EDE ENVIRONMENTAL

May 9, 2024

Mr. Wes Thomas
Oregon Department of Environmental Quality
Northwest Region, Portland Office
Portland Harbor Section
700 NE Multnomah Street, No. 600
Portland, Oregon 97232

EE Project No. 2708
DEQ ECSI File No. 84

SUBJECT: Source Control Interim Remedial Action Measure Concept and Agreement to Move into Design, NW Natural Gasco Site, 7900 NW St. Helens Road, Portland, Oregon

Dear Mr. Thomas,

The NW Natural Design Team (comprising Anchor QEA, Sevenson Environmental Services, Inc., and Ede Environmental, LLC), on behalf of NW Natural, is transmitting for your review and approval a summary of the updated Interim Remedial Action Measure (IRAM) concept as discussed between NW Natural and the Oregon Department of Environmental Quality (DEQ) during our meeting on April 11, 2024. During the April meeting, NW Natural and DEQ reached an agreement in concept regarding the basis and scope for all elements to be included within the IRAM. Agreement on the updated IRAM concept and associated elements is a significant milestone because it will pave the way for the agreed-upon IRAM to move into the design phase; this is of significant importance because it will support construction concurrently with the adjacent Gasco Sediments Site remedy or will expedite remedial design of DEQ's selected upland remedy, whichever happens first.

NW Natural submitted a *Revised Source Control Addendum Report*[1] to DEQ in November 2023 that recommended an enhanced source control approach for contaminated groundwater and dense nonaqueous phase liquid (DNAPL) in the Fill, Upper Alluvium, and Lower Alluvium Water-Bearing Zones (WBZs) at the Gasco Operable Unit (OU). DEQ and NW Natural have had numerous conversations regarding the IRAM approach presented in the *Revised Source Control Addendum Report*, reaching agreement on the specific elements

[1] Anchor QEA, LLC, 2023. *Revised Source Control Addendum Report.* Gasco Operable Unit, ECSI No. 84. Portland, Oregon. November 2, 2023.

and approach during the April meeting. These additional source control elements will ultimately be components of the overall upland remedy for the Gasco OU and will also provide critical long-term effectiveness to the Gasco Sediments Site remedy currently being designed for U.S. Environmental Protection Agency (EPA) review and approval. The IRAM source control elements will physically and chemically eliminate the potential for future DNAPL and dissolved phase contaminant migration from the uplands Gasco OU to the Gasco Sediments Site active cleanup boundaries (the Refined Project Area) by treating soil and DNAPL through in situ stabilization and solidification (ISS).

The purpose of this letter is to document the IRAM elements as updated based on our April meeting so that NW Natural can initiate design of the proposed IRAM scope. A description and summary of the IRAM elements is provided as follows for DEQ review and approval.

IRAM Elements

The IRAM retains the existing shoreline Upper and Lower Alluvium WBZ hydraulic control and containment (HC&C) system and enhances it with additional elements, as shown in Figures 1 and 2. These comprehensive upland source control elements will ensure short- and long-term effectiveness of the sediment remedy by eliminating any potential for upland DNAPL or dissolved phase groundwater contaminant migration from the Gasco OU into the Gasco Sediments Site Refined Project Area. IRAM elements include the following:

1) A deep ISS barrier wall perpendicular to the shoreline along the shared property line with Gasco and US Moorings
    a. This ISS barrier wall segment will be designed to extend to bedrock and will act as a physical barrier to groundwater or potential future DNAPL migration northward from the Gasco OU.
2) A continuous top of riverbank deep ISS barrier wall[2] along the Gasco OU shoreline directly adjacent to the full length of the Gasco property and extending a minimum of approximately 350 feet onto the adjacent Siltronic property
    a. This deep ISS barrier wall will extend to bedrock along the northern shoreline area and to the Lower Silt Unit (through the Fill, Upper Alluvium, and Lower Alluvium WBZs) along the remainder of the shoreline.

[2] The top of riverbank ISS barrier wall will include a design element for potential future localized breaching within the Fill or Alluvium WBZs. This design element would be implemented if it is determined at a future date that contaminant levels in groundwater in certain areas and WBZs have achieved Portland Harbor Superfund Site groundwater cleanup levels and there is agency direction to resume groundwater discharge beyond the top of riverbank across those depths and locations.

   b. DEQ currently considers the southern limit of this portion of barrier wall to be based on the estimated southern extent of nearshore upland DNAPL presence in the Alluvium WBZ.
   c. NW Natural believes the wall should be extended further south to align with the upriver Gasco Sediments Site Refined Project Area boundary that is currently being reevaluated in coordination with EPA.
   d. NW Natural is developing a focused source control addendum providing details on groundwater and DNAPL conditions in that area for DEQ review and consideration.
3) Fill WBZ hydraulic controls (e.g., installation of extraction wells) along the Gasco OU upland shoreline as necessary to control mounding of groundwater on the upland side of the ISS barrier wall
4) Additional Alluvium WBZ extraction wells along the southern portion of the Siltronic property shoreline within the Gasco OU, where needed, to control groundwater gradients on the upland side of the ISS barrier wall
5) Targeted areas of ISS treatment within soils beneath the HC&C system alignment immediately upland of the deep ISS barrier wall to treat hot spot soils containing DNAPL
   a. The boundaries and depths for this additional ISS treatment (Figure 2) have been collectively reviewed and discussed by NW Natural and DEQ, and it is concluded that these prisms form the correct basis for moving this IRAM component into the design phase. Although further refinement of the defined treatment boundaries and depths is not needed, DEQ and NW Natural agree that Tar-Specific Green Optical Screening Tool (TarGOST) data may be collected during design as an option to refine the upland ISS treatment boundaries or depths shown in Figure 2 based on the presence of DNAPL. DEQ and NW Natural have agreed that new TarGOST data may be considered using a multiple lines of evidence (LOE) approach to evaluate retention or elimination of an area, either vertically or laterally, from the current ISS prism. A decision tree that outlines this LOE approach is attached to this letter.

NW Natural looks forward to receiving DEQ's approval of the IRAM concept and scope, allowing the project to move into the design phase with preparation of a Basis of Design Report. Resolution of the IRAM scope has been an important element with ties to the necessary upland Feasibility Study evaluations as well as the EPA sediment remedy design work. NW Natural appreciates the productive discussions with DEQ on IRAM development

and looks forward to the next steps leading into the design of these important IRAM elements.

Should you have any questions, please contact the undersigned.

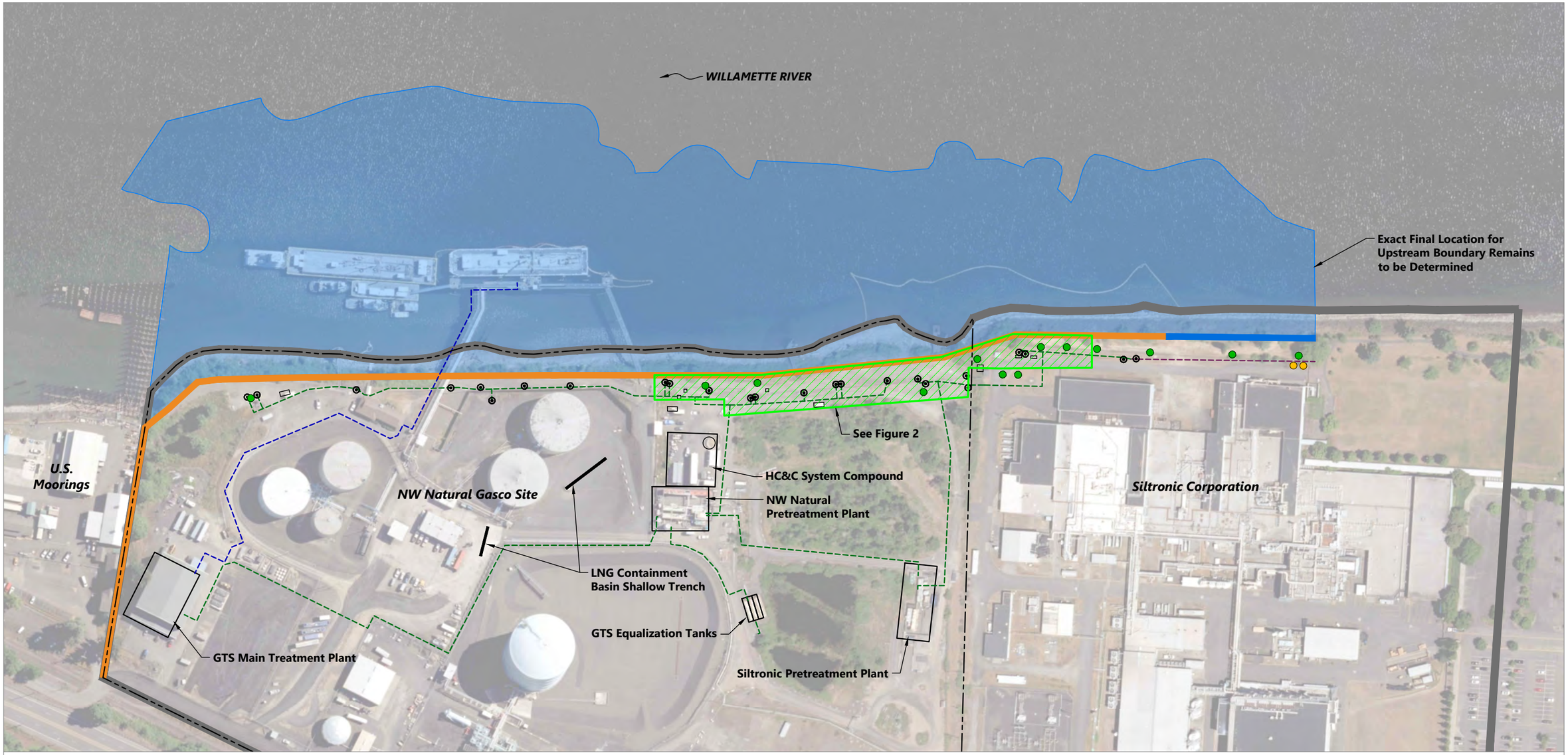
Sincerely,

Robert Ede

Rob Ede, RG
Principal
rede@EdeEnvironmental.com
Attachments:
1) Figure 1: Current IRAM Elements
2) Figure 2 Nearshore Upland ISS Prisms
3) Decision Tree: LOE Approach for ISS Prism Refinement

cc: Bob Wyatt, NW Natural
Patty Dost, Pearl Legal Group PC
Halah Voges, Anchor QEA
Matt Davis, Anchor QEA
Ryan Barth, Anchor QEA
Jen Mott, Anchor QEA
Mike Crystal, Sevenson Environmental Services, Inc.
Dan Hafley, Oregon Department of Environmental Quality

FIGURES



LEGEND:

- Property Boundary (Approximate)
- Gasco OU Boundary
- Existing Fill WBZ LNG Containment Trenches
- Deep ISS Barrier Wall (IRAM-Conceptual)
- Additional Deep ISS Barrier Wall Segment (IRAM-Conceptual)
- GTS Effluent Line to Outfall 001
- GTS Influent Line
- Proposed HC&C System Extension
- Existing HC&C System Upper and Lower Alluvium WBZ Wells
- Proposed HC&C System Fill WBZ Extraction Wells (IRAM-Conceptual)
- Proposed HC&C System Upper and Lower Alluvium WBZ Wells (IRAM-Conceptual)
- EPA Refined Project Boundary
- Area of Interest - Nearshore Upland ISS

0 200 Feet

HORIZONTAL DATUM: Oregon State Plane North Zone, North American Datum (NAD83/HARN 91), International Feet
VERTICAL DATUM: City of Portland
AERIAL SOURCE: PortlandMaps.com dated 2023

Publish Date: 2024/05/02 6:43 AM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Gasco Source Control\0029-RP-021 (Source Control IRAM Elements).dwg Figure 1

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Figure 1
Updated Source Control IRAM Elements

Source Control IRAM Concept Design
Gasco OU

LEGEND:

- Property Boundary (Approximate)
- Gasco OU Boundary
- Existing Fill WBZ LNG Containment Trenches
- Deep ISS Barrier Wall (IRAM-Conceptual)
- Additional Deep ISS Barrier Wall Segment (IRAM-Conceptual)
- GTS Effluent Line to Outfall 001
- GTS Influent Line
- Proposed HC&C System Extension
- Existing HC&C System Upper and Lower Alluvium WBZ Wells
- Proposed HC&C System Fill WBZ Extraction Wells (IRAM-Conceptual)
- EPA Refined Project Boundary
- Area of Interest - Nearshore Upland ISS
- Potential ISS Areas
- 155 feet (Siltronic) / 145 feet (Gasco)
- 130 fee (Siltronic) / 120 feet (Gasco)
- 105 feet (Siltronic) / 95 feet (Gasco)
- 70 feet
- 45 feet

0 80
Feet

HORIZONTAL DATUM: Oregon State Plane North Zone, North American Datum (NAD83/HARN 91), International Feet
VERTICAL DATUM: City of Portland
AERIAL SOURCE: PortlandMaps.com dated 2023

Publish Date: 2024/05/01 2:05 PM | User: hmerrick
Filepath: K:\Projects\0029-NW Natural Gas Co\Gasco Source Control\0029-RP-022 (Source Control IRAM Elements 2).dwg Figure 2

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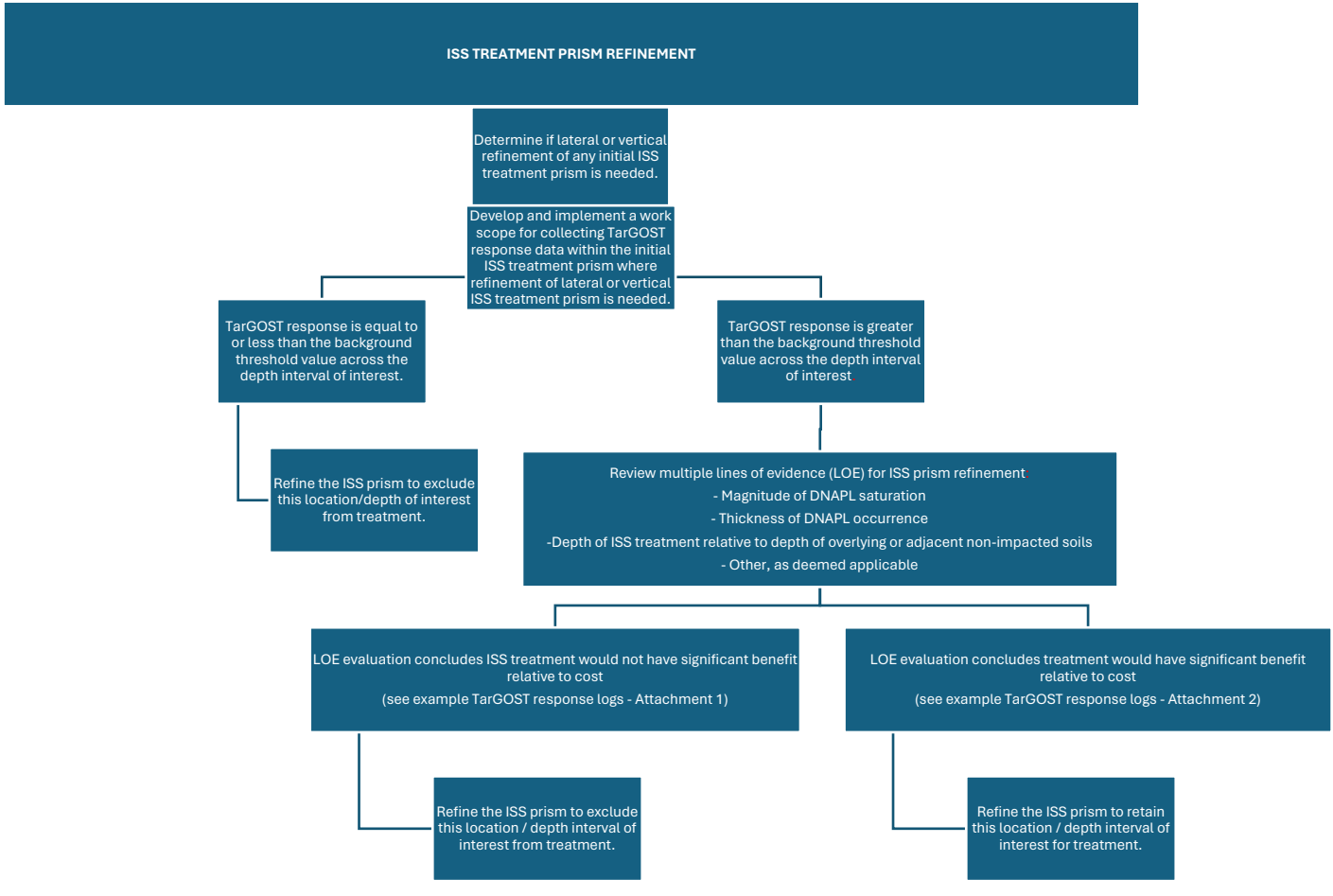
Figure 2
Nearshore Upland ISS Prisms

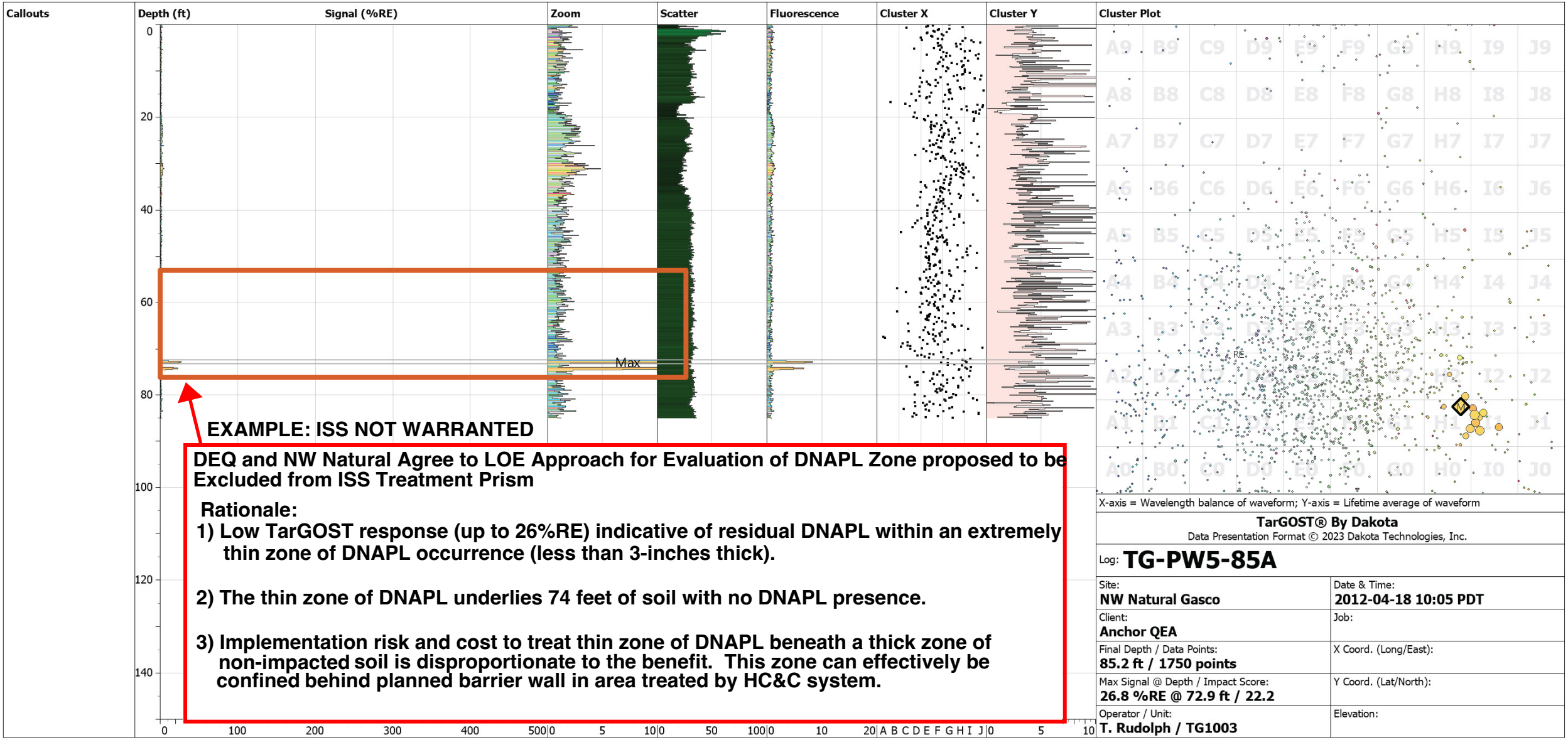
Source Control IRAM Concept Design
Gasco OU

ISS TREATMENT PRISM REFINEMENT
DECISION TREE

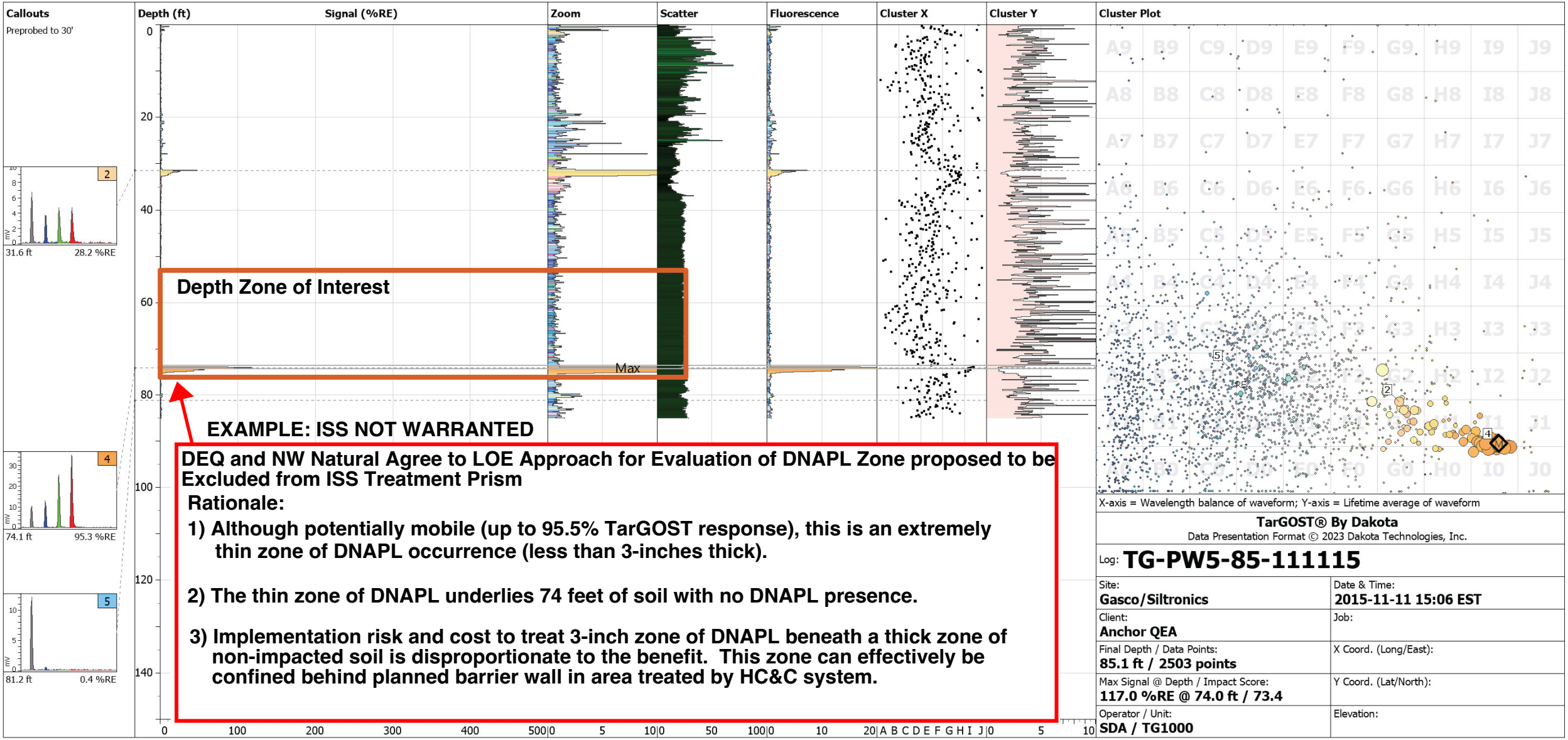

ISS TREATMENT PRISM REFINEMENT
Determine if lateral or vertical refinement of any initial ISS treatment prism is needed.
Develop and implement a work scope for collecting TarGOST response data within the initial ISS treatment prism where refinement of lateral or vertical ISS treatment prism is needed.
TarGOST response is equal to or less than the background threshold value across the depth interval of interest.
TarGOST response is greater than the background threshold value across the depth interval of interest
Refine the ISS prism to exclude this location/depth of interest from treatment.
Review multiple lines of evidence (LOE) for ISS prism refinement
- Magnitude of DNAPL saturation
- Thickness of DNAPL occurrence
-Depth of ISS treatment relative to depth of overlying or adjacent non-impacted soils
- Other, as deemed applicable
LOE evaluation concludes ISS treatment would not have significant benefit relative to cost
(see example TarGOST response logs - Attachment 1)
LOE evaluation concludes treatment would have significant benefit relative to cost
(see example TarGOST response logs - Attachment 2)
Refine the ISS prism to exclude this location / depth interval of interest from treatment.
Refine the ISS prism to retain this location / depth interval of interest for treatment.

ATTACHMENT 1

Example TarGOST Response Logs:
Depth of Interest Excluded from ISS Treatment Prism


Callouts
Depth (ft)
Signal (%RE)
Zoom
Scatter
Fluorescence
Cluster X
Cluster Y
Cluster Plot
Max
EXAMPLE: ISS NOT WARRANTED
DEQ and NW Natural Agree to LOE Approach for Evaluation of DNAPL Zone proposed to be Excluded from ISS Treatment Prism
Rationale:
1) Low TarGOST response (up to 26%RE) indicative of residual DNAPL within an extremely thin zone of DNAPL occurrence (less than 3-inches thick).
2) The thin zone of DNAPL underlies 74 feet of soil with no DNAPL presence.
3) Implementation risk and cost to treat thin zone of DNAPL beneath a thick zone of non-impacted soil is disproportionate to the benefit. This zone can effectively be confined behind planned barrier wall in area treated by HC&C system.
X-axis = Wavelength balance of waveform; Y-axis = Lifetime average of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc.
Log: TG-PW5-85A
Site: NW Natural Gasco
Date & Time: 2012-04-18 10:05 PDT
Client: Anchor QEA
Job:
Final Depth / Data Points: 85.2 ft / 1750 points
X Coord. (Long/East):
Max Signal @ Depth / Impact Score: 26.8 %RE @ 72.9 ft / 22.2
Y Coord. (Lat/North):
Operator / Unit: T. Rudolph / TG1003
Elevation:

TG-PW5-85A

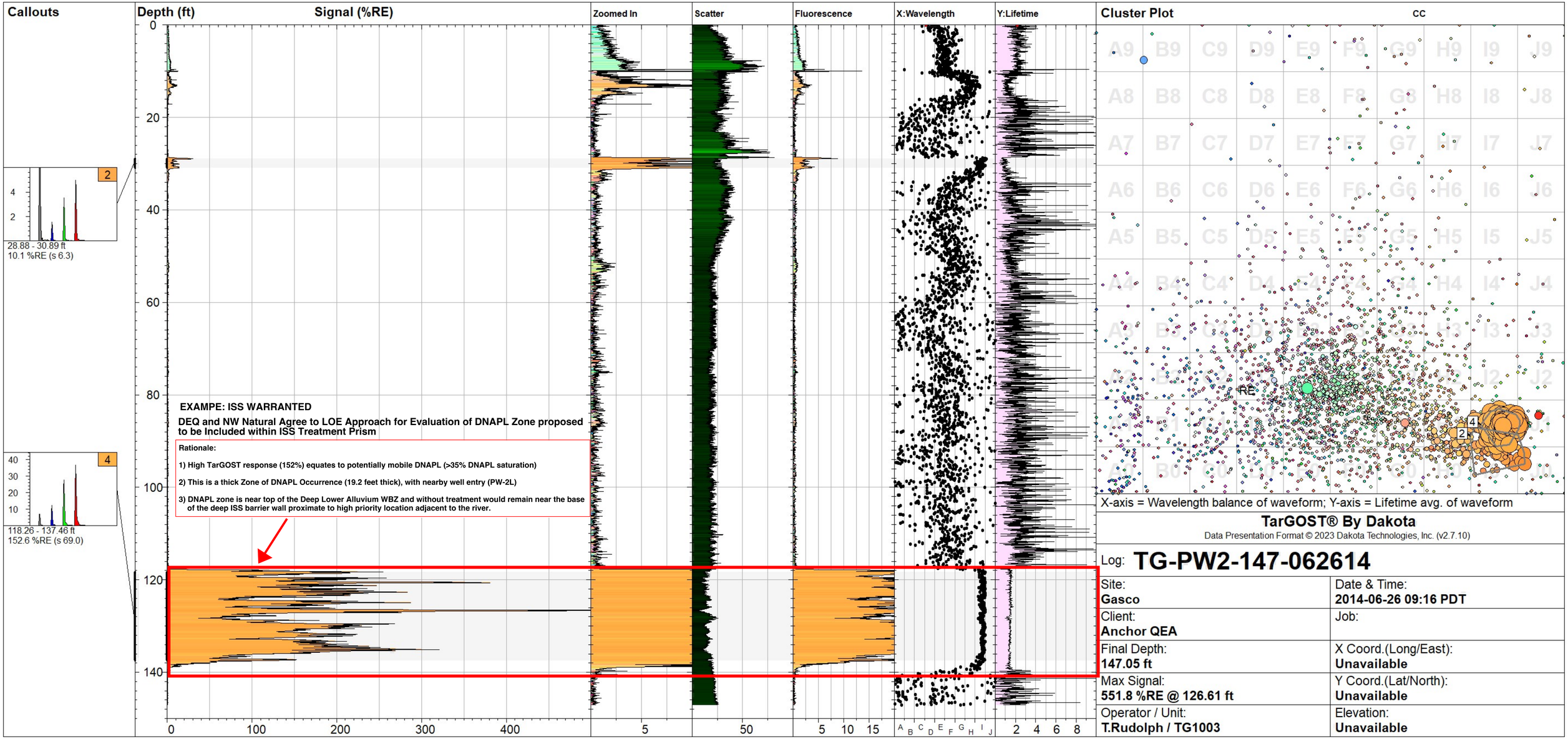


TG-PW5-85-111115

ANCHOR QEA

ATTACHMENT 2

Example TarGOST Response Logs:
Depth of Interest Included within ISS Treatment Prism

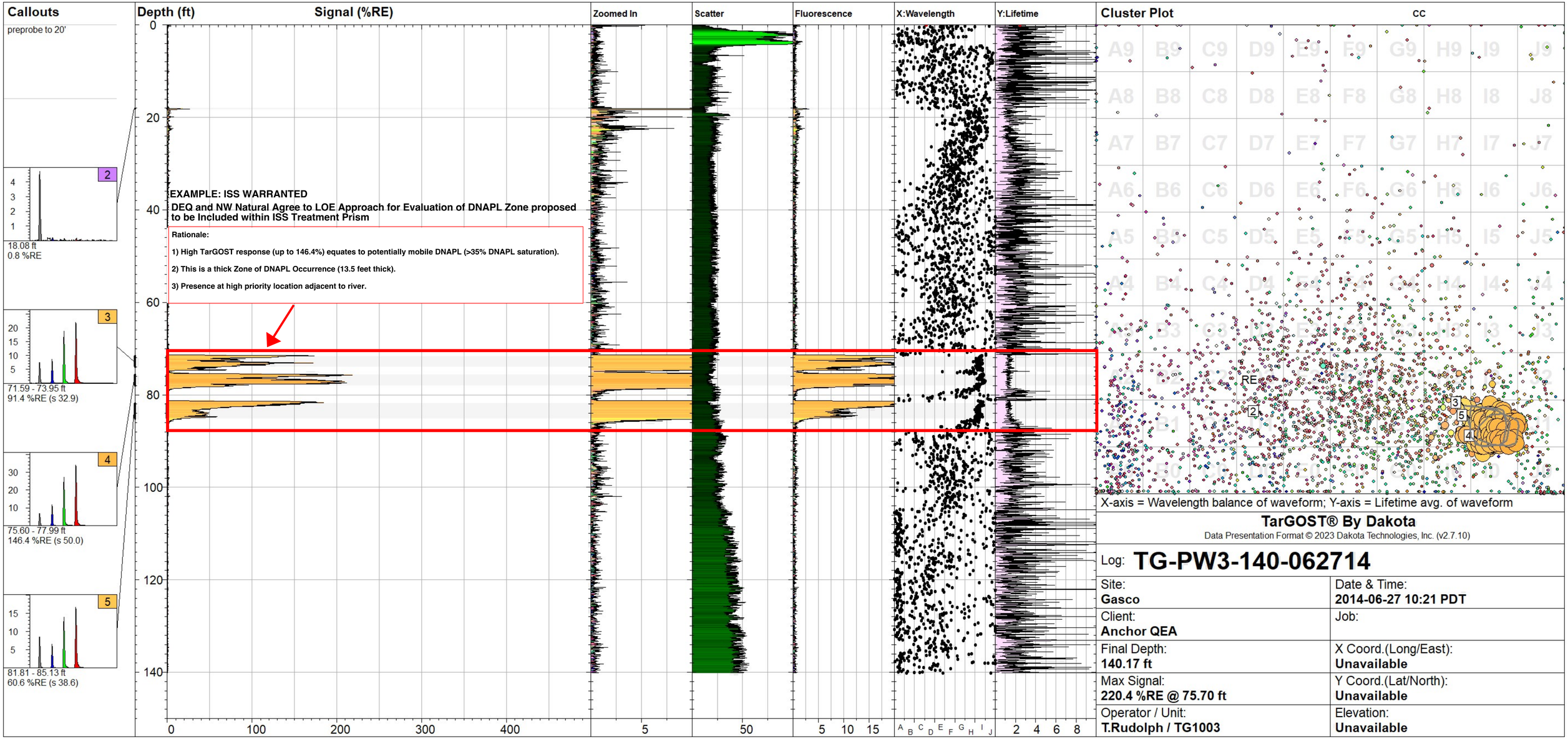


TarGOST® By Dakota

Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.7.10)

Log: **TG-PW2-147-062614**

Site: **Gasco**	Date & Time: **2014-06-26 09:16 PDT**
Client: **Anchor QEA**	Job:
Final Depth: **147.05 ft**	X Coord.(Long/East): **Unavailable**
Max Signal: **551.8 %RE @ 126.61 ft**	Y Coord.(Lat/North): **Unavailable**
Operator / Unit: **T.Rudolph / TG1003**	Elevation: **Unavailable**


Callouts
preprobe to 20'
2
18.08 ft
0.8 %RE
3
71.59 - 73.95 ft
91.4 %RE (s 32.9)
4
75.60 - 77.99 ft
146.4 %RE (s 50.0)
5
81.81 - 85.13 ft
60.6 %RE (s 38.6)
Depth (ft)
Signal (%RE)
EXAMPLE: ISS WARRANTED
DEQ and NW Natural Agree to LOE Approach for Evaluation of DNAPL Zone proposed to be Included within ISS Treatment Prism
Rationale:
1) High TarGOST response (up to 146.4%) equates to potentially mobile DNAPL (>35% DNAPL saturation).
2) This is a thick Zone of DNAPL Occurrence (13.5 feet thick).
3) Presence at high priority location adjacent to river.
Zoomed In
Scatter
Fluorescence
X:Wavelength
Y:Lifetime
Cluster Plot
CC
RE
X-axis = Wavelength balance of waveform; Y-axis = Lifetime avg. of waveform
TarGOST® By Dakota
Data Presentation Format © 2023 Dakota Technologies, Inc. (v2.7.10)
Log: TG-PW3-140-062714
Site: Gasco
Date & Time: 2014-06-27 10:21 PDT
Client: Anchor QEA
Job:
Final Depth: 140.17 ft
X Coord.(Long/East): Unavailable
Max Signal: 220.4 %RE @ 75.70 ft
Y Coord.(Lat/North): Unavailable
Operator / Unit: T.Rudolph / TG1003
Elevation: Unavailable