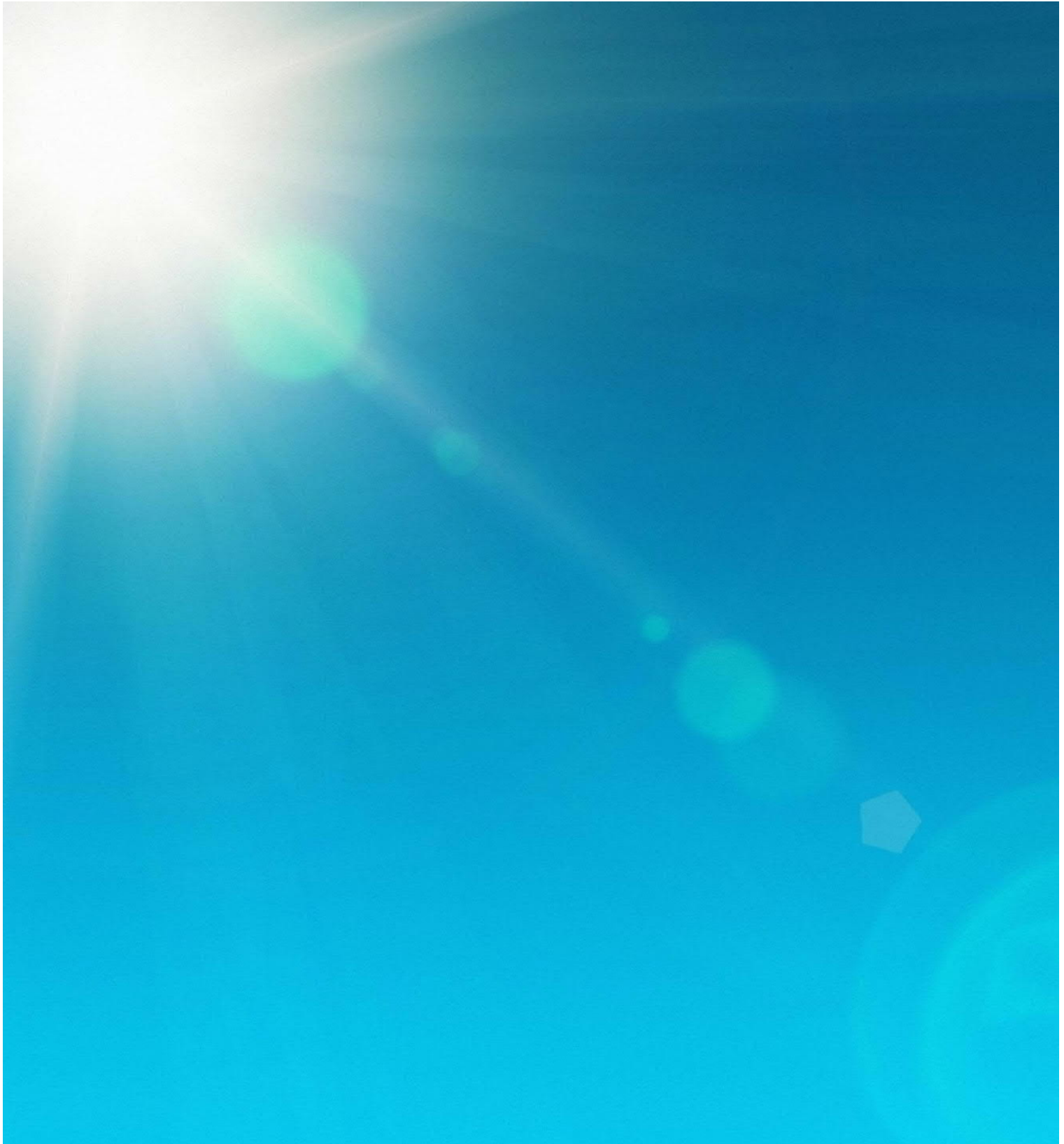


March 2022

# Chapter 11 – Air Quality

Australia-Asia PowerLink Environmental Impact Statement

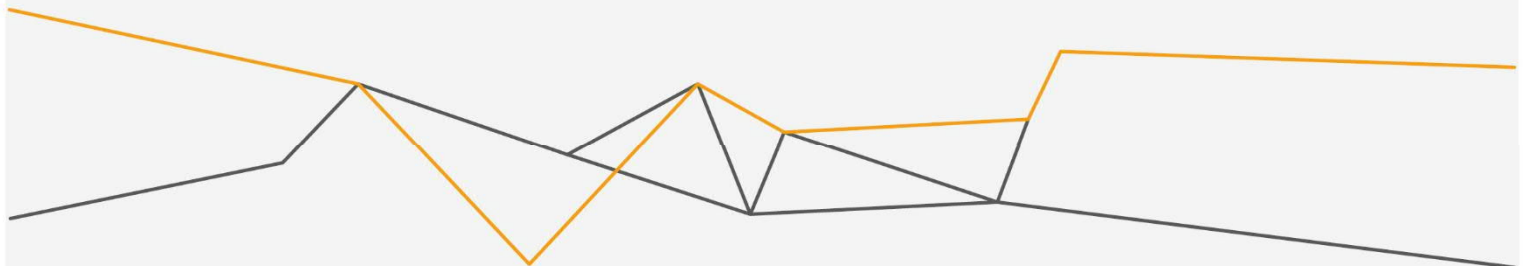


# Chapter 11 - Air Quality

Document ID: 202374

## Revision history

Revision	Date	Purpose	Reviewed by	Approved by
0	21/03/2022	Draft EIS submission	Joe Sheridan	Mark Branson



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## 11 Air Quality

The NT EPA's objective for the Air quality environmental factor is to:

*"Protect air quality and minimise emissions and their impact so that environmental values are maintained."*

This chapter assesses the significance of potential impacts to air quality associated with the Australia-Asia PowerLink (AAPowerLink) proposal. The potential impacts to considered in this chapter were identified with reference to the EIS Terms of Reference (TOR) issued by the NT Environment Protection Authority (NT EPA) (Appendix A), issues raised by stakeholders, and professional judgement of the EIS team (Appendix D) based on their knowledge and understanding of the AAPowerLink components and activities described in Chapter 2 Proposal Description. Potential impacts were then assessed using the Environmental Impact Assessment (EIA) methods described in Chapter 3 Impact Assessment. This chapter presents the findings of the EIA process undertaken for the Air quality factor.

This chapter focusses on assessing particulate matter (PM) and nitrogen oxides (NO<sub>x</sub>) from diesel exhaust emissions. These were identified for assessment because the AAPowerLink construction activities will be a source of these pollutants and they can impact human health and/or amenity if present at elevated levels. The AAPowerLink operational activities do not involve any significant sources of air emissions, and so the air quality assessment focuses on construction air emissions.

Greenhouse gas emissions are addressed separately in Chapter 12 Atmospheric Processes. The impact of dust emissions on flora and fauna is considered in Chapter 5 Terrestrial Ecosystems. Changes in air quality are also considered in Chapter 15 Human Health.

### 11.1 Information sources

The key information source used to prepare this chapter is the AAPowerLink *Air Quality Impact Assessment* (Appendix U). A screening level impact assessment was conducted to determine the potential impact to air quality in the local areas associated with emissions from AAPowerLink construction activities. The assessment was based on regional meteorology developed using the TAPM prognostic meteorological model and atmospheric dispersion modelling using the AUSPLUME model.

Background air quality within the proposal footprint and surrounding areas was determined from the only three long-term regional air quality monitoring stations in the NT, which are in the Darwin suburbs of Palmerston, Stokes Hill, and Winnellie<sup>1</sup>. These stations are all in the greater Darwin region and are located 24-30 km south-west of the Darwin Converter Site (Figure 11-1). Air quality data from each station were assessed for the period between 1 November 2014 and 31 October 2019 (five years) at the Palmerston and Winnellie sites. Data collected at Stokes Hill were assessed for the period between 5 May 2017 and 31 October 2019. Background air quality data derived from these stations is described in Section 11.3.1.

An air emissions inventory was prepared for each component of the AAPowerLink footprint based on construction equipment lists and schedules developed by Sun Cable. Emission factors were used to estimate emissions where no project-specific data was available. Construction dust emissions were estimated using the *Western Regional Air Partnerships (WRAP) Fugitive Dust Handbook* (Countess Environmental, 2004), which provides general composite emission factors to characterise PM emissions arising from construction activities. NO<sub>x</sub> emissions from diesel-fuelled construction vehicles were estimated using the *Tier 3 Non-road diesel engine emission standards* (USEPA, undated), which provide emission factors based on vehicle production date

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<sup>1</sup> At the time of analysis, a monitoring site had recently been installed at Katherine; however, long term data were not yet available.

and engine power. The emissions inventories prepared for the air quality impact assessment are documented in Section 6 of Appendix U Air Quality Impact Assessment.

## 11.2 Relevant policies and guidelines

The EIA for the Air quality factor references the following policies and guidelines:

### *National Environment Protection (Ambient Air Quality) Measure (Air NEPM)*

The National Environment Protection Council has outlined the national ambient air quality standards and goals, which have been adopted by all state and territory governments. These standards and goals for air quality were published in 1998 in the *National Environment Protection (Ambient Air Quality) Measure (Air NEPM)*, followed by the *National Environment Protection (Air Toxics) Measure (Air Toxics NEPM)* completed in 2004. These documents outline the compliance standards and goals for urban locations, with six criteria pollutants identified:

- Nitrogen dioxide (NO<sub>2</sub>)
- Particulate matter as PM<sub>2.5</sub>
- Particulate matter as PM<sub>10</sub>
- Sulfur dioxide (SO<sub>2</sub>)
- Carbon monoxide (CO)
- Lead (Pb)

Of these, NO<sub>2</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> are considered in the AAPowerLink air quality impact assessment. Sources of SO<sub>2</sub> from high-sulfur fuel commonly used in rail and shipping modes of transportation was not included in the assessment as shipping of materials and equipment to the site will be handled by others, is already regulated, and is therefore excluded from the scope of assessment. The proposal does not involve other activities that would cause significant emissions of the other listed pollutants.

### *Waste Management and Pollution Control Act 1998*

Within the NT, air quality is governed under the *Waste Management and Pollution Control Act 1998*. Under the Act, air quality is specified as an environmental protection objective, but there are no designated air quality assessment criteria. In jurisdictions where there are no relevant air quality impact assessment approaches and criteria, it is standard practice to adopt these from neighbouring jurisdictions. The assessment approach and ambient air quality impact assessment criteria promulgated in NSW have therefore been used for the AAPowerLink assessment.

### *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*

The methods that are to be used for modelling and assessing emissions of air pollutants are outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (2016) (NSW EPA, 2016). The Approved Methods prescribe two levels of impact assessment:

- Level 1 – screening-level dispersion modelling technique using worst case input data.
- Level 2 – refined dispersion modelling technique using site-specific input data.

The AAPowerLink air quality impact assessment was conducted as a level two impact assessment using site-specific input data, including:

- Local terrain and land use for meteorological modelling
- Actual locations of construction activities and sensitive receptors

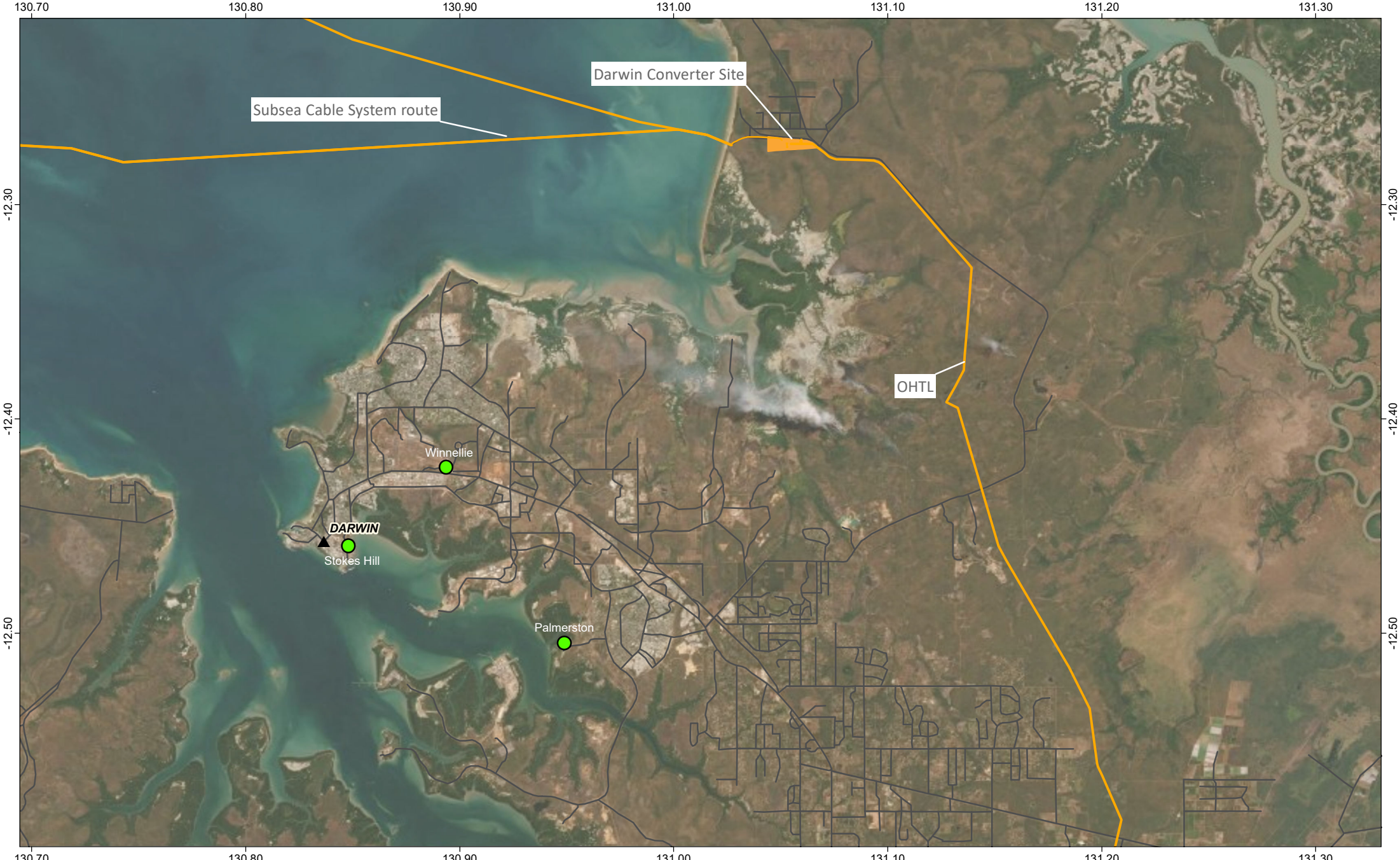
- TAPM prognostic model simulations over the region
- Configuration of the AUSPLUME dispersion model using site-specific emission source characteristics, dimensions, and coordinate locations
- Emission rate estimates based on site-specific activity data and worst-case emissions data.

The NSW Approved Methods sets out the ambient air quality impact assessment criteria for human health under which air quality impacts are to be assessed.

Ambient air quality impact assessment criteria for the AAPowerLink assessment were determined using the more stringent of the relevant Air NEPM standards and the NSW EPA Approved Methods criteria and are shown in Table 11-1.

Table 11-1. Ambient air quality impact assessment criteria (Source: NSW EPA 2016)

Substance	Human Health Assessment criterion ( $\mu\text{g}/\text{m}^3$ )	Averaging period	Where assessment criteria are applied	Modelled percentile statistic used
Nitrogen dioxide ( $\text{NO}_2$ )	246 $\mu\text{g}/\text{m}^3$	1-hour	Nearest offsite sensitive receptor	100
	62 $\mu\text{g}/\text{m}^3$	Annual		N/A
PM <sub>2.5</sub>	25 $\mu\text{g}/\text{m}^3$	24-hour	Nearest offsite sensitive receptor	100
	8 $\mu\text{g}/\text{m}^3$	Annual		N/A
PM <sub>10</sub>	50 $\mu\text{g}/\text{m}^3$	24-hour	Nearest offsite sensitive receptor	100
	25 $\mu\text{g}/\text{m}^3$	Annual		N/A
Total Suspended Particles (TSP)	90 $\mu\text{g}/\text{m}^3$	Annual	Nearest offsite sensitive receptor	N/A
Deposited Dust	2 $\text{mg}/\text{m}^2/\text{month}$	Annual	Nearest offsite sensitive receptor	100



**Legend**

- AAPowerLink infrastructure
- Roads
- Air quality monitoring stations

Source: Sun Cable, EcOz, NTG (NR Maps), NTEPA

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**Figure 11-1: Map of air quality monitoring stations used to derive background air quality**

Project: <span style="color: orange;">Australia-Asia PowerLink</span>		Reference: M-Files ID 202374		Revision: 0
Coordinate System: GDA2020		Date: 08/03/2022		 <b>SUN CABLE</b>
		Scale: 1:250,000	A4	



## 11.3 Environmental values

### 11.3.1 Air pollutants of concern

The AAPowerLink *Air Quality Impact Assessment* (Appendix U) predicted changes in air quality associated with emissions of particulate matter (PM<sub>10</sub>, PM<sub>2.5</sub>, Total Suspended Particles (TSP)) from site ground preparation, infrastructure construction and heavy diesel non-road construction equipment, and nitrogen oxide (NO<sub>x</sub>) emissions from heavy diesel non-road construction equipment. These air pollutants are of concern because of their potential to affect human health (respirable fraction of PM due to inhalation) and to decrease amenity of an area when dust is visible in the air and/or deposits on hard surfaces.

#### 11.3.1.1 Particulate matter - PM<sub>10</sub> and PM<sub>2.5</sub>

Particulate matter refers to particles present in the air at elevated levels where they can be hazardous to human health or cause a nuisance. Potential health effects of airborne particles are closely related to particle size. The most common particle size distributions monitored for assessment against health-based criteria are:

- PM<sub>2.5</sub> (particles less than 2.5 micrometres in diameter): These particles are mainly generated by combustion processes, such as motor vehicle engines, industrial boilers, solid fuel heaters and fires.
- PM<sub>10</sub> (particles less than 10 micrometres in diameter): These particles are generated by combustion and non-combustion processes, including windblown dust, sea salt, industrial processes, motor vehicle engines and fires.

Most particulate matter is too large to be inhaled; however, PM<sub>10</sub> and PM<sub>2.5</sub> are of concern to human health as these particles can enter the lower airways of humans and cause negative health effects. PM<sub>10</sub> and PM<sub>2.5</sub> particles are invisible to the naked eye; by way of comparison, a human hair is about 60 micrometres in diameter (Queensland Government, 2017).

#### 11.3.1.2 Total Suspended Particles (TSP)

Airborne particles up to about 100 micrometres in diameter are referred to as TSP. These particles are generated by combustion and non-combustion processes, including windblown dust, sea salt, earthworks, mining activities, industrial processes, motor vehicle engines and fires. Particles larger than 10 micrometres in diameter are not generally associated with human health effects. However, these particles can cause nuisance problems by being visible in the air and depositing on hard surfaces at properties or other areas that are frequented by people.

#### 11.3.1.3 Deposited dust

Deposited dust refers to air particles that settle out over a given area and time under the influence of gravity. Deposited dust can include particles of any size, but it generally comprises particles larger than 20 micrometres in diameter that rapidly settle out of the air near the point of emission. It is measured to assess if an emission source is causing a nuisance through dust deposition.

#### 11.3.1.4 Nitrogen dioxide (NO<sub>2</sub>)

Nitrogen dioxide (NO<sub>2</sub>) is a gas produced from natural sources, motor vehicles and other fuel burning processes. Elevated levels of NO<sub>2</sub> can cause damage to the human respiratory tract, and may also affect the senses, for example, by reducing a person's ability to smell an odour. High levels of NO<sub>2</sub> can be harmful to vegetation—damaging foliage, decreasing growth, or reducing crop yields. NO<sub>2</sub> can fade and discolour furnishings and fabrics, reduce visibility, and react with surfaces.

### 11.3.2 Background air quality

The main air pollutant in the Top End, where the AAPowerLink Darwin Converter Site and OHTL are proposed to be located, is smoke from distant and local vegetation open burning during the dry season (NT Government, 2018). This is represented as particulates of less than 10 microns ( $PM_{10}$ ) and less than 2.5 microns ( $PM_{2.5}$ ). There is a significant difference in air quality between the wet and dry seasons, with elevated particulates occurring during the dry season when prescribed vegetation burning and bushfires occur. Other pollutants including Carbon Monoxide (CO), Nitrogen Oxides ( $NO_x$ , NO and  $NO_2$ ) and Sulfur Dioxide ( $SO_2$ ) are at very low levels compared to other cities in Australia. Ozone ( $O_3$ ) occurs in moderate levels in the Top End, mainly due to natural processes (NT EPA 2020).

In central NT, where the AAPowerLink Solar Precinct and OHTL are proposed to be located, wind-blown dust is a source of air pollution in addition to smoke from vegetation burning, albeit less so than in the Top End. There are no air monitoring stations that monitor pollutant levels in this region; however, the areas are sparsely populated and developed, and so are expected to have low levels of anthropogenic combustion-related criteria air contaminants (CO,  $NO_x$ , NO and  $NO_2$ , and  $SO_2$ ).

Regional average background concentrations for the air pollutants  $PM_{2.5}$ ,  $PM_{10}$  and  $NO_2$  were calculated using mean observations across the Darwin, Palmerston and Winnellie air monitoring stations with averaging occurring for each time frame and particle range size; these estimates were used as inputs to model all project works and activities, including at the Solar Precinct. Background levels for TSP were calculated based on the well-established assumption of a factor of two relationship between PM and TSP concentrations (Air Environment 2021). Background air quality statistics were compared with the assessment criteria presented earlier in Table 11-2.

Background levels for most pollutants measure below the assessment criteria except for annual  $PM_{2.5}$ . The 24-hour average  $PM_{2.5}$  criteria of  $25 \mu\text{g}/\text{m}^3$  is exceeded on a number of days each year across all three monitoring locations. The 24-hour average  $PM_{10}$  criteria of  $50 \mu\text{g}/\text{m}^3$  is also exceeded on a number of days each year across all three monitoring locations. As indicated earlier, these exceedances are a result of smoke from vegetation burning, which affects air quality in the Top End during the dry season.

As all the monitoring stations are in the Darwin region, background concentrations derived from the data may not be truly representative of background concentrations for each contaminant across the AAPowerLink footprint. In the Darwin region, there are a range of industrial, domestic and vehicle emissions sources in addition to open burning emissions (i.e., contributing to mostly  $PM_{2.5}$  and  $NO_x$  concentrations), whereas for most of the proposal footprint, emissions sources are limited to dust from vehicle traffic on unsealed roads, various types of land uses, and wind erosion (i.e., emitting primarily  $PM_{10}$  and TSP). While bushfires do occur in southern and central NT, the vegetation is sparser and therefore are not likely to represent as significant a source of  $PM_{2.5}$  concentrations as in the Darwin region.

Table 11-2. Background air quality levels compared to assessment criteria

Pollutant	Human Health Assessment criterion (µg/m <sup>3</sup> )		Background levels (µg/m <sup>3</sup> )	
	24-hour	Annual	24-hour	Annual
PM <sub>2.5</sub>	25	8	10.4 (41.6%)	<b>8.3 (103.8%)</b>
PM <sub>10</sub>	50	25	24.3 (48.6%)	19.9 (79.6%)
TSP	-	90	-	39.8 (44.2%)
Deposited dust	-	2 g/m <sup>2</sup> /month <sup>2</sup> 4 g/m <sup>2</sup> /month <sup>3</sup>	-	-

Pollutant	1-hour	Annual	1-hour	Annual
NO <sub>2</sub>	246	62	5.6 (2.3%)	4.7 (7.6%)

### 11.3.3 Sensitive receptors

Most of the AAPowerLink footprint is in remote areas visited by few people and with no permanent residences that would be sensitive to air emissions.

#### Solar Precinct

At the Solar Precinct there are no residences nearby and the nearest dwellings are at the Jangirulu Family Outstation 17 km north-east. Aboriginal people are known to use the area for hunting as discussed in Section 13.5.5, Chapter 13 Community and Economy.

#### Overhead Transmission Line

Along the OHTL there are several locations where there are buildings and houses proximate to the corridor that may be used as residences or visited periodically by people. The locations that could experience air emissions from construction activities are identified in Section 11.4.2 below. The current OHTL corridor traverses through Adelaide River township where there are residences and businesses located nearby that may potentially be affected by air emissions; however, options to divert around this area are being explored to further minimise impacts to the community. Locations of sensitive receptors are also shown in Figure 2-5a to Figure 2-5d in Chapter 2 Proposal Description.

#### Darwin Converter Site and Cable Transition Facilities

The Darwin Converter Site and Cable Transition Facilities at Murrumujuk are the most visited area of the proposal footprint and therefore this area is considered sensitive for the purpose of the air quality impact assessment. Although there are no residences nearby (the nearest are 5 km away at the Tree Point Aboriginal Community), the area is frequented by people partaking in recreational activities on the nearby Gunn Point Beach.

<sup>2</sup> Maximum increase in deposited dust level.

<sup>3</sup> Maximum total deposited dust level

## 11.4 Potential impacts

The potential impacts to air quality associated with the AAPowerLink were identified and assessed using the EIA methodology described in Chapter 3 Impact Assessment. The following potential impacts were considered:

- Emissions of particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>) and diesel exhaust (NO<sub>2</sub>) that could affect human health; and
- Emissions of particulate matter that could affect amenity (measured using TSP and deposited dust).

The *Air Quality Impact Assessment* (Appendix U) predicted changes to air quality with no mitigation. The EIA considered the impact avoidance and mitigation measures detailed in Section 11.5 below and assessed the residual impacts to air quality assuming these measures are effectively implemented.

A residual impact rating was then assigned taking into consideration the scale, magnitude and duration of the impacts, the presence/absence of environmental values and/or sensitive receptors and the level of certainty with respect to the intensity of the impact and the effectiveness of the mitigation measures. The residual impact ratings adopted in the assessment are provided in Table 11-3.

The outcomes of the EIA are summarised in Table 11-4 and Table 11-5 below from the Impact Assessment Registers provided in Appendix E and discussed in the sections below.

Table 11-3. Residual impact ratings adopted for the AAPowerLink EIA

Ratings and Description
<p><b>Minor:</b> A minor residual impact is unlikely to be significant.</p>
<p>A minor impact generally has two or more of the following characteristics:                      Scale: Limited/Localised Magnitude: Negligible/Minor Duration: Short-term/ Medium-term/Reversible.</p> <p><b>OR</b> There are no sensitive receptors or land uses present, and the environment does not contain any aspects that are valuable or otherwise important or unique (i.e., Very Low/Low rating), and there is moderate to high degree of certainty about the likelihood and intensity of the impact, and the effectiveness of proposed mitigation measures.</p>
<p><b>Moderate:</b> A moderate residual impact has potential to be significant. The significance depends on the acceptability of the impacts and the effectiveness of mitigation measures.</p>
<p>A moderate impact generally has two or more of the following characteristics:                      Scale: Localised/Regional Magnitude: Moderate Duration: Medium-term/Long-term</p> <p><b>AND/OR</b> There are sensitive receptors or land uses present, or environmental aspects that are valuable or otherwise important or unique (i.e., Medium-High value rating), and there is a low degree of certainty about the impact, and the effectiveness of proposed mitigation measures.</p>
<p><b>Major:</b> A major residual impact is likely to be significant. The level of acceptability will depend on offsets or benefits compensating for the impact.</p>
<p>Impact generally has two or more of the following characteristics:                      Scale: Regional/ Widespread Magnitude: Moderate/Major Duration: Long-term/Permanent</p> <p><b>AND</b> There are sensitive receptors or land uses present, or environmental aspects that are valuable or otherwise important or unique (i.e., Medium-High value rating).</p>

Table 11-4. Summary of EIA results – Air Quality factor - Construction

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual impact
Emissions of PM or NO <sub>2</sub> that could affect human health Section 11.4.2	Solar Precinct	<b>Likely</b> Construction activities will produce PM and NO <sub>2</sub>	<b>Localised</b> Health criteria is predicted to be met within 501m from activities.	<b>Medium-term</b> Impacts will occur over several years during construction.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Low</b> There are no sensitive receptors present in areas where air quality criteria are predicted to be exceeded.	<b>High</b> Air quality modelling has been undertaken (see Appendix U).	<b>Minor</b>
	OHTL	<b>Likely</b> Construction activities will produce PM and NO <sub>2</sub>	<b>Localised</b> Health criteria is predicted to be met within 63-175m from activities.	<b>Short-term</b> Impacts will occur for a few weeks to months at each location along the OHTL.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Medium</b> There are residences and buildings present in areas where air quality criteria are predicted to be exceeded.	<b>High</b> Air quality modelling has been undertaken (see Appendix U).	<b>Minor</b>
	Darwin Converter Site	<b>Likely</b> Construction activities will produce PM and NO <sub>2</sub>	<b>Localised</b> Health criteria predicted to be exceeded ~ 170-950m from site boundary.	<b>Medium-term</b> Impacts will occur over several years during construction.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Medium</b> People frequent areas where air quality criteria are predicted to be exceeded.	<b>High</b> Air quality modelling has been undertaken (see Appendix U).	<b>Minor</b>

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual impact
	Cable Transition Facilities	<b>Likely</b> Construction activities will produce PM and NO <sub>2</sub>	<b>Localised</b> Health criteria is predicted to be met within ~370m from activities.	<b>Medium-term</b> Impacts will occur over months during construction.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Medium</b> People frequent areas where air quality criteria are predicted to be exceeded.	<b>High</b> Air quality modelling has been undertaken (see Appendix U).	<b>Minor</b>
<b>Emissions of particulate matter (TSP and deposited dust) that could affect amenity</b> Section 11.4.2	Solar Precinct	<b>Possible</b> Construction activities will result in dust emissions.	<b>Localised</b> Nuisance criteria is predicted to be met within 244 m from construction activities.	<b>Medium-term</b> Impacts will occur over several years during construction.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Low</b> There are no sensitive receptors present in areas where air quality criteria are predicted to be exceeded.	<b>High</b> Dust deposition modelling has been undertaken (see Appendix U).	<b>Minor</b>
	OHTL	<b>Likely</b> Construction activities will result in dust emissions.	<b>Localised</b> Nuisance criteria is predicted to be met within 105-123 m from construction activities.	<b>Short-term</b> Impacts will occur for a few weeks to months at each location along the OHTL during construction.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Medium</b> There are residences and buildings present in areas where air quality criteria are predicted to be exceeded.	<b>High</b> Dust deposition modelling has been undertaken (see Appendix U).	<b>Minor</b>
	Darwin Converter Site	<b>Likely</b> Construction activities will result in dust emissions.	<b>Localised</b> Nuisance criteria is predicted to be exceeded ~ 380 m from site boundary.	<b>Medium-term</b> Impacts will occur over several years during construction.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Medium</b> People frequent areas where air quality criteria are predicted to be exceeded.	<b>High</b> Dust deposition modelling has been undertaken (see Appendix U).	<b>Minor</b>

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual impact
Cable Transition Facilities		<b>Likely</b> Construction activities will result in dust emissions.	<b>Localised</b> Nuisance criteria predicted to be met within 123 m from activities.	<b>Medium-term</b> Impacts will occur over months during construction phase.	<b>Minor</b> Emissions are likely to exceed natural variability with no mitigation. Mitigation measures expected to reduce the magnitude of this risk.	<b>Medium</b> People frequent areas where air quality criteria are predicted to be exceeded.	<b>High</b> Dust deposition modelling has been undertaken (see Appendix U).	<b>Minor</b>

Table 11-5. Summary of EIA results – Air Quality factor - Operations

Impact	Location	Likelihood	Scale	Duration	Magnitude	Value rating	Certainty	Residual impact
<b>Emissions of NO<sub>2</sub> from diesel exhaust</b> Section 11.4.3.1	All sites	<b>Possible</b> Operational activities will use vehicles and maintenance equipment.	<b>Limited</b> Diesel emissions from operational activities will affect a small area around activities. Vehicle numbers required during operations are limited.	<b>Short-term</b> Emissions could cause elevated concentrations of NO <sub>2</sub> for short periods of time as vehicles drive by or during maintenance activities.	<b>Negligible</b> Health criteria are unlikely to be exceeded.	<b>Low-Medium</b> There are no sensitive receptors in areas where air emissions will occur i.e., they are limited to within operational areas.	<b>High</b> The only sources of NO <sub>2</sub> during operations will be some vehicles and maintenance equipment.	<b>Minor</b>
<b>Emissions of particulate matter (dust)</b> Section 11.4.3.2	All sites	<b>Possible</b> Operational activities include vehicle movement and possibly minor ground disturbance.	<b>Limited</b> Dust emissions from operational activities will affect a small area around activities. Most of the footprint will be under infrastructure and vegetation management will be used to control dust at the Solar Precinct.	<b>Short-term</b> Emissions could cause elevated concentrations of TSP for short periods of time as vehicles drive by or during maintenance activities that require ground disturbance.	<b>Negligible</b> Health or nuisance criteria are unlikely to be exceeded.	<b>Low-Medium</b> There are no sensitive receptors in areas where air emissions will occur i.e., they are limited to within operational areas.	<b>High</b> Operational activities will not involve major ground disturbance works. Most ground surfaces will be covered.	<b>Minor</b>

## 11.4.1 Areas of potential impacts

### 11.4.1.1 Proposal footprint (direct disturbance)

The direct disturbance footprint for air quality covers the entire construction footprint for each component of the AAPowerLink, as detailed in Chapter 2 Proposal Description. Within these areas, there will be emissions of dust and diesel exhaust associated with land clearing and operation of diesel construction equipment. The area of direct impact to air quality will be associated with active works area where equipment is operating i.e., only parts of the footprint will experience air emissions at any given time and these will move as construction progresses. Although air quality ambient criteria will be exceeded within the construction footprint, mitigation measures and best management practices will be implemented to protect worker health and safety, and all WHS requirements will be met<sup>4</sup>.

### 11.4.1.2 Area of influence (indirect disturbance)

Air emissions will indirectly affect areas surrounding the AAPowerLink proposal footprint as dust and exhaust emissions disperse away from the works areas. The area of influence for each pollutant varies depending on the activities being undertaken and local meteorological conditions. The *Air Quality Impact Assessment* (Appendix U) modelled the area of influence for each component of the proposal footprint as follows:

1. For the Solar Precinct, OHTL, and Cable Transition Facilities, due to the mobile nature of construction activities, the distance decay approach was adopted to determine pollutant concentrations downwind of activities, and the distance until air quality is below the relevant assessment criteria. At these locations the key criteria used to assess air quality impacts were 24-hour average PM<sub>10</sub> and PM<sub>2.5</sub>, hourly NO<sub>2</sub> and annual maximum monthly dust deposition. While the annual average criteria for PM<sub>2.5</sub>, PM<sub>10</sub>, TSP and NO<sub>2</sub> were assessed, the predicted area of influence associated with these averaging periods were not used, since emission sources are unlikely to remain stationary in a fixed location for periods of one year or more.
2. For the Darwin Converter Site where construction will be confined to a specific area, pollutant concentrations were modelled to determine the concentrations that could occur within the site boundaries and in surrounding areas. The key criteria used to assess air quality impacts were average daily and annual PM<sub>2.5</sub>, PM<sub>10</sub>, TSP and NO<sub>2</sub>, and annual maximum monthly dust deposition.

For all locations, the assessment modelled the incremental effect of AAPowerLink construction emissions in the absence of any background concentrations and the cumulative effect with assumed background concentrations based on the regional background air quality data provided in Section 11.3.2. The modelling predicts that air emissions from the AAPowerLink construction activities are likely to affect areas outside of the construction footprint for periods of time during construction. The modelled area of influence from the incremental effect of AAPowerLink construction emissions is generally less than 500 m from construction activities. The exception is for 24-hour average PM<sub>10</sub> emissions at the Darwin Converter Site, which could periodically affect areas up to 950 m from the site, during windy conditions in the dry season. The actual area of influence varies for each pollutant and location and is described in the sections below.

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<sup>4</sup> The construction workforce is not considered a sensitive receptor for the purpose of the air quality impact assessment because specific measures will be required to protect worker health and safety in accordance with the *Work Health and Safety (National Uniform Legislation) Act 2011*.

### 11.4.2 Construction

Impacts to air quality will be the greatest during the construction phase, when large areas of land and soils will be exposed and disturbed by construction works, and large numbers of diesel equipment will be operating inside the proposal footprint. These activities will produce emissions of PM (dust) and NO<sub>2</sub> (from diesel exhaust), which have the potential to affect human health and amenity at locations where there are sensitive receptors present proximate to the construction activities. The potential impacts at each location are discussed below.

#### Solar Precinct

At the Solar Precinct, emissions of PM and NO<sub>2</sub> will occur around each separate work front operating across the proposal footprint at any given time during the four-year construction period. Emissions were modelled for a range of construction activities to determine the area of influence within which elevated concentrations of air pollutants could occur. For each pollutant Table 11-6 presents the maximum modelled separation distance from the AAPowerLink construction activities which is required before relevant air quality assessment criteria are met (referred to as the 'incremental separation distance'), and the distance required to meet assessment criteria when background concentrations are considered ('cumulative separation distance'). The distances presented in the table are the maximum distance from the range of construction activities that were modelled.

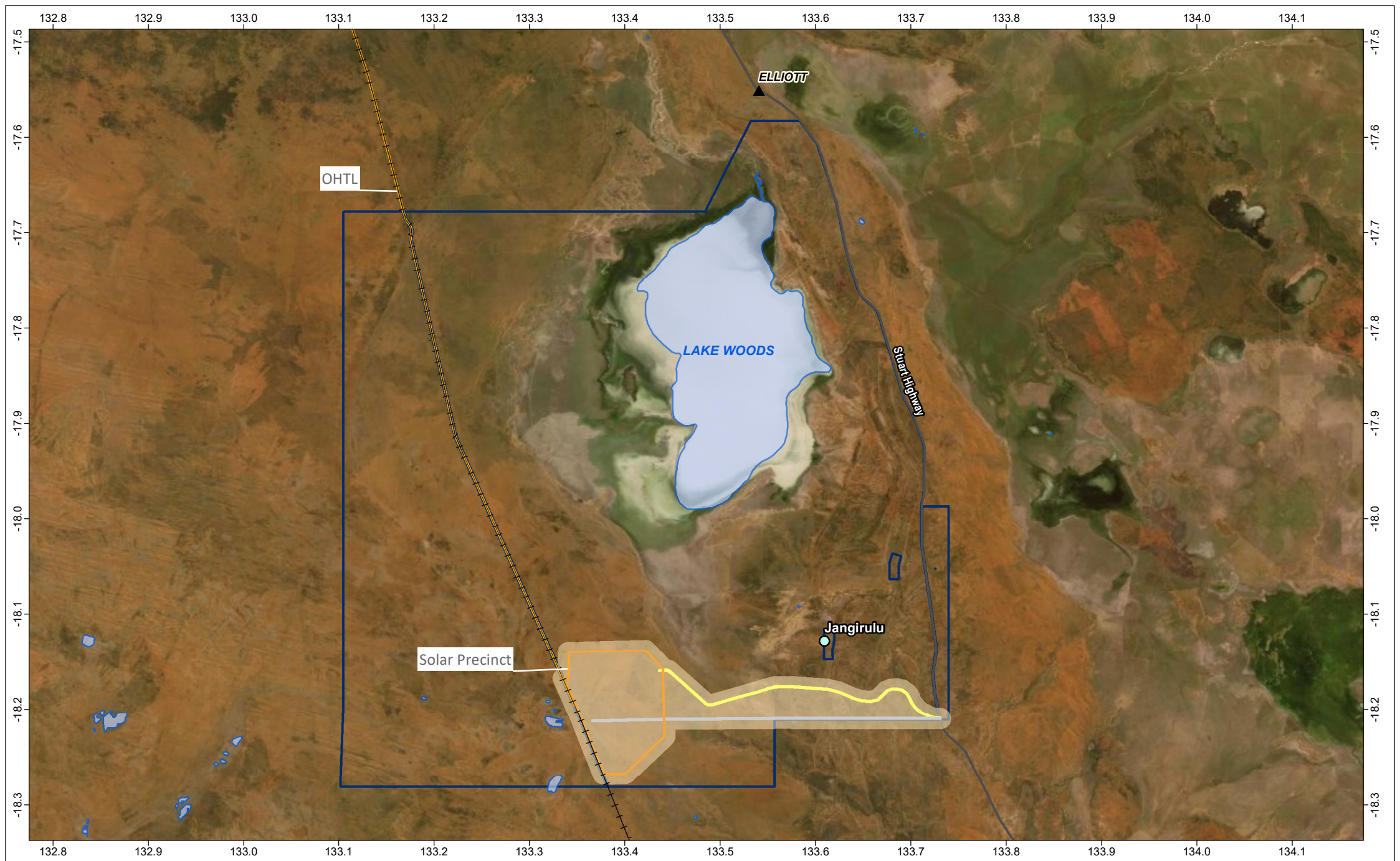
Table 11-6. Predicted distances from construction activities to meet air quality criteria at the Solar Precinct

Pollutant	Human Health Assessment criteria (ug/m <sup>3</sup> )	Incremental separation (project-only) distance to meet criteria (m)	Assumed background concentration (ug/m <sup>3</sup> )	Cumulative separation distance to meet criteria (m)
<b>Pollutants that affect health</b>				
24-hour average PM <sub>2.5</sub>	25	38	10.4	89
Annual average PM <sub>2.5</sub>	8	41	8.3	Not possible
24-hour average PM <sub>10</sub>	50	<b>501</b>	24.3	<b>1,079</b>
Annual average PM <sub>10</sub>	25	214	19.9	1,073
1-hour maximum NO <sub>2</sub>	246	68	5.6	103
Annual NO <sub>2</sub>	62	0	4.7	0
<b>Pollutants that affect amenity</b>				
Annual-max monthly dust deposition rate	2 mg/m <sup>2</sup> /month	244	NA	NA
Annual average TSP	90	88	39.8	213

For the pollutants with potential to cause human health impacts (PM<sub>2.5</sub>, PM<sub>10</sub> and NO<sub>2</sub>), the modelling results indicate that emissions from the AAPowerLink construction activities only could exceed air quality assessment criteria up to approximately 501 m from the activities at the Solar Precinct. The pollutant that is likely to affect the largest area is PM<sub>10</sub> with impacts predicted to occur between 214-501m from construction activities. PM<sub>2.5</sub> and NO<sub>2</sub> are predicted to meet the assessment criteria within 38-214 m from construction activities.

For the pollutants with potential to affect amenity, the modelling results indicated that emissions from the AAPowerLink construction activities exceed assessment criteria for TSP within 88 m, and deposited dust within 244 m from the construction activities i.e., most dust is likely to settle within 244 m from construction activities, with areas further away experiencing minimal impacts.

When background pollutant concentrations were taken into consideration, the modelling results indicate it is possible that air quality assessment criteria for PM<sub>10</sub> could be exceeded up to over 1 km from the construction activities. This area of influence is shown on Figure 11-2. This is considered a highly conservative prediction because the background air quality was derived from the Darwin region air monitoring stations (see Section 11.3.2) where there is a high PM load associated with vegetation burning and dry season dust which is blown from inland areas towards the Darwin region by south-easterly winds.

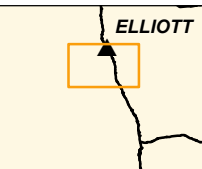


**Legend**

- AAPowerLink infrastructure
- Main access road (sealed)
- All-weather access road (unsealed)
- Railway
- Powell Creek Station
- Outstation
- Air emissions area of influence
- Lakes
- Principal road

Source: Sun Cable, EcoZ, NTG (NR Maps)

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**Figure 11-2: Map showing area of influence from construction air emissions at the Solar Precinct**

Project: <span style="color: orange;">Australia-Asia PowerLink</span>	Reference: M-Files ID 202374	Revision: 1
Coordinate System: GDA2020	Date: 10/02/2022	

0 5 10 15 20 Kilometres

Scale: 1:550,000 A4



While vegetation burning and dust storms would contribute to background PM concentrations at the Solar Precinct, these concentrations are likely to be lower than in the Darwin region.

There are no sensitive receptors proximate to the Solar Precinct that are likely to experience any health or amenity impacts from air emissions associated with AAPowerLink construction activities (Table 11-2). The nearest residences are located at Jangirulu Family Outstation, which is 17 km north-east of the Solar Precinct and 5.5 km from the gravel access road into the site. Use of the proposal footprint area for traditional purposes (hunting) is expected to be infrequent.

### Overhead Transmission Line

Along the OHTL corridor, emissions of PM and NO<sub>2</sub> will occur around each separate work front operating across the proposal footprint at any given time during the four-year construction period. Because of the narrow linear nature of the corridor, air emissions will occur periodically in any given location along the corridor as the work fronts move through, initially undertaking land clearing and site preparation, then installing the poles and stringing the conductors.

Emissions from the construction activities were modelled to determine the area of influence within which elevated concentrations of air pollutants could occur. Separate models were prepared for the southern (inland) sections of the OHTL corridor and the northern (coastal) sections because the different meteorological conditions experienced in those regions affect the dispersion of air pollutants. The southern OHTL corridor used the meteorological model developed for the Solar Precinct, while the northern OHTL corridor used the model developed for the Murrumujuk region.

For each pollutant, Table 11-7 presents the maximum modelled separation distance from the AAPowerLink construction activities required to meet the relevant human health air quality assessment criteria (incremental separation distance), and the distance required to meet assessment criteria when background concentrations are considered (cumulative separation distance).

Table 11-7. Predicted distances from construction activities to meet air quality criteria along the OHTL

Pollutant	Human Health Assessment criteria (ug/m <sup>3</sup> )	Incremental separation distance to meet criteria (m)	Assumed background concentration (ug/m <sup>3</sup> )	Cumulative separation distance to meet criteria (m)
<b>SOUTHERN OHTL CORRIDOR</b>				
<b>Pollutants that affect health</b>				
24-hour average PM <sub>2.5</sub>	25	5	10.4	30
24-hour average PM <sub>10</sub>	50	63	24.3	127
1-hour maximum NO <sub>2</sub>	246	<b>444</b>	5.6	<b>468</b>
<b>Pollutants that affect amenity</b>				
Annual-max monthly dust deposition rate	2 mg/m <sup>2</sup> /month	105	-	-
<b>NORTHERN OHTL CORRIDOR</b>				
<b>Pollutants that affect health</b>				
24-hour average PM <sub>2.5</sub>	25	48	10.4	69
24-hour average PM <sub>10</sub>	50	175	24.3	283
1-hour maximum NO <sub>2</sub>	246	<b>307</b>	5.6	<b>327</b>
Annual-maximum monthly dust deposition rate	2 mg/m <sup>2</sup> /month	123		

For the pollutants with potential to cause human health impacts (PM<sub>2.5</sub>, PM<sub>10</sub> and NO<sub>2</sub>), the modelling results indicate that emissions from the AAPowerLink construction activities could exceed air quality assessment criteria up to approximately 444 m from the OHTL corridor in the south and 307 m in the north. The pollutant that is likely to affect the largest area is NO<sub>2</sub>. PM<sub>2.5</sub> and PM<sub>10</sub> are predicted to meet the assessment criteria within 5- 63 m from OHTL construction activities in the south and 48-175 m in the north.

For the pollutants with potential to affect amenity, modelling results indicated that emissions from the AAPowerLink construction activities could exceed deposited dust assessment criteria within 105 m from the construction activities i.e., most dust produced by the activities will settle within 105 m of the activities, with areas further away experiencing minimal impacts.

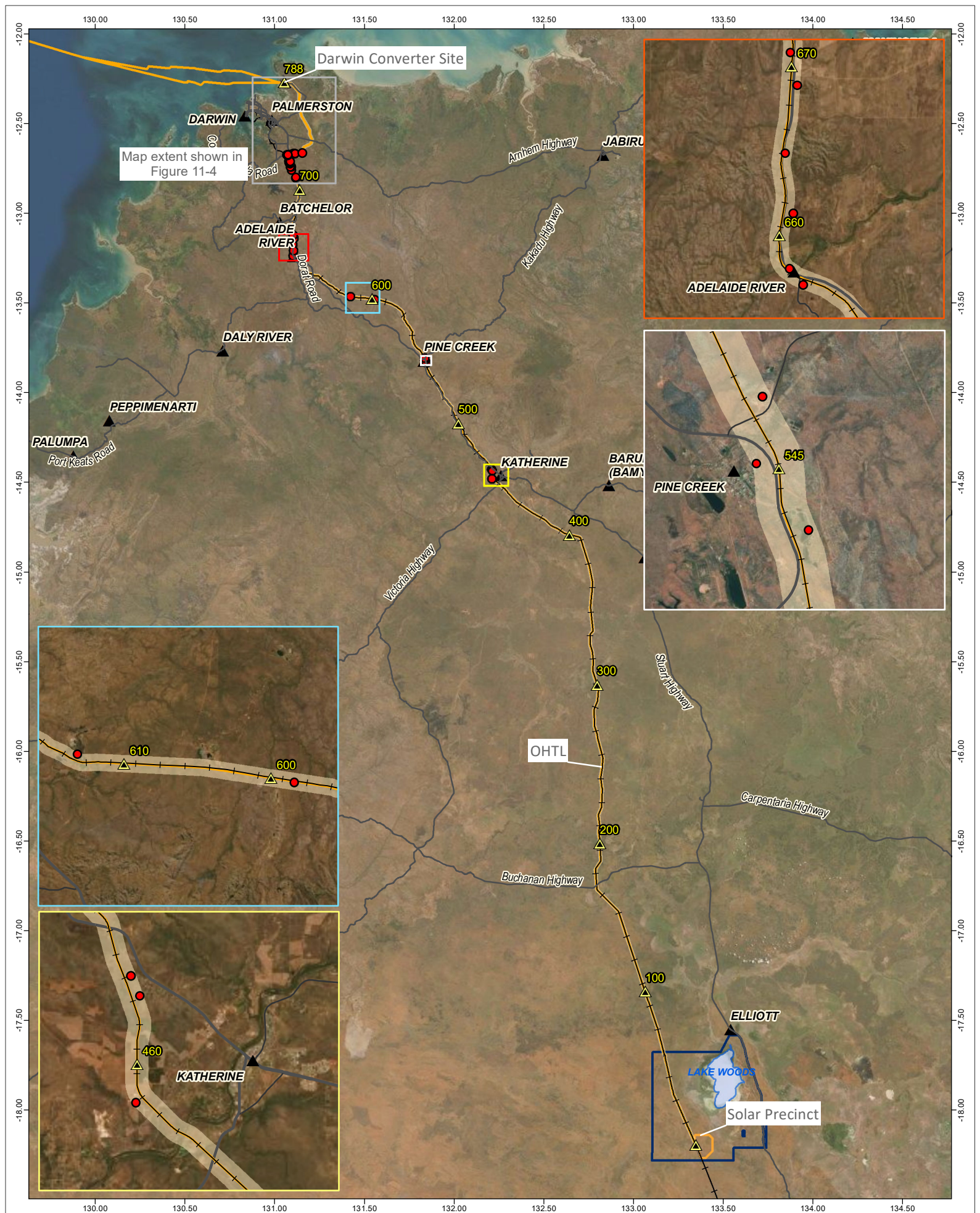
When background pollutant concentrations were taken into consideration, the modelling results indicate it is possible that air quality assessment criteria for NO<sub>2</sub> could be exceeded up to 307-468 m from the construction activities and PM criteria could be exceeded up to 283 m from construction activities. The area of influence, taking background air pollutant concentrations into account, is shown on Figure 11-3 and Figure 11-4.

There are several locations along the OHTL corridor where people may reside in or frequent the areas where air quality criteria may be exceeded. These are listed in Table 11-8 and shown as sensitive receptors on Figure 11-3 and Figure 11-4. The extent of impacts at each of these locations (or sensitive receptors present along potential route diversions, once finalised, as discussed in Chapter 2) will depend on a range of factors including the final OHTL corridor alignment, and the soil moisture and wind conditions at the time of construction.

Mitigation measures to minimise and manage impacts to air quality are described in Chapter 17 Environmental Management and summarised in Section 11.5 below. These measures are expected to be effective at reducing impacts, but it is still possible that some receptors will experience air quality impacts for short periods of time when work fronts move through areas during the mid-late dry season when soil moisture levels are low, windy conditions disperse pollutants away from the works areas and there are cumulative impacts from vegetation burning and windblown dust. These impacts will be managed by engaging with people in specific project areas prior to construction, carrying out visual observations and adaptive management measures to mitigate fugitive dust events (as feasible), and providing a complaints process to track and respond to any stakeholder, Aboriginal and community concerns.

Table 11-8. Locations along OHTL corridor where sensitive receptors could be affected by construction air emissions

Component Location	Receptors from south to north	Distance from proposal footprint
KP474	Rural housing (multiple buildings)	0.4km
KP554	Farmhouse	0.4km
KP557	Pine Creek golf course and track	0.2km
KP608.5	House	0.1km
KP623	Work area	0.5km
KP667	Racecourse - Adelaide River	0.2km
KP667	Adelaide River township	0.11km
KP675	House	0.2km
KP679	Small rural blocks	0.1km
KP681	Small rural blocks	0.1km
KP723 to KP788	Darwin rural areas; Noonamah, Wak Wak, Lambells Lagoon, Herbert and Koolpinyah	0.2 – 0.3km east and west



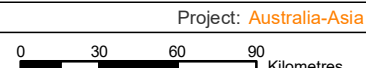
Map extent shown in Figure 11-4

OHTL

Solar Precinct

Figure 11-3: Map showing area of influence from construction air emissions along OHTL

- Legend**
- Potential receptors within the air emissions zone of impact
  - AAPowerLink infrastructure
  - Railway
  - Roads
  - Powell Creek Station
  - Air emissions area of influence



Scale: 1:2,893,085  
 Coordinate System: GDA2020

Project: Australia-Asia PowerLink	
Reference: M-Files ID 202374	Revision: 1
Date: 10/03/2022	



Source: Sun Cable, EcOz, NTG (NR Maps)

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**Legend**

- AAPowerLink infrastructure
- ++ Railway
- Roads
- ▲ OHTL Kilometre Points
- Potential receptors within the air emissions zone of impact
- Air emissions area of influence

Source: Sun Cable, Eco2, NTIG (NR Maps)



**Figure 11-4: Map showing area of influence from construction air emissions along OHTL (northern end)**

Project: **Australia-Asia PowerLink**

		Reference: M-Files ID 202374	
Scale: 1:250,000		Date: 08/03/2022	Revision: A
Coordinate System: GDA2020		A4	

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### *Darwin Converter Site*

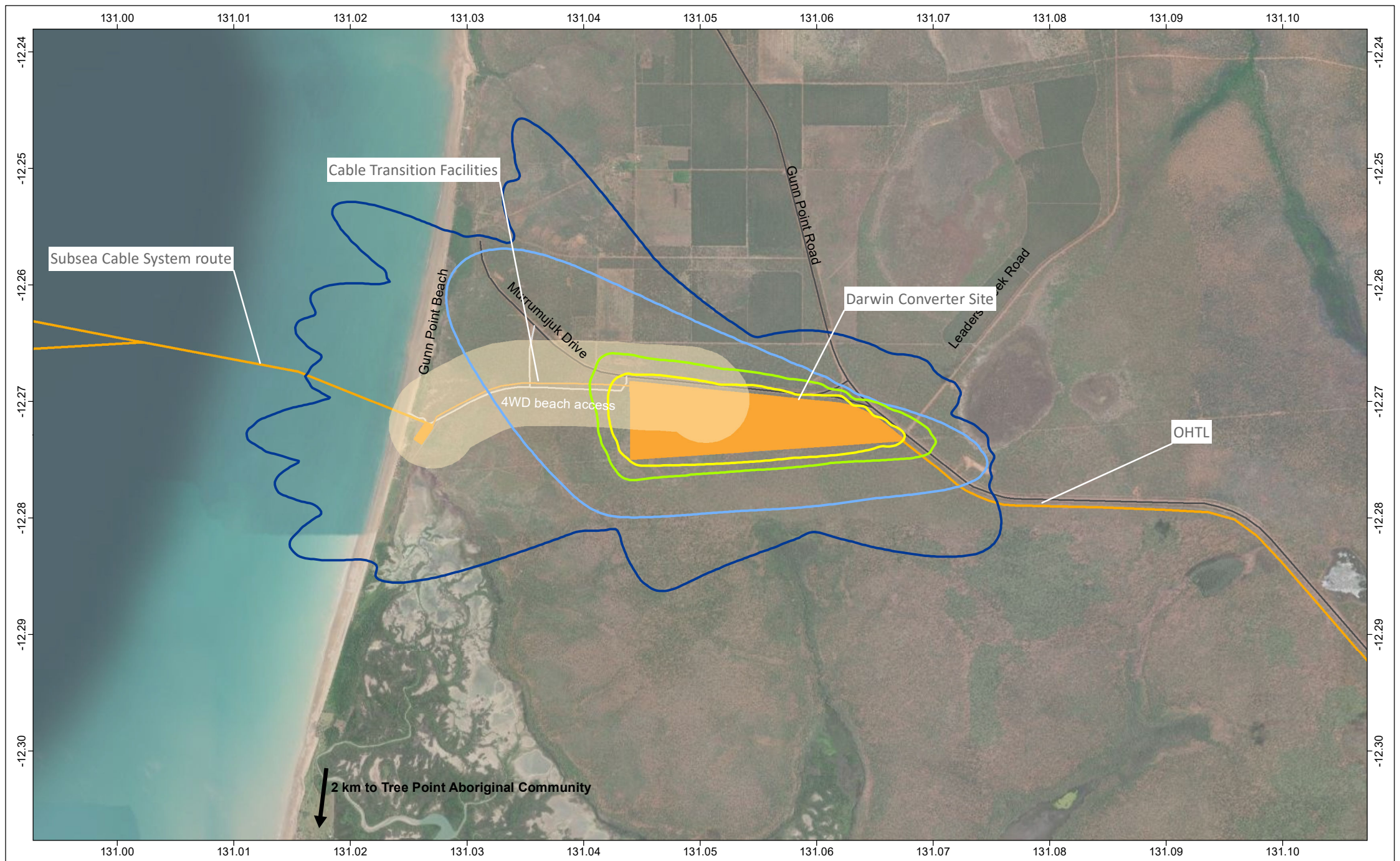
At the Darwin Converter Site, emissions of PM and NO<sub>2</sub> will occur across the proposal footprint over the four-year construction period. Air pollutants were modelled to predict the concentrations that could occur within the construction site boundaries and in surrounding areas. For each pollutant, Table 11-9 presents the predicted maximum incremental ground level concentration at the Darwin Converter Site boundary and the cumulative ground level concentrations when background concentrations are considered and compares both to the relevant air quality assessment criteria. The modelling predicted that air quality assessment criteria will not be met for any of the pollutants at the boundaries of the Darwin Converter Site and there is potential for air emissions from the AAPowerLink construction activities to affect air quality in a localised area.

The area of influence to air quality from the AAPowerLink construction activities has been identified by interrogating the model outputs to determine the distance from the construction site boundaries that pollutant concentrations are predicted to drop below the assessment criteria. The area of influence, within which air quality assessment criteria are predicted to be exceeded, are shown in Figure 11-5.

For the pollutants with potential to cause human health impacts (PM<sub>2.5</sub>, PM<sub>10</sub> and NO<sub>2</sub>), the modelling results indicate that PM<sub>2.5</sub> and NO<sub>2</sub> pollutants could be elevated above the assessment criteria inside the construction site boundary but decrease rapidly and are unlikely to be at levels that cause health effects outside of the site. The assessment criterion for PM<sub>10</sub> is predicted to be exceeded up to 2 km (annual) and 3.5 km (daily) from the site boundary, with the impact affecting a larger area when background concentrations are elevated during the dry season.

For the pollutants with potential to affect amenity (TSP and deposited dust), modelling results indicate that the TSP assessment criterion could be exceeded within 80-222 m of the site boundary, with the impact affecting a larger area when background concentrations of TSP are elevated during the dry season. The deposited dust criterion could be exceeded within approximately 380 m of the site boundary.

Parts of Gunn Point Road and Murrumujuk Drive are within the area of influence for PM<sub>10</sub>, TSP and deposited dust. Human health impacts are considered unlikely to occur as exposure will be limited to people driving through the area in vehicles. Elevated TSP concentrations have potential to cause visibility impacts along the public roads if not adequately mitigated. There are no sensitive land uses within the area predicted to receive deposited dust; however, there is a seasonal swamp inside this area and potential impacts to this feature are discussed in Chapter 8 Aquatic Ecosystems. Modelling results indicate that recreational users of Gunn Point Beach may be exposed to criteria air contaminants. However, the implementation of mitigation measures to minimise and manage impacts to air quality as described in Chapter 17 Environmental Management and summarised in Section 11.5 below are expected to reduce the areas of direct impact and area of influence associated with air emissions from the AAPowerLink construction activities.



**Legend**

- Shore Crossing site
- AAPowerLink infrastructure
- 4WD beach access
- Road
- Area of influence for Cable Transition Facilities

**Area of influence for Darwin Converter Site**

- Annual TSP
- Maximum monthly Dust Deposition Rate
- Annual PM10
- Daily PM10

Source: Sun Cable, EcOz, NTG (NR Maps), Air Environment 2021

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**Figure 11-5: Map of area of influence from construction air emissions at Darwin Converter Site**

Project: **Australia-Asia PowerLink** Reference: M-Files ID 202374 Revision: 1

Coordinate System: GDA2020 Date: 08/03/2022

0 2 Kilometers Scale: 1:45,000 A4

SUN CABLE

Table 11-9. Predicted ground level concentrations of air pollutants at the Darwin Converter Site boundary

Pollutant	Human Health Assessment criteria (ug/m <sup>3</sup> )	Predicted maximum incremental ground level concentration at the site boundary (ug/m <sup>3</sup> )	Assumed background concentration (ug/m <sup>3</sup> )	Predicted maximum cumulative ground level concentration at the site boundary (ug/m <sup>3</sup> )
<b>Pollutants that affect health</b>				
24-hour average PM <sub>2.5</sub>	25	36.0	10.4	46.4
Annual average PM <sub>2.5</sub>	8	14.62	8.3	22.92
24-hour average PM <sub>10</sub>	50	360.6	24.3	384.9
Annual average PM <sub>10</sub>	25	146.5	19.9	166.4
1-hour maximum NO <sub>2</sub>	246	246.6	5.6	252.2
Annual NO <sub>2</sub>	62	25.9	4.7	30.6
<b>Pollutants that affect amenity</b>				
Annual average TSP	90	292.9	39.8	332.7
Annual-max monthly dust deposition rate	2 mg/m <sup>2</sup> /month	30.7 mg/m <sup>2</sup> /month	-	-

### Cable Transition Facilities

Air emissions from the Cable Transition Facilities footprint will mainly be associated with land clearing, trenching and cable burial activities along the 2.7 km long Underground Cable Corridor. Emissions of PM and NO<sub>2</sub> will occur around each separate work front operating across the proposal footprint at any given time.

Emissions from the construction activities were modelled to determine the area of influence within which elevated concentrations of air pollutants could occur. For each pollutant, Table 11-10 presents the maximum modelled separation distance from the AAPowerLink construction activities required to meet the relevant air quality assessment criteria (incremental separation distance), and the distance required to meet assessment criteria when background concentrations are considered (cumulative separation distance).

For the pollutants with potential to cause human health impacts (PM<sub>2.5</sub>, PM<sub>10</sub> and NO<sub>2</sub>), the modelling results indicate that emissions from the AAPowerLink construction activities could exceed air quality assessment criteria up to approximately 370 m from the construction activities. The pollutant that is likely to affect the largest area is NO<sub>2</sub>. PM<sub>2.5</sub> and PM<sub>10</sub> are predicted to meet the assessment criteria within 48 m and 175 m from the construction activities.

For the pollutants with potential to affect amenity, modelling results indicated that emissions from the AAPowerLink construction activities could exceed deposited dust assessment criteria within 123 m from the construction activities i.e., most dust produced by the activities will settle within 123 m of the activities, with areas further away experiencing minimal impacts.

When background pollutant concentrations were taken into consideration, the modelling results indicate it is possible that air quality assessment criteria for NO<sub>2</sub> could be exceeded up to 397 m from the construction activities and PM criteria could be exceeded up to 283 m from construction activities.

It is possible that air quality criteria will be exceeded on Gunn Point Beach for short periods of time during construction. The extent of impacts will depend on a range of factors including the soil moisture and wind conditions at the time of construction. Mitigation measures to minimise and manage impacts to air quality are described in Chapter 17 Environmental Management and summarised in Section 11.5 below. These measures are expected to be effective at reducing impacts, but it is still possible that recreational users of Gunn Point

Beach will experience air quality impacts for short periods of time during peak construction when diesel emissions will be highest and during the mid-late dry season when soil moisture levels are low, windy conditions disperse pollutants away from the works areas and there are cumulative impacts from vegetation burning and windblown dust. These impacts will be managed by engaging with people in the affected areas prior to construction, carrying out visual observations at sensitive locations and applying adaptive management measures (if required), and providing a complaints process.

Table 11-10. Predicted distances from construction activities to meet air quality criteria in the Cable Transition Facilities

Pollutant	Human Health Assessment criteria (ug/m <sup>3</sup> )	Incremental separation distance to meet criteria (m)	Assumed background concentration (ug/m <sup>3</sup> )	Cumulative separation distance to meet criteria (m)
<b>Pollutants that affect health</b>				
24-hour average PM <sub>2.5</sub>	25	48	10.4	69
24-hour average PM <sub>10</sub>	50	175	24.3	283
1-hour maximum NO <sub>2</sub>	246	<b>370</b>	5.6	<b>397</b>
<b>Pollutants that affect amenity</b>				
Annual-maximum monthly dust deposition rate	2 mg/m <sup>2</sup> /month	123	-	-

### 11.4.3 Operations

Once the AAPowerLink infrastructure is installed, the potential for air quality impacts is significantly reduced as there are no major sources of air emissions. Facilities at the Solar Precinct and Darwin Converter Site will be powered by the solar electricity that is generated, with no requirement for on-site diesel power generation. There will likely be some use of diesel-powered vehicles, plant and equipment for routine operations and maintenance activities. There is potential for dust emissions caused by wind erosion of exposed surfaces, traffic movements on unsealed roads/tracks and minor ground disturbance by maintenance and repairs. The potential impacts are summarised below.

#### 11.4.3.1 Diesel exhaust emissions from non-road construction equipment

Vehicle and maintenance equipment are the only expected sources of diesel exhaust emissions. Emissions could cause elevated concentrations of NO<sub>2</sub> for short periods of time as vehicles drive by or during maintenance activities. Assessment criteria for NO<sub>2</sub> are unlikely to be exceeded because the numbers of vehicles, plant and equipment operating at any given time will be limited. Operational emissions will be very infrequent and of low magnitude and expected to be below levels that could cause health impacts. Additionally, impacts are expected to occur in limited operational areas and not to the same scale as during construction.

#### 11.4.3.2 Dust emissions

At the Solar Precinct and Darwin Converter Site, routine operations and maintenance activities will require vehicle movements and possibly minor ground disturbance that will generate dust, and it is also possible that there will be wind-blown dust emissions from any areas of bare ground. Most of the footprint will be under infrastructure, and vegetation management will be used to control dust at the Solar Precinct as detailed in Chapter 2 Proposal Description. The OHTL access track will be used during maintenance inspections and repairs; however, this work will be intermittent in a much smaller area, and dust emissions would thus be less than what is modelled to occur during construction. Emissions from these operations and maintenance activities could cause elevated concentrations of TSP for short periods of time as vehicles drive by, or fugitive TSP and deposited dust during maintenance activities that require ground disturbance. Health or nuisance criteria are unlikely to be exceeded.

### 11.5 Avoidance, mitigation, and monitoring

Sun Cable is committed to applying the environmental decision-making hierarchy when making decisions that could affect the environment. Consistent with Section 26 of the *EP Act*, this involves applying the following approaches in order of priority:

1. Avoid – Ensure that actions are designed to avoid adverse impacts on the environment.
2. Mitigate – Identify management options to mitigate adverse impacts on the environment to the greatest extent practicable.
3. Offset – If appropriate, provide for environmental offsets for significant residual adverse impacts on the environment that cannot be avoided or mitigated.

The environmental management framework that will be adopted for the construction and operation of the AAPowerLink is detailed in Chapter 17 Environmental Management. The framework comprises a Construction Environmental Management Plan (CEMP) and Operations Environmental Management Plan (OEMP) that sit within an overarching Environmental Management System (EMS).

For each of the impacts to air quality discussed in this chapter, Table 11-11 summarises the actions that will be taken to avoid environmental impacts (through site selection and design) and actions proposed to minimise impacts during construction, operation and decommissioning of the proposal. Relevant measures have been referred to in the above discussion of the of potential impacts at each project component. The proposed controls are routine for land development and industrial operations and, assuming proper implementation and adaptive management, should be effective in ensuring air emissions do not pose unacceptable impacts to health of the community or amenity of areas surrounding the AAPowerLink proposal footprint. The measures provided in this chapter, along with any additional measures required to address conditions of approvals, permits and licences, will be integrated into the CEMP and OEMP prepared for the AAPowerLink.

Table 11-11. Air quality – Commitments

Impact	Avoidance	Mitigation	Monitoring	Reporting
<b>Emissions of PM or NO<sub>2</sub> that could affect human health</b>	<p>Whenever possible, plan haul routes to avoid residential areas</p> <p>Efficient staging and layout of construction facilities to minimize haulage, avoid double handling of materials and other excessive equipment operations</p> <p>Use grid or solar power whenever practical over stationary combustion generated power</p> <p>Implement anti-idling policy</p>	<p>NO<sub>x</sub> emissions will be minimised by using electric vehicles and equipment where practicable, and ensuring all machinery, plant and equipment complies with minimum emissions standards</p> <p>Operate equipment at optimum rated loads as determined by equipment manufacturer and follow routine equipment maintenance procedures</p> <p>Ensure all heavy duty on-road and non-road vehicles are late model and meet all commonwealth and NT emission standards</p> <p>Ensure all equipment brought to site is in good working order accompanied by inspection certificates and not exceeding 10% opacity.</p> <p>Position stationary emission sources such as generators away from sensitive receptors with due regard to safety, security, traffic, and other geographic restrictions.</p>	<p>Conduct visual inspections for opacity from vehicle/equipment emissions.</p> <p>Carry out inspections certifying equipment is in good working order prior to shipping to site</p>	<p>Reporting will be carried out per the requirements of the CEMP described in Chapter 17</p> <p>External reporting in accordance with environmental approval conditions.</p>
<b>Emissions of particulate matter (TSP and deposited dust) that could affect amenity</b>	<p>Locate site access roads, laydown areas and stationary equipment (e.g., generators) as far away as possible from sensitive receivers</p> <p>Limit the amount of time between completion of road base and any paved areas to minimize exposure of unpaved surface</p>	<p>Water carts will be used across the project footprint to minimise dust emissions in areas of high risk at regular intervals. Other dust suppressants will be used if water ineffective.</p> <p>Implement on-site vehicle restrictions (e.g., limit the speed of vehicles travelling on unsealed access roads).</p> <p>Provide tyre wash facilities to minimize tracking of mud or dirt onto sealed roads</p> <p>Cover or dampen any stockpiles where practical.</p> <p>Notify and engage with residences and businesses who could be affected ahead of the construction front and implement complaints procedure.</p>	<p>Visual observations for fugitive emissions of dust</p> <p>Conduct regular inspections of construction areas and roads to identify potential sources of dust emissions</p> <p>Develop ‘watching brief’ on ‘nuisance’ impacts to ensure quick responses to any detriment and emerging issues.</p> <p>Implement complaints procedure</p>	<p>Reporting will be carried out per the requirements of the CEMP described in Chapter 17</p> <p>External reporting in accordance with environmental approval conditions.</p>

## 11.6 Residual impact

As stated at the start of this chapter, the NT EPA’s objective for the Air quality factor is to:

*“Protect air quality and minimise emissions and their impact so that environmental values are maintained”.*

The residual impact of the AAPowerLink to Air quality is summarised below, assuming the adoption of the impact avoidance, mitigation and monitoring measures described in this chapter.

Each impact to air quality was assigned a residual impact rating taking into consideration the scale, magnitude and duration of the impacts, the presence/absence of environmental values and/or sensitive receptors and the level of certainty with respect to the intensity of the impact and the effectiveness of the mitigation measures. The residual impact ratings adopted in the assessment were provided earlier in Table 11-3. The combined residual impact to air quality from all components of the AAPowerLink construction and operations is summarised in Table 11-12.

Table 11-12. Residual impact ratings for impacts to Air quality

Impacts	Residual Impact Rating
<b>Construction</b>	
Emissions of PM or NO <sub>2</sub> that could affect human health	Minor
Emissions of particulate matter (TSP/deposited dust) that affect amenity	Minor
<b>Operations</b>	
Emissions of NO <sub>2</sub> from diesel exhaust	Minor
Emissions of particulate matter (dust)	Minor

The results of the EIA process undertaken for the Air quality factor indicate the AAPowerLink will have Minor residual impacts to human health and nuisance as a result of changes in air quality across all project locations for both construction and operations.

The AAPowerLink construction activities will produce dust and diesel exhaust emissions that will impact air quality within the proposal footprint, and this impact is likely to extend into surrounding areas at some locations at times during the construction phase. The atmospheric dispersion modelling predicted that the AAPowerLink emissions could exceed relevant air quality assessment criteria for protection of human health and amenity at distances between 307-943 m from the work fronts as summarised in Table 11-13 below. This distance increases when background air quality is accounted for as shown in the last column of the table; however, it is noted that the cumulative impact at the Solar Precinct is likely an overly conservative estimate due to the background data being derived from the Darwin region air monitoring stations where background levels of PM<sub>2.5</sub> and PM<sub>10</sub> are likely to be higher.

Table 11-13. Distance from AAPowerLink construction works affected by air quality impacts

Location	Buffer limiting pollutant	Distance from works assessment criteria exceeded by AAPowerLink emissions	Distance from works assessment criteria exceeded by cumulative emissions
Solar Precinct	24-hour average PM <sub>10</sub>	501m	1,079m
OHTL (south)	1hr maximum NO <sub>2</sub>	444m	468m
OHTL (north)	1hr maximum NO <sub>2</sub>	307m	327m
Darwin Converter Site	24-hour average PM <sub>10</sub>	943m	3,593m
Cable Transition Facilities	1hr maximum NO <sub>2</sub>	370m	397m

As most of the footprint is in remote areas, there are few locations where people are likely to be affected by the construction air emissions. There is potential for exposure to both combustion and dust emissions at specific locations along the OHTL corridor and at Murrumujuk and Gunn Point Beach associated with construction of the Darwin Converter Site and Cable Transition Facilities. However, the nature of exposure will be transient and occur sporadically, with short durations as work fronts pass by, or if there are high elevated background concentrations during windy periods in the dry season. Overall, residual impacts were considered Minor after considering avoidance, mitigation, inspections, and other monitoring requirements. Sun Cable propose to engage with potentially affected people and implement dust mitigation measures, which is expected to ensure impacts are appropriately managed.

## 11.7 Cumulative impacts

The framework used to assess cumulative impacts from the AAPowerLink is described in Section 3.3 Chapter 3 Impact Assessment. The process involves considering the cumulative or combined impacts to air quality associated with the residual impacts from the AAPowerLink construction emissions, existing air emissions and air emissions associated with reasonably foreseeable developments described in Chapter 3.

The *Air Quality Impact Assessment* (Appendix U) assessed cumulative impacts by deriving background air quality concentrations and taking these into consideration when determining the distance from the AAPowerLink construction activities that air quality criteria are likely to be exceeded for key pollutants. The results of the cumulative impact assessment are reported for each AAPowerLink component in Section 11.4.2 above. For most pollutants the background air quality in the NT is good and the air quality impact assessment found there is limited potential for cumulative impact from the combined effects of existing emissions and AAPowerLink construction emissions. But for PM<sub>2.5</sub> and PM<sub>10</sub>, background concentrations (derived from the monitoring stations in the Darwin region – see Section 11.3.2) either exceed or make up a substantial portion of the assessment criteria for these pollutants as described below:

- Annual average PM<sub>2.5</sub> concentrations are 104% of the criterion
- Annual average PM<sub>10</sub> concentrations are 80% of the criterion
- 24-hour average PM<sub>10</sub> concentrations are 49% of the criterion.

Because of this, the cumulative dust impact assessment is dominated by existing background emissions from natural sources of particulate matter (both PM<sub>10</sub> and PM<sub>2.5</sub>). When AAPowerLink construction activities coincide with periods of increased emissions from vegetation burning in surrounding areas and windy conditions during the dry season, the cumulative impacts of the AAPowerLink activities and background emissions are predicted to result in exceedance of air quality assessment criteria over wider areas than would otherwise occur.

While the air quality impact assessment indicates there is potential for cumulative impacts to result in exceedances of air quality assessment criteria over wider areas, the extent of impacts is likely to be over-estimated due to the limitations of the background air quality data used in the assessment. As all the monitoring stations are in the Darwin region, estimates of background concentrations derived from the data are likely to over-estimate background concentrations of air pollutants for other locations in the AAPowerLink proposal footprint. In the Darwin region, there are a range of industrial, domestic, vehicle and cumulative vegetation burning emissions sources that are not present across most of the proposal footprint where emissions sources are generally limited to dust from vehicle traffic, land uses and wind erosion. As a result, the maximum cumulative concentrations of air pollutants (i.e., the combined emissions from existing uses and the AAPowerLink activities) predicted in the air quality impact assessment are likely conservative.

In terms of reasonably foreseeable projects that could further contribute to cumulative impacts from air emissions, these impacts are only likely to occur if the construction phases of different projects overlap. At the Darwin Converter Site and Cable Transition Facilities there is some potential for cumulative impacts associated with the following activities:

- Construction of the proposed Sea Dragon aquaculture project, which is located directly west.
- Construction of the transmission line to connect the Darwin Converter Site to the Darwin Katherine Electricity System.

Construction dust and diesel exhaust emissions from these projects could result in cumulative impacts to air quality with exceedance of air quality assessment criteria over wider areas than would otherwise occur if the construction phases occurred at different times.

Air quality impacts are mainly associated with the construction phase of the AAPowerLink proposal and are predicted to be localised, which limits the potential for cumulative impacts to air quality. In the Solar Precinct footprint, there are no other current land uses contributing to air quality impacts. In the OHTL component, there are no other known land uses expected to contribute to air quality. Any construction activities that take place nearby to the OHTL route may contribute to cumulative dust and/or diesel emissions, however this is expected to be minor if it occurs. Accordingly, cumulative residual impacts to amenity and human health are possible during the construction phase, however the previously determined residual impact ratings (scale, severity, value, certainty, and likelihood) presented in Table 11-4 and Table 11-5 are not expected to change.

## 11.8 Offsets

The EIA did not identify any significant residual impacts to air quality that require offsets.

## 11.9 References

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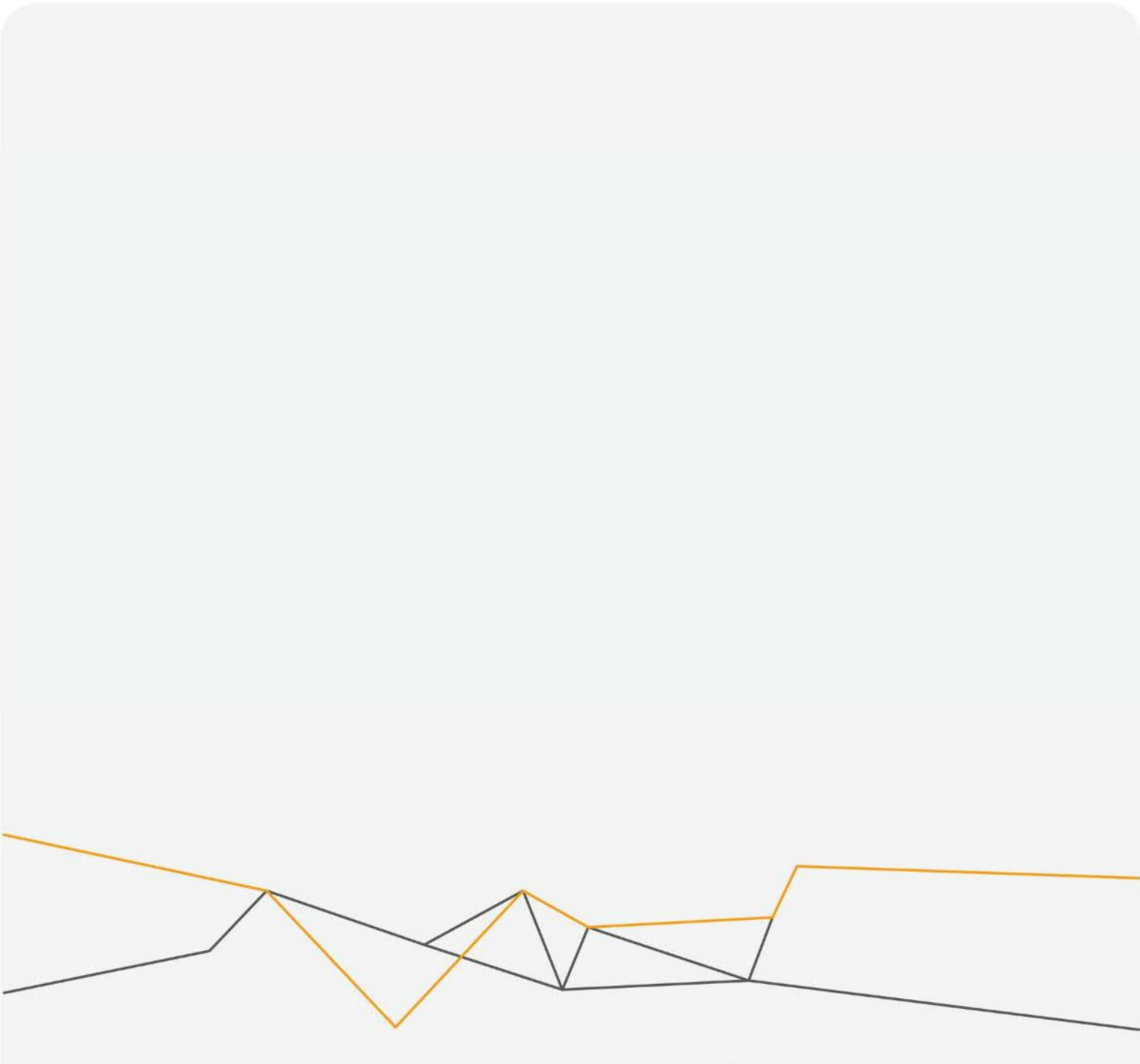
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