

Atlantic Richfield Company

Paul G. Johnson
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March 4, 2022

Jessica LaClair
Project Manager
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

**RE: Monthly Progress Report, February 2022
Former Anaconda Plant (a.k.a. Harbor at Hastings Site) Site No. 3-60-022
Hastings-On-Hudson, New York**

Dear Ms. LaClair:

Enclosed is the February 2022 Monthly Progress Report for the Former Anaconda Plant (a.k.a. Harbor at Hastings Site), New York State Department of Environmental Conservation (NYSDEC) Site No. 3-60-022, Hastings-on-Hudson, New York. This progress report has been prepared in accordance with Section XI of the AMENDED ORDER ON CONSENT and ADMINISTRATIVE SETTLEMENT between Atlantic Richfield Company and NYSDEC, dated November 6, 2013. The time period covered is February 1, 2022 through February 28, 2022.

If you have any questions or comments on this submittal, please feel free to contact me at 630-731-4463.

Sincerely,



Paul G. Johnson
Liability Manager

Enclosure

cc: Village Manager Mary Beth Murphy, Hastings-On-Hudson
Mark Chertok, Hastings-On-Hudson
Karl Coplan, Pace/Riverkeeper
File

ecc: David Harrington, Director, Bureau D, NYSDEC DER
Jacquelyn Nealon, New York State Department of Health
Maureen Schuck, New York State Department of Health
Andrew Guglielmi, NYSDEC, Office of General Counsel
Mayor Nicola Armacost, Hastings-On-Hudson
Trustee Morgan Fleisig, Hastings-On-Hudson
Village Manager Mary Beth Murphy, Hastings-On-Hudson
Nat Federici, P.E., Westchester County Department of Environmental Facilities
Rachel Noe, Westchester County
Jim Lucari, BP
Michael Daneker, Arnold & Porter
Martha Gopal, Sovereign Consulting Inc.

**FORMER ANACONDA WIRE AND CABLE PLANT SITE
(a.k.a. HARBOR AT HASTINGS SITE) OU1
NYSDEC SITE 360022
MONTHLY PROGRESS REPORT 201**

PREPARED BY: Atlantic Richfield Company
Paul Johnson

REPORTING PERIOD: February 1, 2022 through February 28, 2022

1. PROGRESS MADE THIS REPORTING PERIOD:

- DNAPL gauging and recovery was performed on February 7th, and February 8th, 2022; HARW-2 and HARW-5 were gauged and pumped as required by the August 2011 Design Basis Memorandum.
- LNAPL gauging and recovery was performed on February 4th, 2022 in accordance with the IRM Work Plan (Fluor Daniel GTI, December 1997), Fluor Daniel GTI correspondence to the NYSDEC dated May 18, 1998 and Atlantic Richfield correspondence with the NYSDEC on September 2, 2010.
- Progress continued on these on-going design-related activities:
 - *Turbidity Control and Water Quality Monitoring Plan Matrix* provided to NYSDEC February 11th, 2022; awaiting comments.
 - *Final Compliance Monitoring & Adaptive Management Plan for Compensatory Wetland* submitted January 19th. Verbally approved, awaiting written approval.
 - Development of shoreline concepts
 - Wetland wave barrier design
 - SPDES Permit Equivalent Application
 - Community Air Monitoring Plan
 - Community Environmental Response Plan
 - Other design elements
 - Biological Assessment and Essential Fish Habitat Reports (NMFS)
 - Nationwide Permit 38 Pre-Construction Notification
 - Awaiting approval of the TSCA Risk-Based Disposal Action Application from USEPA; NYSDEC and USEPA TSCA to meet in March.

2. UNANTICIPATED PROBLEM AREAS AND RECOMMENDED SOLUTIONS

- None this reporting period.

3. PROBLEMS RESOLVED

- None this reporting period.

4. DELIVERABLES SUBMITTED / RECEIVED

- February 3rd, 2022, Atlantic Richfield to NYSDEC: *Hastings January 2022 Monthly Progress Report*.
- February 16th, 2022, Atlantic Richfield to NYSDEC: *Annual Interim Remedial Measures Report* (LNAPL).
- February 25th, 2022, Atlantic Richfield to NYSDEC: *Biennial Hazardous Waste Report for CYBR 2021*.

5. UPCOMING EVENTS / ACTIVITIES PLANNED

- Scheduling of subsequent gauging and recovery events will be dependent on the developing COVID-19 situation and AR will continue to communicate with NYSDEC regarding schedule. The tentative schedule is outlined below. Due to recent COVID-19 developments the DNAPL recovery event planned for the 1st week of March 2022 may be moved to later in the month or cancelled.
- The next three DNAPL gauging and recovery events are tentatively scheduled to occur the weeks of March 7th, April 4th, and May 2nd, 2022.
- Continue the Water Tower LNAPL IRM activities, as allowable, in accordance with the IRM Work Plan (Fluor Daniel GTI, December 1997), Fluor Daniel GTI correspondence to the NYSDEC dated May 18, 1998 and Atlantic Richfield correspondence with the NYSDEC on September 2, 2010. The upcoming LNAPL IRM event is tentatively scheduled to occur the week of February 7th, 2022 in accordance with the schedule modification request, from monthly to quarterly, sent by Atlantic Richfield to NYSDEC on June 4, 2012, and the approval letter received from NYSDEC dated April 2, 2013.

6. KEY STAFFING

- Sovereign Consulting Inc.
- Parsons Environment and Infrastructure Group, Inc. (OM&M and Security)

7. PERCENTAGE COMPLETE

- DNAPL gauging and recovery – ongoing
- LNAPL IRM – ongoing

8. DATA

- Final data not generated during this reporting period.

9. CITIZEN PARTICIPATION ACTIVITIES

- None this reporting period.

LIST OF ACRONYMS

<i>Acronym</i>	<i>Description</i>
NYSDEC	New York State Department of Environmental Conservation
LNAPL	Light Non-Aqueous Phase Liquid
DNAPL	Dense Non-Aqueous Phase Liquid
OU	Operable Unit
IRM	Interim Remedial Measure
O&M	Operations and Maintenance

LIST OF REFERENCES

FLUOR Daniel GTI, 1997. *Draft Interim Remedial Measure Work Plan – Separate Phase Liquid Recovery*. December.

TABLE I
FEBRUARY DNAPL PUMPING SUMMARY (WEEK OF 02/07/2022)
ATLANTIC RICHFIELD
1 RIVER STREET
HASTINGS-ON-HUDSON, NEW YORK

Well ID	Date Gauged/ Pumped	Installation Angle (deg)	Pre-Pumping Uncorrected Apparent Height (inches)	Pre-Pumping Corrected Apparent Height (inches)	Post-Pumping Uncorrected Apparent Height (inches)	Post-Pumping Corrected Apparent Height (inches)	Total Fluids Removed (gallons) ⁴	Total DNAPL Removed (gallons) ⁶	Post-Purging Distance of DNAPL Surface Below MS/Fill Interface (ft) ⁵
HARW-1	2/7/2022 ¹	0	0	0	NA**	NA**	NA**	NA**	NA**
HARW-2	2/7/2022 ²	0	27.0	27.0			21.0	5.0	4.4
	2/8/2022 ³				4.0	4.0			
HARW-3	2/7/2022 ²	16.5	7.0	6.7			NA**	NA**	3.8
	NA** ³				NA**	NA**			
HARW-4	2/7/2022 ²	24.5	10.0	9.1			NA**	NA**	3.3
	NA** ³				NA**	NA**			
HARW-5	2/7/2022 ²	23.5	36.0	33.0			42.0	7.4	4.2
	2/8/2022 ³				2.0	1.8			
HARW-6	2/7/2022 ²	14.0	7.0	6.8			NA**	NA**	4.0
	NA** ³				NA**	NA**			
HARW-7	12/6/2021 ²	0	22.0	22.0			NA**	NA**	2.9
	NA** ³				NA**	NA**			
HARW-8	2/7/2022 ²	0	10.0	10.0			NA**	NA**	3.9
	NA** ³				NA**	NA**			
HAOW-12A	2/7/2022 ²	0	7.0	7.0			NA**	NA**	4.6
	NA** ³				NA**	NA**			

Total Gallons of DNAPL Removed: 12.5

Notes:

¹DNAPL not present, pumping not completed in this well

²Pre-pumping gauge date

³Post-pumping gauge date.

⁴Total gallons of fluid (DNAPL and groundwater) removed from well based on measurement in container.

⁵Represents the distance of the post-purging DNAPL material interface from the top of the MS/Fill interface.

⁶Unless otherwise noted, this column refers to the total volume of DNAPL removed based calculation of volume based on well diameter and height of DNAPL in the well.

*DNAPL is present but is under 6-inches and discontinuous.

**Volume in the well is less than threshold required to perform DNAPL pumping procedures.

Apparent Height: refers to the distance between the DNAPL surface and the bottom of the well sump which includes all fluids (groundwater and DNAPL) in the matrix.

NA: Not Applicable

TABLE II
SUMMARY OF DNAPL MEASUREMENTS
NYSDEC #3-60-022
1 RIVER STREET

	Date	Depth to Product (ft)	Product Apparent Height - Pre-pumping (ft)	Product Apparent Height - Post-pumping (ft)	Approximate Volume of Product Recovered (gallons) ³	Days Elapsed Between Measurement Readings	Measurement Tool Used	Recovery Procedure Used
MW-12	Cumulative 10/9/2006 - 7/29/2010	-	-	-	5.0	-	-	-
	TOTAL VOLUME RECOVERED TO DATE FROM MW-12 (GALLONS)				5.0			
HAOW-12A	Cumulative 3/2/2009 - 12/7/2020	-	-	-	49.7	-	DMT ⁴	-
	1/4/2021	42.7	0.9	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	42.6	1.0	-	-	56	DMT ⁴	-
	4/5/2021	42.4	1.2	-	-	35	DMT ⁴	-
	5/3/2021	42.6	1.0	-	-	28	DMT ⁴	-
	6/7/2021	42.6	1.0	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	42.6	1.0	-	-	70	DMT ⁴	-
	9/7/2021	42.9	0.7	-	-	22	DMT ⁴	-
	10/11/2021	42.8	0.8	-	-	34	DMT ⁴	-
	11/1/2021	42.8	0.4	-	-	21	DMT ⁴	-
	12/6/2021	42.8	0.5	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	42.8	0.6	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HAOW-12A (GALLONS)				49.7			
HARW-1	Cumulative 9/29/2010 - 12/7/2020	-	-	-	0.0	-	-	-
	1/4/2021	No product detected	0.0	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	No product detected	0.0	-	-	56	DMT ⁴	-
	4/5/2021	No product detected	0.0	-	-	35	DMT ⁴	-
	5/3/2021	No product detected	0.0	-	-	28	DMT ⁴	-
	6/7/2021	No product detected	0.0	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	No product detected	0.0	-	-	70	DMT ⁴	-
	9/7/2021	No product detected	0.0	-	-	22	DMT ⁴	-
	10/11/2021	No product detected	0.0	-	-	34	DMT ⁴	-
	11/1/2021	No product detected	0.0	-	-	21	DMT ⁴	-
	12/6/2021	No product detected	0.0	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	No product detected	0.0	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-1 (GALLONS)				0.0			
HARW-2	Cumulative 9/29/2010 - 12/7/2020	-	-	-	862.6	-	-	-
	1/4/2021	38.0	2.0	0.08	5	28	DMT ⁴	double diaphragm pump
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	39.0	1.0	-	-	56	DMT ⁴	double diaphragm pump
	4/5/2021	38.3	1.8	-	-	35	DMT ⁴	-
	5/3/2021	37.3	2.7	0.08	6.7	28	DMT ⁴	double diaphragm pump
	6/7/2021	39.2	0.8	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	38.3	1.8	-	-	70	DMT ⁴	-
	9/7/2021	37.5	2.5	0.33	5.7	22	DMT ⁴	double diaphragm pump
	10/11/2021	39.0	1.0	-	-	34	DMT ⁴	-
	11/1/2021	38.8	1.3	-	-	21	DMT ⁴	-
	12/6/2021	38.5	1.5	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/8/2022	37.8	2.3	0.33	5	64	DMT ⁴	double diaphragm pump
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-2 (GALLONS)				885.0			

TABLE II
SUMMARY OF DNAPL MEASUREMENTS
NYSDEC #3-60-022
1 RIVER STREET

	Date	Depth to Product (ft)	Product Apparent Height - Pre-pumping (ft)	Product Apparent Height - Post-pumping (ft)	Approximate Volume of Product Recovered (gallons) ³	Days Elapsed Between Measurement Readings	Measurement Tool Used	Recovery Procedure Used
HARW-3	Cumulative 10/14/2010 - 12/7/2020	-	-	-	28.6	-	-	-
	1/4/2021	38.5	0.5	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	38.5	0.5	-	-	56	DMT ⁴	-
	4/5/2021	38.3	0.8	-	-	35	DMT ⁴	-
	5/3/2021	38.5	0.5	-	-	28	DMT ⁴	-
	6/7/2021	38.4	0.6	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	38.4	0.6	-	-	70	DMT ⁴	-
	9/7/2021	38.5	0.5	-	-	22	DMT ⁴	-
	10/11/2021	38.3	0.7	-	-	34	DMT ⁴	-
	11/1/2021	38.4	0.6	-	-	21	DMT ⁴	-
	12/6/2021	38.3	0.8	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	38.4	0.6	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-3 (GALLONS)				28.6			
HARW-4	Cumulative 10/14/2010 - 12/7/2020	-	-	-	219.0	-	-	-
	1/4/2021	38.1	0.9	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	37.8	1.2	-	-	56	DMT ⁴	-
	4/5/2021	38.0	1.0	-	-	35	DMT ⁴	-
	5/3/2021	37.8	1.2	-	-	28	DMT ⁴	-
	6/7/2021	38.0	1.0	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	37.8	1.2	-	-	70	DMT ⁴	-
	9/7/2021	38.0	1.0	-	-	22	DMT ⁴	-
	10/11/2021	37.8	1.2	-	-	34	DMT ⁴	-
	11/1/2021	37.6	1.4	-	-	21	DMT ⁴	-
	12/6/2021	37.4	1.6	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	38.2	0.8	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-4 (GALLONS)				219.0			
HARW-5	Cumulative 7/18/2011 - 12/7/2020	-	-	-	1191.5	-	-	-
	1/4/2021	38.3	2.0	0.08	5.0	28	DMT ⁴	double diaphragm pump
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	36.7	3.6	0.31	9.4	56	DMT ⁴	double diaphragm pump
	4/5/2021	37.1	3.2	0.04	8.2	35	DMT ⁴	double diaphragm pump
	5/3/2021	38.7	1.6	-	-	28	DMT ⁴	-
	6/7/2021	35.9	4.4	0.00	11.5	35	DMT ⁴	double diaphragm pump
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	35.8	4.5	0.00	11.7	70	DMT ⁴	double diaphragm pump
	9/7/2021	38.8	1.5	-	-	22	DMT ⁴	-
	10/11/2021	36.5	3.8	0.17	9.6	34	DMT ⁴	double diaphragm pump
	11/1/2021	38.3	2.0	0.00	5.2	21	DMT ⁴	double diaphragm pump
	12/6/2021	38.3	2.0	0.08	5.0	35	DMT ⁴	double diaphragm pump
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/8/2022	37.3	3.0	0.17	7.4	64	DMT ⁴	double diaphragm pump
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-5 (GALLONS)				1264.5			

TABLE II
SUMMARY OF DNAPL MEASUREMENTS
NYSDEC #3-60-022
1 RIVER STREET

	Date	Depth to Product (ft)	Product Apparent Height - Pre-pumping (ft)	Product Apparent Height - Post-pumping (ft)	Approximate Volume of Product Recovered (gallons) ³	Days Elapsed Between Measurement Readings	Measurement Tool Used	Recovery Procedure Used
HARW-6	Cumulative 7/19/2011 - 12/7/2020	-	-	-	0.0	-	-	-
	1/4/2021	40.1	0.7	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	40.1	0.7	-	-	56	DMT ⁴	-
	4/5/2021	40.1	0.8	-	-	35	DMT ⁴	-
	5/3/2021	40.6	0.2	-	-	28	DMT ⁴	-
	6/7/2021	40.6	0.3	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	40.3	0.5	-	-	70	DMT ⁴	-
	9/7/2021	40.5	0.3	-	-	22	DMT ⁴	-
	10/11/2021	40.3	0.5	-	-	34	DMT ⁴	-
	11/1/2021	40.2	0.6	-	-	21	DMT ⁴	-
	12/6/2021	40.3	0.5	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	40.2	0.6	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-6 (GALLONS)				0.0			
HARW-7	Cumulative 7/18/2011 - 12/7/2020	-	-	-	582.0	-	-	-
	1/4/2021	40.8	1.2	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	40.0	2.0	0.0	5.2	56	DMT ⁴	double diaphragm pump
	4/5/2021	41.3	0.8	-	-	35	DMT ⁴	-
	5/3/2021	41.2	0.8	-	-	28	DMT ⁴	-
	6/7/2021	40.8	1.3	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	39.5	2.5	0.2	6.1	70	DMT ⁴	double diaphragm pump
	9/7/2021	41.8	0.3	-	-	22	DMT ⁴	-
	10/11/2021	41.5	0.5	-	-	34	DMT ⁴	-
	11/1/2021	41.1	0.9	-	-	21	DMT ⁴	-
	12/6/2021	40.6	1.4	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	40.2	1.8	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-7 (GALLONS)				593.3			
HARW-8	Cumulative 7/19/2011 - 12/7/2020	-	-	-	36.1	-	-	-
	1/4/2021	41.8	1.2	-	-	28	DMT ⁴	-
	2/1/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	3/1/2021	41.8	1.3	-	-	56	DMT ⁴	-
	4/5/2021	41.4	1.6	-	-	35	DMT ⁴	-
	5/3/2021	41.0	2.0	0.0	5.2	28	DMT ⁴	double diaphragm pump
	6/7/2021	42.8	0.2	-	-	35	DMT ⁴	-
	7/5/2021	DNAPL pumping not completed due to adverse weather conditions					-	-
	8/16/2021	42.5	0.5	-	-	70	DMT ⁴	-
	9/7/2021	42.5	0.5	-	-	22	DMT ⁴	-
	10/11/2021	42.3	0.7	-	-	34	DMT ⁴	-
	11/1/2021	42.2	0.8	-	-	21	DMT ⁴	-
	12/6/2021	42.2	0.8	-	-	35	DMT ⁴	-
	1/3/2022	DNAPL pumping not completed due to COVID-19 restrictions					-	-
	2/7/2022	42.2	0.8	-	-	63	DMT ⁴	-
	TOTAL VOLUME RECOVERED TO DATE FROM HARW-8 (GALLONS)				41.3			

TABLE II
SUMMARY OF DNAPL MEASUREMENTS
NYSDEC #3-60-022
1 RIVER STREET

	Date	Depth to Product (ft)	Product Apparent Height - Pre-pumping (ft)	Product Apparent Height - Post-pumping (ft)	Approximate Volume of Product Recovered (gallons) ³	Days Elapsed Between Measurement Readings	Measurement Tool Used	Recovery Procedure Used
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TOTAL VOLUME RECOVERED TO DATE FROM ALL WELLS (GALLONS)

3086.4

Notes:

MW-12

Depth to Top of Screen: 33 ft
Depth to Bottom: 36 ft

HAOW-12A

Depth to Top of Screen: 28.6 ft
Depth to Bottom: 43.6 ft

HARW-1

Depth to Top of Screen: 24 ft
Depth to Bottom: 42 ft

HARW-2

Depth to Top of Screen: 26 ft
Depth to Bottom: 40 ft

HARW-3

Angle from Vertical: 16.5°
Vertical Depth to Top of Screen: 25.4 ft
Vertical Depth to Bottom: 39 ft

HARW-4

Angle from Vertical: 24.5°
Vertical Depth to Top of Screen: 28.7 ft
Vertical Depth to Bottom: 41 ft

HARW-5

Angle from Vertical: 23.5°
Vertical Depth to Top of Screen: 27 ft
Vertical Depth to Bottom: 40.3 ft

HARW-6

Angle from Vertical: 14°
Vertical Depth to Top of Screen: 26.7 ft
Vertical Depth to Bottom: 40.8 ft

HARW-7

Depth to Top of Screen: 27.5 ft
Depth to Bottom: 42 ft

HARW-8

Depth to Top of Screen: 28.5 ft
Depth to Bottom: 43 ft

For historical reference to past DNAPL measurement events prior to January 2017, please refer to the January 2018 monthly report submitted to NYSDEC on 5 February 2018.

DMT = DNAPL Measurement Tool, consisting of a copper tubing handle, a spacer section to prevent the probe from contacting the sides of the well riser, and an all-thread rod probe to extend into the DNAPL.

¹ Reserved

² Reserved

³ Volume of product recovered by downwell pump is estimated by approximating the volume discharged to the drum and additional product in tubing and on pump.

Volume of product recovered by bailer is estimated using the bailer volume and number of times bailed.

Volume of product recovered by double diaphragm and positive displacement piston pumps are estimated by approximating the volume discharged to the drum or by using the pre- and post-pumping apparent height of product and the well dimensions (8" diameter well).

⁴ All depth and thickness values for HARW-3, HARW-4 HARW-5 and HARW-6 are provided as vertical equivalents of the field measurements based on the angle of the installed well.