Imperial Oil & Gas

EP 187

Appendix 11

Traffic Impact Assessment

IMP 5-3

EP 187 ACCESS REVIEW
CARPENTARIA HWY, NORTHERN TERRITORY

TRAFFIC IMPACT ASSESSMENT

CIRQA™

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TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

CIRQA has been engaged to undertake a review of the traffic aspects associated with Imperial Oil and Gas' drilling and operations program in the McArthur Basin, McArthur, Northern Territory. Specifically, CIRQA has been requested to prepare a Traffic Impact Assessment (TIA) for inclusion within Imperial Oil and Gas' Environmental Management Plan (EMP).

The TIS analyses the traffic movements forecast to be generated by Imperial Oil and Gas' operations throughout the various phases of the project's lifecycle. Specifically, this report focuses on the external traffic impacts of the proposal, including the Carpentaria Highway access arrangements, and the suitability of the Carpentaria Highway and surrounding road network.

This report summarises the traffic review undertaken of the access arrangements. The review has been prepared in accordance with the Austroads' "*Guide to Traffic Management – Part 12: Impacts of Developments*" (including general adoption of its recommended report structure).

The subject drilling and operations program will be carried out on 'Mambaliya Rrumburriya Wuyaliya' (NT Portion 5706). Vehicle access to the project areas will be provided via two existing access points on the Carpentaria Highway.

Assessment of the turning warrants against the requirements of the Austroads' Guide indicates that formalised separate turn lanes are not warranted, and that no further upgrade to the existing intersections (beyond the existing BAL/BAR treatments) is warranted. Furthermore, the Austroads' Guide also indicates that appropriate sight distances can be established at each of the three access points.

Assessment of the additional traffic associated with the drilling and operations program indicates that up to 76 vehicle movements could be generated by Imperial Oil and Gas' drilling and operations program during its peak in August 2024. These movements will be distributed to the Carpentaria Highway via the two existing access points. Such movements will readily be accommodated at the access points and on the adjacent road network.

2. PROPOSED DEVELOPMENT

2.1 BACKGROUND DEVELOPMENT

Access to the project areas will be provided via existing private unsealed roadways (one to the north of the Carpentaria Highway and one to the south of the Carpentaria Highway). The roadways currently intersect with the Carpentaria Highway, providing connectivity to the broader road network.

2.2 DESCRIPTION OF ON-SITE DEVELOPMENT

2.2.1 LAND USE AND INTENSITY

The proposal comprises civil and construction works associated with the operation of wells within the project areas. The works also include infrastructure including flowlines, pipelines and facilities associated with the drilling and hydraulic fracturing of wells for gas production (i.e. new groundwater bores, office, warehouse and workshop facilities, campsite etc.).

The intensity of traffic movements associated with the proposal will generally be low, albeit with infrequent higher-intensity periods. It is anticipated that the highest level of traffic generation will occur during in August 2024 during consecutive delivery of sand for hydraulic fracturing (as specified by Imperial Oil and Gas, detailed below)

2.2.2 LOCATION

The wells will be located on 'Mambaliya Rrumburriya Wuyaliya', approximately 202 km east of the Carpentaria Highway and Stuart Highway intersection, and 60 km west of Cape Crawford.

2.2.3 ZONING

The subject wells (and associated campsites) are not located within a Zone defined by the Northern Territory Planning Scheme (NTPS).

2.2.4 PHASING AND TIMING

The subject drilling and operations program is anticipated to be undertaken over an 18-month period. An indicative project schedule has been prepared by InGauge, outlining the various activities throughout the program as well as their expected commencement, duration and completion dates. A copy of the anticipated program is attached in Appendix A.

The exploration program is expected to commence in the last week of the first quarter of 2024 (upon receival of relevant approvals and other relevant considerations), with completion expected in the last quarter of 2025.

3. EXISTING AREA CONDITIONS

3.1 STUDY AREA

3.1.1 AREA OF influence

The study area is contained to parcel of land 5706 (referred to as NT Por 5706 or 'Mambaliya Rrumburriya Wuyaliya') and does not include adjacent/neighbouring properties. Figure 1 illustrates the subject parcel of land with regard to the adjacent road network.

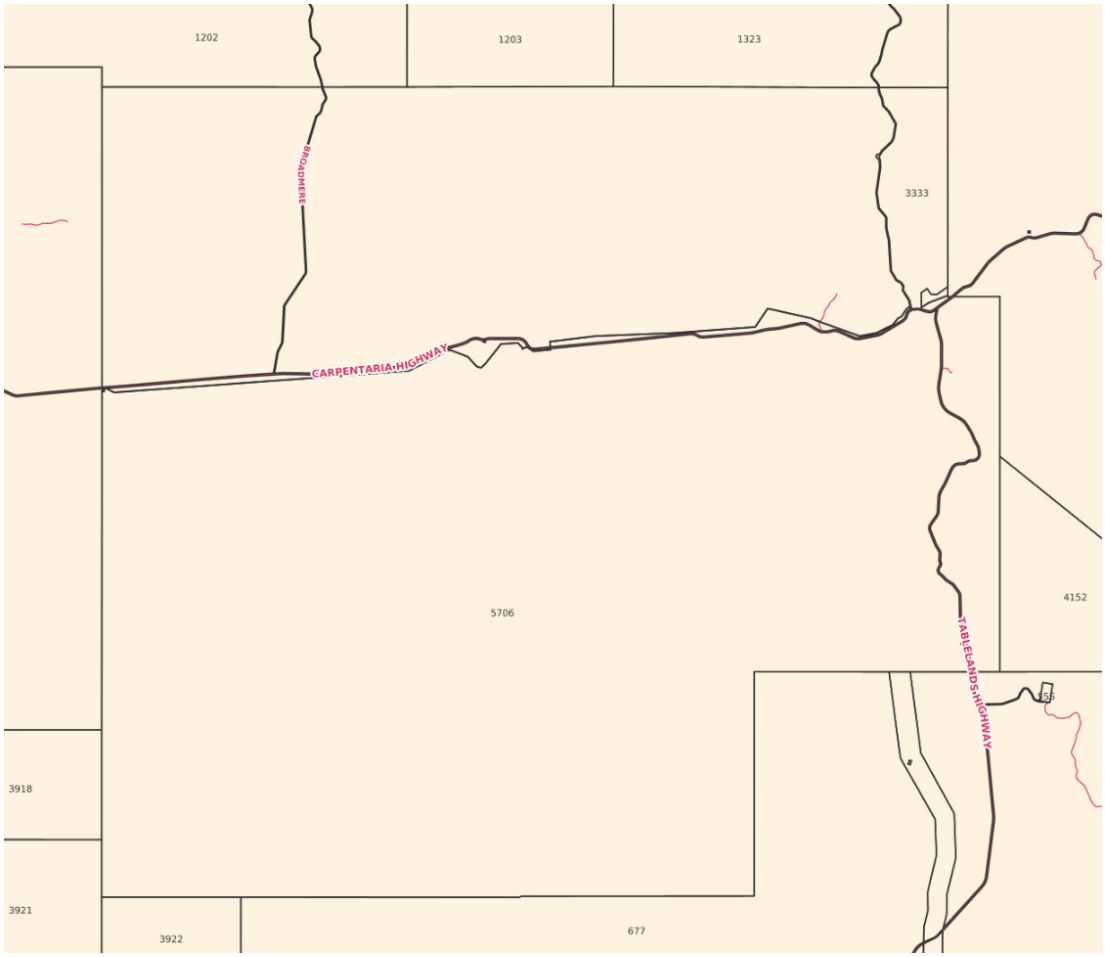


Figure 1 – The subject parcel of land (NT Por 5706) (Source: Northern Territory Government, 2023)

3.1.2 AREA OF SIGNIFICANT TRANSPORTATION IMPACT

The adjacent road network will easily accommodate the increased traffic generation associated with the subject site. The primary impact will generally be limited to the access points on Carpentaria Highway, as well as the Carpentaria Highway west of the project area (i.e. between the Stuart Highway and the southern access). Further discussion of traffic volumes and their associated impacts are provided below.

3.2 STUDY AREA LAND USE

3.2.1 EXISTING LAND USES

The subject parcel of land is currently used as a cattle station. The parcels of land bounding 'Mambaliya Rrumburriya Wuyaliya' are primarily cattle stations and are named as follows:

- North
  - NT Por 1202 ('Broadmere' – Private ownership)
  - NT Por 1203 ('Jandanku' – Aboriginal Lands)
  - NT Por 1323 (Unknown – Unregistered Crown Land)
- East
  - NT Por 3333 (Unknown – Private ownership)
  - NT Por 4319 ('McArthur River' – Private ownership)
  - NT Por 4152 ('Mallapunyah Springs' – Private ownership)
- South
  - NT Por 677 ('Mallapunyah Springs' – Private ownership)
  - NT Por 2101 ('Mallapunyah Springs' – Private ownership)
  - NT Por 3922 (Unknown – Private ownership)
- West
  - NT Por 702 ('Beetaloo Station' – Private ownership)
  - NT Por 3918 (Unknown – Private ownership)
  - NT Por 3921 (Unknown – Private ownership)

3.2.2 EXISTING ZONE

The project areas are not located within a Zone defined by the NTPS.

3.2.3 ANTICIPATED FUTURE DEVELOPMENT

Within the study area, no other development is anticipated in the near future. It is understood that other drilling programs are in the process of being undertaken within the broader area. However, the likelihood of peak traffic movements associated with the various projects aligning is considered limited.

3.3 SITE ACCESSIBILITY

3.3.1 AREA ROADWAY SYSTEM

Within the study area, the only public road is the Carpentaria Highway.

The Carpentaria Highway forms part of the 'Highway 1' network and is under the care and control of the Northern Territory Government. The first 50 km of the Carpentaria Highway (east of the Stuart Highway) currently comprises a sealed two-way carriageway with a single (marked) traffic lane in each direction. It is understood that this extent of two-way carriageway we recently completed in August 2023.

Furthermore, it is also understood that Exact Contracting are in the process of constructing additional two-way carriageway (with a single marked traffic lane in each direction) between chainage 50 km and 109 km. These works are anticipated to be completed in late 2024.

Upgrade works to the following 31 km (up to chainage 140 km) are anticipated to follow, with a decision to award the contract expected to be made by DIPL in the first quarter of 2024. These works are expected to be completed by June 2025 (based upon information provided by DIPL).

A contract relating to the next 35 km of the Carpentaria Highway (up to chainage 175 km) is expected to be awarded in the fourth quarter of 2024, with upgrade works complete in the fourth quarter of 2026 (based upon information provided by DIPL).

The existing (pre-upgrade) configuration of the Carpentaria Highway between the Stuart Highway and the study area generally comprises a central sealed traffic lane with unsealed shoulders on both sides. Frequent widened sealed areas (capable of facilitating two-way vehicle movements on the sealed surface) are located along the length of the Carpentaria Highway.

Furthermore, it is noted that the Carpentaria Highway (between Borroloola and the Carpentaria Highway/Tablelands Highway intersection) comprises of a continuous two-way width seal.

The Carpentaria Highway is subject to a 100 km/h speed limit.

3.3.2 TRAFFIC VOLUMES AND CONDITIONS

Traffic data has been obtained from the Northern Territory Government for one primary (permanent) and two coverage counter stations along the Carpentaria Highway.

In addition, traffic data from one primary (permanent) and one coverage counter station on the Stuart Highway, plus an additional coverage counter station on the Tablelands Highway has been referenced.

The key stations and their respective locations are as follows:

- RKVDP008 *(primary)* – Carpentaria Highway, 44 km east of the Stuart Highway;
- RTVDC031 *(coverage)* – Carpentaria Highway, 5 km west of Tablelands Highway;
- RTVDC033 *(coverage)* – Carpentaria Highway, 5 km east of Tablelands Highway;
- RKVDP003 *(primary)* – Stuart Highway, 19 km north of Carpentaria Highway;
- RKVDC023 *(coverage)* – Stuart Highway, 10 km south of Carpentaria Highway; and
- RTVDC030 *(coverage)* – Tablelands Highway, 5 km south of Carpentaria Highway.

Traffic data (in the form of Annual Average Daily Traffic volumes) has been obtained at each of the above counter locations over a 10-year period (from 2013 to 2022 inclusive). Table 2 illustrates the Annual Average Daily Traffic (AADT) volumes recorded at the above counter stations.

Table 1 – Yearly AADT count data from the various primary and coverage counter stations.

Year	RKVDP008	RKVDP003	RKVDC023	RTVDC031	RTVDC033	RTVDC030
2013	73	444	365	N/A	N/A	N/A
2014	70	448	407	75	97	55
2015	73	461	405	85	N/A	N/A
2016	68	456	422	70	84	56
2017	66	454	429	N/A	N/A	N/A
2018	64	467	474	69	93	61
2019	76	470	454	N/A	N/A	N/A
2020	65	357	345	71	78	91
2021	90	542	311	N/A	N/A	N/A
2022	98	515	513	88	98	44

It should be noted that monthly (seasonal) count data is typically collected and provided for primary counter station (such as RKVDP008). However, the table containing this data appears to have been omitted from the Northern Territory Government's latest "*Annual Traffic Report 2022*". Instead, monthly (seasonal) count data from the "*Annual Traffic Report 2021*" (the latest data publicly available) has instead been referenced.

The data illustrates the variation in traffic volumes across the calendar year as well as the respective 'seasonal factor'. The data obtained is illustrated in Table 3.

Table 2 –2021 monthly traffic count data (from detector RKVDP008) and respective seasonal adjustment factors

Month	Month Count	Seasonal Factor
January	44	0.49
February	39	0.43
March	51	0.57
April	94	1.04
May	107	1.19
June	130	1.44
July	161	1.79
August	122	1.36
September	107	1.19
October	93	1.03
November	76	0.84
December	55	0.61
AADT	90	1.00

As illustrated in Table 3, traffic volumes on the Carpentaria Highway are lower during the summer months of the year (i.e. during the 'wet season'). This is due to the broader road network (i.e. the Carpentaria Highway and connecting roads beyond) being subject to varying restrictions. This can include (but is not limited to) complete road closures and staggered re-openings in order to minimise impacts to pavements and maintain road safety (i.e. open to 4WD/light vehicles, then small commercial vehicles, before full reopening). Such restrictions impact upon a number of sectors including (but not limited to) tourism, agriculture, and industry in varying degrees.

Typical restrictions enforced on the Carpentaria Highway during the 'wet season' include weight restrictions such as '100% legal axle group mass limits' (i.e. no over-mass vehicles) and restrictions on 'Gross Vehicle Masses' (GVMs) such as light vehicles only. On rare occasions (i.e. extreme weather events such as flooding), the Carpentaria Highway has been closed to all traffic movements (the Carpentaria Highway was subject to speed reductions for 70 days 2021 in varying locations, whilst it was reported to be closed entirely for a single day in 2022).

3.3.3 TRANSIT SERVICE

No public transport services are provided within the vicinity of the study area.

3.3.4 PEDESTRIANS AND CYCLISTS

Given the site's remote nature, pedestrian and cyclist movements along the Carpentaria Highway would be extremely unlikely and are not expected to occur.

4. PROJECT TRAFFIC

4.1 PROPOSED SITE ACCESS

It is understood that vehicle access to the project areas will be provided via the same access points used as part of Imperial Oil and Gas' exploration program. Specifically, vehicle access to the project areas is proposed via the following existing access points:

- North access - a priority controlled (Give Way) T-intersection, located approximately 206 km east of the Stuart Highway. This access will provide vehicle access to the northern project area and will continue to facilitate all turning movements at the intersection. *This intersection was referred to as 'EP187' in CIRQA's previous Traffic Impact Assessment*; and
- South access - a priority controlled (Give Way) T-intersection, located approximately 202 km east of the Stuart Highway. This access will provide vehicle access to the souther project area and will continue to facilitate all turning movements at the intersection. *This intersection was referred to as 'SL-4' in CIRQA's previous Traffic Impact Assessment.*

4.2 TRAFFIC GENERATION

Forecast vehicle movements have been provided by InGauge for each item of the drilling and operations program schedule. The forecast traffic generation information provided by Imperial Oil and Gas is attached in Appendix A.

Upon review of the information provided, peak daily traffic generation associated with Imperial Oil and Gas' drilling and operations program is expected to occur in early August 2024. During this time, the following vehicle movements are expected to be generated:

- Carpentaria 6H (2/3); Drilling – 5.7 truck movements plus 1.1 light vehicle movement per day;
- Carpentaria 4H (4); HF Sand Delivery – 14 truck movements per day;
- Spread Shift – Mobilisation *(for Carpentaria 4H (4); HF)* – 6 trucks movements plus 12 light vehicle movements per day;
- Carpentaria 5H (4); HF Sand Delivery – 14 truck movements per day;
- Carpentaria 6H (2/3); HF Sand Delivery – 14 truck movements per day;
- Compressor Station; Construction – 3.3 truck movements plus 1.1 light vehicle movements per day;
- Water Treatment Facilities; Construction – 0.6 truck movements plus 1.1 light vehicle movements per day;

- Carpentaria BD; Civild Construction, Wellpad and Access – 0.6 truck movements plus 1.1 light vehicle movements per day.

Based upon the above, Imperial Oil and Gas' drilling and operations program is expected to generate a peak in the order of 59 truck movements and 17 light vehicle movements (a total of 76 vehicle movements) per day.

The forecast peak is primarily associated with sand deliveries for the HF of Carpentaria 4H, 5H and 6H occurring consecutively. Whilst the start of deliveries is expected to be staggered by approximately one (1) month, the three delivery phases overlap by approximately one month (mid-July 2024 to mid-August 2024) at which point all will be occurring consecutively. Further traffic will also be generated during this period by the mobilisation of equipment, drilling operations and general supporting construction activities, resulting in a concentrated peak in early August.

Whilst it is acknowledged that three HF sand delivery phases will overlap in July 2025, with the exception of traffic associated with the drilling of Carpentaria 8H, no other construction traffic is expected to be generated by Imperial Oil and Gas' operations (during this period, in the order of 48 truck and 8 light vehicle movements per day are expected).

Outside of these periods, general traffic volumes associated with Imperial Oil and Gas' drilling and operations program will be lower than those identified above, given the large portion of traffic generated by sand deliveries (especially during the 'wet season').

It should also be highlighted that multiple well sites will be access via a singular access on the Carpentaria Highway. Therefore, once a vehicle movement phase (such as mobilisation of a 'rig shift' or 'spread shift') is complete, the vast majority of vehicle movements will be internal within the project area. The only exception to this is when vehicles are required to shift between well sites north and south of the Carpentaria Highway, albeit this is expected to only occur one during each given phase (i.e. during the 2024 drilling program, 2024 HF program etc.). It has therefore been determined that minor traffic peak periods will occur on the Carpentaria Highway during mobilisation and demobilisation periods (associated with both drilling and HF.

In order to provide a comprehensive review of the operations and drilling program's traffic impact, analyses have been undertaken for each month throughout the project's lifecycle. It should be noted that the traffic forecast for a given month has been based upon the worst-case day within that period. This therefore provides a conservative assessment with regard to the project's potential traffic impact.

4.3 TRAFFIC DISTRIBUTION & MODAL SPLIT

A detailed traffic distribution has been provided by InGauge with regard to subject drilling and operations program. Specifically, the information provided identified the anticipated origin and destination of vehicle movements generated by the program for each individual phase in the project lifecycle. The detailed distribution of vehicle movements (as provided by InGauge) is attached in Appendix A.

The information also identifies that forecast vehicle movements will be distributed relatively evenly to/from the west (i.e. west of the subject site via the Carpentaria Highway and the Stuart Highway) and to/from the east (i.e. east of the subject area via the Carpentaria Highway and Tablelands Highway) over the project's lifecycle.

The modal split will vary between given sections of the Carpentaria Highway. Based on the data provided by InGauge, it is forecast that approximately 67% of vehicles travelling to/from the west will be commercial vehicles/trucks, whilst only 7% (approx.) of vehicles travelling to/from the east will be commercial vehicles. Between the Northern and Southern access points, in the order of 25% are forecast to be commercial vehicles.

All commercial vehicle movements are assumed to be 53.5 m Road Trains (A-Triples).

Based upon the above, site-related traffic volumes have been forecast along the Carpentaria Highway in three (3) key sections. The key three (3) sections and their respective relative table are as follows:

- Carpentaria Highway, west of the project area's southern access (Table 3);
- Carpentaria Highway, between the southern and northern access roadways (Table 4); and
- Carpentaria Highway, east of the project area's northern access (Table 5).

Table 3 – Forecast traffic volumes on the Carpentaria Highway, west of the site's southern access

Month	Light Vehicles	Heavy Vehicles	Total Traffic Forecast
March 2024	0	0	0
April 2024	12	9	21
May 2024	12	9	21
June 2024	16	30	46
July 2024	16	42	58
August 2024	28	48	76
September 2024	20	46	66
October 2024	8	20	28
November 2024	20	11	31
December 2024	0	1	1
January 2025	0	1	1
February 2025	0	1	1
March 2025	0	1	1
April 2025	0	22	22
May 2025	12	38	50
June 2025	8	48	56
July 2025	8	48	56
August 2025	20	48	68
September 2025	16	36	52
October 2025	20	22	42
November 2025	8	2	10
December 2025	12	7	19
2024 Ave. Monthly Forecast	**13.2**	**21.6**	**34.8**
2025 Ave. Monthly Forecast	**8.7**	**22.8**	**34.5**

Table 4 – Forecast traffic volumes on the Carpentaria Highway, between the site's southern access and northern access

Month	Light Vehicles	Heavy Vehicles	Total Traffic Forecast
March 2024	8	2	10
April 2024	16	2	18
May 2024	40	7	47
June 2024	32	9	41
July 2024	28	20	48
August 2024	32	21	53
September 2024	36	23	59
October 2024	40	25	65
November 2024	40	6	46
December 2024	16	0	16
January 2025	16	0	16
February 2025	8	0	8
March 2025	8	0	8
April 2025	16	4	20
May 2025	16	4	20
June 2025	8	0	8
July 2025	8	0	8
August 2025	20	6	26
September 2025	16	6	22
October 2025	20	6	26
November 2025	20	6	26
December 2025	8	0	8
2024 Ave. Monthly Forecast	28.8	11.5	40.3
2025 Ave. Monthly Forecast	13.7	2.7	16.3

Table 5 – Forecast traffic volumes on the Carpentaria Highway, east of the site's northern access

Month	Light Vehicles	Heavy Vehicles	Total Traffic Forecast
March 2024	8	2	10
April 2024	24	2	26
May 2024	40	7	47
June 2024	40	6	46
July 2024	24	1	25
August 2024	24	1	25
September 2024	24	3	27
October 2024	40	4	44
November 2024	40	4	44
December 2024	16	0	16
January 2025	16	0	16
February 2025	8	0	8
March 2025	8	0	8
April 2025	24	1	25
May 2025	24	1	25
June 2025	8	0	8
July 2025	8	0	8
August 2025	8	0	8
September 2025	8	0	8
October 2025	8	0	8
November 2025	8	0	8
December 2025	8	0	8
2024 Ave. Monthly Forecast	28.0	3.0	31.0
2025 Ave. Monthly Forecast	11.3	0.2	11.5

4.4 TRIP ASSIGNMENT

As above, traffic distribution data has been provided by InGauge, inclusive of a breakdown of light and commercial vehicles. No further trip assignment of traffic forecasts is therefore required.

4.5 FUTURE TRAFFIC

The traffic data identified in Table 1 illustrates a general growth in traffic volumes on the Carpentaria Highway over the past 10-year period. Accordingly, for the purposes of this assessment, traffic volumes have been grown to account for continual road network growth.

It should however be recognised that a portion of volumes recorded on the road network would be those associated with earlier works undertaken by Imperial Oil and Gas on the subject site. Accordingly, growth of these volumes may account for a portion of 'double counting' on the surrounding road network.

Notwithstanding, for the purposes of this assessment, the general growth in traffic volumes identified by the existing dataset has been adopted.

Noting the expected completion date of the subject drilling and operations program, traffic volumes have only been extrapolated into the future up until December 2025 (the expected completion date of the subject drilling and operations works).

The forecast 'base' traffic volumes on the Carpentaria Highway are illustrated in Table 6 (i.e. traffic volumes independent of the subject drilling and operations program).

Table 6 – Forecast 'base' traffic volumes on the Carpentaria Highway

Month	Forecast Daily Traffic Volume
March 2024	60
April 2024	110
May 2024	125
June 2024	152
July 2024	188
August 2024	142
September 2024	125
October 2024	109
November 2024	89
December 2024	64
January 2025	54
February 2025	48
March 2025	62
April 2025	114
May 2025	129
June 2025	157
July 2025	194
August 2025	147
September 2025	129
October 2025	113
November 2025	92
December 2025	66
2024 AADT	**116**
2025 AADT	**109**

No other significant traffic generating development is expected to occur within the vicinity of the site during the drilling and operations program.

4.6 TOTAL TRAFFIC

Taking into account the project-related traffic forecasts identified in Section 4.3, as well as the 'base' traffic forecasts identified Section 4.5, total traffic volumes have been forecast on the three (3) key sections of the Carpentaria Highway.

The total traffic volumes forecast for each of the three (3) key sections are as follows:

- Carpentaria Highway, west of the project area's southern access (Table 7);

- Carpentaria Highway, between the southern and northern access roadways (Table 8); and
- Carpentaria Highway, east of the project area's northern access (Table 9).

Table 7 – Total traffic volumes on the Carpentaria Highway, west of the site's southern access

Month	'Base' Hwy Volume	Forecast Volume	Total Volume
March 2024	60	0	60
April 2024	110	21	131
May 2024	125	21	146
June 2024	152	46	198
July 2024	188	58	246
August 2024	142	76	218
September 2024	125	66	191
October 2024	109	28	137
November 2024	89	31	120
December 2024	64	1	65
January 2025	54	1	55
February 2025	48	1	49
March 2025	62	1	63
April 2025	114	22	136
May 2025	129	50	179
June 2025	157	56	213
July 2025	194	56	250
August 2025	147	68	215
September 2025	129	52	181
October 2025	113	42	155
November 2025	92	10	102
December 2025	66	19	85
2024 Ave. Monthly Forecast	**116**	**35**	**151**
2025 Ave. Monthly Forecast	**109**	**32**	**140**

Table 8 – Total traffic volumes on the Carpentaria Highway, between the site's southern access and northern access

Month	'Base' Hwy Volume	Forecast Volume	Total Volume
March 2024	60	10	70
April 2024	110	18	128
May 2024	125	47	172
June 2024	152	41	193
July 2024	188	48	236
August 2024	142	53	195
September 2024	125	59	184
October 2024	109	65	174
November 2024	89	46	135
December 2024	64	16	80
January 2025	54	16	70
February 2025	48	8	56
March 2025	62	8	70
April 2025	114	20	134
May 2025	129	20	149
June 2025	157	8	165
July 2025	194	8	202
August 2025	147	26	173
September 2025	129	22	151
October 2025	113	26	139
November 2025	92	26	118
December 2025	66	8	74
2024 Ave. Monthly Forecast	**116**	40	157
2025 Ave. Monthly Forecast	**109**	16	125

Table 9 – Total traffic volumes on the Carpentaria Highway, east of the site's northern access

Month	'Base' Hwy Volume	Forecast Volume	Total Volume
March 2024	60	10	70
April 2024	110	26	136
May 2024	125	47	172
June 2024	152	46	198
July 2024	188	25	213
August 2024	142	25	167
September 2024	125	27	152
October 2024	109	44	153
November 2024	89	44	133
December 2024	64	16	80
January 2025	54	16	70
February 2025	48	8	56
March 2025	62	8	70
April 2025	114	25	139
May 2025	129	25	154
June 2025	157	8	165
July 2025	194	8	202
August 2025	147	8	155
September 2025	129	8	137
October 2025	113	8	121
November 2025	92	8	100
December 2025	66	8	74
2024 Ave. Monthly Forecast	**116**	**31**	**147**
2025 Ave. Monthly Forecast	**109**	**12**	**120**

As noted in Section 4.2, the peak traffic generation associated with Imperial Oil and Gas' drilling and operations program is expected to occur in August 2024. Based upon the traffic volumes forecast at this time, total daily turning movement volumes have been forecast at both the southern (Figure 2) and northern (Figure 3) site access points.

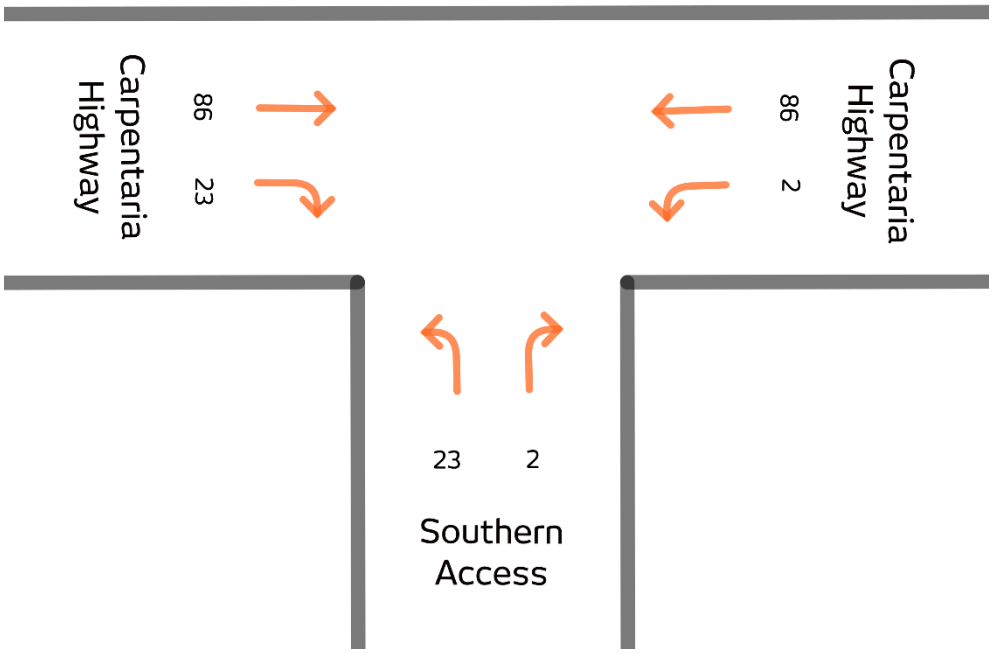


Figure 2 – Total daily traffic volumes forecast at the project area's southern access (August 2024).

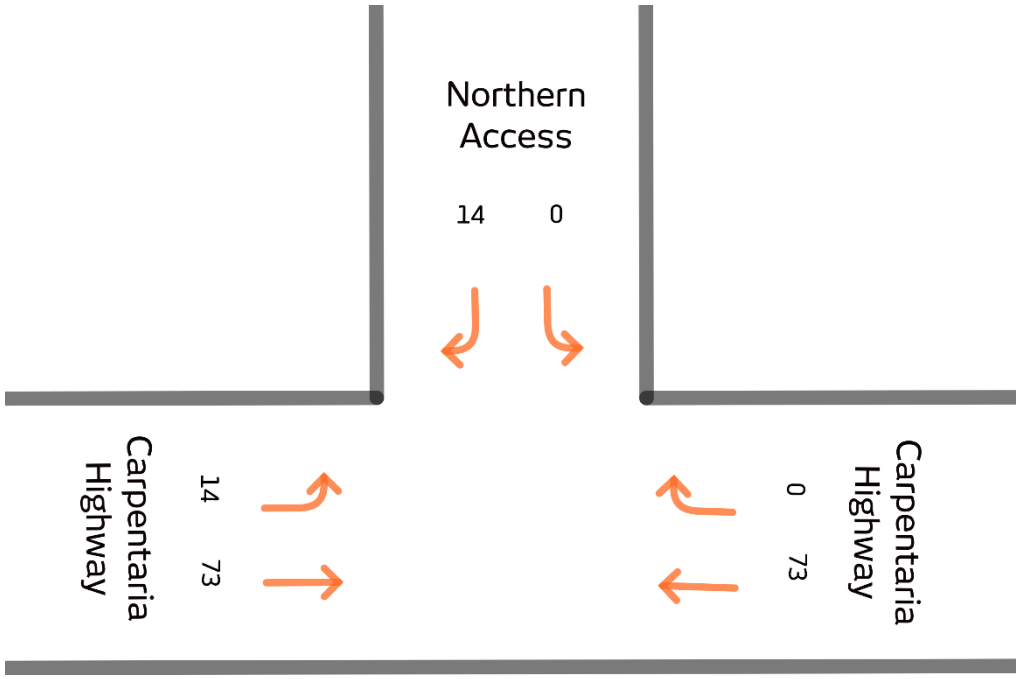


Figure 3 - Total daily traffic volumes forecast at the project area's northern access (August 2024).

5. TRANSPORTATION AND ANALYSIS

5.1 CAPACITY AND LEVEL OF SERVICE

5.1.1 CARPENTARIA HIGHWAY/PROJECT AREA ACCESS POINTS

Given the relatively low number of movements forecast to be associated with a given access, the existing access points will operate satisfactorily as a priority controlled (Give Way) T-intersections.

However, in order to determine if an intersection treatment is warranted, an assessment has been undertaken against the requirements of the relevant Austroads' Guidelines (Figure 2.26 (a) of the "*Guide to Traffic Management – Part 6: Intersections, Interchanges and Crossings*").

Based upon the forecast peak hour traffic volumes (10% of the volumes identified in Figure 2 or Figure 3), the Austroads' Guide identifies that Basic Left-turn (BAL) and Basic Right-turn (BAR) treatments are required (i.e. no separated turn lanes are warranted).

It is understood that the southern and northern access points have been constructed with such treatments as part of earlier exploration works (undertaken by Imperial Oil and Gas). As such, it is therefore considered that the existing site access points are satisfactory to continue accommodating project-related traffic volumes.

5.2 TRANSPORTATION SAFETY

5.2.1 ROAD GEOMETRY

As identified in Section 3.3.1, the Carpentaria Highway generally comprises a single sealed traffic lane within the centre of the roadway, with wide unsealed shoulders on both sides. The Austroads' "*Guide to Road Design – Part 3: Geometric Design*" identifies that on roads "*... where traffic volumes less than 150 vehicles per day and, particularly, where terrain is open, single carriageways may be used*". Such a scenario requires that "*... one or both vehicles must have the outer wheels on the shoulders while passing*".

As identified in Section 4.6, traffic volumes on the Carpentaria Highway are forecast to exceed 150 vehicles per day during a number of months throughout the drilling and operations program. However, taking into account the fluctuations in traffic volumes (i.e. an Annual Average Daily Traffic (AADT) volume), traffic volumes are forecast to be within the general vicinity of 150 vehicles per day.

Of particular note, the section of the Carpentaria Highway between the project area's southern and northern access points is forecast to experience the highest AADT of 157 vpd.

However, it should be highlighted that existing traffic volumes are forecast to exceed 150 vehicles per day on a number of months in a given year. It is understood that DIPL is aware of this and hence the continual upgrade of the Carpentaria Highway currently being undertaken and earmarked in the future. Further discussion in regard to the Carpentaria Highway's geometry and associated upgrade is provided in Section 6.1.1.

5.2.2 SIGHT DISTANCE

A desktop sight distance assessment has been undertaken at subject access points on the Carpentaria Highway. Sight distance assessments have been undertaken based upon the requirements of Austroads' "*Guide to Road Design – Part 3: Geometric Design*" and "*Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections*" for both cars and type two road trains. This is due to the differing speed environments in which the respective vehicles are permitted to travel.

Specifically, light vehicles are permitted to travel at the posted speed limit of 100 km/h and, as such, a design speed of 110 km/h has been adopted. However, with regard to road trains, such vehicles are restricted (by law and typically by a governing device installed within the vehicle) to a maximum of 90 km/h. As such, a design speed of 100 km/h has been adopted for such vehicles.

Due to the rural and remote nature of the Carpentaria Highway, an increased driver reaction time of 2.5 seconds (applicable to roads with large distances between towns and isolated features) has been adopted in the assessments.

A standard deceleration coefficient of 0.36 has been adopted for the assessment with the exception of the consideration of sight distance provisions for type two road trains (such as triple road trains), for which a deceleration coefficient of 0.26 has been adopted.

On the basis of the above, there would be a sight distance requirement of 301 m for light vehicles (based upon a design speed of 110 km/h) and 305 m for type two road trains (based upon a design speed of 100 km/h).

5.2.2.1 Carpentaria Highway/North Access

At the North Access/Carpentaria Highway intersection, the following sight distances were recorded (based upon a desktop inspection):

- West - in excess of 500 m; and

- East – in excess of 500 m.

On the basis of the available sight distances identified above, adequate sight distance will be retained at the existing North Access/Carpentaria Highway intersection for both light vehicles and type two road trains.

Further to the above, it is understood that representatives from DIPL and InGuage have previously met on-site at this access location in order to ensure that appropriate sight distances could be achieved. DIPL previously confirmed their acceptance of this access location with regard in relation to available sight distance.

5.2.2.2 Carpentaria Highway/South Access

At the South Access/Carpentaria Highway intersection, the following sight distances were recorded (based upon a desktop inspection):

- West - in excess of 500 m; and
- East – in excess of 500 m.

On the basis of the available sight distances identified above, adequate sight distance provisions will be achieved at the South Access/Carpentaria Highway intersection for both light vehicles and type two road trains.

Further to the above, it is noted that this intersection was recently approved by DIPL and subsequently constructed in 2020. Similarly to North Access, approval for this intersection would have also comprised assessment of sight distances which, noting that the intersection received approval, appears to have been accepted by DIPL. It is therefore considered that adequate sight distance is achieved and will remain acceptable to DOT.

5.2.3 INTERSECTION SPACING

The Department of Infrastructure, Planning and Logistics' (DIPL's) "*Performance and Design Standards for Northern Territory Government Roads*" identifies minimum access spacings for 'rural arterial' roads (such as the Carpentaria Highway) of 1.0 km when the access points are located on opposite sides, or 2.0 km when access points are located on the same side.

5.2.3.1 Carpentaria Highway/North Access

As noted above, representatives from DIPL are understood to have previously meet with representatives from InGuage to determine the feasibility of the subject access location. It is understood that agreement between DIPL and

InGuage was reached in that the North Access complies with DIPL's access spacing requirements.

5.2.3.2 Carpentaria Highway/South Access

Again, the South Access is an existing access which was approved and constructed in 2020. The access is understood to comply with DIPL's access spacing requirements.

5.2.4 OVERSIZE OR OVERMASS VEHICLES

Imperial Oil and Gas intend to operate a small portion of oversize and/or overmass vehicles along the Carpentaria Highway. It is understood that Imperial Oil and Gas has applied to the Northern Territory Government for an 'oversize or overmass permit', and has since received a permit, to allow such vehicles to travel to/from the subject wells.

As part of the permit, it is understood that pilot/escorts will be required (in front of and behind) when the vehicle is oversize to forewarn vehicles approaching the oversize vehicle. Such requirements are common and considered to be acceptable with regard to the moving of oversize loads.

6. IMPROVEMENT ANALYSIS

6.1 IMPROVEMENTS TO ACCOMMODATE EXISTING TRAFFIC

6.1.1 CARPENTARIA HIGHWAY

As noted in Section 4.6, existing traffic forecasts (i.e. excluding volumes associated with Imperial Oil and Gas' subject drilling and operations program) are anticipated to exceed 150 vehicles per day on a number of months (i.e. volumes in excess of those anticipated for a two-way roadway with a single-width seal).

As outlined in Section 3.3.1, DIPL has engaged Exact Contracting to upgrade the Carpentaria Highway up to chainage 109 km to a two-lane carriageway, with future upgrade works to chainage 175 km earmarked. DIPL has not stated whether further upgrade works will be undertaken, however it would be expected that the continual (rolling) upgrades will be undertaken into the future beyond this point, eventually connecting to the existing two-lane carriageway east of the project area.

It should be noted that a basic two-lane carriageway has the ability to accommodate an AADT in the order of 500 to 1,000 vpd (based upon Table 4.5 of Austroads' "*Guide to Road Design – Part 3: Geometric Design*").

Taking this into consideration, it is therefore considered that DIPL is appropriately managing the geometry of the Carpentaria Highway with respect to existing ('base') traffic volumes.

6.1.2 CARPENTARIA HIGHWAY/NORTH ACCESS

Given the low number of movements along the Carpentaria Highway, the low number of movements expected to be associated with the existing intersection (i.e. turning movements) and the intersection's configuration with BAL/BAR treatments, no upgrades are warranted to accommodate existing volumes.

6.1.3 CARPENTARIA HIGHWAY/SOUTH ACCESS

Given the low number of movements along the Carpentaria Highway, the low number of movements expected to be associated with the existing intersection (i.e. turning movements) and the intersection's configuration with BAL/BAR treatments, no upgrades are warranted to accommodate existing volumes.

6.2 IMPROVEMENTS TO ACCOMMODATE BACKGROUND TRAFFIC

As noted in Section 6.1.1, DIPL is currently undertaking upgrade (carriageway widening) works along the Carpentaria Highway, with works earmarked for chainage 175 km. Additional works would be expected beyond this point, connecting through to the existing two-way seal located within the vicinity of the Carpentaria Highway/Tablelands Highway intersection.

These upgrades are considered appropriate to accommodate future traffic growth on the Carpentaria Highway.

No further improvements (apart from general road maintenance) are considered to be warranted in order to accommodate 'background traffic'.

6.3 IMPROVEMENTS TO ACCOMMODATE TOTAL TRAFFIC

6.3.1 CARPENTARIA HIGHWAY

As noted in Section 3.3.1, DIPL is currently undertaking continual upgrade works along the Carpentaria Highway to widen the existing single-width carriageway to a two-way width, currently accounted for up to chainage 175 km. These works are being undertaken to accommodate existing traffic on the Carpentaria Highway, as well as account for continual growth on the network (as is highlighted in Section 3.3.2).

As noted in Section 6.1.1, the widened (two-lane) carriageway will have the ability to accommodate an AADT up to in the order of 500 to 1,000 vpd upon completion.

Whilst it is acknowledged that the upgrades will not be complete upon commencement (and cease) of Imperial Oil and Gas' drilling and operations program, it expected that the highway will be occupied by completed (two-lane) carriageway or be under roadworks traffic control through to chainage 140 km throughout the duration of the subject program.

As noted in Section 4.1, the southern access is located at chainage 202 km, thereby leaving approximately 62 km of existing single-width seal not affected by roadworks traffic control.

The National Heavy Vehicle Regulator (NHVR) recommends a maximum desirable distance of 50 km between overtaking opportunities on roads with an AADT of between 100 and 500 vehicles per day (as is forecast on the Carpentaria Highway).

It is therefore considered that this is a guideline and not a statutory requirement, subject to unique site characteristics and other relevant information (such as pending upgrade works).

West of the project area's southern access, the additional vehicle movements forecast to be generated throughout the program lifecycle increase monthly average traffic volumes beyond 100 vpd on only two months (November 2024 and November 2025). It is therefore considered that Imperial Oil and Gas' drilling

and operations program will have minimal impact on the existing road operating environment in terms of impacting upon traffic volume 'thresholds'.

Furthermore, it is reiterated that the Carpentaria Highway is earmarked for upgrade (widening) through to chainage 175 km, leaving approximately 27 km between the site's southern access and the end of the upgraded carriageway (as is known at the time of writing). It is therefore not considered that works within this section of roadway are of value or logic, noting the impending rework of this section of highway.

Whilst outside of the project lifecycle, the remaining 27 km falls well within the desirable maximum distance, as well as the recommended average distance, between overtaking opportunities as per relevant NHVR guidelines.

Between the project area's northern and southern access point, traffic volumes on the Carpentaria Highway will be concentrated, with the associated AADT higher than those both east and west of the project area. A relatively high proportion of movements along this section are forecast to be associated with Imperial Oil and Gas' operations.

In order to reduce the operational risk associated with the two-way movement of commercial vehicles along this section, it is recommended that a 'call-up' radio protocol be implemented by Imperial Oil and Gas. It is envisaged that the protocol would work using two-way radio communication (commonly fitted within construction vehicles), whereby a driver approaching the Carpentaria Highway would radio ahead to see if any project-related vehicles (light or commercial) are travelling along the subject section of the Carpentaria Highway (i.e. between the northern and southern site access points), and their relative direction of travel (i.e. eastbound or westbound).

Should no radio response be received, the driver may then proceed from the private roadway onto the Carpentaria Highway through the subject section. Should a response be received, and the direction of travel be conflicting (i.e. for example, the radioed driver is travelling westbound when the exiting driver wishes to travel east), the exiting driver would be required to wait until the vehicle has passed the alternate access.

Employment of such a system will ensure that no opposing project-related vehicles are using the subject section of the Carpentaria Highway simultaneously, thereby significantly minimising potential conflict risk.

Through initial liaison with Imperial Oil and Gas (undertaken by InGauge), it is understood that such a protocol can be readily incorporated into existing

operational requirements. It is therefore expected that such a system will be implemented, affecting all project-related travel between the two access points.

Acknowledging that a large portion of traffic along this section may also be non-project related traffic, it is also recommended that a reduced speed limit be implemented between the northern and southern access points, along with appropriate warning signage (particularly 'Trucks Entering' signage). Such measures will further assist in mitigating potential conflicts along this section of the Carpentaria Highway.

6.3.2 CARPENTARIA HIGHWAY/NORTHERN ACCESS

The existing northern access intersection on the Carpentaria Highway is understood to have been constructed with BAL and BAR treatments to appropriately accommodate movements associated with the largest vehicles anticipated to access the site (53.5 m Road Trains).

The existing intersection would therefore meet (and/or exceed) the layouts shown on the Northern Territory Government's *"Guide to Rural Intersections Treatments Sheet 1 – Types 1 & 2"* (drawing no. C(S)1842-0).

6.3.3 CARPENTARIA HIGHWAY/SOUTHERN ACCESS

The existing southern access intersection is understood to have been constructed with BAL and BAR treatments. Furthermore, the intersection is understood to have been designed to accommodate Road Trains up to 53.5 m in length (the largest vehicle required to use the intersection under the subject proposal). Accordingly, no further improvements are proposed to the intersection.

6.4 EVALUATION

On the basis of the above, it is considered that the additional vehicle movements generated by the proposed drilling and operations program will generally be adequately accommodated with the following measure:

- an internal project-related communication protocol shall be established to assist drivers when accessing the Carpentaria Highway (including approaching from west of the southern access, or east of the northern access);
- a reduced speed limit affecting the section of the Carpentaria Highway between the northern and southern access points shall be considered (in conjunction with DIPL);
- advanced warning signage shall be considered on the Carpentaria Highway to forewarn approaching non-project related traffic of the potential increased presence of large commercial vehicles; and

- should operations be required during the 'wet season', additional work zone traffic management provisions should be implemented (for instance, reduction in the posted speed limit in the vicinity of the access points). Additional maintenance on the condition of the access points may also be required.

7. FINDINGS AND RECOMMENDATIONS

7.1 SITE ACCESSIBILITY

Vehicle access via the project area will be provided via two existing T-intersections on the Carpentaria Highway. The intersections were previously designed to accommodate the turn paths of heavy vehicles such as 53.5 m Road Trains and shall continue to do so. The intersections (access points) comply with the requirements of the Austroads' Guidelines in regard to turning warrants and sight distances.

7.2 TRANSPORTATION IMPACTS

Based upon information provided by InGauge, the additional number of vehicle movements associated with Imperial Oil and Gas' drilling and operations program will generally be accommodated on the Carpentaria Highway. Whilst volumes are likely to exceed the theoretical 150 vpd 'limit' identified by the Austroads Guidelines, upgrade (widening) works are being undertaken by DIPL independently of the subject drilling and operations program. It is therefore considered that appropriate actions are in place to improve the operational conditions of the Carpentaria Highway.

Furthermore, the NHVR guidelines recommend desirable distances between widened two-way opportunities. Upon completion of the known upgrade works, the remaining distance to the site's westernmost access will be less than the average recommended (with respect to traffic volume). Whilst it is acknowledged that the upgrade will not be complete at the commencement of the subject program, it is anticipated that a large portion of the highway will be under roadworks traffic control (i.e. a reduced speed limit). It is therefore considered that an appropriate management strategy will already be largely in place.

Between the two site intersections, traffic impacts will be minimised and managed through the implementation of a radio 'call-up' protocol. It is understood that Imperial Oil and Gas are accepting of such a protocol being implemented, and commonly apply similar practises internally within their various site.

Additional speed limit reductions and advance warning signage shall also be considered to assist with the minimising the project's impact upon general public traffic. This shall be further considered in conjunction with DIPL.

Upon implementation of these factors, it is considered that traffic volumes associated with the proposed drilling and operations program will be readily accommodated.

Furthermore, the existing intersections treatments are considered adequate to accommodate the forecast movements associated with the drilling and operations program.

7.3 ROADWAY IMPROVEMENTS

7.3.1 CARPENTARIA HIGHWAY

On-going inspections and maintenance should be undertaken to ensure the integrity of both the sealed carriageway and unsealed shoulders is of an appropriate standard in the vicinity of the three access points.

7.3.2 CARPENTARIA HIGHWAY/NORTHERN ACCESS

Refer to Section 6.3.2.

7.3.3 CARPENTARIA HIGHWAY/SOUTHERN ACCESS

Refer to Section 6.3.3.

7.4 REPORTING

This report has been prepared in accordance with Austroads' "*Guide to Traffic Management – Part 12: Impacts of Developments*". Specifically, this report has been prepared based upon the reporting structure outlined in Appendix C of the Austroads' Guide.

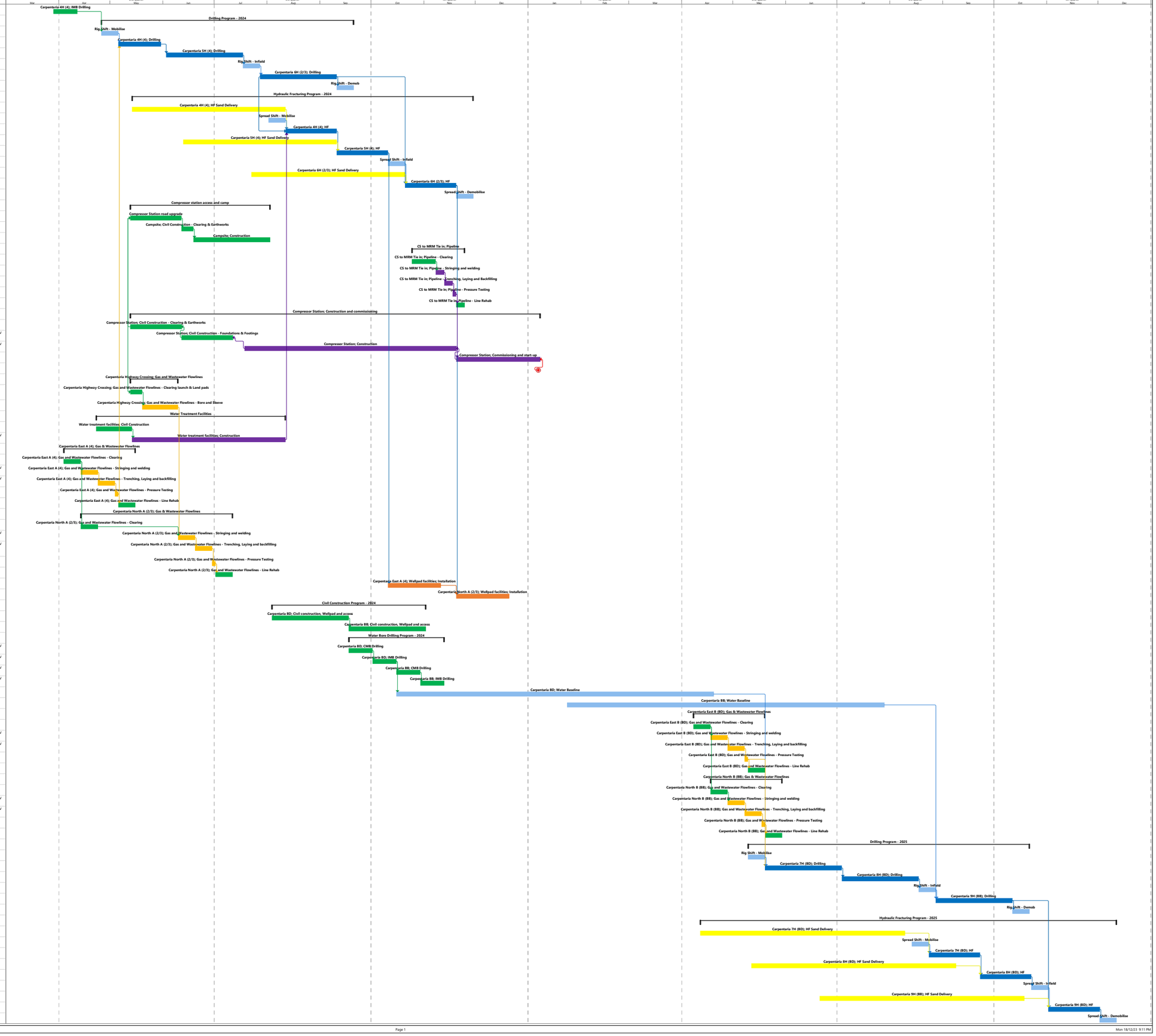
APPENDIX A

IMPERIAL OIL AND GAS - DRILLING AND OEPRATIONS PROGRAM

PREPARED BY INGAUGE

EP187 - EMP IMP5

ID	Task Name	Start	Duration	Finish	Predecessors	Heavy Vehicle information	Light Vehicle information	Intersection used	Via
1	Carpentaria 4H (4); IMB Drilling	Fri 29/03/24	14 days	Thu 11/04/24		5 Truck movements at start and end	4 LV movements per day	South	Cape Crawford
2	**Drilling Program - 2024**	**Fri 26/04/24**	**148 days**	**Fri 20/09/24**					
3	Rig Shift - Mobilise	Fri 26/04/24	10 days	Sun 5/05/24	1FS+14 days	30 Truck movements	60 LV Movements	South	Hi-Way Inn
4	Carpentaria 4H (4); Drilling	Mon 6/05/24	25 days	Thu 30/05/24	3,45	20 truck movements at the start, 4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
5	Carpentaria SH (4); Drilling	Mon 3/06/24	45 days	Wed 17/07/24	4FS+3 days	20 truck movements at the start, 4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
6	Rig Shift - Infield	Thu 18/07/24	10 days	Sat 27/07/24	5	30 Truck movements	60 LV Movements	North, South	
7	Carpentaria 6H (2/3); Drilling	Sun 28/07/24	45 days	Tue 10/09/24	6	20 truck movements at the start, 4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	North	Hi-Way Inn
8	Rig Shift - Demob	Wed 11/09/24	10 days	Fri 20/09/24	7	30 Truck movements	60 LV Movements	North	Hi-Way Inn
9	**Hydraulic Fracturing Program - 2024**	**Tue 14/05/24**	**200 days**	**Fri 29/11/24**					
10	Carpentaria 4H (4); HF Sand Delivery	Tue 14/05/24	90 days	Sun 11/08/24		200 Truck movements		South	High-Way Inn
11	Spread Shift - Mobilise	Fri 2/08/24	10 days	Sun 11/08/24		30 Truck movements	60 LV Movements	South	Hi-Way Inn
12	Carpentaria 4H (4); HF	Mon 12/08/24	30 days	Tue 10/09/24	11,10,4	4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
13	Carpentaria SH (4); HF Sand Delivery	Thu 13/06/24	90 days	Tue 10/09/24		200 Truck movements		South	High-Way Inn
14	Carpentaria SH (4); HF	Wed 11/09/24	30 days	Thu 10/10/24	12,13	4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
15	Spread Shift - Infield	Fri 11/10/24	10 days	Sun 20/10/24	14	30 Truck movements	60 LV Movements	North, South	
16	Carpentaria 6H (2/3); HF Sand Delivery	Tue 23/07/24	90 days	Sun 20/10/24		200 Truck movements		North	High-Way Inn
17	Carpentaria 6H (2/3); HF	Mon 21/10/24	30 days	Tue 19/11/24	15,7FS+4 days,16	4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	North	Hi-Way Inn
18	Spread Shift - Demobilise	Wed 20/11/24	10 days	Fri 29/11/24	17	30 Truck movements	60 LV Movements	North	Hi-Way Inn
19	**Compressor station access and camp**	**Mon 13/05/24**	**82 days**	**Fri 2/08/24**					
20	Compressor Station road upgrade	Mon 13/05/24	30 days	Tue 11/06/24	30SS	10 Truck movements at start and end, 2 truck movements per day for duration	4 LV movements per day	South	Cape Crawford
21	Campsite; Civil Construction - Clearing & Earthworks	Wed 12/06/24	7 days	Tue 18/06/24	20	10 Truck movements at start, 2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
22	Campsite; Construction	Wed 19/06/24	45 days	Fri 2/08/24	21	5 Truck movements at start, 2 truck movements per week for duration	4 LV movements per day	South	High-Way Inn
23	**CS to MRM Tie in; Pipeline**	**Fri 25/10/24**	**31 days**	**Sun 24/11/24**					
24	CS to MRM Tie in; Pipeline - Clearing	Fri 25/10/24	14 days	Thu 7/11/24		2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
25	CS to MRM Tie in; Pipeline - Stringing and welding	Fri 8/11/24	5 days	Tue 12/11/24	24	5 Truck movements at start, 2 truck movements at end	4 LV movements per day	South	Cape Crawford
26	CS to MRM Tie in; Pipeline - Trenching, Laying and Backfilling	Wed 13/11/24	5 days	Sun 17/11/24	25	2 Truck movements at start, 2 truck movements at end	4 LV movements per day	South	High-Way Inn
27	CS to MRM Tie in; Pipeline - Pressure Testing	Mon 18/11/24	2 days	Tue 19/11/24	26	2 Truck movements	4 LV movements per day	South	High-Way Inn
28	CS to MRM Tie in; Pipeline - Line Rehab	Wed 20/11/24	5 days	Sun 24/11/24	27	2 truck movements per week for duration	4 LV movements per day	South	High-Way Inn
29	**Compressor Station; Construction and commissioning**	**Mon 13/05/24**	**240 days**	**Tue 7/01/25**					
30	Compressor Station; Civil Construction - Clearing & Earthworks	Mon 13/05/24	30 days	Wed 12/06/24	31SF	2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
31	Compressor Station; Civil Construction - Foundations & Footings	Wed 12/06/24	30 days	Fri 12/07/24	32SF-7 days	5 Truck movements at start and end, 2 truck movements per week for duration	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
32	Compressor Station; Construction	Fri 19/07/24	4 mons	Wed 20/11/24	33SF	50 Truck movements in first month, + 2 truck movements per week for duration	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
33	Compressor Station; Commissioning and start-up	Wed 20/11/24	7 wks	Tue 7/01/25	34SF,27		4 LV movements per day	South	Cape Crawford
34	Gas Export	Tue 7/01/25	1 day	Tue 7/01/25					
35	**Carpentaria Highway Crossing; Gas and Wastewater Flowlines**	**Mon 13/05/24**	**28 days**	**Sun 9/06/24**					
36	Carpentaria Highway Crossing; Gas and Wastewater Flowlines - Clearing launch & Land pads	Mon 13/05/24	7 days	Sun 19/05/24	2055	2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
37	Carpentaria Highway Crossing; Gas and Wastewater Flowlines - Bore and Sleeve	Mon 20/05/24	21 days	Sun 9/06/24	36	2 Truck movements at start and end, 1 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
38	**Water Treatment Facilities**	**Tue 23/04/24**	**111 days**	**Sun 11/08/24**					
39	Water treatment facilities; Civil Construction	Tue 23/04/24	21 days	Mon 13/05/24		2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
40	Water treatment facilities; Construction	Tue 14/05/24	90 days	Sun 11/08/24	39	10 Truck movements at start, 2 truck movements per week for duration	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
41	**Carpentaria East A (4); Gas & Wastewater Flowlines**	**Thu 4/04/24**	**42 days**	**Wed 15/05/24**					
42	Carpentaria East A (4); Gas and Wastewater Flowlines - Clearing	Thu 4/04/24	10 days	Sat 13/04/24		2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
43	Carpentaria East A (4); Gas and Wastewater Flowlines - Stringing and welding	Sun 14/04/24	10 days	Tue 23/04/24	42	10 Truck movements at start, 2 truck movements per day	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
44	Carpentaria East A (4); Gas and Wastewater Flowlines - Trenching, Laying and backfilling	Wed 24/04/24	10 days	Fri 3/05/24	43	10 Truck movements at start	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
45	Carpentaria East A (4); Gas and Wastewater Flowlines - Pressure Testing	Sat 4/05/24	2 days	Sun 5/05/24	44		4 LV movements per day	South	Cape Crawford
46	Carpentaria East A (4); Gas and Wastewater Flowlines - Line Rehab	Mon 6/05/24	10 days	Wed 15/05/24	45	2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
47	**Carpentaria North A (2/3); Gas & Wastewater Flowlines**	**Sun 14/04/24**	**89 days**	**Thu 11/07/24**					
48	Carpentaria North A (2/3); Gas and Wastewater Flowlines - Clearing	Sun 14/04/24	10 days	Tue 23/04/24	42	2 truck movements per week for duration	4 LV movements per day	North	Cape Crawford
49	Carpentaria North A (2/3); Gas and Wastewater Flowlines - Stringing and welding	Mon 10/06/24	10 days	Wed 19/06/24	48,37	10 Truck movements at end, 2 truck movements per day for duration	4 LV movements per day	North	HV Hi-Way Inn, LV Cape Crawford
50	Carpentaria North A (2/3); Gas and Wastewater Flowlines - Trenching, Laying and backfilling	Thu 20/06/24	10 days	Sat 29/06/24	49	10 Truck movements at end	4 LV movements per day	North	HV Hi-Way Inn, LV Cape Crawford
51	Carpentaria North A (2/3); Gas and Wastewater Flowlines - Pressure Testing	Sun 30/06/24	2 days	Mon 1/07/24	50		4 LV movements per day	North	Cape Crawford
52	Carpentaria North A (2/3); Gas and Wastewater Flowlines - Line Rehab	Tue 2/07/24	10 days	Thu 11/07/24	51	2 truck movements per week for duration	4 LV movements per day	North	Cape Crawford
53	Carpentaria East A (4); Wellpad facilities; Installation	Fri 11/10/24	1 mon	Sun 10/11/24	14				
54	Carpentaria North A (2/3); Wellpad facilities; Installation	Wed 20/11/24	1 mon	Fri 20/12/24	53,17				
55	**Civil Construction Program - 2024**	**Sun 4/08/24**	**90 days**	**Fri 1/11/24**					
56	Carpentaria BD; Civil construction, Wellpad and access	Sun 4/08/24	45 days	Tue 17/09/24		2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
57	Carpentaria BB; Civil construction, Wellpad and access	Wed 18/09/24	45 days	Fri 1/11/24	56	10 Truck movements at end, 2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
58	**Water Bore Drilling Program - 2024**	**Wed 18/09/24**	**56 days**	**Tue 12/11/24**					
59	Carpentaria BD; CMB Drilling	Wed 18/09/24	14 days	Tue 1/10/24		5 Truck movements at start, 1 truck movement per week	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
60	Carpentaria BD; IMB Drilling	Wed 2/10/24	14 days	Tue 15/10/24	59	1 truck movement per week	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
61	Carpentaria BB; CMB Drilling	Wed 16/10/24	14 days	Tue 29/10/24	60	5 Truck movements South to North at start, 1 truck movement per week	4 LV movements per day	North	HV Hi-Way Inn, LV Cape Crawford
62	Carpentaria BB; IMB Drilling	Wed 30/10/24	14 days	Tue 12/11/24	61	5 Truck movements at end, 1 truck movement per week	4 LV movements per day	North	HV Hi-Way Inn, LV Cape Crawford
63	Carpentaria BD; Water Baseline	Wed 16/10/24	6 mons	Sat 19/04/25	60				
64	Carpentaria BB; Water Baseline	Fri 24/01/25	6 mons	Mon 28/07/25					
65	**Carpentaria East B (BD); Gas & Wastewater Flowlines**	**Tue 8/04/25**	**42 days**	**Mon 19/05/25**					
66	Carpentaria East B (BD); Gas and Wastewater Flowlines - Clearing	Tue 8/04/25	10 days	Thu 17/04/25		2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
67	Carpentaria East B (BD); Gas and Wastewater Flowlines - Stringing and welding	Fri 18/04/25	10 days	Sun 27/04/25	66	10 Truck movements at start, 2 truck movements per day for duration	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
68	Carpentaria East B (BD); Gas and Wastewater Flowlines - Trenching, Laying and backfilling	Mon 28/04/25	10 days	Wed 7/05/25	67	10 Truck movements at start	4 LV movements per day	South	HV Hi-Way Inn, LV Cape Crawford
69	Carpentaria East B (BD); Gas and Wastewater Flowlines - Pressure Testing	Thu 8/05/25	2 days	Fri 9/05/25	68		4 LV movements per day	South	Cape Crawford
70	Carpentaria East B (BD); Gas and Wastewater Flowlines - Line Rehab	Sat 10/05/25	10 days	Mon 19/05/25	69	2 truck movements per week for duration	4 LV movements per day	South	Cape Crawford
71	**Carpentaria North B (BB); Gas & Wastewater Flowlines**	**Fri 18/04/25**	**42 days**	**Thu 29/05/25**					
72	Carpentaria North B (BB); Gas and Wastewater Flowlines - Clearing	Fri 18/04/25	10 days	Sun 27/04/25	66	2 truck movements per week for duration	4 LV movements per day	North	Cape Crawford
73	Carpentaria North B (BB); Gas and Wastewater Flowlines - Stringing and welding	Mon 28/04/25	10 days	Wed 7/05/25	72	10 Truck movements at end, 2 truck movements per day for duration	4 LV movements per day	North	HV Hi-Way Inn, LV Cape Crawford
74	Carpentaria North B (BB); Gas and Wastewater Flowlines - Trenching, Laying and backfilling	Thu 8/05/25	10 days	Sat 17/05/25	73	10 Truck movements at end	4 LV movements per day	North	HV Hi-Way Inn, LV Cape Crawford
75	Carpentaria North B (BB); Gas and Wastewater Flowlines - Pressure Testing	Sun 18/05/25	2 days	Mon 19/05/25	74		4 LV movements per day	North	Cape Crawford
76	Carpentaria North B (BB); Gas and Wastewater Flowlines - Line Rehab	Tue 20/05/25	10 days	Thu 29/05/25	75	2 truck movements per week for duration	4 LV movements per day	North	Cape Crawford
77	**Drilling Program - 2025**	**Sat 10/05/25**	**165 days**	**Tue 21/10/25**					
78	Rig Shift - Mobilise	Sat 10/05/25	10 days	Mon 19/05/25		30 Truck movements	60 LV Movements	South	Hi-Way Inn
79	Carpentaria 7H (BD); Drilling	Tue 20/05/25	45 days	Thu 3/07/25	78,69FS-20 days,63	20 truck movements at the start, 4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
80	Carpentaria 8H (BD); Drilling	Fri 4/07/25	45 days	Sun 17/08/25	79	20 truck movements at the start, 4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
81	Rig Shift - Infield	Mon 18/08/25	10 days	Wed 27/08/25	80	30 Truck movements	60 LV Movements	North, South	
82	Carpentaria 9H (BB); Drilling	Thu 28/08/25	45 days	Sat 11/10/25	81,64FS-20 days	20 truck movements at the start, 4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	North	Hi-Way Inn
83	Rig Shift - Demob	Sun 12/10/25	10 days	Tue 21/10/25	82	30 Truck movements	60 LV Movements	North	Hi-Way Inn
84	**Hydraulic Fracturing Program - 2025**	**Sat 12/04/25**	**244 days**	**Thu 11/12/25**					
85	Carpentaria 7H (BD); HF Sand Delivery	Sat 12/04/25	120 days	Sat 9/08/25		200 Truck movements		South	High-Way Inn
86	Spread Shift - Mobilise	Thu 14/08/25	10 days	Sat 23/08/25		30 Truck movements	60 LV Movements	South	Hi-Way Inn
87	Carpentaria 7H (BD); HF	Sun 24/08/25	30 days	Mon 22/09/25	85FS+1 days,86	4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
88	Carpentaria 8H (BD); HF Sand Delivery	Mon 12/05/25	120 days	Mon 8/09/25		200 Truck movements		South	High-Way Inn
89	Carpentaria 8H (BD); HF	Tue 23/09/25	30 days	Wed 22/10/25	87,88FS-4 days	4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	South	Hi-Way Inn
90	Spread Shift - Infield	Thu 23/10/25	10 days	Sat 1/11/25	89	30 Truck movements	60 LV Movements	North, South	
91	Carpentaria 9H (BB); HF Sand Delivery	Sat 21/06/25	120 days	Sat 18/10/25		200 Truck movements		North	High-Way Inn
92	Carpentaria 9H (BD); HF	Sun 2/11/25	30 days	Mon 1/12/25	82FS+2 days,90	4 truck movements per week; Food, Water, Fuel, Waste	4 LV movements per day	North	Hi-Way Inn
93	Spread Shift - Demobilise	Tue 2/12/25	10 days	Thu 11/12/25	92	30 Truck movements	60 LV Movements	North	Hi-Way Inn



Imperial Oil & Gas

EP 187

Appendix 12

Bushfire Management Plan

IMP 5-3

Document Control

Date	Rev	Description	Author(s)	Reviewed	Approved
05/02/24	1	Issued as an Appendix of EMP IMP 5-1	Vic F.	Peter S., Rachel L., Kelvin W., Nicholas F. Trent S., Vicky C.	Robin P.
25/07/24	2	Issued as an Appendix of EMP IMP 5-2	inGauge Energy	Imperial Oil & Gas	Imperial Oil & Gas
12/11/24	3	Approved for use as an Appendix of EMP IMP 5-3	inGauge Energy	Imperial Oil & Gas	Imperial Oil & Gas

Table of Contents

List of Tables

List of Figures

1 Introduction

This Bushfire Management Plan has been developed as part of the suite of documents under the EMP IMP 5-3 and to comply with Section A.3.7 of the *Code of Practice: Onshore Petroleum Activities in the Northern Territory, 2019* (*the Code*). This Bushfire Management Plan applies to the Activity to be carried out in the CPP Area.

2 Background

The CPP Area is in the Australian tropical savannah zone and is generally comprised of open woodland with grassland. Historically, the CPP Area has been regularly burnt using Traditional Owner's fire management practices. Regular burns reduce the risk of significant hot fires and allow for a cooler, less intense burn.

More recently, the CPP Area has been increasingly used for cattle grazing, and as a consequence, many new fence lines and fire breaks have been constructed through the exploration area. As a part of grazing management practices towards the end of the dry season, the CPP Area is regularly burnt to reduce fuel loads and promote new pasture growth through the following wet season. Further background bushfire information is provided in the EMP **Section 4.10.4**.

The Activity includes clearing 226 ha, the construction of new well pads, access tracks, gravel pits and extending existing gravel pits, water bore pads, and well pads. Flowlines and supporting infrastructure, including the Carpentaria Gas Plant (CGP), Water Handling Station (WHS), and campsite, will also be constructed.

3 Analysis of Baseline Information

3.1 Information Source

Baseline fire information has been sourced from the North Australia and Rangelands Fire Information (NAFI) website [NAFI, 2024]. These data have been reviewed and analysed, and the results used in the information presented below. As this Activity will be carried out over an extended period, this document will be reviewed annually for currency of baseline information.

3.2 Fire Frequency and Time Since Last Burn

A fire history report (2001-2023) was generated from the NAFI database for the CPP Area, which encompasses the Sturt Plateau bioregion (~ 98,500 km^2) to the west and the Gulf Fall and Uplands bioregion (~112,500 km^2) to the east and north. The bioregional annual burn history is shown in EMP **Figure 4.10—3**. The report reveals that large-scale fires occur roughly every five to six years in the region. On average, during the last decade, approximately 6,500-8,000 km^2 were burnt each year in each bioregion. This equates to approximately 7% of the total area in each bioregion burned annually. Bushfires in both bioregions in 2023 were particularly widespread. Parts of the CPP Area have been burnt at different frequencies between 2013 and 2022 (**Figure 3—1**). The times since the last fires for the same period are shown in **Figure 3—2**.

3.3 Annual Fuel Load Assessment

The potential fuel load is a key driver of fire behaviour, fire-line intensity, and bushfire hazard. The criteria for assessment of fuel load are provided in the CSIRO's *Bushfire Best Practice Guide* [CSIRO, 2024] and includes:

- Fuel quantity (tonnes of fuel per ha).
- Vegetation assessment, i.e. grassland, shrubland, scrub, open woodland or forest.
- Fuel size and shape, e.g. fine fuel such as tussock grass that burns quickly, woody shrubs that burn moderately (e.g. Turpentine) and coarse fuel (fallen logs, trunks) that burn more slowly.
- Fuel vertical structure, i.e. height and density of tussock grass and mid-story shrubs, closed or open canopy, separation of understorey to canopy.
- Moisture content, including time since the last rain, strong winds, high temperatures, and low humidity, which will decrease moisture level.

A fuel load assessment will be conducted prior to the establishment of any camp, pad or work area. It will be reviewed annually at the conclusion of the Wet Season, for as long as the infrastructure remains in place.

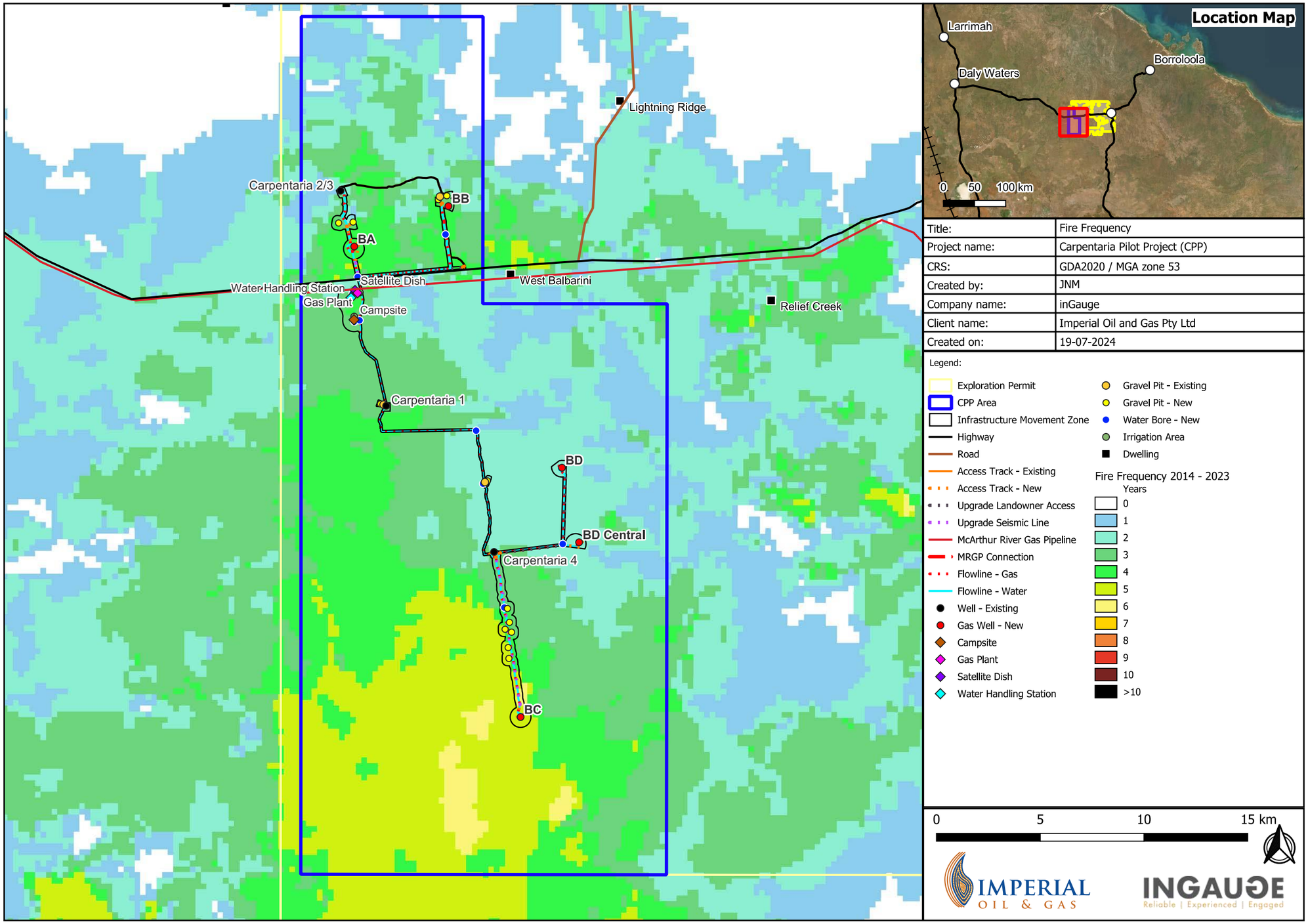


Figure 3—1 CPP Area Fire Frequency 2013-2022

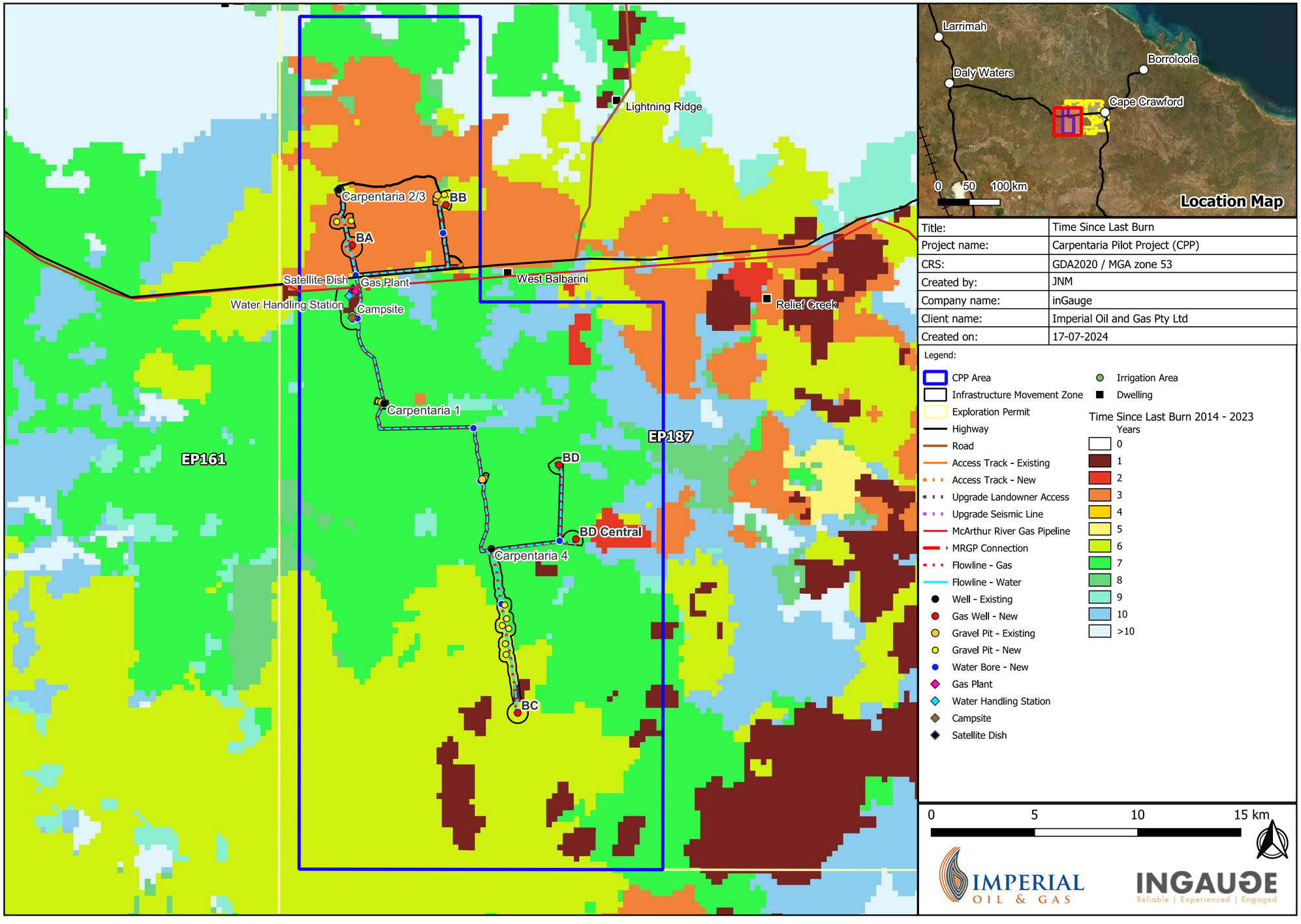


Figure 3—2 CPP Area Time Since Last Burn

4 Impacts on Existing Fire Management

The CPP Area is within the Savanna Fire Management Zone in the Northern Territory. *The Savanna Regional Bushfire Management Plan 2022-23* (SRBMP) (Bushfires NT - Natalie Chester 2022) has been developed, in accordance with the *Bushfires Management Act, 2016 (NT)* to support community-wide fire management within the Savanna Fire Management Zone [Bushfire NT, 2022].

The Fire Management Objectives of the SRBMP are detailed in Section 7 of the SRBMP, and include:

- Safety and asset protection.
- Management of land and resources - using fire to manage native flora and fauna, utilising Indigenous knowledge and cultural practices.
- Conservation - biodiversity enrichment, research, habitat protection, bushfire suppression and cultural protection.
- Carbon abatement - including reducing greenhouse emissions sand carbon sequestration.
- Pastoralism - protection of life and property and weed and pasture management.
- Edge burning - to protect corridors for road, rail, power, water, gas, and riverine corridors.
- Mining and exploration – protection of life, property, and assets.
- Tourism – protection of life, property and assets and exclude fire from specific areas to conserve natural features.
- Defence - protection of life, property, and assets.

The SRBMP identified three risks with a high-risk rating, which are detailed in Section 9.2 of the SRBMP. The three risks and their controls as they apply to the Activity are discussed in the EMP and its Appendices, listed in **Table 4—1**.

Table 4—1 SRBMP High Risks and Controls

Risk	Controls
Detrimental impacts of Gamba Grass and Fire Weeds	• EMP **Section 7.8**. • Weed Management Plan (**Appendix 04**). • Rehabilitation Management Plan (**Appendix 03**).
Damaging fires crossing property boundaries through loss of cooperation between neighbours **Land managers with an insufficient level of expertise in fire management**	• Bushfire Management Plan (**Appendix 12**), in particular **Sections 5** and **6**. • Stakeholder Engagement (EMP **Section 5**). • Emergency Response (Contingency) Plan (**Appendix 09**).
Risk of recurring wildfires impacting multi-tenure fire and land management objectives	• Bushfire Management Plan (**Appendix 12**), in particular **Sections 5** and **6**. • Emergency Response (Contingency) Plan (**Appendix 09**). • Stakeholder Engagement (EMP **Section 5**) • Controls detailed in Description of the Activity (EMP) - **Section 3**, in particular **Sections 3.4** and **3.9** and **Table 3.4—1**.

5 Infrastructure Design, Construction and Operation

The well pads, CGP and WHS (facilities) are designed with a ring-fire access trail/fire break approximately 8 m wide, with approximately 4 m fire breaks around water bore pads. Any areas between the well pad and CGP fence line and fire breaks, e.g., to skirt obstacles, will have large vegetation removed as a reduced fuel load area to minimise the risk of causing a fire in the surrounding environment.

Tank design and construction will be in accordance with the relevant Australian Standards, including AS1554 Series (Structural Steel Welding), AS3990 (Mechanical Equipment - Steel Work), and AS1170 Series (Structural Design Actions, including hydrostatic loading and cyclonic wind rating). On-site construction will adhere to manufacturer-supplied installation and QC/QA

procedures. In addition, tanks are placed on pads (well pads, WHS, etc.) cleared of vegetation and surrounded by firebreaks.

To reduce the risk of fire, all facilities, plant, and equipment will be operated and maintained to the manufacturer's requirements. Standard configuration includes spark arrestors on vehicles and diesel generators.

During the recovery of gas on an appraisal basis, a flare may be installed at each well head. The area set aside for the installation of flares will have a 20 m radius fuel load exclusion zone. At the CGP, a flare system will be installed to safely dispose of gas during CGP plant upsets or abnormal conditions. The flare setup at the CGP will include a minimum exclusion zone of 60 m x 60 m for flammable materials.

The flare exclusion zones are designed in accordance with API Standard 521 and standard industry practices. These zones ensure the area remains free of combustibles and that the radiant heat outside the exclusion zone is below 6.31 kW/m² at a height of 2 m, 50% of the radiant energy required to ignite dry vegetation. This threshold is established to reduce the radiant heat fire risk to As Low As Reasonably Practicable (ALARP). Due to the uncertainty of the final layout of the CGP and well pads, the type of flare used and the proximity of vegetation, radiant heat validation modelling will be conducted to inform adjustments to both the exclusion radius and the flare configuration at the CGP and well pads where necessary.

The welding temperatures for PE pipe used in constructing flowlines are not high enough to be considered a potential source of ignition.

6 Fire Management Practices

6.1 Fire Access Trails and Fire Breaks

As part of the civil construction works, fire access trails and fire breaks approximately 8 m wide will be established throughout the CPP around facilities. These fire access trails and fire breaks will be maintained during operations as required. Access roads and tracks may also act as fire breaks.

6.2 Seasonal Conditions and Fuel Load Assessment

As detailed in **Section 3** of this Plan, an annual seasonal fire load assessment will be conducted while infrastructure remains in place. Assessing the fuel load allows for an understanding of the fire-line intensity, which will, in turn, guide necessary vegetation management in fire breaks.

The primary goal is to ensure that fire breaks are maintained effectively, reducing the risk of fire spread and enhancing site safety.

6.3 Annual Fire Mapping

Annual mapping utilising the available information from the NAFI database will be conducted for the CPP Area to monitor changes to fire frequency (**https://www.firenorth.org.au/**).

If a fire occurs in the CPP Area during the Activity, Imperial (in consultation with land managers) will map the extent of the fire effects within the immediate area and provide DEPWS with the information.

6.4 Controlled Burns

There will be no controlled burns under this EMP. However, the landholders and Traditional Owners may conduct controlled burns in the area.

6.5 Monitoring of Bushfire Alerts

The Site Supervisor will monitor the NAFI website and Secure NT website daily in the dry season and weekly in the wet season. The Site Supervisor will liaise with relevant land holders/pastoralists if a fire on adjacent properties threatens the CPP Area or infrastructure.

Upon noting active fire alerts, the Site Supervisor will convene daily meetings with personnel to review the following:

- Identification and notification procedures for bushfires.
- Key plant and equipment available for use by trained personnel.
- Key plant and equipment that must be removed, if safe, during an evacuation.
- Key plant requiring isolation and the process for isolation.
- Safe evacuation routes, muster points, and potential safe-havens.
- Communication methods, including UHF team channels and designated area channels.

6.6 Coordination with Leaseholder/s and Other Land Users

The CPP Area encompasses several cattle agistments, under Section 19 *Aboriginal Land Rights (Northern Territory) Act, 1976 (Cth) (ALRA)* lease holdings, that are leased from the Mambaliya Rrumburriya Wuyaliya Aboriginal Land Trust. Imperial has ensured that the Activity does not affect the leaseholders' fire management strategies through frequent engagement.

During the Activity's operation, the Site Supervisor will liaise with relevant landholders/pastoralists if it is considered that any element of the Activity may affect them.

6.7 Communication methods

The Emergency Response (contingency) plan (**Appendix 09**) (ERP) details communication protocols to be adopted during all emergency events. Communication will be managed by the Site Supervisor (or delegate), with contact information provided in the ERP. Additional bushfire-specific information is provided in the Bushfire Management Plan 1 pager (**Section 9**), including contact details for local landowners in the event a fire that starts within the Activity has the potential to spread to adjoining property.

Notification to the Bushfires NT fire control officer is made via 000 (or 112 via mobile).

6.8 Local Bushfire Brigades

Should the need arise and upon request, Imperial plant and equipment, such as front-end loaders, graders, pumps, generators and water carts, may be used to support the local firefighting brigades in their local and regional firefighting efforts.

7 Fire Control Measures

7.1 First Response Actions

On identification of a fire incident, the first on-site will immediately check for the status of other people and the extent of the fire, and report to the Site Supervisor. The report to the Site Supervisor should indicate the following:

1. Location
2. Other people present
3. Extent of incident

4. Need for assistance
5. Intentions to assist. (NB Assistance only if within training and ability levels.)

Imperial's Site Supervisor/Incident Commander will assess the incident and activate the Emergency Response (Contingency) Plan if required.

7.2 Site Design and Operation

In terms of site design and operation:

- Tanks will be designed to withstand bushfires and placed on the well pad within the ~ 8 m well pad fire break.
- The well pad flares, if deployed, will be designed to reduce the likelihood of radiant heat igniting adjacent flora. The area set aside for the flare will have a 20 m fuel load exclusion zone and be located on the well pad within the ~ 8 m fire break.
- The CGP flare will be designed to meet the requirements of API 521 and sized to meet maximum plant production, including potential abnormal conditions.
- Flaring at the CGP during the appraisal phase would occur only due to process upsets or during the construction and commissioning of the plant. Flaring at the well pad is only likely to occur during the clean-up phase of the well on occasions when produced gas cannot be sent to the CGP.
- There will be fire extinguishers in all operating plant, the campsite, CGP, and the Site Supervisor's vehicle.

7.3 Fire Management Measures

The following measures and controls will be in place:

- Fire response equipment on-site during civil construction.
- Fire breaks and access trails for fire management will be ~ 8 m wide around facilities, except approximately 4 m wide around water bores. Access roads and tracks may also act as fire breaks.
- Any areas between fire access trails, and the well pad and the CPP Area fence lines will have large vegetation removed.
- All well pad and CGP works will be carried out within the confines of the fire breaks and fire access trails.

- Hot work permits will be used for any activity that has the potential to create heat, sparks, or flames. Hot work permits will be revoked on extreme fire hazard days.
- Fire access trails will be monitored for grassy weeds and controlled where necessary.
- Fire breaks will be monitored and maintained, and inspection records will demonstrate that fire breaks are routinely checked and cleared of fire-risk material for the duration of the Activity.
- Any reduced fuel load areas between fire breaks and the well pad and CGA area fence lines will be monitored and maintained to ensure any regrow of large vegetation is removed.
- The Site Supervisor will monitor the NAFI website and Secure NT website daily in the Dry Season and weekly in the Wet Season and liaise with relevant landholders/pastoralists about potential fire control measures if a fire threatens the CPP Area or infrastructure.
- During the Activity's operation, the Site Supervisor will liaise with relevant land holders/pastoralists if it is considered any CPP activities may affect their fire management practices.
- All machinery and vehicles will be parked in areas of low fire risk where possible.
- Permits under Section 46 of the *Bushfires Management Act, 2016 (NT)* will be sought if flaring is required during NT-declared fire danger periods.

7.4 Training

All personnel will be trained at site inductions and annually in:

- Activity fire prevention and management measures.
- Firefighting equipment location and operation and communication requirements.
- Use of hot work permits for any equipment that has the potential to create heat, sparks, or flames and which could initiate a fire, such as welding, angle grinding, etc.
- Restricted smoking areas and requirements.
- The Bushfire Management Plan and Emergency Response (Contingency) Plan procedures.
- Familiarity with the Bushfire Management Plan One-pager (**Section 9** of this Plan).

8 Emergency Contact Details

Table 8—1 Emergency Contact Details

Entity	Contact Details
Emergency	000 or 112 mobile
Boorroloola Volunteer Fire Services	0411 191 824 Borroloola.NTFRS@pfes.nt.gov.au
Bushfires NT	000 or 112 mobile
Bushfire NT Katherine Office	08 8973 8871 BushfiresNT.Katherine@nt.gov.au
Fire Incident map	https://pfes.nt.gov.au/incidentmap/
Katherine Fire Station	(08) 8973 8014
NAFI North	http://www.firenorth.org.au/nafi3/
National Response Centre	1800 076 251
Secure NT (Fire Bans)	https://securent.nt.gov.au/alerts

9 Bushfire Management Plan One-Pager

Imperial has drafted a one-page Bushfire Management Plan using the guidelines provided by DEPWS. This one-pager will be updated, printed and utilised in on-site inductions, and referenced in conjunction with the Emergency Response (Contingency) Plan (**Appendix 09**).

EP 187 BUSHFIRE MANAGEMENT PLAN 1 PAGER

STAKEHOLDER	CONTACT DETAILS	NAME
EMERGENCY	000	
Imperial Supervisor		
Site Supervisor	[redacted]	TBA
HSE Manager	[redacted]	[redacted]
Bushfires NT	000 or 112 mobile	
Katherine Fire Station	(08) 973 8014	On Call Station Officer
Borroloola Volunteer	0411 191 824	On Call Station Volunteer
DEPWS	(08) 8999 5511	Onshoregas.DEPWS@nt.gov.au
Land Managers (Carp 2/3)	[redacted]	[redacted]
Land Managers (Carp 1)	[redacted]	[redacted]
Bushfire NT Headquarters	(08) 8922 0844	bushfires.nt@nt.gov.au
National Response Centre	1300 560 647	
Bushfires NT Katherine Office	(08) 8973 8871	BushfiresNT.Katherine@nt.gov.au

EP 187 FIRE MONITORING	
EP 187 Fire Weather Forecast Area:	CARPENTARIA EAST
Daily Fire Weather Forecasts:	http://www.bom.gov.au/nt/forecasts/fire-forecast-summary.shtml
Fire Ban Alerts:	https://securent.nt.gov.au/respond/bushfire-alerts#bushfiresntalerts
Fire Danger Declarations:	https://securent.nt.gov.au/prepare-for-an-emergency/fires/bushfires/fire-danger-periods#fire-danger-period
Wildfire Maps:	www.firenorth.org.au/nafi3/

FIRE MANAGEMENT OBJECTIVES

Property Land Uses:
- Gas exploration, cattle grazing.

Site Fire Management Aim:
- To successfully construct and appraise exploration wells without a bushfire incident.

Fire Management Objectives:
Manage the Activity to reduce the risk of fire impacting the following:
- Human health and communities
- Flora communities
- Native Fauna
- Be prepared for fire events.

Limit the impact of any fire events:
- Ensure personal safety
- Protect Imperial and landholder and other assets, and infrastructure.
- Coordinate fire management actions with pastoralists.
- Prevent human-induced bushfire ignitions that cause loss of life, property, or environmental harm.
- Pro-actively manage CPP fire breaks and fire access trails.

PREPAREDNESS PLANNING

Based on the Australian Fire Danger Rating System (AFDRS).

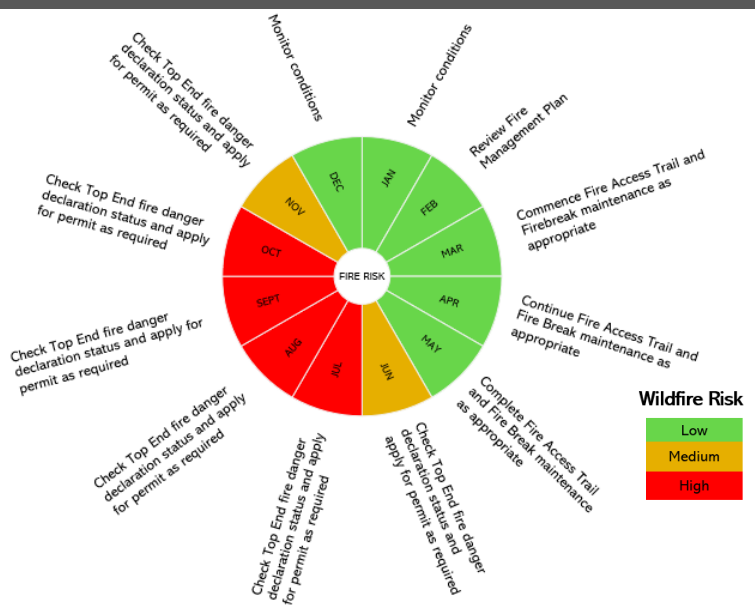
Moderate: Plan and prepare.
Stay up to date and be ready to act if there is a fire.

High: Be ready to act.
- Be alert for fires in your area.
- Decide what you will do if a fire starts.
- If a fire starts, your life and property may be at risk.
- Avoid bushfire risks such as dry ground cover and heavily wooded areas.

Extreme: Act now to protect your life and property.
- These are dangerous fire conditions.
- Check your bush fire plan and that your property is fire ready.
- If a fire starts, take immediate action. If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts.
- Reconsider travel through bushfire risk areas.

Catastrophic: For your survival, leave bushfire risk areas.
- These are the most dangerous conditions for a fire.
- Your life may depend on the decisions you make, even before there is a fire.
- Stay safe by going to a safer location early in the morning or the night before.
- Buildings cannot withstand fires in these conditions. You may not be able to leave, and help may not be available.

ANNUAL WORKS CALENDAR



Weekly Task (Wet season):
Check NAFI and Secure NT website for hotspot alerts, fire bans and planned burning.
Daily Task (Dry season):
Check NAFI and Secure NT website for hotspot alerts, fire bans and planned burning.
General Task
Liaise with local landowners and managers as required during bushfire events.

FIRE MANAGEMENT ACTIONS AND MITIGATION MEASURES

Infrastructure Protection Buffer	The well pads, gas plant, water handling station, campsite and water bore pads designed with a fire break ~ 8 m (sometimes used for access) from the fence line (Error! Reference source not found. **to** Error! Reference source not found.). The well pad flare fuel load buffer radius is 20 m.

Infrastructure Fire Controls	• Fire extinguishers will be located within all operating plant. Further fire equipment will be available in the Imperial Site Supervisor's vehicle, including blankets, at site offices where established.
	• Ensure all machinery and vehicles will be parked in areas of low fire risk and be free of any combustible material.
	• Ensure all personnel are trained and informed before the commencement of the activity relating:
	  ○ Restricted smoking areas and requirements.
	  ○ Firefighting equipment operation and communication.
	  ○ Emergency Response (Contingency) Plan and procedures during a fire emergency (Appendix 09).
	• Site Supervisor is to monitor NAFI regularly and liaise with the pastoralist if a fire threatens infrastructure.
	• Smoking only in designated areas and fit with appropriate bins, no disposal of cigarette butts to land.
	• An evacuation area/emergency muster point is established.
	• Annual fire mapping with NAFI to monitor changes to fire frequency in the CPP Area.

Fire Breaks and Access Trails	Create and maintain ~ 8 m fire breaks around well pads, CGP, WHS, Campsite and ~ 4 m fire breaks around water bore pads for fire management by grading, spraying, or slashing.

FIRE FIRST RESPONDER ACTIONS

- On identification of a fire incident immediately check area for and status of other people and report to the Site Supervisor indicating the:
  - Location
  - Personnel present
  - Extent of incident
  - Need for assistance
  - Intentions to assist. Only assist if within training and ability levels
- Imperial's Site Supervisor/Incident Commander will assess the incident and activate the Emergency Response (Contingency) Plan if required.

EP 187 FIRE MANAGEMENT ZONES (FMZ)

Figure 9—1 FMZ: Campsite

Figure 9—2 FMZ: Gas Plant

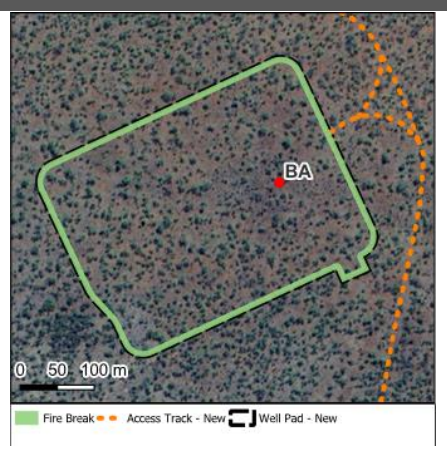


Figure 9—3 FMZ: Well Pad

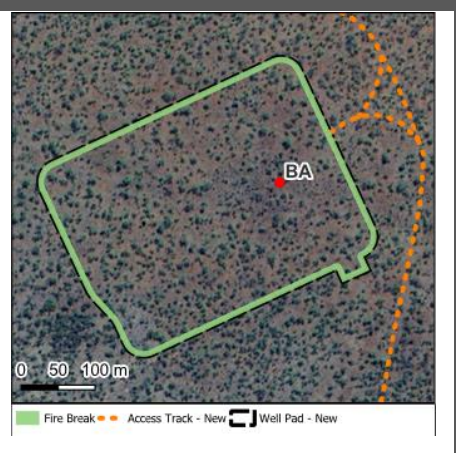


Figure 9—4 FMZ: Water Handling Station

10 References

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Imperial Oil & Gas

EP 187

Appendix 13

Methane Emissions Management Plan

IMP 5-3

Document Control

Date	Rev	Description	Author(s)	Reviewed	Approved
05/02/24	1	Issued as an Appendix of EMP IMP 5-1	Spiros K., Peter S.	Vic F., Nicholas F., Damian O., Kelvin W., Trent S., Vicky C.	Robin P.
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Table of Contents

List of Tables

1 Introduction

1.1 Background

Section D.5.1.2 of the *Code of Practice: Onshore Petroleum Activities in the Northern Territory* (2019) (*the Code*) provides mandatory requirements to be addressed in the development of a Methane Emissions Management Plan (MEMP). This plan has been developed to comply with *the Code* and forms part of this Imperial EP 187 Carpentaria Pilot Project (CPP) EMP.

1.2 Aim

This MEMP aims to reduce fugitive methane emissions from the Activity to ALARP and acceptable through efficient and comprehensive operational practices, monitoring, and management.

1.3 Purpose

The purpose of this plan is to detail how fugitive methane emissions from the Activity will be reduced to as low as reasonably practicable (ALARP) and acceptable. This plan provides a focused and systematic approach to controlling and reducing fugitive emissions.

1.4 Scope

This plan applies to all aspects of the Activity where fugitive emissions of methane could occur.

2 Activity Description

The Activity is described in detail in **Section 3** of the EMP.

3 Greenhouse Gas Emissions – Large Emitters

In September 2021, the NT Government implemented its *Greenhouse Gas Emissions Management for New and Expanding Large Emitters*, [Northern Territory Government, 2021] setting standards for managing greenhouse gas emissions in new or expanding industrial projects.

As part of the Northern Territory's commitment to achieving net-zero emissions by 2050, projects that trigger assessment criteria outlined in the policy must prepare a Greenhouse Gas Abatement Plan.

The guide under the policy for identifying large industrial project is a threshold of;

- Estimated scope 1 emissions (Greenhouse gases directly emitted to atmosphere by an activity) of 100,000 tCO_2-e in any financial year over the life cycle of a project, not counting emissions generated from land clearing directly associated with the project.

Large industrial projects that exceed the threshold must develop and implement a greenhouse gas abatement plan (GGAP) that has been tailored specifically for their project. A project's GGAP should be submitted for assessment as part of the usual process for a project to obtain an environmental authorisation.

Imperial will apply to the Minister for approval to recover petroleum on an appraisal basis under Section 57AAA of the *Petroleum Act 1984 (NT)*. If successful, this will enable Imperial to conduct production appraisal tests without significant flaring. If unsuccessful and the CPP proceeds on a basis different to the one described, the EMP and appendices will be revised under Regulation 17 of the *PER* to account for any new or increased environmental impact or risk.

Excluding flaring of gas to be exported to the MRGP, the average annual GHG estimated emissions from the Activity are approximately 30,000 tCO_2-e over the period covered by 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 tCO_2-e [NT EPA, 2022].

4 Regional Methane Monitoring

4.1 Baseline Methane Assessment

Section D.4.1 of *the Code* sets out the requirements for regional methane baseline assessment and ongoing monitoring. These assessments are conducted by or on behalf of the Northern

Territory Government, funded by industry, and are required to be designed and implemented by a suitably qualified and experienced professional who is approved by the Minister.

The *Methane and Greenhouse Gas Studies for the Beetaloo Sub-basin Strategic Regional Environmental and Baseline Assessment* (*the Methane Study*) aimed to establish the greenhouse gas baseline for the Beetaloo Sub-basin [Cindy Ong et al., 2022].

The *Methane Study* also establishes reference sites and a program for ongoing monitoring to address the requirements described in the final report of the *Scientific Inquiry into Hydraulic Fracturing in the Northern Territory* (*the Inquiry*) and therefore has been accepted as satisfying Section 4.1 of *the Code* [A. Anderson et al., 2018].

4.2 Regional Methane Assessment Program

A Regional Methane Assessment Programme, described in Section D.4.2 of *the Code*, is conducted to characterise the existing natural and anthropogenic sources of methane emissions across each permit or licence area and adjacent areas, before the commencement of exploration activity, and immediately after the commencement of full-scale production.

The *Methane Study* included an estimation of the emission rates of the current main sources of emissions based on best available estimation factors and/or models developed by NT and national government programs and researchers and has therefore been accepted as satisfying Section D.4.2 of *the Code*.

4.3 Routine Periodic Atmospheric Monitoring Programs

Routine Periodic Atmospheric Monitoring Program, described in Section D.4.3 of *the Code*, are conducted to provide for periodic monitoring, so that any changes in methane emissions can be detected during the life of a project that has entered the production phase. These assessments use the Regional Methane Assessment Programmes as their baseline.

As part of the *Methane Study*, series of mobile surveys were conducted from October 2021 to June 2022. The findings included:

- The difference in the background concentration measured within the Beetaloo study area in different seasons is in line with the national reference trend in Australia.
- The main sources of elevated methane concentrations detected during the surveys were cattle, fires, and towns/fuel stations.

The *Methane Study* has been accepted as satisfying the requirements of Section D4.3 of *the Code*.

5 Methane Sources, Controls and Standards

5.1 Potential Sources and Controls

Certain aspects of the Activity may give rise to methane emissions. These aspects and the controls to limit methane emissions are described in **Table 5—1**.

Table 5—1 Emission Descriptions and Controls

Aspect	Emission Description	Controls
Drilling of Petroleum Wells	• Shale formations have negligible permeability with a limited influx of gas from target formations. Methane is not expected to be encountered. If any is found, emissions are expected to be small (<1 tonne) and restricted to outgassing of hydrocarbon within intersected geological formations brought to the surface.	• While drilling, the well is kept overbalanced (well pressure maintained above formation pressure) to prevent gas influx from geological formations into the wellbore.
Operation of Petroleum Wells - Stimulation	• The completed well is unloaded to allow hydrocarbons and fluid to flow to the surface. • All fluids, sand and hydrocarbons from the well will initially flow to an atmospheric pressure open separator. The change from atmospheric pressure separator to low pressure separator is to reduce emissions. The flow to the atmospheric separator will likely be vented as flaring is not currently practicable, however this will be for a short duration when the well is not producing significant gas volumes, so only releases a small amount of gas into the atmosphere from flowback fluid. Once the flow is diverted into the low-pressure separator the gas will be sent to the CGP. • If the well is brought online before the CGP is commissioned it is likely that the well will be cleaned up to a local flare for a minimal period. In this case the flow would be diverted via the separator to the local flare instead of the CGP.	• The well will be kept overbalanced to prevent gas influx during and after stimulation. • Stimulation fluids are kept within the formation after each stage (until flowback). • Personal Gas Detectors (PGD) used on-site where signed or inductions require. Should a methane leak be identified by PGD monitoring, leak classification, remediation and notification requirements as described in the MEMP will be implemented.
Ongoing Well Operations/ Suspension	• During post stimulation operations, methane emissions are restricted to unplanned leaks from wellheads or well pad facilities including surface casing vents.	• Wells completed with multiple barriers in accordance with the approved WOMP. • Well maintenance to be detailed in the approved WOMP. • Wellhead pressure monitoring. • PGD used to check high point vents, flanges, and valves. • Wellheads are designed per the *NT Code of Practice* and API standards to minimise loss of methane containment [DENR, 2019]. • PGD used on-site where signed or inductions require. Should a methane leak be identified by PGD monitoring, leak classification, remediation and notification requirements as described in the MEMP will be implemented. • Routine wellhead maintenance, in accordance with the well Integrity Management System, will be carried out. • Wells are designed and constructed to be gas tight with multiple barriers to flow. • Each well and equipment on a well pad will be inspected every six months for leaks using a United States Environmental Protection Agency (US EPA) Method 21 [United States Environmental Protection Agency, 2017] compliant monitoring device. • Remotely controlled shutdown valves exist on all wells operated in the case of a leak event or process upset.

Aspect	Emission Description	Controls
Carpentaria Gas Plant (CGP)	• Methane emissions at the CGP are restricted to unplanned leaks such as upset conditions or though leaks in fittings.	• Plant and equipment operated and maintained by qualified personnel. • CGP will have a flare system to flare gas from process upsets. • Construction of plant includes leak testing at all leak points and pressure testing of the facility. • 24-hour monitoring of Gas Plant and emergency alarm system. • PGD used on-site where signed or inductions require. Should a methane leak be identified by PGD monitoring, leak classification, remediation and notification requirements as described in the MEMP will be implemented. • Plant designed and installed to Australian standards including HAZOP assessments, leak testing, pressure testing, and appropriate commissioning.
Gas Gathering Flowline Network	• Methane emissions at the flowlines are restricted to unplanned leaks such as upset conditions or though leaks in fittings.	• Automatic over-pressure control on flowlines. • Flowline pressure monitoring. • Flowlines designed, installed, and operated in accordance with Australian Pipelines and Gas Association (APGA) Code of Practice for Upstream Polyethylene Gathering Networks, 2019 (PEGN Code) [APGA, 2019]. • PGD used to check high point vents, flanges, pneumatic controllers, and valves. • PGD used on-site where signed or inductions require. Should a methane leak be identified by PGD monitoring, leak classification, remediation and notification requirements as described in the MEMP will be implemented. • Plant and equipment operated and maintained by qualified personnel. • Flowlines will be inspected weekly by visual inspection of the High Point Valves (HPV).

5.2 Applicable Standards

Industry standards and codes that relate to the minimisation of methane emissions are listed in **Table 5—2**.

Table 5—2 ISO/API Standards for Material Selection

Component	Applicable Standards
Casing	• ISO 11960: Steel pipes for use as casing or tubing for wells. • API Specifications 5CT - Casing and Tubing.
Couplings	• ISO 13679 Procedures for testing casing and tubing connections.
Cement and Additives	• American Petroleum Institute Recommended Practice, (API RP) 10B-2 Recommended Practice for Testing Well Cements.
Drilling Fluids	• ISO 10414-1: Recommended Practice for the Field-Testing Water Based Drilling Fluids. • American Petroleum Institute (API) 13B-1 and 13B-2 Recommended Practices.
Well Control Equipment	• API STD 53: Blow-Out Prevention Equipment Systems for Drilling Wells. • API 16A (ISO 13533): Specification for drill-through equipment. • API 16D: Specification for Control Systems for Drilling Well Control Equipment and Control Systems for Diverter Equipment.
Wellheads	• API 6A: Specification for wellhead and Christmas tree equipment. • ISO 10423: Petroleum and Natural Gas Industries – Drilling and Production Equipment – Wellhead and Christmas Tree Equipment.

Well maintenance will be conducted following the Well Operations Management Plan (WOMP).

6 Monitoring Methodology and Frequency

6.1 Inspection and Monitoring Frequency

Section D.5.2.2 of *the Code* outlines the mandatory requirements for inspection procedures and frequency to detect methane emissions from the Activity.

To ensure fugitive emissions are managed accordingly:

(a) Regular visits will be made to operational well sites, gathering systems and processing facilities in accordance with this MEMP.

(b) PGD used on-site where signed or inductions require. Should a methane leak be identified by PGD monitoring, leak classification, remediation and notification requirements as described in the MEMP will be implemented.

(c) All persons completing emission detection activities will be properly trained and competency assured.

(d) Leak inspections will be conducted on the minimum frequencies detailed in **Table 6—1**.

(e) Leak inspections of individual operating plant will be undertaken at an increased frequency as determined by the risk assessment and in consideration of previous audit/inspection findings for those specific facilities; and

(f) Where the operator uses optical gas imaging for leak detection, an annual inspection using US EPA Method 21 will also be performed on the facility.

Table 6—1 Inspection Minimum Frequency

Facility or System	Operator Leak Detection
Above ground facility – petroleum well pad equipment	• 6 monthly
Low pressure pipeline and fittings	• Annually
Steel or high-pressure pipelines	• Annually
Compressor stations and pneumatic devices	• Quarterly
Processing plant	• Annually
All gas containing equipment following major maintenance (e.g., repacking, replacement of seals)	• Within 48hrs of recommissioning.

*Table 10 of *the Code*

Note: if inspections are conducted using Optical Gas Imaging, an annual inspection using US EPA Method 21 must also be performed on the facility.

6.2 Standard Leak Detection Instruments

Instrument selection and operation will be selected to ensure that they are fit for purpose and maximise the probability of detecting methane leaks.

Section D.5.3.2 of *the Code* details the mandatory requirements for leak detection methods:

(b) Leak testing will be conducted using either:

i. USEPA Method 21; or

ii. Optical gas imaging (OGI).

(c) [No other superior method is currently proposed].

(d) All gas leak surveys will be conducted by suitably qualified personnel using appropriate gas detection instruments calibrated in accordance with the manufacturer's requirements.

(e) Gas detectors will be maintained and tested in accordance with the manufacturer's instructions.

(f) If USEPA Method 21 is used, the gas detection instruments, operation and calibration procedures defined in USEPA Method 21 will be followed.

(g) If OGI is used for leak detection, the instrument will be capable of imaging a gas that is half methane, half propane at a concentration of 10,000 ppm (by volume) at a flow rate of $\leq$ 60 g/hr from a quarter inch (6.4 mm) diameter orifice.

6.3 Leak Detection Methodology

All gas leak detection will be conducted by suitably qualified personnel using appropriate gas detection instruments calibrated and maintained following the manufacturer's requirements.

Leak testing will be undertaken using the United States Environmental Protection Agency (US EPA) *Method 21* [US EPA, 2017] or optical gas imaging (OGI), in accordance with Section D5.2 of *the Code*.

Method 21 or OGI inspections require access to the equipment's surface and are extremely effective at pinpointing leaks [United States Environmental Protection Agency, 2017].

The following procedures will be followed when conducting Method 21 inspections:

1. Ensure gas detector is calibrated and functioning properly.
2. Ensure the appropriate permitting is obtained before entry into a hazardous area.
3. Place the probe inlet at the surface of the component interface where leakage could occur.
4. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where the leakage is indicated until the maximum meter reading is obtained.
5. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time (i.e., at least a minute).
6. If the maximum observed meter reading is greater than 500 ppm at the surface of a piece of infrastructure, the leak will be measured again at 150 mm immediately above (and downwind) of the leak in an open-air environment.
7. The leak will be classified as described in **Section 7** of this MEMP.
8. The location of the leak will be documented and photographed (if it is safe to do so).
9. Any liquid petroleum leaks will also be identified, including estimates of leak rate and the volume released.

If leak detection is conducted using Optical Gas Imaging, a Method 21 detection survey must be done at least once annually.

7 Leak Classification

Leaks will be classified in accordance with Section D5.5 of *the Code.*

7.1 Minor Leak

Section D.5.5.1 of *the Code* defines a minor leak as a leak that:

(a) Originates from an above ground source.

(b) Is an unplanned release.

(c) Yields a methane concentration of 500 ppm (by volume) to 5,000 ppm (by volume) when measured at the surface of the component according to USEPA Method 21; or

(d) Any emission visible with an OGI instrument.

Leaks identified during commissioning or bringing equipment back into service are not classified as minor leaks, however they should still be recorded and reported where required under other frameworks (such as federal legislation or the incident reporting framework of Part 3 of the PERs).

7.2 Significant Leak

Section D.5.5.2 defines a significant leak as a leak that originates from above ground facilities, gathering systems and subsurface pipelines that meets one of the following criteria:

(a) A leak due to an unplanned release from an above ground petroleum facility that, when measured at the surface of the component according to USEPA Method 21; gives a sustained Lower Explosive Limit (LEL) reading greater than 10% (5,000 ppm by volume) of the LEL.

(b) A leak due to an unplanned release from a gathering system - subsurface pipeline that, at ground level; gives a sustained reading greater than 500 ppm (by volume) for a 15 second duration.

(c) A liquid petroleum (condensate / oil) loss of containment that exceeds 200 litres of hydrocarbons.

When it is safe to measure leaks, leaks that are classified as significant leaks during commissioning or bringing equipment back into service will be recorded and reported as per Section D.5.6.2 of the Code.

Any identified leak that reports above the threshold level for reporting significant leaks, or if the leak is too large or not safe to measure, will be recorded and reported as per Section D.5.6.2 of *the Code*.

8 Leak Remediation and Notification

Section D.5.6 of *the Code* details the requirements for leak remediation and notifications.

8.1 Minor Leaks (D.5.6.1)

A minor leak is defined in Section D.5.5.1.(see Section 7.1 above)

(a) All minor leaks must be documented and repaired as soon as practicable, but in any event within 30 days of identification.

(b) In the event of the 30-day deadline being unachievable, the Minister must be notified within the 30 days and provided with the reason for the delay and a target date for completion of the work.

8.2 Significant Leaks (D.5.6.2)

A significant leak is defined in Section D.5.5.2. (See Section 7.2 above).

In the event that a significant leak is detected:

(a) *the safety management system requirements for risk assessment and emergency response must be followed.*

(b) *For all significant leaks,* Imperial's first priorities are as follows:

i. *an exclusion zone a must be established around the leak and appropriate restrictions on access to the exclusion zone must be imposed, along with any other necessary immediate* controls.

ii. *the leak shall be repaired or made safe as soon as practicable immediately after detection, as* follows.

a. *the gas leak must be isolated,* repaired, if possible, contained or otherwise made safe within 72 hours of detection of the leak.

b. *in the event of the 72-hour repair deadline being unachievable, the reason for the delay and a target date for completion of the work must be submitted to the Department of Primary Industry and Resources before the deadline passes; and*

c. if it is contended that the risks of immediately repairing a leak exceed the risk posed by the leak, an extension of the 72-hour deadline may be sought if provided that other measures to mitigate the risk are

undertaken (e.g. ensuring no ignition sources or personnel are permitted in the exclusion zone).

iii. *complying with the other steps in this section D.5.6.2 must not compromise, impair, or delay the operator's actions to immediately make the site safe and establish exclusion zones.*

(c) *Imperial* must make the following notifications:

i. *appropriate notifications must be given to Northern Territory Government departments in compliance with any legislative requirements:*

a. *along with all other details required under relevant legislation, this notification must include the date of identification, nature and level of leak, operating plant site name,* number, and location as well as initial steps taken to minimise the risk; and

b. *in the case of an emergency situation, a notification to the Department of Primary Industry and Resources' emergency hotline number 1 300 935 250 must be made within 24* hours.

ii. *the* landowner or occupier of the property on which these leaks are occurring must be notified if the leak cannot be repaired immediately.

(d) *Remediation work must be conducted in accordance with the following:*

i. *Only commence work after a suitable risk assessment has been undertaken and relevant safety procedures are followed including consideration of all the required Personal Protective Equipment (PPE) and emergency response materials.*

ii. *For leaks identified on well equipment - higher order controls, such as* containment by repair, must be implemented wherever possible.

(e) *For leaks identified on gathering systems (where an excavation is necessary to effect repair) repairs must be completed as soon as reasonably practicable in consideration of the location of the site, safety to personnel and the public, potential environmental harm, likely access to the site from landholders or the general public, and landholder/community concerns in relation to the leak.*

(f) *For leaks identified on well casings or adjacent to the well casing (where a work over rig is necessary to effect repair) repairs must be completed as soon as reasonably practicable in consideration of the location of the well, safety to personnel and the public, potential environmental harm, likely access to the well from landholders or the general public, and landholder/community concerns in relation to the leak.*

(g) *A written close-out report must be submitted within 5 business days of the remediation of the leak, specifying the date of* identification, nature and level of leak, location and name of the operating plant, and the rectification actions taken.

(h) *If finalising the remediation is delayed more than 7 business days from the identification of the leak an update must be submitted on that day. The final close out report shall be provided when all work is completed.*

(i) *Full cooperation with relevant regulators is required.*

9 Compressors and Pneumatic Devices

Section D.5.7.2 of *the Code* details the requirements to ensure that compressors and pneumatic devices are designed, selected, and operated to minimise or eliminate fugitive emissions.

Emissions from compressors and pneumatic devices must be reduced through compliance with the following requirements:

(a) emissions from new, modified, or reconstructed wet seal centrifugal compressors (except for those located at well sites) must be captured and routed to a control device;

(b) the rod packing on each new, modified, or reconstructed reciprocating compressors must meet one of the following:

i. it is changed on or before 26,000 hours of operation; and

ii. it is changed on or before every 36 calendar months; or

iii. it routes all emissions through a closed vent system under negative pressure.

(c) The use of pneumatic controllers on new, modified, or reconstructed infrastructure must comply with the following requirements:

i. for gas processing facilities and compressors they must be driven by instrument air systems with a zero natural gas emissions

ii. for other infrastructure, and where low-bleed pneumatic controllers are used, they must have a natural gas bleed rate no greater than 0.17 m^3 h^{-1} (6 scf/h)

(d) The use of pneumatic pumps must comply with the following requirements:

i. for gas processing facilities and compressors they must be driven by instrument air systems with a zero natural gas emissions.

ii. for well sites, pneumatic pump emissions must be routed to a control device that must achieve greater than 95 % emission reduction.

iii. for existing well sites, which have been modified or reconstructed, it is permissible to direct emissions to an existing control which achieves less than 95% emissions reduction where it is able to be demonstrated that the environmental risks associated with this have been reduced to ALARP and acceptable.

10 Venting and Flaring

Imperial will apply to the Minister for approval to recover petroleum on an appraisal basis under Section 57AAA of the *Petroleum Act 1984 (NT)*. If successful, this will enable Imperial to conduct production appraisal tests without significant flaring. If the application under Section 57AAA is unsuccessful and the CPP proceeds on a basis different to the one described, this EMP will be revised under Regulation 17 of the *PER* to account for any new or increased environmental impacts or risks.

Section D.5.9 of *the Code* details the requirements to ensure that venting and flaring of natural gas is eliminated or minimised where practicable.

10.1 Well Related Activities Mandatory Requirements (D.5.9.2)

(a) For well construction activities Reduced Emissions Completions (REC) should be employed where technically feasible so that gas is captured for sale or other use.

(b) Where REC are not practicable:

i. flaring should be used rather than venting; and

ii. venting should only be used where capture or flaring is not possible.

(c) Emissions from exploration, well construction (including during flowback) and workovers must be measured, and reports submitted. These emissions should be measured using methods consistent with those specified under the National Greenhouse and Energy Reporting (Measurement) Determination 2008. Other methods may be used if approved in an EMP.

10.2 Gas Processing Activities Mandatory Requirements (D.5.9.3)

Where natural gas is vented or flared at a gas processing or other downstream facility, emissions must be estimated and reported. Methods used for this purpose must be consistent with the National Greenhouse and Energy Reporting (Measurement) Determination 2008. Other methods may be used if approved in an EMP.

11 Other Fugitive Emission Sources (D.5.9.4 of *the Code*)

In addition to leaks, venting and flaring considered in the preceding section of this MEMP, methane may also be released in significant quantities during certain planned and unplanned operations. These include some maintenance operations were gas in pipelines or other equipment is blown down, system upsets or accidental releases. Such emissions must be estimated using methods consistent with the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*. Other methods may be used if approved in an EMP.

12 Annual Reporting

12.1 Northern Territory

Section D.6.2 of *the Code* details the mandatory requirements for government reporting.

Imperial will provide an annual report to the Northern Territory Government summarising the following:

- The records of the stages of flowback activities, including:
    - The date and time of the onset of flowback.
    - The date and time of each attempt to route flowback fluid to the separator.
    - The date and time of each occurrence in which the operator reverted to the initial flowback stage.
    - The date and time of well shut-in or connected into adjacent gathering lines.
    - The date and time that temporary flowback equipment is disconnected.
    - The total duration of venting, combustion and flaring over the flowback period.
- The results of leak detection surveys, outlining:
    - The extent of compliance with the leak management plan.
    - A summary of monitoring undertaken during the period.
    - A summary of minor and significant leaks identified during the reporting period including the following:

        - The date of identification and
        - Repair for each leak and those leaks that could not be repaired.
    - An explanation as to why any component could not be repaired and what actions will be taken to either decommission the component or otherwise remedy the problem.

- Imperial's reporting will be in accordance with *Section D.5.6* of *the Code* - Leak Remediation and Notification, and the emissions as described in *Section D.5.9* of *the Code* - Venting and Flaring will be consistent with the reporting requirements of the Clean Energy Regulator (Commonwealth) and will be provided separately to the Northern Territory Government in accordance with *the Code*.
- If the Activity is below the reporting threshold specified by the *Commonwealth National Greenhouse and Energy Reporting Act (2007)*, emissions will still be reported for the approved regulated activities in this EMP to the Northern Territory Government under *the Code*.

12.2 Commonwealth

Imperial will estimate and report all greenhouse gas emissions in accordance with the requirements of the Clean Energy Regulator and the *National Greenhouse Energy Reporting Act, 2007 (Cth)* as required.

13 References

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