

Modification Notice - Regulation 22

Interest Holder	Imperial Oil and Gas Pty Ltd		EMP Title	Environment Management Plan Imperial Oil & Gas 2021-2025 EP187 Work Program NT Exploration Permit (EP) 187		Unique EMP ID No.	IMP4-3	Mod No.	9	Date	13/03/2023
Brief Description	<p>The modification to the activity is to allow for EPT for Carpentaria-2H and Carpentaria-3H wells to go beyond the 90 days to 180 days so that a larger data range can be collected.</p> <p>See attachment 1 for information regarding emissions and flowback amount.</p> <p>Imperial considers that this change is adequately addressed as a Modification rather than a Revision as per Regulation 17 as the emissions are less than the forecast emissions in the approved EMP.</p>										
Geospatial Files Included?	Not applicable										
Does the proposed change result in a new, or increased, potential or actual environmental impact or risk?	If an INCREASE in an existing potential or actual environmental impact or risk is it provided for in the approved EMP?	Does the proposed change require additional mitigation measures to be included?	Has additional stakeholder engagement been conducted?	Does it require additional environmental performance standards and measurement criteria?	Does it affect compliance with Sacred Site Authority Certificates?	Does it affect current rehabilitation, weed, fire, wastewater, erosion and sediment control, spill or emergency response plans?	Will the environmental outcome continue to be achieved and will the impacts and risks be managed to ALARP and acceptable?				
No	Not Applicable	No	No	No	No	No	Yes				
Current EMP Text					Amended EMP Text						
<p><i>Executive summary</i> <i>B Description of the Activities</i></p> <ul style="list-style-type: none"> The Extended Production Testing (EPT) of the above seven wells, with EPT <=90 days for each well 					<p><i>Executive summary</i> <i>B Description of the Activities</i></p> <ul style="list-style-type: none"> The Extended Production Testing (EPT) of the above seven wells, with EPT <=90 days for each well and up to 180 days for Carpentaria-2H and Carpentaria-3H wells 						

Current EMP Text | **Amended EMP Text**

3.1 Overview of the activities proposed

- Extended Production Testing (EPT) of the above seven wells
 - With EPT <=90 days for each of the above seven wells

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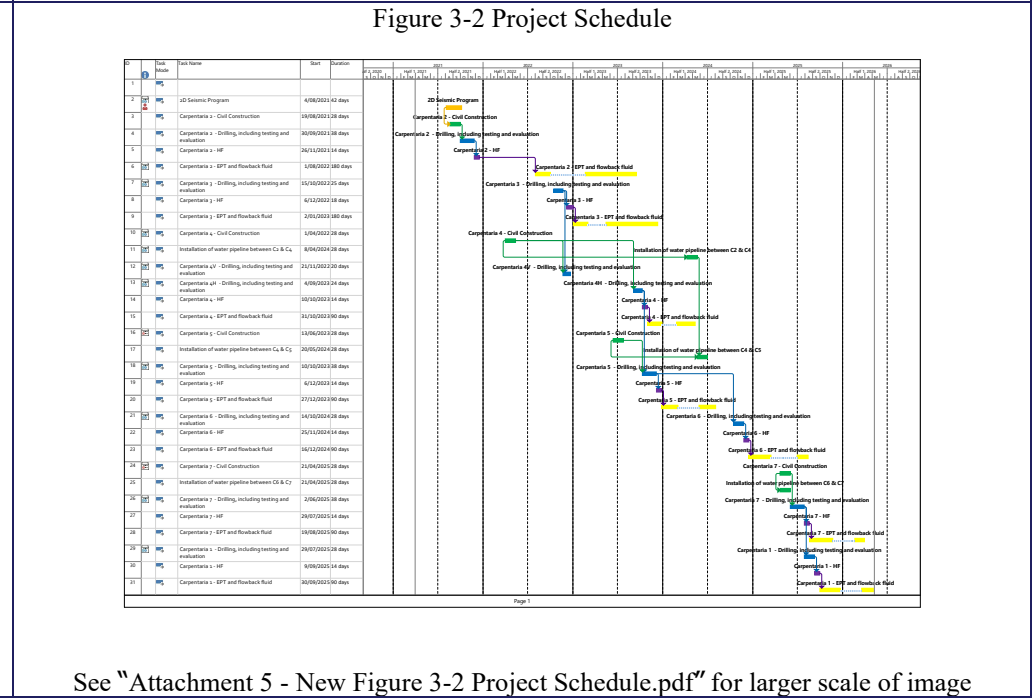
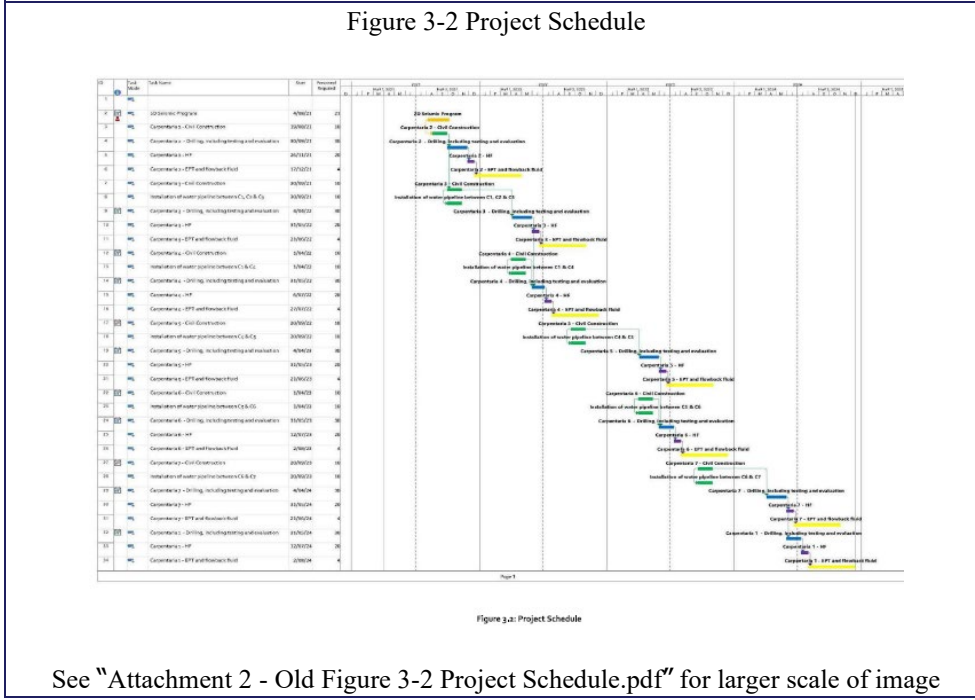
- Extended Production Testing (EPT) of the above seven wells
 - With EPT <=90 days for each well **and up to 180 days for Carpentaria-2H and Carpentaria-3H wells**

Table 5: Key components of the regulated activity
Duration of well production testing: 90 days per well

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Duration of well production testing: 90 days per well **and up to 180 days for Carpentaria-2H and Carpentaria-3H wells**

3.12 Flowback and Extended Production Testing Activities
Imperial will carry out extended production testing for a period of no greater than 90 days for each well.

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Imperial will carry out extended production testing for a period of no greater than 90 days for each well **and up to 180 days for Carpentaria-2H and Carpentaria-3H wells.**



See "Attachment 2 - Old Figure 3-2 Project Schedule.pdf" for larger scale of image

See "Attachment 5 - New Figure 3-2 Project Schedule.pdf" for larger scale of image

Figure 3-71 Estimated Emissions per year

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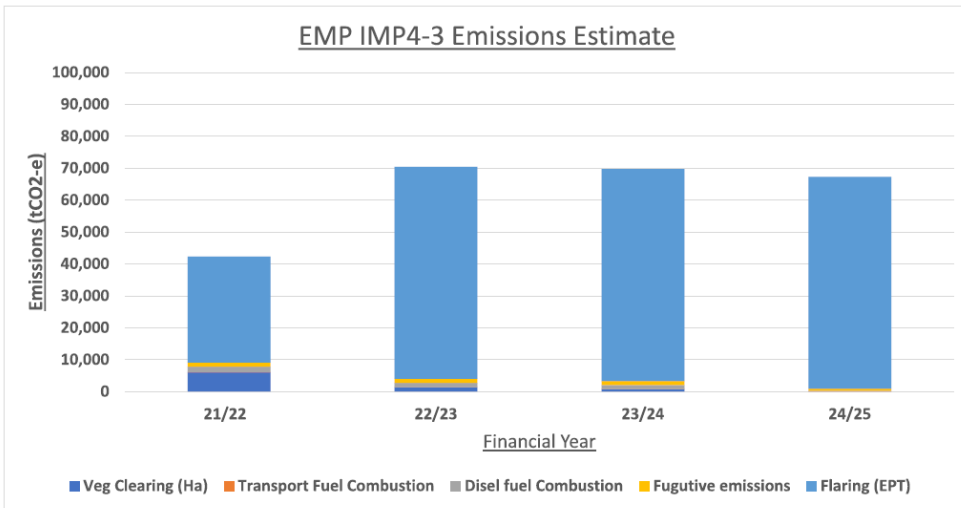
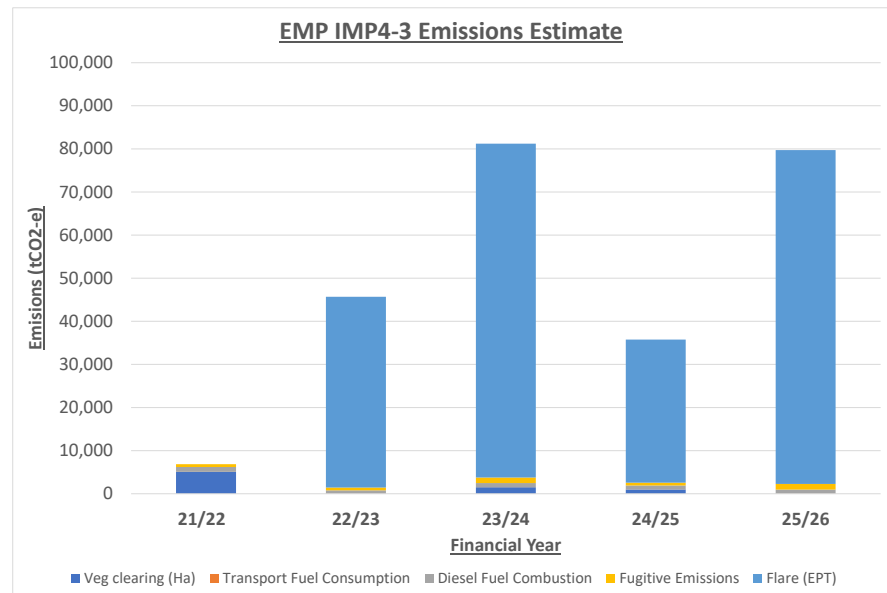


Figure 3.71: Estimated Emissions per year



See "Attachment 6 - New Figure 3-71 Estimated Emissions per year.pdf" for larger scale of image

See "Attachment 3 - Old Figure 3-71 Estimated Emissions per year.pdf" for larger scale of image

Table 19 Gas emissions estimates for this EMP

Source of Emission	Inputs	Assumptions	21/22	22/23	23/24	24/25	Total tCO ₂ -e
Vegetation Clearance	166Ha of eucalypt woodland	Based on the FullCAM model.	6,049.4	1,376.9	740.2	0.0	8166.5
Transport fuel combustion	40 kL Diesel oil (post-2004 vehicles)	Site Transport - Diesel volumes estimated at 100L/day for 400 days. Estimate based on the Emissions and Energy Threshold Calculator – 2018.	43.0	33.3	33.3	6.8	116.4
Diesel Combustion HFS	Drilling, HF and completion activities	HFS spread average fuel consumption is 8,000L/day for 6 days per well plus an additional 4kL for Completions rig Drilling average fuel consumption is 5,000L/day for 38 days per well Estimate based on the Emissions and Energy Threshold Calculator – 2018.	1,748.6	1350.9	1350.6	277.7	4,728
Fugitive emissions HFS	25.9 tonnes of methane (CH ₄)	Based on Australian National Greenhouse Accounts National Inventory Report 2011 Vol 1: Emissions Factor for gas well completions of 25.9 tonnes/completion day and six days, (1 day per well). Conversion of emissions factor from CH ₄ to CO ₂ (25 tCO ₂ -e/CH ₄)	1,295.0	1,295.0	1,295.0	647.5	4,532.5
Flaring	Flared gas EPT 7 of Lateral 180-day EPT 2.5mmscfd 64,008 tonnes	Based on the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Section 3.44) Emissions factor of CO ₂ -e/tonnes flared, with assumed tip efficiency on flare (>96%) CO ₂ factor tCO ₂ -e is 2.8 (64,008t x 2.8) = 179,222 CH ₄ factor tCO ₂ -e is 0.8 (64,008t x 0.8) = 51,206 N ₂ O factor tCO ₂ -e is 0.03 (64,008t x 0.03) = 1,920	33,197.7	66,385.4	66,385.4	66,385.4	232,349.0
Total			42,328.7	70,441.4	69,804.8	67,377.5	249,892.4

*Flaring is the combustion of fuels for non-productive (non-commercial) reasons. For the estimation of emissions from the flaring of fuel, "Method 1" has been used.

See "Attachment 4 - Old Table 19 Gas emissions estimates for this EMP.pdf" for larger scale of image

Table 19 Gas emissions estimates for this EMP

Source of Emission	Inputs	Assumptions	21/22	22/23	23/24	24/25	25/26	Total tCO ₂ -e
Vegetation Clearance	166Ha of eucalypt woodland	Based on the FullCAM model.	5,050.00	0.00	1,500.00	1,000.00	0.00	7,550.00
Transport fuel combustion	40 kL Diesel oil (post-2004 vehicles)	Site Transport - Diesel volumes estimated at 100L/day for 400 days. Estimate based on the Emissions and Energy Threshold Calculator – 2018.	27.96	19.10	23.42	22.05	23.42	115.95
Diesel Combustion HFS	Drilling, HF and completion activities	HFS spread average fuel consumption is 8,000L/day for 6 days per well plus an additional 4kL for Completions rig Drilling average fuel consumption is 5,000L/day for 38 days per well Estimate based on the Emissions and Energy Threshold Calculator – 2018.	1,135.95	775.84	951.52	895.88	951.52	4,710.71
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Total			6,861.41	45,699.40	81,219.62	35,758.15	79,719.62	249,258.20

See "Attachment 7 - New Table 19 Gas emissions estimates for this EMP.pdf" for larger scale of image

Note: Vegetation Clearance amount has dropped approximately 616tCO₂ due to Carpentaria-3H well being drilled on an existing well pad and the requirement for an individual well pad for this well has been removed from the program.

Attachment 1 to Modification Notice.

Flowback and testing activities are covered in the EMP IMP4-3 under section 3.12. This proposal is to extend the EPT times for Carpentaria-2H and Carpentaria-3H wells from 90 days to 180 days.

Emissions Assessment

The EMP undertook assessment of emissions from the EPT at a flat rate of 5 Million standard cubic feet per day (MMSCFD) for 90 days. This would accumulate to approximately 450MMSCF per well that was allowable to be emitted.

For Carpentaria-2H the average gas flow rate at the end of initial 51 days of EPT was 2.21 MMSCF/D see table 1 below. For Carpentaria-3H the average gas flow rate is at 2.56 MMSCF/D on flowback day 27.5.

Both wells are now expected to have 90 days average gas rate well under 2.5 MMSCFD. Below is a table of estimated average rates up to the 90 days. As flow rates will continue to fall as testing is ongoing it is likely that the 450MMSCF unit will not be reached within the 180 days.

EPT will be continuously measured for cumulative gas produced and will be shut in prior to hitting the allowed 450MMSCF. Extending the testing period to 180 days is reasonable without exceeding the allowable calculated emissions while allowing for further data collection. The below two tables have estimated and predicted gas cumulative amounts and flow rate averages

Table 1 - Carpentaria-2H Gas Data

Gas Production days	Gas Cumulative, MMSCF	Average MMSCFD
22.39	55.85	2.49
50.63	111.78	2.21
90 (estimated)	220	2.44
180 (estimated)	387	2.15

Table 2 - Carpentaria-3H Gas Data

Gas Production days	Gas Cumulative, MMSCF	Average MMSCFD
5.61	15.4	2.74
27.5	70.5	2.56
50 (estimated)	149	2.96
90 (estimated)	259	2.88
180 (estimated)	433	2.41

Flowback Volume Assessment

Water production starts several days before the gas breakthrough. Days are given for the corresponding gas production period. Below tables outline the cumulative production of flowback volume for both Carpentaria-2H and Carpentaria-3H wells.

Table 3 - Carpentaria-2H Water Data

Gas Production Days	Water Cumulative, bbls	Fluid Recovery, %%
22.39	23,958	28.6
50.63	26,693	32.1
90 (estimated)	30,266	36.1
180 (estimated)	35,545	42.4

Table 4 - Carpentaria-3H Water Data

Gas Production days	Water Cumulative, bbls	Fluid Recovery, %%
5.61	28,658	20.8
27.5	39,667	28.8
50 (estimated)	44,453	32.2
90 (estimated)	49,754	36.1
180 (estimated)	55,951	40.6

Produced water from Carpentaria-2H was fully consumed for Carpentaria-3H frac fluid preparation or evaporated. The estimated remaining flowback volume from both wells to be produced is under 4ML. There is currently over 7ML of available on-site wastewater storage.

The flowback from both wells does not account for soaking (imbibition) impact which would further lower the fluid recovery percentage.

Extending the testing period to 180 days is reasonable without causing any storage issues for flowback water while allowing for further data collection to occur. EPT will be continuously measured for flowback produced and will be shut in prior to causing storage issues on site.

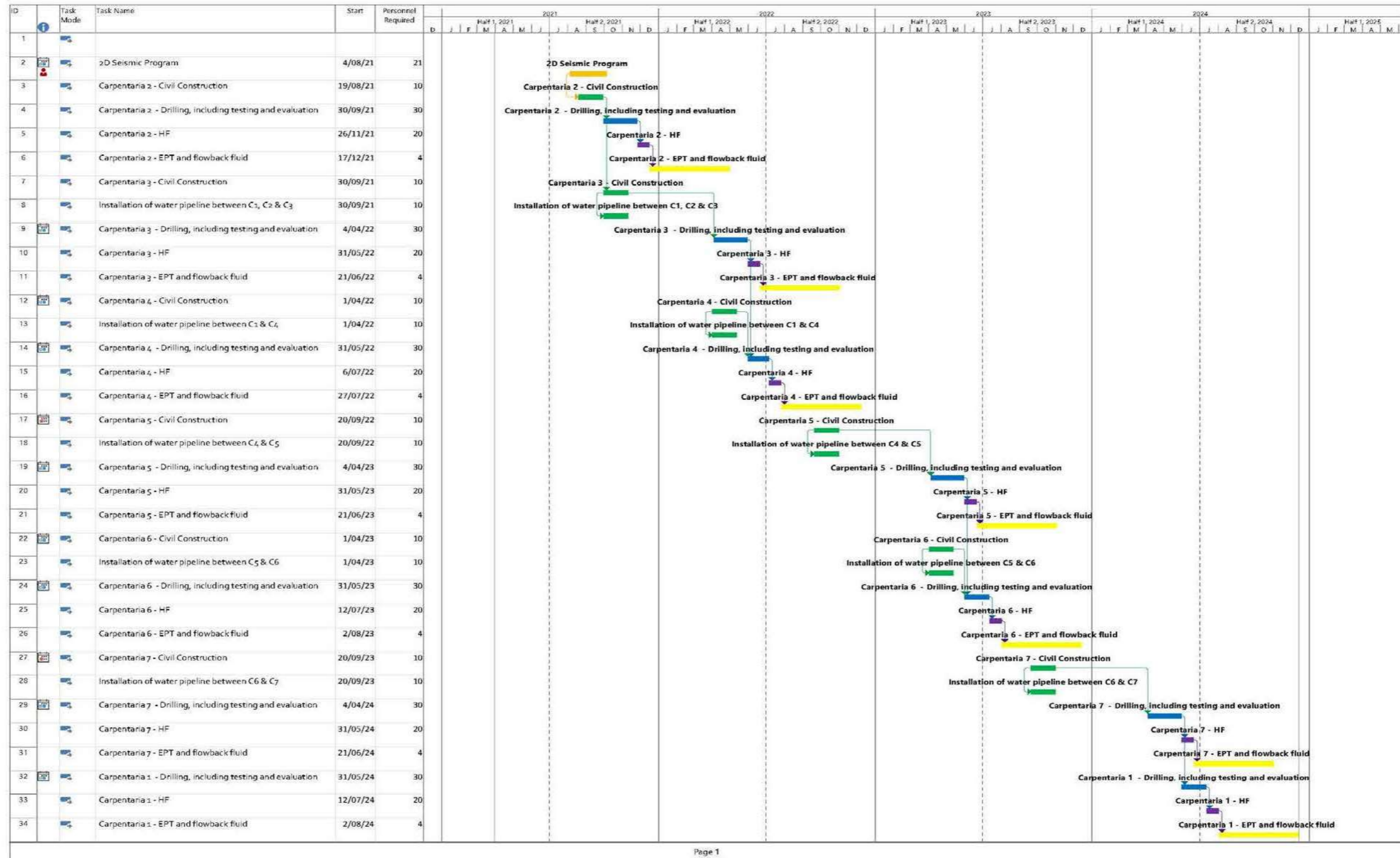


Figure 3.2: Project Schedule

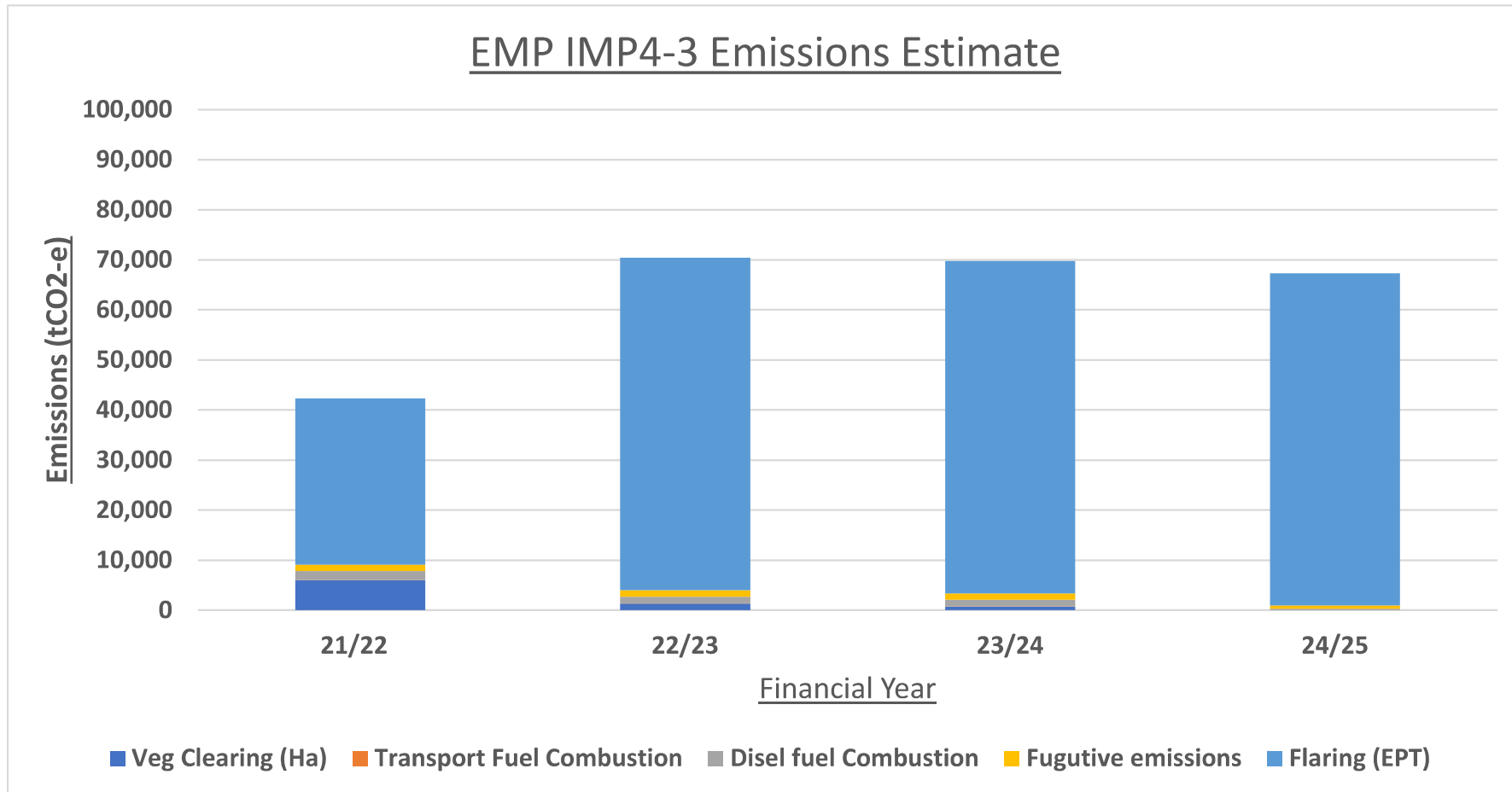


Figure 3.71: Estimated Emissions per year

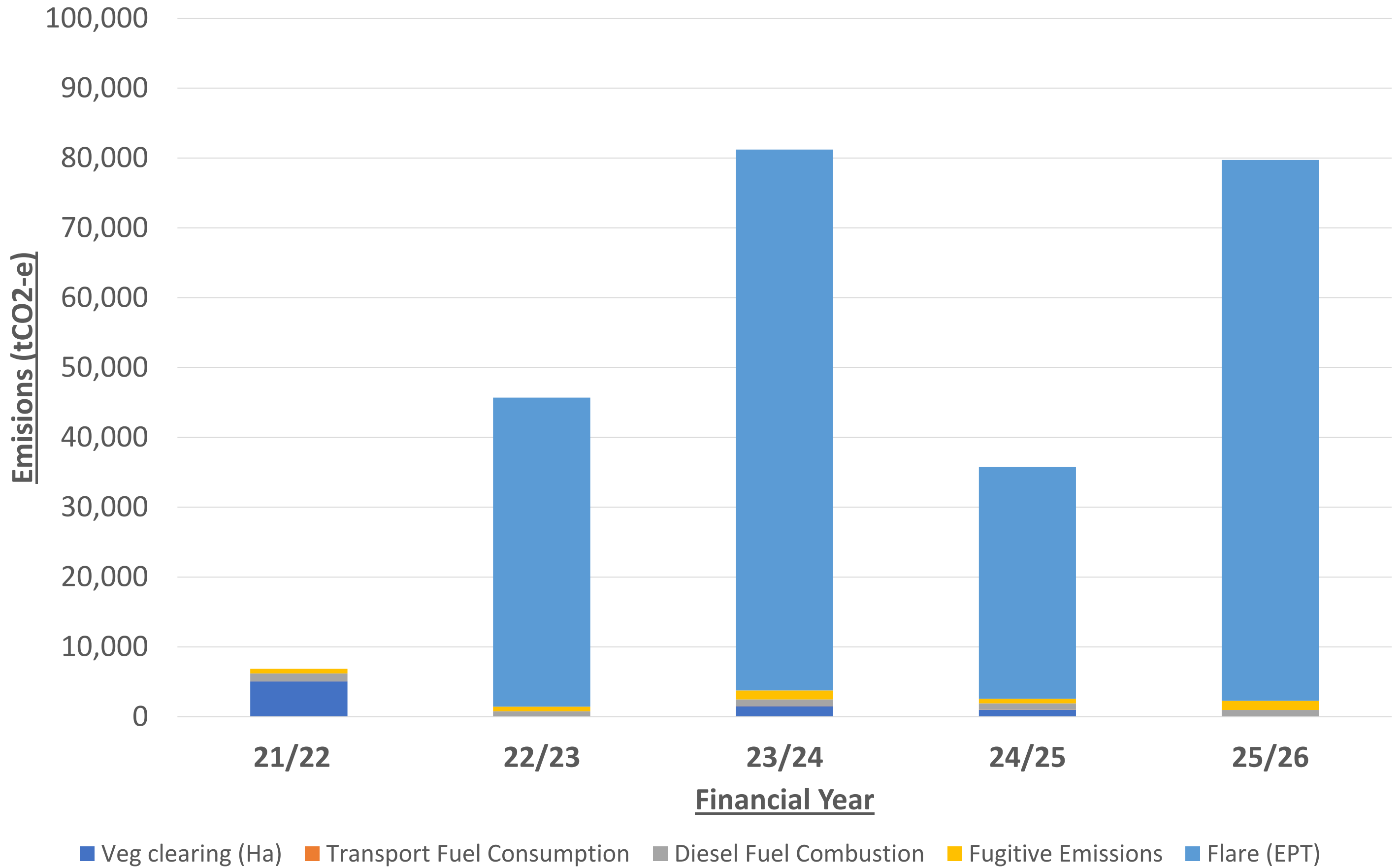
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ID	Task Mode	Task Name	Start	Duration	Timeline																																																																																																			
					2020							2021							2022							2023							2024							2025							2026																																																									
					S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1																																																																																																								
2		2D Seismic Program	4/08/2021	42 days	<p style="text-align: center;">2D Seismic Program</p>																																																																																																			
3		Carpentaria 2 - Civil Construction	19/08/2021	28 days	<p style="text-align: center;">Carpentaria 2 - Civil Construction</p>																																																																																																			
4		Carpentaria 2 - Drilling, including testing and evaluation	30/09/2021	38 days	<p style="text-align: center;">Carpentaria 2 - Drilling, including testing and evaluation</p>																																																																																																			
5		Carpentaria 2 - HF	26/11/2021	14 days	<p style="text-align: center;">Carpentaria 2 - HF</p>																																																																																																			
6		Carpentaria 2 - EPT and flowback fluid	1/08/2022	180 days	<p style="text-align: center;">Carpentaria 2 - EPT and flowback fluid</p>																																																																																																			
7		Carpentaria 3 - Drilling, including testing and evaluation	15/10/2022	25 days	<p style="text-align: center;">Carpentaria 3 - Drilling, including testing and evaluation</p>																																																																																																			
8		Carpentaria 3 - HF	6/12/2022	18 days	<p style="text-align: center;">Carpentaria 3 - HF</p>																																																																																																			
9		Carpentaria 3 - EPT and flowback fluid	2/01/2023	180 days	<p style="text-align: center;">Carpentaria 3 - EPT and flowback fluid</p>																																																																																																			
10		Carpentaria 4 - Civil Construction	1/04/2022	28 days	<p style="text-align: center;">Carpentaria 4 - Civil Construction</p>																																																																																																			
11		Installation of water pipeline between C2 & C4	8/04/2024	28 days	<p style="text-align: center;">Installation of water pipeline between C2 & C4</p>																																																																																																			
12		Carpentaria 4V - Drilling, including testing and evaluation	21/11/2022	20 days	<p style="text-align: center;">Carpentaria 4V - Drilling, including testing and evaluation</p>																																																																																																			
13		Carpentaria 4H - Drilling, including testing and evaluation	4/09/2023	24 days	<p style="text-align: center;">Carpentaria 4H - Drilling, including testing and evaluation</p>																																																																																																			
14		Carpentaria 4 - HF	10/10/2023	14 days	<p style="text-align: center;">Carpentaria 4 - HF</p>																																																																																																			
15		Carpentaria 4 - EPT and flowback fluid	31/10/2023	90 days	<p style="text-align: center;">Carpentaria 4 - EPT and flowback fluid</p>																																																																																																			
16		Carpentaria 5 - Civil Construction	13/06/2023	28 days	<p style="text-align: center;">Carpentaria 5 - Civil Construction</p>																																																																																																			
17		Installation of water pipeline between C4 & C5	20/05/2024	28 days	<p style="text-align: center;">Installation of water pipeline between C4 & C5</p>																																																																																																			
18		Carpentaria 5 - Drilling, including testing and evaluation	10/10/2023	38 days	<p style="text-align: center;">Carpentaria 5 - Drilling, including testing and evaluation</p>																																																																																																			
19		Carpentaria 5 - HF	6/12/2023	14 days	<p style="text-align: center;">Carpentaria 5 - HF</p>																																																																																																			
20		Carpentaria 5 - EPT and flowback fluid	27/12/2023	90 days	<p style="text-align: center;">Carpentaria 5 - EPT and flowback fluid</p>																																																																																																			
21		Carpentaria 6 - Drilling, including testing and evaluation	14/10/2024	28 days	<p style="text-align: center;">Carpentaria 6 - Drilling, including testing and evaluation</p>																																																																																																			
22		Carpentaria 6 - HF	25/11/2024	14 days	<p style="text-align: center;">Carpentaria 6 - HF</p>																																																																																																			
23		Carpentaria 6 - EPT and flowback fluid	16/12/2024	90 days	<p style="text-align: center;">Carpentaria 6 - EPT and flowback fluid</p>																																																																																																			
24		Carpentaria 7 - Civil Construction	21/04/2025	28 days	<p style="text-align: center;">Carpentaria 7 - Civil Construction</p>																																																																																																			
25		Installation of water pipeline between C6 & C7	21/04/2025	28 days	<p style="text-align: center;">Installation of water pipeline between C6 & C7</p>																																																																																																			
26		Carpentaria 7 - Drilling, including testing and evaluation	2/06/2025	38 days	<p style="text-align: center;">Carpentaria 7 - Drilling, including testing and evaluation</p>																																																																																																			
27		Carpentaria 7 - HF	29/07/2025	14 days	<p style="text-align: center;">Carpentaria 7 - HF</p>																																																																																																			
28		Carpentaria 7 - EPT and flowback fluid	19/08/2025	90 days	<p style="text-align: center;">Carpentaria 7 - EPT and flowback fluid</p>																																																																																																			
29		Carpentaria 1 - Drilling, including testing and evaluation	29/07/2025	28 days	<p style="text-align: center;">Carpentaria 1 - Drilling, including testing and evaluation</p>																																																																																																			
30		Carpentaria 1 - HF	9/09/2025	14 days	<p style="text-align: center;">Carpentaria 1 - HF</p>																																																																																																			
31		Carpentaria 1 - EPT and flowback fluid	30/09/2025	90 days	<p style="text-align: center;">Carpentaria 1 - EPT and flowback fluid</p>																																																																																																			

EMP IMP4-3 Emissions Estimate



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