Shelby Lathrop
Operations Lead West

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July 1, 2021

Mr. Peter Campbell, Project Manager
Alaska Department of Environmental Conservation / SPAR / CSP
43335 Kalifornsky Beach Road, Suite 11
Soldotna, AK 99669-8250

Re: Trading Bay Production Facility
2021 Trading Bay Production Facility Groundwater Monitoring and
Site Investigation Work Plan – Amendment 1

ADEC File Number: 2337.38.007
ADEC Hazard ID Number: 1263

Dear Mr. Campbell,

Attached for your review is the *Trading Bay Production Facility, 2021 Trading Bay Production Facility Groundwater Monitoring and Site Investigation Work Plan – Amendment 1* for the referenced facility. The report was prepared by Stantec on behalf of Chevron Environmental Management Company (CEMC).

If you should have any further questions, please do not hesitate to contact me at (925) 842-4249 or via email at SLathrop@chevron.com.

Sincerely,

Shelby Lathrop
Operations Lead West

Cc: Craig Wilson, Stantec

2021 Trading Bay Production Facility Groundwater Monitoring and Site Investigation Work Plan – Amendment 1

June 29, 2021

Prepared for:

Chevron Environmental Management Company

Prepared by:

Stantec Consulting Services Inc.
725 East Fireweed Lane, Suite 200
Anchorage, AK 99503-2245

ADEC File Number: 2337.38.007
ADEC Hazard ID: 1263

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	Craig Wilson	6/28/2021	Roxanne Russell	6/29/2021	Tom Madsen	6/29/2021

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Prepared by 

(signature)

Craig Wilson

Reviewed by 

(signature)

Roxanne Russell

Approved by 

(signature)

Tom Madsen

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Abbreviations & Acronyms

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
CEMC	Chevron Environmental Management Company
COBC	Compliance Order By Consent
Hilcorp	Hilcorp Alaska, LLC
LNAPL	Light Non-Aqueous Phase Liquid
NAPL	Non-Aqueous Phase Liquid
PFAS	Per- and Poly-Fluorinated Alkyl Substances
PRB	Permeable Reactive Barrier
RWS	Recovery Well System
Stantec	Stantec Consulting Services, Inc.
TBPF	Trading Bay Production Facility
USEPA	U.S. Environmental Protection Agency
UNOCAL	Union Oil Company of California
Weston	Weston Solutions, Inc.

1.0 INTRODUCTION

This work plan amends the approved Trading Bay Production Facility 2021 Groundwater Monitoring and Site Investigation Work Plan (Stantec 2021a), referred to as the "2021 Work Plan." The 2021 Work Plan was submitted to the Alaska Department of Environmental Conservation (ADEC) by Stantec Consulting Services Inc. (Stantec) on behalf of Chevron Environmental Management Company (CEMC) in support of investigation and remedial efforts at the Trading Bay Production Facility (TBPF).

Stantec has prepared this "Work Plan Amendment" in response to items requested by ADEC (ADEC 2021) and to results of the of the May 24 through June 7, 2021 field event. This Work Plan Amendment covers the following items:

- Activities to address the benzene concentrations located on the north beach area down gradient of the permeable reactive barrier (PRB)
- Updated procedures for rehabilitation of the recovery well system (RWS)
- Updated project schedule

This work plan does not address ADEC's request to sample for per- and poly-fluorinated alkyl substances (PFAS) from the RWS effluent. A sampling plan for that activity will be addressed separately. Unless specifically noted otherwise in this document, the project team, schedule, procedures, and methods described in the 2021 Work Plan remain applicable.

1.1 AMENDED PROJECT SCHEDULE

Table 1 presents the proposed project schedule for the remainder of the 2021 activities, including the new activities described in this amendment.

Table 1 2021 Proposed Project Schedule (Amended)

Task	Date	Approximate Duration
Recovery Well System O&M and Sampling	Monthly (April – November)	1 Day / month
Beach Seep Sampling and Monitoring Well Sampling, Recovery Well System Maintenance	July 2021	7 Days
Beach Seep Sampling & PRB Monitoring, Recovery Well System Maintenance	September 2021	11 Days

2.0 NORTH BEACH REMEDIATION

2.1 PERMEABLE REACTIVE BARRIER

In accordance with the *2019 Trading Bay Production Facility Additional Beach Assessment and Permeable Reactive Barrier Pilot Study Work Plan* (Stantec 2019a), a 200-foot long pilot PRB was installed on the north beach in October of 2019 (**Figure 1**). The PRB is perpendicular to the identified groundwater flow to allow for in-situ chemical adsorption and enhanced biodegradation. The results of grab groundwater sampling performed upgradient and downgradient of the PRB in 2019 and 2020 have been presented in the annual reports to ADEC (Stantec 2021b).

2.2 PRB PERFORMANCE MONITORING

Grab groundwater samples were collected downgradient of the PRB in 2019 and at two upgradient locations in 2020, to establish baseline concentrations of the dissolved benzene plume for future performance monitoring. Additional direct push groundwater grab samples were collected in September 2020 and May 2021 to determine the effectiveness of the PRB. An additional PRB monitoring event is currently scheduled for September 2021, as described in the 2021 Work Plan (Stantec 2021a).

2.2.1 Benzene Concentrations Down Gradient of the PRB

Prior to installation of the PRB, the results of grab groundwater sampling in 2019 showed a discrete zone of elevated dissolved benzene concentrations down gradient of the PRB around sample points Z4-12 and Z4-13 (**Figure 2**). Subsequent sampling in September 2020 and May 2021 shows a decreasing trend in benzene concentrations in the vicinity of Z4-12 and Z4-13 (**Figures 3** and **4**). Additional sampling will be conducted in September 2021 to continue monitoring the natural attenuation of the dissolved benzene concentrations and provide data for determining future actions.

2.2.2 September 2021 PRB Monitoring Event

The September 2021 PRB monitoring event (described in Section 5.3 of the approved 2021 Work Plan) will be modified slightly, based upon a review of the September 2020 and May 2021 monitoring events. Locations Z5-1, Z5-4, Z5-5, and Z5-6 will not be resampled. Previous sampling at these locations indicates no detectable dissolved benzene concentrations above the laboratory reporting limit for at least two consecutive sampling events. The deeper sampling intervals at Z3-11, Z3-13, Z4-12, and Z4-13 will also be dropped from the September event as the vertical extent of dissolved benzene concentrations has generally been determined from previous sampling events. Instead, the September monitoring event will add locations Z2-5, Z3-4, Z3-5, and Z4-4 to evaluate current dissolved benzene concentrations to the south and southeast of the PRB.

3.0 RECOVERY WELL SYSTEM REHABILITATION

3.1 RECOVERY WELL SYSTEM

The RWS consists of 14 wells that were installed along the bluff top in 2018 to depress the water table, recover mobile non-aqueous phase liquids (NAPL), and mitigate potential further migration of impacts into the beach zone (**Figure 1**). The system was installed per the ADEC-approved work plan dated August 10, 2018, and details of construction are documented in the 2018 annual report dated April 12, 2019 (Stantec 2019b). Pumps are currently installed in eleven of the recovery wells: RW-1, RW-2, RW-3, RW-4, RW-5, RW-7, RW-9, RW-10, RW-11, RW-12, and RW-13. Details of the system's operation and performance have been documented in previous reports, and the 2021 monitoring event schedule and scope are described in the 2021 Work Plan (Stantec 2021a).

3.2 RECOVERY WELL REHABILITATION

As noted in previous reports, iron biofouling and sedimentation in the recovery wells, pumps, and piping have been observed since startup, leading to noticeable declines in performance, increased maintenance requirements, and occasional pump down time. The totalizer, which records total fluid flow from the system, has also been affected to the point of being rendered inoperative due to sediment in the piping.

Proposed 2021 well rehabilitation activities described in the 2021 Work Plan consisted of manual agitation and flushing of the wells to remove silt and sediment, along with an acid/bioacid dispersant flush to reduce iron-reducing bacteria in the wells. This amendment to the 2021 Work Plan emphasizes manual cleaning of the recovery well system and defers the acid/bioacid dispersant flush to the 2022 season.

3.2.1 Mainline Cleaning

The June 2021 well rehabilitation activities were limited to mechanical removal of silt and sediment from the active wells, with encouraging results. The remaining impediment to full system flow appears to be the sedimentation and scale buildup of the mainline piping, particularly in the area immediately upstream of the totalizer.

The mainline section between the MH-16 sampling ports and the totalizer will be mechanically cleaned using a plumbing snake during the September site visit in an attempt to remove accumulated sediments and fouling in the area where the mainline transits through several right-angle bends. The isolation valve immediately upstream of the totalizer will be temporarily removed to allow mechanical access to a section of piping between the totalizer and MH-16. After mechanical cleaning, and pending Hilcorp approval, a temporary hose will be connected between the isolation valve flange and the facility sand trap and the mainline piping will be flushed using the recovery well pumps. The pump effluent will enter the sand trap and be processed by the facility's wastewater treatment system, similar to normal RWS operation.

4.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC). 2017. *Site Characterization Work Plan and Reporting Guidance for Investigation of Contaminated Sites*. March.

ADEC. 2019a. *Field Sampling Guidance.* October.

ADEC. 2019b. *Minimum Quality Assurance Requirements for Sample Handling, Reports, and Laboratory Data*. October.

ADEC. 2020. *18 AAC 75, Oil and Other Hazardous Substances Pollution Control.* November 7.

ADEC. 2021. *Letter to Shelby Lathrop, CEMC.* File 2337.38.007. May 19.

Stantec. 2018. *Conceptual Design for Recovery Well System at the Trading Bay Production Facility*. July 13.

Stantec. 2019a. *2019 Trading Bay Production Facility Additional Beach Assessment and Permeable Reactive Barrier Pilot Study Work Plan*. August 27.

Stantec. 2019b. *Trading Bay Production Facility 2018 Site Investigation, Groundwater Monitoring, and Recovery Well System Report*. May 9.

Stantec. 2020. *Trading Bay Production Facility 2019 Site Investigation, Groundwater Monitoring, and Recovery Well System Report*. April 7.

Stantec. 2021b. *Trading Bay Production Facility 2020 Site Investigation, Groundwater Monitoring, and Recovery Well System Report*. March 16.

Stantec. 2021a. *2021 Trading Bay Production Facility Groundwater Monitoring and Site Investigation Work Plan*. April 27.

FIGURES

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STORMWATER RETENTION POND
PRODUCED WATER RETENTION PONDS
TANK BATTERY 2
TANK BATTERY 1
FACILITY OFFICE

BH-1
BH-1.5
BH-2
BH-2.5
BH-3
BH-4
BH-5
BH-6
BH-7
BH-8
BH-9
BH-10
WCMC

MW-6
RW-14
M-113
F-2
RW-13
RW-12
M-112
F-MW-1
RW-11
M-108
E-MW-1
RW-10
M-111
MW-5
RW-9
DE-8
L-7
M-110
RW-8
M-103
M-102D
M-102S
M-8
RW-7
M-109
N-9
RW-6
MW-4
M-115*
RW-5
M-105*
D-MW-1
RW-4
M-101
S-101
M-107*
RW-3
MW-3
RW-2
N-MW-1
GAMW-4
RW-1
M-106
GAMW-3
CL-1
GAMW-2
GAMW-1
M-116
MW-2
A-MW-1
MW-1
CP-21

N
0 25 50 100
Feet

- Beach Seep Sample Location
- Bluff Top Monitoring Well
- Survey Control
- Recovery Well
- Air Sparge Wells
- Permeable Reactive Barrier (PRB)
- Air Sparge Unit
- Old Outfall Pipeline

Note: * denotes cluster well

SOURCE:
1. Coordinate System: NAD 1983 StatePlane Alaska 4 FIPS 5004 Feet
2. Orthoimagery Source: World Imagerry - Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Project Location
Trading Bay Production Facility
T8N, R14W, S5

Prepared by BT on 2019-01-28
Technical Review by JT on 2019-01-28
Independent Review by AS on 2019-01-28

Client/Project
Chevron Environmental Management Company
Trading Bay Production Facility
2021 Work Plan Amendment

Figure No.
1

Title
TRADING BAY PRODUCTION FACILITY SITE MAP

COOK INLET

APPROXIMATE MHHW (HIGH TIDE)

MLLW (LOW TIDE) IS ~1,000 FEET EAST OF THE BLUFF

ESTIMATE AREA OF NAPL BASED ON SEPARATE PHASE THICKNESS MEASURED IN WELLS, AND/OR FLUORESCENCE FROM OIP BORINGS

M-111 NAPL THICKNESS: 4.52'

L7 NAPL THICKNESS: 1.44'

DE8 NAPL THICKNESS: 0.6'

N9 NAPL THICKNESS: 0.04'

M-102D NAPL THICKNESS: 5.23'

M-115S NAPL THICKNESS: 0.01'

M-115D NAPL THICKNESS: 0.05'

GAMW-3 NAPL THICKNESS: 0.3'

GAMW-2 NAPL THICKNESS: 2.15'

PRODUCED WATER RETENTION PONDS

5 500 1000 1500

0 125 250

APPROXIMATE SCALE IN FEET

LEGEND:

- ABANDONED MONITORING WELL (Prior to 2019)
- MONITORING WELL
- RECOVERY WELL
- MANHOLE (36-INCH DIA)
- BEACH SEEP SAMPLE (August 2020 and September 2020)
- GROUNDWATER/PORE WATER SAMPLING LOCATION (May 2019)
- OIP/SP16 BORING (May 2019)
- GROUNDWATER/PORE WATER SAMPLING LOCATION (September 2019)
- SP16 BORING (September 2019)
- BENZENE CONTOUR (100' INTERVAL)
- LOCATION OF PERMEABLE REACTIVE BARRIER
- WELL WITH MEASURABLE LNAPL

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PROJECT/CLIENT:

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY TRADING BAY PRODUCTION FACILITY
2021 WORK PLAN AMENDMENT

TITLE:

2019 BENZENE ISOCONCENTRATION MAP

PROJECT No.
203721193

dwg_203721193_site_annual_2020.dwg JRO/ RR/ TM 03/12/2021

FIGURE No.

2

COOK INLET

APPROXIMATE MHHW (HIGH TIDE)

MLLW (LOW TIDE) IS ~1,000 FEET EAST OF THE BLUFF

ESTIMATE AREA OF NAPL BASED ON SEPARATE PHASE THICKNESS MEASURED IN WELLS, AND/OR FLUORESCENCE FROM OIP BORINGS

M-111 NAPL THICKNESS: 3.60'

F-MW1 NAPL THICKNESS: 0.01'

DE-8 NAPL THICKNESS: 0.38'

L-7 NAPL THICKNESS: 0.14'

N-9 NAPL THICKNESS: 0.03'

M-102D NAPL THICKNESS: 4.66'

RW-7 NAPL THICKNESS: 0.10'

RW-4 NAPL THICKNESS: 0.01'

RW-2 NAPL THICKNESS: 0.63'

M-115S NAPL THICKNESS: 0.02'
M-115D NAPL THICKNESS: 0.34'

GA-MW-2 NAPL THICKNESS: 4.04'

PRODUCED WATER RETENTION PONDS

0 125 250

APPROXIMATE SCALE IN FEET

LEGEND:

- ABANDONED MONITORING WELL (Prior to 2019)
- MONITORING WELL
- RECOVERY WELL
- MANHOLE (36-INCH DIA)
- BEACH SEEP SAMPLE (August 2020 and September 2020)
- GROUNDWATER/PORE WATER SAMPLING LOCATION (May 2019 and September 2019)
- OIP/SP16 BORING (May 2019 and September 2019)
- GROUNDWATER SAMPLING LOCATION (September 2020)
- SP16 BORING (September 2020)
- BENZENE CONTOUR (100' INTERVAL)
- LOCATION OF PERMEABLE REACTIVE BARRIER
- WELL WITH MEASURABLE LNAPL

NOTES:
1) 2019 SP16 GRAB GROUNDWATER SAMPLE RESULTS WERE USED TO ESTIMATE ISOCONCENTRATIONS IN AREAS NOT SAMPLED IN 2020.

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PROJECT/CLIENT:

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY TRADING BAY PRODUCTION FACILITY
2021 WORK PLAN AMENDMENT

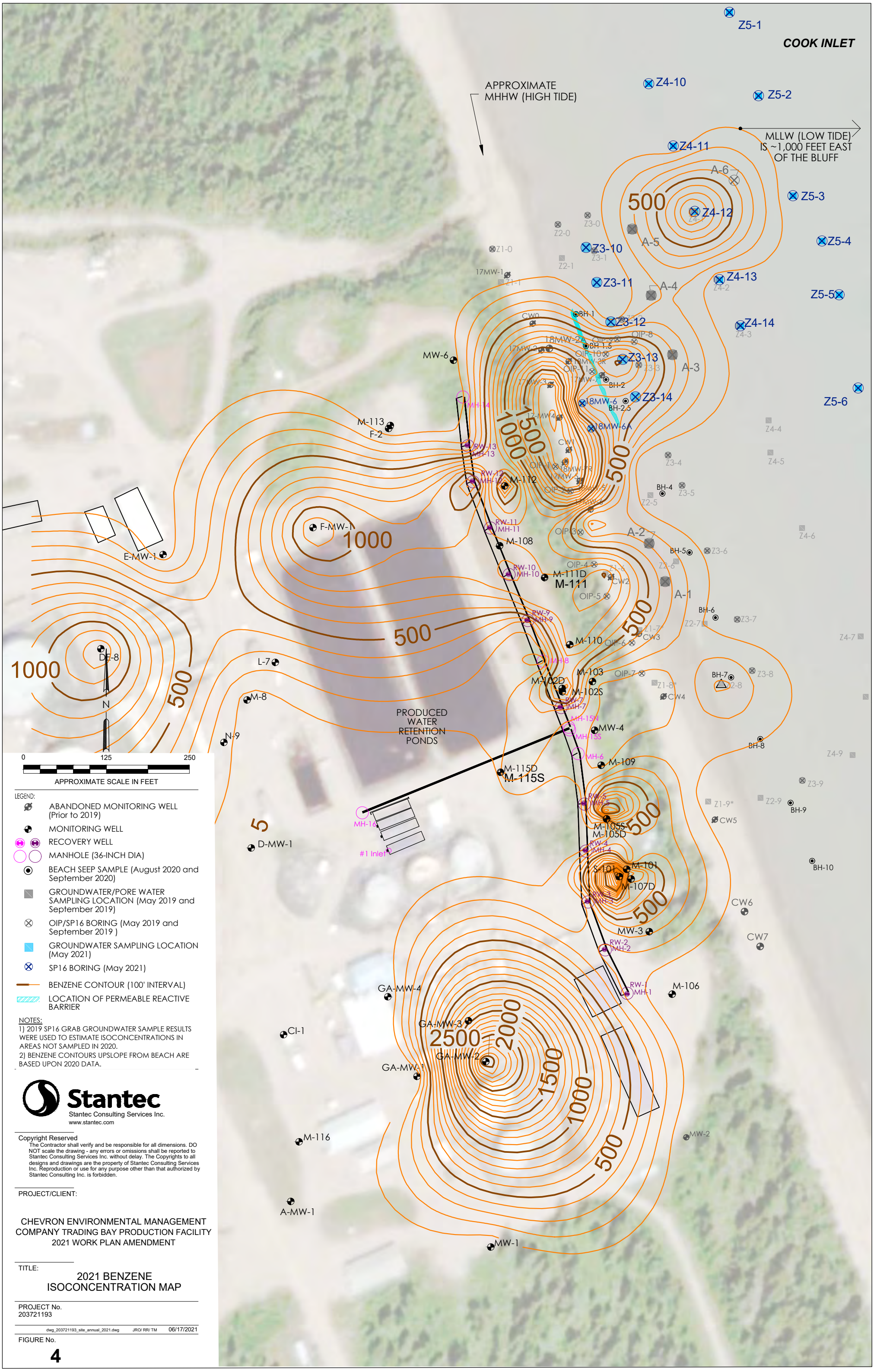
TITLE:

2020 BENZENE ISOCONCENTRATION MAP

PROJECT No.
203721193

dwg_203721193_site_annual_2020.dwg JRO/ RR/ TM 12/09/2020

FIGURE No.
3



LEGEND:

- ABANDONED MONITORING WELL (Prior to 2019)
- MONITORING WELL
- RECOVERY WELL
- MANHOLE (36-INCH DIA)
- BEACH SEEP SAMPLE (August 2020 and September 2020)
- GROUNDWATER/PORE WATER SAMPLING LOCATION (May 2019 and September 2019)
- OIP/SP16 BORING (May 2019 and September 2019)
- GROUNDWATER SAMPLING LOCATION (May 2021)
- SP16 BORING (May 2021)
- BENZENE CONTOUR (100' INTERVAL)
- LOCATION OF PERMEABLE REACTIVE BARRIER

NOTES:

1) 2019 SP16 GRAB GROUNDWATER SAMPLE RESULTS WERE USED TO ESTIMATE ISOCONCENTRATIONS IN AREAS NOT SAMPLED IN 2020.
2) BENZENE CONTOURS UPSLOPE FROM BEACH ARE BASED UPON 2020 DATA.

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2021 WORK PLAN AMENDMENT

TITLE:

2021 BENZENE ISOCONCENTRATION MAP

PROJECT No.
203721193

dwg_203721193_site_annual_2021.dwg JRO/ RR/ TM 06/17/2021

FIGURE No.

4