

EXECUTIVE SUMMARY

Adani Ports and Special Economic Zone Limited (APSEZL) is a part of the Adani Group of Companies, which has interests in global energy trading, coal mining, oil & gas exploration, city gas distribution, edible oil crushing & refining, food storage, shipping, power generation, distribution & transmission, real estate development and infrastructure & logistics. APSEZL is Adani Group's port infrastructure, SEZ and logistics arm.

As part of the Adani Group's growth plan, a new ship recycling facility has been envisaged adjacent the existing Mundra West Port, which is being expanded. The proposed project will recover about 0.3 mt / yr of ships' materials by recycling ships of up to of Light Displacement Tonnage (LDT) ~16000 t.

1.0 PROJECT DESCRIPTION

Mundra West Port is located on the northern part of the Gulf of Kachchh in Kachchh District of Gujarat , off Tunda and Vandh villages falling in Taluka Mundra. The proposed ship recycling yard is slated to be set up within the port limits between latitudes 22°45'34.6" n and 22°45'03"N and longitudes 69°35'54" E and 69°36'31" E. The nearest town is Mundra which is located about 16 km towards the north east. On western side the nearest town is Mandvi, about 25 Km away. NH - 8A passes north of the site at a distance of approximately 8 Km. Rail Link is already available up to Mundra Port. Bhuj and Kandla are the nearest Airports, both about 60 km away.

Presently the land earmarked for the project is partly located in the inter-tidal zone and partly still submerged. The land is being reclaimed by dumping dredge spoils generated on account of expansion of West Port under the Waterfront Development Plan. There will be 10 plots and a Common Vehicle Parking Area will be constructed over 1.9432 ha. The total land requirement has been estimated to be 40.7432 ha. Of this 19.8000 ha area will be used for breaking of ships, 1.613 ha will be used for Green Belt, 5.850 ha for Material Storage, 8.537 ha for other Infrastructure besides the common vehicle parking area; 3.000 ha area shall remain vacant.

The proposed ship recycling yard has been planned for handling ships of up to 16000 LDT (80,000 DWT). Mostly General Cargo Ships, Bulk Carriers and Tankers are expected to be handled. The materials recovered shall comprise of ~236300 t/yr of re-rollable scrap, ~ 28900 t/yr of melting scrap, ~7000 t/yr of cast iron, ~3400 t/yr of non-ferrous metals, ~12100 t/yr of usable machinery and ~10600 t/yr of miscellaneous items.

The air bag method of ship breaking will be followed. In this method the ship will be winched on to dry land over a slip-way made of inflatable marine air bags. Once on dry land, the ship will be allowed to settle on keel blocks and the air bags will be removed. After receipt of necessary statutory clearances, the residual fuel and refrigerants on board will be pumped out and recovered. Subsequently, detachable miscellaneous items will be dismantled and offloaded. The ships will be cut up with LPG-oxygen torches. The recovered materials will cut to manageable sizes and dispatched to buyers by trucks.

The estimated annual requirements of LPG and Oxygen are 1140 t and 7350 t respectively. These gases will be supplied in cylinders. Each plot will store maximum three days requirements of LPG. Power will be required at the site for lighting purposes only. The power will be drawn from the grid. Water will be required at the site for dust suppression (@ 60 m³/day), green belt irrigation and drinking purposes (@ 100 m³/day). Sea water may be used for dust suppression. Potable water will be supplied by Ground Water Infrastructure Limited (GWIL) or water desalination plant of APSEZL. Effluents from the workers' canteens and rest shelters will be used for green belt irrigation.

There will be a small medical unit at the ship-recycling facility to render immediate aid to casualties especially burn cases, cases involving blunt trauma and cases involving smoke / gas inhalation. Medical centre will have ambulance to move serious cases to a Occupational Health Centre located within Mundra Port which is operational round the clock. APSEZL also has a tie up with a super speciality hospital , located adjacent to the Port's township, to handle serious / critical cases.

The proposed project will directly employ 1500 persons of whom about 1000 are expected to be workers and the rest office staff. The workers may be housed in Mundra Port's labour colony.

2.0 DESCRIPTION OF THE ENVIRONMENT

The area within 10 km radius of the project site is designated as the buffer zone. The project site and the buffer zone together constitute the study area. It may be noted that the "Technical EIA Guidance Manual for Ship Breaking Yards" commissioned by Ministry of Environment and Forests in 2010 indicates that the "study area shall be a distance of up to 5 km from the boundary of the proposed ship breaking yard". However, in this case the study area has been extended up to 10 km as there are no habitations within 5 km of the project site.

2.1 Physiography and Drainage

The project area is located on a stretch of beach. Only a small part of the project area lies above the High Tide Line or even the inter-tidal zone at present. The project area is being created by dumping dredge spoils generated as part of the development of West Port.

The area within 5 km radius consists of mud flats, which may be submerged by flood tides, and a few occasional low sandy knolls. To the north east of the project area there are two tidal creeks, Kotdi Creek and Baradimata Creek. Which join the sea through a common channel ~0.5 km east of the project site. The area beyond 5 km of the project site is also flat. About 6 – 7km from the project site, the land is beyond the influence of tides and the vegetation changes to acacia forests, grass lands and agricultural land.

There is no national park, biosphere reserve, sanctuary, archeological site, Reserved or Protected Forest, defense installation and airports within the study area. The area does not fall in a land slide prone zone. The area falls in most active seismic zone as per IS 1893 (Zone V).

2.2 Land Use

Existing land use in the study area has been studied through satellite image processing. ~51% of the study area consists of sea. Another ~2% of the study area is made up of natural water bodies. Mudflats constitute slightly more than 12% of the study area. Scrub lands constitute 11.55% of the study area. Mangroves cover 2.79% of the area. Industrial land and associated infrastructure occupy 8.13% of the study area. Agricultural lands occupy ~ 5% of the study area and that too on the northern fringes of the study area.

2.3 Climate & Meteorology

The study area lies in tropical region where climate is characterised by very hot summers and mild winters. The Kutch area is a semi-arid region with weak and erratic rainfall confined largely to June-October period. Summer is typically from mid March to mid June when temperature ranges from a mean monthly maximum of 32.7°C to mean monthly minimum of 18.3°C. Winter is from December to February when temperature ranges from a mean monthly maximum of 25.7°C to mean monthly minimum of 13.5°C. The mean annual rainfall is 437.7 mm (average of 19.3 rainy days per year). The South-west monsoon lasts from mid June to mid September and the area gets more than 90% of the annual rainfall (408.8 mm) during this period. July is wettest month, with mean monthly rainfall of 196 mm (i.e. 44.8% of annual rainfall; 7.7 rainy days).

The IMD observatory nearest to the project site is at Mandvi, about 25 km towards the west. As per IMD Mandvi records the annual predominant wind directions are West and South-west, prevailing for 34% and 29.5% of the time respectively. During the summer months the predominant wind directions are West and South-west, prevailing for ~35% and ~21% of the time respectively.

There are strong winds at times at Mundra Port. In the period lasting over months March to May the wind direction is generally SWW (225° - 250°) and velocity varies from 20 to 25 Knots. June through August the wind direction is predominantly SW and velocity varies from 25 to 30

Knots with short gusts going up to 35 to 40 Knots. Towards end of September and through October wind direction changes to NE with velocities ranging from 7 to 10 Knots. Direction remaining same the velocity varies 10 knots to 25 Knots in the period November to January. February is the calm period when wind direction is southerly with velocity in the range of 7 Knots. Stormy weather may generate winds having velocity up to 100 Knots which should be taken as the worst case scenario for design of tall structures and heavy duty cranes.

Wind speeds and direction have been monitored round the clock from 01-10-11 to 30-09-12. West is the predominant wind direction (prevailing for about half the time) followed by north-east (prevailing for ~16.5% of the time). Calm conditions {wind speed <1 knot (0.514 m/s)} were non existent.

Wind speeds and direction were also monitored round the clock during the entire post-monsoon season 2012 i.e. from 01-09-12 to 30-11-12. During this period the predominant wind direction was found to be South-south east (prevailing for ~12.5% of the time), followed by north-west Prevailing for ~11.8% of the time). Calm conditions (i.e. wind speed <1 knot) prevailed for 5.35% of the time. The maximum recorded wind-speed during the monitoring period was 39 km/hr. The average wind-speed for the entire monitoring period was ~9 km/hr.

2.4 Air Quality

5 Ambient Air Quality (AAQ) monitoring locations were selected during post-monsoon season, 2011. Samples of 24 hourly duration were taken for monitoring PM₁₀, PM_{2.5}, SO₂, NO_x, Lead, CO and Benzo-a-pyrene (in particulate phase only) were taken twice a week for three months during post-monsoon season, 2011. The results when compared with National Ambient Air Quality Standards of Central Pollution Control Board (CPCB) indicate that air quality is within norms for 3 of the 5 locations At Tunda a single reading for Benzo-a-pyrene exceeds the norms whereas at Siracha a few PM₁₀ readings exceeded the norm but not on consecutive monitoring days.

AAQ monitoring was carried out at 5 locations during post monsoon season 2012 (3 stations were common during both seasons). Samples of 24 hourly duration were taken for monitoring PM₁₀, PM_{2.5}, SO₂ and NO_x were taken twice a week for three months during post-monsoon season, 2012. The results when compared with National Ambient Air Quality Standards of CPCB indicate that air quality is within norms at all the stations.

2.5 Water Quality

The project will not utilise any ground water or surface water. Water required for the project will be supplied through desalination plant of APSEZL or Ground Water Infrastructure Limited (GWIL).

In order to get an idea about the water quality in the study area water samples were collected from four locations in the sea and four tube-wells at different villages during post monsoon season, 2011. Sea water quality when compared with Water Quality Criteria specified by CPCB, the water sources meet criteria specified for Class D i.e. it is suitable for Propagation of Wild life and Fisheries. Ground water quality was compared with IS:10500 (1993). From the results it can be seen that in all the samples, chloride levels are higher than the Desirable Limits, but within the Permissible Limits. At Zarpara, Siracha and Tunda, the Dissolved Solid levels are higher than the Desirable Limits, but within the Permissible Limits; At Navinal, Dissolved Solids are higher than the Permissible limits also. At Zarpara, Navinal and Siracha, Alkalinity levels are higher than the Desirable Limits, but within the Permissible Limits; At Tunda, Alkalinity levels are higher than the Permissible limits also.

Water samples were also collected during post monsoon season, 2012 from four locations in the sea and four tube-wells at different villages, drinking water supplied at Mundra West Port and effluents from a Bulk Carrier, an Oil Tanker and a Container Ship. Sea water quality when compared with Water Quality Criteria specified by CPCB, the water sources meet criteria specified for Class D. During post-monsoon season, 2012, in ground water, chloride, dissolved solids and alkalinity levels are higher than the Desirable Limits, but within the Permissible Limits at Zarpara, Siracha and Navinal. Other parameters were within

the Desirable limits. The results of drinking water analysis have been compared with the drinking water quality standards specified in IS:10500. In Drinking Water too chloride, dissolved solids and alkalinity levels are higher than the Desirable Limits, but within the Permissible Limits. Other parameters were within the Desirable limits. The results of Effluent Water Analysis have been compared with the General Standards for discharge of environmental pollutants to Marine Coastal waters as prescribed by MoEF vide notification dated 19th May'1993 and amendment in December,1993. It was observed that temperature of all the effluents were higher than the permissible limits (i.e. >5°C higher than the receiving waters) . This is because the ships' auxiliary engines were running and were being cooled with water. It may also be noted that Regulation 9 of Annex I of MARPOL 73 / 78 prohibits the discharge of oily effluent whose oil content does not exceed 15 parts per million (ppm) without dilution. The oil content of the discharge waters did not exceed 15 ppm.

2.6 Noise Levels

In order to have an idea about the existing ambient noise level of the study area, noise monitoring has been carried out at five locations during post-monsoon season 2011 and at eight locations during post monsoon season, 2012. The results indicate that during September and October, 2011 day time noise levels are within the norms for Residential Areas. During November, 2011 the day time noise levels exceed the norms for residential Areas, but are within the norms for Industrial Areas. Night time noise levels exceed the norms for residential Areas, but are within the norms for Industrial Areas during all three months. During post-monsoon season, 2012, noise levels at Zarpara, Navinal and Tunda villages were within the norms for residential areas. The monitoring location at Dhrub Village is a commercial area. At this location the day time noise level was within the norm but at night, the noise level was higher than the norm. It may be noted that this area sees a lot of activity round the clock on account of Mundra Port. The other three locations are industrial areas and the noise levels were within the norms.

2.7 Ecology

The study area is located on the northern shore of the Gulf of Kutch. There are some major conservation areas in the region. However, these conservation areas are at a distance from the proposed project site.

About half of the study area is located in the sea.

The project site consists of a narrow strip of beach and area being reclaimed from the sea by dumping dredge spoils. On the beach the, the only vegetation is some clumps of grass. During day-time fresh spoor of jackals, foxes and mongoose were observed in the project area. Birds observed in the project area included Desert Wheat-eater, Larks, Lapwing, Indian Reef Heron, Terns, Whimbrel and Sandpipers.

The landward side of the study area comprises of agricultural land, barren / waste land, grazing land, scrub vegetation, salt flats, tidal creeks & marshy areas and rural settlements. There is a gently undulating sandy area just beyond the project site whose vegetation consists of a few clumps of *Prosopis juliflora* and grasses. The vegetation of the barren lands and scrub lands consists of *Acacia spp.*, *Prosopis juliflora*, *Azadirachta indica* and other xerophytic species, whose density depends on the soil cover. *Jatropha* and *Calotropis* are observed growing along road sides. The vegetation of the salt flats consists of small isolated patches of halophytic herbs. The banks of the creeks are vegetated by mangroves. The major mangroves are along the banks of the Baradimata Creek. The density of mangroves along this creek ranges between 4560 to ~ 3700 trees per ha. The trees are of stunted growth of maximum ~4 ft. in height. About 90% are *Avicennia marina* with a few *Rhizophora mucronata* (~7%) and *Ceriops tagal* (~3%). *Scirpus littoralis* and *Cyperus spp.* are growing along the smallest channels.

The vegetation in and around settlements consists of trees like *Acacia spp.*, *Prosopis juliflora*, *Azadirachta indica*, shrubs, grasses etc. Many of the *Azadirachta indica* trees have probably been planted by local villagers. *Jatropha* and *Calotropis* are observed growing along road sides.

Animals and birds found in the study area are common species. Due to lack of suitable habitat diversity of mammals is low. But the diversity of birds is high, which is also helped by the fact that local villagers provide protection to wildlife.

Plankton and benthos samples were collected from the sea at four locations. Samples of beach / mud-flat fauna were collected from two locations. It may be noted that the sampling locations in the sea are those from where water and sediment samples were also collected. Copepods and amphipods were the most common group of zoo-plankton. Larval forms of crustaceans and fishes were also present in some samples. Chaetognaths were present in only two samples and that too only in November. It may be noted that the samples were collected during day-time. During day-time, few zoo-plankton are present at or near the surface (during day-time phytoplankton are present in large numbers in shallow waters). Among sub-tidal benthic fauna Polychaete worms are the dominant group followed by amphipods. Among sub-tidal benthic fauna Nemertina and Polychaeta are the dominant groups. Mudskipper fishes (*Periophthalmus spp.*) were also seen at the edge of tidal creeks.

2.8 Traffic Survey

Traffic density analysis has been carried at two locations: At the gate of West Port and at the North Gate, which is the main SEZ gate. Monitoring was carried out for 24 hours on 3rd October, 2012. 1026 nos. of vehicles of all types passed through the West Port gate, while more than 4500 vehicles passed through North Gate.

2.9 Socio-economic Environment

Total population of the study area as recorded in 2001 census is 9038. The sex ratio in the study area is 984.6 females per 1000 males. SC and ST categories constitute about 15.15% and 2.69% of the population respectively. Literacy rate is poor (only 45.67%). Working population constitute 41.67% of the total population. Main and marginal workers constitute 33.93% and 7.73% of total population respectively. A sample survey in the villages indicated that 80% respondents in landless category while 15% are large farmers (land holding >10 acres); 5% of the respondents' land holdings are between 5 and 10 acres. Working as contractors and running small business are observed to be main source of income for the people of the study area. Most land holders have sold their land to industries or other land holders and now work as contractors, industrial workers or run small businesses. The few farmers in the area grow cotton, fodder for domestic livestock and date palms.

Agriculture is characterized by mono-crop culture. About 76.0% of the Gross Cropped Area (GCA) is used for cultivation of cotton. Area for date palms is around 19% while, fodder is grown in 5% of the area. The cropping intensity is very low (about 60%).

The people of the study area spend major portion of their disposable income on food items. However, there has been a growing tendency amongst villagers towards increasing expenditure on non-food items. About 15.5% and 38.5% of the members have education at primary level and middle school level respectively. In the high school and intermediate levels there are about 9.17% and 3.67% persons respectively. There are some graduates (around 3.67%). Villagers' interest towards education has been increasing due to hope of getting jobs especially in the non-agricultural sources which are going to come up in and around Mundra and the industrial belt of Gandhidham-Kandla which are 60 - 70 km away.

3.0 ANTICIPATED IMPACTS AND MITIGATION MEASURES

3.1 Land Environment:

The project will require 40.7432 ha of land. Presently most of the land earmarked for the project is submerged. Only a small proportion is above the water level. The land for the project is being created by dumping of dredge spoils generated on account of development / expansion of West Port.

Solid Waste disposal

The proposed project is expected to produce 2174 t /yr of solid wastes. The wastes of concern are thermal insulation, which may contain asbestos, paint ships which are likely to contain heavy metals such as lead, copper, zinc, tin, chromium and possibly poly-chlorinated biphenyls (PCBs), electric cable insulation, which may contain PCBs, damaged electrical equipment which may contain PCBs, Lead, Beryllium, PVCs, Copper, Cadmium, Mercury, Antimony, Hexavalent Chromium, Octabromodiphenyl ether (OBDE), Tetrabromobisphenol A (TBBPA) etc.

A dedicated trained Asbestos Removal Supervisor will be appointed to oversee asbestos removal activities. In the proposed facility, there will be 10 plots. A trained Asbestos Removal Supervisor (referred as Supervisor henceforth) may oversee asbestos removal work in more than one plot. The duties of the Supervisor shall include:

1. Setting up regulated areas / enclosures / containments around location of asbestos and asbestos containing material (ACM) on board the ship, ensure their integrity and set up procedures to control entry and exit of workers from these areas.
2. Supervise all worker exposure monitoring.
3. Ensure that all workers handling asbestos use proper Personal Protective Equipment (PPEs). The supervisor shall also ensure that these workers use the hygiene facilities and observe the decontamination procedures.
4. Ensure through on-site inspection that engineering controls are functioning properly and workers are following the prescribed work procedures.

The first step shall involve identification of asbestos and ACM on board the ship. A thorough inspection of the ship shall be carried out to note the presence of asbestos and ACM. Based on the location of asbestos and ACM on the ship, the Supervisor will set up regulated / containment areas and put up prominent and easily understood signs denoting them. Similar areas will be put up on the plots as well for dismantling sub-assemblies containing asbestos.

Since asbestos and ACM are classified as Hazardous Wastes as per "Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008" they have to be removed before Grant of Cutting Permission by Gujarat Pollution Control Board .

The Supervisor shall regulate the entry and exit of workers to and from the asbestos containment areas. The best operating practices to control asbestos emissions are as follows:

- ❖ All asbestos and ACM have to be thoroughly wetted prior to removal. A misting unit may be used to create a highly humid atmosphere within the removal area which will quicken the settling of airborne asbestos fibres.
- ❖ During removal, the Supervisor shall ensure that the dismantled material is carefully lowered to the ground, without dropping, throwing or sliding or damaging or disturbing the material.
- ❖ After removal the dismantled units / sections must be collected and contained in leak proof wrapping for disposal or stripped of asbestos / ACM.
- ❖ If the asbestos / ACM is stripped, the workers must ensure that the asbestos / ACM remains wet during stripping. Local exhaust ventilation and collection system will be used to filter out asbestos particles generated during stripping. The system must exhibit no visible emissions to the outside air.
- ❖ The regulated areas, where asbestos handling is done must be marked in a manner that limits the number of workers in the area and workers outside the area are not exposed to airborne asbestos. Only authorized personnel will be allowed to enter the area. All personnel entering the area must wear approved respirators and be medically fit to do so. Eating, smoking, drinking or chewing paan / tobacco / gum are strictly forbidden within the regulated area.
- ❖ Workers engaged in asbestos removal shall wear special protective clothing including face masks and respirators and gloves, which they shall don and discard in special enclosures equipped with decontamination facilities.

- ❖ The asbestos handling enclosure has to be cleaned with Vacuum cleaners equipped with High Efficiency Particulate Air (HEPA) filters. To ensure that airborne asbestos does not migrate from the regulated area, attempts will be made to use critical barriers, wherein one or more layers of plastic will be used to seal all openings into a work area to prevent migration of airborne asbestos.
- ❖ Sub-assemblies containing asbestos / ACM will be dismantled in a negative pressure enclosure, whose ventilation outlet will have heavy duty HEPA filters, on the plot. Nevertheless there will be arrangement for water sprinkling inside the enclosure. Additionally, workers engaged in dismantling asbestos / ACM inside this enclosure will wear special protective clothing and go through a three stage entry / exit process.
- ❖ After wetting, all asbestos containing waste material (ACWM) will be sealed in leak proof containers while still wet. For bulk wastes, that will not fit into containers without further recycling, the facility will put these wastes into leak proof wrapping, which will be sealed with duct tape while still wet. If it is decided to place bulk ACWM in trailers or roll-off boxes, the trailers / boxes will be lined with plastic sheeting prior to loading. To minimize the logistics / problems of handling ACWM, efforts will be made to package as much as possible of the ACWM on board the ship itself in the regulated enclosure.
- ❖ The following work practices / engineering controls shall not be used for asbestos removal work as the disturb ACM:
 - Use of high speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.
 - Use of compressed air for asbestos / ACM removal, unless the compressed air is used in conjunction with an enclosed ventilation designed to capture the dust cloud created by the compressed air.
 - Dry sweeping, shoveling or other dry clean up of dust /debris containing asbestos / ACM
 - Employee rotation as a means of reducing individual asbestos exposure.
- ❖ The packaged ACWM will be transported by trucks to the authorized TSDF facility being operated by M/S Nandesari Environment Control Pvt. Ltd. (NECL). APSEZL has entered into an agreement with M/S NECL in this regard. All the material will be transported to the disposal site in NECL's special vehicles.

Wastes containing 50 mg/kg or more of PCBs are classified as "Hazardous Wastes" vide Schedule II of Hazardous Wastes (Management, Handling and Trans-boundary Movement), Rules, 2008 {Sl. No. A16 of the Schedule}. All wastes, which may contain PCBs (e.g. damaged electrical cable insulation, capacitors etc.) will be segregated and stored separately in labeled packages as specified in Rule 19 of the Hazardous Wastes (Management, Handling and Trans-boundary Movement), Rules, 2008. The plot owners shall maintain records of generation and disposal of PCB wastes as specified in Rules 21 and 22 of the said Hazardous Wastes (Management, Handling and Trans-boundary Movement), Rules, 2008. The wastes will be transported to an authorized Treatment, Storage and Disposal Facility (TSDF) for hazardous wastes and disposed off as specified in Rules 20, 21 and 18 of the said rules, respectively. APSEZL has entered into an agreement with M/s NECL, who are operating such a facility, in this regard

Paint chips are likely to contain lead, chromium, zinc, copper and other heavy metals. Tarpaulin sheets will be spread below the surfaces which are to be stripped of paint prior to cutting to collect the falling paint chips. Decks where paint chips have fallen will be cleaned and the debris picked up using vacuum cleaners. The paint chips will be placed in leak proof labeled containers and stored in a designated place prior to being dispatched to the designated TSDF for hazardous wastes.

E-wastes will attract the provisions of Hazardous Wastes (Management, Handling and Trans-boundary Movement), Rules, 2008 and E-Waste (Management and Handling) Rules, 2011. The facility shall follow the stipulations of Rule 7 of E-Waste (Management and Handling) Rules, 2011. The facility shall obtain authorization and registration from GPCB in accordance with the procedures under Rules 9 and 11 of the said Rules. The dismantled material is properly stored and transported. Workers engaged in dismantling and handling e-waste are issued proper

personal protective equipment (gloves, dust masks etc.). The recoverable items are sold only to authorized recyclers. The facility shall ensure that the non-recyclable / non-recoverable components are sent to an authorized TSDF {in this case the TSDF being operated by M/S NECL}. The facility shall file a return in Form 3 to GPCB on or before 30th June following the financial year to which the return relates.

As stipulated under Rule 12 of E-Waste (Management and Handling) Rules, 2011, the facility shall Maintain a record of generation of e-wastes, their storage and segregation, storage and disposal (sale to authorized recycler and handing over to authorised TSDF). These records should be made available for inspection by concerned authorities. The facility shall ensure that the e-wastes generated at the facility are not stored for more than one hundred and eighty days.

Other solid wastes which are likely to be generated are remnants of cargo, packaging material (wood, cardboard, paper), insulating material (rubber, thermocol, plastics etc.), metal chips, contaminated soil etc. All non-hazardous non-metallic materials will be collected and stacked separately till they can be dispatched to the TSDF being operated by M/s NECL. In spite of best efforts, the sand of the beach may be contaminated by spillages of oil / oily sludge, paint debris etc. In such cases, the contaminated sand will be scraped off and dispatched to NECL's TSDF.

3.2 Impacts on Water Quality and Mitigation Measures

The effluents which are likely to be generated from the proposed project are Ballast water (maximum 4000 t / ship), Bilge water (maximum ~200 m³/ship), Slops generated during washing of cargo tanks and pipelines of oil tankers, Oily water generated due to washing of fuel tanks prior to cutting and Sewage from the facility's offices, rest rooms and canteens (@ 80 m³/day).

In order to prevent the spread of invasive species due to discharge of ballast water, the International Maritime Organisation (IMO) has formulated a protocol which requires ships to change their ballast water in high seas while transiting between ports. A system for recording the ballast water exchange has also been devised and all ships are required to maintain the same for scrutiny. Concerned port authorities scrutinize the records of ballast water exchange prior to discharge of ballast water in their respective ports. In some cases ballast water may be contaminated with oil (i.e. the ballast water is "Dirty"). Regulation 9 of Annex I of MARPOL 73 / 78 prohibits the discharge of oily effluent whose oil content exceed 15 parts per million (ppm) without dilution. Regulation 16 of Annex I of MARPOL 73 / 78 also stipulates that all ships of more than 400 t Gross Tonnage, must have Oil Filtering systems on board.

At the proposed project necessary administrative measures will be taken to prevent the discharge of un-exchanged ballast water, oily ballast water, untreated bilge water, slops and other oily effluents. Wash water from ballast water tanks will contain sediments which may contain dormant forms of invasive organisms and hence will be disposed off to M/S NECL's TSDF.

Effluents from the canteen and rest areas will be diverted through drains to the green belt / plantation areas. Sanitary sewage generated in toilets will be treated in septic tanks and soak pit.

4.3 Impacts on Air Quality & Mitigation Measures

At the proposed ship recycling yard, LPG will be used for gas cutting of ships @ 1140 t/yr. Other than CO₂, NO_x will be generated. The annual NO_x generation has been estimated to be 4500 kg /yr i.e. 15 kg/day. This is will be generated over a wide area and hence will be easily dispersed and diluted, more so because of prevailing high wind speeds.

HSD will also be used as fuel in diesel powered material handling equipment and vehicles. This will lead to generation of NO_x. These NO_x emissions will also be emitted over a wide area and will be easily dispersed and diluted. Thus the NO_x levels in ambient air will remain unchanged.

Fugitive dust will be generated due to handling of rusted steel plates on the beach and operation of trucks on road serving the project. Iron dust is hard and heavy. It will not spread beyond the ship recycling plots. The land of the ship-recycling area will be compacted, which will reduce fugitive dust generation. Nevertheless, a dense green belt will be developed to screen

fugitive dust. Most of the materials recovered during ship recycling will be despatched by trucks. Fugitive dust is likely to be generated from the roads. However, the dust generation will be minimized by having wide metalled roads which will be kept in good repair. A dense green belt will be developed along the roads to screen fugitive dust. Thus the air quality will remain virtually unchanged beyond a few m from the roads. Water will be sprinkled on the plots periodically to suppress fugitive dust. All personnel engaged in performing abrasive work (e.g. stripping paint from surfaces prior to gas cutting), cleaning dusty surfaces and handling dusty material will be issued dust masks and wearing the same will be strictly enforced.

4.5 Impacts on Ecology and Mitigation Measures

As already indicated, project will be located mostly on land which will be reclaimed from the sea by dumping dredge spoils. A small stretch of inter-tidal zone shall also be required for the project. As regards impact on wildlife is concerned, most of the wild life in the project areas and its vicinity are confined to common small species.

The strong light in the project premises during night may cause disturbances to the fauna in the near by areas. It has been planned that all the light posts erected along the boundary of the project area will face inwards and down wards (with reflectors facing the project area and downwards), so that the light do not spreads out side the project boundary.

1.613 ha of plantations will be created within the initial 2 years. The species are suitable for planting in the area are *Casurina equisetifolia*, *Prosopis juliflora* and *Salvadora spp.*. Saplings of *Casurina* and *Salvadora* will be planted in pits at about 2 m intervals so that the tree density is about 2500 trees per ha. *Prosopis* saplings will be planted at 3 – 3.5 m intervals. The pits will be filled with a mixture of good quality soil and organic manure (cow dung, agricultural waste, kitchen waste). The saplings will be planted just after the commencement of the monsoons to ensure maximum survival.

It should also be noted that APSEZL is engaged in protection of 1254 ha of mangroves in accordance with Environmental Clearance of Water Front Development Plan.

4.6 Occupational Safety & Health

50 workers shall be involved in ship winching (8 hours per day but not regularly), 30 workers shall be involved in asbestos removal and handling (8 hours per day but not regularly), 250 workers shall be involved in ship cutting (8 hours daily), 250 workers shall be involved in dismantling of detachable items (8 hours daily) and 300 workers shall be involved in material sorting and loading (8 hours daily).

Rules and Safety guidelines as stipulated in the Indian Factories Act, 1948 and Gujarat Factories Rule, 1963 will be followed. Risk assessment will be carried out in the yard on a regular basis. The goal for each risk assessment session is to identify hazards, determine risk ratings and controls and to review the implementation of risk controls from previous risk assessment sessions. Assessed risks and steps for prevention and control of loss / damage due to accidents shall be communicated to employees through hoardings, boards, posters and internal company communications.

Health impact assessment will be carried out through Surveillance of the factors in work zones and work practices, which may affect workers' health and Periodical medical examination (PME).

APSEZL already has an Occupational Health Centre (OHC) located within the port for looking after the occupational safety and health aspects of Mundra Port's workers . The OHC is open round the clock. This OHC will look after the requirements of the proposed project also. The OHC is functional round the clock. The OHC is headed by a Chief Medical Officer (CMO). He is assisted by 3 Medical Officers (MOs), who work in shifts, so that one MO is always on duty. There are 14 male nurses and one female nurse. 4 male nurses are on duty during each shift, whereas the female nurse is on duty during general shifts only. There are also 3 wardboys. There are 4 ambulances of which 2 are ICUs on wheels. First Aid Centres have been established at different strategic locations. Emergency equipment is available at the OHC. 20% of the employees have

received certified training in First Aid. Measures have been initiated so that all employees receive such training. Casualties receive first aid at site. If required they are shifted to the OHC. Very serious / critical cases are shifted to a super speciality hospital (Sterling Hospital) located adjacent to the Port's township. Burn cases receive treatment at the OHC and if warranted at Sterling Hospital.

All employees undergo pre-employment medical examination including mandatory HIV screening. Subsequently all employees less than 35 years age, undergo PME every alternate year. Employees more than 35 years old undergo PME every year. Employees engaged in hazardous work undergo PME twice a year regardless of age. Medical records are computerized and there is provision to maintain individual workers' medical records for up to fifteen years after his / her retirement. The OHC has x-ray machine, ECG, spirometer and defibrillator. The OHC is equipped to undertake cardiac function tests, pulmonary function tests and eye tests with in-house resources. Audiometry tests are presently outsourced but necessary action has been initiated to carry out these tests also in-house.

APSEZL has a dedicated Safety Department which functions round the clock. 24 Safety Officers have been deployed in Mundra Port and associated installations. In addition there is one Safety Manager each at Mundra Port and West Port. APSEZL is certified for ISO 9000, 14001, 18001 and 28000. Behavioural Safety Programme has been implemented from 1st August, 2012. The Safety Department has 35 multi gas meters to check for presence of inflammable and toxic gases. Noise meters and lux meters are also available. Third party monitoring of work zone dust levels is being carried out.

The existing OHC and Safety Department will look after the requirements of the proposed project also for which the existing resources will be suitably augmented. At the proposed project also workers will undergo pre-employment and regular annual / bi-annual medical examination as per prevalent practices in APSEZL. The frequency of the PME may be increased if so stipulated by the concerned statutory authorities.

All new recruits will be given basic training on safety. Work zone air quality & noise levels and drinking water quality will be monitored regularly. The effect of these environmental attributes on the workers health will be communicated to the workers through awareness programmes. Training on occupational safety and health will be imparted by the project's Safety Officer, the Medical Officer and the Asbestos Removal Supervisor.

The CMO will be responsible for early identification of onset of occupational diseases and recommend necessary remedial action to prevent further damage. The OHC shall carry out the necessary tests to diagnose the incidence of occupational diseases / disorders. The Safety Officer will be responsible for the purchase and issue of all personal protective equipment (PPE) e.g. shoes, helmets, various types of gloves, aprons, dust respirators, ear plugs, goggles etc. and distributed to both company employees and contractors' employees. The Asbestos Removal Supervisor will be responsible for purchase and issue of PPEs to asbestos workers. Safety boots will be issued every 6 months, helmets every 3 years and other PPEs as per requirement. If any PPEs are damaged before their scheduled replacement, fresh equipment will be issued.

During uplifting of ship, workers are at risk in case of equipment failure. To minimize the risk of failures, winches will be regularly serviced and thoroughly overhauled prior to being used for ship uplift. For winching of ships, equipment with sufficient rated capacity (including margin of safety) for the weight of the ship to be hauled will be selected. All equipment will be thoroughly examined prior to being put to use. During ship uplift only trained personnel will be deployed under the supervision of a safety officer to ensure that safety procedures are strictly followed.

For workers engaged in asbestos work, a Decontamination Area shall be established as close as possible to the Regulated Area. It will consist of a Clean Change Room, a Shower Room and an Equipment Room. The enclosure shall be kept at negative pressure through the ventilation room which has heavy duty HEPA filters. Fresh air will be drawn into the enclosure through a damper valve. Workers coming to work, will enter the Clean Change Room first, where they shall deposit

their street clothing in assigned lockers. They shall put on protective clothing consisting of whole body clothing, head coverings, gloves and foot coverings and respiratory protection. The Supervisor shall inspect the workers clothing before allowing them in to the regulated area. The workers shall collect their working equipment from the Equipment Room and then proceed to the working area. Tight fitting Powered-Air Purifying Respirators (PAPR) should be provided. It should be noted that all workers engaged in asbestos work removal work requiring use of respirators must be medically certified that he shall be able to function normally while wearing respirators. After completion of work, the workers shall enter the Decontamination Area of Equipment Room, where they shall first vacuum themselves to remove debris and contaminants deposited on their clothing; the vacuum cleaners used for the purpose shall be provided with HEPA filters. After vacuuming themselves, the workers remove their other clothing, gloves, caps etc., but not the respirators, and deposit them in labeled impermeable containers / bags. They shall then proceed to the Shower Room for a shower before proceeding to the Clean Change Room, where they shall remove their Respirators and put on their street clothes again. All equipment and surface of containers filled with ACM must be cleaned prior to removing them from the Equipment Room. While sending the used clothes for cleaning and washing, they should be packed in leak-proof labeled containers; the cleaners should be informed about the possible presence of asbestos on the soiled clothing and that they should take necessary protective measures. The Asbestos Removal Supervisor shall ensure that the procedures are strictly followed. The Supervisor shall clearly demarcate all asbestos work areas in large letters in prominent colours and symbols stating "Danger", "Keep Out", "Entry of Authorised Personnel Only", "Entry Without Wearing Protective Clothing and Respirators Forbidden; Can Cause Cancer", "No Smoking", "No Eating", "No Paan Chewing" etc. Prominent slogans spelling out proper work practices should also be displayed in the regulated areas. The languages used must be English, Gujrati, Hindi and other languages spoken by the workers deployed in the yard.

At the proposed project, LPG will be used for cutting of ships. Also, fuel oil, HSD and lubricating oils remaining on board the ships will be pumped out. There is also the possibility of flammable gas mixtures remaining on board in cargo tanks of tankers / gas carriers. The oxygen-enriched atmosphere in enclosed or confined spaces may cause the normally fire-resistant materials to catch fire when cutting torches are used. When fires occur, the confined or enclosed spaces of work make the escape difficult or almost impossible for the employees working in those areas. Fire in such confined or enclosed spaces may also result in atmospheres of combustible gases, toxic fumes, or oxygen-depleted air. Workers in the ship breaking yards, therefore, face risk from fire, explosions, toxic gases, and fume that can result in burns, death, and asphyxia.

At the proposed project, all tankers' / gas carriers' cargo tanks and pipelines will be purged with inert gas prior to the ship being allowed to be beached. Prior to cutting, Hot Work Certificate shall be obtained from the concerned authorities. Nevertheless, the atmosphere inside enclosed spaces shall be tested with gas meters for presence of explosive and toxic gas mixtures prior to workers entering such areas. Workers will not be allowed to work in confined spaces where the atmospheric oxygen content is less than 19.5% (by volume) or more than 22% (by volume) except for emergency rescue or for a short durations for installation of ventilation equipment necessary to start work in the space, provided no ignition sources are present, the atmosphere in the space is monitored continuously, Atmospheres at or above the Upper Explosive Limit (10% hydrocarbon content by volume) are maintained and the workers are provided with respirators and other PPEs. If an enclosed space, whose atmosphere is considered unsafe, is found, the same shall be prominently labeled. The space shall be ventilated till the conditions inside are deemed safe to work in. While workers are working in enclosed spaces, heavy duty blowers shall be used to ventilate the work areas and prevent buildup of gases generated due to LPG burning.

On board the ships, sufficient numbers of portable fire extinguishers will be kept ready near operations involving flammable materials. APSEZL has a dedicated Fire Fighting Department equipped with 3 fire tenders, 3 water browsers and 8 portable fire pumps. The Fire Fighting Department is headed by the Fire Officer. More than 120 fire crew are on duty. APSEZL has also signed MOUs with nearby major industries (Adani Power Ltd., Tata Power Ltd., Adani Welspun Ltd. etc.) for mutual assistance for fighting.

The process of ship cutting shall involve stripping paint from surfaces which will be cut followed by cutting with LPG-oxygen torches. Usually paint is stripped by chipping and rubbing with wire brushes. During this process, workers are at risk on account of flying off of paint chips which may damage the eyes and inhalation of paint dust which may contain heavy metals and toxic additives. To prevent the same, workers engaged in paint chipping and cleaning will be asked to wear goggles and dust masks.

Metals will be cut with LPG-oxygen torches. While handling LPG, all necessary fire safety rules will be followed. All LPG and oxygen cylinders will be kept erect and shored to ensure that they remain in the erect position. Safety supervisor shall ensure the same. Workers shall use welders' goggles / masks to protect their eyes and faces from intense heat and light. Fire-retardant gloves shall be used to protect the workers' hands. Workers may also be issued with fire retardant suits and gas masks. The work areas shall be adequately ventilated to prevent build up of combustion gases and dissipate the heat generated due to LPG burning. Before taking breaks and at end of shifts concerned workers shall ensure that all torches are extinguished and valves / regulators of gas cylinders turned to the "Off" position. Safety supervisor shall ensure the same.

All workers deployed on board the ships shall wear safety helmets. Areas below areas where dismantling work is on shall be cordoned off. Workers engaged in dismantling work shall wear safety gloves while handling heavy / sharp / breakable objects. Workers working at height shall wear full body safety harnesses and safety belts.

Wearing of safety helmets will be strictly enforced amongst all personnel working on board the ships and in material handling areas. Workers engaged in handling heavy pieces of metal, glass and objects with sharp edges shall be issued with safety gloves. Areas below heavy lifts shall be cordoned off. There shall be audio-visual warnings while mobile cranes are moving heavy objects. Hauling / lifting chains / cables / ropes will be regularly inspected /tested for integrity.

5.0 ADDITIONAL STUDIES

5.1 Public Consultation

During the field study an opinion poll was conducted to ascertain local villagers' opinion about the project. 48% of the respondents are optimistic about the project because of the employment opportunity. About 18.5% expect increased business opportunities. ~15 % of them are hopeful about peripheral development. So far disadvantages are concerned, ~15% of the respondents are worried about the problem of pollution and damage to the environment. One respondent is apprehensive that the project will increase vehicular traffic and road accidents will increase.

5.2 Socio-economic Impacts

The proposed project is expected to introduce a set of new activities, which will influence the socio-economic condition of the people of the surrounding areas. Such impacts may be marginal or non-marginal depending on the extent of change caused by the project to alter the existing equilibrium of the socio-economic system. The project is likely to bring benefits for the local people. Analysis of various aspects of the study amply reveals that the proposed activities are going to create considerable impact on the socio-economic conditions of the people in the study area. The project is unlikely to cause any damage to the agricultural situation of the area. It is likely to benefit the farming community by way of supplementary income through non-farm sources. Local people are likely to get a significant share of the jobs generated by the project in accordance with their qualifications. The project is also expected to generate substantial indirect employment in other sectors e.g. in the small scale industrial units and service centres etc. which are expected to come in the vicinity of the project. The indirect employment and income effects are likely to be much larger than the direct effects of the project.

5.3 Risk Assessment

Risk assessment has been carried out for the proposed project. At the project furnace oil (F.O.) will be pumped out of the ships into road tankers. No F.O. will be stored at the proposed facility. Since F.O. does

not catch fire easily implementation of certain basic safety precautions will prevent occurrence of any fires. Maximum of 60 nos. 19 kg LPG cylinders (i.e. a total of 1.15 t LPG) will be stored on each plot. The probability of spontaneous failure of one LPG cylinder is $\sim 1 \times 10^{-6}$ per year. The chances of leak failure of one LPG cylinder $\sim 2.6 \times 10^{-6}$ per year. In case of 1 LPG cylinder leaking and catching fire, the heat radiation intensity shall be less than 1 Kw/m^2 {the radiation which causes pain to personnel if unable to reach cover within 20 seconds. Blistering of skin (1st degree burns) is likely} beyond 14 m i.e. the effects of the fire shall remain more or less within the plot. In case the spilled LPG explodes (vapour cloud explosion), the heat radiation intensity shall be about 1 Kw/m^2 at a distance of ~ 150 m. In case the vapour cloud explosion leads to rupture of all the cylinders followed by a vapour cloud explosion, the heat radiation intensity shall be about 1 Kw/m^2 at a distance of ~ 550 m To prevent LPG fires, the LPG will be stored in designated godowns with necessary safety features.

6.0 ENVIRONMENTAL MONITORING AND MANAGEMENT

An Environmental Cell (EEC) has been formed at the APSEZL for looking after the requirements of the installations in and around Mundra Port. This group will look after the requirements of the proposed project also for which the resources may be augmented. The EC shall undertake all the monitoring work to ensure the effectiveness of environmental mitigation measures. The suggestions given in the Environmental Monitoring Programme shall be implemented by the EC by following an implementation schedule. The environmental attributes / activities to be monitored to ensure proper implementation and effectiveness of various mitigation measures envisaged / adopted during the expansion plan are meteorology, air quality & emissions, water quality, drainage system, noise, solid waste management, plantations and occupational safety & health.

Presently the EC has total twelve persons including a retired IAS officer who had held the post of Environment Secretary, Govt. of Gujarat and who acts as advisor to the group. Two more persons are being recruited. For development and maintenance of jobs like drainage, clearing settling pits etc. assistance from the APSEZL's civil engineering department is taken. Plantation works are undertaken by APSEZL's Horticulture Department. CSR activities are looked after by APSEZL's CSR Department. The EC also co-ordinates with other departments and carries out liaison work with external agencies like State & Central Pollution Control Boards and AERB. For proper implementation of the EMP, the officials responsible for EMP implementation will be trained suitably.

7.0 BENEFITS OF THE PROJECT

The expansion project shall facilitate help withdraw old un-economical and possibly unsafe ships from the operational fleet and recover and recycle the construction material and salvageable machinery and miscellaneous items. The positive points are (i) Strong direct and indirect employment generation potential (ii) Opening up of new business opportunities (iii) Peripheral development and creation of social capital etc.