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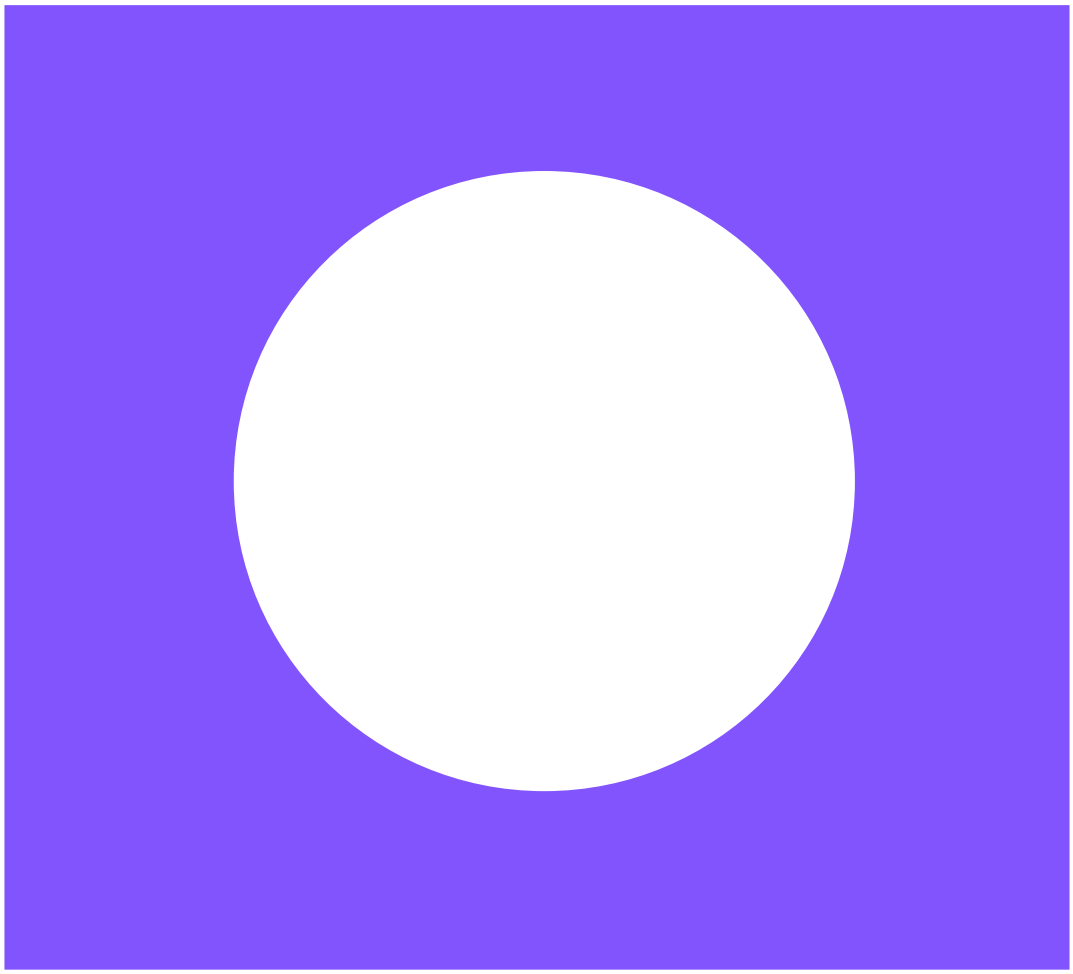

City of Centralia Groundwater Nitrate Investigation

March 2025

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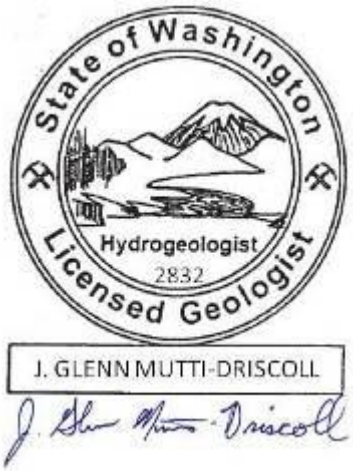
City of Centralia Groundwater Nitrate Investigation

March 2025

Issue and revision record

Revision	Date	Originator	Checker	Approver	Description
1	2/21/25	JGMD	NB	IRJ	Initial Draft Report
2	3/21/25			JGMD	Report Finalization

This report, and Mott MacDonald's work contributing to this report, were reviewed by the undersigned and approved for release.



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Document reference: 507107008-001

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Executive Summary

In October and November 2024, Lewis County Public Health collected groundwater nitrate samples from multiple residential water supply wells in the southwest Fords Prairie area of Centralia, Washington in response to resident concerns. The sample results indicated that nitrate concentrations in multiple wells exceeded the federal maximum contaminant level (MCL) for drinking water (10 mg/L as N). Based on regional groundwater flow directions previously mapped in the Centralia area (Pacific Groundwater Group 2019A), the residential wells with elevated nitrate concentrations are hydraulically downgradient of multiple properties served by septic tanks as well as a game farm operated by the Washington State Department of Fish and Wildlife (WDFW) for raising pheasants. In response to the October and November 2024 nitrate results, the City of Centralia (City), Lewis County Public Health, and WDFW commissioned this nitrate investigation to better understand the degree to which game farm operations and other land uses in southwest Fords Prairie may impact groundwater quality so that effective mitigative actions can be pursued.

During Phase 1 of this study, Mott MacDonald reviewed publicly available data for the southwest Fords Prairie area including mapped surficial soils, geologic units, and groundwater elevations and regional flow paths. The City also provided historic groundwater quality and water level data for review from its groundwater nitrate monitoring network. Mott MacDonald additionally participated in a site visit to the game farm and Centralia High School to its north. Based on their proximity to the affected drinking water wells, the study area for the Phase 1 and Phase 2 investigations was focused on these properties. As part of the Phase 1 investigation, historic aerial photos of the study area were reviewed to better understand its current and historic land uses.

Phase 2 included a field investigation on the game farm and high school properties, which included installing four monitoring wells, collecting groundwater samples, and collecting soil samples. Monitoring well installation and groundwater and soil sampling occurred between January 27 and February 3, 2025.

The February 2025 groundwater elevations from new and existing monitoring wells in the study area indicate that the local groundwater flow direction is similar to the regional groundwater flow direction reviewed during Phase 1.

Analytical results for groundwater samples collected in Phase 2 indicate that multiple wells in the study area have nitrate concentrations in exceedance of the drinking water MCL. The highest concentration (39.4 mg/L as N) was observed in monitoring well MW-17, which was installed in January 2025 on the game farm property. The high concentration observed at this well relative to upgradient monitoring well MW-16 (6.39 mg/L as N) suggests the game farm property impacts groundwater nitrate concentrations.

The Phase 2 soil sampling results found soil concentrations of nitrate and ammonia to be relatively low, with the observed soil nitrate concentrations below post-harvest concentration targets for agricultural soils established by Sullivan and others (2021). However, because soil nitrate and ammonia samples for the current study were collected during the wet season, the observed concentrations are likely lower than concentrations that occur in the study area during the late summer/early fall. The post-harvest soil nitrate targets referenced apply to concentrations measured at the end of the dry season, before seasonal rains can move nitrate deeper into the subsurface. Soil nitrate sampling results for this study therefore were

inconclusive, and future sampling is necessary to define soil nitrate concentrations in the late summer/early fall. Soil sampling results also identified locally elevated soil organic nitrogen concentrations (relative to other soils in the study area) in select portions of the game farm, however additional sampling in the late summer/early fall is necessary to assess the local relationship between nitrate leaching potential and soil organic nitrogen concentrations, and to identify if areas of higher nitrate leaching potential exist onsite.

Simple analytical equations and site data were used to calculate a range of estimated travel times for precipitation to move through unsaturated zone soils and for groundwater to travel from the game farm area to properties north of the high school. The total estimated travel time from MW-17 land surface to shallow groundwater at MW-19 ranges from 3.7 to 14.2 years, which includes 2.4 to 3.9 years in the unsaturated zone (above groundwater) and 1.3 to 10.3 years in the aquifer. Additionally delays on the order of 3 to 5 years between when changes in management practices for a field are implemented and when fall soil nitrate tests improve may also occur as noted in agricultural literature for western Washington (Sullivan and others, 2021). While these combined time of travel and effective implementation timeframe estimates span a broad spectrum and could be further refined, they suggest that a reasonably expected timeframe for groundwater concentrations north of the high school to improve in response to land management changes could be on the order of 7 years or greater. Additional site evaluations and/or a review of specific mitigation strategies could better bracket the estimated remediation timeframe.

Mott MacDonald's recommendations based on technical findings from this study include:

- Long-term treatment or alternative water supply options for affected drinking water wells should be evaluated, and short-term treatment options or technologies (such as under-sink water treatment systems) should be reviewed and implemented as soon as possible.
- Quarterly groundwater samples and water level measurements should continue being collected from the City's groundwater nitrate monitoring network, and should include recently added monitoring wells MW-16 to MW-19. If possible, arrangements to enable water level monitoring at the high school irrigation well should be made. If funding is available and local well-owners are willing, additional monitoring from select residential wells should be considered.
- Soil nitrate and soil organic nitrogen sampling should occur in September prior to the onset of seasonal rains in the study area to better evaluate if select fields or areas have a greater nitrate leaching potential than others. This information could be used to develop targeted best management practices for addressing areas with the highest leaching potential.
- Pending results from subsequent late summer/early fall soil sampling, an agronomist or other agricultural professional should be consulted with to develop nitrate management plan with site-specific land management and/or cropping practices that can effectively reduce nitrate leaching in the game farm area.
- Soil and/or groundwater samples near the two underground storage tanks (USTs) and a former composting area should occur to assess their potential contribution to the elevated groundwater nitrate concentrations observed should be further evaluated. Routine maintenance and pumping of the USTs should continue to occur.

1 Introduction

The City of Centralia is underlain by the Centralia Outwash Gravel Aquifer (COGA), a highly productive shallow aquifer that the City relies on for water supply. Most water that recharges the COGA enters it within the City's Critical Aquifer Recharge Area (CARA), which includes much of the City to the north and west of the Skookumchuck River and Chehalis River confluence (Figure 1). Septic systems within the City limits and in unincorporated areas of the Urban Growth Area (UGA) overlie the COGA, as well as agricultural land uses, and could potentially contribute to nitrate contamination within the shallow aquifer. Most septic systems and agricultural land uses overlying the COGA occur in the Fords Prairie and Waunch Prairie areas (Figure 1).

To better understand potential aquifer contamination risks, in 2017 the City hired the Pacific Groundwater Group (which has since merged with Mott McDonald) to review historical nitrate data for the Centralia area and identify potential sources of nitrate in the basin (PGG, 2017). Available groundwater nitrate data from 1972 to 2016 were reviewed and found multiple areas in Fords Prairie with historically elevated concentrations (between 2.5 and 10 mg/L as N), but none that exceeded the federal drinking water Maximum Contaminant Level (MCL) for nitrate (10 mg/L as N). Potential nitrate sources identified included septic systems, agricultural lands and parks, the Bob Oke Game Farm, and dry wells. The study recommended that the City develop a groundwater nitrate monitoring network.

In 2019 the City established a groundwater nitrate monitoring network, which focused on the Fords Prairie area where the City's primary wellfields are located. This network initially included six monitoring wells and select City supply wells. In 2022 the network was expanded to include three additional monitoring wells in the Fords Prairie area to fill data gaps and establish sentinel monitoring wells for the City's Fords Prairie Wellfield. Routine quarterly groundwater nitrate sampling occurs from the City's monitoring network.

In October and November 2024, groundwater samples were collected by Lewis County Public Health from residential water supply wells in the Fords Prairie area near Mayberry Road. Multiple wells sampled had nitrate concentrations that exceeded the federal maximum contaminant level (MCL) in drinking water (10 mg/L as N). General groundwater flow paths previously mapped for the COGA (Figure 1) suggested that potential upgradient contamination sources could be the Bob Oke game farm and/or private septic systems.

The following investigation was performed to help the City, Lewis County Public Health, and WDFW evaluate potential impacts that study area land uses may have on nitrate concentrations in groundwater. The investigation was structured in two phases. During Phase 1 Mott MacDonald reviewed and evaluated existing data to inform a field investigation. The Phase 2 field investigation was conducted to investigate groundwater conditions beneath and nearby the game farm facility, as well as soil nitrogen concentrations.

This work was performed, and this report prepared, for exclusive use by the City of Centralia, Lewis County Public Health, and WDFW for exclusive application to the project sites, using hydrogeologic practices generally accepted in this area at this time. This is in lieu of other warranties, express or implied.

2 Phase 1 Data Evaluation

2.1 Soils & Geology

Mott MacDonald reviewed mapped soils and surficial geology for the Fords Prairie area from the following sources:

- Lewis County Soil Map (NRCS, 2024)
- Geologic Map of the Centralia 7.5-Minute Quadrangle (Sadowski and others, 2018)
- Hydrology and Quality of Groundwater in the Centralia-Chehalis Area Surficial Aquifer (Pitz and others, 2005).

Surficial geologic maps and County-scale soil maps indicate that high permeability glacial outwash materials consisting mostly of sand and gravel are present at and near land surface in the Fords Prairie area. The drinking water aquifer beneath Fords Prairie is also comprised of these materials. In areas closer to the Chehalis River, finer-grained floodplain deposits consisting of clay, silt, sand, and fine gravel are present at land surface. The finer grained floodplain deposits and soils have lower infiltration rates than soils derived from the glacial outwash materials, and where present, may provide a degree of protection to the underlying aquifer from contaminants. The contact between where floodplain and glacial outwash soils occur crosses the game farm facility. The mapped location of this soil contact is presented in a subsequent data reporting figure (see Section 3.2.1)[1].

2.2 Groundwater Flow Direction

As part of the City's efforts to re-delineate the Wellhead Protection Area for the Fords Prairie Wellfield in 2019, a groundwater flow map for the COGA was developed by compiling available groundwater elevation data from numerous wells and the approximate mapped boundary of the COGA. Figure 1 is reproduced from Pacific Groundwater Group (2019A), and presents the approximate extent of the COGA, late-summer to early-fall groundwater elevations, and generalized groundwater flow directions. It should be noted that the delineated COGA boundaries are approximate, and the mapped extent generally represents high yielding parts of the aquifer that could be suitable for future municipal wellfields. Regions immediately south of the mapped COGA extent shown in Figure 1 (including portions of Borst Park and the game farm) are part of the same shallow aquifer system but are likely composed of thinner or less productive geologic materials.

The groundwater elevations and general flow paths presented in Figure 1 represent late summer to early fall conditions, and were generated by compiling water level data from multiple different sources and from different years. Because Figure 1 incorporates data spanning multiple years rather than a snapshot where all measurements occurred over the course of a few days, the elevation contours and flow paths are considered generalized.

[1] It should be noted that Mott MacDonald's Phase 1 and Phase 2 evaluations rely on the Lewis County soil coverage from the NRCS dated 8/27/2024. As part of our review, Mott MacDonald identified an earlier 2015 NRCS soil coverage that differs with respect to the extent and location of floodplain soils on the game farm property. Because a supporting report documenting the changes was not identified for review, if future management decisions are made based on the mapped extent of floodplain soils, outreach to the NRCS is recommended to confirm the 2024 soil coverage for the area reflects the best available science.

As part of the City's groundwater nitrate monitoring efforts, groundwater nitrate samples have been collected and water levels measured in the monitoring wells on a quarterly basis since 2020. Because these water level measurements typically are taken over the course of one to two days, snapshot groundwater elevation maps were created using the March and September 2024 water level measurements. March and September water levels were selected because they represent groundwater elevations during high- and low-water periods of the year.

Figures 2 and 3 present groundwater elevations measured from the City's nitrate monitoring well network for March and September 2024. The similarity in groundwater flow directions in Figures 2 and 3 indicates that the general direction of groundwater flow in the COGA remains consistent during the high- and low-seasonal periods. Based on the March and September 2024 data, seasonal changes in water level elevation range from 7.6 to 13.1 feet[2], with observed changes in groundwater elevation in the vicinity of the game farm of approximately 13 feet.

2.3 Groundwater Chemistry Review

The City provided groundwater nitrate data collected between December 2019 and December 2024 from their monitoring network for Mott MacDonald's review. These data are plotted in Figure 4. The order of monitoring wells presented in Figure 4 are approximately from east (MW-7) to west (MW-5). Groundwater nitrate concentration maps included in Appendix A also present quarterly sampling results from March 2023 to December 2024.

Figure 4 indicates that roughly half of the City's groundwater nitrate monitoring locations consistently have concentrations less than 5 mg/L as N, and these wells have relatively little concentration variability (within +/- 1 mg/L generally) from one event to the next. Wells with higher historic nitrate concentrations tend to have higher variability, and in some instances concentrations can double between sampling events. With the exception of MW-7, most wells with higher nitrate concentrations are located in western Fords Prairie, and likely reflect land uses in this area.

2.4 Site Visit & Aerial Photo Review

Mott MacDonald participated in a site visit at the game farm on January 8, 2025 with City personnel and WDFW staff. Based on discussions during the site visit, the annual operation cycle at the game farm includes:

- Approximately 2,000 laying hens and 200 roosters live onsite year-round.
- Chicks hatch in batches between April and June, and chicks are moved to brooder houses within a day of hatching. Chicks remain in a brooder house (which includes access to a small outdoor pen adjacent to it) for approximately 6 weeks.
- At roughly 6 weeks, the juvenile birds are moved to larger fields and/or flight pens. The birds remain in the larger fields until they are approximately 21 to 22 weeks old, at which point they are released offsite.
- Roughly 43,000 to 50,000 pheasants are onsite during peak summer months. Roughly 4,000 birds a week are removed from the site and released during a 10-week period from roughly September through November.

[2] Water levels at MW-4 varied by 16 feet between March and September 2024; however, because it is located adjacent to a stormwater infiltration pond the wet season water level elevation from MW-4 is not considered representative of aquifer conditions.

During the site visit the locations and logistics regarding the installation of Phase 2 monitoring wells were also discussed.

Possible contaminant point sources (or locations that could act as point sources if not maintained properly) identified from the site visit include two underground storage tanks where liquid waste from the nearby brooder houses are conveyed, and an area where pine shavings (used for bedding in the brooder houses) historically were composted.

To better understand historic game farm site use and field histories, Mott MacDonald reviewed aerial photos from 1990 to 2024 available on Google Earth and the Lewis County GIS Web Map (Lewis County GIS Web Map). Fields in closest proximity to the game farm barns and offices appear to have the longest history of use based on the aerial photos, while established pens in more distant fields appear to have been incrementally added between the late 1990s and 2019. Fields with longer histories of use may have larger reservoirs of soil organic nitrogen (due to more years of bird manure accumulating on them), and if such a relationship exists could affect the nitrate leaching potential of different areas of the game farm. The approximate area of near-continuous historic use identified from the aerial photo review is shown in a subsequent Phase 2 data reporting figure (see Section 3.2.1).

Mott MacDonald understands that recent site operational changes at the game farm in response to groundwater nitrate concerns have included minimizing use of the northern area that overlays the mapped productive portion of the COGA and that pine shavings removed from the brooder houses are no longer composted onsite.

A site visit to the high school property also occurred on January 8, 2025 with City staff. A barn with several small pens and two adjacent pastures are present west of the high school, which we understand supports three goats and one cow as part of an agricultural program. The school's irrigation well is present in one of these pastures and is used irrigate nearby sports practice fields. Historic aerial photos from Google Earth and Lewis County GIS Web Map suggest that the agricultural area footprint at the high school and area of the fields surrounding the school have not significantly changed since the 1990s.

3 Phase 2 Field Investigation

Based on findings from the Phase 1 data review, a field investigation was performed to evaluate potential nitrate impacts from the game farm on groundwater. The field investigation included the following activities:

- Installing four monitoring wells on the game farm and neighboring high school property
- Collecting 11 shallow soil samples from the game farm and neighboring high school property for laboratory analysis of nitrate + nitrite, ammonia, and Total Kjeldahl Nitrogen (TKN).
- Collecting four deeper soil samples (one from each borehole) for laboratory analysis of nitrate + nitrite, ammonia, and TKN.
- Collecting groundwater samples at each new monitoring well and select neighboring wells in the site vicinity for laboratory analysis of nitrate.

These activities and results are summarized below.

3.1 Groundwater Investigation Results

3.1.1 Well Installation Summary

Monitoring well locations were selected based on the Phase 1 data evaluation, and considered regional groundwater flow directions, surficial geology and soils, historic land use, and spatial distribution. Holt Services installed four monitoring wells on the following dates:

- **MW-16**: January 27, 2025
- **MW-17**: January 29, 2025
- **MW-18**: January 28, 2025
- **MW-19:** January 31, 2025

The new wells were drilled using a sonic drill rig and were constructed as 2-inch diameter, schedule 40 PVC monitoring wells completed at depths ranging from 38.6 to 40 feet below ground surface (bgs). Each well was finished with flush-to-grade protective monuments. Following installation, the wells were developed by Holt Services using a submersible pump until the discharge water was visibly clear.

Further construction details can be found in Table 1 and well construction logs included in Appendix B. Well construction logs for monitoring wells MW-13 to MW-15 (installed in 2022) are also included in Appendix B since earlier versions of these logs did not include survey data.

3.1.2 Groundwater Flow Direction

Measuring point elevations for monitoring wells MW-16 to MW-19 were surveyed by City staff in February 2025. Measuring point elevations for the City's groundwater nitrate monitoring well network, including MW-16 through MW-19 are listed in Table 1. The elevations were surveyed by the City using a GPS unit with a vertical accuracy of +/- 0.04 feet during 2024 or 2025. It should be noted that some measuring point elevations listed in Table 1 differ from values previously reported by Pacific Groundwater Group (2019B) due primarily to a discrepancy in vertical datum corrections.

Figure 5 presents groundwater elevations measured from select monitoring wells in the study area on February 3, 2025. Mott MacDonald contoured the groundwater elevation data to assess the approximate direction of groundwater flow in the study area based on available data. Groundwater flows from areas of high groundwater elevation to areas of low groundwater elevation. The approximate northwest groundwater flow direction depicted in Figure 5 is similar to the generalized groundwater flow direction arrow shown in Figures 1 to 3 for the study area in southwest Fords Prairie.

Mott MacDonald recommends that additional water level snapshots from the 2025 monitoring wells and the City's pre-existing monitoring wells be collected to further evaluate potential seasonal variability in local groundwater flow direction or hydraulic gradient.

3.1.3 Groundwater Nitrate Sampling

Groundwater nitrate samples were collected for this study by City Public Works personnel on February 3, 2025 from:

- Monitoring wells MW-14 through MW-19
- The game farm water supply well (GFPW)
- The irrigation well on the high school property (HSPW)

Groundwater samples were analyzed for nitrate at the Lewis County Environmental Health Laboratory, which is a Washington state accredited drinking water laboratory located in Chehalis, Washington. A copy of the laboratory report copy is included in Appendix C.

Figure 6 presents groundwater nitrate concentrations from the February 2025 sampling event. Groundwater samples collected from wells on the upgradient side of the game farm (GFPW and MW-16) had elevated nitrate concentrations (2.81 and 6.39 mg/L as N respectively) but did not exceed the drinking water MCL for nitrate (10 mg/L as N). Groundwater nitrate concentrations were significantly higher near MW-17 (39.4 mg/L as N) and MW-15 (26.3 mg/L as N). The concentration increase between upgradient well MW-16 and these wells suggests a potential impact on groundwater nitrate concentrations from the game farm. Other downgradient wells sampled that exceed the nitrate drinking water MCL include MW-18, MW-19, and HSPW.

The well sampled farthest downgradient from the study area, MW-14, is a sentinel well upgradient of the City's Fords Prairie Wellfield. The nitrate concentration in MW-14 for this event (5.43 mg/L as N) was below the drinking water MCL and is within the historically observed concentration range for this well (Figure 4).

3.2 Soil Investigation Results

Soil samples were collected from the game farm and high school properties for analysis of different nitrogen components. Nitrate + nitrite (NO_3 + NO_2), ammonia, and TKN (which measures organic nitrogen with ammonia combined) were analyzed by Analytical Resources Incorporated (ARI), a Washington state-accredited laboratory located in Tukwila, Washington. A copy of the laboratory report copy is included in Appendix C.

For nitrate to enter the groundwater system from an organic source (such as plant residues or manure), soil microbes must convert the organically-bound nitrogen into ammonium and then into nitrate. Due to warmer temperatures, soil microbes can convert significantly more organically- bound nitrogen into ammonium and nitrate during the spring and summer. Because nitrate is soluble in water, fall and winter rains that occur at the end of the growing season typically cause nitrate not taken up by plants to leach downward and out of the root zone. A

general depiction of this process as well as the relationship between the unsaturated zone and the underlying surficial aquifer are presented in Figure 7.

Due to seasonal soil nitrogen dynamics, soil nitrate sampling for agricultural fields west of the Cascades is recommended to occur in late summer or early fall, before seasonal rains can mobilize nitrate unused by plants out of the shallow soil system (Sullivan and others, 2021). Therefore, the timing of the Phase 2 surficial soil sampling (January 2025) was not ideal from a soil nitrate sampling perspective, however Phase 2 soil nitrate and ammonia samples were collected to provide initial site screening data.

3.2.1 Surficial Soil Samples

Mott MacDonald representatives collected surficial soil samples from the game farm and high school properties on January 27 and 28th, 2025 as composite samples. For each composite sample, soil samples from four locations within an individual field were collected and mixed together in a stainless steel bowl prior to filling the sample jar. Because variability between individual soil samples collected within the same field can be high, composite samples are generally more representative of average field conditions. Soil samples were collected by shovel from the upper 4 to 8-inches of the soil profile. Due to high gravel content in the topsoil, other methods of soil sampling (via a soil probe or auger) were not possible. Large organic debris, root matter, and gravel were manually removed from the soil samples by hand as possible prior to filling the sampling jars. Soil sample locations were selected based on the Phase 1 data evaluation, and considered mapped surficial soils, historic land use (game farm soil sample locations considered the apparent historic duration and type (brooder pen versus flight pen) of use), and spatial distribution.

Surficial soil sampling results are presented in Table 2 and Figure 8. In addition to soil nitrogen testing results, Figure 8 also shows the mapped boundary of floodplain soils in the site vicinity and fields that fall within the approximate area of near-continuous historic use discussed in Section 2.4.

Observed nitrate and ammonia concentrations for surficial soil samples collected in January 2025 for this study ranged from 0.3 to 12.8 mg/Kg-N for nitrate + nitrite and 0.74 to 4.94 mg/Kg-N ammonia, and had high spatial variability. A post-harvest soil nitrate concentration target for agricultural fields west of the Cascades is less than 15 to 20 mg/Kg (Sullivan and others, 2021), which all soil samples achieved. As discussed above, nitrate concentrations in the January 2025 surficial soil samples could be biased low (relative to concentrations that occur at the end of the dry season) because they were collected in the wet season. Future soil sampling will be necessary to assess the seasonal variability of nitrate in study area surficial soils.

TKN (which measures ammonia and organic nitrogen concentrations combined) concentrations in the January 2025 surficial soil samples were greater than the ammonia and nitrate + nitrate concentrations, indicating that most nitrogen present in the surficial soils occurs in the form of organic nitrogen (Table 2 and Figure 8). Organic nitrogen is naturally high in topsoil and its concentration and the ability of local soil microbes to break down the organic nitrogen into nitrate can be highly variable. High variability was observed in surficial soil TKN values from the game farm vicinity (similar to the nitrate + nitrite and ammonia sampling results), with concentrations that ranged from 2,840 to 6,130 mg/Kg. The area of near-continuous historic field use identified in Figure 8 includes both the lowest (2,840 mg/Kg) and three highest (5,480 – 6,130 mg/Kg) observed soil TKN concentrations. Due to this high observed variability and because soil TKN concentrations cannot definitively be used to predict the potential for soil nitrate formation (Sullivan and others, 2021), Mott MacDonald recommends that soil nitrate sampling be performed in September 2025 to better assess the onsite relationship between

nitrate leaching potential and soil TKN concentrations. These data could help with selection of effective future mitigation practices and better assess potential relationships between observed soil nitrogen concentrations, soil type, and/or areas with near-continuous historic field use.

3.2.2 Borehole Soil Samples

During drilling activities in January 2025 one soil sample was collected from each monitoring well borehole, at sample depths ranging from 5 to 14 feet bgs. The intent of these samples was to quantify soil nitrogen concentrations in the subsurface below the root zone, but above the water table. Borehole samples were collected as grab samples, with gravel manually removed prior to filling the sample jar, consistent with laboratory recommendations

Borehole soil sample results are presented in Table 2 and Figure 8, with borehole soil sample result text boxes in Figure 8 shaded blue. In general, nitrate and ammonia concentrations in the borehole soil samples were lower than concentrations observed in shallow soils from the study area. TKN concentrations were also lower in the borehole soil samples, which was generally expected since most organic matter within the root zone occurs as particles rather than dissolved organic matter in the soil water, and therefore is not typically mobilized downward by seasonal rains.

3.3 Time of Travel Estimates

Published hydrogeologic data and data from the Phase 2 field investigation were used to estimate travel times for precipitation to vertically transit the unsaturated zone at the game farm site, and then travel in a predominantly horizontal direction via groundwater flow to the northern property boundary of the high school. The conceptual cross section shown in Figure 7 depicts these different subsurface zones. Simple analytical approaches were used for these initial travel time estimates, which could be further refined with additional site testing and/or applying more sophisticated numerical models. Because nitrate is highly soluble in and mobilized by water, travel time estimates for water in the subsurface are commonly used to estimate subsurface nitrate travel times.

3.3.1 Unsaturated Zone Time of Travel Estimate

The time of travel for precipitation to reach the aquifer on the game farm site was estimated using a piston flow calculation approach. A piston flow analysis estimates the volume of pore space present in the unsaturated zone and then calculates how long it would take natural precipitation to fill the estimated pore space The piston flow analysis is a simplified approximation of how water flows in the unsaturated zone and assumes that water moves downward through the unsaturated zone as if pushed by a piston (with infiltration occurring at the land surface pushing water already present in the unsaturated zone deeper, similar to a conveyor belt).

Table 3 presents values used for this estimate, and estimated transit times for areas with floodplain versus glacial outwash soils. A previous study by the USGS (Gendaszek and Welch, 2018) estimated average annual groundwater recharge rates for the Centralia area, which accounted for soil property differences that affect groundwater recharge. Average annual depths to groundwater were assumed based on the City's groundwater monitoring data in the site vicinity.

Applying this simplified analytic technique, the unsaturated zone time of travel estimate for the study area ranges from 2.4 to 3.9 years, with a faster transit time estimated for the glacial outwash soils than floodplain soils due to more groundwater recharge occurring where outwash

soils are present. This estimated range indicates that impacts or benefits caused by changes in land management practices at the land surface are not likely to affect underlying groundwater concentrations for approximately 2 to 4 years.

3.3.2 Groundwater Time of Travel Estimate

The groundwater time of travel estimate was calculated using water level elevations measured on February 3, 2025. The groundwater flow path evaluated was from MW-17 to MW-19, and the time of travel estimates were calculated using Darcy's Law.

Table 4 lists the input parameters used to estimate the groundwater travel time from MW-17 to MW-19. Because groundwater travel time estimates are highly sensitive to the horizontal hydraulic conductivity of the aquifer, two different hydraulic conductivity values were assumed to represent a range of potential groundwater travel times. The higher horizontal hydraulic conductivity value applied (2,430 ft/d) is based on aquifer tests performed at the City's nearby Fords Prairie Wellfield. However, because the wellfield is completed in the most productive area of the COGA known, an estimate using the COGA's median horizontal hydraulic conductivity (310 ft/d, from Pitz and others, 2005) was also calculated. Applying the values presented in Table 4, the groundwater time of travel estimated from the game farm to properties north of the high school is between 1.3 and 10.3 years.

This estimated groundwater time of travel range could be further refined through local aquifer tests, the incorporation of seasonal changes in hydraulic gradient and/or groundwater flow direction (if present), and/or a more sophisticated groundwater modeling analysis.

3.3.3 Soil Nitrogen Cycling Timeframe in the Root Zone

Soil nitrogen sampling data collected as part of the Phase 2 investigation are inconclusive with respect to nitrate leaching potential because the samples represent a single point in time during the wet season. Additional data are needed to understand late-summer conditions and define potential management practices that can best reduce nitrate leaching to groundwater. Sullivan and others (2021) report that "improved [crop or manure] management will likely not result in reduced fall soil nitrate tests for three to five years on fields with a long-term history of manure application." Though game farm soils have not received intentional manure applications in the manner of some agricultural soils, a similar delay between best management practice implementation and when results are measurable in the root zone is possible if subsequent soil sampling confirms this dynamic is present.

3.3.4 Time of Travel Estimates Discussion

The unsaturated zone and groundwater time of travel estimates presented above are based on simple analytical equations and could be further refined through additional data collection and/or applying more sophisticated analytical methods. The possible delay between implementation of best management practices and when fall soil nitrate concentrations may decrease (Section 3.3.3) is provided for informational purposes, but additional soil testing data will be necessary to understand if similar delay may occur in study area soils. Combined, these initial estimates suggest that the timeframe for groundwater nitrate concentrations north of the high school to improve in response to changes in management practices on the game farm could be on the order of 7 to 19 years.

3.4 Recommendations

Based on the results from the field investigation, Mott MacDonald's recommendations include the following:

- Long-term treatment or alternative water supply options for affected drinking water wells should be evaluated, and short-term treatment options or technologies (such as under-sink water treatment systems) should be reviewed and implemented as soon as possible.
- Quarterly groundwater samples and water level measurements should continue being collected from the City's groundwater nitrate monitoring network, and should include recently added monitoring wells MW-16 to MW-19. If possible, arrangements to enable water level monitoring at the high school irrigation well should be made. If funding is available and local well-owners are willing, additional monitoring from select residential wells should be considered.
- Soil nitrate and TKN sampling should occur in September prior to the onset of seasonal rains in the study area to better evaluate if select fields or areas have a greater nitrate leaching potential than others. This information could be used to develop targeted best management practices for addressing areas with the highest leaching potential.
- If soil sampling results from the game farm over the next year reveal elevated nitrate levels, a nitrate management plan is recommended to help optimize onsite practices and minimize nitrate leaching.
- Soil and/or groundwater samples near the two underground storage tanks (USTs) and a former composting area should occur to assess their potential contribution to the elevated groundwater nitrate concentrations observed should be further evaluated. Routine maintenance and pumping of the USTs should continue to occur.

4 References

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Table 1. Well Construction Information, City of Centralia Nitrate Monitoring Network

Well Name	Easting (ft)	Northing (ft)	Measuring Point Elevation (ft, NAVD 88)	Year Installed	Ecology Unique Well ID	Stick Up from Monument Top (ft)	Screen Top (ft bgs)	Screen Bottom (ft bgs)	Total Depth (ft bgs)
MW-1	1018994.8	517992.5	180.27	2004	AKB 696	2.50	42.50	52.50	53.00
MW-2	1016664.2	519539.8	180.10	1995	ACD 333	unk.	20.00	35.00	35.00
MW-3	1018355.7	516535.0	172.89	2019	BLT 951	-0.42	24.38	34.38	34.56
MW-4	1017621.5	520910.3	175.40	2019	BLT 948	-0.38	24.57	34.57	34.90
MW-5	1012979.7	526269.2	166.97	2019	BLT 953	-0.31	24.53	34.53	34.71
MW-6	1014547.9	517461.5	171.74	2019	BLT 950	-0.45	30.02	40.02	40.20
MW-7	1026973.8	523402.7	195.26	2019	BLT 952	-0.30	14.64	24.64	24.82
MW-8	1013170.8	523593.2	169.32	2019	BLT 949	-0.53	29.84	39.84	40.02
MW-9	1012862.2	520569.3	NA	2001	NA	NA	39.5	61.0	66.5
MW-10	1022902.7	518466.1	NA	1935	NA	NA	40.0	66.0	90.0
MW-11	1017553.4	516935.5	NA	1996	NA	NA	51.0	63.5	68.4
MW-12	1015271.4	519887.9	NA	unk.	NA	NA	unk.	unk.	unk.
MW-13	1015271.4	519887.9	173.06	2022	BPW 500	-0.40	27.50	37.50	37.70
MW-14	1012829.7	520040.5	169.26	2022	BPW 499	-0.39	27.67	37.67	37.87
MW-15	1013634.3	517498.7	172.38	2022	BPW 498	-0.41	28.94	38.94	39.14
MW-16	1014561.3	516838.4	169.99	2025	BQM 627	~ -0.5*	28.40	38.40	38.60
MW-17	1013489.0	517160.2	168.65	2025	BQM 629	~ -0.5*	29.80	39.80	40.00
MW-18	1012710.6	517369.8	166.11	2025	BQM 628	~ -0.5*	29.30	39.30	39.50
MW-19	1012844.6	518459.5	166.36	2025	BQM 630	~ -0.5*	29.80	39.80	40.00

Notes

X-Y coordinates are projected in State Plane South, NAD 83

bgs = below ground surface; bmp = below measuring point

* Stick up measurement approximate, requires field verification.

unk.- unknown

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Table 2. Phase 2 Soil Nitrogen Sampling Results

Location	Sample location description	Units	Nitrate + Nitrite as N	Ammonia-N	TKN
Surficial Soil Samples					
S-1	High school property near MW-19	mg/kg	0.3	4.94	3,570
S-2	pen 21 west end	mg/kg	12.5	1.85	4,570
S-3	pen G	mg/kg	3.31	0.74	3,550
S-4	near historic compost area	mg/kg	0.76	1.15	4,950
S-5	pen F (one of the brooder pens within it)	mg/kg	4.09	1.06	6,010
S-6	pen E (one of the larger brooder pens within it)	mg/kg	12.8	3.05	6,130
S-7	one of the small brooder pens north of Pen 1	mg/kg	7.59	4.51	2,840
S-8	pen 31	mg/kg	6.08	1.37	3,200
S-9	pen 11 south	mg/kg	5.59	1.15	5,480
S-10	pen 38	mg/kg	0.48	1.18	3,570
S-11	pen 8 on the east property boundary	mg/kg	4.91	1.32	4,740
Borehole Samples					
MW-16-14	Sample collected at 14.0 feet bgs from MW-16 borehole	mg/kg	0.55	0.4 U	134
MW-17-5	Sample collected at 5.0 feet bgs from MW-17 borehole	mg/kg	0.63	0.49	46.5 U
MW-18-5.8	Sample collected at 5.8 feet bgs from MW-18 borehole	mg/kg	4.55	2.31	1,180
MW-19-7.2	Sample collected at 7.2 feet bgs from MW-19 borehole	mg/kg	0.1 U	0.51	63.0 U

Notes:

TKN = Total Kjeldahl Nitrogen

bgs = below ground surface

U: analyte concentration less than the laboratory reporting limit (the numeric value presented)

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Table 3. Unsaturated Zone Time of Travel Estimates

Parameter	Unit	Glacial Outwash Soils	Floodplain Soils	Data Source
Average Annual Groundwater Recharge	in/yr	25-29	15-19	Gendaszek and Welch, 2018
	ft/yr	2.25	1.42	Calculated from mid-range (27 and 17 in/yr) recharge values
Average Depth to Groundwater	ft bgs	22	22	City of Centralia groundwater monitoring data from wells MW-6 and MW-15. Sesaonal depths to water range from approximately 14 to 28 feet bgs.
Effective Porosity		0.25	0.25	Assumed based on literature values
Average Annual Pore Velocity	ft/yr	9.0	5.7	Calculated using piston flow assumptions
Estimated Time of Travel for Precipitation to Reach the Water Table	years	2.4	3.9	

Notes:
bgs = below ground surface

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Table 4. Groundwater Time of Travel Estimates

Parameter	Unit	Fords Prairie Wellfield Kh	Median COGA Kh	Data Source
Horizontal Hydraulic Conductivity (Kh)	ft/d	2,430	310	PGG, 2019A; Pitz and others, 2005
Change in Groundwater Elevation (MW-17 to MW-19)	ft	0.45	0.45	Measured on 2/5/25
Distance (MW-17 to MW-19)	ft	1,450	1,450	Approximate distance between wells
Hydraulic Gradient		0.00031	0.00031	Calculated from site data
Effective Porosity		0.25	0.25	Assumed based on literature values
Groundwater Velocity	ft/d	3.0	0.4	Calculated using Darcy's Law
Estimated Time of Travel from MW-17 to MW-19	days	481	3,768	
	years	1.3	10.3	

Notes:

Kh = Horizontal Hydraulic Conductivity

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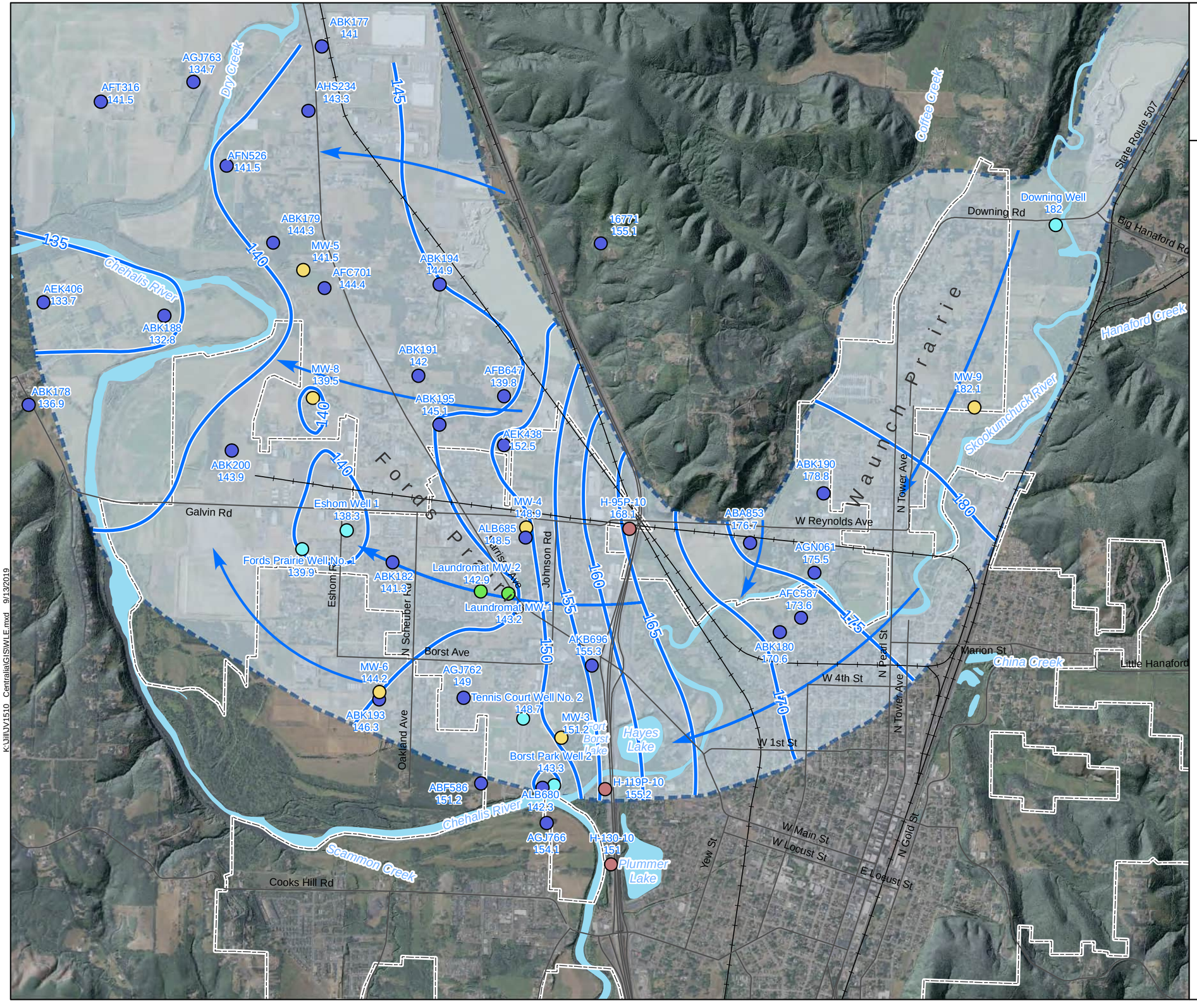
Figure 1

COGA Groundwater Elevation Map

PgG



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Water Level Data Source

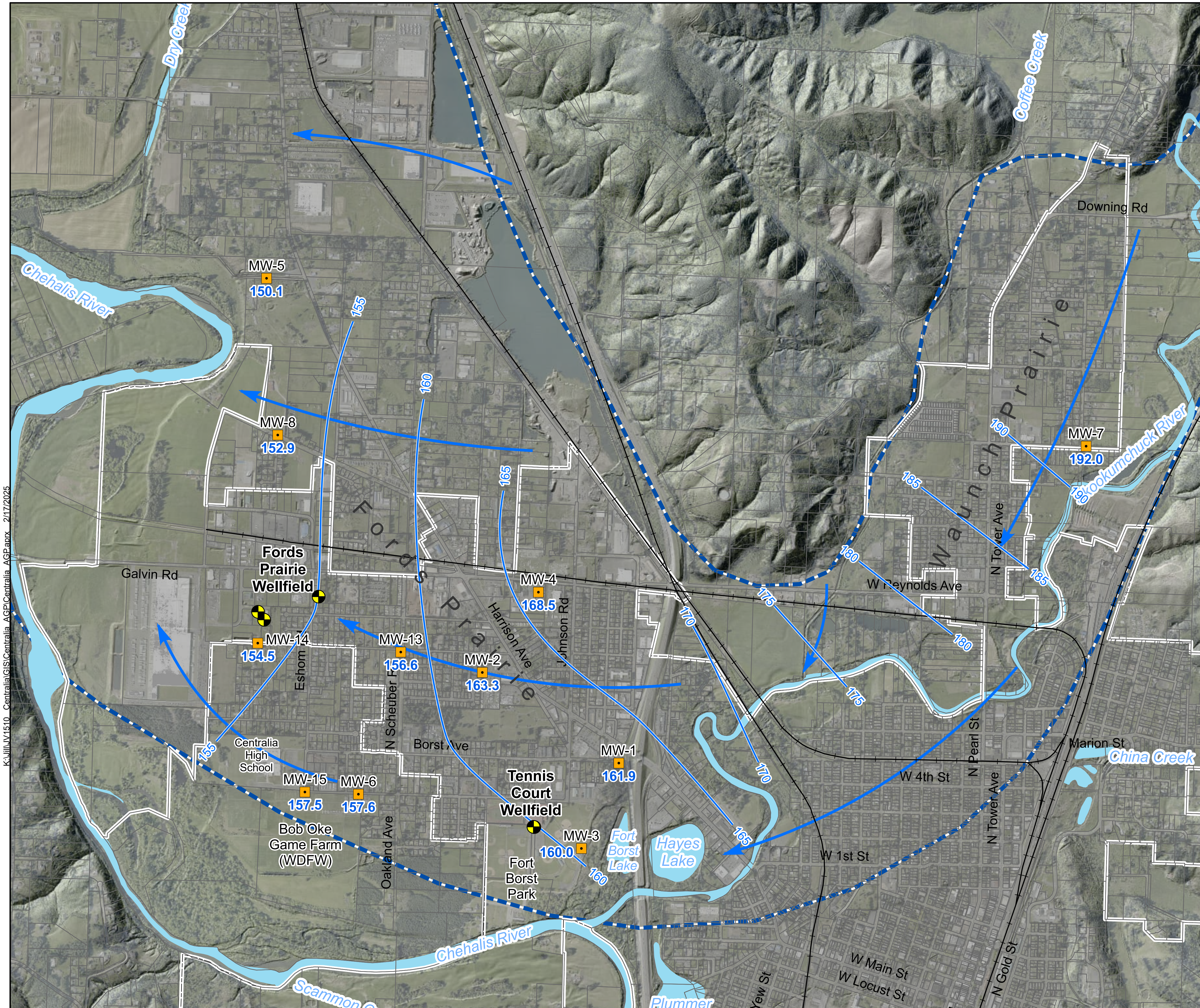
- City Monitoring Well (9/2019)
- City Production Well (Variable Date)
- Pitz and Others (10/2004)
- Trailer Village (Variable Date)
- WSDOT (9/2011)
- General Groundwater Flow Directions
- General Groundwater Elevation Contours
- Mapped Extent of Centralia Outwash Gravel Aquifer

N

0 Feet 2,000

Figure 2
Groundwater Elevations
March 2024

City of Centralia



180.54 - Groundwater Elevation

- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Groundwater Elevation Contours
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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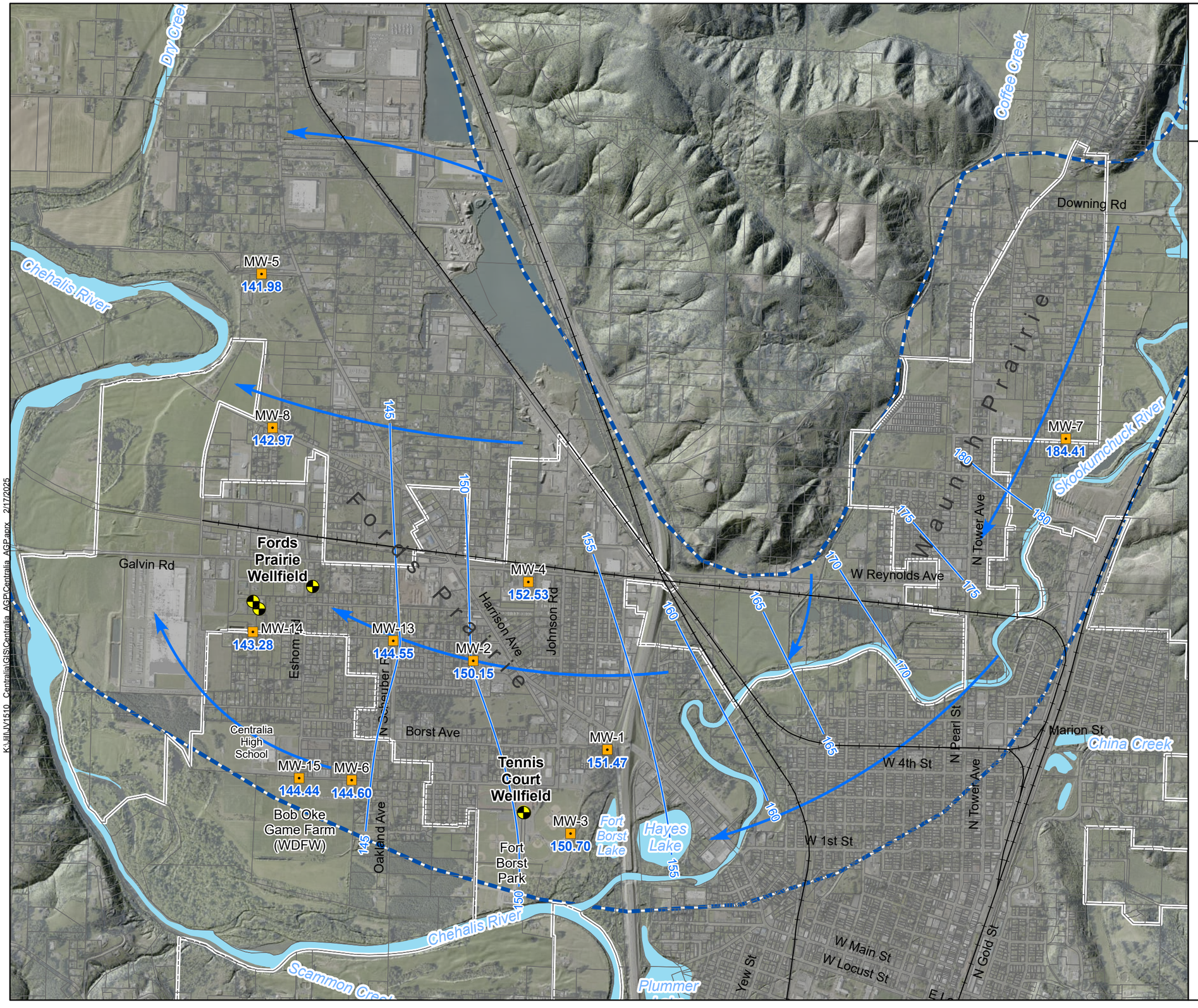
Figure 3

Groundwater Elevations
September 2024

City of Centralia

MOTT MACDONALD



180.54 - Groundwater Elevation

- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Groundwater Elevation Contours
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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East

West

Nitrate Concentration (mg/L as N)

Dec-19 Jun-20 Sep-20 Dec-20 Mar-21 Jun-21 Sep-21 Dec-21 Mar-22 May-22
Sep-22 Nov-22 Mar-23 Jun-23 Sep-23 Dec-23 Mar-24 Jun-24 Sep-24 Dec-24

Drinking Water MCL

MW-7 MW-10 MW-1 MW-3 MW-11 MW-4 MW-2 MW-13 MW-6 MW-15 MW-14 MW-9 MW-8 MW-5

Notes:

- Drinking Water Maximum Contaminant Level (MCL) for Nitrate = 10 mg/L as N

Figure 4.
City of Centralia Historic Groundwater Nitrate Monitoring Data

City of Centralia
507107008-001

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Figure 5

Groundwater Elevations
February 2025

City of Centralia

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Fords Prairie Wellfield

MW-14
151.41

MW-13

MW-19
152.93

MW-15
153.33

MW-18
153.29

MW-17
153.38

MW-6

MW-16
153.82

HSPW

GFPW

Centralia High School

Bob Oke Game Farm (WDFW)

Southworth Ln
Fords Prairie Ave
Rodoin Ave
Russell Rd
Meadow Ln
Joyce Ln
Dogwood Ln
Greenwood Ln
Fieldcrest Ave
Sunnyside Dr
Keyu Ln
Alberta Dr
Karla Ct
Rancho Rd
Eshom Rd
Mason Ave
Cobra Ln
N Scheuber Rd
Jalyn St
Jalyn Ct
Mayberry Rd
Prill Rd
McKinley Ln W
Elizabeth Ct
McKinley Ln N
Borst Ave
Tiger Ln
Cowlitz Rd
Pheasant Rd
Cypress Ln
Mt Vista Rd
Laurel Ln
Keerns Ln
Bengal Ct
Scott Dr
Oakland Ave
Southgate Dr

151.5
152.0
152.5
153.0
153.5

153.0 - Water Level Elevation, February 2025

Production Wells

Dedicated Monitoring Wells

Centralia City Limits

Groundwater Elevation Contours

Approximate Groundwater Flow Direction

N

0 Feet 500

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Figure 6

Groundwater Nitrate Concentrations
February 2025

City of Centralia

MOTT MACDONALD

3.05 - Nitrate Concentration (mg/L), February 2025

- Production Wells
- Dedicated Monitoring Wells
- Centralia City Limits
- Approximate Groundwater Flow Direction

N

0 Feet 500

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Depiction of Typical Water Flow in the Subsurface

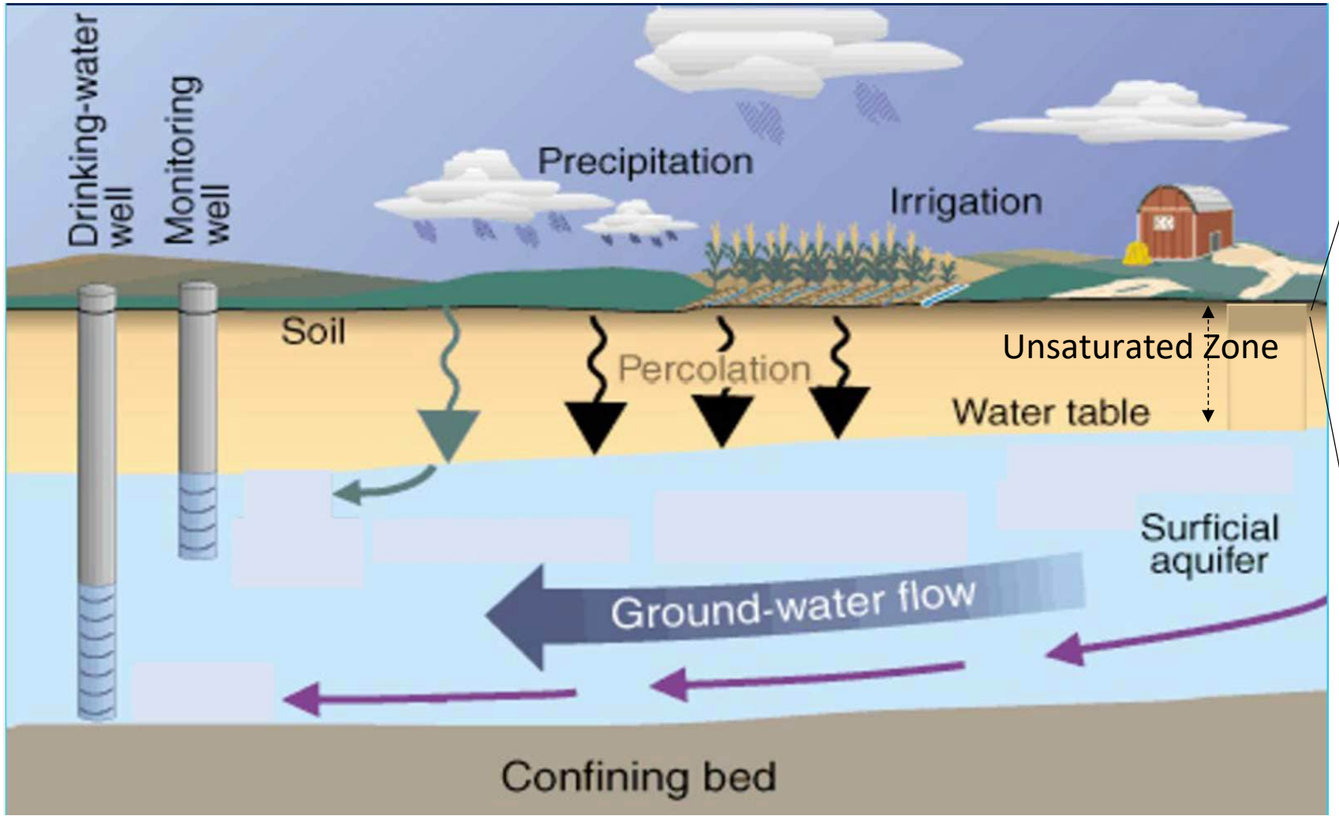

Figure adapted from: Eyes Underground: Lower Yakima Valley website maintained by Washington Department of Ecology https://storymaps.arcgis.com/stories/75dbce15a4c04b0e8e54dc633efa5f99

Generalized Soil Nitrogen Processes Within the Root Zone

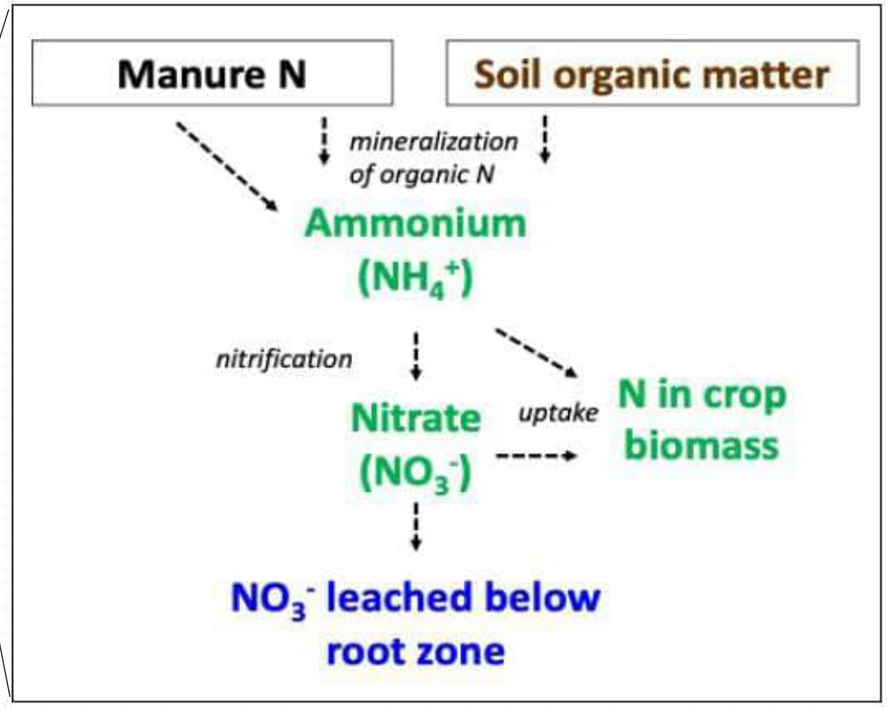

Figure from Sullivan and others (2021)

Figure 7.
Subsurface Flow Paths and Soil Nitrogen Processing Illustration

City of Centralia
507107008-001

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Figure 8

Soil Sampling Results
February 2025

City of Centralia

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S-1
NO_3+NO_2: 0.3 mg/kg
Ammonia: 4.94 mg/kg
TKN: 3570 mg/kg

MW-19-7.2
NO_3+NO_2: 0.1 U mg/kg
Ammonia: 0.51 mg/kg
TKN: 63.0 U mg/kg

S-2
NO_3+NO_2: 12.5 mg/kg
Ammonia: 1.85 mg/kg
TKN: 4570 mg/kg

MW-18-5.8
NO_3+NO_2: 4.55 mg/kg
Ammonia: 2.31 mg/kg
TKN: 1180 mg/kg

MW-17-5
NO_3+NO_2: 0.63 mg/kg
Ammonia: 0.49 mg/kg
TKN: 46.5 U mg/kg

S-3
NO_3+NO_2: 3.31 mg/kg
Ammonia: 0.74 mg/kg
TKN: 3550 mg/kg

S-5
NO_3+NO_2: 4.09 mg/kg
Ammonia: 1.06 mg/kg
TKN: 6010 mg/kg

S-7
NO_3+NO_2: 7.59 mg/kg
Ammonia: 4.51 mg/kg
TKN: 2840 mg/kg

S-8
NO_3+NO_2: 6.08 mg/kg
Ammonia: 1.37 mg/kg
TKN: 3200 mg/kg

S-9
NO_3+NO_2: 5.59 mg/kg
Ammonia: 1.15 mg/kg
TKN: 5480 mg/kg

S-6
NO_3+NO_2: 12.8 mg/kg
Ammonia: 3.05 mg/kg
TKN: 6130 mg/kg

MW-16-14
NO_3+NO_2: 0.55 mg/kg
Ammonia:0.4 U mg/kg
TKN: 134 mg/kg

S-10
NO_3+NO_2: 0.48 mg/kg
Ammonia: 1.18 mg/kg
TKN: 3570 mg/kg

S-11
NO_3+NO_2: 4.91 mg/kg
Ammonia: 1.32 mg/kg
TKN: 4740 mg/kg

S-4
NO_3+NO_2: 0.76 mg/kg
Ammonia: 1.15 mg/kg
TKN: 4950 mg/kg

Floodplain Soils

Centralia High School

Bob Oke Game Farm (WDFW)

Prill Rd
McKinley Ln W
Elizabeth Ct
McKinley Ln N
Borst Ave
Eshom Rd
N Scheuber Rd
Tiger Ln
Cowlitz Rd
Pheasant Rd
Mt Vista Rd
Laurel Ln
Oakland Ave
Southgate Dr

Soil Sample Locations

- Surface Soil Sample Locations
- Borehole Sample Location
- Floodplain Soils Boundary (NRCS, 2024)
- Approximate Area of Near-Continuous Use (1990 – 2025)
- Centralia City Limits

N

0 Feet 500

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Appendix A:
City of Centralia Groundwater Nitrate Concentration Maps, March 2023 to December 2024

Figure A-1

Centralia Groundwater Nitrate Monitoring Data March 2023

City of Centralia

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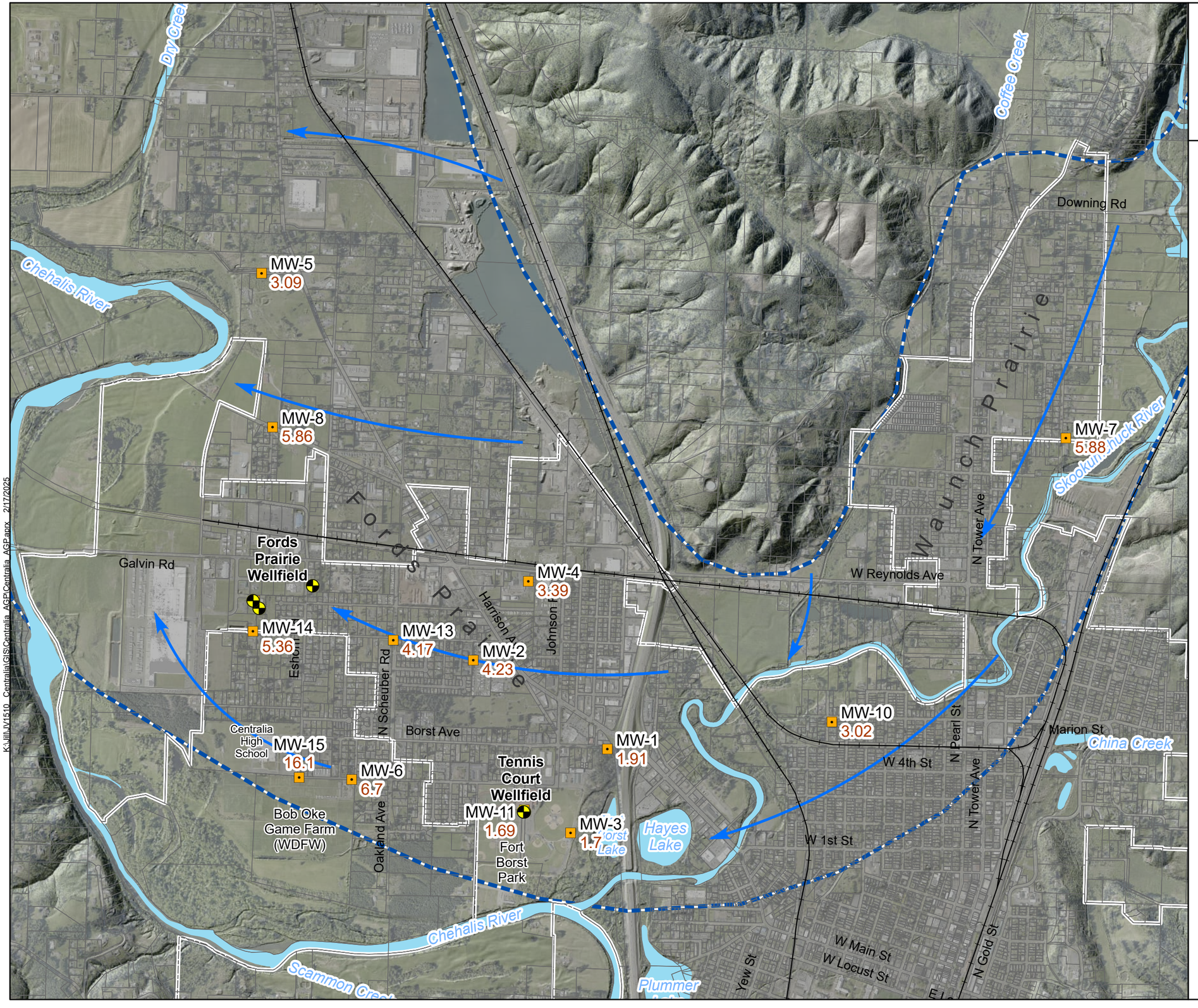

3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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Figure A-2

Centralia Groundwater Nitrate Monitoring Data June 2023

City of Centralia

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MW-5
2.2

MW-8
6.81

MW-9
3.83

MW-14
5.39

MW-13
4.18

MW-2
4.55

MW-4
3.34

MW-10
2.94

MW-1
1.88

MW-15
18.7

MW-11
1.76

MW-3
1.96

MW-7
3.81

3.05 - Nitrate + Nitrite Concentration (mg/L as N)

Dry Creek
Chehalis River
Coffee Creek
Downing Rd
Fords Prairie
Waunch Prairie
Skookumchuck River
Galvin Rd
Fords Prairie Wellfield
Harrison Ave
Johnson Rd
Eshom
N Scheuber Rd
W Reynolds Ave
N Tower Ave
Centralia High School
Borst Ave
Tennis Court Wellfield
Fort Borst Park
Bob Oke Game Farm (WDFW)
Oakland Ave
Hayes Lake
Borst Lake
N Pearl St
Marion St
China Creek
W 4th St
W 1st St
W Main St
W Locust St
N Gold St
Yew St
Plummer
Scammon Creek

Production Wells
Dedicated Monitoring Wells
Mapped Extent of Centralia Outwash Gravel Aquifer
Centralia City Limits
Generalized Groundwater Flow Direction

N

0 Feet 2,000

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Figure A-3

Centralia Groundwater Nitrate Monitoring Data September 2023

City of Centralia

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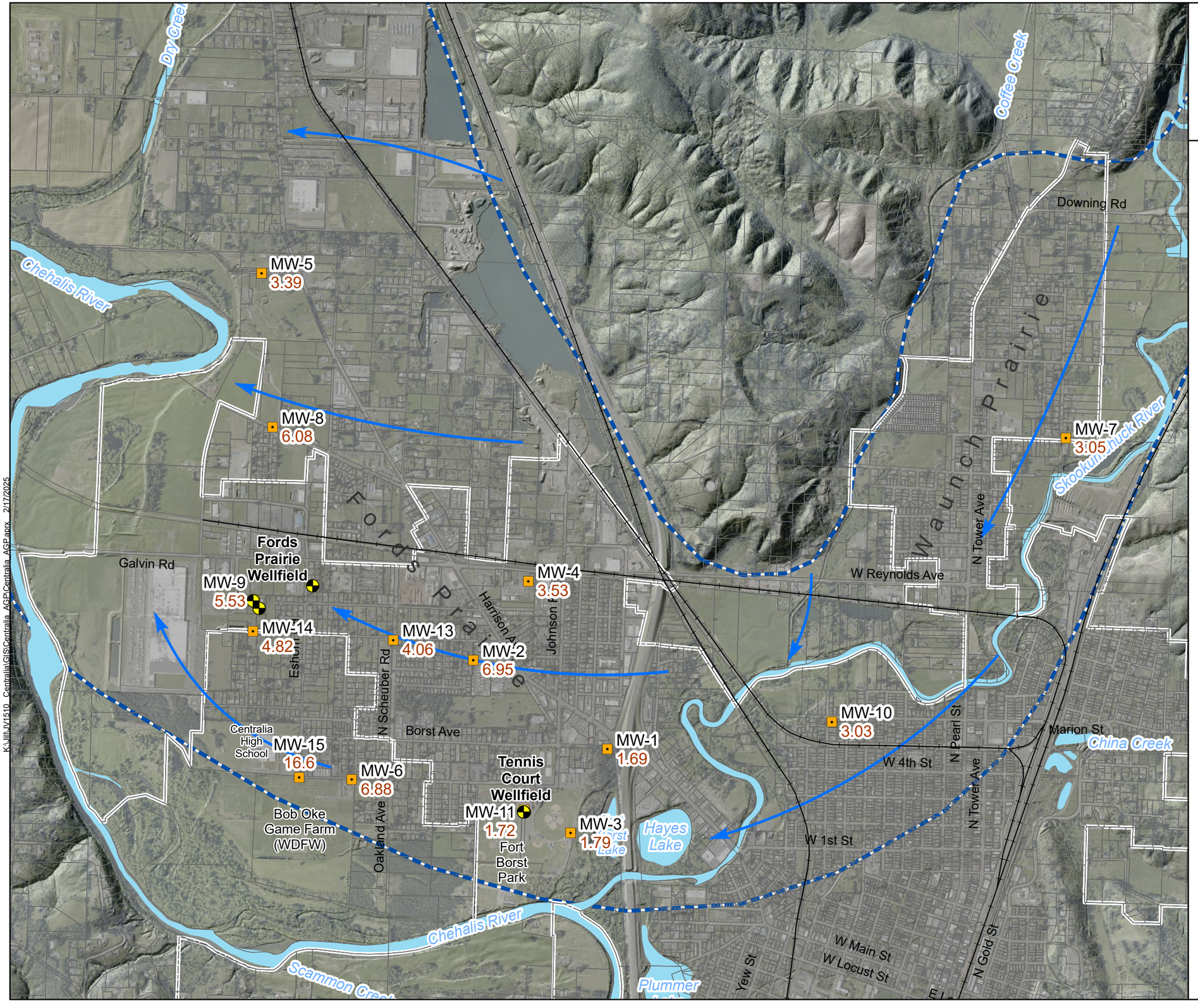


3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

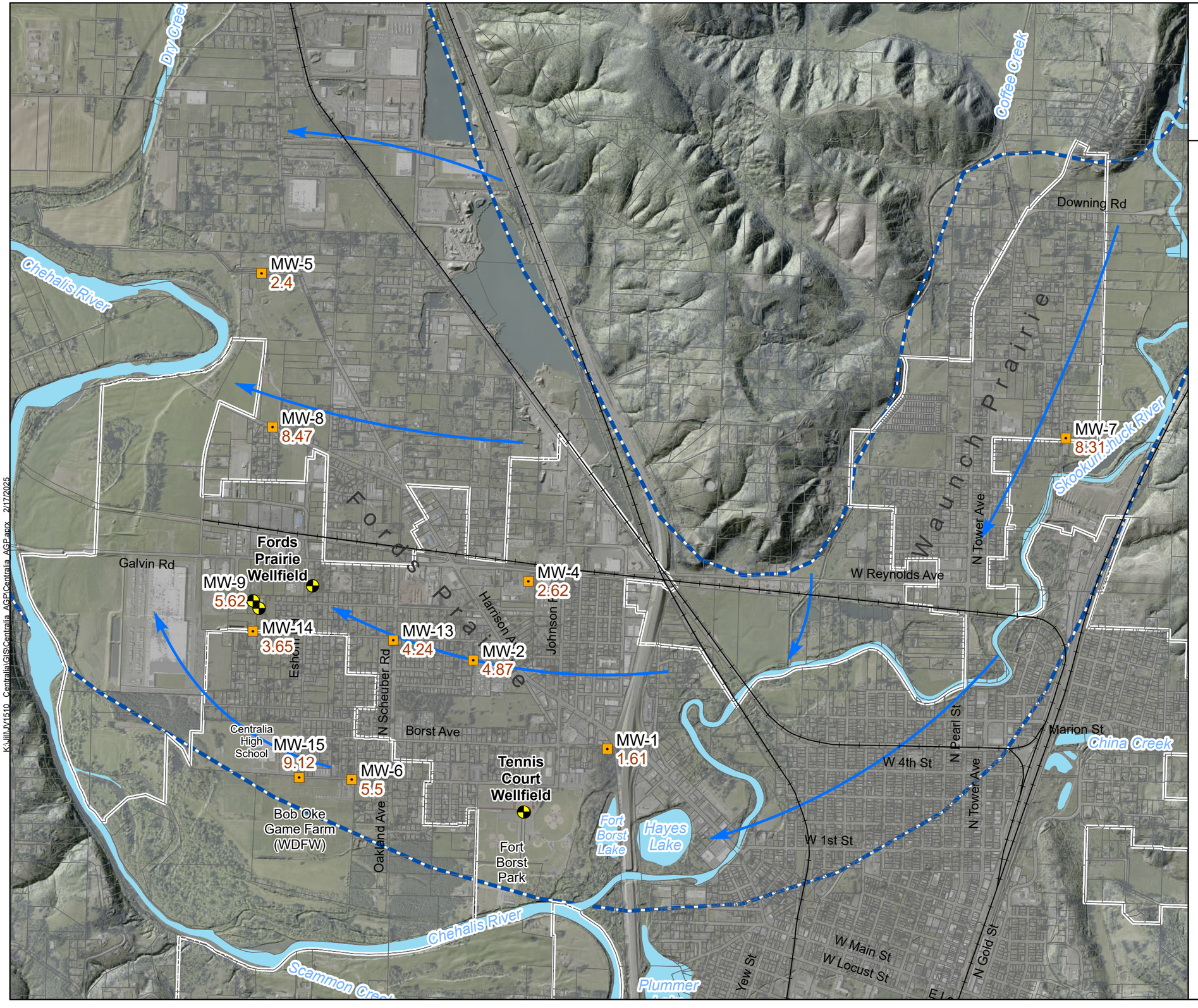
0 Feet 2,000

Figure A-4

Centralia Groundwater Nitrate Monitoring Data December 2023

City of Centralia

MOTT MACDONALD



3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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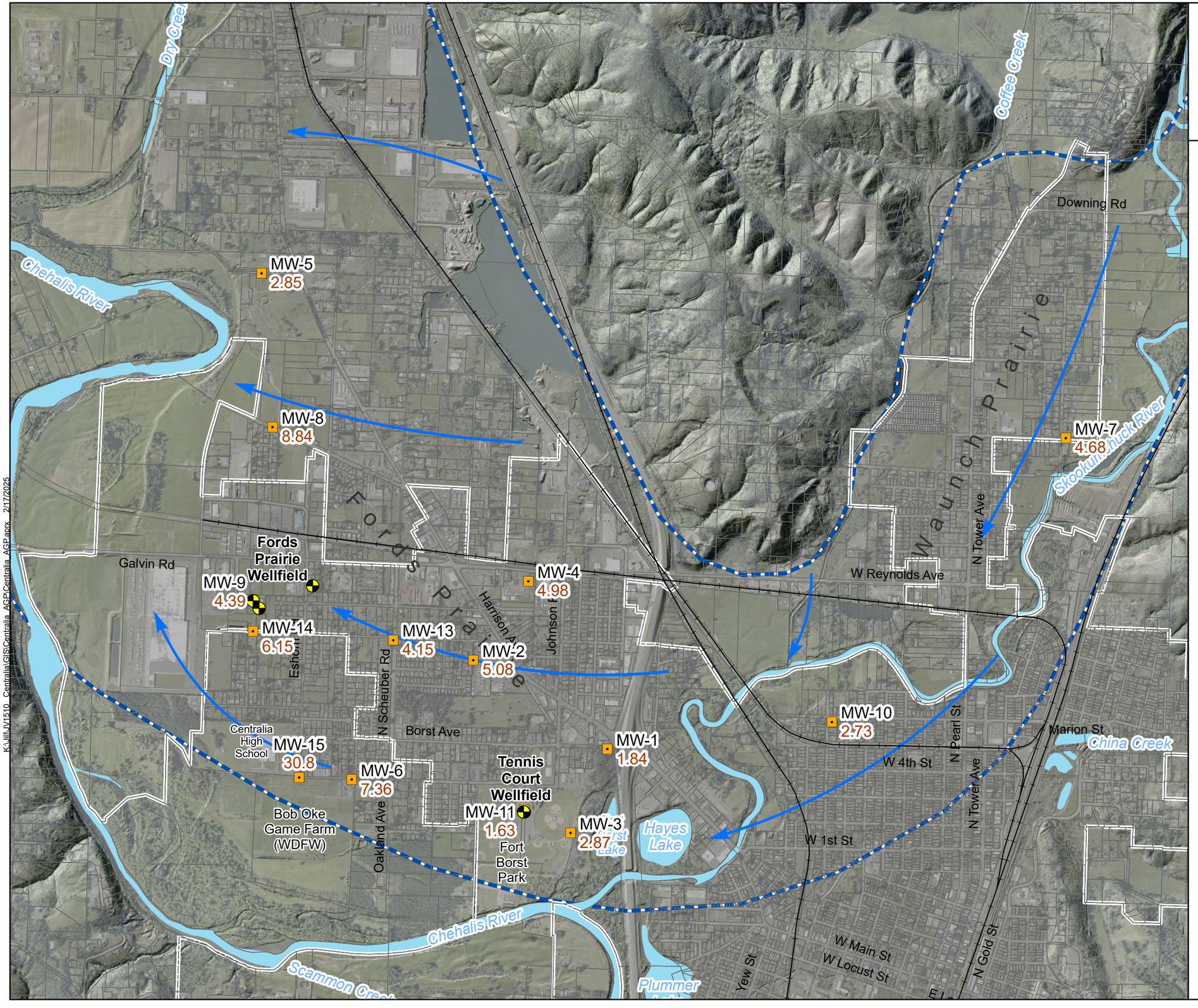
Figure A-5

Centralia Groundwater Nitrate Monitoring Data March 2024

City of Centralia

MOTT MACDONALD



3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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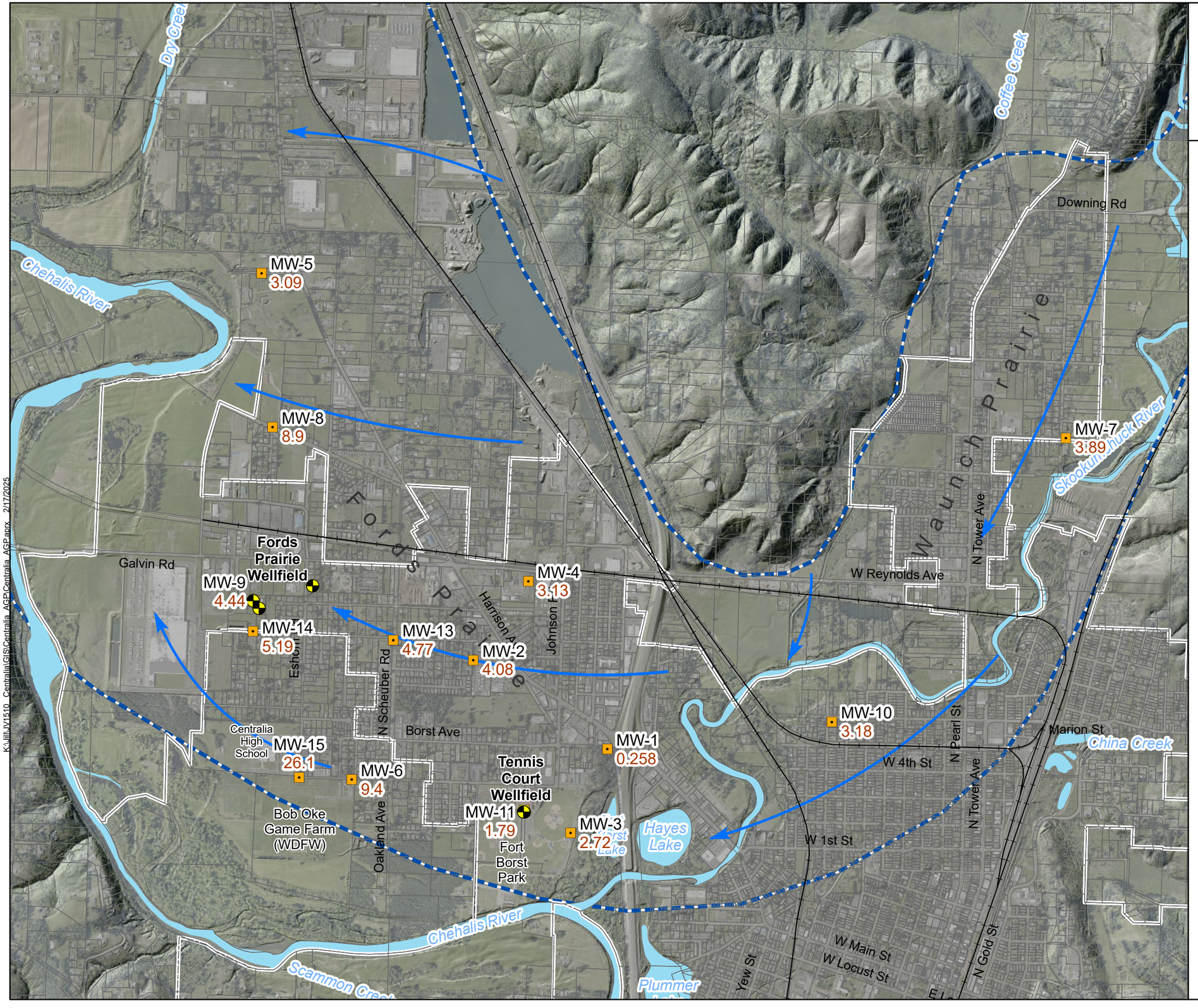
Figure A-6

Centralia Groundwater Nitrate Monitoring Data June 2024

City of Centralia

MOTT MACDONALD



3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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Figure A-7

Centralia Groundwater Nitrate Monitoring Data
September 2024

City of Centralia

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MW-5
3.37

MW-8
7.74

MW-7
4.49

Fords Prairie Wellfield
MW-9
5.09

MW-14
4.07

MW-13
4.32

MW-4
2.73

MW-10
3.16

Centralia High School
MW-15
21.8

MW-6
9.18

Tennis Court Wellfield
MW-11
1.68

MW-3
2.05

Bob Oke Game Farm (WDFW)

Fort Borst Park

Hayes Lake

Downing Rd
Galvin Rd
W Reynolds Ave
Borst Ave
W 4th St
W 1st St
W Main St
W Locust St
Marion St
Harrison Ave
Johnson Rd
Eshom
N Scheuber Rd
Oakland Ave
N Pearl St
N Tower Ave
N Gold St
Yew St

Dry Creek
Chehalis River
Coffee Creek
Skookum Chuck River
China Creek
Scammon Creek
Plummer

Fords Prairie
Waunch Prairie

3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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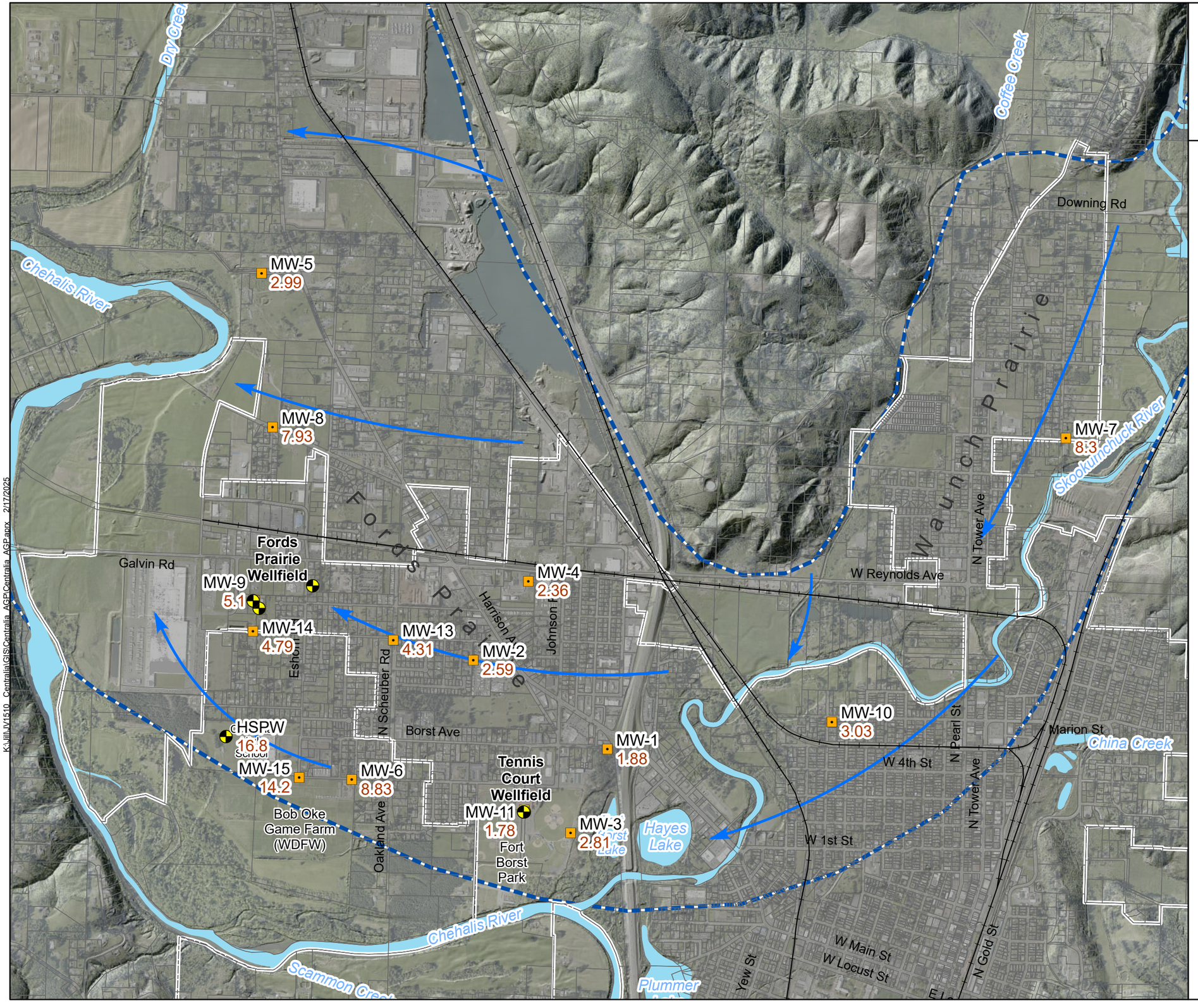
Figure A-8

Centralia Groundwater Nitrate Monitoring Data December 2024

City of Centralia

MOTT MACDONALD



3.05 - Nitrate + Nitrite Concentration (mg/L as N)

- Production Wells
- Dedicated Monitoring Wells
- Mapped Extent of Centralia Outwash Gravel Aquifer
- Centralia City Limits
- Generalized Groundwater Flow Direction

N

0 Feet 2,000

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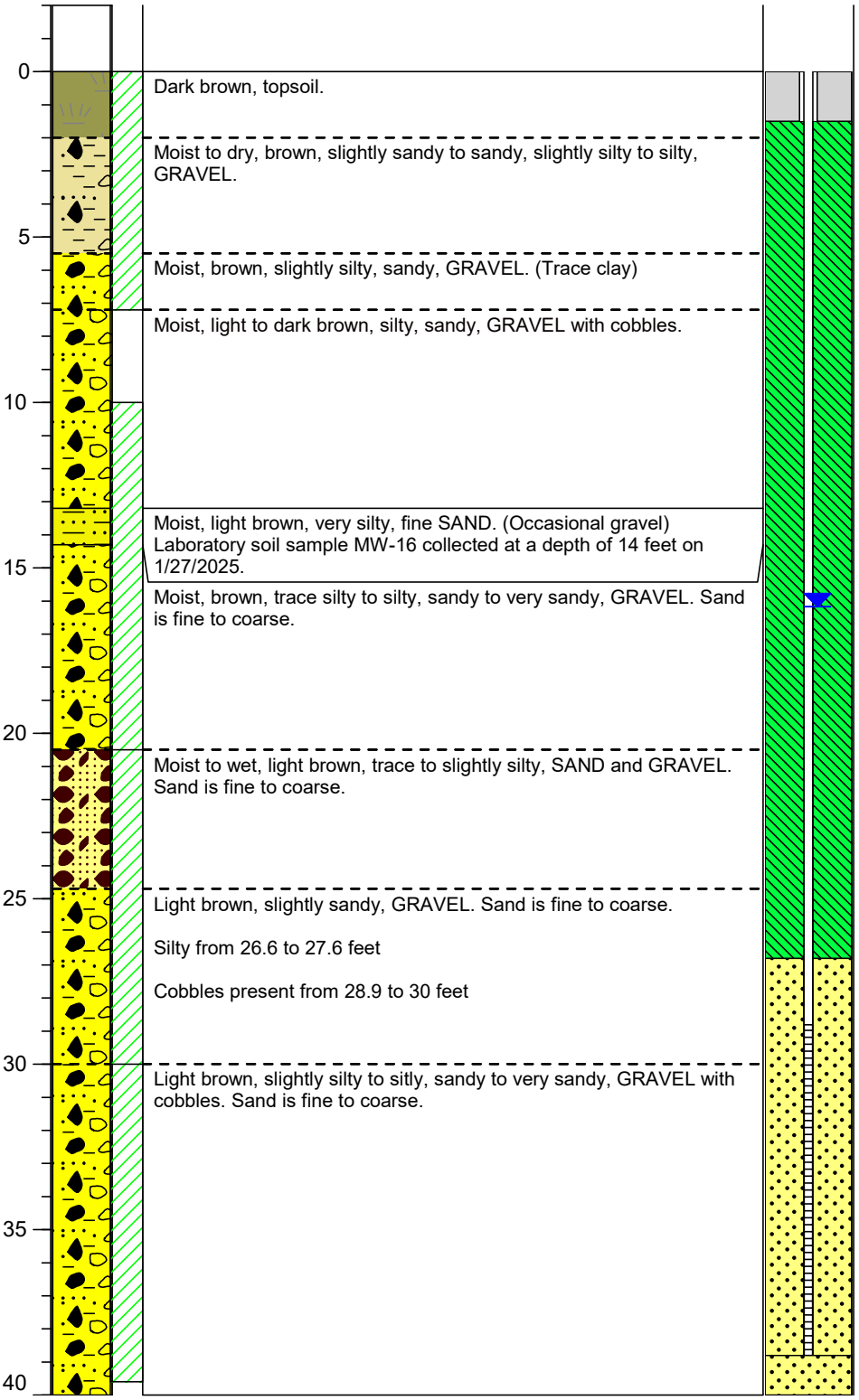
Appendix B:
Monitoring Well Construction Logs

Depth (ft)	Graphic Log	Recovery	Soil Description	Well Construction



Flush monument with locking well cap

Concrete Surface Seal
(0 - 1.5 feet)

3/8-inch Hole Plug Bentonite Seal
(1.5 - 26.8 feet)

Depth to Water (2/3/2025)
16.17 feet below measuring point (bmp)

2-inch, Schedule 40 PVC Riser Pipe
(0 - 28.4 feet)

6-inch Diameter Borehole (0 - 40 feet)

2-inch, 10 Slot, Schedule 40 PVC Screen
(28.4 - 38.4 feet)

12/20 Gilibrand Silica Sand
Filter Pack (26.8 - 40 feet)

2-inch PVC Schedule 40 Threaded Endcap
(38.4 - 38.6 feet)
Bottom of Boring (40 feet)

Northing: 1014561.25 ft NAD83/91
Easting: 516838.385 ft
Measuring Point Elevation: 169.99 ft NAVD88
Ecology UWID: BQM 627
Drilled: 1/27/2025
Location Description: East property boundary of Game Farm adjacent to Pen 3

Driller: Holt Services, Inc.
Drilling Method: Sonic
Logged by: Nathan Burt, Mott MacDonald
Depth to Water (bmp): 16.17 feet

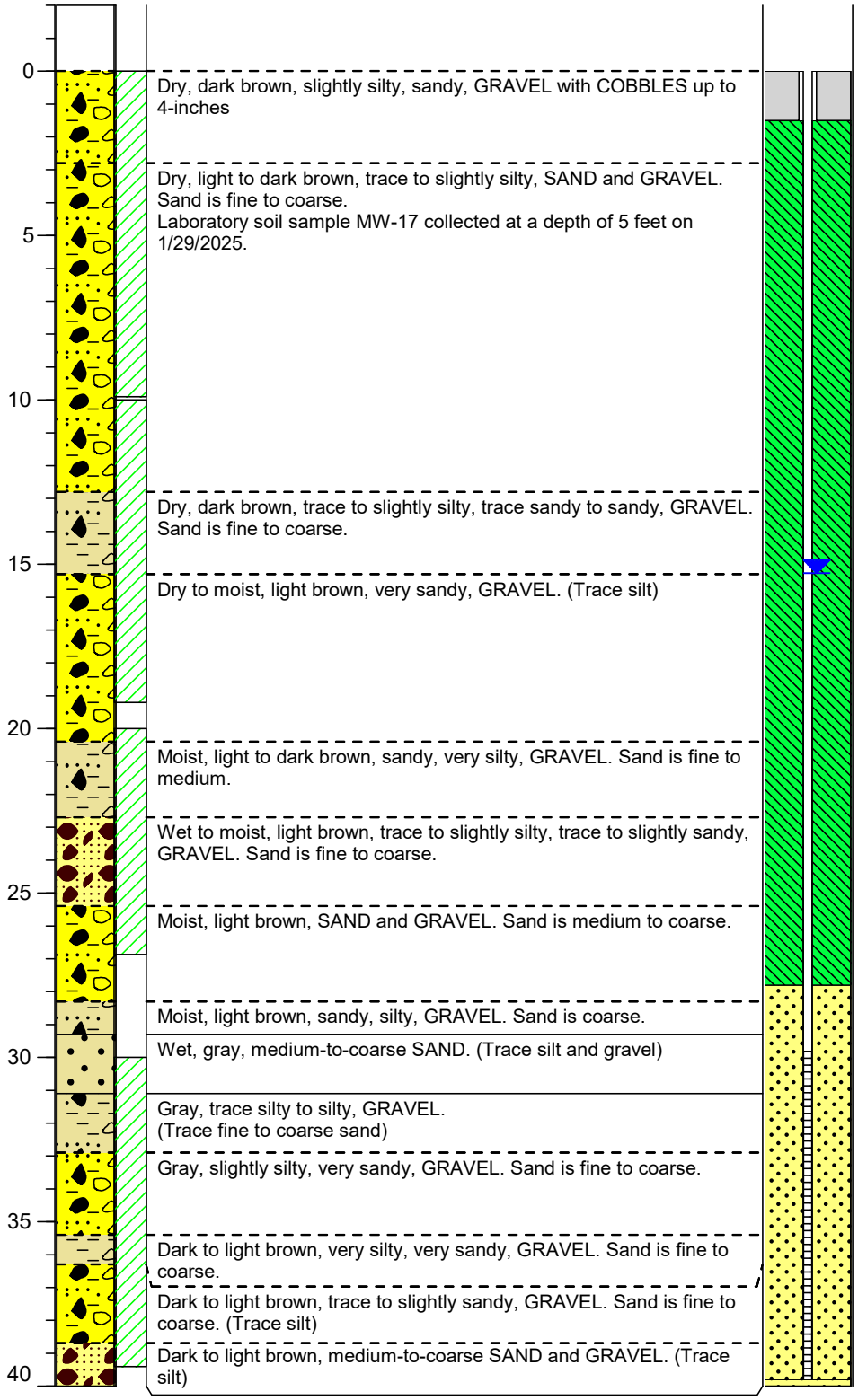
MW-16
Boring Log and As-Built

Centralia Monitoring Wells

507107008

MOTT MACDONALD

Depth (ft)	Graphic Log	Recovery	Soil Description	Well Construction



Northing: 1013488.99 ft NAD83/91
Easting: 517160.216 ft
Measuring Point Elevation: 168.65 ft NAVD88
Ecology UWID: BQM 629
Drilled: 1/29/2025
Location Description: Game Farm alley between Pens 13 North and 24

Driller: Holt Services Inc.
Drilling Method: Sonic
Logged by: Nathan Burt, Mott MacDonald
Depth to Water (bmp): 15.27 feet

MW-17
Boring Log and As-Built

Centralia Monitoring Wells

507107008

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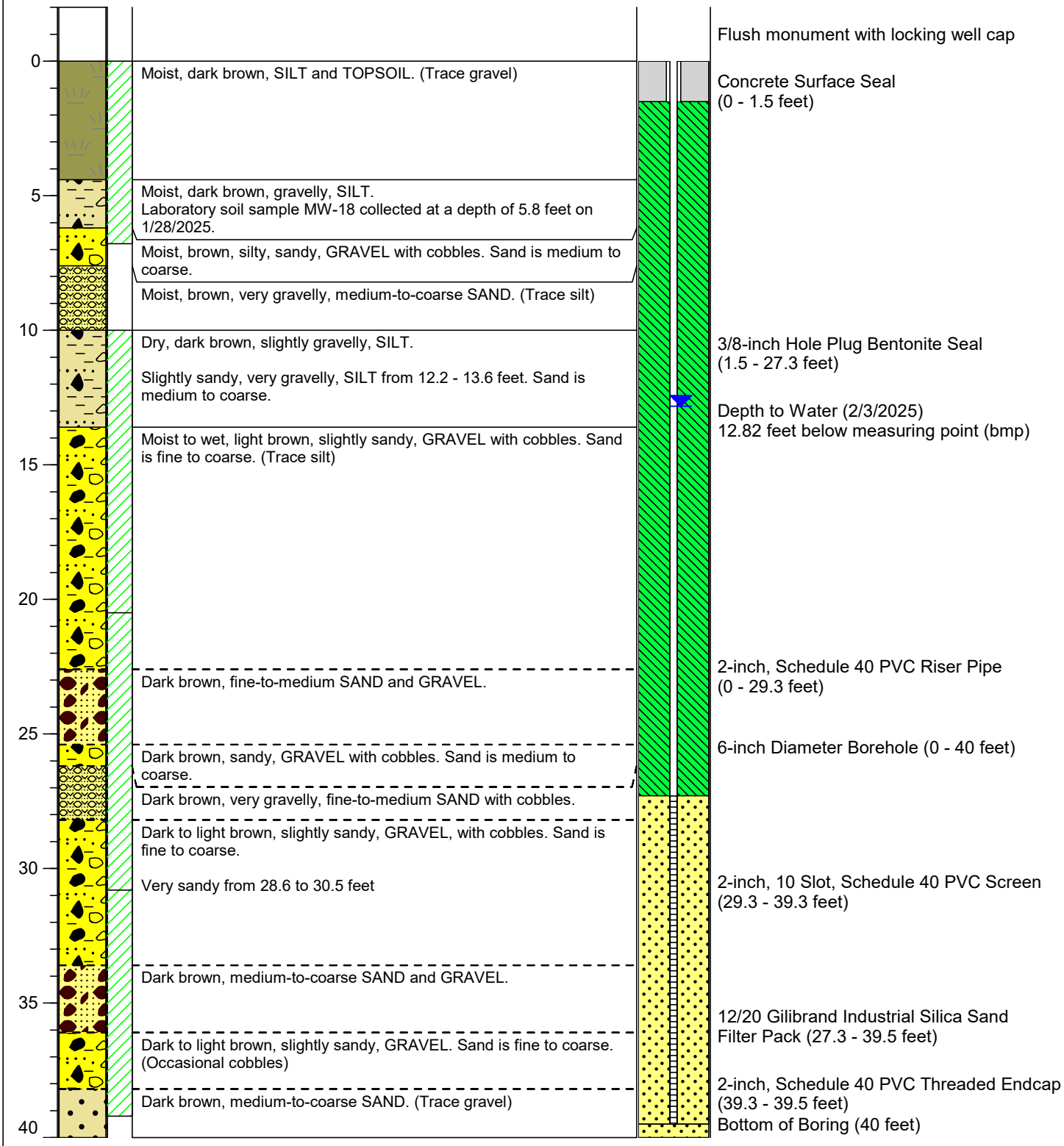

Northing: 1012710.60 NAD83/91
Easting: 517369.844 ft
Measuring Point Elevation: 166.11 ft NAVD88
Ecology UWID: BQM 628
Drilled: 1/28/2025
Location Description: Game Farm alley near SE corner of Pen 23

Driller: Holt Services, Inc.
Drilling Method: Sonic
Logged by: Nathan Burt, Mott MacDonald
Depth to Water (bmp): 12.82 feet

MW-18
Boring Log and As-Built

Centralia Monitoring Wells

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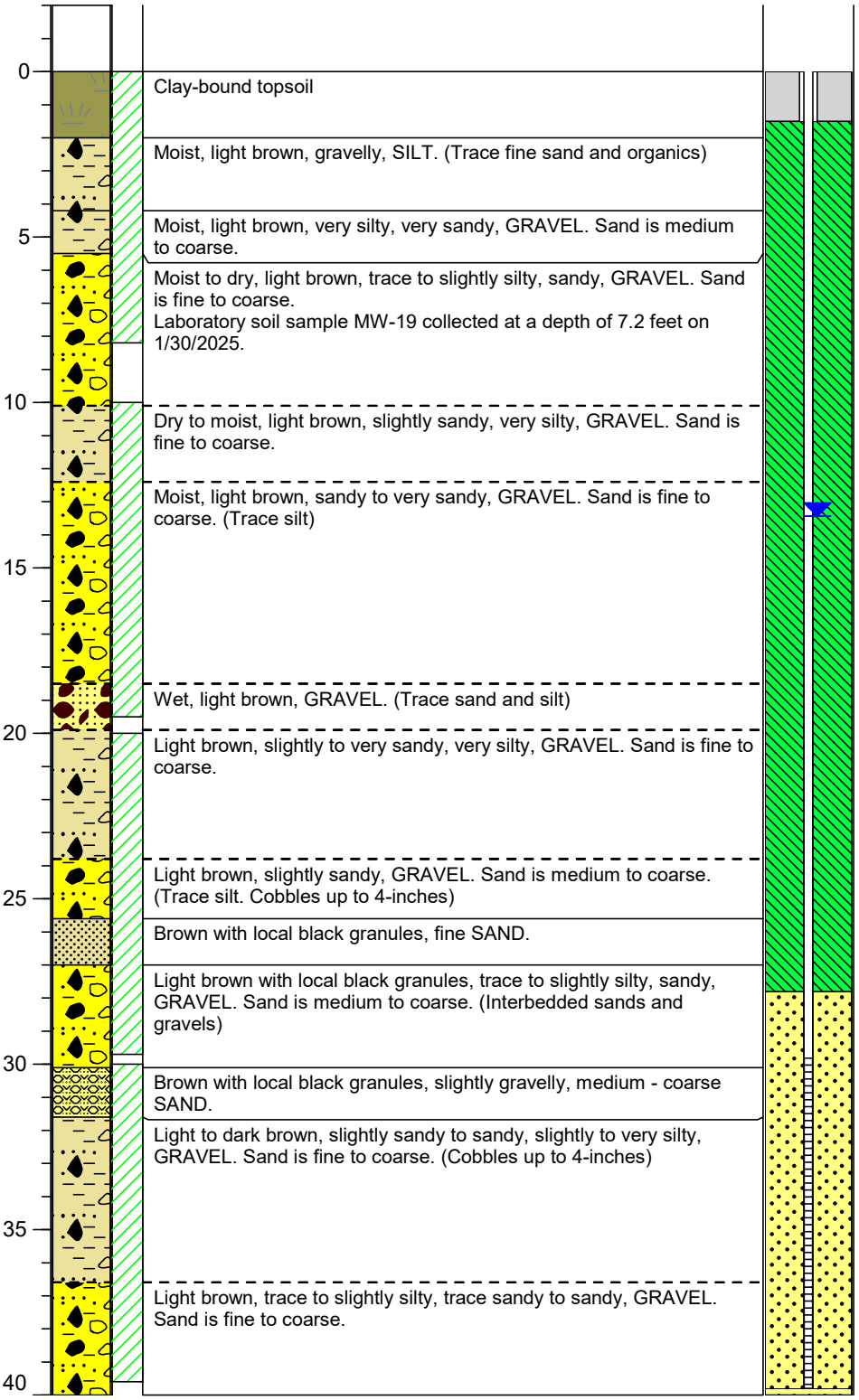
Depth (ft)	Graphic Log	Recovery	Soil Description	Well Construction



Clay-bound topsoil

Moist, light brown, gravelly, SILT. (Trace fine sand and organics)

Moist, light brown, very silty, very sandy, GRAVEL. Sand is medium to coarse.

Moist to dry, light brown, trace to slightly silty, sandy, GRAVEL. Sand is fine to coarse.
Laboratory soil sample MW-19 collected at a depth of 7.2 feet on 1/30/2025.

Dry to moist, light brown, slightly sandy, very silty, GRAVEL. Sand is fine to coarse.

Moist, light brown, sandy to very sandy, GRAVEL. Sand is fine to coarse. (Trace silt)

Wet, light brown, GRAVEL. (Trace sand and silt)

Light brown, slightly to very sandy, very silty, GRAVEL. Sand is fine to coarse.

Light brown, slightly sandy, GRAVEL. Sand is medium to coarse. (Trace silt. Cobbles up to 4-inches)

Brown with local black granules, fine SAND.

Light brown with local black granules, trace to slightly silty, sandy, GRAVEL. Sand is medium to coarse. (Interbedded sands and gravels)

Brown with local black granules, slightly gravelly, medium - coarse SAND.

Light to dark brown, slightly sandy to sandy, slightly to very silty, GRAVEL. Sand is fine to coarse. (Cobbles up to 4-inches)

Light brown, trace to slightly silty, trace sandy to sandy, GRAVEL. Sand is fine to coarse.

Flush monument with locking well cap

Concrete Surface Seal
(0 - 1.5 feet)

3/8-inch Hole Plug Bentonite Seal
(1.5 - 27.8 feet)

Depth to Water (2/3/2025)
13.43 feet below measuring point (bmp)

6-inch Diameter Borehole (0 - 40 feet)

2-inch, Schedule 40 PVC Riser Pipe
(0 - 29.8 feet)

2-inch, 10 Slot, Schedule 40 PVC Screen
(29.8 - 39.8 feet)

12/20 Gilibrand Industrial Silica Sand Filter Pack (27.8 - 39.8 feet)

2-inch, PVC Schedule 40 Threaded Endcap
(39.8 - 40 feet)

Bottom of Boring (40 feet)

Northing: 1012844.60 ft NAD83/91
Easting: 518459.509 ft
Measuring Point Elevation: 166.36 ft NAVD88
Ecology UWID: BQM 630
Drilled: 1/30/2025
Location Description: Centralia High School North Property Boundary, due north of northwest corner of school

Driller: Holt Services, Inc.
Drilling Method: Sonic
Logged by: Nathan Burt, Mott MacDonald
Depth to Water (bmp): 13.43 feet

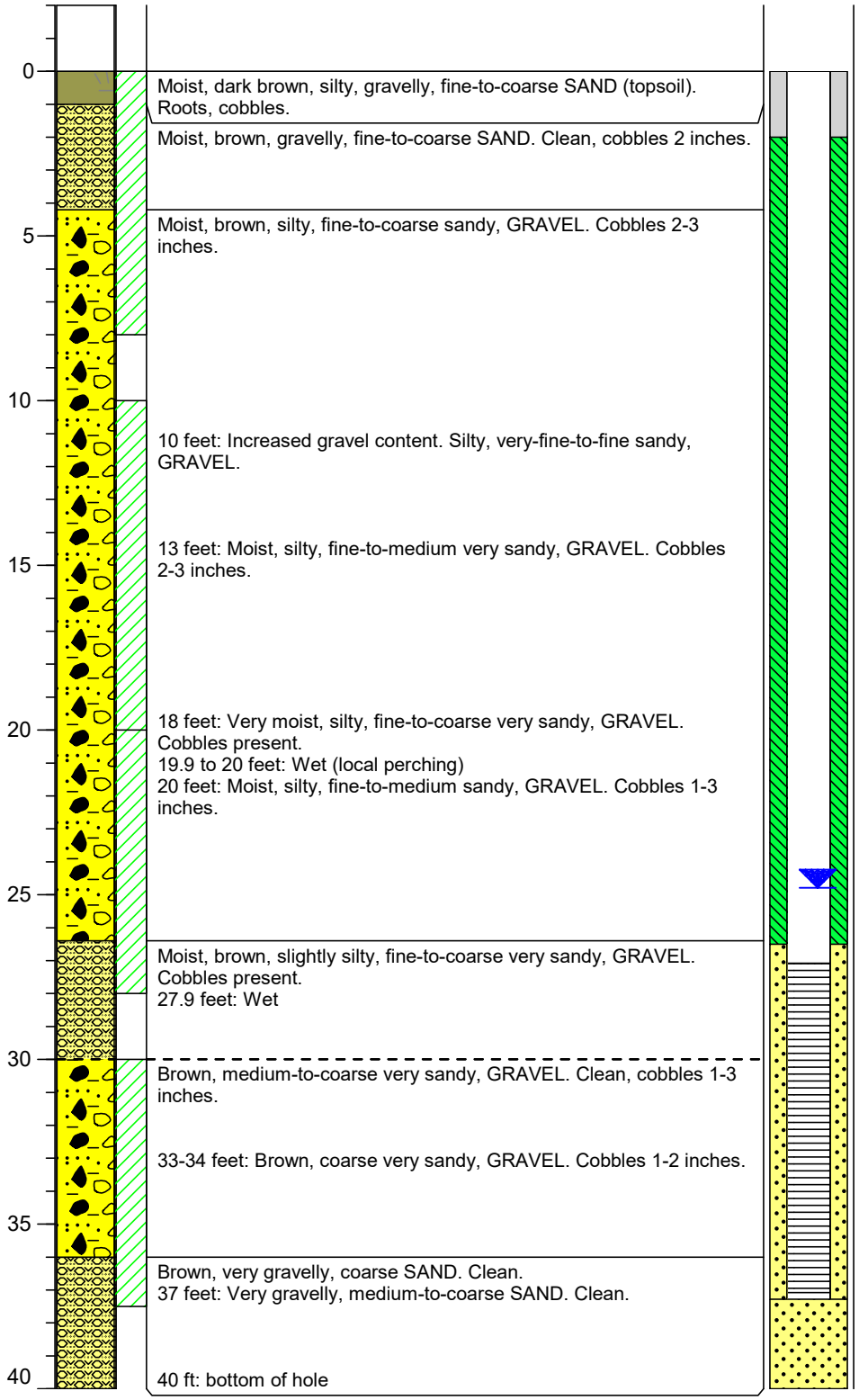
MW-19
Boring Log and As-Built

Centralia Monitoring Wells

507110387

MOTT MACDONALD

Depth (ft)	Graphic Log	Recovery	Soil Description	Well Construction



Soil Description

Moist, dark brown, silty, gravelly, fine-to-coarse SAND (topsoil). Roots, cobbles.

Moist, brown, gravelly, fine-to-coarse SAND. Clean, cobbles 2 inches.

Moist, brown, silty, fine-to-coarse sandy, GRAVEL. Cobbles 2-3 inches.

10 feet: Increased gravel content. Silty, very-fine-to-fine sandy, GRAVEL.

13 feet: Moist, silty, fine-to-medium very sandy, GRAVEL. Cobbles 2-3 inches.

18 feet: Very moist, silty, fine-to-coarse very sandy, GRAVEL. Cobbles present.
19.9 to 20 feet: Wet (local perching)
20 feet: Moist, silty, fine-to-medium sandy, GRAVEL. Cobbles 1-3 inches.

Moist, brown, slightly silty, fine-to-coarse very sandy, GRAVEL. Cobbles present.
27.9 feet: Wet

Brown, medium-to-coarse very sandy, GRAVEL. Clean, cobbles 1-3 inches.

33-34 feet: Brown, coarse very sandy, GRAVEL. Cobbles 1-2 inches.

Brown, very gravelly, coarse SAND. Clean.
37 feet: Very gravelly, medium-to-coarse SAND. Clean.

40 ft: bottom of hole

Well Construction

Flush Monument with locking well cap.
Stickdown approximately 0.4 feet
Cement Surface Seal (0 - 2 feet)

Bentonite Seal (2 - 26.5 feet)

2-inch, PVC Schedule 40 Riser Pipe (0.4 - 27.5 feet)

6-inch diameter borehole (0 - 40 feet)

Depth to Water (bgs): 24.79 ft

Silica Sand Filter Pack (26.5 - 40 feet)

2-inch, 10-slot, Schedule 40 PVC Screen (27.5 - 37.5 feet)

2-inch, Schedule 40 PVC Threaded Endcap (37.5 - 37.7 feet)

Northing: 1015271.445 NAD83/91
Easting: 519887.904 ft
Measuring Point Elevation: 173.06 ft NAVD88
Ecology UWID: BPW 500
Drilled: 12/15/22
Location Description: Near SW corner of intersection of Russell Rd & Scheuber Rd N

Driller: Quaid Curtis, Holt Services
Drilling Method: Sonic
Logged by: Alla Skaskevych, MM
Depth to Water (bmp): 24.39 feet

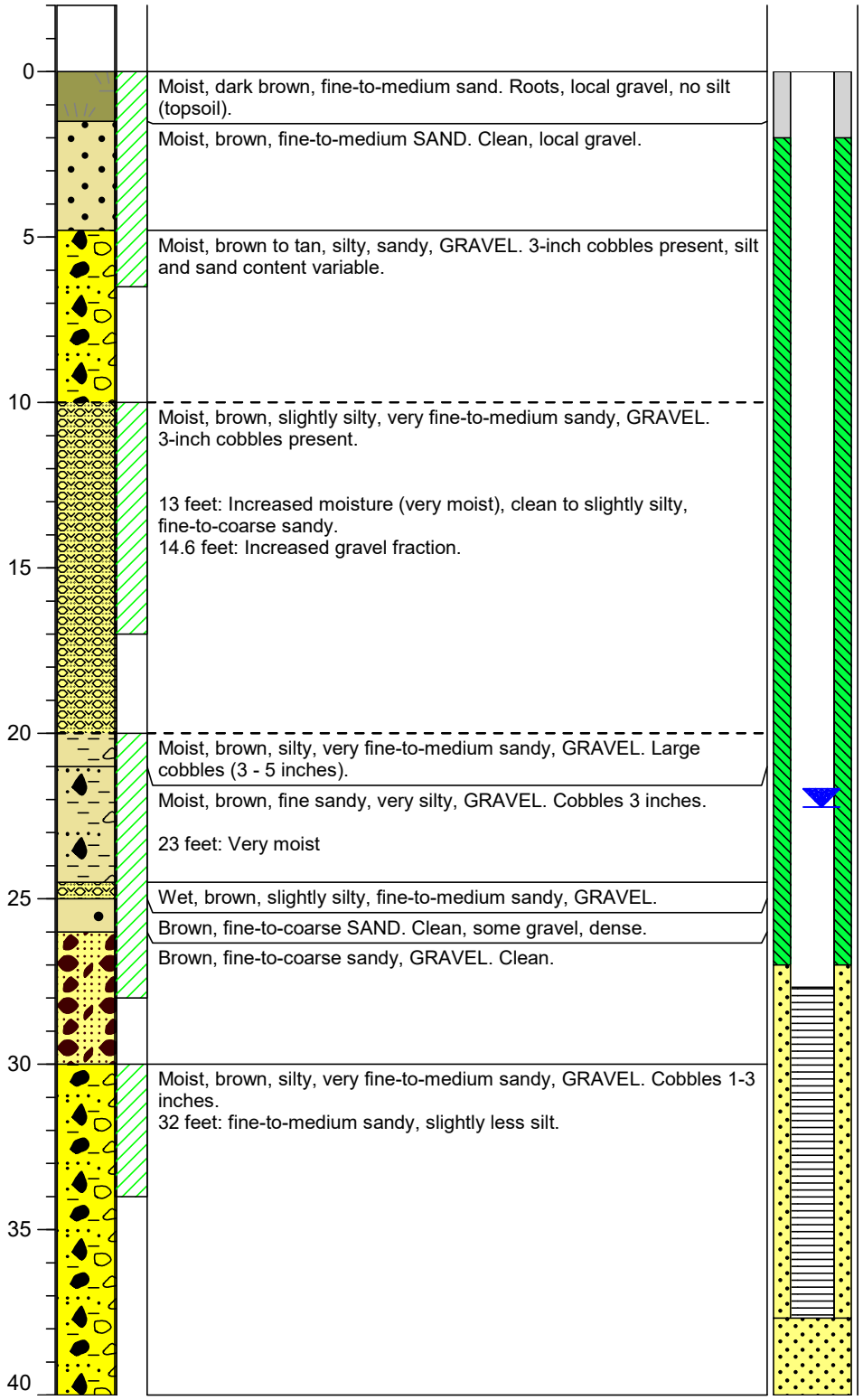
MW-13
Boring Log and As-Built

Centralia Nitrate Monitoring Wells

507107008

MOTT MACDONALD

Depth (ft)	Graphic Log	Recovery	Soil Description	Well Construction



Northing: 1012829.736 ft NAD83/91
Easting: 520040.5181 ft
Measuring Point Elevation: 169.26 ft NAVD88
Ecology UWID: BPW 499
Drilled: 12/15/22
Location Description: Right-of-Way north of 3702 Russell Rd

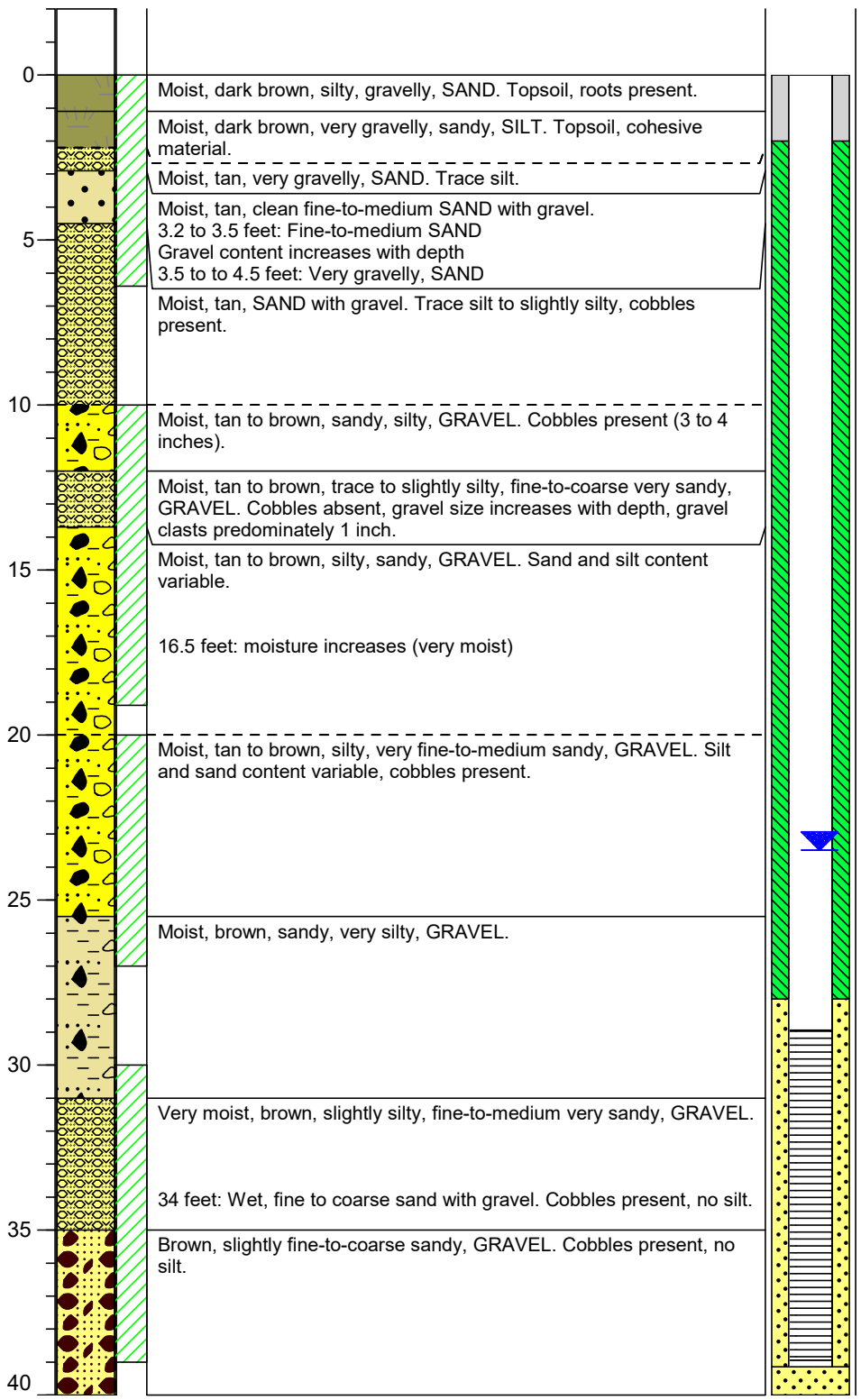
Driller: Quaid Curtis, Holt Services
Drilling Method: Sonic
Logged by: Alla Skaskevych, MM
Depth to Water (bmp): 21.84 feet

MW-14
Boring Log and As-Built

Centralia Nitrate Monitoring Wells

507107008

MOTT MACDONALD



Northing: 1013634.281 ft NAD83/91
Easting: 517498.707 ft
Measuring Point Elevation: 172.38 ft NAVD88
Ecology UWID: BPW 498
Drilled: 12/15/22
Location Description: SW corner of Eshom and Mt. Vista Rd intersection

Driller: Quaid Curtis, Holt Services
Drilling Method: Sonic
Logged by: Glenn Mutti-Driscoll & Alla S., MM
Depth to Water (bmp): 23.08 feet

MW-15
Boring Log and As-Built

Centralia Nitrate Monitoring Wells

507107008

MOTT MACDONALD

Appendix C:
Phase 2 Investigation Laboratory Data Reports

Analytical Resources, LLC
Analytical Chemists and Consultants
Tukwila, WA

14 March 2025

Nathan Burt
Mott MacDonald
1601 5th Avenue Suite 800
Seattle, WA 98101

RE: City Of Centralia Nitrogen Soil Study 2025 (Nitrogen Soil Study 2025)

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

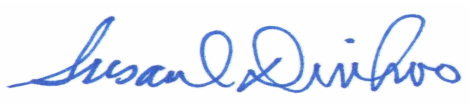
Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)	Associated SDG ID(s)
25B0011	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC



Susan Dunnihoo For Kelly Bottem, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

ACCREDITED IN ACCORDANCE WITH nelac
Cert# 100006-012

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 25B0011	Turn-around Requested:	Page:	of
ARI Client Company: MOTT MACC	Phone: 2066007855	Date:	Ice Present?
Client Contact: NATHAN.BURT@MOTTMAC.COM		No. of Coolers:	Cooler Temps:
Client Project Name: CITY OF CENTRALIA			
Client Project #:	Samplers: N.B / R.M.O		

Analytical Resources, LLC
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested								Notes/Comments
MW-16	1/27/25	13:55		1	TKN	NN	NH3	SOLIDS					
MW-17	1/29/25	16:56		"	"	"	"	"					
MW-18	1/28/25	16:43		"	"	"	"	"					
MW-19	1/31/25	14:08		"	"	"	"	"					
S-1	1/28/25	11:38		"	"	"	"	"					
S-2	1/28/25	08:01		"	"	"	"	"					
S-3	1/27/25	16:37		"	"	"	"	"					
S-4	1/28/25	09:41		"	"	"	"	"					
S-5	1/27/25	16:17		"	"	"	"	"					
~~S-6~~	~~1/29/25~~	~~15:10~~		~~"~~	~~-~~	~~-~~	~~-~~	~~-~~					

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: NATHAN BURT	Printed Name: Roman A.	Printed Name:	Printed Name:
	Company: MM	Company: ARLLC	Company:	Company:
	Date & Time: 01/31/25 1641	Date & Time: 1/31/25 1641 1/31/25	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 25B0011	Turn-around Requested:	Page:	of
ARI Client Company: MM	Phone: 2066007855	Date:	Ice Present?
Client Contact: NATHAN.BURT@MOTTMAC.COM		No. of Coolers:	Cooler Temps:
Client Project Name: CITY OF CENTRALIA			
Client Project #:	Samplers: N.B / AMD		

Analytical Resources, LLC
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested								Notes/Comments
S-6	1/27/25	14:55		1	TKN	NN	NH3	SOLIDS					
S-7	1/27/25	14:40		"	"	"	"	"					
S-8	1/27/25	16:00		"	"	"	"	"					
S-9	1/27/25	15:25		"	"	"	"	"					
S-10	1/27/25	15:45		"	"	"	"	"					
S-11	1/27/25	15:10		"	"	"	"	"					
				~~"~~	~~"~~	/							
				"	~~"~~								
				~~"~~									
				~~"~~									

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: NATHAN BURT	Printed Name: Roman M.	Printed Name:	Printed Name:
	Company: MM	Company: ARLLC	Company:	Company:
	Date & Time: 01/31/25 16:41	Date & Time: 1/31/25 1641	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-16	25B0011-01	Solid	27-Jan-2025 13:55	31-Jan-2025 16:41
MW-17	25B0011-02	Solid	29-Jan-2025 16:56	31-Jan-2025 16:41
MW-18	25B0011-03	Solid	28-Jan-2025 16:43	31-Jan-2025 16:41
MW-19	25B0011-04	Solid	31-Jan-2025 14:08	31-Jan-2025 16:41
S-1	25B0011-05	Solid	28-Jan-2025 11:38	31-Jan-2025 16:41
S-2	25B0011-06	Solid	28-Jan-2025 08:01	31-Jan-2025 16:41
S-3	25B0011-07	Solid	27-Jan-2025 16:37	31-Jan-2025 16:41
S-4	25B0011-08	Solid	28-Jan-2025 09:41	31-Jan-2025 16:41
S-5	25B0011-09	Solid	27-Jan-2025 16:17	31-Jan-2025 16:41
S-6	25B0011-10	Solid	27-Jan-2025 14:55	31-Jan-2025 16:41
S-7	25B0011-11	Solid	27-Jan-2025 14:40	31-Jan-2025 16:41
S-8	25B0011-12	Solid	27-Jan-2025 16:00	31-Jan-2025 16:41
S-9	25B0011-13	Solid	27-Jan-2025 15:25	31-Jan-2025 16:41
S-10	25B0011-14	Solid	27-Jan-2025 15:45	31-Jan-2025 16:41
S-11	25B0011-15	Solid	27-Jan-2025 15:10	31-Jan-2025 16:41

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

Work Order Case Narrative

Wet Chemistry

The sample(s) were initially prepared and analyzed within the recommended holding times. Due to a suspected discrepancy with sample S-7 (25B0011-11), that sample was redigested and reanalyzed outside recommended holding times. The data was loaded but due to the discrepancy the entire batch was reanalyzed outside holding time to verify all the values for the sequence. The reanalysis confirmed that samples in the sequence were out of order, affecting MW-17, MW-18, MW-19 and S-7. The initial data within holding time was corrected to reflect the correct sample IDs. The process for loading the sequence has been corrected to sue the container barcodes, to ensure if samples are loaded out of order the sequence will correctly reflect the client sample IDs.

The data analyzed outside holding time is biased high and has not been included in this report.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

The matrix spike (MS) percent recoveries and the duplicate (DUP) relative percent difference (RPD) were within advisory control limits.

Revised 03/14/2025 to correct TKN data.

Analytical Resources, LLC
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Mott MacC Project Name: City of Centralia

COC No(s): NA Delivered by: Fed-Ex UPS Courier Hand Delivered Other:

Assigned ARI Job No: 25B0011 Tracking No: NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) Time 1641 8.5° Temp Gun ID#: 9208

Was a temperature blank included in the cooler? YES NO

Were coolers received between 0°- 6° (°C) YES NO

Was sufficient ice used (if appropriate)? NA YES NO

Cooler Accepted by: [signature] Date: 1/31/25 Time: 1641

Complete custody forms and attach all shipping documents

Log-In Phase:

What kind of packing material was used? Bubble Wrap Wet Ice Gel Packs Baggies Foam Block N/A Other:

Are any samples that were out of temperature compliance documented in LIMS? YES NO

How were bottles sealed in plastic bags? Individually Grouped Not

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI NA

Were the sample(s) split by ARI? NA YES Date/Time: Equipment: Split by:

Samples Logged by: Anthony G. Date: 213125 Time: 7:53 Labels checked by: AG

***** Notify Project Manager of discrepancies or concerns *****

Additional Notes, Discrepancies, & Resolutions:

By: Date:

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-16

25B0011-01 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 13:55
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:29

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-01 A
Preparation Batch: BNB0015 — Sample Size: 4.9 g (wet) — Dry Weight:4.17 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 85.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.10	0.10	0.55	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-16

25B0011-01 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 13:55
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-01
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 85.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	85.10	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-16

25B0011-01 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 13:55
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:03

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-01 A
Preparation Batch: BNB0012 — Sample Size: 4.69 g (wet) — Dry Weight:3.99 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 85.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.40	0.40	ND	mg/kg NH3-N	U

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-16

25B0011-01 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 13:55
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 11:43

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-01 A
Preparation Batch: BNB0036 — Sample Size: 0.2804 g (wet) — Dry Weight:0.24 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 85.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		1	52.4	52.4	134	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-17

25B0011-02 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/29/2025 16:56
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:32

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-02 A
Preparation Batch: BNB0015 — Sample Size: 4.26 g (wet) — Dry Weight:3.92 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 91.95

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.10	0.10	0.63	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-17

25B0011-02 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/29/2025 16:56
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-02
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 91.95

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	91.95	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-17

25B0011-02 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/29/2025 16:56
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:07

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-02 A
Preparation Batch: BNB0012 — Sample Size: 4.68 g (wet) — Dry Weight:4.30 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 91.95

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.37	0.37	0.49	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-17

25B0011-02 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/29/2025 16:56
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:15

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-02 A
Preparation Batch: BNB0036 — Sample Size: 0.2926 g (wet) — Dry Weight:0.27 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 91.95

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		1	46.5	46.5	ND	mg/kg	U

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-18

25B0011-03 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/28/2025 16:43
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:33

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-03 A
Preparation Batch: BNB0015 — Sample Size: 4.88 g (wet) — Dry Weight:3.77 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 77.18

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	4.55	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-18

25B0011-03 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/28/2025 16:43
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-03
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 77.18

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	77.18	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-18

25B0011-03 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/28/2025 16:43
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:08

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-03 A
Preparation Batch: BNB0012 — Sample Size: 4.86 g (wet) — Dry Weight:3.75 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 77.18

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.43	0.43	2.31	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-18

25B0011-03 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/28/2025 16:43
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 11:58

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-03 A
Preparation Batch: BNB0036 — Sample Size: 0.2055 g (wet) — Dry Weight:0.16 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 77.18

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		1	78.8	78.8	1180	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-19

25B0011-04 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/31/2025 14:08
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:35

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-04 A
Preparation Batch: BNB0015 — Sample Size: 4.53 g (wet) — Dry Weight:3.97 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 87.73

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.10	0.10	ND	mg/kg	U

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-19

25B0011-04 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/31/2025 14:08
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-04
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 87.73

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	87.73	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

MW-19

25B0011-04 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/31/2025 14:08
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:09

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-04 A
Preparation Batch: BNB0012 — Sample Size: 4.52 g (wet) — Dry Weight:3.97 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 87.73

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.40	0.40	0.51	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-04 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/31/2025 14:08
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 11:59

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-04 A
Preparation Batch: BNB0036 — Sample Size: 0.2262 g (wet) — Dry Weight:0.20 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 87.73

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		1	63.0	63.0	ND	mg/kg	U

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-05 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/28/2025 11:38
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:42

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-05 A
Preparation Batch: BNB0015 — Sample Size: 4.69 g (wet) — Dry Weight:3.55 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 75.77

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	0.30	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-05 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/28/2025 11:38
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-05
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 75.77

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	75.77	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-05 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/28/2025 11:38
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:10

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-05 A
Preparation Batch: BNB0012 — Sample Size: 4.76 g (wet) — Dry Weight:3.61 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 75.77

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.44	0.44	4.94	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-05RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/28/2025 11:38
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:10

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-05RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.192 g (wet) — Dry Weight:0.15 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 75.77

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	430	430	3570	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-06 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/28/2025 08:01
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-06
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 74.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	74.51	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-06 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/28/2025 08:01
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:19

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-06 A
Preparation Batch: BNB0012 — Sample Size: 4.84 g (wet) — Dry Weight:3.61 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 74.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.44	0.44	1.85	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-06RE1 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/28/2025 08:01
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:59

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-06RE1 A
Preparation Batch: BNB0015 — Sample Size: 4.46 g (wet) — Dry Weight:3.32 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 74.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		2	0.24	0.24	12.5	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-06RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/28/2025 08:01
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:11

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-06RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.2083 g (wet) — Dry Weight:0.16 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 74.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	403	403	4570	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-07 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 16:37
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:44

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-07 A
Preparation Batch: BNB0015 — Sample Size: 4.29 g (wet) — Dry Weight:3.41 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 79.39

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.12	0.12	3.31	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-07 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 16:37
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-07
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 79.39

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	79.39	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-07 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 16:37
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:20

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-07 A
Preparation Batch: BNB0012 — Sample Size: 4.77 g (wet) — Dry Weight:3.79 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 79.39

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.42	0.42	0.74	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-07RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 16:37
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:24

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-07RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.1909 g (wet) — Dry Weight:0.15 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 79.39

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	412	412	3550	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-08 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/28/2025 09:41
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:45

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-08 A
Preparation Batch: BNB0015 — Sample Size: 4.62 g (wet) — Dry Weight:3.55 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 76.82

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	0.76	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-08 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/28/2025 09:41
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-08
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 76.82

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	76.82	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-08 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/28/2025 09:41
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:21

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-08 A
Preparation Batch: BNB0012 — Sample Size: 4.91 g (wet) — Dry Weight:3.77 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 76.82

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.42	0.42	1.15	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-08RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/28/2025 09:41
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:25

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-08RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.2194 g (wet) — Dry Weight:0.17 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 76.82

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	371	371	4950	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-09 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 16:17
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:46

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-09 A
Preparation Batch: BNB0015 — Sample Size: 4.31 g (wet) — Dry Weight:3.53 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 81.96

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	4.09	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-09 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 16:17
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-09
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 81.96

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	81.96	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-09 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 16:17
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:22

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-09 A
Preparation Batch: BNB0012 — Sample Size: 4.5 g (wet) — Dry Weight:3.69 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 81.96

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.43	0.43	1.06	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-09RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 16:17
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:26

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-09RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.1913 g (wet) — Dry Weight:0.16 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 81.96

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	399	399	6010	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-10 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 14:55
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-10
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 70.80

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	70.80	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-10 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 14:55
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:23

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-10 A
Preparation Batch: BNB0012 — Sample Size: 4.73 g (wet) — Dry Weight:3.35 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 70.80

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.48	0.48	3.05	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-10RE1 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 14:55
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 14:00

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-10RE1 A
Preparation Batch: BNB0015 — Sample Size: 4.75 g (wet) — Dry Weight:3.36 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 70.80

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		2	0.24	0.24	12.8	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-10RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 14:55
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:27

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-10RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.2357 g (wet) — Dry Weight:0.17 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 70.80

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	375	375	6130	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-11 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 14:40
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:49

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-11 A
Preparation Batch: BNB0015 — Sample Size: 4.3 g (wet) — Dry Weight:3.36 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 78.22

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.12	0.12	7.59	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-11 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 14:40
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-11
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 78.22

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	78.22	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-11 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 14:40
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:25

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-11 A
Preparation Batch: BNB0012 — Sample Size: 4.94 g (wet) — Dry Weight:3.86 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 78.22

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.41	0.41	4.51	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-11RE6 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 14:40
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:09

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-11RE6 A
Preparation Batch: BNB0036 — Sample Size: 0.2075 g (wet) — Dry Weight:0.16 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 78.22

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		2	154	154	2840	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-12 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 16:00
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:50

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-12 A
Preparation Batch: BNB0015 — Sample Size: 4.73 g (wet) — Dry Weight:3.56 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 75.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	6.08	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-12 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 16:00
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-12
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 75.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	75.23	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-12 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 16:00
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:26

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-12 A
Preparation Batch: BNB0012 — Sample Size: 4.62 g (wet) — Dry Weight:3.48 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 75.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.46	0.46	1.37	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-12RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 16:00
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:28

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-12RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.2241 g (wet) — Dry Weight:0.17 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 75.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	371	371	3200	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-13 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 15:25
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:51

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-13 A
Preparation Batch: BNB0015 — Sample Size: 4.76 g (wet) — Dry Weight:3.79 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 79.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	5.59	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-13 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 15:25
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-13
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 79.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	79.59	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-13 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 15:25
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:27

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-13 A
Preparation Batch: BNB0012 — Sample Size: 4.58 g (wet) — Dry Weight:3.65 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 79.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.44	0.44	1.15	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-13RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 15:25
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:29

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-13RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.1948 g (wet) — Dry Weight:0.16 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 79.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	403	403	5480	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-14 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 15:45
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:57

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-14 A
Preparation Batch: BNB0015 — Sample Size: 4.66 g (wet) — Dry Weight:3.64 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 78.08

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.11	0.11	0.48	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-14 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 15:45
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-14
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 78.08

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	78.08	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-14 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 15:45
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:28

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-14 A
Preparation Batch: BNB0012 — Sample Size: 4.31 g (wet) — Dry Weight:3.37 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 78.08

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.48	0.48	1.18	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-14RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 15:45
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:34

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-14RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.1941 g (wet) — Dry Weight:0.15 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 78.08

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	412	412	3570	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-15 (Solid)

Wet Chemistry

Method: EPA 353.2 — Sampled: 01/27/2025 15:10
Instrument: LACHAT2 Analyst: CB — Analyzed: 02/07/2025 13:58

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-15 A
Preparation Batch: BNB0015 — Sample Size: 4.64 g (wet) — Dry Weight:3.42 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 73.78

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Nitrate + Nitrite as N		1	0.12	0.12	4.91	mg/kg	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-15 (Solid)

Wet Chemistry

Method: SM 2540 G-11 — Sampled: 01/27/2025 15:10
Instrument: BAL2 Analyst: LM — Analyzed: 02/05/2025 10:46

Sample Preparation: Preparation Method: No Prep Wet Chem — Extract ID: 25B0011-15
Preparation Batch: BNB0037 — Sample Size: 5 g (wet)
Prepared: 02/04/2025 — Final Volume: 5 mL — % Solids: 73.78

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	73.78	%	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-15 (Solid)

Wet Chemistry

Method: SM 4500-NH3 H-11 — Sampled: 01/27/2025 15:10
Instrument: LACHAT1 Analyst: CB — Analyzed: 02/04/2025 14:29

Sample Preparation: Preparation Method: MSA 33.3 — Extract ID: 25B0011-15 A
Preparation Batch: BNB0012 — Sample Size: 4.67 g (wet) — Dry Weight:3.45 g
Prepared: 02/03/2025 — Final Volume: 40 mL — % Solids: 73.78

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Ammonia-N	7664-41-7	1	0.46	0.46	1.32	mg/kg NH3-N	

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

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25B0011-15RE1 (Solid)

Wet Chemistry

Method: SM 4500-Norg D-11 — Sampled: 01/27/2025 15:10
Instrument: LACHAT1 Analyst: GD — Analyzed: 02/05/2025 12:35

Sample Preparation: Preparation Method: LACHAT 10-107-06-1-I — Extract ID: 25B0011-15RE1 A
Preparation Batch: BNB0036 — Sample Size: 0.2075 g (wet) — Dry Weight:0.15 g
Prepared: 02/04/2025 — Final Volume: 25 mL — % Solids: 73.78

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Kjeldahl Nitrogen		5	408	408	4740	mg/kg	D

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BNB0012 - SM 4500-NH3 H-11

Instrument: LACHAT1 Analyst: CB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BNB0012-BLK1)				Prepared: 03-Feb-2025 Analyzed: 04-Feb-2025 14:01							
Ammonia-N	ND	0.40	0.40	mg/kg NH3-N							U
LCS (BNB0012-BS1)				Prepared: 03-Feb-2025 Analyzed: 04-Feb-2025 14:02							
Ammonia-N	101	8.00	8.00	mg/kg NH3-N	100		101	90-110			D
Duplicate (BNB0012-DUP1)		**Source: 25B0011-01**		Prepared: 03-Feb-2025 Analyzed: 04-Feb-2025 14:05							
Ammonia-N	ND	0.39	0.39	mg/kg NH3-N		ND				20	U
Matrix Spike (BNB0012-MS1)		**Source: 25B0011-01**		Prepared: 03-Feb-2025 Analyzed: 04-Feb-2025 14:06							
Ammonia-N	101	0.40	8.26	mg/kg NH3-N	103	ND	97.6	75-125			D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BNB0015 - EPA 353.2

Instrument: LACHAT2 Analyst: CB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BNB0015-BLK2)				Prepared: 03-Feb-2025 Analyzed: 07-Feb-2025 13:41							
Nitrate + Nitrite as N	ND	0.10	0.10	mg/kg							U
LCS (BNB0015-BS1)				Prepared: 03-Feb-2025 Analyzed: 07-Feb-2025 13:28							
Nitrate + Nitrite as N	106	2.00	2.00	mg/kg	100		106	90-110			D
Duplicate (BNB0015-DUP1)		**Source: 25B0011-01**		Prepared: 03-Feb-2025 Analyzed: 07-Feb-2025 13:30							
Nitrate + Nitrite as N	0.55	0.10	0.10	mg/kg		0.55			1.14	20	
Matrix Spike (BNB0015-MS1)		**Source: 25B0011-01**		Prepared: 03-Feb-2025 Analyzed: 07-Feb-2025 13:31							
Nitrate + Nitrite as N	106	2.07	2.07	mg/kg	104	0.55	103	75-125			D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Mott MacDonald	Project: City Of Centralia Nitrogen Soil Study 2025	
1601 5th Avenue Suite 800	Project Number: Nitrogen Soil Study 2025	**Reported:**
Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

Analysis by: Analytical Resources, LLC

Wet Chemistry - Quality Control

Batch BNB0036 - SM 4500-Norg D-11

Instrument: LACHAT1 Analyst: GD

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BNB0036-BLK1)				Prepared: 04-Feb-2025 Analyzed: 05-Feb-2025 11:40							
Total Kjeldahl Nitrogen	ND	41.7	41.7	mg/kg							U
LCS (BNB0036-BS1)				Prepared: 04-Feb-2025 Analyzed: 05-Feb-2025 11:41							
Total Kjeldahl Nitrogen	423	41.7	41.7	mg/kg	417		101	90-110			
LCS (BNB0036-BS2)				Prepared: 04-Feb-2025 Analyzed: 05-Feb-2025 11:42							
Total Kjeldahl Nitrogen	433	41.7	41.7	mg/kg	417		104	90-110			
Duplicate (BNB0036-DUP1)		**Source: 25B0011-01**		Prepared: 04-Feb-2025 Analyzed: 05-Feb-2025 11:44							
Total Kjeldahl Nitrogen	ND	51.3	51.3	mg/kg		134				20	U
Duplicate (BNB0036-DUP2)		**Source: 25B0011-01**		Prepared: 04-Feb-2025 Analyzed: 05-Feb-2025 11:44							
Total Kjeldahl Nitrogen	ND	52.4	52.4	mg/kg		134				20	U

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Seattle WA, 98101	Project Manager: Nathan Burt	14-Mar-2025 17:04

Instrument: BAL2 Analyst: LM

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BNB0037-BLK1)				Prepared: 04-Feb-2025 Analyzed: 05-Feb-2025 10:46							
Total Solids	ND	0.04	0.04	%							U

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Certified Analyses included in this Report

Analyte	Certifications
EPA 353.2 in Solid	
Nitrate + Nitrite as N	WADOE,NELAP
SM 4500-NH3 H-11 in Solid	
Ammonia-N	WADOE,NELAP
SM 4500-Norg D-11 in Solid	
Total Kjeldahl Nitrogen	DoD-ELAP,WADOE

Code	Description	Number	Expires
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program, PJLA Testing	66169	01/31/2026
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2025
WADOE	WA Dept of Ecology	C558	06/30/2025

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Notes and Definitions

*	Flagged value is not within established control limits.
D	The reported value is from a dilution
H	Hold time violation - Hold time was exceeded.
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
[2C]	Indicates this result was quantified on the second column on a dual column analysis.