LOOP Bi-Directional Main Oil Line
Environmental Impact Analysis
September 2017

This analysis addresses the potential impacts of minor facility alterations to render the LOOP Main Oil Line capable of operating in a bi-directional mode to facilitate vessel loading operations at the Port. Amendments to the Port's Operations Manual directly addressing such operations have been submitted to the U.S. Coast Guard Captain of the Port, Morgan City and the Executive Director of the Offshore Terminal Authority for review and approval. Operations of the Deepwater Port are covered in detail in the Final Environmental Impact Statement for the LOOP Deepwater Port Project as well as in the ongoing Environmental Monitoring Program (EMP) required by the federal and state licenses issued to LOOP. This analysis supplements the EIS and EMP reviews by specifically addressing the federal actions required to enable the proposed facility alterations and Operations Manual Amendments.

The original design and configuration of the Deepwater Port supports the ability to load vessels out of the Marine Terminal and loading operations are authorized by LOOP's current license. The alterations and amendments proposed at this time will facilitate LOOP's exercise of this existing authorization. This analysis has been prepared with the support of CK Associates, the Environmental Monitoring Program contractor, and supplemented by input of Dr. James Richardson, Alumni Professor of Economics and Public Administration at Louisiana State University as well as other subject matter experts available to the licensee.

I. Description of Proposal:

Two federal actions are requested by LOOP:

A. Coast Guard approval of minor alterations to valves and pumping systems at the SPMs and offshore platform. These alterations are discussed in detail in the July 17 and August 17, 2017 submittals to the USCG and LOTA (the Submittals).

B. Coast Guard approval of amendments to LOOP's Operations Manual directly addressing vessel loading operations. The proposed amendments are shown in redline version as part of the above Submittals.

II. Alternatives:

LOOP believes that the proposed alterations represent the most advanced available technology and that the proposed loading processes called for by the Operations Manual Amendments are fully compliant with industry best practices. LOOP is ready, however, to implement all reasonable Coast Guard recommendations regarding these issues. "No Action" is not a permissible alternative in these circumstances both because the applicable Coast Guard regulations require action and because 42 U.S.C. 6212a (b) specifically prohibits imposition by any government official of any restriction (presumably by either action or inaction) on the export of crude oil. The Coast Guard must approve the proposed alterations and amendments unless it finds that the proposals fail to fulfill the Deepwater Port Act's requirement for continuing utilization of best available technology or otherwise fail to conform to the requirements of the Deepwater Port Act or other applicable legal requirements. No authorizations or permits from other federal agencies are required.

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III. Best Available Technology Demonstration and Assessment of Potential Impacts:

First, as demonstrated in the USCG Submittal attached as Annex A[1], the minor facility alterations contemplated by this proposal have been designed in conformity with the highest professional standards and are fully compliant with current industry best practices. No environmental impacts will result from their installation. Second, as demonstrated by the following analyses, the loading procedures contemplated by the proposed Operations Manual amendments would substantially advance the available loading technology and would substantially reduce both the environmental risks and potential environmental impacts associated with loading operations.

A. ***General*** - The current vessel loading process for crude oil in the Western Gulf and bordering states involves the loading of small to medium range tankers at onshore facilities and lightering in the Gulf to VLCC or ULCC carriers. Loading at LOOP's offshore facility is a far superior technology in that it: 1) substantially reduces small tanker and service vessel congestion in the Mississippi River and Texas ports and avoids risks inherent in lightering, thereby significantly reducing the risk of accidents and resulting oil spills; 2) substantially decreases air emissions associated with the loading process; 3) substantially improves the efficiency of loading operations and thereby reduces fuel consumption and waste of assets. LOOP does not expect that loading operations at the Port will have a significant impact on either domestic oil production or level of exports. The primary effect of LOOP's proposed loading operations will be to displace the riskier and less efficient transfer operations which are currently being utilized with safer, more efficient, technologies. No construction permits are required for the minor facility modifications required for the Bi-Directional Main Oil Line.

B. ***Air Quality*** – Emissions from LOOP's Marine Terminal and Vessels receiving cargos at the terminal are regulated, exclusively, by the Department of Interior under the Outer Continental Shelf Lands Act. Emissions from the loading operations contemplated by LOOP are well below the level determined to be "significant" pursuant to the specified formula and are thus "exempt" under the applicable DOI regulations (calculations attached as Annex B). Any emissions above the "significance" level established by the DOI regulations may be subject to offset requirements which LOOP would be fully prepared to fulfill.

Oil Spill Risk –The LOOP deepwater port complex is constructed, operated and maintained in accordance with the philosophy that spill prevention is the first line of defense in emergency response. From 1981 through July 31, 2017, LOOP has offloaded approximately 10.49 billion barrels of oil and experienced no significant spills during its operations. The original Environmental Impact Statement prepared for the proposed deepwater port complex projected five barrels of oil would be spilled for every one million barrels unloaded. The facility has received over 10, 150 vessels during this period and less than 5% have experienced any issues resulting in the release of oil. The actual volume spilled to date is approximately 2.6% of the EIS projection. To attain this operationally excellent standard, numerous preventive and response measures were incorporated in the design and operation of all components of the complex. Additionally, detailed emergency plans have been developed and a broad cache of response resources maintained, which together are routinely tested.

[1] July 17 and August 14, 2017 submissions to MARAD and U. S. Coast Guard. Copies of submission documents are on file with LOTA and USCG COTP.

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C. ***Safety Considerations -***

Pre-Modification Tests

Prior to proceeding with the proposed modifications to facilitate vessel loading, a number of tests have been performed to properly evaluate the system design and performance. The movement of oil from the Clovelly facility to the Marine Terminal is very similar to the movement of crude oil from Clovelly to the LOCAP St. James facility. Cavern pressure is used to provide the energy required to flow the crude oil to its final destination. Pressure and flow control valves are used to control the flow and surge relief valves are used to mitigate events. LOOP has contracted DNG GL Oil and Gas to develop a hydraulic model of the loading operation. The model developed using SynerGi Pipeline Simulator software is used to simulate events and test the system performance. Initial simulation and tests have been performed to analyze potential pressure surge events. Additional tests have been performed to analyze system performance during start-up and shutdowns and the resulting data used to develop engineering, administrative and operational controls to ensure safe operation of the system. The operational controls are detailed in the Operations Manual delivered as part of the Submittals.

Inert Gas System

Ships are fitted with an inert gas system to purge the cargo tanks until the concentration of hydrocarbon vapors in the cargo tanks has been reduced significantly to be considered gas free. This minimizes the hazards due to the dispersal of flammable vapors in the atmosphere and to flammable mixtures in a cargo tank. Instruments in the cargo tanks measure the oxygen concentration. Once gas free, loading operations can commence. Each cargo tank is fitted with a vent line connect to the main riser which is fitted with a pressure/vacuum valve to regulate the pressure and vacuum in the cargo tanks. The mast risers fitted with flame arrestors are typically over 20 ft. above the deck.

Overfill Prevention Systems

Ships are equipped with multiple redundant systems that together prevent an overfill event. Engineering, Administrative and Operational controls are also in place. High-level alarms and overfill alarms, together with gauging and tank filling procedures are in place to prevent an overfill scenario. In the case of an incident, the ship's deck is curved to provide containment and prevent a spill. Loading operations are constantly monitored by LOOP and ship personnel. A loading plan is submitted to LOOP prior to the start and its careful monitored to ensure no unexpected changes in operation. LOOP's Mooring Masters remain on board throughout the berthing and loading operation. They are equipment with a radio and an Emergency Shutdown (ESD) tone which keeps them in constant communication with LOOP's Oil Movement Controllers and provide the ability for shutting down loading operations.

Ultimately, the project has been designed and will be implemented with multiple measures place to further the goal of protecting life, the environment and general marine safety.

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Water Quality and other Ecological Impacts – The Bi-directional Main Oil Line project has very little potential to adversely affect water quality in the project area because the LOOP facility is already constructed and operating. Increased turbidity/suspended sediment in water quality associated with construction activities will not occur because the proposed project does not include any construction activities. Existing wastewater discharges have minimal environmental impacts to receiving waters because existing wastewater discharges are permitted and monitored in accordance with state and federal permits and have not caused or exhibited degradation of water quality. No additional wastewater discharges are anticipated by the proposed project. Accidental releases provide the only potential to adversely affect water quality. However, the facility is designed and operated to minimize accidental releases through structural controls, non-structural controls, and strict operating procedures. Agencies with oversight responsibilities relative to historical resources and other cultural concerns have been engaged in the review of the Bi-Directional Main Oil Line project and no issues or concerns have been presented.

Socio-Economic Impacts – Lafourche and St. James parishes are very reliant on businesses in Transportation and Warehousing such as LOOP LLC and Manufacturing especially as compared to the rest of the state as indicated by the following comparisons: 14% of the business establishments in Lafourche ad St. James parishes are in Transportation and Warehousing and Manufacturing compared to only 7% of all business establishments in Regional Labor Markets 1 and 3 and about 7% of all business establishments statewide; 29% of the employment in Lafourche and St. James parishes are in Transportation and Warehousing and Manufacturing compared to 12% of the employment in the overall regional labor markets and 11% of employment statewide; and, 45% of the earnings in Lafourche and St. James parishes come from Transportation and Warehousing and Manufacturing compared to 17% in the regional labor markets and 16% statewide.

Maintaining the movement of oil through LOOP maintains expenditures by LOOP on its business operations. These expenditures support jobs, earnings, and state and local tax revenues in Lafourche and St. James parishes and throughout the state of Louisiana. In Lafourche and St. James parishes we estimate maintaining from 78 to 311 jobs with earnings of $5.7 million to $22.8 million depending on maintaining expenditures by LOOP LLC from $25 million to $100 million. Statewide, the numbers might seem relative small; however, in Lafourche and St. James parishes the jobs and earnings estimates are substantial and will have ripple effects through all sectors of the local economy. In addition, LOOP pays directly about $4.53 million in state and local taxes.

IV. Conclusion:

The minor alterations and Operations Manual amendments proposed by LOOP promote marine safety and reduce the risk of environmental damage. No foreseeable significant environmental or other impacts associated with implementation of these proposals have been identified.

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ANNEX A

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ANNEX B

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Loading Loss Emission Calculations
LOOP Marine Terminal Bi-directional Pipeline Project

Attached please find Loading Loss Emission Calculations for the LOOP Marine Terminal's Bi-directional Pipeline Project.

The Department of the Interior ("DOI") has jurisdiction over OCS air pollutant emissions sources in federal waters in the western Gulf of Mexico, and LOOP's operations, located in the Gulf of Mexico west of 87.5 degrees longitude, are subject to DOI regulation.

The regulations governing the air quality program are found at 30 C.F.R. Part 500. Sources subject to DOI's regime must comply with standards similar to those which EPA enforces only if their emissions would "significantly affect" a state's air quality. DOI applies a two-step exemption and significance determination approach. The projected emissions of volatile organic compounds ("VOCs") from any facility which is not exempt based on the analysis described below will be deemed to significantly affect the air quality in the nearest onshore area.

To determine whether a facility is exempt from further air quality review, the highest annual-estimated total amount of emissions of each air pollutant, from the facility and vessels serving it is compared to the emission exemption amount for each air pollutant calculated using the formulas provided. For volatile organic compounds ("VOCs"), the primary concern for an offshore loading facility, the exemption level is calculated by the following formula: $E = 33.3D$ (where E is the emission exemption amount expressed in tons per year, and D is the distance of the proposed facility from the closest onshore area of a State, expressed in statute miles).

The attached calculations are designed to err on the side of caution by taking into account a range of factors that affect emissions, and depict two scenarios utilizing cargos with representative Reid Vapor Pressures ("RVP") of 4 and 8, a range of values between which the crude loaded by LOOP will fall. This yields calculated annual emissions of between 423.54 and 554.64 tons/year. Assuming that the loading operations take place 20.7 statute miles offshore, the maximum allowable VOCs to qualify LOOP for the exemption would be 689 tons/year. Therefore, even in the highest-emissions scenario, LOOP's emissions will not significantly affect the air quality in the nearest on-shore area and meet the standard for exemption from DOI regulation.

LOOP Marine Terminal
Loading Loss Emissions Calculation

Reference:
AP-42, Section 5.2 Transportation And Marketing Of Petroleum Liquids
Equation 2
Loading Loss: $C_L = C_A + C_G$

C_L = Loading Loss, lb/Mgal crude oil loaded
C_A = Arrival emission factor, contributed by vapors in the empty hold before loading, lb/Mgal
C_G = Generated emission factor, contributed by evaporation during loading, lb/Mgal loaded

CA Factor	Hold Condition
0.86	Uncleaned
0.46	Ballasted
0.33	Cleaned/Gas-free

Equation 3

$C_G = 1.84(0.44P-0.42)MG/T$

P = True vapor pressure of loaded crude oil, psia =	2.6
M = Molecular weight of vapors, lb/lb-mole =	50
G = Vapor growth factor = 1.02	1.02
T = Temp of vapors, R =	528.08
Assumed weight percentage that is VOC =	85%

All values per TANKS4.09 for RVP4 Crude as used in the Clovelly Farm emissions basis
Factors and formulas from AP-42 are for TOC, assume 85% is VOC per AP-42 guidance.

Calculated Laoding Loss (lb VOC/Mgal)

C_L =	**0.840**	**Uncleaned**	<-- Selected
	0.500	Ballasted	
	0.390	Cleaned/Gas-free	

VLCC Loaded/yr =	12	
VLCC Capacity =	2,000,000	Bbls
Barrels Loaded =	24,000,000	Bbls/yr
Maximum short-term loading rate =	40,000	Bbls/hr

Use the AP-42 emission factor developed based on loading of a previously "uncleaned" ship/barge.
This approach was concurred with by Rob Ferry based on the operational description.

Calculated Annual Emissions =	423.54	tons/yr
Calculated Maximum Hourly Emissions =	1,411.80	lb/hr

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LOOP Marine Terminal
Loading Loss Emissions Calculation

Reference:
AP-42, Section 5.2 Transportation And Marketing Of Petroleum Liquids
Equation 2
Loading Loss: $C_L = C_A + C_G$

C_L = Loading Loss, lb/Mgal crude oil loaded
C_A = Arrival emission factor, contributed by vapors in the empty hold before loading, lb/Mgal
C_G = Generated emission factor, contributed by evaporation during loading, lb/Mgal loaded

Calculated Laoding Loss (lb VOC/Mgal)

C_L =	**1.100**	**Uncleaned**	<-- Selected
	0.760	Ballasted	
	0.650	Cleaned/Gas-free	

CA Factor	Hold Condition
0.86	Uncleaned
0.46	Ballasted
0.33	Cleaned/Gas-free

VLCC Loaded/yr =	12	
VLCC Capacity =	2,000,000	Bbls
Barrels Loaded =	24,000,000	Bbls/yr
Maximum short-term loading rate =	40,000	Bbls/hr

Equation 3

$C_G = 1.84(0.44P-0.42)MG/T$

Use the AP-42 emission factor developed based on loading of a previously "uncleaned" ship/barge.
This approach was concurred with by Rob Ferry based on the operational description.

P = True vapor pressure of loaded crude oil, psia =	6.514
M = Molecular weight of vapors, lb/lb-mole =	50
G = Vapor growth factor = 1.02	1.02
T = Temp of vapors, R =	528.08
Assumed weight percentage that is VOC =	85%

Calculated Annual Emissions =	554.64	tons/yr
Calculated Maximum Hourly Emissions =	1,848.81	lb/hr

All values per TANKS4.09 for RVP8 Crude as used in the Clovelly Farm emissions basis
Factors and formulas from AP-42 are for TOC, assume 85% is VOC per AP-42 guidance.

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