

Traffic Impact Assessment

Construction of a Green Ammonia Terminal at the Walvis Bay Port Area

Submitted to:
Environmental Compliance Consultancy (Pty) Ltd
PO Box 91193, Klein Windhoek
Windhoek, Namibia

Submitted by:
Zutari Namibia (Pty) Ltd.
Mandela Offices 1
Windhoek, Namibia
Project Number 1002938

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1 Introduction and Background

1.1 Introduction

Cleanergy Solutions Namibia (Pty) Ltd is a joint venture between Ohlthaver & List (O&L) Group and CMB.TECH, the Ohlthaver & List (O&L) Group is the largest privately owned consortium in Namibia, with an operational track record spanning over a century and covering a diverse number of industries. CMB.TECH, a Belgium company specialising in the design, construction and operations of large marine and industrial modes of transportation that utilise hydrogen and ammonia. It forms an integral part of Compagnie Maritime Belge which is a family-owned shipping group, founded in 1895.

Cleanergy Solutions Namibia intends on becoming a driving force in the growth of the Namibia's hydrogen economy, while contributing to the global shift for industrial decarbonisation. The organisation is in the process of finalising the construction of the first hydrogen production plant in Namibia, with first production intended for the latter part of 2024.

As part of the bigger intended hydrogen and ammonia infrastructure development and operation, which Cleanergy Solutions are actively pursuing, the Proposed construction of the ammonia terminal will occur at the Walvis Bay port area, in the Erongo Region, Namibia as shown in Figure 1. The proposed site can be accessed via the B2 road between Swakopmund and Walvis Bay and is aligned to the overall port development masterplan.

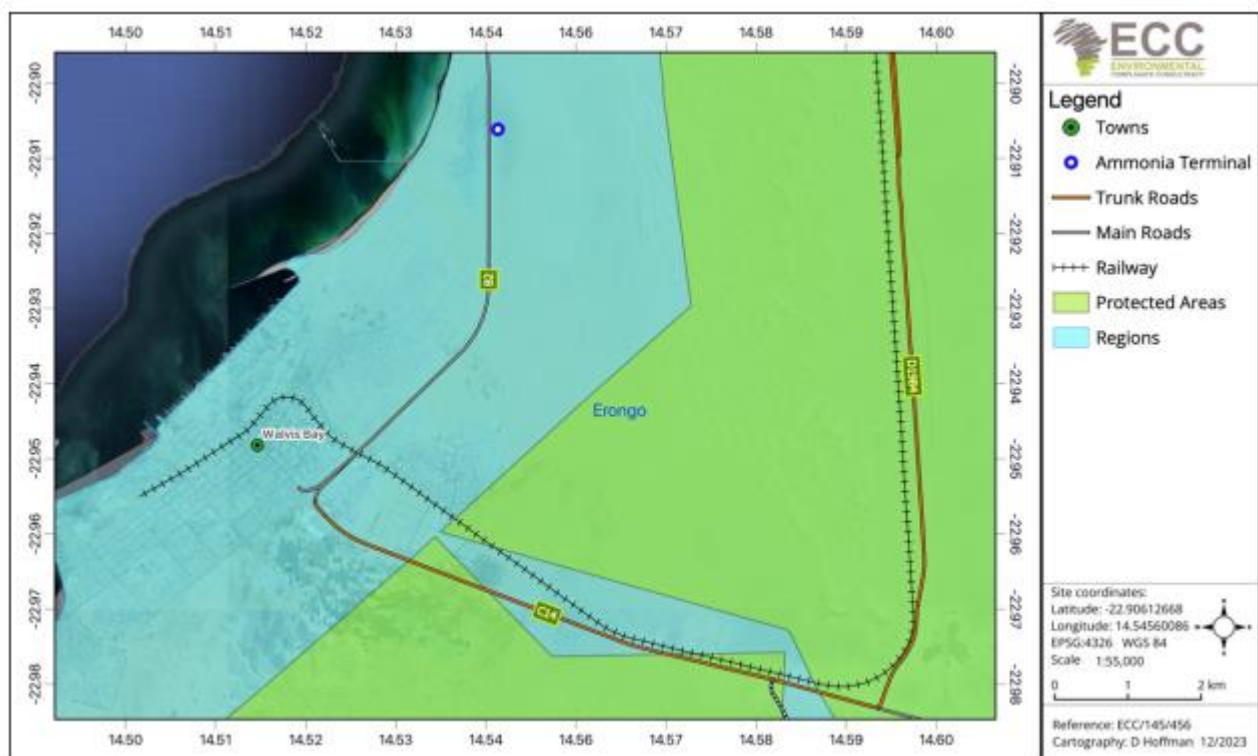


Figure 1 - Locality map of the project

1.2 Route Description

The study was based on the current road network; the expected affected routes around the Walvis Bay Port area; the present traffic operating and pavement conditions; and an evaluation of the impact of the proposed ammonia terminal traffic generation on the existing road network. The following road sections were identified which might be impacted by the new development:

Ammonia Terminal

- The High-volume sealed road, B2 Main Road

The B2 Main Road is a bituminous surfaced road, designed and constructed for high traffic volumes. The section of road that is affected by the project will only be the section of road between Swakopmund and Walvis Bay along the coast. Maintenance on this road is carried out under the Roads Authority of Namibia.



Figure 2 – Route area map

1.3 Objective of the study

Environmental Compliance Consultancy (ECC) needs a traffic impact assessment study for the proposed construction of an ammonia terminal at the Walvis Bay port area, Erongo region, Namibia. The project, owned by Cleanergy Solutions Namibia (Pty) Ltd., involves various facilities including an ammonia storage tank, nitrogen generation unit, and associated infrastructure.

2 Approach and Methodology

In line with the objectives of this study and with reference to the planned traffic expected to be generated by the construction and operation of the ammonia terminal in the Walvis Bay port area, the following methodology guided the Traffic Impact Assessment:

- A meeting was held with the Client to clarify and confirm the proposed route options, items discussed at the participation meeting regarding the road and traffic and items to be included in the study from ECC's side.
- Discussions were held with representatives of the Roads Authority to identify possible future upgrades.
- A site investigation was undertaken to evaluate the surface condition of the roads identified, observe existing traffic flow operations, identified dwellings along the routes, affected communities, safety concerns and possible problematic crossings.
- Traffic data from traffic counting stations located on B2 was obtained from the Road Management System of the Roads Authority. Traffic data was used to determine the average daily traffic (ADT) and annual average daily traffic (AADT).
- The expected generated traffic as received from Cleanergy Solutions Namibia were assigned to the road network and added to the existing traffic volumes.
- The effect that the expected additional generated traffic will have on the conditions of the transport routes was assessed.

The effect of the generated traffic on the affected communities were also assessed in terms of construction activities and additional traffic volumes.

3 Site Investigation

A site investigation was undertaken, and the following observations were recorded during the visit:

- **Access to the Ammonia Terminal (Walvis Bay Port area)**

The option for access from the B2 Main Road was investigated as well as the impact on the surrounding roads.

- **Existing Intersections affected by the Project**

An inventory of all the accesses to the farms and settlements were recorded. This information was used to provide an indication of the affected communities and stakeholders along the proposed transport routes.

- **Existing Pavement Condition**

The condition of the existing pavement was surveyed to determine the overall condition and the effect of what newly generated traffic will have.

- **Geometric Alignment Evaluation**

Sight distances at all accesses and intersections were investigated and assessed to ensure the safety of the public from any additional traffic.

3.1 Access to the Ammonia Terminal

The Ammonia Terminal is located just outside Walvis Bay at the Walvis Bay Port Area. During the construction and operational phases, access from the B2 Main Road to the Ammonia Terminal will be required. A potential access was identified, and it was assessed to determine the impact of the generated traffic from the construction and operational phases of the ammonia terminal.



Figure 3 – Potential Access from B2 Main Road

Access from B2 Main Road to the Ammonia Terminal

Possible access to the Ammonia Terminal on the B2 Main Road between Swakopmund and Walvis Bay, was investigated. A new intersection will have to be constructed to gain access to the B2 Main Road from the Ammonia Terminal. Sight distances to both sides were investigated and found to be adequate. An intersection, with a deceleration lane and a passing lane, is proposed. Additional traffic generated by the ammonia terminal during construction and operational phases will have little to no impact on the existing traffic and upgrading of the existing road is not deemed necessary.

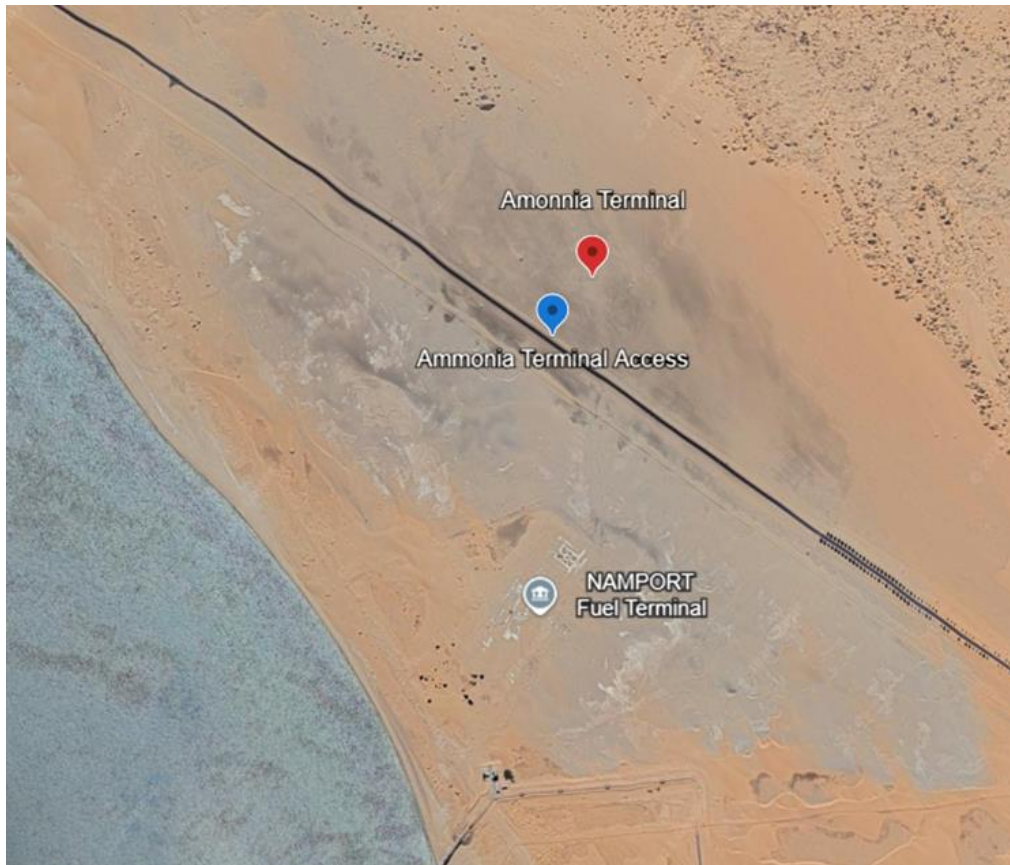


Figure 4 – Position of potential access from B2 Main Road to the Ammonia Terminal



Figure 5 – Proposed Ammonia Terminal Access (B2)

3.2 Existing Intersections affected by the Project

All existing intersections along the B2 road between Swakopmund and Walvis Bay was identified in the study area. These intersections provide communities and stakeholders access to the following:

- Industrial Property
- National Park (Dorob Park)
- Afrodite Beach
- Dolphin Beach
- Langstrand
- Walvis Bay Residential Area

Residential properties are located around the Walvis Bay town area with access to the Langstrand, Dolfin Beach and Afrodite Beach also located in the study area. Most of the tourist attractions along the study area consists of lookout points along the B2 Main Road next to the ocean. The Walvis Bay town area consist of an industrial area and residential properties located near the ammonia terminal.

There are five intersections identified on the B2 Main Road. The locations of these intersections are located as shown in Figure 5 below.

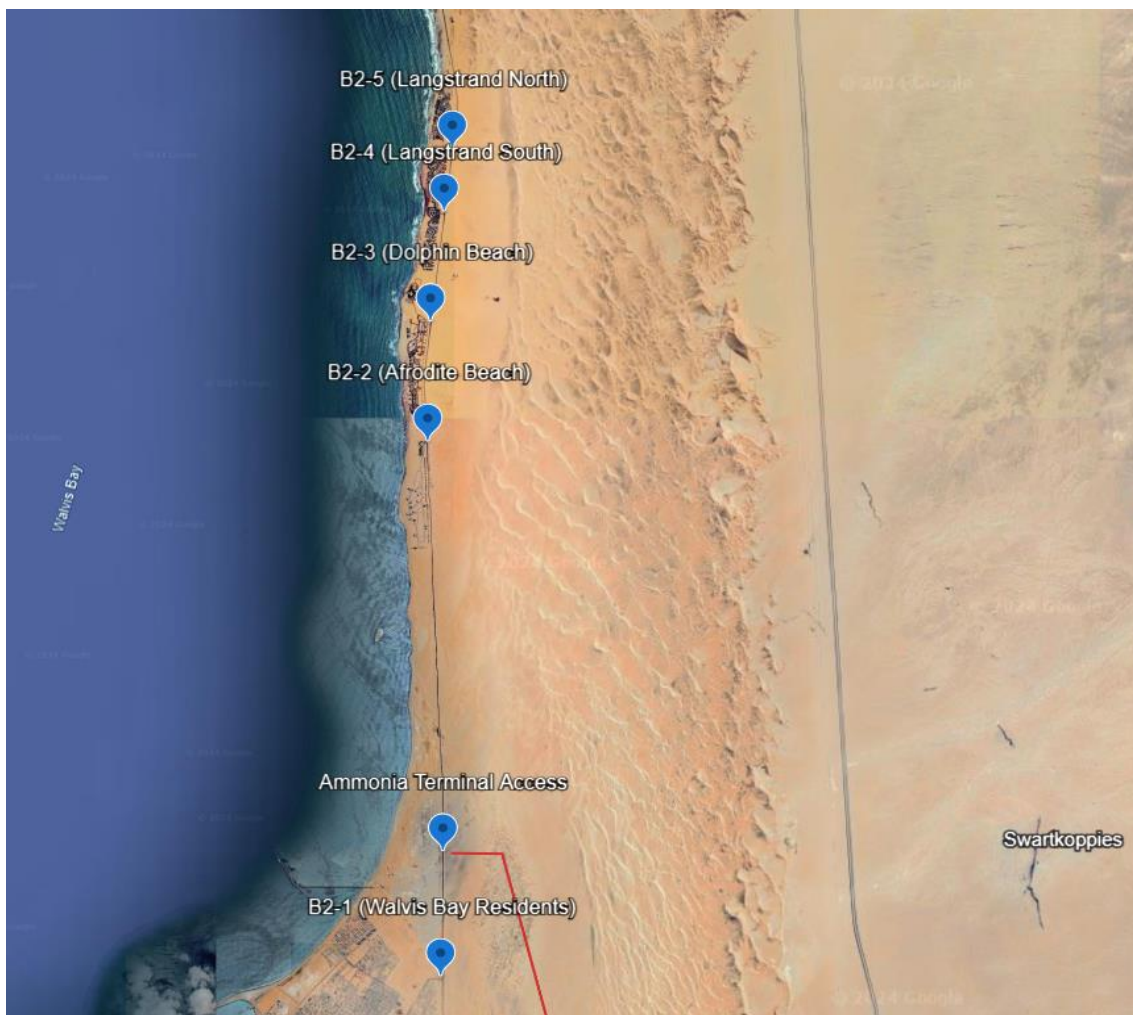


Figure 6 - Identified intersections along B2 Main Road

The table below indicates the location of the intersections, affected stakeholder as well as the condition of the intersections identified in the study area. The potential access to the Ammonia Terminal was also added to the list for additional information.

Table 1 - Intersections located on the B2 Main Road and D1984 Road

Intersection No.	Location	Size	Stakeholder	Condition	Adequate sight Distance	Potential Access to Terminal
B2-1	22°55'19"S 14°32'38"E	Major, West side	Walvis Bay Residents	Good	Yes	No
B2-2	22°51'16"S 14°32'32"E	Major, West side	Afrodite Beach Residents	Good	Yes	No
None	22°54'22"S 14°32'40"E	N/A	Ammonia Terminal Access	N/A	Yes	Yes
B2-3	22°50'21"S 14°32'34"E	Major, West side	Dolphin Beach Residents	Good	Yes	No
B2-4	22°49'31"S 14°32'40"E	Major, West side	Langstrand South Residents	Good	Yes	No
B2-5	22°49'02"S 14°32'44"E	Major, West side	Langstrand North Residents	Good	Yes	No

The major intersections along the B2 Main Road provide access to various residential areas. During the site investigation it was found that a large percentage of vehicles make use of these intersections. They are in a good condition with minor defects identified at selected intersections. None of the identified intersections can be utilized in future to provide potential access to the ammonia terminal during the construction and operational phases. Due to the high volume of traffic currently on the B2 Main Road, the additional traffic added by the proposed project should have little to no effect on the current traffic and infrastructure.



Figure 7 – Intersection B2-1 (Walvis Bay Residents)



Figure 8 - Intersection B2-2 (Afrodite Beach)

3.3 Existing pavement conditions

A condition survey was conducted during August 2024. The condition of the affected road was inspected, and the survey findings of the B2 Main Road summarized below.

B2 Main Road

The 35km section of road between Swakopmund and Walvis Bay is a high traffic volume sealed bitumen surfaced road. Most of the road section is in a good condition with minor defects identified on isolated sections listed below:

- Isolated edge breaks
- Minor rutting near intersections
- Small potholes
- Small Cracks



Figure 9 – Photos of minor defects taken on a section of the B2 Road

During the site investigation a team from the Roads Authority of Namibia Maintenance division was busy with edge break repairs and the team informed that pothole and crack repairs were scheduled within the next year.

3.4 Geometric Alignment Evaluation

The geometric alignment of the affected road section was also evaluated to determine if any sections of the road should be upgraded to accommodate the additional generated traffic. Both the horizontal alignment as well as the vertical alignment was found to be adequate for the design speed of the road. Sight distances at all the accesses and intersections were checked to determine if this conforms to minimum standards.

All the accesses and intersections were found to have ample sight distance in both directions to ensure that the road users could safely use them. The stopping distances, for the design speed of the road, are adequate and if an obstruction is detected, ample reaction time is allowed to avoid a collision.

4 Affected Communities

During the site investigation all the affected communities along the proposed route of the ammonia terminal were identified. The traffic impact on these communities were assessed and is reported on in the section below.

The following communities were identified:

- Walvis Bay Town Residents
- Swakopmund Town Residents
- Afrodite Beach Residents
- Dolphin Beach Residents
- Langstrand Residents

Walvis Bay Town Residents

The additional traffic expected to be generated during the construction and operational phases will have little to no impact on the residents. This is due to the volume of vehicles currently using the B2 Main Road to gain access to the Walvis Bay town is high in comparison with the additional traffic to be added by the ammonia terminal during both phases. The closest intersection to gain access to the Walvis Bay Municipal area has recently been upgraded to accommodate the high-volume traffic on the B2 Main Road and to provide safe access for the residents.



Figure 10 – Walvis Bay Town, Residents

Swakopmund Town Residents

The additional traffic during both the construction and operational phases will have little to no impact on the residents as the volume of vehicles currently using the B2 Main Road is high in comparison with the additional traffic to be added by the ammonia terminal during both phases.

Afrodite Beach Residents

The additional traffic during both the construction and operational phases will have little to no impact on the residents as the volume of vehicles currently using the B2 Main Road is high in comparison with the additional traffic to be added by the ammonia terminal during both phases. The intersection to gain access to Afrodite Beach has been upgraded to accommodate the high-volume traffic on the B2 Main Road and to provide safe access for the residents.



Figure 11 – Afrodite Beach, Residents

Dolphin Beach

The additional traffic during both the construction and operational phases will have little to no impact on the residents as the volume of vehicles currently using the B2 Main Road is high in comparison with the additional traffic to be added by the ammonia terminal during both phases. The intersection to gain access to Dolphin Beach has been upgraded to accommodate the high-volume traffic on the B2 Main Road and to provide safe access for the residents.



Figure 12 – Dolphin Beach, Residents

Langstrand Residents

The additional traffic during both the construction and operational phases will have little to no impact on the residents as the volume of vehicles currently using the B2 Main Road is high in comparison with the additional traffic to be added by the ammonia terminal during both phases. Both intersections to gain access to Langstrand has been upgraded to accommodate the high-volume traffic on the B2 Main Road and to provide safe access for the residents.



Figure 13 - Langstrand, Residents

5 Traffic Assessment

5.1 Existing Traffic Data

Existing traffic data collected included available historic traffic data, moving traffic counts and estimated traffic data from the Roads Authority of Namibia. Below are the positions where traffic counts were taken:

- Permanent Counting Station 021 (RA St 021) on B2 Main Road (364-day data, 2023)
- Permanent Counting Station 253 (RA St 253) on B2 Main Road (302-day data, 2023)

In Table 2 below, traffic data, as received from the Roads Authority and the moving traffic counts are being summarized. The Average Daily Traffic (A.D.T) has been presented in following table.

Table 2 - Average Daily Traffic Volumes per Link

Description	ADT Light	ADT Heavy	ADT Total
B2:			
RA Station 21 (2023) – Swakopmund to Arandis	2,339	951	3,290
RA Station 253 (2023) – Arandis to Usakos	1,766	841	2,607
Moving Traffic Count – Swakopmund to Walvis Bay	3,480	165	3,645
D1984:			
Moving Traffic Count	420	780	1200

The data from the moving vehicle count, has been converted to 24 hour counts by using the information from the permanent and ad hoc stations. The heavy vehicles as a percentage of the ADT for each section is listed below:

- 29% of the ADT on the B2 Main Road between Swakopmund and Arandis.
- 32% of the ADT on the B2 Main Road between Arandis and Usakos.
- 4.5% of the ADT on the B2 Main Road between Swakopmund and Walvis Bay.

Analysing the data from both moving traffic counts, it was found that most of the heavy vehicles using the roads between Swakopmund and Walvis Bay are using the D1984 Road instead of the B2 Main Road. This is due to a restriction on heavy vehicles, put in place by the Roads Authority of Namibia on the B2 Main Road between Swakopmund and Walvis Bay.

Most of the light vehicles on the B2 Main Road between Swakopmund and Walvis Bay are the residents commuting from home to their respective places of work. Small delivery vehicles and trucks are also making use of the B2 Main Road to deliver various services and goods to the respective residential areas.

5.2 Additional Traffic Data

The information from the draft scoping report was used to determine the additional traffic that will be added to the existing road infrastructure during the construction and operational phases of the project. Using the available data as well as estimating peak additional traffic contributions during both phases are summarised in the next section.

Construction Phase Additional Traffic

The scoping report indicates job opportunities may be available for unskilled and semi-skilled local workers, it was assumed that approximately 30 to 80 workers will be hired during the construction phase with two security guards on night duty. The workers will be transported from Walvis Bay and Swakopmund to site using two busses on a daily basis.

The varying waste categories expected to be produced by the project are general household waste, plastics and hazardous waste. All household or non-hazardous waste if applicable will be disposed of at the local landfill site and the hazardous waste will be disposed at the disposal site in Walvis Bay. A waste management plan will be implemented on site which may include a small truck to transport waste. It is assumed that removal of waste will be done on a daily basis by means of a small truck or LDV.

Additional construction materials will also be transported to site (cement, water, tools, ext.). The assumption was made that the delivery of these materials will be done once per day using a truck.

The construction supervision team as well as the foremen will travel to site on a daily basis from Walvis Bay and Swakopmund to monitor all construction activities. This will be done by means of LDV's and it is estimated that a maximum of 5 LDV's will be utilized during the construction phase of the project.

Table 3 - Average Daily Traffic Volumes added during the Construction Phase

Description	ADT Light	ADT Heavy	ADT Total
B2:			
Vehicles added during construction phase	5	3	8

It is recommended that during peak delivery of the construction materials, that the contractor makes use of temporary road signs as well as flag ladies. These resources can be stationed at the intersection along the B2 Main Road to always ensure safe access of all construction and delivery vehicles.

Operational Phase Additional Traffic

During the operational phase, liquid ammonia will be transported from the ammonia plant to the ammonia terminal for storage. Ammonia will be loaded on a vessel for export. Figure 14 shows a representation of the overall block flow diagram of the ammonia terminal.

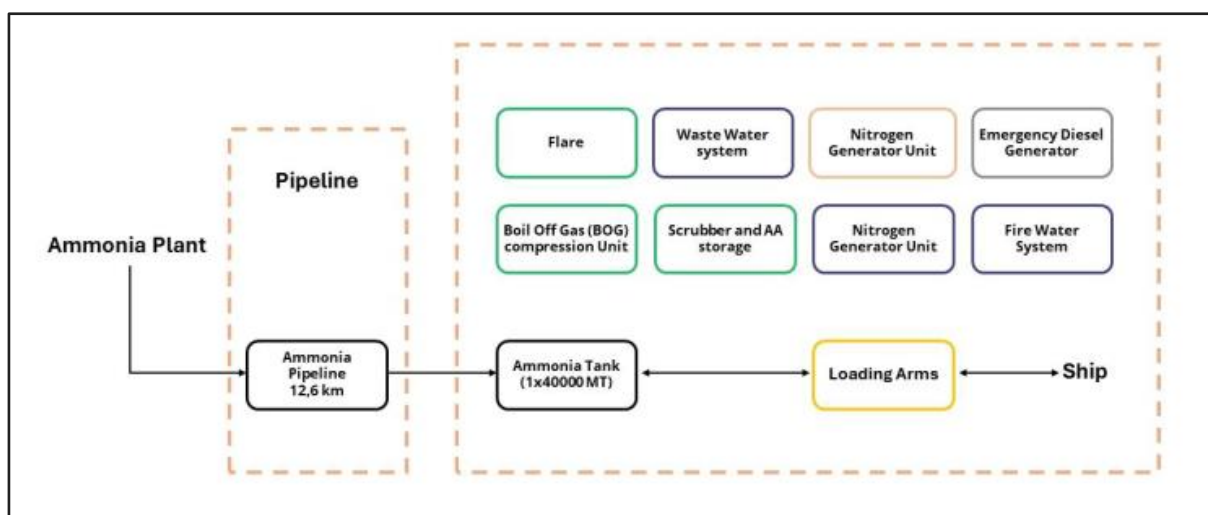


Figure 14 - Block Flow diagram of the ammonia terminal

A waste management plan will be implemented on site which may include a small truck to transport waste. It is assumed that removal of waste will be done on a daily basis by means of a small truck or LDV.

The scoping report indicates job opportunities may be available for unskilled and semi-skilled local workers, it was assumed that approximately 20 to 40 workers will be hired during the operational phase with two security guards on night duty. The workers will be transported from Walvis Bay and Swakopmund to site using one bus on a daily basis.

The operational supervision team will travel to site on a daily basis from Walvis Bay and Swakopmund to monitor all operational activities. This will be done by means of LDV's and it is estimated that a maximum of 5 LDV's will be utilized during the operational phase of the project.

Table 4 – Estimated Average Daily Traffic Volumes added during the Operational Phase

Description	ADT Light	ADT Heavy	ADT Total
B2:			
Vehicles added during operational phase	5	2	7

5.3 Traffic Impact

The expected generated traffic was assigned to each road section of the affected routes and added to the existing traffic volumes as to ascertain the impact of the proposed project on the surrounding road network. To illustrate the impact of the additional traffic on receptors along the routes, the following log-graphs were developed. These graphs show the current traffic, generated traffic and the total traffic on each road section.

Construction Phase

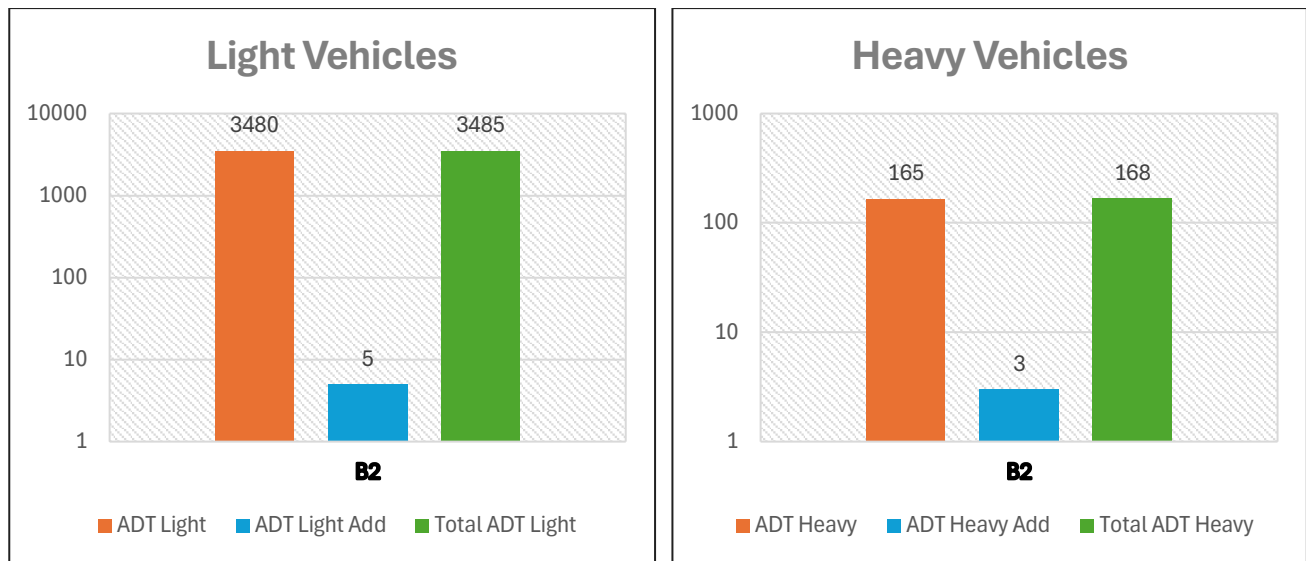


Figure 15 - Impact of generated light and heavy traffic during the construction phase

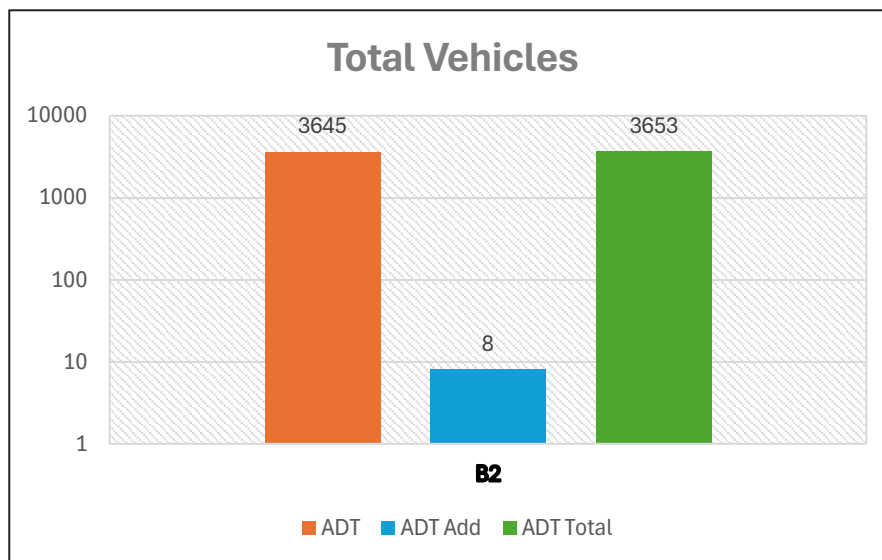


Figure 16 - Impact of Total generated traffic during the construction phase

Operational Phase

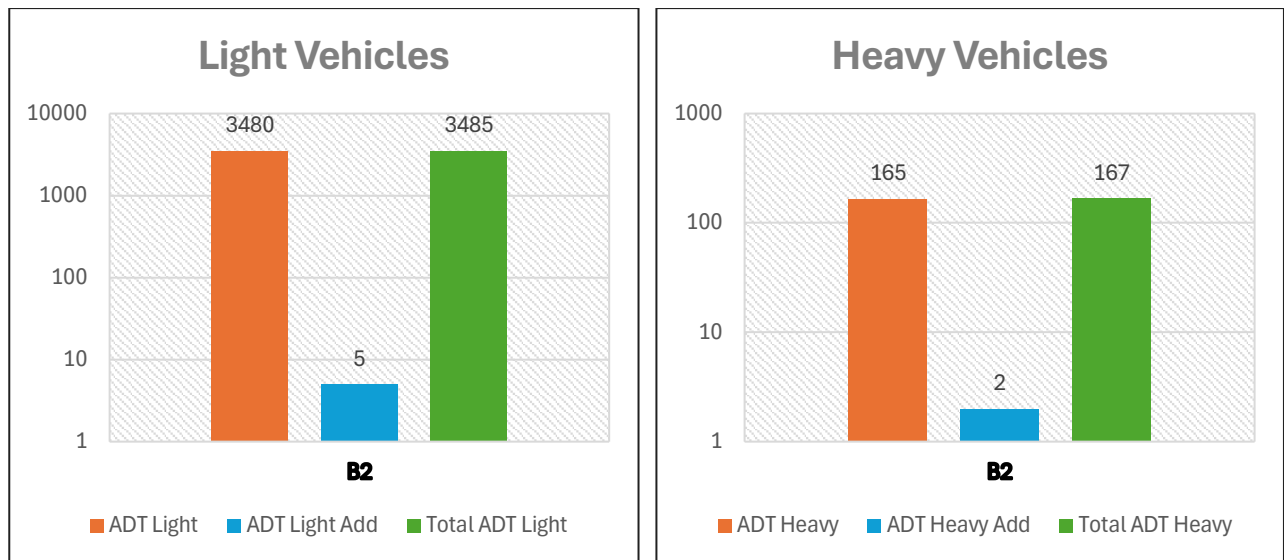


Figure 17 - Impact of generated light and heavy traffic during the construction phase

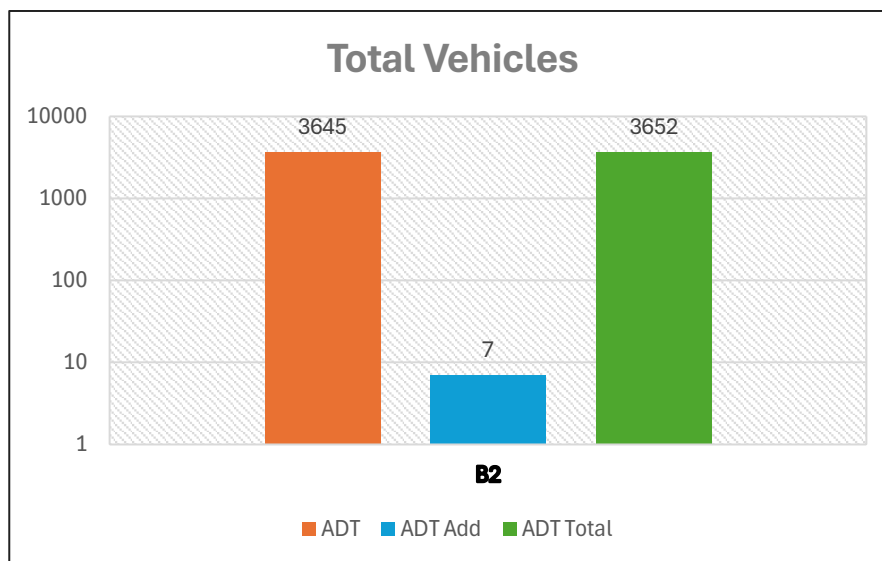


Figure 18 - Impact of Total generated traffic during the construction phase

5.4 Conclusion

Cleanergy Solutions Namibia is in the process of finalising the construction of the first hydrogen demonstration plant in Namibia, with first production intended for the latter part of 2024.

As part of the bigger intended hydrogen and ammonia infrastructure development and operation, which Cleanergy Solutions are actively pursuing, the Proposed construction of the ammonia terminal will occur at the Walvis Bay port area, in the Erongo Region, Namibia. The proposed site can be accessed via the B2 road between Swakopmund and Walvis Bay and is aligned to the overall port development masterplan.

The Traffic Impact Assessment performed by Zutari Namibia covered the investigation into the current situation, including the current traffic, condition of the road infrastructure and the safety concerns on the current roads. The study further reported on the impact of additional traffic on the road infrastructure, affected communities along the route and the necessary mitigation and control measures.

It is concluded that:

- The proposed access to the Ammonia Terminal has adequate sight distances to both sides. An intersection, with a deceleration lane and a passing lane, is proposed.
- The road surface of the investigated road and intersections are currently in a good condition.
- The geometry of the intersections is adequate for the current as well as the expected generated traffic.
- Sight distances of the intersections along the routes are adequate for the designed speed.
- The expected generated traffic will have little to no impact on the current traffic, road infrastructure as well as on the communities along the route.