

REDACTED

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**From:** THOMAS Wesley \* DEQ <Wesley.THOMAS@deq.oregon.gov>  
**Sent:** Thursday, March 16, 2023 1:52 PM  
**To:** Rob Ede <robe@hahnenv.com>  
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**Subject:** RE: Effective Solubility Data Collection

Rob,

Thank you for providing the follow up information. DEQ approves the proposed effective solubility data collection.

Regards,

Wes

**Wesley Thomas, P.E.**  
Project Manager/Environmental Engineer  
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**From:** Rob Ede <[robe@hahnenv.com](mailto:robe@hahnenv.com)>  
**Sent:** Wednesday, March 1, 2023 11:13 AM  
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**Subject:** Re: Effective Solubility Data Collection

Hi Wes,

Please find answers to the questions that were provided in your January 23, 2023 e-mail ([blue text below](#)) regarding the proposed effective solubility data collection work. Please note that there is also a Figure and a Table attached to this e-mail that are referenced in our responses below.

Let me know if you have any additional questions or would like to discuss further.

Thank you!

-Rob

1. Please provide a summary of the criteria that were used to identify the proposed wells for testing. We note that there are other wells with notable DNAPL accumulation volumes.

[Proposed wells for effective solubility testing were selected to include a dataset with: a range of apparent DNAPL compositions as indicated by TarGOST waveform data; locations in each of the WBZs containing DNAPL \(Fill, Upper Alluvium, and Lower Alluvium WBZs\), and with a representative spatial distribution across the Gasco OU. With regard to DNAPL composition \(represented by TarGOST waveform color\), DNAPL samples either had an orange, yellow, or blue-green waveform color. Therefore, wells with DNAPLs covering those three waveform colors were selected for effective solubility testing.](#)

2. In addition, please provide a table that identifies each well proposed for sampling and a brief rationale for conducting the testing at that location.

[The attached table shows the well selected for analysis, associated WBZ, composite TarGOST waveform color, and associated GSA. The proposed list of wells has been modified from the original proposal based on review of TarGOST waveform data so that locations representing all three waveform colors are included in the sampling program.](#)

3. Please add WS-33-81 and WS-43-36 to the list of wells to be sampled. These wells have elevated concentrations of chlorinated solvents (and associated breakdown products) and DNAPL accumulation. Please confirm that VOC analysis will include chlorinated solvent constituents.

[DEQ later rescinded the request to sample WS-33-81, as that well has been abandoned \(email from Wesley Thomas to Rob Ede, January 23, 2023\). WS-43-36 has been added to the list of wells to be sampled. VOC analysis will include chlorinated VOCs.](#)

4. Please add total and free cyanide to the analyte list.  
[Free and total cyanide will be added to the analyte list.](#)

5. Please provide a description of how the groundwater samples will be collected. To collect a useful sample for estimating effective solubility, the groundwater sample should be located as close to the DNAPL interface as possible (e.g., from the well sump that has accumulated DNAPL).

[One of these sampling methods will be used at each well.](#)

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[At MW-06-32, the sample of groundwater will be collected from the discharge line that extends into the NAPL storage tank, collecting the first groundwater after DNAPL removal.](#)

- At the other wells equipped with a DNAPL pumps, the pump will be activated and slowly raised above the DNAPL just until groundwater flows from the pump discharge tube.
- For wells without a dedicated DNAPL pump, the depth of the DNAPL/water interface will be measured using a downhole interface probe. A pump or intake tubing will be lowered into the well to within 1 foot of DNAPL/water interface.
  - A peristaltic pump will be used if the groundwater level is shallow enough (less than 20 feet below ground surface).
  - A submersible electric pump will be used at the remaining wells.In all cases, a ceramic filter will be used to filter the groundwater sample prior to collection in laboratory bottles to avoid including any DNAPL droplets or sheens in the groundwater samples.

6. Provide a summary of the field QA/QC documentation that will be used to verify that the sampling objectives were achieved (e.g., groundwater included in the sample was at the DNAPL interface, ceramic filters do not contain activated carbon).

An interface probe will be used to identify the groundwater/DNAPL interface for placement of the pump tubing at each well that does not include a dedicated pneumatic DNAPL pump. The intake of the pump will be lowered to within 1 foot of the interface. Before using any of the ceramic filters for groundwater sampling, one of them will be broken to confirm that it does not contain any activated carbon or other internal treatment medium. Also, after sampling is complete at each well location, the ceramic filter will be carefully broken open to confirm there is no internal filtering medium (i.e., the filter consists of only porous ceramic) and verify the correct filters were provided by the manufacturer. The collected groundwater sample will be inspected to confirm that it does not contain any visible DNAPL or sheen.

**Rob Ede, R.G.**  
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On Jan 23, 2023, at 1:50 PM, THOMAS Wesley \* DEQ <[Wesley.THOMAS@deq.oregon.gov](mailto:Wesley.THOMAS@deq.oregon.gov)> wrote:

Rob,

With respect to question 3, below. Ignore the request to add WS-33-81. That well has been abandoned.

Wes

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**From:** THOMAS Wesley \* DEQ  
**Sent:** Monday, January 23, 2023 11:54 AM  
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**Cc:** Mr. Bob Wyatt <[rjw@nwnatural.com](mailto:rjw@nwnatural.com)>; Ms. Patty Dost <[pdost@pearllegalgroup.com](mailto:pdost@pearllegalgroup.com)>; Mr. Mike Gefell <[mgefell@anchorqea.com](mailto:mgefell@anchorqea.com)>; Mr. John Renda <[jrenda@anchorqea.com](mailto:jrenda@anchorqea.com)>; Halah Voges <[hvoges@anchorqea.com](mailto:hvoges@anchorqea.com)>; Ryan Barth <[rbarth@anchorqea.com](mailto:rbarth@anchorqea.com)>; Mr. Myron Burr <[myron.burr@siltronic.com](mailto:myron.burr@siltronic.com)>; Ms. Jen Mott <[jmott@anchorqea.com](mailto:jmott@anchorqea.com)>  
**Subject:** RE: Effective Solubility Data Collection

Rob,

In general, DEQ concurs that collecting data to support estimation of effective solubility of DNAPL components at wells with a range of anticipated DNAPL compositions will be valuable for the FS. DEQ has a few follow up questions about the proposed scope of work.

1. Please provide a summary of the criteria that were used to identify the proposed wells for testing. We note that there are other wells with notable DNAPL accumulation volumes.
2. In addition, please provide a table that identifies each well proposed for sampling and a brief rationale for conducting the testing at that location.
3. Please add WS-33-81 and WS-43-36 to the list of wells to be sampled. These wells have elevated concentrations of chlorinated solvents (and associated breakdown products) and DNAPL accumulation. Please confirm that VOC analysis will include chlorinated solvent constituents.
4. Please add total and free cyanide to the analyte list.
5. Please provide a description of how the groundwater samples will be collected. To collect a useful sample for estimating effective solubility, the groundwater sample should be located as close to the DNAPL interface as possible (e.g., from the well sump that has accumulated DNAPL).
6. Provide a summary of the field QA/QC documentation that will be used to verify that the sampling objectives were achieved (e.g., groundwater included in the sample was at the DNAPL interface, ceramic filters do not contain activated carbon).

Thanks,  
Wes

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**From:** Rob Ede <[robe@hahnenv.com](mailto:robe@hahnenv.com)>  
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**Subject:** Effective Solubility Data Collection

Hi Wes,

As we recently discussed, NW Natural plans to collect supplemental groundwater samples and DNAPL samples at several wells across the Gasco OU. At each well, a groundwater sample will be collected first, followed by a DNAPL sample. Consistent with the procedures that were used to collect porewater samples in sediment containing DNAPL, each groundwater sample will be

pumped through a porous ceramic filter to avoid including DNAPL or sheen in the groundwater sample. These data will characterize DNAPL composition and the empirical effective solubility of DNAPL components, and will support modeling to estimate the time required to reach groundwater cleanup levels for various remedial options in the FS. Wells that will be sampled currently contain DNAPL with a range of compositions as indicated by TarGOST waveform data, and are distributed in the Fill, Upper Alluvium, and Lower Alluvium WBZs. They include: MW-50F, MW-11-32, MW-8-29, PW-3-85, MW-38U, MW-PW2L, MW-10-25, PW-11U, MW-18-30, MW-15-50, and MW-8-56. The analytical parameters for groundwater and DNAPL samples will include: VOCs, PAHs, and TPH.

If you concur with this supplemental data collection, we will commence the work as soon as practicable. Please let me know if you have any questions.

Thanks,

-Rob

**Rob Ede, R.G.**

Principal

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