Alba Power Station 5 Block 4 Supplementary ESIA

Contaminated Land Risk Assessment

January 2023
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Rev. 00

Aluminium
for the world

Environment Arabia

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Table of abbreviations

ACM	Asbestos Containing Materials
ACOP	Alba Code of Practice
Alba	Aluminium Bahrain BSC
ASTM	American Society for Testing and Materials
CCGT	Combined Cycle Gas Turbine
CESMP	Construction Environmental and Social Management Plan
Citrus	Citrus Advisors Ltd.
DIV	Dutch Intervention Value
DTV	Dutch Target Value
EACS	Environment Arabia Consultancy Services WLL
EPAP	Equator Principles Action Plan
EPC	Engineering Procurement and Construction
ESA	Environmental Site Assessment
ESIA	Environmental and Social Impact Assessment
EWA	Electricity and Water Authority
GE	General Electric
GW	Groundwater
IWPP	Integrated Water and Power Project
kV	Kilovolt
MPW	Mitsubishi Power Ltd.
MW	Mega Watts
NOMAC	First National Operation and Maintenance Co. Ltd.
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
SCE	Supreme Council for Environment
SEPCO III	SEPCO III Bahrain Construction Company W.L.L.
SHE	Safety Health and Environment
TPH	Total Petroleum Hydrocarbons

1 INTRODUCTION

This Contaminated Land 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 and with minimum nominal ISO rating of a 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.

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, concept for the new Block 4 is like the existing Blocks 1 to 3, and the services will be provided from the common facilities from the existing PS5 or other plants within the Alba complex.

Rationale behind the expansion of PS5 Block 4 is 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 06th 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 and EPAP.

1.2 Scope of the assessment

The objective of the assessment is to determine the nature and magnitude of risks due to contamination of land at Al Dur Laydown Yard. The assessment will:

- Identify if there is an existing contamination land / soil quality baseline study for the construction laydown area;

- if not, advise Alba on how best to be assured that there is not pre-existing soil and/or groundwater contamination at the area from previous activities at/or adjacent to the site;
- once an appropriate baseline has been defined, confirm whether there is the need for any remediation or monitoring of pre-existing contamination;
- identify what controls (by Alba and the Engineering, Procurement and Construction (EPC) Contractor) will be in place during construction to prevent soil and/or groundwater contamination from occurring;
- identify monitoring procedures for the area during construction (by Alba, the EPC Contractor, CESMP monthly audit team, Alba SHE department);
- assess whether existing monitoring arrangements are considered adequate based on any existing contamination and the risks posed by planned construction activities in the area;
- identify what procedures will be in place for site closure, and if required, clean-up at the end of the construction Project;
- evaluate whether existing Alba systems, procedures and requirements are sufficient to manage these risks; and
- identify any additional Project specific mitigations required to be implemented by Alba and the EPC Contractor to manage these risks.

2 LEGISLATION AND GUIDANCE

2.1 Legislation

There are no specific environmental regulations in Bahrain in respect of land contamination; however, environmental issues in Bahrain are mainly dealt with under Law No. 7 of 2022 in Respect of the Environment (Law No. 7).

The main objective of Law No. 7 is set out in Article 3, which provides for the following:

- Protecting the environment and its sources from all activities and practices that include causes of pollution and environmental degradation, and those that affect biological diversity.
- Preventing and combating pollution in all its forms and stopping the environmental degradation through the plans and policies necessary to preserve it from the harmful effects resulting from activities that cause harm to humans, the marine environment, land or the air.
- Preserving and developing natural resources and ensuring the achievement of sustainable development goals and the preservation of biodiversity in the Kingdom's territory.

Article 5 of Law No. 7 states the following:

- Monitoring and inspecting public and private activities that negatively affect humans and the environment and conducting inspections to evaluate safety conditions and the extent of compliance with the provisions of this law and the regulations and decisions issued in implementation of it.
- Studying the nature of soil and water, and proposing means of preserving them from deterioration, pollution and low sufficiency, through the necessary controls to limit their misuse or depletion.

2.2 Guidelines

Since the Kingdom of Bahrain does not specify standards related to soil and groundwater quality, a best practice standard should be applied in accordance with the lender's requirements.

Although not technically international standards, many appraisals of soil quality utilize the Dutch guidelines for soil contamination, also referred as "The Dutch List". These guideline values, which have been generated using a risk-based approach, are intended to highlight the need for any potential remedial action. The Dutch List values, typically used for initial screening of soil quality, are the Dutch Target Values (DTVs) and Dutch Intervention Values (DIVs). The values are presented in **Table 2.1**.

DIVs indicate the concentrations at which soil remediation may be required (i.e. the concentrations at which the functional properties of the soil in relation to humans, plant life and animal life are seriously impaired or threatened).

Table 2.1 The Dutch List values

Parameter	Soil (mg/kg dry matter)		Groundwater (µg/l in solution)	
	Target	Intervention	Target	Intervention
Metals				
Antimony	3	15	-	20

Parameter	Soil (mg/kg dry matter)		Groundwater (µg/l in solution)	
	Target	Intervention	Target	Intervention
Arsenic	29	55	107	60
Barium	160	625	50	625
Cadmium	0.8	12	0.4	6
Chromium	100	380	1	30
Cobalt	9	240	20	100
Copper	36	190	15	75
Mercury	0.3	10	0.05	0.3
Lead	85	530	15	75
Molybdenum	3	200	5	300
Nickel	35	210	15	75
Zinc	140	720	65	800
Inorganic Compounds				
Bromide	20	-	0.3 mg/l	-
Chloride	-	-	100 mg/l	-
Fluoride	500	-	0.5 mg/l	-
Aromatic Compounds				
Benzene	0.01	1	0.2	30
Ethylbenzene	0.03	50	4	150
Toluene	0.01	130	7	1000
Xylenes	0.1	25	0.2	70
Polycyclic Aromatic Hydrocarbons (PAH)				
PAH (Sum 10)	1	40	-	-
Naphthalene	-	-	0.01	70
Anthracene	-	-	0.0007	5
Phenanthrene	-	-	0.003	5
Fluoranthene	-	-	0.003	1
Benzo(a)anthracene	-	-	0.0001	0.5
Chrysene	-	-	0.003	0.2
Benzo(a)pyrene	-	-	0.0005	0.05
Benzo(gh)perylene	-	-	0.0003	0.05
Benzo(k)fluoranthene	-	-	0.0004	0.05
Indeno(1,2,3-cd)pyrene	-	-	0.0004	0.05

3 CONTAMINATED LAND ASSESSMENT

The construction laydown yard for the PS5 Block 4 expansion Project is located in Al Dur area (**Figure 3.1**). The laydown area includes warehouses for chemical and material storage, open yard for storage and a fence (**Figure 3.2**). UTM Coordinates of the Laydown Yard is presented in **Table 3.1**.Layouts of the warehouses, stock yard, offices and camp are provided in **Appendix 3A**.

Table 3.1 Coordinates of the laydown yard

Easting	Northing
460527.330	2872036.102
460707.663	2871976.336
460422.535	2871719.901
460602.420	2871660.284

The laydown yard was built as part of the Al Dur Phase II Integrated Water and Power Project (IWPP) and was operational since March 2019. A consortium including SEPCO III was the EPC contractor for the Al Dur Phase II IWPP.

Since the consortium including SEPCO III was commissioned as the EPC contractor for Block 4 expansion Project, the existing laydown yard will be utilized. As such, there is no need to construct a new laydown yard facility for the Block 4 construction phase.

The Contaminated Land Assessment at the laydown yard was conducted in accordance with the Phase 1 Environmental Site Assessment (ESA) guidelines specified in American Society for Testing and Materials (ASTM), Standard E1527 – 13.

“The purpose of a Phase I ESA is to identify actual evidence or potential evidence of site contamination. The process involves the commissioning of, the evaluation of, and the reporting of historical information collected through a records review, a site visit and interviews with key personnel. The Phase I ESA should assist in reducing uncertainty about potential liabilities and may be a basis for further investigation of the Property. Phase I ESAs may be used to make informed decisions about property transactions, to identify certain baseline environmental conditions, to assist in meeting regulatory requirements and as an initial step in site remediation.” (American Society for Testing and Materials (ASTM International), Standard E1527-13, Phase I Environmental Site Assessment).

3.1 Site visit and findings

3.1.1 General site conditions

EACS, Alba and SEPCO III representatives conducted a joint walkover across the laydown yard and accommodation area on 13th November 2022. Photographs were taken during the walkover and are presented in **Figure 3.3** and **Appendix 3B**.

The purpose of the site visit and walkover was to observe current utilization of the laydown yard including current usage, storage of materials, generation of hazardous materials, the storage and handling of generated waste and the storage of waste water.

The laydown yard footprint appears to have limited past use. From the review of historical satellite imagery of the location, it is suspected that this land was only been used once previously as a laydown yard during the construction of Al Dur Phase I IWPP as described earlier (**Section 3.4 Appendix 3C**).

CLIENT: alba Aluminium for the world	LEGEND: Laydown yard		SCALE BAR: 0 – 0.4 km	NORTH ARROW: N
CONSULTANT: Environment Arabia	FIGURE TITLE: Figure 3.1 - Construction laydown yard	DATE: February 2023	DATUM: WGS 1984 UTM Zone 39N	REFERENCE: (from the client)
	PROJECT TITLE: ALBA PS5 Block 4 - Contaminated land risk assessment	SCALE (A4): 1:10,052	PREPARED BY: MS	

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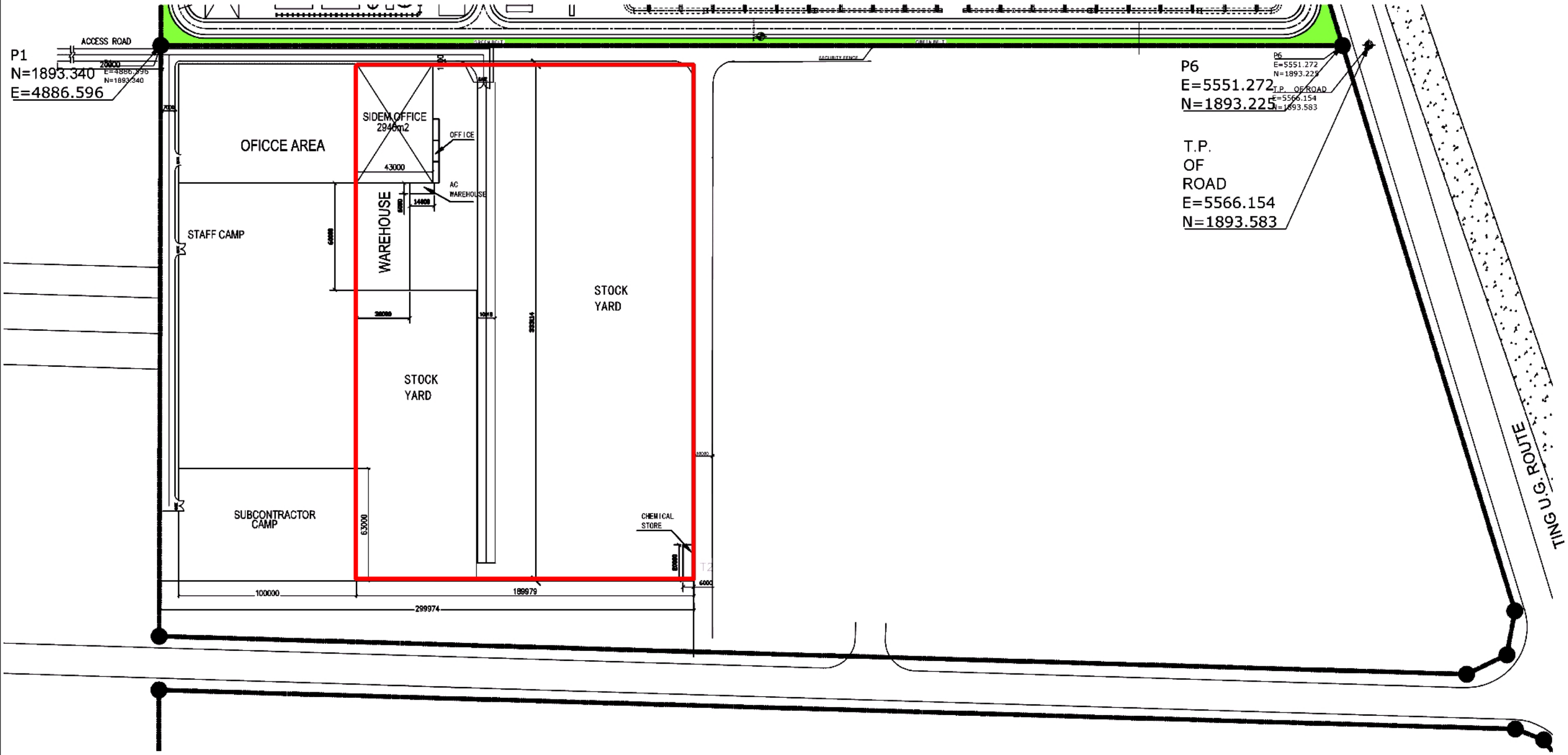

CLIENT:	LEGEND: Laydown yard boundary		SCALE BAR: NOT TO SCALE	NORTH ARROW:
CONSULTANT: Environment Arabia	FIGURE TITLE: Figure 3.2 - Laydown yard layout		DATE: February 2023	DATUM: WGS 1984 UTM Zone 39N
	PROJECT TITLE: ALBA PS5 Block 4 - Contaminated land risk assessment		SCALE (A4): 1:44,700	PREPARED BY: MS
			REFERENCE: (from the client)	

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Figure 3.3 Photographs from site walkover

3.1.2 Underground storage tanks

No underground storage tanks were reported by the SEPCO III representative and no evidence of underground storage facilities (i.e., fill / vent pipes) was observed in the laydown yard during the site visit.

3.1.3 Above ground storage tanks

Three (3) above ground storage tanks were observed in the laydown yard. All three tanks are being used for storing water for fire suppression. No other storage tanks are present.

3.1.4 Polychlorinated Biphenyls (PCBs)

In 1982, voluntary action was undertaken by the electricity departments in the Kingdom of Bahrain to substitute the oil containing PCBs from the electric capacitors and transformers of the main stations. Given that the year of construction of the warehouses and storage areas was between 2018 – 2019, it is extremely unlikely that PCB's are present in on-site electrical equipment. No evidence of PCB containing materials were observed in the laydown yard during the site visit.

3.1.5 Asbestos Containing Materials (ACMs)

Bahrain banned Asbestos in the year 1996. ACMs are commonly found in building construction materials (particularly buildings constructed prior to 1996). Given the year of construction of warehouse and storage areas it is unlikely that ACMs are present in the property. EACS did not conduct an asbestos survey as part of this assessment as SEPCO III confirmed that ACMs were not used in the construction.

3.1.6 Chemical storage and handling

The chemical storage area (**Figure 3.4**) contains an impervious concrete floor, air conditioning, spill kits, fire extinguishers and ventilation. Material such as paint and electrolyte liquids purchased for the Al Dur Phase II IWPP are still stored in the area. However, these materials are owned by First National Operation and Maintenance Co. Ltd. (NOMAC) and will be transferred to the storage area in Al Dur Phase II power plant. The chemical store was clean with no sign of spill or contamination observed on the floor of the warehouse or in adjacent areas.

Figure 3.4 Chemical storage area

3.1.7 Warehouse

The warehouse was inspected (**Figure 3.5**). Materials for Al Dur Phase II Project remain stored in both the warehouse and open yard. These will be transferred to Al Dur Phase II power plant area. Housekeeping is excellent, the warehouse and open yard were both very well organised with no visible contamination observed on the ground or at adjacent areas.

Figure 3.5 Warehouse

3.1.8 Waste management

No hazardous waste storage was observed in the laydown yard during the site visit. All wastes have been removed off-site by SCE authorized waste transfer contractors.

There was no storage of liquid wastes observed during site visit.

3.1.9 Gas and oil wells and infrastructure

No gas or oil wells or associated infrastructure were observed on or adjacent to the site.

3.1.10 Soil fill and land reclamation

Historical satellite imagery of the laydown yard was collected during the desktop study (**Section 3.4 Appendix 3C**). Imagery is available from May 2004. No evidence of filling or land reclamation was observed in the imagery analysed.

3.1.11 Radioactive materials and equipment

There was no radioactive materials or radioactive equipment observed at the laydown yard.

3.1.12 Spills

No spillage was observed on the laydown yard during site visit.

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3.1.13 Storage containers

A total of 130 containers were stored in the open yard during the site visit (**Figure 3.6**). The containers belong to Al Dur Phase II IWPP. Out of 130, 95 containers contain spare parts for Al Dur Phase II IWPP and the balance of 35 are empty. The containers were well organised and the containers and their contents present no risks to the environment.

Figure 3.6 Storage containers at laydown yard

3.1.14 Staining or stressed vegetation

No evidence of historical chemical discharges or releases (i.e., staining or stressed vegetation) was observed during the site visit. Various species of plant are planted in the accommodation area where the laydown yard for Al Dur Phase I IWPP was located (**Figure 3.7**).

Figure 3.7 Vegetation observed at accommodation area

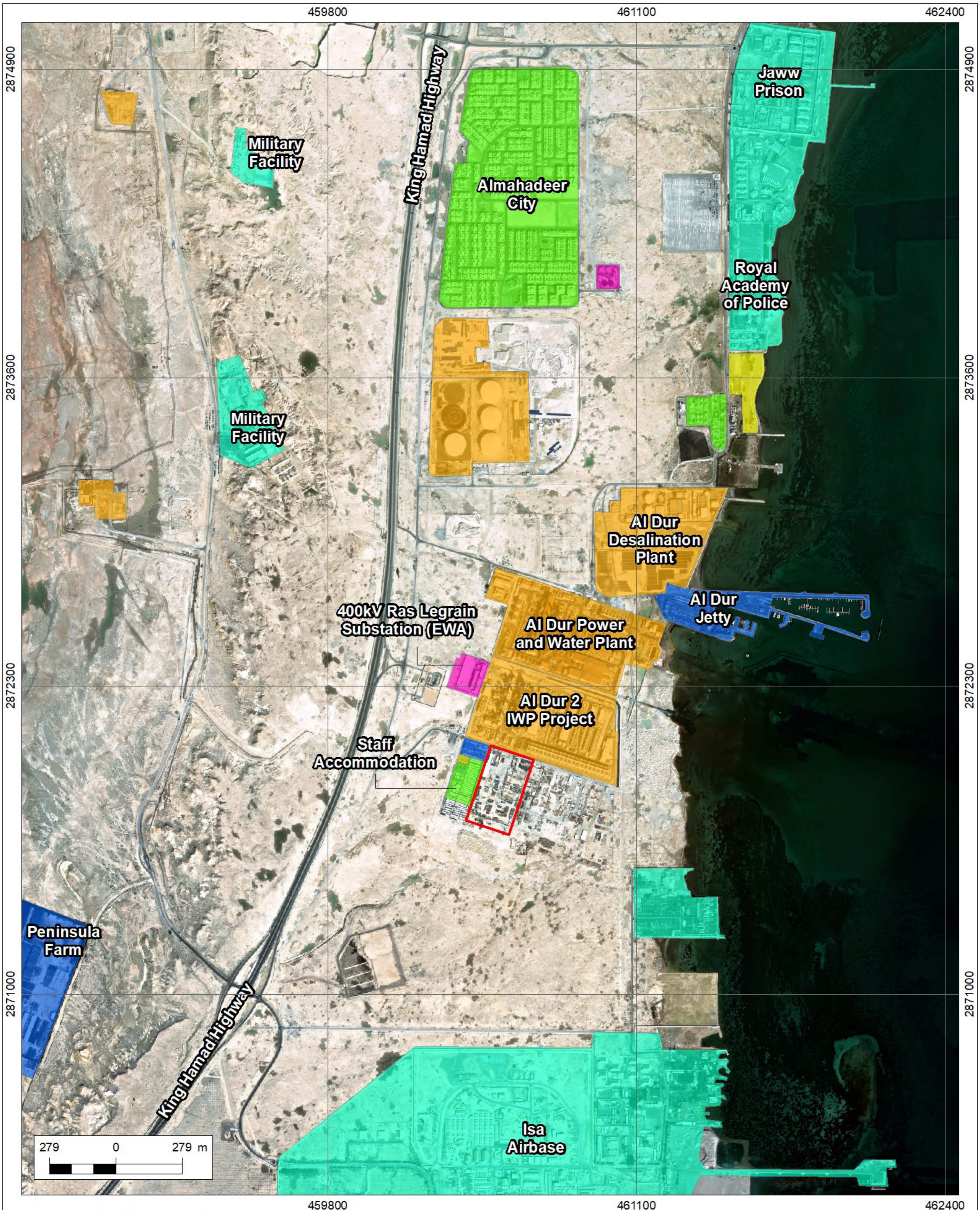
3.1.15 Excavations and standing water

A deep excavation exists (**Figure 3.8**) to the north of the laydown yard. No standing water or contamination was observed in this excavation.

Figure 3.8 **Excavation at the boundary of laydown yard and Al Dur Phase II IWPP**

3.2 Adjacent land use

To the east, south and west is vacant land. Al Dur Phase II IWPP and Phase I IWPP are located to the north of laydown yard (**Figure 3.9**).



CLIENT: alba Aluminium for the world

LEGEND:

- Laydown yard
- Cemetery
- Commercial
- Government
- Industrial
- Recreational
- Residential
- Utilities

NORTH ARROW: N

CONSULTANT: Environment Arabia

FIGURE TITLE: Adjacent landuse	DATE: February 2023
PROJECT TITLE: ALBA PS5 Block 4 - Contaminated land risk assessment	PREPARED BY: MS

DATUM: WGS 1984 UTM Zone 39N

SCALE (A4): 1:20,556

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3.3 Site history and documents review

Table 3.1 shows the list of documents reviewed during the preparation of this risk assessment.

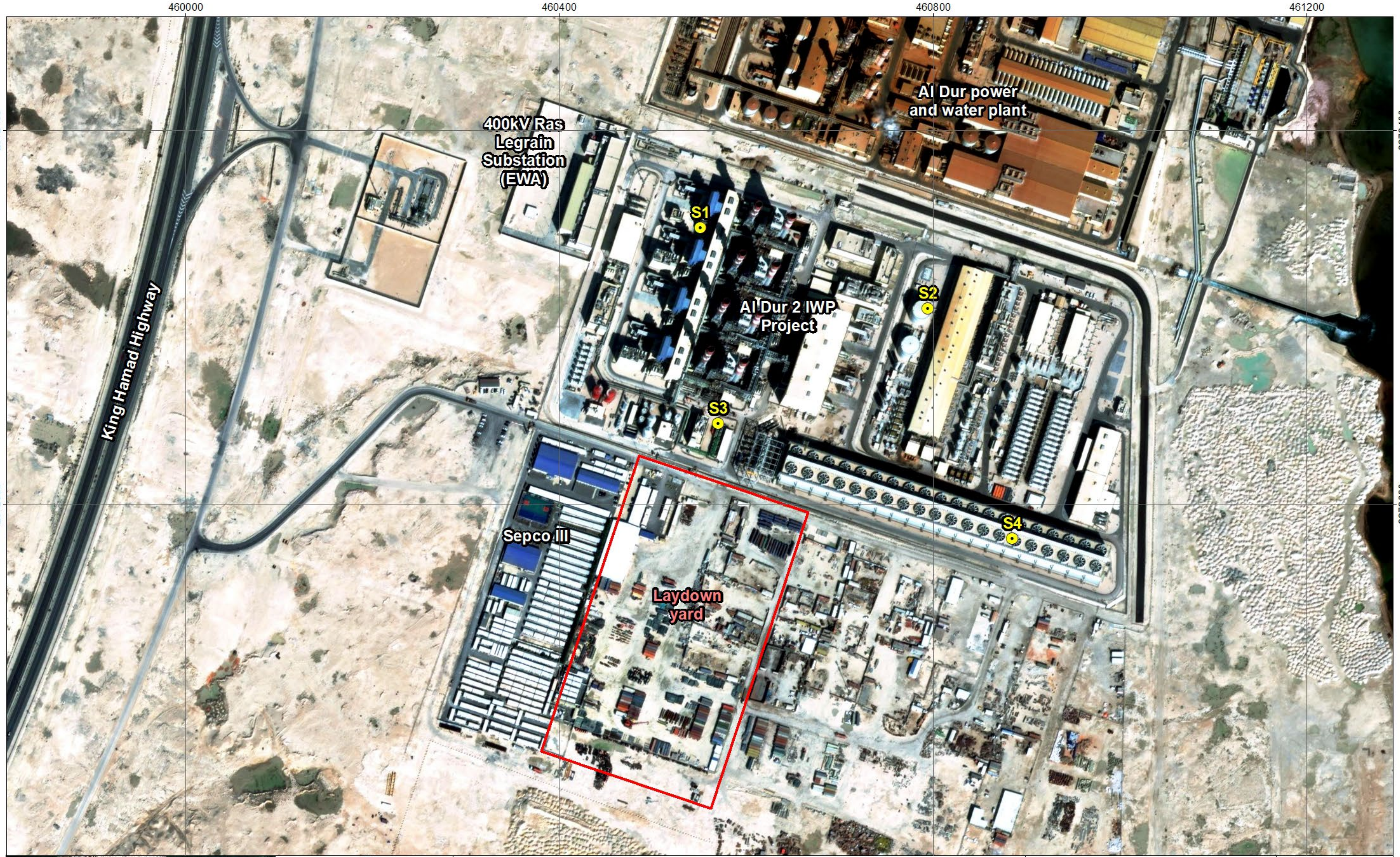
Table 3.2 List if documents reviewed

Sl. No.	Document Description
1	1305/001/063 – Al Dur Phase II IWPP (Independent Water and Power Project) Environmental and Social Impact Assessment – Volume 2: Final prepared for ACWA Power by 5Capitals
2	1B080901 – Environmental Evaluation Report for Al Dur Phase II IWPP – Revision 2 prepared for Haya Power and Desalination Company by EACS
3	ENV-RJC-20-00070-PS5-ESIA-01 – Environmental and Social Impact Assessment Report for PS5 Block 4
4	IFC general EHS Guidelines: Environmental – April 30, 2007
5	ENV-RJC-20-00070-PS5-ESIA-ADM-01 – ESIA Addendum Report
6	ACOPC-003-Monthly SHE Report Procedure-Rev 02
7	ACOPC-005 Contractors E and S Performance Review
8	ACOPC-006 EPC or EPCM Engagement Procedure-Rev 00
9	AGLC 001 Monthly Safety Health and Environment Report Guideline
10	PS5 Block 4 Chemical Management and Hazard Communication Procedure PS5-B4-01-YDC-GGP-SEP-00020
11	PS5 Block 4 Pollution Prevention Procedure PS5-B4-01-YDC-GGP-SEP-00018
12	PS5 Block 4 Refuelling Operations Procedure PS5-B4-01-YDC-GGP-SEP-00022
13	PS5 Block 4 Waste Management Procedure PS5-B4-01-YDC-GGP-SEP-00023
14	PS5 Block 4 Emergency Preparedness and Response Procedure PS5-B4-01-YDC-GGP-SEP-00004
15	PS5 Block 4 Spill Prevention Procedure PS5-B4-01-YDC-GGP-SEP-00021
16	ACOP-056-Environmental Monitoring
17	ACOP-065-Environment Emergency Response
18	ACOP-070- Chemicals and Hazardous Materials Management
19	PS 5 Block 4 Safety, Health, Environment and Social Monitoring Procedure PS5-B4-01-YDC-GGP-SEP-00016
20	Alba Groundwater Monitoring Plan
21	ASTM E 1527 – 13

3.3.1 Soil and groundwater quality report review

3.3.1.1 Soil quality

Soil sampling was carried out by Byrne Looby on behalf of 5 Capitals (5C) for the 2019 Al Dur Phase II IWPP ESIA. Four (4) sampling locations were selected and surface samples collected in the area of Al Dur II (**Figure 3.10**). The laydown yard was not sampled; however, it appears that locations S3 and S4 are located in proximity of the laydown yard boundary. From each of the four (4) sampling locations, about 1 kg of top soil was sampled. Results were analysed for a range of determinants and compared to the Dutch List guidelines (DIV) which provide the best practice benchmark for soil and groundwater conditions (**Table 3.2**).



CLIENT: alba Aluminium for the world	LEGEND: Soil sampling locations (ByrneLooby, 2019) / Laydown yard	SCALE BAR: 0 – 0.2 km	NORTH ARROW: N
CONSULTANT: Environment Arabia	FIGURE TITLE: ByrneLooby soil sampling locations	DATE: February 2023 / DATUM: WGS 1984 UTM Zone 39N	REFERENCE: (5C ESIA, February 2019)
	PROJECT TITLE: ALBA PS5 Block 4 - Contaminated land risk assessment	SCALE (A4): 1:5,354 / PREPARED BY: MS	

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Table 3.3 Soil analysis results (source: 5C ESIA February 2019)

Parameter	S-1	S-2	S-3	S-4	DIV
pH	7.5	8.0	8.0	7.4	-
Sulphate (SO_3)	0.26	3.3	0.08	4.3	-
Chloride (Cl)	1.34	1.9	0.17	0.16	-
Organic Matter	0.97	0.52	0.19	0.58	-
Carbonate (as $CaCO_3$)	68.4	48.0	72.1	49.7	-
Oil and Grease	<50	<50	<50	<50	-
Heavy Metal (mg/kg)					
Nickel (Ni)	9	10	8	17	210
Arsenic (As)	<0.5	<0.5	<0.5	<0.5	55
Selenium (Se)	<0.1	<0.1	<0.1	<0.1	-
Copper (Cu)	13	7	16	16	190
Zinc (Zn)	25	10	32	30	720
Cadmium (Cd)	0.22	0.17	0.26	0.33	12
Mercury (Hg)	<0.2	<0.2	<0.2	<0.2	10
Chromium (Cr)	11	15	11	19	380
Lead (Pb)	<0.5	<0.5	<0.5	<0.5	<0.5
Phenols and PCB (mg/kg)					
Phenols	<0.1	<0.1	<0.1	<0.1	40
Polychlorinated Biphenyl (PCB)	<0.1	<0.1	<0.1	<0.1	1
Total Petroleum Hydrocarbons (TPH) (mg/kg)					
C6 – C9 (GRO)	<0.2	<0.2	<0.2	<0.2	-
C10 – C28 (DRO)	<10	<10	<10	<10	-
C29 – C40 (Heavy Fractions)	<50	<50	<50	<50	-
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/kg)					
Naphthalene	<100	<100	<100	<100	-
Acenaphthene	<100	<100	<100	<100	-
Fluorene	<100	<100	<100	<100	-
Phenanthrene	<100	<100	<100	<100	-
Anthracene	<100	<100	<100	<100	-
Fluoranthene	<100	<100	<100	<100	-
Pyrene	<100	<100	<100	<100	-
BTEX (µg/kg)					
Benzene	<10	<10	<10	<10	1,000
Toluene	<10	<10	<10	<10	130,000
Ethylbenzene	<10	<10	<10	<10	50,000
Xylenes	<10	<10	<10	<10	25,000

Note: Where the results obtained have been provided in µg/kg, the DIVs has been converted from mg/kg to µg/kg. The results highlighted in green are those well within the established DIVs while those that have not been highlighted are parameters for which there are no established standard values.

The 5C ESIA concludes that, given that all the determinants were below DIVs, it is likely that the soils in Al Dur II area are not contaminated.

3.3.1.2 Groundwater quality

Similarly, as part of the 5C ESIA carried out for the 2019 Al Dur Phase II IWPP (February 2019), three (3) boreholes were drilled around the area surrounding the Al Dur II site (**Figure 3.11**).

Groundwater was encountered at different depth for all three boreholes with the shallowest depth encountered close to the sea.

Table 3.4 Groundwater Depth (Source: 5C ESIA February 2019)

Borehole	Location	Depth (m)
GW – 1	Approximately 1.1km to the coastal waters located east of the Al Dur Phase II IWPP	15.65
GW – 2	Approximately 190m to the coastal waters located east of the Al Dur Phase II IWPP	3.9
GW – 3	Approximately 306m to the coastal waters located east of the Al Dur Phase II IWPP	7.65

The groundwater samples were analysed for pH, COD, BOD, TDS, TOC, TPH, PAH, nutrients, a suite of heavy metals and other physicochemical parameters (**Table 3.4**).

CLIENT: alba Aluminium for the world

LEGEND: Groundwater sampling locations — Laydown yard

SCALE BAR: 0 — 0.2 km

NORTH ARROW: N

CONSULTANT: Environment Arabia

FIGURE TITLE: Groundwater sampling locations

DATE: February 2023

DATUM: WGS 1984 UTM Zone 39N

REFERENCE: (5C ESIA, February 2019)

PROJECT TITLE: ALBA PS5 Block 4 - Contaminated land risk assessment

SCALE (A4): 1:5,354

PREPARED BY: MS

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Table 3.5 Groundwater analysis (source: 5C ESIA February 2019)

Parameter	GW – 1	GW – 2	GW – 3	DIV
pH	7.5	7.2	7.2	-
Electrical Conductivity @25^{0}C	27,100	18,000	53,700	-
Total Dissolved Solids (TDS)	18,152	11,650	37,224	-
Biochemical Oxygen Demand (BOD)	4	4	3	-
Chemical Oxygen Demand (COD)	29	25	34	-
Total Organic Carbon (TOC)	0.8	1	2	-
Heavy Metals				
Arsenic (As)	<0.005	<0.005	<0.005	0.06
Cadmium (Cd)	<0.005	<0.005	<0.005	0.006
Chromium (Cr)	<0.005	<0.005	<0.005	0.03
Copper (Cu)	<0.01	<0.01	<0.01	0.075
Lead (Pb)	<0.05	<0.05	<0.05	0.075
Mercury (Hg)	<0.002	<0.002	<0.002	0.0003
Nickel (Ni)	<0.01	<0.01	<0.01	0.075
Iron (Fe)	0.03	0.01	0.01	-
Zinc (Zn)	<0.01	<0.01	<0.01	0.8
Selenium (Se)	<0.01	<0.01	<0.01	-
Other Inorganic Substances				
Chloride (Cl)	8,863	5,530	20,384	-
Calcium (Ca)	745	609	802	-
Nitrate Nitrogen (NO_3 – N)	1.4	1.3	2.8	-
Total Phosphate (PO_4^{3-})	<0.1	<0.1	<0.1	-
Total Hardness as $CaCO_3$	4,380	2,880	6,800	-
Total Alkalinity as $CaCO_3$	90	118	118	-
Sulphate (SO_4^{2-})	2,522	1,710	2,782	-
Magnesium (Mg)	612	330	1,166	-
Potassium (K)	210	150	480	-
Sodium (Na)	4,982	3,047	11,334	-
Total Petroleum Hydrocarbons (TPH) (µg/l)				
C6 – C9 (GRO)	<1	<1	<1	-
C10 – C28 (DRO)	<10	<10	<10	-
C29 – C40 (Heavy Fractions)	<50	<50	<50	-
Polycyclic Aromatic Hydrocarbons (PAHs) (µg/l)				
Naphthalene	<5	<5	<5	70
Acenaphthene	<5	<5	<5	-
Fluorene	<5	<5	<5	-
Phenanthrene	<5	<5	<5	5
Anthracene	<5	<5	<5	5
Fluoranthene	<5	<5	<5	1

Parameter	GW – 1	GW – 2	GW – 3	DIV
Pyrene	<5	<5	<5	-
BTEX (µg/l)				
Benzene	<1	<1	<1	30
Toluene	<1	<1	<1	1,000
Ethylbenzene	<1	<1	<1	150
Xylenes	<1	<1	<1	70
Phenols and PCBs				
Phenols	<0.002	<0.002	<0.002	2,000
Polychlorinated Biphenyl (PCB)	<10	<10	<10	0.01

Note: Where the results obtained have been provided in mg/l, the DIVs has been converted to µg/l. The results highlighted in green are those well within the Dutch Groundwater Intervention Values while those that have not been highlighted are parameters for which there are no established standard values.

The ESIA concludes that all the results of the groundwater sampling show results are well below DIVs.

3.3.2 Receptor sensitivity

A receptor sensitivity analysis was conducted in 5C ESIA February 2019 and is presented in **Table 3.5**.

Table 3.6 Geology, soils and groundwater – receptor sensitivity (Source: 5C ESIA February 2019)

Receptor	Receptor sensitivity	Justification
Soil quality	**Low**	Based on the results from the soil analysis, there are no elevated concentration of heavy metals above established limits or detectable concentrations of hydrocarbons. With no apparent areas of contamination within the site, the site can say to be characteristically green field in nature. The soil within the Project site is typical of the soil characteristics found in Bahrain. Hence, it is of low importance and rarity on a local scale
Groundwater quality	**Low**	The Project site is located within other nearby industrial facilities and groundwater at the site is expected to be brackish (due to the sea). As such, it is not a source of drinking water importance.

3.4 Satellite imagery

Satellite imageries were reviewed for the years 2004, 2005, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2018, 2019, 2020 and 2022. The satellite imagery was obtained from google earth using historical imagery function (refer **Appendix 4C**).

The 2004 to 2005 satellite images show that the laydown yard area was empty barren land. The 2005 images show that site preparation works of Al Dur Phase I IWPP were ongoing.

In the 2009 to May 2011 images, activity at the laydown yard area is visible. It is assumed that the land was used as laydown yard for Al Dur Phase I IWPP. The construction progress of Phase I IWPP is also visible in the images.

The August 2011 image show that the construction of Al Dur Phase I IWPP was completed and the laydown yard is empty.

The 2012 to March 2018 images show that the laydown yard area is empty and unused land.

The December 2018 image shows some construction activities at the laydown yard and Al Dur Phase II IWPP locations.

The 2019 images show that laydown yard, site offices and accommodation area is completed and Al Dur Phase II IWPP construction work is in progress.

The 2020 and March 2022 images show that the laydown yard is fully occupied and construction of Al Dur Phase II IWPP is nearing completion.

3.5 Contamination control plans

Alba and the EPC Contractor has the following procedures in place in relation to controlling potential contamination at the laydown area:

- EPC Contractor:
  - Spill prevention procedure;
  - refuelling operations procedure;
  - pollution prevention procedure;
  - chemical management and hazard communication;
  - waste management; and
  - emergency preparedness and response.
- Alba Code of Practice (ACOP):
  - Chemical and hazardous materials management;
  - environment emergency response; and
  - monthly SHE reporting procedure.

Upon review of the procedures, the following is recommended in relation to ensuring sufficient controls are applied at the project laydown area:

- The procedures detail management measures to prevent contamination due to the spillages, leakages and accidental releases at PS5 Block 4 construction site. The EPC contractor should either prepare a separate contamination control plan for the laydown area or an additional section should be included in the existing procedures and plans to address the control measures specific to the laydown area;
- spill classification (major or minor) and control measures based on spill classification are included in the Alba ACOP on environment emergency response but are not identified or described in EPC contractor's spill prevention and emergency response plans. The EPC contractor shall revise the control plans to include spill classification and measures for each type of spill;
- considering the space limitations of Block 4 construction site and site offices, it is expected that the EPC contractor will be storing chemicals at Al Dur laydown yard. The control measures to be adopted during transfer and transport to Block

4 construction site should be included in the EPC contractor's chemical management, spill prevention and emergency response procedures;
- soil sampling and laboratory analysis should be conducted in the event of a spill. The SCE should be notified if a major spill occurs. These measures should be added to the control plans;
- in the event of the presence of contaminated materials authorization to dispose contaminated material at landfill site should be obtained from the SCE and this requirement should be added to the control plans;
- training requirements related to spill prevention, control and clean-up is not addressed in the EPC contractor's procedure. It is recommended to revise the procedures to include training and tool box talk requirements;
- the EPC contractor's construction safety, health and environment procedure shall be revised to include a section about contamination monitoring and reporting guideline; and
- EPC contractor shall assign a team to undertake regular monitoring at the laydown yard and log any spillages, leaks, etc. in a log book.

3.6 Environmental monitoring program

The following monitoring procedures were reviewed during the assessment process:

- Alba ACOPC-003-Monthly SHE Report Procedure-Rev 02 (24 Sep 2018);
- Alba ACOP-056-Environmental Monitoring; and
- PS5 Block 4 Construction Safety, Health, Environment and Social Monitoring Procedure PS5-B4-01-YDC-GGP-SEP-00016.

An environmental monitoring plan specific to laydown yard was not available for review. However, ACOPC-003 provides guidelines on reporting contamination incidents occurred at the construction site. The reporting procedure addresses, the measures to be implemented in the event of a spill or leak of chemicals / fuel / oil and the reporting requirements.

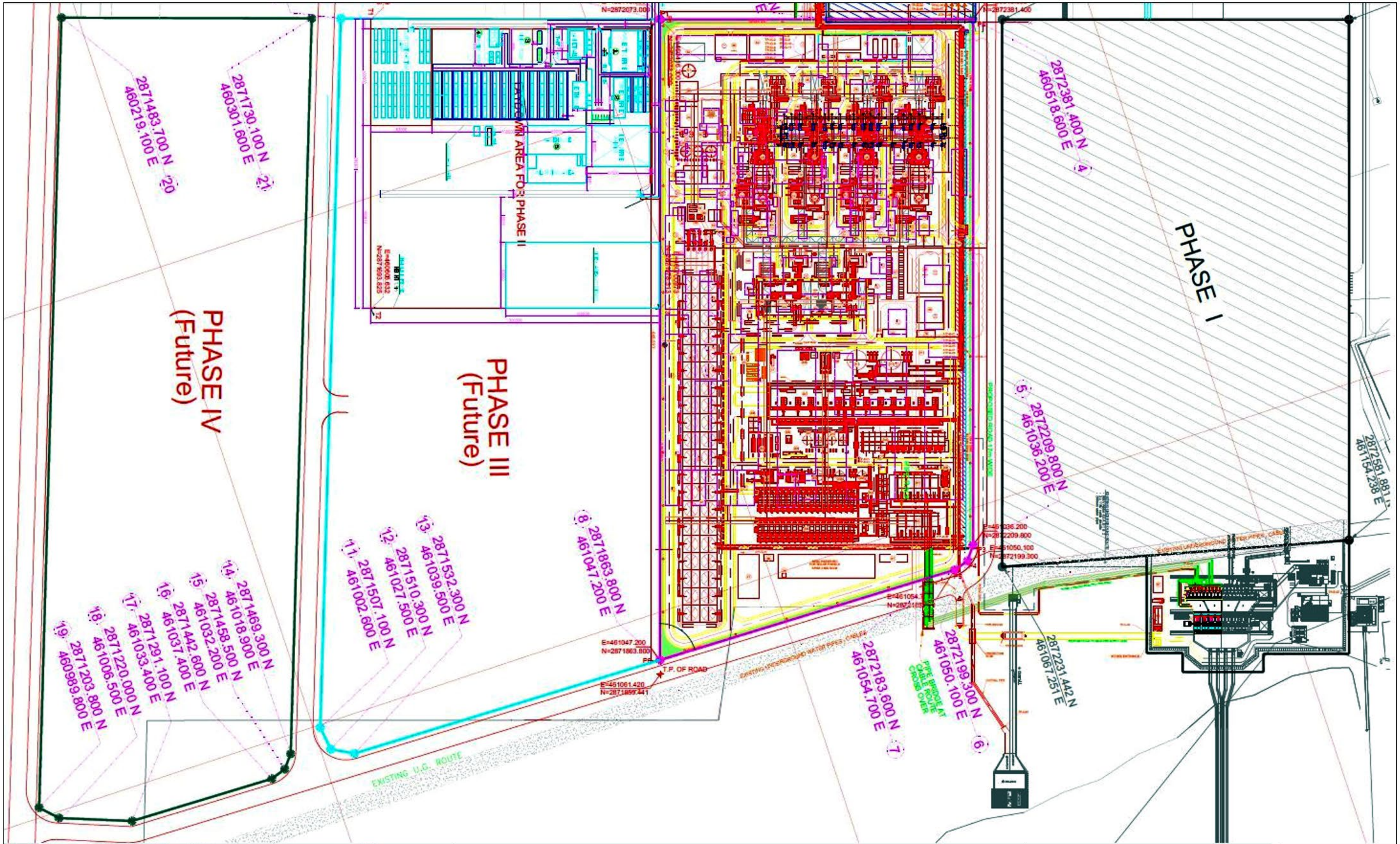
It is recommended that the EPC contractor should include a monitoring program for the laydown yard in the construction safety, health, environment and social monitoring procedure. The following shall be included in the monitoring plan:

- Daily visual inspection of the laydown yard for signs of any visible contamination;
- inspection of chemical storage area, equipment and machinery parking area;
- check equipment and machinery for any leaks;
- record the findings of the inspection on a log sheet;
- soil sampling and laboratory analysis requirements; and
- storage, handling and disposal of contaminated soil.

3.7 Laydown yard closure

At present SEPCO III have no plans to demobilize from Al Dur as they are expecting other Projects in the Kingdom. Hence, site-closure and clean-up procedure with methodology for inspections and exploratory study requirement is not available for review at the time of preparation of this document. SEPCO III confirmed that a plan will be prepared and implemented if they have to demobilize the laydown yard, site offices and accommodation facilities in future.

From the document review it is understood that the Electricity and Water Authority (EWA) plans to build the third IWPP in Al Dur and there is a potential for a fourth IWPP adjacent to this (**Figure 3.12**). Phase III IWPP will be built on the current laydown yard and the adjacent plot.



CLIENT:

Aluminium for the world

LEGEND:

(NA)

SCALE BAR:

NOT TO SCALE

NORTH ARROW:

CONSULTANT:

Environment Arabia

FIGURE TITLE:

Al Dur IWPP plot plans

DATE:

February 2023

DATUM:

WGS 1984 UTM Zone 39N

REFERENCE:

(from the client)

PROJECT TITLE:

ALBA PS5 Block 4 - Contaminated land risk assessment

SCALE (A4):

1:5,250

PREPARED BY:

MS

D:\GIS Database\1. Projects\1B0114202 - ALBA Stn 5 Contaminated Land Risk Assmt Al Dur\mxd\3.12 Al Dur IWPP plot plans.mxd

3.8 Conclusions

The Contaminated Land Assessment was conducted in accordance with the Phase 1 Environmental Site Assessment (ESA) guidelines specified in American Society for Testing and Materials (ASTM), Standard E1527 – 13.

EACS, Alba and SEPCO III representatives conducted a joint walkover in the laydown yard and accommodation area on 13th November 2022. EACS team noted the observations during the site visit and interviews were held with SEPCO III site representatives. Following the completion of the site visit, a review of available documents was completed to identify the presence of any past contamination as well as a review of procedures to prevent contamination and available contamination monitoring plans.

The following key observations were made by this Phase 1 assessment:

- Soil and groundwater quality in proximity to the site are well within the DIVs. With no apparent areas of contamination within the site;
- with the exception of the use of the site as a laydown yard during Al Dur Phase I IWPP construction period current and historical satellite photographs of the site indicate that the history of the site does not include any activities likely to result in any land contamination; and
- during previous laydown activities at the site between 2018 to 2022 (during al Dur Phase I IWPP construction), no spill incidents occurred in the laydown yard.

Based on the above findings, EACS recommends that no additional assessments are require in terms of pre-existing contamination and remediation.

The laydown site is well managed and the facilities to store chemicals and fuels follow good international industry practice in terms of prevention of leaks and spills and spill containment, as such the risk of contamination at the laydown area has been reduced to as low as is practicable.

Upon review of the existing contamination control plans and procedures as well as current spill response arrangements, some gaps were noted in relation spill classification, transportation of chemicals and monitoring that can be easily addressed in the documentation and recommendations to address these gaps are included in section 3.5.

The existing procedures cover the construction area but do not specifically include the laydown yard. As liquid chemicals and fuels will be stored at the laydown area to support the Alba Block 4 power station construction, there is always a potential for contamination through accidental spillage, therefore contamination prevention controls and spill response procedures must be in place. Hence, it is recommended that current procedures are adapted to include the laydown area or alternatively, the EPC contractor should prepare a procedure specific to the laydown area that contains all of the necessary spill and contamination prevention controls, monitoring requirements and response measures.

It is also recommended that a contamination monitoring program for the laydown yard should be added to the EPC Contractor's construction safety, health, environment and social monitoring procedure.

A procedure for the laydown site closure and any necessary clean-up required has not been prepared yet. Since the land will be utilized for the construction of Al Dur Phase III

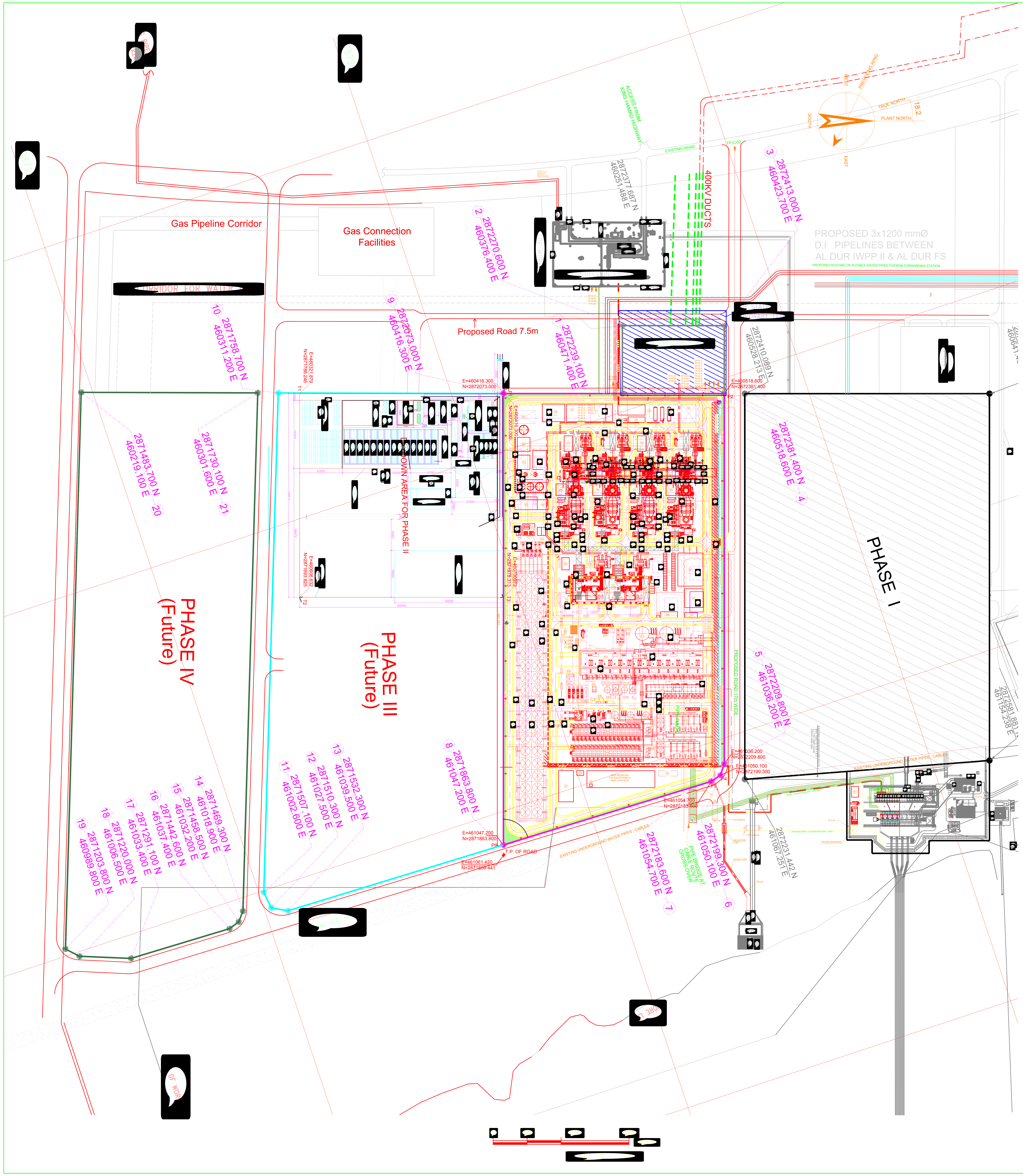
IWWP, EACS recommends that the EPC contractor should prepare a site closure and clean-up plan which will include the following aspects as a minimum:

- A Phase I ESA prior to the closure of the yard;
- methodology for Phase II (intrusive study) and Phase III (remediation and rectification) ESA;
- procedure for management and mitigation of risks during site-closure and clean-up activities; and
- environmental monitoring program during the site closure and clean-up phase.

Environment Arabia

Appendix 3A

Laydown Yard Layout



LEGEND

NO.	DESCRIPTION
1	TURBINE BUILDING
2	STEAM TURBINE BUILDING
3	HEAT RECOVERY STEAM GENERATOR (HRSG)
4	MAIN STACK
5	BY - PASS STACK
6	GAS TURBINE STEP - UP TRANSFORMER
7	STEAM TURBINE STEP - UP TRANSFORMER
8	TRANSFORMER COMPOUND TANK
9	SECONDARY E-ROOM (FOR MV AND LV FEED)
10	BLOWDOWN PIT AND PUMPS
11	INTEGRAL DEAREATOR (HOLD)
12	HP FEED WATER PUMP & MONO-RAIL
13	N2 BOTTLE SHADE FOR HRSG
14	HRSG SAMPLING SYSTEM
15	HRSG CHEMICAL DOSING SYSTEM
16	ELECTRICAL ROOM FOR GT (EACH)
17	EMERGENCY DIESEL GENERATOR
18	CLOSED COOLING WARTER PUMP
19	COOLING WATER HEAT EXCHANGER
20	BLACK START GENERATORS
21	CIRCULATING WATER PUMPS
23	RESERVED AREAS FOR WATER PUMPS
24	CHEMICAL STORAGE AND HAZARDOUS STORAGE AREA
25	WATER TREATMENT BUILDING
26	EFFLUENT WATER TREATMENT (NEUTRALIZATION)
27	OILY COLLECTION BASIN
28	FUEL GAS COND. SYSTEM
29	SEWAGE TREATMENT SYSTEM
30	AIR COMPRESSOR CONTAINER
31	CONDENSATE TANKS
32	COMMON ELECTRICAL BUILDING
33	FUEL GAS RMS AREA
34	N2 BOTTLE SHADE FOR GAS STATION
35	SOCIAL BUILDING
36	WAREHOUSE & WORKSHOP BUILDING
37	CAR PARKING CANOPY
38	ADMINISTRATION BUILDING
39	GATEHOUSE BUILDING
40	SWGR BUILDING FOR COOLING TOWER
41	COOLING TOWER
42	DEMI WATER BUFFER STORAGE TANKS
43	GATEHOUSE CABIN FOR ROAD ACCESS CONTROL
44	CONDENSER
45	GT GEN AND GT TRANSF REMOVAL AREA
46	GT LAYDOWN AND MAINTENANCE AREA
47	CEMS COMMON FOR BOTH STACKS
48	FEED WATER PUMPS LAYDOWN AND MAINT. AREA
49	ST LAYDOWN AND MAINT. AREA
50	FF PUMP HOUSE
51	FF TANK
52	SECOND PASS PERMEATED TANK
53	SERVICE WATER TANK
54	LAYDOWN AREA 20FT CONTAINERS
55	AREA FOR STORAGE, BLASTING AND DARK ROOM
56	GAS EXPANDER
57	SECONDARY GATE HOUSE
58	NON HAZARDOUS WASTE STORAGE
59	ST TRANSFORMER MAINT. AREA
60	ST BUILDING CRANE
61	GT BUILDING CRANE
62	GT GEN HOIST AND REMOVAL AREA
63	CW SAMPLING SYSTEM
64	CONDENSATE DOSING SYSTEM
65	COOLING SYSTEM DOSING
66	TRUCK SCALE
67	ELECTROCHLORINATION BUILDING
68	STORM WATER PIT
69	WATER INTAKE ELECTRICAL ROOM
70	WATER INTAKE EMERGENCY DIESEL GENERATOR
71	WATER INTAKE SCREENING SYSTEM
72	SEAWATER INTAKE PUMPS FOR THE POWER PLANT
73	HRSG LAYDOWN AREA
74	SEAWATER INTAKE PUMPS FOR SCREENS CLEANING
75	SEAWATER INTAKE PUMPS FOR THE RO PLANT
76	ELECTRICAL HOUSE FOR SOLAR FIELD
77	BLOCK 1 ELECTRICAL BUILDING
78	BLOCK 2 ELECTRICAL BUILDING
79	LABORATORY
80	CCWC SHELTER
81	TENTATIVE PILOT TRIAL AREA
200	COMPRESSED AIR SYSTEM
201	PRETREATMENT SYSTEM (DAF)
202	DESALINATION PLANT ELECTRICAL BUILDING
203	DUAL MEDIA PRESSURE FILTERS (DMPF) AND BACKWASH WATER TANKS
204	DMPF AIR BACKWASH SYSTEM
205	SLUDGE THICKENING SYSTEM AND BACKWASH WASTE WATER TANK
206	SLUDGE DEWATERING AND STORAGE SYSTEM
207	RO BUILDING AND RO AUXILIARIES SYSTEM
208	CHEMICAL SYSTEM
209	LIME MILK SATURATORS AND LIME MILK PREPARATION SYSTEM
210	CO2 SYSTEM
211	POTABLE WATER TANKS & EXPORT SYSTEM

NOTES:

1.- THIS PLOT PLANT AND LAYOUT IS PRELIMINARY AND TO BE USED ONLY FOR TENDER. NOT FOR CONSTRUCTION PURPOSES

2.- SPACING BETWEEN EQUIPMENT AND BUILDINGS IS PRELIINARY AND WIL BE REVISED IN ACCORDANCE WITH NFPA AND LOCAL REGUILATIONS DURING DETAIL DESIGN STAGE

3.- SITE FINISHED ELEVATION
GAS CONNECTION FACILITIES: EL + 112 = N.S.D (NATIONAL SURVEY DATUM) + 18.5 M
POWER PLANT AND DESAL. PLANT: EL + 100 = N.S.D (NATIONAL SURVEY DATUM) + 6.5 M
SEA WATER INTAKE FACILITIES: EL + 96 = N.S.D (NATIONAL SURVEY DATUM) + 2.5 M

4.- TIDAL INFORMATION
- H.A.T. : (+) 0.45 m N.D.S.
- M.S.L. : (+) 0.00 m N.D.S.
- L.A.T. : (-) 0.45 m N.D.S.

5.- SOLAR PANELS WILL BE INSTALLED ON TOP OF BUILDING WHERE POSSIBLE. NEEDED TOTAL SURFACE 9000M2

6.- SPACE ALLOWANCE FOR FUTHER PIPING OR CABLE ROUTING

EXTERNAL INTERFACE POINT LIST

TP-C-01 - SEAWATER OUTFALL STRUCTURE
TP-C-02 - MAIN ACCESS ROAD
TP-C-03 - ACCESS ROAD TO SEAWATER INTAKE AREA
TP-C-04 - ACCESS ROAD TO 400kV GIS
TP-E-01 - 400kV CABLE FROM GENERATOR TRANSFORMER TO GIS
TP-E-02 - EARTHING AT 400kV GIS
TP-E-03 - GENERATOR, TRANSFORMER AND 400kV CABLE PROTECTION, CONTROL & MONITORING
TP-E-04 - COMMUNICATION - SCADA BETWEEN UNIT CONTROL ROOM AND GIS CONTROL ROOM
TP-E-05 - POWER METERING SYSTEM
TP-E-06 - POWER SUPPLY TO GAS CONNECTION
TP-E-07 - BACKUP POWER SUPPLY TO SHARED FACILITY
TP-IC-1 - PLANT TELEPHONES, TELE-MEASUREMENTS, INDICATIONS, SIGNALING, ETC
TP-IC-2 - NATURAL GAS METERING AND MEASUREMENT FACILITIES
TP-IC-3 - WATER METERING SYSTEM
TP-IC-4 - SIGNALS FROM POWER PALNTS DCS
TP-IC-5 - SIGNALS FROM SWRO DCS
TP-IC-6 - POTABLE WATER SYSTEM
TP-IC-7 - ELECTRICAL SIGNALS
TP-IC-8 - PERFORMANCE MONITORING
TP-IC-9 - FUEL DEMAND MODEL AND SETTLEMENT SYSTEM
TP-IC-10 - VOICE AND DATA COMMUNICATION
TP-IC-11 - COMMUNICATIONS TATWEER CONTROL CENTER TERMINAL
TP-M-01 - NATURAL GAS SUPPLY
TP-M-02 - SEAWATER INTAKE
TP-M-03 - POTABLE WATER SUPPLY TO BUYER'S AL DUR FORWARDING STATION
TP-M-04 - POTABLE WATER SUPPLY TO 400KV GIS
TP-M-05 - FIREWATER SUPPLY TO 40KV GIS
TP-M-06 - OVERFLOW & DRAIN FROM AL DUR FORWARDING STATION
TP-M-07 - POTABLE WATER SUPPLY TO GAS CONNECTION FACILITY
TP-M-08 - FIRE WATER SUPPLY TO GAS CONNECTION FACILITY

INTERNAL INTERFACE POINT LIST

XTP-C-01 - ROAD INTERFACE
XTP-C-02 - FENCE INTERFACE 1
XTP-C-03 - FENCE INTERFACE 2
XTP-E-01 - 4x11kV POWER SUPPLY TO RO PLANT
XTP-E-02 - CONTROL CABLES BETWEEN POWER PLANT AND SWRO
XTP-E-11 - CABLE ROUTE
XTP-M-01 - 2nd PASS PERMEATE TO DEMIN PLANT (x2)
XTP-M-02 - POTABLE WATER NETWORK
XTP-M-03 - WATER SUPPLY TO FIRE TANK
XTP-M-04 - FIRE FIGHTING WATER NETWORK
XTP-M-05 - SERVICE WATER NETWORK
XTP-M-06 - COOLING WATER RETURN
XTP-M-07 - SEAWAGE TREATED WATER
XTP-M-08 - RAIN WATER DRAINAGE
XTP-M-09 - PROCESS WATER DRAINAGE

REV.	DATE/FECHA	DESCRIPTION/DESCRIPCION	DRAWN/DIBUJADO	CHECK/COMPROBADO	APPROVE/APROBADO
10D	2018/10/18	ISSUED FOR TENDER	DMC	DST	ACB
10C	2018/09/26	ISSUED FOR TENDER	DMC	DST	ACB
09	2018/07/30	ISSUED FOR TENDER	DMC	DST	ACB
08	2018/06/25	ISSUED FOR TENDER	DMC	DST	ACB
07	2018/06/22	ISSUED FOR TENDER	DMC	DST	ACB
06	2018/06/14	ISSUED FOR TENDER	DMC	DST	ACB

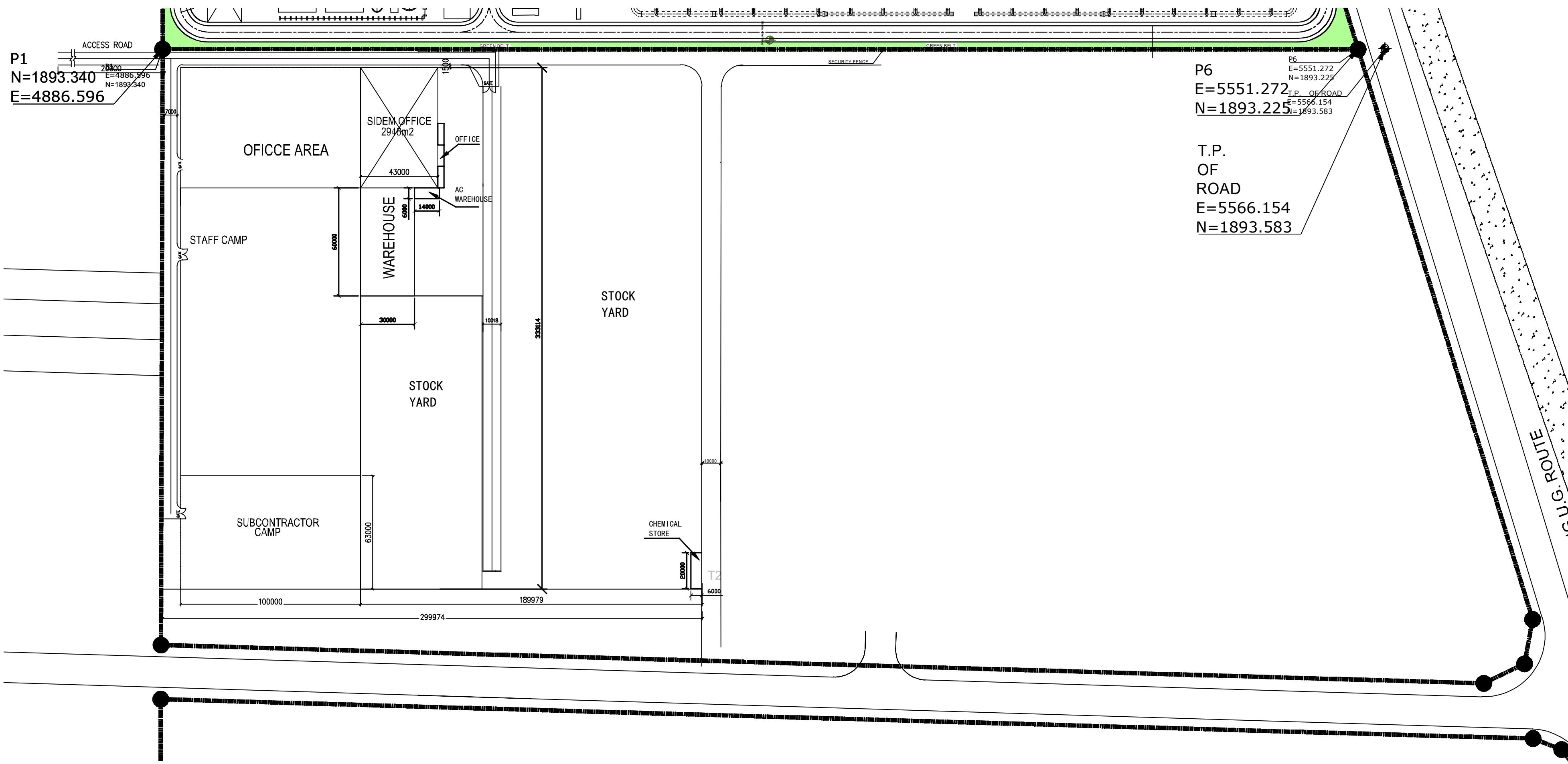
	Drawn/Dibujado	Check/Comprobado	Scale A0/ Escala A0: IND.	Revision/Revisión
Date/Fecha:	2018/05/02	2018/05/02		10D
Name/Nombre:	DMC	DST	Format/ Formato: A1	

Contractor/ Contratista

Project/Encargo
KINGDOM OF BAHRAIN
AL DUR INDEPENDENT WATER & POWER PROJECT
PHASE II

Title/ Titulo
PLOT PLAN
OVERALL PLOT PLAN - PHASE II

Drawing nº/Plano nº: T12.2.3 | Sheet/ Hoja 1 of/ de 7 | Project nº/Encargo nº: 4601/2017/3100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OFFICE
AC
WAREHOUSE
WAREHOUSE
14000
60000
30000
STAFF CAMP
STOCK
YARD
STOCK
YARD
10018
333114
SUBCONTRACTOR
CAMP
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CHEMICAL
STORE
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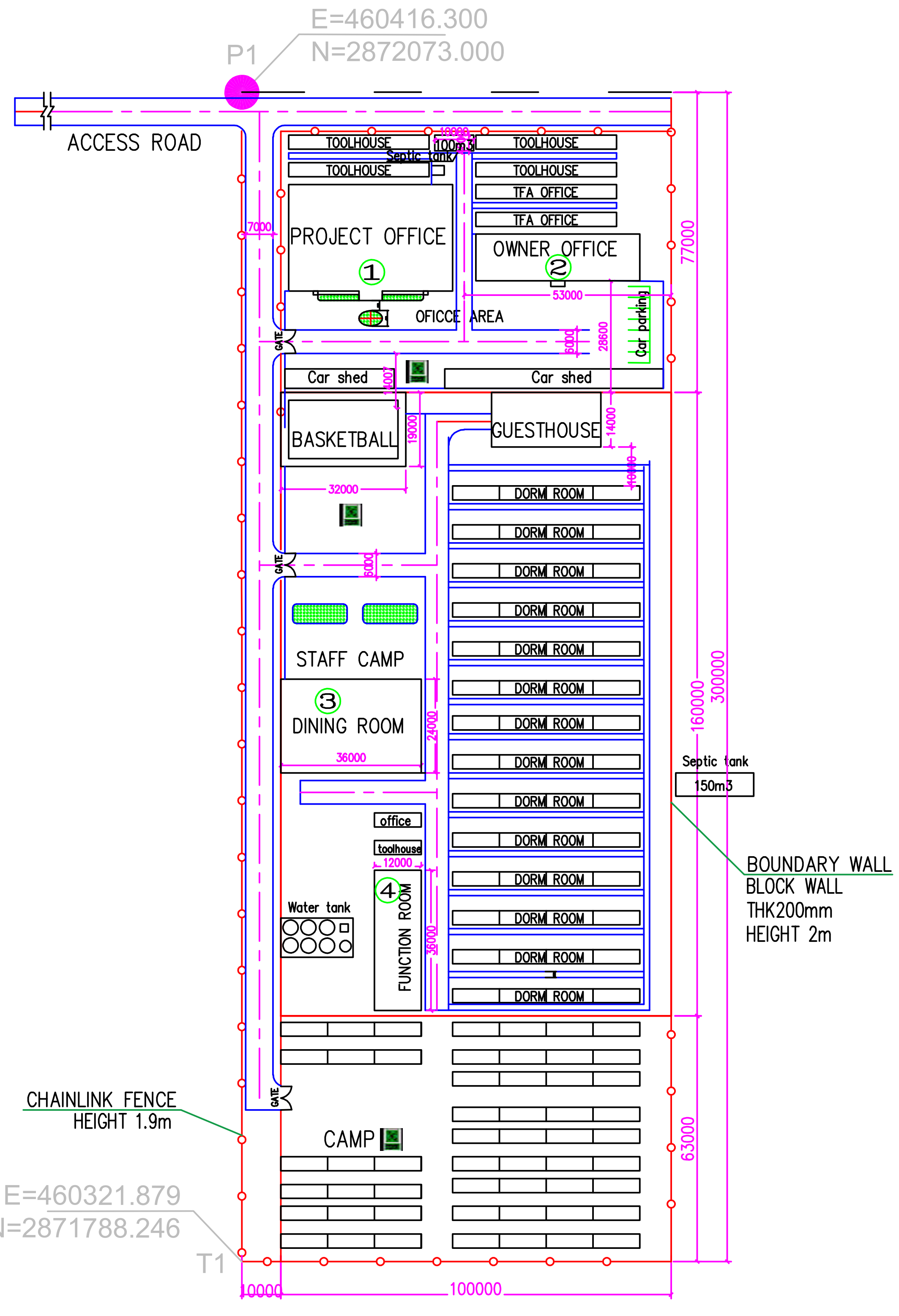
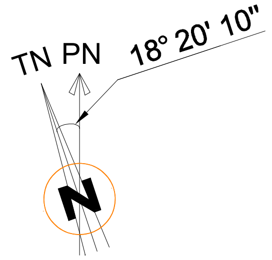


LAYOUT PLAN FOR OFFICE & CAMP

GEO LOCATION PLAN



BUILDING LIST		
No.	BUILDING NAME	AREA (m2)
1	PROJECT OFFICE	1161
2	OWNER OFFICE	504
3	DINING HALL	864
4	MULTI-FUNCTION HALL	432
5	GUEST HOUSE	346

NOTES :

1. THIS DRAWING IS TO BE READ WITH ALL RELATED ARCHITECTURAL, CIVIL, STRUCTURAL & MEP DRAWINGS AND OTHER RELEVANT INFORMATION, INCLUDING ALL SPECIFICATIONS, REPORTS, CALCULATIONS AND DETAILS, AS WELL AS THE CONDITIONS OF CONTRACT.
2. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS IN METRES, UNLESS STATED OTHERWISE.
3. DO NOT SCALE FROM THE DRAWINGS.
4. FIGURED DIMENSIONS ONLY ARE TO BE CONSIDERED FROM THIS DRAWING. ALL DIMENSIONS ARE TO BE CHECKED ON SITE. REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK. IF IN DOUBT ASK.
5. CONTRACTOR MUST VERIFY ALL JOB DIMENSIONS, DRAWINGS, DETAILS, SPECIFICATIONS AND ANY OTHER RELEVANT DOCUMENT. ANY DISCREPANCIES TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER BEFORE PROCEEDING WITH WORK.
6. ALL WORKS, COMPONENTS, SETTING OUT, LEVELS, MATERIALS AND FINISHES ARE TO BE INSPECTED AND APPROVED BY THE ENGINEER PRIOR TO COMMENCEMENT AND INSTALLATION.
7. CONTRACTOR MUST SUBMIT ALL ARCHITECTURAL, CIVIL, STRUCTURAL SHOP DRAWINGS, METHOD STATEMENTS, CALCULATIONS, TEST CERTIFICATES OR ANY OTHER CONSTRUCTION DOCUMENT AS REQUIRED BY THE ENGINEER AND OBTAIN APPROVAL OF THE ENGINEER PRIOR TO ANY COMMENCEMENT & INSTALLATION.

No.	DESCRIPTION	DATE	SIGN

KEY PLAN

CLIENT

EWA
هيئة الكهرباء والماء
Electricity & Water Authority

DEVELOPER

HAYA POWER & DESALINATION COMPANY B.S.C.

PROJECT CONTRACTOR

sepcoIII 山东电建

中国电建 POWERCHINA

SIDEM

CONSULTANTS

الأنصاري للخدمات الهندسية
ANSARI ENGINEERING SERVICES S.P.C.
PLANNING, ARCHITECTURAL, INTERIOR DESIGN, CIVIL, STRUCTURAL, MECHANICAL, ELECTRICAL, LAND SURVEYING
t. (973) 17534123 | w. www.aesbah.com
f. (973) 17533340 | e. aes@aesbah.com
Level 3, Sabha Building, Diplomatic Area
P.O. Box: 10122, Manama, Kingdom of Bahrain

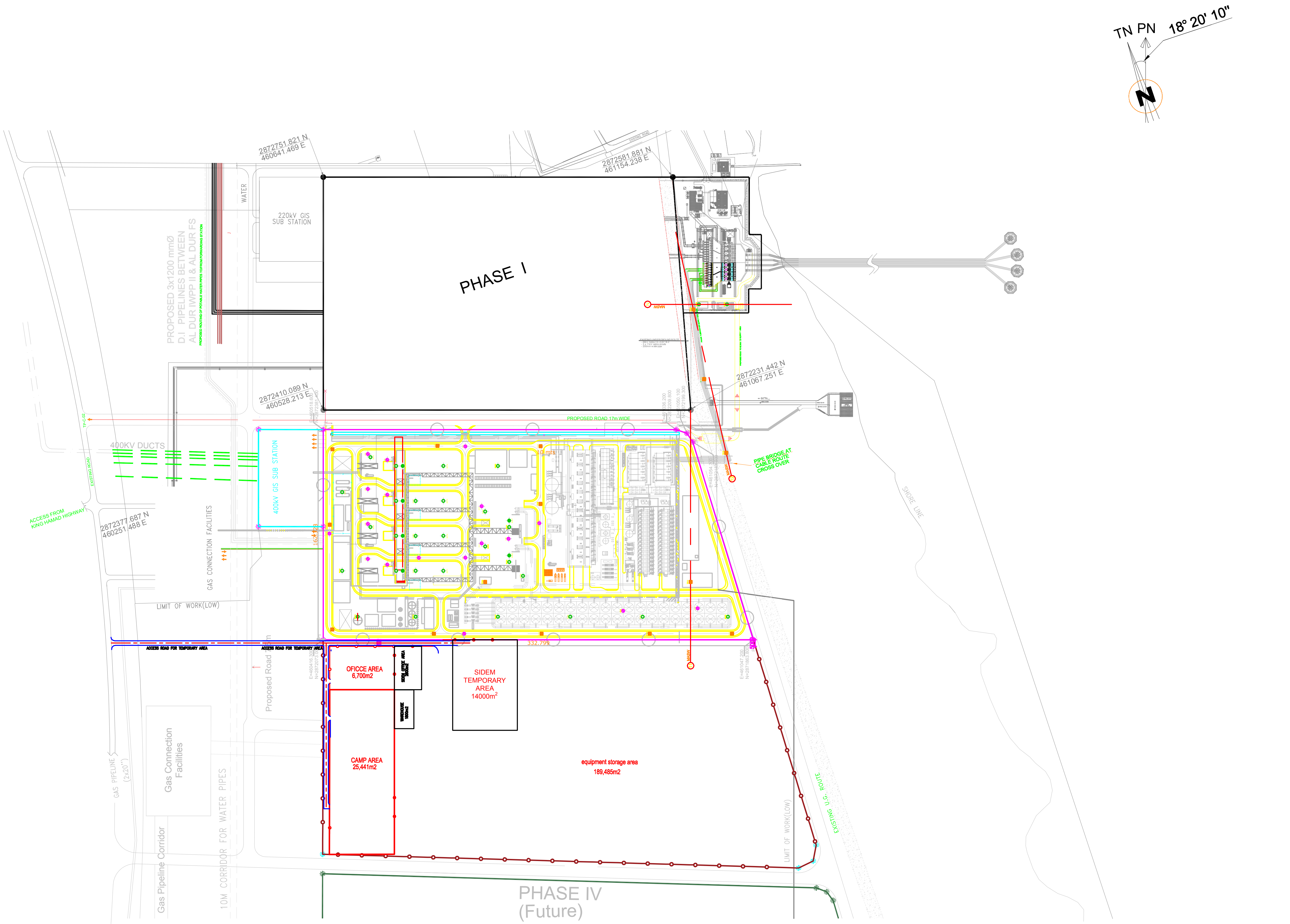
DESIGN STAGE: DETAILED DESIGN

PURPOSE OF ISSUE: Issued for Municipal Submission

DRAWING TITLE: LAYOUT PLAN FOR OFFICE & CAMP

SCALE	DESIGNED BY	DRAWN BY
1:100	CHECKED BY	APPROVED BY
	ORIGIN DATE	ISSUED DATE 2-12-2018

DRAWING NO. HR-F001S-T0101-01 REV. M01



NOTES :

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7. CONTRACTOR MUST SUBMIT ALL ARCHITECTURAL, CIVIL, STRUCTURAL SHOP DRAWINGS, METHOD STATEMENTS, CALCULATIONS, TEST CERTIFICATES OR ANY OTHER CONSTRUCTION DOCUMENT AS REQUIRED BY THE ENGINEER AND OBTAIN APPROVAL OF THE ENGINEER PRIOR TO ANY COMMENCEMENT & INSTALLATION.

No.	DESCRIPTION	DATE	SIGN

KEY PLAN

CLIENT

EWA
هيئة الكهرباء والماء
Electricity & Water Authority

DEVELOPER

HAYA POWER & DESALINATION COMPANY B.S.C.

PROJECT

sepcoIII 山东电建
中国电建 POWERCHINA
SIDEM

CONSULTANTS

الانصاري للخدمات الهندسية
ANSARI ENGINEERING SERVICES S.P.C.
PLANNING, ARCHITECTURAL, INTERIOR DESIGN, CIVIL, STRUCTURAL, MECHANICAL, ELECTRICAL, LAND SURVEYING
t. (973) 17534123 | w. www.aesbah.com
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Level 3, Sabha Building, Diplomatic Area
P.O. Box: 10122, Manama, Kingdom of Bahrain

DESIGN STAGE: DETAILED DESIGN

PURPOSE OF ISSUE: Issued for Municipal Submission

DRAWING TITLE: LAYOUT PLAN OVERALL PLOT PLAN-PHASE II

SCALE	DESIGNED BY	DRAWN BY
1:1000	CHECKED BY	APPROVED BY
	ORIGIN DATE	ISSUED DATE 14-11-2018

DRAWING NO. HR-F001S-T0101-01 | REV. M01

Appendix 3B

Site Photographs

Environment Arabia


SANY
SCC1500D


SANY


SANY


DEMINERALIZED WATER
TANK A

Environment Arabia

Appendix 3C

Satellite Images

<table>
<tr><td colspan="2">
</td></tr>
<tr><td>2004</td><td>Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.</td></tr>
<tr><td colspan="2">
</td></tr>
<tr><td>2005</td><td>Satellite image shows the laydown yard is an empty unused land parcel. However, to the north site preparation / construction works of Al Dur Phase I IWPP is in progress. No developments to the south, west and east of the location.</td></tr>
</table>

<table>
<tr><td colspan="2">
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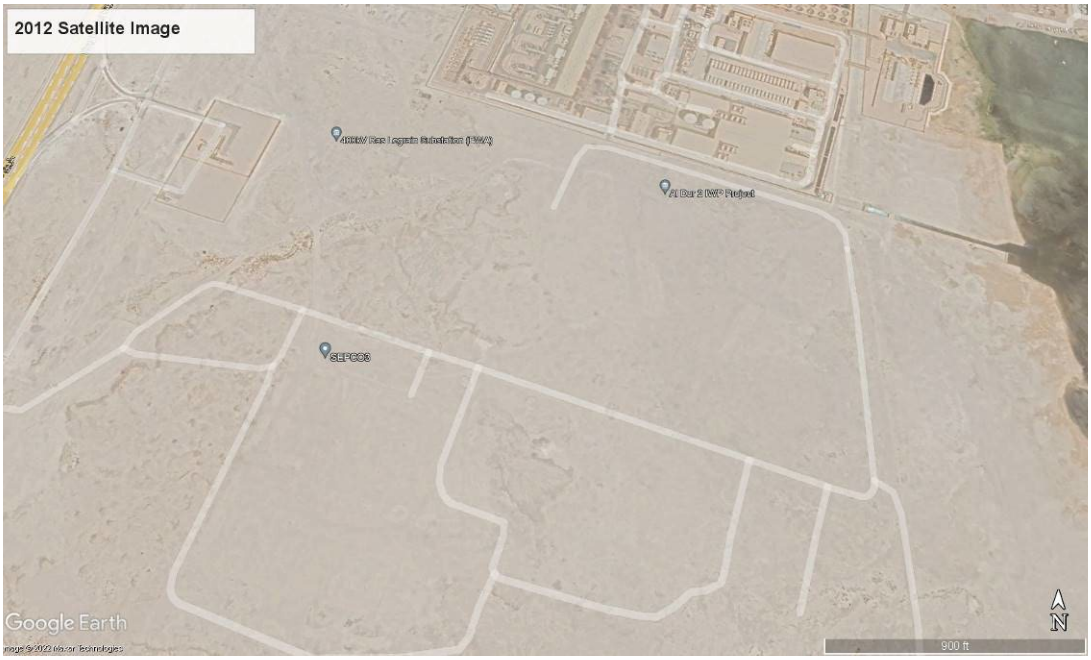
<tr><td>2009</td><td>Satellite image shows activity on the laydown yard land parcel. Construction work of Al Dur Phase I IWPP is in progress. Hence, it is suspected that the land parcel was used as laydown yard for Al Dur Phase I. No developments on south, west and east of the location.</td></tr>
<tr><td colspan="2">
</td></tr>
<tr><td>2010</td><td>Satellite image shows activity on the laydown yard land parcel. Construction work of Al Dur Phase I IWPP is in progress. Hence, it is suspected that the land parcel was used as laydown yard for Al Dur Phase I. No developments on south and east of the location. Material storage to the west of laydown yard.</td></tr>
</table>

<table>
<tr><td colspan="2">
</td></tr>
<tr><td>May 2011</td><td>Satellite image shows activity the laydown yard still functioning. Construction work of Al Dur Phase I IWPP is in progress. No developments on south and east of the location. Material storage area to the west of the laydown yard.</td></tr>
<tr><td colspan="2">
</td></tr>
<tr><td>August 2011</td><td>Satellite image shows the laydown yard demobilization completed. No activity in the land parcel. Al Dur Phase I IWPP construction works completed. No developments to the south, east and west of the laydown yard.</td></tr>
</table>

	
2012	Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.
	
2013	Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.

	
2014	Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.
	
2015	Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.

<table>
<tr><td colspan="2">
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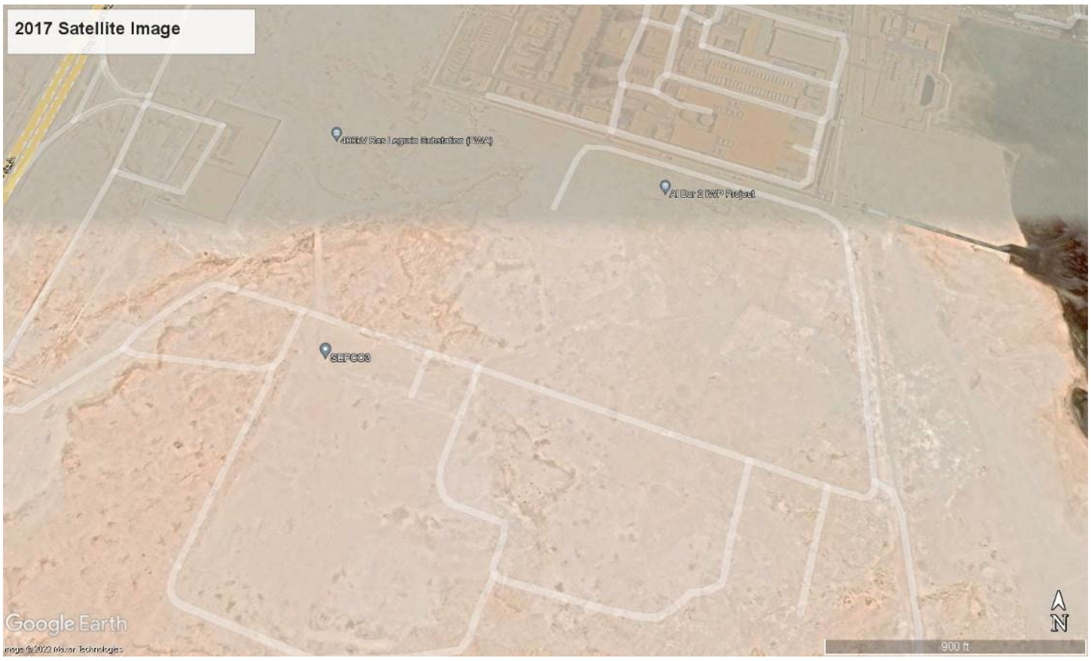
<tr><td>2016</td><td>Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.</td></tr>
<tr><td colspan="2">
</td></tr>
<tr><td>2017</td><td>Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.</td></tr>
</table>

March 2018	Satellite image shows the laydown yard is an empty unused land parcel. No developments on the north, east, west and south of the yard.

December 2018	Satellite image shows the mobilization of the current laydown yard started. Construction works of Al Dur Phase II IWPP started which is located to the north. No developments on the east, west and south of the yard.

<table>
<tr><td colspan="2">
</td></tr>
<tr><td>July 2019</td><td>Satellite image shows that SEPCO III accommodation, site offices and laydown area are in operation. Construction works of Al Dur Phase II IWPP is in progress. Land parcel to the east is assigned as laydown yard for the water plant. No developments on the west and south of the yard.</td></tr>
<tr><td colspan="2">
</td></tr>
<tr><td>2020</td><td>Satellite image shows that SEPCO III accommodation and site offices are in operation. Laydown yard is fully occupied. Construction works of Al Dur Phase II IWPP is in progress. Land parcel to the east is assigned as laydown yard for the water plant. No developments on the west and south of the yard.</td></tr>
</table>

2022	Satellite image shows that SEPCO III accommodation and site offices are in operation. Laydown yard is fully occupied. Construction works of Al Dur Phase II IWPP is in progress. Demobilization started at the laydown yard located to the east. No developments on the west and south of the yard.