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Environmental Impact Assessment of Halfaya Oilfield Project

Abstract-*Implement the necessary measures is necessary to limit the potential damages and risks resulting from oil and gas exploration activities to take the necessary precautions and arrangements to protect the land, air, waters and the groundwater basins from pollution and damage. The Environmental Impact Assessment (EIA) process is used to ensure that environmental and social sustainability considerations are included in decisions regarding the Projects considering the possible impacts associated with the proposed Centralized Waste Facility (CWF). The EIA was undertaken with consideration of the environmental standards and guidelines to determine the environmental impact assessment of Halfaya Oilfield; this facility is located in Missan Province in southern Iraq, south east of Amarah City. The Project has been assessed with respect to the applicable Federal or Client standard. Where appropriate, international standards have been considered alongside Federal and Client standards for reference. The EIA commenced on the 13th of October 2014 and is expected to last a total of 9 months. The classification of wastes is made using the EU European Waste Classification (EWC) codes; these codes describe whether the material is hazardous, non-hazardous, or inert. The work is split by where the waste arises, and then there are categories and sub-categories in each part. CPE has confirmed that there are no naturally occurring radioactive materials (NORM) arising from drilling activities at Halfaya. At the concept design stage for treatment, storage and disposal of each of the recorded waste streams have been described and reported in this work.*

Keywords- *EIA, Oilfield, Alternatives, Environmental Management Plan, Monitoring Program.*

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1. Introduction

Environmental Impact Assessment Is the process of assessing the potential impacts (negative or positive) of a proposed project on the natural environment. [1] Environmental impact is defined as a natural, chemical, biological, cultural, or socio-economic change to the ecosystem because of project activities. EIA is training on what will be carried out prior to any project or major activities or what will be undertaken to ensure that the environment cannot be harmed in the short or long term. Therefore, the process by which the environmental influence resulting from one of the activities. The International Association for Environmental Impact Assessment (IAIA) defined it as:

I. "Are the process of identifying, forecasting, evaluating, mitigating biophysical and social impacts, and all the impacts of development proposals being taken before major decisions and commitments are made." [2] [3] the objective of this process is to give decision-makers a means to decide whether to continue or stop the project. The purpose of the EIA process is to ensure that environmental and social sustainability considerations are included in decisions regarding the Projects considering the possible impacts associated with the proposed CWF. The objectives of this EIA are to provide an overview description of the proposed Project; identify key elements of relevant environmental legislation and guidance; have an integrated understanding of the present environmental conditions of Project and its area of influence; provide a vehicle for consultation with key stakeholders; predict and evaluate the potential environmental impacts related to the design construction, operation and decommissioning of the CWF; design the proper prevention, mitigation and remedial measures for

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the protection of the population and the environment, while ensuring the full compliance with the applicable environmental regulations; identify residual impacts i.e. those which remain following the implementation of committed mitigation measures; and, develop a framework for environmental management and monitoring. PCH plans to develop a Centralized Waste Facility (CWF) to service its Halfaya operations. The CWF is planned to contain facilities to handle hazardous and non-hazardous wastes from construction & demolition activities, industrial operations, and domestic and clinical waste from worker accommodation. The facility will contain a range of processes for managing both liquid and solid wastes, including enclosed storage and processing facilities, tanks and ponds, and raise, biological treatment and an incinerator.The EIA commenced on the 13th of October 2014 and is expected to last a total of 9 months. The EIA consists of the three main stages and milestones shown in Table 1.

II. Policy, Legal and Administrative Framework

The EIA was undertaken with consideration of the environmental standards and guidelines as listed in Table 2.[4,5] The Project has been assessed with respect to the applicable Federal or Client standard. Where appropriate, international standards have been considered alongside Federal and Client standards for reference. The EIA is prepared in line with Iraqi Federal and Maysan Governorate laws and guidelines, most notably Law 27/2009, Protection & Improvement of the Environment. The key stages of the EIA process are illustrated in Fig. 1 below. The criteria for assessment and evaluation of impacts and recommendations for mitigation and enhancement are detailed in Figure 1.

Table 1: Timeline for Stages and Deliverables

Stage	Milestone / Deliverable	Status	Completion Date
Scoping	Scoping Report	Draft	April 2015
Final	May 2015		
Environmental	Baseline EBS Report	Draft	May 2015
Final	August ٢٠١٥		
Impact	Assessment EIA Report	Draft	August 2015
Final	August 2015		

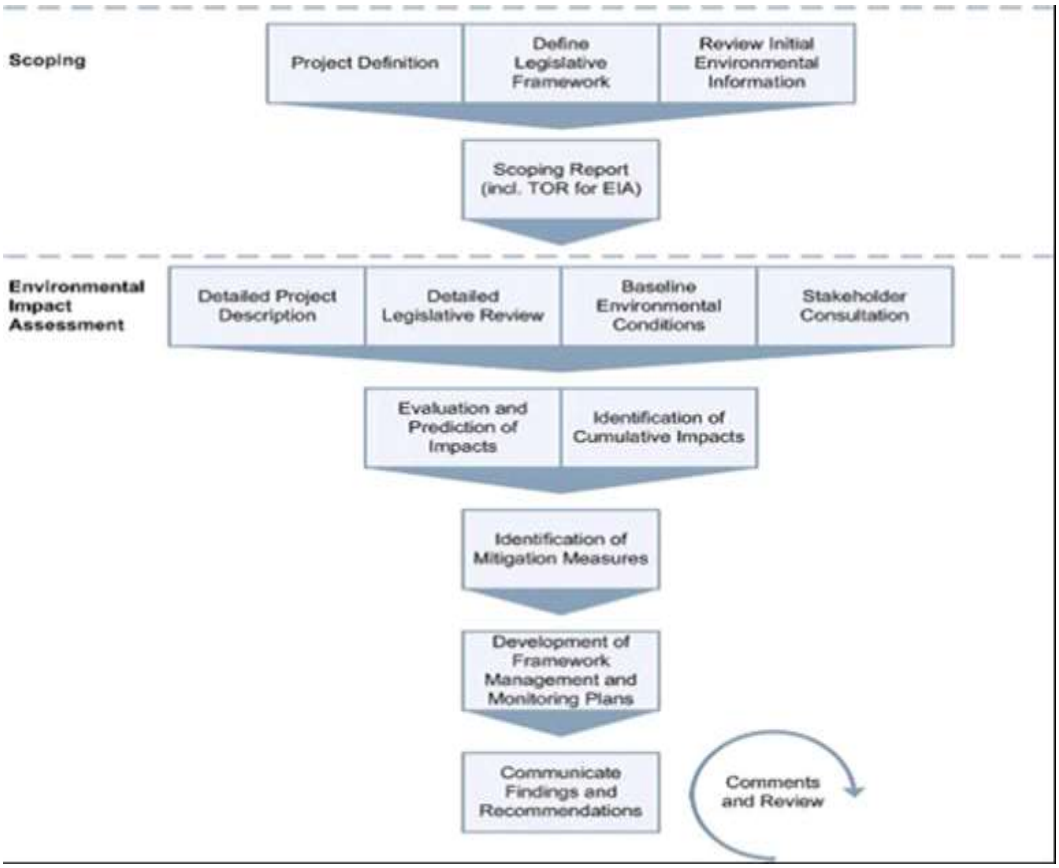

Figure 1: The Stages of EIA Process

Table 2: Relevant Environmental Standards. [4,5]

Aspect	Federal and Client Standards	Reference International Standards
Ari Emissions Limits. [4]	* Federal Law atmospheric emissions (2012) Directive No.3/2012 - National Limitations on Emissions in Activities and Work.	World Health Organization (WHO) (2005) Ari Quality Guidelines Global Update UK Highways Agency(2008) Design Manual. for Roads and Bridges : Volume 11:2, part5
Ambient Ari Quality.[5]	* Federal Law atmospheric emissions (2012) Directive No.3/2012 - National Limitations on Emissions in Activities and Work.	World Health Organization (WHO) (2005) Ari Quality Guidelines Global Update.
Noise	* Iraq National Limitations on Emissions in Activities and Work Directive No.3/2012. * Noise Mitigation in Iraqi Kurdistan Region, Law 1/2011.	* British Standard 5228 Code of practice for Noise and Vibration Control on Construction and Open Sites* World Bank Group (2007) Environmental Health and Safety Guidelines General EHS guidelines. [6]
Water Quality.[7]	* None identified.	* World Banks Safeguard Policy 4.07(Water Management). * IFC Performance Standard PS3(Pollution Prevention and Abatement).
Wastewater Housing, Spatial Discharge. [8]	* Federal Law for the Preservation of Water Resources (2001) Law No.2/2001 - Waste - Water Discharge Standards (Section 5) Presented in Article (18) .	* Dutch Ministry of Planning and Environment (curricular ,2009). * IFC Performance Standard PS3(Pollution Prevention)
Soils and Housing, Spatial Groundwater. [9]	* None identified.	* Dutch Ministry of Planning and Environment (curricular ,2009). * IFC Performance Standard PS3(Pollution Prevention)
Ari Emissions Limits.[10] Update .	* Federal Law atmospheric emissions (2012) Directive No.3/2012 – National Limitations Emissions in Activities and Work.	* World Health Organization (WHO) (2005) Ari Quality Guidelines Global* UK Highways Agency (2008) Design Manual for Roads and Bridges: Volume 11:2, part 5
Ambient Ari Quality.[11]	* Federal Law for atmospheric emission (2012) Directive No.3/2012 - National Limitations on Emissions in Activities and Work.	* World Health Organization (2005) Air Quality Guidelines Global Update.
Noise Safety. [12]	* Iraq National Limitations on Emissions in Activities and Work Directive No.3/2012. * Noise Mitigation in Iraqi Kurdistan Region, Law 1/2011.	* British Standard 5228 Code of practice for Noise and Vibration Control on Construction and Open Sites* World Bank Group (2007) Environmental Health and Safety Guidelines General EHS guidelines. [6]
Water Quality.[13]	* None identified.	* World Banks Safeguard Policy 4.07(Water Management) . * IFC Performance Standard PS3(Pollution Prevention and Abatement)
Wastewater Spatial Discharge.[14]	* Federal Law for the Preservation of Water Resources (2001) Law No.2/2001 - Waste - Water Discharge Standards (Section 5) Presented in Article (18) .	* Dutch Ministry of Housing, Planning and Environment(curricular ,2009). * IFC Performance Standard PS3(Pollution Prevention and Abatement)
Soils and Spatial Groundwater. [15]	* None identified.	* Dutch Ministry of Housing, Planning and Environment (curricular ,2009). * IFC Performance Standard PS3(Pollution Prevention and Abatement).

The environmental legislative requirements applicable to the Project include Iraq Federal Legislation, Regulations and Guidelines Maysan Regional Legislation, Regulations and Guidelines; PCH Policies and Guidance; International and regional Treaties and Conventions; and, International environmental standards and best practices. The basic law governing environmental protection in Iraq is Law 27/2009, Protection & Improvement of the Environment. Whilst not going into specific detail nor presenting environmental aspect-specific standards, Law 27/2009 outlines the principles of regulating the following: Atmospheric Emissions; Noise Reduction; Soil and Earth Protection; Protection of Biodiversity; Management of Hazardous Materials and Wastes; Protection of the Environment from Pollution Resulting from the Exploration and extraction of Petroleum and Natural Gas; Environmental Monitoring; And Punitive Provisions.Environmental Provisions of the law includes a number of detailed provisions that projects must comply with. General provisions that may be applicable to the Project.

2. Experimental Work

Provide systems of pollution treatment through using the cleanest technologies and, when a defect in the efficiency of this technology occurs, remedy the defect as soon as possible and inform the Ministry. The executive summary summarizes the important findings in the EIA report and the study findings as follows:

1- It should include a brief description of the proposed project, a brief summary of key findings of Characterization of baselines ،

2- Summary of the most important environmental aspects, which are the main sources of impacts, nature and size .

3- The main environmental impacts and details of the importance of the environmental issues to be dealt with and processes most appropriate to solve them.

4- Information should be concise, accurate and presented. In a meaningful way, indicates how important they are, taking into account the use of maps Basic, tables and images whenever possible،

5- Provide devices for the measurement and control of the pollutants, specific to the nature of the pollutant .

6- Initiate and maintain a Project-specific database recording concentration and the nature of Project pollutants.

7- Implement, where possible, Implement the necessary measures to limit the potential damages and risks and implement the necessary arrangements to discharge the saline waters associated with the extraction of the crude oil in environmentally-acceptable methods.

8- The use of renewable energy technology to reduce pollution.

Do not discharge oil on land or inject it into geological strata from which water is used for human and agricultural purposes.Report incidents to the Ministry and provide information related to the causes and response actions. Operationally, the proponent has an ongoing obligation to report Project incidents that affect the environment. These must be reported to the Environmental Protection and Improvement Council (EPIC).Regulators include the Environmental Controller within the Ministry of Environment; an Environmental Police Division is currently being established within the Ministry of Interior. The Instructions No. 14 for 1990 – Industrial, Agricultural and Service Projects identify a series of development types and associated specific development requirements. ‘Development Projects for Chemical, Petrochemical and Oil Industries’ are classified as ‘activities polluting environment class (A),’ with the following site limitations:

1- The nearest sensitive receptors (such as residential areas) must be at least 15 km in the direction of the prevailing wind and at least 10 km in other directions from the site boundaries.

2- Establishing these projects in valleys and narrow depressions are prohibited. The establishment is also prohibited on plains if a natural or artificial structure (hill, plateau, or forests) diverts the prevailing wind from the site. Where this requirement cannot be met, a study must be undertaken to evaluate the environmental impact of the proposed Project .

3- The point of discharge for any treated waters must be at a distance, not less than 5km from the nearest drinking water source. Environmental requirements that are required by these environmental instructions for this development type are as follows: Liquid industrial wastes must be treated to comply with Regulation No. 25 for 1967 Protection of Rivers and Public Water from Pollution. Gaseous and/or solid air emissions must be treated to comply with the local air quality specifications.The Project proponent will be responsible for maintaining the efficiency of treatment operations and the compliance of any discharged treated waters with Regulation No. 25 for 1967 – Protection of Rivers and Public Water from Pollution. Other federal legislation and regulations issued by the Iraqi Ministry of Environment expand upon Environment Law 27 and are listed in Table 3.

Table 3: Other Federal Environmental Legislation and Regulations

Parameters	Unit	Value
Altitude	Metres above sea level (M ASL)	4~10
Atmospheric Pressure	kilopascal (kPa)	102
Max. Temp	c	55
Dry Bulb Temp.	c	22.2 (GPSA)
Dry Bulb Temp.	c	42.2 (GPSA 11-3b)
Max. Metal Temp. by Sun Shine	c	80
Min. Temp	c	-2
Max. Speed Wind	Metres per second (m/s)	40
Prevailing Wind Direction	Winter	NW-SE
Prevailing Wind Direction	Summer	NW-SE
Max. Relative Humidity	-	80%
Max. Relative Humidity	-	25%
Rainfall	Millimetres per annum (mm/a)	177.4
Underground Temp.	c	15 in winter (1.2-1.6m) 33.6 in summer (1m)
Evaporation Rate	Millimetres per annum (mm/a)	3,054.4

The Project will be developed in line with the environmental requirements and guidelines of PetroChina Halfaya operations in Iraq. The key requirements and guidelines are laid out in the following documents by PetroChina and include:

1- Environmental Planning and ESIA Requirements (PCH.EPG.001).
2- Environmental Assessment & Approval Guidance Note for Well Site Planning Procedure QA/QC (PCH.EPG.002).
3- Use of Management – Working in Agricultural Areas (PCH.EPG.003.1).
4- Land Management (PCH.EPG003) Geology, Geomorphology, Topography & Landscape (PCH.EPG.004) Preservation & Protection of Archaeology.
5- Cultural Heritage (PCH.EPG.005) Aqueous Effluents (PCH.EPG.006).
6- Biodiversity and Conservation Management (PCH.EPG.007).
7- Managing Emissions to the Atmosphere (PCH.EPG.008).
8- Managing Greenhouse Gases and Ozone Depleting Substances (PCH.EPG.009) .
9- Managing Environmental Noise (PCH.EPG.010).
10- Management of Naturally Occurring Radioactive Material (PCH.EPG.011).
11- Guidance for Environmental Management Plans (PCH.EPG.012).
12- Guidance for the Preparation of Environmental Management Plans – General Mitigation Measures)PCH.EPG.013).
13- Guidance for the Preparation of Environmental Management Plans – Drilling Sites (PCH.EPG.014).
14- Guidance for the Preparation of Environmental Management Plans – Well Test and In-Field Flaring (PCH.EPG.015).
15- Well, Work-Overs - Environmental Planning Guidance for the Management of Site Wastes & Processes (PCH.EPG.016).
16- Guidance for the Management of Site Wastes (PCH.EPG.017).
17- Hazardous Materials–Basic Storage (PCH.EPG.018).
18- Guidance for Self-Monitoring and Auditing (PCH.EPG.019).
19- Site Restoration (PCH.EPG.020).

II. Description of the Project

PCH plans to develop a Centralized Waste Facility (CWF) to service its Halfaya operations. The CWF is planned to contain facilities to handle hazardous and non- hazardous wastes from construction & demolition activities, industrial operations, and domestic and clinical waste from2017, and will have a lifespan of around 25 years.

III. Public Consultations

The Halfaya Oilfield is located in 'Missan' Province in southern Iraq, southeast of Amarah City. The area is largely semi-arid with scattered vegetation and areas of former marshland notable for having been drained significantly because of policies implemented by the former Iraqi regime and the on-going competition for upstream water resources. The eastern extent of the oilfield is sited within the Hawizeh Marshes, a designated Ramsar wetland of international significance and an important area for biodiversity conservation. The Hawizeh marshes and the wider Mesopotamian Marshes system are a defining feature of the local environment and provide essential ecosystem services to a large trans-boundary area. Following the site selection process outlined site immediately to the southeast of planned Centralized Processing Facility (CPF) No. 3 has been selected as the preferred location for the CWF (see Figure 4). The Project Site is in

the area of production facilities, between wells HF161 and HF162 and adjacent to the planned CPF 3 site. The land cover at the Project site is largely flat farmland with areas of bush, scrub and grassland.

CPE has confirmed that there are no naturally occurring radioactive materials (NORM) arising from drilling activities at Halfaya based on the report 2014-06-02 HWH Assessment Report REV 10 June 2014. No additional details have been made available. Atmospheric and climatic data relevant to the Project Area is given in Table 4.

Table 4: Project Area Atmospheric and Climatic Data

Ref	Year	Title
Law 2	1984	Carcinogenic Material
Law 2	2001	Preservation of Water Resources
Law 4	1989	Storing and Handling of Chemical Materials
Law 5	1990	Sanitary Landfill of Wastes
Law 27	2009	Protection & Improvement of the Environment
Law 55	2002	Antiquities Law
Law 84	1985	Hydrocarbon Preservation
Law 89	1981	Lighting at Work
Law 89	1981	Vibration
Law 99	1980	Radiation
Law 417	2001	Drinking Water Standard Ambient Air Quality Standard
Directive 3	2012	Atmospheric Emission Standards Federal Law for Industrial Projects Federal Law for Noise

Figure 2: The Waste Hierarchy (Source: Department for Environment Food and Rural Affairs, UK, June 2011)

*Note: The data above is from the Email- Confirmation for climate data on Mar. 10th, 2010, Email- Confirmation for climate data on June 30th, 2010. Dry Bulb Temp is referred to GPSA 11-3b.

Figure 3: Photographs of the Project Site and Surrounding, the south-east of planned Centralized Processing Facility (CPF) No. 3

Table 5: Overview of Waste Sources

Source	Waste Type
All Facilities	Batteries
MSW	Bulky Waste
MSW,	Drilling Wastes Dense Plastics
CPF 1 – 3	Dewatered Sludge - Produced Water
SWP 1 – 2	Dewatered Sludge - Source Water
Drilling	Wastes Drill Cuttings
MSW	Fines
All Facilities	Fluorescent tubes
Medical	General Medical Waste
MSW	Glass (MSW)
MSW	Household Hazardous Was
Construction	Inert Material
Multiple Locations	Lubricants
Construction	Metal (Construction and CPF scrap)
MSW	Metals
Laboratory	Misc. Lab Wastes (Used Gloves, cotton wool, etc.)
MSW	Organic Food
MSW/Landscaping Other	Organics (Garden Waste)
MSW	Paper & Card
MSW	Plastic Film
Camps and facilities in the Contract Area	Raw Sewage (m_3)
Sewage Treatment	Sewage Sludge
Medical	Sharps
Drilling Wastes	Spent Cement
CPF 1 – 3	Tank Bottom Sediments & Oily Debris
MSW	Textiles
Vehicle Workshop	Tyres
Drill Pads/ SWP 1 – 2	Used Chemical Bags
Generators/CPF1 -3/ Vehicle Workshop	Used Filters
CPF 1 – 3	Used Intermediate Bulk Containers
Laboratory	Used Laboratory Sampling Glass Bottles
CPF 1 - 3/SWP 1 – 2	Used Metal Drums
CPF 1 – 3	Used Plastic Drums
Laboratory	Varsol
Laboratory	Waste Sample Oil (Lab)
MSW	WEEE
Construction	Wood (Packaging and Pallets)

Table 6: Annual Produced Water Sludge Arising, 2014 to 2024

Year	2014	2020	2030	2040
Tonnage	-	30,798	124,730	154,846

Table 7: Annual Tonnage of Process Water Sludge

Year	2014	2015	2016	2017-2040
Tonnage	526	526	2,716	4,906

3. Results and Discussions

The Project refers to the design, construction, operation and decommissioning of the CWF and the related management of wastes at sites arising from oilfield development related activities within the Contract Area. Waste streams that currently arise within the Contract Area, which will be treated at the CWF site according to activity, type and primary treatment methods are shown in Table 5. The preferred options for the CWF at the concept design stage for treatment, storage and disposal of each of the above waste streams is described in the following sub-sections. At source

Or at the CWF. Recoverable/recyclable materials such as metals, wood, inert materials (such as concrete and masonry), wood, glass, and plastics will be processed (i.e., cleaned, bulked, baled and loaded onto vehicles) at the site, for onward sale by the operator. The space requirements for the Facilities are dependent on both the arising and the time limits for onsite storage.

I. Monitoring Program

The classification of wastes is made using the EU European Waste Classification (EWC) codes, which have a code for each type of waste, and the code states whether the material is hazardous, non-hazardous or inert. The chapters are split by where the waste arises, and then there are categories and sub-categories in each chapter. There is clearly some scope for variation within

each code, but this system of allocation is used widely and flows through to the type of incineration required and the type of land raise and handling risk assessments used.

A. Construction Waste

Waste construction materials will arise from various sites across the Contract Area (see Section 4.11 on current and future developments). These materials will be managed according to the waste hierarchy. Construction wastes will be separated into the various streams either.

B. Slop Oil and Produced Water Sludge

'Slop oil' generally refers to the sediments and oily debris that accumulate in the bottom of oil storage tanks. Currently, the Halfaya site does not generate slop oil, as the crude oil has an average residence time in the storage tank of 4 hours, which has been observed to be below the duration required for tank bottom sediments to form and therefore the entrained sediments and water are exported with the crude oil. In the future, the slop oil may need regular management, including treatment and disposal at the CWF. Produced water' refers to the water by-product separated from crude oil at the CPUs. Sludge is collected from the CPF buffer, skimming or water injection tanks and floatation unit skids. Sludge is pumped to sludge storage tanks, before being dewatered (to 75 – 80%) using screw presses. Provision has been made in the CWF design to remove the remaining moisture from this sludge at the CWF in drying beds and evaporation ponds, prior to disposing of the residual 'cake' in the land raise.

C. Empty Plastic and Metal Containers (potentially contaminated) Empty plastic and metal containers, such as spent fuel and chemical drums, arise from various sources across the Contract Area, a proportion of which are contaminated with toxic or otherwise hazardous residues. Where practicable and appropriate, empty containers, such as diesel drums should be reused at source by the vendors. In practice, reuse of empty containers may be limited. Empty metal containers delivered to the facility will be washed at a dedicated and environmentally controlled area within the Project site. The cleaned containers will be compressed and baled for onward sale for recycling Empty plastic containers will be recycled where possible (i.e., baled / compacted and sold off-site). However, due to the low quantity of plastic drums projected, it is likely that they will be disposed of at the Facility's incinerator.

D. Sludge from Source Water Plants

Two source water plants (SWP), one currently operational and the other in the design phase will supply the Halfaya produce waste sludge which requires treatment and disposal. Table 7shows annual tonnages of process water sludge between 2014 and 2040. Sludge will be dried in drying beds and composted or disposed of in the land raise, or high-temperature incinerator. Activities with the required volumes for its operations.

E. Organic Waste

Organic waste arising in the Contract Area will be treated at the CWF. Organic waste arising is predominantly food waste from labor accommodation, offices and canteens. At present, food waste is disposed of in MSW land raise outside the contract area. Treatment of organic food waste and green landscaping waste will take place at an In-vessel Composting (IVC) plant at the site. The IVC will utilize the chipped wood from the construction waste as a bulking agent.

F. Chemical Bags

Miscellaneous used chemicals bags arise from various sources in the Contract Area, a proportion of which may contain hazardous residues. Where practicable and appropriate, used chemical bags delivered to the facility will be cleaned at a dedicated and environmentally controlled area within the Project site. Cleaning systems using air for blowing chemicals out of the bags will be investigated to determine if they are viable for the types of chemicals and number of bags. The cleaned chemicals bags will be reused. Where it is not practicable to reuse the used chemicals bags, they will be disposed of at the CWF's high-temperature incinerator.

G. Waste Lubricant Oil

Waste lubricant oils arising in the Contract Area will be temporarily be stored in an appropriate storage facility at the CWF prior to being disposed of at the high-temperature incinerator.

H. Laboratory Wastes

Wastes arising at laboratories include chemical wastes and glass bottles. Glass bottles commonly contain oily residues which make them unsuitable for recycling. Therefore, the likely preferred option is to dispose of them in the CWF's high-temperature incinerator. Further investigations with technology suppliers are required to determine the feasibility of incinerating glass bottles.

Waste chemicals consist of surplus chemicals that are used in the laboratory sampling and testing processes. Further investigations are currently being carried out to quantify and identify the types of chemicals that are produced in order to assess the potential options for treatment.

I. Municipal Solid Waste

Municipal Solid Waste (MSW) arises at worker accommodation, facilities, and worksites across the Contract Area.1 It is planned to manage MSW

in line with the principles of the waste hierarchy, with an emphasis on recycling (i.e., plastics, paper/card, metals) and energy recovery (food waste).Source segregation will be introduced to separation of dry recyclables (plastic and card), food and residual waste (anything else). Household hazardous will also be segregated at source for separate collection. The food fraction of MSW will be managed as part of the organic waste stream. Card and plastic bottles will be baled at the waste facility and stored prior to the sale for recycling. Household hazardous wastes will be managed at the CWF (hazardous land raise or incineration). Residual MSW will be disposed of at the CWF in the land raise or by incineration.

J. Medical Waste

Medical waste arising at the various clinics associated with the Halfaya oilfield development will be collected regularly and transported to the CWF for disposal. Medical waste should be stored separately in temperature-controlled conditions prior to being treated in the high-temperature incinerator at the CWF. Incoming medical waste will be monitored through visual inspection and measurement of volume / weight. Medical waste (e.g., radiological and x-ray related waste) labeled as radioactive, or otherwise suspected of being radioactive, will not be accepted by the facility.

K.Vehicle Workshop Waste

Vehicle workshops at Halfaya oilfield facilities produce various waste streams including potentially hazardous wastes such as solvents, oils, vehicle fuels, batteries, acid, oil interceptor waste, oily rags, empty chemicals containers, coatings, spark plugs and filters. Potentially hazardous wastes arising at vehicle workshops will be source separated, stored in a controlled and separated area, collected and transferred to the CWF. The hazardous waste will be disposed of in the CWF's high-temperature incinerator if possible (subject to technology supplier confirmation). Otherwise, this waste stream will be deposited in the on-site hazardous and raise. Used tires are currently re-used as barriers and road/pathway markings. This practice will continue in the Contract Area. However, it should reuse discontinue, used tires would be collected and disposed of at the CWF. The method of disposal is not confirmed but would be likely to be by depositing them in the landraise or destructing them via high-temperature incineration. It is assumed that vehicles will be sold before their end-of-life. Scrap materials arising will, therefore, be minor. Should scrap materials from vehicles be recovered, they can be sold to the local scrap market. Due diligence should be exercised when selecting vehicle breaking companies / scrap merchants to ensure compliance with environmental regulations and good practices where possible.

L. Spent Cement

At presently spent cement is disposed of as mixed waste, along with drilling mud and drill cuttings. Should PetroChina have a proposal to separate these wastes approved by it partners, it is proposed to provide a storage pad for up to twelve months of spent cement storage at the CWF site. During this time the material can either be delivered and stored, before transporting it to its end use on a regular basis, or it can be stockpiled for up to a year and then transported. In the short-term, the management of drill cuttings and drilling muds will take place at source and it is not planned to treat these waste streams at the CWF at present.

M. Fly Ash and Bottom Ash

As described above, it is planned to operate a high-temperature incinerator at the CWF for the treatment/disposal of various waste streams. Fly-ash (fine particles rising through the chimney) and bottom ash (residual particles in the grate) will be produced as a by-product of the incineration process. Fly ash is considered to be a hazardous material, which would require appropriate storage prior to disposal by containment in an engineered hazardous land raise cell. Bottom ash is considered to be less hazardous than fly ash and may be recycled (e.g., as an aggregate for construction activity). Recycling of bottom ash is currently being investigated and will be confirmed later in the detailed design phase.

4. Conclusion

The EIA was undertaken with consideration of the environmental standards and guidelines, where The Project was developed in line with the environmental requirements and guidelines of PetroChina Halfaya operations in Iraq. The CWF is planned to contain facilities to handle hazardous and non-hazardous wastes from construction & demolition activities, industrial operations, and domestic and clinical waste from worker accommodation. Where practicable, wastes will be managed in line with the principles of the waste management hierarchy, which priorities reuse, then recycling, energy recovery and finally safe and controlled disposal to land raise. CPE has confirmed that there are no naturally occurring radioactive materials (NORM) arising from drilling activities at Halfaya based on the report 2014-06-02 HWH

Assessment Report REV 10 June 2014. Waste streams that currently arise within the Contract Area which will be treated at the CWF site according to activity, type and primary treatment methods with the preferred options for the CWF at the concept design stage for treatment, storage and disposal of each of the above waste streams have been described and reported in this work.

5. Acknowledgment

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