Memorandum

DATE: September 8, 2025
TO: Jeremy Schmidt and Kristin Beck
Washington State Department of Ecology
FROM: Industrial Waste Area Generators Group III (IWAG)
TRS Group, Inc. (TRS)
PROJECT: 64180.023
REGARDING: Supplement to the In Situ Thermal Remediation (ISTR) Vapor Recovery (VR) Operations and Maintenance (O&M) Manual Revision 1 Addendum: ISTR VR Test Memo

The operation, maintenance, and monitoring (OMM) procedures for in situ thermal remediation (ISTR) and vapor recovery (VR) in Zone A are documented in the November 2024 ISTR and VR Operations and Maintenance (O&M) Manual (2024 ISTR VR O&M Revision 1) and the July 2025 ISTR VR O&M Manual Revision 1 Addendum (July 2025 Addendum), which was approved by Ecology on July 31, 2025.

Additional VR system testing was performed in August of 2025 to further understand flow distribution from the VR screens. Generally, there are three elevations of vapor capture in Zone A. There are shallow VR points co-located with each of the heaters, Touchet bed VR points either co-located with heaters at the bottom of the treatment interval or installed within three newly installed characterization borings (mid VR points), and there are deep standalone VR points within the Upper Pasco Gravels. The August system testing applied vacuum to screens at each of the three elevations of capture independent from the other elevations. Test results are documented in the attached ISTR VR Test memo (Test Memo) and indicate that negative pressure was observed in all test scenarios at locations up to 200 ft away. The testing showed higher vapor concentrations from the mid VR points, and lower concentrations from the shallow and deep capture points. Results of the testing, conducted at approximately half the available flow capacity of the system, show that existing infrastructure will provide a radius of influence facilitating the necessary capture for the successful operation of the Phase 2 ISTR system. The test results do not indicate a need for revision to the July 2025 Addendum but will be used to guide future operational changes during Phase 2 system operations. The attached Test Memo is therefore being included as a supplement to the 2024 ISTR VR O&M Revision 1 and the July 2025 Addendum.

Based on the VR test results, minor adjustments have been made to the initial valve configuration for Phase 2 start-up described in the July 2025 Addendum. Instead of 100% of the shallow VR points being opened by 25%, approximately half of the shallow points will be closed completely with the other half will be opened to 25%. This will improve capture from the Touchet bed (mid VR) screens where vapor concentrations were observed to be higher but is expected to provide sufficient capture to maintain negative pressures at the pressure monitoring points within the ISTR treatment area and along the perimeter.

TRS Group, Inc.

In Situ Thermal Remediation Vapor Recovery Operations and Maintenance Manual Revision 1 Addendum

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Pasco, Washington

Date: 7/30/2025

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Introduction

The *In Situ Thermal Remediation (ISTR) Vapor Recovery (VR) Operations and Maintenance (O&M) Manual* was revised in November of 2024 (2024 ISTR VR O&M Revision 1) to incorporate changes to system infrastructure, operations, maintenance and monitoring based on operational challenges encountered during Phase 1. This ISTR VR O&M Addendum (Addendum) summarizes those November 2024 changes and includes additional operation and monitoring changes to be incorporated into Phase 2 of ISTR operations. The intent of this Addendum is to supplement the O&M Manual and not replace it.

The primary challenge encountered during Phase 1 operations was the increase in concentrations of some contaminants of concern (COCs) in groundwater downgradient of the heated area. For Phase 2 operations, the probability of similar impacts below the treatment zone will be reduced by additional measures described in this Addendum. These measures include increased VR in the Upper Pasco Gravels (UPG) using the ten standalone VR points installed in November 2024, an increase in total vapor capture volume, and a decrease in the use of ambient bleed air. In addition, heat input will be regulated based on results from increased monitoring and data collection described in this Addendum. The VR points as well as the temperature and pressure monitoring points are represented in **Attachment A**.

The Phase 2 VR system includes capture points within the heated volume as well as below the heated volume in the UPG. The green columns in **Figure 1** represent the sand interval of each VR point collocated with a heater. The white horizontal lines represent the bottom of the designed treatment interval. The orange and magenta columns represent the 10 UPG standalone VR points and 14 deep screen VR (collocated with select heaters) installed at the bottom of the Phase 1 and Phase 2 treatment areas, respectively. The distribution of VR points represented in **Figure 1** allows for capture within and below the treatment volume, with the purpose of creating a gradient of vapor movement in the subsurface toward the VR system.

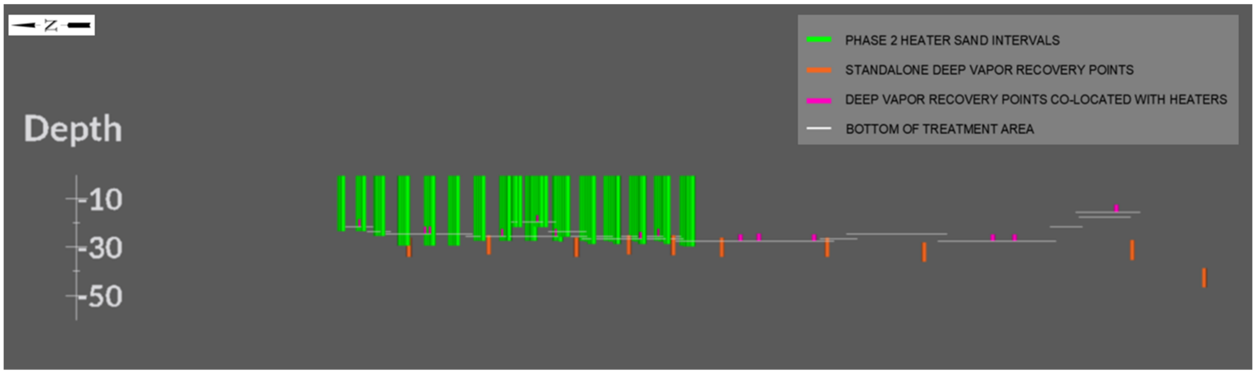


Figure 1. Phase 2 VR

A critical component of the vapor capture system is up-time. Several upgrades to the system have been made to ensure that unplanned shutdowns of the vapor capture and treatment system are prevented or minimized. Planned shutdowns will generally last less than two hours. These are detailed in this Addendum.

Another challenge encountered during Phase 1 operations was evidence of subsurface smoldering/combustion. Temperature and vapor monitoring showed indirect evidence of smoldering/combustion which led to temporary local temperature increases as contaminants were being oxidized into carbon dioxide (CO_2). While this mechanism reduces the amount of semi-volatile compounds in the formation, TRS was requested to minimize smoldering/combustion to reduce the risk of uncontrolled vapor release if the smoldering extended beyond the vacuum influence of the vapor recovery system. For Phase 2, the increased VR rates may cause additional oxygen to be pulled in, potentially enhancing conditions for smoldering. Therefore, a careful balance between maintaining vapor capture and reducing smoldering will be maintained through the operational guidance provided the Phase 2 Operations and Contingencies section of this Addendum.

ISTR System Changes

Since operations of Phase 1 concluded in October 2024, the following infrastructure (as documented in the 2024 ISTR VR O&M Revision 1) has been added:

- Ten standalone deep VR points and associated VR piping have been installed to recover mass present in the UPG. In **Figure 2**, the ten deep standalone VR points are shown below in orange with black polygons representing the top of the UPG layer. Deep VR points previously installed per the original design are also shown in magenta and are connected to the VR manifold. These deep VR screens have better access to the permeable soil beneath the treatment zone. VR access to the deeper soils provides improved protection of the groundwater by creating a gradient of vapor flow away from the water and toward the VR system.

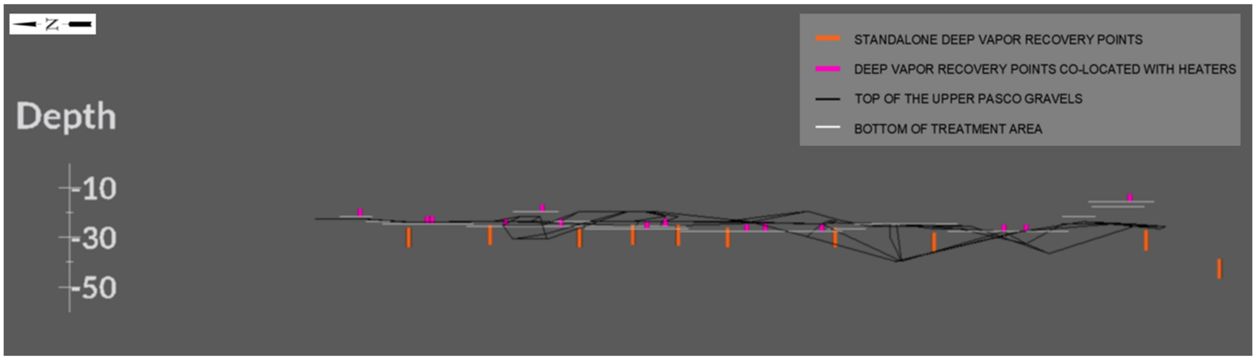


Figure 2. Deep VR Screens

- Temperature monitoring point (TMP) K13D was installed to measure temperature within and beneath the Phase 2 treatment area.
- VR system improvements:
    - A thorough inspection and maintenance event was performed by others on the regenerative thermal oxidizer (RTO) and associated non-ISTR components in March of 2025.
    - A thorough inspection and maintenance event was also performed by TRS on ISTR components including the condenser, cooling towers, and blower in March of 2025.

- An ISTR treatment blower bypass has been installed allowing for seamless transition and use of the former SVE 30 hp blower in the event of thermal VR blower maintenance or repair of more than a few hours.
- The rotor assembly and the variable frequency drive (VFD) have been replaced in the ISTR blower and are in like-new condition entering Phase 2.
- A backup 40 hp ISTR blower is staged at the site in the event of a primary ISTR blower failure.
- A piping manifold sloped to gravity drain toward the condenser for the Phase 2 heaters, as well as a separate VR piping header for the deep standalone VR points in the Phase 1 area were installed. The sloped piping will prevent the accumulation of condensed water vapor in the piping, which could reduce flow from the subsurface. Separation of the Phase 2 VR piping and the Phase 1 deep and standalone VR points allows for more precise flow balance between the treatment volume and the Phase 1 area.
- Stainless steel Phase 2 VR control valves have been installed, replacing the brass valves to address corrosion impacts that occurred during Phase 1.
  - These stainless steel control valves were installed vertically instead of horizontally to reduce corrosion due to build up of condensation within horizontal sections of piping.

- Condenser and water treatment system improvements:
  - A backup wet deck and drift eliminator for the cooling tower are staged at the site in the event replacements are needed.
  - Additional filtration for condensate has been incorporated including bag filters, organoclay, and a tertiary liquid-phase granular activated carbon (LGAC) vessel as previously documented in the 2024 ISTR VR O&M Revision 1.
- An additional downgradient groundwater performance monitoring well (MW-64S) has been added to monitor VOC concentrations in groundwater at a location strategically closer to and downgradient of Phase 2 operations.
- RTO lower explosive limit (LEL) readings have been incorporated into the ISTR system operating program so that remote LEL observation can be used to guide operational changes.
- Five peripheral TMP and pressure monitoring point (PMP) locations will be added to the perimeter of the Phase 2 treatment volume, and will be referred to as thermal peripheral points in this document.
  - The locations will be used to monitor both pneumatic control and heat propagation away from the treatment volume.
  - Locations must be installed within 45 days of initial Phase 2 heating.
  - Soil borings will be logged from a starting depth of approximately 5 ft bgs, down to 10 ft into the UPG or an approximate depth of 40 ft bgs. PID readings will be measured every foot.
  - Soil samples will be collected from approximately each 5-foot interval. If PID screening within a 5-foot interval exceeds 100 parts per million by volume (ppmv)[1],

[1] PID screening threshold based on a review of PEC data correlation of PID measurements to total TPH. A threshold of 100 ppmv is more conservative than the 200 ppmv threshold set in the Compliance Monitoring Plan for screening the presence of NAPL.

- a composite sample from that interval will be analyzed for VOCs, SVOCs, TPH-Gx, and TPH-Dx in accordance with the Ecology-approved Compliance Monitoring Plan. The data from these samples will be used to interpret smoldering risk on the site periphery.
    - Locations will include temperature monitoring at five-foot intervals from at least 10 ft into the UPG up to 5 ft bgs.
    - If historic soil data show organic concentrations higher than 3,000 mg/kg deeper than 10 ft into the UPGs, the boring and monitoring will be extended to soils below this 3,000 mg/kg elevation.
    - Cross section and layout of the thermal peripheral points are included in **Attachment A.**
- Four characterization borings are planned for installation during the peripheral TMP/PMP installation.
    - The characterization borings will extend from surface down to approximately 70 ft bgs.
    - These borings are intended to better understand the vertical profile of contaminant mass within and below the treatment volume.
    - In three of the four borings, a 2-inch by 5-foot stainless steel screen will be installed from 15 -20 ft bgs. This screen will provide focused vapor capture capacity within the Touchet beds.
    - Soil borings will be logged from a starting depth of approximately 20 ft bgs, down to the water table and/or an approximate depth of 70 ft bgs. PID readings will be measured every foot.
    - Soil samples will be collected from approximately each 5-foot interval starting at the bottom of the treatment volume, informed by the soil sample depth of greatest PID measurement to assist with correlation of PID readings. The first two samples collected directly underneath the treatment volume will be analyzed first, with subsequent deeper samples archived pending initial results. Soil samples will be analyzed for VOCs, SVOCs, TPH-Gx, and TPH-Dx in accordance with the Ecology-approved Compliance Monitoring Plan.
    - The borings beneath the sand pack will be backfilled with neat cement grout, as will the boring collocated with BH28.
    - Cross section and layout of the characterization points are included in **Attachment A.**
- One TMP will be added to monitor temperatures between the western edge of the Phase 1 and the natural gas line.
    - The location of this TMP was selected to be between an area of elevated temperatures at the western edge of the Phase 1 area and the gas line.
    - The depth of the TMP extends well below the depth of the gas line, which based on observations made during sheet pile installation, should be approximately 5 ft bgs.
    - Cross section and layout of the TMP are included in **Attachment A.**
- A bypass piping route will be installed around the ISTR blower, condenser, and liquid treatment system to facilitate a changeover to operation solely under the historic SVE system blower, RTO, and liquid processing systems.

- This change will occur at the end of ISTR operations, and will be based on the conditions described in the Phase 2 System Operations, Maintenance, and Monitoring section below.
- A temperature sensor will be installed at the inlet to the piping on the west side of Dietrich Road. This will be used to confirm the incoming temperature of the vapor stream to the piping is below 50°C.

- A downgradient injection well array has been installed approximately 200 to 350 feet downgradient of the Phase 1 thermal treatment area, and a PlumeStop™ injection event occurred in February of 2025 for in situ groundwater treatment directly upgradient of MW-12S in the pathway of the plume. The injection wells remain in place.

Operation Monitoring and Data Collection

Additional data points and increases to the frequency of data collection will be incorporated into Phase 2 operations. A list of increased monitoring is provided below with additional explanations, as needed.

- PMP data collection within the ISTR treatment zone and at the exterior points will be three times weekly, instead of weekly, and will be increased to daily during times of falling barometric pressure or observations of positive or zero pressure at any PMP.
- Weekly measurement of combustion data including; CO_2, CO and O_2 at the RTO inlet by Apex Companies, LLC, by and through its wholly owned subsidiary PBS Engineering and Environmental LLC (Apex), and weekly measurement by Apex and TRS at the operating deep standalone VR points.
- Flowrate and vacuum readings as well as photoionization detector (PID) and combustion data will be collected weekly from the active deep standalone VR points. These readings will be collected within the surface VR line that connects to each deep standalone VR screen prior to that line connecting to the surface piping manifold. These readings will allow for a regional understanding of volumetric capture, vapor concentration, and potential smoldering activity.
- Monitoring well MW-64S will be sampled by Apex every three weeks during ISTR operations[2], and sampling frequencies of certain existing key wells downgradient of Zone A have been increased in accordance with Ecology November 8, 2024, letter.
- Temperature data within the Phase 1 area will continue to be collected in areas where smoldering is suspected, per the July 15, 2025 e-mail request by Ecology.
    - This includes daily readings from J20, J23, N23, M28, P29, Q22, and Q28.
    - Also, weekly monitoring from H19, H20, H21, H22, H23, J24, and J25.
- Temperature monitoring at Balefill Area thermocouples will continue by Apex throughout Phase 2 operations. The locations of these and all other hand readings that may be collected during Phase 2 are shown in **Figure 3** in green. TMPs installed within Phase 2 where temperature readings will be automatically recorded are shown in blue. **Figure 3** highlights the range of access for temperature monitoring both within and below the treatment volume.
- Temperature monitoring at the five thermal peripheral points.

[2] Per Ecology (ECY) letter dated November 8, 2024, groundwater monitoring wells adjacent to Zone A will be gauged for light non-aqueous phase liquid and inform ECY in writing of these results concurrent with laboratory analytical results from that monitoring event.

- Temperature monitoring of vapor stream into HDPE piping.

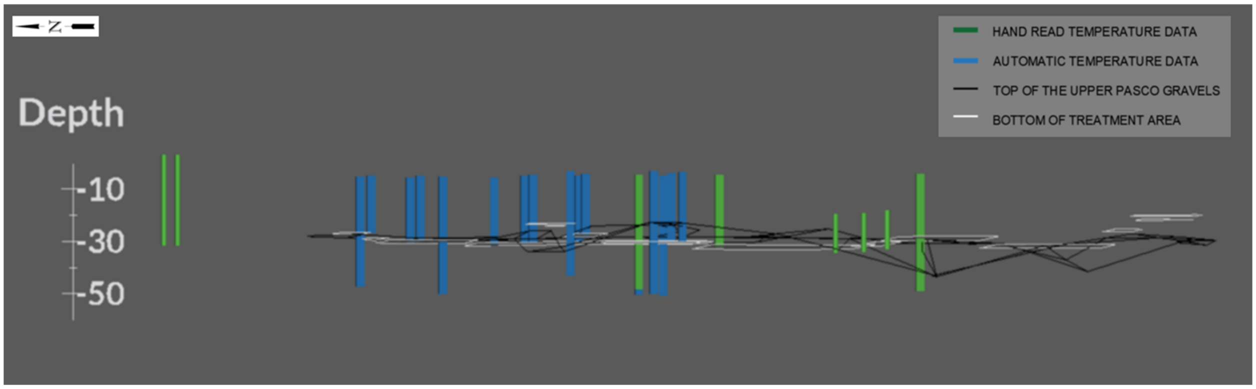


Figure 3. Temperature Monitoring

Phase 2 System Operations, Maintenance, and Monitoring

Operational decision making will incorporate additional infrastructure and collected data to achieve the ISTR Remedial Action Objectives. The following operational, maintenance, and monitoring changes will be implemented during Phase 2:

- For heater operation to proceed, negative pressure is required within the treatment volume, the five thermal peripheral points, and at the seven historic SVE perimeter PMPs.
    - This negative pressure will lead to slower and reduced heating at the site perimeters but will ensure a gradient of flow into the treatment volume.
- Total vapor capture flow will be increased from the Phase 1 average of 555 standard cubic feet per minute (scfm) to between 800 and 1,000 scfm, with approximately 400 scfm coming from the operation of deep standalone VR points.
    - Total flow target will be balanced between maintaining a negative pressure at the treatment zone and exterior PMPs, while minimizing cooling of the heated volume, and in a manner that reduces the propagation of smoldering conditions.
- Ambient bleed air will only be used temporarily to flush lines of accumulated condensate on an as-needed short-term basis, or to flush VR lines in the event of a temporary VR shutdown but will not be a primary mechanism for LEL management.
    - Power reduction will be used to manage LEL, and is described in the Phase 2 Operations and Contingency section below.
- Increases in VOC groundwater concentrations at downgradient wells will instigate a discussion with Ecology, Floyd|Snider (F|S) and IWAG to determine if heating should be continued, reduced, or ended until groundwater concentrations stabilize or drop.
    - Any potential use of the downgradient injection wells following such an event will be determined by IWAG with approval of Ecology.
    - Vapor capture will continue whether power to the heaters is on or not, and will be increased to the extent practical.

- Weekly surface temperature monitoring of vapor recovery lines will be conducted using a thermal imaging camera to assess flow through individual VR screens.
    - Thermal image review of the vapor recovery piping offers a good indication of capture from individual points. Cooler VR lines can be an indication of clogging of a capture point. Points will be cleaned or replaced as needed to maintain capture. If capture from an individual point cannot be restored, and adjacent PMPs don't show negative pressure, additional repair efforts or installation of a replacement VR point will occur within three days. Impacted heaters may also be disconnected from power as needed to maintain negative pressure at the PMPs.
- Performance soil sampling will occur as close to the point of desiccation as possible to reduce the risk of smoldering conditions. Shutting down heaters adjacent to soils that have met the criteria will help reduce the risk of smoldering conditions.
    - Energy, temperature, and mass recovery as estimated from vapor stream concentration data will be used to optimally select a sampling date, as discussed below. This may require multiple mobilizations as moisture and contaminant content are expected to be variable throughout the Phase 2 treatment area.
        - Initial sampling is likely to occur when approximately 60% of the modeled energy has been input.
            - Bench scale results and Phase 1 performance data indicate that many areas of the site will have reached the soil criteria prior to inputting 100% of the modeled energy.
        - Average temperature across the vertical treatment area in a given area should be 90°C or higher.
            - Phase 1 operational data indicates peak mass removal occurred at an average temperature of 90 to 95°C.
            - The existing performance standards described in the Engineering Design Report (EDR) will apply regardless of the timing of performance soil sampling.
        - Daily mass recovery should be less than 2% of total Phase 2 recovered mass for at least two weeks prior to sampling.
            - This percentage is based on Phase 1 mass recovery data, and indicates an asymptotic condition for mass recovery.
- VR will continue for a minimum of two weeks after all Phase 2 heaters have been shut down. Final shutdown of the ISTR system VR will be based on a multiple lines of evidence approach in coordination with Ecology and IWAG.
    - Shutdown of the ISTR VR blower, condenser and liquid treatment system will occur when ambient air PID concentrations in the breathing zone of Zone A remain below action levels without shallow vapor capture and when temperatures entering the condenser are less than 50°C for at least two weeks. If extended vapor capture is warranted by subsurface smoldering or UPG soil gas concentrations equal to or greater than historic SVE extraction concentrations, the ISTR bypass will be implemented.
        - Temporary shutdown of the ISTR VR blower will occur two weeks after the shutdown of all Phase 2 heaters. The above-mentioned PID readings will be collected within 24 hours of this shutdown.

        - If PID concentrations are above action levels, VR will be brought back online adjacent to locations where action levels were exceeded until breathing zone concentrations remain below action levels for two consecutive days.
            - Iterative breathing zone testing may be necessary before all VR locations can be closed.
    - Smoldering conditions will also be confirmed to be stable or in decline without VR.
        - Infrastructure will be installed post heating to connect the standalone deep VR points to the historic SVE system including the RTO and associated monitoring and treatment equipment. These connections may include the installation of additional condensate processing and treatment equipment if soil vapors contain moisture beyond the historic system capacity. The historic system can be brought back online while demobilization of the ISTR system occurs.
        - After demobilization of the ISTR VR components is complete, VR using the historic SVE system will continue until site temperatures are consistently in decline for 2 weeks and until no signs of ongoing smoldering are observed.

Phase 2 Initial Startup Operations

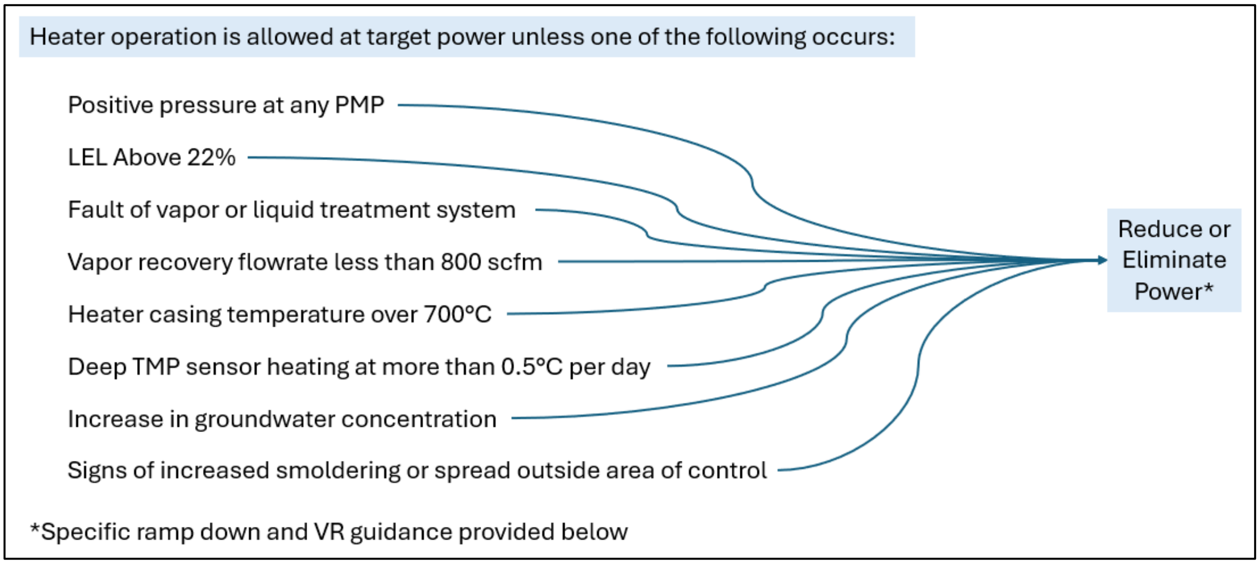
Startup of the Phase 2 system will occur over an approximate two-week period and will adhere to the following guidance unless changes are agreed upon by Ecology, IWAG, and TRS.

- All ten of the deep standalone VR point valves will be opened 100% initially.
- All eight Phase 2 deep collocated VR valves will be opened 100% initially.
- All bleed air valves in the VR piping manifold as well as the blower bleed air valve will be closed initially.
- All shallow VR points will be set at 25% open initially.
    - Shallow VR on the northern row of the Phase 1 heaters (row 16) will be operated during Phase 2 operations.
- A flowrate of between 800 and 1000 scfm will be maintained, with approximately 400 scfm coming from the deep standalone VR points. This may require further adjustments of the valves from initial set points.
    - Adjustments may be made to valve positions as needed to maintain this overall flowrate objective and negative pressure at each PMP.
- After target flow has been established and maintained for a period of at least two hours, negative pressure will be confirmed at the PMPs.
- If positive or zero pressures are observed at any PMP, adjustments to blower speed, and/or VR valve positions will be used to rebalance flow in a way that maintains a negative pressure at all PMPs.
    - Positive or zero pressure may be temporarily observed during periodic weather events, so pressure monitoring will be increased to daily during periods of quickly falling barometric pressure to distinguish if the pressure is weather related.
        - If positive or zero pressure readings are related to weather, startup testing will continue uninterrupted.
        - If positive or zero pressure are not correlated to weather events adjustments to VR will be made until a negative pressure can be maintained at all PMPs.

- Once the targeted flow and negative pressure have been established and an LEL of less than 25% (per the 2024 ISTR VR O&M Revision 1) is maintained for at least one hour, a round of deep standalone VR data will be collected from all active standalone points including temperature, pressure, flow rate, PID, and CO_2 and CO data.
- Following the confirmation of desired VR conditions of negative PMP pressure and minimum flow rate, heater power will be applied to all Phase 2 heaters.
    - Power application to the heaters will ramp slowly for the first three days, with an initial application of 25% of target power for eight hours, and then 10% increases in power every eight hours until the target power of 735 kW has been achieved.
    - After the initial ramp up, future ramp ups after heater downtime will last between four and eight hours unless power has been off for more than three days at which point the ramp up may take up to three days.
    - If at any point, despite adjustments to vapor capture, positive or zero pressure unrelated to a weather event, or an LEL in excess of 22 % is observed, reductions in power will be made until both conditions are satisfied. Reductions in power could be on individual heaters, circuits, or areas of the site depending on the severity of the exceedance.

Phase 2 Operations and Contingency

After conclusion of initial startup activities within the above listed parameters, full operations will continue until treatment goals as described in Section 5.1 of the Compliance Monitoring Plan have been met and shutdown of the ISTR system has been agreed upon by all parties. If an operational parameter is not satisfied, a contingency plan for addressing the deviation will be implemented as described below.



- Positive or zero pressure is observed at any PMP;
    - VR well valve positions will be adjusted to optimize capture from the positive or zero pressure area while maintaining negative pressure at all other points.
    - If valve adjustments are insufficient to maintain a negative pressure, heater power will be reduced in circuits adjacent to the observed pressure in 10% increments every two hours until vacuum is reestablished.

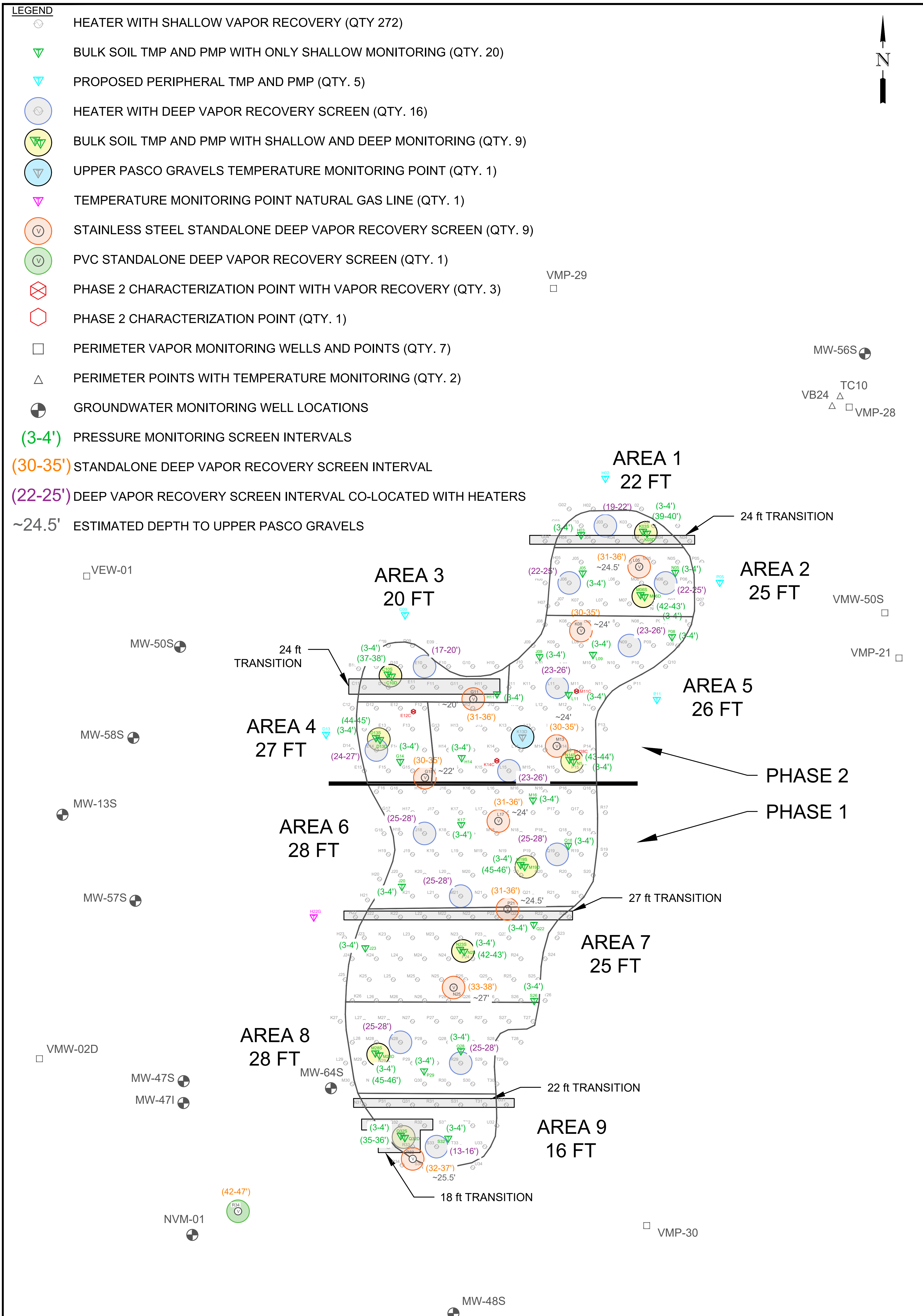
- Power application will be turned off on adjacent circuits if negative pressure cannot be maintained, additional VR screen in a new boring will be added as needed.
    - Power will be ramped back up in 10% increments as negative pressure is maintained for at least two hours.
- Total flow not between 800 and 1000 scfm;
    - This flow range is intended for operations of the entire Phase 2 volume and may be scaled back as areas of heating are taken offline. The scale will be on a per volume basis of currently operating heaters compared to the total Phase 2 treatment volume.
    - If negative pressure can be maintained at lower flowrates, the remediation may be accelerated. Higher flow rates will bring ambient subsurface air from soils farther from the treatment volume. This air will act to cool the perimeter of the treatment volume as it is pulled through the heated soils. Reductions in flow will reduce heat loss. Reductions in flow below 800 scfm will be communicated to Ecology and IWAG via electronic mail within 24 hrs.
- LEL readings are above 22%;
    - Power will be reduced by 10% when LEL readings as measured at the RTO inlet reach 22% to ensure that LEL remains below 25%. If LEL continues to rise, power will be reduced in 10% increments every two hours until LEL stabilizes or drops.
    - Power will be increased once LEL of 22% or less has been maintained for at least eight hours.
    - Adjustments will also be made to vapor recovery by balancing flow between areas of high and low concentration to reduce LEL while maintaining negative pressure at all PMPs.
- Deep TMP temperature increasing by more than 0.5°C/day for more than 5 consecutive days;
    - Sudden and sustained increases in temperature could be associated with convective fluid movement or smoldering as opposed to conductive heat transfer from the heaters.
    - Temperature monitoring at points exceeding the 0.5°C rate of increase will increase by including hand readings at 10 and 15 feet below the bottom of the treatment interval. Data from these points will be used to better understand the potential for convective heat transfer and the impacts of vapor capture adjustment and heater power adjustment.
    - Heating will be reduced in 10% increments in circuits adjacent to the TMP, and will be reviewed and adjusted daily until the heat up rate slows to less than 0.5°C per day.
    - Regional VR may be adjusted until heating slows to less than 0.5°C per day.
- Increase in standalone VR point concentration of more than an order of magnitude in one week.
    - A sudden increase in vapor concentration could be an indication of convective fluid movement or smoldering.
        - Temperature and pressure data from adjacent monitoring points as well as smoldering data will be used to determine if vapor capture should be increased or decreased to stabilize or reduce the increasing concentration.

        - If adjustments to vapor capture are not successful in stabilizing or reducing vapor concentrations within one week, heating will be reduced in 10% increments in circuits adjacent to the VR point, and will be reviewed and adjusted daily until concentrations stabilize.
- Individual VR lines lacking desired flow;
    - VR lines will be scanned weekly with an infrared camera to confirm flow.
    - If flow is not observed and positive or zero pressure are observed at adjacent PMPs, the impacted heater will be disconnected from power and the line cleared or replaced within three days.
    - Once flow and PMP vacuum are reestablished the heater will be brought back online.
        - Flow may be reestablished though cleaning of subsurface components using steam or brushes, surface piping or valves may be replaced, or new VR points installed within a new boring.
        - Overlapping radius of influence from adjacent VR points may also be sufficient to maintain capture of a clogged point, as observed at adjacent PMPs.
- RTO and associated vapor and liquid treatment systems are not functioning as intended;
    - Faults in the operation of the vapor capture and treatment system will require power to the heaters be turned off until the treatment system functionality has been restored.
    - The post blower VGAC vessels are sized to vent the VR piping and treatment equipment in the event of a temporary shutdown of the RTO. If the RTO is inoperable for more than one week and must be bypassed to protect the breathing zone or groundwater, larger vessels will need to be installed and adjustments made to the air permit.
    - Ecology will be informed within 24 hours if it is determined the RTO will be inoperable for more than one week.
- Smoldering data including temperature and CO_2/CO/O_2 data indicate acceleration of smoldering;
    - If smoldering data and/or temperature data indicate a sudden spike in smoldering activity, or indicate smoldering may spread beyond the monitoring and VR radius, heating will be reduced in the circuits adjacent to the smoldering location until confidence in capture and control are obtained.
    - If smoldering conditions are observed to be related to increased oxygen flow, adjustments to vapor recovery may be used to manage smoldering conditions alongside or instead of reductions in heating.
    - Confidence of capture and control will come from a stabilization or reduction of conditions for at least one week.
    - If collected data indicate the possible movement of smoldering outside the pneumatic and temperature monitoring of the system, a review of historic data will be used to understand the risk of vertical or lateral smoldering migration.
        - If data show negligible risk due to the area being bound by soils too clean to propagate the front, monitoring and heating will continue as long as pneumatic control can be confirmed.
        - If data shows a risk of propagation due to adjacent soil mass, monitoring infrastructure will be installed in the direction of the adjacent mass. This

monitoring point will match the design of the thermal peripheral points and could later be used as an extraction point if smoldering does propagate.
        - If no historic data is available to guide the installation of additional monitoring, a point will be installed in the direction of the nearest sensitive receptor (utility, road, sheet pile wall, etc.) at a distance of at least 15 ft from the nearest heater or temperature monitoring point.
- Groundwater concentrations increase by more than an order of magnitude from most recent pre-Phase 2 sample (baseline) at MW-64S;
  If all other system monitoring and operational systems have been insufficient to prevent migration of contaminant mass to the groundwater, MW-64S will act as a sentinel well, providing early warning of groundwater impacts.
    - If groundwater concentrations increase at MW-64S by less than an order of magnitude above baseline and are less than site-cleanup levels, additional groundwater samples will be collected from MW-64S and directly downgradient wells NVM-01 and MW-47S, and a meeting will be held by TRS, F|S, IWAG, and Ecology to evaluate the changes in groundwater quality within the context of ISTR monitoring data.
    - If groundwater concentrations increase by more than an order of magnitude above baseline or above site-cleanup levels, TRS will reduce power to all heaters by 50%. Additional groundwater samples will be collected from MW-64S and directly downgradient wells NVM-01, MW-47S, and MW-12S, and a meeting will be held by TRS, F|S, IWAG, and Ecology to evaluate the changes in groundwater quality within the context of ISTR monitoring data and discuss next steps, likely including activation of existing deep vapor recovery wells within the Phase 1 area and the southern location and additional data collection.
        - This reduction in power should maintain temperature by overcoming heat loss. TRS will observe temperature trends within TMPs after the 50% power reduction. If site average temperatures are dropping by more than 0.5°C per day over the next week TRS may request to increase power to overcome losses as necessary.
        - Groundwater sampling should then be repeated within the next week to better observe a trend in concentrations.
        - If concentrations are stable or decreasing, power will then be reapplied at 75% of the original power. If concentrations are still increasing, power will be reduced to 25%.
        - Groundwater sampling should be repeated weekly with a 3-day turnaround time to help inform operational decision making.
        - If results are still stable or decreasing after increasing power back to 75%, then power can be restored to 100% and groundwater will continue to be monitored weekly for an additional 2 weeks.
        - If results show an increase in concentration, power will be kept at the 25% input until concentrations are stable or decreasing for two consecutive events.
    - The results of the sampling will be used to determine if downgradient injection (i.e., with PlumeStop or equivalent) is warranted. A determination of the need for downstream injection will be made based on observed Phase 2 groundwater trends, experience from historic plume migration and from observations made during

Phase 1 and post Phase 1 operations. Injections will be used if adjustments to ISTR operations have been determined insufficient for protection of groundwater and will be necessary to prevent migration of contaminants at concentrations above site cleanup levels from leaving the property.

This Addendum may be revised during Phase 2 operations (based on observations and collected data) with consent from Ecology and IWAG.



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0 22 44 88
SCALE IN FEET

DESIGNED BY: C. CROWNOVER
DRAWN BY: E. SEILER
CHECKED BY: TRS PERSONNEL
PROJECT MANAGER: S. AVRITT
TECHNOLOGY REVIEW: PENDING APPROVAL

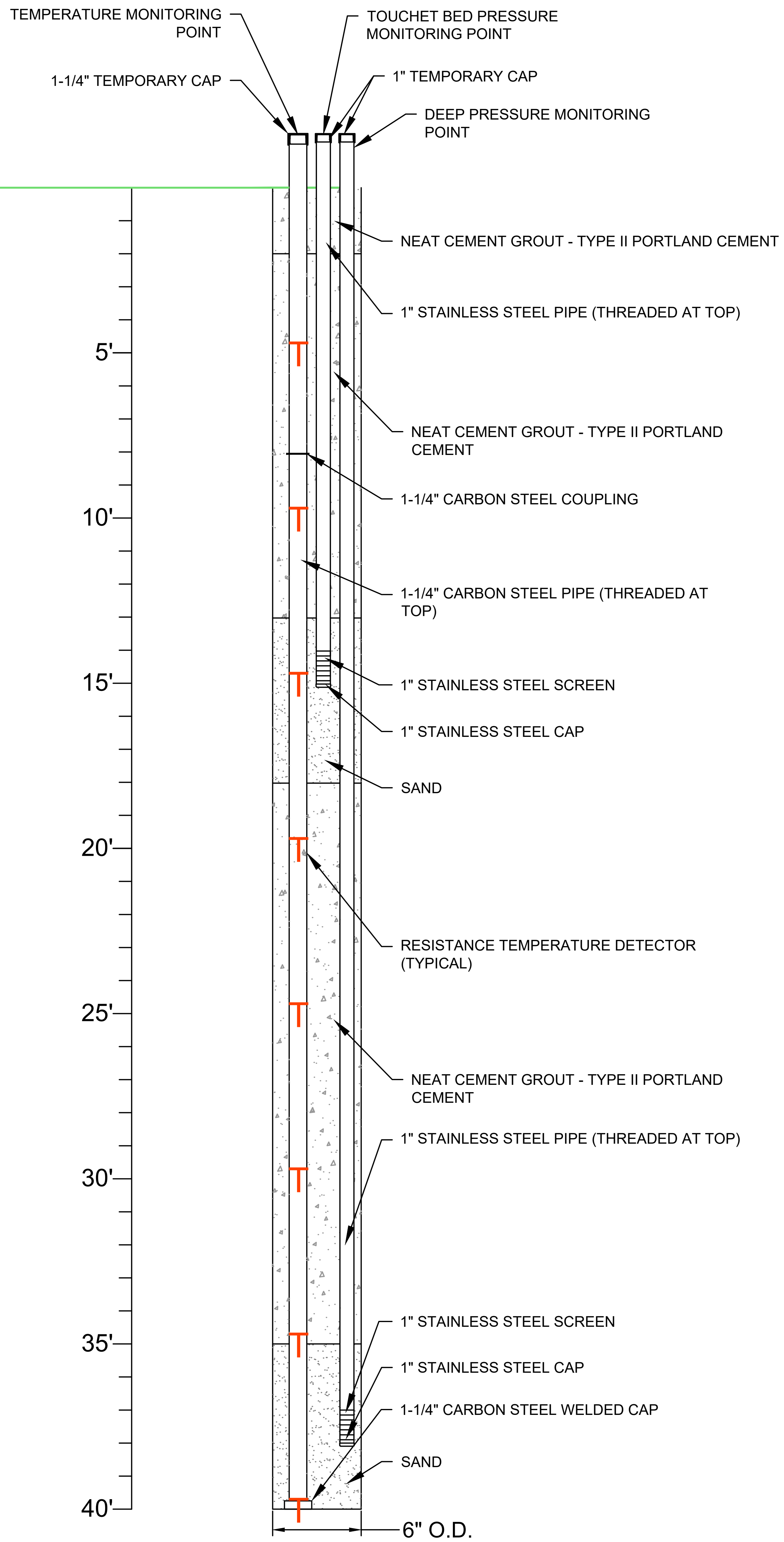
SITE: PASCO ZONE A
LOCATION: PASCO, WA
CLIENT: IWAG

SITE PLAN

APPROVED FOR CONSTRUCTION
BY ____________________
DATE ____________________

DATE: 2025.JUN.23
PROJECT: WA.1707
SHEET

PERIPHERAL TEMPERATURE AND PRESSURE MONITORING POINT (TYPICAL OF 5)



NOTE:

1. BORING MUST EXTEND 10 FEET INTO THE UPPER PASCO GRAVELS. BORING DEPTH AND SCREEN INTERVALS MAY BE INCREASED OR DECREASED BASED ON LOCAL ELEVATION OF PASCO GRAVELS.

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DESIGNED BY: C. CROWNOVER
DRAWN BY: E. SEILER
CHECKED BY: C. CROWNOVER
PROJECT MANAGER: S. AVRITT
TECHNOLOGY REVIEW: APPROVED

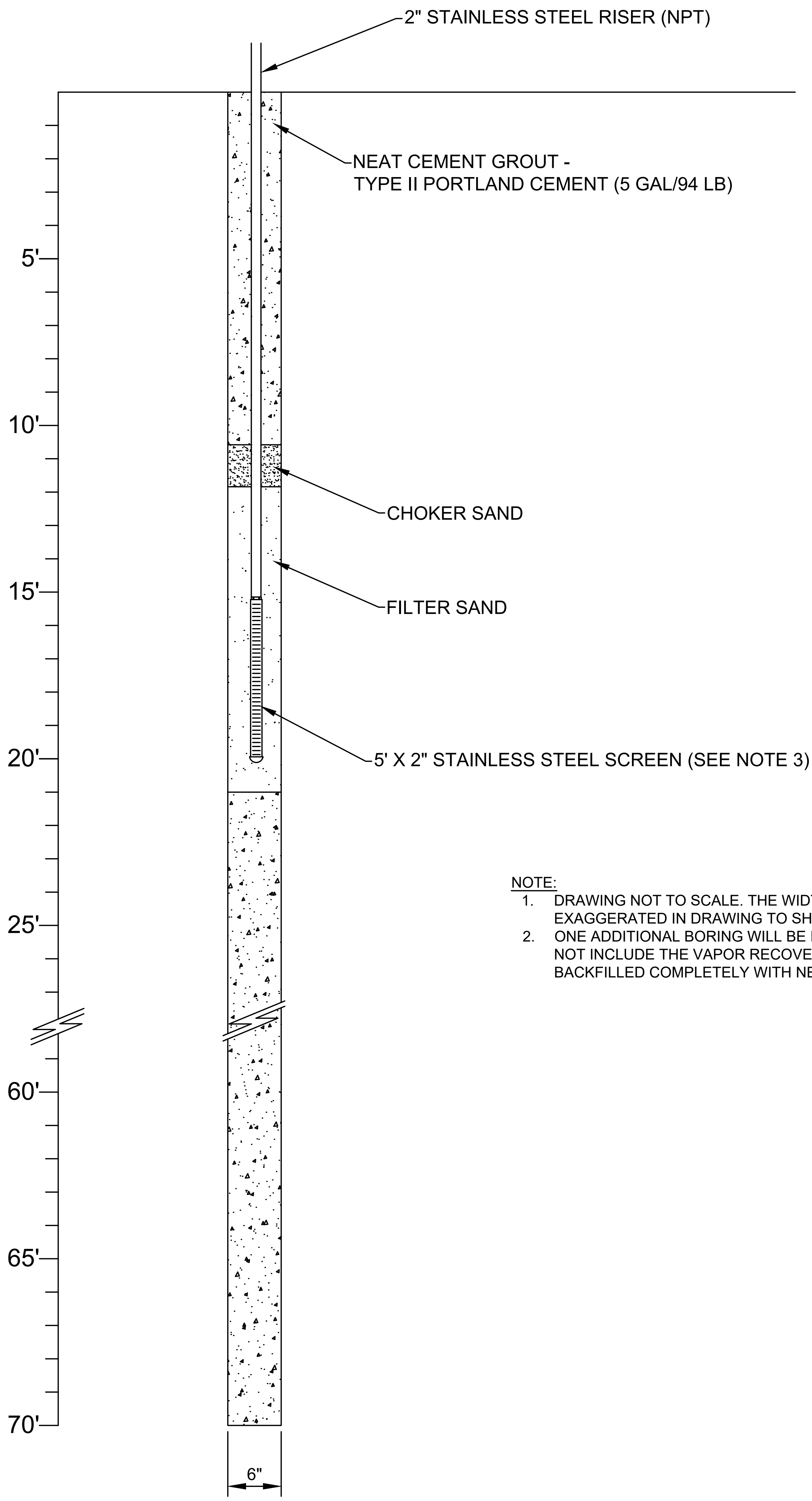
SITE: PASCO ZONE A
LOCATION: PASCO, WA
CLIENT: IWAG

PERIPHERAL TEMPERATURE AND PRESSURE MONITORING POINT DETAIL

APPROVED FOR CONSTRUCTION
BY
DATE 2023.SEP.20

DATE 2025.JUL.23
PROJECT WA.1707
SHEET M-37

CHARACTERIZATION VAPOR RECOVERY POINT
(TYPICAL OF 3) (SEE NOTE 2)



NOTE:
1. DRAWING NOT TO SCALE. THE WIDTH OF PIPE AND BOREHOLE ARE EXAGGERATED IN DRAWING TO SHOW DETAIL.
2. ONE ADDITIONAL BORING WILL BE INSTALLED AT BH28C, BUT WILL NOT INCLUDE THE VAPOR RECOVERY SCREEN, AND WILL BE BACKFILLED COMPLETELY WITH NEAT CEMENT GROUT.

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DESIGNED BY: C. CROWNOVER
DRAWN BY: E. SEILER
CHECKED BY: C. CROWNOVER
PROJECT MANAGER: S. AVRITT
TECHNOLOGY REVIEW: APPROVED

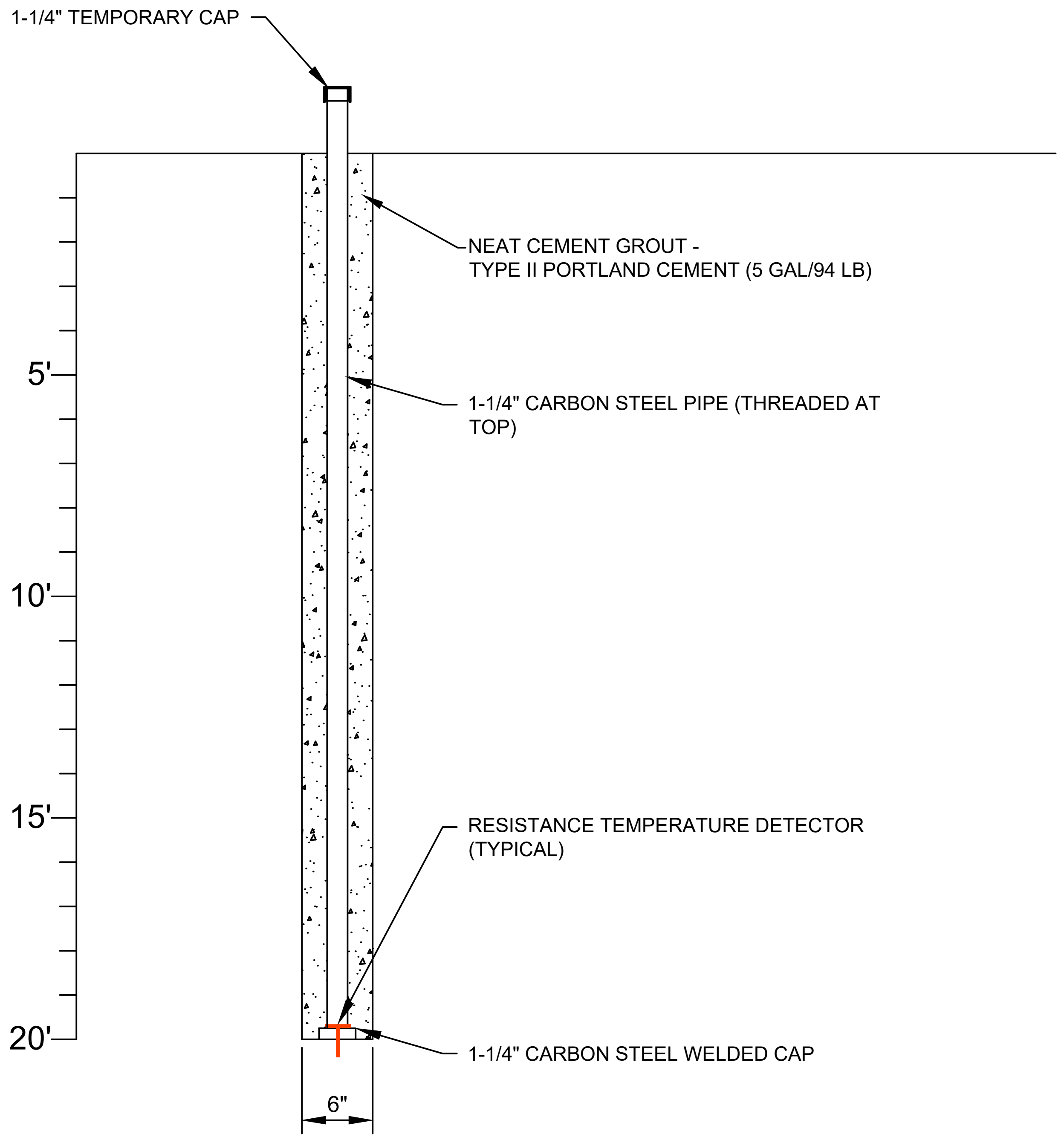
SITE: PASCO ZONE A
LOCATION: PASCO, WA
CLIENT: IWAG

CHARACTERIZATION VAPOR RECOVERY POINT DETAIL

APPROVED FOR CONSTRUCTION
BY
DATE 2023.SEP.20

DATE: 2025.JUL.23
PROJECT: WA.1707
SHEET: M-38

GAS LINE TEMPERATURE MONITORING POINT
(TYPICAL OF 1)



NOTE:

1. DRAWING NOT TO SCALE. THE WIDTH OF PIPE AND BOREHOLE ARE EXAGGERATED IN DRAWING TO SHOW DETAIL.
2. PIPE TO EXTEND 1 FOOT ABOVE GRADE

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DESIGNED BY: C. CROWNOVER
DRAWN BY: E. SEILER
CHECKED BY: C. CROWNOVER
PROJECT MANAGER: S. AVRITT
TECHNOLOGY REVIEW: APPROVED

SITE: PASCO ZONE A
LOCATION: PASCO, WA
CLIENT: IWAG

GAS LINE TEMPERATURE MONITORING POINT DETAIL

APPROVED FOR CONSTRUCTION
BY [signature]
DATE 2023.SEP.20

DATE: 2025.JUL.23
PROJECT: WA.1707
SHEET: M-39

TRS Group, Inc.

In Situ Thermal Remediation Vapor Recovery Test

Pasco Landfill NPL Site,

Pasco, Washington

Date: 8/26/2025

TRS Group, Inc.
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P.O. Box 737
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Introduction

This report summarizes a test of the vapor recovery (VR) infrastructure for Phase 2 operations of the in situ thermal remediation system at the Pasco Landfill Site. To quantify the vacuum influence of the existing VR system a series of tests were performed on subsections of VR screens distributed throughout the site. Each test included vacuum measurements from pressure monitoring points (PMPs) distributed within, beneath and outside of the treatment volume. The PMP locations are shown in **Attachment A**.

Results from each test are included in **Attachment B** and a visual summary of the test results is included as **Attachment C**.

Test Parameters and Results

In each test scenario a subsection of VR screens was used as the sole point of vapor capture. The blower was run at a low speed of 25 Hz during all testing, well below the capability of the blower, but at a flow rate achievable by all test scenarios. This blower speed was at the lowest flow that could maintain negative pressure at all points and is less than half of the 800 to 1,000 standard cubic feet per minute (scfm) planned for operations in Phase 2. The reason this blower speed was used was to document potential areas where there was the lowest vacuum. These tested subsections were selected based largely upon their elevation. Screens are installed both in the Touchet beds within the treatment volume, and the Upper Pasco Gravels (UPG) at the bottom and below the treatment volume. Vacuum measurements were collected using a Dwyer Series 475 Mark III digital manometer with a range of 0-20 inches of water (in H_2O), or 0-4 in H_2O column where higher resolution was required at lower vacuum.

Observed vacuums in each test revealed that readings taken in the morning had higher vacuums than the afternoon readings. These differences seem to be related to ambient temperature which approached 100 °F during testing. Phase 1 Deep testing, Phase 1 Co-Located Deep, and Phase 2 Shallow testing showed that flow and vacuum readings were relatively consistent during subsequent morning readings but observed vacuums were less in afternoon readings. No positive pressures were observed during testing, with only a few zero readings during testing at points most distant from vapor extraction. The first round of data for each test was collected between 25 min and 3.5 hours after valve positions were set for the test. Adjustments to valve positions seem to have an almost immediate and consistent impact on field measurements. Most of the tests were run overnight and results on the subsequent morning were comparable to the initial results. The following includes a summary of the test results for each subsection:

- Phase 1 deep standalone VR points (only):

    The Phase 1 Standalone test included applying vacuum to the southern five standalone points (L17, P21, N25, R33, and R34) installed within the UPG and no other open screens. All locations showed induced vacuum during the first and third round of data collection, with two locations (PMP K03S and VMW-50S) showing zero pressure or vacuum during the second round. Induced vacuum ranged from zero to 2.23 in H_2O. Average vapor recovery flow rate for this test was 403 scfm. Blower vacuum readings during this test were an average of 4 inches of mercury (in Hg) as recorded in the header system. The Phase 1 Deep figure in **Attachment C** shows that the most significant induced vacuums are in the deeper monitoring points, especially those points directly below the Phase 1 area.

- Phase 2 deep standalone VR points (only):

  The Phase 2 Standalone test included applying vacuum to the northern five standalone points (L05, K08, G11, M13, and G15) installed within the UPG and no other open screens. PMP M28S was the only location showing zero pressure or induced vacuum during the first round, with all other locations showing induced vacuum across both rounds of data collection. Induced vacuum ranged from zero to 3.12 in H_2O. Average vapor recovery flow rate for this test was 453 scfm. Blower vacuum readings during this test were an average of 2.5 in Hg as recorded in the header system. The Phase 2 Deep figure in **Attachment C** shows the most significant induced vacuums at the deep locations across the site, with the highest readings directly beneath Phase 2.

- Phase 1 and 2 deep standalone VR points (only):

  With all ten deep standalone points connected to the blower (applied vacuum), all PMP readings indicated induced vacuum. The induced vacuum ranged from 0.012 to 3.30 in H_2O. Average vapor recovery flow rate for this test was 473 scfm. Blower vacuum readings during this test were an average of 1.7 in Hg as recorded in the header system. As observed in the Phase 1 and 2 Deep Standalone figure included in **Attachment C**, induced vacuum distribution is more evenly spread within the UPG, as well as the shallow PMPs.

- Phase 1 deep co-located heater screens (only):

  The Phase 1 Co-located Deep points (J18, Q19, M21, N28, R29, and S32) showed vacuum at all PMPs except PMP K03S on the northernmost edge of Phase 2, where a zero pressure/vacuum was recorded. In this test, induced vacuums ranged from zero to 1.76 in H_2O. The initial VR flowrate of 255 scfm seems to be an instrument error or associated with delayed flow equilibrium, as both subsequent readings 4 and 22 hours later are consistent at 415 scfm. Applied blower vacuum readings on this test were the highest observed at 8.4 in Hg as recorded in the header system. The higher blower vacuum is likely related to the tighter soils expected at the elevation of most of the screens as well as the smaller number and size of screens used for the test. Most of these screens are installed within the Touchet beds, or in a transition zone with the UPGs.

- Phase 2 deep co-located heater screens (only):

  The Phase 2 Co-located Deep points (J03, J06, N06, N09, E10, L11, E14, L15) show vacuum at all points. In this test, induced vacuums ranged from 0.010 to 1.97 in H_2O. Header applied vacuum readings on this test were 6.3 in Hg, slightly lower than the Phase 1 deep co-located test but higher than 4 in Hg observed during the deep standalone tests. The higher blower vacuum is likely related to the tighter soils expected at the elevation of most of the screens as well as the smaller number and size of screens used for the test. Most of these screens are installed within the

Touchet beds, or in a transition zone with the UPGs. Average vapor recovery flow rate for this test was 496 scfm.

- Phase 2 shallow co-located heater screens (only):

  This test included all 129 Phase 2 shallow vapor recovery points with individual valves opened to about 25%. Pinching the valves to 25% open allows for a better overall flow distribution but can be adjusted during operations to optimize regional capture. The first round of readings indicated vacuum at all points except PMP P29, where a zero reading was recorded. The subsequent afternoon readings also showed zero at PMPs J20, J23, N23S, Q22, M28S, S26, and S32. In this test, vacuums ranged from zero to 4.77 in H2O. The 4.75 in H2O induced at PMP M06D is an outlier, as the next highest reading was at 2.42 inH_2O. Average vapor recovery flow rate for this test was 438 scfm. Blower vacuum readings during this test were an average of 1.7 in Hg as recorded in the header system. Compared to all of the deep VR testing above, this test had higher airflow and lower applied vacuum which was to be expected with the large number of screens (even at 25% open). The shallow VR points have greater access to ambient air at the cap perimeter, but the radius of influence is still large and impacts both shallow and deep PMPs.

Blower speed was maintained at 25 hertz for all tests, which provided flows between 255 and 510 scfm. The average flow for all tests was 411 scfm. PID readings at the blower effluent were between 63 and 500 parts per million (ppm). The highest concentrations were observed at the Phase 2 co-located points where they ranged from 491 to 500 ppm. The lowest concentrations were observed in the Phase 2 shallow points at 63 ppm. For the deep standalone tests, concentrations were between 153 and 204 ppm. These PID readings match historic soil concentration data, with most of the volatile mass in the deeper region of the treatment volume, and lower average concentrations in the shallow soils within the treatment volume and the soils beneath the treatment volume. Blower effluent PID readings reveal that vapors recovered from the UPG tend to provide a uniform average concentration of 157 ppm, however, individual points directly beneath the heated volume show variability from twice the average down to less than 10 ppm.

Phase 2 Operations Guidance

In all tests vacuums were observed throughout the treatment volume as well as within the exterior PMPs. The zero readings observed at points distant from vapor extraction were only observed during sunny hot days and were not observed during cooler morning readings. With as few as six 1-inch diameter by 3-foot-long VR screens, vacuum influence can be seen at least 210 feet away from the screens. This significant radius of influence shows that an inward gradient can be achieved with the existing infrastructure.

The PID readings collected during testing showed the highest concentrations were recovered from the Phase 2 deep co-located points. These points are installed nearest the soils with the highest remaining historic volatile organic soil concentrations. Concentrations observed from the shallow points and the deep standalone points were significantly lower. Given these observations, TRS suggests that the 8 deep Phase 2 co-located points should have their valves 100% open throughout operations to increase the relative flow volume recovered from these points.

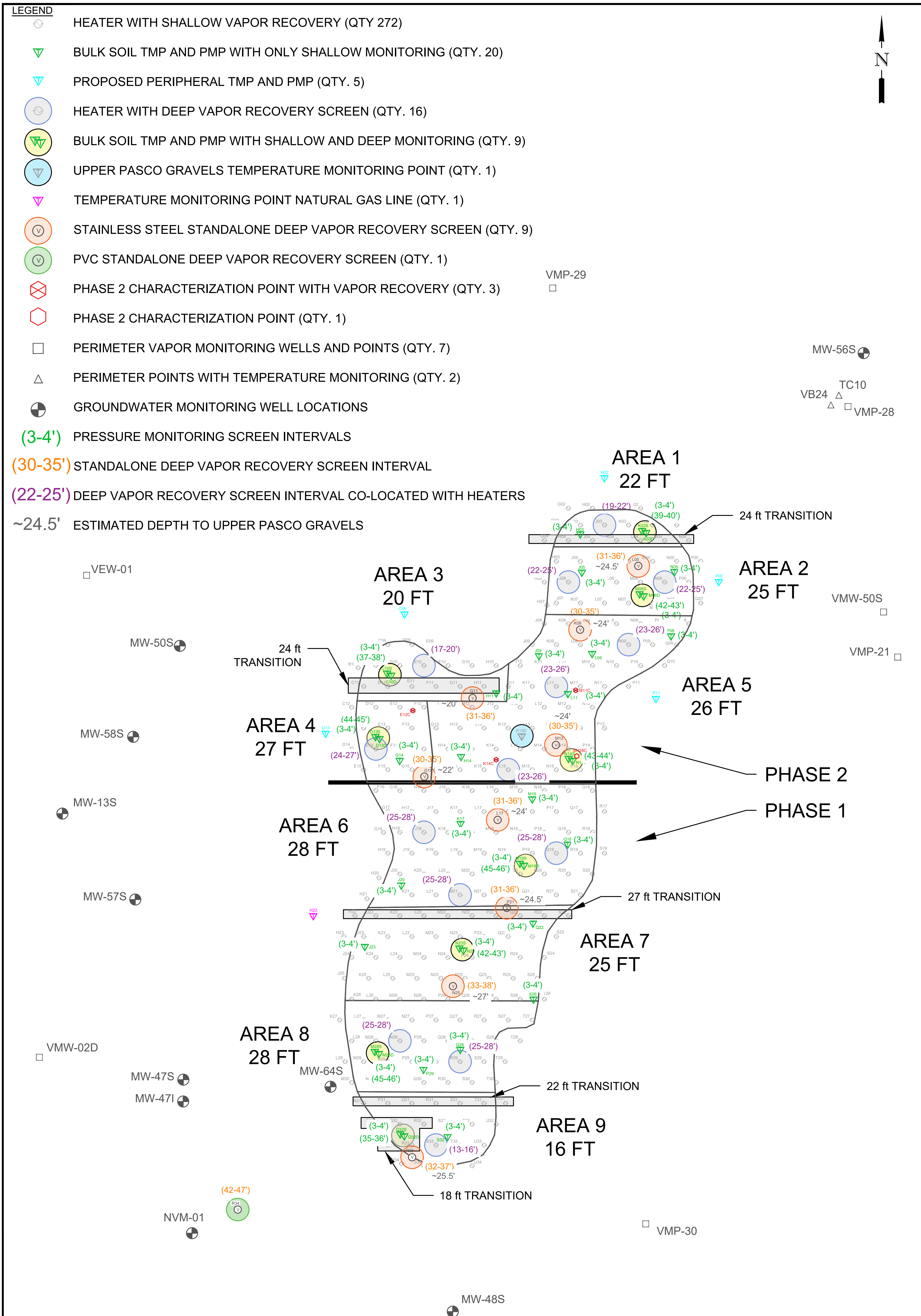
Although concentrations in the Phase 2 shallow VR points are currently low, these concentrations will certainly increase as heating begins. TRS suggest that the Phase 2 valves remain at 25% open, and that adjustments to valve position can be made based on observed vacuums at adjacent shallow PMPs. These points have significantly overlapping radius of influence, so not all points need to remain open at all times, but TRS will notify Ecology and IWAG if total flow is less than 800 SCFM during operations.

While the VR testing utilized an average recovery rate of 411 scfm, the permitted capacity of the system is up to 1,000 scfm. During Phase 2 operations, an even greater radius of influence is expected due to the higher average recovery of between 800 and 1,000 scfm. The VR testing results indicate that the operational guidance included in the Operations and Maintenance Manual Addendum (Addendum) is well founded, but that flow priority may need adjustment to optimize mass recovery. Given that the Phase 2 deep co-located points showed significantly higher concentrations, capture from these points should be prioritized. To avoid pulling contaminated vapors vertically downward during operations, it is suggested that the 400 scfm target for the standalone points may need to be lowered if concentrations increase significantly at the standalone points during heating. As described in the Addendum, temperature, pressure, and smoldering data will be used to guide flow adjustments on the standalone points.

The relatively low concentrations observed in the Phase 2 shallow VR points could represent some increased ambient air capture at the cap perimeter. TRS suggests that a weekly check of vapor concentrations from just the shallow VR points can be used to judge if ambient air collection is limiting the effectiveness of the shallow points. If significant dilution is apparent, TRS suggests turning off every other shallow valve completely to increase the relative volume of capture by the deeper points. Reductions in shallow capture can be continued as long as vacuums are maintained at the PMPs, LEL limits are not exceeded, and no odor or steam issues are observed at the surface.

If the results and guidance of this testing are satisfactory to all parties, TRS will update the Addendum by referencing this report. Once the final Addendum is approved, we would like to begin operations of the Phase 2 system.

Attachment A



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SCALE IN FEET

DESIGNED BY: C. CROWNOVER
DRAWN BY: E. SEILER
CHECKED BY: TRS PERSONNEL
PROJECT MANAGER: S. AVRITT
TECHNOLOGY REVIEW: PENDING APPROVAL

SITE: PASCO ZONE A
LOCATION: PASCO, WA
CLIENT: IWAG

SITE PLAN

APPROVED FOR CONSTRUCTION
BY ____________
DATE ____________

DATE: 2025.JUN.23
PROJECT: WA.1707
SHEET:

Attachment B

Locations to open: Standalone points L17, P21, N25, R33, and R34 10:45 AM, 92 °

Date:	8/11/2025	8/11/2025	8/12/2025			
Time:	11:10	14:10	6:25			
Blower Speed (Hz)	25	25	25			
Total Flow (SCFM)	425	390	395			
Header Vac (inHg/inH2O)	-4.0	-4.0	-4.1			
Ambient Temp (°F)	92	98	65			
Barometer (inHg)	=29.95	↓29.89	=29.87			
PMP Survey ("H2O)						
PMP H03	-0.055	-0.018	-0.063			
PMP K03S	-0.018	0.000	-0.022			
PMP K03D	-1.132	-0.457	-1.10			
PMP J05	-0.058	-0.022	-0.057			
PMP N05	-0.106	-0.041	-0.121			
PMP M06S	-0.320	-0.137	-0.026			
PMP M06D	-1.248	-0.567	-0.29			
PMP C10S	-0.030	-0.011	-0.024			
PMP C10D	-1.54	-0.71	-1.39			
PMP H11	-0.015	-0.009	-0.018			
PMP D13S	-0.08	-0.065	-0.12			
PMP D13D	-1.56	-0.80	-1.52			
PMP G14	-0.08	-0.059	-0.13			
PMP P08	-0.178	-0.075	-0.13			
PMP J09	-0.162	-0.076	-0.12			
PMP L09	-0.154	-0.080	-0.10			
PMP L11	-0.062	-0.032	-0.066			
PMP H14	-0.012	-0.037	-0.08			
PMP N14S	-0.123	-0.076	-0.09			
PMP N14D	-1.742	-1.024	-1.69			
PMP K17	-0.378	-0.25	-0.36			
PMP J20	-0.031	-0.009	-0.032			
PMP M16	-0.091	-0.062	-0.06			
PMP M19S	-0.118	-0.066	-0.08			
PMP M19D	-2.095	-1.301	-2.07			
PMP Q18	-0.254	-0.166	-0.21			
PMP J23	-0.06	-0.043	-0.06			
PMP N23S	-0.22	-0.14	-0.24			
PMP N23D	-2.20	-1.44	-2.23			
PMP Q22	-0.040	-0.017	-0.043			
PMP M28S	-0.021	-0.010	-0.024			
PMP M28D	-1.83	-1.09	-1.88			
PMP P29	-0.09	-0.083	-0.12			

Date:	8/11/2025	8/11/2025	8/12/2025			
Time:	11:10	14:10	6:25			
PMP Q28	-0.504	-0.347	-0.50			
PMP S26	-0.187	-0.106	-0.15			
PMP Q32S	-0.087	-0.048	-0.08			
PMP Q32D	-2.17	-1.45	-2.10			
PMP S32	-0.081	-0.051	-0.06			
PMP D14 S	-0.61	-0.37	-0.49			
PMP D14 D	-1.67	-0.93	-1.43			
PMP C09 S	-0.60	-0.22	-0.36			
PMP C09 D	-1.52	-0.64	-1.26			
PMP H02 S	-0.289	-0.12	-0.28			
PMP H02 D	-1.08	-0.47	-1.07			
PMP P05 S	-0.382	-0.16	-0.34			
PMP P05 D	-1.158	-0.53	-1.16			
PMP P11 S	-0.728	-0.37	-0.72			
PMP P11 D	-1.384	-0.75	-1.28			
VMP-21	-0.067	-0.009	-0.10			
VMP-28	-0.19	-0.029	-0.30			
VMP-29	-0.87	-0.270	-0.99			
VMP-30	-1.30	-0.592	-1.52			
VMW-02D	-1.02	-0.398	-1.32			
VMW-50S	-0.06	0.000	-0.11			
VEW-01	-0.85	-0.212	-1.11			
Standalone line vac ("H20)						
L17	-19.72	-20.8	-19.84			
N25	-36.4	-34.0	-31.14			
P21	-22.0	-22.3	-21.41			
R33	-16.0	-15.0	-14.73			
R34	-10.7	-9.2	-10.32			
Standalone dp ("H20)						
L17	-0.20	-0.17	-0.16			
N25	-1.40	-1.39	-1.46			
P21	-0.37	-0.41	-0.42			
R33	-0.50	-0.32	-0.39			
R34	-1.30	-1.05	-1.22			
Standalone temps (°C)						
L17	143		108			
N25	152		159			
P21	145		156			
R33	140		93			
R34	94		75			

Date:	8/11/2025	8/11/2025	8/12/2025			
Time:	11:10	14:10	6:25			
Standalone PID						
L17	22.1	27.4	22.8			
N25	302	156	209			
P21	146	104	150			
R33	10.4	10.1	8.2			
R34	1.2	1.3	0.3			

Locations to open: Standalone points L05, K08, G11, M13, and G15 8:20

Date:	8/12/2025	8/13/2025				
Time:	11:05	6:05				
Blower Speed (Hz)	25	25				
Total Flow (SCFM)	460	445				
Header Vac (inHg/inH2O)	0.8/30.0	2.1/32				
Ambient Temp (^{o}F)	91	71				
lower Effluent PID (ppm)		153				
Barometer (inHg)	↓29.85	↑29.74				
PMP Survey ("H2O)						
PMP H03	-0.12	-0.16				
PMP K03S	-0.047	-0.060				
PMP K03D	-2.28	-2.97				
PMP J05	-0.14	-0.162				
PMP N05	-0.24	-0.32				
PMP M06S	-0.71	-0.24				
PMP M06D	-2.75	-0.87				
PMP C10S	-0.029	-0.041				
PMP C10D	-1.88	-2.38				
PMP H11	-0.042	-0.048				
PMP D13S	-0.16	-0.20				
PMP D13D	-1.86	-2.33				
PMP G14	-0.19	-0.23				
PMP P08	-0.33	-0.35				
PMP J09	-0.344	-0.239				
PMP L09	-0.31	-0.34				
PMP L11	-0.124	-0.155				
PMP H14	-0.13	-0.15				
PMP N14S	-0.186	-0.199				
PMP N14D	-2.55	-3.12				
PMP K17	-0.44	-0.55				
PMP J20	-0.026	-0.033				
PMP M16	-0.098	-0.128				
PMP M19S	-0.110	-0.143				
PMP M19D	-1.81	-2.37				
PMP Q18	-0.27	-0.35				
PMP J23	-0.045	-0.068				
PMP N23S	-0.12	-0.16				
PMP N23D	-1.30	-1.79				
PMP Q22	-0.021	-0.039				
PMP M28S	0.000	-0.012				
PMP M28D	-0.88	-1.37				

Date:	8/12/2025	8/13/2025				
Time:	11:05	6:05				
PMP P29	-0.062	-0.102				
PMP Q28	-0.28	-0.403				
PMP S26	-0.111	-0.159				
PMP Q32S	-0.037	-0.075				
PMP Q32D	-0.77	-1.26				
PMP S32	-0.033	-0.073				
PMP D14 S	-0.52	-0.52				
PMP D14 D	-1.58	-1.87				
PMP C09 S	-0.66	-0.61				
PMP C09 D	-2.00	-2.28				
PMP H02 S	-0.56	-0.62				
PMP H02 D	-2.02	-2.43				
PMP P05 S	-0.68	-0.52				
PMP P05 D	-2.06	-2.48				
PMP P11 S	-1.26	-1.33				
PMP P11 D	-2.36	-2.87				
VMP-21	-0.065	-0.10				
VMP-28	-0.295	-0.47				
VMP-29	-1.38	-1.95				
VMP-30	-0.71	-1.33				
VMW-02D	-0.502	-1.12				
VMW-50S	-0.093	-0.12				
VEW-01	-0.78	-1.39				
Standalone line vac ("H20)						
G11	28.2	29.8				
G15	30.0	30.0				
K08	26.0	27.5				
L05	26.4	28.6				
M13	29.5	30.7				
Standalone dp ("H20)						
G11	0.66	0.73				
G15	0.63	0.26				
K08	1.38	1.41				
L05	0.72	0.84				
M13	0.30	0.57				
Standalone temps (°C)						
G11	113	95.5				
G15	117	94.3				
K08	114	86.5				
L05	115	88.0				

Date:	8/12/2025	8/13/2025				
Time:	11:05	6:05				
M13	122	91.6				
Standalone PID						
G11	21.2	37.0				
G15	49.7	53.0				
K08	252	255				
L05	90.3	112				
M13	91.0	102				

Locations to open: Standalone points L17, P21, N25, R33, R34, L05, K08, G11, M13, and G15 8:50 start

Date:	8/13/2025	8/14/2025				
Time:	12:30	5:35				
Blower Speed (Hz)	25	25				
Total Flow (SCFM)	505	440				
Header Vac (inHg/inH2O)	0.4/22.0	0.5/23.4				
Ambient Temp (^{o}F)	95	67				
Blower Effluent PID (ppm)	159	158				
Barometer (inHg)	↓29.73	↑29.86				
PMP Survey ("H2O)						
PMP H03	-0.104	-0.164				
PMP K03S	-0.029	-0.065				
PMP K03D	-2.13	-2.98				
PMP J05	-0.116	-0.143				
PMP N05	-0.200	-0.324				
PMP M06S	-0.64	-0.841				
PMP M06D	-2.49	-3.02				
PMP C10S	-0.020	-0.052				
PMP C10D	-1.82	-2.73				
PMP H11	-0.025	-0.057				
PMP D13S	-0.149	-0.249				
PMP D13D	-1.84	-2.70				
PMP G14	-0.165	-0.258				
PMP P08	-0.311	-0.400				
PMP J09	-0.301	-0.383				
PMP L09	-0.273	-0.384				
PMP L11	-0.104	-0.166				
PMP H14	-0.110	-0.166				
PMP N14S	-0.172	-0.251				
PMP N14D	-0.242	-3.30				
PMP K17	-0.44	-0.607				
PMP J20	-0.021	-0.047				
PMP M16	-0.093	-0.132				
PMP M19S	-0.102	-0.154				
PMP M19D	-2.09	-2.85				
PMP Q18	-0.269	-0.352				
PMP J23	-0.057	-0.107				
PMP N23S	-0.165	-0.245				
PMP N23D	-1.81	-2.66				
PMP Q22	-0.047	-0.056				
PMP M28S	-0.012	-0.031				
PMP M28D	-1.35	-2.18				
PMP P29	-0.093	-0.141				
PMP Q28	-0.375	-0.569				
PMP S26	-0.157	-0.220				

Date:	8/13/2025	8/14/2025				
Time:	12:30	5:35				
PMP Q32S	-0.055	-0.100				
PMP Q32D	-1.46	-2.17				
PMP S32	-0.033	-0.102				
PMP D14 S	-0.54	-0.91				
PMP D14 D	-1.69	-2.52				
PMP C09 S	-0.66	-1.01				
PMP C09 D	-1.94	-2.79				
PMP H02 S	-0.52	-0.79				
PMP H02 D	-1.88	-2.76				
PMP P05 S	-0.64	-0.80				
PMP P05 D	-1.93	-2.82				
PMP P11 S	-1.17	-1.70				
PMP P11 D	-2.23	-3.12				
VMP-21	-0.070	-0.193				
VMP-28	-0.303	-0.624				
VMP-29	-1.32	-2.24				
VMP-30	-0.99	-1.98				
VMW-02D	-0.78	-1.72				
VMW-50S	-0.080	-0.235				
VEW-01	-0.086	-1.82				
Standalone line vac ("H20)						
G11	-18.4	-19.1				
G15	-20.3	-20.1				
K08	-19.7	-19.7				
L05	-20.9	-19.4				
L17	-11.2	-12.0				
M13	-21.4	-20.9				
N25	-14.8	-15.5				
P21	-11.6	-12.2				
R33	-7.7	-8.0				
R34	-5.8	-6.1				
Standalone dp ("H20)						
G11	0.40	0.21				
G15	0.20	0.17				
K08	0.76	0.88				
L05	0.36	0.40				
L17	0.07	0.05				
M13	0.19	0.24				
N25	0.44	0.35				
P21	0.23	0.10				
R33	0.09	0.11				
R34	0.36	0.44				
Standalone temps (°C)						

Date:	8/13/2025	8/14/2025				
Time:	12:30	5:35				
G11	126	90.5				
G15	130	84.4				
K08	122	69.1				
L05	120	76.0				
L17	121	87.3				
M13	120	79.2				
N25	137	130				
P21	122	117				
R33	129	76.5				
R34	118	60.1				
Standalone PID						
G11	40	36				
G15	57	74				
K08	222	248				
L05	113	149				
L17	46.6	50				
M13	101	131				
N25	221	242				
P21	151	166				
R33	18.4	26				
R34	0.3	4				

Locations to open:	Co-located deep VR points: J18, Q19, M21, N28, R29, S32				7:15
Date:	8/14/2025	8/14/2025	8/15/2025		
Time:	8:50	12:45	6:50		
Blower Speed (Hz)	25	25	25		
Total Flow (SCFM)	255	415	415		
Header Vac (inHg/inH2O)	8.4	8.4	8.4		
Ambient Temp (°F)	72	84	67		
Blower Effluent PID (ppm)	186	204	161		
Barometer (inHg)	↑29.89	↓29.86	↑29.88		
PMP Survey ("H2O)					
PMP H03	-0.069	-0.027	-0.068		
PMP K03S	-0.028	0.000	-0.027		
PMP K03D	-1.40	-0.532	-1.13		
PMP J05	-0.076	-0.030	-0.073		
PMP N05	-0.149	-0.058	-0.131		
PMP M06S	-0.388	-0.160	-0.341		
PMP M06D	-1.16	-0.612	-1.20		
PMP C10S	-0.020	-0.031	-0.024		
PMP C10D	-1.50	-0.701	-1.28		
PMP H11	-0.017	-0.010	-0.023		
PMP D13S	-0.141	-0.055	-0.130		
PMP D13D	-1.56	-0.77	-1.35		
PMP G14	-0.149	-0.061	-0.142		
PMP P08	-0.168	-0.085	-0.187		
PMP J09	-0.188	-0.086	-0.169		
PMP L09	-0.176	-0.080	-0.153		
PMP L11	-0.065	-0.033	-0.077		
PMP H14	-0.102	-0.064	-0.101		
PMP N14S	-0.112	-0.077	-0.137		
PMP N14D	-1.75	-0.845	-1.51		
PMP K17	-0.433	-0.273	-0.431		
PMP J20	-0.025	-0.011	-0.034		
PMP M16	-0.085	-0.067	-0.103		
PMP M19S	-0.107	-0.057	-0.113		
PMP M19D	-1.72	-0.911	-1.61		
PMP Q18	-0.259	-0.161	-0.266		
PMP J23	-0.071	-0.044	-0.066		
PMP N23S	-0.162	-0.088	-0.157		
PMP N23D	-1.68	-0.848	-1.47		
PMP Q22	-0.034	-0.020	-0.037		
PMP M28S	-0.028	-0.018	-0.034		
PMP M28D	-1.69	-0.879	-1.50		

Date:	8/14/2025	8/14/2025	8/15/2025			
Time:	8:50	12:45	6:50			
PMP P29	-0.224	-0.156	-0.224			
PMP Q28	-0.57	-0.364	-0.521			
PMP S26	-0.187	-0.050	-0.165			
PMP Q32S	-0.771	-0.651	-0.782			
PMP Q32D	-1.58	-0.76	-1.41			
PMP S32	-1.75	-1.68	-1.76			
PMP D14 S	-0.469	-0.19	-0.45			
PMP D14 D	-1.54	-0.71	-1.28			
PMP C09 S	-0.548	-0.18	-0.44			
PMP C09 D	-1.49	-0.62	-1.19			
PMP H02 S	-0.406	-0.09	-0.29			
PMP H02 D	-1.40	-0.52	-1.07			
PMP P05 S	-0.514	-0.16	-0.39			
PMP P05 D	-1.44	-0.56	-1.10			
PMP P11 S	-0.871	-0.34	-0.68			
PMP P11 D	-1.56	-0.69	-1.25			
VMP-21	-0.112	-0.028	-0.05			
VMP-28	-0.374	-0.06	-0.26			
VMP-29	-1.26	-0.44	-0.96			
VMP-30	-1.35	-0.47	-1.13			
VMW-02D	-1.18	-0.37	-0.99			
VMW-50S	-0.143	-0.026	-0.07			
VEW-01	-1.18	-0.37	-0.96			

Locations to open: Co-located deep VR points: J03, J06, N06, N09, E10, L11, E14, L15 7:30:00 AM

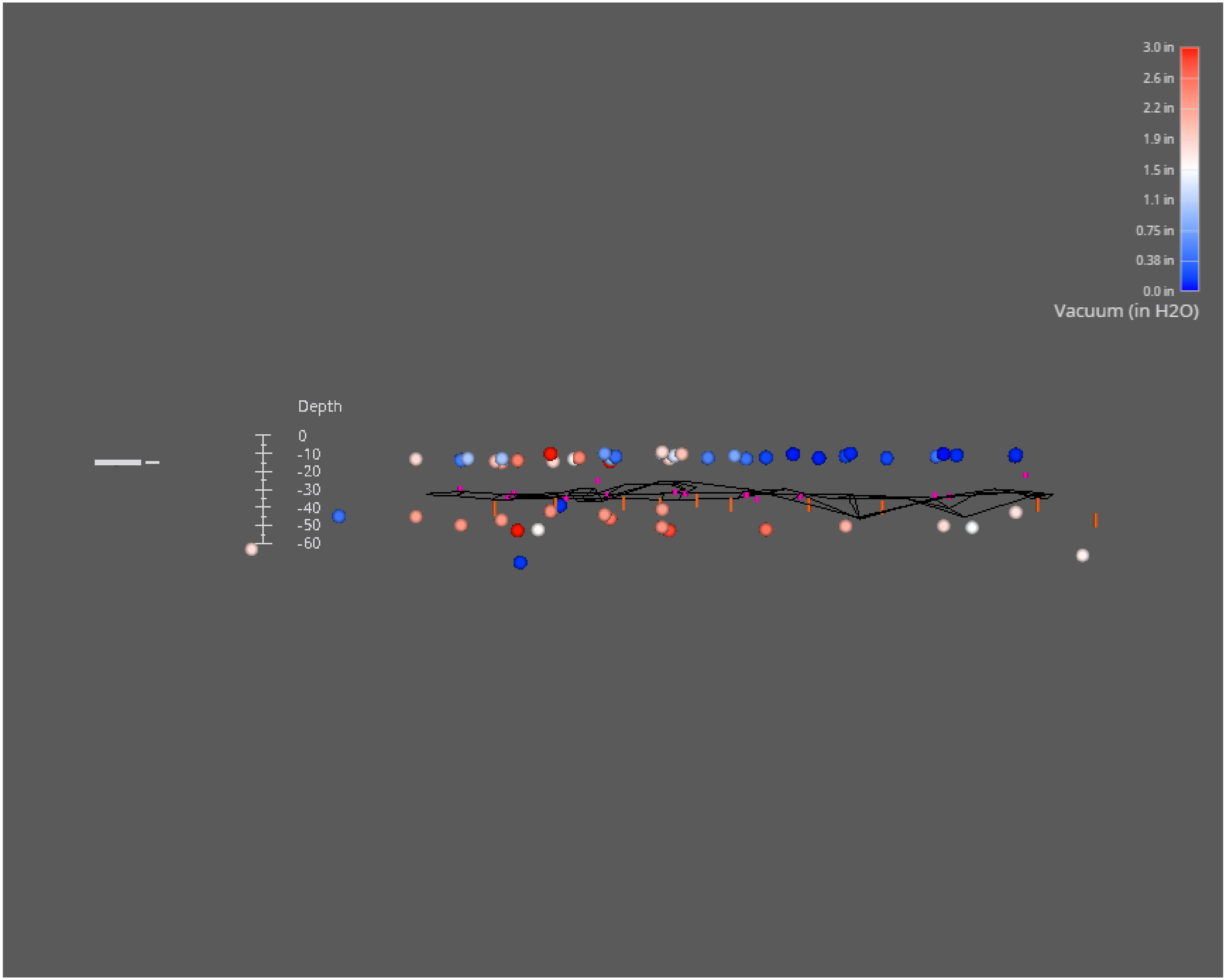
Date:	8/15/2025	8/15/2025				
Time:	8:00	10:00				
Blower Speed (Hz)	25	25				
Total Flow (SCFM)	330	380				
Header Vac (inHg/inH2O)	6.3	6.25				
Ambient Temp (^{o}F)	70	72				
Blower Effluent PID (ppm)	491	500				
Barometer (inHg)	=29.88	↑29.89				
PMP Survey ("H2O)						
PMP H03	-0.371	-0.364				
PMP K03S	-0.093	-0.090				
PMP K03D	-1.81	-1.73				
PMP J05	-0.325	-0.321				
PMP N05	-0.421	-0.397				
PMP M06S	-1.48	-1.45				
PMP M06D	-1.97	-1.87				
PMP C10S	-0.217	-0.193				
PMP C10D	-1.48	-1.40				
PMP H11	-0.051	-0.044				
PMP D13S	-0.234	-0.224				
PMP D13D	-1.47	-1.39				
PMP G14	-0.197	-0.180				
PMP P08	-0.648	-0.605				
PMP J09	-0.437	-0.421				
PMP L09	-0.613	-0.605				
PMP L11	-0.170	-0.168				
PMP H14	-0.119	-0.105				
PMP N14S	-0.155	-0.146				
PMP N14D	-1.73	-1.61				
PMP K17	-0.323	-0.291				
PMP J20	-0.032	-0.029				
PMP M16	-0.081	-0.081				
PMP M19S	-0.081	-0.063				
PMP M19D	-1.36	-1.21				
PMP Q18	-0.184	-0.172				
PMP J23	-0.045	-0.034				
PMP N23S	-0.098	-0.076				
PMP N23D	-1.08	-0.932				
PMP Q22	-0.012	-0.012				
PMP M28S	-0.010	-0.015				
PMP M28D	-0.921	-0.745				

Date:	8/15/2025	8/15/2025				
Time:	8:00	10:00				
PMP P29	-0.059	-0.036				
PMP Q28	-0.229	-0.160				
PMP S26	-0.110	-0.071				
PMP Q32S	-0.049	-0.019				
PMP Q32D	-0.895	-0.695				
PMP S32	-0.045	-0.032				
PMP D14 S	-0.52	-0.50				
PMP D14 D	-1.32	-1.22				
PMP C09 S	-1.72	-1.68				
PMP C09 D	-1.50	-1.43				
PMP H02 S	-1.03	-1.01				
PMP H02 D	-1.60	-1.56				
PMP P05 S	-0.75	-0.71				
PMP P05 D	-1.66	-1.59				
PMP P11 S	-1.76	-1.68				
PMP P11 D	-1.74	-1.63				
VMP-21	-0.096	-0.063				
VMP-28	-0.27	-0.25				
VMP-29	-1.17	-1.13				
VMP-30	-0.89	-0.73				
VMW-02D	-0.78	-0.63				
VMW-50S	-0.06	-0.05				
VEW-01	-0.89	-0.8				

Locations to open:	All shallow VR		8:50			
Date:	8/18/2025	8/18/2025	8/19/2025			
Time:	9:50	13:30	7:00			
Blower Speed (Hz)	25	25	25			
Total Flow (SCFM)	435	510	370			
Header Vac (inHg/inH2O)	18.5 in H20	18.5 in H20	24.5			
Blower Vacuum (inHg)	1.7	1.7				
Ambient Temp (°F)	73	83	63			
Blower Effluent PID (ppm)	80	61	43			
Barometer (inHg)	↑29.93	↓29.90	↑30.04			
PMP Survey ("H2O)						
PMP H03	-0.84	-0.72	-0.81			
PMP K03S	-0.42	-0.35	-0.40			
PMP K03D	-1.16	-0.31	-1.08			
PMP J05	-0.76	-0.75	-0.77			
PMP N05	-1.77	-1.60	-1.63			
PMP M06S	-0.45	-0.06	-1.11			
PMP M06D	-4.75	-4.77	-4.56			
PMP C10S	-0.59	-0.51	-0.57			
PMP C10D	-1.06	-0.22	-1.02			
PMP H11	-0.26	-0.27	-0.26			
PMP D13S	-0.66	-0.81	-0.95			
PMP D13D	-0.77	-0.27	-1.01			
PMP G14	-1.68	-1.67	-1.64			
PMP P08	-1.20	-1.27	-1.22			
PMP J09	-0.70	-1.92	-1.93			
PMP L09	-1.13	-0.82	-1.14			
PMP L11	-0.73	-0.68	-0.75			
PMP H14	-0.81	-0.79	-1.03			
PMP N14S	-1.44	-1.15	-1.63			
PMP N14D	-1.02	-0.25	-1.06			
PMP K17	-0.40	-0.28	-0.44			
PMP J20	-0.021	0.000	-0.015			
PMP M16	-0.36	-0.27	-0.39			
PMP M19S	-0.06	-0.043	-0.08			
PMP M19D	-0.95	-0.25	-0.95			
PMP Q18	-0.17	-0.11	-0.20			
PMP J23	-0.033	0.000	-0.037			
PMP N23S	-0.081	0.000	-0.07			
PMP N23D	-0.80	-0.031	-0.80			
PMP Q22	-0.022	0.000	0.000			
PMP M28S	-0.75	0.000	0.000			

Date:	8/18/2025	8/18/2025	8/19/2025			
Time:	9:50	13:30	7:00			
PMP M28D	-0.012	-0.099	-0.80			
PMP P29	0.000	0.000	0.000			
PMP Q28	-0.15	-0.019	-0.09			
PMP S26	-0.05	0.000	-0.100			
PMP Q32S	-0.044	-0.06	-0.052			
PMP Q32D	-0.79	-0.05	-0.84			
PMP S32	-0.039	0.000	-0.043			
PMP D14 S	-0.63	-0.49	-0.97			
PMP D14 D	-0.58	-0.27	-0.97			
PMP C09 S	-1.74	-1.13	-2.38			
PMP C09 D	-0.79	-0.3	-0.97			
PMP H02 S	-0.75	-0.74	-1.03			
PMP H02 D	-0.73	-0.34	-1.05			
PMP P05 S	-0.58	-0.41	-1.63			
PMP P05 D	-0.83	-0.26	-1.04			
PMP P11 S	-1.36	-2.25	-2.42			
PMP P11 D	-0.89	-0.45	-1.06			
VMP-21	-0.074	-0.009	-0.09			
VMP-28	-0.29	-0.089	-0.28			
VMP-29	-0.94	-0.33	-0.96			
VMP-30	-0.78	-0.18	-0.92			
VMW-02D	-0.71	-0.14	-0.87			
VMW-50S	-0.27	-0.025	-0.11			
VEW-01	-1.54	-0.23	-0.94			

Attachment C


3.0 in
2.6 in
2.2 in
1.9 in
1.5 in
1.1 in
0.75 in
0.38 in
0.0 in
Vacuum (in H2O)
Depth
0
-10
-20
-30
-40
-50
-60

Z Scale: 1