



Basis of Design

Oakland Bulk and Oversized Terminal

California Capital Investment Group

Preliminary Engineering

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1 Basis of Design

This establishes the definition of elements of the preliminary engineering design to achieve the production capacities desired by the owner and defines the basic infrastructure needs to operate the plant in the manner desired by the owner with respect to safety and environmental goals.

2 Project Definition

2.1 Title of Project

Oakland Bulk and Oversize Terminal (OBOT).

2.2 Background

Oakland Bulk and Oversize Terminal (OBOT) OBOT intends to re-develop the Oakland Army Base located within the Port Authority Outer Harbor in Oakland, CA. OBOT is responding to a general shortfall in trans-shipment capacity for the marine export of bulk products from the West Coast.

The Oakland Army Base Property covers approximately 135 acres. The leasable area of OBOT covers 20.31 acres, consisting of 12.45 acres of land area and 7.86 acres of wharf. The project property consists of warehouse storage and mostly paved and impervious concrete. OBOT has entered into a 60-year lease agreement with the City of Oakland to develop the site. Subsequently, OBOT has entered into a development agreement with Trans Logistics Solutions (TLS) to develop the OBOT. OBOT is the long-term lease holder and TLS will be a tenant of OBOT.

OBOT will develop the marine terminal based on a staged implementation approach. Design capacity will be 9 million tonnes per annum (Mtpa), with a stabilized throughput of 75% of design, or 6.3 Mtpa. The first stage (Stage 1) will develop the terminal overall capacity to approximately 6.3 Mtpa and include trans-shipment of Bulk Material Products.

2.3 Project Objectives

OBOT's objectives for this phase of the project are to create a terminal for the receipt by rail, storage and shipment of Commodity A and Commodity B as follows:

- Commodity A with a desired throughput of 5.0Mtpa.
- Commodity B with a desired throughput of 1.5Mtpa.
- There is a requirement for segregated storage to blend Commodity A.
- No requirement for segregated storage or blending of Commodity B.
- To commission the new terminal by the 1st quarter of 2018.
- Utilize proven technologies and modern design standards.
- Utilize Best Control Technology (BCT) to control or eliminate emissions.
- No lost time injuries or environmental breaches.

3 General

3.1 Location

The property is located on the San Francisco Bay at the East end of the Bay Bridge in Oakland, California. The site can be found at 37.82°, -122.318° (Lat., Lon.).

3.2 Soils

There have been several geotechnical studies made available to HDR for review. These studies outline basic design data for a few different pile configurations, as well as slope stability under the existing wharves in non-seismic conditions. One of the documents identifies the potential seismic-induced liquefaction and lateral spreading hazards at this site and recommends further studies to determine the types of ground improvement methods necessary to mitigate these hazards, based on the configuration of the facility and tolerance to settlement and lateral displacement.

Reviewed studies are outlined below:

- Technical Memo – Dredged Slope Stability, Oct. 17, 2014, Kleinfelder: This memo summarizes the static stability of the slope beneath wharves 6, 6½, and 7 under proposed dredging to 50 ft. depth near the berth face. The report concludes that the stability of the existing slope can accommodate the proposed dredging, but specifically excludes the stability of the modified slope under seismic loading.
- Seismic Site Specific Horizontal Accelerations, Nov. 24, 2014, Kleinfelder: This memo provides site specific lateral seismic accelerations for CLE, DE and MCE earthquake hazard levels for Wharves 6, 6½ and 7. It does not provide information about liquefaction or lateral spreading potential of the site.
- West Gateway Terminal Preliminary Pile Capacity Geotechnical Memo, Oct. 28, 2014, Kleinfelder: This memorandum provides preliminary pile capacities for three different types of pile, based on a CPT performed on the upland side of the dock. These pile capacities are intended for preliminary design of the piled foundations supporting equipment and buildings on the upland side of the terminal. The pile capacities do not include any reductions for seismic induced liquefaction or lateral spreading.
- 65% Geotechnical Report, Oakland Army Base – Horizontal Development, Jun. 20, 2013, Berlogar Stevens & Associates: Memorandum with preliminary analysis and recommendations based on geotechnical explorations performed around the site. This memo identifies the liquefaction and lateral spreading hazards for the site and recommends further analysis to determine specific impacts on the proposed design of the facility.

3.2.1 Geotechnical Recommendations

Additional Geotechnical Recommendations to come.



3.3 Units of Measurement

The Imperial system of units will be used and is assumed to be the system of units used for design, fabrication and construction.

Material capacities will be given in metric tons (tonnes).

3.4 Service Life

Design lives for the various elements of the terminal are provided in Table 3-1.

Table 3-1. Service Life

System	Design Life
Major Equipment Structures (Shiploaders, Stackers, Conveyors, Reclaimers, Railcar Dumper, etc.)	30 years
Mechanical Components (Reducers, bearings, pumps, etc.)	60,000 hours
Structural Components	50 years
Marine Fender System	25 years

The design service life of equipment and structures relies on inspection, maintenance and repairs at regularly scheduled intervals. Major equipment such as shiploaders, stackers, reclaimers and railcar dumper will also require periodic major refurbishment for repairs to coating systems and other component upgrades that cannot otherwise be conducted during normal maintenance windows.

3.5 Safety & Access

The design, manufacture and installation of the required equipment shall be designed to comply with the regulations of the local, state and federal authorities having jurisdiction, as well as Occupational Safety and Health Administration (OSHA).

All platforms, stairs, handrails, walkways, ladders and accesses shall be specified to comply with the requirements of the local, state and federal authorities having jurisdiction as well as OSHA.

Mechanical components will be selected and designed to facilitate safe access for inspection, maintenance, disassembly and replacement.

4 Scope of Work

The specific scope of work for the OBOT Preliminary Engineering includes design of facilities and systems as follows:

- Site preparation including clearing, grading and ground improvements to strengthen existing soils and mitigate seismic-induced liquefaction and lateral spreading.
- Utility services (potable and process water, sanitary sewer, natural gas, and electricity).
- Fire protection systems.



- Access roads and equipment maintenance and circulation routes.
- Rail departure track from mainline railway, on-site operations and storage rail for unit train unloading and storage.
- Covered bulk material storage structures and foundations.
- Surfacing and structural design of storage pads, general site access and operations areas.
- Material handling equipment and foundations for railcar unloading, stacking, storage, reclaiming and ship loading.
- Administration, maintenance and operations buildings and associated foundations.
- Stormwater management facilities (retention/detention ponds, culverts, and ditches).
- Process water collection and treatment facilities.
- Marine structures, dock, mooring and fendering systems for loading ships.

5 Products

Products to be handled by the terminal are Commodity A and B. There is a requirement to blend Commodity A. The design for Commodity A blending is limited to two sources. The blending process is expected to be accomplished through reclaiming operations performed during ship loading. There are no requirements for the blending of the Commodity B, but each product handled will be required to have segregated storage.

The properties of materials handled at the facility are defined in Table 5-1.

Table 5-1. Material Properties

Properties	Commodity A	Commodity B
Bulk Density	48 lb/ft ³ (Volume Calculations) 55 lb/ft ³ (Mass Calculations)	59 lb/ft ³ (Volume Calculations) 78 lb/ft ³ (Mass Calculations)
Angle of Repose	35-38°	32-37°
Surcharge Angle	20-25°	20-25°
Moisture Content (Inherent)	12% (Inherent) 11% (Surface) 23% (Total)	0%
Maximum Lump Size	3 in	Granules
Corrosiveness	Not Corrosive	Not Corrosive
Abrasiveness	Extremely Abrasive	Abrasive
Special Handling Constraints	Very dusty, exhibits spontaneous combustion behavior, potentially explosive	Very dusty, hygroscopic

6 Throughput

OBOT intends to develop the marine terminal based in phases per Table 6-1.

Table 6-1. Terminal Throughput

Properties	(Estimated)
Commodity A	5.0 MMTPA
Commodity B	1.5 MMTPA

A preliminary spreadsheet simulation has been developed as a separate document.

7 Hours of Operation

The terminal will operate three 8-hour shifts a day, 362 days a year.

8 Marine

8.1 General

A new mooring and berthing system will be constructed at the existing wharf (Wharf 7) capable of handling Capesize vessels. The proposed mooring and berthing system will be independent of the existing wharf, and will utilize breasting dolphins with fender panels and mooring dolphins with quick release mooring hooks. The dolphins will utilize steel pipe piles with cast-in-place concrete pile caps. There will also be two in-water arc shaped runways to support the quadrant loaders, founded on steel pipe piles. The pivot point supporting the tail end of the quadrant loaders will be supported on piles driven within the footprint of the existing wharf. The pivot support structure will have an independent pile supported foundation and be isolated from the existing timber wharf structure.

8.2 Design Vessels

Design vessel information is provided in Table 8-1.

Table 8-1. Design Vessels

Specification	Handysize/ Handymax	Panamax	Capesize
Deadweight tonnage	25,000-50,000 DWT	60,000-80,000 DWT	180,000 DWT ¹
Length Overall (LOA)	630 ft.	965 ft.	1020 ft.
Beam	105 ft.	106 ft.	148 ft.
Loaded Draft (Max.)	39 ft.	46 ft.	51 ft. ¹
Dredging Depth	No Dredging	No Dredging	No Dredging ¹

¹ Capesize ships, due to the existing 51 feet of draft with no plans for dredging, will be lightly loaded to an approximate maximum of 130,000 tonnes.

8.3 Mooring operations

No mooring operations studies are proposed at this stage of the project and it is assumed that Capesize vessels can be moved into position to moorage facilities that will be designed to accept the design vessel.

8.4 Dredging

No dredging is proposed to increase the design draft conditions. However, maintenance dredging will be required to maintain the design draft at the berth.

9 Mechanical

9.1 General

Mechanical equipment will be selected based on modern material handling systems utilizing automation where reasonable to increase efficiency. Conveyance systems will be designed to Conveyor Equipment Manufacturers Association (CEMA) standards.

The mechanical systems will include:

- Railcar unloading equipment.
- Stacking, reclaiming and storage equipment.
- Conveyors for feeding, stacking and reclaiming.
- Ship loading equipment.

9.2 Railcar Dumpers

Requirements for the railcar dumpers can be found in Table 9-1.

Table 9-1. Railcar Dumper Requirements

Properties	Commodity A	Commodity B
Type	Bottom Dump	Bottom Dump
Railcars	North American Covered Hopper Cars ¹	North American Closed Top Hopper Cars
Gross Weight	130 tonnes	130 tonnes
Net Capacity	110 tonnes	110 tonnes
Number of Dumpers:	1	1
Railcar Positioning Method	Switching Locomotive or Indexer	Switching Locomotive or Indexer
Design Dump Cycle Time	See Simulation	See Simulation

¹ Removable, fiberglass covers

9.3 Conveyance

9.3.1 Troughed Belt Conveyors

Commodity A

Commodity A conveyors will be 48 or 84 in. equipped with 45° CEMA class C6 or E7 idlers, troughed fabric belts, electric drive units and remote gravity take-ups and a maximum angle of 15 degrees. Where practical, drive units will be located at ground level with vehicle access. All conveyors will be housed in fully-enclosed galleries with single sided walkways and designed with ample access to tail pulleys and other critical areas for maintenance.

Commodity B

Commodity B conveyors will be 48 in. equipped with 35° CEMA class C6 idlers, troughed fabric belts, electric drive units and remote gravity take-ups and a maximum angle of 15 degrees. Where practical, drive units will be located at ground level with vehicle access. All conveyors will be housed in fully-enclosed galleries with single sided walkways and designed with ample access to tail pulleys and other critical areas for maintenance.

9.3.2 Pipe Conveyors

Pipe conveyors will transport material from the railcar dumper to storage. The pipe conveyor will be ø23 in., equipped with electric drive units and gravity take-ups. The pipe conveyor will be of a self-carrying design that includes a single-sided walkway, top cover and expanded metal guarding along each side.

9.3.3 High-Angle Conveyors

High angle conveyors will be used to move material from the unloading pit to the pipe conveyors. The high-angle conveyors will be approximately 72 in. wide with 16 in. tall side walls equipped with electric drive units, automatic take-up and will be fully enclosed.

9.4 Contaminated Material

Contaminated product diverters will be included to remove material from the reclaim belts, between the storage buildings and shiploaders.

9.5 Storage

9.5.1 Commodity A

Material will be stored in a series of covered longitudinal stockpiles. Stacking to the longitudinal stockpiles will be accomplished by the use of an overhead conveyor and tripper.

The Commodity A storage capacities are:

- | | |
|-----------|-----------------------------------|
| 1. Pile 1 | 105,000 ¹ tonnes total |
| | 105,000 ¹ tonnes live |

- | | |
|-----------|----------------------------------|
| 2. Pile 2 | 75,000 ¹ tonnes total |
| | 75,000 ¹ tonnes live |

Material will be manually reclaimed from the longitudinal stockpiles by dozers into a series of dozer traps.

¹ In the case of segregated storage piles within the storage building, storage building 1 will have an estimated capacity of 84,000 tonnes, building 2 will have an estimated capacity of 55,000 tonnes.

9.5.2 Commodity B

Material will be stored in a concrete storage dome(s). The storage dome(s) will be filled from the top and include a dust collection system.

The Commodity B storage capacities are:

- | | |
|-----------|---------------------|
| 1. Dome 1 | 60,000 tonnes total |
| | 50,000 tonnes live |

Material will be reclaimed from the storage dome(s) by gravity onto a series of reclaim conveyors in above ground tunnels underneath the dome(s).

9.6 Sampling

9.6.1 Commodity A

Three-stage automatic sampling will take place on the outgoing product flows at the East shiploader.

9.6.2 Commodity B

Automatic sampling is not required for the Commodity B system.

9.7 Shiploading

9.7.1 Commodity A

Shiploading will be accomplished with the use of dual telescoping quadrant shiploaders. Each shiploader will be equipped with loading spoons for hatch trimming. The shiploaders will be design to accommodate wash down of system between shipments.

9.7.2 Commodity B

Shiploading will be accomplished with the use of a fixed, shuttling, slewing shiploader, utilizing a cascade type loading chute.

9.7.3 Shiploader control

Shiploaders will be controlled by remote control boxes from the decks of the ships, with backup control stations located on the shiploaders.

9.7.4 Shiploader Chute/Spout Maintenance

Over the dock access will be provided for cleaning and maintaining loading chutes and spouts.

9.8 Dust Control

9.8.1 Commodity A

Dust will be controlled by:

- Dry fog and/or water sprays at the covered railcar dumper building.
- Covered bulk material storage buildings.
- Enclosed transfers.
- Enclosed/Covered conveyors.
- Dry fog and/or water sprays at transfer points and stockpiles.

9.8.2 Commodity B

Dust will be controlled by cartridge style, pulse-jet, dust collectors or bin vents:

- Unloading boots, enclosed hopper and dust collection at the covered railcar dumper building.
- Enclosed storage domes with dust collection.
- Enclosed conveyor transfers.
- Covered conveyors.
- Dust Collection at transfer points and shiploader, as required.
- Dust collectors will be provided with rotary air locks.

10 Structural

10.1 General

Structural design and development of loads will be based on the California Building Code and ASCE 7. It is anticipated that soil conditions will require ground improvements and pile supported foundations for all major equipment and storage buildings to mitigate settlement and seismic hazards associated with liquefaction.

Design of the marine structures will be in accordance with ASCE/COPRI 61-14 and utilize non-linear seismic analysis methods in the detailed design phase. It is assumed that any construction activities utilizing or affecting the existing wharf will be further investigated, and may include the need for a structural condition assessment and analysis of the existing elements for the temporary loads associated with mobile crane outriggers and any other construction loads. It is also anticipated that some lighter structures may be supported directly by the existing wharves which could potentially require wharf repairs depending on the outcome of the condition assessment.

10.2 Live Loads

The vehicular/access lanes of the dock and trestle will be designed to an HS20-44 highway load, or a 20T mobile crane (whichever controls based on span length). Conveyor galleries and access platforms will be designed for a 60psf live load.

10.3 Wind Loads

Design wind speed: $V_{ult}=110$ mph (Exp. C, Risk Category II) per Figure 1609A of the California Building Code.

10.4 Vessel Loads

Mooring and berthing loads for the dock and fender system will be based on Capesize vessels (Approximately 180,000 DWT) Mooring and spring line loads for detailed design will be based on specialized mooring analysis software (OPTIMOOR or similar).

Berthing loads for the fender system and breasting dolphins will assume a vessel approach speed of 0.50 fps (normal to the berth face) and 10 degree approach angle.

10.5 Seismic Loads

Seismic design of the upland structures and foundations will be based on the International Building Code (IBC) and ASCE 7. The following site-specific design parameters were included in the 65% geotechnical report by Berlogar Stevens & Associates listed in Section 3.2:

- S_s : 1.5
- S_1 : 0.6
- S_{MS} : 1.35
- S_{M1} : 1.44
- S_{DS} : 0.9
- S_{D1} : 0.96

**Above seismic parameters based on Site Class 'E'*

Seismic design of the marine structures will be based on the performance-based analysis methods of ASCE/COPRI 61-14. The three seismic performance levels will be as follows:

- Operating Level Earthquake (OLE):
 - 1 in 72 year event (50% probability of exceedance in 50 years)
- Contingency Level Earthquake (CLE):
 - 1 in 475 year event (10% probability of exceedance in 50 years)
- Design Earthquake (DE):
 - 2/3 of Full Maximum Considered Earthquake (MCE); MCE defined as (2% probability of exceedance in 50 years) per ASCE 7

11 Electrical and Controls

11.1 Electrical

Utility electrical power will be delivered to the site by two independent 12.47kV three-phase systems owned by the Port of Oakland or PG&E. At the Point-of-Delivery on the site, utility power will be received at main service electrical room with metering and isolation/protection. Electrical power will be distributed on site at 12.47kV three-phase in an open-loop system (site electrical distribution loop) to area electrical rooms located throughout the site.

Each area electrical room will distribute electrical power to equipment, motors, lighting etc. through unit substation transformers that will step down the voltage to service voltages required.

Electrical Shore Power and Communications will be provided at a vault mounted on the wharf to interface with docked ships, allowing them to connect to the electrical grid (cold ironing).

Power and control cable will be jacketed armored cable suitable for heavy industrial environments. Non-armored cable may be used where installed in cable duct or other enclosed raceway. Cables will be distributed in cable tray where possible.

Uninterruptible Power Supplies (UPSs) will be used to power the Site Control System, select lighting and other services required to be in service after the loss of electrical power.

Drives for conveyors and selected other equipment will include AC motors controlled by Variable Frequency Drives (VFDs).

Generators will be used as the back-up or emergency power source for services that are required to be in service under loss of electrical power, which are too large for a UPS system.

LED lighting will be the primary technology used for lighting throughout the site.

11.2 Controls

The Site Control System will be based on a PLC/SCADA system. A dual-redundant hot backup processor system will be used for the PLC. The SCADA system will provide a graphical and data analysis interface for operation.

The PLC system will utilize remote input/output racks closed to the field instruments, devices and final control elements. The control system will communicate via Ethernet over fiber optic cables to remote racks.

Input/output (I/O) devices will be 4-20mA for analog signals, 24VDC or 120VAC for discrete (on/off) signals. Specialty devices such as RTDs to measure temperature will use RTD signal directly to the PLC I/O.

The SCADA system main Graphical User Interfaces (GUIs) will be located in a Central Control Room located at the Administration Building. Operator Interface Terminals (OITs) will be provided at site area locations where required.

Control will be either Remote or Local. Remote control is operational control through the PLC/SCADA system via the GIUs or OITs. Local control is manual control through Local Control Panels (LCPs) that may include pushbuttons, selector switches, pilot lights, drive interface terminals, etc.

Major equipment, for example shiploaders, may have on-board, stand-alone control systems. These control systems will be specified to be compatible with the Site Control System. Communications to stand-alone equipment will be Ethernet over fiber optic cable. The Site Control System will monitor and/or provide supervisory control through the communications link. Exceptions would be any emergency signals that would require hard-wiring.

The rail unloading facilities will have an independent control system. This system will be compatible with and linked to the downstream control system. Only when the downstream control system is configured for material transfers, and verified, will the rail unloading system be allowed to initiate transfers.

12 Infrastructure

12.1 Rail Systems

A rail system, designed to meet with BNSF and UP Industrial Track Standards will be used for receipt and processing of unit trains. There will be an arrival and departure spur from the mainline to the facility. Unit trains will be processed in approximately 26-car segments through discharging into a below grade dumping pit and conveyance system. The 26-car segments will be pulled or pushed through the dumping stations either by a switching locomotive or an indexer, which will be evaluated during preliminary engineering.

12.1.1 Train and Railcar Data

The design calls for incoming trains of 104 railcars to be split in and handled on 26 railcars "ladder type" storage tracks. Commodity A railcars are expected to be bottom dump aluminum construction, closed top hopper cars, with gross weight of 130 tonnes, cargo capacity of approximately 110 tonnes. Commodity B railcars are expected to be steel construction, closed top, bottom dump hopper cars, each with approximately 90 tonnes of cargo capacity.

Commodity A cars will be bottom hopper, rapid discharge style cars, with removable, fiberglass covers.

Commodity B cars will be 60 ft. long, closed top hopper cars. Variable configurations and numbers of hoppers are anticipated. The Commodity B cars will be unloaded in a stationary position. Pneumatic gate opening/closing devices will be used.

12.2 Site Preparation

12.2.1 Clearing and Grubbing

Clearing, grubbing and top soil stripping is to be done only where required leaving as much of the existing vegetation as practicable. The design will:

- Establish vegetation clearing, grubbing, and over-stripping requirements.
- Determine the applicable regulations and restrictions for disposal of materials through discussions with appropriate authorities.

12.2.2 Temporary Spill Containment and Erosion Control

The design will:

- Establish the regulations surrounding the disposal of site runoff into off-site water courses through discussions with the appropriate authorities.
- Provide the necessary containment facilities for products of erosion and oil spills originating from construction activities and equipment operation, etc.
- Provide appropriate best management practices to treat site runoff and prevent siltation of natural water courses.

12.2.3 Ground Improvement

Ground improvements will be based on Geotechnical Engineers recommendations, it is assumed that some type of ground improvement will be required for the Commodity A storage building for support of the Commodity A stockpile. An appropriate recommendation for the type and extent of ground improvement will be determined, after additional geotechnical studies, during detail engineering.

12.2.4 Demolition

Demolition is being done by the Owner and is assumed to be completed prior to the start of site work

12.2.5 Earthworks

Re-grading of the site to create appropriate base grades for the new facilities. It is assumed that grading will be driven by the requirements of operations of the new facilities and other design constraints rather than trying to achieve an earthwork balance.

The design will establish the approximate extent of excavation, import and export required in accordance with the recommendations of the Owner's Geotechnical Engineer. Surplus material will be disposed of as directed by the Owner's representative. Disposal of contaminated soil is not anticipated.

12.2.6 Hazardous Materials

The site may contain toxic or hazardous materials. If present, these materials and subsequent mitigation strategies will be established by others, with a specific focus on

determining areas of potential soil contamination and establishing the nature and extent of remediation required.

The design will assume no hazardous materials findings.

12.3 Surfacing

The design will account for surfacing materials in and around the new facilities to allow for the movement of personnel and equipment, and to direct surface runoff water away from facilities to drains and ditches. In general, the surfacing will include:

- Pavement where vehicular or access ways warrant.
- Gravel for pedestrian paths and maintenance areas.
- Grass or vegetation for low use areas and landscaped areas.

12.4 Roads/Vehicular Access

The design will specify on-site access roads that connect buildings and maintained facilities. Roads will be designed in accordance with the following specifications:

- Maximum grade: 10%
- Minimum centerline radius: 50 ft.
- Minimum traffic (traveled way) width (2 lanes): 16.5 ft.
- Minimum vertical clearance: 16 ft.
- Cross slopes: 2%

Pavement thickness design is to be provided by Owner's Geotechnical Engineer. Additional turning radii accommodations for large delivery equipment and mobile maintenance equipment may be considered for access ways depending on operations requirements identified to the Engineer by the Owner.

12.5 Site Drainage

Site drainage for stormwater surface runoff will be facilitated through the use of stormwater management facilities that could include open channel and underground gravity conveyance systems, stormwater pump stations/force main systems, and stormwater detention/infiltration and treatment systems. The design will establish the appropriate methodologies for sizing stormwater management facilities based on local requirements for stormwater quality and flow control.

Low Impact Development (LID) techniques will be considered for accomplishing local stormwater quality and flow control standards. LID techniques may include reducing impervious surfaces where practical and utilizing infiltration where feasible as determined by the Owner's Geotechnical Engineer. Excess stormwater will discharge through an approved and permitted outlet. Opportunities for storing and reusing stormwater for process or dust suppression may be considered depending economic feasibility.

The drainage design will evaluate and select best management practices for site specific source controls where appropriate. Process water contacting bulk materials or used for facility maintenance will have drainage collection systems separate from stormwater runoff collection facilities. Bulk materials handled on site will be covered in storage buildings and enclosed/covered conveyors to provide environmental protection during material transfers.

12.6 Water Systems

The design will include water systems for Potable Water, Process Water, and Fire Water.

- Potable Water will be sourced by a metered connection from the local purveyor. All pipe and materials for the potable water system will conform to requirements of the local purveyor and health authority. Potable water supply and metering for arriving ships will be provided.
- Process Water will be sourced from potable water by an approved backflow prevention device. Process water may also include treated water from onsite recycling operations and from collected stormwater where connected internal to the process water system and protected by backflow prevention device.
- Fire Water will be sourced from potable water following an approved backflow prevention device.
- The design of all water mains, including those not designed to provide fire protection, will be subject to hydraulic analysis and sized based on flow demands and pressure requirements.

12.6.1 Materials

Pipe, fitting, valve and fire hydrant materials will conform to the latest industry standards and local requirements. Plastic pipe may not be used in locations with potential exposure to petroleum products.

Packing and jointing materials will meet applicable standards. Pipes having mechanical joints or slip-on joints with rubber gaskets are preferred. Normally:

- Cement mortar-lined, push-on joint, ductile iron will be used for areas subject to mostly truck traffic and heavier, off-road wheel loads, or where cover is less than 3 ft.
- C900 polyvinyl chloride pipe will be used elsewhere, to a maximum 12 in. diameter.
- Galvanized Steel Pipe Schedule 40 will be used for process water.

12.6.2 Valves

- The design will provide shut-off valves on water mains to provide appropriate shut down for maintenance and operations activities.
- The design will provide means of removing air, such as hydrants or air relief valves, where air can accumulate at high points within water mains.
- A combination air/vacuum relief valve will be provided at the crest (highest) point of the water main.

12.6.3 Cross-Connections and Inter-Connections

The design will not connect the water distribution system to any pipes, pumps, hydrants or tanks that may contain unsafe water or other contaminating materials and that may be discharged or drawn into the distribution system.

12.7 Vacuum Systems

Locations in the facility that handle Commodity B will be equipped with vacuum collection headers to allow for dry clean up of fugitive materials. These vacuum systems will consist of hose connections in process areas that connect to a main header leading to a vacuum-truck accessible location.

12.8 Fire Protection

12.8.1 General

The fire protection system will be designed, installed, tested and inspected to NFPA standards. Materials and equipment used in the fire protection system will meet Underwriters Laboratory and Factory Mutual requirements.

The local fire authority will approve the final design, equipment selection, and layout of the fire protection system.

12.8.2 Piping, Fire Hydrants and Hose Cabinets

Fire protection system water mains will conform to NFPA 24, with a minimum size of NPS 6, a minimum operating pressure of 55 psi, and a pressure drop as described in NFPA 24.

The design will specify approved fire hydrants where required by code. In accordance with NFPA 307, fire hydrants will be located no closer than 40 ft. from any major building, at intervals no greater than 300 ft., no less than 150 ft. from a dead head, and such that each facility is within reach of at least two hydrants. The hydrant opening size will be 2.5 in. and the most remote hydrant will have a minimum residue pressure of 20 psi with a minimum flow rate of 1000 gpm.

12.9 Wastewater Systems

The design will include water systems for Sanitary Waste Water and Process Waste Water.

- Sanitary Waste Water will be discharged to the sewer system operated by the local purveyor and will comply with the permit regulations associated with discharge. All pipe and materials for the Sanitary Waste Water system will conform to requirements of the local purveyor and health authority.
- Process Waste Water will be conveyed to an onsite treatment facility for either recirculation onsite as Process Water or for discharge as appropriate, either as stormwater or sanitary wastewater.

- The design of all wastewater mains will be subject to hydraulic analysis and sized based on flow demands and pressure requirements.
- Underground wastewater pipelines will be designed with at least 3 ft. of cover.

12.9.1 Pipe Materials

The design will use the following pipe materials, which will be selected to suit the physical and chemical properties of the liquids they convey:

- Fiberglass reinforced plastic pipe: Pipe lengths will be joined using bell-and-spigot joints or a butt-and-strap technique. Bell-and-spigot pipe joint gaskets will be made of appropriate synthetic materials to suit the liquid being carried by the pipe.
- High-density polyethylene pipe: Pipe lengths will be joined using butt fusion methods or flanges.
- Polyvinyl chloride pipe: Pipe lengths will be joined using bell-and-spigot gasketed joints or solvent welds.
- Stainless steel (SAE grade 304) or epoxy-lined and coated mild steel pipe (for exposed pipelines): Pipe lengths will be welded or joined using flanged or Victaulic couplings.
- Sewer pipelines will be designed with at least 2 ft. of cover below sub-grade where they pass under heavily traveled roads.

12.9.2 Force Mains

Force mains will be designed to maintain a minimum fluid velocity of 3 ft/s and a maximum velocity of 11.5 ft/s. Force mains will aim to rise continuously toward an outlet without local high points. An automatic air relief valve will be provided at each high point in the force main to prevent air locks.

A combined air/vacuum relief valve will be provided at the crest (highest point) of each force main. Force mains will enter the gravity system at a point not higher than 2 ft. above the flow line of the receiving manhole.

12.9.3 Water Pumping

Pumps shall be provided for locations where pumping is required.

Submersible pumps shall be used where possible and designed to handle slurry flow with a solid weight concentration of up to 1%.

Pumps shall be controlled by level instruments and preference shall be given to pumps that can run dry.

12.10 Cable Trenches

It is assumed that duct banks will convey main underground systems outside of areas where they can be conveyed by above ground structures on cable trays.

12.11 Security and Fencing

To the west side of the facility is a public access area. There will be fencing and screening placed along this area to provide control access and provide visual separation.

12.11.1 Parking

Parking for ILWU, administrative staff and visitors will be provided outside of secure facility.

12.12 Office and Maintenance Facility

There will be an administration/maintenance building located between the entrance and the stockpile area. The administration/maintenance building will be approximately 7,500 ft².

12.13 Dock Office

An approximate 200 ft² dock office with Internet, Ethernet, HMI and phone access.

12.14 Gangway Access

Gangway access to provide safe access to all ships will be provided.

12.15 Operating and Maintenance Vehicles

Mobile equipment such as forklifts, wheel loaders, boom trucks, welders, service trucks, pickups, and light utility vehicles are assumed to be required, but will be specified and provided by the terminal.