Chlorine and Caustic Soda Manufacturing Plant, Pavlodar, Kazakhstan

Non Technical Summary for the Environmental and Social Impact Assessment

Prepared for:

JSC Caustic

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Contents

1 Introduction & Scope

This document is a Non Technical Summary (NTS) of the Environmental and Social Impact Assessment (ESIA) for the expansion of a chlor-alkali production facility by JSC Caustic (the Company). The Project involves the manufacture of chlorine, caustic soda, hydrochloric acid and associated products using Best Available Techniques (BAT) on the site of the former Pavlodar Chemical Plant (PCP) in Pavlodar, North Kazakhstan. It aims to provide an overview of the Project, the main potential environmental and social impacts and JSC Caustic's approach to the management of those impacts.

This NTS summarises the more detailed findings provided in the OVOS[1], an ESIA addendum[2] (which supplements the OVOS), and other Project related documentation. It also makes reference to an accompanying Public Consultation and Disclosure Plan (PCDP). This suite of documents is collectively referred to as the Project's environmental and social 'disclosure package', which has been prepared in line with the Company's disclosure programme and to meet the requirements the European Bank for Reconstruction and Development (EBRD), which is one of the lenders considering direct funding of the Project.

2 Project Description

2.1 Background

JSC Caustic has been operating out of a number of buildings located on the site of the former PCP since 2002, importing chlorine and distributing chlorine and chlorine based products within Kazakhstan. However, it now intends to use international funding to equip an existing building (Building 115) and the adjoining workshop with new chlor-alkali production equipment, and to lay new railway sections to a salt unloading warehouse and a railway tanker loading/storage area.

The Project is one of thirty key projects identified to be of key national importance to Kazakhstan, and will support the revival of the chemical industry in Kazakhstan by the establishment of modern production facilities.

2.2 Site Context and historical activities

The Project site is located on the former PCP site within the North Pavlodar Industrial Zone, on the outskirts of Pavlodar city approximately 100km west of the Russian border in North Kazakhstan (Figure 1). The River Irtysh flows close to the site resulting in nearby vegetative cover although the surrounding area is generally barren and semi-arid.

[1] The OVOS is an Environmental Impact Assessment required under Kazakh law for projects with the potential to result in adverse environmental impacts.

[2] The ESIA addendum has been developed to according to EBRD's requirements to supplement the OVOS; it is not the obligatory document for the Republic of Kazakhstan.

Figure 1: Location of Pavlodar in North Kazakhstan

The nearest residential areas to the site are located to the south and west of the North Pavlodar industrial Zone with dachas (summer houses) located to the south in relatively close proximity of the site as shown in Figure 2.

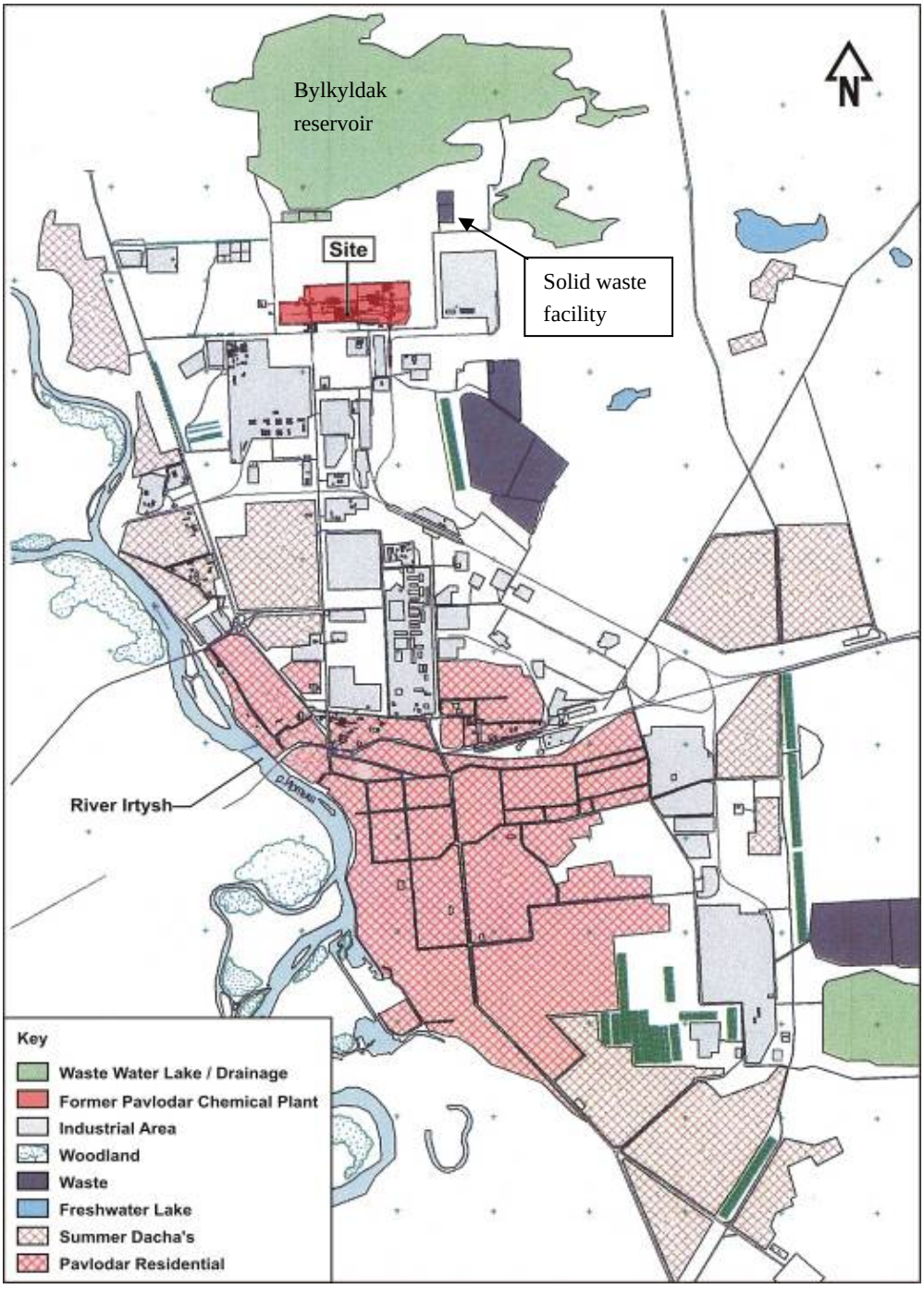

Figure 2. Location of the proposed site and surrounding land use

Chlorine was previously manufactured at the PCP using a mercury based technology. As a result of these earlier activities some areas of the former PCP site are known to have been contaminated during its historical operating period (1975 to 1993) with approximately 900 tonnes of mercury accumulated in the soil. At the end of 1998 the demolition of the most mercury polluted building (no. 31) began. In 2002 the Government of the Republic of Kazakhstan made the decision to invest in a clean-up programme.

As part of this decontamination programme, the mercury electrolysis shop was demolished and its structures were buried in a special 'sarcophagus' landfill. At that time construction commenced of a clay wall barrier around the mercury contamination. After completion of the clean-up programme the remediation works were accepted by the State Commission.

In 2004 a governmental mercury monitoring programme was developed to measure the existing level of mercury content in the environment (atmosphere, soil, surface and underground water). The monitoring programme is scheduled to end in 2020 provided the remaining level of mercury pollution falls to acceptable levels. The area previously occupied by the mercury electrolysis shop and the sarcophagus are under municipal ownership and does not belong to JSC Caustic.

2.3 JSC Caustic's Current Operations

JSC Caustic's existing assets within the former PCP site comprise offices, operational and non-operational buildings, including the existing building 115 (Figure 3) which will accommodate the new plant, the dam (retaining walls) of the industrial waste water reservoir "Bylkyldak" (Figure 2), an industrial solid waste landfill site, rail tankers for chemical transportation and a railway spur linking the site to the main line.

Figure 3. Building 115

JSC Caustic's current operations include the import of chlorine from the Russian Federation, the subsequent distribution of chlorine in cylinders and containers and the production of a bleaching liquid (Belizna) and sodium hypochlorite.

Wastewater effluent, including site storm water, is discharged under license to the industrial wastewater reservoir ("Bylkyldak"), which is also at the northern end of the industrial area approximately 1 km North of the proposed manufacturing site. This industrial reservoir was constructed in 1973 (at the same time as the former PCP site) with the sole purpose of collecting industrial waters, domestic sewage, drainage and storm waters from the whole Pavlodar Northern Industrial Zone. The reservoir is under the responsibility of Pavlodar city Akimat and JSC Caustic has no obligations connected to management of the reservoir.

On the western, northern and eastern sides it is bordered by an artificially constructed dam to contain the water. The reservoir is known to be contaminated not only with mercury, but also with other pollutants such as other heavy metals, sulphate, chloride and other organic pollutants. As highlighted above, JSC Caustic does not own the industrial reservoir, but does have ownership and responsibility for the retaining dam walls.

JSC Caustic also has a 30 year land lease for the industrial solid waste disposal site located near to the site (Figure 2). The facility was built in 1987 in order to receive hazardous wastes from the former PCP site and is now the property of JSC Caustic.

The water supply to the site is provided under permit from the Northern water intake of the River Irtysh. The Company is currently only using a small proportion of the permitted allowance.

2.4 JSC Caustic's Future Operations

Following implementation of the proposed Project, JSC Caustic will continue to distribute chlorine and chlorine based products within Kazakhstan, however it will also have the capacity to produce chlorine on site rather than rely on the import of chlorine. In addition to chlorine it will manufacture, caustic soda solution, flaked caustic, sodium hypochlorite solution and hydrochloric acid. When operational, the new plant will have the capacity to manufacture approximately 27,000 tonnes of caustic soda, 10,000 tonnes of liquid chlorine, 12,000 tonnes of sodium hypochlorite and 43,000 tonnes (as a 35% solution) of hydrochloric acid per annum.

The Company will continue to distribute bulk product by rail and in addition it will transport large quantities of salt, which is required for chlorine production, by road and rail from Zhamankol and Kalkaman salt lakes located approximately 50km south west of Pavlodar.

The new plant will use membrane technology which is considered to represent Best Available Techniques[3] for safety and environmental concerns. The proposed technology brings the following benefits:

- membrane technology which eliminates the need to use mercury (a major problem with earlier chlorine production in Pavlodar);
- has lower energy requirements than alternative technologies;
- results in relatively small waste water discharges which are free of chlorate and bromate and have appropriate effluent treatment facilities for other contaminants where necessary;
- can be equipped with a chlorine destruction unit which ensures chlorine emissions to air are minimised during normal operations, and in the event of an emergency, is capable of absorbing full cell room production until the plant can be shut down (as is the case for this project); and
- appropriate handling of spent membranes and gaskets which will be achieved using the Company's existing landfill site.

The new facility will have the capacity to hold 465 tonnes of liquid chlorine within three storage tanks, each with a capacity of 155 tonnes (125m^3). A fourth empty tank will be available for the transfer of chlorine from one of the other tanks in an emergency. A further six tanks, each with a 85m^3 capacity, will be available for storage of hydrochloric acid, and five tanks, each with 100m^3 capacity, will be available to store caustic soda solution.

Future operations will take place almost entirely within Building 115 (Figure 3), a large warehouse type building. Hours of operation of the plant will remain unchanged (24 hours, 7 days a week for 330 days of the year) and the number of employees will remain at approximately 120. Water will continue to be sourced from the River Irtysh within the limits of the abstraction licence in place (approximately 290,000 cubic metres per year), and energy demands will be provided from existing sources (there is a power plant located within the Pavlodar North Industrial Zone).

2.5 Project timeframes

The operations are scheduled to start before the end of 2010. The delivery of equipment took place between Quarter 2 and 4, 2009. As of the Quarter 4, 2009 some plant equipment had been delivered and was in storage prior to assemblage. Currently some preliminary installation work is also underway.

The lifespan of the plant will depend upon actual industry needs with JSC Caustic currently having long-term contractual rights for land tenure until 2030. The new equipment would be expected to last for at least 40 years.

[3] IPPC, Reference Document on Best Available Techniques in the Chlor-Alkali Manufacturing Industry, December 2001.

3 Legislative framework and applicable standards

The Project is required to comply with all relevant environmental and social laws of the Republic of Kazakhstan. In addition, in order to fulfil the lenders' requirements, the Project must meet the requirements of international guidance and standards, including World Bank guidance and EU Standards. Further details of the legislative framework and applicable standards are given in the ESIA Addendum.

4 Analysis of alternatives

4.1 Project need versus the 'no project' alternative

The Project will involve the modernisation of existing facilities using modern environmentally clean technology and Best Available Techniques to manufacture high-quality chemical products. Projects with such characteristics have been identified as essential to support the growing national economy and to meet the demand for chlorine, caustic soda, hydrochloric acid and hypochlorite.

The main consumers of caustic soda, chlorine and hydrochloric acid in Kazakhstan are enterprises of non-ferrous and ferrous metallurgy, agricultural factories, heat and power production enterprises, textile, pulp and paper industry, sanitary and medicine services and facilities, civil construction, communication, transport and petroleum companies, public utilities and others. Implementation of the Project will increase the sustainability of chemical and metallurgy industry in Kazakhstan and reduce its dependence on the import of chemical products.

The necessity and objectives for the Project are addressed by separate key strategic documents including national level decrees, a programme for innovative development in the Pavlodar Region and a JSC Caustic development programme. The Project is also listed in the Thirty Corporate Leading Projects, National Economy Development Programme (2008).

4.2 Alternative site

When considering a site for a project, factors such as land take, existing environmental quality, socio-economic conditions, the availability of a suitable workforce and supporting infrastructure must be taken into account. In this case the Project is effectively an expansion of existing operations at a site that is already designated for the manufacture of chemical products. This means that it already has many advantages, including environmental advantages, such as:

- an existing suitably qualified workforce;
- an existing infrastructure (e.g. rail and road links, power supply); and
- a location in a developed industrial site and in a suitable region of Kazakhstan where the risk from natural disasters e.g. earthquakes, is small.

These advantages mean that alternative sites would be unrealistic.

4.3 Alternative Technologies

Two alternative technologies, (mercury cell electrolysis and diaphragm cell electrolysis) were considered. However, both these technologies have significant technical and/or environmental disadvantages compared with the membrane technology (see Section 2.4).

The membrane cell process was developed in the 1970s and 1980s and is considered to be the most promising and fast-developing technique for the production of chlorine and caustic soda and is used by nearly all chlor-alkali plants world-wide that have been developed since 1987.

5 Baseline environment

5.1 Environmental baseline

The environmental baseline for the Project is described in detail in the OVOS. A summary of the key points relating to each of the elements of the environment is provided in the remainder of this section.

5.1.1 Atmospheric environment

The climate of the region is characterized by a cold winter and warm dry summer with a tendency for drought. Pavlodar and the Project site are situated within an air quality Zone II, with a moderate potential of atmosphere pollution (Zone I – low potential, Zone III – raised potential, Zone IV – high potential and Zone V – very high potential). This means that the most commonly occurring climatic conditions are favourable for the dispersion of harmful substances in the atmosphere and thus considered a suitable location for industry.

The presence of the North Industrial Zone near to Pavlodar city means that the atmosphere is already affected by a range of pollutants including for example dust, sulphur dioxide and hydrocarbons. Monitoring of air quality is undertaken by the DGP Pavlodarsky Center of Hydrometeorology and the data suggests that the background concentrations of pollutants in Pavlodar are below the maximum concentration limit and that emissions from JSC Caustic's future activities are acceptable.

5.1.2 Water environment

The nearest natural surface water body to the Project is the River Irtysh which is located approximately 6km to the West of the Project site. The River Irtysh is approximately 500 - 600m wide with a depth of approximately 3-4 metres. The river is influenced on a seasonal basis by snow melt with a rise in the flow beginning in March and peaking in May. Water levels are significantly decreased in mid summer and in mid winter. The water quality in the river is good and as a result is used to supply drinking water to settlements in the Pavlodar region and is also used to catch fish.

As described in Section 2.3, Bylkyldak industrial wastewater reservoir is used by industry in the North Pavlodar Industrial Zone to discharge their waste water including industrial process waters, sewage effluent and storm water runoff. It was also used historically in this way. The industrial waste water reservoir is approximately 6km (southwest to northeast

axis) by 3.75km (central width) with a depth of up to 8m. It has a design capacity of 74 million cubic metres but the maximum observed volume occurred in 1995 and was approximately 64.3 million cubic metres. Since then water levels have fallen. The reservoir has a natural clay base and a series of constructed dam walls in lower lying areas to retain the industrial effluents.

The groundwater is heavily influenced by both past and present human industrial activities and it is known that in some areas of the former PCP the groundwater has been contaminated with mercury as a result of historical activities. Data suggest that a mercury plume has spread in a north to north-west direction from the primary source of the contamination (the former Building 31), parallel to the River Irtysh, but away from the immediate vicinity of the JSC Caustic Project site.

As stated in Section 2.2, this area has been subject to a clean-up and containment programme realised by the municipal authorities without participation of JSC Caustic.

5.1.3 Soil & geology

The area is considered to be within an area of severely eroded soils. The soil is unstructured, sandy and sandy-loam with a low organic content. The industrial location means that the soil is only considered appropriate for use for industrial purposes (i.e. not agricultural). Soil testing undertaken in 2007 has indicated that the contaminants in the soil in the area do not exceed the maximum acceptable concentrations except in the case of mercury in some areas. This mercury contamination is associated with historical activities (discussed in Section 2.2).

5.1.4 Flora & fauna

Approximately 5% of Kazakh territory is protected for ecological reasons and the country aims to increase this area to 6.4% by 2030. Wetland environments in particular support important bird communities and in some cases are protected. The Pavlodar Province has three protected areas covering approximately 235,000 hectares, although none are in the immediate proximity of Pavlodar city.

The developed area of Pavlodar City and the Northern Industrial Zone is not characterised by fauna of any significance. In the surrounding flat (field) areas fauna is dominated by birds such as the lark, yellow wagtail, black-headed chisel, rook and kestrel. Further afield, in protected areas near the River Irtysh, there is a rich fauna characterised by nesting birds, animals and fish. Fish species include those of valuable breeds.

Bylkyldak reservoir is officially designated as an industrial area. It is contaminated with a range of pollutants and in particular has high mercury concentrations in reservoir sediments, however despite this the reservoir has an established vegetation (e.g. extensive areas of reeds), supports fish and bird communities and thus has some ecological value. Birds in the area are thought to include two species listed as ‘Near Threatened’ at a global level by the International Union for Conservation of Nature (IUCN). These are the black-winged pratincole and the red-footed falcon. It is considered that the reservoir is also potentially

suitable for other IUCN threatened species such as the dalmation pelican, the marbled teal and the white headed duck.

5.1.5 Cultural heritage

There are no protected areas or any historical or archaeological monuments of interest in the area.

6 Potential environmental and social impacts and mitigation measures

6.1 Potential environmental impacts and proposed mitigation measures

6.1.1 Introduction

The construction and operation of the proposed chlor-alkali plant has the potential to impact the natural environment. Whereas construction impacts will mainly be temporary, any impacts during operation of the facility are likely to be longer term or permanent. Potential impacts and where appropriate proposed mitigation measures aimed at reducing impacts are summarised in the following sub-sections for the construction and operation phases.

6.1.2 Potential impacts & proposed mitigation measures during construction

Construction induced environmental impacts can typically include increased air emissions from machinery and/or vehicles, effluent discharge, construction wastes including vegetation, soils and buildings wastes from site clearance and demolition works. For this Project however existing buildings will be utilised and thus construction activities are limited to building modifications and the construction of a small section of railway, which will require some earthworks.

Emissions to air will result from vehicles and other machinery but will be small and temporary emission sources that can be minimised via standard measures such as regular maintenance of equipment and vehicles. Effluent discharges will be limited to domestic waste water.

Construction waste will be predominantly non-hazardous, although some hazardous waste is likely to be generated. The Project will also require the relocation of some potentially contaminated soil situated close to building 115 which will be tested for contamination before relocation or if necessary, treated and/or disposed. Wastes will be managed in line with a waste management plan to ensure waste is minimised, re-used and recycled as far as possible. Of note, JSC Caustic operates it own industrial landfill site which is designed to receive hazardous wastes.

JSC Caustic will reuse the existing sewer system which previously served the former PCP. Before its use for the new plant the existing sewer system will be checked for leaks. Furthermore, because there is a small risk of historical mercury contamination in the sewer

system JSC Caustic will monitor effluents to ensure mercury concentrations do not exceed the limits set for mercury in drinking water.

6.1.3 Potential impacts & proposed mitigation measures during operation

The proposed technology is modern and incorporates Best Available Techniques in particular in relation to clean and efficient technology.

Air quality

The main emissions to air from the proposed plant will be chlorine, hydrogen chloride, sodium chloride, nitrogen oxides, VOCs, particulate matter and sulphur dioxide. Emissions of these substances (as well as others) will be abated as far as possible prior to emission via stacks and ventilation systems to ensure that levels do not exceed standards.

Air dispersion modelling has been undertaken to predict likely levels of pollutants from the proposed plant at the borders of sanitary protection zone (SPZ) and in residential areas. This modelling indicates that levels will be considerably below the Maximum Allowable Concentrations for all substances under normal conditions.

Water use and surface water quality

Water will be abstracted under licence from the River Irtysh to operate the plant and provide sufficient drinking water to employees. The plant will implement water efficiency measures where possible including the reuse of water in the cooling system.

Waste water (including surface water runoff) from the plant will be discharged to the Bylkyldak industrial waste water reservoir (which is not the property of JSC Caustic) via an on-site sewer. Excluding surface water runoff, the total discharged is expected to be approximately 129,000m^3/annum. Whilst quantities of waste water will increase with the proposed new plant (but will remain well within allowed flow rates), the use of modern clean technology, in which many potential contaminants are recycled within the plant, will result in concentrations of contaminants that will be considerably lower in comparison to the waste water discharged from past activities and they are not expected to significantly increase the levels of existing pollution within the reservoir.

Soil and Groundwater quality

Impacts to groundwater will be minimised via good practice measures to ensure that potentially contaminating substances do not reach open ground. Such measures include ensuring appropriate containment measures for all potentially polluting liquid substances during their use and storage, the installation of hard standing where appropriate, minimising the need the underground pipes, limiting the depth of underground structures and installing automated monitoring of the process. Groundwater quality, flow and level monitoring are already undertaken in the vicinity of the site and this monitoring will continue. The installation of measures to minimise the likelihood of groundwater contamination in particular the use of hard standing will also minimise the likelihood of impacts to soil/ground.

Land take

The chlor-alkali plant will be located on existing industrial land owned by JSC Caustic and there will be no additional land take.

Ecological impact

Potential impacts to ecology are likely to be limited to impacts associated with Bylkyldak industrial reservoir, which has some ecological value. These impacts could either be negative or positive. For example:

- Adverse impacts from pollution events from accidental spillages/releases of pollutants into the site drainage system;
- Changes to the current volumes and quality of the waste water entering the industrial reservoir adversely affecting the current or future flora and fauna or benefiting it through dilution of existing concentrations of contaminants; and

JSC Caustic's future operations are not expected to have any significant affect on the current ecology of Bylkyldak industrial reservoir and the surrounding land. However, if JSC Caustic does undertake any activity with potential to adversely affect the ecology (e.g. construction works), it will undertake appropriate ecological assessment and implement measures to minimise the impacts of such activities.

Impacts from waste

The plant will generate significant quantities of waste, mainly comprising brine from the washing of raw salt (non-hazardous) and sludges from the filtration of brine and treatment of waste water (hazardous). The brine from the washing of raw salt will be managed in accordance with good industry practice and consequently disposed to a lined solid waste landfill facility. Other wastes will also be transported by road tanker to the existing JSC Caustic solid industrial waste landfill. This landfill is appropriately licensed in line with national requirements. Groundwater and air quality monitoring of the potential impacts of the landfill site is undertaken in line with a programme agreed with the authorities.

6.2 Potential social impacts and proposed mitigation

6.2.1 Introduction

The Project has the potential to cause both negative and positive socio-economic impacts as discussed in the following sub-sections. Where appropriate proposed mitigation measures are also described.

6.2.2 Potential negative socio-economic impacts during construction

Large construction projects often result in the short term influx of a construction workforce that can result in additional strain being placed on existing infrastructure, community health problems and conflicts between residents and the local workforce. Such impacts are predicted to be minor for this Project for the following reasons:

- Construction will take place within the existing industrial zone several kilometres away from residential areas;
- The workforce required will be small especially when placed within the context of the population of Pavlodar city;
- Pavlodar city has the capacity to provide accommodation and transport for the workforce if required; and
- The construction phase will only last twelve months.

These factors will also mean that other negative socio-economic impacts are likely to be minor such as the potential for an economic 'boom-bust' situation (a small number of local jobs are likely to be created during construction however these will not transform the region but neither will they cause a major loss in employment at the end of the construction phase). The Project will not result in additional land-take and therefore there is no risk of resettlement.

6.2.3 Potential negative socio-economic impacts during normal operation

Potential socio-economic impacts during operation of the new facility are mainly linked to the risk to community health from deterioration in environmental quality (e.g. air quality, ground and/or water resources contamination) as a result of emissions to air, discharge of wastewater and disposal of solid wastes. Such potential impacts will be minimised through compliance with all applicable Kazakh emissions standards and through good waste management practices. Further details are provided in Section 6.1.3 on potential environmental impacts.

Potential noise impacts have been calculated for domestic properties and indicate that noise levels will be below regulatory standards.

6.2.4 Potential positive socio-economic impacts

As one of the thirty corporative leading projects under the National Economy Development Strategy in Kazakhstan, the Project is expected to contribute to regional and national development. Whilst short term impacts are likely to minor (as discussed above) it is expected to provide a regional economic stimulus that may not only encourage further investment (including foreign investment) and new enterprise, but also lead to improvements in employment opportunities, education and health provisions.

6.2.5 Community health risk from legacy contamination

As described in Section 2.2, (with further details given in the OVOS and the ESIA Addendum), the North Pavlodar Industrial Zone including Bylkyldak industrial reservoir has been contaminated with mercury as a result of past industrial activities. This historical contamination could harm the health of people living in nearby communities if it is not contained within the reservoir, for example, if water and sediments reach the surrounding fields and affect drinking water or food.

Monitoring of the groundwater, surface water, surrounding soils, fish tissue and bovine tissue samples has been undertaken at the site and near to surrounding villages. This monitoring has shown that levels of mercury in surface waters and groundwater being used for drinking water are low and not of concern and that this is also the case for levels of mercury in bovine tissue. However mercury levels found in fish tissue caught in Bylkyldak reservoir exceeded the Kazakh and the World Health Organisation (WHO) human health criteria, meaning that the fish are unfit for human consumption and present a significant risk to human health if eaten. Of note, Bylkyldak reservoir is an industrial sewages collector and does not have fishery protection status; it is not used for fish cultivation and fish from the reservoir must not be eaten.

It is essential that monitoring continues for all environmental media (even those, such as groundwater used for drinking water, where levels are not currently considered a concern) given the long term persistence of mercury in the environment. In addition JSC Caustic should continue communications with the local community, informing them that the reservoir is contaminated and that the fish are unsafe for consumption

It is also important that assessment and monitoring is undertaken of the structural integrity of Bylkyldak reservoir's dam walls and foundations to ensure the water (and thus contamination) would be contained in the event that water levels in the reservoir increase in the future. Similarly water levels in the reservoir should be managed to ensure that contaminated sediments remain under water and cannot be spread by the wind.

6.2.6 Summary of construction and operational impacts

The main potential socio-economic impacts arise from historical activities and legacy contamination rather than JSC Caustic's past or future activities. Whilst JSC Caustic did not cause these issues, as a responsible company, actions should be taken to minimise the risk of impacts to community health during their operations at the site. JSC Caustic will make available a public grievance mechanism (as part of a Public Consultation and Disclosure Plan) for use by any member of the public in the event of a perceived or actual impact as a result of the JSC Caustic activities during construction or operation.

Further potential socio-economic impacts are associated with abnormal, unplanned and emergency events, as described in Section 7.

6.3 Potential Impacts from decommissioning

In the short term old facilities might be dismantled. The need to dismantle old facilities will be determined following the finalisation of an 'industrial development plan' which will consider any future need to re use old buildings. If buildings are to be dismantled, decommissioning plans will be developed which prevent any harm from historical pollution. Such historical pollution will be identified in an "environmental liabilities audit" commissioned by JSC Caustic in Q3, 2009.

Decommissioning of the proposed Project (the new facility) will not take place until the lifespan of the Plant comes to an end, and thus decommissioning impacts will be considered

at a later stage. In line with Kazakh legislation decommissioning plans will include environmental & safety measures, and clean-up and rehabilitation actions to be taken.

Decommissioning in relation to the solid waste landfill cells will be considered as part of a Landfill Closure Plan which is scheduled to be developed in 2010/11 and is required by Kazakh legislation.

7 Unplanned events and emergency planning

Existing activities at the site involve the handling and transportation of hazardous materials and in the event of a major chemical release there is potential for considerable human health impacts if the risks are not managed properly. This risk is recognised by JSC Caustic and as a result numerous control measures are already in place for the existing site with further control measures to be put in place as part of the proposed Project, to minimise the risk of an accident occurring and to limit the consequences in the unlikely situation that an accident does occur.

Safety measures in the Project design include a wide range of automated control systems. In addition the plant has been designed by a specialist company and uses industry best practice techniques to minimize the risk of chlorine and other leaks. A safety management system has already been adopted by JSC Caustic and this will be updated to reflect new operational practices associated with the new equipment.

The natural setting of the site also serves to reduce the risk of an emergency event. In particular this is due to the flat relief eliminating the risk of landslides, avalanches and other natural hazards which could lead to the rupture or collapse of equipment/storage vessels. The Pavlodar region is also not prone to significant earthquakes.

The transportation of hazardous materials by rail and road is common practice in Kazakhstan as it is throughout the world. JSC Caustic will comply with all legislative safety requirements applicable to a chemical company for the bulk transportation of dangerous goods. Equipment must be licensed and subject to inspections, for example, there is annual inspection of containers used to transport dangerous chemicals. It is important to note that the transportation of JSC Caustic chemical products will continue unchanged, with little difference in the risk to the community, whereas the long distance importation of chlorine from Russia will cease once the new plant is operational.

With regard to emergency planning JSC Caustic will operate in full compliance with the legal requirements for industrial safety in Kazakhstan. Such requirements have led to the development of comprehensive emergency response plans. These plans include the Company's on site emergency response plans which are integrated with regional off-site plans produced by the Department of Emergencies of Pavlodar Region. In addition to the safety measures in place to minimise the risk of an incident, JSC Caustic staff are equipped with emergency response equipment and available to respond to incidents 24 hours per day. Trained staff include fire fighters and emergency rescue personnel.

8 Potential cumulative & transboundary impacts

Cumulative impacts are analysed in the context of the Project's area of influence and therefore potentially relate to further planned development of the Project, any existing project and other Project-related developments that have been defined at the time that the ESIA was undertaken. There are no currently planned additional JSC Caustic activities in the area that might generate cumulative impacts nor are there any specific known or foreseeable projects that are related to or might be stimulated by this Project.

In line with the Convention on Environmental Impact in a Transboundary Context (the Espoo Convention) consideration has been given to potential impacts as a result of the proposed Project that may affect neighbouring countries. Two potential transboundary impacts that might occur in abnormal circumstances were identified for further consideration in the ESIA addendum:

- Contamination of the river Irtysh near Pavlodar which then flows to Russia; and
- Loss of chlorine from a rail tanker in close proximity to an international border resulting in a toxic gas cloud entering a neighbouring state e.g. from a rail accident.

Following further consideration of these potential transboundary impacts it is considered that:

- For the first scenario, there is a theoretical pathway for mercury to reach Russia via the River Irtysh if the Bylkyldak dam walls were breached resulting in the loss of water and sediment. However, the risk is minimal because of the distances separating Bylkyldak reservoir from the Russian border (6km to the river and a further 200km to the border). The risk of transboundary impact is further reduced because the current water levels in Bylkyldak are low and unlikely to increase as a result of JSC Caustic's future operations. Consequently, even if the dam walls were to fail, with current water levels close to the base of the dam walls, there is little chance that water would escape. Nevertheless, the dam walls will be properly maintained to ensure water and sediment is contained in Bylkyldak in case water levels do increase in the longer term.

- For the second, the current transportation of chlorine from Russia will cease, and moreover, the Company has no future plans to either export or distribute chlorine and other hazardous materials across or in close proximity of international borders.

Consequently transboundary impacts are of minimal concern.

9 Recommended monitoring and management actions

Monitoring and management actions have been identified throughout the OVOS and the ESIA Addendum and have subsequently been summarised in this NTS. An overall summary of these, including recommendations for the responsible party and the timeframe in which they should be carried out is provided in the action plan below.

Topic	Monitoring/Management Action	Source	Responsible Party	Timeframe
Management Systems	Current management practices should be supplemented such that its management systems comply with recognised international health, safety and environmental management systems (i.e. ISO 14001 & OSHAS 18001).	ESIA Addendum	JSC Caustic	To be in place shortly after the new facility is operational
Management Systems	Safety management practices shall be consistent with Kazakhstan safety requirements. Further studies are also underway to confirm that the plant also meets European safety standards, as specified by the European Union SEVESO II Directive.	ESIA Addendum	JSC Caustic	To be in place prior to operation of the new plant
Management Systems	Routine requests shall be made for monitoring studies concerning the sarcophagus that are undertaken by the authorities and other sources.	ESIA Addendum	JSC Caustic	Annually throughout operations in accordance with the State monitoring schedule
Management Systems	Periodic safety inspections including external audits of the facilities in line with national requirements.	ESIA Addendum	JSC Caustic	In accordance with legislative requirements
Emergency Planning	Existing emergency response plans shall be updated to ensure they reflect the new facilities.	ESIA Addendum	JSC Caustic	Prior to the start of operation of the new facility
Emergency Planning	Regular training and exercises relating to the updated emergency plans shall take place. Training needs shall be defined in a training plan. Exercises will take place on frequent basis and include on site exercises/drills and off site exercises involving 3rd parties' emergency services.	ESIA Addendum	JSC Caustic	To be defined in the emergency response plans

Topic	Monitoring/Management Action	Source	Responsible Party	Timeframe
Construction impacts	A construction environmental and social management plan shall be prepared which includes a basic code of conduct for construction workers outlining minimum standards of behaviour.	ESIA Addendum	JSC Caustic	Prior to construction phase
Construction impacts	The soil to the rear of Building 115 should be analysed for contamination before relocation. If found to be contaminated a remediation/disposal plan should be developed to ensure it is managed in an environmentally responsible manner.	ESIA Addendum	JSC Caustic	Prior to construction phase
Environmental & social liabilities	An environmental liabilities audit should be undertaken in order to establish whether any liability may affect the proposed development and thus require the adoption of appropriate remedial actions.	ESIA Addendum	JSC Caustic	Q3, 20009
Infrastructure assessment	Visual inspection of the dam walls should continue. The integrity of the dam should be periodically confirmed by suitably qualified engineers.	ESIA Addendum	JSC Caustic	Periodically
Infrastructure assessment	An integrity survey of the existing drainage system should be undertaken. Because there is a slight risk of historical mercury contamination in the sewer system JSC Caustic will also monitor effluents to ensure mercury concentrations do not exceed the limits set for mercury in drinking water.	ESIA Addendum	JSC Caustic	Pre operations
Stakeholder engagement	A Public Consultation and Disclosure Plan (PCDP) shall be prepared in line with lender requirements.	ESIA Addendum	JSC Caustic	Throughout Project lifetime
Security	Security measures shall be improved to help prevent access to the landfill by members of the local community in order to prevent illegal fly-tipping/burning of waste at the landfill. This security should involve physical barriers and appropriate signage.	ESIA Addendum	JSC Caustic and municipal authorities	Prior to operation of the new facility
Decommissioning	A decommissioning plan shall be prepared based upon the findings of the future Industrial Development Plan (by regional authorities) and the findings of the Environmental Liabilities Audit (to be undertaken by JSC	ESIA Addendum	JSC Caustic	Following the finalisation of the development and

Topic	Monitoring/Management Action	Source	Responsible Party	Timeframe
	Caustic) that addresses the short term decommissioning/disposal of redundant machinery and the longer term decommissioning of surplus buildings.			liability studies
Decommissioning	Preliminary decommissioning plans should be developed for the proposed new plant including options for dismantling, reuse, recycling and disposal.	ESIA Addendum	JSC Caustic	Pre construction
Decommissioning	A landfill closure plan shall be prepared in 2011.	OVOS	JSC Caustic	By 2011
Emissions to air	Abatement equipment shall be installed to ensure emissions to air are minimised as far as possible prior to release and so at a minimum standards are not exceeded.	OVOS	JSC Caustic	During design & construction
Resource use	Water efficiency measures shall be implemented to minimise the need for water abstraction (except where additional abstraction is required and authorised to maintain water levels in the reservoir).	OVOS	JSC Caustic	Construction and operational phases
Emissions to ground	Good practice measures shall be implemented in order to ensure potentially contaminating substances do not reach open ground including appropriate containment measures for all potentially polluting liquid substances and soluble solids, the installation of hard standing, minimisation of the need for underground pipework, limiting the depth of underground structures and installing automated monitoring of the process and its associated equipment.	OVOS	JSC Caustic	Construction and operational phases
Environmental monitoring	Air quality and groundwater monitoring already undertaken by JSC Caustic should be continued into the future.	OVOS	JSC Caustic	Continuously
Environmental monitoring	Monitoring of the landfill site shall continue to be undertaken in line with a programme agreed with the authorities.	OVOS	JSC Caustic	Continuously
Noise emissions	At source and end-of-pipe measures shall be put into place to ensure	OVOS	JSC Caustic	During construction

Topic	Monitoring/Management Action	Source	Responsible Party	Timeframe
	that noise levels are below regulatory standards.			
Transport of dangerous goods	Compliance with all legislative safety requirements applicable to a chemical company for the bulk transportation of dangerous goods shall be met.	OVOS	JSC Caustic	Operations
Emissions to air	In the event of unfavourable meteorological conditions specific measures shall be implemented in order to ensure emissions to air are reduced in line with legal requirements including at a minimum those detailed in table 8.7 of the OVOS.	OVOS	JSC Caustic	When unfavourable meteorological conditions are announced by the authorities
Electromagnetic fields	All metal parts of the process equipment including the associated railway infrastructure where electrification is possible shall be grounded.	OVOS	JSC Caustic	During construction
Waste management	Waste management measures shall be put in place to reduce the likelihood of any impact on the environment in line with good practice and at a minimum including the requirements detailed in table 8.15 of the OVOS	OVOS	JSC Caustic	Construction and operational phases
Waste Water treatment	The proposed facility will be designed with water a new treatment facility which will remove pollutants from the process waste water prior to discharge of into Bylkyldak industrial waste water reservoir. The plant is designed to comply with Kazakh and European Union discharge standards. Hazardous sludges from the waste water treatment facility will be disposed in JSC Caustic's solid waste disposal site, which is designed to receive hazardous waste materials.	ESIA addendum	JSC Caustic	Prior to operation of the new plant
Management of non hazardous brine	Brine generated during the manufacture of chlorine will not be discharged to Bylkyldak industrial waste water reservoir. Instead it will be disposed to JSC Caustic's solid waste disposal site. The solid waste	ESIA addendum	JSC Caustic	Solution to be agreed prior to operations

Topic	Monitoring/Management Action	Source	Responsible Party	Timeframe
	disposal site has an impermeable lining that will contain the saline material thus preventing contamination of surface and groundwaters.			

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