing project for production of shale gas in the Beetaloo. There are no existing commercially producing shale gas analogues to draw from in Australia. If the Appraisal Phase is not successful, the residual environmental impacts from the Activity are unlikely to be significant.
- Overall land clearing and groundwater requirements are modest. There are no pits, waste rock or tailing dams to be left behind. Rehabilitation of the well pads, water handling station and other disturbance areas will be facilitated by site selection on deep sandy clay loam tussock grass country in the Sturt Plateau.
- The well pad includes a multi-well pad design, which significantly scales up potential energy production intensity at a well pad, and:
 - Maximises petroleum production so that the optimum value of the resource is returned to the NT (*Petroleum Act 1984 [NT]*).
 - Minimises the disturbance footprint and resources required to undertake the Activity in accordance with ESD principles (*Environment Protection Act 2019 [NT]*).
- Careful attention in the well pad design and other disturbance areas to the discreet storage of vegetation and topsoil containing high cation exchange capacity (CEC) will significantly enhance native savannah tussock grassland recovery in the rehabilitation of disturbed sites to baseline conditions.

- The EMP specifies arrangements for recording, monitoring, and reporting information in a manner that will enable the Minister for Environment, Parks and Water Security to determine whether the environmental outcomes and environmental performance standards in the EMP are being met.
- Stakeholder engagement has been ongoing since EP 187 exploration recommenced in 2019 and will continue throughout the life of the Activity.
- A Stakeholder Engagement and Consultation Plan for the CPP Activity is contained in the EMP **Section 5** – Stakeholder Engagement. The outcomes of the stakeholder engagement for the proposed Activity undertaken to date, including a Stakeholder Engagement Report and a Communications Log, are contained in the EMP **Appendix 10** (Stakeholder Engagement Report).

1 Introduction

The proponent, Imperial Oil & Gas Pty Limited (Imperial), is a wholly-owned subsidiary of Empire Energy Group Limited. Imperial holds a 100% working interest in Exploration Permit (EP) 187. Further proponent details are included in the Referral Form that accompanied this document.

Imperial is proposing to undertake an appraisal program on EP 187 comprising up to 10 unconventional petroleum wells (Carpentaria Pilot Project (CPP)). The location of the CPP Area in relation to EP 187 is shown in **Figure. i**.

The Velkerri shale formation within the Amungee Member of the Beetaloo Basin has been proven to contain large volumes of hydrocarbons. Imperial has proven that these hydrocarbon accumulations extend into the southwestern portion of EP 187 on the Eastern margin of the Basin.

2 Previous Campaigns

Imperial has undertaken significant exploration on EP 187 since 2019, which includes:

- 388 km of 2D seismic data acquisition.
- Carpentaria 1 – Vertical well drilled, hydraulically fractured and EPT.
- Carpentaria 2H – Horizontal well drilled, hydraulically fractured, and EPT.
- Carpentaria 3H – Horizontal well drilled, hydraulically fractured, and EPT.
- Carpentaria 4V – Vertical well drilled and suspended.

3 Location of the Project

The CPP Area is situated on the southwest flank of EP 187 (**Figure. i**) in the Sturt Plateau bioregion at the crest of the Favenc Range (refer **Figure 6.2—1**), with a peak elevation of approximately 270 m AHD. The Activity will occur in the CCP Area, which is within the coordinates listed in **Table. iii**, and shown in **Figure. i**.

The layout of the Activity is shown in **Figure. ii - Figure. vii**.

4 The Activity

The Activity will allow Imperial to enter the Appraisal Phase in EP 187. Imperial proposes to export gas produced in the Appraisal Phase to the McArthur River Gas Pipeline that transects the CPP Area commencing in 2025.

The Activity proposed to be conducted in the CCP Area is a Regulated Activity as defined by the *Petroleum (Environment) Regulations 2016 (NT) (PER)* and includes the associated works:

- Land clearing to establish up to four new well pads out of five locations being considered as well as the potential expansion of the existing well pads at Carpentaria 2/3 and 4.
- Clearing for new access tracks, and the expansion of existing landowner tracks.
- Clearing for gas and water/wastewater flowlines and a connection to the McArthur River Gas Pipeline (MRGP).
- Clearing for up to nine new gravel pits plus the expansion of three existing gravel pits at Carpentaria 1, 2/3 and 4.
- Clearing to establish a gas plant, water handling station, campsite, ground water extraction and control monitoring bores, and a communications satellite dish.
- Earthworks associated with excavating drilling sumps, turkey's nests, trenching for gas, and water flowline and MRGP connection.
- Construction of new groundwater extraction bores, above ground tanks, the Carpentaria Gas Plant (CGP) (inc. office warehouse, workshop), Water Handling Station (WHS), gas and water/wastewater flowlines.
- Drilling hydraulic fracturing completion and workover of up to 10 new wells (including the re-entry of the existing well at Carpentaria 4), and the tie in and testing of up to 10 new wells plus the existing wells at Carpentaria 2/3).
- Operation and Maintenance of up to 12 (up to 10 new and 2 existing) gas wells, new and existing well pads, laydown yard and helipad location at Carpentaria 1, groundwater extraction bores, above ground tanks, the Carpentaria Gas Plant (CGP), Water Handling Station (WHS), gas and water/wastewater flowlines and camps (including irrigation of treated sewage effluent and grey water).
- The storage and transportation of petroleum from up to 12 gas wells through flowlines and gas plant to the MRGP.
- The storage, transfer, reuse, use, and disposal of wastewater or hazardous substances via flowline and heavy vehicle.

- The recovery of petroleum on an appraisal basis.
- Suspension or abandonment of the wells and decommissioning, of facilities.

5 Key Activity Components

5.1 Summary of Key Activity Components

A summary of the key components of the Activity is provided in **Table 5.1—1**.

Table 5.1—1 Key Components Table

Aspect	Component	Size/Capacity
Carpentaria Gas Project	New disturbed area proposed	Up to ~226 ha (including 21 ha contingency).
	Number of well pads	Up to 4 new from 5 investigated sites, and 2 existing.
	Life of each well pad	Up to 50 years
	Workforce (FTE)	<ul style="list-style-type: none"> • Year 1 average: 130 • Peak: ≤ 280 • Operational: ≤ 10
	Closure period	2 years + monitoring
Petroleum	Petroleum appraisal	~ 25 TJ/day
	Number of wells	Up to 10 new wells (including a re-entry) plus 2 existing
	Tons of proppant = sand	~ 14,000 tonnes per well
	Gas gathering network	up to 60 km
Water Management	Ground water requirement for drilling, HF, and dust suppression	~ 950 ML
	HF Flowback / water flowlines	up to 60 km
	Grey water – domestic	~ 3 ML/year

Aspect	Component	Size/Capacity	
Solid Waste	Drilling waste – inert landfill	~1,500 m ³ / well	
	Domestic waste	~ 100 m ³ / year	
Gravel Quantities	Access tracks + hardstand	~ 100,000 m ³	
Potential Land Disturbance Required for the Activity	Area	Quantity (Up to)	Disturbance (Up to) (ha)
	New Well Pads	4	45.6
	Expansion of Existing Well Pads	2	16.5
	New Access Tracks (8 m width)	16.2 km	13.0
	Upgraded Landholder Access Tracks (Currently 4 m wide to be widened by 4 m)	11.9 km	4.75
	Contingency Access Tracks (8 m width)	8.1 km	6.5
	New Gravel Pits	9	37.3
	Expansion of Existing Gravel Pits	3	20.3
	Water Bore Pads	9	1.1
	Gas and Water / Wastewater Flowlines (Co-located with access tracks 8 m width otherwise 16 m width)	53 km	49
	Contingency Gas and Water / Wastewater Flowlines (16 m width)	7 km	11
	MRGM Connection (16 m width)	120 m	0.2
	Contingency MRGM Connection (16 m width)	18.8 km	3

Aspect	Component	Size/Capacity	
	Gas Plant	1	5.7
	Water Handling Station	1	10.6
	Campsite	1	1.2
	Pipeline Communications Satellite Dish	1	0.25
	Estimated Total New	205 ha	
	Estimated Total Contingency	21 ha	
	Max Disturbance Estimate	226 ha	

An overview of the key aspects of the Activity are provided below. These aspects are:

- Workforce and activity schedule
- Well pads
- Carpentaria Gas Plant
- Water Handling Station
- Water and gas flowlines
- Access Tracks

5.2 Workforce and Activity Schedule

The estimated Activity annual workforce requirements for field development and operations are shown in **Figure 5.2—1**; the workforce design conservatively reflects the seasonal constraints of the main construction operations in this Appraisal Phase.

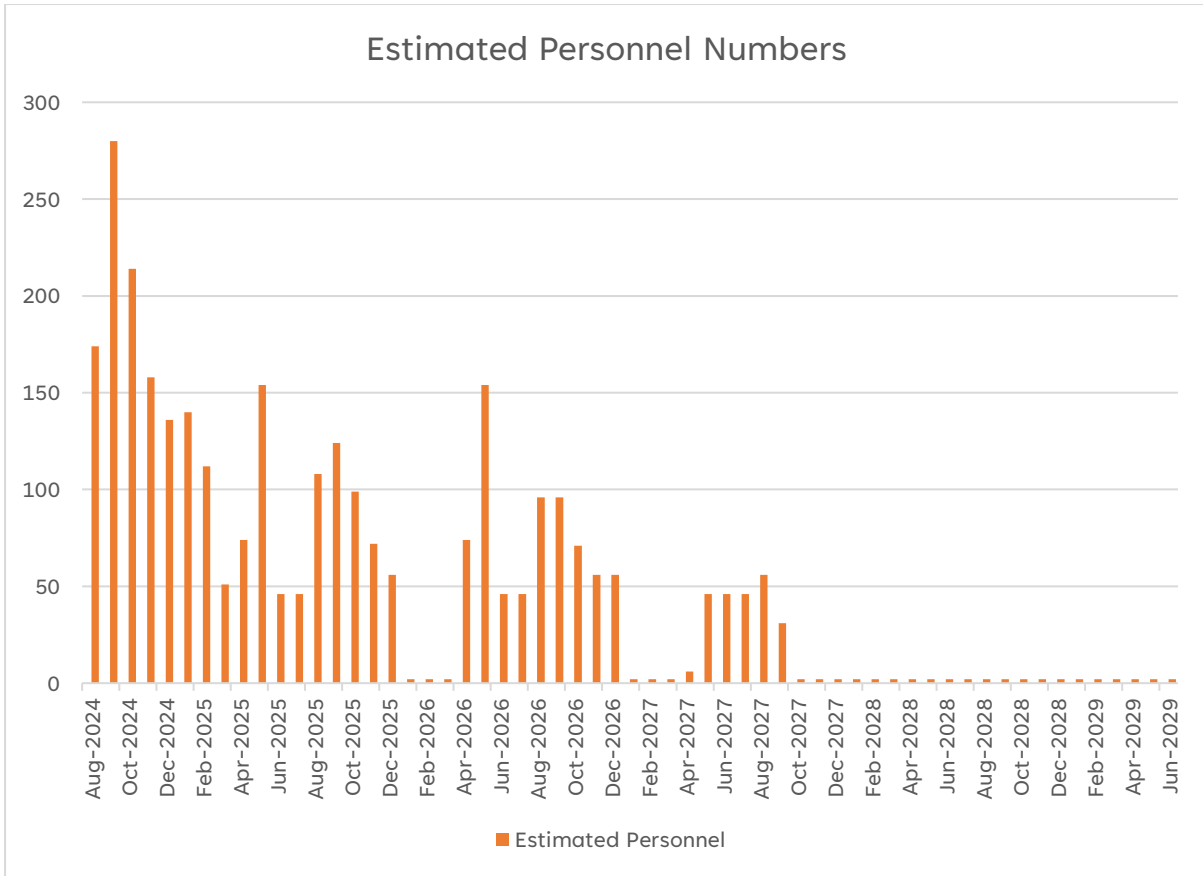


Figure 5.2—1 Estimated Monthly Activity Workforce, 2025

An indicative timetable for the proposed Activity through to the end of the end of the EMP five-year term, the indicative schedule is outlined in **Figure 5.2—2**. Imperial proposes to commence Appraisal Phase gas exports to the McArthur River Gas Pipeline in 2025. Appraisal operations will occur 24 hours a day, 365 days per year, including the wetter months of the year (November to March). However, it is noted that the indicative timetable may be affected by weather conditions. On average, there are 195 days with no rain each year in the CPP Area. However, rainfall in this arid period is also highly variable.

Weather conditions will be monitored daily during the local wet season to allow risks to operational needs to be addressed. An analysis of rainfall is provided in **Section 6.6** of this **Referral**, in the EMP **Section 4** (Description of the Environment) and in the EMP **Appendix 06** (Waste and Wastewater Management Plan).

5.3 Well Pads and Other Infrastructure - Site Selection and Construction

The key principle of isolation, containment, integrity, and monitoring in both environmental and engineering controls is a key consideration in site selection and design.

The well pad sites were conceptually assessed using Source-Pathway-Receptor analysis, as described further in EMP **Section 6.1**. This integrated approach was also used for other main Activity elements, including the WHS and CGP. An indicative well pad layout is provided in **Figure 5.3—1**.

The multi-well pad design significantly scales up potential energy production at a well pad, and:

- Incorporates multiple up to 5 km but typically 3 km long horizontal wells, aligned in the target shale, approximately 1.6 km below ground level, as shown diagrammatically in **Figure 5.3—2**. It is noted that a maximum of 4 well heads per pad is proposed for this Activity.
- Maximises petroleum production so that the optimum value of the resource is returned to the Northern Territory (*Petroleum Act 1984 [NT]*).
- Minimises the Activity disturbance footprint and required resources, in accordance with ESD principles (*Environment Protection Act 2019 [NT]*).

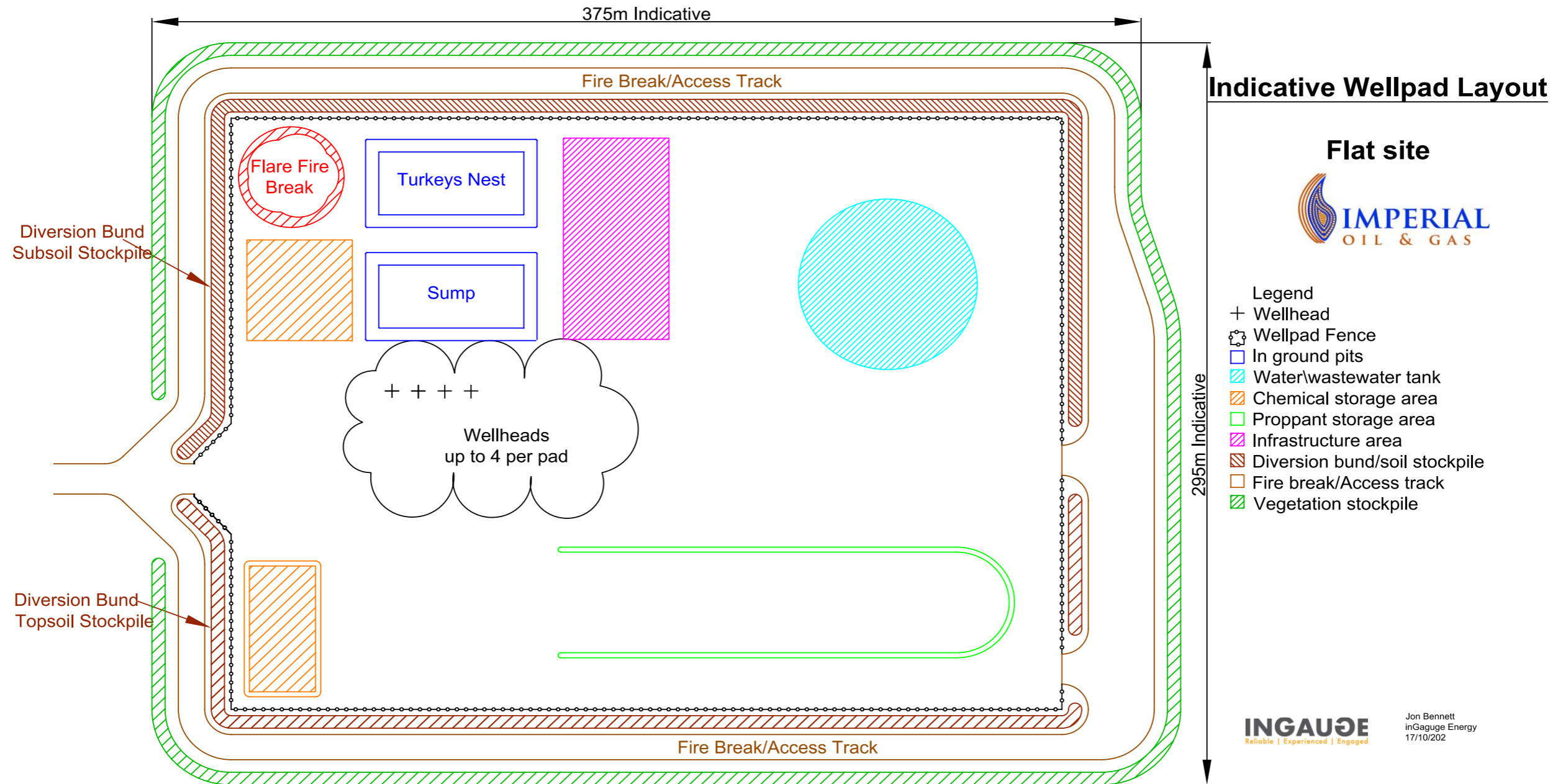


Figure 5.3—1 Indicative Well Pad Layout

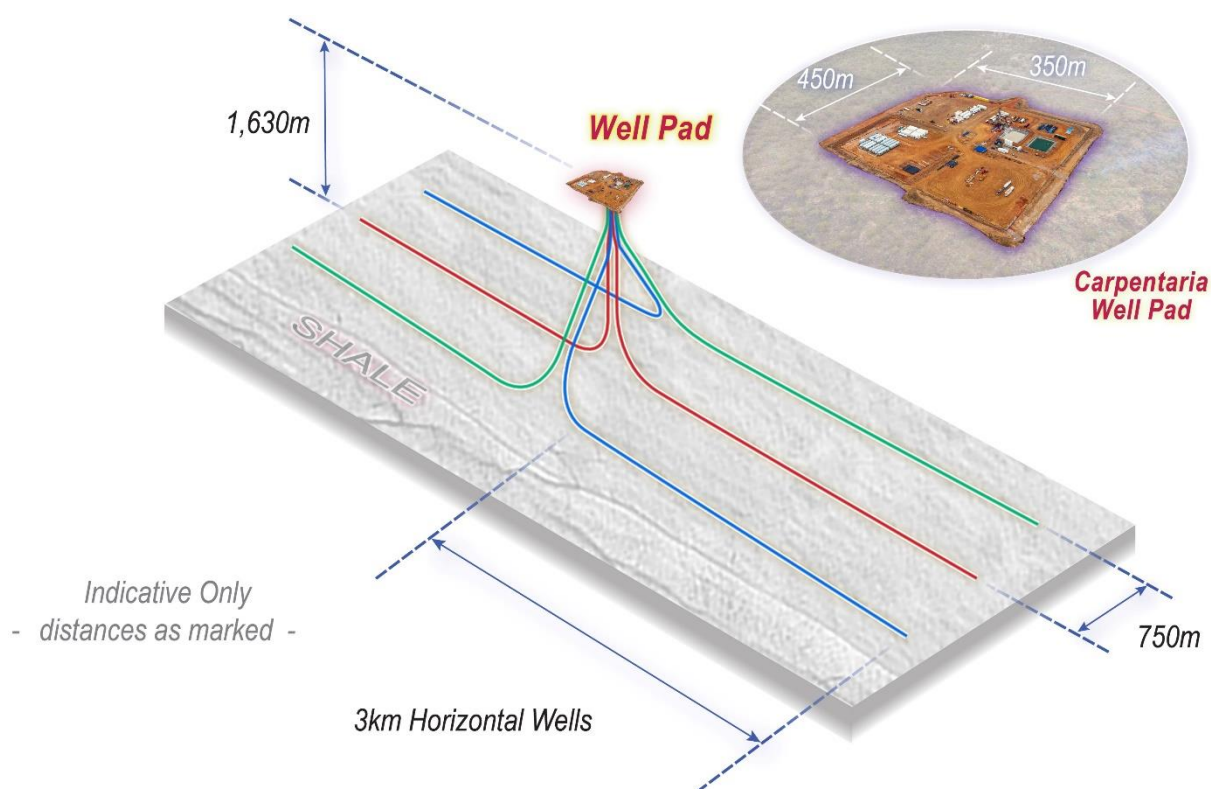


Figure 5.3—2 Indicative Schematic View of Multiple Horizontal Wells from a Single CPP Well Pad

A field assessment of the final proposed locations for well pad ground-disturbance has been completed (EMP **Appendix 01** - Ecological Assessment) to ensure:

- Avoidance of riparian zones and the relevant riparian buffers for drainage depressions and Stream Orders 1 to 3.
- The locations of hollow-bearing trees and buffers are avoided.
- There are no active Grey Falcon nesting sites within 300 m of the proposed well pads and other disturbance areas.

The design of well pad locations (EMP **Section 3.3**) and site selection criteria (EMP **Section 4** Description of the Environment) reinforce the principles of operational isolation, containment, integrity, and monitoring.

Environmental risks associated with well pad site selection and construction will be controlled as follows:

- The well design incorporates separate stockpiling locations for vegetation and critical topsoil horizon for subsequent site rehabilitation.

- A fire break / access track encircles a bunded well pad with a site access track design that incorporates a ring road. This ring road is a physical site boundary and firebreak.
- The well pad is fenced.
- Boundary bunding provides site isolation and containment, and erosion and sediment control.
- Well pads located preferentially above predicted potential 1-in-100-year flood zones.
- Sub-soil stripped from well pad areas to be windrowed above the cut batter and fire break upslope, including bunding on fill areas, as required to prevent erosion.
- Diversion berms and mitigation measures on the upslope side of the pad to divert or dissipate runoff prior to it entering the pad (**Figure 5.3—3**). Lined sumps to prevent seepage to ground from storage of drilling by-products.
- Bunded sumps to prevent surface water from inundating the sumps.
- Bunded and compacted tank pads to prevent surface water flow from undermining above-ground tanks.



Figure 5.3—3 Topsoil Windrow Used to Divert Clean Water Away from the Well Pad

5.4 Carpentaria Gas Plant (CGP)

A gas compressor station will be installed and operated as part of the Activity. The CGP will take gas from the low-pressure gathering network, condition it and increase the pressure for export to the MRGP. Except for maintenance down times, the CGP is anticipated to run 24 hours/day, seven days/week.

The CGP will include an associated Communications Satellite Dish.

5.5 Water Handling Station (WHS)

A centralised WHS will be required for the Activity. The WHS will be the primary storage for flowback for potential treatment and/or reuse for hydraulic stimulation of subsequent wells.

5.6 Water and Gas Flowlines

Imperial will install wastewater and gas gathering networks utilising low-pressure (less than 1,670 kPa Maximum Allowable Operating Pressure [MAOP]) High Density Polyethylene (HDPE) flowlines. These will be designed to transfer large volumes of water/wastewater safely and efficiently between well pads and the WHS and to gather gas for transfer to the CGP.

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5.7 Access Tracks

All new access tracks for the Activity will be approximately 8 m wide and will be located within a 20 m movement zone to account for any deviations around sensitive environmental features and to account for any vehicle turnarounds and stormwater turn-outs, as well as erosion and sediment control measures and the stockpile of cleared vegetation. Vegetation will be cleared from new access tracks and stockpiled, or mulched for rehabilitation.

6 Environmental Factors

6.1 Key Environmental Factors and Objectives

The existing environment has been considered against the EPA environmental factors and objectives listed in **Table 6.1—1** and discussed in detail below under the NT EPA Themes of Land, Water, Air, and People [NT EPA, 2022b].

Table 6.1—1 Key CPP Environmental Factors and Objectives

Theme	Environmental Factor	Objective
Land	Landform	Conserve the variety and integrity of distinctive physical landforms.
	Terrestrial Environmental Quality	Protect the quality and integrity of land and soils so that environmental values are supported and maintained.
	Terrestrial Ecosystems	Protect terrestrial habitats to maintain environmental values, including biodiversity, ecological integrity, and ecological functioning.
Water	Hydrological Processes	Protect the hydrological regimes of groundwater and surface water so that environmental values, including ecological health, land use and the welfare and amenity of people, are maintained.
	Inland Water Quality	Protect the quality of groundwater and surface water so that environmental values, including ecological health, land use and the welfare and amenity of people, are maintained.
	Aquatic Ecosystems	Protect aquatic habitats to maintain environmental values, including biodiversity, ecological integrity, and ecological functioning.
Air	Air Quality	Protect air quality and minimise emissions and their impact so that environmental values are maintained.
	Atmospheric Processes	Minimise greenhouse gas emissions to contribute to the NT Government’s goal of achieving net zero greenhouse gas emissions by 2050.

Theme	Environmental Factor	Objective
People	Community and Economy	Enhance communities and the economy for the welfare, amenity, and benefit of current and future generations of Territorians.
	Culture and Heritage	Protect sacred sites, culture, and heritage.
	Human Health	Protect the health of the NT population.

These themes are discussed below.

6.2 Land

6.2.1 Landforms

The CPP Area is situated on the southwest flank of EP 187 in the Sturt Plateau and Gulf Fall and Uplands bioregions and on the divide between the Limmen Bight River and McArthur River catchments. The Carpentaria Highway and McArthur River Gas Pipeline bisect the CPP Area from east to west and are generally aligned, following topographic high points in the local landscape at approximately 250 m AHD (**Figure 6.2—1**).

The CPP Area is located on the eastern boundary of the Sturt Plateau bioregion (**Figure 6.2—2**). The bioregion covers an area of approximately 98,500 km². The Sturt Plateau bioregion mostly comprises deeply weathered, gently undulating plains on laterised Cretaceous sandstones; this includes the CPP Area [DEPWS, 2022b].

To the north and east in the CPP Area, the Gulf Fall and Uplands bioregion is present. It covers an area of 112,500 km². The landscape of the Gulf Fall and Uplands bioregion, in contrast to the Sturt Plateau, includes gorges, water holes and dissected sandstone plateaus, undulating terrain with scattered low, steep hills on skeletal soils and shallow sands [DEPWS, 2022b].

The CPP Area is located mostly on lateritic plains and rises. This area is characterised by high erosional stability on gently undulating plains, comprising of deep red clay loams, earthy sands, and brown clays.

At the northern end of the CPP Area, the Bukalara land system is characterised by rugged rocky plateaus with rock outcrops and skeletal sandy soils that are composed of the Early Cambrian Bukalara Sandstone, overlying folded Proterozoic material.

6.2.2 Topography

The CPP Area is mostly deeply weathered, gently undulating plains on laterised Cretaceous sandstones. Within the CPP Area, elevations vary from approximately 220 m to 265 m AHD. The CPP Area's 1-in-100-year flood line in this segment of the Relief Creek sub-catchment is predicted to be approximately 226 m AHD.

The topographic crest feature, the Favenc Range, is on the northern side of the Carpentaria Highway. In this portion of the CPP Area, the land is fine-grained sedimentary plains and rises. In contrast, the south of the Highway is as coarse-grained sedimentary hills and ranges.

The low relief terrain of the Sturt Plateau may result in varying scale topographic depressions. These depressions may become ephemeral "soaks". From an Activity operational perspective, these areas are to be avoided.

6.2.3 Terrestrial Environmental Quality

Average rainfall in the CPP region at Daly Waters to the west is 650 ± 430 mm; and at McArthur River Mine to the east the average rainfall is $880 \text{ mm} \pm 670$ mm. The corresponding annual average evaporation is 2,650 mm and 2,600 mm, respectively.

The CPP Area is dominated by a savannah tree-grass system with a tussock grass understorey [DEPWS, 2022a]. This vegetation is characterised by large, perennial tussock grasses, broad-leaved and lilioid herbs in the inter tussock spaces and sparse presence of woody plants. In localised areas of higher soil moisture, such as ephemeral topographic depressions, which are common in the region, forbs may dominate over tussock grasses.

The dominant vegetation communities are open woodland dry sclerophyll forests of *Eucalyptus miniata* (Darwin Woollybutt), *E. tetradonta* (Darwin Stringybark) and *E. bleeseri* (Smooth stemmed Bloodwood) with an understorey of tussock grasses. Monoculture stands of *E. pruinosa* (Silverleaf Box) occur extensively south of the Carpentaria Highway on floodplains.

Savannah tussock grasses are considered resilient perennial vegetation that is generally easy to rehabilitate in deep loam clay sand and Red Kandosol soil, provided erosion is managed; they also have seasonally synchronous seed production. This hardiness is evidenced by the Sturt Plateau savannah's recovery after drought, fire, and overgrazing effects.

Soil mapping in the environs of the CPP Area broadly reflect topographic and ground elevation features, as evident in **Figure 6.2—3**. The CPP Area comprises soils that are predominantly neutral sandy clay red and yellow earths dominated by deep Red Kandosols, which support the vast savannah grassland of much of the Sturt Plateau [DEPWS, 2022a].

The proposed CPP site layout demonstrates preference selection of Kandosol soil types and avoidance of vertosol ("black soil") soil areas for well pads and other disturbance areas.

The soils in the CPP Area result from prolonged, intense, deep weathering of parent rock material high in iron and/or aluminium oxides and kaolin clays, giving them their characteristic profile and red kandosol colour. Subsoil horizons are generally weak to non-structured reddish clay loams and medium clays.

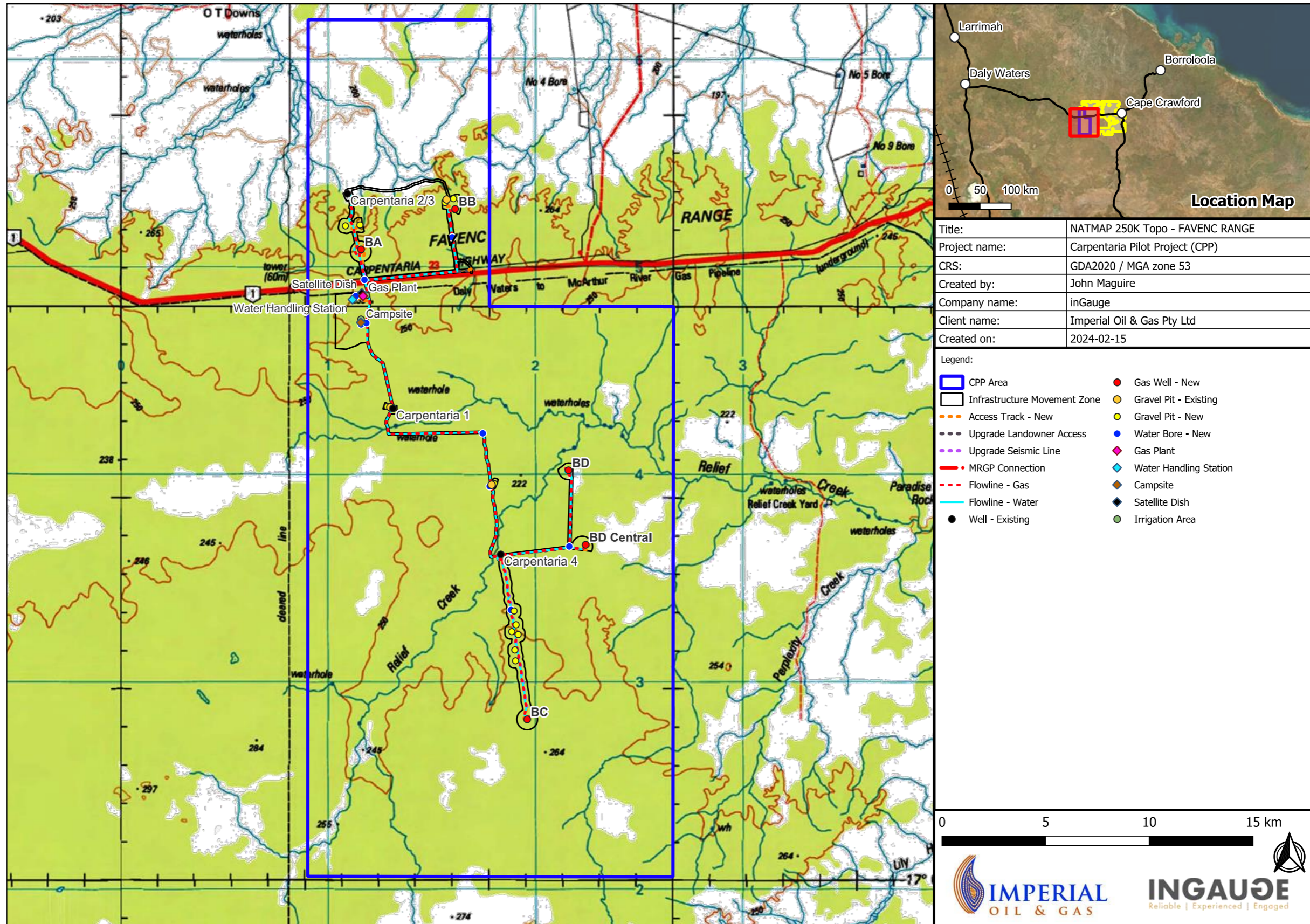


Figure 6.2—1 Sturt Plateau, Gulf Falls and Uplands Bioregions – Favenc Range Catchment Divide

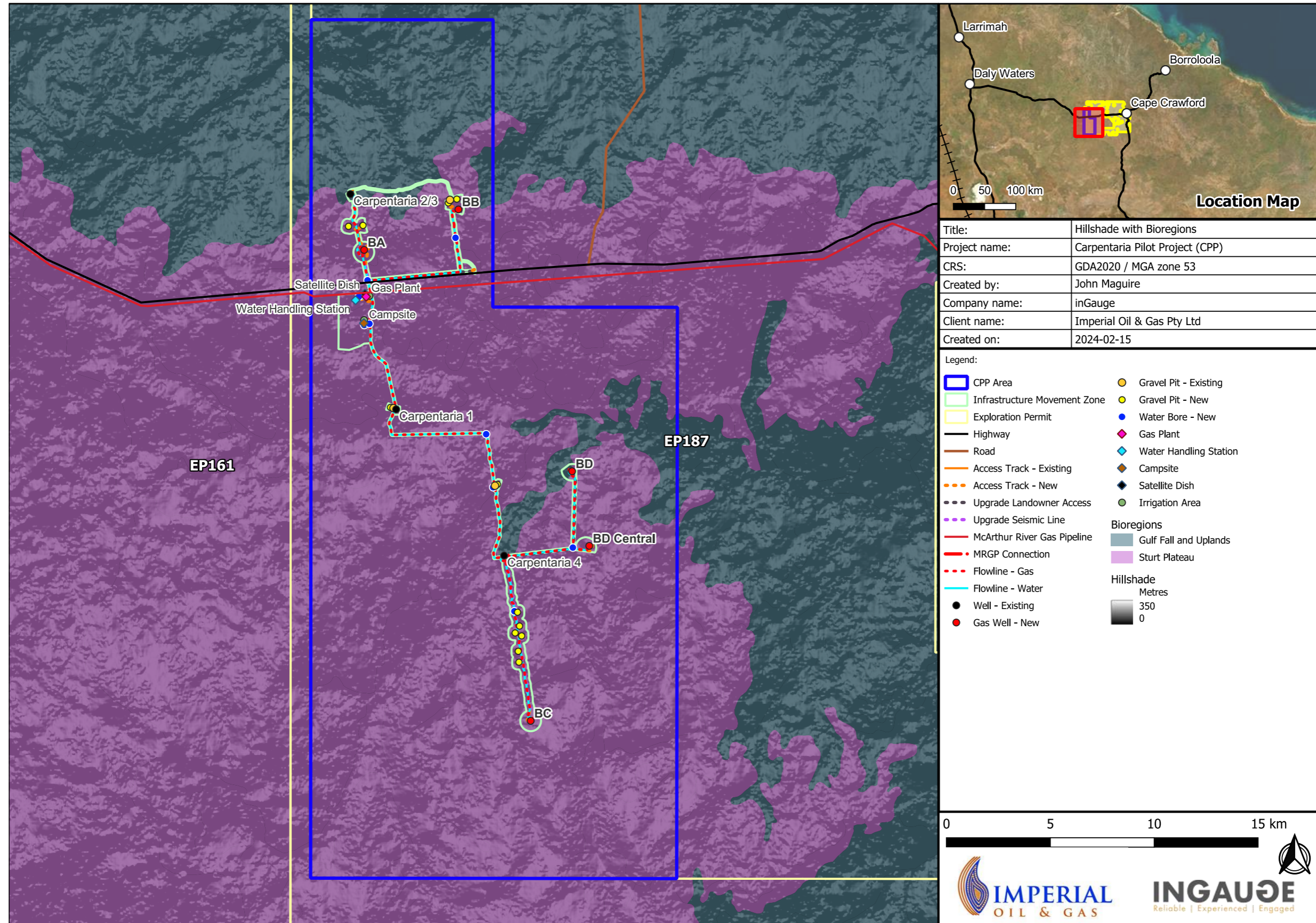


Figure 6.2—2 Sturt Plateau Bioregion and Gulf Falls and Upland Bioregion Convergence

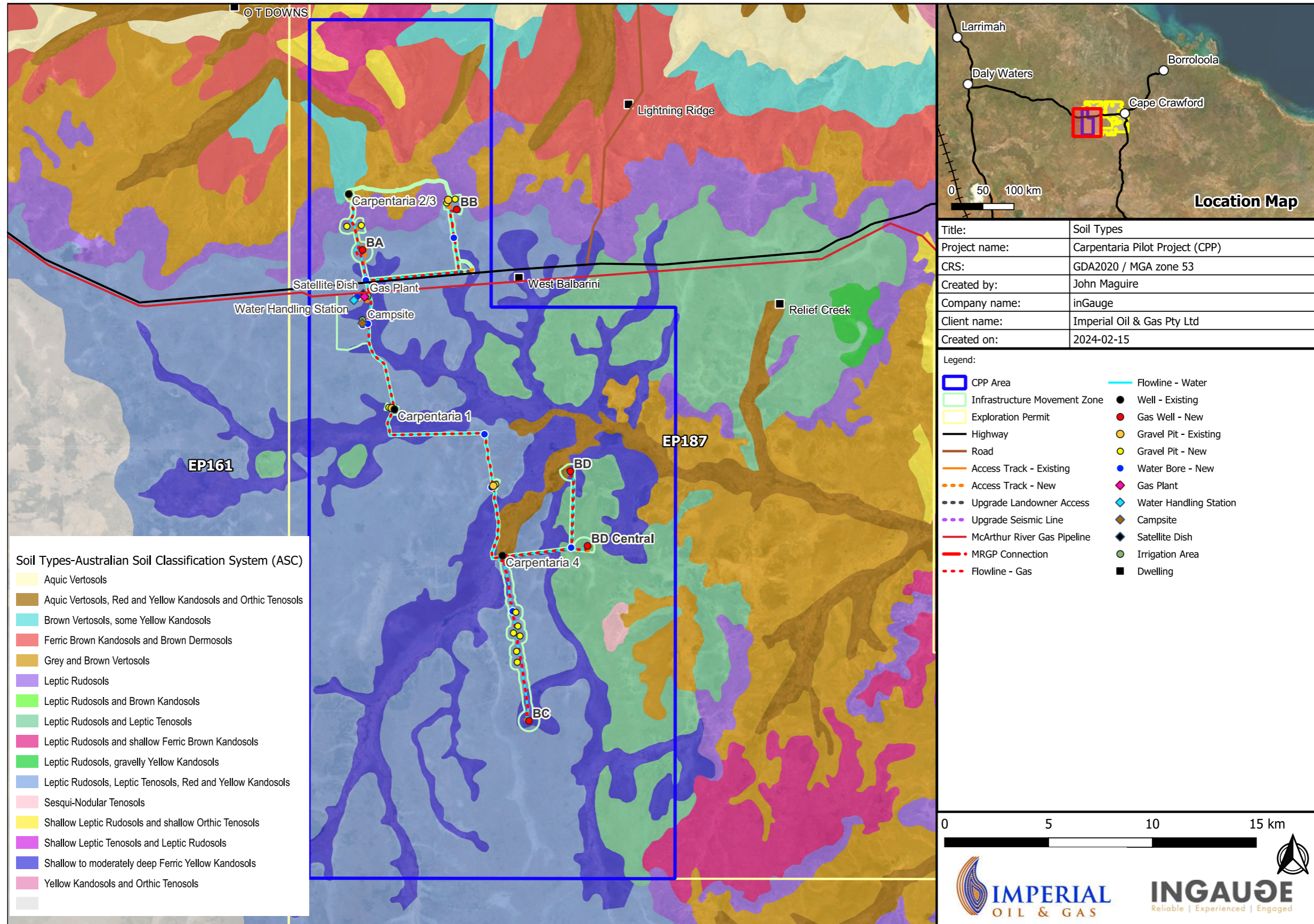


Figure 6.2—3 Soil Types in CPP Area

Kandosols characteristically have rapid liquid infiltration due to the surface soil having a relatively high sand content and, therefore, larger pore spaces [C Richards et al., 2023] compared with “cracking” clays. Kandosol soils in slope areas are subject to erosion without controls; they are not prone to salinisation. Soils around the well pads are weakly acidic with an average pH = 6.5 ± 0.2 at 30 cm and pH = 6.7 ± 0.4 at 90 cm depth. This soil is nominally classified as sandy-clay with a relatively high clay content of > 30%.

The more problematic Vertosol soil groups, in terms of petroleum field layout and well pad selection, are characterised by deep “cracking” clays, commonly referred to locally as “black soil country”. These appear to be confined to the north of CPP Area, at the hinterland of the Favenc Range, at ground elevations below 200m AHD. These soil areas have been avoided in the site selection process.

The upper drainage line reaches of the sub-catchment of Relief Creek on the eastern side of CPP Area are evident in the soil mapping for this feature as ferric yellow Kandosols, that form surface erosional features, from channel incision, in the formation of the 1st and 2nd order stream network in the CPP Area. A range of controls and buffers in the vicinity of this feature are described in **EMP Appendix 05** (Erosion and Sediment Control Plan) of the EMP, in the site selection process.

Leptic Rudosols occur at the crest of the Favenc Range, at elevations > 250 m AHD, in the north of CPP. These have mostly shallow profiles overlying hard or weathered rock. They are soils in which the profile is not or only slightly gravelly (< 10% >2 mm) throughout, either loose or only weakly coherent, both moist and dry, and the texture is dominantly sandy, and with a clay content < 15%.

6.2.3.1 Site Selection

Site selection is a primary action in environmental mitigation in onshore petroleum developments in the NT, as emphasized in *the Code*. The CPP Area environmental factors were spatially analysed to assist in the environmental risk assessment of proposed locations for the Activity, sourced from:

- SREBA vegetation and surface water features.
- NRM GIS layers.
- SRTM elevation that has been calibrated in the CPP Area using known benchmarks such as CPP wells AHD elevations, predicted flood level, offsets from local infrastructure and existing water bores.
- Compliance with *the Code*.

In addition, the following studies have informed the Activity’s site selection and risk assessment:

- Engineering and Environmental field surveys at proposed well pad disturbance area locations, linear infrastructure corridors, creek crossings and proposed WHS and CGP locations (EMP **Appendix 01** Ecological Assessment).
- Anthropological surveys of proposed CPP disturbance sites in combination with Traditional Owner representatives, Anthropologist and Ecologist (EMP **Appendix 02** Cultural and Heritage Assessment).
- Drone lidar topographical mapping of proposed key CPP sites (EMP **Appendix 05** Erosion and Sediment Control Plan).
- CPP Area flood modelling (**Section 4** of the EMP Description of the Environment).

A comprehensive discussion of the risk assessment process is provided in **Section 6** of the EMP. A summary of the risk assessment process is provided in **Section 7** of this **Referral**, including a list of the potential environmental impacts with an initial risk ranking of 4 and 5 (**Table 7.1—1**). This table includes the residual ranking after implementation of controls. **Table 6.1—6** in the EMP provides the full risk assessment table.

6.2.3.2 Well Pad Soils

The analysis below provides the average results of a range of key analytes of interest in soil cores and also drill cuttings taken at the existing well pads in the CPP Area. There is limited variation in soil physical profiles through depth in any of the 60 cm deep cores, except that clay content is significantly higher in the phreatic horizon, which would limit infiltration to the deeper vadose horizon (**Figure 6.2—4**). The well pad soil mainly comprises sandy-clay. The relatively high clay content of this soil (> 30%) serves to mitigate predicted infiltration at a well pad.

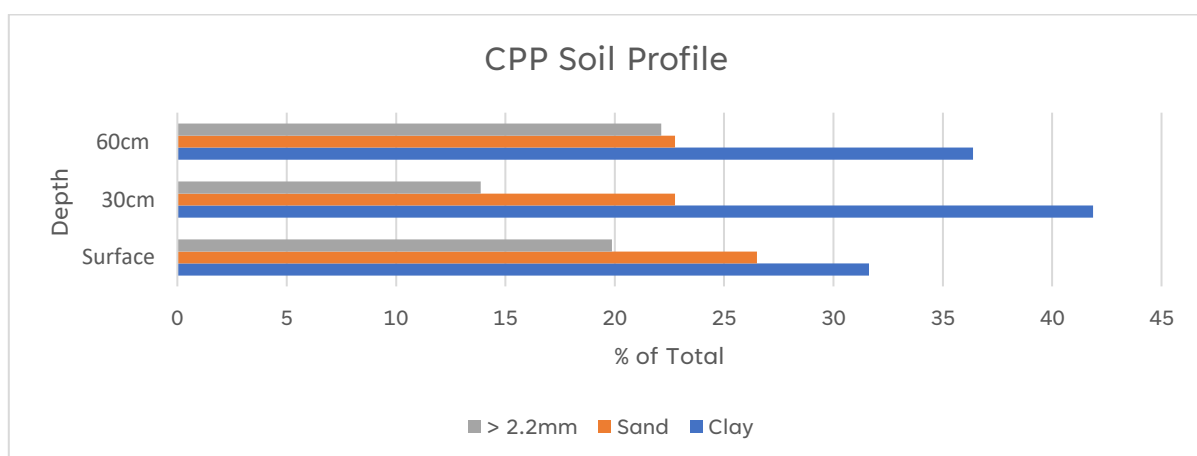


Figure 6.2—4 Soil Core Analysis Well Pads in the CPP Area

The average analysis of key soil nutrients with soil profile depth and in drill cuttings at the CPP Area is shown in **Table 6.2—1**. The cation exchange capacity (CEC) is the capacity of clay to adsorb and exchange cations. CEC is a crucial soil property that plays a significant role in soil health and nutrient availability in rehabilitation works. It is an inherent soil characteristic and is difficult to alter significantly. A CEC value less than 5 cmol(+)/kg is considered low, while a value greater than 15 cmol(+)/kg is high [N McKenzie et al., 2004].

Results of CEC analysis of the well pad soil core profiles found a significant difference between topsoil with elevated CEC and deeper soils with much lower CEC. This result reflects the benefits of stockpiling the more fertile topsoil in the CPP well pad design during land clearing for the Activity for subsequent site rehabilitation purposes. The topsoil from the CPP Area is currently used in the re-vegetation of bare areas, as evidenced by the ongoing monitoring of the Imperial EP 187 seismic line rehabilitation.

Table 6.2—1 Key Nutrients in CPP Area Soils and Drill Cuttings

Soil Sample Source	Cation Exchange Capacity (cmol(+)/kg)	Carbon Total (g/kg)	Phosphorus Total (g/kg)	Nitrogen Total (g/kg)
Surface	20	0.8	0.1	0.3
30 cm Depth	5.8	0.5	0.1	0.3
90 cm Depth	6.0	0.3	0.1	0.3
Cuttings	7.5	1.3	0.3	0.35

6.2.3.3 Soil Infiltration by HF Flowback

The American Petroleum Institute guidelines describe detailed strategies for addressing salt impacts of produced water spills at petroleum well sites (API, 2006).

Typical HF Flowback concentrations of chloride has been used in infiltration modelling simulations. The modelling results predicted that soil chloride concentration rapidly attenuates with depth. However, predicted chloride concentrations in the surface soil from a HF Flowback spill may exceed 25 mg/kg. This would be in addition to the average baseline of 40 mg/kg on the well pad, and under this HF flowback spill scenario modelling, would likely benefit future plant growth to salt tolerant species, without appropriate soil remediation (**Figure 6.2—5**).

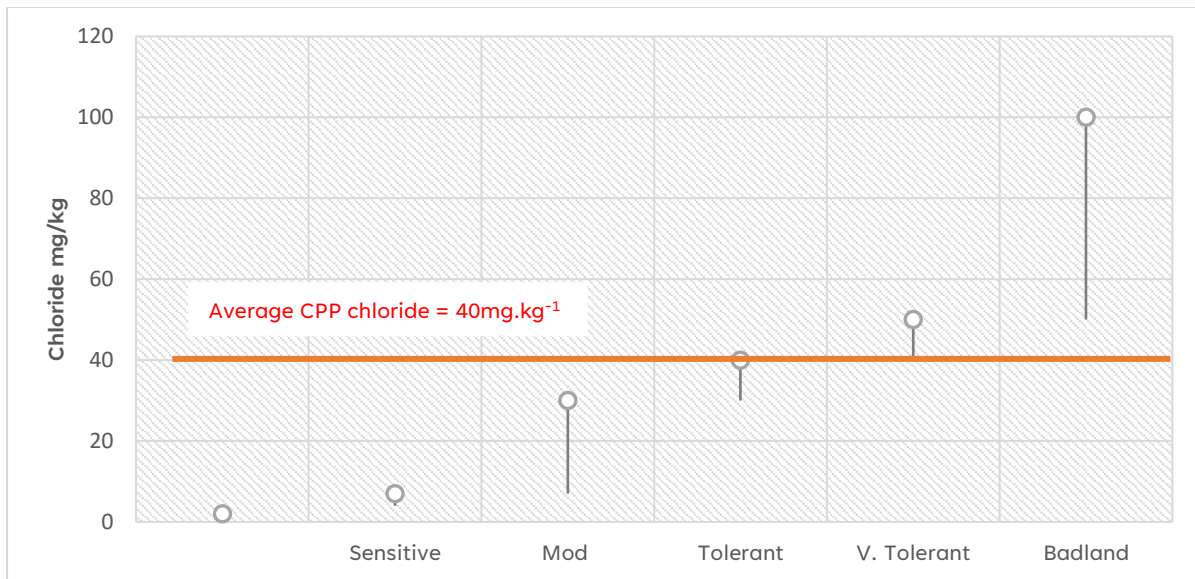


Figure 6.2—5 CPP Soil Chloride Level and Plant Tolerance

6.2.4 Terrestrial Ecosystems

6.2.4.1 EPBC Protected Matters

The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEE) Protected Matters search tool (PMST) was used to identify threatened species and vegetation communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) that could occur within a search area of 20 km radius of the CPP Area. The results of this search are detailed in EMP **Appendix 01** (Environmental Assessment Report).

No MNES mammals, reptiles, threatened invertebrates or threatened flora were found during desktop searches or field surveys within the study area that may potentially be impacted by the Activity. Additionally, no Threatened Ecological Communities (TEC), World Heritage Properties, National Heritage Places, Wetlands of International Importance, Great Barrier Reef Marine Park, or Commonwealth Marine Areas occur within the CPP Area.

The EPBC PMST search did not identify any nationally threatened flora species. However, potential habitat was identified for 13 threatened terrestrial species and 13 migratory species listed under the EPBC Act. These are listed in **Table 6.2—2**. Of the species identified, the Freshwater Sawfish (*Pristis pristis*) and the six migratory wetland birds were excluded from further consideration as there is no suitable habitat for these species within the study area defined in **Appendix 01** (Environmental Assessment Report).

Subsequent to the environmental assessments associated with the Environmental Assessment Report (**Appendix 01**) (which was finalised in October 2023), the Northern Blue-tongued skink has been uplisted to Critically Endangered in December 2023 [DCCEE, 2023]. Previously the

Northern Blue-tongued skin was listed as Data Deficient, and as such it was not identified in the following EPBC listings (PMST and SIA), and detailed below in **Section 6.2.4.1** and **6.2.4.2**.

Controls for the protection of threatened species, including the Northern Blue-tongued skink are discussed in **Section 6** Environmental Risks and Mitigation Measures.

Table 6.2—2 Listed Threatened Species (October 2023)

Common Name	Scientific Name	Threat Category	Presence
Birds			
Curlew Sandpiper	<i>Calidris ferruginea</i>	Critically Endangered	Species or species habitat may occur within area.
Red Goshawk	<i>Erythrotriorchis radiatus</i>	Endangered	Species or species habitat may occur within area.
Gouldian Finch	<i>Erythrura gouldiae</i>	Endangered	Species or species habitat known to occur within area.
Grey Falcon	<i>Falco hypoleucos</i>	Vulnerable	Species or species habitat may occur within area.
Crested Shrike-tit (northern)	<i>Falcunculus frontatus whitei</i>	Vulnerable	Species or species habitat likely to occur within area.
Painted Honeyeater	<i>Grantiella picta</i>	Vulnerable	Species or species habitat may occur within area.
Australian Painted Snipe	<i>Rostratula australis</i>	Endangered	Species or species habitat may occur within area.
Masked Owl (northern)	<i>Tyto novaehollandiae kimberli</i>	Vulnerable	Species or species habitat likely to occur within area.
Mammals			

Common Name	Scientific Name	Threat Category	Presence
Ghost Bat	<i>Macroderma gigas</i>	Vulnerable	Species or species habitat may occur within area.
Greater Bilby	<i>Macrotis lagotis</i>	Vulnerable	Species or species habitat may occur within area.
Northern Brushtail Possum	<i>Trichosurus vulpecula arnhemensis</i>	Vulnerable	Species or species habitat may occur within area.
Reptiles			
Gulf Snapping Turtle	<i>Elseya lavarackorum</i>	Endangered	Species or species habitat may occur within area.
Fish			
Freshwater Sawfish	<i>Pristis pristis</i>	Vulnerable	Species or species habitat may occur within area.
Migratory Marine Birds			
Fork-Tailed Swift	<i>Apus pacificus</i>	-	Species or species habitat likely to occur within area.
Migratory Marine Species			
Freshwater Sawfish	<i>Pristis pristis</i>	Vulnerable	Species or species habitat may occur within area.
Migratory Terrestrial Species			
Red-rumped Swallow	<i>Cecropis daurica</i>	-	Species or species habitat may occur within area.
Oriental Cuckoo/Horsfields Cuckoo	<i>Cuculus optatus</i>	-	Species or species habitat may occur within area.

Common Name	Scientific Name	Threat Category	Presence
Barn Swallow	<i>Hirundo rustica</i>	-	Species or species habitat may occur within area.
Grey Wagtail	<i>Motacilla cinerea</i>	-	Species or species habitat may occur within area.
Yellow Wagtail	<i>Motacilla flava</i>	-	Species or species habitat may occur within area.
Migratory Wetland Species			
Common Sandpiper	<i>Actitis hypoleucos</i>	-	Species or species habitat may occur within area.
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>	-	Species or species habitat may occur within area.
Curlew Sandpiper	<i>Calidris ferruginea</i>	Critically Endangered	Species or species habitat may occur within area.
Pectoral Sandpiper	<i>Calidris melanotos</i>	-	Species or species habitat may occur within area.
Oriental Plover/Oriental Dotterel	<i>Charadrius veredus</i>	-	Species or species habitat may occur within area.
Oriental Pratincole	<i>Glareola maldivarum</i>	-	Species or species habitat may occur within area.

No species identified in the PMST were observed during on ground surveys of the study area from 2021-2023 (EMP **Appendix 01** Environmental Assessment Report). However, two of the species were detected previously in the SREBA surveys [L Young, J Patykowski, I Leiper, C Nano,

A Fisher, et al., 2022]. These were the vulnerable Grey Falcon (*Falco hypoleucos*) and the migratory/marine listed Fork-tailed Swift (*Apus pacificus*).

The Grey Falcon occurs at low densities in arid and semi-arid inland Australia where annual rainfall is less than 500 mm. They frequent timbered lowland plains, particularly Acacia shrublands that are crossed by tree-lined water courses.

The Fork-Tailed Swift is a summer migrant (October – April) and is almost entirely aerial. The previous observation was likely to be a ‘fly-over’ and they are unlikely to utilise the ground environment of the study area, based on their behaviour (EMP **Appendix 01** Environmental Assessment Report).

6.2.4.2 Significant Impact Assessment

A Significant Impact Assessment (SIA) was also undertaken in accordance with *Matters of National Environmental Significance* (MNES) – *Significant Impact Guidelines* [DEWHA, 2013]. The SIA includes an assessment of EPBC listed species that are either known to occur or are considered likely to occur in the study area. The results of this assessment are reported further in EMP **Appendix 01**.

The focus of the SIA was on listed threatened species, significant species and listed migratory birds that may potentially occur in the CPP Area. In summary, a total of eight threatened, significant, or listed migratory birds were assessed in accordance with the guidelines.

These included the EPBC listed Grey Falcon, Gouldian Finch, and Painted Honeyeater, as well as the EPBC migratory or marine birds Glossy Ibis (*Plegadis falcinellus*), Great Egret (*Ardea alba*), Cattle Egret (*Bulbulcus ibis*), Whistling Kite (*Haliastur sphenurus*), and Rainbow Bee-eater (*Merops ornatus*). An addendum to the SIA for the Northern, Blue-tongued skink (*Tiliqua scincoides intermedia*) which has been uplisted to Critically Endangered in December 2023; and the Mertens' Water Monitor (*Varanus mertensi*) which has also been listed as Endangered under the EPBC Act has been undertaken for the CPP Area.

Based on the impact criteria and assessment of each of these identified species, the proposed Activity will not pose a significant impact. This will be achieved through avoidance of critical habitat, management practices including biosecurity controls, and mitigation such as isolation and containment in wastewater management.

This conclusion is consistent with the overall findings of the SREBA study in terms of primary controls for mitigating potential impacts to listed species, in onshore gas development in the Beetaloo [L Young, J Patykowski, I Leiper, C Nano, A Fisher, et al., 2022]. For instance, CPP well pad locations were selected to avoid significant habitat trees, waterways, and riparian areas, which offer the most likely habitat for these potential species (EMP **Appendix 01**).

6.2.4.3 Other Threatened and Significant Fauna and Flora

Reports from the SREBA surveys [L Young, J Patykowski, I Leiper, C Nano, A Fisher, et al., 2022] were analysed to identify records of threatened flora and fauna that were documented in the study area during baseline assessments. This included both EPBC and *Territory Parks and Wildlife Conservation Act 1976 (TPWC)* listed species.

A total of six threatened or significant fauna species were previously recorded within a 1 km radius of the disturbance area, during the targeted 2021-2022 SREBA surveys [L Young, J Patykowski, I Leiper, C Nano, A Fisher, et al., 2022].

Those observed were the Threatened Grey Falcon; marine and Migratory Listed Fork-tailed Swift (both mentioned above in **Section 6.2.4.1**) and the Marine Listed Rainbow Bee-eater (*Merops ornatus*); Near Threatened Australian Bustard (*Ardeotis australis*) and Pictorella Mannikin (*Heteromunia pectoralis*); and the Northern Blue-tongued skink (*Tiliqua scincoides intermedia*), which was Data Deficient under the TPWC Act [L Young, J Patykowski, I Leiper, C Nano, A Fisher, et al., 2022], though as mentioned previously was subsequently uplisted to Critically Endangered [DCCEEW, 2023].

There were no threatened fauna (EPBC or TPWC) species observed within the study area during the October 2023 survey. One near threatened fauna species was identified, the Spectacled Hare-wallaby (*Lagorchestes conspicillatus*) (EMP **Appendix 01**). As wallabies are highly mobile and inherently shy, they are unlikely to be impacted by proposed Activity as they can readily avoid CPP disturbance areas, which occupy a very small percentage of the overall landscape.

Additionally, one species of conservation significance under the EPBC was recorded in the October 2023 survey, the Whistling Kite (*Haliastur sphenurus*). While habitat exists for some conservation significant species in the area, given the location of disturbance areas, species habitat requirements and likelihood of occurrence, impacts from the proposed Activity are considered low.

While not considered Threatened under the EPBC or TPWC, Data Deficient species are considered to be Significant under the *TPWC Act*. Two Significant flora species, *Chamaecrista deserti* and *Synostemon trachyspermus* were previously recorded within the study area, both pre 2021 and 2021-2022 during the SREBA surveys [L Young, J Patykowski, I Leiper, C Nano, A Fisher, et al., 2022]. Both species are listed as Data Deficient under the TPWC Act. There were no listed Threatened flora species recorded in the study area during the environmental field surveys in October 2023, including the two Significant species mentioned above (EMP **Appendix 01**).

6.2.4.4 Weeds

There are 111 exotic plant species that have been recorded within the SREBA study region [DEPWS, 2022a]. This includes 32 species listed under the *Weeds Management Act 2001 (NT)*,

12 of which are Class A weeds (to be eradicated), and 20 are Class B weeds (growth and spread to be controlled).

Within the SREBA study region, weed occurrence was greatest in the more mesic vegetation types (floodplain woodland, riparian woodland, woodland on black soil plain, Brushbox (*Lophostemon* sp.) swamps and Paperbark (*Melaleuca* sp.) woodland, as well as Bullwaddy woodland [L Young, J Patykowski, I Leiper, C Nano, A Fisher, et al., 2022]. None of these habitats are present in the CPP Area.

Weed surveys were undertaken annually on EP 187, from 2019 to 2023. The results are detailed in the Weed Management Plan (WMP) in **Appendix 04**. A desktop analysis was used to identify historic weed records within the study area, as well as species listed as a ‘priority’ by the Northern Territory Government [DEPWS, 2021a]. Following this, on ground weed surveys took place following wet season conditions over consecutive years.

Seven Class A weeds were identified during desktop analysis to occur, or potentially occur in the EP 187 region (**Table 6.2—3**). Two of these Class A and Weeds of National Significance (WONS) species, Prickly Acacia (*Vachellia nilotica*) and Bellyache bush (*Jatropha gossypifolia*), had historic (pre-2018) records within the area of assessment.

Prickly Acacia was previously detected north of the Carpentaria highway, while Bellyache bush was recorded east of the CPP Area, on the Carpentaria Highway. Both observations were outside of the CPP Area of disturbance and no records of either species, or any other Class A weeds, were made during on ground surveys from 2019 to 2023.

A further eight, Class B weeds were identified to occur or potentially occur in the region during the desktop analysis (**Table 6.2—3**). Subsequent on ground surveys from 2019 to 2023, detected six of these Class B species in the surrounding environment, however, no records were made within the CPP Area of disturbance (and hence management area).

Two of these species, Grader grass (*Themeda quadrivalvis*) and Parkinsonia (*Parkinsonia aculeata*) are also Weeds of National Significance (WONS). Grader grass was detected on the road verge alongside the CPP Area, while Parkinsonia was detected further north of the Carpentaria Highway. Monitoring and mitigation measures including biosecurity controls in place to reduce the risk of introduction; and measures to check weed growth and weed spread in accordance with the Northern Territory Weed Management Handbook [DEPWS, 2021b].

The results of the weed survey for new well pad locations, conducted in October 2023, available with the summary of results from all previous weed surveys on EP 187, are included in the WMP.

Table 6.2—3 Previously Recorded and Priority Weeds

Scientific Name	Common Name	Declaration	Detection
<i>Bidens pilosa</i>	Cobbler's peg	Nil	On ground record (2023). Identified within CPP management area.
<i>Prosopis spp.</i>	Mesquite	WONS, Class A, Class C	Not recorded. Priority weed.
<i>Vachellia nilotica</i> (previously <i>Acacia nilotica</i>)	Prickly acacia	WONS, Class A, Class C	Previous desktop record. Outside of CPP management area.
<i>Parkinsonia aculeata</i>	Parkinsonia	WONS, Class B	Previous desktop record and on ground records (2018). Outside of CPP management area.
<i>Ziziphus mauritiana</i>	Chinee apple	Class A, Class C	Not recorded. Priority weed.
<i>Mimosa pigra</i>	Mimosa	WONS, Class A, Class C	Not recorded. Priority weed.
<i>Jatropha Gossypifolia</i>	Bellyache bush	WONS, Class A, Class C	Previous desktop record. Outside of CPP management area, on Carpentaria Highway.
<i>Andropogon gayanus</i>	Gamba grass	WONS, Class A, Class C	Not recorded. Priority weed.
<i>Azadirachta indica</i>	Neem	Class B	Not recorded. Priority weed.
<i>Themeda quadrivalvis</i>	Grader Grass	WONS, Class B	On ground records (2020-2021). Located on Carpentaria Highway.
<i>Stachytarpheta spp</i>	Snake Weed	Class B	Not recorded. Priority weed.
<i>Martynia annua</i>	Devils Claw	Class A	Not recorded. Priority weed.
<i>Hyptis suaveolens</i>	Hyptis	Class B	Previous desktop records and on ground records (2018 – 2021). Located on Carpentaria Highway.
<i>Alternanthera pungens</i>	Khaki weed	Class B	Previous desktop record. Outside of CPP management area.

Scientific Name	Common Name	Declaration	Detection
<i>Sida acuta, Sida cordifolia, Sida rhombifolia</i>	Sida	Class B	Previous desktop records. Outside of CPP management area.
<i>Leonotis nepetifolia</i>	Lion's Tail	-	Previous records.
<i>Tribulus sp.</i>	Caltrop	Class B	On ground record (2019), outside of CPP management area.