Cayucos Sustainable Water Project - Ocean Outfall

Initial Environmental Study

Technical Attachments

- Technical Memorandum- CSWP Ocean Outfall Marine Construction Range of Effects and Proposed Mitigation, Miller Marine Science and Consulting, September 2018

- CSWP Ocean Outfall CalEEMod Tables, MIG, November 2018

- Hydrodaynamic Analysis of DIfffuser Retrofit to the Estero Marine Terminal Pipeline for the CSWP, Michael Baker International, July 2018

- Estero Marine Terminal Decommissioning PEP Appendices, Padre 2016:
 E-Preliminary Marine Wildlife Contingency Plan,
F-Oil Spill Response Plan,
C- Contaminated Materials and Management Plan

Technical Memorandum

Date: September 8, 2018
Prepared For: Mr. David Foote, Firma
Prepared By: Mr. Eric Miller, Miller Marine Science & Consulting, Inc.
Subject: Cayucos Sustainable Water Project Ocean Outfall Marine Construction Range of Effects and Proposed Mitigation

BRIEF PROJECT SUMMATION

The Cayucos Sustainable Water Project Ocean Outfall (Proposed Project) includes repurposing a no longer used oil terminal loading line (Load Line 2 or LL2) as a new wastewater outfall. After Chevron Pipeline Company, LL2 current owner, cleans the line to the extent possible a slip sleeve will be inserted in the line to further isolate and seal the native steel pipe that may have legacy hydrocarbon contamination from its prior uses. Within this sleeve, a high-density polyethylene pipe (HDPE) will be pulled shoreward into the pipe after being introduced at the seaward terminus. The HDPE will serve as the new ocean outfall pipeline. At the offshore terminus of the HDPE, a multiport diffuser will be installed to maximize mixing and dilution of the wastewater effluent. The effluent being of substantially lower density than the receiving waters will be buoyant at discharge and float towards the surface as it mixes. Hydrodynamic modeling of the diffuser design and operation indicates no scour or sediment redistribution at the point of discharge. A thermocline marks a sharp, natural change in ambient water density. In the project area, a thermocline exists near the sea surface. This thermocline will act as a boundary for the buoyant plume trapping it beneath and preventing it from reaching the water's surface. The installation and operation of this diffuser present possible environmental impacts that are evaluated during an environmental review in compliance with the California Environmental Quality Act (CEQA) requirements.

The proposed project is similar to the proposed Large Organism Exclusion Device (LOED) proposed and permitted for the San Onofre Nuclear Generating Station located in northern San Diego County near San Clemente, California (SLC 2012). The LOED project required the installation of a coarse-mesh enclosure over the two primary offshore intake structures used by the generating station to withdraw seawater for cooling. The enclosure's purpose was to reduce or eliminate the take of marine mammals and sea turtles into the cooling water system. As with the Proposed Project, the LOED installation was going to involve minimal disturbance to subtidal communities. A large construction barge was needed as the primary work platform to install the LOEDs. Tugboats were to transport the barge and position it at the worksite, while a crew boat would carry the construction team to and from the project site each day.

As with the Proposed Project, each LOED was to be gravity secured using concrete blocks (for the LOED) or cradle (for the diffuser). No pile driving was proposed for the project. All LOED components would be fabricated dockside and transported to the project site. In the case of the LOED, all parts would be loaded on the barge while in port and transported to the project site. The State Lands Commission certified the Mitigated Negative Declaration for the LOED project in October 2012. Due to the generating station closure in June 2013, the LOED project was dramatically scaled back in response to the sharp decrease in cooling water needed. The final disposition was to wrap each intake structure (primary and auxiliary) with 9-in square mesh, therefore complying the California State regulations for power plant cooling water intakes.

The LOED project may serve as a reasonable template for the Proposed Project's anticipated impacts and potential mitigation measures to ensure no significant impact to the marine environment occurs from the Proposed Project.

CONSTRUCTION METHOD ASSUMPTIONS

On August 2, 2018, Mr. David Foote provided a summary of a meeting he had with Mr. Mark Steffy of Longitude 123 to discuss possible marine construction methods for the Proposed Project.

1. An HDPE pipe will be pulled through the existing steel LL2 pipe with no excavation needed. Possible excavation will be required if the HDPE cannot be safely navigated around 30-degree bend in LL2 under the beach. If required, this excavation will be conducted under a new or amended permit.
2. Offshore equipment will include: one 200-ton barge with diesel generators to support construction equipment and serve as the primary work platform, two tugboats to position the barge, and one crew boat to transport crew between the port and worksite each day.
3. Anchoring the barge, at a minimum, will be needed. The support vessels may need additional anchorage if securing each to the barge is not possible.
4. Offshore construction duration is estimated at four weeks.
5. The HDPE pipe will be assembled in port/dockside and transported to the worksite while floating.
6. Commercial divers will perform all subtidal work.
7. The Offshore diffuser will be constructed dockside and floated out to the worksite with installation by divers.
8. Weighted cradles will be placed on the seabed to support the diffuser.
9. No piledriving is currently planned to support the project.

ANTICIPATED IMPACTS CAUSED BY CONSTRUCTION AND DIFFUSER OPERATION

1. Underwater noise is not expected to reach levels of concern (160 dB) for marine mammals. Pulling the HDPE pipe shoreward through LL2 is not likely to generate concerning levels of noise. Other activities (divers, boat motors, above-water construction machinery) are likewise not expected to produce sound at levels of concern.
2. Placement of the cradles to support the diffuser will create minimal noise, but will likely disturb and temporarily resuspend sediments, as well as cover soft-bottom benthic communities within the footprint of the cradles and diffuser. The minimal turbidity created by the cradle placement will quickly abate in the ambient currents. Mobile organisms will likely move away from the project site in response to the divers and gradual placement of the cradles. Standard construction methods suggest each cradle will be slowly placed on the seabed to minimize danger to the cradle and divers positioning the cradle. This slow approach will induce escape by any mobile fishes in the area.

3. Anchoring could result in an impact if placed on a sensitive habitat such as seagrass beds, kelp beds, or rocky reefs. Sensitive habitats are rare in the area, and the anchoring plan included in the Project Execution Plan prepared by Padre Associates for Chevron (2016) provided considerable information on the location of sensitive habitats in the area.
4. The movement and placement of large equipment and infrastructure can harm marine life if the equipment or infrastructure strikes an animal.
5. Transiting on the ocean, especially with large minimally agile vessels like a barge pose risks for ship strikes with marine mammals and sea turtles that do not swim fast enough to avoid the ship, e.g., dolphins and California sea lions.
6. Uncontrolled release of hydrocarbons due to spills, broken hydraulic lines, or leaky seals on equipment.

PROPOSED MITIGATION

The following mitigation options were proposed for the Proposed Project and are generally consistent with those employed for other projects, including the LOED project.

1. An experienced and National Marine Fisheries Service-certified marine monitor will be on site during all phases of the construction beginning with escorting the crew boat and barge with escort tugboats in the port out to the project site. The monitor will be charged with viewing an area of approximately 100 meters surrounding the transiting vessels or barge, depending on the activities at the time, to watch for slow-moving marine mammals and sea turtles approaching the work site. If a slow-moving marine mammal or sea turtle is observed, the monitor will be empowered to stop the work as soon as can be accomplished safely to allow the animal to leave the 100-meter protection zone. Dolphins, seals, and California sea lions are gregarious and highly mobile animals that are often drawn towards human activities in the marine environment. The potential for injuring one of these healthy animals is minimal due to their agility in the water. Each of these agile animals will be noted and monitored if it enters the protection zone to ensure it is not suffering from an existing ailment or injury that reduces its agility. In the event an injured marine animal enters the protection zone, work will be stopped until the injured animal has transited out of the area or has been retrieved by the appropriate agency (National Marine Fisheries Service or marine mammal rescue center). The appropriate agency will be notified as soon as the animal can be reasonably verified as injured. Verification will include observations of lacerations or other evident open wounds, missing limbs, and uncharacteristic behavior.
2. Before the project initiation, a final anchoring plan will be developed, and the seabed topography will be verified to ensure the proposed anchoring locations are still free of any sensitive habitats. The current anchoring plan will be used as the basis for the final anchoring plan. All anchoring will occur as per the final anchoring plan to ensure no impacts to sensitive habitats occurs.
3. The oil spill response plan provided in the Project Execution Plan will be implemented at all times. This includes maintaining secondary containment around all petroleum storage tanks, avoid fueling equipment while on the open water susceptible to waves and swell,

keep an appropriately stocked oil spill response kit on all vessels to quickly respond to unpredictable spills or leaks.

REFERENCES

California State Lands Commission (SLC). 2012. SONGS Units 2 and 3 offshore large organism exclusion device installation project. Available at: http://www.slc.ca.gov/Info/CEQA/SONGS_LOED.html

Padre Associates. 2016. Project Execution Plan (PEP). Prepared for Chevron Pipeline Company

Cayucos Sustainable Water Project Ocean Outfall

San Luis Obispo County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	0.30	0.00	0

1.2 Other Project Characteristics

Urbanization Rural | **Wind Speed (m/s)** 3.2 | **Precipitation Freq (Days)** 44

Climate Zone 3 | **Operational Year** 2020

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 | **CH4 Intensity (lb/MWhr)** 0.029 | **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Modeler: CPD. This project file is for construction emissions only.

Land Use - User-defined industrial land use inputted to reflect construction emission scenario

Construction Phase - Construction phases reflect project-specific activities (non-marine).

Off-road Equipment - Tie-in equipment based on professional experience

Off-road Equipment - Pipe bend replacement equipment based on professional experience and similar projects in the area.

Off-road Equipment - Pipe pull (non-marine) equipment based on Dynergy Morro Bay Marine Terminal Decommissioning Project. Other construction equipment = winches

Grading - Total acres graded based on disturbance for tie-in and pipe-bend replacement activities.

Trips and VMT - Workers trips assume 2.5 trips per day for 8 workers for tie-in and pipe bend; 2 trips per day workers during pipe pull phase.

On-road Fugitive Dust - % paved road travel set to 99 to reflect travel on sand/dirt access road

Cayucos Sustainable Water Project Ocean Outfall - San Luis Obispo County, Winter

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	100.00	25.00
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tblConstructionPhase	PhaseEndDate	1/15/2019	1/21/2019
tblConstructionPhase	PhaseStartDate	1/16/2019	1/22/2019
tblConstructionPhase	PhaseStartDate	1/15/2019	1/1/2019
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tblGrading	MaterialExported	0.00	100.00
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tblOffRoadEquipment	HorsePower	172.00	238.00
tblOffRoadEquipment	LoadFactor	0.50	0.40
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tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentType		Other Material Handling Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Other Construction Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType		Welders
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tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
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tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
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tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
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tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
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2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	4.4937	34.9242	34.0242	0.0576	16.2605	1.6030	17.8634	1.7601	1.5424	3.3025	0.0000	5,498.5301	5,498.5301	1.0909	0.0000	5,525.8021
Maximum	**4.4937**	**34.9242**	**34.0242**	**0.0576**	**16.2605**	**1.6030**	**17.8634**	**1.7601**	**1.5424**	**3.3025**	**0.0000**	**5,498.5301**	**5,498.5301**	**1.0909**	**0.0000**	**5,525.8021**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	4.4937	11.7042	34.0242	0.0576	16.2605	1.6030	17.8634	1.7601	1.5424	3.3025	0.0000	5,498.5301	5,498.5301	1.0909	0.0000	5,525.8021
Maximum	**4.4937**	**11.7042**	**34.0242**	**0.0576**	**16.2605**	**1.6030**	**17.8634**	**1.7601**	**1.5424**	**3.3025**	**0.0000**	**5,498.5301**	**5,498.5301**	**1.0909**	**0.0000**	**5,525.8021**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**66.49**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Effluent Transmission Tie In	Trenching	1/1/2019	1/14/2019	5	10	Effluent Transmission Tie-in
2	LL2 Pipe Bend Replacement	Grading	1/1/2019	1/21/2019	5	15	30 deg. bend pipe replacement
3	L2 HDPE Pipe Pull (non-marine)	Building Construction	1/22/2019	2/25/2019	5	25	Pipe Pull (non-marine equipment)

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
LL2 Pipe Bend Replacement	Concrete/Industrial Saws	1	10.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Cranes	0	4.00	231	0.29
Effluent Transmission Tie In	Concrete/Industrial Saws	0	8.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Concrete/Industrial Saws	0	8.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Forklifts	0	6.00	89	0.20
LL2 Pipe Bend Replacement	Rubber Tired Dozers	0	1.00	247	0.40
LL2 Pipe Bend Replacement	Graders	0	8.00	187	0.41
Effluent Transmission Tie In	Welders	1	4.00	46	0.45
LL2 Pipe Bend Replacement	Rubber Tired Loaders	1	10.00	203	0.36
Effluent Transmission Tie In	Trenchers	1	10.00	247	0.40
L2 HDPE Pipe Pull (non-marine)	Rubber Tired Dozers	0	1.00	247	0.40
LL2 Pipe Bend Replacement	Excavators	1	10.00	158	0.38
Effluent Transmission Tie In	Tractors/Loaders/Backhoes	1	10.00	97	0.37
L2 HDPE Pipe Pull (non-marine)	Tractors/Loaders/Backhoes	0	0.00	97	0.37
LL2 Pipe Bend Replacement	Welders	1	10.00	46	0.45
LL2 Pipe Bend Replacement	Tractors/Loaders/Backhoes	0	8.00	97	0.37
L2 HDPE Pipe Pull (non-marine)	Other Material Handling Equipment	2	18.00	168	0.40
L2 HDPE Pipe Pull (non-marine)	Other Construction Equipment	2	24.00	238	0.42
L2 HDPE Pipe Pull (non-marine)	Air Compressors	1	18.00	78	0.48
L2 HDPE Pipe Pull (non-marine)	Welders	2	18.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Effluent Transmission Tie In	4	20.00	6.00	8.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT
LL2 Pipe Bend Replacement	4	20.00	12.00	12.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT
L2 HDPE Pipe Pull (non-marine)	7	70.00	10.00	12.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Effluent Transmission Tie In - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3654	14.7260	7.7248	0.0158		0.6875	0.6875		0.6365	0.6365		1,542.6534	1,542.6534	0.4726		1,554.4683
Total	**1.3654**	**14.7260**	**7.7248**	**0.0158**		**0.6875**	**0.6875**		**0.6365**	**0.6365**		**1,542.6534**	**1,542.6534**	**0.4726**		**1,554.4683**

3.2 Effluent Transmission Tie In - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.3600e-003	0.2776	0.0630	6.3000e-004	0.2493	1.6900e-003	0.2510	0.0273	1.6200e-003	0.0289		67.8686	67.8686	3.9600e-003		67.9676
Vendor	0.0544	1.1859	0.3544	2.6500e-003	1.2195	0.0134	1.2329	0.1352	0.0128	0.1480		281.5042	281.5042	0.0136		281.8445
Worker	0.1069	0.0920	0.7861	1.8300e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		181.7510	181.7510	6.8200e-003		181.9215
Total	**0.1697**	**1.5555**	**1.2036**	**5.1100e-003**	**5.4912**	**0.0164**	**5.5076**	**0.5963**	**0.0156**	**0.6120**		**531.1238**	**531.1238**	**0.0244**		**531.7336**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3654	2.9217	7.7248	0.0158		0.6875	0.6875		0.6365	0.6365	0.0000	1,542.6534	1,542.6534	0.4726		1,554.4683
Total	**1.3654**	**2.9217**	**7.7248**	**0.0158**		**0.6875**	**0.6875**		**0.6365**	**0.6365**	**0.0000**	**1,542.6534**	**1,542.6534**	**0.4726**		**1,554.4683**

3.2 Effluent Transmission Tie In - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.3600e-003	0.2776	0.0630	6.3000e-004	0.2493	1.6900e-003	0.2510	0.0273	1.6200e-003	0.0289		67.8686	67.8686	3.9600e-003		67.9676
Vendor	0.0544	1.1859	0.3544	2.6500e-003	1.2195	0.0134	1.2329	0.1352	0.0128	0.1480		281.5042	281.5042	0.0136		281.8445
Worker	0.1069	0.0920	0.7861	1.8300e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		181.7510	181.7510	6.8200e-003		181.9215
Total	**0.1697**	**1.5555**	**1.2036**	**5.1100e-003**	**5.4912**	**0.0164**	**5.5076**	**0.5963**	**0.0156**	**0.6120**		**531.1238**	**531.1238**	**0.0244**		**531.7336**

3.3 LL2 Pipe Bend Replacement - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.7752	0.0000	0.7752	0.4163	0.0000	0.4163			0.0000			0.0000
Off-Road	1.8833	15.9013	13.0642	0.0253		0.7753	0.7753		0.7462	0.7462		2,412.5932	2,412.5932	0.5424		2,426.1524
Total	**1.8833**	**15.9013**	**13.0642**	**0.0253**	**0.7752**	**0.7753**	**1.5505**	**0.4163**	**0.7462**	**1.1625**		**2,412.5932**	**2,412.5932**	**0.5424**		**2,426.1524**

3.3 LL2 Pipe Bend Replacement - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.3600e-003	0.2776	0.0630	6.3000e-004	0.2493	1.6900e-003	0.2510	0.0273	1.6200e-003	0.0289		67.8686	67.8686	3.9600e-003		67.9676
Vendor	0.1088	2.3719	0.7088	5.3000e-003	2.4391	0.0268	2.4659	0.2703	0.0256	0.2960		563.0084	563.0084	0.0272		563.6890
Worker	0.1069	0.0920	0.7861	1.8300e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		181.7510	181.7510	6.8200e-003		181.9215
Total	**0.2241**	**2.7414**	**1.5580**	**7.7600e-003**	**6.7108**	**0.0298**	**6.7406**	**0.7315**	**0.0285**	**0.7599**		**812.6279**	**812.6279**	**0.0380**		**813.5781**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.7752	0.0000	0.7752	0.4163	0.0000	0.4163			0.0000			0.0000
Off-Road	1.8833	4.4857	13.0642	0.0253		0.7753	0.7753		0.7462	0.7462	0.0000	2,412.5932	2,412.5932	0.5424		2,426.1524
Total	**1.8833**	**4.4857**	**13.0642**	**0.0253**	**0.7752**	**0.7753**	**1.5505**	**0.4163**	**0.7462**	**1.1625**	**0.0000**	**2,412.5932**	**2,412.5932**	**0.5424**		**2,426.1524**

3.3 LL2 Pipe Bend Replacement - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.3600e-003	0.2776	0.0630	6.3000e-004	0.2493	1.6900e-003	0.2510	0.0273	1.6200e-003	0.0289		67.8686	67.8686	3.9600e-003		67.9676
Vendor	0.1088	2.3719	0.7088	5.3000e-003	2.4391	0.0268	2.4659	0.2703	0.0256	0.2960		563.0084	563.0084	0.0272		563.6890
Worker	0.1069	0.0920	0.7861	1.8300e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		181.7510	181.7510	6.8200e-003		181.9215
Total	**0.2241**	**2.7414**	**1.5580**	**7.7600e-003**	**6.7108**	**0.0298**	**6.7406**	**0.7315**	**0.0285**	**0.7599**		**812.6279**	**812.6279**	**0.0380**		**813.5781**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.0238	27.6086	30.6443	0.0464		1.5751	1.5751		1.5158	1.5158		4,352.506 9	4,352.506 9	1.0419		4,378.555 4
Total	**4.0238**	**27.6086**	**30.6443**	**0.0464**		**1.5751**	**1.5751**		**1.5158**	**1.5158**		**4,352.506 9**	**4,352.506 9**	**1.0419**		**4,378.555 4**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	5.0100e-003	0.1665	0.0378	3.8000e-004	0.1496	1.0200e-003	0.1506	0.0164	9.7000e-004	0.0174		40.7212	40.7212	2.3700e-003		40.7805
Vendor	0.0907	1.9766	0.5906	4.4200e-003	2.0326	0.0223	2.0549	0.2253	0.0214	0.2466		469.1736	469.1736	0.0227		469.7408
Worker	0.3741	0.3219	2.7515	6.3900e-003	14.0783	4.5800e-003	14.0829	1.5184	4.2200e-003	1.5227		636.1284	636.1284	0.0239		636.7253
Total	**0.4698**	**2.4650**	**3.3799**	**0.0112**	**16.2605**	**0.0279**	**16.2884**	**1.7601**	**0.0266**	**1.7867**		**1,146.0232**	**1,146.0232**	**0.0489**		**1,147.2467**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.0238	0.0000	30.6443	0.0464		1.5751	1.5751		1.5158	1.5158	0.0000	4,352.5069	4,352.5069	1.0419		4,378.5554
Total	**4.0238**	**0.0000**	**30.6443**	**0.0464**		**1.5751**	**1.5751**		**1.5158**	**1.5158**	**0.0000**	**4,352.5069**	**4,352.5069**	**1.0419**		**4,378.5554**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	5.0100e-003	0.1665	0.0378	3.8000e-004	0.1496	1.0200e-003	0.1506	0.0164	9.7000e-004	0.0174		40.7212	40.7212	2.3700e-003		40.7805
Vendor	0.0907	1.9766	0.5906	4.4200e-003	2.0326	0.0223	2.0549	0.2253	0.0214	0.2466		469.1736	469.1736	0.0227		469.7408
Worker	0.3741	0.3219	2.7515	6.3900e-003	14.0783	4.5800e-003	14.0829	1.5184	4.2200e-003	1.5227		636.1284	636.1284	0.0239		636.7253
Total	**0.4698**	**2.4650**	**3.3799**	**0.0112**	**16.2605**	**0.0279**	**16.2884**	**1.7601**	**0.0266**	**1.7867**		**1,146.0232**	**1,146.0232**	**0.0489**		**1,147.2467**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	13.00	13.00	13.00	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Industrial	0.559162	0.032279	0.198583	0.128083	0.030808	0.007362	0.013004	0.019140	0.002385	0.001267	0.005421	0.000811	0.001695

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Cayucos Sustainable Water Project Ocean Outfall

San Luis Obispo County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	0.30	0.00	0

1.2 Other Project Characteristics

Urbanization Rural **Wind Speed (m/s)** 3.2 **Precipitation Freq (Days)** 44

Climate Zone 3 **Operational Year** 2020

Utility Company Pacific Gas & Electric Company

CO2 Intensity (lb/MWhr) 641.35 **CH4 Intensity (lb/MWhr)** 0.029 **N2O Intensity (lb/MWhr)** 0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Modeler: CPD. This project file is for construction emissions only.

Land Use - User-defined industrial land use inputted to reflect construction emission scenario

Construction Phase - Construction phases reflect project-specific activities (non-marine).

Off-road Equipment - Tie-in equipment based on professional experience

Off-road Equipment - Pipe bend replacement equipment based on professional experience and similar projects in the area.

Off-road Equipment - Pipe pull (non-marine) equipment based on Dynergy Morro Bay Marine Terminal Decommissioning Project. Other construction equipment = winches

Grading - Total acres graded based on disturbance for tie-in and pipe-bend replacement activities.

Trips and VMT - Workers trips assume 2.5 trips per day for 8 workers for tie-in and pipe bend; 2 trips per day workers during pipe pull phase.

On-road Fugitive Dust - % paved road travel set to 99 to reflect travel on sand/dirt access road

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	100.00	25.00
tblConstructionPhase	NumDays	2.00	15.00
tblConstructionPhase	PhaseEndDate	1/17/2019	2/25/2019
tblConstructionPhase	PhaseEndDate	1/15/2019	1/21/2019
tblConstructionPhase	PhaseStartDate	1/16/2019	1/22/2019
tblConstructionPhase	PhaseStartDate	1/15/2019	1/1/2019
tblGrading	AcresOfGrading	7.50	0.30
tblGrading	MaterialExported	0.00	100.00
tblLandUse	LotAcreage	0.00	0.30
tblOffRoadEquipment	HorsePower	78.00	247.00
tblOffRoadEquipment	HorsePower	172.00	238.00
tblOffRoadEquipment	LoadFactor	0.50	0.40
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentType		Other Material Handling Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Other Construction Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	6.00	8.00

tblOnRoadDust	HaulingPercentPave	100.00	99.00
tblOnRoadDust	HaulingPercentPave	100.00	99.00
tblOnRoadDust	HaulingPercentPave	100.00	99.00
tblOnRoadDust	VendorPercentPave	100.00	99.00
tblOnRoadDust	VendorPercentPave	100.00	99.00
tblOnRoadDust	VendorPercentPave	100.00	99.00
tblOnRoadDust	WorkerPercentPave	100.00	99.00
tblOnRoadDust	WorkerPercentPave	100.00	99.00
tblOnRoadDust	WorkerPercentPave	100.00	99.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripNumber	0.00	8.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	VendorTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	0.00	70.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	4.4454	34.8667	34.0450	0.0580	16.2605	1.6027	17.8631	1.7601	1.5421	3.3022	0.0000	5,536.6114	5,536.6114	1.0906	0.0000	5,563.8758
Maximum	**4.4454**	**34.8667**	**34.0450**	**0.0580**	**16.2605**	**1.6027**	**17.8631**	**1.7601**	**1.5421**	**3.3022**	**0.0000**	**5,536.6114**	**5,536.6114**	**1.0906**	**0.0000**	**5,563.8758**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2019	4.4454	11.6467	34.0450	0.0580	16.2605	1.6027	17.8631	1.7601	1.5421	3.3022	0.0000	5,536.6114	5,536.6114	1.0906	0.0000	5,563.8758
Maximum	**4.4454**	**11.6467**	**34.0450**	**0.0580**	**16.2605**	**1.6027**	**17.8631**	**1.7601**	**1.5421**	**3.3022**	**0.0000**	**5,536.6114**	**5,536.6114**	**1.0906**	**0.0000**	**5,563.8758**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**66.60**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**	**0.0000**	**2.3000e-004**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Effluent Transmission Tie In	Trenching	1/1/2019	1/14/2019	5	10	Effluent Transmission Tie-in
2	LL2 Pipe Bend Replacement	Grading	1/1/2019	1/21/2019	5	15	30 deg. bend pipe replacement
3	L2 HDPE Pipe Pull (non-marine)	Building Construction	1/22/2019	2/25/2019	5	25	Pipe Pull (non-marine equipment)

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
LL2 Pipe Bend Replacement	Concrete/Industrial Saws	1	10.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Cranes	0	4.00	231	0.29
Effluent Transmission Tie In	Concrete/Industrial Saws	0	8.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Concrete/Industrial Saws	0	8.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Forklifts	0	6.00	89	0.20
LL2 Pipe Bend Replacement	Rubber Tired Dozers	0	1.00	247	0.40
LL2 Pipe Bend Replacement	Graders	0	8.00	187	0.41
Effluent Transmission Tie In	Welders	1	4.00	46	0.45
LL2 Pipe Bend Replacement	Rubber Tired Loaders	1	10.00	203	0.36
Effluent Transmission Tie In	Trenchers	1	10.00	247	0.40
L2 HDPE Pipe Pull (non-marine)	Rubber Tired Dozers	0	1.00	247	0.40
LL2 Pipe Bend Replacement	Excavators	1	10.00	158	0.38
Effluent Transmission Tie In	Tractors/Loaders/Backhoes	1	10.00	97	0.37
L2 HDPE Pipe Pull (non-marine)	Tractors/Loaders/Backhoes	0	0.00	97	0.37
LL2 Pipe Bend Replacement	Welders	1	10.00	46	0.45
LL2 Pipe Bend Replacement	Tractors/Loaders/Backhoes	0	8.00	97	0.37
L2 HDPE Pipe Pull (non-marine)	Other Material Handling Equipment	2	18.00	168	0.40
L2 HDPE Pipe Pull (non-marine)	Other Construction Equipment	2	24.00	238	0.42
L2 HDPE Pipe Pull (non-marine)	Air Compressors	1	18.00	78	0.48
L2 HDPE Pipe Pull (non-marine)	Welders	2	18.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Effluent Transmission Tie In	4	20.00	6.00	8.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT
LL2 Pipe Bend Replacement	4	20.00	12.00	12.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT
L2 HDPE Pipe Pull (non-marine)	7	70.00	10.00	12.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Effluent Transmission Tie In - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3654	14.7260	7.7248	0.0158		0.6875	0.6875		0.6365	0.6365		1,542.6534	1,542.6534	0.4726		1,554.4683
Total	**1.3654**	**14.7260**	**7.7248**	**0.0158**		**0.6875**	**0.6875**		**0.6365**	**0.6365**		**1,542.6534**	**1,542.6534**	**0.4726**		**1,554.4683**

3.2 Effluent Transmission Tie In - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.1400e-003	0.2754	0.0592	6.4000e-004	0.2493	1.6600e-003	0.2510	0.0273	1.5900e-003	0.0289		68.8381	68.8381	3.8300e-003		68.9338
Vendor	0.0527	1.1755	0.3313	2.6900e-003	1.2195	0.0132	1.2328	0.1352	0.0127	0.1478		285.2747	285.2747	0.0131		285.6021
Worker	0.0940	0.0810	0.8037	1.9200e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		190.6697	190.6697	7.0000e-003		190.8448
Total	**0.1548**	**1.5319**	**1.1942**	**5.2500e-003**	**5.4912**	**0.0162**	**5.5074**	**0.5963**	**0.0155**	**0.6118**		**544.7824**	**544.7824**	**0.0239**		**545.3806**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3654	2.9217	7.7248	0.0158		0.6875	0.6875		0.6365	0.6365	0.0000	1,542.6534	1,542.6534	0.4726		1,554.4683
Total	**1.3654**	**2.9217**	**7.7248**	**0.0158**		**0.6875**	**0.6875**		**0.6365**	**0.6365**	**0.0000**	**1,542.6534**	**1,542.6534**	**0.4726**		**1,554.4683**

3.2 Effluent Transmission Tie In - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.1400e-003	0.2754	0.0592	6.4000e-004	0.2493	1.6600e-003	0.2510	0.0273	1.5900e-003	0.0289		68.8381	68.8381	3.8300e-003		68.9338
Vendor	0.0527	1.1755	0.3313	2.6900e-003	1.2195	0.0132	1.2328	0.1352	0.0127	0.1478		285.2747	285.2747	0.0131		285.6021
Worker	0.0940	0.0810	0.8037	1.9200e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		190.6697	190.6697	7.0000e-003		190.8448
Total	**0.1548**	**1.5319**	**1.1942**	**5.2500e-003**	**5.4912**	**0.0162**	**5.5074**	**0.5963**	**0.0155**	**0.6118**		**544.7824**	**544.7824**	**0.0239**		**545.3806**

3.3 LL2 Pipe Bend Replacement - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.7752	0.0000	0.7752	0.4163	0.0000	0.4163			0.0000			0.0000
Off-Road	1.8833	15.9013	13.0642	0.0253		0.7753	0.7753		0.7462	0.7462		2,412.5932	2,412.5932	0.5424		2,426.1524
Total	**1.8833**	**15.9013**	**13.0642**	**0.0253**	**0.7752**	**0.7753**	**1.5505**	**0.4163**	**0.7462**	**1.1625**		**2,412.5932**	**2,412.5932**	**0.5424**		**2,426.1524**

3.3 LL2 Pipe Bend Replacement - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.1400e-003	0.2754	0.0592	6.4000e-004	0.2493	1.6600e-003	0.2510	0.0273	1.5900e-003	0.0289		68.8381	68.8381	3.8300e-003		68.9338
Vendor	0.1054	2.3510	0.6626	5.3700e-003	2.4391	0.0265	2.4656	0.2703	0.0253	0.2957		570.5494	570.5494	0.0262		571.2041
Worker	0.0940	0.0810	0.8037	1.9200e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		190.6697	190.6697	7.0000e-003		190.8448
Total	**0.2075**	**2.7074**	**1.5255**	**7.9300e-003**	**6.7108**	**0.0295**	**6.7402**	**0.7315**	**0.0281**	**0.7596**		**830.0571**	**830.0571**	**0.0370**		**830.9827**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					0.7752	0.0000	0.7752	0.4163	0.0000	0.4163			0.0000			0.0000
Off-Road	1.8833	4.4857	13.0642	0.0253		0.7753	0.7753		0.7462	0.7462	0.0000	2,412.5932	2,412.5932	0.5424		2,426.1524
Total	**1.8833**	**4.4857**	**13.0642**	**0.0253**	**0.7752**	**0.7753**	**1.5505**	**0.4163**	**0.7462**	**1.1625**	**0.0000**	**2,412.5932**	**2,412.5932**	**0.5424**		**2,426.1524**

3.3 LL2 Pipe Bend Replacement - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	8.1400e-003	0.2754	0.0592	6.4000e-004	0.2493	1.6600e-003	0.2510	0.0273	1.5900e-003	0.0289		68.8381	68.8381	3.8300e-003		68.9338
Vendor	0.1054	2.3510	0.6626	5.3700e-003	2.4391	0.0265	2.4656	0.2703	0.0253	0.2957		570.5494	570.5494	0.0262		571.2041
Worker	0.0940	0.0810	0.8037	1.9200e-003	4.0224	1.3100e-003	4.0237	0.4338	1.2100e-003	0.4351		190.6697	190.6697	7.0000e-003		190.8448
Total	**0.2075**	**2.7074**	**1.5255**	**7.9300e-003**	**6.7108**	**0.0295**	**6.7402**	**0.7315**	**0.0281**	**0.7596**		**830.0571**	**830.0571**	**0.0370**		**830.9827**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.0238	27.6086	30.6443	0.0464		1.5751	1.5751		1.5158	1.5158		4,352.5069	4,352.5069	1.0419		4,378.5554
Total	**4.0238**	**27.6086**	**30.6443**	**0.0464**		**1.5751**	**1.5751**		**1.5158**	**1.5158**		**4,352.5069**	**4,352.5069**	**1.0419**		**4,378.5554**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.8800e-003	0.1652	0.0355	3.8000e-004	0.1496	9.9000e-004	0.1506	0.0164	9.5000e-004	0.0173		41.3028	41.3028	2.3000e-003		41.3603
Vendor	0.0879	1.9592	0.5522	4.4800e-003	2.0326	0.0221	2.0546	0.2253	0.0211	0.2464		475.4578	475.4578	0.0218		476.0035
Worker	0.3288	0.2836	2.8130	6.7100e-003	14.0783	4.5800e-003	14.0829	1.5184	4.2200e-003	1.5227		667.3438	667.3438	0.0245		667.9567
Total	**0.4215**	**2.4080**	**3.4007**	**0.0116**	**16.2605**	**0.0276**	**16.2881**	**1.7601**	**0.0263**	**1.7864**		**1,184.1045**	**1,184.1045**	**0.0486**		**1,185.3204**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	4.0238	0.0000	30.6443	0.0464		1.5751	1.5751		1.5158	1.5158	0.0000	4,352.5069	4,352.5069	1.0419		4,378.5554
Total	**4.0238**	**0.0000**	**30.6443**	**0.0464**		**1.5751**	**1.5751**		**1.5158**	**1.5158**	**0.0000**	**4,352.5069**	**4,352.5069**	**1.0419**		**4,378.5554**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	4.8800e-003	0.1652	0.0355	3.8000e-004	0.1496	9.9000e-004	0.1506	0.0164	9.5000e-004	0.0173		41.3028	41.3028	2.3000e-003		41.3603
Vendor	0.0879	1.9592	0.5522	4.4800e-003	2.0326	0.0221	2.0546	0.2253	0.0211	0.2464		475.4578	475.4578	0.0218		476.0035
Worker	0.3288	0.2836	2.8130	6.7100e-003	14.0783	4.5800e-003	14.0829	1.5184	4.2200e-003	1.5227		667.3438	667.3438	0.0245		667.9567
Total	**0.4215**	**2.4080**	**3.4007**	**0.0116**	**16.2605**	**0.0276**	**16.2881**	**1.7601**	**0.0263**	**1.7864**		**1,184.1045**	**1,184.1045**	**0.0486**		**1,185.3204**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	13.00	13.00	13.00	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Industrial	0.559162	0.032279	0.198583	0.128083	0.030808	0.007362	0.013004	0.019140	0.002385	0.001267	0.005421	0.000811	0.001695

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Unmitigated	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Landscaping	1.0000e-005	0.0000	1.0000e-004	0.0000		0.0000	0.0000		0.0000	0.0000		2.2000e-004	2.2000e-004	0.0000		2.3000e-004
Total	**1.0000e-005**	**0.0000**	**1.0000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**		**2.2000e-004**	**2.2000e-004**	**0.0000**		**2.3000e-004**

7.0 Water Detail

7.1 Mitigation Measures Water

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Cayucos Sustainable Water Project Ocean Outfall

San Luis Obispo County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
User Defined Industrial	1.00	User Defined Unit	0.30	0.00	0

1.2 Other Project Characteristics

Urbanization	Rural	**Wind Speed (m/s)**	3.2	**Precipitation Freq (Days)**	44
Climate Zone	3			**Operational Year**	2020
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	641.35	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - Modeler: CPD. This project file is for construction emissions only.

Land Use - User-defined industrial land use inputted to reflect construction emission scenario

Construction Phase - Construction phases reflect project-specific activities (non-marine).

Off-road Equipment - Tie-in equipment based on professional experience

Off-road Equipment - Pipe bend replacement equipment based on professional experience and similar projects in the area.

Off-road Equipment - Pipe pull (non-marine) equipment based on Dynergy Morro Bay Marine Terminal Decommissioning Project. Other construction equipment = winches

Grading - Total acres graded based on disturbance for tie-in and pipe-bend replacement activities.

Trips and VMT - Workers trips assume 2.5 trips per day for 8 workers for tie-in and pipe bend; 2 trips per day workers during pipe pull phase.

On-road Fugitive Dust - % paved road travel set to 99 to reflect travel on sand/dirt access road

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	100.00	25.00
tblConstructionPhase	NumDays	2.00	15.00
tblConstructionPhase	PhaseEndDate	1/17/2019	2/25/2019
tblConstructionPhase	PhaseEndDate	1/15/2019	1/21/2019
tblConstructionPhase	PhaseStartDate	1/16/2019	1/22/2019
tblConstructionPhase	PhaseStartDate	1/15/2019	1/1/2019
tblGrading	AcresOfGrading	7.50	0.30
tblGrading	MaterialExported	0.00	100.00
tblLandUse	LotAcreage	0.00	0.30
tblOffRoadEquipment	HorsePower	78.00	247.00
tblOffRoadEquipment	HorsePower	172.00	238.00
tblOffRoadEquipment	LoadFactor	0.50	0.40
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentType		Rubber Tired Loaders
tblOffRoadEquipment	OffRoadEquipmentType	Rubber Tired Dozers	Trenchers
tblOffRoadEquipment	OffRoadEquipmentType		Excavators
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentType		Other Material Handling Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Other Construction Equipment
tblOffRoadEquipment	OffRoadEquipmentType		Air Compressors
tblOffRoadEquipment	OffRoadEquipmentType		Welders
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	0.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	1.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	0.00	2.00
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		Effluent Transmission Tie In
tblOffRoadEquipment	PhaseName		LL2 Pipe Bend Replacement
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	PhaseName		L2 HDPE Pipe Pull (non-marine)
tblOffRoadEquipment	UsageHours	8.00	10.00
tblOffRoadEquipment	UsageHours	8.00	0.00
tblOffRoadEquipment	UsageHours	6.00	8.00

tblOnRoadDust	HaulingPercentPave	100.00	99.00
tblOnRoadDust	HaulingPercentPave	100.00	99.00
tblOnRoadDust	HaulingPercentPave	100.00	99.00
tblOnRoadDust	VendorPercentPave	100.00	99.00
tblOnRoadDust	VendorPercentPave	100.00	99.00
tblOnRoadDust	VendorPercentPave	100.00	99.00
tblOnRoadDust	WorkerPercentPave	100.00	99.00
tblOnRoadDust	WorkerPercentPave	100.00	99.00
tblOnRoadDust	WorkerPercentPave	100.00	99.00
tblProjectCharacteristics	UrbanizationLevel	Urban	Rural
tblTripsAndVMT	HaulingTripNumber	0.00	8.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	HaulingTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	0.00	6.00
tblTripsAndVMT	VendorTripNumber	0.00	12.00
tblTripsAndVMT	VendorTripNumber	0.00	10.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	10.00	20.00
tblTripsAndVMT	WorkerTripNumber	0.00	70.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0790	0.5977	0.5789	1.0700e-003	0.2543	0.0296	0.2839	0.0303	0.0284	0.0586	0.0000	93.8695	93.8695	0.0186	0.0000	94.3336
Maximum	**0.0790**	**0.5977**	**0.5789**	**1.0700e-003**	**0.2543**	**0.0296**	**0.2839**	**0.0303**	**0.0284**	**0.0586**	**0.0000**	**93.8695**	**93.8695**	**0.0186**	**0.0000**	**94.3336**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2019	0.0790	0.1079	0.5789	1.0700e-003	0.2543	0.0296	0.2839	0.0303	0.0284	0.0586	0.0000	93.8694	93.8694	0.0186	0.0000	94.3335
Maximum	**0.0790**	**0.1079**	**0.5789**	**1.0700e-003**	**0.2543**	**0.0296**	**0.2839**	**0.0303**	**0.0284**	**0.0586**	**0.0000**	**93.8694**	**93.8694**	**0.0186**	**0.0000**	**94.3335**

	ROG	**NOx**	**CO**	**SO2**	**Fugitive PM10**	**Exhaust PM10**	**PM10 Total**	**Fugitive PM2.5**	**Exhaust PM2.5**	**PM2.5 Total**	**Bio- CO2**	**NBio-CO2**	**Total CO2**	**CH4**	**N20**	**CO2e**
Percent Reduction	**0.00**	**81.94**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	**1-1-2019**	**3-31-2019**	0.6768	0.1871
		Highest	0.6768	0.1871

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	3.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**3.0000e-005**

2.2 Overall Operational

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	3.0000e-005
Energy	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Mobile	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Waste						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Water						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0000**	**0.0000**	**2.0000e-005**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**3.0000e-005**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Effluent Transmission Tie In	Trenching	1/1/2019	1/14/2019	5	10	Effluent Transmission Tie-in
2	LL2 Pipe Bend Replacement	Grading	1/1/2019	1/21/2019	5	15	30 deg. bend pipe replacement
3	L2 HDPE Pipe Pull (non-marine)	Building Construction	1/22/2019	2/25/2019	5	25	Pipe Pull (non-marine equipment)

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 0

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 0; Non-Residential Outdoor: 0; Striped Parking Area: 0 (Architectural Coating – sqft)

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
LL2 Pipe Bend Replacement	Concrete/Industrial Saws	1	10.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Cranes	0	4.00	231	0.29
Effluent Transmission Tie In	Concrete/Industrial Saws	0	8.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Concrete/Industrial Saws	0	8.00	81	0.73
L2 HDPE Pipe Pull (non-marine)	Forklifts	0	6.00	89	0.20
LL2 Pipe Bend Replacement	Rubber Tired Dozers	0	1.00	247	0.40
LL2 Pipe Bend Replacement	Graders	0	8.00	187	0.41
Effluent Transmission Tie In	Welders	1	4.00	46	0.45
LL2 Pipe Bend Replacement	Rubber Tired Loaders	1	10.00	203	0.36
Effluent Transmission Tie In	Trenchers	1	10.00	247	0.40
L2 HDPE Pipe Pull (non-marine)	Rubber Tired Dozers	0	1.00	247	0.40
LL2 Pipe Bend Replacement	Excavators	1	10.00	158	0.38
Effluent Transmission Tie In	Tractors/Loaders/Backhoes	1	10.00	97	0.37
L2 HDPE Pipe Pull (non-marine)	Tractors/Loaders/Backhoes	0	0.00	97	0.37
LL2 Pipe Bend Replacement	Welders	1	10.00	46	0.45
LL2 Pipe Bend Replacement	Tractors/Loaders/Backhoes	0	8.00	97	0.37
L2 HDPE Pipe Pull (non-marine)	Other Material Handling Equipment	2	18.00	168	0.40
L2 HDPE Pipe Pull (non-marine)	Other Construction Equipment	2	24.00	238	0.42
L2 HDPE Pipe Pull (non-marine)	Air Compressors	1	18.00	78	0.48
L2 HDPE Pipe Pull (non-marine)	Welders	2	18.00	46	0.45

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Effluent Transmission Tie In	4	20.00	6.00	8.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT
LL2 Pipe Bend Replacement	4	20.00	12.00	12.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT
L2 HDPE Pipe Pull (non-marine)	7	70.00	10.00	12.00	13.00	13.00	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Effluent Transmission Tie In - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.8300e-003	0.0736	0.0386	8.0000e-005		3.4400e-003	3.4400e-003		3.1800e-003	3.1800e-003	0.0000	6.9974	6.9974	2.1400e-003	0.0000	7.0510
Total	**6.8300e-003**	**0.0736**	**0.0386**	**8.0000e-005**		**3.4400e-003**	**3.4400e-003**		**3.1800e-003**	**3.1800e-003**	**0.0000**	**6.9974**	**6.9974**	**2.1400e-003**	**0.0000**	**7.0510**

3.2 Effluent Transmission Tie In - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.4000e-003	3.0000e-004	0.0000	1.1000e-003	1.0000e-005	1.1100e-003	1.2000e-004	1.0000e-005	1.3000e-004	0.0000	0.3104	0.3104	2.0000e-005	0.0000	0.3108
Vendor	2.7000e-004	6.0000e-003	1.7200e-003	1.0000e-005	5.4000e-003	7.0000e-005	5.4600e-003	6.0000e-004	6.0000e-005	6.7000e-004	0.0000	1.2868	1.2868	6.0000e-005	0.0000	1.2883
Worker	4.8000e-004	4.5000e-004	3.9100e-003	1.0000e-005	0.0178	1.0000e-005	0.0178	1.9300e-003	1.0000e-005	1.9400e-003	0.0000	0.8311	0.8311	3.0000e-005	0.0000	0.8319
Total	**7.9000e-004**	**7.8500e-003**	**5.9300e-003**	**2.0000e-005**	**0.0243**	**9.0000e-005**	**0.0244**	**2.6500e-003**	**8.0000e-005**	**2.7400e-003**	**0.0000**	**2.4283**	**2.4283**	**1.1000e-004**	**0.0000**	**2.4310**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	6.8300e-003	0.0146	0.0386	8.0000e-005		3.4400e-003	3.4400e-003		3.1800e-003	3.1800e-003	0.0000	6.9974	6.9974	2.1400e-003	0.0000	7.0509
Total	**6.8300e-003**	**0.0146**	**0.0386**	**8.0000e-005**		**3.4400e-003**	**3.4400e-003**		**3.1800e-003**	**3.1800e-003**	**0.0000**	**6.9974**	**6.9974**	**2.1400e-003**	**0.0000**	**7.0509**

3.2 Effluent Transmission Tie In - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	4.0000e-005	1.4000e-003	3.0000e-004	0.0000	1.1000e-003	1.0000e-005	1.1100e-003	1.2000e-004	1.0000e-005	1.3000e-004	0.0000	0.3104	0.3104	2.0000e-005	0.0000	0.3108
Vendor	2.7000e-004	6.0000e-003	1.7200e-003	1.0000e-005	5.4000e-003	7.0000e-005	5.4600e-003	6.0000e-004	6.0000e-005	6.7000e-004	0.0000	1.2868	1.2868	6.0000e-005	0.0000	1.2883
Worker	4.8000e-004	4.5000e-004	3.9100e-003	1.0000e-005	0.0178	1.0000e-005	0.0178	1.9300e-003	1.0000e-005	1.9400e-003	0.0000	0.8311	0.8311	3.0000e-005	0.0000	0.8319
Total	**7.9000e-004**	**7.8500e-003**	**5.9300e-003**	**2.0000e-005**	**0.0243**	**9.0000e-005**	**0.0244**	**2.6500e-003**	**8.0000e-005**	**2.7400e-003**	**0.0000**	**2.4283**	**2.4283**	**1.1000e-004**	**0.0000**	**2.4310**

3.3 LL2 Pipe Bend Replacement - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.8100e-003	0.0000	5.8100e-003	3.1200e-003	0.0000	3.1200e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0141	0.1193	0.0980	1.9000e-004		5.8100e-003	5.8100e-003		5.6000e-003	5.6000e-003	0.0000	16.4150	16.4150	3.6900e-003	0.0000	16.5073
Total	**0.0141**	**0.1193**	**0.0980**	**1.9000e-004**	**5.8100e-003**	**5.8100e-003**	**0.0116**	**3.1200e-003**	**5.6000e-003**	**8.7200e-003**	**0.0000**	**16.4150**	**16.4150**	**3.6900e-003**	**0.0000**	**16.5073**

3.3 LL2 Pipe Bend Replacement - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.0000e-005	2.1100e-003	4.6000e-004	0.0000	1.6500e-003	1.0000e-005	1.6700e-003	1.8000e-004	1.0000e-005	1.9000e-004	0.0000	0.4656	0.4656	3.0000e-005	0.0000	0.4663
Vendor	8.0000e-004	0.0180	5.1500e-003	4.0000e-005	0.0162	2.0000e-004	0.0164	1.8100e-003	1.9000e-004	2.0100e-003	0.0000	3.8604	3.8604	1.8000e-004	0.0000	3.8649
Worker	7.2000e-004	6.8000e-004	5.8600e-003	1.0000e-005	0.0267	1.0000e-005	0.0267	2.9000e-003	1.0000e-005	2.9100e-003	0.0000	1.2467	1.2467	5.0000e-005	0.0000	1.2479
Total	**1.5800e-003**	**0.0208**	**0.0115**	**5.0000e-005**	**0.0445**	**2.2000e-004**	**0.0447**	**4.8900e-003**	**2.1000e-004**	**5.1100e-003**	**0.0000**	**5.5727**	**5.5727**	**2.6000e-004**	**0.0000**	**5.5790**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					5.8100e-003	0.0000	5.8100e-003	3.1200e-003	0.0000	3.1200e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0141	0.0336	0.0980	1.9000e-004		5.8100e-003	5.8100e-003		5.6000e-003	5.6000e-003	0.0000	16.4150	16.4150	3.6900e-003	0.0000	16.5072
Total	**0.0141**	**0.0336**	**0.0980**	**1.9000e-004**	**5.8100e-003**	**5.8100e-003**	**0.0116**	**3.1200e-003**	**5.6000e-003**	**8.7200e-003**	**0.0000**	**16.4150**	**16.4150**	**3.6900e-003**	**0.0000**	**16.5072**

3.3 LL2 Pipe Bend Replacement - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.0000e-005	2.1100e-003	4.6000e-004	0.0000	1.6500e-003	1.0000e-005	1.6700e-003	1.8000e-004	1.0000e-005	1.9000e-004	0.0000	0.4656	0.4656	3.0000e-005	0.0000	0.4663
Vendor	8.0000e-004	0.0180	5.1500e-003	4.0000e-005	0.0162	2.0000e-004	0.0164	1.8100e-003	1.9000e-004	2.0100e-003	0.0000	3.8604	3.8604	1.8000e-004	0.0000	3.8649
Worker	7.2000e-004	6.8000e-004	5.8600e-003	1.0000e-005	0.0267	1.0000e-005	0.0267	2.9000e-003	1.0000e-005	2.9100e-003	0.0000	1.2467	1.2467	5.0000e-005	0.0000	1.2479
Total	**1.5800e-003**	**0.0208**	**0.0115**	**5.0000e-005**	**0.0445**	**2.2000e-004**	**0.0447**	**4.8900e-003**	**2.1000e-004**	**5.1100e-003**	**0.0000**	**5.5727**	**5.5727**	**2.6000e-004**	**0.0000**	**5.5790**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0503	0.3451	0.3831	5.8000e-004		0.0197	0.0197		0.0190	0.0190	0.0000	49.3566	49.3566	0.0118	0.0000	49.6520
Total	**0.0503**	**0.3451**	**0.3831**	**5.8000e-004**		**0.0197**	**0.0197**		**0.0190**	**0.0190**	**0.0000**	**49.3566**	**49.3566**	**0.0118**	**0.0000**	**49.6520**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.0000e-005	2.1100e-003	4.6000e-004	0.0000	1.6500e-003	1.0000e-005	1.6700e-003	1.8000e-004	1.0000e-005	1.9000e-004	0.0000	0.4656	0.4656	3.0000e-005	0.0000	0.4663
Vendor	1.1100e-003	0.0250	7.1500e-003	6.0000e-005	0.0225	2.8000e-004	0.0228	2.5200e-003	2.7000e-004	2.7900e-003	0.0000	5.3616	5.3616	2.5000e-004	0.0000	5.3679
Worker	4.2000e-003	3.9500e-003	0.0342	8.0000e-005	0.1556	6.0000e-005	0.1556	0.0169	5.0000e-005	0.0170	0.0000	7.2724	7.2724	2.7000e-004	0.0000	7.2791
Total	**5.3700e-003**	**0.0311**	**0.0418**	**1.4000e-004**	**0.1797**	**3.5000e-004**	**0.1801**	**0.0196**	**3.3000e-004**	**0.0199**	**0.0000**	**13.0996**	**13.0996**	**5.5000e-004**	**0.0000**	**13.1133**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0503	0.0000	0.3831	5.8000e-004		0.0197	0.0197		0.0190	0.0190	0.0000	49.3565	49.3565	0.0118	0.0000	49.6519
Total	**0.0503**	**0.0000**	**0.3831**	**5.8000e-004**		**0.0197**	**0.0197**		**0.0190**	**0.0190**	**0.0000**	**49.3565**	**49.3565**	**0.0118**	**0.0000**	**49.6519**

3.4 L2 HDPE Pipe Pull (non-marine) - 2019

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	6.0000e-005	2.1100e-003	4.6000e-004	0.0000	1.6500e-003	1.0000e-005	1.6700e-003	1.8000e-004	1.0000e-005	1.9000e-004	0.0000	0.4656	0.4656	3.0000e-005	0.0000	0.4663
Vendor	1.1100e-003	0.0250	7.1500e-003	6.0000e-005	0.0225	2.8000e-004	0.0228	2.5200e-003	2.7000e-004	2.7900e-003	0.0000	5.3616	5.3616	2.5000e-004	0.0000	5.3679
Worker	4.2000e-003	3.9500e-003	0.0342	8.0000e-005	0.1556	6.0000e-005	0.1556	0.0169	5.0000e-005	0.0170	0.0000	7.2724	7.2724	2.7000e-004	0.0000	7.2791
Total	**5.3700e-003**	**0.0311**	**0.0418**	**1.4000e-004**	**0.1797**	**3.5000e-004**	**0.1801**	**0.0196**	**3.3000e-004**	**0.0199**	**0.0000**	**13.0996**	**13.0996**	**5.5000e-004**	**0.0000**	**13.1133**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
User Defined Industrial	0.00	0.00	0.00		
Total	0.00	0.00	0.00		

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
User Defined Industrial	13.00	13.00	13.00	0.00	0.00	0.00	0	0	0

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
User Defined Industrial	0.559162	0.032279	0.198583	0.128083	0.030808	0.007362	0.013004	0.019140	0.002385	0.001267	0.005421	0.000811	0.001695

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Mitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
NaturalGas Unmitigated	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.2 Energy by Land Use - NaturalGas

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

5.3 Energy by Land Use - Electricity

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	3.0000e-005
Unmitigated	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	3.0000e-005

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	3.0000e-005
Total	**0.0000**	**0.0000**	**2.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**3.0000e-005**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	0.0000	0.0000	2.0000e-005	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	3.0000e-005	3.0000e-005	0.0000	0.0000	3.0000e-005
Total	**0.0000**	**0.0000**	**2.0000e-005**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**3.0000e-005**	**3.0000e-005**	**0.0000**	**0.0000**	**3.0000e-005**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

7.2 Water by Land Use

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
User Defined Industrial	0 / 0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.0000	0.0000	0.0000	0.0000
Unmitigated	0.0000	0.0000	0.0000	0.0000

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
User Defined Industrial	0	0.0000	0.0000	0.0000	0.0000
Total		**0.0000**	**0.0000**	**0.0000**	**0.0000**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

Cayucos Sustainable Water Project Ocean Outfall
Morro Bay, CA
Air Quality and Greenhouse Gas Emission Estimates
Prepared by MIG, November 2018

MARINE VESSEL EQUIPMENT SUMMARY

Marine Equipment	Horsepower (hp)	Load Factor	Number	Hours (hrs) Per Day	Duration (Days)	Max Daily hp-hrs	Total Phase hp-hrs
Barge - Generator	100	0.74	1	24	25	1,776	44,400
Crew Boat Main Engine	500	0.38	2	4	25	1,520	38,000
Crew Boat Generator	75	0.74	1	24	25	1,332	33,300
Tug Boat 1 Main Engine	500	0.38	2	2	25	760	19,000
Tug Boat 1 Generator	75	0.74	1	24	25	1,332	33,300
Tug Boat 2 Main Engine	500	0.38	2	2	25	760	19,000
Tug Boat 2 Generator	75	0.74	1	24	25	1,332	33,300

Table Notes:

1) Marine Equipment horsepower, load factor, and enigine number assumptions from Morro Bay Power Plant Decomissioning IS/MND (CSLC, 2018).

2) Marine equipment hours per day and duration based on project-specific characteristics and assumptions.

MARINE VESSEL EQUIPMENT EMISSION FACTORS (G/HP-HR)

Marine Equipment	ROG	NOX	CO	SO2	PM10	PM2.5	DPM	CO2	N2O	CH4
Barge - Generator	0.405	3.446	3.396	0.006	0.206	0.206	0.206	568.229	0.011	0.036
Crew Boat Main Engine	0.149	5.220	3.729	0.969	0.149	0.137	0.149	514.541	0.002	0.007
Crew Boat Generator	0.405	3.446	3.396	0.006	0.206	0.206	0.206	568.229	0.011	0.036
Tug Boat 1 Main Engine	0.149	5.220	3.729	0.969	0.149	0.137	0.149	514.541	0.002	0.007
Tug Boat 1 Generator	0.405	3.446	3.396	0.006	0.206	0.206	0.206	568.229	0.011	0.036
Tug Boat 2 Main Engine	0.149	5.220	3.729	0.969	0.149	0.137	0.149	514.541	0.002	0.007
Tug Boat 2 Generator	0.405	3.446	3.396	0.006	0.206	0.206	0.206	568.229	0.011	0.036

Table Notes:

1) Vessel generator emissions factors from CalEEMod, V. 2016.3.2. Factors assume operational year of 2019. N2O factors are scaled based on the proportion of N2O to CH4 for main engine emissions.

2) Vessel main engine emissions from 2016 Puget Sound Maritme Emissions Inventory (Starcrest Consulting Group 2018, Table C.1). Emission Factors are based on Category 1, Tier 2 diesel engine. Emission factors converted from grams/kilowatt-hour to grams/horsepower-hour by converting using 1 kw = 1.341

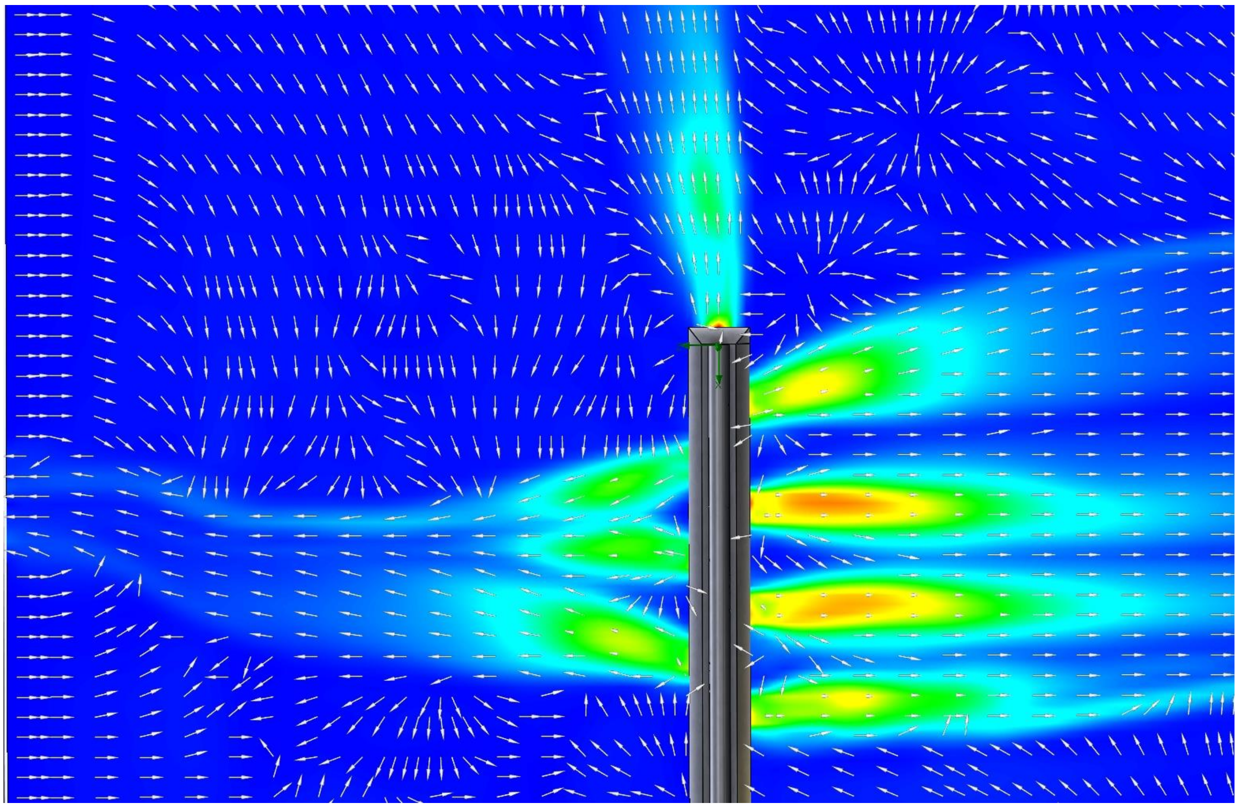
MARINE VESSEL EMISSIONS, POUNDS PER DAY (MAX DAY)

Marine Equipment	ROG	NOX	CO	SO2	PM10	PM2.5	DPM	CO2	N2O	CH4
Barge - Generator	1.59	13.49	13.30	0.02	0.81	0.81	0.81	2,224.81	0.04	0.14
Crew Boat Main Engine	0.50	17.49	12.49	3.25	0.50	0.46	0.50	1,724.21	0.01	0.02
Crew Boat Generator	1.19	10.12	9.97	0.02	0.60	0.60	0.60	1,668.61	0.03	0.11
Tug Boat 1 Main Engine	0.25	8.75	6.25	1.62	0.25	0.23	0.25	862.11	0.00	0.01
Tug Boat 1 Generator	1.19	10.12	9.97	0.02	0.60	0.60	0.60	1,668.61	0.03	0.11
Tug Boat 2 Main Engine	0.25	8.75	6.25	1.62	0.25	0.23	0.25	862.11	0.00	0.01
Tug Boat 2 Generator	1.19	10.12	9.97	0.02	0.60	0.60	0.60	1,668.61	0.03	0.11
TOTAL	6.15	78.83	68.20	6.57	3.62	3.54	3.62	10,679.06	0.16	0.51

MARINE VESSEL EMISSIONS, Tons per Quarter

Marine Equipment	ROG	NOX	CO	SO2	PM10	PM2.5	DPM	CO2	N2O	CH4
Barge - Generator	0.02	0.17	0.17	0.00	0.01	0.01	0.01	27.81	0.00	0.00
Crew Boat Main Engine	0.01	0.22	0.16	0.04	0.01	0.01	0.01	21.55	0.00	0.00
Crew Boat Generator	0.01	0.13	0.12	0.00	0.01	0.01	0.01	20.86	0.00	0.00
Tug Boat 1 Main Engine	0.00	0.11	0.08	0.02	0.00	0.00	0.00	10.78	0.00	0.00
Tug Boat 1 Generator	0.01	0.13	0.12	0.00	0.01	0.01	0.01	20.86	0.00	0.00
Tug Boat 2 Main Engine	0.00	0.11	0.08	0.02	0.00	0.00	0.00	10.78	0.00	0.00
Tug Boat 2 Generator	0.01	0.13	0.12	0.00	0.01	0.01	0.01	20.86	0.00	0.00
TOTAL, tons	0.08	0.99	0.85	0.08	0.05	0.04	0.05	133.49	0.00	0.01
TOTAL, metric tons								121.07	0.00	0.01

Hydrodynamic Analysis of a Diffuser Retrofit to the Estero Marine Terminal Pipeline for the Cayucos Sustainable Water Project (CSWP)



Submitted by:
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Submitted to:
Cayucos Sanitary District

Draft: 24 July 2018

EXECUTIVE SUMMARY: A hydrodynamic dilution and scour analysis is performed for a diffuser retrofit to *Load-Line 2* (LL2) at the Chevron Estero Marine Terminal, to serve as an ocean outfall for the proposed Cayucos Sustainable Water Project (CSWP). The Load Line-2 (LL2) pipeline consists of a nominal 22-inch diameter onshore section and a nominal 20-inch diameter offshore section. Underwater inspections and testing still leave some concerns over the degree of degradation that the LL2 pipeline may have suffered due to marine corrosion. However, the maximum anticipated wet weather daily discharges of the CSWP will not require a 20-inch pipeline for adequate conveyance of estimated effluent loads to the discharge location in 51 ft of local water depth. Consequently, this study proceeds under the assumption of utilizing a smaller diameter high-density polyethylene (HDPE) pipeline for CSWP conveyance that is inside the existing 20-inch steel LL2 pipeline (referred to as *pipe-in-pipe*). With this arrangement, the existing 20-inch steel LL2 pipeline will serve as armored outer sleeve for the new smaller diameter HDPE pipeline that will exit the 16-inch reduction fitting at the terminal end of LL2, where it will then junction with a linear diffuser section. This arrangement will also allow the depth of the new CSWP outfall to be comparable to or slightly deeper than the presently permitted MBCSD WWTP outfall.

A sensitivity analysis was performed for the head losses associated with a 3,952 ft. long HDPE pipe-in-pipe of various diameters inside the present Load-Line-2 steel pipe, terminating with a 200 ft. long diffuser. The diffuser is based on the well-established linear diffuser concept with 50 ports on alternate sides, where each port is 0.63 in. dia. Only the 10-inch and 12-inch pipe-in-pipe options are viable alternatives within the head limits of the proposed new outfall pump station. The 12-inch HDPE pipe-in-pipe was selected as the best design option because the 10-inch option would consume 85% of the total available head in friction losses at maximum daily discharge rates of 1.2 mgd. During the progressive build-out phases of the CSWP, the proposed diffuser at the LL2 site will be required to provide adequate dilution across a wide range of discharges that spans 18-fold, from maximum daily discharges of as much as 1.2 mgd to as little as 0.066 mgd in the event that community water purveyors determine recycled water is advantageous to be developed as a water source. To accommodate this wide range in potential discharge rates, the 50 discharge ports of the proposed CSWP diffuser will be fitted with Tideflex TF-125 series check valves. These check valves will maintain optimal discharge velocities and prevent ambient seawater from flooding the deeper end of the diffuser during extreme low-flow conditions, or during no-flow conditions when the system is shut down for maintenance.

Hydrodynamic dilution modeling of the new diffuser design at the Load Line-2 site was performed using the EPA certified mixing model, CORMIX v11. This model determined that the proposed diffuser will achieve minimum initial dilution that ranges from 386 : 1 at the anticipated maximum daily discharge of 1.2 mgd, increasing to 2700 : 1 at full CSWP build-out when utilization of recycled water may reduce effluent discharges to a projected minimum of 0.066 mgd. This dilution performance is, (at worst), 3 times greater than the certified minimum initial dilution of the present Morro Bay outfall (cf. NPDES permit No. CA0047881). Unlike discharges from the Morro Bay outfall that occasionally broach the sea surface during worst-month conditions, the discharge plume from the Load Line-2 diffuser is always at least 6 ft. below the sea surface. The highest point that the discharge plume rises in the water column is referred to as the “trapping level”; and the BOD at the trapping level (6 ft below the sea surface) is never greater than 0.23 mg/L even if the Load Line-2 diffuser is required to discharge BOD at a maximum daily level of 90 mg/L. This is 6 times lower BOD concentrations at the trapping level than the present Morro Bay outfall achieves for instantaneous maximum discharges of BOD. If we consider the more nominal

average monthly BOD emissions of 30 mg/L, (which corresponds with the projected maximum daily emissions from the bio-reactor per Appendix-E of the 90% design report, WSC, 2018), then the Load Line-2 diffuser will dilute BOD at the trapping level to as little as 0.01 mg/L, which is 90 times less than what the present Morro Bay outfall achieves for average monthly discharges of BOD. Similar dilution performance is exhibited for TSS using the new CSWP diffuser at the LL2 site. The CORMIX model finds TSS concentrations at the trapping level are 3 times lower with the new CSWP diffuser at LL2 than what the present Morro Bay outfall achieves for instantaneous maximum discharges of TSS; and that average monthly TSS concentrations at the trapping level with the new CSWP diffuser will be 16 times less than what the present Morro Bay outfall achieves for average monthly discharges of TSS. In addition, the footprint of the zone of initial dilution (ZID) across the trapping layer was found to be very small, consisting of a rectangle measuring 369 ft. in the on/off shore direction and 166 ft. in the along-shore direction; a total ZID area of only 1.4 acres. Therefore, the proposed new CSWP at the LL2 site will be a significant improvement over present ocean discharges from the Morro Bay Cayucos Sanitary District Waste Water Treatment Plant (MBCSD WWTP).

The California State Lands Commission is requiring that the CSWP diffuser at the LL2 discharge site minimize scour and re-suspension of benthic sediments. The computational fluid dynamics (CFD) modeling of ultimate maximum discharge from the proposed CSWP diffuser (1.2 mgd) determined that diffuser induced velocities on the seafloor are everywhere at least 5 times less than the threshold of motion speed of the seabed sediments found at the LL2 discharge site. Consequently, it was concluded that scour and re-suspension of benthic sediments by the CSWP diffuser will not occur.

1) Introduction:

This is a hydraulic design and hydrodynamic dilution and scour analysis of a diffuser retrofit to *Load-Line 2* (LL2) at the Chevron Estero Marine Terminal, (Figure-1) to serve as an ocean outfall for the proposed Cayucos Sustainable Water Project (CSWP). During wet periods or when there is no demand for tertiary treated recycled water, daily discharges from the new CSWP outfall are anticipated to be as much as 1.2 million gallons per day (mgd), while average wet weather discharges would be about 1/3rd less, 0.385 mgd, (cf. Table-1). With production of recycled water for the tertiary irrigation, the estimated daily discharges to the new outfall will be approximately 0.241 mgd. At the time that community water purveyors determine recycled water is advantageous to be developed as a water source, the estimated anticipated discharge to the outfall will be reduced to approximately 0.066 mgd. Discharges at full build out of the CSWP represent a significant (order of magnitude) reduction from present discharges of treated municipal wastewater from the Morro Bay Cayucos Sanitary District Waste Water Treatment Plant (MBCSD WWTP); which has been permitted for peak seasonal dry weather flows of 2.36 mgd and maximum wet weather flows of 6.64 mgd using the existing MBCSD WWTP outfall in 50 ft. of water depth at 35º, 23', 11" N; 120º, 52', 29" W, (Water Quality Control Board, Central Coast Region order # R3-2008-0065, NPDES No. CA0047881, cf. CWRQCB, 2008).

The CSWP alternative to the present MBCSD WWTP outfall is Chevron's de-commissioned Load Line-2 (LL2) pipeline which consists of a nominal 22-inch diameter onshore section and a nominal 20-inch diameter offshore section. The overall length of LL2, from onshore origination to offshore termination is approximately 3,952 ft. The offshore segment of LL2 terminates in 51 ft of local water depth (Figure 1). Several offshore sections of the LL2 pipeline are buried beneath seafloor sediment, and the condition survey of the LL2 still leaves some concerns over the degree of degradation the LL2 pipeline may have suffered due to marine corrosion, (Associated Pacific, 2007; Longitude 123., 2014). However, the maximum anticipated wet weather daily discharges of the CSWP will not require a 20-inch pipeline for adequate conveyance to the discharge location in 51 ft of local water depth (Figure 1). And so, this study proceeds under the assumption of utilizing a smaller diameter high-density polyethylene (HDPE) pipeline for CSWP conveyance that is inside the existing 20-inch steel LL2 pipeline (referred to as *pipe-in-pipe*). Consequently, the existing 20-inch steel LL2 pipeline will serve as armored outer sleeve for the new smaller diameter HDPE pipeline that will exit the 16-inch reduction fitting at the terminal end of LL2, where it will then junction with a linear diffuser section. This arrangement will allow the depth of the new CSWP outfall to be comparable to or slightly deeper than the presently permitted MBCSD WWTP outfall.

2) Regulatory Considerations:

The amended California Ocean Plan (SWRCB, 2015) establishes two distinct sets of discharge limits, one for buoyant discharges, and the other for dense (negatively buoyant) discharges. Because the Cayucos Sustainable Water Project (CSWP) anticipates using the *Membrane-Bioreactor* (MBR) treatment process, there will be no negatively buoyant brine constituent in the effluent. Consequently, discharges from the new CSWP outfall are regulated under Provisions III.C.4(b-d) of the California Ocean Plan, as applied to a Zone of Initial Dilution (ZID). The California Ocean Plan defines the ZID as the zone in which

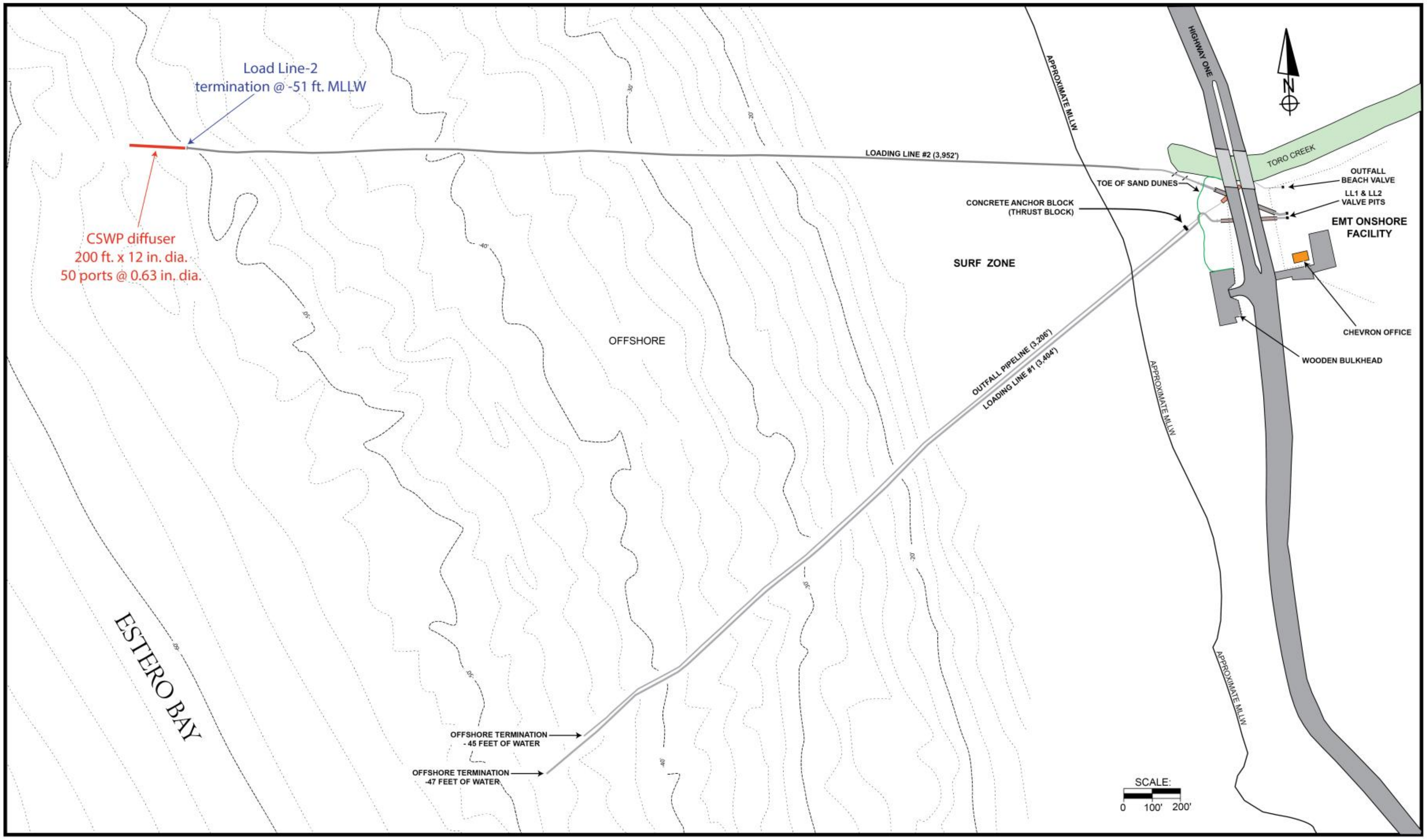


Figure 1: Site Location for the CSWP diffuser at the end of Load Line # 2 in 51 ft. of local water depth.

Table-1: Projected Cayucos Sustainable Water Project Wastewater Flows and Loads, (from WSC, 2018)

Parameter	Units	ADWF	AWWF	AA	MM	MW	MD	PH
Flow	mgd	0.370	0.385	0.335	0.500	0.700	1.20	4.20
	PF (to AA)	1.1	1.15	1.0	1.5	2.1	3.5	13.5
TSS	ppd	1,000	820	910	1,455	1,910	2,365	--
	mg/L	210	117	326	349	327	236	
BOD	ppd	950	795	795	1,270	1,585	1,900	--
	mg/L	200	113	285	305	271	190	
Ammonia	ppd-N	160	95	110	190	310	340	--
	mg/L-N	52	30	39	46	53	34	
TKN	ppd-N	180	110	120	220	350	385	--
	mg/L-N	58	34	43	53	60	38	

the process of initial dilution is completed. Initial dilution is defined within Appendix I of the *California Ocean Plan* as follows:

"*Initial Dilution is the process which results in the rapid and irreversible turbulent mixing of wastewater with ocean water around the point of discharge. For a submerged buoyant discharge, characteristic of most municipal and industrial wastes that are released from the submarine outfalls, the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing*"

Provision III.C.4(d) of the Ocean Plan requires that minimum initial dilution be determined in a specific manner:

"*For the purpose of this Plan, minimum initial dilution is the lowest average initial dilution within any single month of the year. Dilution estimates shall be based on observed waste characteristics, observed receiving water density structure, and the assumption that no currents, of sufficient strength to influence the initial dilution process, flow across the discharge structure*".

The current NPDES permit for the existing MBCSD WWTP outfall certifies a minimum initial dilution ratio of 133:1 at a ZID boundary referred to as the *trapping level*, (Figure 2). (Note, the trapping level typically occurs at a density interface between warm surface water and cold bottom water, known as the *thermocline*). Given the comparable depth of the proposed CSWP outfall, it is highly likely that these same minimum initial dilution requirements will be required of the diffuser retrofitted to the terminal end of the LL2 pipeline. These minimum initial dilution ratios are achieved at the "trapping level" during *worst-month conditions*. The trapping level refers to the height in the water column above the point of discharge where the buoyant discharge plume ceases to rise further. In the case of the existing MBCSD WWTP outfall, where large discharge volumes are combined with shallow discharge depths, the trapping level becomes the sea surface during worst-month conditions. It remains to be determined if this sea surface broaching of the wastewater effluent can be avoided with the significantly smaller discharge volumes anticipated for the CSWP outfall. If so, the proposed CSWP outfall would most likely be regarded as a significant improvement by the Central Coast Regional Water Quality Control Board.

Amended Ocean Plan requirements to minimize diffuser-induced scour per Section III.M.2 (b) apply only to dense (negatively buoyant) discharges. Because the CSWP effluent will be positively buoyant in ocean receiving waters, these Ocean Plan requirements will not apply to the new LL2 ocean outfall diffuser. However, staff of the California States Lands Commission has specifically requested that the potential for the new diffuser to scour the surrounding seabed be evaluated.

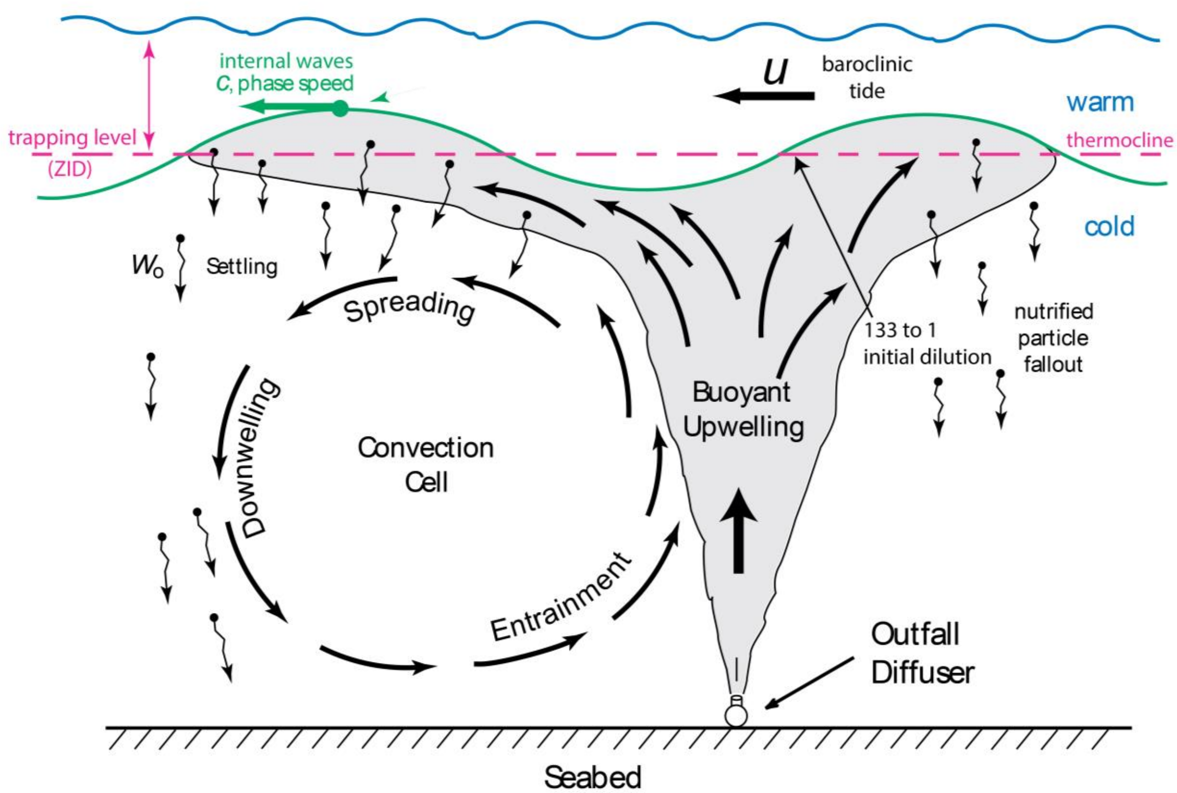


FIGURE 2: Schematic diagram of the rising buoyant plume ascending to the trapping level for buoyant wastewater effluent discharged from the present Morro Bay outfall diffuser in 15 m of local water depth (per NPDES No. CA0047881).

3) Pipe-in-Pipe and Diffuser Design Criteria:

The design process begins with the performance requirements of the diffuser. In this case, we anticipate that the CSWP outfall diffuser must be at least as good as the existing MBCSD WWTP outfall diffuser, even though the CSWP discharge rates will be between 5-fold and 10-fold smaller. Appendix-A gives the effluent limitations from the present NPDES permit (No. CA0047881) for the MBCSD WWTP outfall. Instantaneous maximum discharges for 5-day biological oxygen demand (BOD_5) are set at 180 mg/L and 105 mg/L for instantaneous maximum discharges of total suspended solids (TSS). These limits are based on Ocean Plan criteria using a calculated minimum initial dilution of 133:1 for the existing MBCSD WWTP outfall diffuser. Using these values, the existing outfall diffuser dilutes maximum discharges of BOD_5 to a final concentration $C0_{BOD} = 180/(133 + 1) = 1.34$ mg/L, once initial dilution is completed at the trapping layer; while excess concentrations of TSS at the trapping layer will dilute to $C0_{TSS} = 105/(133 + 1) = 0.78$ mg/L. These concentrations following initial dilution are consistent with effluent limits for receiving waters as stated in USEPA, 1986. *Quality Criteria for Water* (EPA 440/5-86/001) and in USEPA, 1991." Technical Support Document for Water Quality-based Toxics Control" (EPA/505/2-90-001). Therefore, we will design to at least a minimum initial dilution of 133 to 1 with an added objective of preventing the effluent from reaching the sea surface (i.e., maintaining the trapping level beneath the sea surface during worst-month ocean stratification conditions).

3.1 CSWP Effluent: The daily maximum CSWP effluent discharge rate is 1.2 mgd. Table-1 contains additional discharge operating points to be considered in the dilution analysis, including maximum weekly (MW), maximum monthly (MM), average annual (AA), average wet-weather flow (AWWF) and average dry-weather flow (ADWF). We also must consider ultimate low-flows estimated to be as little as 0.066 mgd after full CSWP build-out, once community water purveyors determine recycled water is advantageous to be developed as a water source. Therefore, the new CSWP diffuser design at the LL2 discharge site must be able to generate a minimum initial dilution of 133 : 1 over a range of discharges that spans 18-fold, from 0.066 mgd to 1.2 mgd; a significant challenge given that a diffuser is typically a tuned-system for a single best-operating point.

The 90% design report for CSWP states that daily maximum emissions of BOD_5 will be 90 mg/L, and daily maximum TSS emissions will be 90 mg/L. The new BOD_5 technology-based standard for the CSWP is a factor of 2 improvement over present instantaneous maximum BOD_5 emissions under the present NPDES permit. New effluent limitations for additional CSWP operating points are listed in Table-2 below, indicating a 3-fold span in the range of concentrations of BOD_5 and TSS emissions from the CSWP outfall at the end of Chevron's Load Line-2 (LL2).

3.2 Pipe Sizing and Head Losses: Table-3 gives projected Outfall Criteria for the Cayucos Sustainable Water Project from the 90% design report, WSC, (2018). The primary issue with sizing the HDPE pipe-in-pipe are the projected head limitations, which appear to be specified at only 25 ft. for the new pump station. A sensitivity analysis was performed utilizing Hazen-Williams algorithms for the head losses associated with a 3,952 ft. long HDPE pipe-in-pipe at the termination of the 20-inch LL@ pipeline of various diameters inside the present Load-Line-2 steel pipe terminating with a 200 ft. long diffuser. The diffuser concept utilized in these sensitivity calculations is shown in Figure 3 and measures 200 ft. total length and is based on the well-established linear diffuser concept with 50 ports on alternate sides, where each port is 0.63 in. dia. Diameters of the pipe-in-pipe were varied from 6 inches to 12 inches, and the results of the sensitivity analysis are summarized in Table-4. Only the 10-inch and 12-inch pipe-in-pipe options are viable alternatives within the head limits of the proposed new outfall pump station.

Table-2: Projected Cayucos Sustainable Water Project Technology-Based Effluent Limitations, (from WSC, 2018)

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Biological Oxygen Demand (BOD_5) 5-day @ 20°C	mg/L	30	45	90	---	---
Total Suspended Solids	mg/L	30	45	90	---	---
pH	standard units	---	---	---	6.0	9.0
Oil and Grease	mg/L	25	40	75	---	---
Settable Solids	ml/L	1.0	1.5	3.0	---	---
Turbidity	NTU	75	100	225	---	---
Fecal Coliform Bacteria	MPN/100 mL	---	200[1]	2000	---	---

[1]7-Sample median

Table-3: Projected Outfall Criteria for the Cayucos Sustainable Water Project (from WSC, 2018).

Parameter	Value	Units
WRRF to Existing dual 8” Forcemains at LS5		
WRRF effluent Pump Flow	1,300	gpm
WRRF Effluent Pump Head	120	feet
Forcemain Length	4,888	feet
Forcemain Diameter	10	inches
Modifications near Ocean Outfall		
15” Gravity Main Extension Length	30	feet
New Pump Station Flow	1,300	gpm
New Pump Station Head	25	feet
Forcemain from Pump Station to Outfall Length	300	feet
Forcemain from Pump Station to Outfall Diameter	10	inches

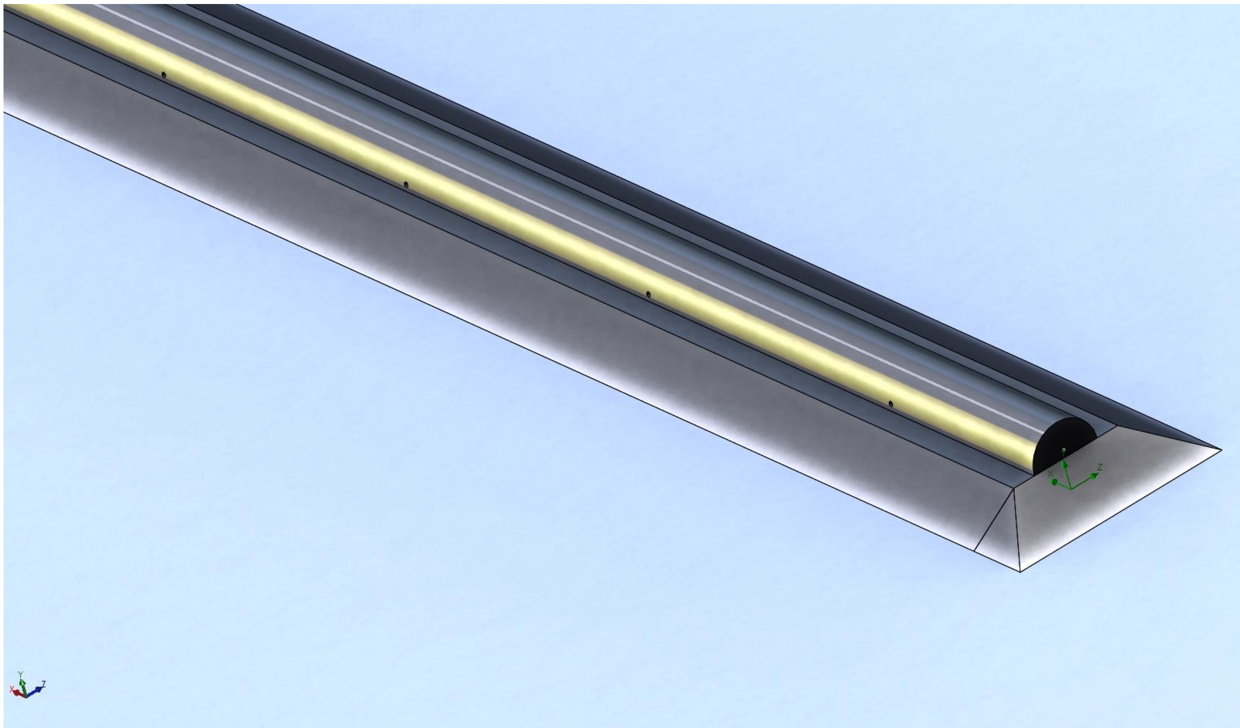


Figure 3: Conceptual design for a 200 ft. long diffuser with 50 ea. discharge ports to mate with the 3,952 ft. long HDPE pipe-in-pipe at the termination of the 20-inch LL@ pipeline.

The 12-inch HDPE pipe-in-pipe option produces only 6.7 ft. of head loss along the 3,952 ft. run of the existing LL2 steel pipe section, and another 4.76 ft of head loss from the 200 ft. linear diffuser section, or a total of 11.46 ft. of total head loss and allowing a residual head safety factor of 54%. While the 10-inch pipeline would be easier to route inside the existing LL@ 20-inch steel pipe, the smaller diameter would add another 10 ft. of head loss, bring the total head loss for the 10-inch pipe-in-pipe option to 21.16 ft., or 85% of the total available head. Therefore, we will proceed with the remaining analysis using the 12-inch HDPE pipe-in-pipe as the best design option and base the dilution and scour analysis on that concept. One additional design assumption incorporated in that analysis will be the use of duckbill check valves on all discharge ports, (Figure-4). The Tideflex TF-125 series check valve will maintain optimal discharge velocities over a wide range of discharge flow rates, and prevent flooding of the lower end of the diffuser during extreme low-flow conditions, or during no-flow conditions when the system is shut down for maintenance.

Table 4: Head Losses (from Hazen-Williams algorithms) for a 3,952 ft. long HDPE pipe-in-pipe of various diameters inside the present Load-Line-2 steel pipe terminating with a 200 ft. long diffuser

Discharge Rate (mgd/gpm)	12 in Pipeline Length (ft) Velocity (ft/s) Head Loss (ft)	10 in Pipeline Velocity (ft/s) Head Loss (ft)	9 in Pipeline Velocity (ft/s) Head Loss (ft)	6 in Pipeline Velocity (ft/s) Head Loss (ft)	Diffuser Length Port # Port Diameter Discharge Velocity	Diffuser Port Froude # Head Loss
0.066 mgd (45.83 gpm)	L = 3952 ft. U = 0.13 ft/s ΔH = 0.03 ft.	L = 3952 ft. U = 0.19 ft/s ΔH = 0.1 ft.	L = 3952 ft. U = 0.23 ft/s ΔH = 0.13 ft.	L = 3952 ft. U = 0.52 ft/s ΔH = 0.9 ft.	l = 200 ft. N = 50 d_i = 0.63 in. V_i = 0.95 ft/s	F_r = 4.78 ΔH_d = 0.014 ft.
0.241 mgd (167.36 gpm)	L = 3952 ft. U = 0.47 ft/s ΔH =0.3 ft.	L = 3952 ft. U = 0.68 ΔH = 0.8 ft.	L = 3952 ft. U = 0.84 ft/s ΔH = 1.4 ft.	L = 3952 ft. U = 1.90 ft/s ΔH = 10.1 ft.	l = 200 ft. N = 50 d_i = 0.63 in. V_i = 3.51 ft/s	F_r = 17.47 ΔH_d = 0.19 ft.
0.335 mgd (233.64 gpm)	L = 3952 ft. U = 0.66 ft/s ΔH = 0.6 ft.	L = 3952 ft. U = 0.95 ft/s ΔH = 1.6 ft.	L = 3952 ft. U = 1.18 ft/s ΔH = 2.6 ft.	L = 3952 ft. U = 2.65 ft/s ΔH = 18.7 ft.	l = 200 ft. N = 50 d_i = 0.63 in. V_i = 4.89 ft/s	F_r = 24.28 ΔH_d = 0.37 ft.
0.5 mgd (347.22 gpm)	L = 3952 ft. U = 0.99 ft/s ΔH = 1.3 ft.	L = 3952 ft. U = 1.42 ft/s ΔH = 3.2 ft.	L = 3952 ft. U = 1.75 ft/s ΔH = 5.4 ft.	L = 3952 ft. U = 3.94 ft/s ΔH = 38.9 ft.	l = 200 ft. N = 50 d_i = 0.63 in. V_i = 7.28 ft/s	F_r = 36.24 ΔH_d = 0.82 ft.
0.7 mgd (486.11 gpm)	L = 3952 ft. U = 1.38 ft/s ΔH = 2.5 ft.	L = 3952 ft. U = 1.99 ft/s ΔH = 6.0 ft.	L = 3952 ft. U = 2.45 ft. ΔH = 10.1 ft.	L = 3952 ft. U = 5.52 ft/s ΔH = 72.5 ft.	l = 200 ft. N = 50 d_i = 0.63 in. V_i = 10.20 ft/s	F_r = 50.74 ΔH_d = 1.62 ft.
1.2 mgd (833.33 gpm)	L = 3952 ft. U = 2.36 ft/s ΔH = 6.7 ft.	L = 3952 ft. U = 3.4 ft/s ΔH = 16.4 ft.	L = 3952 ft. U = 4.2 ft/s ΔH = 27.3 ft.	L = 3952 ft. U = 9.46 ft/s ΔH = 196.6 ft.	l = 200 ft. N = 50 d_i = 0.63 in. V_i = 17.49 ft/s	F_r = 86.98 ΔH_d = 4.76 ft.

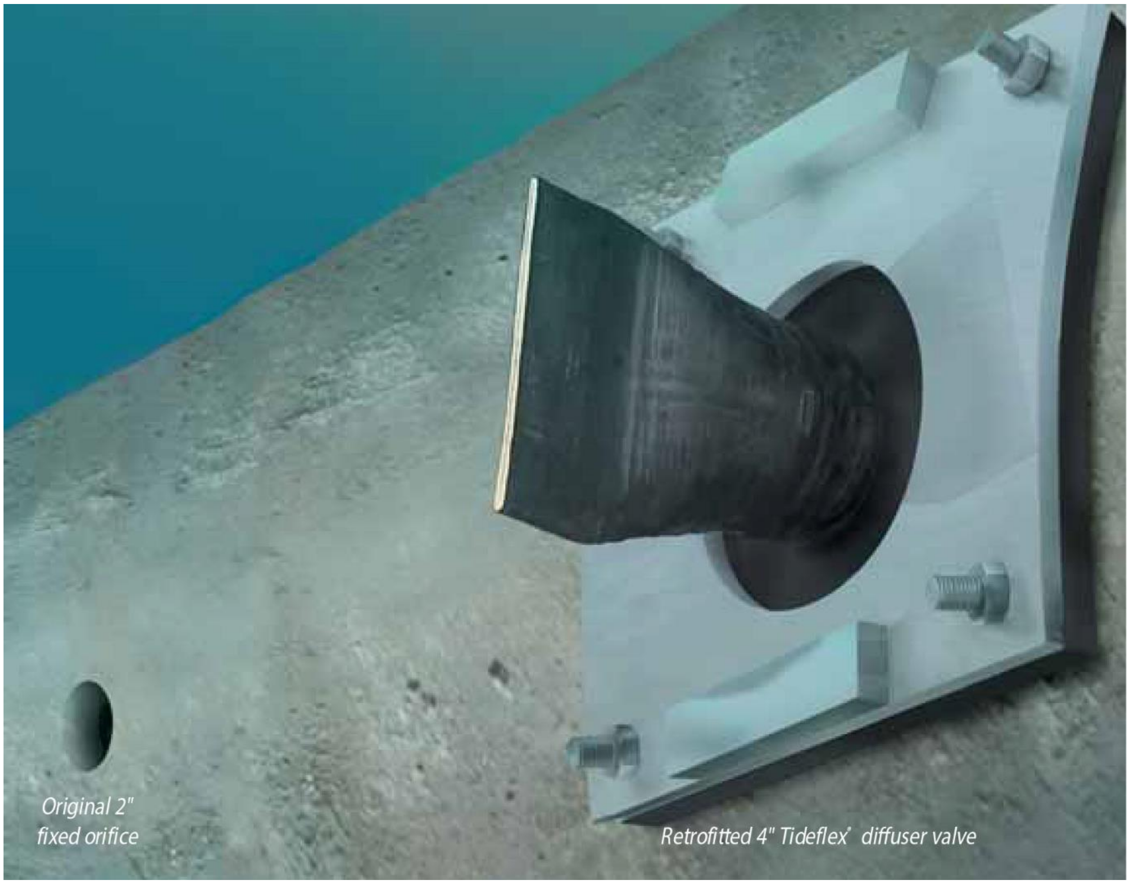


Figure 4: Tideflex duckbill check valve: TF-125 series check valve to maintain optimal discharge velocities over a wide range of discharge flow rates; cf. http://www.redvalve.com/tideflex/tideflex-products/tideflex-effluent-diffuser-systems/

4) Technical Approach:

Analysis of diffuser design and dilution performance uses a combination of hydrodynamic models: a near field mixing zone model, CORMIX v11 certified by the U.S. Environmental Protection Agency and the California State Water Resources Control Board for use in ocean outfall design; and a type of hydrodynamic model known as ***computational fluid dynamics*** (CFD). We use CORMIX as the credentialed arbitrator for determination of minimum initial dilution (otherwise referred to as *dilution credit*). We supplement CORMIX modeling with a commercially available CFD model known as *COSMOS/ FLowWorks* to compute the velocity field of the turbulent discharge jets and entrainment streams in the receiving waters, and the footprint of the *zone of initial dilution* (ZID) at the trapping level. We also use *COSMOS/ FLowWorks* to evaluate potential seabed scour of neighboring benthic sediments induced by the proposed diffuser design; and that design will be optimized to both minimize scour as well as achieve the required minimum initial dilution.

5) Dilution Model Initialization

The model inputs to CORMIX v 11 are listed in the *Session Reports* in Appendix B.1-B.18. The input parameters fall into three categories: ambient parameters, discharge parameters, and mixing zone parameters. Each of these is identical except for the discharge rates, (which vary from a minimum of 0.066 mgd to a maximum of 1.2 mgd); and the BOD_5 and TSS concentrations (which vary from 30 mg/L for average monthly to 90 mg/L for maximum daily). The Ocean Plan associates worst-month with the temperature and salinity profiles of the receiving waters. Historic temperature and salinity data was assimilated from the Morro Bay Shore Station of the Central and Northern California Ocean Observation System (CeNCOOS), https://www.cencoos.org/data/shore/morro. The station has been operational since 2007 and consists of four sensors. This station is located near the mouth of Morro Bay, and in particular, operates a profiling Sea-Bird 37 SIP CTD: conductivity, temperature, depth sensor to provide temperature/salinity profiles. Following protocols adopted in previous dilution studies, the worst-month assessment of this study was based on the most recent complete year in the available period of record, which was 2013. This may be considered as a representative year of the verified period of record because it contained months when the Southern Oscillation Index was negative values (El Nino conditions), embedded between other months when the index turned positive (La Nino conditions), see NOAA, (2018). Thus 2013 contained months representative of both of the dominate oceanographic regimes, and December 2013 was found to produce the worst-month dilution results.

6) Dilution Results:

We begin the discussion of the dilution results by considering in Figure 5 a 3-d CORMIX mapping of the maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser with maximum daily BOD_5 and TSS emissions, (90 mg/L). The CSWP effluent is buoyant in the local ambient sea water of Morro Bay, and consequently all the plumes from each of the 50 discharge ports rise vertically in the water column, where the average local water depth is 15.94 m (52.3 ft.). Vertical dimensions along the z-axis in Figure 5 are shown in meters above the seabed; and excess concentrations over ambient for BOD_5 and TSS are shown according to the color bar scale in the lower left-hand corner. In the design of the CSWP diffuser, the 50 discharge ports have been spaced optimally to provide rapid merging of the individual discharge plumes, which occurs within about 5 meters (16.4 ft.) above the seabed. Plume merging results in a rapid increase in the dilution rate, and the color transition of the discharge plumes in Figure 5 indicates that excess concentrations drop 2 orders of magnitude from end-of-pipe discharge concentrations once plume merging occurs. This is apparent in the vertical profile of the dilution (mixing ratio, S) plotted in Figure 6. At 5 m above the seabed, the dilution profile in Figure 6 shows an abrupt increase in dilution, from S= 103.7 to S = 143.7, once plume merging occurs. The fully merged *plane-plume* continues to rise in the water column until reaching the trapping level at 14.13 m (46.4 ft.) above the seabed, or 1.81 m (5.94 ft.) below the sea surface. Thus, even for maximum daily effluent discharges, the effluent plume from the CSWP diffuser at the LL2 discharge site never reaches the sea surface. Instead, the plume remains trapped about 6 ft. below the sea surface, spreading out along the trapping level and defining the limit of the *zone of initial dilution* (ZID). Figure 6 indicates a final dilution mixing ratio of S = 386.3 is reached at the trapping level (14.13 m above the seabed), when the CSWP diffuser operates at all-out maximum daily effluent discharges of 1.2 mgd with maximum daily BOD_5 and TSS emissions, (90 mg/L). This dilution mixing ratio corresponds to a minimum initial dilution factor of Dm = S - 1 = 385.1 : 1, (sometimes referred to as dilution credit). The vertical profiles of BOD_5 and TSS

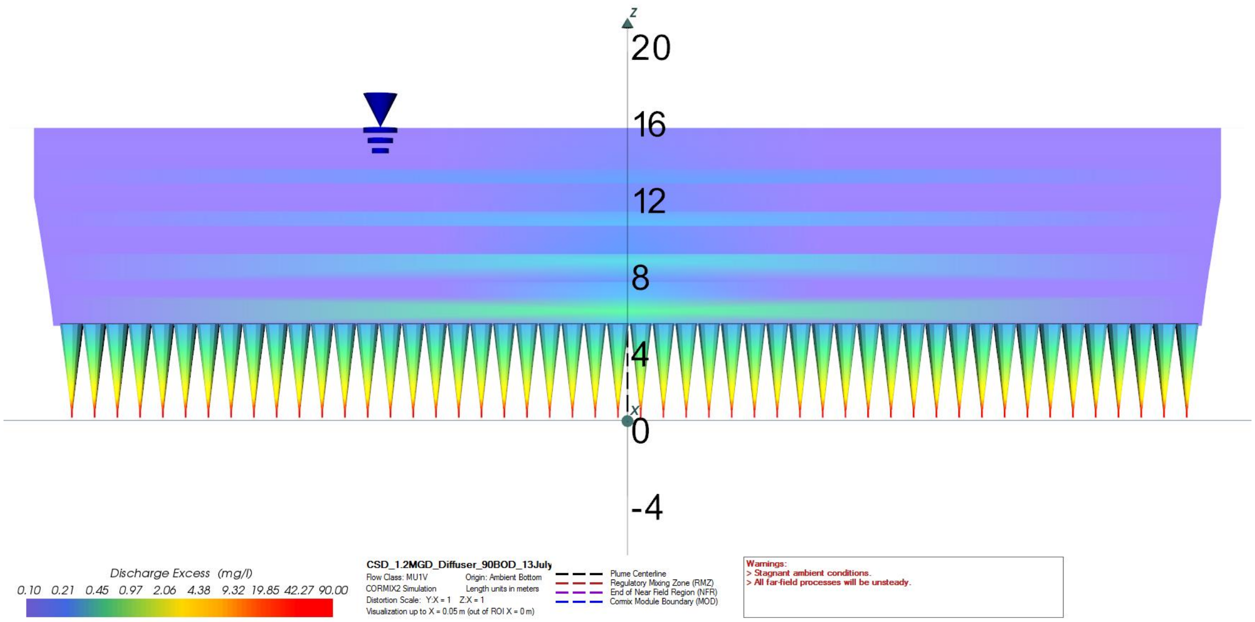


Figure 5: CORMIX v11 discharge and plume visualization of maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser with maximum daily BOD_5 and TSS emissions (90 mg/L). Vertical dimensions along the z-axis are shown in meters above the seabed. Excess concentrations over ambient for BOD_5 and TSS are shown according to the color bar scale in the lower left-hand corner.

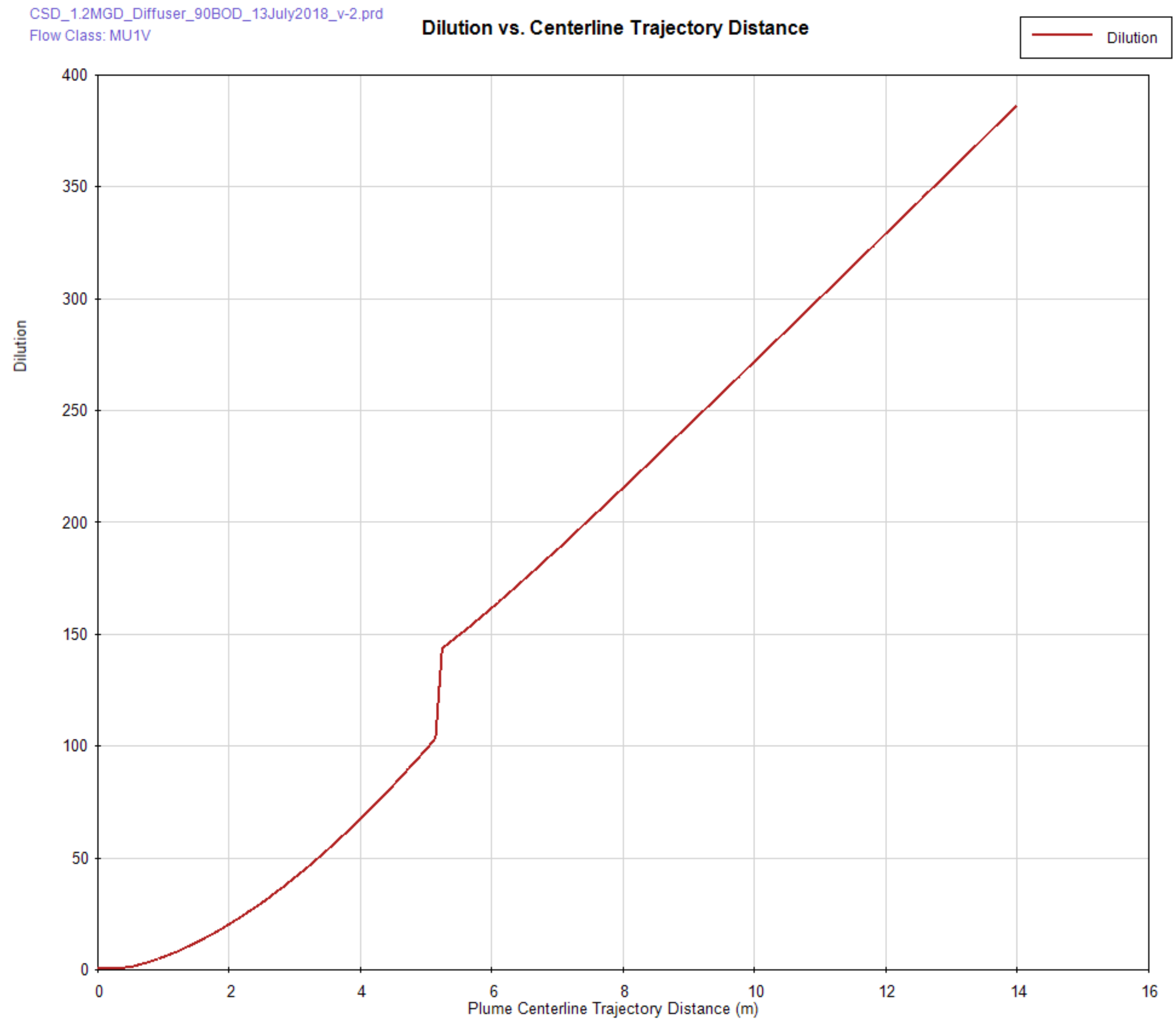
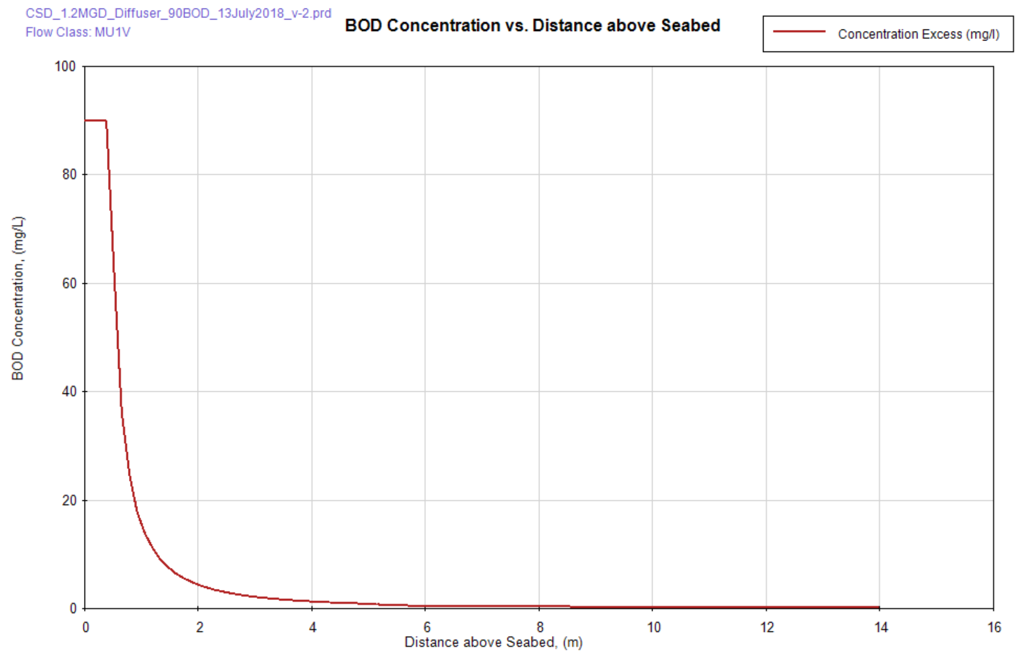


Figure 6: Vertical profile of the dilution (mixing ratio, S) during maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser with maximum daily BOD_5 and TSS emissions (90 mg/L). Note the abrupt increase in dilution mixing ratio at 5 m above the seabed due to plume merging, (cf. Figure 5)

a)



b)

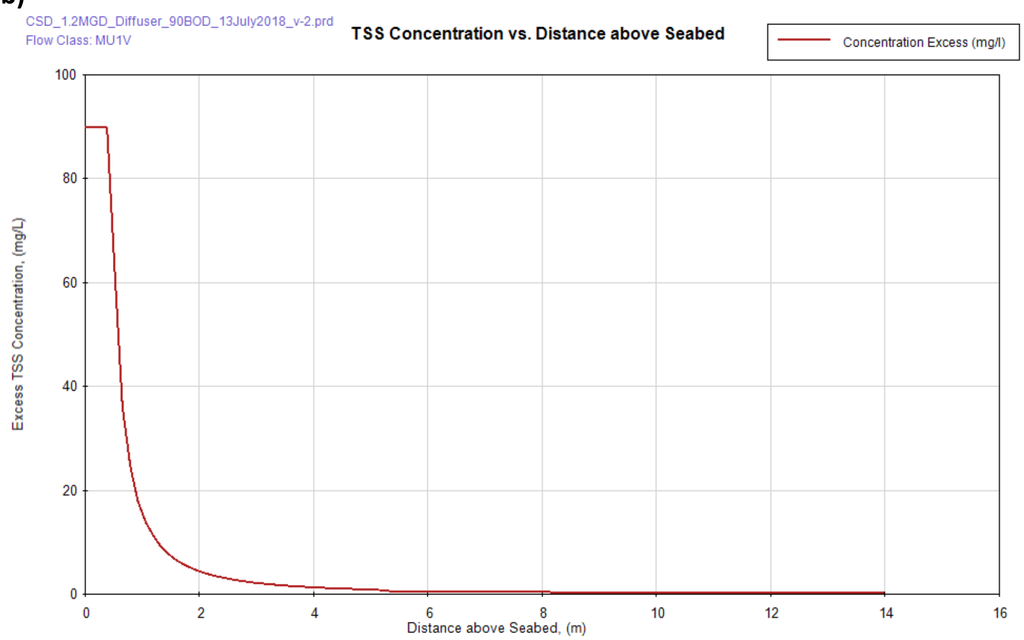


Figure 7: Vertical profiles of BOD_5 and TSS during maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser. Excess concentrations of BOD_5 and TSS at end-of-pipe emissions are $C_0 =$ 90 mg/L. Final concentrations at the trapping level (14.13 m above the seabed) are C_f = 0.233 mg/L.

during maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser are plotted in Figure 7. These profiles clearly show a 2-order of magnitude decline in the excess BOD_5 and TSS concentrations from an initial end-of-pipe concentration of C_0 = 90 mg/L. By the time the effluent plume reaches the trapping level (96.7 sec after initial discharge), the final excess concentrations of BOD_5 and TSS decline to as little as, C_f = 0.233 mg/L.

Dilution results for all the combinations of discharge rates and effluent concentrations are summarized in Figures 8-10, and detailed printouts and effluent concentration and dilution profiles are listed in the CORMIX *Prediction Files* in Appendix C.1-C.18. Figure 8 plots the minimum initial dilution of the proposed CSWP diffuser as a function of effluent discharge rate as computed by the CORMIX v11 dilution model. Minimum initial dilution is calculated at the outer edge of the zone of initial dilution (ZID), which is defined by the trapping level (cf Section-2, Figure-2). Figure 8 shows that the new diffuser design at the Load Line-2 site will achieve minimum initial dilution that ranges from 386 : 1 at the anticipated maximum daily discharge of 1.2 mgd, increasing to 2700 : 1 at full CSWP build-out when utilization of recycled water may reduce effluent discharges to a projected minimum of 0.066 mgd. This dilution performance of the new CSWP diffuser at LL2 is, (at worst), 3 times greater than the certified minimum initial dilution of the present Morro Bay outfall (cf. NPDES permit No. CA0047881). Unlike discharges from the Morro Bay outfall that occasionally broach the sea surface during worst-month conditions, the discharge plume from the Load Line-2 diffuser is always at least 6 ft. below the sea surface. The highest point that the plume rises in the water column is referred to as the "trapping level"; and Figure 9 shows that the BOD at the trapping level (6 ft below the sea surface) is never greater than 0.23 mg/L even if the Load Line-2 diffuser is required to discharge BOD at a maximum daily level of 90 mg/L per Table-2. This is 6 times lower BOD concentrations at the trapping level than the present Morro Bay outfall achieves for instantaneous maximum discharges of BOD. If we consider the more nominal average monthly BOD emissions of 30 mg/L according to Table-2 (which corresponds with the maximum daily emissions from the bio-reactor in Appendix-E of WSC, 2018), then the Load Line-2 diffuser will dilute BOD at the trapping level to as little as 0.01 mg/L, which is 90 times less than what the present Morro Bay outfall achieves for average monthly discharges of BOD. Similar dilution performance is exhibited for TSS using the new CSWP diffuser at the LL2 site. Figure 10 shows that TSS concentrations at the trapping level (i.e., outer edge of the ZID), are 3 times lower with the new CSWP diffuser at LL2 than what the present Morro Bay outfall achieves for instantaneous maximum discharges of TSS; and that average monthly TSS concentrations at the trapping level with the new CSWP diffuser will be 16 times less than what the present Morro Bay outfall achieves for average monthly discharges of TSS. Therefore, the proposed new CSWP at the LL2 site will be a significant improvement over present ocean discharges from the Morro Bay Cayucos Sanitary District Waste Water Treatment Plant (MBCSD WWTP).

The final aspect of the dilution analysis is to define the boundaries of the *zone of initial dilution* (ZID). This is done for the purposes of informing future compliance monitoring of where appropriate monitoring locations at the LL2 discharge site may be located. In particular, a monitoring site should not be located inside the ZID boundaries. From the Ocean Plan, we infer that the ZID will be only that portion of the trapping layer surface where, " *the momentum of the discharge and its initial buoyancy act together to produce turbulent mixing".* To map the ZID, we utilize the computational fluid dynamics

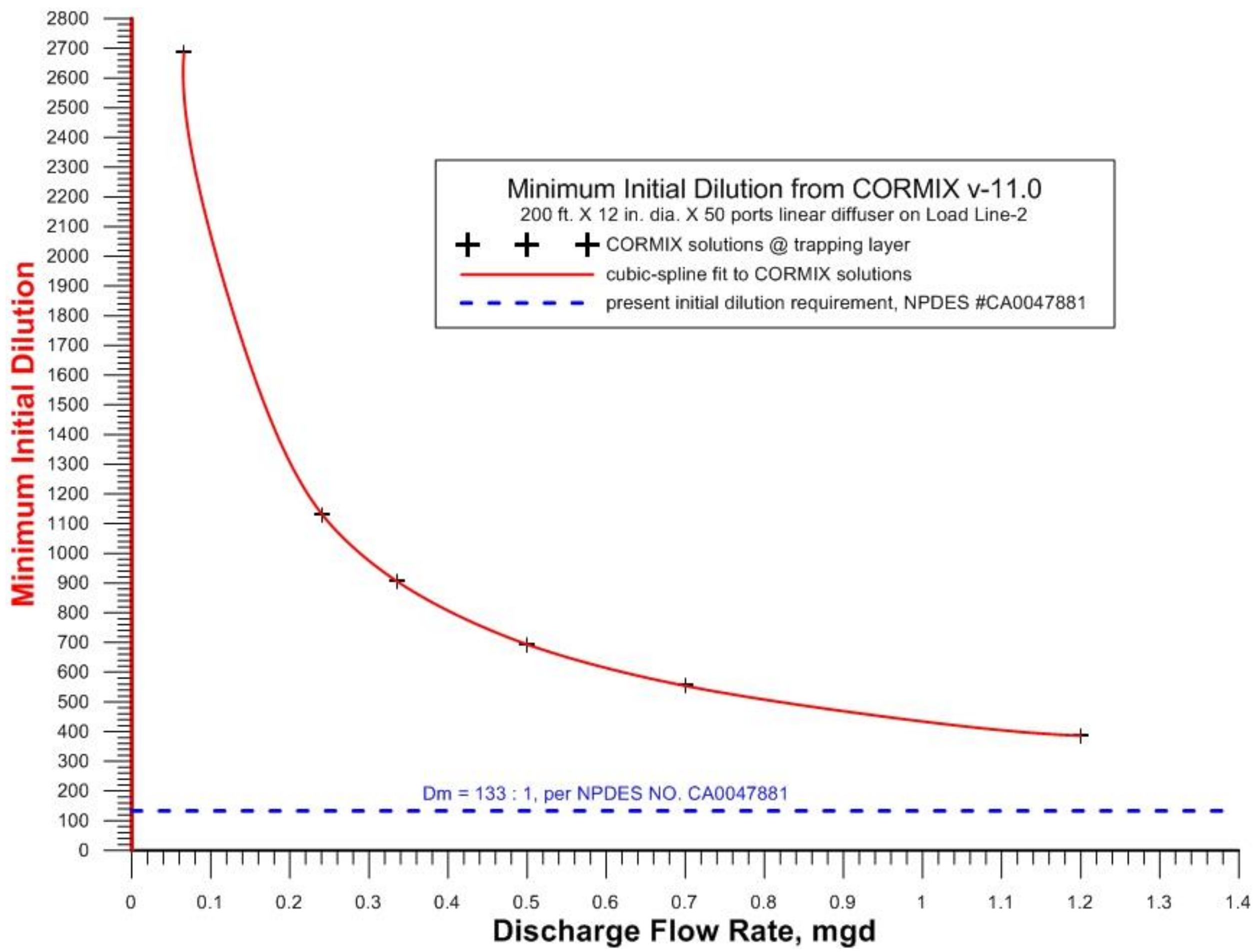


Figure 8: Minimum initial dilution of the proposed CSWP diffuser as a function of effluent discharge rate as computed by the CORMIX v11 dilution model certified by US EPA. Minimum initial dilution is calculated at the outer edge of the zone of initial dilution (ZID), which is defined by the trapping level (cf Section-2, Figure-2). Proposed diffuser is designed to mate with a 12-inch HDPE pipe-in-pipe slip linear inside the present 20-inch Load Line-2 steel pipeline. The proposed diffuser is 200 ft. in length by 12 in. dia. and features 50 ea. 0.063 in. dia. ports fitted with Tideflex TF-125 series check valve for velocity control and to prevent flooding of outer discharge ports during minimum flow conditions.

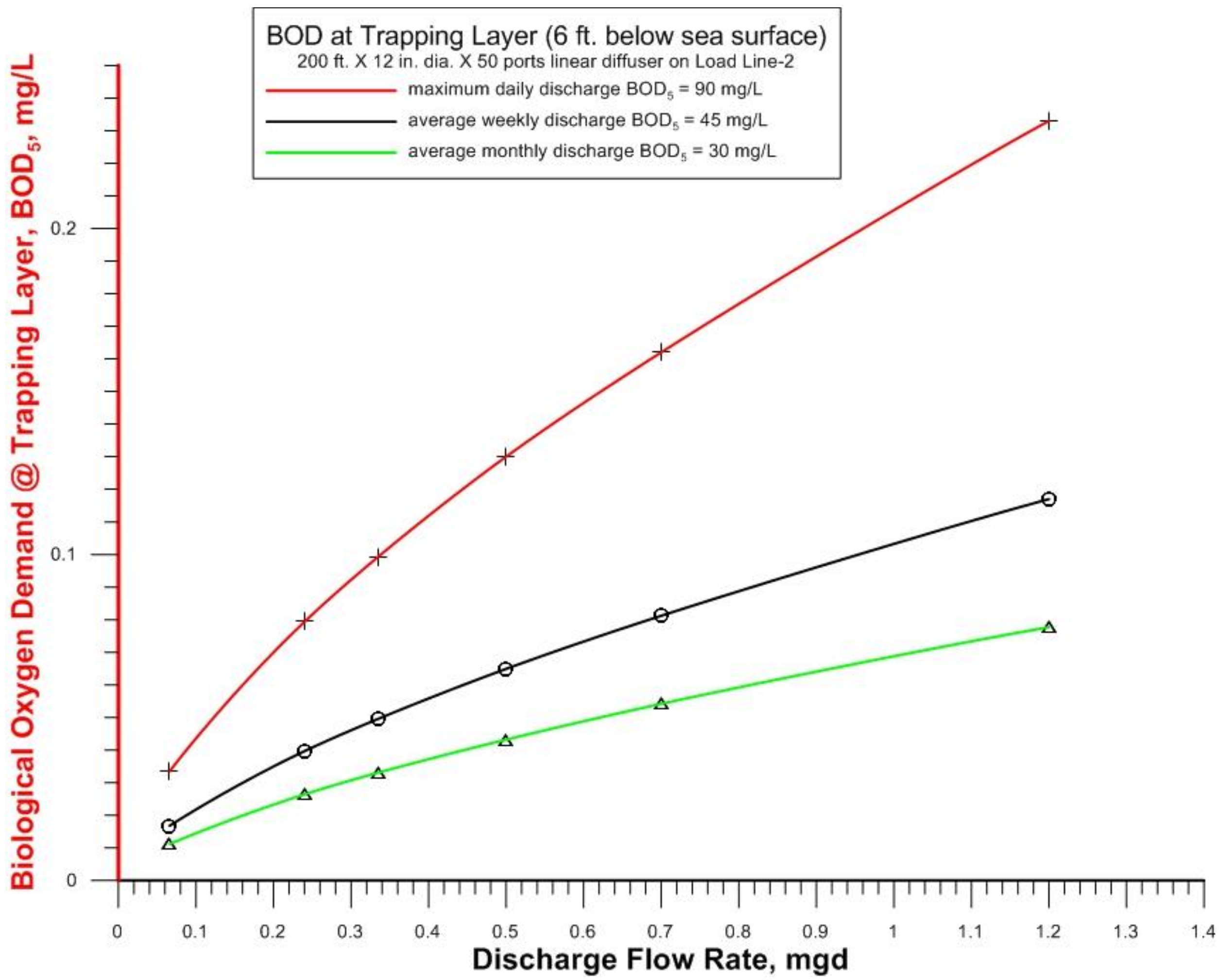


Figure 9: Excess Biological Oxygen Demand (BOD_5) at the outer edge of the zone of initial dilution (i.e. trapping level) as a function of CSWP diffuser discharge rate as computed by the CORMIX v11 certified dilution model. Proposed diffuser is designed to mate with a 12-inch HDPE pipe-in-pipe slip linear inside the present 20-inch Load Line-2 steel pipeline. The proposed diffuser is 200 ft. in length by 12 in. dia. and features 50 ea. 0.063 in. dia. ports fitted with Tideflex TF-125 series check valve for velocity control and to prevent flooding of outer discharge ports during minimum flow conditions.

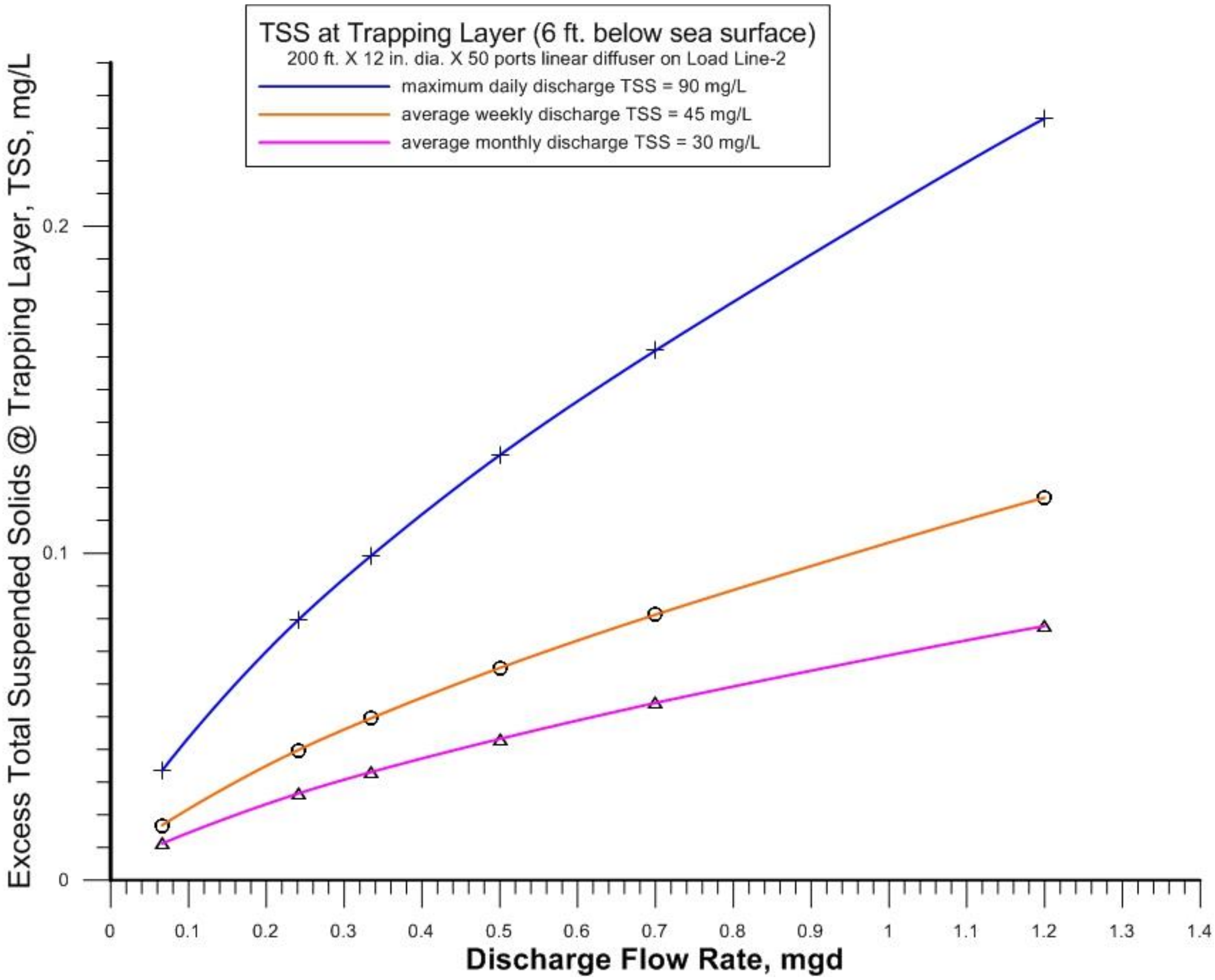


Figure 10: Excess Total Suspended Solids (TSS) at the outer edge of the zone of initial dilution (i.e. trapping level) as a function of CSWP diffuser discharge rate as computed by the CORMIX v11 certified dilution model. Proposed diffuser is designed to mate with a 12-inch HDPE pipe-in-pipe slip linear inside the present 20-inch Load Line-2 steel pipeline. The proposed diffuser is 200 ft. in length by 12 in. dia. and features 50 ea. 0.063 in. dia. ports fitted with Tideflex TF-125 series check valve for velocity control and to prevent flooding of outer discharge ports during minimum flow conditions.

(CFD) model known as *COSMOS/ FLowWorks* to compute the velocity field of the discharge at the trapping level. Figure 11 gives a velocity contour cut-plot of the velocity field on the trapping layer surface, (14.13 m above the seabed) for maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser at the Load Line-2 discharge site, (where local water depth averages 15.94 m, or 52.3 ft.). Diffuser induced velocities are contoured according to the color bar scale on the left-hand side. Inspection of the velocity contours shows a bilateral patch of green about 200 ft. in length corresponding to velocities on the order of 0.002 m/s (2 mm/s) directly above the alternating pattern of the 50 discharge ports CSWP diffuser. However, this residual momentum from the diffuser on the trapping level surface decays an order of magnitude, down to 0.0002 m/s (0.2 mm/s), along a rectangular boundary enclosing the diffuser site that measures 369 ft. by 166 ft. Since it is not possible to measure velocities smaller than 0.2 mm/s (using the most sophisticated acoustic Doppler velocimeter), we will utilize this threshold as a demarcation of the outer edge of the ZID. Hence, we conclude that the footprint of the zone of initial dilution (ZID) across the trapping layer surface is very small, consisting of a rectangle measuring 369 ft. in the on/off shore direction and 166 ft. in the along-shore direction; a total area of only 1.4 acres.

7) Diffuser Scour Analysis

A diffuser scour analysis is not required for buoyant discharges under The Ocean Plan, but rather is a supplemental requirement of the California State Lands Commission. Two benthic sediment samples were collected at the termination of Load Line-2 at depths of -51 ft. and -54 ft. MLLW by divers of Longitude 123, and shipped to Michael Baker International for grain size analysis. The samples were visually inspected and judged to be comprised of non-cohesive sediments and subsequently dried and subjected to a standard sieve analysis. The grain size distributions of the two benthic sediment samples are plotted in Figures 12 and 13, which indicate the samples were predominantly comprised of medium-fine sand. The average median grain size of the two samples was found to be D_{50} = 0.397 mm.

The decisive question in this regard is whether a diffuser-induced flow across the seabed sediment/water interface at the LL2 site is sufficient to erode and re-suspend the at-rest benthic sediments. From the plume discharge patterns in Figure 5, it is clear that the discharge jets from the proposed CSWP diffuser do not directly impinge upon the seabed because the effluent is buoyant and rises away from the seabed. Moreover, Figures 5 and 6 show that the rising plumes become vertically well mixed within just a few meters above the seabed, thereby diluting the effluent momentum and greatly reducing whatever residual entrainment velocities flow across the seabed. A high-resolution velocity contour plot in Figure 14 maps the diffuser-induced velocities over the seabed plane around the base of the CSWP diffuser structure using the COSMOS/FloWorks CFD model. Close inspection of Figure 14 reveals that the highest velocities on the seabed occur immediately adjacent of the base of the CSWP discharge structure where maximum velocities reach $u_{\max}$ = 0.04 m/s (0.13 ft/s).

The sediment data at the LL2 discharge in Figures 12 & 13 indicate a median grain size of D_{50} = 0.397 mm. When this median grain size is plotted on the Hjulstrom Curve in Figure 15, (see red arrows), it is found that these offshore sediments have a threshold of motion (critical current speed) at u_{crit} = 0.64 ft/sec. Because the maximum diffuser induced velocity on the seafloor ($u_{\max}$ = 0.13 ft/sec) is nearly

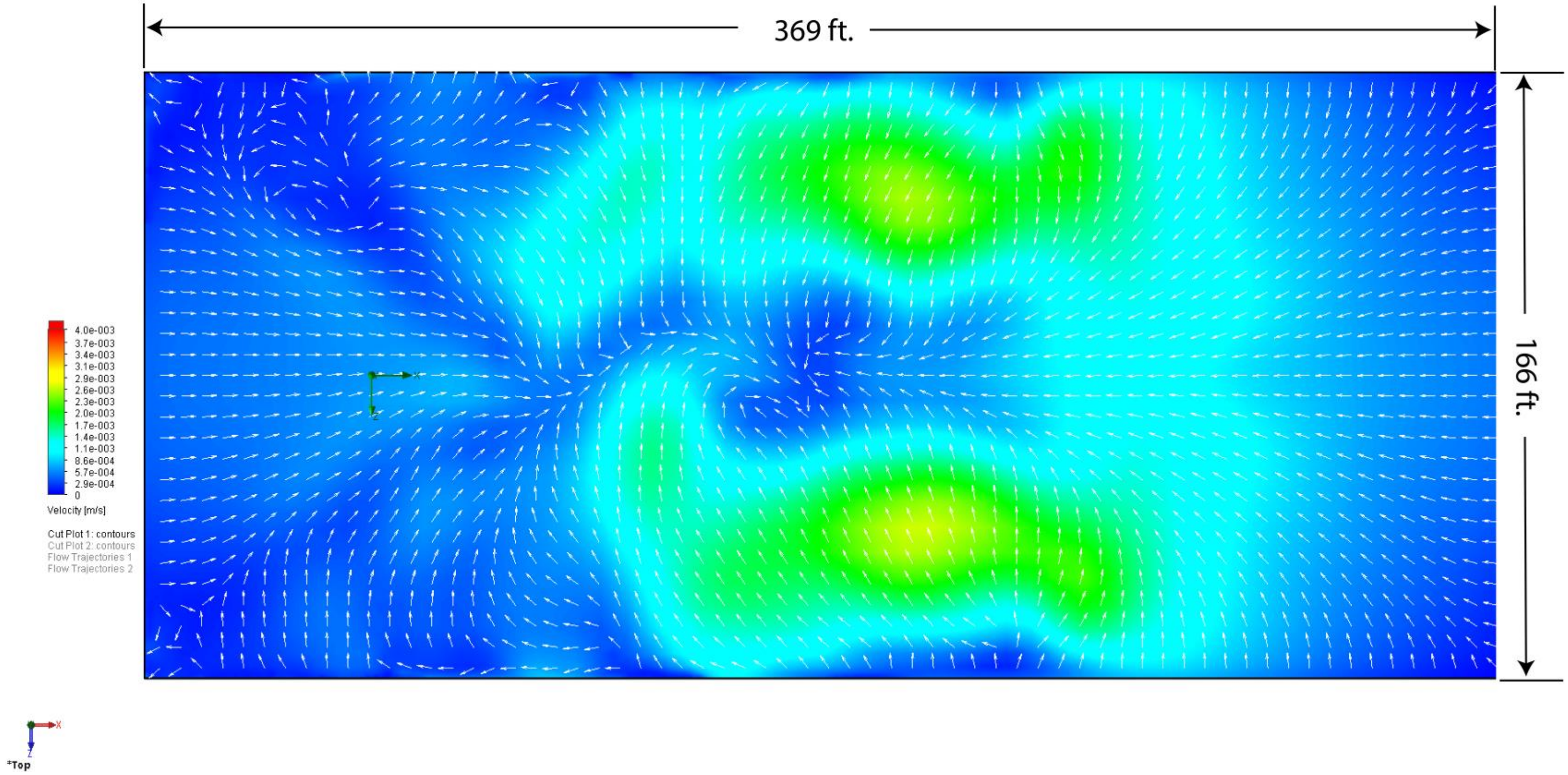
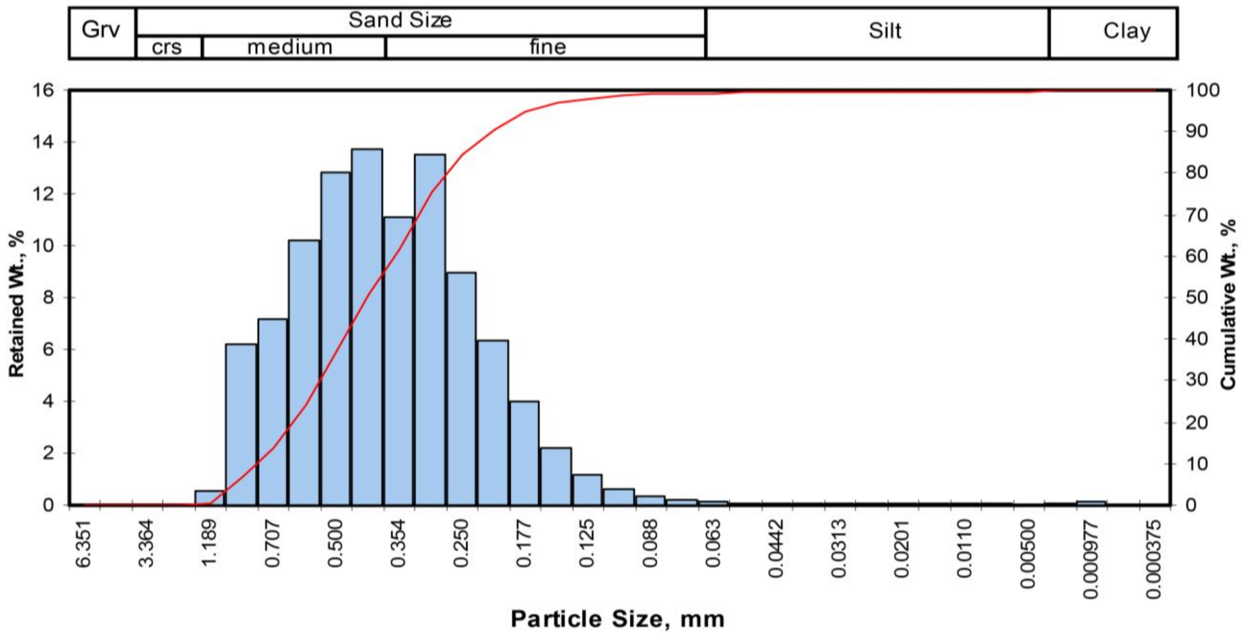


Figure 11: *COSMOS/ FLowWorks* simulation of the velocity field on the trapping layer surface, (14.13 m above the seabed) for maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser at the Load Line-2 discharge site where local water depth averages 15.94 m (52.3 ft.). Diffuser induced velocities contoured according to the color bar scale on the left-hand side.



Opening: Inches	Opening: Millimeters	Phi of Screen	U.S. No.	Sample Weight, grams	Increment Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	0.57	0.57	0.57
0.0331	0.841	0.25	20	6.23	6.23	6.80
0.0278	0.707	0.50	25	7.20	7.20	14.01
0.0234	0.595	0.75	30	10.20	10.20	24.21
0.0197	0.500	1.00	35	12.80	12.81	37.02
0.0166	0.420	1.25	40	13.70	13.71	50.72
0.0139	0.354	1.50	45	11.10	11.10	61.83
0.0117	0.297	1.75	50	13.50	13.51	75.33
0.0098	0.250	2.00	60	8.99	8.99	84.33
0.0083	0.210	2.25	70	6.35	6.35	90.68
0.0070	0.177	2.50	80	3.97	3.97	94.65
0.0059	0.149	2.75	100	2.20	2.20	96.85
0.0049	0.125	3.00	120	1.18	1.18	98.03
0.0041	0.105	3.25	140	0.63	0.63	98.66
0.0035	0.088	3.50	170	0.33	0.33	98.99
0.0029	0.074	3.75	200	0.18	0.18	99.17
0.0025	0.063	4.00	230	0.11	0.11	99.28
0.0021	0.053	4.25	270	0.07	0.07	99.35
0.00174	0.0442	4.50	325	0.05	0.05	99.41
0.00146	0.0372	4.75	400	0.05	0.05	99.45
0.00123	0.0313	5.00	450	0.04	0.04	99.49
0.000986	0.0250	5.32	500	0.05	0.05	99.54
0.000790	0.0201	5.64	635	0.04	0.04	99.58
0.000615	0.0156	6.00		0.04	0.04	99.62
0.000435	0.0110	6.50		0.05	0.05	99.67
0.000308	0.00781	7.00		0.04	0.04	99.71
0.000197	0.00500	7.65		0.03	0.03	99.74
0.000077	0.00195	9.00		0.09	0.09	99.83
0.000038	0.000977	10.00		0.15	0.15	99.98
0.000019	0.000488	11.00		0.02	0.02	100.00
0.000015	0.000375	11.38		0.00	0.00	100.00
TOTALS				**100.00**	**100.00**	**100.00**

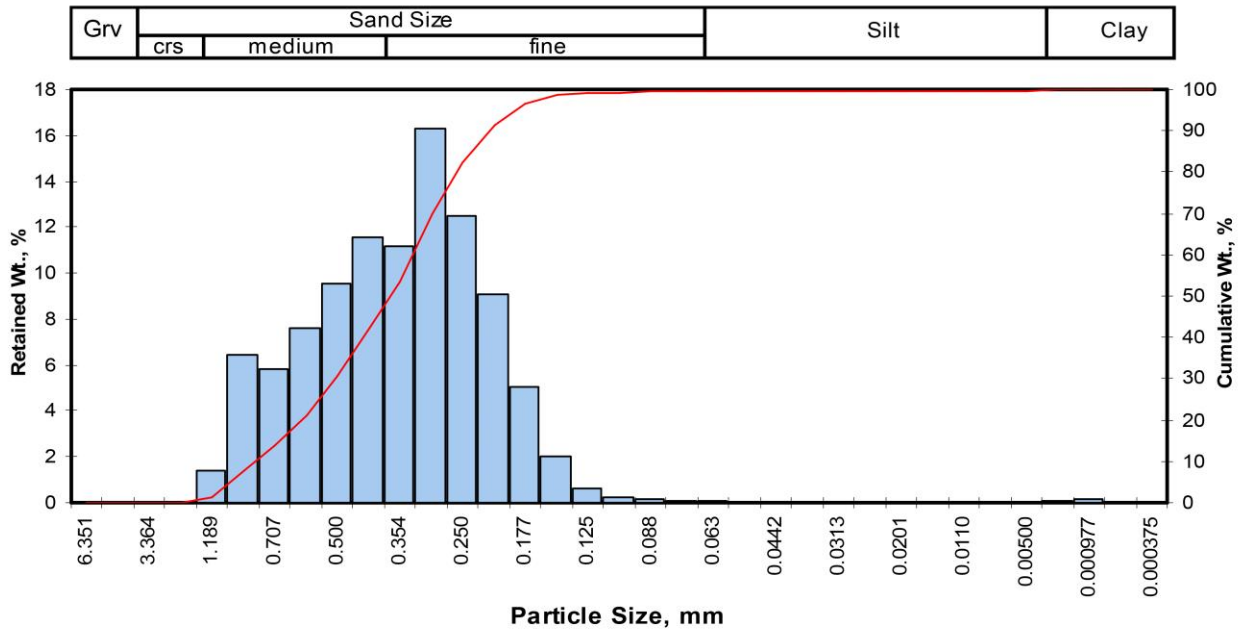
Cumulative Weight Percent greater than: Weight percent	Phi Value	Particle Size: Inches	Particle Size: Millimeters
5	0.11	0.0366	0.930
10	0.36	0.0307	0.779
16	0.55	0.0269	0.684
25	0.77	0.0232	0.588
40	1.05	0.0190	0.481
50	1.24	0.0167	0.424
60	1.46	0.0143	0.364
75	1.74	0.0118	0.299
84	1.99	0.0099	0.252
90	2.22	0.0084	0.214
95	2.54	0.0068	0.172

Measure	Trask	Inman	Folk-Ward
Median, phi	1.24	1.24	1.24
Median, in.	0.0167	0.0167	0.0167
Median, mm	0.424	0.424	0.424
Mean, phi	1.17	1.27	1.26
Mean, in.	0.0175	0.0163	0.0165
Mean, mm	0.443	0.415	0.418
Sorting	1.404	0.721	0.729
Skewness	0.988	0.046	0.058
Kurtosis	0.257	0.688	1.020

Grain Size Description (ASTM-USCS Scale)	Medium sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	50.72
Fine Sand	200	48.45
Silt	>0.005 mm	0.57
Clay	<0.005 mm	0.26
	Total	**100**

Figure 12: Grain size distribution for benthic sediment Sample #1 taken at the end of Load Line-2 in 51 ft. of local water depth.



Opening		Phi of	U.S.	Sample Weight,	Increment Weight,	Cumulative Weight,
Inches	Millimeters	Screen	No.	grams	percent	percent
0.2500	6.351	-2.67	1/4	0.00	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00	0.00
0.0468	1.189	-0.25	16	1.37	1.37	1.37
0.0331	0.841	0.25	20	6.44	6.44	7.81
0.0278	0.707	0.50	25	5.85	5.85	13.66
0.0234	0.595	0.75	30	7.60	7.60	21.26
0.0197	0.500	1.00	35	9.56	9.56	30.82
0.0166	0.420	1.25	40	11.60	11.60	42.42
0.0139	0.354	1.50	45	11.20	11.20	53.61
0.0117	0.297	1.75	50	16.30	16.30	69.91
0.0098	0.250	2.00	60	12.50	12.50	82.41
0.0083	0.210	2.25	70	9.07	9.07	91.48
0.0070	0.177	2.50	80	5.06	5.06	96.54
0.0059	0.149	2.75	100	1.99	1.99	98.53
0.0049	0.125	3.00	120	0.60	0.60	99.13
0.0041	0.105	3.25	140	0.21	0.21	99.34
0.0035	0.088	3.50	170	0.15	0.15	99.49
0.0029	0.074	3.75	200	0.11	0.11	99.60
0.0025	0.063	4.00	230	0.05	0.05	99.65
0.0021	0.053	4.25	270	0.02	0.02	99.67
0.00174	0.0442	4.50	325	0.02	0.02	99.69
0.00146	0.0372	4.75	400	0.02	0.02	99.71
0.00123	0.0313	5.00	450	0.01	0.01	99.72
0.000986	0.0250	5.32	500	0.01	0.01	99.73
0.000790	0.0201	5.64	635	0.01	0.01	99.74
0.000615	0.0156	6.00		0.01	0.01	99.75
0.000435	0.0110	6.50		0.01	0.01	99.76
0.000308	0.00781	7.00		0.01	0.01	99.77
0.000197	0.00500	7.65		0.00	0.00	99.78
0.000077	0.00195	9.00		0.07	0.07	99.85
0.000038	0.000977	10.00		0.14	0.14	99.99
0.000019	0.000488	11.00		0.01	0.01	100.00
0.000015	0.000375	11.38		0.00	0.00	100.00
TOTALS				100.00	100.00	100.00

Cumulative Weight Percent greater than			
Weight	Phi	Particle Size	
percent	Value	Inches	Millimeters
5	0.03	0.0385	0.978
10	0.34	0.0310	0.788
16	0.58	0.0264	0.670
25	0.85	0.0219	0.556
40	1.20	0.0172	0.436
50	1.42	0.0147	0.374
60	1.60	0.0130	0.330
75	1.85	0.0109	0.277
84	2.04	0.0095	0.243
90	2.21	0.0085	0.216
95	2.42	0.0073	0.186

Measure	Trask	Inman	Folk-Ward
Median, phi	1.42	1.42	1.42
Median, in.	0.0147	0.0147	0.0147
Median, mm	0.374	0.374	0.374
Mean, phi	1.26	1.31	1.35
Mean, in.	0.0164	0.0159	0.0155
Mean, mm	0.416	0.403	0.393
Sorting	1.416	0.733	0.729
Skewness	1.049	-0.148	-0.154
Kurtosis	0.244	0.631	0.977
Grain Size Description (ASTM-USCS Scale)		Fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	42.42
Fine Sand	200	57.18
Silt	>0.005 mm	0.18
Clay	<0.005 mm	0.22
	Total	100

Figure 13: Grain size distribution for benthic sediment Sample #2 taken at the end of Load Line-2 in 54 ft. of local water depth.

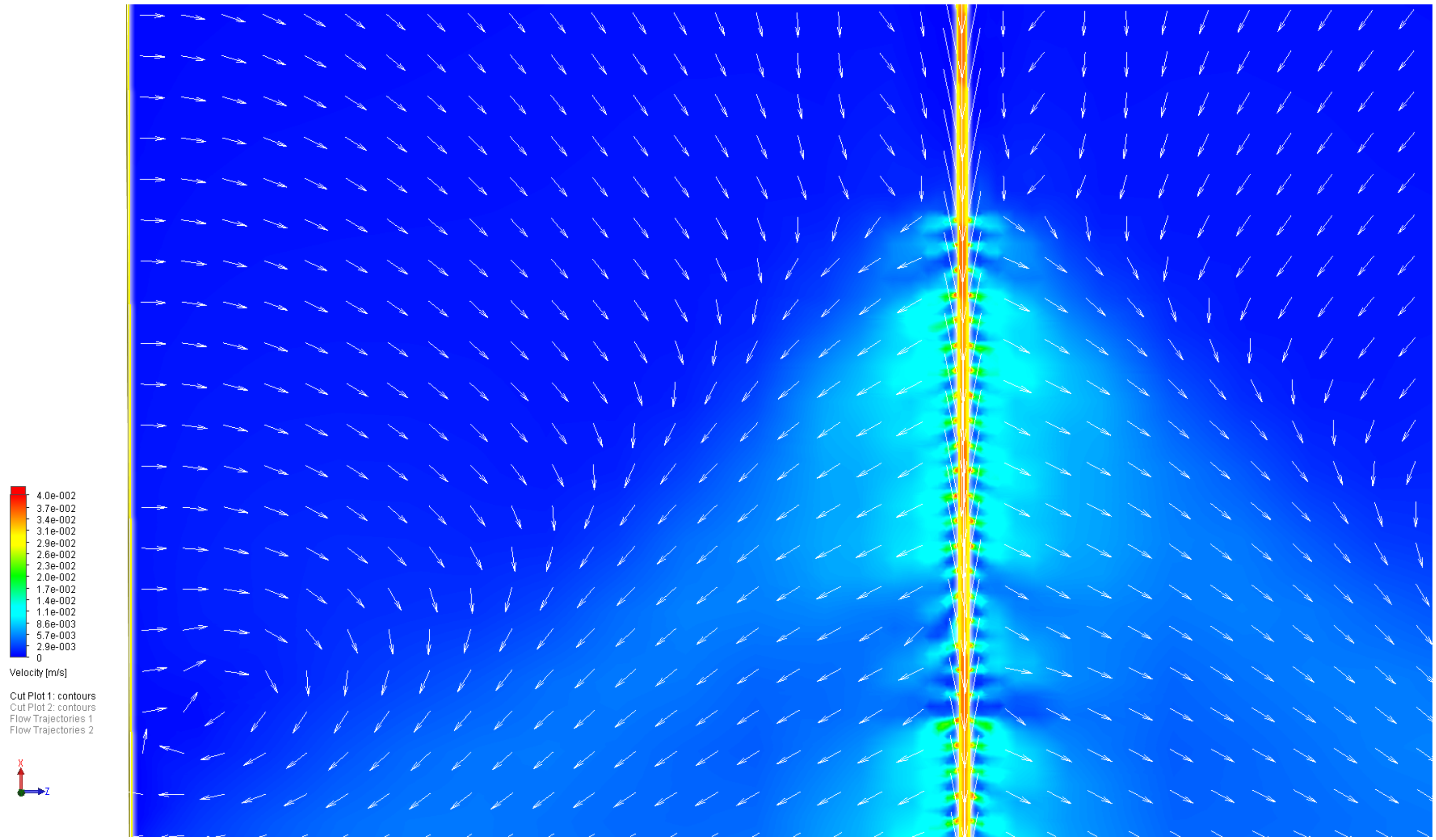


Figure 14: *COSMOS/ FLowWorks* simulation of the velocity field on the seabed for maximum daily effluent discharges (1.2 mgd) from the proposed CSWP linear diffuser at the Load Line-2 discharge site where local water depth averages 15.94 m (52.3 ft.). Diffuser induced velocities contoured according to the color bar scale on the left-hand side. Note maximum velocity on the seabed induced by vertically rising discharge plumes reaches a maximum of only u_{max} = 0.04 m/s (0.13 ft/s).

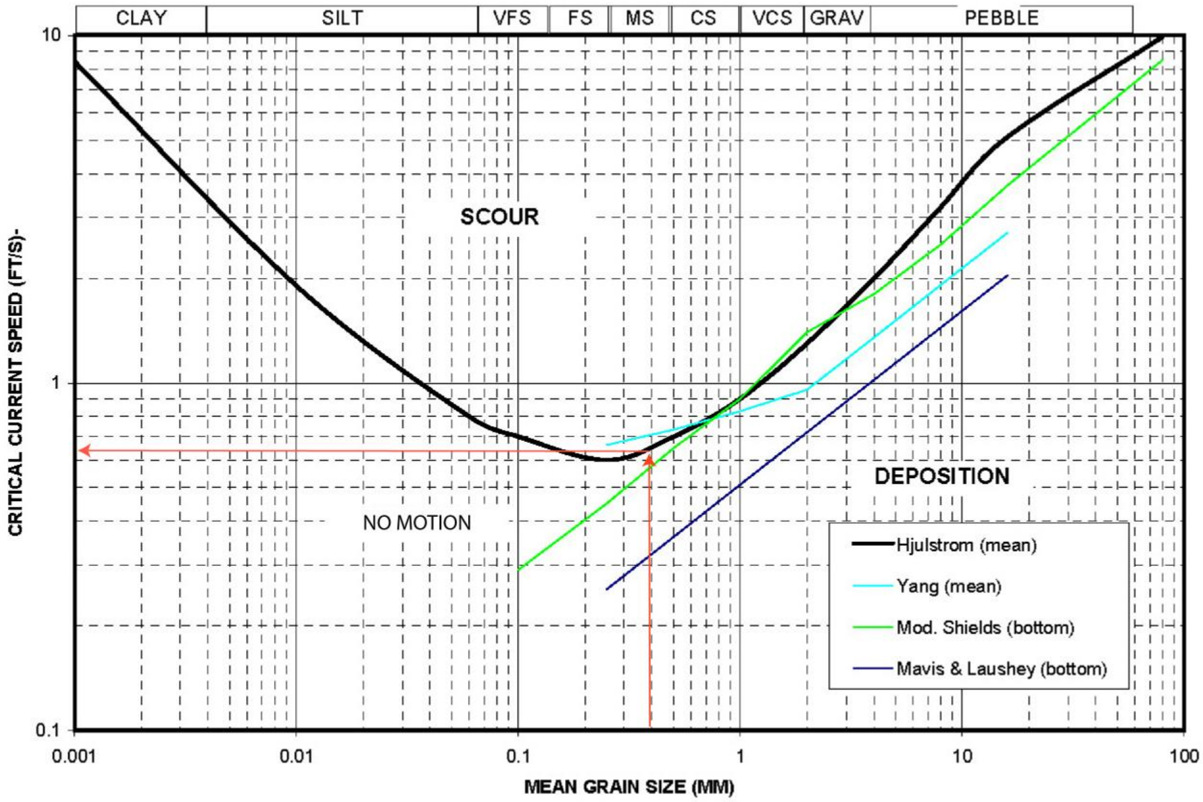


Figure 15: Hjulstrom curve after Bagnold, (1956, 1963) shown as black line for critical current speeds of quartz sediment as a function of mean grain size. Critical current speed for the finest grain size (very fine sand) at the HBGS discharge site is shown by the solid arrows. Area below the Hjulstrom curve corresponds to either no sediment motion or deposition; area above the curve corresponds to scour, erosion and resuspension of the sediments. The median sediment size at the Load Line-2 discharge site is D_{50} = 0.397 mm which projects up to the Hjulstrom curve to a corresponding critical current speed of u_{crit} = 0.64 ft/sec, above which the seabed sands will scour and be suspended. The maximum diffuser induced velocity on the seafloor is $u_{\max}$ = 0.13 ft/sec, (cf. Figure 14). Hence the diffuser will not scour and re-suspend the seafloor sediments.

5 times less than the threshold of motion for the sediments found around the diffuser, $u_{\max} < u_{crit}$, we conclude the proposed CSWP diffuser will not cause suspension of benthic sediments at the LL2 discharge site, (cf. Dyer, 1985; Jenkins, et.al., 1994). This conclusion is conservative because it is basedon the absolute highest diffuser induced velocities on the seabed that result from maximum daily CSWP discharges of 1.2 mgd.

8) Conclusions:

A hydrodynamic dilution and scour analysis is performed for a diffuser retrofit to *Load-Line 2* (LL2) at the Chevron Estero Marine Terminal, to serve as an ocean outfall for the proposed Cayucos Sustainable Water Project (CSWP). The Load Line-2 (LL2) pipeline consists of a nominal 22-inch diameter onshore section and a nominal 20-inch diameter offshore section. Underwater inspections and testing still leave some concerns over the degree of degradation that the LL2 pipeline may have suffered due to marine corrosion. However, the maximum anticipated wet weather daily discharges of the CSWP will not require a 20-inch pipeline for adequate conveyance of estimated effluent loads to the discharge location in 51 ft of local water depth. Consequently, this study proceeds under the assumption of utilizing a smaller diameter high-density polyethylene (HDPE) pipeline for CSWP conveyance that is inside the existing 20-inch steel LL2 pipeline (referred to as *pipe-in-pipe*). With this arrangement, the existing 20-inch steel LL2 pipeline will serve as armored outer sleeve for the new smaller diameter HDPE pipeline that will exit the 16-inch reduction fitting at the terminal end of LL2, where it will then junction with a linear diffuser section. This arrangement will also allow the depth of the new CSWP outfall to be comparable to or slightly deeper than the presently permitted MBCSD WWTP outfall.

A sensitivity analysis was performed for the head losses associated with a 3,952 ft. long HDPE pipe-in-pipe of various diameters inside the present Load-Line-2 steel pipe, terminating with a 200 ft. long diffuser. The diffuser is based on the well-established linear diffuser concept with 50 ports on alternate sides, where each port is 0.63 in. dia. Only the 10-inch and 12-inch pipe-in-pipe options are viable alternatives within the head limits of the proposed new outfall pump station. The 12-inch HDPE pipe-in-pipe was selected as the best design option because the 10-inch option would consume 85% of the total available head in friction losses at maximum daily discharge rates of 1.2 mgd. During the progressive build-out phases of the CSWP, the proposed diffuser at the LL2 site will be required to provide adequate dilution across a wide range of discharges that spans 18-fold, from maximum daily discharges of as much as 1.2 mgd to as little as 0.066 mgd in the event that community water purveyors determine recycled water is advantageous to be developed as a water source. To accommodate this wide range in potential discharge rates, the 50 discharge ports of the proposed CSWP diffuser will be fitted with Tideflex TF-125 series check valves. These check valves will maintain optimal discharge velocities and prevent ambient seawater from flooding the deeper end of the diffuser during extreme low-flow conditions, or during no-flow conditions when the system is shut down for maintenance.

Hydrodynamic dilution modeling of the new diffuser design at the Load Line-2 site was performed using the EPA certified mixing model, CORMIX v11. This model determined that the proposed diffuser will achieve minimum initial dilution that ranges from 386 : 1 at the anticipated maximum daily discharge of 1.2 mgd, increasing to 2700 : 1 at full CSWP build-out when utilization of recycled water may reduce effluent discharges to a projected minimum of 0.066 mgd. This dilution performance is, (at worst), 3 times greater than the certified minimum initial dilution of the present Morro Bay outfall (cf. NPDES permit No. CA0047881). Unlike discharges from the Morro Bay outfall that occasionally broach the sea surface during worst-month conditions, the discharge plume from the Load Line-2 diffuser is always at least 6 ft. below the sea surface. The highest point that the discharge plume rises in the water column is referred to as the "trapping level"; and the BOD at the trapping level (6 ft below the sea surface) is never greater than 0.23 mg/L even if the Load Line-2 diffuser is required to discharge BOD at a maximum daily level of 90 mg/L. This is 6 times lower BOD concentrations at the trapping level than the present Morro Bay outfall achieves for instantaneous maximum discharges of BOD. If we consider the more nominal average monthly BOD emissions of 30 mg/L, (which corresponds with the projected maximum daily emissions from the bio-reactor per Appendix-E of the 90% design report, WSC, 2018), then the Load Line-2 diffuser will dilute BOD at the trapping level to as little as 0.01 mg/L, which is 90 times less than what the present Morro Bay outfall achieves for average monthly discharges of BOD. Similar dilution performance is exhibited for TSS using the new CSWP diffuser at the LL2 site. The CORMIX model finds TSS concentrations at the trapping level are 3 times lower with the new CSWP diffuser at LL2 than what the present Morro Bay outfall achieves for instantaneous maximum discharges of TSS; and that average monthly TSS concentrations at the trapping level with the new CSWP diffuser will be 16 times less than what the present Morro Bay outfall achieves for average monthly discharges of TSS. In addition, the footprint of the zone of initial dilution (ZID) across the trapping layer was found to be very small, consisting of a rectangle measuring 369 ft. in the on/off shore direction and 166 ft. in the along-shore direction; a total ZID area of only 1.4 acres. Therefore, the proposed new CSWP at the LL2 site will be a significant improvement over present ocean discharges from the Morro Bay Cayucos Sanitary District Waste Water Treatment Plant (MBCSD WWTP).

The California State Lands Commission is requiring that the CSWP diffuser at the LL2 discharge site minimize scour and re-suspension of benthic sediments. The computational fluid dynamics (CFD) modeling of ultimate maximum discharge from the proposed CSWP diffuser (1.2 mgd) determined that diffuser induced velocities on the seafloor are everywhere at least 5 times less than the threshold of motion speed of the seabed sediments found at the LL2 discharge site. Consequently, it was concluded that scour and re-suspension of benthic sediments by the CSWP diffuser will not occur.

9) References:

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APPENDIX-A: WASTE DISCHARGES REQUIREMENTS FOR THE MORRO BAY AND CAYUCOS WASTEWATER TREATMENT PLANT DISCHARGES TO THE PACIFIC OCEAN, MORRO BAY, SAN LUIS OBISPO COUNTY NPDES NO. CA0047881

IV. EFFLUENT LIMITATIONS[1] AND DISCHARGE SPECIFICATIONS

effluent shall not exceed the following limits:

Constituent	Unit of Measurement	Average Monthly	Instantaneous Maximum
BOD_5	mg/L	120	180
	lbs/day	2062	3092
	kg/day	936	1404
Suspended Solids	mg/L	70	105
	lbs/day	1203	1804
	kg/day	546	819

C. Effluent shall not exceed the following limits:

1.

Constituent	Units	Average Monthly	Average Weekly	Instantaneous Maximum
Grease and Oil	mg/L	25	40	75
	lbs/day	430	687	1288
	kg/day	195	312	585
Settleable Solids	mL/L	1.0	1.5	3.0
Turbidity	NTU	75	100	225
pH	--	Within limits of 6.0 to 9.0 at all times.		

2. FOR PROTECTION OF MARINE AQUATIC LIFE

Constituent	Units	Six-Month Median	Maximum Daily	Instantaneous Maximum
Arsenic	mg/L	0.67	3.89	10.3
Cadmium	mg/L	0.13	0.54	1.34
Chromium(Hex)[2]	mg/L	0.27	1.07	2.68
Copper	mg/L	0.14	1.34	3.75
Lead	mg/L	0.27	1.07	2.68
Mercury	µg/L	5.29	21.4	53.5
Nickel	mg/L	0.67	2.68	6.70
Selenium	mg/L	2.01	8.04	20.1

[1] Based on Ocean Plan criteria using a calculated minimum initial dilution of 133:1. If actual dilution is found to be less than
133:1, these values will be recalculated.
[2] The Discharger may at its option meet this limitation as a Total Chromium limitation.

At instantaneous max discharge, BOD dilutes at Dm = 133 : 1 to C0 = 180/(133 + 1) = 1.34 mg/L

At instantaneous max discharge, TSS dilutes at Dm =133 : 1 to C0 = 105/(133 + 1) = 0.78 mg/L

APPENDIX-B.1: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.066mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.066MGD Diffuser
30BOD 13July2018 v-2.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--11:20:48
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F       = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 0.29 m/s
  Total discharge flowrate      Q0     = 0.002892 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 30 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
-----------------------------------------------------------------------------
```

```
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)         q0     = 0.000047 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000014 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000014 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000011 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000011 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.03 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 47.83
  Port/nozzle Froude number       FRD0   = 4.78
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0112 mg/l
  Dilution at edge of NFR              s = 2684.6
  NFR Location:                        x = 0.04 m
    (centerline coordinates)           y = 0 m
                                       z = 14.12 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       256.2241 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
```

```
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
*********************** TOXIC DILUTION ZONE SUMMARY ***********************
No TDZ was specified for this simulation.
********************* REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 22.4
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 0.79 m
  Plume dimensions:      half-width (bh) = 0.08 m
                          thickness (bv) = 0.08 m
******************** FINAL DESIGN ADVICE AND COMMENTS *********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.2: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.066mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.066MGD Diffuser
45BOD 13July2018 v-4.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/17/2018--13:28:45
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor  F      = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 0.29 m/s
  Total discharge flowrate      Q0     = 0.002892 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 45 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
-----------------------------------------------------------------------------
```

```
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)         q0     = 0.000047 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000014 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000014 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000011 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000011 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.03 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 47.83
  Port/nozzle Froude number       FRD0   = 4.78
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0168 mg/l
  Dilution at edge of NFR              s = 2684.6
  NFR Location:                        x = 0.04 m
    (centerline coordinates)           y = 0 m
                                       z = 14.12 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       256.2241 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
```

```
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
*********************** TOXIC DILUTION ZONE SUMMARY ***********************
No TDZ was specified for this simulation.
********************* REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 33.6
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 0.97 m
  Plume dimensions:      half-width (bh) = 0.10 m
                          thickness (bv) = 0.10 m
******************** FINAL DESIGN ADVICE AND COMMENTS *********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.3: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.066mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.066MGD Diffuser
90BOD 13July2018 v-1.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--11:12:32
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                 HA        = 15.94 m
  Depth at discharge            HD        = 15.94 m
  Ambient velocity              UA        = 0.0001 m/s
  Darcy-Weisbach friction factor F        = 0.1
  Wind velocity                 UW        = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 0.29 m/s
  Total discharge flowrate      Q0     = 0.002892 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 90 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000047 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000014 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000014 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000011 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000011 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.03 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 47.83
  Port/nozzle Froude number       FRD0   = 4.78
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0335 mg/l
  Dilution at edge of NFR              s = 2684.6
  NFR Location:                        x = 0.04 m
    (centerline coordinates)           y = 0 m
                                       z = 14.12 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       256.2241 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 67.2
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.38 m
  Plume dimensions:      half-width (bh) = 0.15 m
                          thickness (bv) = 0.15 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.4: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.241mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.241MGD Diffuser
30BOD 13July2018 v-3.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--12:38:33
******************************************************************************
SUMMARY OF INPUT DATA:
------------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F       = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
------------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 1.07 m/s
  Total discharge flowrate      Q0     = 0.010559 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 30 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
------------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000173 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000182 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000185 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000040 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000041 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.16 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 174.63
  Port/nozzle Froude number       FRD0   = 17.47
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0265 mg/l
  Dilution at edge of NFR              s = 1130.1
  NFR Location:                        x = 0.03 m
    (centerline coordinates)           y = 0 m
                                       z = 14.12 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       166.0151 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 22.4
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.25 m
  Plume dimensions:      half-width (bh) = 0.13 m
                          thickness (bv) = 0.13 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.5: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.241mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.241MGD Diffuser
45BOD 13July2018 v-4.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/17/2018--13:18:30
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F       = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 1.07 m/s
  Total discharge flowrate      Q0     = 0.010559 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 45 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000173 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000182 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000185 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000040 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000041 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m          Lm  = 99999 m          LM  = 0.16 m
  lm' = 99999 m          Lb' = 99999 m          La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 174.63
  Port/nozzle Froude number       FRD0   = 17.47
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0398 mg/l
  Dilution at edge of NFR              s = 1130.1
  NFR Location:                        x = 0.03 m
    (centerline coordinates)           y = 0 m
                                       z = 14.12 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       166.0151 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
*********************** TOXIC DILUTION ZONE SUMMARY ***********************
No TDZ was specified for this simulation.
********************* REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 33.6
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.54 m
  Plume dimensions:      half-width (bh) = 0.16 m
                          thickness (bv) = 0.16 m
********************* FINAL DESIGN ADVICE AND COMMENTS ********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.6: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.241mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.241MGD Diffuser
90BOD 13July2018 v-1.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--12:30:11
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                         = unbounded
  Average depth                 HA      = 15.94 m
  Depth at discharge            HD      = 15.94 m
  Ambient velocity              UA      = 0.0001 m/s
  Darcy-Weisbach friction factor  F     = 0.1
  Wind velocity                 UW      = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD      = 60.96 m
  Nearest bank                          = left
  Diffuser endpoints            YB1     = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC  = 1.24 m
  Port/Nozzle diameter          D0      = 0.0158 m
    with contraction ratio              = 1
  Equivalent slot width         B0      = 0.000159 m
  Total area of openings        TA0     = 0.0099 m^2
  Discharge velocity            U0      = 1.07 m/s
  Total discharge flowrate      Q0      = 0.010559 m^3/s
  Discharge port height         H0      = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 90 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
-----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000173 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000182 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000185 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000040 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000041 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.16 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 174.63
  Port/nozzle Froude number       FRD0   = 17.47
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0796 mg/l
  Dilution at edge of NFR              s = 1130.1
  NFR Location:                        x = 0.03 m
    (centerline coordinates)           y = 0 m
                                       z = 14.12 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       166.0151 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 67.2
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 2.24 m
  Plume dimensions:      half-width (bh) = 0.25 m
                          thickness (bv) = 0.25 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.7: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.335 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.335MGD Diffuser
30BOD 13July2018 v-1.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--10:51:57
******************************************************************************
SUMMARY OF INPUT DATA:
------------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                   HA      = 15.94 m
  Depth at discharge              HD      = 15.94 m
  Ambient velocity                UA      = 0.0001 m/s
  Darcy-Weisbach friction factor  F       = 0.1
  Wind velocity                   UW      = 0 m/s
  Stratification Type             STRCND = U
  Surface density                 RHOAS  = 1025.1000 kg/m^3
  Bottom density                  RHOAB  = 1025.1000 kg/m^3
------------------------------------------------------------------------------
DISCHARGE PARAMETERS:             Submerged Multiport Diffuser Discharge
  Diffuser type                   DITYPE = alternating perpendicular
  Diffuser length                 LD      = 60.96 m
  Nearest bank                            = left
  Diffuser endpoints              YB1     = 1204.57 m;    YB2 = 1265.53 m
  Number of openings              NOPEN  = 50
  Number of Risers                NRISER = 50
  Ports/Nozzles per Riser         NPPERR  = 1
  Spacing between risers/openings SPAC    = 1.24 m
  Port/Nozzle diameter            D0      = 0.0158 m
    with contraction ratio                = 1
  Equivalent slot width           B0      = 0.000159 m
  Total area of openings          TA0     = 0.0099 m^2
  Discharge velocity              U0      = 1.49 m/s
  Total discharge flowrate        Q0      = 0.014677 m^3/s
  Discharge port height           H0      = 0.15 m
  Nozzle arrangement              BETYPE = alternating without fanning
  Diffuser alignment angle        GAMMA  = 90 deg
  Vertical discharge angle        THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle      SIGMA  = 0 deg
  Relative orientation angle      BETA    = 90 deg
  Discharge density               RHO0    = 1000.34 kg/m^3
  Density difference              DRHO    = 24.7600 kg/m^3
  Buoyant acceleration            GP0     = 0.2369 m/s^2
  Discharge concentration         C0      = 30 mg/l
  Surface heat exchange coeff.    KS      = 0 m/s
  Coefficient of decay            KD      = 0 /s
------------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000241 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000351 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000358 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000056 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000057 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.24 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 242.75
  Port/nozzle Froude number       FRD0   = 24.28
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0331 mg/l
  Dilution at edge of NFR              s = 906.8
  NFR Location:                        x = 0.02 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                         thickness (bv) = 1.90 m
Cumulative travel time:       148.6272 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 22.4
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.41 m
  Plume dimensions:      half-width (bh) = 0.15 m
                          thickness (bv) = 0.15 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.8: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.335 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:               Chevron Estero Marine TErminal, CA
  DESIGN CASE:                 Chevron Load Line #2 Diffuser
  FILE NAME:                   C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.335MGD Diffuser
45BOD 13July2018 v-4.prd
  Using subsystem CORMIX2:    Multiport Diffuser Discharges
  Start of session:            07/17/2018--13:11:36
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                         = unbounded
  Average depth                  HA     = 15.94 m
  Depth at discharge             HD     = 15.94 m
  Ambient velocity               UA     = 0.0001 m/s
  Darcy-Weisbach friction factor F      = 0.1
  Wind velocity                  UW     = 0 m/s
  Stratification Type            STRCND = U
  Surface density                RHOAS  = 1025.1000 kg/m^3
  Bottom density                 RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:            Submerged Multiport Diffuser Discharge
  Diffuser type                  DITYPE = alternating perpendicular
  Diffuser length                LD     = 60.96 m
  Nearest bank                          = left
  Diffuser endpoints             YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings             NOPEN  = 50
  Number of Risers               NRISER = 50
  Ports/Nozzles per Riser        NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter           D0     = 0.0158 m
    with contraction ratio              = 1
  Equivalent slot width          B0     = 0.000159 m
  Total area of openings         TA0    = 0.0099 m^2
  Discharge velocity             U0     = 1.49 m/s
  Total discharge flowrate       Q0     = 0.014677 m^3/s
  Discharge port height          H0     = 0.15 m
  Nozzle arrangement             BETYPE = alternating without fanning
  Diffuser alignment angle       GAMMA  = 90 deg
  Vertical discharge angle       THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle     SIGMA  = 0 deg
  Relative orientation angle     BETA   = 90 deg
  Discharge density              RHO0   = 1000.34 kg/m^3
  Density difference             DRHO   = 24.7600 kg/m^3
  Buoyant acceleration           GP0    = 0.2369 m/s^2
  Discharge concentration        C0     = 45 mg/l
  Surface heat exchange coeff.   KS     = 0 m/s
  Coefficient of decay           KD     = 0 /s
-----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000241 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000351 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000358 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000056 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000057 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.24 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 242.75
  Port/nozzle Froude number       FRD0   = 24.28
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0496 mg/l
  Dilution at edge of NFR              s = 906.8
  NFR Location:                        x = 0.02 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       148.6272 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 33.6
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.74 m
  Plume dimensions:      half-width (bh) = 0.19 m
                          thickness (bv) = 0.19 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
```

APPENDIX-B.9: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.335 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                    CORMIX MIXING ZONE EXPERT SYSTEM
                        CORMIX Version 11.0GTH
                     HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.335MGD Diffuser
90BOD 13July2018 v-2.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--11:01:15
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor  F      = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 1.49 m/s
  Total discharge flowrate      Q0     = 0.014677 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 90 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
-----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000241 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000351 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000358 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000056 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000057 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.24 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 242.75
  Port/nozzle Froude number       FRD0   = 24.28
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0993 mg/l
  Dilution at edge of NFR              s = 906.8
  NFR Location:                        x = 0.02 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       148.6272 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 67.2
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 2.54 m
  Plume dimensions:      half-width (bh) = 0.28 m
                          thickness (bv) = 0.28 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.10: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.5 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.5MGD Diffuser
30BOD 13July2018 v-3.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--12:19:38
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F       = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 2.22 m/s
  Total discharge flowrate      Q0     = 0.021906 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 30 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000359 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000782 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000798 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000083 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000085 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.41 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 362.31
  Port/nozzle Froude number       FRD0   = 36.24
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0432 mg/l
  Dilution at edge of NFR              s = 693.7
  NFR Location:                        x = 0.02 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       129.8953 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 22.4
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.63 m
  Plume dimensions:      half-width (bh) = 0.17 m
                          thickness (bv) = 0.17 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.11: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.5 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.5MGD Diffuser
45BOD 13July2018 v-3.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/17/2018--13:00:51
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                  HA       = 15.94 m
  Depth at discharge             HD       = 15.94 m
  Ambient velocity               UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F        = 0.1
  Wind velocity                  UW       = 0 m/s
  Stratification Type            STRCND = U
  Surface density                RHOAS  = 1025.1000 kg/m^3
  Bottom density                 RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:            Submerged Multiport Diffuser Discharge
  Diffuser type                  DITYPE = alternating perpendicular
  Diffuser length                LD       = 60.96 m
  Nearest bank                            = left
  Diffuser endpoints             YB1      = 1204.57 m;    YB2 = 1265.53 m
  Number of openings             NOPEN  = 50
  Number of Risers               NRISER = 50
  Ports/Nozzles per Riser        NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter           D0       = 0.0158 m
    with contraction ratio                = 1
  Equivalent slot width          B0       = 0.000159 m
  Total area of openings         TA0      = 0.0099 m^2
  Discharge velocity             U0       = 2.22 m/s
  Total discharge flowrate       Q0       = 0.021906 m^3/s
  Discharge port height          H0       = 0.15 m
  Nozzle arrangement             BETYPE = alternating without fanning
  Diffuser alignment angle       GAMMA  = 90 deg
  Vertical discharge angle       THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle     SIGMA  = 0 deg
  Relative orientation angle     BETA   = 90 deg
  Discharge density              RHO0   = 1000.34 kg/m^3
  Density difference             DRHO   = 24.7600 kg/m^3
  Buoyant acceleration           GP0    = 0.2369 m/s^2
  Discharge concentration        C0     = 45 mg/l
  Surface heat exchange coeff.   KS     = 0 m/s
  Coefficient of decay           KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000359 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000782 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000798 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000083 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000085 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.41 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 362.31
  Port/nozzle Froude number       FRD0   = 36.24
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0649 mg/l
  Dilution at edge of NFR              s = 693.7
  NFR Location:                        x = 0.02 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                          thickness (bv) = 1.90 m
Cumulative travel time:       129.8953 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 33.6
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 2.02 m
  Plume dimensions:      half-width (bh) = 0.22 m
                          thickness (bv) = 0.22 m
********************* FINAL DESIGN ADVICE AND COMMENTS *********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.12: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.5 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.5MGD Diffuser
90BOD 13July2018 v-1.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--12:11:54
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                 HA        = 15.94 m
  Depth at discharge            HD        = 15.94 m
  Ambient velocity              UA        = 0.0001 m/s
  Darcy-Weisbach friction factor F        = 0.1
  Wind velocity                 UW        = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 2.22 m/s
  Total discharge flowrate      Q0     = 0.021906 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 90 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
-----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000359 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.000782 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.000798 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000083 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000085 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.41 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 362.31
  Port/nozzle Froude number       FRD0   = 36.24
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.1297 mg/l
  Dilution at edge of NFR             s = 693.7
  NFR Location:                       x = 0.02 m
    (centerline coordinates)          y = 0 m
                                      z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.38 m
                         thickness (bv) = 1.90 m
Cumulative travel time:       129.8953 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 67.2
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 2.95 m
  Plume dimensions:      half-width (bh) = 0.33 m
                          thickness (bv) = 0.33 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
```

APPENDIX-B.13: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.7 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.7MGD Diffuser
30BOD 13July2018 v-1.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--11:51:21
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                         = unbounded
  Average depth                  HA     = 15.94 m
  Depth at discharge             HD     = 15.94 m
  Ambient velocity               UA     = 0.0001 m/s
  Darcy-Weisbach friction factor F      = 0.1
  Wind velocity                  UW     = 0 m/s
  Stratification Type            STRCND = U
  Surface density                RHOAS  = 1025.1000 kg/m^3
  Bottom density                 RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:            Submerged Multiport Diffuser Discharge
  Diffuser type                  DITYPE = alternating perpendicular
  Diffuser length                LD     = 60.96 m
  Nearest bank                          = left
  Diffuser endpoints             YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings             NOPEN  = 50
  Number of Risers               NRISER = 50
  Ports/Nozzles per Riser        NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter           D0     = 0.0158 m
    with contraction ratio              = 1
  Equivalent slot width          B0     = 0.000159 m
  Total area of openings         TA0    = 0.0099 m^2
  Discharge velocity             U0     = 3.11 m/s
  Total discharge flowrate       Q0     = 0.030669 m^3/s
  Discharge port height          H0     = 0.15 m
  Nozzle arrangement             BETYPE = alternating without fanning
  Diffuser alignment angle       GAMMA  = 90 deg
  Vertical discharge angle       THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle     SIGMA  = 0 deg
  Relative orientation angle     BETA   = 90 deg
  Discharge density              RHO0   = 1000.34 kg/m^3
  Density difference             DRHO   = 24.7600 kg/m^3
  Buoyant acceleration           GP0    = 0.2369 m/s^2
  Discharge concentration        C0     = 30 mg/l
  Surface heat exchange coeff.   KS     = 0 m/s
  Coefficient of decay           KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000503 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.001533 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.001564 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000117 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000119 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.64 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 507.24
  Port/nozzle Froude number       FRD0   = 50.74
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0542 mg/l
  Dilution at edge of NFR              s = 553.9
  NFR Location:                        x = 0.07 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.37 m
                         thickness (bv) = 1.89 m
Cumulative travel time:       115.9826 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 22.4
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 1.85 m
  Plume dimensions:      half-width (bh) = 0.20 m
                          thickness (bv) = 0.20 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.14: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.7 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.7MGD Diffuser
45BOD 13July2018 v-4.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/16/2018--14:05:56
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor  F      = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD       = 60.96 m
  Nearest bank                           = left
  Diffuser endpoints            YB1      = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0       = 0.0158 m
    with contraction ratio               = 1
  Equivalent slot width         B0       = 0.000159 m
  Total area of openings        TA0      = 0.0099 m^2
  Discharge velocity            U0       = 3.11 m/s
  Total discharge flowrate      Q0       = 0.030669 m^3/s
  Discharge port height         H0       = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0       = 45 mg/l
  Surface heat exchange coeff.  KS       = 0 m/s
  Coefficient of decay          KD       = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000503 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.001533 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.001564 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000117 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000119 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.64 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 507.24
  Port/nozzle Froude number       FRD0   = 50.74
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0812 mg/l
  Dilution at edge of NFR              s = 553.9
  NFR Location:                        x = 0.07 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.37 m
                          thickness (bv) = 1.89 m
Cumulative travel time:       115.9826 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 33.6
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 2.29 m
  Plume dimensions:      half-width (bh) = 0.25 m
                          thickness (bv) = 0.25 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.15: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.7 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 0.7MGD Diffuser
90BOD 13July2018 v-2.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--11:56:09
***************************************************************************
SUMMARY OF INPUT DATA:
---------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                  HA       = 15.94 m
  Depth at discharge             HD       = 15.94 m
  Ambient velocity               UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F        = 0.1
  Wind velocity                  UW       = 0 m/s
  Stratification Type            STRCND = U
  Surface density                RHOAS  = 1025.1000 kg/m^3
  Bottom density                 RHOAB  = 1025.1000 kg/m^3
---------------------------------------------------------------------------
DISCHARGE PARAMETERS:            Submerged Multiport Diffuser Discharge
  Diffuser type                  DITYPE = alternating perpendicular
  Diffuser length                LD     = 60.96 m
  Nearest bank                          = left
  Diffuser endpoints             YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings             NOPEN  = 50
  Number of Risers               NRISER = 50
  Ports/Nozzles per Riser        NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter           D0     = 0.0158 m
    with contraction ratio              = 1
  Equivalent slot width          B0     = 0.000159 m
  Total area of openings         TA0    = 0.0099 m^2
  Discharge velocity             U0     = 3.11 m/s
  Total discharge flowrate       Q0     = 0.030669 m^3/s
  Discharge port height          H0     = 0.15 m
  Nozzle arrangement             BETYPE = alternating without fanning
  Diffuser alignment angle       GAMMA  = 90 deg
  Vertical discharge angle       THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle     SIGMA  = 0 deg
  Relative orientation angle     BETA   = 90 deg
  Discharge density              RHO0   = 1000.34 kg/m^3
  Density difference             DRHO   = 24.7600 kg/m^3
  Buoyant acceleration           GP0    = 0.2369 m/s^2
  Discharge concentration        C0     = 90 mg/l
  Surface heat exchange coeff.   KS     = 0 m/s
  Coefficient of decay           KD     = 0 /s
---------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
```

```
  Discharge (volume flux)         q0     = 0.000503 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.001533 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.001564 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000117 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000119 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 0.64 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 507.24
  Port/nozzle Froude number       FRD0   = 50.74
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS   = MU1V |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.1625 mg/l
  Dilution at edge of NFR              s = 553.9
  NFR Location:                        x = 0.07 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.37 m
                          thickness (bv) = 1.89 m
Cumulative travel time:       115.9826 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
```

```
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 67.2
  Plume location:                      x = 0.01 m
    (centerline coordinates)           y = 0 m
                                       z = 3.36 m
  Plume dimensions:      half-width (bh) = 0.38 m
                          thickness (bv) = 0.38 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.16: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.1.2 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 1.2MGD Diffuser
30BOD 13July2018 v-3.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--10:44:54
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                   HA      = 15.94 m
  Depth at discharge              HD      = 15.94 m
  Ambient velocity                UA      = 0.0001 m/s
  Darcy-Weisbach friction factor  F       = 0.1
  Wind velocity                   UW      = 0 m/s
  Stratification Type             STRCND = U
  Surface density                 RHOAS  = 1025.1000 kg/m^3
  Bottom density                  RHOAB  = 1025.1000 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:             Submerged Multiport Diffuser Discharge
  Diffuser type                   DITYPE = alternating perpendicular
  Diffuser length                 LD      = 60.96 m
  Nearest bank                            = left
  Diffuser endpoints              YB1     = 1204.57 m;    YB2 = 1265.53 m
  Number of openings              NOPEN  = 50
  Number of Risers                NRISER = 50
  Ports/Nozzles per Riser         NPPERR  = 1
  Spacing between risers/openings SPAC    = 1.24 m
  Port/Nozzle diameter            D0      = 0.0158 m
    with contraction ratio                = 1
  Equivalent slot width           B0      = 0.000159 m
  Total area of openings          TA0     = 0.0099 m^2
  Discharge velocity              U0      = 5.33 m/s
  Total discharge flowrate        Q0      = 0.052575 m^3/s
  Discharge port height           H0      = 0.15 m
  Nozzle arrangement              BETYPE = alternating without fanning
  Diffuser alignment angle        GAMMA  = 90 deg
  Vertical discharge angle        THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle      SIGMA  = 0 deg
  Relative orientation angle      BETA   = 90 deg
  Discharge density               RHO0   = 1000.34 kg/m^3
  Density difference              DRHO   = 24.7600 kg/m^3
  Buoyant acceleration            GP0    = 0.2369 m/s^2
  Discharge concentration         C0      = 30 mg/l
  Surface heat exchange coeff.    KS      = 0 m/s
  Coefficient of decay            KD      = 0 /s
-----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)         q0      = 0.000862 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.004504 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.004596 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000200 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000204 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
```

```
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 1.32 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number             FR0    = 869.55
  Port/nozzle Froude number       FRD0   = 86.98
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.0777 mg/l
  Dilution at edge of NFR              s = 386.3
  NFR Location:                        x = 0.05 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.37 m
                          thickness (bv) = 1.89 m
Cumulative travel time:       96.7116 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                      =  0 m
  Intrusion stagnation point            =  0 m
  Intrusion thickness                   =  0 m
  Intrusion half width at impingement   =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
```

```
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                  = 1.34  mg/l
  Corresponding dilution                s = 22.4
  Plume location:                       x = 0.00 m
    (centerline coordinates)            y = 0 m
                                        z = 2.26 m
  Plume dimensions:      half-width (bh) = 0.24 m
                          thickness (bv) = 0.24 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.17: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.1.2 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 1.2MGD Diffuser
45BOD 13July2018 v-5.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/16/2018--13:56:20
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                   HA     = 15.94 m
  Depth at discharge              HD     = 15.94 m
  Ambient velocity                UA     = 0.0001 m/s
  Darcy-Weisbach friction factor  F      = 0.1
  Wind velocity                   UW     = 0 m/s
  Stratification Type             STRCND = U
  Surface density                 RHOAS  = 1025.1000 kg/m^3
  Bottom density                  RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:             Submerged Multiport Diffuser Discharge
  Diffuser type                   DITYPE = alternating perpendicular
  Diffuser length                 LD     = 60.96 m
  Nearest bank                           = left
  Diffuser endpoints              YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings              NOPEN  = 50
  Number of Risers                NRISER = 50
  Ports/Nozzles per Riser         NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter            D0     = 0.0158 m
    with contraction ratio               = 1
  Equivalent slot width           B0     = 0.000159 m
  Total area of openings          TA0    = 0.0099 m^2
  Discharge velocity              U0     = 5.33 m/s
  Total discharge flowrate        Q0     = 0.052575 m^3/s
  Discharge port height           H0     = 0.15 m
  Nozzle arrangement              BETYPE = alternating without fanning
  Diffuser alignment angle        GAMMA  = 90 deg
  Vertical discharge angle        THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle      SIGMA  = 0 deg
  Relative orientation angle      BETA   = 90 deg
  Discharge density               RHO0   = 1000.34 kg/m^3
  Density difference              DRHO   = 24.7600 kg/m^3
  Buoyant acceleration            GP0    = 0.2369 m/s^2
  Discharge concentration         C0     = 45 mg/l
  Surface heat exchange coeff.    KS     = 0 m/s
  Coefficient of decay            KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)         q0     = 0.000862 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.004504 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.004596 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000200 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000204 m^3/s^3
----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
```

```
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 1.32 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 869.55
  Port/nozzle Froude number       FRD0   = 86.98
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.1165 mg/l
  Dilution at edge of NFR              s = 386.3
  NFR Location:                        x = 0.05 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.37 m
                          thickness (bv) = 1.89 m
Cumulative travel time:       96.7116 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  0 m
  Intrusion stagnation point              =  0 m
  Intrusion thickness                     =  0 m
  Intrusion half width at impingement     =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
```

```
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY ***********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 33.6
  Plume location:                      x = 0.00 m
    (centerline coordinates)           y = 0 m
                                       z = 2.81 m
  Plume dimensions:      half-width (bh) = 0.31 m
                          thickness (bv) = 0.31 m
********************* FINAL DESIGN ADVICE AND COMMENTS **********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
-----------------------------------------------------------------------------
```

APPENDIX-B.17: CORMIX Session Report CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.1.2 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX Version 11.0GTH
                       HYDRO2:Version-11.0.0.0  April,2018
SITE NAME/LABEL:                Chevron Estero Marine TErminal, CA
  DESIGN CASE:                  Chevron Load Line #2 Diffuser
  FILE NAME:                    C:\projects\Cayucos Chevron\Cayucos CORMIX\CSD 1.2MGD Diffuser
90BOD 13July2018 v-2.prd
  Using subsystem CORMIX2:     Multiport Diffuser Discharges
  Start of session:             07/13/2018--10:37:51
****************************************************************************
SUMMARY OF INPUT DATA:
----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                          = unbounded
  Average depth                 HA       = 15.94 m
  Depth at discharge            HD       = 15.94 m
  Ambient velocity              UA       = 0.0001 m/s
  Darcy-Weisbach friction factor F       = 0.1
  Wind velocity                 UW       = 0 m/s
  Stratification Type           STRCND = U
  Surface density               RHOAS  = 1025.1000 kg/m^3
  Bottom density                RHOAB  = 1025.1000 kg/m^3
----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 60.96 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1204.57 m;    YB2 = 1265.53 m
  Number of openings            NOPEN  = 50
  Number of Risers              NRISER = 50
  Ports/Nozzles per Riser       NPPERR  = 1
  Spacing between risers/openings SPAC   = 1.24 m
  Port/Nozzle diameter          D0     = 0.0158 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.000159 m
  Total area of openings        TA0    = 0.0099 m^2
  Discharge velocity            U0     = 5.33 m/s
  Total discharge flowrate      Q0     = 0.052575 m^3/s
  Discharge port height         H0     = 0.15 m
  Nozzle arrangement            BETYPE = alternating without fanning
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Actual Vertical discharge angle THEAC  = 0 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge density             RHO0   = 1000.34 kg/m^3
  Density difference            DRHO   = 24.7600 kg/m^3
  Buoyant acceleration          GP0    = 0.2369 m/s^2
  Discharge concentration       C0     = 90 mg/l
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)       q0     = 0.000862 m^2/s
  Momentum flux
      (based on slot width B0)    m0 =U0^2*B0   = 0.004504 m^3/s^2
      (based on volume flux q0)   m0 =U0*q0     = 0.004596 m^3/s^2
  Buoyancy flux
      (based on slot width B0)    j0 =U0*GP0*B0 = 0.000200 m^3/s^3
      (based on volume flux q0)   j0 =q0*GP0    = 0.000204 m^3/s^3
----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
```

```
  LQ  = 0.00 m         Lm  = 99999 m         LM  = 1.32 m
  lm' = 99999 m         Lb' = 99999 m         La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 869.55
  Port/nozzle Froude number       FRD0   = 86.98
  Velocity ratio                  R      = 99999
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                        = no
  Water quality standard specified       = yes
  Water quality standard          CSTD   = 1.34 mg/l
  Regulatory mixing zone                 = yes
  Regulatory mixing zone specification   = distance
  Regulatory mixing zone value           = 15.54 m (m^2 if area)
  Region of interest                     = 1524 m
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *-----------------------*
  | FLOW CLASS   = MU1V |
  *-----------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 15.94 m
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the BOTTOM below the port/diffuser center:
    1235.05 m from the left bank/shore.
  Number of display steps NSTEP = 100 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at NFR edge  c = 0.233 mg/l
  Dilution at edge of NFR              s = 386.3
  NFR Location:                        x = 0.05 m
    (centerline coordinates)           y = 0 m
                                       z = 14.13 m
  NFR plume dimensions:  half-width (bh) = 32.37 m
                          thickness (bv) = 1.89 m
Cumulative travel time:       96.7116 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                      =  0 m
  Intrusion stagnation point            =  0 m
  Intrusion thickness                   =  0 m
  Intrusion half width at impingement   =  0 m
  Intrusion half thickness at impingement =  0 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Because of the specified STAGNANT ambient conditions, there exists
  no steady-state far-field for this discharge.
  Unsteady circulations and pollutant buid-up may result in the far-field.
-----------------------------------------------------------------------------
```

```
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
*********************** TOXIC DILUTION ZONE SUMMARY ***********************
No TDZ was specified for this simulation.
********************* REGULATORY MIXING ZONE SUMMARY **********************
An RMZ was specified but its boundary was not encountered within the
  predicted plume region.
In a subsequent analysis, use an ROI that extends further downstream.
But:
The ambient water quality standard was encountered at the following
  plume position:
  Water quality standard                 = 1.34  mg/l
  Corresponding dilution               s = 67.2
  Plume location:                      x = 0.01 m
    (centerline coordinates)           y = 0 m
                                       z = 4.13 m
  Plume dimensions:       half-width (bh) = 0.47 m
                           thickness (bv) = 0.47 m
******************** FINAL DESIGN ADVICE AND COMMENTS *********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
---------------------------------------------------------------------------
DIFFUSER DESIGN DETAILS:  Because of the alternating arrangement
  of the opposing nozzles/ports, the AVERAGE VERTICAL ANGLE (THETA)
  has been set to 90 deg.  This represents a ZERO NET HORIZONTAL
  MOMENTUM FLUX for the entire diffuser.
---------------------------------------------------------------------------
```

APPENDIX-C.1: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.066mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.066MGD_Diffuser_30BOD_13July2018_v-2.prd
 Time stamp:        07/13/2018--11:20:48

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =      15.94  HD    =      15.94
 UA    =      0.000 F      =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U          RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =    1235.05  YB1   =    1204.57  YB2   =    1265.53
 LD    =      60.96  NOPEN =   50       NRISER=   50        SPAC  =       1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =       0.15  SUB0  =      15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =      90.00  THETA =      0.00  SIGMA =       0.00  BETA  =      90.00
 U0    =      0.293 Q0    =      0.003 Q0A   =0.2892E-02
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.3000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.4743E-04          SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1363E-04   j0 =U0*GP0*B0 =0.1101E-04   (based on slot width B0)
 m0 =U0*q0   =0.1390E-04   j0 =q0*GP0    =0.1124E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.03  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.2892E-02  M0    =0.8306E-03  J0    =0.6712E-03
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.19  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =      47.83  FRD0  =      4.78  R     =  99999.00  PL    =  655.21
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.9662E-06  M0    =0.5890E-04
 lQ=B  =      0.002 lM    =      0.00  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.026 LM    =      0.03  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.021 D0    =      0.060 A0    =       0.003 THETA =      90.00
 FR0   =      0.90  FRD0  =      0.18  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
```

```
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 22222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.300E+02   0.03     0.03     0.293   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.10  XE    =      0.00  YE    =      0.00  ZE    =      0.25

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.25     1.0 0.300E+02   0.03     0.03     0.293   .00000E+00
      0.00     0.00    0.25     1.0 0.300E+02   0.02     0.02     0.050   .19895E-01
      0.00     0.00    0.39     3.9 0.771E+01   0.03     0.03     0.162   .87870E+00
      0.00     0.00    0.52     8.9 0.338E+01   0.04     0.04     0.142   .17992E+01
      0.00     0.00    0.66    15.3 0.196E+01   0.06     0.06     0.128   .28333E+01
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00     0.00    0.80    23.0 0.130E+01   0.08     0.08     0.119   .39622E+01
      0.00     0.00    0.94    31.9 0.940E+00   0.09     0.09     0.111   .51640E+01
      0.00     0.00    1.08    41.9 0.715E+00   0.11     0.11     0.106   .64466E+01
      0.00     0.00    1.22    53.0 0.566E+00   0.13     0.13     0.101   .77943E+01
      0.00     0.00    1.36    65.0 0.461E+00   0.14     0.14     0.097   .91912E+01
      0.00     0.00    1.50    78.1 0.384E+00   0.16     0.16     0.093   .10653E+02
      0.00     0.00    1.63    92.1 0.326E+00   0.18     0.18     0.090   .12166E+02
      0.00     0.00    1.77   107.0 0.280E+00   0.20     0.20     0.088   .13726E+02
      0.00     0.00    1.91   122.7 0.244E+00   0.21     0.21     0.085   .15321E+02
      0.00     0.00    2.05   139.3 0.215E+00   0.23     0.23     0.083   .16969E+02
      0.00     0.00    2.19   156.8 0.191E+00   0.25     0.25     0.081   .18658E+02
```

0.00	0.00	2.33	175.1	0.171E+00	0.26	0.26	0.080	.20386E+02
0.00	0.00	2.47	194.1	0.155E+00	0.28	0.28	0.078	.22138E+02
0.00	0.00	2.61	213.9	0.140E+00	0.30	0.30	0.076	.23938E+02
0.01	0.00	2.74	234.6	0.128E+00	0.31	0.31	0.075	.25773E+02
0.01	0.00	2.88	255.9	0.117E+00	0.33	0.33	0.074	.27641E+02
0.01	0.00	3.02	278.1	0.108E+00	0.35	0.35	0.073	.29540E+02
0.01	0.00	3.16	300.7	0.998E-01	0.36	0.36	0.071	.31457E+02
0.01	0.00	3.30	324.3	0.925E-01	0.38	0.38	0.070	.33417E+02
0.01	0.00	3.44	348.6	0.861E-01	0.40	0.40	0.069	.35406E+02
0.01	0.00	3.58	373.5	0.803E-01	0.41	0.41	0.068	.37424E+02
0.01	0.00	3.72	399.0	0.752E-01	0.43	0.43	0.068	.39454E+02
0.01	0.00	3.85	425.3	0.705E-01	0.45	0.45	0.067	.41526E+02
0.01	0.00	3.99	452.3	0.663E-01	0.46	0.46	0.066	.43624E+02
0.01	0.00	4.13	479.9	0.625E-01	0.48	0.48	0.065	.45747E+02
0.01	0.00	4.27	508.0	0.591E-01	0.50	0.50	0.064	.47879E+02
0.01	0.00	4.41	536.9	0.559E-01	0.51	0.51	0.064	.50051E+02
0.01	0.00	4.55	566.5	0.530E-01	0.53	0.53	0.063	.52247E+02
0.01	0.00	4.69	596.7	0.503E-01	0.55	0.55	0.062	.54467E+02
0.01	0.00	4.83	627.3	0.478E-01	0.56	0.56	0.062	.56692E+02
0.01	0.00	4.96	658.8	0.455E-01	0.58	0.58	0.061	.58957E+02
0.01	0.00	5.10	690.8	0.434E-01	0.60	0.60	0.061	.61243E+02
0.01	0.00	5.24	723.5	0.415E-01	0.61	0.61	0.060	.63550E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.32	994.9	0.302E-01	0.78	31.26	0.042	.64778E+02
0.01	0.00	5.52	1027.4	0.292E-01	0.79	31.27	0.043	.69570E+02
0.01	0.00	5.66	1050.2	0.286E-01	0.80	31.28	0.043	.72794E+02
0.01	0.00	5.80	1073.4	0.279E-01	0.81	31.29	0.044	.75990E+02
0.02	0.00	5.94	1097.0	0.273E-01	0.83	31.31	0.044	.79139E+02
0.02	0.00	6.07	1121.0	0.268E-01	0.84	31.32	0.044	.82290E+02
0.02	0.00	6.21	1145.5	0.262E-01	0.85	31.33	0.045	.85421E+02
0.02	0.00	6.35	1170.2	0.256E-01	0.87	31.35	0.045	.88537E+02
0.02	0.00	6.49	1195.0	0.251E-01	0.88	31.36	0.045	.91615E+02
0.02	0.00	6.63	1220.2	0.246E-01	0.90	31.38	0.045	.94704E+02
0.02	0.00	6.77	1245.7	0.241E-01	0.91	31.39	0.045	.97781E+02
0.02	0.00	6.91	1271.4	0.236E-01	0.93	31.41	0.045	.10085E+03
0.02	0.00	7.05	1297.2	0.231E-01	0.94	31.42	0.046	.10391E+03
0.02	0.00	7.18	1323.0	0.227E-01	0.96	31.44	0.046	.10694E+03
0.02	0.00	7.32	1349.2	0.222E-01	0.98	31.46	0.046	.10998E+03
0.02	0.00	7.46	1375.5	0.218E-01	0.99	31.47	0.046	.11302E+03
0.02	0.00	7.60	1401.9	0.214E-01	1.01	31.49	0.046	.11605E+03
0.02	0.00	7.74	1428.2	0.210E-01	1.03	31.51	0.046	.11906E+03
0.02	0.00	7.88	1454.8	0.206E-01	1.05	31.53	0.046	.12208E+03
0.02	0.00	8.02	1481.5	0.202E-01	1.06	31.54	0.046	.12510E+03
0.02	0.00	8.16	1508.3	0.199E-01	1.08	31.56	0.046	.12811E+03
0.02	0.00	8.29	1534.9	0.195E-01	1.10	31.58	0.046	.13110E+03
0.02	0.00	8.43	1561.8	0.192E-01	1.12	31.60	0.046	.13411E+03
0.02	0.00	8.57	1588.8	0.189E-01	1.14	31.62	0.046	.13712E+03
0.02	0.00	8.71	1615.6	0.186E-01	1.15	31.63	0.046	.14010E+03
0.02	0.00	8.85	1642.7	0.183E-01	1.17	31.65	0.046	.14310E+03
0.03	0.00	8.99	1669.8	0.180E-01	1.19	31.67	0.046	.14610E+03
0.03	0.00	9.13	1696.8	0.177E-01	1.21	31.69	0.046	.14908E+03
0.03	0.00	9.27	1724.0	0.174E-01	1.23	31.71	0.046	.15207E+03
0.03	0.00	9.40	1751.2	0.171E-01	1.25	31.73	0.046	.15507E+03
0.03	0.00	9.54	1778.5	0.169E-01	1.27	31.75	0.046	.15806E+03
0.03	0.00	9.68	1805.6	0.166E-01	1.29	31.77	0.046	.16103E+03
0.03	0.00	9.82	1832.9	0.164E-01	1.30	31.78	0.046	.16402E+03
0.03	0.00	9.96	1860.2	0.161E-01	1.32	31.80	0.047	.16701E+03
0.03	0.00	10.10	1887.4	0.159E-01	1.34	31.82	0.047	.16998E+03
0.03	0.00	10.24	1914.8	0.157E-01	1.36	31.84	0.047	.17297E+03
0.03	0.00	10.38	1942.2	0.154E-01	1.38	31.86	0.047	.17595E+03
0.03	0.00	10.51	1969.5	0.152E-01	1.40	31.88	0.047	.17892E+03
0.03	0.00	10.65	1996.9	0.150E-01	1.42	31.90	0.047	.18190E+03
0.03	0.00	10.79	2024.4	0.148E-01	1.44	31.92	0.047	.18489E+03
0.03	0.00	10.93	2051.6	0.146E-01	1.46	31.94	0.047	.18785E+03
0.03	0.00	11.07	2079.1	0.144E-01	1.48	31.96	0.047	.19083E+03
0.03	0.00	11.21	2106.6	0.142E-01	1.50	31.98	0.047	.19382E+03
0.03	0.00	11.35	2134.1	0.141E-01	1.51	31.99	0.047	.19680E+03
0.03	0.00	11.48	2161.5	0.139E-01	1.53	32.01	0.047	.19976E+03

```
     0.03     0.00   11.62  2189.0 0.137E-01   1.55    32.03     0.047   .20274E+03
     0.03     0.00   11.76  2216.6 0.135E-01   1.57    32.05     0.047   .20572E+03
     0.03     0.00   11.90  2243.9 0.134E-01   1.59    32.07     0.047   .20868E+03
     0.04     0.00   12.04  2271.5 0.132E-01   1.61    32.09     0.047   .21166E+03
     0.04     0.00   12.18  2299.0 0.130E-01   1.63    32.11     0.047   .21464E+03
     0.04     0.00   12.32  2326.4 0.129E-01   1.65    32.13     0.047   .21760E+03
     0.04     0.00   12.46  2354.0 0.127E-01   1.67    32.15     0.047   .22058E+03
     0.04     0.00   12.59  2381.6 0.126E-01   1.69    32.17     0.047   .22356E+03
     0.04     0.00   12.73  2409.0 0.125E-01   1.71    32.19     0.047   .22651E+03
     0.04     0.00   12.87  2436.6 0.123E-01   1.73    32.21     0.047   .22949E+03
     0.04     0.00   13.01  2464.2 0.122E-01   1.75    32.23     0.047   .23247E+03
     0.04     0.00   13.15  2491.8 0.120E-01   1.77    32.25     0.047   .23545E+03
     0.04     0.00   13.29  2519.2 0.119E-01   1.79    32.27     0.047   .23840E+03
     0.04     0.00   13.43  2546.8 0.118E-01   1.81    32.29     0.047   .24138E+03
     0.04     0.00   13.57  2574.5 0.117E-01   1.82    32.30     0.047   .24436E+03
     0.04     0.00   13.70  2601.9 0.115E-01   1.84    32.32     0.047   .24731E+03
     0.04     0.00   13.84  2629.5 0.114E-01   1.86    32.34     0.047   .25029E+03
     0.04     0.00   13.98  2657.2 0.113E-01   1.88    32.36     0.047   .25327E+03
     0.04     0.00   14.12  2684.6 0.112E-01   1.90    32.38     0.047   .25622E+03
 Cumulative travel time =         256.2241 sec  (    0.07 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
---------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      89.81 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg


  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
---------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
---------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.2: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.066mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-------------------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.066MGD_Diffuser_45BOD_13July2018_v-4.prd
 Time stamp:        07/17/2018--13:28:45

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      0.293 Q0    =      0.003 Q0A   =0.2892E-02
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.4500E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.4743E-04         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1363E-04   j0 =U0*GP0*B0 =0.1101E-04   (based on slot width B0)
 m0 =U0*q0   =0.1390E-04   j0 =q0*GP0    =0.1124E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.03  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.2892E-02  M0    =0.8306E-03  J0    =0.6712E-03
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.19  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     47.83  FRD0  =      4.78  R     =  99999.00  PL    =  655.21
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.9662E-06  M0    =0.5890E-04
 lQ=B  =      0.002 lM    =      0.00  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.026 LM    =      0.03  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.021 D0    =      0.060 A0    =      0.003 THETA =     90.00
 FR0   =      0.90  FRD0  =      0.18  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
```

```
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 2222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.4500E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.450E+02   0.03     0.03     0.293   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.10  XE    =      0.00  YE    =      0.00  ZE    =      0.25

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.25     1.0 0.450E+02   0.03     0.03     0.293   .00000E+00
      0.00     0.00    0.25     1.0 0.450E+02   0.02     0.02     0.050   .19895E-01
      0.00     0.00    0.39     3.9 0.116E+02   0.03     0.03     0.162   .87870E+00
      0.00     0.00    0.52     8.9 0.506E+01   0.04     0.04     0.142   .17992E+01
      0.00     0.00    0.66    15.3 0.294E+01   0.06     0.06     0.128   .28333E+01
      0.00     0.00    0.80    23.0 0.195E+01   0.08     0.08     0.119   .39622E+01
      0.00     0.00    0.94    31.9 0.141E+01   0.09     0.09     0.111   .51640E+01
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00     0.00    1.08    41.9 0.107E+01   0.11     0.11     0.106   .64466E+01
      0.00     0.00    1.22    53.0 0.849E+00   0.13     0.13     0.101   .77943E+01
      0.00     0.00    1.36    65.0 0.692E+00   0.14     0.14     0.097   .91912E+01
      0.00     0.00    1.50    78.1 0.576E+00   0.16     0.16     0.093   .10653E+02
      0.00     0.00    1.63    92.1 0.489E+00   0.18     0.18     0.090   .12166E+02
      0.00     0.00    1.77   107.0 0.420E+00   0.20     0.20     0.088   .13726E+02
      0.00     0.00    1.91   122.7 0.367E+00   0.21     0.21     0.085   .15321E+02
      0.00     0.00    2.05   139.3 0.323E+00   0.23     0.23     0.083   .16969E+02
      0.00     0.00    2.19   156.8 0.287E+00   0.25     0.25     0.081   .18658E+02
```

0.00	0.00	2.33	175.1	0.257E+00	0.26	0.26	0.080	.20386E+02
0.00	0.00	2.47	194.1	0.232E+00	0.28	0.28	0.078	.22138E+02
0.00	0.00	2.61	213.9	0.210E+00	0.30	0.30	0.076	.23938E+02
0.01	0.00	2.74	234.6	0.192E+00	0.31	0.31	0.075	.25773E+02
0.01	0.00	2.88	255.9	0.176E+00	0.33	0.33	0.074	.27641E+02
0.01	0.00	3.02	278.1	0.162E+00	0.35	0.35	0.073	.29540E+02
0.01	0.00	3.16	300.7	0.150E+00	0.36	0.36	0.071	.31457E+02
0.01	0.00	3.30	324.3	0.139E+00	0.38	0.38	0.070	.33417E+02
0.01	0.00	3.44	348.6	0.129E+00	0.40	0.40	0.069	.35406E+02
0.01	0.00	3.58	373.5	0.120E+00	0.41	0.41	0.068	.37424E+02
0.01	0.00	3.72	399.0	0.113E+00	0.43	0.43	0.068	.39454E+02
0.01	0.00	3.85	425.3	0.106E+00	0.45	0.45	0.067	.41526E+02
0.01	0.00	3.99	452.3	0.995E-01	0.46	0.46	0.066	.43624E+02
0.01	0.00	4.13	479.9	0.938E-01	0.48	0.48	0.065	.45747E+02
0.01	0.00	4.27	508.0	0.886E-01	0.50	0.50	0.064	.47879E+02
0.01	0.00	4.41	536.9	0.838E-01	0.51	0.51	0.064	.50051E+02
0.01	0.00	4.55	566.5	0.794E-01	0.53	0.53	0.063	.52247E+02
0.01	0.00	4.69	596.7	0.754E-01	0.55	0.55	0.062	.54467E+02
0.01	0.00	4.83	627.3	0.717E-01	0.56	0.56	0.062	.56692E+02
0.01	0.00	4.96	658.8	0.683E-01	0.58	0.58	0.061	.58957E+02
0.01	0.00	5.10	690.8	0.651E-01	0.60	0.60	0.061	.61243E+02
0.01	0.00	5.24	723.5	0.622E-01	0.61	0.61	0.060	.63550E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.32	994.9	0.452E-01	0.78	31.26	0.042	.64778E+02
0.01	0.00	5.52	1027.4	0.438E-01	0.79	31.27	0.043	.69570E+02
0.01	0.00	5.66	1050.2	0.429E-01	0.80	31.28	0.043	.72794E+02
0.01	0.00	5.80	1073.4	0.419E-01	0.81	31.29	0.044	.75990E+02
0.02	0.00	5.94	1097.0	0.410E-01	0.83	31.31	0.044	.79139E+02
0.02	0.00	6.07	1121.0	0.401E-01	0.84	31.32	0.044	.82290E+02
0.02	0.00	6.21	1145.5	0.393E-01	0.85	31.33	0.045	.85421E+02
0.02	0.00	6.35	1170.2	0.385E-01	0.87	31.35	0.045	.88537E+02
0.02	0.00	6.49	1195.0	0.377E-01	0.88	31.36	0.045	.91615E+02
0.02	0.00	6.63	1220.2	0.369E-01	0.90	31.38	0.045	.94704E+02
0.02	0.00	6.77	1245.7	0.361E-01	0.91	31.39	0.045	.97781E+02
0.02	0.00	6.91	1271.4	0.354E-01	0.93	31.41	0.045	.10085E+03
0.02	0.00	7.05	1297.2	0.347E-01	0.94	31.42	0.046	.10391E+03
0.02	0.00	7.18	1323.0	0.340E-01	0.96	31.44	0.046	.10694E+03
0.02	0.00	7.32	1349.2	0.334E-01	0.98	31.46	0.046	.10998E+03
0.02	0.00	7.46	1375.5	0.327E-01	0.99	31.47	0.046	.11302E+03
0.02	0.00	7.60	1401.9	0.321E-01	1.01	31.49	0.046	.11605E+03
0.02	0.00	7.74	1428.2	0.315E-01	1.03	31.51	0.046	.11906E+03
0.02	0.00	7.88	1454.8	0.309E-01	1.05	31.53	0.046	.12208E+03
0.02	0.00	8.02	1481.5	0.304E-01	1.06	31.54	0.046	.12510E+03
0.02	0.00	8.16	1508.3	0.298E-01	1.08	31.56	0.046	.12811E+03
0.02	0.00	8.29	1534.9	0.293E-01	1.10	31.58	0.046	.13110E+03
0.02	0.00	8.43	1561.8	0.288E-01	1.12	31.60	0.046	.13411E+03
0.02	0.00	8.57	1588.8	0.283E-01	1.14	31.62	0.046	.13712E+03
0.02	0.00	8.71	1615.6	0.279E-01	1.15	31.63	0.046	.14010E+03
0.02	0.00	8.85	1642.7	0.274E-01	1.17	31.65	0.046	.14310E+03
0.03	0.00	8.99	1669.8	0.269E-01	1.19	31.67	0.046	.14610E+03
0.03	0.00	9.13	1696.8	0.265E-01	1.21	31.69	0.046	.14908E+03
0.03	0.00	9.27	1724.0	0.261E-01	1.23	31.71	0.046	.15207E+03
0.03	0.00	9.40	1751.2	0.257E-01	1.25	31.73	0.046	.15507E+03
0.03	0.00	9.54	1778.5	0.253E-01	1.27	31.75	0.046	.15806E+03
0.03	0.00	9.68	1805.6	0.249E-01	1.29	31.77	0.046	.16103E+03
0.03	0.00	9.82	1832.9	0.246E-01	1.30	31.78	0.046	.16402E+03
0.03	0.00	9.96	1860.2	0.242E-01	1.32	31.80	0.047	.16701E+03
0.03	0.00	10.10	1887.4	0.238E-01	1.34	31.82	0.047	.16998E+03
0.03	0.00	10.24	1914.8	0.235E-01	1.36	31.84	0.047	.17297E+03
0.03	0.00	10.38	1942.2	0.232E-01	1.38	31.86	0.047	.17595E+03
0.03	0.00	10.51	1969.5	0.228E-01	1.40	31.88	0.047	.17892E+03
0.03	0.00	10.65	1996.9	0.225E-01	1.42	31.90	0.047	.18190E+03
0.03	0.00	10.79	2024.4	0.222E-01	1.44	31.92	0.047	.18489E+03
0.03	0.00	10.93	2051.6	0.219E-01	1.46	31.94	0.047	.18785E+03
0.03	0.00	11.07	2079.1	0.216E-01	1.48	31.96	0.047	.19083E+03
0.03	0.00	11.21	2106.6	0.214E-01	1.50	31.98	0.047	.19382E+03
0.03	0.00	11.35	2134.1	0.211E-01	1.51	31.99	0.047	.19680E+03
0.03	0.00	11.48	2161.5	0.208E-01	1.53	32.01	0.047	.19976E+03

```
      0.03     0.00   11.62  2189.0 0.206E-01   1.55    32.03     0.047   .20274E+03
      0.03     0.00   11.76  2216.6 0.203E-01   1.57    32.05     0.047   .20572E+03
      0.03     0.00   11.90  2243.9 0.201E-01   1.59    32.07     0.047   .20868E+03
      0.04     0.00   12.04  2271.5 0.198E-01   1.61    32.09     0.047   .21166E+03
      0.04     0.00   12.18  2299.0 0.196E-01   1.63    32.11     0.047   .21464E+03
      0.04     0.00   12.32  2326.4 0.193E-01   1.65    32.13     0.047   .21760E+03
      0.04     0.00   12.46  2354.0 0.191E-01   1.67    32.15     0.047   .22058E+03
      0.04     0.00   12.59  2381.6 0.189E-01   1.69    32.17     0.047   .22356E+03
      0.04     0.00   12.73  2409.0 0.187E-01   1.71    32.19     0.047   .22651E+03
      0.04     0.00   12.87  2436.6 0.185E-01   1.73    32.21     0.047   .22949E+03
      0.04     0.00   13.01  2464.2 0.183E-01   1.75    32.23     0.047   .23247E+03
      0.04     0.00   13.15  2491.8 0.181E-01   1.77    32.25     0.047   .23545E+03
      0.04     0.00   13.29  2519.2 0.179E-01   1.79    32.27     0.047   .23840E+03
      0.04     0.00   13.43  2546.8 0.177E-01   1.81    32.29     0.047   .24138E+03
      0.04     0.00   13.57  2574.5 0.175E-01   1.82    32.30     0.047   .24436E+03
      0.04     0.00   13.70  2601.9 0.173E-01   1.84    32.32     0.047   .24731E+03
      0.04     0.00   13.84  2629.5 0.171E-01   1.86    32.34     0.047   .25029E+03
      0.04     0.00   13.98  2657.2 0.169E-01   1.88    32.36     0.047   .25327E+03
      0.04     0.00   14.12  2684.6 0.168E-01   1.90    32.38     0.047   .25622E+03
 Cumulative travel time =         256.2241 sec  (    0.07 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      89.81 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg


  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.3: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.066mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX2 PREDICTION FILE:
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.066MGD_Diffuser_90BOD_13July2018_v-1.prd
 Time stamp:        07/13/2018--11:12:32

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      0.293 Q0    =      0.003 Q0A   =0.2892E-02
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.9000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.4743E-04         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1363E-04   j0 =U0*GP0*B0 =0.1101E-04   (based on slot width B0)
 m0 =U0*q0   =0.1390E-04   j0 =q0*GP0    =0.1124E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.03  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.2892E-02  M0    =0.8306E-03  J0    =0.6712E-03
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.19  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =     47.83  FRD0  =      4.78  R     =  99999.00  PL    =  655.21
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.9662E-06  M0    =0.5890E-04
 lQ=B  =      0.002 lM    =      0.00  lm    =  99999.00  lmp   =  99999.00
```

```
 LQ    =      0.026 LM    =      0.03  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.021 D0    =      0.060 A0    =      0.003 THETA =     90.00
 FR0   =      0.90  FRD0  =      0.18  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.9000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
----------------------------------------------------------------------------------------------
----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.900E+02   0.03     0.03     0.293   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
----------------------------------------------------------------------------------------------
----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.10  XE    =      0.00  YE    =      0.00  ZE    =      0.25

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.25     1.0 0.900E+02   0.03     0.03     0.293   .00000E+00
      0.00     0.00    0.25     1.0 0.900E+02   0.02     0.02     0.050   .19895E-01
      0.00     0.00    0.39     3.9 0.231E+02   0.03     0.03     0.162   .87870E+00
      0.00     0.00    0.52     8.9 0.101E+02   0.04     0.04     0.142   .17992E+01
```

0.00	0.00	0.66	15.3	0.587E+01	0.06	0.06	0.128	.28333E+01
0.00	0.00	0.80	23.0	0.391E+01	0.08	0.08	0.119	.39622E+01
0.00	0.00	0.94	31.9	0.282E+01	0.09	0.09	0.111	.51640E+01
0.00	0.00	1.08	41.9	0.215E+01	0.11	0.11	0.106	.64466E+01
0.00	0.00	1.22	53.0	0.170E+01	0.13	0.13	0.101	.77943E+01
0.00	0.00	1.36	65.0	0.138E+01	0.14	0.14	0.097	.91912E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **

The pollutant concentration in the plume falls below water quality standard or CCC value of 0.134E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

0.00	0.00	1.50	78.1	0.115E+01	0.16	0.16	0.093	.10653E+02
0.00	0.00	1.63	92.1	0.977E+00	0.18	0.18	0.090	.12166E+02
0.00	0.00	1.77	107.0	0.841E+00	0.20	0.20	0.088	.13726E+02
0.00	0.00	1.91	122.7	0.733E+00	0.21	0.21	0.085	.15321E+02
0.00	0.00	2.05	139.3	0.646E+00	0.23	0.23	0.083	.16969E+02
0.00	0.00	2.19	156.8	0.574E+00	0.25	0.25	0.081	.18658E+02
0.00	0.00	2.33	175.1	0.514E+00	0.26	0.26	0.080	.20386E+02
0.00	0.00	2.47	194.1	0.464E+00	0.28	0.28	0.078	.22138E+02
0.00	0.00	2.61	213.9	0.421E+00	0.30	0.30	0.076	.23938E+02
0.01	0.00	2.74	234.6	0.384E+00	0.31	0.31	0.075	.25773E+02
0.01	0.00	2.88	255.9	0.352E+00	0.33	0.33	0.074	.27641E+02
0.01	0.00	3.02	278.1	0.324E+00	0.35	0.35	0.073	.29540E+02
0.01	0.00	3.16	300.7	0.299E+00	0.36	0.36	0.071	.31457E+02
0.01	0.00	3.30	324.3	0.278E+00	0.38	0.38	0.070	.33417E+02
0.01	0.00	3.44	348.6	0.258E+00	0.40	0.40	0.069	.35406E+02
0.01	0.00	3.58	373.5	0.241E+00	0.41	0.41	0.068	.37424E+02
0.01	0.00	3.72	399.0	0.226E+00	0.43	0.43	0.068	.39454E+02
0.01	0.00	3.85	425.3	0.212E+00	0.45	0.45	0.067	.41526E+02
0.01	0.00	3.99	452.3	0.199E+00	0.46	0.46	0.066	.43624E+02
0.01	0.00	4.13	479.9	0.188E+00	0.48	0.48	0.065	.45747E+02
0.01	0.00	4.27	508.0	0.177E+00	0.50	0.50	0.064	.47879E+02
0.01	0.00	4.41	536.9	0.168E+00	0.51	0.51	0.064	.50051E+02
0.01	0.00	4.55	566.5	0.159E+00	0.53	0.53	0.063	.52247E+02
0.01	0.00	4.69	596.7	0.151E+00	0.55	0.55	0.062	.54467E+02
0.01	0.00	4.83	627.3	0.143E+00	0.56	0.56	0.062	.56692E+02
0.01	0.00	4.96	658.8	0.137E+00	0.58	0.58	0.061	.58957E+02
0.01	0.00	5.10	690.8	0.130E+00	0.60	0.60	0.061	.61243E+02
0.01	0.00	5.24	723.5	0.124E+00	0.61	0.61	0.060	.63550E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.32	994.9	0.905E-01	0.78	31.26	0.042	.64778E+02
0.01	0.00	5.52	1027.4	0.876E-01	0.79	31.27	0.043	.69570E+02
0.01	0.00	5.66	1050.2	0.857E-01	0.80	31.28	0.043	.72794E+02
0.01	0.00	5.80	1073.4	0.838E-01	0.81	31.29	0.044	.75990E+02
0.02	0.00	5.94	1097.0	0.820E-01	0.83	31.31	0.044	.79139E+02
0.02	0.00	6.07	1121.0	0.803E-01	0.84	31.32	0.044	.82290E+02
0.02	0.00	6.21	1145.5	0.786E-01	0.85	31.33	0.045	.85421E+02
0.02	0.00	6.35	1170.2	0.769E-01	0.87	31.35	0.045	.88537E+02
0.02	0.00	6.49	1195.0	0.753E-01	0.88	31.36	0.045	.91615E+02
0.02	0.00	6.63	1220.2	0.738E-01	0.90	31.38	0.045	.94704E+02
0.02	0.00	6.77	1245.7	0.722E-01	0.91	31.39	0.045	.97781E+02
0.02	0.00	6.91	1271.4	0.708E-01	0.93	31.41	0.045	.10085E+03
0.02	0.00	7.05	1297.2	0.694E-01	0.94	31.42	0.046	.10391E+03
0.02	0.00	7.18	1323.0	0.680E-01	0.96	31.44	0.046	.10694E+03
0.02	0.00	7.32	1349.2	0.667E-01	0.98	31.46	0.046	.10998E+03
0.02	0.00	7.46	1375.5	0.654E-01	0.99	31.47	0.046	.11302E+03
0.02	0.00	7.60	1401.9	0.642E-01	1.01	31.49	0.046	.11605E+03
0.02	0.00	7.74	1428.2	0.630E-01	1.03	31.51	0.046	.11906E+03
0.02	0.00	7.88	1454.8	0.619E-01	1.05	31.53	0.046	.12208E+03

0.02	0.00	8.02	1481.5	0.607E-01	1.06	31.54	0.046	.12510E+03
0.02	0.00	8.16	1508.3	0.597E-01	1.08	31.56	0.046	.12811E+03
0.02	0.00	8.29	1534.9	0.586E-01	1.10	31.58	0.046	.13110E+03
0.02	0.00	8.43	1561.8	0.576E-01	1.12	31.60	0.046	.13411E+03
0.02	0.00	8.57	1588.8	0.566E-01	1.14	31.62	0.046	.13712E+03
0.02	0.00	8.71	1615.6	0.557E-01	1.15	31.63	0.046	.14010E+03
0.02	0.00	8.85	1642.7	0.548E-01	1.17	31.65	0.046	.14310E+03
0.03	0.00	8.99	1669.8	0.539E-01	1.19	31.67	0.046	.14610E+03
0.03	0.00	9.13	1696.8	0.530E-01	1.21	31.69	0.046	.14908E+03
0.03	0.00	9.27	1724.0	0.522E-01	1.23	31.71	0.046	.15207E+03
0.03	0.00	9.40	1751.2	0.514E-01	1.25	31.73	0.046	.15507E+03
0.03	0.00	9.54	1778.5	0.506E-01	1.27	31.75	0.046	.15806E+03
0.03	0.00	9.68	1805.6	0.498E-01	1.29	31.77	0.046	.16103E+03
0.03	0.00	9.82	1832.9	0.491E-01	1.30	31.78	0.046	.16402E+03
0.03	0.00	9.96	1860.2	0.484E-01	1.32	31.80	0.047	.16701E+03
0.03	0.00	10.10	1887.4	0.477E-01	1.34	31.82	0.047	.16998E+03
0.03	0.00	10.24	1914.8	0.470E-01	1.36	31.84	0.047	.17297E+03
0.03	0.00	10.38	1942.2	0.463E-01	1.38	31.86	0.047	.17595E+03
0.03	0.00	10.51	1969.5	0.457E-01	1.40	31.88	0.047	.17892E+03
0.03	0.00	10.65	1996.9	0.451E-01	1.42	31.90	0.047	.18190E+03
0.03	0.00	10.79	2024.4	0.445E-01	1.44	31.92	0.047	.18489E+03
0.03	0.00	10.93	2051.6	0.439E-01	1.46	31.94	0.047	.18785E+03
0.03	0.00	11.07	2079.1	0.433E-01	1.48	31.96	0.047	.19083E+03
0.03	0.00	11.21	2106.6	0.427E-01	1.50	31.98	0.047	.19382E+03
0.03	0.00	11.35	2134.1	0.422E-01	1.51	31.99	0.047	.19680E+03
0.03	0.00	11.48	2161.5	0.416E-01	1.53	32.01	0.047	.19976E+03
0.03	0.00	11.62	2189.0	0.411E-01	1.55	32.03	0.047	.20274E+03
0.03	0.00	11.76	2216.6	0.406E-01	1.57	32.05	0.047	.20572E+03
0.03	0.00	11.90	2243.9	0.401E-01	1.59	32.07	0.047	.20868E+03
0.04	0.00	12.04	2271.5	0.396E-01	1.61	32.09	0.047	.21166E+03
0.04	0.00	12.18	2299.0	0.391E-01	1.63	32.11	0.047	.21464E+03
0.04	0.00	12.32	2326.4	0.387E-01	1.65	32.13	0.047	.21760E+03
0.04	0.00	12.46	2354.0	0.382E-01	1.67	32.15	0.047	.22058E+03
0.04	0.00	12.59	2381.6	0.378E-01	1.69	32.17	0.047	.22356E+03
0.04	0.00	12.73	2409.0	0.374E-01	1.71	32.19	0.047	.22651E+03
0.04	0.00	12.87	2436.6	0.369E-01	1.73	32.21	0.047	.22949E+03
0.04	0.00	13.01	2464.2	0.365E-01	1.75	32.23	0.047	.23247E+03
0.04	0.00	13.15	2491.8	0.361E-01	1.77	32.25	0.047	.23545E+03
0.04	0.00	13.29	2519.2	0.357E-01	1.79	32.27	0.047	.23840E+03
0.04	0.00	13.43	2546.8	0.353E-01	1.81	32.29	0.047	.24138E+03
0.04	0.00	13.57	2574.5	0.350E-01	1.82	32.30	0.047	.24436E+03
0.04	0.00	13.70	2601.9	0.346E-01	1.84	32.32	0.047	.24731E+03
0.04	0.00	13.84	2629.5	0.342E-01	1.86	32.34	0.047	.25029E+03
0.04	0.00	13.98	2657.2	0.339E-01	1.88	32.36	0.047	.25327E+03
0.04	0.00	14.12	2684.6	0.335E-01	1.90	32.38	0.047	.25622E+03

Cumulative travel time = 256.2241 sec (0.07 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.81 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
even though some ADDITIONAL DILUTION MAY OCCUR!

```
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.4: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.241mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX2 PREDICTION FILE:
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.241MGD_Diffuser_30BOD_13July2018_v-3.prd
 Time stamp:        07/13/2018--12:38:33

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      1.070 Q0    =      0.011 Q0A   =0.1056E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.3000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.1732E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1817E-03   j0 =U0*GP0*B0 =0.4021E-04   (based on slot width B0)
 m0 =U0*q0   =0.1854E-03   j0 =q0*GP0    =0.4103E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.16  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1056E-01  M0    =0.1108E-01  J0    =0.2451E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.69  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    174.63  FRD0  =     17.47  R     =  99999.00  PL    =  276.30
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.7674E-05  M0    =0.4678E-03
 lQ=B  =      0.004 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.020 LM    =      0.06  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.045 D0    =      0.077 A0    =      0.005 THETA =     90.00
 FR0   =      1.52  FRD0  =      0.33  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
```

```
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 2222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y        Z        S       C        BV       BH       Uc        TT
      0.00     0.00     0.15     1.0 0.300E+02   0.04     0.04     1.070   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.18  XE    =      0.00  YE    =      0.00  ZE    =      0.34

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y        Z        S       C        BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00     0.34     1.0 0.300E+02   0.04     0.04     1.070   .00000E+00
      0.00     0.00     0.34     1.0 0.300E+02   0.04     0.04     0.075   .13256E-01
      0.00     0.00     0.47     2.3 0.129E+02   0.03     0.03     0.225   .68469E+00
      0.00     0.00     0.61     4.7 0.637E+01   0.05     0.05     0.204   .13292E+01
      0.00     0.00     0.75     7.7 0.392E+01   0.07     0.07     0.189   .20333E+01
      0.00     0.00     0.89    11.1 0.270E+01   0.08     0.08     0.176   .27910E+01
      0.00     0.00     1.03    15.1 0.199E+01   0.10     0.10     0.167   .35965E+01
      0.00     0.00     1.16    19.4 0.154E+01   0.12     0.12     0.159   .44452E+01
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00     0.00     1.30    24.3 0.124E+01   0.13     0.13     0.152   .53332E+01
      0.00     0.00     1.44    29.5 0.102E+01   0.15     0.15     0.147   .62576E+01
      0.00     0.00     1.58    35.1 0.854E+00   0.17     0.17     0.142   .72156E+01
      0.00     0.00     1.72    41.2 0.729E+00   0.18     0.18     0.137   .82053E+01
      0.00     0.00     1.85    47.5 0.632E+00   0.20     0.20     0.134   .92171E+01
      0.00     0.00     1.99    54.2 0.553E+00   0.22     0.22     0.130   .10264E+02
      0.00     0.00     2.13    61.4 0.489E+00   0.23     0.23     0.127   .11338E+02
      0.00     0.00     2.27    68.8 0.436E+00   0.25     0.25     0.124   .12438E+02
```

0.00	0.00	2.40	76.6	0.392E+00	0.27	0.27	0.122	.13561E+02
0.00	0.00	2.54	84.7	0.354E+00	0.28	0.28	0.119	.14708E+02
0.00	0.00	2.68	93.1	0.322E+00	0.30	0.30	0.117	.15878E+02
0.00	0.00	2.82	101.9	0.295E+00	0.32	0.32	0.115	.17069E+02
0.00	0.00	2.96	110.9	0.270E+00	0.33	0.33	0.113	.18281E+02
0.00	0.00	3.09	120.3	0.249E+00	0.35	0.35	0.111	.19513E+02
0.00	0.00	3.23	130.0	0.231E+00	0.37	0.37	0.109	.20765E+02
0.00	0.00	3.37	139.8	0.215E+00	0.38	0.38	0.108	.22026E+02
0.00	0.00	3.51	150.1	0.200E+00	0.40	0.40	0.106	.23315E+02
0.00	0.00	3.65	160.6	0.187E+00	0.42	0.42	0.105	.24621E+02
0.01	0.00	3.78	171.5	0.175E+00	0.43	0.43	0.104	.25946E+02
0.01	0.00	3.92	182.6	0.164E+00	0.45	0.45	0.102	.27287E+02
0.01	0.00	4.06	193.9	0.155E+00	0.47	0.47	0.101	.28644E+02
0.01	0.00	4.20	205.6	0.146E+00	0.48	0.48	0.100	.30018E+02
0.01	0.00	4.34	217.5	0.138E+00	0.50	0.50	0.099	.31408E+02
0.01	0.00	4.47	229.7	0.131E+00	0.52	0.52	0.098	.32813E+02
0.01	0.00	4.61	242.1	0.124E+00	0.53	0.53	0.097	.34233E+02
0.01	0.00	4.75	254.9	0.118E+00	0.55	0.55	0.096	.35668E+02
0.01	0.00	4.89	267.7	0.112E+00	0.57	0.57	0.095	.37107E+02
0.01	0.00	5.02	281.0	0.107E+00	0.58	0.58	0.094	.38570E+02
0.01	0.00	5.16	294.4	0.102E+00	0.60	0.60	0.093	.40048E+02
0.01	0.00	5.30	308.2	0.973E-01	0.62	0.62	0.092	.41539E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.34	419.4	0.715E-01	0.78	31.26	0.065	.41989E+02
0.01	0.00	5.58	435.2	0.689E-01	0.79	31.27	0.066	.45570E+02
0.01	0.00	5.71	444.8	0.674E-01	0.80	31.28	0.067	.47645E+02
0.01	0.00	5.85	454.6	0.660E-01	0.82	31.30	0.067	.49702E+02
0.01	0.00	5.99	464.5	0.646E-01	0.83	31.31	0.068	.51744E+02
0.01	0.00	6.13	474.6	0.632E-01	0.84	31.32	0.068	.53773E+02
0.01	0.00	6.27	484.9	0.619E-01	0.85	31.33	0.069	.55790E+02
0.01	0.00	6.40	495.2	0.606E-01	0.87	31.35	0.069	.57797E+02
0.01	0.00	6.54	505.7	0.593E-01	0.88	31.36	0.069	.59780E+02
0.01	0.00	6.68	516.2	0.581E-01	0.90	31.38	0.069	.61770E+02
0.01	0.00	6.82	526.9	0.569E-01	0.91	31.39	0.070	.63753E+02
0.01	0.00	6.96	537.7	0.558E-01	0.93	31.41	0.070	.65730E+02
0.01	0.00	7.09	548.5	0.547E-01	0.95	31.43	0.070	.67701E+02
0.01	0.00	7.23	559.4	0.536E-01	0.96	31.44	0.070	.69667E+02
0.01	0.00	7.37	570.4	0.526E-01	0.98	31.46	0.070	.71629E+02
0.01	0.00	7.51	581.4	0.516E-01	1.00	31.48	0.071	.73587E+02
0.01	0.00	7.65	592.4	0.506E-01	1.01	31.49	0.071	.75542E+02
0.01	0.00	7.78	603.5	0.497E-01	1.03	31.51	0.071	.77493E+02
0.01	0.00	7.92	614.7	0.488E-01	1.05	31.53	0.071	.79442E+02
0.01	0.00	8.06	625.8	0.479E-01	1.07	31.55	0.071	.81374E+02
0.01	0.00	8.20	637.0	0.471E-01	1.08	31.56	0.071	.83318E+02
0.01	0.00	8.33	648.2	0.463E-01	1.10	31.58	0.071	.85259E+02
0.01	0.00	8.47	659.5	0.455E-01	1.12	31.60	0.071	.87199E+02
0.02	0.00	8.61	670.8	0.447E-01	1.14	31.62	0.071	.89137E+02
0.02	0.00	8.75	682.1	0.440E-01	1.16	31.64	0.071	.91074E+02
0.02	0.00	8.89	693.4	0.433E-01	1.17	31.65	0.071	.93009E+02
0.02	0.00	9.02	704.7	0.426E-01	1.19	31.67	0.071	.94928E+02
0.02	0.00	9.16	716.1	0.419E-01	1.21	31.69	0.071	.96861E+02
0.02	0.00	9.30	727.5	0.412E-01	1.23	31.71	0.071	.98793E+02
0.02	0.00	9.44	738.9	0.406E-01	1.25	31.73	0.071	.10072E+03
0.02	0.00	9.58	750.3	0.400E-01	1.27	31.75	0.072	.10265E+03
0.02	0.00	9.71	761.7	0.394E-01	1.29	31.77	0.072	.10458E+03
0.02	0.00	9.85	773.2	0.388E-01	1.30	31.78	0.072	.10651E+03
0.02	0.00	9.99	784.5	0.382E-01	1.32	31.80	0.072	.10842E+03
0.02	0.00	10.13	796.0	0.377E-01	1.34	31.82	0.072	.11035E+03
0.02	0.00	10.26	807.5	0.372E-01	1.36	31.84	0.072	.11228E+03
0.02	0.00	10.40	818.9	0.366E-01	1.38	31.86	0.072	.11420E+03
0.02	0.00	10.54	830.4	0.361E-01	1.40	31.88	0.072	.11613E+03
0.02	0.00	10.68	841.9	0.356E-01	1.42	31.90	0.072	.11805E+03
0.02	0.00	10.82	853.3	0.352E-01	1.44	31.92	0.072	.11996E+03
0.02	0.00	10.95	864.8	0.347E-01	1.46	31.94	0.072	.12189E+03
0.02	0.00	11.09	876.3	0.342E-01	1.48	31.96	0.072	.12381E+03
0.02	0.00	11.23	887.9	0.338E-01	1.49	31.97	0.072	.12573E+03
0.02	0.00	11.37	899.4	0.334E-01	1.51	31.99	0.072	.12765E+03
0.02	0.00	11.51	910.9	0.329E-01	1.53	32.01	0.072	.12958E+03

```
      0.02      0.00    11.64    922.4 0.325E-01   1.55    32.03     0.072   .13150E+03
      0.02      0.00    11.78    933.9 0.321E-01   1.57    32.05     0.072   .13341E+03
      0.02      0.00    11.92    945.4 0.317E-01   1.59    32.07     0.072   .13533E+03
      0.02      0.00    12.06    956.9 0.313E-01   1.61    32.09     0.072   .13725E+03
      0.02      0.00    12.19    968.5 0.310E-01   1.63    32.11     0.072   .13917E+03
      0.02      0.00    12.33    980.0 0.306E-01   1.65    32.13     0.072   .14109E+03
      0.02      0.00    12.47    991.6 0.303E-01   1.67    32.15     0.072   .14301E+03
      0.02      0.00    12.61   1003.0 0.299E-01   1.69    32.17     0.072   .14492E+03
      0.02      0.00    12.75   1014.6 0.296E-01   1.71    32.19     0.072   .14684E+03
      0.02      0.00    12.88   1026.2 0.292E-01   1.73    32.21     0.072   .14876E+03
      0.02      0.00    13.02   1037.7 0.289E-01   1.74    32.22     0.072   .15068E+03
      0.02      0.00    13.16   1049.3 0.286E-01   1.76    32.24     0.072   .15260E+03
      0.03      0.00    13.30   1060.8 0.283E-01   1.78    32.26     0.072   .15452E+03
      0.03      0.00    13.44   1072.4 0.280E-01   1.80    32.28     0.072   .15644E+03
      0.03      0.00    13.57   1083.9 0.277E-01   1.82    32.30     0.072   .15835E+03
      0.03      0.00    13.71   1095.4 0.274E-01   1.84    32.32     0.072   .16027E+03
      0.03      0.00    13.85   1107.0 0.271E-01   1.86    32.34     0.072   .16219E+03
      0.03      0.00    13.99   1118.6 0.268E-01   1.88    32.36     0.072   .16411E+03
      0.03      0.00    14.12   1130.1 0.265E-01   1.90    32.38     0.072   .16602E+03
 Cumulative travel time =         166.0151 sec  (    0.05 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      89.88 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg


  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.5: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.241mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX2 PREDICTION FILE:
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
--------------------------------------------------------------------------------------------
--------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.241MGD_Diffuser_45BOD_13July2018_v-4.prd
 Time stamp:        07/17/2018--13:18:30

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      1.070 Q0    =      0.011 Q0A   =0.1056E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.4500E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.1732E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1817E-03   j0 =U0*GP0*B0 =0.4021E-04   (based on slot width B0)
 m0 =U0*q0   =0.1854E-03   j0 =q0*GP0    =0.4103E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.16  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1056E-01  M0    =0.1108E-01  J0    =0.2451E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.69  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    174.63  FRD0  =     17.47  R     =  99999.00  PL    =  276.30
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.7674E-05  M0    =0.4678E-03
 lQ=B  =      0.004 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.020 LM    =      0.06  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.045 D0    =      0.077 A0    =      0.005 THETA =     90.00
 FR0   =      1.52  FRD0  =      0.33  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
```

```
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 22222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.4500E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.450E+02   0.04     0.04     1.070   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.18  XE    =      0.00  YE    =      0.00  ZE    =      0.34

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.34     1.0 0.450E+02   0.04     0.04     1.070   .00000E+00
      0.00     0.00    0.34     1.0 0.450E+02   0.04     0.04     0.075   .13256E-01
      0.00     0.00    0.47     2.3 0.193E+02   0.03     0.03     0.225   .68469E+00
      0.00     0.00    0.61     4.7 0.955E+01   0.05     0.05     0.204   .13292E+01
      0.00     0.00    0.75     7.7 0.588E+01   0.07     0.07     0.189   .20333E+01
      0.00     0.00    0.89    11.1 0.405E+01   0.08     0.08     0.176   .27910E+01
      0.00     0.00    1.03    15.1 0.299E+01   0.10     0.10     0.167   .35965E+01
      0.00     0.00    1.16    19.4 0.231E+01   0.12     0.12     0.159   .44452E+01
      0.00     0.00    1.30    24.3 0.185E+01   0.13     0.13     0.152   .53332E+01
      0.00     0.00    1.44    29.5 0.153E+01   0.15     0.15     0.147   .62576E+01
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00     0.00    1.58    35.1 0.128E+01   0.17     0.17     0.142   .72156E+01
      0.00     0.00    1.72    41.2 0.109E+01   0.18     0.18     0.137   .82053E+01
      0.00     0.00    1.85    47.5 0.947E+00   0.20     0.20     0.134   .92171E+01
      0.00     0.00    1.99    54.2 0.829E+00   0.22     0.22     0.130   .10264E+02
      0.00     0.00    2.13    61.4 0.733E+00   0.23     0.23     0.127   .11338E+02
      0.00     0.00    2.27    68.8 0.654E+00   0.25     0.25     0.124   .12438E+02
```

0.00	0.00	2.40	76.6	0.588E+00	0.27	0.27	0.122	.13561E+02
0.00	0.00	2.54	84.7	0.531E+00	0.28	0.28	0.119	.14708E+02
0.00	0.00	2.68	93.1	0.483E+00	0.30	0.30	0.117	.15878E+02
0.00	0.00	2.82	101.9	0.442E+00	0.32	0.32	0.115	.17069E+02
0.00	0.00	2.96	110.9	0.406E+00	0.33	0.33	0.113	.18281E+02
0.00	0.00	3.09	120.3	0.374E+00	0.35	0.35	0.111	.19513E+02
0.00	0.00	3.23	130.0	0.346E+00	0.37	0.37	0.109	.20765E+02
0.00	0.00	3.37	139.8	0.322E+00	0.38	0.38	0.108	.22026E+02
0.00	0.00	3.51	150.1	0.300E+00	0.40	0.40	0.106	.23315E+02
0.00	0.00	3.65	160.6	0.280E+00	0.42	0.42	0.105	.24621E+02
0.01	0.00	3.78	171.5	0.262E+00	0.43	0.43	0.104	.25946E+02
0.01	0.00	3.92	182.6	0.247E+00	0.45	0.45	0.102	.27287E+02
0.01	0.00	4.06	193.9	0.232E+00	0.47	0.47	0.101	.28644E+02
0.01	0.00	4.20	205.6	0.219E+00	0.48	0.48	0.100	.30018E+02
0.01	0.00	4.34	217.5	0.207E+00	0.50	0.50	0.099	.31408E+02
0.01	0.00	4.47	229.7	0.196E+00	0.52	0.52	0.098	.32813E+02
0.01	0.00	4.61	242.1	0.186E+00	0.53	0.53	0.097	.34233E+02
0.01	0.00	4.75	254.9	0.177E+00	0.55	0.55	0.096	.35668E+02
0.01	0.00	4.89	267.7	0.168E+00	0.57	0.57	0.095	.37107E+02
0.01	0.00	5.02	281.0	0.160E+00	0.58	0.58	0.094	.38570E+02
0.01	0.00	5.16	294.4	0.153E+00	0.60	0.60	0.093	.40048E+02
0.01	0.00	5.30	308.2	0.146E+00	0.62	0.62	0.092	.41539E+02
Merging of individual jet/plumes to form plane jet/plume:								
0.01	0.00	5.34	419.4	0.107E+00	0.78	31.26	0.065	.41989E+02
0.01	0.00	5.58	435.2	0.103E+00	0.79	31.27	0.066	.45570E+02
0.01	0.00	5.71	444.8	0.101E+00	0.80	31.28	0.067	.47645E+02
0.01	0.00	5.85	454.6	0.990E-01	0.82	31.30	0.067	.49702E+02
0.01	0.00	5.99	464.5	0.969E-01	0.83	31.31	0.068	.51744E+02
0.01	0.00	6.13	474.6	0.948E-01	0.84	31.32	0.068	.53773E+02
0.01	0.00	6.27	484.9	0.928E-01	0.85	31.33	0.069	.55790E+02
0.01	0.00	6.40	495.2	0.909E-01	0.87	31.35	0.069	.57797E+02
0.01	0.00	6.54	505.7	0.890E-01	0.88	31.36	0.069	.59780E+02
0.01	0.00	6.68	516.2	0.872E-01	0.90	31.38	0.069	.61770E+02
0.01	0.00	6.82	526.9	0.854E-01	0.91	31.39	0.070	.63753E+02
0.01	0.00	6.96	537.7	0.837E-01	0.93	31.41	0.070	.65730E+02
0.01	0.00	7.09	548.5	0.820E-01	0.95	31.43	0.070	.67701E+02
0.01	0.00	7.23	559.4	0.804E-01	0.96	31.44	0.070	.69667E+02
0.01	0.00	7.37	570.4	0.789E-01	0.98	31.46	0.070	.71629E+02
0.01	0.00	7.51	581.4	0.774E-01	1.00	31.48	0.071	.73587E+02
0.01	0.00	7.65	592.4	0.760E-01	1.01	31.49	0.071	.75542E+02
0.01	0.00	7.78	603.5	0.746E-01	1.03	31.51	0.071	.77493E+02
0.01	0.00	7.92	614.7	0.732E-01	1.05	31.53	0.071	.79442E+02
0.01	0.00	8.06	625.8	0.719E-01	1.07	31.55	0.071	.81374E+02
0.01	0.00	8.20	637.0	0.706E-01	1.08	31.56	0.071	.83318E+02
0.01	0.00	8.33	648.2	0.694E-01	1.10	31.58	0.071	.85259E+02
0.01	0.00	8.47	659.5	0.682E-01	1.12	31.60	0.071	.87199E+02
0.02	0.00	8.61	670.8	0.671E-01	1.14	31.62	0.071	.89137E+02
0.02	0.00	8.75	682.1	0.660E-01	1.16	31.64	0.071	.91074E+02
0.02	0.00	8.89	693.4	0.649E-01	1.17	31.65	0.071	.93009E+02
0.02	0.00	9.02	704.7	0.639E-01	1.19	31.67	0.071	.94928E+02
0.02	0.00	9.16	716.1	0.628E-01	1.21	31.69	0.071	.96861E+02
0.02	0.00	9.30	727.5	0.619E-01	1.23	31.71	0.071	.98793E+02
0.02	0.00	9.44	738.9	0.609E-01	1.25	31.73	0.071	.10072E+03
0.02	0.00	9.58	750.3	0.600E-01	1.27	31.75	0.072	.10265E+03
0.02	0.00	9.71	761.7	0.591E-01	1.29	31.77	0.072	.10458E+03
0.02	0.00	9.85	773.2	0.582E-01	1.30	31.78	0.072	.10651E+03
0.02	0.00	9.99	784.5	0.574E-01	1.32	31.80	0.072	.10842E+03
0.02	0.00	10.13	796.0	0.565E-01	1.34	31.82	0.072	.11035E+03
0.02	0.00	10.26	807.5	0.557E-01	1.36	31.84	0.072	.11228E+03
0.02	0.00	10.40	818.9	0.549E-01	1.38	31.86	0.072	.11420E+03
0.02	0.00	10.54	830.4	0.542E-01	1.40	31.88	0.072	.11613E+03
0.02	0.00	10.68	841.9	0.534E-01	1.42	31.90	0.072	.11805E+03
0.02	0.00	10.82	853.3	0.527E-01	1.44	31.92	0.072	.11996E+03
0.02	0.00	10.95	864.8	0.520E-01	1.46	31.94	0.072	.12189E+03
0.02	0.00	11.09	876.3	0.514E-01	1.48	31.96	0.072	.12381E+03
0.02	0.00	11.23	887.9	0.507E-01	1.49	31.97	0.072	.12573E+03
0.02	0.00	11.37	899.4	0.500E-01	1.51	31.99	0.072	.12765E+03
0.02	0.00	11.51	910.9	0.494E-01	1.53	32.01	0.072	.12958E+03

```
      0.02      0.00   11.64    922.4 0.488E-01   1.55     32.03      0.072   .13150E+03
      0.02      0.00   11.78    933.9 0.482E-01   1.57     32.05      0.072   .13341E+03
      0.02      0.00   11.92    945.4 0.476E-01   1.59     32.07      0.072   .13533E+03
      0.02      0.00   12.06    956.9 0.470E-01   1.61     32.09      0.072   .13725E+03
      0.02      0.00   12.19    968.5 0.465E-01   1.63     32.11      0.072   .13917E+03
      0.02      0.00   12.33    980.0 0.459E-01   1.65     32.13      0.072   .14109E+03
      0.02      0.00   12.47    991.6 0.454E-01   1.67     32.15      0.072   .14301E+03
      0.02      0.00   12.61   1003.0 0.449E-01   1.69     32.17      0.072   .14492E+03
      0.02      0.00   12.75   1014.6 0.444E-01   1.71     32.19      0.072   .14684E+03
      0.02      0.00   12.88   1026.2 0.439E-01   1.73     32.21      0.072   .14876E+03
      0.02      0.00   13.02   1037.7 0.434E-01   1.74     32.22      0.072   .15068E+03
      0.02      0.00   13.16   1049.3 0.429E-01   1.76     32.24      0.072   .15260E+03
      0.03      0.00   13.30   1060.8 0.424E-01   1.78     32.26      0.072   .15452E+03
      0.03      0.00   13.44   1072.4 0.420E-01   1.80     32.28      0.072   .15644E+03
      0.03      0.00   13.57   1083.9 0.415E-01   1.82     32.30      0.072   .15835E+03
      0.03      0.00   13.71   1095.4 0.411E-01   1.84     32.32      0.072   .16027E+03
      0.03      0.00   13.85   1107.0 0.406E-01   1.86     32.34      0.072   .16219E+03
      0.03      0.00   13.99   1118.6 0.402E-01   1.88     32.36      0.072   .16411E+03
      0.03      0.00   14.12   1130.1 0.398E-01   1.90     32.38      0.072   .16602E+03
 Cumulative travel time =         166.0151 sec  (    0.05 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
---------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      89.88 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg


  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
---------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
---------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.6: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.241mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
---------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.241MGD_Diffuser_90BOD_13July2018_v-1.prd
 Time stamp:        07/13/2018--12:30:11

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      1.070 Q0    =      0.011 Q0A   =0.1056E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.9000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.1732E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1817E-03   j0 =U0*GP0*B0 =0.4021E-04   (based on slot width B0)
 m0 =U0*q0   =0.1854E-03   j0 =q0*GP0    =0.4103E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.16  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1056E-01  M0    =0.1108E-01  J0    =0.2451E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.69  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    174.63  FRD0  =     17.47  R     =  99999.00  PL    =  276.30
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.7674E-05  M0    =0.4678E-03
 lQ=B  =      0.004 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.020 LM    =      0.06  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.045 D0    =      0.077 A0    =      0.005 THETA =     90.00
 FR0   =      1.52  FRD0  =      0.33  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
```

```
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 22222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.9000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.900E+02   0.04     0.04     1.070   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.18  XE    =      0.00  YE    =      0.00  ZE    =      0.34

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.34     1.0 0.900E+02   0.04     0.04     1.070   .00000E+00
      0.00     0.00    0.34     1.0 0.900E+02   0.04     0.04     0.075   .13256E-01
      0.00     0.00    0.47     2.3 0.386E+02   0.03     0.03     0.225   .68469E+00
      0.00     0.00    0.61     4.7 0.191E+02   0.05     0.05     0.204   .13292E+01
      0.00     0.00    0.75     7.7 0.118E+02   0.07     0.07     0.189   .20333E+01
      0.00     0.00    0.89    11.1 0.810E+01   0.08     0.08     0.176   .27910E+01
      0.00     0.00    1.03    15.1 0.598E+01   0.10     0.10     0.167   .35965E+01
      0.00     0.00    1.16    19.4 0.463E+01   0.12     0.12     0.159   .44452E+01
      0.00     0.00    1.30    24.3 0.371E+01   0.13     0.13     0.152   .53332E+01
      0.00     0.00    1.44    29.5 0.305E+01   0.15     0.15     0.147   .62576E+01
      0.00     0.00    1.58    35.1 0.256E+01   0.17     0.17     0.142   .72156E+01
      0.00     0.00    1.72    41.2 0.219E+01   0.18     0.18     0.137   .82053E+01
      0.00     0.00    1.85    47.5 0.189E+01   0.20     0.20     0.134   .92171E+01
      0.00     0.00    1.99    54.2 0.166E+01   0.22     0.22     0.130   .10264E+02
      0.00     0.00    2.13    61.4 0.147E+01   0.23     0.23     0.127   .11338E+02
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00     0.00    2.27    68.8 0.131E+01   0.25     0.25     0.124   .12438E+02
```

0.00	0.00	2.40	76.6	0.118E+01	0.27	0.27	0.122	.13561E+02
0.00	0.00	2.54	84.7	0.106E+01	0.28	0.28	0.119	.14708E+02
0.00	0.00	2.68	93.1	0.967E+00	0.30	0.30	0.117	.15878E+02
0.00	0.00	2.82	101.9	0.884E+00	0.32	0.32	0.115	.17069E+02
0.00	0.00	2.96	110.9	0.811E+00	0.33	0.33	0.113	.18281E+02
0.00	0.00	3.09	120.3	0.748E+00	0.35	0.35	0.111	.19513E+02
0.00	0.00	3.23	130.0	0.693E+00	0.37	0.37	0.109	.20765E+02
0.00	0.00	3.37	139.8	0.644E+00	0.38	0.38	0.108	.22026E+02
0.00	0.00	3.51	150.1	0.600E+00	0.40	0.40	0.106	.23315E+02
0.00	0.00	3.65	160.6	0.560E+00	0.42	0.42	0.105	.24621E+02
0.01	0.00	3.78	171.5	0.525E+00	0.43	0.43	0.104	.25946E+02
0.01	0.00	3.92	182.6	0.493E+00	0.45	0.45	0.102	.27287E+02
0.01	0.00	4.06	193.9	0.464E+00	0.47	0.47	0.101	.28644E+02
0.01	0.00	4.20	205.6	0.438E+00	0.48	0.48	0.100	.30018E+02
0.01	0.00	4.34	217.5	0.414E+00	0.50	0.50	0.099	.31408E+02
0.01	0.00	4.47	229.7	0.392E+00	0.52	0.52	0.098	.32813E+02
0.01	0.00	4.61	242.1	0.372E+00	0.53	0.53	0.097	.34233E+02
0.01	0.00	4.75	254.9	0.353E+00	0.55	0.55	0.096	.35668E+02
0.01	0.00	4.89	267.7	0.336E+00	0.57	0.57	0.095	.37107E+02
0.01	0.00	5.02	281.0	0.320E+00	0.58	0.58	0.094	.38570E+02
0.01	0.00	5.16	294.4	0.306E+00	0.60	0.60	0.093	.40048E+02
0.01	0.00	5.30	308.2	0.292E+00	0.62	0.62	0.092	.41539E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.34	419.4	0.215E+00	0.78	31.26	0.065	.41989E+02
0.01	0.00	5.58	435.2	0.207E+00	0.79	31.27	0.066	.45570E+02
0.01	0.00	5.71	444.8	0.202E+00	0.80	31.28	0.067	.47645E+02
0.01	0.00	5.85	454.6	0.198E+00	0.82	31.30	0.067	.49702E+02
0.01	0.00	5.99	464.5	0.194E+00	0.83	31.31	0.068	.51744E+02
0.01	0.00	6.13	474.6	0.190E+00	0.84	31.32	0.068	.53773E+02
0.01	0.00	6.27	484.9	0.186E+00	0.85	31.33	0.069	.55790E+02
0.01	0.00	6.40	495.2	0.182E+00	0.87	31.35	0.069	.57797E+02
0.01	0.00	6.54	505.7	0.178E+00	0.88	31.36	0.069	.59780E+02
0.01	0.00	6.68	516.2	0.174E+00	0.90	31.38	0.069	.61770E+02
0.01	0.00	6.82	526.9	0.171E+00	0.91	31.39	0.070	.63753E+02
0.01	0.00	6.96	537.7	0.167E+00	0.93	31.41	0.070	.65730E+02
0.01	0.00	7.09	548.5	0.164E+00	0.95	31.43	0.070	.67701E+02
0.01	0.00	7.23	559.4	0.161E+00	0.96	31.44	0.070	.69667E+02
0.01	0.00	7.37	570.4	0.158E+00	0.98	31.46	0.070	.71629E+02
0.01	0.00	7.51	581.4	0.155E+00	1.00	31.48	0.071	.73587E+02
0.01	0.00	7.65	592.4	0.152E+00	1.01	31.49	0.071	.75542E+02
0.01	0.00	7.78	603.5	0.149E+00	1.03	31.51	0.071	.77493E+02
0.01	0.00	7.92	614.7	0.146E+00	1.05	31.53	0.071	.79442E+02
0.01	0.00	8.06	625.8	0.144E+00	1.07	31.55	0.071	.81374E+02
0.01	0.00	8.20	637.0	0.141E+00	1.08	31.56	0.071	.83318E+02
0.01	0.00	8.33	648.2	0.139E+00	1.10	31.58	0.071	.85259E+02
0.01	0.00	8.47	659.5	0.136E+00	1.12	31.60	0.071	.87199E+02
0.02	0.00	8.61	670.8	0.134E+00	1.14	31.62	0.071	.89137E+02
0.02	0.00	8.75	682.1	0.132E+00	1.16	31.64	0.071	.91074E+02
0.02	0.00	8.89	693.4	0.130E+00	1.17	31.65	0.071	.93009E+02
0.02	0.00	9.02	704.7	0.128E+00	1.19	31.67	0.071	.94928E+02
0.02	0.00	9.16	716.1	0.126E+00	1.21	31.69	0.071	.96861E+02
0.02	0.00	9.30	727.5	0.124E+00	1.23	31.71	0.071	.98793E+02
0.02	0.00	9.44	738.9	0.122E+00	1.25	31.73	0.071	.10072E+03
0.02	0.00	9.58	750.3	0.120E+00	1.27	31.75	0.072	.10265E+03
0.02	0.00	9.71	761.7	0.118E+00	1.29	31.77	0.072	.10458E+03
0.02	0.00	9.85	773.2	0.116E+00	1.30	31.78	0.072	.10651E+03
0.02	0.00	9.99	784.5	0.115E+00	1.32	31.80	0.072	.10842E+03
0.02	0.00	10.13	796.0	0.113E+00	1.34	31.82	0.072	.11035E+03
0.02	0.00	10.26	807.5	0.111E+00	1.36	31.84	0.072	.11228E+03
0.02	0.00	10.40	818.9	0.110E+00	1.38	31.86	0.072	.11420E+03
0.02	0.00	10.54	830.4	0.108E+00	1.40	31.88	0.072	.11613E+03
0.02	0.00	10.68	841.9	0.107E+00	1.42	31.90	0.072	.11805E+03
0.02	0.00	10.82	853.3	0.105E+00	1.44	31.92	0.072	.11996E+03
0.02	0.00	10.95	864.8	0.104E+00	1.46	31.94	0.072	.12189E+03
0.02	0.00	11.09	876.3	0.103E+00	1.48	31.96	0.072	.12381E+03
0.02	0.00	11.23	887.9	0.101E+00	1.49	31.97	0.072	.12573E+03
0.02	0.00	11.37	899.4	0.100E+00	1.51	31.99	0.072	.12765E+03
0.02	0.00	11.51	910.9	0.988E-01	1.53	32.01	0.072	.12958E+03

0.02	0.00	11.64	922.4	0.976E-01	1.55	32.03	0.072	.13150E+03
0.02	0.00	11.78	933.9	0.964E-01	1.57	32.05	0.072	.13341E+03
0.02	0.00	11.92	945.4	0.952E-01	1.59	32.07	0.072	.13533E+03
0.02	0.00	12.06	956.9	0.940E-01	1.61	32.09	0.072	.13725E+03
0.02	0.00	12.19	968.5	0.929E-01	1.63	32.11	0.072	.13917E+03
0.02	0.00	12.33	980.0	0.918E-01	1.65	32.13	0.072	.14109E+03
0.02	0.00	12.47	991.6	0.908E-01	1.67	32.15	0.072	.14301E+03
0.02	0.00	12.61	1003.0	0.897E-01	1.69	32.17	0.072	.14492E+03
0.02	0.00	12.75	1014.6	0.887E-01	1.71	32.19	0.072	.14684E+03
0.02	0.00	12.88	1026.2	0.877E-01	1.73	32.21	0.072	.14876E+03
0.02	0.00	13.02	1037.7	0.867E-01	1.74	32.22	0.072	.15068E+03
0.02	0.00	13.16	1049.3	0.858E-01	1.76	32.24	0.072	.15260E+03
0.03	0.00	13.30	1060.8	0.848E-01	1.78	32.26	0.072	.15452E+03
0.03	0.00	13.44	1072.4	0.839E-01	1.80	32.28	0.072	.15644E+03
0.03	0.00	13.57	1083.9	0.830E-01	1.82	32.30	0.072	.15835E+03
0.03	0.00	13.71	1095.4	0.822E-01	1.84	32.32	0.072	.16027E+03
0.03	0.00	13.85	1107.0	0.813E-01	1.86	32.34	0.072	.16219E+03
0.03	0.00	13.99	1118.6	0.805E-01	1.88	32.36	0.072	.16411E+03
0.03	0.00	14.12	1130.1	0.796E-01	1.90	32.38	0.072	.16602E+03

```
 Cumulative travel time =        166.0151 sec  (    0.05 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      89.88 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg


  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.7: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.335mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
----------------------------------------------------------------------------------------------
----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.335MGD_Diffuser_30BOD_13July2018_v-1.prd
 Time stamp:        07/13/2018--10:51:57

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      1.488 Q0    =      0.015 Q0A   =0.1468E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.3000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.2408E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.3511E-03   j0 =U0*GP0*B0 =0.5589E-04   (based on slot width B0)
 m0 =U0*q0   =0.3582E-03   j0 =q0*GP0    =0.5703E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.24  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1468E-01  M0    =0.2140E-01  J0    =0.3407E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.96  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    242.75  FRD0  =     24.28  R     =  99999.00  PL    =  221.83
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.1300E-04  M0    =0.7924E-03
```

```
 lQ=B  =      0.004 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.019 LM    =      0.08  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.055 D0    =      0.082 A0    =      0.005 THETA =     90.00
 FR0   =      1.73  FRD0  =      0.39  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.300E+02   0.04     0.04     1.488   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.22  XE    =      0.00  YE    =      0.00  ZE    =      0.37

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.37     1.0 0.300E+02   0.04     0.04     1.488   .00000E+00
      0.00     0.00    0.37     1.0 0.300E+02   0.04     0.04     0.088   .11424E-01
      0.00     0.00    0.50     2.1 0.144E+02   0.04     0.04     0.243   .64358E+00
```

```
     0.00      0.00     0.64     4.1 0.735E+01   0.05      0.05      0.223   .12366E+01
     0.00      0.00     0.78     6.5 0.462E+01   0.07      0.07      0.207   .18744E+01
     0.00      0.00     0.92     9.3 0.321E+01   0.09      0.09      0.194   .25627E+01
     0.00      0.00     1.06    12.6 0.239E+01   0.10      0.10      0.184   .32925E+01
     0.00      0.00     1.19    16.1 0.186E+01   0.12      0.12      0.176   .40543E+01
     0.00      0.00     1.33    20.0 0.150E+01   0.14      0.14      0.169   .48561E+01
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
     0.00      0.00     1.47    24.3 0.124E+01   0.15      0.15      0.163   .56837E+01
     0.00      0.00     1.61    28.8 0.104E+01   0.17      0.17      0.157   .65470E+01
     0.00      0.00     1.74    33.7 0.890E+00   0.19      0.19      0.153   .74383E+01
     0.00      0.00     1.88    38.8 0.773E+00   0.20      0.20      0.148   .83491E+01
     0.00      0.00     2.02    44.3 0.677E+00   0.22      0.22      0.145   .92914E+01
     0.00      0.00     2.16    50.0 0.600E+00   0.24      0.24      0.141   .10250E+02
     0.00      0.00     2.29    56.0 0.536E+00   0.25      0.25      0.138   .11239E+02
     0.00      0.00     2.43    62.3 0.482E+00   0.27      0.27      0.135   .12249E+02
     0.00      0.00     2.57    68.8 0.436E+00   0.29      0.29      0.133   .13272E+02
     0.00      0.00     2.71    75.6 0.397E+00   0.30      0.30      0.130   .14323E+02
     0.00      0.00     2.84    82.6 0.363E+00   0.32      0.32      0.128   .15385E+02
     0.00      0.00     2.98    89.9 0.334E+00   0.34      0.34      0.126   .16473E+02
     0.00      0.00     3.12    97.4 0.308E+00   0.35      0.35      0.124   .17580E+02
     0.00      0.00     3.26   105.2 0.285E+00   0.37      0.37      0.122   .18695E+02
     0.00      0.00     3.39   113.2 0.265E+00   0.39      0.39      0.120   .19836E+02
     0.00      0.00     3.53   121.4 0.247E+00   0.40      0.40      0.118   .20984E+02
     0.00      0.00     3.67   129.9 0.231E+00   0.42      0.42      0.117   .22157E+02
     0.00      0.00     3.81   138.6 0.216E+00   0.44      0.44      0.115   .23345E+02
     0.00      0.00     3.94   147.5 0.203E+00   0.45      0.45      0.114   .24540E+02
     0.00      0.00     4.08   156.6 0.192E+00   0.47      0.47      0.113   .25758E+02
     0.01      0.00     4.22   166.0 0.181E+00   0.49      0.49      0.111   .26991E+02
     0.01      0.00     4.36   175.5 0.171E+00   0.50      0.50      0.110   .28228E+02
     0.01      0.00     4.50   185.3 0.162E+00   0.52      0.52      0.109   .29489E+02
     0.01      0.00     4.63   195.3 0.154E+00   0.54      0.54      0.108   .30753E+02
     0.01      0.00     4.77   205.5 0.146E+00   0.55      0.55      0.107   .32040E+02
     0.01      0.00     4.91   215.9 0.139E+00   0.57      0.57      0.106   .33340E+02
     0.01      0.00     5.05   226.5 0.132E+00   0.59      0.59      0.105   .34644E+02
     0.01      0.00     5.18   237.3 0.126E+00   0.60      0.60      0.104   .35969E+02
     0.01      0.00     5.32   248.3 0.121E+00   0.62      0.62      0.103   .37296E+02
  Merging of individual jet/plumes to form plane jet/plume:
     0.01      0.00     5.35   336.7 0.891E-01   0.78     31.26      0.073   .37593E+02
     0.01      0.00     5.60   350.0 0.857E-01   0.80     31.28      0.074   .40951E+02
     0.01      0.00     5.73   357.6 0.839E-01   0.81     31.29      0.075   .42795E+02
     0.01      0.00     5.87   365.5 0.821E-01   0.82     31.30      0.075   .44638E+02
     0.01      0.00     6.01   373.5 0.803E-01   0.83     31.31      0.076   .46466E+02
     0.01      0.00     6.15   381.6 0.786E-01   0.84     31.32      0.076   .48270E+02
     0.01      0.00     6.28   389.8 0.770E-01   0.85     31.33      0.077   .50077E+02
     0.01      0.00     6.42   398.1 0.754E-01   0.87     31.35      0.077   .51862E+02
     0.01      0.00     6.56   406.5 0.738E-01   0.88     31.36      0.077   .53651E+02
     0.01      0.00     6.70   415.0 0.723E-01   0.90     31.38      0.078   .55434E+02
     0.01      0.00     6.83   423.5 0.708E-01   0.91     31.39      0.078   .57198E+02
     0.01      0.00     6.97   432.2 0.694E-01   0.93     31.41      0.078   .58969E+02
     0.01      0.00     7.11   440.8 0.681E-01   0.95     31.43      0.078   .60722E+02
     0.01      0.00     7.25   449.5 0.667E-01   0.96     31.44      0.078   .62484E+02
     0.01      0.00     7.39   458.3 0.655E-01   0.98     31.46      0.079   .64241E+02
     0.01      0.00     7.52   467.1 0.642E-01   1.00     31.48      0.079   .65983E+02
     0.01      0.00     7.66   476.0 0.630E-01   1.01     31.49      0.079   .67734E+02
     0.01      0.00     7.80   484.9 0.619E-01   1.03     31.51      0.079   .69483E+02
```

0.01	0.00	7.94	493.8	0.608E-01	1.05	31.53	0.079	.71216E+02
0.01	0.00	8.07	502.8	0.597E-01	1.07	31.55	0.079	.72960E+02
0.01	0.00	8.21	511.7	0.586E-01	1.08	31.56	0.079	.74689E+02
0.01	0.00	8.35	520.7	0.576E-01	1.10	31.58	0.079	.76428E+02
0.01	0.00	8.49	529.7	0.566E-01	1.12	31.60	0.079	.78154E+02
0.01	0.00	8.62	538.8	0.557E-01	1.14	31.62	0.080	.79890E+02
0.01	0.00	8.76	547.9	0.548E-01	1.16	31.64	0.080	.81626E+02
0.01	0.00	8.90	556.9	0.539E-01	1.17	31.65	0.080	.83347E+02
0.01	0.00	9.04	566.0	0.530E-01	1.19	31.67	0.080	.85080E+02
0.01	0.00	9.17	575.1	0.522E-01	1.21	31.69	0.080	.86799E+02
0.01	0.00	9.31	584.2	0.513E-01	1.23	31.71	0.080	.88530E+02
0.02	0.00	9.45	593.3	0.506E-01	1.25	31.73	0.080	.90247E+02
0.02	0.00	9.59	602.5	0.498E-01	1.27	31.75	0.080	.91976E+02
0.02	0.00	9.72	611.6	0.491E-01	1.29	31.77	0.080	.93692E+02
0.02	0.00	9.86	620.8	0.483E-01	1.30	31.78	0.080	.95419E+02
0.02	0.00	10.00	629.9	0.476E-01	1.32	31.80	0.080	.97134E+02
0.02	0.00	10.14	639.1	0.469E-01	1.34	31.82	0.080	.98860E+02
0.02	0.00	10.27	648.3	0.463E-01	1.36	31.84	0.080	.10059E+03
0.02	0.00	10.41	657.5	0.456E-01	1.38	31.86	0.080	.10230E+03
0.02	0.00	10.55	666.7	0.450E-01	1.40	31.88	0.080	.10402E+03
0.02	0.00	10.69	675.8	0.444E-01	1.42	31.90	0.080	.10574E+03
0.02	0.00	10.82	685.1	0.438E-01	1.44	31.92	0.080	.10746E+03
0.02	0.00	10.96	694.2	0.432E-01	1.46	31.94	0.080	.10917E+03
0.02	0.00	11.10	703.5	0.426E-01	1.48	31.96	0.080	.11089E+03
0.02	0.00	11.24	712.7	0.421E-01	1.49	31.97	0.080	.11261E+03
0.02	0.00	11.37	721.9	0.416E-01	1.51	31.99	0.080	.11433E+03
0.02	0.00	11.51	731.1	0.410E-01	1.53	32.01	0.080	.11604E+03
0.02	0.00	11.65	740.3	0.405E-01	1.55	32.03	0.080	.11776E+03
0.02	0.00	11.79	749.6	0.400E-01	1.57	32.05	0.080	.11948E+03
0.02	0.00	11.92	758.8	0.395E-01	1.59	32.07	0.080	.12119E+03
0.02	0.00	12.06	768.1	0.391E-01	1.61	32.09	0.080	.12291E+03
0.02	0.00	12.20	777.3	0.386E-01	1.63	32.11	0.080	.12462E+03
0.02	0.00	12.34	786.5	0.381E-01	1.65	32.13	0.080	.12634E+03
0.02	0.00	12.47	795.7	0.377E-01	1.67	32.15	0.080	.12805E+03
0.02	0.00	12.61	805.0	0.373E-01	1.69	32.17	0.080	.12977E+03
0.02	0.00	12.75	814.2	0.368E-01	1.71	32.19	0.080	.13148E+03
0.02	0.00	12.89	823.5	0.364E-01	1.72	32.20	0.080	.13320E+03
0.02	0.00	13.03	832.8	0.360E-01	1.74	32.22	0.080	.13492E+03
0.02	0.00	13.16	842.0	0.356E-01	1.76	32.24	0.080	.13663E+03
0.02	0.00	13.30	851.3	0.352E-01	1.78	32.26	0.080	.13835E+03
0.02	0.00	13.44	860.5	0.349E-01	1.80	32.28	0.080	.14006E+03
0.02	0.00	13.58	869.8	0.345E-01	1.82	32.30	0.080	.14178E+03
0.02	0.00	13.71	879.0	0.341E-01	1.84	32.32	0.080	.14349E+03
0.02	0.00	13.85	888.3	0.338E-01	1.86	32.34	0.080	.14521E+03
0.02	0.00	13.99	897.5	0.334E-01	1.88	32.36	0.080	.14691E+03
0.02	0.00	14.13	906.8	0.331E-01	1.90	32.38	0.080	.14863E+03

Cumulative travel time = 148.6272 sec (0.04 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.89 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.8: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.335mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX2 PREDICTION FILE:
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.335MGD_Diffuser_45BOD_13July2018_v-4.prd
 Time stamp:        07/17/2018--13:11:36

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      1.488 Q0    =      0.015 Q0A   =0.1468E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.4500E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.2408E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.3511E-03   j0 =U0*GP0*B0 =0.5589E-04   (based on slot width B0)
 m0 =U0*q0   =0.3582E-03   j0 =q0*GP0    =0.5703E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.24  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1468E-01  M0    =0.2140E-01  J0    =0.3407E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.96  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    242.75  FRD0  =     24.28  R     =  99999.00  PL    =  221.83
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.1300E-04  M0    =0.7924E-03
```

```
 lQ=B  =      0.004 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.019 LM    =      0.08  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.055 D0    =      0.082 A0    =      0.005 THETA =     90.00
 FR0   =      1.73  FRD0  =      0.39  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.4500E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.450E+02   0.04     0.04     1.488   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.22  XE    =      0.00  YE    =      0.00  ZE    =      0.37

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.37     1.0 0.450E+02   0.04     0.04     1.488   .00000E+00
      0.00     0.00    0.37     1.0 0.450E+02   0.04     0.04     0.088   .11424E-01
      0.00     0.00    0.50     2.1 0.216E+02   0.04     0.04     0.243   .64358E+00
```

```
      0.00      0.00     0.64     4.1 0.110E+02   0.05      0.05      0.223   .12366E+01
      0.00      0.00     0.78     6.5 0.693E+01   0.07      0.07      0.207   .18744E+01
      0.00      0.00     0.92     9.3 0.482E+01   0.09      0.09      0.194   .25627E+01
      0.00      0.00     1.06    12.6 0.358E+01   0.10      0.10      0.184   .32925E+01
      0.00      0.00     1.19    16.1 0.279E+01   0.12      0.12      0.176   .40543E+01
      0.00      0.00     1.33    20.0 0.225E+01   0.14      0.14      0.169   .48561E+01
      0.00      0.00     1.47    24.3 0.186E+01   0.15      0.15      0.163   .56837E+01
      0.00      0.00     1.61    28.8 0.156E+01   0.17      0.17      0.157   .65470E+01
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00      0.00     1.74    33.7 0.134E+01   0.19      0.19      0.153   .74383E+01
      0.00      0.00     1.88    38.8 0.116E+01   0.20      0.20      0.148   .83491E+01
      0.00      0.00     2.02    44.3 0.102E+01   0.22      0.22      0.145   .92914E+01
      0.00      0.00     2.16    50.0 0.900E+00   0.24      0.24      0.141   .10250E+02
      0.00      0.00     2.29    56.0 0.804E+00   0.25      0.25      0.138   .11239E+02
      0.00      0.00     2.43    62.3 0.722E+00   0.27      0.27      0.135   .12249E+02
      0.00      0.00     2.57    68.8 0.654E+00   0.29      0.29      0.133   .13272E+02
      0.00      0.00     2.71    75.6 0.595E+00   0.30      0.30      0.130   .14323E+02
      0.00      0.00     2.84    82.6 0.545E+00   0.32      0.32      0.128   .15385E+02
      0.00      0.00     2.98    89.9 0.501E+00   0.34      0.34      0.126   .16473E+02
      0.00      0.00     3.12    97.4 0.462E+00   0.35      0.35      0.124   .17580E+02
      0.00      0.00     3.26   105.2 0.428E+00   0.37      0.37      0.122   .18695E+02
      0.00      0.00     3.39   113.2 0.398E+00   0.39      0.39      0.120   .19836E+02
      0.00      0.00     3.53   121.4 0.371E+00   0.40      0.40      0.118   .20984E+02
      0.00      0.00     3.67   129.9 0.346E+00   0.42      0.42      0.117   .22157E+02
      0.00      0.00     3.81   138.6 0.325E+00   0.44      0.44      0.115   .23345E+02
      0.00      0.00     3.94   147.5 0.305E+00   0.45      0.45      0.114   .24540E+02
      0.00      0.00     4.08   156.6 0.287E+00   0.47      0.47      0.113   .25758E+02
      0.01      0.00     4.22   166.0 0.271E+00   0.49      0.49      0.111   .26991E+02
      0.01      0.00     4.36   175.5 0.256E+00   0.50      0.50      0.110   .28228E+02
      0.01      0.00     4.50   185.3 0.243E+00   0.52      0.52      0.109   .29489E+02
      0.01      0.00     4.63   195.3 0.230E+00   0.54      0.54      0.108   .30753E+02
      0.01      0.00     4.77   205.5 0.219E+00   0.55      0.55      0.107   .32040E+02
      0.01      0.00     4.91   215.9 0.208E+00   0.57      0.57      0.106   .33340E+02
      0.01      0.00     5.05   226.5 0.199E+00   0.59      0.59      0.105   .34644E+02
      0.01      0.00     5.18   237.3 0.190E+00   0.60      0.60      0.104   .35969E+02
      0.01      0.00     5.32   248.3 0.181E+00   0.62      0.62      0.103   .37296E+02
  Merging of individual jet/plumes to form plane jet/plume:
      0.01      0.00     5.35   336.7 0.134E+00   0.78     31.26      0.073   .37593E+02
      0.01      0.00     5.60   350.0 0.129E+00   0.80     31.28      0.074   .40951E+02
      0.01      0.00     5.73   357.6 0.126E+00   0.81     31.29      0.075   .42795E+02
      0.01      0.00     5.87   365.5 0.123E+00   0.82     31.30      0.075   .44638E+02
      0.01      0.00     6.01   373.5 0.120E+00   0.83     31.31      0.076   .46466E+02
      0.01      0.00     6.15   381.6 0.118E+00   0.84     31.32      0.076   .48270E+02
      0.01      0.00     6.28   389.8 0.115E+00   0.85     31.33      0.077   .50077E+02
      0.01      0.00     6.42   398.1 0.113E+00   0.87     31.35      0.077   .51862E+02
      0.01      0.00     6.56   406.5 0.111E+00   0.88     31.36      0.077   .53651E+02
      0.01      0.00     6.70   415.0 0.108E+00   0.90     31.38      0.078   .55434E+02
      0.01      0.00     6.83   423.5 0.106E+00   0.91     31.39      0.078   .57198E+02
      0.01      0.00     6.97   432.2 0.104E+00   0.93     31.41      0.078   .58969E+02
      0.01      0.00     7.11   440.8 0.102E+00   0.95     31.43      0.078   .60722E+02
      0.01      0.00     7.25   449.5 0.100E+00   0.96     31.44      0.078   .62484E+02
      0.01      0.00     7.39   458.3 0.982E-01   0.98     31.46      0.079   .64241E+02
      0.01      0.00     7.52   467.1 0.963E-01   1.00     31.48      0.079   .65983E+02
      0.01      0.00     7.66   476.0 0.945E-01   1.01     31.49      0.079   .67734E+02
      0.01      0.00     7.80   484.9 0.928E-01   1.03     31.51      0.079   .69483E+02
```

0.01	0.00	7.94	493.8	0.911E-01	1.05	31.53	0.079	.71216E+02
0.01	0.00	8.07	502.8	0.895E-01	1.07	31.55	0.079	.72960E+02
0.01	0.00	8.21	511.7	0.879E-01	1.08	31.56	0.079	.74689E+02
0.01	0.00	8.35	520.7	0.864E-01	1.10	31.58	0.079	.76428E+02
0.01	0.00	8.49	529.7	0.850E-01	1.12	31.60	0.079	.78154E+02
0.01	0.00	8.62	538.8	0.835E-01	1.14	31.62	0.080	.79890E+02
0.01	0.00	8.76	547.9	0.821E-01	1.16	31.64	0.080	.81626E+02
0.01	0.00	8.90	556.9	0.808E-01	1.17	31.65	0.080	.83347E+02
0.01	0.00	9.04	566.0	0.795E-01	1.19	31.67	0.080	.85080E+02
0.01	0.00	9.17	575.1	0.782E-01	1.21	31.69	0.080	.86799E+02
0.01	0.00	9.31	584.2	0.770E-01	1.23	31.71	0.080	.88530E+02
0.02	0.00	9.45	593.3	0.758E-01	1.25	31.73	0.080	.90247E+02
0.02	0.00	9.59	602.5	0.747E-01	1.27	31.75	0.080	.91976E+02
0.02	0.00	9.72	611.6	0.736E-01	1.29	31.77	0.080	.93692E+02
0.02	0.00	9.86	620.8	0.725E-01	1.30	31.78	0.080	.95419E+02
0.02	0.00	10.00	629.9	0.714E-01	1.32	31.80	0.080	.97134E+02
0.02	0.00	10.14	639.1	0.704E-01	1.34	31.82	0.080	.98860E+02
0.02	0.00	10.27	648.3	0.694E-01	1.36	31.84	0.080	.10059E+03
0.02	0.00	10.41	657.5	0.684E-01	1.38	31.86	0.080	.10230E+03
0.02	0.00	10.55	666.7	0.675E-01	1.40	31.88	0.080	.10402E+03
0.02	0.00	10.69	675.8	0.666E-01	1.42	31.90	0.080	.10574E+03
0.02	0.00	10.82	685.1	0.657E-01	1.44	31.92	0.080	.10746E+03
0.02	0.00	10.96	694.2	0.648E-01	1.46	31.94	0.080	.10917E+03
0.02	0.00	11.10	703.5	0.640E-01	1.48	31.96	0.080	.11089E+03
0.02	0.00	11.24	712.7	0.631E-01	1.49	31.97	0.080	.11261E+03
0.02	0.00	11.37	721.9	0.623E-01	1.51	31.99	0.080	.11433E+03
0.02	0.00	11.51	731.1	0.616E-01	1.53	32.01	0.080	.11604E+03
0.02	0.00	11.65	740.3	0.608E-01	1.55	32.03	0.080	.11776E+03
0.02	0.00	11.79	749.6	0.600E-01	1.57	32.05	0.080	.11948E+03
0.02	0.00	11.92	758.8	0.593E-01	1.59	32.07	0.080	.12119E+03
0.02	0.00	12.06	768.1	0.586E-01	1.61	32.09	0.080	.12291E+03
0.02	0.00	12.20	777.3	0.579E-01	1.63	32.11	0.080	.12462E+03
0.02	0.00	12.34	786.5	0.572E-01	1.65	32.13	0.080	.12634E+03
0.02	0.00	12.47	795.7	0.566E-01	1.67	32.15	0.080	.12805E+03
0.02	0.00	12.61	805.0	0.559E-01	1.69	32.17	0.080	.12977E+03
0.02	0.00	12.75	814.2	0.553E-01	1.71	32.19	0.080	.13148E+03
0.02	0.00	12.89	823.5	0.546E-01	1.72	32.20	0.080	.13320E+03
0.02	0.00	13.03	832.8	0.540E-01	1.74	32.22	0.080	.13492E+03
0.02	0.00	13.16	842.0	0.534E-01	1.76	32.24	0.080	.13663E+03
0.02	0.00	13.30	851.3	0.529E-01	1.78	32.26	0.080	.13835E+03
0.02	0.00	13.44	860.5	0.523E-01	1.80	32.28	0.080	.14006E+03
0.02	0.00	13.58	869.8	0.517E-01	1.82	32.30	0.080	.14178E+03
0.02	0.00	13.71	879.0	0.512E-01	1.84	32.32	0.080	.14349E+03
0.02	0.00	13.85	888.3	0.507E-01	1.86	32.34	0.080	.14521E+03
0.02	0.00	13.99	897.5	0.501E-01	1.88	32.36	0.080	.14691E+03
0.02	0.00	14.13	906.8	0.496E-01	1.90	32.38	0.080	.14863E+03

Cumulative travel time = 148.6272 sec (0.04 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.89 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.9: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.335mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...IX\CSD_0.335MGD_Diffuser_90BOD_13July2018_v-2.prd
 Time stamp:        07/13/2018--11:01:15

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      1.488 Q0    =      0.015 Q0A   =0.1468E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.9000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.2408E-03        SIGNJ0=      1.0
 m0 =U0^2*B0 =0.3511E-03   j0 =U0*GP0*B0 =0.5589E-04   (based on slot width B0)
 m0 =U0*q0   =0.3582E-03   j0 =q0*GP0    =0.5703E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.24  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.1468E-01  M0    =0.2140E-01  J0    =0.3407E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      0.96  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    242.75  FRD0  =     24.28  R     =  99999.00  PL    =  221.83
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.1300E-04  M0    =0.7924E-03
```

```
 lQ=B  =      0.004 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.019 LM    =      0.08  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.055 D0    =      0.082 A0    =      0.005 THETA =     90.00
 FR0   =      1.73  FRD0  =      0.39  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.9000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.900E+02   0.04     0.04     1.488   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.22  XE    =      0.00  YE    =      0.00  ZE    =      0.37

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.37     1.0 0.900E+02   0.04     0.04     1.488   .00000E+00
      0.00     0.00    0.37     1.0 0.900E+02   0.04     0.04     0.088   .11424E-01
      0.00     0.00    0.50     2.1 0.431E+02   0.04     0.04     0.243   .64358E+00
```

```
      0.00      0.00    0.64     4.1 0.221E+02   0.05      0.05      0.223   .12366E+01
      0.00      0.00    0.78     6.5 0.139E+02   0.07      0.07      0.207   .18744E+01
      0.00      0.00    0.92     9.3 0.964E+01   0.09      0.09      0.194   .25627E+01
      0.00      0.00    1.06    12.6 0.717E+01   0.10      0.10      0.184   .32925E+01
      0.00      0.00    1.19    16.1 0.559E+01   0.12      0.12      0.176   .40543E+01
      0.00      0.00    1.33    20.0 0.449E+01   0.14      0.14      0.169   .48561E+01
      0.00      0.00    1.47    24.3 0.371E+01   0.15      0.15      0.163   .56837E+01
      0.00      0.00    1.61    28.8 0.312E+01   0.17      0.17      0.157   .65470E+01
      0.00      0.00    1.74    33.7 0.267E+01   0.19      0.19      0.153   .74383E+01
      0.00      0.00    1.88    38.8 0.232E+01   0.20      0.20      0.148   .83491E+01
      0.00      0.00    2.02    44.3 0.203E+01   0.22      0.22      0.145   .92914E+01
      0.00      0.00    2.16    50.0 0.180E+01   0.24      0.24      0.141   .10250E+02
      0.00      0.00    2.29    56.0 0.161E+01   0.25      0.25      0.138   .11239E+02
      0.00      0.00    2.43    62.3 0.144E+01   0.27      0.27      0.135   .12249E+02
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.00      0.00    2.57    68.8 0.131E+01   0.29      0.29      0.133   .13272E+02
      0.00      0.00    2.71    75.6 0.119E+01   0.30      0.30      0.130   .14323E+02
      0.00      0.00    2.84    82.6 0.109E+01   0.32      0.32      0.128   .15385E+02
      0.00      0.00    2.98    89.9 0.100E+01   0.34      0.34      0.126   .16473E+02
      0.00      0.00    3.12    97.4 0.924E+00   0.35      0.35      0.124   .17580E+02
      0.00      0.00    3.26   105.2 0.856E+00   0.37      0.37      0.122   .18695E+02
      0.00      0.00    3.39   113.2 0.795E+00   0.39      0.39      0.120   .19836E+02
      0.00      0.00    3.53   121.4 0.741E+00   0.40      0.40      0.118   .20984E+02
      0.00      0.00    3.67   129.9 0.693E+00   0.42      0.42      0.117   .22157E+02
      0.00      0.00    3.81   138.6 0.649E+00   0.44      0.44      0.115   .23345E+02
      0.00      0.00    3.94   147.5 0.610E+00   0.45      0.45      0.114   .24540E+02
      0.00      0.00    4.08   156.6 0.575E+00   0.47      0.47      0.113   .25758E+02
      0.01      0.00    4.22   166.0 0.542E+00   0.49      0.49      0.111   .26991E+02
      0.01      0.00    4.36   175.5 0.513E+00   0.50      0.50      0.110   .28228E+02
      0.01      0.00    4.50   185.3 0.486E+00   0.52      0.52      0.109   .29489E+02
      0.01      0.00    4.63   195.3 0.461E+00   0.54      0.54      0.108   .30753E+02
      0.01      0.00    4.77   205.5 0.438E+00   0.55      0.55      0.107   .32040E+02
      0.01      0.00    4.91   215.9 0.417E+00   0.57      0.57      0.106   .33340E+02
      0.01      0.00    5.05   226.5 0.397E+00   0.59      0.59      0.105   .34644E+02
      0.01      0.00    5.18   237.3 0.379E+00   0.60      0.60      0.104   .35969E+02
      0.01      0.00    5.32   248.3 0.362E+00   0.62      0.62      0.103   .37296E+02
  Merging of individual jet/plumes to form plane jet/plume:
      0.01      0.00    5.35   336.7 0.267E+00   0.78     31.26      0.073   .37593E+02
      0.01      0.00    5.60   350.0 0.257E+00   0.80     31.28      0.074   .40951E+02
      0.01      0.00    5.73   357.6 0.252E+00   0.81     31.29      0.075   .42795E+02
      0.01      0.00    5.87   365.5 0.246E+00   0.82     31.30      0.075   .44638E+02
      0.01      0.00    6.01   373.5 0.241E+00   0.83     31.31      0.076   .46466E+02
      0.01      0.00    6.15   381.6 0.236E+00   0.84     31.32      0.076   .48270E+02
      0.01      0.00    6.28   389.8 0.231E+00   0.85     31.33      0.077   .50077E+02
      0.01      0.00    6.42   398.1 0.226E+00   0.87     31.35      0.077   .51862E+02
      0.01      0.00    6.56   406.5 0.221E+00   0.88     31.36      0.077   .53651E+02
      0.01      0.00    6.70   415.0 0.217E+00   0.90     31.38      0.078   .55434E+02
      0.01      0.00    6.83   423.5 0.213E+00   0.91     31.39      0.078   .57198E+02
      0.01      0.00    6.97   432.2 0.208E+00   0.93     31.41      0.078   .58969E+02
      0.01      0.00    7.11   440.8 0.204E+00   0.95     31.43      0.078   .60722E+02
      0.01      0.00    7.25   449.5 0.200E+00   0.96     31.44      0.078   .62484E+02
      0.01      0.00    7.39   458.3 0.196E+00   0.98     31.46      0.079   .64241E+02
      0.01      0.00    7.52   467.1 0.193E+00   1.00     31.48      0.079   .65983E+02
      0.01      0.00    7.66   476.0 0.189E+00   1.01     31.49      0.079   .67734E+02
      0.01      0.00    7.80   484.9 0.186E+00   1.03     31.51      0.079   .69483E+02
```

0.01	0.00	7.94	493.8	0.182E+00	1.05	31.53	0.079	.71216E+02
0.01	0.00	8.07	502.8	0.179E+00	1.07	31.55	0.079	.72960E+02
0.01	0.00	8.21	511.7	0.176E+00	1.08	31.56	0.079	.74689E+02
0.01	0.00	8.35	520.7	0.173E+00	1.10	31.58	0.079	.76428E+02
0.01	0.00	8.49	529.7	0.170E+00	1.12	31.60	0.079	.78154E+02
0.01	0.00	8.62	538.8	0.167E+00	1.14	31.62	0.080	.79890E+02
0.01	0.00	8.76	547.9	0.164E+00	1.16	31.64	0.080	.81626E+02
0.01	0.00	8.90	556.9	0.162E+00	1.17	31.65	0.080	.83347E+02
0.01	0.00	9.04	566.0	0.159E+00	1.19	31.67	0.080	.85080E+02
0.01	0.00	9.17	575.1	0.156E+00	1.21	31.69	0.080	.86799E+02
0.01	0.00	9.31	584.2	0.154E+00	1.23	31.71	0.080	.88530E+02
0.02	0.00	9.45	593.3	0.152E+00	1.25	31.73	0.080	.90247E+02
0.02	0.00	9.59	602.5	0.149E+00	1.27	31.75	0.080	.91976E+02
0.02	0.00	9.72	611.6	0.147E+00	1.29	31.77	0.080	.93692E+02
0.02	0.00	9.86	620.8	0.145E+00	1.30	31.78	0.080	.95419E+02
0.02	0.00	10.00	629.9	0.143E+00	1.32	31.80	0.080	.97134E+02
0.02	0.00	10.14	639.1	0.141E+00	1.34	31.82	0.080	.98860E+02
0.02	0.00	10.27	648.3	0.139E+00	1.36	31.84	0.080	.10059E+03
0.02	0.00	10.41	657.5	0.137E+00	1.38	31.86	0.080	.10230E+03
0.02	0.00	10.55	666.7	0.135E+00	1.40	31.88	0.080	.10402E+03
0.02	0.00	10.69	675.8	0.133E+00	1.42	31.90	0.080	.10574E+03
0.02	0.00	10.82	685.1	0.131E+00	1.44	31.92	0.080	.10746E+03
0.02	0.00	10.96	694.2	0.130E+00	1.46	31.94	0.080	.10917E+03
0.02	0.00	11.10	703.5	0.128E+00	1.48	31.96	0.080	.11089E+03
0.02	0.00	11.24	712.7	0.126E+00	1.49	31.97	0.080	.11261E+03
0.02	0.00	11.37	721.9	0.125E+00	1.51	31.99	0.080	.11433E+03
0.02	0.00	11.51	731.1	0.123E+00	1.53	32.01	0.080	.11604E+03
0.02	0.00	11.65	740.3	0.122E+00	1.55	32.03	0.080	.11776E+03
0.02	0.00	11.79	749.6	0.120E+00	1.57	32.05	0.080	.11948E+03
0.02	0.00	11.92	758.8	0.119E+00	1.59	32.07	0.080	.12119E+03
0.02	0.00	12.06	768.1	0.117E+00	1.61	32.09	0.080	.12291E+03
0.02	0.00	12.20	777.3	0.116E+00	1.63	32.11	0.080	.12462E+03
0.02	0.00	12.34	786.5	0.114E+00	1.65	32.13	0.080	.12634E+03
0.02	0.00	12.47	795.7	0.113E+00	1.67	32.15	0.080	.12805E+03
0.02	0.00	12.61	805.0	0.112E+00	1.69	32.17	0.080	.12977E+03
0.02	0.00	12.75	814.2	0.111E+00	1.71	32.19	0.080	.13148E+03
0.02	0.00	12.89	823.5	0.109E+00	1.72	32.20	0.080	.13320E+03
0.02	0.00	13.03	832.8	0.108E+00	1.74	32.22	0.080	.13492E+03
0.02	0.00	13.16	842.0	0.107E+00	1.76	32.24	0.080	.13663E+03
0.02	0.00	13.30	851.3	0.106E+00	1.78	32.26	0.080	.13835E+03
0.02	0.00	13.44	860.5	0.105E+00	1.80	32.28	0.080	.14006E+03
0.02	0.00	13.58	869.8	0.103E+00	1.82	32.30	0.080	.14178E+03
0.02	0.00	13.71	879.0	0.102E+00	1.84	32.32	0.080	.14349E+03
0.02	0.00	13.85	888.3	0.101E+00	1.86	32.34	0.080	.14521E+03
0.02	0.00	13.99	897.5	0.100E+00	1.88	32.36	0.080	.14691E+03
0.02	0.00	14.13	906.8	0.993E-01	1.90	32.38	0.080	.14863E+03

Cumulative travel time = 148.6272 sec (0.04 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.89 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.10: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.5 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_0.5MGD_Diffuser_30BOD_13July2018_v-3.prd
 Time stamp:        07/13/2018--12:19:38

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      2.221 Q0    =      0.022 Q0A   =0.2191E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.3000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.3594E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.7820E-03   j0 =U0*GP0*B0 =0.8342E-04   (based on slot width B0)
 m0 =U0*q0   =0.7980E-03   j0 =q0*GP0    =0.8512E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.41  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.2191E-01  M0    =0.4767E-01  J0    =0.5085E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      1.43  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    362.31  FRD0  =     36.24  R     =  99999.00  PL    =  169.85
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.2467E-04  M0    =0.1504E-02
```

```
 lQ=B  =      0.005 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.018 LM    =      0.11  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.070 D0    =      0.089 A0    =      0.006 THETA =     90.00
 FR0   =      2.03  FRD0  =      0.48  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.300E+02   0.04     0.04     2.221   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.26  XE    =      0.00  YE    =      0.00  ZE    =      0.41

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.41     1.0 0.300E+02   0.04     0.04     2.221   .00000E+00
      0.00     0.00    0.41     1.0 0.300E+02   0.04     0.04     0.107   .93702E-02
      0.00     0.00    0.55     1.8 0.163E+02   0.04     0.04     0.266   .59539E+00
```

0.00	0.00	0.69	3.4	0.870E+01	0.06	0.06	0.248	.11287E+01
0.00	0.00	0.82	5.4	0.559E+01	0.07	0.07	0.232	.17008E+01
0.00	0.00	0.96	7.6	0.395E+01	0.09	0.09	0.219	.23102E+01
0.00	0.00	1.10	10.1	0.297E+01	0.11	0.11	0.208	.29537E+01
0.00	0.00	1.23	12.9	0.232E+01	0.12	0.12	0.199	.36337E+01
0.00	0.00	1.37	15.9	0.188E+01	0.14	0.14	0.191	.43378E+01
0.00	0.00	1.51	19.2	0.156E+01	0.16	0.16	0.184	.50687E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **

The pollutant concentration in the plume falls below water quality standard or CCC value of 0.134E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

0.00	0.00	1.65	22.7	0.132E+01	0.17	0.17	0.178	.58248E+01
0.00	0.00	1.78	26.5	0.113E+01	0.19	0.19	0.173	.66046E+01
0.00	0.00	1.92	30.5	0.983E+00	0.21	0.21	0.169	.74126E+01
0.00	0.00	2.06	34.7	0.865E+00	0.22	0.22	0.164	.82360E+01
0.00	0.00	2.19	39.1	0.767E+00	0.24	0.24	0.161	.90796E+01
0.00	0.00	2.33	43.7	0.686E+00	0.26	0.26	0.157	.99424E+01
0.00	0.00	2.47	48.5	0.618E+00	0.27	0.27	0.154	.10824E+02
0.00	0.00	2.61	53.5	0.560E+00	0.29	0.29	0.151	.11723E+02
0.00	0.00	2.74	58.8	0.510E+00	0.31	0.31	0.148	.12646E+02
0.00	0.00	2.88	64.2	0.467E+00	0.32	0.32	0.146	.13578E+02
0.00	0.00	3.02	69.8	0.430E+00	0.34	0.34	0.143	.14527E+02
0.00	0.00	3.15	75.5	0.397E+00	0.36	0.36	0.141	.15491E+02
0.00	0.00	3.29	81.5	0.368E+00	0.37	0.37	0.139	.16470E+02
0.00	0.00	3.43	87.6	0.342E+00	0.39	0.39	0.137	.17470E+02
0.00	0.00	3.57	94.0	0.319E+00	0.41	0.41	0.135	.18478E+02
0.00	0.00	3.70	100.4	0.299E+00	0.42	0.42	0.133	.19499E+02
0.00	0.00	3.84	107.1	0.280E+00	0.44	0.44	0.132	.20534E+02
0.00	0.00	3.98	113.9	0.263E+00	0.46	0.46	0.130	.21581E+02
0.00	0.00	4.12	120.9	0.248E+00	0.47	0.47	0.128	.22650E+02
0.00	0.00	4.25	128.1	0.234E+00	0.49	0.49	0.127	.23722E+02
0.00	0.00	4.39	135.4	0.222E+00	0.50	0.50	0.126	.24807E+02
0.00	0.00	4.53	142.9	0.210E+00	0.52	0.52	0.124	.25904E+02
0.01	0.00	4.66	150.5	0.199E+00	0.54	0.54	0.123	.27012E+02
0.01	0.00	4.80	158.4	0.189E+00	0.55	0.55	0.122	.28140E+02
0.01	0.00	4.94	166.3	0.180E+00	0.57	0.57	0.121	.29271E+02
0.01	0.00	5.08	174.4	0.172E+00	0.59	0.59	0.119	.30413E+02
0.01	0.00	5.21	182.7	0.164E+00	0.60	0.60	0.118	.31566E+02
0.01	0.00	5.35	191.1	0.157E+00	0.62	0.62	0.117	.32729E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.36	257.8	0.116E+00	0.78	31.26	0.083	.32852E+02
0.01	0.00	5.62	268.6	0.112E+00	0.80	31.28	0.085	.35968E+02
0.01	0.00	5.76	274.5	0.109E+00	0.81	31.29	0.085	.37581E+02
0.01	0.00	5.90	280.5	0.107E+00	0.82	31.30	0.086	.39180E+02
0.01	0.00	6.04	286.6	0.105E+00	0.83	31.31	0.087	.40768E+02
0.01	0.00	6.17	292.8	0.102E+00	0.84	31.32	0.087	.42357E+02
0.01	0.00	6.31	299.0	0.100E+00	0.86	31.34	0.088	.43926E+02
0.01	0.00	6.45	305.4	0.982E-01	0.87	31.35	0.088	.45487E+02
0.01	0.00	6.58	311.8	0.962E-01	0.88	31.36	0.088	.47041E+02
0.01	0.00	6.72	318.3	0.943E-01	0.90	31.38	0.089	.48589E+02
0.01	0.00	6.86	324.8	0.924E-01	0.92	31.40	0.089	.50143E+02
0.01	0.00	7.00	331.4	0.905E-01	0.93	31.41	0.089	.51681E+02
0.01	0.00	7.13	338.0	0.888E-01	0.95	31.43	0.089	.53215E+02
0.01	0.00	7.27	344.7	0.870E-01	0.96	31.44	0.090	.54746E+02
0.01	0.00	7.41	351.4	0.854E-01	0.98	31.46	0.090	.56272E+02
0.01	0.00	7.55	358.1	0.838E-01	1.00	31.48	0.090	.57807E+02
0.01	0.00	7.68	364.9	0.822E-01	1.01	31.49	0.090	.59329E+02
0.01	0.00	7.82	371.7	0.807E-01	1.03	31.51	0.090	.60847E+02

0.01	0.00	7.96	378.5	0.793E-01	1.05	31.53	0.090	.62364E+02
0.01	0.00	8.09	385.3	0.779E-01	1.07	31.55	0.091	.63879E+02
0.01	0.00	8.23	392.2	0.765E-01	1.09	31.57	0.091	.65402E+02
0.01	0.00	8.37	399.0	0.752E-01	1.10	31.58	0.091	.66914E+02
0.01	0.00	8.51	405.9	0.739E-01	1.12	31.60	0.091	.68423E+02
0.01	0.00	8.64	412.8	0.727E-01	1.14	31.62	0.091	.69932E+02
0.01	0.00	8.78	419.7	0.715E-01	1.16	31.64	0.091	.71439E+02
0.01	0.00	8.92	426.6	0.703E-01	1.18	31.66	0.091	.72946E+02
0.01	0.00	9.05	433.6	0.692E-01	1.19	31.67	0.091	.74451E+02
0.01	0.00	9.19	440.5	0.681E-01	1.21	31.69	0.091	.75955E+02
0.01	0.00	9.33	447.5	0.670E-01	1.23	31.71	0.091	.77469E+02
0.01	0.00	9.47	454.5	0.660E-01	1.25	31.73	0.091	.78972E+02
0.01	0.00	9.60	461.4	0.650E-01	1.27	31.75	0.091	.80474E+02
0.01	0.00	9.74	468.4	0.640E-01	1.29	31.77	0.091	.81975E+02
0.01	0.00	9.88	475.4	0.631E-01	1.31	31.79	0.091	.83476E+02
0.01	0.00	10.01	482.4	0.622E-01	1.32	31.80	0.091	.84976E+02
0.01	0.00	10.15	489.4	0.613E-01	1.34	31.82	0.091	.86476E+02
0.01	0.00	10.29	496.4	0.604E-01	1.36	31.84	0.091	.87975E+02
0.01	0.00	10.43	503.4	0.596E-01	1.38	31.86	0.091	.89485E+02
0.01	0.00	10.56	510.4	0.588E-01	1.40	31.88	0.091	.90984E+02
0.02	0.00	10.70	517.5	0.580E-01	1.42	31.90	0.091	.92482E+02
0.02	0.00	10.84	524.5	0.572E-01	1.44	31.92	0.091	.93979E+02
0.02	0.00	10.97	531.5	0.564E-01	1.46	31.94	0.091	.95477E+02
0.02	0.00	11.11	538.5	0.557E-01	1.48	31.96	0.092	.96974E+02
0.02	0.00	11.25	545.5	0.550E-01	1.49	31.97	0.092	.98471E+02
0.02	0.00	11.39	552.6	0.543E-01	1.51	31.99	0.092	.99978E+02
0.02	0.00	11.52	559.7	0.536E-01	1.53	32.01	0.092	.10148E+03
0.02	0.00	11.66	566.7	0.529E-01	1.55	32.03	0.092	.10297E+03
0.02	0.00	11.80	573.7	0.523E-01	1.57	32.05	0.092	.10447E+03
0.02	0.00	11.93	580.8	0.517E-01	1.59	32.07	0.092	.10596E+03
0.02	0.00	12.07	587.8	0.510E-01	1.61	32.09	0.092	.10746E+03
0.02	0.00	12.21	594.9	0.504E-01	1.63	32.11	0.092	.10895E+03
0.02	0.00	12.34	601.9	0.498E-01	1.65	32.13	0.092	.11045E+03
0.02	0.00	12.48	609.0	0.493E-01	1.67	32.15	0.092	.11195E+03
0.02	0.00	12.62	616.0	0.487E-01	1.69	32.17	0.092	.11345E+03
0.02	0.00	12.76	623.1	0.481E-01	1.70	32.18	0.092	.11494E+03
0.02	0.00	12.89	630.1	0.476E-01	1.72	32.20	0.092	.11644E+03
0.02	0.00	13.03	637.2	0.471E-01	1.74	32.22	0.092	.11793E+03
0.02	0.00	13.17	644.3	0.466E-01	1.76	32.24	0.092	.11943E+03
0.02	0.00	13.30	651.3	0.461E-01	1.78	32.26	0.092	.12092E+03
0.02	0.00	13.44	658.4	0.456E-01	1.80	32.28	0.092	.12243E+03
0.02	0.00	13.58	665.5	0.451E-01	1.82	32.30	0.092	.12392E+03
0.02	0.00	13.72	672.5	0.446E-01	1.84	32.32	0.092	.12542E+03
0.02	0.00	13.85	679.6	0.441E-01	1.86	32.34	0.092	.12691E+03
0.02	0.00	13.99	686.7	0.437E-01	1.88	32.36	0.092	.12840E+03
0.02	0.00	14.13	693.7	0.432E-01	1.90	32.38	0.092	.12990E+03

Cumulative travel time = 129.8953 sec (0.04 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.91 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.11: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.5 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORMIX MIXING ZONE EXPERT SYSTEM
                Subsystem CORMIX2: Multiport Diffuser Discharges
                              CORMIX Version 11.0GTH
                      HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_0.5MGD_Diffuser_45BOD_13July2018_v-3.prd
 Time stamp:        07/17/2018--13:00:51

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =     0.000  F     =     0.100  USTAR =0.1118E-04
 UW    =     0.000  UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =     0.016  A0    =     0.000  H0    =      0.15  SUB0  =     15.79
 D0INP =     0.016  CR0   =     1.000  B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =     2.221  Q0    =     0.022  Q0A   =0.2191E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.4500E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.3594E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.7820E-03   j0 =U0*GP0*B0 =0.8342E-04   (based on slot width B0)
 m0 =U0*q0   =0.7980E-03   j0 =q0*GP0    =0.8512E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =     0.000 lM    =      0.41  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.2191E-01  M0    =0.4767E-01  J0    =0.5085E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      1.43  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    362.31  FRD0  =     36.24  R     =  99999.00  PL    =  169.85
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.2467E-04  M0    =0.1504E-02
```

```
 lQ=B  =      0.005 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.018 LM    =      0.11  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.070 D0    =      0.089 A0    =      0.006 THETA =     90.00
 FR0   =      2.03  FRD0  =      0.48  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.4500E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.450E+02   0.04     0.04     2.221   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.26  XE    =      0.00  YE    =      0.00  ZE    =      0.41

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.41     1.0 0.450E+02   0.04     0.04     2.221   .00000E+00
      0.00     0.00    0.41     1.0 0.450E+02   0.04     0.04     0.107   .93702E-02
      0.00     0.00    0.55     1.8 0.244E+02   0.04     0.04     0.266   .59539E+00
```

0.00	0.00	0.69	3.4	0.131E+02	0.06	0.06	0.248	.11287E+01
0.00	0.00	0.82	5.4	0.838E+01	0.07	0.07	0.232	.17008E+01
0.00	0.00	0.96	7.6	0.592E+01	0.09	0.09	0.219	.23102E+01
0.00	0.00	1.10	10.1	0.445E+01	0.11	0.11	0.208	.29537E+01
0.00	0.00	1.23	12.9	0.349E+01	0.12	0.12	0.199	.36337E+01
0.00	0.00	1.37	15.9	0.282E+01	0.14	0.14	0.191	.43378E+01
0.00	0.00	1.51	19.2	0.234E+01	0.16	0.16	0.184	.50687E+01
0.00	0.00	1.65	22.7	0.198E+01	0.17	0.17	0.178	.58248E+01
0.00	0.00	1.78	26.5	0.170E+01	0.19	0.19	0.173	.66046E+01
0.00	0.00	1.92	30.5	0.148E+01	0.21	0.21	0.169	.74126E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **

The pollutant concentration in the plume falls below water quality standard or CCC value of 0.134E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

0.00	0.00	2.06	34.7	0.130E+01	0.22	0.22	0.164	.82360E+01
0.00	0.00	2.19	39.1	0.115E+01	0.24	0.24	0.161	.90796E+01
0.00	0.00	2.33	43.7	0.103E+01	0.26	0.26	0.157	.99424E+01
0.00	0.00	2.47	48.5	0.927E+00	0.27	0.27	0.154	.10824E+02
0.00	0.00	2.61	53.5	0.841E+00	0.29	0.29	0.151	.11723E+02
0.00	0.00	2.74	58.8	0.766E+00	0.31	0.31	0.148	.12646E+02
0.00	0.00	2.88	64.2	0.701E+00	0.32	0.32	0.146	.13578E+02
0.00	0.00	3.02	69.8	0.645E+00	0.34	0.34	0.143	.14527E+02
0.00	0.00	3.15	75.5	0.596E+00	0.36	0.36	0.141	.15491E+02
0.00	0.00	3.29	81.5	0.552E+00	0.37	0.37	0.139	.16470E+02
0.00	0.00	3.43	87.6	0.513E+00	0.39	0.39	0.137	.17470E+02
0.00	0.00	3.57	94.0	0.479E+00	0.41	0.41	0.135	.18478E+02
0.00	0.00	3.70	100.4	0.448E+00	0.42	0.42	0.133	.19499E+02
0.00	0.00	3.84	107.1	0.420E+00	0.44	0.44	0.132	.20534E+02
0.00	0.00	3.98	113.9	0.395E+00	0.46	0.46	0.130	.21581E+02
0.00	0.00	4.12	120.9	0.372E+00	0.47	0.47	0.128	.22650E+02
0.00	0.00	4.25	128.1	0.351E+00	0.49	0.49	0.127	.23722E+02
0.00	0.00	4.39	135.4	0.332E+00	0.50	0.50	0.126	.24807E+02
0.00	0.00	4.53	142.9	0.315E+00	0.52	0.52	0.124	.25904E+02
0.01	0.00	4.66	150.5	0.299E+00	0.54	0.54	0.123	.27012E+02
0.01	0.00	4.80	158.4	0.284E+00	0.55	0.55	0.122	.28140E+02
0.01	0.00	4.94	166.3	0.271E+00	0.57	0.57	0.121	.29271E+02
0.01	0.00	5.08	174.4	0.258E+00	0.59	0.59	0.119	.30413E+02
0.01	0.00	5.21	182.7	0.246E+00	0.60	0.60	0.118	.31566E+02
0.01	0.00	5.35	191.1	0.235E+00	0.62	0.62	0.117	.32729E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.36	257.8	0.175E+00	0.78	31.26	0.083	.32852E+02
0.01	0.00	5.62	268.6	0.168E+00	0.80	31.28	0.085	.35968E+02
0.01	0.00	5.76	274.5	0.164E+00	0.81	31.29	0.085	.37581E+02
0.01	0.00	5.90	280.5	0.160E+00	0.82	31.30	0.086	.39180E+02
0.01	0.00	6.04	286.6	0.157E+00	0.83	31.31	0.087	.40768E+02
0.01	0.00	6.17	292.8	0.154E+00	0.84	31.32	0.087	.42357E+02
0.01	0.00	6.31	299.0	0.150E+00	0.86	31.34	0.088	.43926E+02
0.01	0.00	6.45	305.4	0.147E+00	0.87	31.35	0.088	.45487E+02
0.01	0.00	6.58	311.8	0.144E+00	0.88	31.36	0.088	.47041E+02
0.01	0.00	6.72	318.3	0.141E+00	0.90	31.38	0.089	.48589E+02
0.01	0.00	6.86	324.8	0.139E+00	0.92	31.40	0.089	.50143E+02
0.01	0.00	7.00	331.4	0.136E+00	0.93	31.41	0.089	.51681E+02
0.01	0.00	7.13	338.0	0.133E+00	0.95	31.43	0.089	.53215E+02
0.01	0.00	7.27	344.7	0.131E+00	0.96	31.44	0.090	.54746E+02
0.01	0.00	7.41	351.4	0.128E+00	0.98	31.46	0.090	.56272E+02
0.01	0.00	7.55	358.1	0.126E+00	1.00	31.48	0.090	.57807E+02
0.01	0.00	7.68	364.9	0.123E+00	1.01	31.49	0.090	.59329E+02
0.01	0.00	7.82	371.7	0.121E+00	1.03	31.51	0.090	.60847E+02

0.01	0.00	7.96	378.5	0.119E+00	1.05	31.53	0.090	.62364E+02
0.01	0.00	8.09	385.3	0.117E+00	1.07	31.55	0.091	.63879E+02
0.01	0.00	8.23	392.2	0.115E+00	1.09	31.57	0.091	.65402E+02
0.01	0.00	8.37	399.0	0.113E+00	1.10	31.58	0.091	.66914E+02
0.01	0.00	8.51	405.9	0.111E+00	1.12	31.60	0.091	.68423E+02
0.01	0.00	8.64	412.8	0.109E+00	1.14	31.62	0.091	.69932E+02
0.01	0.00	8.78	419.7	0.107E+00	1.16	31.64	0.091	.71439E+02
0.01	0.00	8.92	426.6	0.105E+00	1.18	31.66	0.091	.72946E+02
0.01	0.00	9.05	433.6	0.104E+00	1.19	31.67	0.091	.74451E+02
0.01	0.00	9.19	440.5	0.102E+00	1.21	31.69	0.091	.75955E+02
0.01	0.00	9.33	447.5	0.101E+00	1.23	31.71	0.091	.77469E+02
0.01	0.00	9.47	454.5	0.990E-01	1.25	31.73	0.091	.78972E+02
0.01	0.00	9.60	461.4	0.975E-01	1.27	31.75	0.091	.80474E+02
0.01	0.00	9.74	468.4	0.961E-01	1.29	31.77	0.091	.81975E+02
0.01	0.00	9.88	475.4	0.947E-01	1.31	31.79	0.091	.83476E+02
0.01	0.00	10.01	482.4	0.933E-01	1.32	31.80	0.091	.84976E+02
0.01	0.00	10.15	489.4	0.920E-01	1.34	31.82	0.091	.86476E+02
0.01	0.00	10.29	496.4	0.907E-01	1.36	31.84	0.091	.87975E+02
0.01	0.00	10.43	503.4	0.894E-01	1.38	31.86	0.091	.89485E+02
0.01	0.00	10.56	510.4	0.882E-01	1.40	31.88	0.091	.90984E+02
0.02	0.00	10.70	517.5	0.870E-01	1.42	31.90	0.091	.92482E+02
0.02	0.00	10.84	524.5	0.858E-01	1.44	31.92	0.091	.93979E+02
0.02	0.00	10.97	531.5	0.847E-01	1.46	31.94	0.091	.95477E+02
0.02	0.00	11.11	538.5	0.836E-01	1.48	31.96	0.092	.96974E+02
0.02	0.00	11.25	545.5	0.825E-01	1.49	31.97	0.092	.98471E+02
0.02	0.00	11.39	552.6	0.814E-01	1.51	31.99	0.092	.99978E+02
0.02	0.00	11.52	559.7	0.804E-01	1.53	32.01	0.092	.10148E+03
0.02	0.00	11.66	566.7	0.794E-01	1.55	32.03	0.092	.10297E+03
0.02	0.00	11.80	573.7	0.784E-01	1.57	32.05	0.092	.10447E+03
0.02	0.00	11.93	580.8	0.775E-01	1.59	32.07	0.092	.10596E+03
0.02	0.00	12.07	587.8	0.766E-01	1.61	32.09	0.092	.10746E+03
0.02	0.00	12.21	594.9	0.756E-01	1.63	32.11	0.092	.10895E+03
0.02	0.00	12.34	601.9	0.748E-01	1.65	32.13	0.092	.11045E+03
0.02	0.00	12.48	609.0	0.739E-01	1.67	32.15	0.092	.11195E+03
0.02	0.00	12.62	616.0	0.730E-01	1.69	32.17	0.092	.11345E+03
0.02	0.00	12.76	623.1	0.722E-01	1.70	32.18	0.092	.11494E+03
0.02	0.00	12.89	630.1	0.714E-01	1.72	32.20	0.092	.11644E+03
0.02	0.00	13.03	637.2	0.706E-01	1.74	32.22	0.092	.11793E+03
0.02	0.00	13.17	644.3	0.698E-01	1.76	32.24	0.092	.11943E+03
0.02	0.00	13.30	651.3	0.691E-01	1.78	32.26	0.092	.12092E+03
0.02	0.00	13.44	658.4	0.683E-01	1.80	32.28	0.092	.12243E+03
0.02	0.00	13.58	665.5	0.676E-01	1.82	32.30	0.092	.12392E+03
0.02	0.00	13.72	672.5	0.669E-01	1.84	32.32	0.092	.12542E+03
0.02	0.00	13.85	679.6	0.662E-01	1.86	32.34	0.092	.12691E+03
0.02	0.00	13.99	686.7	0.655E-01	1.88	32.36	0.092	.12840E+03
0.02	0.00	14.13	693.7	0.649E-01	1.90	32.38	0.092	.12990E+03

Cumulative travel time = 129.8953 sec (0.04 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.91 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.12: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.5 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX2 PREDICTION FILE:
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
---------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_0.5MGD_Diffuser_90BOD_13July2018_v-1.prd
 Time stamp:        07/13/2018--12:11:54

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =     0.000  F     =     0.100  USTAR =0.1118E-04
 UW    =     0.000  UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =     0.016  A0    =     0.000  H0    =      0.15  SUB0  =     15.79
 D0INP =     0.016  CR0   =     1.000  B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =     2.221  Q0    =     0.022  Q0A   =0.2191E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.9000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.3594E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.7820E-03   j0 =U0*GP0*B0 =0.8342E-04   (based on slot width B0)
 m0 =U0*q0   =0.7980E-03   j0 =q0*GP0    =0.8512E-04   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =     0.000 lM    =      0.41  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.2191E-01  M0    =0.4767E-01  J0    =0.5085E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      1.43  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    362.31  FRD0  =     36.24  R     =  99999.00  PL    =  169.85
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.2467E-04  M0    =0.1504E-02
```

```
 lQ=B  =      0.005 lM    =      0.01  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.018 LM    =      0.11  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.070 D0    =      0.089 A0    =      0.006 THETA =     90.00
 FR0   =      2.03  FRD0  =      0.48  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.9000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.900E+02   0.04     0.04     2.221   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.26  XE    =      0.00  YE    =      0.00  ZE    =      0.41

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.41     1.0 0.900E+02   0.04     0.04     2.221   .00000E+00
      0.00     0.00    0.41     1.0 0.900E+02   0.04     0.04     0.107   .93702E-02
      0.00     0.00    0.55     1.8 0.488E+02   0.04     0.04     0.266   .59539E+00
```

0.00	0.00	0.69	3.4	0.261E+02	0.06	0.06	0.248	.11287E+01
0.00	0.00	0.82	5.4	0.168E+02	0.07	0.07	0.232	.17008E+01
0.00	0.00	0.96	7.6	0.118E+02	0.09	0.09	0.219	.23102E+01
0.00	0.00	1.10	10.1	0.890E+01	0.11	0.11	0.208	.29537E+01
0.00	0.00	1.23	12.9	0.697E+01	0.12	0.12	0.199	.36337E+01
0.00	0.00	1.37	15.9	0.564E+01	0.14	0.14	0.191	.43378E+01
0.00	0.00	1.51	19.2	0.468E+01	0.16	0.16	0.184	.50687E+01
0.00	0.00	1.65	22.7	0.396E+01	0.17	0.17	0.178	.58248E+01
0.00	0.00	1.78	26.5	0.340E+01	0.19	0.19	0.173	.66046E+01
0.00	0.00	1.92	30.5	0.295E+01	0.21	0.21	0.169	.74126E+01
0.00	0.00	2.06	34.7	0.259E+01	0.22	0.22	0.164	.82360E+01
0.00	0.00	2.19	39.1	0.230E+01	0.24	0.24	0.161	.90796E+01
0.00	0.00	2.33	43.7	0.206E+01	0.26	0.26	0.157	.99424E+01
0.00	0.00	2.47	48.5	0.185E+01	0.27	0.27	0.154	.10824E+02
0.00	0.00	2.61	53.5	0.168E+01	0.29	0.29	0.151	.11723E+02
0.00	0.00	2.74	58.8	0.153E+01	0.31	0.31	0.148	.12646E+02
0.00	0.00	2.88	64.2	0.140E+01	0.32	0.32	0.146	.13578E+02

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **

The pollutant concentration in the plume falls below water quality standard or CCC value of 0.134E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

0.00	0.00	3.02	69.8	0.129E+01	0.34	0.34	0.143	.14527E+02
0.00	0.00	3.15	75.5	0.119E+01	0.36	0.36	0.141	.15491E+02
0.00	0.00	3.29	81.5	0.110E+01	0.37	0.37	0.139	.16470E+02
0.00	0.00	3.43	87.6	0.103E+01	0.39	0.39	0.137	.17470E+02
0.00	0.00	3.57	94.0	0.958E+00	0.41	0.41	0.135	.18478E+02
0.00	0.00	3.70	100.4	0.896E+00	0.42	0.42	0.133	.19499E+02
0.00	0.00	3.84	107.1	0.840E+00	0.44	0.44	0.132	.20534E+02
0.00	0.00	3.98	113.9	0.790E+00	0.46	0.46	0.130	.21581E+02
0.00	0.00	4.12	120.9	0.744E+00	0.47	0.47	0.128	.22650E+02
0.00	0.00	4.25	128.1	0.703E+00	0.49	0.49	0.127	.23722E+02
0.00	0.00	4.39	135.4	0.665E+00	0.50	0.50	0.126	.24807E+02
0.00	0.00	4.53	142.9	0.630E+00	0.52	0.52	0.124	.25904E+02
0.01	0.00	4.66	150.5	0.598E+00	0.54	0.54	0.123	.27012E+02
0.01	0.00	4.80	158.4	0.568E+00	0.55	0.55	0.122	.28140E+02
0.01	0.00	4.94	166.3	0.541E+00	0.57	0.57	0.121	.29271E+02
0.01	0.00	5.08	174.4	0.516E+00	0.59	0.59	0.119	.30413E+02
0.01	0.00	5.21	182.7	0.493E+00	0.60	0.60	0.118	.31566E+02
0.01	0.00	5.35	191.1	0.471E+00	0.62	0.62	0.117	.32729E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.36	257.8	0.349E+00	0.78	31.26	0.083	.32852E+02
0.01	0.00	5.62	268.6	0.335E+00	0.80	31.28	0.085	.35968E+02
0.01	0.00	5.76	274.5	0.328E+00	0.81	31.29	0.085	.37581E+02
0.01	0.00	5.90	280.5	0.321E+00	0.82	31.30	0.086	.39180E+02
0.01	0.00	6.04	286.6	0.314E+00	0.83	31.31	0.087	.40768E+02
0.01	0.00	6.17	292.8	0.307E+00	0.84	31.32	0.087	.42357E+02
0.01	0.00	6.31	299.0	0.301E+00	0.86	31.34	0.088	.43926E+02
0.01	0.00	6.45	305.4	0.295E+00	0.87	31.35	0.088	.45487E+02
0.01	0.00	6.58	311.8	0.289E+00	0.88	31.36	0.088	.47041E+02
0.01	0.00	6.72	318.3	0.283E+00	0.90	31.38	0.089	.48589E+02
0.01	0.00	6.86	324.8	0.277E+00	0.92	31.40	0.089	.50143E+02
0.01	0.00	7.00	331.4	0.272E+00	0.93	31.41	0.089	.51681E+02
0.01	0.00	7.13	338.0	0.266E+00	0.95	31.43	0.089	.53215E+02
0.01	0.00	7.27	344.7	0.261E+00	0.96	31.44	0.090	.54746E+02
0.01	0.00	7.41	351.4	0.256E+00	0.98	31.46	0.090	.56272E+02
0.01	0.00	7.55	358.1	0.251E+00	1.00	31.48	0.090	.57807E+02
0.01	0.00	7.68	364.9	0.247E+00	1.01	31.49	0.090	.59329E+02
0.01	0.00	7.82	371.7	0.242E+00	1.03	31.51	0.090	.60847E+02

0.01	0.00	7.96	378.5	0.238E+00	1.05	31.53	0.090	.62364E+02
0.01	0.00	8.09	385.3	0.234E+00	1.07	31.55	0.091	.63879E+02
0.01	0.00	8.23	392.2	0.229E+00	1.09	31.57	0.091	.65402E+02
0.01	0.00	8.37	399.0	0.226E+00	1.10	31.58	0.091	.66914E+02
0.01	0.00	8.51	405.9	0.222E+00	1.12	31.60	0.091	.68423E+02
0.01	0.00	8.64	412.8	0.218E+00	1.14	31.62	0.091	.69932E+02
0.01	0.00	8.78	419.7	0.214E+00	1.16	31.64	0.091	.71439E+02
0.01	0.00	8.92	426.6	0.211E+00	1.18	31.66	0.091	.72946E+02
0.01	0.00	9.05	433.6	0.208E+00	1.19	31.67	0.091	.74451E+02
0.01	0.00	9.19	440.5	0.204E+00	1.21	31.69	0.091	.75955E+02
0.01	0.00	9.33	447.5	0.201E+00	1.23	31.71	0.091	.77469E+02
0.01	0.00	9.47	454.5	0.198E+00	1.25	31.73	0.091	.78972E+02
0.01	0.00	9.60	461.4	0.195E+00	1.27	31.75	0.091	.80474E+02
0.01	0.00	9.74	468.4	0.192E+00	1.29	31.77	0.091	.81975E+02
0.01	0.00	9.88	475.4	0.189E+00	1.31	31.79	0.091	.83476E+02
0.01	0.00	10.01	482.4	0.187E+00	1.32	31.80	0.091	.84976E+02
0.01	0.00	10.15	489.4	0.184E+00	1.34	31.82	0.091	.86476E+02
0.01	0.00	10.29	496.4	0.181E+00	1.36	31.84	0.091	.87975E+02
0.01	0.00	10.43	503.4	0.179E+00	1.38	31.86	0.091	.89485E+02
0.01	0.00	10.56	510.4	0.176E+00	1.40	31.88	0.091	.90984E+02
0.02	0.00	10.70	517.5	0.174E+00	1.42	31.90	0.091	.92482E+02
0.02	0.00	10.84	524.5	0.172E+00	1.44	31.92	0.091	.93979E+02
0.02	0.00	10.97	531.5	0.169E+00	1.46	31.94	0.091	.95477E+02
0.02	0.00	11.11	538.5	0.167E+00	1.48	31.96	0.092	.96974E+02
0.02	0.00	11.25	545.5	0.165E+00	1.49	31.97	0.092	.98471E+02
0.02	0.00	11.39	552.6	0.163E+00	1.51	31.99	0.092	.99978E+02
0.02	0.00	11.52	559.7	0.161E+00	1.53	32.01	0.092	.10148E+03
0.02	0.00	11.66	566.7	0.159E+00	1.55	32.03	0.092	.10297E+03
0.02	0.00	11.80	573.7	0.157E+00	1.57	32.05	0.092	.10447E+03
0.02	0.00	11.93	580.8	0.155E+00	1.59	32.07	0.092	.10596E+03
0.02	0.00	12.07	587.8	0.153E+00	1.61	32.09	0.092	.10746E+03
0.02	0.00	12.21	594.9	0.151E+00	1.63	32.11	0.092	.10895E+03
0.02	0.00	12.34	601.9	0.150E+00	1.65	32.13	0.092	.11045E+03
0.02	0.00	12.48	609.0	0.148E+00	1.67	32.15	0.092	.11195E+03
0.02	0.00	12.62	616.0	0.146E+00	1.69	32.17	0.092	.11345E+03
0.02	0.00	12.76	623.1	0.144E+00	1.70	32.18	0.092	.11494E+03
0.02	0.00	12.89	630.1	0.143E+00	1.72	32.20	0.092	.11644E+03
0.02	0.00	13.03	637.2	0.141E+00	1.74	32.22	0.092	.11793E+03
0.02	0.00	13.17	644.3	0.140E+00	1.76	32.24	0.092	.11943E+03
0.02	0.00	13.30	651.3	0.138E+00	1.78	32.26	0.092	.12092E+03
0.02	0.00	13.44	658.4	0.137E+00	1.80	32.28	0.092	.12243E+03
0.02	0.00	13.58	665.5	0.135E+00	1.82	32.30	0.092	.12392E+03
0.02	0.00	13.72	672.5	0.134E+00	1.84	32.32	0.092	.12542E+03
0.02	0.00	13.85	679.6	0.132E+00	1.86	32.34	0.092	.12691E+03
0.02	0.00	13.99	686.7	0.131E+00	1.88	32.36	0.092	.12840E+03
0.02	0.00	14.13	693.7	0.130E+00	1.90	32.38	0.092	.12990E+03

Cumulative travel time = 129.8953 sec (0.04 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.91 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.13: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.7 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                        CORMIX MIXING ZONE EXPERT SYSTEM
                Subsystem CORMIX2: Multiport Diffuser Discharges
                              CORMIX Version 11.0GTH
                      HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_0.7MGD_Diffuser_30BOD_13July2018_v-1.prd
 Time stamp:        07/13/2018--11:51:21

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      3.109 Q0    =      0.031 Q0A   =0.3067E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.3000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.5031E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1533E-02   j0 =U0*GP0*B0 =0.1168E-03   (based on slot width B0)
 m0 =U0*q0   =0.1564E-02   j0 =q0*GP0    =0.1192E-03   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.64  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.3067E-01  M0    =0.9344E-01  J0    =0.7119E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      2.00  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    507.24  FRD0  =     50.74  R     =  99999.00  PL    =  135.72
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.4226E-04  M0    =0.2576E-02
```

```
 lQ=B  =      0.006 lM    =      0.02  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.016 LM    =      0.14  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.086 D0    =      0.095 A0    =      0.007 THETA =     90.00
 FR0   =      2.32  FRD0  =      0.57  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
   ORIGIN is located at the bottom and the diffuser mid-point:
     1235.05 m  from the LEFT  bank/shore.
   X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.300E+02   0.05     0.05     3.109   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.30  XE    =      0.00  YE    =      0.00  ZE    =      0.45

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.45     1.0 0.300E+02   0.05     0.05     3.109   .00000E+00
      0.00     0.00    0.45     1.0 0.300E+02   0.05     0.05     0.127   .78448E-02
      0.00     0.00    0.59     1.7 0.179E+02   0.04     0.04     0.287   .55223E+00
```

0.00	0.00	0.73	3.0	0.994E+01	0.06	0.06	0.270	.10440E+01
0.00	0.00	0.86	4.6	0.650E+01	0.08	0.08	0.254	.15675E+01
0.00	0.00	1.00	6.4	0.465E+01	0.09	0.09	0.241	.21222E+01
0.00	0.00	1.14	8.5	0.354E+01	0.11	0.11	0.229	.27017E+01
0.00	0.00	1.27	10.8	0.279E+01	0.13	0.13	0.220	.33125E+01
0.00	0.00	1.41	13.2	0.227E+01	0.14	0.14	0.211	.39484E+01
0.00	0.00	1.55	15.9	0.189E+01	0.16	0.16	0.204	.46077E+01
0.00	0.00	1.68	18.7	0.160E+01	0.18	0.18	0.198	.52891E+01
0.00	0.00	1.82	21.7	0.138E+01	0.19	0.19	0.192	.59860E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard
or CCC value of 0.134E+01 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality
standard or CCC value.

0.00	0.00	1.96	25.0	0.120E+01	0.21	0.21	0.187	.67076E+01
0.00	0.00	2.09	28.3	0.106E+01	0.23	0.23	0.183	.74479E+01
0.00	0.00	2.23	31.9	0.941E+00	0.24	0.24	0.179	.82059E+01
0.00	0.00	2.37	35.6	0.842E+00	0.26	0.26	0.175	.89810E+01
0.00	0.00	2.50	39.5	0.760E+00	0.28	0.28	0.171	.97666E+01
0.00	0.00	2.64	43.5	0.690E+00	0.29	0.29	0.168	.10574E+02
0.00	0.00	2.78	47.7	0.629E+00	0.31	0.31	0.165	.11396E+02
0.00	0.00	2.92	52.0	0.577E+00	0.33	0.33	0.162	.12232E+02
0.00	0.00	3.05	56.5	0.531E+00	0.34	0.34	0.160	.13083E+02
0.01	0.00	3.19	61.1	0.491E+00	0.36	0.36	0.157	.13941E+02
0.01	0.00	3.33	65.9	0.455E+00	0.38	0.38	0.155	.14819E+02
0.01	0.00	3.46	70.8	0.424E+00	0.39	0.39	0.153	.15709E+02
0.01	0.00	3.60	75.9	0.395E+00	0.41	0.41	0.151	.16612E+02
0.01	0.00	3.74	81.1	0.370E+00	0.42	0.42	0.149	.17527E+02
0.01	0.00	3.87	86.4	0.347E+00	0.44	0.44	0.147	.18447E+02
0.01	0.00	4.01	91.8	0.327E+00	0.46	0.46	0.145	.19386E+02
0.01	0.00	4.15	97.4	0.308E+00	0.47	0.47	0.143	.20336E+02
0.01	0.00	4.28	103.2	0.291E+00	0.49	0.49	0.142	.21296E+02
0.01	0.00	4.42	109.0	0.275E+00	0.51	0.51	0.140	.22268E+02
0.01	0.00	4.56	115.0	0.261E+00	0.52	0.52	0.139	.23243E+02
0.01	0.00	4.69	121.1	0.248E+00	0.54	0.54	0.137	.24235E+02
0.01	0.00	4.83	127.4	0.236E+00	0.56	0.56	0.136	.25238E+02
0.01	0.00	4.97	133.7	0.224E+00	0.57	0.57	0.135	.26250E+02
0.01	0.00	5.10	140.2	0.214E+00	0.59	0.59	0.133	.27272E+02
0.01	0.00	5.24	146.8	0.204E+00	0.61	0.61	0.132	.28297E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.37	206.0	0.146E+00	0.78	31.26	0.093	.29318E+02
0.01	0.00	5.51	210.5	0.142E+00	0.79	31.27	0.094	.30819E+02
0.02	0.00	5.65	215.1	0.139E+00	0.80	31.28	0.095	.32273E+02
0.02	0.00	5.79	219.8	0.136E+00	0.81	31.29	0.096	.33713E+02
0.02	0.00	5.92	224.6	0.134E+00	0.82	31.30	0.096	.35131E+02
0.02	0.00	6.06	229.5	0.131E+00	0.83	31.31	0.097	.36550E+02
0.02	0.00	6.20	234.4	0.128E+00	0.84	31.32	0.097	.37959E+02
0.02	0.00	6.34	239.4	0.125E+00	0.86	31.34	0.098	.39361E+02
0.02	0.00	6.47	244.5	0.123E+00	0.87	31.35	0.098	.40756E+02
0.02	0.00	6.61	249.6	0.120E+00	0.89	31.37	0.099	.42135E+02
0.02	0.00	6.75	254.8	0.118E+00	0.90	31.38	0.099	.43518E+02
0.02	0.00	6.88	260.0	0.115E+00	0.92	31.40	0.100	.44897E+02
0.02	0.00	7.02	265.2	0.113E+00	0.93	31.41	0.100	.46272E+02
0.02	0.00	7.16	270.5	0.111E+00	0.95	31.43	0.100	.47633E+02
0.02	0.00	7.29	275.8	0.109E+00	0.97	31.45	0.100	.49000E+02
0.02	0.00	7.43	281.2	0.107E+00	0.98	31.46	0.100	.50365E+02
0.03	0.00	7.57	286.5	0.105E+00	1.00	31.48	0.101	.51727E+02
0.03	0.00	7.70	291.9	0.103E+00	1.02	31.50	0.101	.53087E+02
0.03	0.00	7.84	297.3	0.101E+00	1.03	31.51	0.101	.54434E+02

0.03	0.00	7.98	302.7	0.991E-01	1.05	31.53	0.101	.55790E+02
0.03	0.00	8.11	308.2	0.973E-01	1.07	31.55	0.101	.57144E+02
0.03	0.00	8.25	313.7	0.956E-01	1.09	31.57	0.101	.58496E+02
0.03	0.00	8.39	319.1	0.940E-01	1.10	31.58	0.101	.59847E+02
0.03	0.00	8.52	324.6	0.924E-01	1.12	31.60	0.102	.61186E+02
0.03	0.00	8.66	330.1	0.909E-01	1.14	31.62	0.102	.62535E+02
0.03	0.00	8.80	335.6	0.894E-01	1.16	31.64	0.102	.63882E+02
0.03	0.00	8.93	341.2	0.879E-01	1.18	31.66	0.102	.65229E+02
0.04	0.00	9.07	346.7	0.865E-01	1.19	31.67	0.102	.66564E+02
0.04	0.00	9.21	352.2	0.852E-01	1.21	31.69	0.102	.67909E+02
0.04	0.00	9.34	357.8	0.839E-01	1.23	31.71	0.102	.69253E+02
0.04	0.00	9.48	363.3	0.826E-01	1.25	31.73	0.102	.70586E+02
0.04	0.00	9.62	368.8	0.813E-01	1.27	31.75	0.102	.71929E+02
0.04	0.00	9.75	374.4	0.801E-01	1.29	31.77	0.102	.73271E+02
0.04	0.00	9.89	380.0	0.789E-01	1.31	31.79	0.102	.74613E+02
0.04	0.00	10.03	385.5	0.778E-01	1.32	31.80	0.102	.75944E+02
0.04	0.00	10.16	391.1	0.767E-01	1.34	31.82	0.102	.77285E+02
0.04	0.00	10.30	396.7	0.756E-01	1.36	31.84	0.102	.78625E+02
0.04	0.00	10.44	402.3	0.746E-01	1.38	31.86	0.102	.79964E+02
0.04	0.00	10.57	407.9	0.736E-01	1.40	31.88	0.102	.81294E+02
0.05	0.00	10.71	413.5	0.726E-01	1.42	31.90	0.102	.82633E+02
0.05	0.00	10.85	419.1	0.716E-01	1.44	31.92	0.102	.83972E+02
0.05	0.00	10.98	424.7	0.706E-01	1.46	31.94	0.102	.85311E+02
0.05	0.00	11.12	430.3	0.697E-01	1.47	31.95	0.102	.86639E+02
0.05	0.00	11.26	435.9	0.688E-01	1.49	31.97	0.102	.87977E+02
0.05	0.00	11.39	441.5	0.680E-01	1.51	31.99	0.102	.89315E+02
0.05	0.00	11.53	447.1	0.671E-01	1.53	32.01	0.102	.90643E+02
0.05	0.00	11.67	452.7	0.663E-01	1.55	32.03	0.102	.91981E+02
0.05	0.00	11.80	458.3	0.655E-01	1.57	32.05	0.102	.93318E+02
0.05	0.00	11.94	463.9	0.647E-01	1.59	32.07	0.102	.94654E+02
0.06	0.00	12.08	469.5	0.639E-01	1.61	32.09	0.102	.95982E+02
0.06	0.00	12.21	475.2	0.631E-01	1.63	32.11	0.102	.97318E+02
0.06	0.00	12.35	480.8	0.624E-01	1.65	32.13	0.103	.98655E+02
0.06	0.00	12.49	486.4	0.617E-01	1.67	32.15	0.103	.99992E+02
0.06	0.00	12.62	492.0	0.610E-01	1.68	32.16	0.103	.10132E+03
0.06	0.00	12.76	497.6	0.603E-01	1.70	32.18	0.103	.10265E+03
0.06	0.00	12.90	503.3	0.596E-01	1.72	32.20	0.103	.10399E+03
0.06	0.00	13.04	508.9	0.589E-01	1.74	32.22	0.103	.10533E+03
0.06	0.00	13.17	514.5	0.583E-01	1.76	32.24	0.103	.10665E+03
0.06	0.00	13.31	520.1	0.577E-01	1.78	32.26	0.103	.10799E+03
0.07	0.00	13.45	525.8	0.571E-01	1.80	32.28	0.103	.10932E+03
0.07	0.00	13.58	531.4	0.565E-01	1.82	32.30	0.103	.11065E+03
0.07	0.00	13.72	537.0	0.559E-01	1.84	32.32	0.103	.11199E+03
0.07	0.00	13.86	542.7	0.553E-01	1.86	32.34	0.103	.11332E+03
0.07	0.00	13.99	548.3	0.547E-01	1.88	32.36	0.103	.11466E+03
0.07	0.00	14.13	553.9	0.542E-01	1.89	32.37	0.103	.11598E+03

Cumulative travel time = 115.9826 sec (0.03 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.58 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
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APPENDIX-C.14: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.7 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX2 PREDICTION FILE:
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
----------------------------------------------------------------------------------------------
----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_0.7MGD_Diffuser_45BOD_13July2018_v-4.prd
 Time stamp:        07/16/2018--14:05:56

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      3.109 Q0    =      0.031 Q0A   =0.3067E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.4500E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.5031E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1533E-02   j0 =U0*GP0*B0 =0.1168E-03   (based on slot width B0)
 m0 =U0*q0   =0.1564E-02   j0 =q0*GP0    =0.1192E-03   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.64  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.3067E-01  M0    =0.9344E-01  J0    =0.7119E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      2.00  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    507.24  FRD0  =     50.74  R     =  99999.00  PL    =  135.72
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.4226E-04  M0    =0.2576E-02
```

```
 lQ=B  =      0.006 lM    =      0.02  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.016 LM    =      0.14  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.086 D0    =      0.095 A0    =      0.007 THETA =     90.00
 FR0   =      2.32  FRD0  =      0.57  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.4500E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.450E+02   0.05     0.05     3.109   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.30  XE    =      0.00  YE    =      0.00  ZE    =      0.45

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.45     1.0 0.450E+02   0.05     0.05     3.109   .00000E+00
      0.00     0.00    0.45     1.0 0.450E+02   0.05     0.05     0.127   .78448E-02
      0.00     0.00    0.59     1.7 0.269E+02   0.04     0.04     0.287   .55223E+00
```

0.00	0.00	0.73	3.0	0.149E+02	0.06	0.06	0.270	.10440E+01
0.00	0.00	0.86	4.6	0.976E+01	0.08	0.08	0.254	.15675E+01
0.00	0.00	1.00	6.4	0.698E+01	0.09	0.09	0.241	.21222E+01
0.00	0.00	1.14	8.5	0.530E+01	0.11	0.11	0.229	.27017E+01
0.00	0.00	1.27	10.8	0.419E+01	0.13	0.13	0.220	.33125E+01
0.00	0.00	1.41	13.2	0.340E+01	0.14	0.14	0.211	.39484E+01
0.00	0.00	1.55	15.9	0.283E+01	0.16	0.16	0.204	.46077E+01
0.00	0.00	1.68	18.7	0.240E+01	0.18	0.18	0.198	.52891E+01
0.00	0.00	1.82	21.7	0.207E+01	0.19	0.19	0.192	.59860E+01
0.00	0.00	1.96	25.0	0.180E+01	0.21	0.21	0.187	.67076E+01
0.00	0.00	2.09	28.3	0.159E+01	0.23	0.23	0.183	.74479E+01
0.00	0.00	2.23	31.9	0.141E+01	0.24	0.24	0.179	.82059E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard
or CCC value of 0.134E+01 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality
standard or CCC value.

0.00	0.00	2.37	35.6	0.126E+01	0.26	0.26	0.175	.89810E+01
0.00	0.00	2.50	39.5	0.114E+01	0.28	0.28	0.171	.97666E+01
0.00	0.00	2.64	43.5	0.103E+01	0.29	0.29	0.168	.10574E+02
0.00	0.00	2.78	47.7	0.944E+00	0.31	0.31	0.165	.11396E+02
0.00	0.00	2.92	52.0	0.865E+00	0.33	0.33	0.162	.12232E+02
0.00	0.00	3.05	56.5	0.796E+00	0.34	0.34	0.160	.13083E+02
0.01	0.00	3.19	61.1	0.736E+00	0.36	0.36	0.157	.13941E+02
0.01	0.00	3.33	65.9	0.683E+00	0.38	0.38	0.155	.14819E+02
0.01	0.00	3.46	70.8	0.636E+00	0.39	0.39	0.153	.15709E+02
0.01	0.00	3.60	75.9	0.593E+00	0.41	0.41	0.151	.16612E+02
0.01	0.00	3.74	81.1	0.555E+00	0.42	0.42	0.149	.17527E+02
0.01	0.00	3.87	86.4	0.521E+00	0.44	0.44	0.147	.18447E+02
0.01	0.00	4.01	91.8	0.490E+00	0.46	0.46	0.145	.19386E+02
0.01	0.00	4.15	97.4	0.462E+00	0.47	0.47	0.143	.20336E+02
0.01	0.00	4.28	103.2	0.436E+00	0.49	0.49	0.142	.21296E+02
0.01	0.00	4.42	109.0	0.413E+00	0.51	0.51	0.140	.22268E+02
0.01	0.00	4.56	115.0	0.391E+00	0.52	0.52	0.139	.23243E+02
0.01	0.00	4.69	121.1	0.372E+00	0.54	0.54	0.137	.24235E+02
0.01	0.00	4.83	127.4	0.353E+00	0.56	0.56	0.136	.25238E+02
0.01	0.00	4.97	133.7	0.337E+00	0.57	0.57	0.135	.26250E+02
0.01	0.00	5.10	140.2	0.321E+00	0.59	0.59	0.133	.27272E+02
0.01	0.00	5.24	146.8	0.307E+00	0.61	0.61	0.132	.28297E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.37	206.0	0.218E+00	0.78	31.26	0.093	.29318E+02
0.01	0.00	5.51	210.5	0.214E+00	0.79	31.27	0.094	.30819E+02
0.02	0.00	5.65	215.1	0.209E+00	0.80	31.28	0.095	.32273E+02
0.02	0.00	5.79	219.8	0.205E+00	0.81	31.29	0.096	.33713E+02
0.02	0.00	5.92	224.6	0.200E+00	0.82	31.30	0.096	.35131E+02
0.02	0.00	6.06	229.5	0.196E+00	0.83	31.31	0.097	.36550E+02
0.02	0.00	6.20	234.4	0.192E+00	0.84	31.32	0.097	.37959E+02
0.02	0.00	6.34	239.4	0.188E+00	0.86	31.34	0.098	.39361E+02
0.02	0.00	6.47	244.5	0.184E+00	0.87	31.35	0.098	.40756E+02
0.02	0.00	6.61	249.6	0.180E+00	0.89	31.37	0.099	.42135E+02
0.02	0.00	6.75	254.8	0.177E+00	0.90	31.38	0.099	.43518E+02
0.02	0.00	6.88	260.0	0.173E+00	0.92	31.40	0.100	.44897E+02
0.02	0.00	7.02	265.2	0.170E+00	0.93	31.41	0.100	.46272E+02
0.02	0.00	7.16	270.5	0.166E+00	0.95	31.43	0.100	.47633E+02
0.02	0.00	7.29	275.8	0.163E+00	0.97	31.45	0.100	.49000E+02
0.02	0.00	7.43	281.2	0.160E+00	0.98	31.46	0.100	.50365E+02
0.03	0.00	7.57	286.5	0.157E+00	1.00	31.48	0.101	.51727E+02
0.03	0.00	7.70	291.9	0.154E+00	1.02	31.50	0.101	.53087E+02
0.03	0.00	7.84	297.3	0.151E+00	1.03	31.51	0.101	.54434E+02

0.03	0.00	7.98	302.7	0.149E+00	1.05	31.53	0.101	.55790E+02
0.03	0.00	8.11	308.2	0.146E+00	1.07	31.55	0.101	.57144E+02
0.03	0.00	8.25	313.7	0.143E+00	1.09	31.57	0.101	.58496E+02
0.03	0.00	8.39	319.1	0.141E+00	1.10	31.58	0.101	.59847E+02
0.03	0.00	8.52	324.6	0.139E+00	1.12	31.60	0.102	.61186E+02
0.03	0.00	8.66	330.1	0.136E+00	1.14	31.62	0.102	.62535E+02
0.03	0.00	8.80	335.6	0.134E+00	1.16	31.64	0.102	.63882E+02
0.03	0.00	8.93	341.2	0.132E+00	1.18	31.66	0.102	.65229E+02
0.04	0.00	9.07	346.7	0.130E+00	1.19	31.67	0.102	.66564E+02
0.04	0.00	9.21	352.2	0.128E+00	1.21	31.69	0.102	.67909E+02
0.04	0.00	9.34	357.8	0.126E+00	1.23	31.71	0.102	.69253E+02
0.04	0.00	9.48	363.3	0.124E+00	1.25	31.73	0.102	.70586E+02
0.04	0.00	9.62	368.8	0.122E+00	1.27	31.75	0.102	.71929E+02
0.04	0.00	9.75	374.4	0.120E+00	1.29	31.77	0.102	.73271E+02
0.04	0.00	9.89	380.0	0.118E+00	1.31	31.79	0.102	.74613E+02
0.04	0.00	10.03	385.5	0.117E+00	1.32	31.80	0.102	.75944E+02
0.04	0.00	10.16	391.1	0.115E+00	1.34	31.82	0.102	.77285E+02
0.04	0.00	10.30	396.7	0.113E+00	1.36	31.84	0.102	.78625E+02
0.04	0.00	10.44	402.3	0.112E+00	1.38	31.86	0.102	.79964E+02
0.04	0.00	10.57	407.9	0.110E+00	1.40	31.88	0.102	.81294E+02
0.05	0.00	10.71	413.5	0.109E+00	1.42	31.90	0.102	.82633E+02
0.05	0.00	10.85	419.1	0.107E+00	1.44	31.92	0.102	.83972E+02
0.05	0.00	10.98	424.7	0.106E+00	1.46	31.94	0.102	.85311E+02
0.05	0.00	11.12	430.3	0.105E+00	1.47	31.95	0.102	.86639E+02
0.05	0.00	11.26	435.9	0.103E+00	1.49	31.97	0.102	.87977E+02
0.05	0.00	11.39	441.5	0.102E+00	1.51	31.99	0.102	.89315E+02
0.05	0.00	11.53	447.1	0.101E+00	1.53	32.01	0.102	.90643E+02
0.05	0.00	11.67	452.7	0.994E-01	1.55	32.03	0.102	.91981E+02
0.05	0.00	11.80	458.3	0.982E-01	1.57	32.05	0.102	.93318E+02
0.05	0.00	11.94	463.9	0.970E-01	1.59	32.07	0.102	.94654E+02
0.06	0.00	12.08	469.5	0.958E-01	1.61	32.09	0.102	.95982E+02
0.06	0.00	12.21	475.2	0.947E-01	1.63	32.11	0.102	.97318E+02
0.06	0.00	12.35	480.8	0.936E-01	1.65	32.13	0.103	.98655E+02
0.06	0.00	12.49	486.4	0.925E-01	1.67	32.15	0.103	.99992E+02
0.06	0.00	12.62	492.0	0.915E-01	1.68	32.16	0.103	.10132E+03
0.06	0.00	12.76	497.6	0.904E-01	1.70	32.18	0.103	.10265E+03
0.06	0.00	12.90	503.3	0.894E-01	1.72	32.20	0.103	.10399E+03
0.06	0.00	13.04	508.9	0.884E-01	1.74	32.22	0.103	.10533E+03
0.06	0.00	13.17	514.5	0.875E-01	1.76	32.24	0.103	.10665E+03
0.06	0.00	13.31	520.1	0.865E-01	1.78	32.26	0.103	.10799E+03
0.07	0.00	13.45	525.8	0.856E-01	1.80	32.28	0.103	.10932E+03
0.07	0.00	13.58	531.4	0.847E-01	1.82	32.30	0.103	.11065E+03
0.07	0.00	13.72	537.0	0.838E-01	1.84	32.32	0.103	.11199E+03
0.07	0.00	13.86	542.7	0.829E-01	1.86	32.34	0.103	.11332E+03
0.07	0.00	13.99	548.3	0.821E-01	1.88	32.36	0.103	.11466E+03
0.07	0.00	14.13	553.9	0.812E-01	1.89	32.37	0.103	.11598E+03

```
 Cumulative travel time =         115.9826 sec  (    0.03 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

  Vertical angle of layer/boundary impingement    =      89.58 deg
  Horizontal angle of layer/boundary impingement  =       0.00 deg


  Discharge into STAGNANT AMBIENT environment:
      STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,
```

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.15: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 0.7 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_0.7MGD_Diffuser_90BOD_13July2018_v-2.prd
 Time stamp:        07/13/2018--11:56:09

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      3.109 Q0    =      0.031 Q0A   =0.3067E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.9000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.5031E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.1533E-02   j0 =U0*GP0*B0 =0.1168E-03   (based on slot width B0)
 m0 =U0*q0   =0.1564E-02   j0 =q0*GP0    =0.1192E-03   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      0.64  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.3067E-01  M0    =0.9344E-01  J0    =0.7119E-02
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      2.00  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    507.24  FRD0  =     50.74  R     =  99999.00  PL    =  135.72
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.4226E-04  M0    =0.2576E-02
```

```
 lQ=B  =      0.006 lM    =      0.02  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.016 LM    =      0.14  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.086 D0    =      0.095 A0    =      0.007 THETA =     90.00
 FR0   =      2.32  FRD0  =      0.57  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.9000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.900E+02   0.05     0.05     3.109   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.30  XE    =      0.00  YE    =      0.00  ZE    =      0.45

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.45     1.0 0.900E+02   0.05     0.05     3.109   .00000E+00
      0.00     0.00    0.45     1.0 0.900E+02   0.05     0.05     0.127   .78448E-02
      0.00     0.00    0.59     1.7 0.538E+02   0.04     0.04     0.287   .55223E+00
```

```
      0.00      0.00     0.73     3.0 0.298E+02   0.06      0.06      0.270   .10440E+01
      0.00      0.00     0.86     4.6 0.195E+02   0.08      0.08      0.254   .15675E+01
      0.00      0.00     1.00     6.4 0.140E+02   0.09      0.09      0.241   .21222E+01
      0.00      0.00     1.14     8.5 0.106E+02   0.11      0.11      0.229   .27017E+01
      0.00      0.00     1.27    10.8 0.837E+01   0.13      0.13      0.220   .33125E+01
      0.00      0.00     1.41    13.2 0.681E+01   0.14      0.14      0.211   .39484E+01
      0.00      0.00     1.55    15.9 0.567E+01   0.16      0.16      0.204   .46077E+01
      0.00      0.00     1.68    18.7 0.480E+01   0.18      0.18      0.198   .52891E+01
      0.00      0.00     1.82    21.7 0.414E+01   0.19      0.19      0.192   .59860E+01
      0.00      0.00     1.96    25.0 0.361E+01   0.21      0.21      0.187   .67076E+01
      0.00      0.00     2.09    28.3 0.318E+01   0.23      0.23      0.183   .74479E+01
      0.00      0.00     2.23    31.9 0.282E+01   0.24      0.24      0.179   .82059E+01
      0.00      0.00     2.37    35.6 0.253E+01   0.26      0.26      0.175   .89810E+01
      0.00      0.00     2.50    39.5 0.228E+01   0.28      0.28      0.171   .97666E+01
      0.00      0.00     2.64    43.5 0.207E+01   0.29      0.29      0.168   .10574E+02
      0.00      0.00     2.78    47.7 0.189E+01   0.31      0.31      0.165   .11396E+02
      0.00      0.00     2.92    52.0 0.173E+01   0.33      0.33      0.162   .12232E+02
      0.00      0.00     3.05    56.5 0.159E+01   0.34      0.34      0.160   .13083E+02
      0.01      0.00     3.19    61.1 0.147E+01   0.36      0.36      0.157   .13941E+02
      0.01      0.00     3.33    65.9 0.137E+01   0.38      0.38      0.155   .14819E+02
** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
 The pollutant concentration in the plume falls below water quality standard
   or CCC value of 0.134E+01 in the current prediction interval.
 This is the spatial extent of concentrations exceeding the water quality
   standard or CCC value.
      0.01      0.00     3.46    70.8 0.127E+01   0.39      0.39      0.153   .15709E+02
      0.01      0.00     3.60    75.9 0.119E+01   0.41      0.41      0.151   .16612E+02
      0.01      0.00     3.74    81.1 0.111E+01   0.42      0.42      0.149   .17527E+02
      0.01      0.00     3.87    86.4 0.104E+01   0.44      0.44      0.147   .18447E+02
      0.01      0.00     4.01    91.8 0.980E+00   0.46      0.46      0.145   .19386E+02
      0.01      0.00     4.15    97.4 0.924E+00   0.47      0.47      0.143   .20336E+02
      0.01      0.00     4.28   103.2 0.872E+00   0.49      0.49      0.142   .21296E+02
      0.01      0.00     4.42   109.0 0.825E+00   0.51      0.51      0.140   .22268E+02
      0.01      0.00     4.56   115.0 0.783E+00   0.52      0.52      0.139   .23243E+02
      0.01      0.00     4.69   121.1 0.743E+00   0.54      0.54      0.137   .24235E+02
      0.01      0.00     4.83   127.4 0.707E+00   0.56      0.56      0.136   .25238E+02
      0.01      0.00     4.97   133.7 0.673E+00   0.57      0.57      0.135   .26250E+02
      0.01      0.00     5.10   140.2 0.642E+00   0.59      0.59      0.133   .27272E+02
      0.01      0.00     5.24   146.8 0.613E+00   0.61      0.61      0.132   .28297E+02
  Merging of individual jet/plumes to form plane jet/plume:
      0.01      0.00     5.37   206.0 0.437E+00   0.78     31.26      0.093   .29318E+02
      0.01      0.00     5.51   210.5 0.427E+00   0.79     31.27      0.094   .30819E+02
      0.02      0.00     5.65   215.1 0.418E+00   0.80     31.28      0.095   .32273E+02
      0.02      0.00     5.79   219.8 0.409E+00   0.81     31.29      0.096   .33713E+02
      0.02      0.00     5.92   224.6 0.401E+00   0.82     31.30      0.096   .35131E+02
      0.02      0.00     6.06   229.5 0.392E+00   0.83     31.31      0.097   .36550E+02
      0.02      0.00     6.20   234.4 0.384E+00   0.84     31.32      0.097   .37959E+02
      0.02      0.00     6.34   239.4 0.376E+00   0.86     31.34      0.098   .39361E+02
      0.02      0.00     6.47   244.5 0.368E+00   0.87     31.35      0.098   .40756E+02
      0.02      0.00     6.61   249.6 0.361E+00   0.89     31.37      0.099   .42135E+02
      0.02      0.00     6.75   254.8 0.353E+00   0.90     31.38      0.099   .43518E+02
      0.02      0.00     6.88   260.0 0.346E+00   0.92     31.40      0.100   .44897E+02
      0.02      0.00     7.02   265.2 0.339E+00   0.93     31.41      0.100   .46272E+02
      0.02      0.00     7.16   270.5 0.333E+00   0.95     31.43      0.100   .47633E+02
      0.02      0.00     7.29   275.8 0.326E+00   0.97     31.45      0.100   .49000E+02
      0.02      0.00     7.43   281.2 0.320E+00   0.98     31.46      0.100   .50365E+02
      0.03      0.00     7.57   286.5 0.314E+00   1.00     31.48      0.101   .51727E+02
      0.03      0.00     7.70   291.9 0.308E+00   1.02     31.50      0.101   .53087E+02
      0.03      0.00     7.84   297.3 0.303E+00   1.03     31.51      0.101   .54434E+02
```

0.03	0.00	7.98	302.7	0.297E+00	1.05	31.53	0.101	.55790E+02
0.03	0.00	8.11	308.2	0.292E+00	1.07	31.55	0.101	.57144E+02
0.03	0.00	8.25	313.7	0.287E+00	1.09	31.57	0.101	.58496E+02
0.03	0.00	8.39	319.1	0.282E+00	1.10	31.58	0.101	.59847E+02
0.03	0.00	8.52	324.6	0.277E+00	1.12	31.60	0.102	.61186E+02
0.03	0.00	8.66	330.1	0.273E+00	1.14	31.62	0.102	.62535E+02
0.03	0.00	8.80	335.6	0.268E+00	1.16	31.64	0.102	.63882E+02
0.03	0.00	8.93	341.2	0.264E+00	1.18	31.66	0.102	.65229E+02
0.04	0.00	9.07	346.7	0.260E+00	1.19	31.67	0.102	.66564E+02
0.04	0.00	9.21	352.2	0.256E+00	1.21	31.69	0.102	.67909E+02
0.04	0.00	9.34	357.8	0.252E+00	1.23	31.71	0.102	.69253E+02
0.04	0.00	9.48	363.3	0.248E+00	1.25	31.73	0.102	.70586E+02
0.04	0.00	9.62	368.8	0.244E+00	1.27	31.75	0.102	.71929E+02
0.04	0.00	9.75	374.4	0.240E+00	1.29	31.77	0.102	.73271E+02
0.04	0.00	9.89	380.0	0.237E+00	1.31	31.79	0.102	.74613E+02
0.04	0.00	10.03	385.5	0.233E+00	1.32	31.80	0.102	.75944E+02
0.04	0.00	10.16	391.1	0.230E+00	1.34	31.82	0.102	.77285E+02
0.04	0.00	10.30	396.7	0.227E+00	1.36	31.84	0.102	.78625E+02
0.04	0.00	10.44	402.3	0.224E+00	1.38	31.86	0.102	.79964E+02
0.04	0.00	10.57	407.9	0.221E+00	1.40	31.88	0.102	.81294E+02
0.05	0.00	10.71	413.5	0.218E+00	1.42	31.90	0.102	.82633E+02
0.05	0.00	10.85	419.1	0.215E+00	1.44	31.92	0.102	.83972E+02
0.05	0.00	10.98	424.7	0.212E+00	1.46	31.94	0.102	.85311E+02
0.05	0.00	11.12	430.3	0.209E+00	1.47	31.95	0.102	.86639E+02
0.05	0.00	11.26	435.9	0.206E+00	1.49	31.97	0.102	.87977E+02
0.05	0.00	11.39	441.5	0.204E+00	1.51	31.99	0.102	.89315E+02
0.05	0.00	11.53	447.1	0.201E+00	1.53	32.01	0.102	.90643E+02
0.05	0.00	11.67	452.7	0.199E+00	1.55	32.03	0.102	.91981E+02
0.05	0.00	11.80	458.3	0.196E+00	1.57	32.05	0.102	.93318E+02
0.05	0.00	11.94	463.9	0.194E+00	1.59	32.07	0.102	.94654E+02
0.06	0.00	12.08	469.5	0.192E+00	1.61	32.09	0.102	.95982E+02
0.06	0.00	12.21	475.2	0.189E+00	1.63	32.11	0.102	.97318E+02
0.06	0.00	12.35	480.8	0.187E+00	1.65	32.13	0.103	.98655E+02
0.06	0.00	12.49	486.4	0.185E+00	1.67	32.15	0.103	.99992E+02
0.06	0.00	12.62	492.0	0.183E+00	1.68	32.16	0.103	.10132E+03
0.06	0.00	12.76	497.6	0.181E+00	1.70	32.18	0.103	.10265E+03
0.06	0.00	12.90	503.3	0.179E+00	1.72	32.20	0.103	.10399E+03
0.06	0.00	13.04	508.9	0.177E+00	1.74	32.22	0.103	.10533E+03
0.06	0.00	13.17	514.5	0.175E+00	1.76	32.24	0.103	.10665E+03
0.06	0.00	13.31	520.1	0.173E+00	1.78	32.26	0.103	.10799E+03
0.07	0.00	13.45	525.8	0.171E+00	1.80	32.28	0.103	.10932E+03
0.07	0.00	13.58	531.4	0.169E+00	1.82	32.30	0.103	.11065E+03
0.07	0.00	13.72	537.0	0.168E+00	1.84	32.32	0.103	.11199E+03
0.07	0.00	13.86	542.7	0.166E+00	1.86	32.34	0.103	.11332E+03
0.07	0.00	13.99	548.3	0.164E+00	1.88	32.36	0.103	.11466E+03
0.07	0.00	14.13	553.9	0.162E+00	1.89	32.37	0.103	.11598E+03

Cumulative travel time = 115.9826 sec (0.03 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.58 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 The discharge densimetric Froude number (FRD0) is well below unity.
 INTRUSION OF AMBIENT WATER into the discharge opening will occur!
 This is an UNDESIRABLE operating condition.
 To prevent intrusion, change the discharge  parameters (e.g. decrease
 the discharge opening area) in order  to increase the discharge Froude number!

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.16: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 1.2 mgd, BOD_5 & TSS = 30 mg/L

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
----------------------------------------------------------------------------------------------
----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_1.2MGD_Diffuser_30BOD_13July2018_v-3.prd
 Time stamp:        07/13/2018--10:44:54

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      5.329 Q0    =      0.053 Q0A   =0.5258E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.3000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.8625E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.4504E-02   j0 =U0*GP0*B0 =0.2002E-03   (based on slot width B0)
 m0 =U0*q0   =0.4596E-02   j0 =q0*GP0    =0.2043E-03   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      1.32  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.5258E-01  M0    =0.2746E+00  J0    =0.1220E-01
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      3.43  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    869.55  FRD0  =     86.98  R     =  99999.00  PL    =   94.75
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.1001E-03  M0    =0.6103E-02
```

```
 lQ=B  =      0.007 lM    =      0.03  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.015 LM    =      0.20  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.118 D0    =      0.106 A0    =      0.009 THETA =     90.00
 FR0   =      2.88  FRD0  =      0.75  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.3000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.300E+02   0.05     0.05     5.329   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.38  XE    =      0.00  YE    =      0.00  ZE    =      0.53

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.53     1.0 0.300E+02   0.05     0.05     5.329   .00000E+00
      0.00     0.00    0.53     1.0 0.300E+02   0.05     0.05     0.172   .58170E-02
      0.00     0.00    0.67     1.5 0.204E+02   0.05     0.05     0.322   .48928E+00
```

0.00	0.00	0.80	2.5	0.120E+02	0.07	0.07	0.308	.92000E+00
0.00	0.00	0.94	3.7	0.816E+01	0.08	0.08	0.293	.13726E+01
0.00	0.00	1.07	5.0	0.598E+01	0.10	0.10	0.279	.18482E+01
0.00	0.00	1.21	6.5	0.461E+01	0.12	0.12	0.268	.23459E+01
0.00	0.00	1.35	8.1	0.369E+01	0.13	0.13	0.257	.28644E+01
0.00	0.00	1.48	9.9	0.303E+01	0.15	0.15	0.248	.34025E+01
0.00	0.00	1.62	11.8	0.254E+01	0.17	0.17	0.241	.39589E+01
0.00	0.00	1.75	13.8	0.217E+01	0.18	0.18	0.234	.45328E+01
0.00	0.00	1.89	16.0	0.188E+01	0.20	0.20	0.227	.51232E+01
0.00	0.00	2.03	18.3	0.164E+01	0.22	0.22	0.222	.57292E+01
0.00	0.00	2.16	20.7	0.145E+01	0.23	0.23	0.217	.63501E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **

The pollutant concentration in the plume falls below water quality standard
or CCC value of 0.134E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality
standard or CCC value.

0.00	0.00	2.30	23.2	0.130E+01	0.25	0.25	0.212	.69854E+01
0.00	0.00	2.43	25.8	0.116E+01	0.27	0.27	0.207	.76343E+01
0.00	0.00	2.57	28.5	0.105E+01	0.28	0.28	0.203	.82963E+01
0.00	0.00	2.71	31.3	0.957E+00	0.30	0.30	0.200	.89711E+01
0.00	0.00	2.84	34.3	0.875E+00	0.31	0.31	0.196	.96580E+01
0.00	0.00	2.98	37.3	0.804E+00	0.33	0.33	0.193	.10357E+02
0.00	0.00	3.11	40.5	0.741E+00	0.35	0.35	0.190	.11072E+02
0.00	0.00	3.25	43.7	0.686E+00	0.36	0.36	0.187	.11794E+02
0.00	0.00	3.39	47.1	0.637E+00	0.38	0.38	0.184	.12526E+02
0.00	0.00	3.52	50.5	0.594E+00	0.40	0.40	0.182	.13268E+02
0.01	0.00	3.66	54.1	0.555E+00	0.41	0.41	0.179	.14021E+02
0.01	0.00	3.79	57.7	0.520E+00	0.43	0.43	0.177	.14784E+02
0.01	0.00	3.93	61.4	0.488E+00	0.45	0.45	0.175	.15556E+02
0.01	0.00	4.07	65.3	0.460E+00	0.46	0.46	0.173	.16338E+02
0.01	0.00	4.20	69.2	0.434E+00	0.48	0.48	0.171	.17129E+02
0.01	0.00	4.34	73.2	0.410E+00	0.50	0.50	0.169	.17929E+02
0.01	0.00	4.47	77.3	0.388E+00	0.51	0.51	0.167	.18738E+02
0.01	0.00	4.61	81.4	0.368E+00	0.53	0.53	0.166	.19555E+02
0.01	0.00	4.75	85.7	0.350E+00	0.54	0.54	0.164	.20381E+02
0.01	0.00	4.88	90.1	0.333E+00	0.56	0.56	0.162	.21215E+02
0.01	0.00	5.02	94.5	0.317E+00	0.58	0.58	0.161	.22057E+02
0.01	0.00	5.16	99.0	0.303E+00	0.59	0.59	0.159	.22914E+02
0.01	0.00	5.29	103.7	0.289E+00	0.61	0.61	0.158	.23772E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.39	143.7	0.209E+00	0.78	31.26	0.111	.24397E+02
0.01	0.00	5.56	147.7	0.203E+00	0.79	31.27	0.112	.25955E+02
0.01	0.00	5.70	150.9	0.199E+00	0.80	31.28	0.114	.27158E+02
0.01	0.00	5.84	154.2	0.195E+00	0.81	31.29	0.115	.28350E+02
0.01	0.00	5.97	157.5	0.190E+00	0.82	31.30	0.115	.29534E+02
0.01	0.00	6.11	160.9	0.186E+00	0.83	31.31	0.116	.30708E+02
0.01	0.00	6.24	164.3	0.183E+00	0.85	31.33	0.117	.31876E+02
0.01	0.00	6.38	167.8	0.179E+00	0.86	31.34	0.117	.33038E+02
0.01	0.00	6.52	171.4	0.175E+00	0.87	31.35	0.118	.34194E+02
0.02	0.00	6.65	174.9	0.172E+00	0.89	31.37	0.118	.35345E+02
0.02	0.00	6.79	178.5	0.168E+00	0.90	31.38	0.119	.36492E+02
0.02	0.00	6.92	182.1	0.165E+00	0.92	31.40	0.119	.37635E+02
0.02	0.00	7.06	185.8	0.161E+00	0.94	31.42	0.119	.38774E+02
0.02	0.00	7.20	189.4	0.158E+00	0.95	31.43	0.120	.39911E+02
0.02	0.00	7.33	193.1	0.155E+00	0.97	31.45	0.120	.41053E+02
0.02	0.00	7.47	196.9	0.152E+00	0.98	31.46	0.120	.42185E+02
0.02	0.00	7.60	200.6	0.150E+00	1.00	31.48	0.121	.43314E+02
0.02	0.00	7.74	204.3	0.147E+00	1.02	31.50	0.121	.44442E+02
0.02	0.00	7.88	208.1	0.144E+00	1.04	31.52	0.121	.45568E+02

0.02	0.00	8.01	211.9	0.142E+00	1.05	31.53	0.121	.46692E+02
0.02	0.00	8.15	215.6	0.139E+00	1.07	31.55	0.121	.47815E+02
0.02	0.00	8.28	219.4	0.137E+00	1.09	31.57	0.121	.48936E+02
0.02	0.00	8.42	223.2	0.134E+00	1.11	31.59	0.121	.50057E+02
0.02	0.00	8.56	227.0	0.132E+00	1.12	31.60	0.122	.51176E+02
0.02	0.00	8.69	230.9	0.130E+00	1.14	31.62	0.122	.52294E+02
0.02	0.00	8.83	234.7	0.128E+00	1.16	31.64	0.122	.53412E+02
0.03	0.00	8.96	238.5	0.126E+00	1.18	31.66	0.122	.54528E+02
0.03	0.00	9.10	242.4	0.124E+00	1.20	31.68	0.122	.55644E+02
0.03	0.00	9.24	246.2	0.122E+00	1.21	31.69	0.122	.56760E+02
0.03	0.00	9.37	250.0	0.120E+00	1.23	31.71	0.122	.57874E+02
0.03	0.00	9.51	253.9	0.118E+00	1.25	31.73	0.122	.58988E+02
0.03	0.00	9.64	257.8	0.116E+00	1.27	31.75	0.122	.60102E+02
0.03	0.00	9.78	261.6	0.115E+00	1.29	31.77	0.122	.61215E+02
0.03	0.00	9.92	265.5	0.113E+00	1.31	31.79	0.122	.62328E+02
0.03	0.00	10.05	269.4	0.111E+00	1.33	31.81	0.122	.63440E+02
0.03	0.00	10.19	273.2	0.110E+00	1.34	31.82	0.122	.64552E+02
0.03	0.00	10.32	277.1	0.108E+00	1.36	31.84	0.122	.65664E+02
0.03	0.00	10.46	281.0	0.107E+00	1.38	31.86	0.122	.66775E+02
0.03	0.00	10.60	284.9	0.105E+00	1.40	31.88	0.122	.67886E+02
0.03	0.00	10.73	288.7	0.104E+00	1.42	31.90	0.122	.68997E+02
0.03	0.00	10.87	292.6	0.103E+00	1.44	31.92	0.122	.70107E+02
0.04	0.00	11.00	296.5	0.101E+00	1.46	31.94	0.123	.71217E+02
0.04	0.00	11.14	300.4	0.999E-01	1.48	31.96	0.123	.72328E+02
0.04	0.00	11.28	304.3	0.986E-01	1.49	31.97	0.123	.73438E+02
0.04	0.00	11.41	308.2	0.973E-01	1.51	31.99	0.123	.74547E+02
0.04	0.00	11.55	312.1	0.961E-01	1.53	32.01	0.123	.75656E+02
0.04	0.00	11.68	316.0	0.949E-01	1.55	32.03	0.123	.76766E+02
0.04	0.00	11.82	319.9	0.938E-01	1.57	32.05	0.123	.77875E+02
0.04	0.00	11.96	323.8	0.927E-01	1.59	32.07	0.123	.78984E+02
0.04	0.00	12.09	327.7	0.916E-01	1.61	32.09	0.123	.80093E+02
0.04	0.00	12.23	331.6	0.905E-01	1.63	32.11	0.123	.81202E+02
0.04	0.00	12.36	335.5	0.894E-01	1.65	32.13	0.123	.82311E+02
0.04	0.00	12.50	339.4	0.884E-01	1.66	32.14	0.123	.83419E+02
0.04	0.00	12.64	343.3	0.874E-01	1.68	32.16	0.123	.84527E+02
0.04	0.00	12.77	347.2	0.864E-01	1.70	32.18	0.123	.85635E+02
0.04	0.00	12.91	351.1	0.854E-01	1.72	32.20	0.123	.86744E+02
0.05	0.00	13.04	355.0	0.845E-01	1.74	32.22	0.123	.87852E+02
0.05	0.00	13.18	358.9	0.836E-01	1.76	32.24	0.123	.88960E+02
0.05	0.00	13.32	362.8	0.827E-01	1.78	32.26	0.123	.90068E+02
0.05	0.00	13.45	366.7	0.818E-01	1.80	32.28	0.123	.91176E+02
0.05	0.00	13.59	370.6	0.809E-01	1.82	32.30	0.123	.92284E+02
0.05	0.00	13.72	374.5	0.801E-01	1.84	32.32	0.123	.93392E+02
0.05	0.00	13.86	378.5	0.793E-01	1.85	32.33	0.123	.94501E+02
0.05	0.00	14.00	382.4	0.785E-01	1.87	32.35	0.123	.95609E+02
0.05	0.00	14.13	386.3	0.777E-01	1.89	32.37	0.123	.96712E+02

Cumulative travel time = 96.7116 sec (0.03 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.70 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.17: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 1.2 mgd, BOD_5 & TSS = 45 mg/L

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_1.2MGD_Diffuser_45BOD_13July2018_v-5.prd
 Time stamp:        07/16/2018--13:56:20

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      5.329 Q0    =      0.053 Q0A   =0.5258E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.4500E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.8625E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.4504E-02   j0 =U0*GP0*B0 =0.2002E-03   (based on slot width B0)
 m0 =U0*q0   =0.4596E-02   j0 =q0*GP0    =0.2043E-03   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      1.32  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.5258E-01  M0    =0.2746E+00  J0    =0.1220E-01
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      3.43  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    869.55  FRD0  =     86.98  R     =  99999.00  PL    =   94.75
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.1001E-03  M0    =0.6103E-02
```

```
 lQ=B  =      0.007 lM    =      0.03  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.015 LM    =      0.20  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.118 D0    =      0.106 A0    =      0.009 THETA =     90.00
 FR0   =      2.88  FRD0  =      0.75  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.4500E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.450E+02   0.05     0.05     5.329   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.38  XE    =      0.00  YE    =      0.00  ZE    =      0.53

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.53     1.0 0.450E+02   0.05     0.05     5.329   .00000E+00
      0.00     0.00    0.53     1.0 0.450E+02   0.05     0.05     0.172   .58170E-02
      0.00     0.00    0.67     1.5 0.306E+02   0.05     0.05     0.322   .48928E+00
```

0.00	0.00	0.80	2.5	0.181E+02	0.07	0.07	0.308	.92000E+00
0.00	0.00	0.94	3.7	0.122E+02	0.08	0.08	0.293	.13726E+01
0.00	0.00	1.07	5.0	0.897E+01	0.10	0.10	0.279	.18482E+01
0.00	0.00	1.21	6.5	0.692E+01	0.12	0.12	0.268	.23459E+01
0.00	0.00	1.35	8.1	0.553E+01	0.13	0.13	0.257	.28644E+01
0.00	0.00	1.48	9.9	0.454E+01	0.15	0.15	0.248	.34025E+01
0.00	0.00	1.62	11.8	0.381E+01	0.17	0.17	0.241	.39589E+01
0.00	0.00	1.75	13.8	0.325E+01	0.18	0.18	0.234	.45328E+01
0.00	0.00	1.89	16.0	0.281E+01	0.20	0.20	0.227	.51232E+01
0.00	0.00	2.03	18.3	0.246E+01	0.22	0.22	0.222	.57292E+01
0.00	0.00	2.16	20.7	0.218E+01	0.23	0.23	0.217	.63501E+01
0.00	0.00	2.30	23.2	0.194E+01	0.25	0.25	0.212	.69854E+01
0.00	0.00	2.43	25.8	0.175E+01	0.27	0.27	0.207	.76343E+01
0.00	0.00	2.57	28.5	0.158E+01	0.28	0.28	0.203	.82963E+01
0.00	0.00	2.71	31.3	0.144E+01	0.30	0.30	0.200	.89711E+01

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **

The pollutant concentration in the plume falls below water quality standard or CCC value of 0.134E+01 in the current prediction interval.

This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

0.00	0.00	2.84	34.3	0.131E+01	0.31	0.31	0.196	.96580E+01
0.00	0.00	2.98	37.3	0.121E+01	0.33	0.33	0.193	.10357E+02
0.00	0.00	3.11	40.5	0.111E+01	0.35	0.35	0.190	.11072E+02
0.00	0.00	3.25	43.7	0.103E+01	0.36	0.36	0.187	.11794E+02
0.00	0.00	3.39	47.1	0.956E+00	0.38	0.38	0.184	.12526E+02
0.00	0.00	3.52	50.5	0.891E+00	0.40	0.40	0.182	.13268E+02
0.01	0.00	3.66	54.1	0.832E+00	0.41	0.41	0.179	.14021E+02
0.01	0.00	3.79	57.7	0.780E+00	0.43	0.43	0.177	.14784E+02
0.01	0.00	3.93	61.4	0.733E+00	0.45	0.45	0.175	.15556E+02
0.01	0.00	4.07	65.3	0.690E+00	0.46	0.46	0.173	.16338E+02
0.01	0.00	4.20	69.2	0.651E+00	0.48	0.48	0.171	.17129E+02
0.01	0.00	4.34	73.2	0.615E+00	0.50	0.50	0.169	.17929E+02
0.01	0.00	4.47	77.3	0.582E+00	0.51	0.51	0.167	.18738E+02
0.01	0.00	4.61	81.4	0.553E+00	0.53	0.53	0.166	.19555E+02
0.01	0.00	4.75	85.7	0.525E+00	0.54	0.54	0.164	.20381E+02
0.01	0.00	4.88	90.1	0.500E+00	0.56	0.56	0.162	.21215E+02
0.01	0.00	5.02	94.5	0.476E+00	0.58	0.58	0.161	.22057E+02
0.01	0.00	5.16	99.0	0.454E+00	0.59	0.59	0.159	.22914E+02
0.01	0.00	5.29	103.7	0.434E+00	0.61	0.61	0.158	.23772E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.39	143.7	0.313E+00	0.78	31.26	0.111	.24397E+02
0.01	0.00	5.56	147.7	0.305E+00	0.79	31.27	0.112	.25955E+02
0.01	0.00	5.70	150.9	0.298E+00	0.80	31.28	0.114	.27158E+02
0.01	0.00	5.84	154.2	0.292E+00	0.81	31.29	0.115	.28350E+02
0.01	0.00	5.97	157.5	0.286E+00	0.82	31.30	0.115	.29534E+02
0.01	0.00	6.11	160.9	0.280E+00	0.83	31.31	0.116	.30708E+02
0.01	0.00	6.24	164.3	0.274E+00	0.85	31.33	0.117	.31876E+02
0.01	0.00	6.38	167.8	0.268E+00	0.86	31.34	0.117	.33038E+02
0.01	0.00	6.52	171.4	0.263E+00	0.87	31.35	0.118	.34194E+02
0.02	0.00	6.65	174.9	0.257E+00	0.89	31.37	0.118	.35345E+02
0.02	0.00	6.79	178.5	0.252E+00	0.90	31.38	0.119	.36492E+02
0.02	0.00	6.92	182.1	0.247E+00	0.92	31.40	0.119	.37635E+02
0.02	0.00	7.06	185.8	0.242E+00	0.94	31.42	0.119	.38774E+02
0.02	0.00	7.20	189.4	0.238E+00	0.95	31.43	0.120	.39911E+02
0.02	0.00	7.33	193.1	0.233E+00	0.97	31.45	0.120	.41053E+02
0.02	0.00	7.47	196.9	0.229E+00	0.98	31.46	0.120	.42185E+02
0.02	0.00	7.60	200.6	0.224E+00	1.00	31.48	0.121	.43314E+02
0.02	0.00	7.74	204.3	0.220E+00	1.02	31.50	0.121	.44442E+02
0.02	0.00	7.88	208.1	0.216E+00	1.04	31.52	0.121	.45568E+02

0.02	0.00	8.01	211.9	0.212E+00	1.05	31.53	0.121	.46692E+02
0.02	0.00	8.15	215.6	0.209E+00	1.07	31.55	0.121	.47815E+02
0.02	0.00	8.28	219.4	0.205E+00	1.09	31.57	0.121	.48936E+02
0.02	0.00	8.42	223.2	0.202E+00	1.11	31.59	0.121	.50057E+02
0.02	0.00	8.56	227.0	0.198E+00	1.12	31.60	0.122	.51176E+02
0.02	0.00	8.69	230.9	0.195E+00	1.14	31.62	0.122	.52294E+02
0.02	0.00	8.83	234.7	0.192E+00	1.16	31.64	0.122	.53412E+02
0.03	0.00	8.96	238.5	0.189E+00	1.18	31.66	0.122	.54528E+02
0.03	0.00	9.10	242.4	0.186E+00	1.20	31.68	0.122	.55644E+02
0.03	0.00	9.24	246.2	0.183E+00	1.21	31.69	0.122	.56760E+02
0.03	0.00	9.37	250.0	0.180E+00	1.23	31.71	0.122	.57874E+02
0.03	0.00	9.51	253.9	0.177E+00	1.25	31.73	0.122	.58988E+02
0.03	0.00	9.64	257.8	0.175E+00	1.27	31.75	0.122	.60102E+02
0.03	0.00	9.78	261.6	0.172E+00	1.29	31.77	0.122	.61215E+02
0.03	0.00	9.92	265.5	0.170E+00	1.31	31.79	0.122	.62328E+02
0.03	0.00	10.05	269.4	0.167E+00	1.33	31.81	0.122	.63440E+02
0.03	0.00	10.19	273.2	0.165E+00	1.34	31.82	0.122	.64552E+02
0.03	0.00	10.32	277.1	0.162E+00	1.36	31.84	0.122	.65664E+02
0.03	0.00	10.46	281.0	0.160E+00	1.38	31.86	0.122	.66775E+02
0.03	0.00	10.60	284.9	0.158E+00	1.40	31.88	0.122	.67886E+02
0.03	0.00	10.73	288.7	0.156E+00	1.42	31.90	0.122	.68997E+02
0.03	0.00	10.87	292.6	0.154E+00	1.44	31.92	0.122	.70107E+02
0.04	0.00	11.00	296.5	0.152E+00	1.46	31.94	0.123	.71217E+02
0.04	0.00	11.14	300.4	0.150E+00	1.48	31.96	0.123	.72328E+02
0.04	0.00	11.28	304.3	0.148E+00	1.49	31.97	0.123	.73438E+02
0.04	0.00	11.41	308.2	0.146E+00	1.51	31.99	0.123	.74547E+02
0.04	0.00	11.55	312.1	0.144E+00	1.53	32.01	0.123	.75656E+02
0.04	0.00	11.68	316.0	0.142E+00	1.55	32.03	0.123	.76766E+02
0.04	0.00	11.82	319.9	0.141E+00	1.57	32.05	0.123	.77875E+02
0.04	0.00	11.96	323.8	0.139E+00	1.59	32.07	0.123	.78984E+02
0.04	0.00	12.09	327.7	0.137E+00	1.61	32.09	0.123	.80093E+02
0.04	0.00	12.23	331.6	0.136E+00	1.63	32.11	0.123	.81202E+02
0.04	0.00	12.36	335.5	0.134E+00	1.65	32.13	0.123	.82311E+02
0.04	0.00	12.50	339.4	0.133E+00	1.66	32.14	0.123	.83419E+02
0.04	0.00	12.64	343.3	0.131E+00	1.68	32.16	0.123	.84527E+02
0.04	0.00	12.77	347.2	0.130E+00	1.70	32.18	0.123	.85635E+02
0.04	0.00	12.91	351.1	0.128E+00	1.72	32.20	0.123	.86744E+02
0.05	0.00	13.04	355.0	0.127E+00	1.74	32.22	0.123	.87852E+02
0.05	0.00	13.18	358.9	0.125E+00	1.76	32.24	0.123	.88960E+02
0.05	0.00	13.32	362.8	0.124E+00	1.78	32.26	0.123	.90068E+02
0.05	0.00	13.45	366.7	0.123E+00	1.80	32.28	0.123	.91176E+02
0.05	0.00	13.59	370.6	0.121E+00	1.82	32.30	0.123	.92284E+02
0.05	0.00	13.72	374.5	0.120E+00	1.84	32.32	0.123	.93392E+02
0.05	0.00	13.86	378.5	0.119E+00	1.85	32.33	0.123	.94501E+02
0.05	0.00	14.00	382.4	0.118E+00	1.87	32.35	0.123	.95609E+02
0.05	0.00	14.13	386.3	0.117E+00	1.89	32.37	0.123	.96712E+02

Cumulative travel time = 96.7116 sec (0.03 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.70 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
```

APPENDIX-C.18: CORMIX Prediction File CSWP 50-port x 200 ft. Linear Diffuser December 2013, Discharge Q = 1.2 mgd, BOD_5 & TSS = 90 mg/L

```
CORMIX2 PREDICTION FILE:
222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
                       CORMIX MIXING ZONE EXPERT SYSTEM
               Subsystem CORMIX2: Multiport Diffuser Discharges
                             CORMIX Version 11.0GTH
                     HYDRO2 Version 11.0.0.0 April 2018
---------------------------------------------------------------------------------------------
---------------------------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:   Chevron Estero Marine TErminal, CA
 Design case:       Chevron_Load_Line_#2 Diffuser
 FILE NAME:         C:\...RMIX\CSD_1.2MGD_Diffuser_90BOD_13July2018_v-2.prd
 Time stamp:        07/13/2018--10:37:51

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =     15.94  HD    =     15.94
 UA    =      0.000 F     =      0.100 USTAR =0.1118E-04
 UW    =      0.000 UWSTAR=0.0000E+00
 Uniform density environment
 STRCND=  U         RHOAM = 1025.1000

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:     DITYPE= alternating_perpendicular
 BANK  =  LEFT      DISTB =   1235.05  YB1   =   1204.57  YB2   =   1265.53
 LD    =     60.96  NOPEN =   50       NRISER=   50       SPAC  =      1.24    NPPERR =    1
 D0    =      0.016 A0    =      0.000 H0    =      0.15  SUB0  =     15.79
 D0INP =      0.016 CR0   =      1.000 B0    =0.1586E-03
 Nozzle/port arrangement:   alternating_without_fanning
 GAMMA =     90.00  THETA =      0.00  SIGMA =      0.00  BETA  =     90.00
 U0    =      5.329 Q0    =      0.053 Q0A   =0.5258E-01
 RHO0  = 1000.3400  DRHO0 =0.2476E+02  GP0   =0.2369E+00
 C0    =0.9000E+02  CUNITS=  mg/l
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.8625E-03         SIGNJ0=      1.0
 m0 =U0^2*B0 =0.4504E-02   j0 =U0*GP0*B0 =0.2002E-03   (based on slot width B0)
 m0 =U0*q0   =0.4596E-02   j0 =q0*GP0    =0.2043E-03   (based on volume flux q0)
 Associated 2-d length scales (meters)
 lQ=B  =      0.000 lM    =      1.32  lm    =  99999.00
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.5258E-01  M0    =0.2746E+00  J0    =0.1220E-01
 Associated 3-d length scales (meters)
 LQ    =      0.01  LM    =      3.43  Lm    =  99999.00  Lb    =  99999.00
                                       Lmp   =  99999.00  Lbp   =  99999.00

NON-DIMENSIONAL PARAMETERS
 FR0   =    869.55  FRD0  =     86.98  R     =  99999.00  PL    =   94.75
 (slot)             (port/nozzle)

RECOMPUTED SOURCE CONDITIONS FOR ALTERNATING JETS OR RISER GROUPS:
 Momentum fluxes:   m0    =0.1001E-03  M0    =0.6103E-02
```

```
 lQ=B  =      0.007 lM    =      0.03  lm    =  99999.00  lmp   =  99999.00
 LQ    =      0.015 LM    =      0.20  Lm    =  99999.00  Lmp   =  99999.00
 Properties of riser group with  1 ports/nozzles each:
 U0    =      0.118 D0    =      0.106 A0    =      0.009 THETA =     90.00
 FR0   =      2.88  FRD0  =      0.75  R     =  99999.00
 (slot)             (riser group)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU1V   2
 2  Applicable layer depth HS =    15.94  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.9000E+02  CUNITS=  mg/l
 NTOX  =  0
 NSTD  =  1         CSTD  =0.1340E+01
 REGMZ =  1
 REGSPC=  1         XREG  =     15.54  WREG  =      0.00  AREG  =      0.00
 XINT  =   1524.00  XMAX  =   1524.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1235.05 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP = 100 display intervals per module
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)

       X        Y       Z        S       C       BV       BH       Uc        TT
      0.00     0.00    0.15     1.0 0.900E+02   0.05     0.05     5.329   .00000E+00

END OF MOD101: DISCHARGE MODULE (SINGLE PORT AT DIFFUSER CENTER)
-----------------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------------
BEGIN CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

 Jet/plume transition motion in weak crossflow.

 Zone of flow establishment:            THETAE=     90.00  SIGMAE=      0.00
  LE    =      0.38  XE    =      0.00  YE    =      0.00  ZE    =      0.53

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = before merging: Gaussian 1/e (37%) half-width in horizontal plane
                        normal to trajectory
        after merging:  top-hat half-width in horizontal plane
                        parallel to diffuser line
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)
   Uc = Local centerline excess velocity (above ambient)
   TT = Cumulative travel time

       X        Y       Z        S       C       BV       BH       Uc        TT
  Individual jet/plumes before merging:
      0.00     0.00    0.53     1.0 0.900E+02   0.05     0.05     5.329   .00000E+00
      0.00     0.00    0.53     1.0 0.900E+02   0.05     0.05     0.172   .58170E-02
      0.00     0.00    0.67     1.5 0.611E+02   0.05     0.05     0.322   .48928E+00
```

0.00	0.00	0.80	2.5	0.361E+02	0.07	0.07	0.308	.92000E+00
0.00	0.00	0.94	3.7	0.245E+02	0.08	0.08	0.293	.13726E+01
0.00	0.00	1.07	5.0	0.179E+02	0.10	0.10	0.279	.18482E+01
0.00	0.00	1.21	6.5	0.138E+02	0.12	0.12	0.268	.23459E+01
0.00	0.00	1.35	8.1	0.111E+02	0.13	0.13	0.257	.28644E+01
0.00	0.00	1.48	9.9	0.908E+01	0.15	0.15	0.248	.34025E+01
0.00	0.00	1.62	11.8	0.762E+01	0.17	0.17	0.241	.39589E+01
0.00	0.00	1.75	13.8	0.650E+01	0.18	0.18	0.234	.45328E+01
0.00	0.00	1.89	16.0	0.563E+01	0.20	0.20	0.227	.51232E+01
0.00	0.00	2.03	18.3	0.493E+01	0.22	0.22	0.222	.57292E+01
0.00	0.00	2.16	20.7	0.436E+01	0.23	0.23	0.217	.63501E+01
0.00	0.00	2.30	23.2	0.389E+01	0.25	0.25	0.212	.69854E+01
0.00	0.00	2.43	25.8	0.349E+01	0.27	0.27	0.207	.76343E+01
0.00	0.00	2.57	28.5	0.316E+01	0.28	0.28	0.203	.82963E+01
0.00	0.00	2.71	31.3	0.287E+01	0.30	0.30	0.200	.89711E+01
0.00	0.00	2.84	34.3	0.263E+01	0.31	0.31	0.196	.96580E+01
0.00	0.00	2.98	37.3	0.241E+01	0.33	0.33	0.193	.10357E+02
0.00	0.00	3.11	40.5	0.222E+01	0.35	0.35	0.190	.11072E+02
0.00	0.00	3.25	43.7	0.206E+01	0.36	0.36	0.187	.11794E+02
0.00	0.00	3.39	47.1	0.191E+01	0.38	0.38	0.184	.12526E+02
0.00	0.00	3.52	50.5	0.178E+01	0.40	0.40	0.182	.13268E+02
0.01	0.00	3.66	54.1	0.166E+01	0.41	0.41	0.179	.14021E+02
0.01	0.00	3.79	57.7	0.156E+01	0.43	0.43	0.177	.14784E+02
0.01	0.00	3.93	61.4	0.147E+01	0.45	0.45	0.175	.15556E+02
0.01	0.00	4.07	65.3	0.138E+01	0.46	0.46	0.173	.16338E+02

** WATER QUALITY STANDARD OR CCC HAS BEEN FOUND **
The pollutant concentration in the plume falls below water quality standard or CCC value of 0.134E+01 in the current prediction interval.
This is the spatial extent of concentrations exceeding the water quality standard or CCC value.

0.01	0.00	4.20	69.2	0.130E+01	0.48	0.48	0.171	.17129E+02
0.01	0.00	4.34	73.2	0.123E+01	0.50	0.50	0.169	.17929E+02
0.01	0.00	4.47	77.3	0.116E+01	0.51	0.51	0.167	.18738E+02
0.01	0.00	4.61	81.4	0.111E+01	0.53	0.53	0.166	.19555E+02
0.01	0.00	4.75	85.7	0.105E+01	0.54	0.54	0.164	.20381E+02
0.01	0.00	4.88	90.1	0.999E+00	0.56	0.56	0.162	.21215E+02
0.01	0.00	5.02	94.5	0.952E+00	0.58	0.58	0.161	.22057E+02
0.01	0.00	5.16	99.0	0.909E+00	0.59	0.59	0.159	.22914E+02
0.01	0.00	5.29	103.7	0.868E+00	0.61	0.61	0.158	.23772E+02

Merging of individual jet/plumes to form plane jet/plume:

0.01	0.00	5.39	143.7	0.626E+00	0.78	31.26	0.111	.24397E+02
0.01	0.00	5.56	147.7	0.609E+00	0.79	31.27	0.112	.25955E+02
0.01	0.00	5.70	150.9	0.596E+00	0.80	31.28	0.114	.27158E+02
0.01	0.00	5.84	154.2	0.584E+00	0.81	31.29	0.115	.28350E+02
0.01	0.00	5.97	157.5	0.571E+00	0.82	31.30	0.115	.29534E+02
0.01	0.00	6.11	160.9	0.559E+00	0.83	31.31	0.116	.30708E+02
0.01	0.00	6.24	164.3	0.548E+00	0.85	31.33	0.117	.31876E+02
0.01	0.00	6.38	167.8	0.536E+00	0.86	31.34	0.117	.33038E+02
0.01	0.00	6.52	171.4	0.525E+00	0.87	31.35	0.118	.34194E+02
0.02	0.00	6.65	174.9	0.515E+00	0.89	31.37	0.118	.35345E+02
0.02	0.00	6.79	178.5	0.504E+00	0.90	31.38	0.119	.36492E+02
0.02	0.00	6.92	182.1	0.494E+00	0.92	31.40	0.119	.37635E+02
0.02	0.00	7.06	185.8	0.484E+00	0.94	31.42	0.119	.38774E+02
0.02	0.00	7.20	189.4	0.475E+00	0.95	31.43	0.120	.39911E+02
0.02	0.00	7.33	193.1	0.466E+00	0.97	31.45	0.120	.41053E+02
0.02	0.00	7.47	196.9	0.457E+00	0.98	31.46	0.120	.42185E+02
0.02	0.00	7.60	200.6	0.449E+00	1.00	31.48	0.121	.43314E+02
0.02	0.00	7.74	204.3	0.440E+00	1.02	31.50	0.121	.44442E+02
0.02	0.00	7.88	208.1	0.433E+00	1.04	31.52	0.121	.45568E+02

0.02	0.00	8.01	211.9	0.425E+00	1.05	31.53	0.121	.46692E+02
0.02	0.00	8.15	215.6	0.417E+00	1.07	31.55	0.121	.47815E+02
0.02	0.00	8.28	219.4	0.410E+00	1.09	31.57	0.121	.48936E+02
0.02	0.00	8.42	223.2	0.403E+00	1.11	31.59	0.121	.50057E+02
0.02	0.00	8.56	227.0	0.396E+00	1.12	31.60	0.122	.51176E+02
0.02	0.00	8.69	230.9	0.390E+00	1.14	31.62	0.122	.52294E+02
0.02	0.00	8.83	234.7	0.384E+00	1.16	31.64	0.122	.53412E+02
0.03	0.00	8.96	238.5	0.377E+00	1.18	31.66	0.122	.54528E+02
0.03	0.00	9.10	242.4	0.371E+00	1.20	31.68	0.122	.55644E+02
0.03	0.00	9.24	246.2	0.366E+00	1.21	31.69	0.122	.56760E+02
0.03	0.00	9.37	250.0	0.360E+00	1.23	31.71	0.122	.57874E+02
0.03	0.00	9.51	253.9	0.354E+00	1.25	31.73	0.122	.58988E+02
0.03	0.00	9.64	257.8	0.349E+00	1.27	31.75	0.122	.60102E+02
0.03	0.00	9.78	261.6	0.344E+00	1.29	31.77	0.122	.61215E+02
0.03	0.00	9.92	265.5	0.339E+00	1.31	31.79	0.122	.62328E+02
0.03	0.00	10.05	269.4	0.334E+00	1.33	31.81	0.122	.63440E+02
0.03	0.00	10.19	273.2	0.329E+00	1.34	31.82	0.122	.64552E+02
0.03	0.00	10.32	277.1	0.325E+00	1.36	31.84	0.122	.65664E+02
0.03	0.00	10.46	281.0	0.320E+00	1.38	31.86	0.122	.66775E+02
0.03	0.00	10.60	284.9	0.316E+00	1.40	31.88	0.122	.67886E+02
0.03	0.00	10.73	288.7	0.312E+00	1.42	31.90	0.122	.68997E+02
0.03	0.00	10.87	292.6	0.308E+00	1.44	31.92	0.122	.70107E+02
0.04	0.00	11.00	296.5	0.304E+00	1.46	31.94	0.123	.71217E+02
0.04	0.00	11.14	300.4	0.300E+00	1.48	31.96	0.123	.72328E+02
0.04	0.00	11.28	304.3	0.296E+00	1.49	31.97	0.123	.73438E+02
0.04	0.00	11.41	308.2	0.292E+00	1.51	31.99	0.123	.74547E+02
0.04	0.00	11.55	312.1	0.288E+00	1.53	32.01	0.123	.75656E+02
0.04	0.00	11.68	316.0	0.285E+00	1.55	32.03	0.123	.76766E+02
0.04	0.00	11.82	319.9	0.281E+00	1.57	32.05	0.123	.77875E+02
0.04	0.00	11.96	323.8	0.278E+00	1.59	32.07	0.123	.78984E+02
0.04	0.00	12.09	327.7	0.275E+00	1.61	32.09	0.123	.80093E+02
0.04	0.00	12.23	331.6	0.271E+00	1.63	32.11	0.123	.81202E+02
0.04	0.00	12.36	335.5	0.268E+00	1.65	32.13	0.123	.82311E+02
0.04	0.00	12.50	339.4	0.265E+00	1.66	32.14	0.123	.83419E+02
0.04	0.00	12.64	343.3	0.262E+00	1.68	32.16	0.123	.84527E+02
0.04	0.00	12.77	347.2	0.259E+00	1.70	32.18	0.123	.85635E+02
0.04	0.00	12.91	351.1	0.256E+00	1.72	32.20	0.123	.86744E+02
0.05	0.00	13.04	355.0	0.254E+00	1.74	32.22	0.123	.87852E+02
0.05	0.00	13.18	358.9	0.251E+00	1.76	32.24	0.123	.88960E+02
0.05	0.00	13.32	362.8	0.248E+00	1.78	32.26	0.123	.90068E+02
0.05	0.00	13.45	366.7	0.245E+00	1.80	32.28	0.123	.91176E+02
0.05	0.00	13.59	370.6	0.243E+00	1.82	32.30	0.123	.92284E+02
0.05	0.00	13.72	374.5	0.240E+00	1.84	32.32	0.123	.93392E+02
0.05	0.00	13.86	378.5	0.238E+00	1.85	32.33	0.123	.94501E+02
0.05	0.00	14.00	382.4	0.235E+00	1.87	32.35	0.123	.95609E+02
0.05	0.00	14.13	386.3	0.233E+00	1.89	32.37	0.123	.96712E+02

Cumulative travel time = 96.7116 sec (0.03 hrs)

END OF CORJET (MOD110): JET/PLUME NEAR-FIELD MIXING REGION

BEGIN MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING

Vertical angle of layer/boundary impingement = 89.70 deg
Horizontal angle of layer/boundary impingement = 0.00 deg

Discharge into STAGNANT AMBIENT environment:
STEADY-STATE MIXING CONDITION IS NOT POSSIBLE in this zone,

```
      even though some ADDITIONAL DILUTION MAY OCCUR!
    Also, all far-field processes will be UNSTEADY.
  SIMULATION STOPS because of stagnant ambient conditions.

END OF MOD232: LAYER BOUNDARY IMPINGEMENT/UPSTREAM SPREADING
-----------------------------------------------------------------------------------------------
** End of NEAR-FIELD REGION (NFR) **

 SIMULATION STOPS because of STAGNANT AMBIENT conditions.
   All far-field processes will be UNSTEADY.
-----------------------------------------------------------------------------------------------
CORMIX2: Multiport Diffuser Discharges       End of Prediction File
22222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222222
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APPENDIX E
PRELIMINARY MARINE WILDLIFE CONTINGENCY PLAN

E.1 INTRODUCTION

This Preliminary Marine Wildlife Contingency Plan (MWCP) has been prepared in support of the proposed Chevron Environmental Management Company (CEMC) Estero Marine Terminal (EMT) Decommissioning Project (Project). This Project involves the final decommissioning of the remaining EMT tanker berth components to comply with the abandonment requirements of the California State Lands Commission (CSLC).The purpose of the MWCP is to list measures that will be incorporated into the Project that are designed to reduce or eliminate impacts of the proposed decommissioning activities on marine wildlife (wildlife). Additional mitigation and contingency measures may be incorporated into this MWCP after the issuance of applicable Project permits.

Operations associated with the removal of the marine terminal components are not expected to result in injury or long term disturbance of wildlife. Though unlikely, there is the potential for incidents with wildlife during the transiting of work vessels to the Project site from Morro Bay, shoreline/intertidal decommissioning activities, and during pre- and post-geophysical debris surveys. It is anticipated that offshore and onshore decommissioning activities will be short-term and will be completed using a limited amount of equipment, including marine vessels, and will thus only have a limited potential to impact wildlife.

E.2 REGULATORY BASIS

Special-status species are protected by the Federal Endangered Species Act of 1973 (Section 9 and implementing regulations 50 CFR Part 17). The Federal Endangered Species Act (FESA) makes it unlawful to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect an Endangered or Threatened species, or to attempt to engage in any such conduct. Anyone violating the provisions of the FESA and regulations is subject to a fine and imprisonment. An Endangered species is any species, which the Secretaries of the Department of the Interior and/or the Department of Commerce determine is in danger of extinction throughout all or a portion of its range. A Threatened species is any species, which the Secretaries determine is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range. The United States Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) Fisheries are responsible for implementation of the FESA.

NOAA Fisheries is also responsible for enforcing the Marine Mammal Protection Act of 1972 (MMPA), which protects all marine mammals within U.S. waters. Specifically, the MMPA prohibits the intentional killing or harassment of marine mammals; however, incidental harassment, with authorization from the appropriate Federal agency, may be permitted.

Because operations occur in State waters, the California Department of Fish and Wildlife (CDFW) is involved in an advisory capacity, under the California ESA (CESA). Any accidental contact with marine mammals during the course of vessel operations must be promptly reported to the NOAA Fisheries Stranding Coordinator and CDFW dispatch (refer to Section E.6).

Sensitive habitats are also provided protection for some special-status species under Federal and State regulations. Section 3 of the FESA provides protection of Critical Habitat areas designated for some Endangered marine mammals and are regulated by the USFWS and NOAA. The Project site occurs within Critical Habitat for leatherback turtle (*Demochelys coriacea*) (Area 7) which encompasses the neritic waters between Point Arena and Point Arguello. Sensitive habitats, including pinniped haul-outs and rookeries and Marine Protected Areas (MPAs), defined by the CESA, are afforded protection by the CDFW under the Marine Life Protection Act. Figures E.3-1 and E.4-1 illustrate the locations of these sensitive areas.

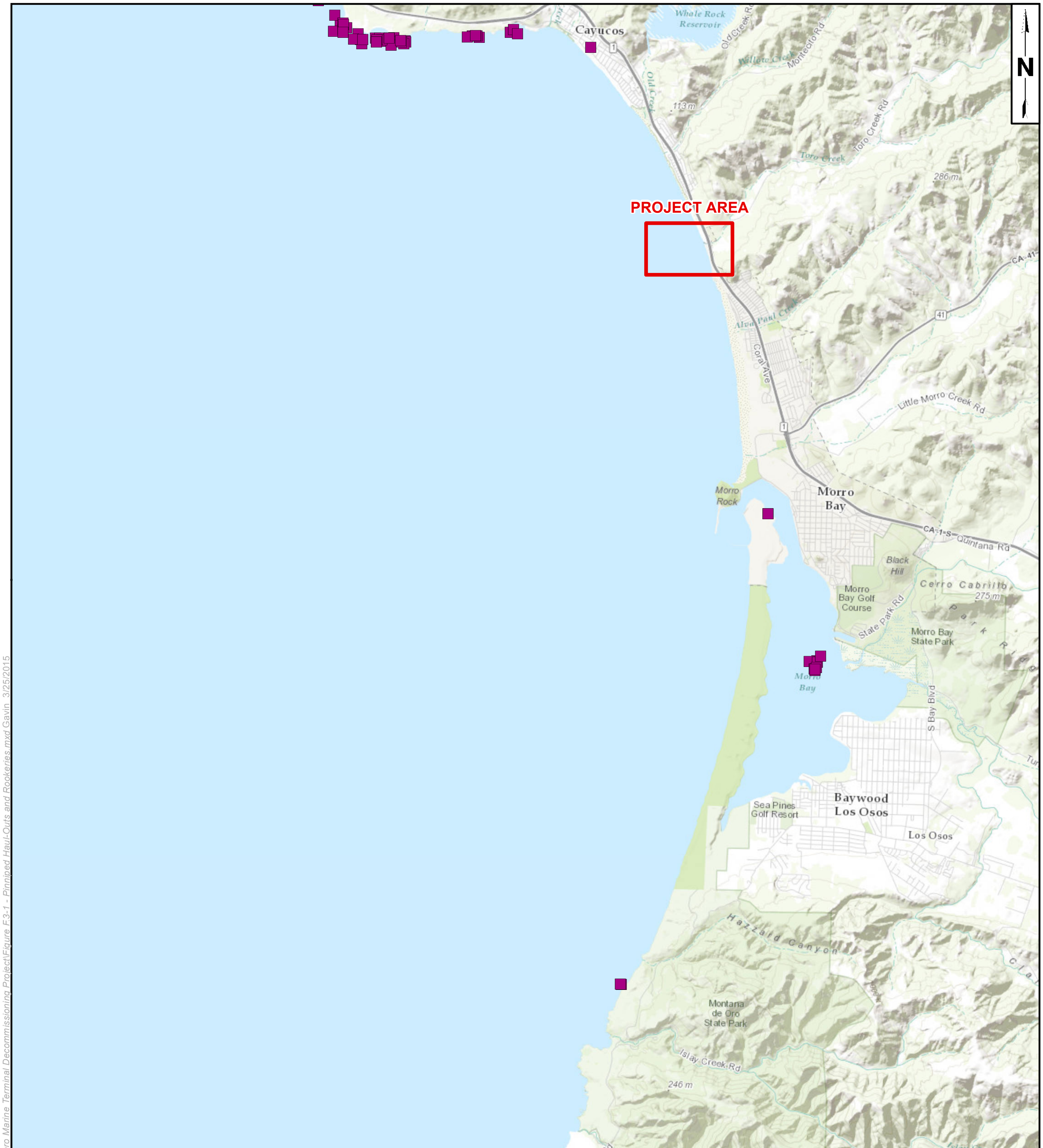
In addition, the California Coastal act, which is administered by the California Coastal Commission (CCC), identifies protective measures for nearshore marine resources. The Coastal Act asserts jurisdiction over coastal waters, streams, wetlands, estuaries, and lakes. The Coastal Act provides protection of human health and populations of marine organisms and protection is given to areas and species of special biological or economic significance. Uses of marine environments, under the Coastal Act, shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

E.2.1 PINNIPED HAUL-OUTS AND ROOKERIES

Pinnipeds haul-out onshore for a variety of reasons including breeding, pupping, molting and resting. The central California coast provides a diversity of haul-out locations such as rocky shorelines, sandy beaches, estuaries and mudflats (Figure E.3-1). California sea lion (*Zalophus californianus*), harbor seals (*Phoca vitulina*), and Northern elephant seals (*Mirounga angustirostris*) have several haul-outs along the beaches, on rocky outcroppings, and within the tidal flats of Morro Bay. The nearest pinniped haul-out or rookery is located on Cayucos beach approximately 3.7 kilometers (km) [2.3 miles (mi)] north from the Project area; therefore, Project activities will not occur in the vicinity of a pinniped haul-out site or rookery and no avoidance measures are necessary.

E.2.2 MARINE PROTECTED AREAS

There are two Marine Protected Areas (MPAs) within the Project region on the central coast of California, each afforded protection under the Marine Life Protection Act by California Department of Fish and Wildlife (CDFW) (Figure E.4-1). The nearest MPA to the Project area is the Morro Bay MPA, which is approximately four km (2.5 mi) les south of the Project area. Project activities are not proposed to occur within any MPAs.



LEGEND:

■ Pinniped Haulout/Rookery

0 4,300 8,600

FEET

Source: ESRI Online Topo Map, BOEM
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only.

padre associates, inc.
ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS

PROJECT NAME:
ESTERO MARINE TERMINAL DECOMMISSIONING PROJECT, ESTERO BAY, CA

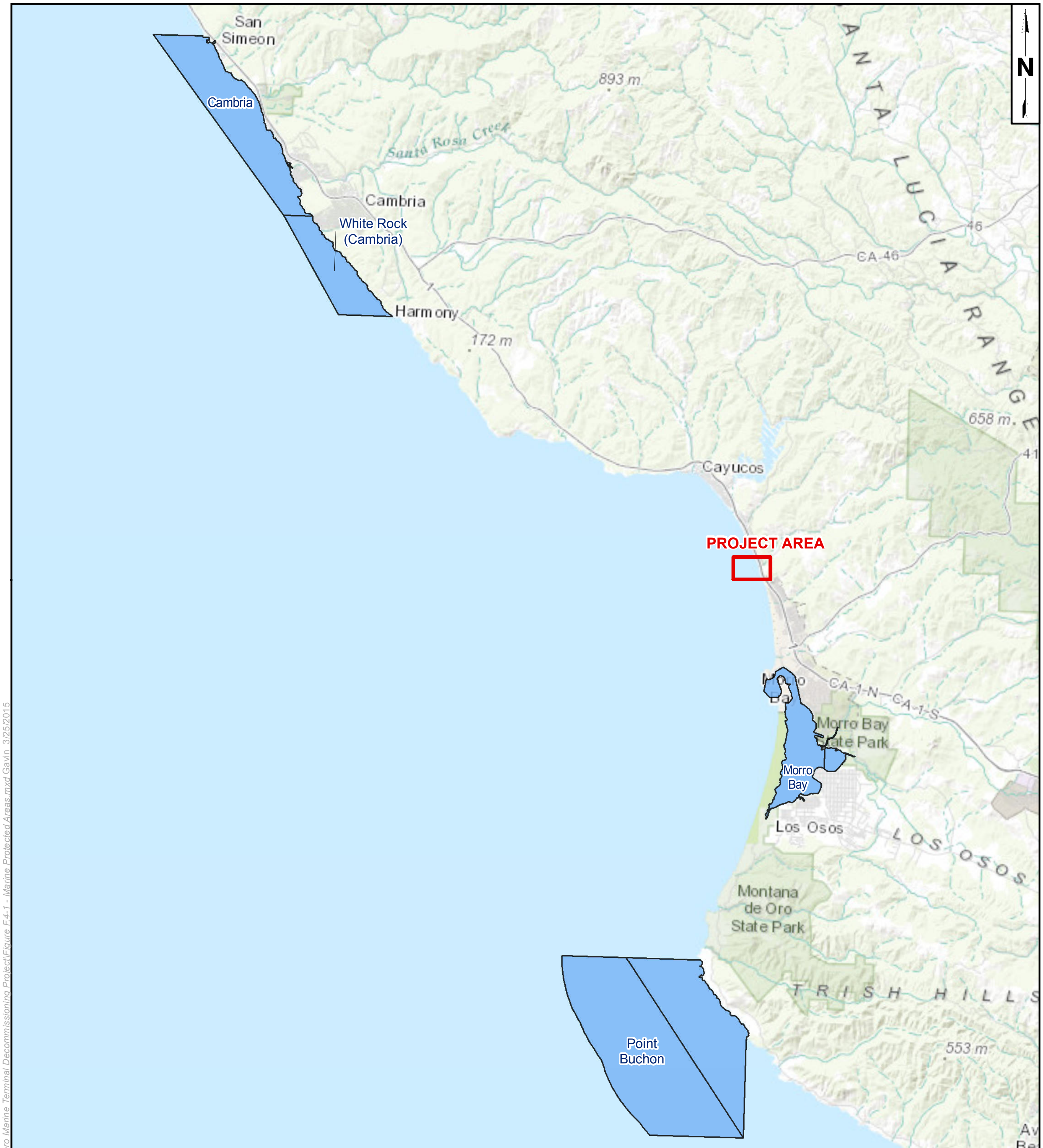
PROJECT NUMBER: 1302-0392

DATE: March 2015

PINNIPED HAUL-OUTS AND ROOKERIES

FIGURE E.3-1

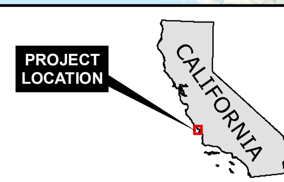
Z:\Kristin\GIS Maps\Map Project\Estero Hill Plant\Estero Marine Terminal Decommissioning Project\Figure F3-1 - Pinniped Haul-Outs and Rookeries.mxd Gavin 3/25/2015



LEGEND:

Marine Protected Area (MPA)

0 1.9 3.8
MILES



Source: ESRI Online Topo Map, BOEM
Coordinate System: NAD 1983 StatePlane California V FIPS 0405 Feet
Notes: This map was created for informational and display purposes only.

Z:\Kristin\GIS Maps\Map Project\Estero Hill Plant\Estero Marine Terminal Decommissioning Project\Figure F4-1 - Marine Protected Areas.mxd Gavin 3/25/2015

padre associates, inc. ENGINEERS, GEOLOGISTS & ENVIRONMENTAL SCIENTISTS	PROJECT NAME: ESTERO MARINE TERMINAL DECOMMISSIONING PROJECT, ESTERO BAY, CA		MARINE PROTECTED AREAS	FIGURE E.4-1
	PROJECT NUMBER: 1302-0392	DATE: March 2015		

E.3 MITIGATIONS AND MONITORING

E.3.1 Pre-Activity Environmental Orientation

A biologist will present an environmental orientation for all Project personnel prior to conducting work. The purpose of the orientation is to educate Project personnel on identification of wildlife in the Project area and to provide an overview of the wildlife mitigation measures that will be implemented during the Project. Specifically, the orientation will include, but not be limited to, the following:

- Identification of wildlife expected to occur in the Project area and periods of occurrence along the central coast;
- Overview of the MMPA, FESA, CESA regulatory agencies responsible for enforcement of the regulations, and penalties associated with violations;
- Procedures to be followed during mobilization/demobilization, and transiting of Project vessels, anchoring of the derrick barge, and throughout the duration of the Project; and
- Reporting requirements in the event of an inadvertent collision and/or injury to a marine mammal or sensitive habitats.

E.3.2 Monitoring and Mitigations

E.3.2.1 Marine Wildlife Monitors

Marine wildlife monitors approved by NOAA Fisheries, USFWS, CCC, and CEMC will be present during all offshore activities, including vessel transits, anchoring, construction activities, and decommissioning debris surveys. The monitors will be experience in marine mammal identification and able to describe relevant behaviors that may occur in proximity to in-water construction activities. The monitors will be placed at the best vantage point(s) practicable to monitor for marine wildlife and implement shutdown/delay procedures directly to lead Project managers and vessel captains. The monitors will be capable to authorize stop of work, stop of vessel, or slowing of vessel speeds to avoid marine mammal conflicts.

Marine wildlife and their behaviors during Project activities will be noted with specific times they were observe by the monitor during all marine activities. Avoidance mitigations will be noted as they are implemented. The monitor will also document all Project activities and times as they were completed. These observations will be available to regulatory agencies, as necessary, and provided in the Project completion technical report following Project completion.

E.3.2.2 Vessel Transit

The area in and around Estero Bay supports local populations of marine wildlife, the most common species likely to occur during Project activities, include: sea otters (*Enhydra lutris* nereis), short- and long-beaked common dolphin (*Delphis delphis* and *Delphis capensis,* respectively), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), bottlenose dolphin (*Tursiops truncates*); California sea lion (*Zalophus californicus*), harbor seal (*Phoca vitulina richardsi*), California gray whale (*Eschrichtius robustus*), humpback whale (*Megaptera novaeangliae*), and occasionally sea turtles (Cryptodira). The mobilization, demobilization, and pre- and post-debris surveys will involve Project vessels traveling to and from Morro Bay Harbor located approximately four km (2.5 mi) south of the Project site. Observations of these marine mammals are likely to occur during this transit. In general, vessels will remain at least 100 m (330 ft) from marine mammals, the recommended distance set by NOAA Fisheries, to minimize the chance of collision or disturbance.

Dolphins are typically identified from a distance due to the surface disturbance created as they swim. Dolphins generally tolerate or even approach vessels, and reactions to boats often appear to be related to the dolphins' normal activity. Dolphins will often "run" with a boat leaping from the water, or riding the bow or stern wakes. If dolphins are observed riding the boat's wake or swimming immediately adjacent to the vessel, the vessel would slow down and keep a steady course until the dolphins lose interest. Resting and foraging dolphins tend to avoid boats while socializing.

Very little information on pinnipeds' responses to vessels is available; however, sea lions in the water often tolerate close and frequent approaches by vessels. California sea lions are the only pinniped within the Project area that regularly haul-out on man-made structures such as docks, buoys, oil and gas structures and even slow moving vessels. Bartholomew (1967) suggests sea lions hauled-out on land are more responsive than when they are in the water, and react when boats approach within 330 to 660 ft. Harbor seals also often retreat into the water in response to approaching boats. Small boats that approach within 330 ft also displace harbor seals from haul out areas. Less severe disturbances can cause alert reactions without departure.

Cetaceans (whales) vary in their swimming patterns and duration of dives and therefore the onboard marine wildlife monitors and all shipboard personnel will be watchful as the vessel crosses the path of a whale or anytime whales are observed in the area.

Due to the documented presence of sea otters along the central coast, there is a high probability that sea otters will be encountered during Project operations. A collision is unlikely; however, vessel personnel should be especially watchful within the Project site during deconstruction activities and/or anytime sea otters are observed in the area.

Project activities are proposed to be conducted on a 24/7 basis, as such, Project vessels may need to transit in low light conditions. Impact avoidance measures will be implemented to decrease the potential of a collision with marine wildlife. Avoidance measures will consist of downward-facing sodium lamps, decreased vessel speed, and a NOAA-approved marine wildlife monitor onboard the vessel monitoring transit with night vision equipment.

If the marine wildlife monitor observes a marine mammal or reptile within the path of the transiting vessel, he/she will immediately report that observation to the vessel operator who will, unless those actions will jeopardize the safety of the vessel or crew, slow the vessel and/or change course in order to avoid contact.

If whales are observed during transit periods, the vessel operator will institute the following measures:

- Maintain a minimum distance of 100 m (330 ft) from sighted whales;
- Do not cross directly in front of or across the path of sighted whales;
- Transit parallel to whales and maintain a constant speed that is not faster than the whale's speed;
- Do not position the vessel in such a manner to separate female whales from their calf;
- Do not use the vessel to herd or drive whales; and
- If a whale engages in evasive or defensive action, slow the vessel and move away from the animal until the animal calms or moves out of the area.

E.3.2.3 Anchoring

As indicated in Appendix G - Marine Safety and Anchoring Plan, the anchoring of the derrick barge will include placement of four to six anchors into pre-designated anchor spreads. The coordinates of all pre-designated anchor locations will be entered into a differential Global Positioning System (GPS) system onboard the anchor assist vessel to ensure anchors are placed at those locations only. With the exception of the first anchor deployed, all derrick barge and support vessel anchors will be deployed and recovered by the support tug utilizing the following procedure. The first anchor will be lowered from the support tug to seafloor at the pre-designated location. Once the first anchor is lowered, the support tug will "fly" the other anchors from the derrick barge to the pre-designated anchor locations specified.

"Flying" anchors is a procedure in which the anchor is carried or suspended by the support tug and transported to the pre-designated anchor location with a crown line. The anchor is lowered to the seafloor by the crown line at the pre-designated site, and the anchor is raised vertically by the crown line for transport back to the support barge when the anchors are "weighed" (lifted off of the seafloor). Flying anchors to and from location eliminates unnecessary anchor chain contact with the seafloor. It should be noted that at no time will the contractor be permitted to drag anchors across the sea floor. Utilizing "fly-over" anchoring techniques is expected to minimize seafloor disturbances from anchoring activities to the maximum extent possible.

Immediately prior to lowering the anchors into position, the marine wildlife monitor (positioned on the anchor assist vessel) will scan the Project area for the presence of any marine wildlife. This measure is intended to avoid potential impacts associated with lowering of vessel anchors (i.e., anchors and chain lengths could potentially injure marine wildlife). Upon approval from the marine wildlife monitor, the anchoring of the derrick barge will proceed. In the event marine wildlife are identified within the Project area, anchoring procedures will be delayed until the animal(s) move a safe distance from the Project area, as determined by the marine wildlife monitor.

E.3.2.4 Offshore Construction Activities

During offshore construction, all marine operations will be conducted per the procedures outlined in Appendix G - Marine Safety and Anchoring Plan which emphasizes "good mariner practices". Further, every effort to avoid approaching and disturbing marine mammals in the water or at rest should be conducted. However, in the unlikely event that a marine wildlife is observed proximal to decommissioning activities, the onboard marine wildlife monitor will observe the animal and will alter or cease onboard operations if the animal may be directly or indirectly affected.

E.3.2.5 Noise Effects

The proposed Project will result in the short-term increase of underwater noise as a result of dynamic pipe ramming operations. Marine mammal noise-associated harassment is defined by NOAA as any noise above 160 dB re 1 μPa RMS, and the Fisheries Hydroacoustic Working Group have developed sound pressure levels (SPLs) safety criteria for fish, which are defined at a maximum of 206 dB re 1 μPa and an accumulated sound exposure level (SEL) of 187 dB re 1 μPa^2-s. All noise associated with the dynamic pipe ramming operations will occur above the water surface, therefore damping the noise levels emitted into the water column. Noise levels will not exceed thresholds defined by NOAA and the Fisheries Hydroacoustic Working Group; therefore are considered less than significant. However, if marine wildlife traverse the site during pipe ramming activities, there is a potential for those individuals to be subjected to noise levels that may disturb their natural behavior and could be considered a significant impact if not mitigated properly.

To avoid significant impacts to marine wildlife, the marine wildlife monitor will be present throughout dynamic pipe ramming operations. The monitor will be located such that he/she has a clear view of the marine waters for at least 300 m (1,000 ft) on either side of the pipeline removal area. A designated "safety zone" of 152 m (500 ft) will be implemented throughout dynamic pipe ramming operations. Each time pipe ramming operations are initiated, the pipe ramming equipment will be slowly ramped-up to allow any wildlife to vacate the area before ramming operations reach full power. All marine wildlife within the safety zone will be noted and recorded if present. If any animals show behavioral changes during equipment start-up, the equipment will be shut down until the animal(s) move out of the safety zone, or after 15 minutes of the animal(s) remaining in the safety zone, the equipment will be slowly ramped-up to full power. If the animal is not sighted after the initial shut down, the wildlife monitor will observe the safety zone for a minimum of ten minutes before allowing the equipment to be reinitiated. The wildlife monitor will have the authority to stop ramming operations if any animals show behavioral changes within the safety zone once the equipment has begun operating. The monitor will also have the authority to recommend continuation or cessation of operations during periods of limited visibility based on the observed abundance of marine wildlife. Periodic reevaluation of weather conditions and reassessment of the continuation/cessation recommendation will be completed by the wildlife monitor.

The wildlife monitor will record all observations of marine wildlife including the species, number of individuals, behavior, distance from the pipeline removal area, and direction of movement. In addition, any actions taken by the monitor or contractor when an animal is observed within the safety zone will also be recorded, as well as the results of those actions.

E.3.2.6 Pre- and Post-Decommissioning Debris Surveys

A pre- and post-debris survey will be conducted utilizing low-energy pulse generating equipment within the offshore facilities lease boundary. The purpose of the pre- debris survey will be to provide a baseline image of the seafloor that can be used to check against the results of a post-project debris survey to ensure that any decommissioning-related debris is identified and recovered. The post-decommissioning survey will aid in identify any targeted debris items that were missed or created by the decommissioning operations. Surveys utilizing geophysical equipment, such as multi-beam echosounders, fall under the CSLC Low Energy Offshore Geophysical Permit Program (OGPP). Debris surveys will be conducted by a currently permitted operator, and prior to the initiation each survey, a separate, survey-specific MWCP will be prepared in accordance with a CSLC issued Low-Energy Geophysical Permit.

E.3.3 Project Lighting

Offshore Project activities are proposed for 24/7 operations. Consequently, lighting will be required for night time work. To minimize potential impacts on marine wildlife and resting shore birds, lighting will be low intensity and directed downward to conduct specific tasks. Direct illumination of wildlife will be avoided, and when possible, green lighting will be used to reduce attraction to the lights and equipment.

E.4 PROCEDURE FOR INJURED OR DECEASED WILDLIFE

E.4.1 Collision with Marine Wildlife

In the event a collision with marine mammal or reptile occurs, the vessel captain must document the conditions under which the accident occurred, including the following:

- Location (latitude and longitude) of the vessel when the collision occurred;
- Date and time of collision;
- Speed and heading of the vessel at the time of collision;
- Observation conditions (e.g., wind speed and direction, swell height, visibility in miles or kilometers, and presence of rain or fog) at the time of collision;

- Species of marine wildlife contacted (if known);
- Whether an observer was monitoring marine wildlife at the time of collision; and
- Name of vessel, vessel owner/operator (the company), and captain or officer in charge of the vessel at time of collision.

In the event a collision occurs, the vessel will stop, if safe to do so. However, the vessel is not obligated to stand by and may proceed after confirming that it will not further damage the marine wildlife by doing so. The vessel operator will then communicate by radio or telephone all details to the vessel's base of operations.

From the vessel's base of operations, a telephone call will be placed to the National Marine Fisheries Service West Coast (California) Stranding Coordinator in Long Beach (Table 6.1), to obtain instructions. Alternatively, the vessel captain may contact the NMFS Stranding Coordinator directly using the marine operator to place the call or directly from an onboard telephone, if available.

The MMPA requires that collisions with or other project-related impacts to marine wildlife will be reported promptly to the NMFS Stranding Coordinator. From the report, the NMFS Stranding Coordinator will coordinate subsequent action, including enlisting the aid of CDFW and/or marine mammal rescue organizations, if necessary.

It is unlikely that the vessel will be asked to stand by until NOAA Fisheries or CDFW personnel arrive; however, this will be determined by the NOAA Fisheries Stranding Coordinator. According to the MMPA, the vessel operator is not allowed to aid injured marine wildlife or recover the carcass unless requested to do so by the Stranding Coordinator.

Although NOAA Fisheries has primary responsibility for marine wildlife in both State and Federal waters, the CDFW will also be advised if an incident has occurred in State waters affecting a protected species. Reports will be communicated to the Federal and State agencies listed in Table E.6.1-1.

Table E.6.1-1. Collision Contact Information

Federal	State	
Justin Viezbicke Stranding Coordinator NOAA Fisheries Service Long Beach, California (562) 980-3230	Enforcement Dispatch Desk California Department of Fish and Wildlife Long Beach, California (562) 590-5132	California State Lands Commission Mineral Resources Management Division Long Beach, California (562) 590-5071

E.5 OBSERVATION RECORDING AND MONITORING REPORT

The marine wildlife monitor will record observations on data forms and will photo-document observations whenever possible. The data forms will be used as the primary source for the Project completion technical report. A Project completion technical report will be prepared and provided to the appropriate agencies, if requested. The report will document Project activities, wildlife observations, and a summary of encounters with any wildlife and subsequent actions taken during the Project. The report will be submitted to the appropriate agencies with 30 days of completion of the Project.

E.6 REFERENCES

Bartholomew, G.A. (1967). Seal and sea lion populations of the California Islands, In: R.N. Philbrick (ed.), Proceedings, Symposium on the Biology of the California Islands, Santa Barbara Botanic Garden, Santa Barbara, CA, pp. 229-244.

Fahy, Tina (personal communication). NOAA Fisheries, Long Beach, California. Telephone discussion with Ray de Wit, Padre Associates, Inc. October 3, 2008.

APPENDIX F
OIL SPILL RESPONSE PLAN

F.1 INTRODUCTION

This Oil Spill Response Plan (OSRP) has been prepared in support of the proposed Chevron Estero Marine Terminal (EMT) Decommissioning Project (Project). The purpose of this OSRP is to present an overview of the measures incorporated into the Project design to minimize the potential for a hydrocarbon release and to outline the procedures and protocols that will be utilized in the event of an onshore or offshore oil spill resulting from Project activities.

Chevron proposes to decommission the EMT tanker berth facilities which include three pipelines; a wastewater outfall line and two petroleum loading lines (Loading Line #1 and Loading Line #2) in accordance with the abandonment requirements. This will be accomplished by removing the majority of the EMT tanker berth facilities in their entirety while potentially abandoning certain portions of the facilities in place should complete removal not be technically feasible or safe to do so. The decommissioning work will be performed using conventional marine and terrestrial equipment and conventional methodologies and procedures. Please refer to Section 2.0 - Project Description for a more detailed description of the proposed decommissioning activities.

F.2 POTENTIAL SPILL SOURCES

Potential spill sources of hydrocarbons include releases from onshore and offshore equipment used during the decommissioning of the EMT facilities, accidental discharges from onshore fuel storage and refueling operations (if needed), and leakage from the pipelines during cleaning and/or removal operations. There are no other pipelines adjacent to the EMT that are considered a potential spill source.

F.2.1 Onshore Equipment

Equipment associated with the onshore decommissioning activities includes excavators, backhoes, bulldozers, loaders, generators, air compressors, hydraulic power sources, dynamic pipe rammer, and welding machines. This equipment is primarily diesel-powered. The use of motorized terrestrial equipment in the onshore and beach operations present opportunities for accidental hydrocarbon releases. These include leakage of fuel, motor oil, or hydraulic fluid when the equipment is operated, when it is idled, during refueling, or during equipment maintenance. To prevent equipment leakage all equipment used at the site will be required to be in good working condition and will be inspected each day for leakage. Onshore, equipment that is found to be leaking petroleum product will be immediately moved to an equipment staging and refueling area and the leaking fluids contained until the equipment is repaired. All onshore equipment refueling and maintenance will take place at a designated equipment staging area which will provide additional protection against off-site migration of oil. In the event of a spill onshore the contractor will take the appropriate action to clean up the spill. Specifically, on-site spill clean-up equipment, such as sorbent pads, booms, and temporary storage facilities shall be available at work sites during all onshore decommissioning activities. Additional resources, available through contracted services, will be available should onsite equipment be insufficient to recover and remove the spilled petroleum product.

F.2.2 Offshore Equipment

Several offshore support vessels may be employed at the Project site while pipelines are removed. A derrick barge with onboard decommissioning equipment such as a diesel-driven crane, air compressors, etc. may be the primary offshore decommissioning support vessel. Additional materials or deck barges may be involved and one or more tugboats may be onsite to set anchors and tend the barges. The derrick barge and all motor driven vessels shall have diesel fuel and/or gasoline, and lubricants onboard. However, while all vessels are considered potential spill sources, the likelihood of a spill is remote because a spill could only occur if the hull of a vessel is breached in the area of the fuel tank, if a storage container is spilled, if deck equipment leaks and the leaks enters the water, or if a vessel sinks.

The derrick barge will have deck equipment aboard to support the offshore decommissioning activities. The deck equipment may include air compressors, generators, welders, dynamic pipe rammer, and winches. The potential for a release from this diesel-powered equipment is minimal due to the small volume of fuel and lubrication fluids contained within each piece of equipment. Equipment that is used on a day-to-day basis will be monitored for leaks; if a leak is observed, the faulty equipment will cease operation and appropriate clean-up and corrective measures will be implemented. All deck-mounted equipment will have drip pans under them and sorbent pads will be available on the barge for clean-up of minor hydrocarbon leaks from the deck equipment. All equipment refueling will be limited to refueling from deck mounted Coast Guard approved fuel totes or from integral fuel tanks built into the derrick barge. No cross-vessel fueling will be permitted. All hydrocarbon-based fluids stored onboard the vessels will be in appropriate containers and will include secondary containment structures.

F.2.3 Pipeline Leaks

Although the pipelines were flushed in 1999 with light-cycle oil then with water to reduce petroleum hydrocarbon concentrations to less than 15 parts per million, the pipelines will be pigged and flushed prior to the start of the decommissioning Project. Analytical results confirming that the proposed concentration target has been achieved will be submitted to the applicable agencies prior to the commencement of decommissioning pipeline removal activities. The pigging and flushing maintenance activity will ensure that any residual hydrocarbons that may still be in the pipelines are removed to the extent feasible prior to decommissioning, minimizing a potential release of hydrocarbons from the pipelines during decommissioning.

F.3 OIL SPILL RESPONSE TEAM

Chevron and its contractors will maintain an onsite spill response team to handle minor spills (five barrels or less) and to provide initial response to major spills (more than five barrels) during Project activities. The onsite response team is responsible for reporting, containment, and clean-up of any minor spills using onsite equipment and procedures.

The onsite team will be supervised by the Onsite Project Manager (or other appointed supervisor) and will consist of all qualified contractor personnel working onsite at the time of the spill. The On-Scene Coordinator will request additional response personnel and equipment, if necessary.

Chevron has an existing contract with Clean Seas for offshore spill response and cleanup services and with Advanced Clean-up Technologies (ACT) for onshore spill support. Although not anticipated, if an offshore release occurs that is beyond the response capabilities of the designated onsite response team, Clean Seas or ACT will provide additional assistance in the mechanical containment and recovery of offshore and terrestrial oil spills, respectively. Contact information for those two contractors is provided in Table F.3-1.

Table F.3-1. Emergency Oil Spill Response Contractors (Secondary Responders)

Role	Contact Information
Terrestrial Emergency Response	**Advanced Clean-up Technologies, Inc.** 937 North A Street Fillmore, California 93016 (805) 542-4997
Marine Emergency Response	**Clean Seas** 990 Cindy Lane, Unit B Carpinteria, CA 93013 (805) 684-3838

F.4 ONSITE RESPONSE EQUIPMENT

The onsite spill response team will have access to an appropriate quantity of onsite spill response and cleanup material during decommissioning activities. The anchor-handling tugboat or other support vessel will be utilized as a boom tender vessel, if necessary. In the event of a spill, the Project Manager will immediately cease Project operations in order to deploy appropriate spill response equipment. Table F.4-1 lists the minimum onsite spill response equipment that will be maintained and readily available for emergency response of minor spills.

Table F.4-1. Onsite Spill Response Equipment Inventory

Quantity	Equipment Type
4	400-foot Absorbent Boom
10 Bales	3M Type 156 Sorbent Pads
100	Plastic Storage Bags
1	Roll of Visqueen sheeting
1,000 feet	Containment Boom

F.5 NOTIFICATION

An important step in the response procedure is notification to others of an incident. Notification is essential to activate the response organizations, alert company management, obtain assistance and cooperation of agencies, mobilize resources and comply with local, State, and Federal regulations. The order of notification is based on the premise that those parties who can render assistance in controlling or minimizing the impacts of an incident be notified before those that are remote from the incident. Refer to Table F.5-1 for a list of agency notifications to be made in the event of an incident. The notification process encompasses the following categories:

- Emergency Agency notification;
- Company notification/onsite spill response team activation;
- Cleanup contractors (if required);
- Notification of other interested parties; and
- Periodic progress updates and reports (if necessary).

Table F.5-1. Emergency Agency Notification Matrix

Type of Emergency	Agencies to be Notified	Telephone	Notification Criteria	Notification Time Frame	Information to Report
Oil Spill to Land or Marine Waters	California Office of Emergency Services	(916) 845-8510	All spills to land or water	Immediately	1. Location of release or threatened release 2. Qty released 3. Type of oil 4. Your name & phone number
	National Response Center	(800) 424-8802			
	USCG Morro Bay Station	(805) 772-2167			
	State Lands Commission (Mineral Resources Management)	(562) 590-5201			
	California Department of Fish and Wildlife/ OSPR	(916) 445-9338			
	California Coastal Commission (Central Coast Office)	(831) 427-4863			
	Oiled Wildlife Care Network	(530) 752-4167			
	Marine Mammal Center - Morro Bay Rescue Line	(805) 771-8300			
Medical Emergencies	Fire Department/ Ambulance	**911**	Medical assistance and/or transport required	ASAP	1. Type of injury 2. Location 3. Condition 4. Action taken 5. No. of victims
	CalOSHA	(800) 794-6900		As required	

ASAP As soon as possible
USCG U.S. Coast Guard
CalOSHA California Occupational Safety and Health Administration
OSPR Office of Oil Spill Prevention and Response

F.5.1 Emergency Agency Notification

The Lampert-Keene Seastrand Oil Spill Prevention and Response Act (SB 2040) requires notification of the California Office of Emergency Services when oil spills occur or threaten to occur from facilities, vessels, or pipelines into California marine waters. It should be noted that the California Oil Spill Contingency Plan defines an oil spill as any amount of oil emitted by any means into California's waters (OSPR, 2001). The California Code of Regulations implementing SB 2040 requires that the specific information shown in Table F.5-2 be given to the agencies when making notifications.

Table F.5-2. Information Checklist

Name of reporter Facility name and location Date and time of the spill
Cause (if known -- don't speculate) and location of the spill
Estimate of the volume of oil spilled and the volume at immediate risk of spillage
Material spilled (e.g., crude oil), and any inhalation hazards or explosive vapor hazards, if known
Prevailing sea conditions: • Wave height • Size and appearance of slick • Direction of slick movement • Speed of movement, if known
Prevailing weather conditions: • Wind speed • Wind direction • Air temperature
Measures taken or planned by personnel on scene • For containment • For cleanup
Current condition of the facility
Any casualties?

NOTE: When making reports, record the agency, name of person contacted, and the date and time of notification. Reporting of a spill shall NOT be delayed solely to gather all the information noted above.

All actions, including agency notification, should be recorded on the Event Log. A regulatory agency address directory is provided in Table F.5-3.

Table F.5-3. Addresses of Regulatory Agencies

NATIONAL RESPONSE CENTER U.S. Coast Guard Headquarters 2100 Second Street SW Ste. 7102 Washington, D.C. 20593	**CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE Office of Spill Prevention and Response (OSPR)** 1700 K Street Ste. 250 Sacramento, CA 95811
U.S. COAST GUARD, Morro Bay Station 1279 Embarcadero Morro Bay, CA 93442	**CALIFORNIA EMERGENCY MANAGEMENT AGENCY** 3650 Schriever Avenue Mather, CA 95655
U.S. DEPARTMENT OF TRANSPORTATION 111 Grand Avenue Oakland, CA 94612	**CALIFORNIA DIVISION OF SAFETY AND HEALTH** 7718 Meany Avenue Bakersfield, CA 93008
NATIONAL MARINE FISHERIES SERVICE 501 W. Ocean Blvd. Long Beach, CA 90802	**CALIFORNIA STATE LANDS COMMISSION** 200 Oceangate, 12th Floor Long Beach, CA 90802
CALIFORNIA COASTAL COMMISSION 725 Front Street, Suite #300 Santa Cruz, CA 95060	

Essential agency notifications are further assured by the California Office of Emergency Services and the National Response Center, since they will notify related State and Federal agencies.

If a spill impacts navigable waters, notification of the National Response Center is mandatory and normally results in simultaneous notification of the U.S. Coast Guard. However, it is recommended that a call be made to the local U.S. Coast Guard office in Morro Bay at (805) 772-2167.

Based on the spill trajectory analysis, if the spill is a threat to the shoreline, the appropriate fire department should also be contacted. This would not normally be an immediate notification.

F.5.2 Company Notification

Chevron requires that all emergencies be brought to the attention of Chevron management. The Onsite Project Manager (Qualified Individual) will notify by radio or telephone appropriate Chevron management with an initial assessment of the extent and nature of the spill, and will activate additional company resources, if necessary.

QUALIFIED INDIVIDUAL

Andy Smith, Project Manager	
WORK:	805-546-6915 805-778-6282
CELLULAR:	805-540-9812

F.6 MARINE SPILL SCENARIOS AND RESPONSE PROCEDURES

F.6.1 Minor Spills

This scenario consists of minor spillage of oil or oily water (less than five barrels) from a marine support vessel or pipeline. In this case, response will consist of deployment of sorbent boom and sorbent pads that are stored on the support barge. In addition, containment boom will be deployed if necessary. Table F.6-1 lists the response procedures for a minor marine spill.

Table F.6-1. Minor Marine Oil Spill Response Procedures

Responsible Person	Action
Marine Superintendent - Contractor	• Assess the spill size and type of material spilled. • Take action to contain the spill and prevent further spillage. • Inform the Project Superintendent as soon as possible as to the source of the spill, type of material spilled and status of control operations. • Maintain surveillance of source and oil slick. • Assist the onsite response team in implementing clean up procedures including deployment of the absorbent and/or containment boom and sorbent pads and proper storage and disposal of oily debris and sorbent pads. • Account for all personnel and ensure their safety. • Determine if there is a threat of fire or explosion. • If a threat of fire or explosion exists, suspend all control and/or response operations until the threat is eliminated. • Assess the spill situation to determine the status of response operations, estimate spill volume, estimate speed and direction of oil slick movement and determine resource needs. • Notify the Project Manager.

Responsible Person	Action
Project Manager - Chevron or Contractor	• Mobilize the onsite oil spill response team. • Determine if oil spill response contractor or oil spill response organization should be notified. • Notify appropriate agencies including: – National Response Center (800) 424-8802 – California Emergency Management Agency (916) 845-8510 – State Lands Commission (562) 590-5201 – California Coastal Commission (831) 427-4863 – California Department of Fish and Wildlife/OSPR (916) 445-9338 – U.S. Coast Guard Morro Bay Station (805) 772-2167 – Oil Wildlife Care Network (530) 752-4167 – Marine Mammal Center – Morro Bay (805) 771-8300 • Supervise response and clean up operations. • File written reports to appropriate agencies.

F.6.2 Major Spills

For the purposes of this OSRP, a major spill is defined as any spill greater than five barrels. The only realistic spill potential is minor spills from the marine support vessels, deck equipment, and the marine terminal pipelines. Since the loading pipelines will be pigged and flushed of any residual hydrocarbons prior to Project commencement, proposed Project activities are not expected to result in a major oil spill. Further, all marine operations will be conducted per the procedures outlined in Appendix G - Marine Safety and Anchoring Plan, which emphasizes “good mariner practices” and further reduces the potential for a large spill to occur as a result of Project implementation.

F.7 ONSHORE SPILL SCENARIOS AND RESPONSE PROCEDURES

F.7.1 Minor Spills

This scenario consists of minor spillage of fuel, oil or hydraulic fluid from terrestrial equipment used to support the onshore decommissioning activities. Any fuel, motor oil, or hydraulic spills that occur will be contained with appropriate containers (i.e. drip pans or other impervious material) and sorbent pads. Sorbent pads will be maintained at each onshore location where work with petroleum-fueled equipment is being performed.

F.7.2 Major Spills

Onshore decommissioning activities will primarily consist of cementing the pipelines from the onshore termination out to a water depth of approximately -4.6 meters (-15 feet) mean low low water (MLLW) and removal of the marine terminal pipelines from the onshore facilities to the beach.

Because the pipelines will be pigged and flushed prior to Project commencement, the marine terminal pipelines are not considered a significant potential source for a major onshore oil spill. None of the other decommissioning activities are expected to involve any large volumes (greater than five barrels) of hydrocarbons. Thus, it is unlikely that sources that could result in a major spill will be encountered during onshore Project activities. However, should oil-containing materials be encountered, they will be handled in accordance with the procedures outlined in Appendix C - Contaminated Materials Management Plan.

APPENDIX C
CONTAMINATED MATERIALS AND MANAGEMENT PLAN

C.1 INTRODUCTION

This Contaminated Materials and Management Plan (CMMP) has been prepared for the proposed Chevron Estero Marine Terminal (EMT) Decommissioning Project (Project). The purpose of this CMMP is to present an overview of the procedures and protocols that will be utilized during the Project to safely and appropriately recover, handle, characterize, store, transport, and dispose of any contaminated materials encountered during the Project. In the event that petroleum hydrocarbon-containing soil is encountered during excavation activities, the contaminated soil will be excavated to the extent necessary to safely remove the pipelines.

C.2 PROJECT BACKGROUND

Chevron has conducted numerous site assessment activities at the EMT Shore Plant area and beach areas to define and characterize the extent of petroleum hydrocarbon impacts. Two areas of petroleum hydrocarbon-containing soil are located west of Highway 1: the northern area is located within the eastern portion of the beach area adjacent to Highway 1 and between the two loading lines, and the southern area is in the former pier bulkhead area (refer to Figure 5.8 -1 – Area of Petroleum Hydrocarbons-Containing Soils). The depths of contaminated soils within these two areas are limited to a "smear zone" within the seasonal fluctuation of groundwater table.

The depth to contaminated soils at the northern area reportedly ranges from 2.7 meter (m) [nine feet (ft)] to 3.7 m (12 ft) in depth with an average thickness of two to three feet (Entrix, 1996). The southern area of petroleum hydrocarbon-containing soils is located beneath the former pier bulkhead area. The depths of petroleum hydrocarbon-containing soil at the bulkhead area range from 4.0 m (13 ft) to 6.1 m (20 ft) and have an average thickness of 1.5 m (five ft) to 2.1 m (seven ft) (Entrix, 1995).

Areas of petroleum hydrocarbon-containing soil and groundwater are known to exist at the Shore Plant area east of Highway 1. Between 2009 and 2011, Chevron completed remedial excavations at three areas, known as the Estero Source Removal Project. The Source Removal Project was conducted to comply with Cleanup or Abatement Order No. 98-091 issued by the California Regional Water Quality Control Board – Central Coast Region (RWQCB). The objective of the Source Removal Project was to improve groundwater quality at the Project site by removing mobile separate-phase petroleum hydrocarbons within the saturated zone in three identified plume areas. These include the Cutter Stock area, 1999 Pipeline Release area, Control House area, and the Ballast Pond. Following completion of the excavations and backfill of each area, new groundwater monitoring wells were installed within the excavation area footprints to facilitate evaluation of groundwater quality and compliance with the site closure objective of one milligram per liter (mg/L) for total petroleum hydrocarbons.

The completion of the Source Removal Project is documented in the *Remedial Action Completion Report, Estero Source Removal Project, Chevron Estero Marine Terminal, Morro Bay, California*, prepared by Cardno-Entrix and dated June 2011. During the course of the Project, a total of approximately 32,400 cubic yards of petroleum hydrocarbon-containing soil was excavated and transported offsite for disposal at the Chemical Waste Management disposal facility located in Kettleman City, California. Additionally, a total of 9,937 gallons (238 barrels) of petroleum were recovered from the excavations and transported to the Chevron Midway Pump Station in Taft, California, for re-introduction into the crude oil pipeline system (Cardno-Entrix, 2011). The various phases of the Project will also have the potential to result in excavation or handling of petroleum hydrocarbon-containing soils which will be managed in accordance with this CMMP. The RWQCB will review the CMMP prior to the initiation of Project construction activities. Therefore, all CMMP activities at the subject facility will be conducted under the direction of a Chevron representative in consultation with the RWQCB.

Pilings and side wall timbers that have been treated with creosote may also be encountered during the demolition of the former pier bulkhead. Wood that has been treated with a wood preservative is considered Treated Wood Waste (TWW) and will be managed in accordance with the *California Waste Code for Treated Wood Waste (California Code of Regulations Title 22, Division 4.5, Chapter 11, Appendix XII)*.

C.3 HEALTH AND SAFETY PLAN

The contractor will be required to prepare a site-specific Health and Safety Plan for the Project. This Health and Safety Plan will present protocols to protect worker and community health and safety during the course of the Project. In addition, the contractor will be required to provide documentation demonstrating completion of health and safety training for all employees involved with work at the Project site.

C.4 FIELD PROCEDURES AND PROTOCOLS

The following field procedures and protocols will be applied to appropriately handle petroleum hydrocarbon-containing soils encountered during decommissioning of the facility.

C.4.1 Field Monitoring

Monitoring of the pipeline excavations for contaminated soils will be conducted by a trained and experienced field monitor under the direction of a State of California Professional Geologist. The onsite field monitor will observe the excavation activities for visual indications of hydrocarbon-containing soil. The field monitor will conduct field screening of suspect soils to identify and segregate the total petroleum hydrocarbon (TPH)-affected materials. The soil will be screened visually and through the use of a field portable photoionization detector (PID). Soil samples will be collected for chemical analysis from the pipeline excavation in areas that are visibly contaminated or indicate elevated PID readings. Soil samples will be collected from areas of suspected contamination to confirm visual and PID indications. Soil samples will also be collected from areas after excavation to document the removal of TPH-affected soils. Soil samples will be geologically logged by Padre using the Unified Soil Classification System.

After removal of the pipelines and confirmation sampling is performed, the excavated area will be backfilled with soils from the Project site.

C.4.2 Sample Collection and Analytical Program

Sample Collection. In the event excavation activities encounter contaminated soils, confirmation soil samples will be collected directly from the trench floor or lower portion of the trench sidewall. All sample collection locations will be documented by the onsite monitor by reference to a permanent marker or located using a hand-held Global Positioning System (GPS) receiver.

Soil samples will also be collected from stockpiled contaminated materials for chemical analyses. Soil samples will be collected utilizing four-ounce glass jars with Teflon-lined lids. Samples will be sealed, labeled, and placed in a properly pre-cooled ice chest immediately following collection. The samples will be delivered to an independent, state-certified analytical laboratory the same day of collection, and chain-of-custody forms will be used to document sample management. Sample collection will be documented in the field monitor's log and on a site map. Groundwater samples may also be collected from the excavations if potentially contaminated groundwater is required to be pumped from the excavation to permit a safe work area or could be released to the Pacific Ocean or Toro Creek.

Representative samples will be collected from the former pier bulkhead pilings, side wall timbers and suspected TWW materials in order to characterize the material for disposal purposes. Materials suspected of being TWW will be sampled to include a representative sample by weight. TWW is typically impregnated on the outside with only partial saturation to the interior of the material. However, for disposal purposes a representative sample of the entire material must be submitted for chemical analysis by weight – including the center of the material which is not impregnated with a wood preservative, but will be disposed of as treated wood waste. A complete cross section of pilings or timbers shall be collected and submitted to the analytical laboratory for particle size reduction, homogenization and chemical analysis. After the laboratory has performed particle size reduction and prepared a homogenous sample, a representative sample can be collected for chemical analyses. Analytical results can then be reported on weight-to-weight basis (i.e., milligrams per kilogram [mg/kg]).

C.5 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance/Quality Control (QA/QC) procedures will be utilized in both sample collection and chemical analyses. The purpose of the QA/QC procedures will be to ensure the reliability and compatibility of all data generated during the soil and waste characterization activities. The analytical laboratory will provide laboratory QA/QC to include sample spikes and spike duplicates, instrument blanks, and surrogate recoveries. Field QA/QC will include decontamination blanks and trip blank samples. Decontamination and trip blanks will be collected at a frequency of one sample per day.

C.5.1 Field Quality Assurance/Quality Control Procedures

Field QA/QC procedures will be performed at the Project site and consist of the following measures:

- Chain-of-Custody (COC) forms will be used for sample submittal to the laboratory; and
- Field information regarding sample collection, sample types, soil descriptions, sample identification numbers, and sample times will be collected and recorded on Field Data Sheets or in the Field Logbooks as required.

The COC will be used to document sample collection and shipment to the laboratory for analysis. A COC record will accompany all samples submitted for analysis. Forms will be completed and sent with the samples for each laboratory and each shipment. The COC record will identify the contents of each shipment and maintain the custodial integrity of the samples. Generally, a sample is considered to be in someone's custody if it is either in someone's physical possession, in someone's view, locked up, or kept in a secured area that is restricted to authorized personnel. Until receipt by the laboratory, the custody of the samples will be the responsibility of the sample collector.

Field QA/QC samples will be collected and submitted for analysis along with the samples using the following sampling frequency:

- **Trip Blanks.** One trip blank sample per each day of sample collection; and,
- **Decontamination Blank.** One decontamination blank per each day of sample collection.

C.5.2 Trip Blank Samples

Trip blank samples consist of a sample of the deionized water provided by the laboratory and stored with the unique samples collected during each day of field activities. The purpose of the trip blank sample is to evaluate the potential for cross-contamination of samples during handling in the field. The trip blank samples will be handled in the same manner as all other samples and submitted for TPH/ benzene, toluene, ethylbenzene, and xylenes (BTEX) analyses.

C.5.3 Decontamination Blank Samples

The decontamination blank will be collected from the final rinsate water used to clean sampling equipment. The purpose of the decontamination sample is to ensure that cross contamination is not occurring from one sample collection location to another. The decontamination blanks will be handled in the same manner as all other samples and submitted for TPH/BTEX analyses.

C.6 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Laboratory QA/QC procedures include the following:

- Laboratory analyses will be performed within the required holding time for all samples;
- A state-certified hazardous waste testing laboratory will conduct the required analysis; and
- The laboratory will provide the following information for each sample:
  - Method blank data;
  - Surrogate recovery, instrument tuning, and calibration data; and
  - Signed laboratory reports including the sample designation, date of sample collection, date of sample analysis, laboratory analytical method employed, sample volume, and the minimum Reporting Limit (RL).

Chevron will utilize a California certified laboratory to provide the chemical analyses of the samples collected.

C.7 LABORATORY ANALYTICAL PROGRAM

Soil and groundwater samples collected during the course of the Project will be chemically analyzed for the following:

- TPH by United States (U.S.) Environmental Protection Agency (EPA) method 8015 modified, in the carbon range of C_4 to C_{40};
- BTEX and methyl tertiary-butyl ether (MtBE) by U.S. EPA method 8260;
- Polynuclear aromatic hydrocarbons (PAHs) by U.S. EPA method 8270; and

Suspected TWW samples collected during the course of the Project will be chemically analyzed for the following:

- o, m, & p-Cresol, Naphthalene, and Anthracene by toxicity characteristic leaching procedure (TCLP) extraction and EPA 8270 analysis;
- Pentachlorophenal by EPA 8270;
- California Assessment Metals (CAMs) 17 metals; and
- 96-hour fish bioassay for total toxicity using fathead minnows, if required.

C.8 STOCKPILING OF CONTAMINATED SOILS

This section presents stockpiling requirements to be followed in the event that petroleum hydrocarbon-containing soil is encountered during excavation activities. During excavation activities, uncontaminated materials will be stockpiled adjacent to the excavation for reuse as fill material during the backfill and compaction process. In the event that TPH-containing soil is encountered during excavation activities, the contaminated soil will be excavated to the extent necessary to safely remove the pipelines. TPH-containing stockpiles will be assessed for hydrocarbon content per the procedures outlined below. Soils indicated with TPH concentrations in excess of 100 milligram per kilogram (mg/kg), based on chemical analyses, will not be used for backfill material at the Project site.

TPH-containing soil will be removed from the beach using a rubber-tire loader and loaded onto dump trucks to be transferred to the Shore Plant area east of Highway 1. It is anticipated that a designated stockpile area located at the onshore facility east of Highway 1 will be used to stockpile any TPH-containing soils encountered during excavation activities.

Designated stockpile areas will be identified at the Shore Plant area prior to the initiation of excavation activities:

- Covers on storage piles will be maintained in place at all times in areas not actively involved in soil addition or removal;
- Contaminated soil will be covered or encapsulated with an impermeable material. No headspace shall be allowed by the covering where vapors could accumulate;
- Covered piles will be designed in such a way to eliminate erosion due to water or public nuisance;
- Clean soils will be segregated from contaminated soils; and
- TWW stockpiled prior to transportation will be stored on polyethylene sheeting.

C.9 WASTE MANAGEMENT

C.9.1 Contaminated Soil

In the event that soil with TPH concentrations in excess of 100 mg/kg are encountered, the contaminated material will be segregated from other materials, chemically characterized, and then transported to an appropriate receiving facility for proper disposal or treatment and recycling. Uncontaminated soil will be used to backfill the excavation areas.

C.9.2 Pipe Coating

The coated pipelines will be handled and disposed as non-friable asbestos waste or recycled in accordance with Federal and State regulations (Refer to Appendix M – Asbestos Removal and Disposal Plan).

C.9.3 Treated Wood Waste

Chemical analyses will be performed to determine whether the TWW is Federally regulated as hazardous waste pursuant to the Resource Conservation and Recovery Act of 1976 (“RCRA-TWW”), or California regulated under California Code of Regulations, Title 22 (“TWW”), or both, or a non-hazardous waste.

C.10 REPORTING

Chevron will notify the following agencies in the event that soil with TPH in excess of 100 mg/kg is encountered during excavation activities:

- Central Coast Regional Water Quality Control Board;
- County of San Luis Obispo Division of Environmental Health; and
- California State Lands Commission.

Following completion of the Project, Chevron will submit a report to the above-listed agencies which will include the volumes of contaminated soils removed, results of sampling and laboratory analyses, and the disposition of contaminated materials including TWW. Copies of all laboratory analytical reports and waste manifests will also be included with the report.

C.11 REFERENCES

Cardno-Entrix. 2011. *Remedial Action Completion Report, Estero Source Removal Project, Chevron Estero Marine Terminal, Morro Bay, California,* prepared for Chevron Environmental Management Company. June 30.

Entrix. 1995. *Results of Additional Well Installation & Third Quarter 1995 Monitoring and Sampling, Chevron Estero Marine Terminal,* prepared for Chevron Pipe Line Company. August.

____. 1996. *Atascadero Beach Investigation, Remediation, and Restoration, Chevron Estero Marine Terminal*, prepared for Chevron Pipe Line Company. March.