Alba Power Station 5 Block 4
Supplementary ESIA
Construction Dust Risk Assessment

February 2023
1B0114203 – B
Rev. 01

Aluminium
for the world

Environment Arabia

(PO Box 10379)
The Address Tower
Office 203, 2nd floor, Bldg 655
Road 3614, Block 0436
Al Seef, Kingdom of Bahrain
+973 17 533 259 Telephone
+973 17 533 754 Fax
info@environmentarabia.com E-mail

Title	Alba Power Station 5 Block 4 Construction Dust Risk Assessment
Date	March 2023
Author	Rajith Chandran

Document History		
File Name, Revision Number	Status	Date
Alba Power Station 5 Block 4 Construction Dust Assessment, Rev 00	Draft	28.02.2023
Alba Power Station 5 Block 4 Construction Dust Assessment, Rev 01	Final	05.03.2023

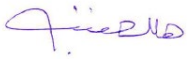
Checked By	Richard Wyness	
Initials/Date	RW	05.03.2023
Approved By	Halel Engineer	
Initials/Date		05.03.2023

Table of contents

Tables

Figures

Table of abbreviations

ACOP	Alba Code of Practice
Alba	Aluminium Bahrain BSC
CCGT	Combined Cycle Gas Turbine
CESMP	Construction Environmental and Social Management Plan
Citrus	Citrus Advisors Ltd.
DMP	Dust Management Plan
DMRB	Design Manual for Roads and Bridges
EACS	Environment Arabia Consultancy Services WLL
EPAP	Equator Principles Action Plan
EPC	Engineering Procurement and Construction
ESIA	Environmental and Social Impact Assessment
EWA	Electricity and Water Authority
GE	General Electric
IAQM	Institute of Air Quality Management
IWPP	Integrated Water and Power Project
KBSP	Khalifa Bin Salman Port
kV	Kilovolt
MPW	Mitsubishi Power Ltd.
MW	Mega Watts
$PM_{2.5}$	Particulate Matter <2.5 Microns
PM_{10}	Particulate Matter <10 Microns
SCE	Supreme Council for Environment
SEPCO III	SEPCO III Bahrain Construction Company W.L.L.
SHE	Safety Health and Environment
SOP	Standard Operating Procedure

1 INTRODUCTION

This Construction Dust Risk Assessment is the part of a suite of documents prepared as supplementary reports to the Environmental and Social Impact Assessment (ESIA) undertaken for the Alba Power Station 5 (PS5) Block 4 project.

1.1 Project description

Aluminium Bahrain B.S.C. (Alba) consistently ranks as one of the largest and most modern Aluminium smelters in the world. Known for its technological strength and innovative policies, Alba enforces strict environmental guidelines, maintains a high track record for safety, and is widely regarded as one of the top performers on a global scale.

Alba PS 5 Block 4 Combined Cycle Power Plant is an expansion of the existing Power Station 5, which was commissioned in 2019 – 2020 and consists of 3 x CCGT Blocks of 1:1:1 configuration, with H class gas turbine technology, GE A650 steam turbine, GE (Alstom legacy) heat recovery steam generator, GE Mark VIe distribute control system. PS5 power is exported to the Alba islanded grid through a recently completed (2019) Siemens 220kV indoor gas insulated switchgear Substation.

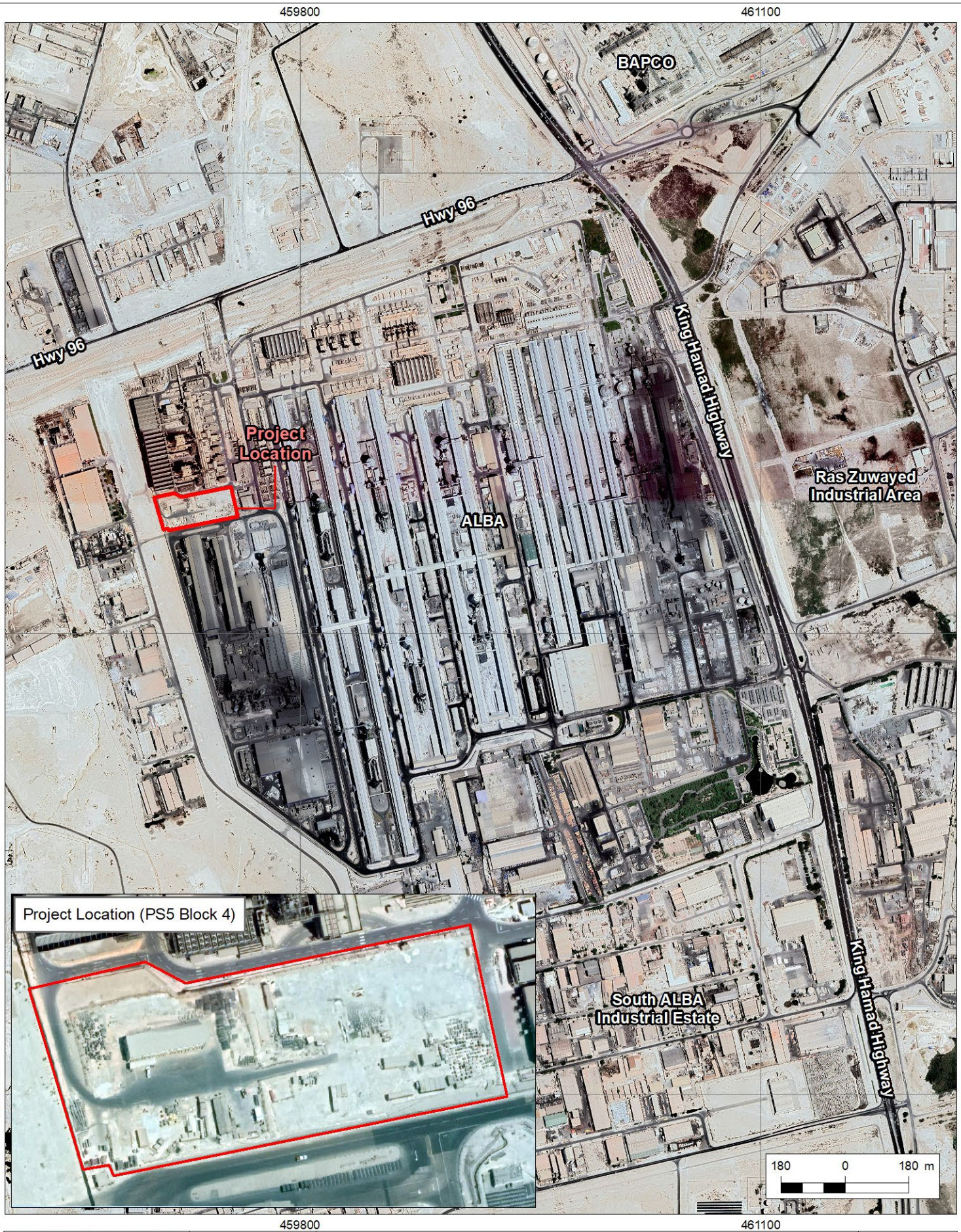
PS5 Block 4 Project is the addition of a fourth Block of similar 1:1:1 configuration with J-class gas turbine technology with a minimum nominal ISO rating of 680.8 MW and it also includes tie into the existing 220kV Substation. A Consortium of Mitsubishi Power Ltd. (MPW) and SEPCO III Electric Power Construction Co. Ltd. (SEPCO III) will execute PS5 Block 4 as the Engineering, Procurement and Construction (EPC) Contractors for the Project.

PS5 capacity will increase from 1,800 MW to 2,481 MW. Block 4 Gas turbine unit will have the capability to operate on 100% Khuff gas, 100% Residual will also have the capability to operate on any proportionate mixture of Khuff-residual gas. Generally, the concept for the new Block 4 is similar to the existing Blocks 1 to 3, with services provided from common facilities existing at PS5 or other plants within the Alba complex.

The rationale behind the expansion of PS5 Block 4 is that the efficiency of this combined cycle power plant is much higher than combined cycle power plants of PS 3 and PS 4. Power Station 3, which is operating on a low load, will be shut down and will be kept as emergency standby. Power station 4 will be running partially.
An ESIA report was submitted to the Supreme Council for Environment on 06 January 2022 and environmental clearance was issued. Alba forwarded the approved ESIA report to BNP Paribas – the coordinator of project finance. BNP Paribas appointed Citrus advisors Ltd. (Citrus) to conduct a review on the report for compliance with Equator Principles 4. Citrus then prepared a report that highlighted some gaps and an Equator Principles Action Plan (EPAP) to address them.

Alba commissioned Environment Arabia Consultancy Services (EACS) to address the gaps in the ESIA in accordance with the EPAP.

Project location is presented in **Figure 1.1**.



CLIENT: Aluminium for the world

CONSULTANT: Environment Arabia

LEGEND: Project location (PS5 Block 4)

NORTH ARROW:

FIGURE TITLE: Figure 1.1 Project location

DATE: February 2023

DATUM: WGS 1984 (UTM Zone 39N)

PROJECT TITLE: Alba Power Station 5 Block 4 Supplementary ESIA

PREPARED BY: MS

SCALE (A4): 1:13,982

D:\GIS Database\1. Projects\1B0114201 - ALBA Stn 5 Rd Traffic Safety Risk Assmt\mxd\1.1 Project location.mxd

1.2 Scope of the assessment

The overall objective of the assessment is to determine the nature and magnitude of risks due to construction dust generation. The assessment will:

- Identify any sensitive receptors (people/businesses) along the construction traffic route(s) and those who work near the SEPCO III site offices, gates to the Al Dur Construction Laydown Area and gates to the Block 4 project site.
- Using the information presented in the ESIA, consider how Block 4 construction dust generation poses specific risks to the specific identified receptors.
- Evaluate whether existing Alba and EPC Contractor systems, procedures and requirements are specific enough and sufficient to manage and monitor these specific risks on sensitive receptors (including Construction Environment and Social Management Plan (CESMP) and management controls).
- Identify any additional project-specific mitigations or monitoring requirements required to be implemented by Alba and the EPC Contractor to manage these risks. Specifically consider publicizing and providing access to a direct grievance channel for the public.

1.3 Documents reviewed

Table 1.1 shows the list of documents reviewed during the preparation of this risk assessment.

Table 1.1 List if documents reviewed

Sl. No.	Document description
1	ACOP-006- Control of Physical Hazard and Ergonomics
2	ACOP-052-Performance Measurement and Monitoring
3	ACOP-056-Environmental Monitoring
4	AGLC 001 Monthly Safety Health and Environment Report Guideline (Scanned)
5	PS5 Block 4 Excavation Procedure PS5-B4-01-YDC-GGP-SEP-00040
6	PS5 Block 4 Health Safety Environmental Management Plan PS5-B4-01-YDC-GGP-SEP-00002
7	PS5 Block 4 Pollution Prevention Procedure PS5-B4-01-YDC-GGP-SEP-00018
8	PS5 Block 4 Respiratory Protection Procedure PS5-B4-01-YDC-GGP-SEP-00009
9	PS5 Block 4 Traffic Management Plan PS5-B4-01-YDC-GGP-SEP-00034 V0.4
10	SOP (75.18) Ambient Air Sampling
11	ESIA_Report_of_PS5_Block_4_Expansion_Project
12	Addendum to the ESIA study
13	1B0114201 Alba Power Station 5 Block 4 Construction Traffic Risk Assessment, Rev 01

2 LEGISLATION AND GUIDANCE

Air quality standards are established to protect human health and the environment. In Bahrain, national standards are set out in Ministerial Order No. 2 of 2021, which updated the previous relevant Ministerial Order No. 10 of 1999 with respect to Environmental Standards (air and water). Ministerial Order No. 2 of 2021 includes updated ambient air quality and industry emission standards. The existing Bahraini national air quality standards relevant to particulate matter are shown in **Table 2.1**.

Table 2.1 Air quality standards – particulate matter

Pollutant	Averaging period	Bahrain (µg/m³)	UK / EU (µg/m³)	WHO (µg/m³)	IFC (µg/m³)
PM_{10}	24-hour	340(1)	50(2)	45(3,4)	50(8)
	Annual	80	40	15(5)	20(9)
$PM_{2.5}$	24-hour	50	-	15(3,6)	25(10)
	Annual	25	25	5(7)	10(11)

Notes:

1. Article 8 of Ministerial Order 2 of 2021 that 'Exceedance of the ambient air quality particulate matter standard (24 hours measurement) is not considered an exceedance of the standard if measured during unusual circumstances such as dust storms.
2. Not to be exceeded more than 35 times a year.
3. 99th percentile (i.e. 3-4 exceedance days per year).
4. WHO also proposed interim targets of 150µg/m³, 100µg/m³, 75µg/m³ and 50µg/m³, which are the same as the 2005 interim targets with the introduction of a fourth interim target at the level of the 2005 air quality guideline (50µg/m³).
5. WHO also proposed interim targets of 70µg/m³, 50µg/m³, 30µg/m³ and 20µg/m³, which are the same as the 2005 interim targets with the introduction of a fourth interim target at the level of the 2005 air quality guideline (20µg/m³).
6. WHO also proposed interim targets of 75µg/m³, 50µg/m³, 37.5µg/m³ and 25µg/m³, which are the same as the 2005 interim targets with the introduction of a fourth interim target at the level of the 2005 air quality guideline (25µg/m³).
7. WHO also proposed interim targets of 35µg/m³, 25µg/m³, 15µg/m³ and 10µg/m³, which are the same as the 2005 interim targets with the introduction of a fourth interim target at the level of the 2005 air quality guideline (10µg/m³).
8. IFC also proposed interim targets of 150µg/m³, 100µg/m³ and 75µg/m³.
9. IFC also proposed interim targets of 70µg/m³, 50µg/m³ and 30µg/m³.
10. IFC also proposed interim targets of 75µg/m³, 50µg/m³ and37.5µg/m³.
11. IFC also proposed interim targets of 35µg/m³, 25µg/m³ and15µg/m³.

3 RISK ASSESSMENT APPROACH AND METHODOLOGY

3.1 Temporal scope

The construction phase of the project commenced in July 2022 and is expected to continue until 2025. Impacts during construction would occur within this period.

3.2 Area of Influence (AoI)

According to the UK Institute of Air Quality Management (IAQM), emissions of dust and fine particulate matter generated as a result of construction works would have the greatest effect on receptors within 350 m of the site boundary (IAQM, 2014, 2016)[1,2] beyond this distance, impacts are not anticipated to be significant.

3.3 Methodology

Dust impacts may occur during construction as a result of dust generation and exhaust emissions from construction plant and vehicles. The UK IAQM guidance document (IAQM, 2014) on the assessment of dust from demolition and construction provides a framework for the assessment of construction dust risk.

A qualitative dust assessment has been undertaken using the IAQM methodology. IAQM guidance sets out the methodology for establishing project related dust generation risk by taking into account the dust emission magnitude derived using information on the activities to be undertaken and their scale, and potential impacts based on the proximity and number of sensitive receptors in the area of activity. Based on the calculated risk, commensurate mitigation measures are recommended that when implemented would be considered to be sufficient to mitigate significant dust impacts. Details of the assessment steps are as follows:

3.3.1 Step 1: Screen the need for a detailed assessment

An assessment will normally be required where there is a human receptor within:

- 350 m of the boundary of the site; or
- 50 m of the route(s) used by construction vehicles on the public highway and up to 500 m from the site entrance(s).

Where the need for a more detailed assessment is screened out, it can be concluded that the level of risk is “negligible”.

3.3.2 Step 2: Assess the risk of dust impacts

The risk of dust arising in sufficient quantities to cause annoyance and/or health and/or ecological impacts will be determined using four risk categories: negligible, low, medium and high risk. A site is allocated to a risk category based on two factors:

- The scale and nature of the works, which determines the potential dust emission magnitude as small, medium or large (STEP 2A); and
- the sensitivity of the area to dust impacts (STEP 2B), which is defined as low, medium or high sensitivity.

[1] IAQM (2014) Guidance on the assessment of dust from demolition and construction. Institute of Air Quality Management, London
[2] IAQM (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning. Institute of Air Quality Management, London.

These two factors are combined in STEP 2C to determine the risk of dust impacts with no mitigation applied. The risk category assigned to the site can be different for each of the four potential activities (demolition, earthworks, construction and trackout). There was not anticipated to be any demolition required during Project construction, therefore, demolition was not assessed.

3.3.3 Step 2A: Define the potential dust emission magnitude

The dust emission magnitude is based on the scale of the anticipated works and is classified as Small, Medium, or Large. **Table 3.1** describes potential dust emission magnitude for various activities.

Table 3.1 Dust emission magnitude criteria

Activity	Criteria used to determine dust emission class		
	Small	**Medium**	**Large**
Earthworks	• Total site area <2,500 m^2; • <5 heavy moving earth vehicles active at any one time.	• Total site area 2,500 – 10,000 m^2; • 5 – 10 heavy moving earth moving vehicles active at any one time.	• Total site area >10,000 m^2, • >10 heavy earth moving vehicles active at any one time.
Construction	• Total building volume <25,000 m^3; • Construction material with low potential for dust release.	• Total building volume 25,000 – 100,000 m^3; • Potentially dusty construction material (e.g. concrete).	• Total building volume >100,000 m^3; • On site concrete batching.
Trackout	• <10 outward HGV trips in any one day; • Unpaved road length <50 m.	• 10 – 50 outward HGV trips in any one day. • Unpaved road length 50 – 100 m.	• >50 outward HGV trips in any one day; • Unpaved road length >100 m.

Step 2B: Define sensitivity of the area

The sensitivity of the area takes account of a number of factors:

- The specific sensitivities of receptors in the area;
- the proximity and number of those receptors;
- in the case of PM_{10}, the local background concentration; and
- site-specific factors, such as whether there are natural shelters, such as trees, to reduce the risk of wind-blown dust.

Table 3.2 outlines the criteria used for determining the sensitivity of receptors.

Table 3.2 Criteria for determining the sensitivity of the receptors

Sensitivity of receptor	Criteria for determining sensitivity	
	Dust soiling effects	Health effects of PM_{10}
High	Dwellings, museums and other culturally important collections, medium and long-term car parks and car showrooms	Residential properties, hospitals, schools and residential care homes
Medium	Parks, places of work	Office and shop workers not occupationally exposed to PM_{10}
Low	Playing fields, farmland, footpaths, short-term car parks and roads	Public footpaths, playing fields, parks and shopping streets

Table 3.3 and **Table 3.4** presents the criteria used to determine the sensitivity of the area to dust soiling effects and human health impacts respectively.

Table 3.3 Sensitivity of the area to dust soiling effects on people and property

Receptor sensitivity	Number of receptors	Distance from source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 3.4 Sensitivity of the area to human health impacts

Receptor sensitivity	Annual Mean PM_{10} Concentrations	Number of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
High	>32µg/m^3	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	>28-32µg/m^3	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	>24-28µg/m^3	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low

Receptor sensitivity	Annual Mean PM_{10} Concentrations	Number of receptors	Distance from the source (m)				
			<20	<50	<100	<200	<350
	<24µg/m^3	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	>32µg/m^3	>10	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	>28-32µg/m^3	>10	Medium	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	>24-28µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
	<24µg/m^3	>10	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

3.3.4 Step 2C: Define the risk of impacts

Table 3.5, **Table 3.6** and **Table 3.7** (IAQM 2014) assigns a level of risk for each activity allowing risk levels to be prioritised and the level of mitigation to be applied.

Table 3.5 Risk of dust impacts – earth works

Potential impact	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table 3.6 Risk of dust impacts – construction

Potential impact	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Medium risk	Low risk
Low	Low risk	Low risk	Negligible

Table 3.7 Risk of dust impacts – trackout

Potential impact	Dust emission magnitude		
	Large	Medium	Small
High	High risk	Medium risk	Low risk
Medium	Medium risk	Low risk	Negligible
Low	Low risk	Low Risk	Negligible

3.3.5 Step 3: Site specific mitigation

Step three of the IAQM guidance identifies appropriate site-specific mitigation. These measures are related to whether the site is a low, medium or high-risk site.

Available dust management measures contained in Alba and EPC contractor management processes and procedures as well as in the CESMP were evaluated for activities where dust generation is of high risk to receptors.

3.3.6 Step 4: Determine significant effects

With the implementation of the relevant mitigation, the residual impacts from the construction will be determined in accordance with IAQM guidance.

3.3.7 Sensitive receptors

The sensitive receptor locations are identified in accordance with the distance criteria of human receptor detailed in Step 1: Screen the need for a detailed assessment (IAQM, 2014):

- 350 m of the boundary of the site; and
- 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

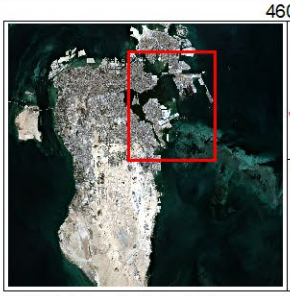
The receptor locations are provided in **Table 3.8** and locations are presented in **Figure 3.1** to **Figure 3.5**.

Table 3.8 Sensitive receptors

Zone	Receptor ID	Description	Coordinates	
			Easting	Northing
Construction traffic route	1	Naval Support Activity (NSA)	0461360	2898671
	2	General Organization for Youth and Sports	0460043	2898162
	3	Hana Apartment Building	0459928	2898104
	4	King Khalid Grand Mosque	0459754	2898006
	5	Diamond 1 Apartment Building	0459629	2897934
	6	KIMS Health Hospital	0459607	2897907
	7	Zohal Accommodation	0459337	2897798
	8	Private Property	0460464	2893601
	9	Private Property	0460570	2893278
	10	Civil Defence School	0459370	2889558

Zone	Receptor ID	Description	Coordinates	
			Easting	Northing
	11	Labour Accommodation	0462672	2884944
	12	Downtown Labour Camp	0461988	2884785
Al Dur laydown yard	13	Sepco 3 Office[3]	0460370	2872043
	14	Sepco 3 Staff Accommodation	0460351	2871977
PS5 Block 4 Area	15	WestPoint Home Bahrain WLL	0459198	2885713
	16	Middle East Recycling Company (MERCO)	0459310	2885575
	17	Bahrain Pipeline Construction Co.	0459066	2885459
	18	Kingdom Oil Company	0459335	2885454
	19	GB Asphalt & Concrete	0459266	2885398
	20	Al Salam Furniture Industries	0459317	2885415
	21	Justa Star Kitchens	0459276	2885286
	22	Doma Tissue	0459354	2885308
	23	Tylos Plastic Industries	0459340	2885203
	24	Polycon Bahrain WLL	0459420	2885098
	25	Security Cabin	0459413	2885586
	26	Site Entrance Gate for Vehicles	0459417	2885574
	27	First Aid Centre	0459420	2885537
	28	Site Office	0459430	2885508

[3] This receptor also falls within the construction traffic routes as well as the Al Dur Laydown area.



CLIENT: alba — Aluminium for the world

CONSULTANT: Environment Arabia

LEGEND:

- Sensitive receptors
- Residential
- Industrial facilities
- Commercial
- Hospital
- Recreational
- Government
- Religious facility
- 50m buffer (from the construction routes)

NORTH ARROW: N

FIGURE TITLE: Figure 3.1 Sensitive receptors and landuse adjacent to the construction route (North of ALBA)

DATE: February 2023

DATUM: WGS 1984 UTM Zone 39N

PROJECT TITLE: ALBA PS5 Block 4 - Noise and dust risk assessment

PREPARED BY: MS

SCALE (A4): 1:77,949

D:\GIS Database\1. Projects\1B0114203 - ALBA Stn 5 Block 4 Risk Assmt Noise & Dust\mxd\Human receptors_constructionroute_norht.mxd

CLIENT: Aluminium for the world

CONSULTANT: Environment Arabia

LEGEND:
- Sensitive receptors
- 50m buffer (from the construction routes)
- Sepco 3 office
- Commercial
- Industrial facilities
- Residential

NORTH ARROW: N

FIGURE TITLE: Figure 3.2 Sensitive receptors and landuse adjacent to the construction route (South of ALBA)

DATE: February 2023

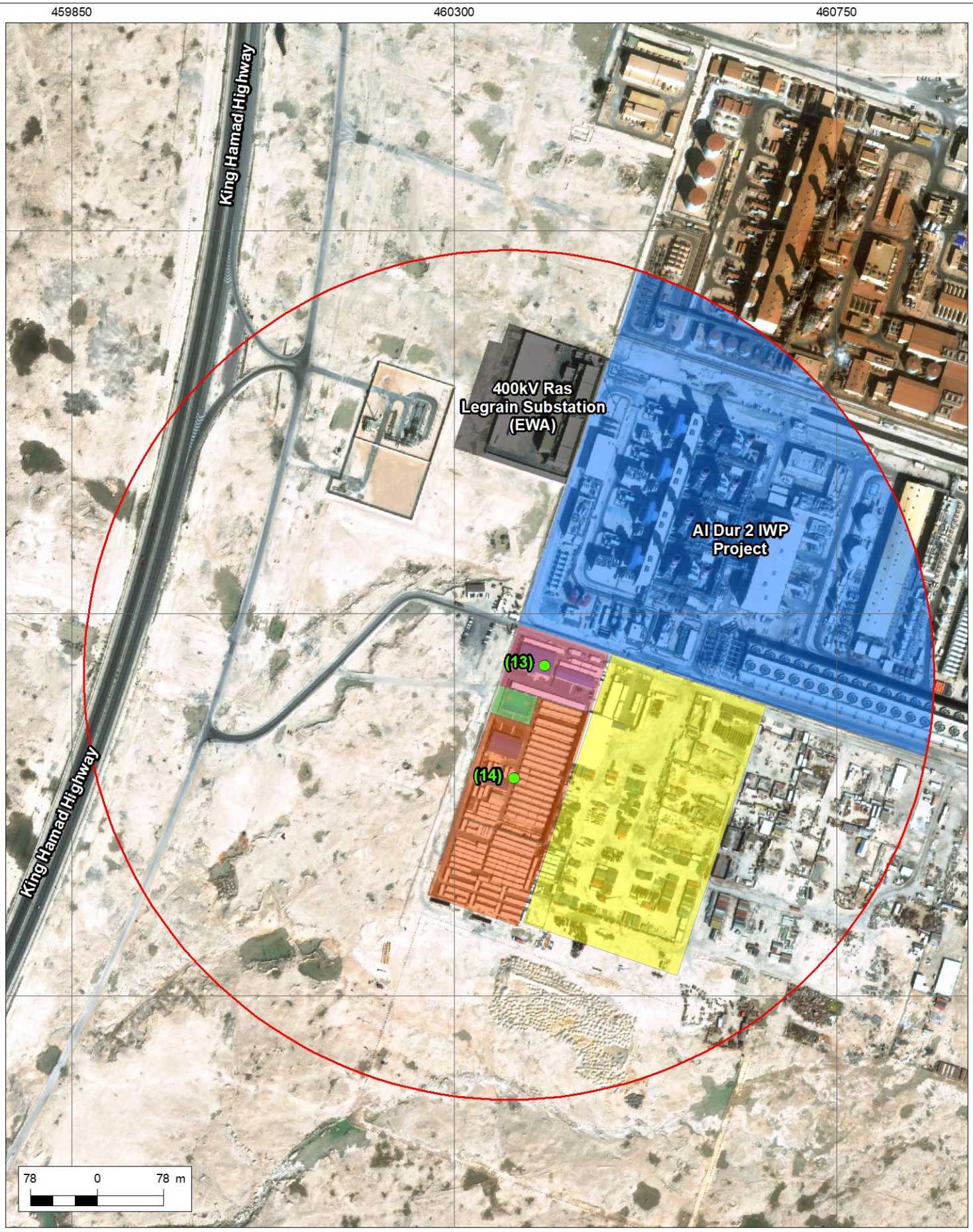
DATUM: WGS 1984 UTM Zone 39N

PROJECT TITLE: ALBA PS5 Block 4 - Noise and dust risk assessment

PREPARED BY: MS

SCALE (A4): 1:60,787

D:\GIS Database\1. Projects\1B0114203 - ALBA Stn 5 Block 4 Risk Assmt Noise & Dust\mxd\Human receptors_constructionroute.mxd



CLIENT: Aluminium for the world	LEGEND: Sensitive receptors; 500m buffer (from the site entrance); Site office; Industrial Facilities; Recreational; Residential; Utilities; Laydown aera			NORTH ARROW:
CONSULTANT: Environment Arabia	FIGURE TITLE: Figure 3.3 Sensitive receptors and landuse adjacent to Al Dur laydown area (500m away from the entrance)		DATE: February 2023	DATUM: WGS 1984 UTM Zone 39N
	PROJECT TITLE: ALBA PS5 Block 4 - Noise and dust risk assessment		PREPARED BY: MS	SCALE (A4): 1:5,894

D:\GIS Database\1. Projects\1B0114203 - ALBA Stn 5 Block 4 Risk Assmt Noise & Dust\mxd\Human receptors_laydown.mxd

CLIENT: Aluminium for the world

CONSULTANT: Environment Arabia

LEGEND:
- 350m buffer (from the site boundary)
- PS5 Block 4
- ALBA
- Industrial facilities

NORTH ARROW: N

FIGURE TITLE: Figure 3.4 Sensitive receptors and landuse adjacent to PS5 Block 4 (350m away from the site boundary)

DATE: February 2023

DATUM: WGS 1984 UTM Zone 39N

PROJECT TITLE: ALBA PS5 Block 4 - Noise and dust risk assessment

PREPARED BY: MS

SCALE (A4): 1:5,524

D:\GIS Database\1. Projects\1B0114203 - ALBA Stn 5 Block 4 Risk Assmt Noise & Dust\mxd\Human receptors_Block4 boundary.mxd

CLIENT: Aluminium for the world

CONSULTANT: Environment Arabia

LEGEND:
- Sensitive receptors
- 500m buffer (from the site entrance)
- Industrial facilities
- PS5 Block 4
- ALBA

NORTH ARROW:

FIGURE TITLE: Figure 3.5 Sensitive receptors and landuse adjacent to PS5 Block 4 (500m away from the site boundary)

DATE: February 2023

DATUM: WGS 1984 UTM Zone 39N

PROJECT TITLE: ALBA PS5 Block 4 - Noise and dust risk assessment

PREPARED BY: MS

SCALE (A4): 1:5,524

D:\GIS Database\1. Projects\1B0114203 - ALBA Stn 5 Block 4 Risk Assmt Noise & Dust\mxd\Human receptors_v2.mxd

4 CONSTRUCTION DUST RISK ASSESSMENT

Project construction works with the potential to generate emissions of dust include ground levelling, excavation for foundations and structures, stockpiling and concrete works as well as the transportation of materials, equipment and the workforce to and from the construction site

A qualitative assessment of dust impacts was undertaken in accordance with methodology provided in IAQM guidance[1], as described in **Section 3** of this report and is further detailed in the following subsections.

Step 1 of the guidance requires the identification of human receptors within 350m of the boundary of the site and / or 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

There are businesses / industries located within 500m of the Block 4 site entrance, 350m from the site boundary and within 50m of the construction traffic route (**Table 3.8**). Eight (8) industrial facilities which include West Point Home, Middle East Recycling Co., Kingdom Oil Company, Al Salam Furniture Industries, GB Asphalt and Concrete, Kitchen Supply Store and Dona Tissues are located within 350m of the Block 4 site boundary. Al Dur Phase II IWPP and SEPCO III accommodation facilities are located within 500m of the construction laydown yard entrance.

4.1.1 Determining impact magnitude and sensitivity

Step 2A of the assessment (**Table 3.1**) requires the determination of potential dust emission magnitude from construction works. The dust emission magnitude was determined using IAQM guidelines and is detailed in **Table 4.1**.

Table 4.1 Magnitude of dust emissions

Activity	Dust emission magnitude	Rationale
Earthworks	Large	Site area is >10,000 m^2. Rock breaking and excavations are required.
Construction	Large	Total building volume >100,000 m^3. Potentially dusty construction material will be used (e.g., concreting, backfilling).
Trackout	Medium	10 - 50 HGV trips in any one day. Access road up to the site entrance is paved.

Step 2B defined of the sensitivity of the area. As described earlier, the Block 4 Project site is located within an industrial area surrounded by small to heavy industries. Since the industries follow an 8-hour, 3 shift work policy, it is anticipated that the workers will not be exposed to dust levels over a time period relevant to the air quality objective of PM_{10} (i.e. 24 hours air quality objective of 340 µg/m^3 or annual objective of 80 µg/m^3). Open desert space and quarry constitute ~27% of the land use within the area whereas industries constitute ~13.5%. Given the nature of industries and potential dust generating activities located in an upwind direction, the receptors are considered to be **medium** sensitivity type based on IAQM criteria (**Table 3.2**).

Based on a medium sensitivity type for the receptors and the distance of the receptors from the Project construction site the receptors the sensitivity of the area to dust soiling and human health effects from PM_{10} are considered to be low as per IAQM criteria (**Table 3.3** and **Table 3.4**).

Outcome of Step 2B analysis based on the criteria listed in **Table 3.3** and **Table 3.4** is presented in **Table 4.2** below.

Table 4.2 Outcome of defining sensitivity of the area

Potential impact	Receptor sensitivity	Number of receptors	Sensitivity of the area (receptor distance from source is 100 - 350m)		
			Earthwork	Construction	Trackout
Dust soiling	Medium	>1	Low	Low	Low
Human health	Medium	>10	Low	Low	Low

4.1.2 Impact risk definition

Step 2C determines the risk of dust impacts as a combination of the dust emission magnitude and sensitivity of the area and based on IAQM risk levels (**Table 3.5**), Table 3.6. and Table 3.7, the assessment found that dust risk during earthworks, construction and trackout for Power Station 5 Block 4 were low (**Table 4.3**).

Table 4.3 Summary of dust impact risk

Potential impact	Risk		
	Earthworks	Construction	Trackout
Dust soiling	Low risk	Low risk	Low risk
Human health	Low risk	Low risk	Low risk

In any case, given the arid, desert environment, it is considered unlikely that effects of dust soiling could be specifically attributed to the earthworks, construction works or trackout related to the Power Station 5 Block 4 Project.

4.1.3 Construction Traffic

As described earlier, the majority of construction traffic routes to the Project site will be along major highways. Human receptors within 350m of the site boundary, 50m of the traffic routes used by construction vehicles and up to 500m from the site and laydown yard entrances were identified and are listed in **Table 3.8**. Analysis of all receptors in proximity to the transportation routes that will be used for construction traffic found that once leaving the main highways, the routes are through industrial and commercial areas and no receptors that would be sensitive to traffic movements such as residential areas, settlements, labour accommodation sites, hospitals, schools or other public amenities are present. As such, no increased risk to sensitive receptors is expected from dust generation due to construction related traffic.

Al Dur Phase II IWPP and SEPCO III accommodation facility is located within 500m of the construction laydown yard entrance. To the west and south of the laydown are vacant desert land. Accommodation facility is located on the eastern boundary line of the laydown yard. Given the low number of receptors in proximity to the laydown during daytime when most of the material transport occurs, the sensitivity of the area is considered to be **low**.

4.2 Dust Management Plan

The EPC contractor and Alba have the following procedures in place in relation to managing dust emissions from the Block 4 Project construction site and construction traffic:

- Relevant EPC Contractor documents:
  - Pollution Prevention Procedure;
  - Respiratory Protection Procedure;
  - Traffic Management Plan;
  - Excavation Procedure; and
  - Health, Safety and Environmental Management Plan.

- The Alba Code of Practice (ACOP) which contains the following:
  - Control of Physical Hazard and Ergonomics;
  - Performance Measurement and Monitoring;
  - Environmental Monitoring;
  - Monthly Safety Health and Environment report guideline;
  - CESMP; and
  - Ambient Air sampling.

The EPC contractor has included air quality management measures in the CESMP and the management approaches included in IFC's General EHS guidelines into their pollution prevention procedure. The risk assessment suggests that impacts to receptors outside the Project construction site due to construction dust is low. The CESMP recommends that a construction dust minimization plan shall be formulated by the EPC Contractor.

Recommended additional best practice measures to be considered for the reduction of dust generation includes :

- increase the frequency of site inspections for air quality and dust issues on site when activities with a high potential to produce dust are being carried out during windy conditions;
- agree dust monitoring locations and include these in the CESMP;
- inspect on-site haul route for integrity and instigate necessary repairs to the surface as soon as reasonably practical.

Any complaints raised by external parties with respect to dust will be handled as with all complaints through the processes and procedures contained in the Project stakeholder engagement plan as well as Alba's and the EPC Contractor's grievance mechanisms. The grievance mechanism should be reviewed to ensure that guidelines to record all noise dust and air quality related complaints are adequate in that the dust generation sources can be identified to allow appropriate measures to be taken to mitigate the generation of dust.

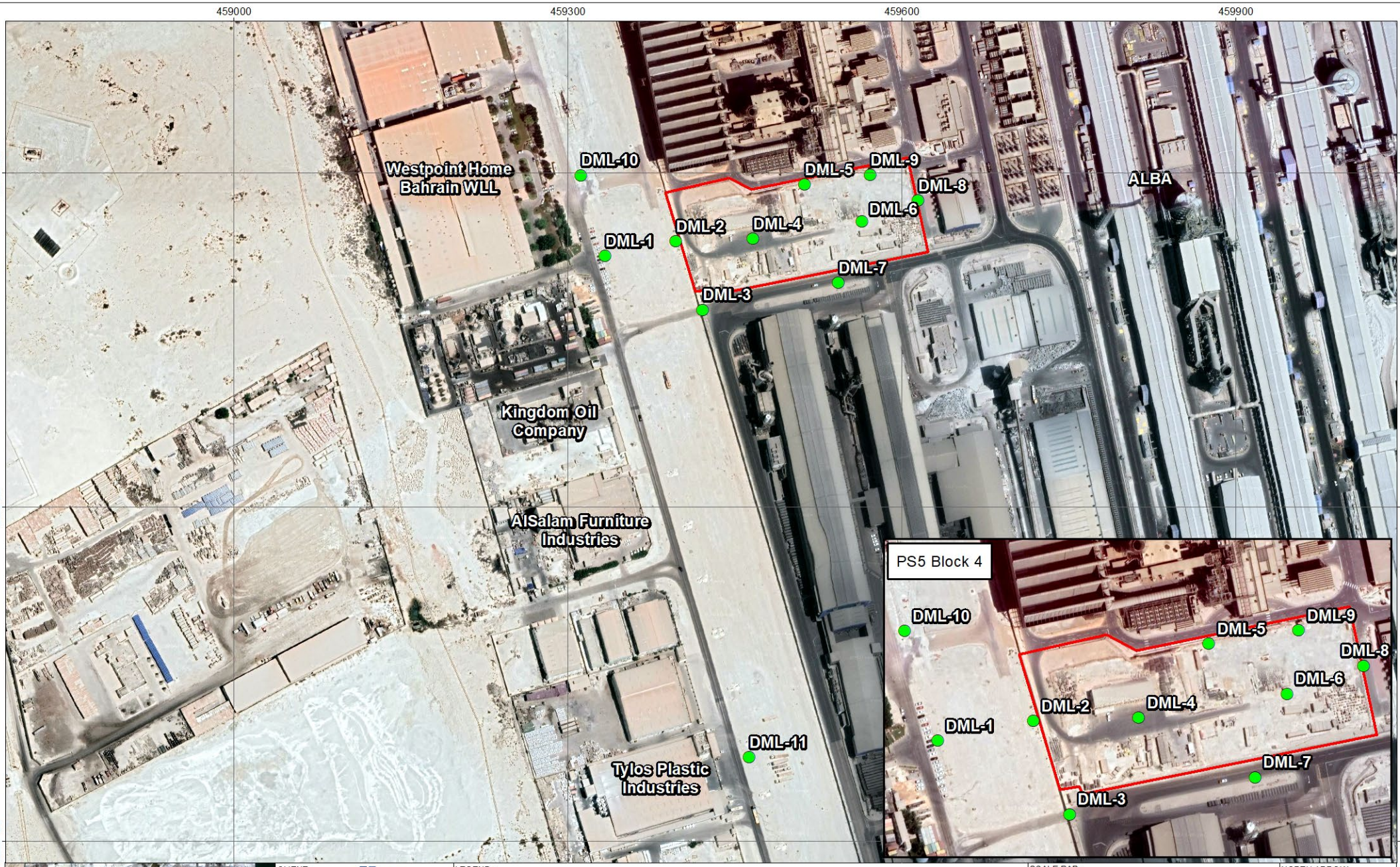
4.3 Dust Monitoring Program

The following monitoring plans were reviewed during the risk assessment process:

- ACOP-052-Performance Measurement and Monitoring;
- ACOP-056-Environmental Monitoring;
- AGLC 001 Monthly Safety Health and Environment Report Guideline; and
- SOP (75.18) Ambient Air Sampling.

The EPC contractor has a dust monitoring program in place and undertaking regular dust monitoring at 9 locations as shown in **Figure 4.1**. The monitoring locations include site boundary, construction areas and adjacent road. It is recommended to implement the following additional requirements:

- Include entrance of West Point Home and Tylos Plastics as 2 additional monitoring locations (refer **Figure 4.1**) as:
    - West Point Home's manufactures textile products which are sensitive dust pollution;
    - Tylos Plastics manufactures plastic products and store the final products outside the plant premises prior to shipping.
- dust monitoring results shall be included in the monthly SHE reports to Alba and shall be made available to CESMP audit team to include in the monthly audit reports.



CLIENT: Aluminium for the world

CONSULTANT: Environment Arabia

LEGEND: Dust monitoring locations; PS5 Block 4 area

SCALE BAR: 0 — 0.15 km

NORTH ARROW: N

FIGURE TITLE: Figure 4.1 Dust monitoring locations

DATE: February 2023

DATUM: WGS 1984 UTM Zone 39N

REFERENCE: (from the client)

PROJECT TITLE: ALBA PS5 Block 4 - noise and dust risk assessment

SCALE (A4): 1:4,509

PREPARED BY: MS

D:\GIS Database\1. Projects\1B0114203 - ALBA Stn 5 Block 4 Risk Assmt Noise & Dust\mxd\2.2 dust monitoring locations.mxd

5 REFERENCES

1. IAQM Guidance on the assessment of dust from demolition and construction, 2014.
2. IAQM Guidance on Monitoring in the Vicinity of Demolition and Construction Sites, October 2018.
3. IAQM Guidance on the Assessment of Mineral Dust Impacts for Planning, May 2016.
4. IAQM Guidance on Monitoring in the Vicinity of Demolition and Construction Sites, October 2018.