Quality Assurance Project Plan

Yakima Basin Nitrate Study
Phase 2 – Initial Nitrate/Coliform Screening of Domestic Water Wells
February 2010 Sampling Event

Yakima County, Washington

U.S. EPA Region 10
1200 6th Ave
Seattle, WA 98101
January 27, 2010

QAPP Approvals:

_____ Date: _____
EPA Field Sampling Manager, Curt Black

_____ Date: _____
EPA Unit Manager, Mike Cox

_____ Date: _____
EPA Health, Safety and Environmental Management, Cathe Bell

_____ Date: _____
EPA Regional Quality Assurance Manager, Gina Grepo-Grove

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1 Project Management Elements

1.1 Distribution List

Copies of the completed/signed project plan should be distributed to:

TABLE 1 – Distribution List

Name	Affiliation	Phone/E-mail
Curt Black	EPA Sampling Project Manager	206 553-1262
Gina Grepo-Grove	EPA Regional Quality Assurance Manager (RQAM)	206 553-6395
Mike Cox	OEA REU Manager	206 553-1597
Eric Winiecki	EPA Office of Water Contact	206-553-6904
Gerald Dodo	Manchester Lab Contact	360-871-8728
Stephanie Harris	Lead Microbiology	360-871-8710
Cathe Bell	EPA Health and Safety	206 553-0308
Sandra Halstead	EPA Prosser Place Based	509-786-9225

1.2 Project/Task Organization

This section identifies the personnel involved in the Yakima County domestic supply well nitrate/microbial sampling and analytical activities and defines their respective responsibilities in the process.

Curt Black, EPA Nitrate Project Sampling Manager - Will be the responsible official for this sampling project. Responsible for overseeing the overall sampling and

scheduling the work required to complete this project among the Offices and partner Agencies involved. Curt can be reached at 206-553-1262 office or 206 755-4541 cell.

Gina Grepo-Grove, Regional Quality Assurance Manager (RQAM) - The EPA RQAM or her staff will be responsible for reviewing and approving the QA Plan. She may also provide technical input on proposed sampling design, analytical methodologies, and data review or may assist with coordinating laboratory services. Gina is independent of the unit generating or using the data. Gina can be reached at 206-553- 1632. Don Matheny of the QA Unit is the specific contact who coordinated with Manchester and can be reached at 206-553-2599

Brent Richmond, Field Support Coordinator - Will be responsible for preparing needed sampling equipment and sampling containers supplied by MEL. Brent will report to the Project Manager. Brent can be reached at 360-871-8711. Note, in the event other labs are used, sample containers will come directly from the labs doing the analysis.

Gerald Dodo, Manchester Laboratory Contact - Has acted to answer questions on lab capability and capacity. Gerald can be reached at 360-871-8728.

Bethany Plewe, **Regional Sample Control Center**, will be providing sample numbers on a weekly basis and scheduling samples into the Manchester Lab. Bethany can be reached at 206-553-1603.

Karen Norton, ESAT Manchester Laboratory Contractor, will be receiving the samples at the lab. Karen can be reached at 360-871-8760.

Problem Definition/Background

1.2.1 Background

Ground-water sampling data from 1990-2008 in the Lower Yakima Valley of Washington State has shown as many as 12% of area wells to be contaminated above the drinking water standard for nitrate (10 mg/L) and about 20% to demonstrate bacterial contamination (Options Paper, 2009) These wells tend to be shallow and in many cases are primarily used by tribal members of the Yakima Nation, or Spanish speaking families participating in the local agricultural economy. However, these wells may be used by anyone in the community not served by a public water-supply system.

Sampling efforts conducted to date have focused on nitrate primarily because EPA has a national standard for this compound. However, utilizing resources made available in the Regionally Applied Research Effort (RARE) program, we propose a sampling approach which, over the next few months, will extend far beyond nitrate. In this way we hope to identify the causes of high nutrient levels in the ground water of the Lower Yakima Valley. In this program we hope to link the land-uses which are the source of nitrate with its fate in local drinking water wells.

Funding from the RARE Program, as well as other Region 10 funding sources, is enabling the EPA to get into the field to answer questions raised by the community. At a meeting in December, 2008, EPA was advised that community members want to know what is in their drinking water. While no systematic testing of private drinking water wells is done by any level of government, sampling for nitrate has been conducted in the lower valley for decades. Despite this testing, today Yakima residents still have no way to link land uses to observed adverse effects in the quality of their ground water.

With this study, EPA proposes an even-handed assessment of potential sources of nitrate by working to analytically detect trace concentrations of compounds released with the nitrate. EPA hopes to assess which activities on the landscape are contributing excess nitrate to shallow ground water. In this way we can determine which practices or activities are protective of continuing ground-water quality, and which activities are threats to the ground-water resource. In addition, the sampling from this project will provide enforcement-quality data that could be used in later enforcement actions.

Potential sources of nitrate include rural residential septic systems, low-density animal husbandry, application of chemical fertilizers to agricultural crops, application of manure to agricultural crops, spray-field application of nutrient-rich waste waters, and confined animal operations, either the operations themselves, manure storage facilities, or the lagoons which contain liquid effluent from those operations.

In order to develop a linkage between the high nitrate observed in a private drinking water well and the land use which is adversely affecting ground-water quality it will be necessary to look beyond nitrate. Analytical methods are available to detect a wide range of organic compounds which originate with the nitrate and which may provide a linkage back to the source. By looking at the agricultural chemicals, the hormones or the personal care products traveling with nitrate, we hope to distinguish between sources including farming practices, confined animal feeding operations or rural residential septic systems. Many of these trace organics can be detected at exquisitely low concentrations – some as low as single digit parts per trillion.

These hormones, pesticides, personal care products and pharmaceuticals are widely used by either humans, used for veterinary care of livestock or applied to crops. Additionally, isotopic techniques are available to characterize the nitrogen and oxygen components of the nitrate molecule which may be useful to trace the nutrient back to its source. Finally, for wells with significant fecal coliform contamination, we can employ microbial source tracking to determine if the source of the coliform was human or ruminant.

1.2.2 Objectives/Scope

This project is organized into phases. Phase 1 included the development of a GIS tool to organize the large amount of historical information and allow the examination of the landscape for spatial patterns in that data. This tool is in use and serving the project well.

The objective of Phase 2 was to evaluate if, down gradient of potential nitrate contaminant sources, there are drinking water wells with nitrate levels over the MCL

and/or elevated total coliform. This will help us better select potential nitrate sources and sampling sites for further source characterization in Phase 3, and will help management evaluate whether there is a basis for enforcement action. The sampling from this project will provide enforcement-quality data that could be used in later enforcement actions.

The objective of Phase 3 is to conduct research/sampling per a Regionally Applied Research Effort (RARE) grant to test techniques which may improve our abilities to link specific practices to high nitrate levels in groundwater and private wells**.** Phase 3 will take the highest nitrate concentration wells identified in Phase 2 for re-sampling. Phase 3, the RARE sampling, will analyze for a wide range of potential tracing or linking compounds which may be traveling with the nitrate. These compounds would then potentially identify, or link back to, the land use from which the nitrate came. These compounds include estrogens, androgens, veterinary and human antibiotics, agricultural chemicals, personal care products and human medications and compounds such as caffeine. Additionally, analyses will be performed for degradation byproducts from the compounds above.

The use of private domestic water supply wells required contacting many individual home owners and requesting access to sample their drinking water. It further involved using wells installed for another purpose as windows into what is happening in the groundwater. These wells may not be screened at horizons where they optimally intersect what we seek to monitor. However, the alternative of either direct-push geoprobe style investigatory-soil borings or dedicated-well installations was not feasible given our interest in timely collection of this data and the resources available.

Phase 3 attempts to demonstrate the potential to use low concentrations of trace organic compounds to link land use to observed nitrate contamination.

A Phase 4 is possible using dedicated transects of geoprobe borings and other appropriate technology for accurate characterization of ground water impacts from the areas under investigation. The objective of Phase 4 is to evaluate data from Phase 3 to determine next steps to better control nitrate contamination including potential enforcement actions. Phase 4 may also add time-since-infiltration data, or age dating of ground water, to better evaluate the local dynamics of the ground-water flow system.

Project/Task Description and Schedule

1.2.3 Project/Task Description

Phase 1 – The project team has developed a Geographic Information System (GIS) application that will be used to identify sample sites for Phase 2 of the project. The locations selected will be locations with the greatest potential for impacts to the aquifer as well as the greatest concentration of domestic supply wells for monitoring aquifer impacts. The tool incorporates the majority of known nitrate, coliform, ammonia, and general chemistry data from the lower Yakima Valley. It also includes the locations of wells, well analytical results,

home tracts with septic systems, land elevation, elevation of ground water surface, aquifer vulnerability to contamination, crop type, estimated fertilizer application rates, dairy and other animal feeding operation (AFO) locations, roads and an aerial photo layer.

The project team utilized the following criteria when potential sites were selected for sampling in Phase 2

❖ For Rural Residential Septic Systems:
Select an area with a high concentration of homes not served by sanitary sewer. Select a community with a location on the aquifer such that ground-water flow can be expected to be consistent from season to season and is predictable in direction. Select sites which present as little as possible up-gradient contributing sources of nitrate. Select sites with a linear array of homes using individual domestic water supply wells along the down-gradient side of the community. Select sites with demography similar to the sewered control community from which specific trace-organic analytes used to characterize rural residential septage will be selected. Select sites with a history of down-gradient detections of nitrates in excess of the MCL.

❖ For Agricultural Crop Land Sites:
Select an area with a history of use for crops requiring a high fertilizer application rate. To the extent possible, select a crop with a history of heavy accessory agricultural chemical use. Select a tract with a location on the aquifer such that ground-water flow can be expected to be consistent from season to season and is predictable in direction. Select sites which present as little as possible other different up-gradient contributing sources of nitrate. Select sites with a linear array of homes using individual domestic water supply wells along the down-gradient side of the crop land. Select sites with a history of down-gradient detections of nitrates in excess of the MCL.

❖ For Animal Feeding Operations (AFOs)
Select an area with a high concentration of animal units per unit area of available land. Select an AFO with a location on the aquifer such that ground-water flow can be expected to be consistent from season to season and is predictable in direction. Select sites which present as little as possible other up-gradient contributing sources of nitrate. Select sites with a linear array of homes using individual domestic water supply wells along the down-gradient side, or sides, of the area of interest. Select sites with a history of compliance issues or community complaints, other factors being equal. Select sites with a history of down-gradient detections of nitrates in excess of the MCL.

Phase 2 –A series of articles in the local paper, public meetings across the lower valley and radio programs provided information to the community prior to mobilization of the field teams. Two-person teams consisting of two EPA employees trained for this project will be used.

Outreach teams will establish contact with many homeowner prior to sampling. EPA Sampling Teams will collected a GPS location from the well, and fill in an access permission form developed by the EPA team (in Spanish and English) if it hasn't been collected. If the

homeowner is unwilling to sign the form, but is willing to have a sample taken, just note the unwillingness on the form and go ahead and collect the sample as long as verbal permission is obtained.

The lead sampler will collect a sample for analysis for nitrate-N by EPA's Manchester Environmental Lab (MEL). This same individual may also collected a sample for enumeration/quantification of total coliform; with fecal coliform or E. coli analysis conducted if the sample is total coliform positive.. The coliform sample is triggered by the condition of the water-supply well surface/sanitary seal. If the seal is not intact, or other means of ingress into the well bore are observed, then a coliform sample will be collected by the team. The well condition will also be photo documented by the sample team. The bacterial sample will be analyzed by the EPA Field Laboratory which is certified for testing total coliform in drinking water. If large amounts (>14cfu/100ml) of coliform bacteria are found, the well will be resampled for microbial source tracking by MEL. The results of the field screening will be shared with the homeowner with a description of the meaning of the results. Depending on the field screening result for nitrate, the homeowner are asked to expect a repeat visit for the wider trace-organic suite during the RARE field work – only about 10% of homes will be selected for resampling during Phase 3.

Phase 3 – Based on the results from Phase 2 sampling, a subset of homes will be selected, as part of the RARE project, to be analyzed for an extensive list of trace organic analytes along with general water chemistry parameters. Additionally, the potential source areas up-gradient of these homes will become the focus of characterization activities. The classes of organic compounds in the RARE study include: estrogens and androgens, antibiotics, trace organics such as personal care products, pharmaceuticals and pesticides. Additionally we will determine the isotopic makeup of the nitrate in a subset of wells for source tracking.

For the source characterization work in Phase 3, areas up-gradient of wells showing significant MCL exceedances for nitrate will be selected for intensive characterization. These may include Animal Feeding Operations (AFOs) such as dairies or feedlots, or crop land with a history of high nitrate application rates. For the rural-residential septage characterization, 3 small sewer-treatment plants will be selected with similar contributing community demographics to the surrounding rural area.

1.2.4 Schedule of Tasks

Table 2 – Activity Schedule and Tentative Start and Completion Dates* .....

Task	Start Date	Completion Date	
Phase 2 - QAPP Ver. 8 for Review	**January 26, 2010**	**February 1, 2010**	
Phase 3 – QAPP Ver 1 for Review	**February 1, 2010**	**February 20, 2010**	
Phase 2 – Nitrate Sampling	**February 22, 2010**	**March 7, 2010**	
Laboratory Analysis/QA	**February 23, 2010**	**March 15, 2010**	

Phase 3 – QAPP Ver 2 for Review	**March 8, 2010**	**March 26, 2010**	
Phase 3 – RARE Sampling	**April 12, 2010**	**April 22, 2010**	
Laboratory Analysis/QA	**April 13, 2010**	**September 30, 2010**	
Report Preparation	**October 4, 2010**	**November 8, 2010**	

1.3 Data Quality Objectives and Criteria for Measurement Data

Data Quality Objectives (DQOs) are the quantitative and qualitative terms field personnel and project managers use to describe how good the data need to be in order to meet the project's objectives. DQOs for measurement data (referred to here as data quality indicators) are precision, accuracy, representativeness, completeness, comparability, and measurement range. The overall QA objective for analytical data is to ensure that data of known and acceptable quality are provided. To achieve this goal, data must be reviewed for 1) representativeness, 2) comparability, 3) precision, 4) accuracy (or bias), and 5) completeness. Precision, accuracy, completeness, sample representativeness and data comparability are necessary attributes to ensure that analytical data are reliable, scientifically sound, and legally defensible. Each analytical result or set of results generated should be fully defensible in any legal action, whether administrative, civil, or criminal.

Precision: Samples in duplicate will be analyzed on a 10 % frequency (1 per 10 samples collected). The precision is evaluated using the Relative Percent Difference (RPD) values between the duplicate sample results.

Accuracy: For parameters analyzed in the fixed laboratory, accuracy will be evaluated by the use percent recovery (%R) of the target analyte in spiked samples and also the recoveries of the surrogates in all samples and QC samples.

$$\% \text{ Recovery} = \frac{SQ - NQ}{S} \times 100$$

SQ = quantity of spike or surrogate found in sample
NQ = quantity found in native (unspiked) sample
S = quantity of spike or surrogate added to native sample

Representativeness is the degree to which data from the project accurately represent a particular characteristic of the environmental matrix which is being tested. Representativeness of samples is ensured by adherence to standard field sampling protocols and standard laboratory protocols. The design of the sampling scheme and number of samples should provide a representativeness of each matrix or product of the chemical processes being sampled. For this phase of work, we are sampling drinking water at the point where it is used by the homeowner.

Comparability is the measurement of the confidence in comparing the results of one sampling event with the results of another achieved by using the same matrix, sample location, sampling techniques and analytical methodologies.

Critical measurements for this study include nitrate concentration in drinking water and quantification of coliform contamination. These data will be used to identify the subset of wells which have the highest nitrate concentrations. Those highest-nitrate wells will then be resampled in Phase 3 for a wide range of trace-organic compounds, nitrogen and oxygen isotopic determination of the nitrate in each sample, general chemistry and field parameters.

Phase 3 sampling will provide a linkage between high nitrate observed in domestic supply wells and the up-gradient land uses which are responsible for the nitrate. These data will then be used in determining flow within the aquifer and source characterization. The measurement data criteria are typical of enforcement cases for the preliminary phase nitrate and coliform data. The subsequent phases will be more flexible due to our reliance on research labs to provide state-of-the-art analytical methods for hormones and other trace organic compounds at fractional part per trillion detection limits.

This phase of the research study will be adequately illustrative of aquifer characteristics if data at approximately the Reporting Limit listed in Table 1 are provided by the lab. Any sample which may have an enforcement use, such as nitrate and coliform, will be collected by an EPA Sampler trained in such sample collection.
Data Completeness

Completeness: Completeness is the percentage of valid results obtained compared to the total number of samples taken for a parameter. Since sampling from inspections are usually grab and limited in number of samples, the number of valid results obtained from the analyses are expected to be equal or better than 85%. %Completeness may be calculated using the following formula:

$$\% \text{ Completeness} = \frac{\text{\# of valid results}}{\text{\# of samples taken}} \times 100$$

For this project, Completeness is used in a more significant sense of the adequacy of sampling in Phase 2 to provide the necessary pool of suitable wells for sampling in Phase 3. It is very similar to the concept of Power in sampling design where we need a certain number of samples from a particular area to demonstrate something with sufficient statistical power.

Based on the 1-in-8 results historically (>12%) for MCL exceedances in the area, 8 times as many wells **might need** to be visited during nitrate screening in Phase 2 as will be sampled in Phase 3 – RARE Sampling. Considerable uncertainty surrounds this historically based 1-in-8 value. A recent study by IHS in the Satus Basin gave more than 1 in 3 wells exceeding the MCL for nitrate. Other recent studies have much more challenging results – from our perspective - with approximately 2-percent of wells exceeding the MCL in the Ahtanum Basin. There is reason to anticipate, since we are

focusing this investigation adjacent to suspected sources, that our field effort will have a higher ratio of MCL exceedances. However, resources are limiting our field effort. We are sampling as many wells as current resources including personnel can support. In the event that Phase 2 doesn't yield sufficient numbers of high nitrate well measurements, the scope of the Phase 3 RARE Sampling may need to be adjusted. Alternatively, we could decide to return to the field to fill in the needed Phase 2 nitrate data. .

The QA objectives outlined, above, will be evaluated in conjunction with the data validation process.

1.3.1 Special Training Requirements/Certification

Field personnel are required to complete the 24-hour Basic Health and Safety training. The personnel will obtain a basic health and safety training certification from the 24-hour or 40-hour training which should be maintained current by attending an 8-hour safety training refresher course every year. All of the training courses listed above are provided by EPA Region X. The lead sampler will have inspector training and/or inspector credentials. Furthermore, sampling and sample documentation skills are also assured by the "mentoring" provided by the senior inspectors in the field. The senior worker on each field team will be responsible for all aspects of the collection of the nitrate and microbial sample from each home. The assisting team member will conduct the indicator parameter data collection.

Additionally, each person participating on a sampling team will undergo a 1 day workshop to go over the objectives, approach, equipment, calibration, data collection, record-keeping, site safety and shipping requirements for this project.

The laboratories performing the sample analysis for this program are SDWA certified and/or accredited. Scientists (Microbiologists/Chemists) performing the analytical work for this project have extensive knowledge, skill and demonstrated experience in the execution of the analytical methods being requested.

1.3.2 Documentation and Records

Complete documentation for field sampling teams may include but is not limited to the following forms:

- Site Sampling data form – one per household
- Chain of Custody Logs
- Sample Container Labels
- Photographs, Sketches, Photo Logs or other documentation.

Field Teams will maintain field notes and all documents and data collected will be submitted to the field sampling program manager.

The following documents will be archived at the Manchester Environmental Laboratory or the designated laboratory performing the analysis: (1) signed hard copies of sampling and chain-of-custody records (2) electronic and hard copy of analytical data including extraction and sample preparation bench sheets, raw data and reduced analytical data.

The laboratory will store all sample receipt, sample login, extraction/preparation, and laboratory instrument print-outs and other analytical documentation as per their established SOP.

2 Measurement/Data Acquisition

2.1 Sampling Process Design (Experimental Design)

Prior to domestic supply well sampling, the field team will review and evaluate the specific source being characterized (rural-residential septic area, concentrated crop area, or dairy or feedlot), which may include facility background information, historical ownership, surrounding land uses and a review of other possible source areas of contamination.

The team should be familiar with the ranking of the households in the area which is based on landscape position of the house with respect to sources under investigation. Well depth and screened interval for the domestic well should also receive consideration.

The results of the outreach effort, with records of the homes were successfully contacted, or which homes were targeted but have not been reached or which homes have refused sampling will be supplied to the teams. The teams will have a prioritized list of homes and will work from the best/optimally located homes outward to homes further from the center of where maximum concentrations are anticipated based on up-gradient land use and our understanding of ground-water flow.

2.2 Sample Collection Procedures

2.2.1 Health and Safety

All personnel participating in this project will follow the safety requirements outlined below. Samples collected during this sampling are not considered hazardous since they are from drinking-water sources, but personnel should be aware of the potential hazards associated with the collection, handling, analysis, and disposal of the samples. It is the responsibility of the participating personnel to follow all necessary safety measures and to bring to the attention of the project manager any issues concerning safety.

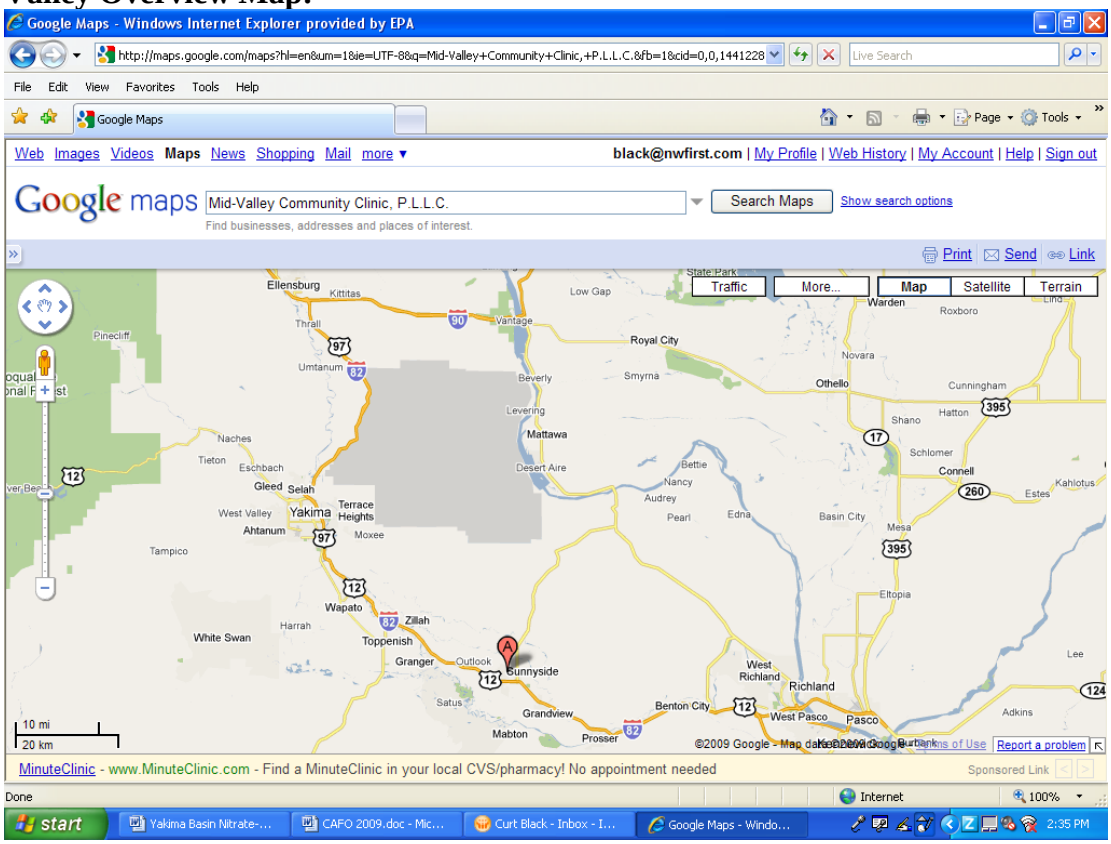
Job Hazard Assessments have been completed for the mobilization and sampling activities of this project. They are in Appendix 3. As the sampling is occurring in private homes, significant concerns surround approaching a home. These may be in unfamiliar neighborhoods, and may be in the territory of a domestic dog with an attitude. It is

similarly possible to encounter home owners who are unsympathetic to our work. If the team encounters a home owner with a strongly negative response, simply withdraw.

Field personnel will have a cell phone for emergency contacts. Cell phone coverage is good in the Lower Yakima Basin. Emergency services can be reached by dialing 911.

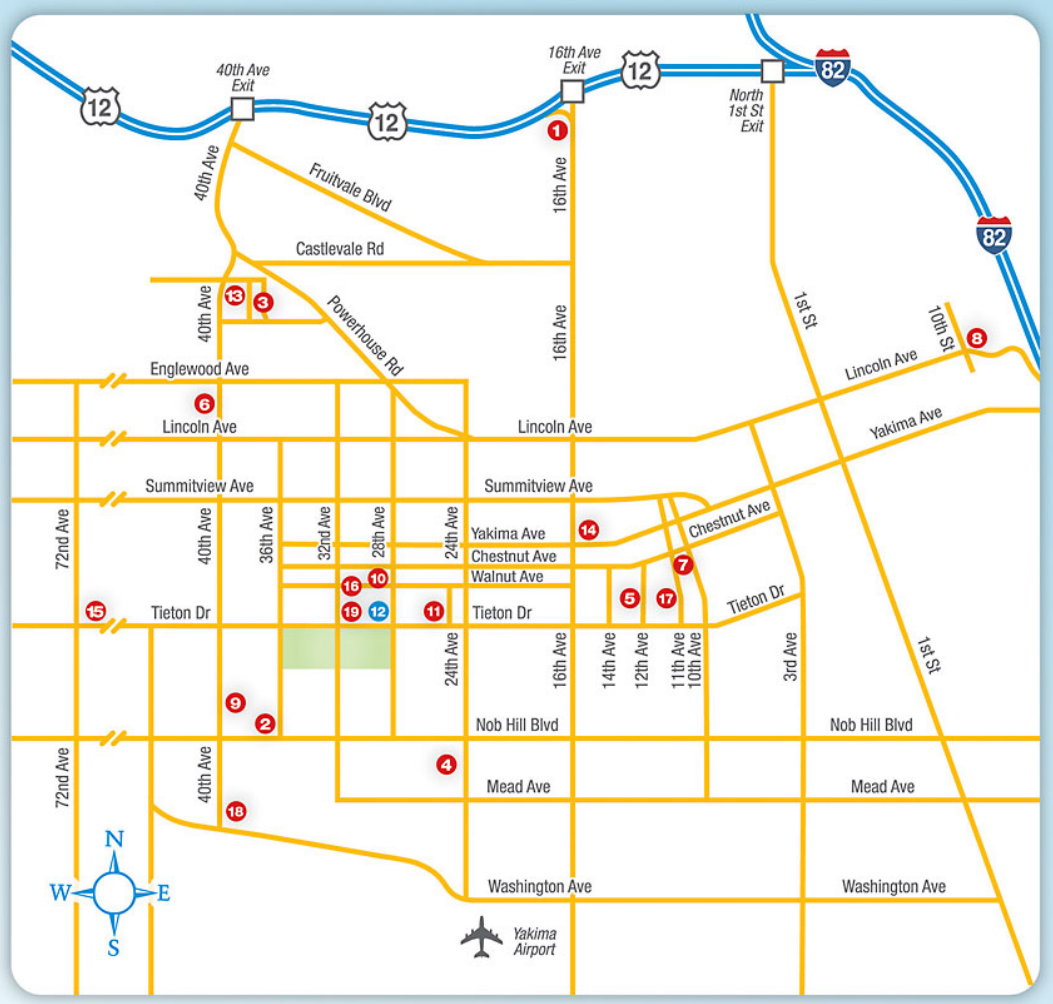
Nearby hospitals include:
Yakima, Washington. Yakima Valley Memorial Hospital • 2811 Tieton Drive • Yakima, WA 98902 • **(509) 575-8000**
Sunnyside Washington. Mid-Valley Community Clinic •700 South 11th •Sunnyside,WA 98944 • (**509) 839-6822**

Valley Overview Map:



See Attached Map Yakima Valley Memorial Hospital, 2811 Tieton Drive, Yakima 509 575-8000

Directions from the East: I-82 – Exit 34, East Nob Hill Blvd, west bound.
Continue over the bridge over the railroad tracks – becomes West Nob Hill Blvd. –
Continue to 16th Ave and turn right (northbound) on 16th.
Continue 4 blocks to Tieton Drive and Turn left, (westbound) onto Tieton.
Hospital is on the right after S. 28th Avenue at 2811 Tieton Drive.



1 **16th Ave Station**
Memorial Occupational Medicine
Memorial Orthopedic Medicine
Memorial Interventional Pain Care
Memorial Rehabilitation and Physical Medicine
Memorial Therapy Services
1470 N. 16th Ave, 574-3300

2 **Business Services**
3803 W. Nob Hill Blvd, 575-8255

3 **Children's Village**
3801 Kern Rd, 574-3200

4 **Community Education**
2506 W. Nob Hill Blvd, 575-8484

5 **Cornerstone Medical Clinic**
402 S. 12th Ave, 248-3263

6 **Family Medicine of Yakima**
504 N. 40th Ave, 966-9480

7 **Garden Village**
206 S. 10th Ave, 453-4854

8 **Heritage Grove**
115 N. 10th St, 248-4173

9 **Home Health & Hospice**
1019 S. 40th Ave, 574-3600

10 **Maternal Health Services**
2903 W. Walnut Ave, 575-8160

11 **The Memorial Foundation**
2701 Tieton Dr, 576-5794

12 **Yakima Valley Memorial Hospital**
2811 Tieton Dr, 575-8000

13 **North Star Lodge/Memorial's Cancer Center**
808 N. 39t Ave, 574-3400

14 **`Ohana, Memorial's Mammography Center**
1515 W. Yakima Ave, 574-3860

15 **Pacific Crest Family Medicine**
311 S. 72nd Ave, 972-1818

16 **Sleep Center at Memorial**
406 S. 30th Ave, Suite 206, 452-5378

17 **Valley Imaging**
314 S. 11th Ave, Suite B, 248-7380

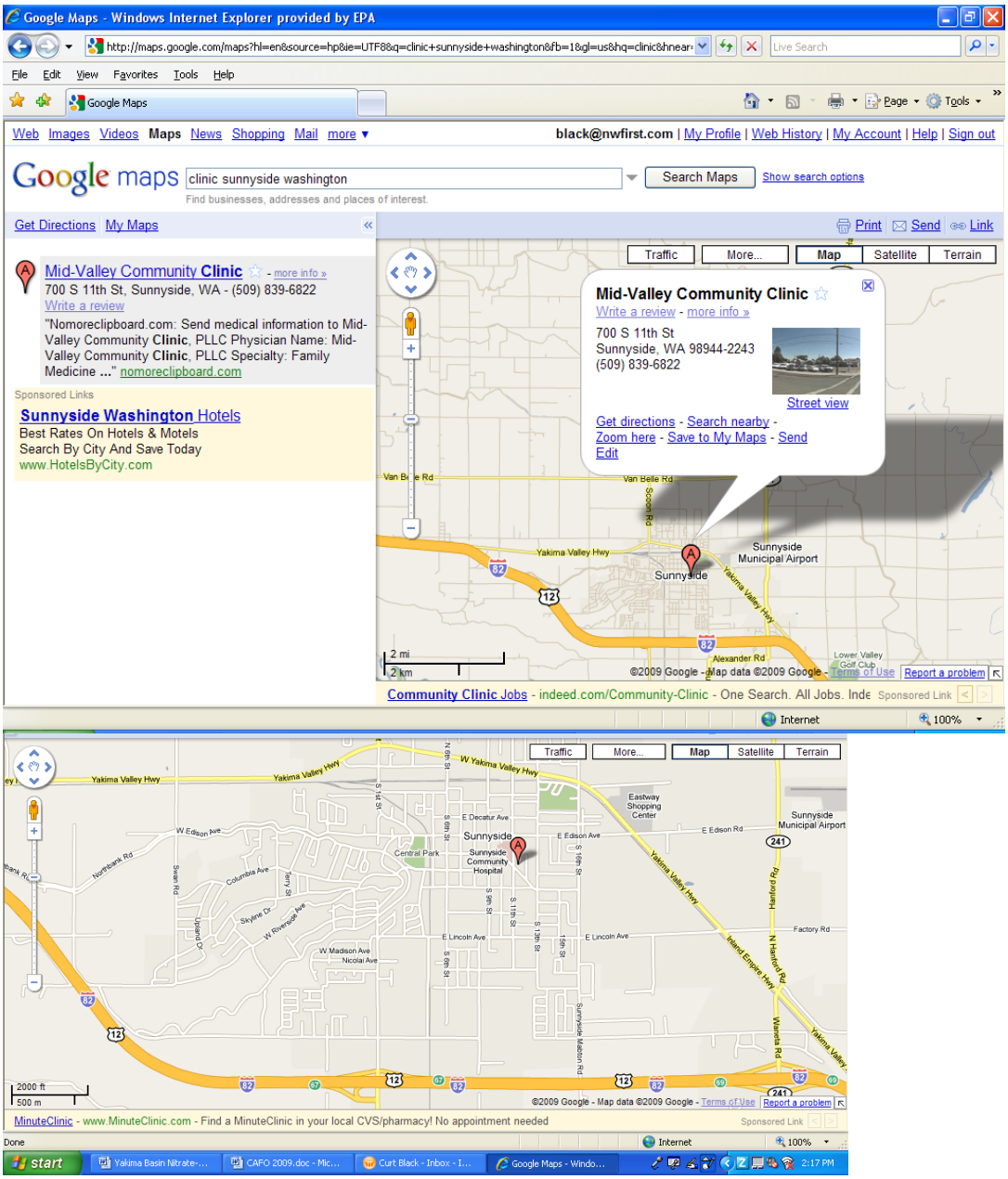
18 **Yakima Gastroenterology Associates**
3090 Creekside Loop, Suite 110, 248-6616

19 **West Pavilion I**
Cascade Surgical Partners, 575-3946
Yakima Neurosurgery Associates, 249-5217
Yakima Plastic Surgery Associates, 575-8633
Surgi-Center at Memorial, 576-0123
3003 Tieton Drive

Produced by MedMaps® 6/08 www.medmaps.com

Sunnyside Community Hospital
700 South 11th Street
Sunnyside, WA 98944-2243
(509) 839-6822

Directions from the west: I-82, exit 67, Go north of South 1st Street, Right onto E. Lincoln Ave., Left onto S 11th Street. Hospital is 5 blocks north on the left side



2.2.2 Location

For the purposes of this project, not all wells are of equal interest. We are focusing on specific parcels located in areas of high concentrations of specific crop use, rural-residential septic systems, or down-gradient of dairies or feedlots. The locations of interest have been screened and the households of interest ranked to help the field teams focus their activities where we hope to find the greatest aquifer impacts.

Property owners may have been contacted by the EPA Region 10 Outreach personnel or local cooperating contact personnel. An initial letter and follow-up attempts will have been made to interest property owners in knowing more about the water they and their families are drinking. If a property owner will not provide access, then a nearby well will be used with the intention of providing the widest and most uniform coverage of the area of focus for each area being assessed. As describe above, locations identified as high priority are expected to be better than locations that are off the axis of transport for the constituents of concern moving with the ground water. At the same time, it is impossible to know what path ground water is taking in the subsurface and anisotropy in the sediments carrying the water may divert the plume far from where we expect. For this reason, the widest possible screening is probably the best.

2.2.3 Sample Collection

a) By the time the EPA field team arrives, the property owner may have already signed an access agreement.

b) As discussed above, the sample site locations will be determined using the GIS application. Well owners who will potentially be included in the survey will be contacted by phone, mail, or in person to get the best possible participation by the community as well as to facilitate the establishment of rapport with the sampling team.

c) Well locations for each home will be identified and GPS coordinates for the well recorded. Additionally, location information (owner names, addresses, phone numbers, etc.) will be provide for the sample team.

d) Field work for this screening phase of sampling will be completed during the period of February 16 –March 5, 2010, and will probably include as many wells as resources permit. Prior to leaving the Regional office, the sample locations will be prioritized so that the field efforts of the sampling team can be focused on areas of greatest interest.

2.2.4 Sample Collection Activities

a) Each week, each sample teams will be provided a block of sample numbers as supplied by the lab for their use. On this project since each team will be collecting 6 or 7 samples per day, we will lable label by hand – just be very clear that the sample number goes with the bottle and that bottle was used at the site being sampled and the number matches the field data form and Chain of Custody (COC) for that site.

b) Samples will be collected by teams, each team composed of 2 EPA Region 10 field workers. Since we are seeking complete screening of selected areas, sampling will be as opportunity permits. The sampling team will likely work their way down a list stopping at each home, in turn, developing a relationship and appealing to curiosity on the part of the homeowner for the quality of the water being consumed by the family. If EPA does not have enough access agreements in hand at the time of sampling, samplers may go door-to-door requesting access in priority sampling areas.

c) After the team meets the homeowner and determines if the yard is safe to enter, the location of the well should be determined and a GPS fix for the well should be obtained. At this time, examine the well for the integrity of the sanitary seal/ surface seal. If the well is open to surface contamination (collapse around the well pad, no well pad, no seal, open seal) to the extent that material from the surface such as run-on water or organisms could fall into the well, then note that on the data form, take a photo of the installation with the Home ID number on it and plan to collect a Coliform bacteria sample at this home. If the home is a cold- call then assign your own ID from your block of ID numbers.

d) Unfiltered samples will be collected directly from the disinfected faucet or other sampling point. Since this sampling will occur during mid-winter in the Columbia Basin, the samples will collected from the primary drinking and cooking water source inside the home – usually the Kitchen Sink. In this way the sample team will not be exposing the outdoor hose bib to the risk of freezing.

e) The team will be setting up a flow-through cell for the collection of indicator parameters using a multi-parameter probe. Parameters such as dissolved oxygen, oxidation/reduction potential, total dissolved solids, pH, , and temperature will be recorded. If this is the first sample of the day, the multi-parameter probe for these measurements needs to be calibrated and results from that calibration recorded on a field data sheet.

f) Samples to be collected are included in Table 4 where the numbers of containers, the order of filling, the preservation and much other data useful to the sampling crew is tabulated.

g) For setup, the flow-through cell will be place to drain into the sink. Any filter or aerator will be removed from the faucet prior to sampling. The faucet will be sprayed with Lysol or a similar disinfectant and the excess wiped away with a clean paper towel. A flow-through cell will be plumbed into the system with variable width "bubble tubing" in various sizes and combinations and/or hose clamps or another means to convey the water to the flow-through cell. The discharge from the flow-through cell will be directed into the sink.

h) The team will make certain that no water softening equipment or reverse-osmosis treatment units are in use. If such equipment is present, the sample will be obtained before (upstream) of the softening or RO unit. Filtered samples will not be collected.

i) The selected household cold water faucets/taps will be purged for a minimum of five minutes prior to sampling. The purpose of purging is to clear the delivery system of stagnant water and provide fresh water for sampling. Ideally, the sampling team will hear the pressure tank cycle at least twice during the purging.

j) After 5 minutes of purging, take a nitrate test strip measurement. Since we are only screening for high nitrate wells to feed into the Phase 3 trace-organic sampling, if the well is below 10 mg/l we will make sure the sample has a positive REDOX and Oxygen present, but will not collect the laboratory samples. If the well has 10mg/l Nitrate or higher by the test strip, follow the rest of the sampling procedure. If the well is low in Oxygen and REDOX, then go ahead and take the sample as outlined below including TKN.

k) At the 5 minute purge time, if the sample is below 10mg/l nitrate by the test strip, and therefore, no laboratory nitrate sample will be collected, evaluate if a coliform bacteria sample should be collected. If during collection of the GPS reading, the well surface/sanitary seal appears to be in a condition where material could enter the well, then take a Coliform bacteria sample.

l) All field parameter values will be monitored and recorded at 1 minute intervals during purging, and temperature, DO and oxidation-reduction potential stabilization will be used as primary indicators that the system has been adequately purged and that sampling may begin. In some cases, the parameters will not stabilize within a reasonable period of time. Fluctuation is usually caused by the normal cycling of the well pump as controlled by the pressure tank switch. Experienced field personnel will determine when sufficient water has been purged

in these cases – purge times in excess of 10 minutes are not expected since we are focused on shallow wells in private homes.

m) After the purge is compete, the hose to the flow-through cell will be disconnected from the tap and the bottles filled without turning off the flow of water (the flow rate may be decreased if desired for ease in filling. Fill the nitrate bottle to within 1-inch of the top and cap it securely, then fill the microbial sample bottle to the second line indicated on the container. Do **not** rinse out the coliform sample bottle. It contains sodium bisulfite to remove the chlorine which may be present. Hold the caps in one hand and the bottle in the other – do not place the caps on any surface. Screw the caps securely onto each bottle after it is filled. Note the time of sampling on the field data form.

n) If, during purging, the dissolved oxygen value is below 2mg/l or the oxidation-reduction potential is a negative value, then in addition to the nitrate bottle and coliform sample bottle, an additional bottle for TKN will be filled. Fill it in the same manner as above and preserve as described below before capping.

o) If a TKN sample is taken, it will require acid to be added in the field as a preservative. Sample pH will be spot-checked in the field to determine adequate preservation, and additional acid will be added if needed. Sample preservation requirements are included in Table 4. For the spot check, pour a small amount of the acidified sample into the small plastic caps supplied and using a multi-indicator test strip, make sure the pH is less than 2. If so, cap the bottle, if not add more acid and recheck.

p) A duplicate needs to be collected at the discretion of the sampling team at one location out of each ten. Select the location for the duplicate using the nitrate indicator test strips. Select a well that gives a value in excess of 10 mg/l nitrate. Use a second sample number and fill another complete bottle set with the second number. For example: your 13th location might have given a field nitrate value of greater than 20 mg/l and you select it for a dup. Each sample team follows this procedure;

q) A chain of custody form and sample bottle labels will be completed by the team lead to insure the sample number is identical on the field data form, the sample labels and the chain of custody sheet. Only one sample number is used for each location – that is the same number would be used at a household for the nitrate bottle, the microbial sample bottle and the TKN bottle, if one is needed. A second sample number would be used on another entire bottle set if a duplicate sample is collected at this location.

r) Samples will be placed on ice in coolers for shipment or delivery to the designated laboratory. Please refer to the Sample Container SOP for more details. We no longer use temperature blanks in the shipment. Manchester uses a remote infrared thermometer to check shipment temperatures upon arrival. Samples will be shipped as needed to meet analytical holding times. Microbial samples will be analyzed by the mobile lab which will be located at the Fairfield Inn and Suites in Yakima. (address: (137 N Fair Street), Yakima,. Directions: Take Highway 82 to Yakima.. Take exit 33 to E. Yakima Ave. Turn right on 9th . Take first right on east A street, turn left on N 10th street, Turn Right on E. Lincoln Avenue. Hotel on your right side.) .

s) Shipping for nitrate and TKN will be by FedEX –last shipment time is **4:00 pm** from Yakima – at I-82, **Exit 36**, East Valley Mall Blvd. – follow East Valley Mall Blvd to Main Street/South 1st Street, turn right (northbound) and FedEX is on the right: 2401 South 1st Street, Yakima, WA 98903

(509) 469-0650 - Plan to arrive by 4:00 You are shipping to:
Manchester Environmental Laboratory,
7411 Beach Drive East
Port Orchard, WA 98366
(360) 871-8800

Karen Norton, ESAT Manchester Laboratory Contractor, will be receiving the samples at the lab. Karen can be reached at 360-871-8760

2.2.5 Sample Collection for Time Series Determination

An additional sampling activity is included in this QAPP. A time series of weekly samples will be obtained from two wells in the study area to help determine the temporal variation in concentration with time for nitrate+nitrite values. No previous studies have been done to determine temporal variability. This series will be collected across the beginning of the irrigation season to see the possible effect of this on nitrate+nitrite. We have a cooperative homeowner in the Harrah area who has volunteered for this work.

Sampling will be done weekly from 2 wells. The data from this part of the project will not be used for enforcement purposes and will be collected by the homeowner and shipped every 3 weeks for 3 months to the Manchester Lab. This work is under ESD-163B ---Formal Request Yakima Basin Nitrate Study Phase 2--Time Series Data. The samples will be analyzed for Nitrate+Nitrite, Method 353.2 into 500ml HDPE containers and preserved with H_2SO_4 to a pH <2 and refrigerated to <4 degrees C.

This time series should provide information as to the variability with time of nitrate levels and possible any link to nitrate levels and the timing of the start of the irrigation season.

2.2.6 Sample Collection Equipment

Table 3 -Suggested Sample Equipment for Yakima Valley Nitrate Screen

General	Safety	Emergency
Copy of this QAPP EPA ID Field Data Sheets Camera Waterproof Pens & Markers Clipboard flashlight Sample containers Ice Chest plus extras for equipment transport Table of Homes to be Sampled GPS Flow-Through Cell Multiparameter Probe Plumbing / Connections and clamps Calibration Solutions Custody Sheets/Custody Seals/blank labels	Water Proof (Rubber) Boots Rain gear Rubber gloves Soap, towels, and water for washing hands Acid cleanup kit (sodium bicarb in Ziploc) Eye protection Hand Sanitizer Positive attitude in community interactions Situational Awareness	First Aid Kit Phone numbers Cell Phone

All sample jars used for this project will be new and clean. All sample containers will be supplied by Manchester. These will consist of quart Cubitainers or one-liter HDPE containers.

2.2.7 Shipping Requirements

Shipping for nitrate and TKN will be by FedEX

Last shipment time M-F is **3:00 pm (Express) 5:00pm (Ground)** from Yakima. Saturday is Express/Air only by 11:30am from Yakima – off I-82, Because of this we have arranged with Cascade Analytical to take our samples on Saturdays by 4:30pm (each of the two Saturdays of the project). Cascade Analytical's address is in Table 5, page 28. For the Sunday samples, we will hand carry them with us back as the teams switch out for week 1 or we demobilize for week 2.

At exit 33, take ramp right for Yakima Ave toward Terrace HTS, 0.6mi, Bear right onto E Yakima Ave 0.9mi, Road name changes to W Yakima Ave 0.5mi, Bear right onto Summitview Ave.
Ship from: Mail-N-MORE, 732 Summitview Ave, Yakima, WA 98902

(509)575-4760 -

Hours of Operation
Mon 8:00 AM-6:00 PM
Tue 8:00 AM-6:00 PM
Wed 8:00 AM-6:00 PM
Thu 8:00 AM-6:00 PM
Fri 8:00 AM-6:00 PM
Sat 10:00 AM-5:00 PM
Sun CLOSED

Express Ship Drop off Time
Mon 3:00 PM
Tue 3:00 PM
Wed 3:00 PM

Thu 3:00 PM
Fri 3:00 PM
Sat 11:30 AM
Sun No Pickup
Ground Ship Drop off Time
Mon 5:00 PM
Tue 5:00 PM
Wed 5:00 PM
Thu 5:00 PM
Fri 5:00 PM
Sat No Pickup
Sun No Pickup

There is also a FedEX office in Sunnyside – ACE Postal Center, 1726 Gregory Ave, 98944, 509-839-3222 Shipping ONLY Mon-Fri – Drop off by 3:00pm Express or 4:00pm Ground.

From Eastbound I-82, At exit 63, take ramp right toward Sunnyside / Outlook, go 0.3 mi, Turn left onto W Sunnyside Rd, go 0.3 mi, Turn right onto Yakima Valley Hwy, go 3.5 mi, Turn right onto S 13th St, go 0.3 mi, Arrive 1726 Gregory Ave, Sunnyside, WA 98944.

You are shipping to:
Manchester Environmental Laboratory,
7411 Beach Drive East
Port Orchard, WA 98366
(360) 871-8800

Karen Norton, ESAT Manchester Laboratory Contractor, will be receiving the samples at the lab. Karen can be reached at
360-871-8760. Please call her when you have shipped and let her know how many samples to expect.

2.2.8 Decontamination Procedures

We are working with drinking water in private homes. This medium is expected to be considerably safer than much of what we typically encounter in environmental sampling. Still, keep the work area as clean as possible; minimize contact with the water during purging and filling the bottles and use hand sanitizer upon arriving and departing each location.

2.2.8 Sample Handling and Custody Requirements

This subsection describes sample identification and chain-of-custody procedures that will be used for the Phase 2 Yakima Basin Nitrate Study field activities. The purpose of these procedures is to ensure that the quality of the samples is maintained during collection, transportation, storage, and analysis. All chain-of-custody requirements comply with USEPA Manchester Environmental Laboratory's (MEL's) SOPs for sample handling. All sample control and chain-of-custody procedures will follow MEL's SOPs or the *Contract Laboratory Program Guidance for Field Samplers* (EPA 2004b).

Examples of sample documents used for custody purposes will be provided to the team and include the following:

- Custody seals,
- Chain-of-custody records or traffic reports, and
- Field logbooks with data forms bound for each team for each week.

During the field effort, the site manager or delegate is responsible for maintaining an inventory of these sample documents. This inventory will be recorded in a cross-referenced matrix of the following:

- Sample location,
- Sample identification number,
- Analyses requested and request form numbers,
- Chain-of-custody record numbers,
- Bottle lot numbers, and
- Air bill numbers.

Brief descriptions of the major sample identification and documentation records and forms are provided below.

2.2.9 Sample Identification

All samples will be identified using the sample numbers assigned by the EPA RSCC. Each sample label will be affixed to the jar and covered with clear tape. A sample tracking record will be kept as each sample is collected. The following will be recorded: location, matrix, sample number, observations, and depth. In addition to the EPA-assigned sample number, samples will be tracked with a sample code system designed to allow easy reference to the sample's origin and type. The sample code key will not be provided to the laboratory. Table 2-4 summarizes the sample tracking and location codes.

2.2.10 Sample Labels

To minimize handling of sample containers, labels will be completed before sample collection to the extent possible. After being attached firmly to the sample container, the labels will be protected with clear tape. The sample labels will provide the following information:

- Sample number,
- Sample location number;
- Date and time of collection,
- Sampler name,
- Analyses required, and
- Preservation (when required).

2.2.11 Custody Seals

Custody seals are preprinted gel-type seals, designed to break into small pieces if the seals are disturbed. Sample shipping containers (coolers, drums, cardboard boxes) will be sealed in as many places as necessary to ensure security. Seals will be signed and dated before use. Clear tape will be placed over the seals to ensure that the seals are not broken accidentally during shipment. Upon receipt at the laboratory, the custodian will check (and certify by completing the package receipt log) that seals on shipping containers are intact.

2.2.12 Chain-of-Custody Records and Traffic Reports

For samples to be analyzed at the EPA MEL the chain-of-custody records, analyses-required forms, and/or analytical traffic report forms will be completed as described in the *Contract Laboratory Program Guidance for Field Samplers* (EPA 2004b). The chain-of-custody record, analyses-required forms, and analytical traffic reports will be completed fully at least in duplicate by the field technician designated by the site manager as responsible for sample shipment to the appropriate laboratory. Information specified on the chain-of-custody record will contain the same level of detail found in the site logbook, except that the on-site measurement data will not be recorded. The custody record will include the following information:

- Name and company or organization of person collecting the samples,
- Date samples were collected,
- Type of sampling conducted (composite or grab),
- Sample number (using those assigned by the EPA RSCC),
- Location of sampling station (using the sample code system described in Table 2-4),
- Number and type of containers shipped,
- Analysis requested, and
- Signature of the person relinquishing samples to the transporter, with the date and time of transfer noted and signature of the designated sample custodian at the receiving facility.

If samples require rapid laboratory turnaround, the person completing the chain-of-custody record(s) will note these or similar constraints in the remarks section of the custody record.

The relinquishing individual will record all shipping data (e.g., air bill number, organization, time, and date) on the original custody record, which will be transported with the samples to the laboratory and retained in the laboratory's file. Original and duplicate custody records, together with the air bill(s) or delivery note(s), constitute a complete custody record. It is the site manager's responsibility to ensure that all records are consistent and that they become part of the permanent job file.

2.2.13. Field Logbooks and Data Forms

Field logbooks of data forms are necessary to document daily activities and observations. Bound logbooks of data forms have been assembled for each sampling team for each week of the project. Documentation will be sufficient to enable participants to reconstruct events that occurred during the project accurately and objectively at a later time. All daily logs will be kept in a bound notebook. All entries will be made in waterproof ink, dated, and signed. No pages will be removed for any reason.

If corrections are necessary, these corrections will be made by drawing a single line through the original entry (so that the original entry is legible) and writing the corrected entry alongside. The correction will be initialed and dated. Corrected errors may require a footnote explaining the correction.

2.2.13 Photographs

Photographs will be taken as directed by the team leader. Documentation of a photograph is crucial to its validity as a representation of an existing situation. The following information will be noted in the project or task log concerning photographs:

- Date and time,
- Photographer (initials),
- Description of photograph taken,
- Sequential number of the photograph,
- Camera lens system used, and
- Direction.

2.2.14 Custody Procedures

The primary objective of chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection to completion of all required analyses. A sample is in custody when it is:

- In someone's physical possession,
- In someone's view,
- Locked up, or
- Kept in a secured area that is restricted to authorized personnel.

2.2.14 Field Custody Procedures

The following guidance will be used to ensure proper control of samples in the field:

- As few people as possible will handle samples.
- Coolers or boxes containing cleaned bottles will be sealed with a custody tape seal during transport to the field or while in storage before use. Sample bottles from unsealed coolers or boxes, or bottles that appear to have been tampered with, will not be used.

- The sample collector will be responsible for the care and custody of collected samples until they are transferred to another person or dispatched properly under chain-of-custody rules.
- The sample collector will record sample data in the field logbook.
- The site team leader will determine whether proper custody procedures were followed during the field work and will decide if additional samples are required.

When transferring custody (for example, releasing samples to a shipping agent), the following will apply:

- The coolers in which the samples are packed will be sealed and accompanied by two copies of the chain-of-custody record(s). When transferring samples, the individuals relinquishing and receiving them must sign, date, and note the time on each of the chain-of-custody record(s). This will document sample custody transfer.
- Samples will be dispatched to the laboratory for analysis with separate chain-of-custody records accompanying each shipment. The chain-of-custody records will be signed by the relinquishing individual, and the method of shipment, name of courier, and other pertinent information will be entered in the chain-of-custody record before placement in the shipping container. Shipping containers will be sealed with custody seals for shipment to the laboratory.
- All shipments will be accompanied by chain-of-custody records identifying their contents. The original custody records kept in a zip-lock bag and taped inside the lid of the cooler will accompany each cooler shipment. The other copies will be distributed appropriately to the site team leader and site manager.
- If sent by common carrier, a bill of lading will be used. Freight bills and bills of lading will be retained as part of the permanent documentation.

2.2.15 Laboratory Custody Procedures

A designated sample custodian at the laboratory will accept custody of the shipped samples from the carrier and enter preliminary information about the package into a package or sample receipt log, including the initials of the person delivering the package and the status of the custody seals on the coolers (for example, broken versus unbroken). The custodian responsible for sample log-in will follow the laboratory's SOP for opening the package, checking the contents, and verifying that the information on the chain-of-custody agrees with the information on the samples received. The commercial laboratory will follow its internal chain-of-custody procedures as stated in the laboratory QA manual. The laboratory will check the temperature blank inside the cooler and document it in the sample log-in form. Should the temperature be greater than what is required by the Statement of Work or the method, the sample custodian will inform the region and proceed to follow the course of actions stipulated in the SOW or specified by the regional QA Coordinator.

2.3 Inspection/Acceptance Requirements for Supplies and Consumables

2.4 Analytical Methods Requirements

Please Refer to Table 4 for a list of requested analytes, methods, containers, preservation methods and holding times. None of the samples in this project need be retained by the lab after analysis. These samples are primarily from drinking water wells and as such are considered non-hazardous.

2.5 Quality Assurance & Quality Control

a) Components of quality assurance and quality control will include data quality objectives, equipment calibration, analytical procedures and reporting levels, quality control procedures, data reduction, validation, and reporting, performance and systems audits, data assessment, corrective action, and quality assurance reports. Manchester will follow its written QA/QC Plan to assure data quality.

b) Quality control in the field shall include field instrument checking and re-calibration, if necessary, immediately prior to the beginning of sample collection each morning.

d) Duplicate samples for both nitrate and coliform shall be collected one for every 10 samples collected. Like sample containers shall be filled one after the other (co-sampled), from a continuous flow of the tap or spigot undergoing sampling for the nitrate duplicate.

Approximately 10% of the field measurements will be made in duplicate by collecting co-located field duplicate samples and analyzing both samples separately. In addition, approximately 5% of the samples will be analyzed in duplicate (analytical duplicate). If the method will allow, a matrix spike and matrix spike duplicate will also be analyzed per batch of 20 samples. The spike recoveries and the relative percent differences (RPDs) are calculated and reported for each parameter. The required precision and accuracy for this project is 20% relative percent difference (RPD) and accuracy, as measured by recovery of spikes is expected to be 80-120%.

2.6 Instrument Calibration and Frequency

All field instruments will be calibrated each day prior to use using standards traceable to NBS or using procedures relying on physical constants (such as dissolved oxygen at equilibrium with distilled water at a known temperature). Lab instruments are under a rigorous program of QA and which will be followed under Manchester Lab standard protocols. Field instruments measure a wide range of environmental variables and those measurements are subject to error to the extent that field personnel are unfamiliar with the means used to obtain the measurement. To address this Appendix 1 contains specific information on each of the parameters we will measure, what each measurement means and detailed descriptions of how to calibrate for each parameter.

2.7 Inspection/Acceptance Requirements for Supplies and Consumables

Sample bottles used for microbial testing will be appropriately cleaned and sterilized as per MEL SOP MiG001A. They will be certified clean polypropylene bottles (150 or 250 mL). All sample jars or cubitainers used for chemical analysis in this project will be new and certified clean provided by the laboratory. Field personnel will make note of the information on the certificate of analysis that accompanies sample jars to ensure that they meet the specifications and guidance for contaminant free sample containers.

2.8 Data Management

Field Data Sheets, photos, GPS location data and the Sample Labels and Chain of Custody Data Sheets will be used to document the sampling and inspection activities. For each sample location, the following will be recorded on a dedicated data sheet for each location:

- Homeowner or Tenant name and address
- This sample is screening circle one: Crop Land / Rural Septic / Dairy / Feedlot
- Specific name of facility or locality (eg. Zillah rural residential septic area)
- GPS as close to well location as possible
- sample number (write on the data sheet at the same time as container label)
- If a Duplicate is taken here, then note second sample number
- Date of sample collection
- Multi-parameter Probe calibration results (if first sample of the day)
- Time of Purge Start
- Indicator Parameters for each minute during purge (10 minute maximum)
- Time of Purge End
- Do indicator parameters indicate anoxic groundwater
  (negative Redox or DO <= 1.0 mg/l) – if so –>>> Take TKN sample
- time of each sample collection
- physical description of sample location
- color and any notes on sample appearance or collection process
- Log of any photos taken and description of subject – turn on date/time stamp

The Sample Label and Chain of Custody Data Sheets will have the following information:

- site name
- sample number
- date
- time of each sample collection
- sampler's name or initials
- sampling location in the form of Family Name or Street and House Number.

For fixed laboratory analyses, field duplicates will be assigned a separate unique sample identifier and will be submitted 'blind' to the analytical laboratory.

All data generated during this project will be processed, stored, and distributed according to laboratory's SOPs.

3 Assessment and Oversight

3.1 Assessments and Response Actions

The EPA Field Sampling Project Manager will be responsible for reviewing field log notebooks for accuracy and completeness within 24 hours of each inspection. Sample results provided to the Sampling Project Manager by the laboratory will be assembled for a sampling report. The EPA Field Sampling Project Manager will compare the sample information on the field data sheets with the analytical results to ensure that no transcriptions errors have occurred.

With the exception of the microbiological analyses, RPDs between field duplicate and analytical duplicate measurements will be calculated by the laboratory. RPD's greater than the project requirements will be noted in the associated inspection reports.

Laboratories routinely perform performance checks using different program specific quarterly blind and double blind check standards. Each method of analysis requires specific QA/QC runs that must be complied with by the laboratory performing the analysis. An internal assessment of the data and results are also routinely conducted by the appropriate supervisors and the Laboratory QA Coordinator. No additional audits will be performed on the laboratory for this project.

Corrective action procedures that might be implemented from QA results or detection of unacceptable data will be developed if required and documented in Attachment 2.

4 Reports to Management

Only the data validation reports with the properly qualified data shall be provided by the laboratory to the Field Sampling Project Manager. If, for any reason, the schedules or procedures above cannot be followed, the EPA Field Sampling Project Manager must complete the Attachment 1- Sample Alteration Form (SAF). The SAF should be reviewed and approved by the QAO. The laboratory should be given a copy of the QAO approved SAF for reference and project file.

5 Data Validation and Usability

5.1 Data Review, Validation, and Verification Requirements

The criteria for the validation will follow those specified in this QA plan and the criteria specified in the methods.

5.2 Validation and Verification Methods

All data generated shall be validated in accordance with the QA/QC requirements specified in the methods, and the technical specifications outlined in the QAPP. The summary of all analytical results will be reported to the EPA Field Sampling Project Manager. The raw data for this project shall be maintained by the laboratory. Data validation will be performed by the laboratory for all the analyses prior to the release of data. The laboratory will also archive the analytical data into their laboratory data management system.

5.3 Reconciliation with User Requirements

All data and related information obtained during the course of this project will be included in a data report package. Non-detected nitrate results will be assessed to determine if they meet the reporting limit requirements set forth in the QAPP and the drinking water MCLGs.

6 Table 4 Analytes, Methods, Holding Times and Preservation

Analyte	Method	Reporting Limit	Container type	Number of Containers	Container Number	Bias (accuracy)	Variability (precision)	Hold time	Preservation
Laboratory Measurements									
Nitrate	300.0	0.06mg/l	500ml polyethylene	1	1	80-120%	+/- 20%*	48 hours	6deg.C.
Chloride	300.0	0.06mg/l	500ml polyethylene	1	1	80-120%	+/- 20%*	28 Days	6deg.C.
Total Coliform /E. coli enumerative	SM 9222B 9221F	1CFU/100ml	250 ml or 120 ml sterile	1	2	n/a	n/a	30 Hours	NaS2O3 (Sodium Thiosulfate)**
Kjeldahl Nitrogen (TKN)	351.2	0.5mg/l	1-L polyethylene	1	3	80-120%	+/- 20%*	28 Days	6deg.C.-H2SO4 - pH<2
Field Measurements ***									
Temperature	170.1	0.5 °C	n/a	n/a	n/a	+/- 0.5 °C	+/- 1.5 °C	n/a	n/a
Hydrogen Ion	150.1	0.1 SU	n/a	n/a	n/a	+/- 0.1 SU	+/- 0.3 SU	n/a	n/a
Dissolved Oxygen	360.1	0.3 mg/L	n/a	n/a	n/a	+/- 0.3 mg/L	+/- 0.5 mg/L	n/a	n/a
Specific Conductance	120.1	1 µS/cm	n/a	n/a	n/a	+/- 7%	+/- 10%	n/a	n/a
Redox Potential	SM 2580 B	10 mv	n/a	n/a	n/a	+/- 50 mv	+/- 50 mv	n/a	n/a
Nitrate	Test strips	0.1 mg/L	n/a	n/a	n/a	+/- 0.5%	+/- 20%	n/a	n/a

- - 1 Field Duplicate is to be collected out of each 10 wells - duplicate will be chosen at any well giving a high field indication for NO3

** - Sodium thiosulfate is already added by the lab to the sample container

*** - Accuracy of field measurements is established at the time of calibration utilizing known standards, precision is measured with duplicate measurements

SM – Standard Methods for the Examination of Water and Waste Water (18 - 20thEd.)

7 Analytes for the Time-Series Data Collection

Analyte	Method	Reporting Limit	Container type	Number of Containers	Container Number	Bias (accuracy)	Variability (precision)	Hold time	Preservation
Laboratory Measurements									
Nitrate + Nitrite	353.2	0.05mg/l	500ml polyethylene	1	1	80-120%	+/- 20%*	28 days	H2SO4 pH <2 <4deg.C.

7.1 Table 5 – Analytical Labs in the Lower Yakima County Accredited for Drinking Water Analysis

lab_name	st	city	address	Cert *	cont
Ag Health Laboratories, Inc. – ion-selective electrode	**WA**	**Sunnyside**	**445 Barnard Boulevard**	**D**	**(509)**
Cascade Analytical, Inc –Andy Schut ("Skut") **Ion-Chromatgraphy** (matches method used by Manchester Lab)	**WA**	Yakima	**1008 W Ahtanum Rd. Union Gap, WA 98903**	**D**	**(509)**
Valley Environmental Laboratory – ion-selective electrode	**WA**	**Yakima**	**201 East D Street**	**D**	**(509)**

- - Lab is Certified for Drinking Water Analysis = **D**,

8 Sample Alteration Form

Project Name and Number: _____

Material to be Sampled: _____
_____

Measurement Parameter: _____
_____

Standard Procedure for Field Collection & Laboratory Analysis (cite reference):
_____
_____

Reason for Change in Field Procedure or Analysis Variation:
_____
_____
_____

Variation from Field or Analytical Procedure:
_____
_____
_____

Special Equipment, Materials or Personnel Required:
_____
_____

Initiators Name: _____ Date: _____

Project Officer: _____ Date: _____

QA Officer: _____ Date: _____

9 Corrective Action Form

Project Name and Number: _____

Sample Dates Involved: _____

Measurement Parameter: _____
_____

Acceptable Data Range: _____
_____

Problem Areas Requiring Corrective Action:
_____
_____
_____

Measures Required to Correct Problem:
_____
_____
_____
_____

Means of Detecting Problems and Verifying Correction:
_____
_____
_____

Initiators Name: _____ Date: _____

Project Officer: _____ Date: _____

QA Officer: _____ Date: _____

10 Yakima Nitrate Screening – Phase 2 – Field Sampling Data Form

Team 1 2 3 Week 1 or 2 Sample _____ (Consecutive number) Date_____

This sample is screening: (circle one): Crop Land / Rural Septic / Dairy / Feedlot/Mixed_____

Family or Tenant Name _____Address:_____

Phone:_____ City/Zip:_____Appointment Time: _____

Water Softener or Reverse Osmosis Unit in Home? YES / NO Alternate Sampling Location Selected? YES / NO

Describe Alternate Sampling Location for Collection before Treatment:

_____

GPS at well location: Lat_____ Long_____Waypoint Number(s):__ 60 Sec. Avg? YES / NO

Sample number _____ Dup. Sample number _____

(write on the data sheet and container label) (If a Duplicate is taken)

Time of Purge Start: _____ Caps off DO and PH probe? Yes/No

Minute 0: TEMP: PH: REDOX: COND: DO:
Minute 1: TEMP: PH: REDOX: COND: DO:
Minute 2: TEMP: PH: REDOX: COND: DO:
Minute 3: TEMP: PH: REDOX: COND: DO:
Minute 4: TEMP: PH: REDOX: COND: DO:
Minute 5: TEMP: PH: REDOX: COND: DO:
Test Strip Reading from Nitrate field test (circle range) 0 <1 <2 <5 <10 <20 <50 50+
Well Sanitary Seal/Surface Completion compromised – Taking Bacterial Sample Yes / No - Photo Taken Yes / No
Minute 6: TEMP: PH: REDOX: COND: DO:
Minute 7: TEMP: PH: REDOX: COND: DO:
Minute 8: TEMP: PH: REDOX: COND: DO:
Minute 9: TEMP: PH: REDOX: COND: DO:
Time of Purge End:_____ - Indicator parameters indicate anoxic groundwater YES / NO

(negative Redox or DO <= 2.0 mg/l) – if so –>>> Take TKN sample

Sample Collection Time:_____

Physical description of sample location :_____

Color/Odor and any notes on sample appearance or collection process:_____

Log of any photos taken and description of subject – turn on date/time stamp:

EPA Field Sampler:_____ Assisted by: _____

Notes: _____

_____

Remove adapter from sink if used, replace caps on PH and O2 probe, log samples on COC forms Thank Homeowner

11 Appendix 1 – SOP for Instrument Calibration

1.0 Scope and Application

This standard operating procedure (SOP) provides guidance for the calibration and use of the Horiba U-53G Multi Water Quality Checker (U-53G) by qualified, field inspectors, investigators, or other field personnel.

2.0 Summary of Test method

Following guidance from applicable analytical methods, regulations and publications, field personnel prepare a Quality Assurance Project Plan (QAPP) which includes specifications for appropriate field parameters to be measured by the U-53G. Based on the information in the QAPP, a service request is received by Field Support Center personnel and the instrument(s) are prepared and packed for shipment or pickup. Within OEA, selected members of the Environmental Services Unit on-site with Region 10 Manchester Environmental Laboratory provide this service. The U-53G is a muti-meter instrument that can simultaneously measure: pH, Temperature, Dissolved Oxygen, Conductivity, Total Dissolved Solids, Salinity, Turbidity, Oxidation Reduction Potential, Depth and GPS position. The U-53G is composed of the sensor unit, that is lowered into the water, and the hand held monitor, which allow the user to view and log sensor readings. The U-53G is calibrated using the methods below. It is designed for field use and applications include: rivers, lakes, and ground or tap water using a flow through cell.

3.0 Acronyms

COND - Conductivity
DO – Dissolved Oxygen
DOT – United States Department of Transportation
IATA – International Air Transport Association
NIST – National Institute of Standards and Technology
NTU – Nephelometric Turbidity Unit
OEA – Office of Environmental Assessment
ORP – Oxidation Reduction Potential
QA – Quality Assurance
QAPP – Quality Assurance Project Plan
SOP – Standard Operating Procedure
TDS – Total Dissolved Solids
TURB- Turbidity

4.0 Interferences and Precautions

- Do not use instrument in magnetic fields. Measurement errors will occur.
- Do not immerse in alcohol, organic solvent, strong acid, strong alkaline or other similar solutions.
- Does not support measurement of samples containing fluorine.
- Do not subject to strong shocks. Do not drop.
- Ensure all calibration solutions are the same temperature as ambient air temperature.
- Holding the probe while calibrating may cause the internal probe temperature to rise causing a Dissolved Oxygen (DO) calibration error
- Do not drop instrument into water lower gently dropping will cause sensors to fail and my produce false readings or instrument failure.
- Do not use below depths of 30 meters. Sensor probes are only resistant to 30 meters. Below these depths may give false reading or instrument failure.
- Unit must be turned on for 20 minutes prior to calibrating or using DO measurements.
- For non-flowing water slowly move instrument up and down to induce flow over DO membrane.

- Oxidation Reduction Potential (ORP) standard solutions must be used within one hour at which point it may be transformed. For this reason ORP standard solutions may not be stored.
- When measuring ORP with low concentration of oxidants and reductants such as tap water, well water, or water that underwent treatment there may less repeatability and stability, in general.
- Always use the calibration cup provided. Other containers may create effects from ambient light that cause incorrect turbidity calibrations.
- Avoid turbidity measurement in direct sunlight, since the readout may be affected.

5.0 Safety

Use appropriate personal protective equipment including gloves and safety glasses when using calibration solutions.

6.0 Equipment and Supplies

- U-53G multi Water Quality Checker, Control Unit and Sensor Probe
  - pH Sensor
  - ORP Sensor
  - Reference electrode
  - DO Sensor
  - Turbidity Sensor

- Calibration Cup(s) or appropriate containers as specified in sensor calibration section
- pH reference internal solution
- DO sensor internal solution set
- DO Membrane spare parts set
- Spanner wrench for DO sensor
- Cleaning Brush
- Back pack
- Strap
- Silicone Grease
- Instruction Manuel
- De-ionized water (DI water)
- Bubbler
- pH 4,7,10 Calibration Standard
- Sodium Sulfite (zero DO)
- Quinhydrone Solution (ORP Standard)
- Auto Cal Solutions (0 NTU, pH 4, 4.40 ms/S)
- Conductivity Calibration Solutions
- Turbidity Calibration Solutions
- Sensor Guard and Cap
- LR14 alkaline dry cell batteries, C-size
- Coin battery, CR-2032
- Protective caps for DO, and pH Storage
- Flow Cell assembly w/ appropriate size tubing
- Scale
- Beakers
- Graduated Cylinders
- Calibration Solution Disposal Container

7.0 Calibration Solutions and Standards

7.1 **pH**

7.1.1 pH standard 4, 7, and 10, NIST traceable with expiration date.

7.1.2 Auto Cal Solution, NIST traceable with expiration date

7.2 **DO**

7.2.1 Zero DO solution is a Sodium Sulfite salt mixed with water (DI or Tap) at a ratio of 50g of sodium sulfite to 1000 ml of water.

7.2.2 Span DO solution is water saturated with air. This is done by using a bubbler in a bath of water.

7.2.3 Each solution shall be made fresh just prior to calibration or drift measurement.

7.3 **ORP**

7.3.1 ORP standard powder (quinhydrone) mixed with 250 ml of deionized water and/or premixed ORP standard, NIST traceable with expiration date.

7.4 **Conductivity**

7.4.1 Auto Cal Solution, NIST traceable with expiration date.

7.4.2 Conductivity Standards, range of mS/cm, NIST traceable with expiration date.

7.5 **Turbidity**

7.5.1 Auto Cal Solution, NIST traceable with expiration date.

7.5.2 Turbidity Solutions, Range of NTU's, Auto Cal Solution, NIST traceable with expiration date.

8.0 Shipment and Storage

8.1 All equipment and calibration standards or solutions shall be shipped in compliance with the appropriate IATA or DOT requirements.

8.2 Calibration solutions and standards should be placed in Ziploc bags with taped caps and placed upright in the shipping container to minimize spilling during shipping.

8.3 If the equipment will be shipped or delivered, it will be placed into ice chests, cardboard boxes, or other appropriate containers with adequate cushioning material to prevent breakage and custody sealed to confirm not tapering of the standards has take place during shipment.

8.4 **Storage For Short Term Use Only**

8.4.1 Prior to use inspect DO and pH for sensor caps are present and remove. DO is a white cap, the pH is a black cap.

8.4.2 Replace caps filled with DI water between uses and for short term storage of less than two months. Note: Any water may be used in the field to ensure sensors remain wet. Replace water with DI water once available.

8.4 Follow instruction manual for long term storage, which is defined as storage of longer than 2 months.

9.0 Quality Control and Documentation

9.1 Calibration and drift measurements, see section 10, should be conducted for each sampling event at a frequency outlined in the QAPP. For this project, that will be daily prior to field use.

9.2 The calibration of the instrument sets each parameter to a given standard or solution.

9.3 Drift measurements should also be done at the end of each sampling event. Drift is the measurement of the standards or solutions used for calibration. This measurement will indicate if the instrument has "drifted" during the course instrument use. It is used as an indicator to ensure the probes are in good working order and the readings obtained during the sampling event are accurate.

9.4 All calibration solutions and standards shall be made fresh prior to use or be used within the labels expiration date.

9.5 All commercial standards or solutions shall be NIST traceable with expiration date.

9.6 Documentation of the measurements can occur by two methods: electronically by saving the measurements in the instrument for downloading after the sampling event and/or by logging readings manually into a log book. In either case follow the project specific QAPP or SOP. For example: Inspection type activities require a logbook with numbered pages and must be bound.

9.7 An equipment log book accompanies the U-53G. Each user shall enter User name, Location of equipment use, Date equipment used, Calibrations that occurred, and other applicable information or failures. This log book remains with the U-53G and should not be used as the data log for the project.

10.0 Calibration and Standardization

The U-53G offers two methods to calibrate. Selection of the calibration method depends on how accurate and the quality of data needed. For general screening the Auto Calibration generally will meet the needs. The second method each parameter is manually calibrated with a zero and a span(s) standard. It is the operator's responsibility to know the limitations of this instrument, any EPA standard methods that apply, and the quality of data required by the project and/or QAPP. Operators should become familiar with the instruction manual for the U-53G. This outline will not duplicate the instruction manual verbatim.

10.1 Auto Calibration

10.1.1 **PRIOR TO USE REMOVE DO AND pH SENSOR STORAGE CAPS**
10.1.2 Turn unit on using the power button. For DO sensors the unit must remain on for 20 minutes to stabilize and prior to calibration.
10.1.3 Using the auto cal solution and fill calibration cup to the "with TURB" line located on the side of the cup.
10.1.4 Place calibration cup into black calibration cup to eliminate light sources.
10.1.5 Press the CAL button or right arrow to the Calibration Tab.
10.1.6 Press the down arrow to Auto Calibration
10.1.7 Press Enter and follow instructions on screen.
10.1.8 Instructions should then direct you to place sensors into calibration cup.
10.1.9 Monitor values of the sensors once stabilized press ENTER to start calibration
10.1.10 Do not remove the unit from calibration solution the will display "-----" until finished.
10.1.11 The display will direct you to press MEAS to exit to measurement screen.
10.1.12 If error occurs make note of error code and refer to instruction manual, Section 4.6 Troubleshooting.

10.2 Manual Calibration

Manual Calibration is used to individually calibrate sensors. It is used to ensure good measurement precision throughout all measurement ranges. It should be noted the temperature calibration should follow the most current version of the Inorganic Chemistry Support Equipment Monitoring SOP along with procedures outlined below, since the H-53G allows temperature calibration the temperature obtained from the Inorganic Chemistry Support Equipment Monitoring SOP can be entered directly into the H-53G and no correction factor is necessary.

10.2.1 **PRIOR TO USE REMOVE DO AND pH SENSOR STORAGE CAPS**

10.2.2 Turn unit on using the power button. For DO sensors the unit must remain on for 20 minutes to stabilize and prior to calibration.

10.2.3 Press the CAL button or right arrow to the Calibration Tab.

10.2.4 **Temperature (Performed yearly or as needed)**

10.2.4.1 Following the Inorganic Chemistry Support Equipment Monitoring SOP
10.2.4.2 Press the CAL button or right arrow to the Calibration Tab.
10.2.4.3 Press the down arrow to Manual Calibration
10.2.4.4 Move the cursor to Temp and press ENTER
10.2.4.5 Press the up and down arrow to adjust value
10.2.4.6 Once value is stable press ENTER to start calibration
10.2.4.7 When calibration is finished press ENTER for measurement mode

10.2.5 **pH**

10.2.5.1 Calibrate the zero point (pH 7) first, rinse calibration cup 2-3 times with DI water, then fill with pH 7 standard solution to the w/TURB reference line.
10.2.5.2 Rinse the senor probe 2-3 times with DI water to remove any dirt and then submerge into calibration cup
10.2.5.3 Press CAL or from the Calibration Tab and press the down arrow to “Manual Calibration”
10.2.5.4 Move the cursor to pH and press ENT
10.2.5.5 Set the number of calibration points for two
10.2.5.6 Press the up and down to set the pH value of 7.00 for the pH 7 standard, reference temperature vs. pH standard value chart
10.2.5.7 Check that the value has stabilized then press ENTER to start calibration.
10.2.5.8 Once complete press Enter to continue to span cal.
10.2.5.9 Rinse calibration cup 2-3 times with DI water
10.2.5.10 Fill cup with pH 4 or pH 10 to the w/TURB reference line. Place sensor into calibration cup.
10.2.5.11 Check that the value has stabilized, reference temperature vs. pH standard value chart, press ENTER to start calibration.
10.2.5.12 When calibration complete press ENTER to return to calibration parameter menu.

10.2.6 **ORP**

10.2.6.1 Rinse the sensor probe and calibration cup 2 to 3 times with DI water
10.2.6.2 Place sensor probe into solution.
10.2.6.3 Fill calibration cup with ORP standard to the w/TURB reference line.
10.2.6.4 Press the units CAL key to set calibration mode
10.2.6.5 Press down arrow to Manual Calibration and press ENTER
10.2.6.6 Move the cursor to ORP and press ENTER
10.2.6.7 Press the up or down arrow to adjust the mV to match the standard mV for the given standard temperature.
10.2.6.8 Check the measurement value has stabilized and press ENTER
10.2.6.9 Once complete press ENTER to return to the calibration selection screen.

10.2.7 **Conductivity (COND)**

10.2.7.1 Rinse the sensor probe 2 to 3 times with DI water to remove any dirt
10.2.7.2 Remove as much moisture from the sensor, the zero calibration is done in air.

10.2.7.3 Press the units CAL key to set calibration mode
10.2.7.4 Press the down arrow to Manual Calibration and press ENTER
10.2.7.5 Move the cursor to COND and press ENTER
10.2.7.6 Press up or down arrow to select number of calibration points.
10.2.7.7 Press up or down arrow to set COND to 0.00 mS/cm
10.2.7.8 Check the measurement value has stabilized and press ENTER
10.2.7.9 Once complete press ENTER to proceed to first span calibration procedure
10.2.7.10 Wash the sensor probe and calibration cup 2 to 3 times with DI water.
10.2.7.11 Fill calibration cup to the w/TURB reference line with a 0.00 to 0.999mS/cm standard.
10.2.7.12 Place sensor probe into solution.
10.2.7.13 Press up or down to set value to standard.
10.2.7.14 Check to ensure measurement value has stabilized and press ENTER
10.2.7.15 Once complete press ENTER to proceed to the second span calibration procedure.
10.2.7.16 Wash the sensor probe and calibration cup 2 to 3 times with DI water.
10.2.7.17 Fill calibration cup to the w/TURB reference line with a 1.00 to 9.99 mS/cm standard.
10.2.7.18 Place sensor probe into solution.
10.2.7.19 Press up or down to set value to standard.
10.2.7.20 Check to ensure measurement value has stabilized and press ENTER
10.2.7.21 Once complete press ENTER to proceed to the third span calibration procedure.
10.2.7.22 Wash the sensor probe and calibration cup 2 to 3 times with DI water.
10.2.7.23 Fill calibration cup to the w/TURB reference line with a 10.0 to 100.0 mS/cm standard.
10.2.7.24 Place sensor probe into solution.
10.2.7.25 Press up or down to set value to standard.
10.2.7.26 Check to ensure measurement value has stabilized and press ENTER
10.2.7.27 Once complete press ENTER to proceed to the calibration parameter screen.

10.2.8 **Turbidity (TURB)**

10.2.8.1 Rinse the sensor probe and calibration cup 2 to 3 times with DI water
10.2.8.2 Fill calibration cup with zero standard to the w/TURB reference line.
10.2.8.3 Place calibration cup into black calibration cup to eliminate light sources.
10.2.8.4 Place the sensor probe into calibration cup with standard.
10.2.8.5 Press the units CAL key to set calibration mode
10.2.8.6 Press down arrow to Manual Calibration and press ENTER
10.2.8.7 Move the cursor to TURB and press ENTER
10.2.8.8 Press the up or down arrow to select number of calibration points
10.2.8.9 Press up or down to set value to the 0.00 standard.
10.2.8.10 Check to ensure measurement value has stabilized and press ENTER
10.2.8.11 Once complete press ENTER to proceed to the first span calibration procedure.
10.2.8.12 Wash the sensor probe and calibration cup 2 to 3 times with DI water.
10.2.8.13 Fill calibration cup to the w/TURB reference line with a 0.1 to 10.0 NTU standard.
10.2.8.14 Place sensor probe into solution.
10.2.8.15 Press up or down to set value to standard.
10.2.8.16 Check to ensure measurement value has stabilized and press ENTER
10.2.8.17 Once complete press ENTER to proceed to the second span calibration procedure.
10.2.8.18 Wash the sensor probe and calibration cup 2 to 3 times with DI water.
10.2.8.19 Fill calibration cup to the w/TURB reference line with a 10.0 to 100.0 NTU standard.
10.2.8.20 Place sensor probe into solution.
10.2.8.21 Press up or down to set value to standard.
10.2.8.22 Check to ensure measurement value has stabilized and press ENTER
10.2.8.23 Once complete press ENTER to proceed to the third span calibration procedure.
10.2.8.24 Wash the sensor probe and calibration cup 2 to 3 times with DI water.
10.2.8.25 Fill calibration cup to the w/TURB reference line with a 100 to 1000 NTU standard.

10.2.8.26 Place sensor probe into solution.
10.2.8.27 Press up or down to set value to standard.
10.2.8.28 Check to ensure measurement value has stabilized and press ENTER
10.2.8.29 Once complete press ENTER to proceed to the calibration parameter screen.

10.2.9 **Dissolved Oxygen (DO)**

10.2.9.1 Prepare standard solutions

10.2.9.1.1 Add 50 g of sodium sulfite to 1000 ml of water and stir to dissolve. Generally, 1000 ml of solution is not needed for one calibration. Use the ratios 12.5 per 250 ml or 25 g per 500 ml depending on number of instruments that will be calibrated.
10.2.9.1.2 Pour 1 to 2 liters of water into a suitable container and feed air into water using a bubbler or air pump until it is oxygen saturated.

10.2.9.2 Rinse the sensor probe 2 to 3 times with DI water
10.2.9.3 Place sensor into zero standard into the calibration cups (black and clear). Fill solution over the DO sensor slot in the cup, this is the area between the black cup and the clear cup.
10.2.9.4 Press the units CAL key to set calibration mode.
10.2.9.5 Press down arrow to Manual Calibration and press ENTER.
10.2.9.6 Move the cursor to %DO and press ENTER.
10.2.9.7 Press the up or down arrow to selecting two (2) for the number of calibration points.
10.2.9.8 Press the up or down arrow to adjust the %DO to match zero.
10.2.9.9 Check to ensure the measurement value has stabilized and then press ENTER.
10.2.9.10 Once complete press ENTER to proceed to span calibration procedure.
10.2.9.11 Place sensor guard on sensor unit to protect sensors.
10.2.9.12 Place sensor probe into oxygen saturated bath solution.
10.2.9.13 Press up or down to set value to 100%.
10.2.9.14 Check to ensure measurement value has stabilized and press ENTER.
10.2.9.15 Once complete press ENTER to return to the calibration selection screen.

10.2.10 **Water Depth (DEPTH)**

10.2.10.1 Rinse the sensor probe 2 to 3 times with DI water
10.2.10.2 Press the CAL button or right arrow to the Calibration Tab.
10.2.10.3 Press the down arrow to “Manual Calibration”
10.2.10.4 Move the cursor to Depth and press ENTER.
10.2.10.5 Press the up and down arrow to adjust value to 0.00 meters
10.2.10.6 Once value is stable press ENTER to start calibration
10.2.10.7 When calibration if finished press ENT for measurement mode

10.3 **Drift Measurements**

10.3.1 Turn unit on using the power button. For DO sensors the unit must remain on for 20 minutes to stabilize and prior to calibration.

10.3.2 Using the calibration cup or appropriate container with each successive standard or solution and measure the value by pressing the MEAS button.

10.3.3 Record and compare to the standard or solution value. The difference is the drift value.

10.3.4 A percentage of drift can be calculated by subtracting the drift measurement from the standard and dividing by the standard value. This percentage can be used to monitor the equipments sensors and to ensure data quality and repeatability.

11.0 Measurement and Data Collection

11.1 Any instrument requests should be made to Field Services staff via phone or email with **AT LEAST TWO WEEKS** notice to ensure adequate standards are available and equipment is serviceable.

11.2 **PRIOR TO USE REMOVE DO AND pH SENSOR STORAGE CAPS**

11.3 Single Measurement

11.3.1 Turn unit on using the power button. For DO sensors the unit must remain on for 20 minutes to stabilize, use the internal clock and DO reading, and prior to calibration.
11.3.2 Check that each sensor and sensor guard is mounted.
11.3.3 Press the right or left arrow to the Single Measurement tab or screen.
11.3.4 **NOTE: DO NOT** press MEAS key while unit in the air, this will cause turbidity wiper failure.
11.3.5 Submerge sensor probe in the sample, gently shake them to remove air bubbles form sensors.
11.3.6 For non-flowing water gently move sensor probe up and down at a rate of 20 to 30 cm a second.
11.3.7 When non-turbidity values are stable press MEAS to acquire values.
11.3.8 Press ENTER to save the values or write values in logbook.
11.3.9 Press ESC to cancel operation.
11.3.10 Continue to next measurement or press and hold PWR button to power off.

11.4 GPS Information

11.4.1 Press the right arrow to the Data Operations tab or screen.
11.4.2 Press the down arrow to move the cursor to GPS Information then press ENTER.
11.4.3 When position data exists it will be displayed, if no data is displayed data has not been received.

Data Operations

11.4.4 Press the right arrow to the Data Operations tab or screen.
11.4.5 Press the down arrow to move the cursor to View Data then press ENTER.
11.4.6 Move the cursor to Site/Date/All and then press ENTER. The Site name or Date will need to be entered depending on your selection. All data will display with the most recent first.
11.4.7 Press the up or down arrow to scroll though data.
11.4.8 To delete data from the Data Operation tab or screen cursor to Delete Data and press ENTER.
11.4.9 Press the left arrow to confirm Yes and press ENTER. All data will be deleted.
11.4.10 It is the operator's responsibility to save data obtained during the sampling event. The unit may be cleared of all data upon return either by the ESU personnel or the next user.

11.5 Calibration Record Check

11.5.1 Press the right arrow to the Data Operations tab or screen.
11.5.2 Press the down arrow to move the cursor to Calibration Record then press ENTER
11.5.3 The latest calibration record will be displayed. Scroll by pressing the down arrow

11.6 Sensor Information

11.6.1 Press the right arrow to the Information tab or screen.
11.6.2 When sensor probe is normal "All sensors are available." will appear.
11.6.3 When a sensor has a problem a message will be generated. Refer to the instruction manual for troubleshooting information. (Section 4.6 pages 89 to 94)

12.0 Calculations

12.1 Principals of measurements for each parameter are outlined in the instruction manual for the instrument. Refer to pages 100-109 or Sections 6.3 thru 6.11

12.2 Some of the calibrations solutions need to be mixed. Refer to the calibration section of the instruction manual or section 10 above for mixture ratios.

12.3 Refer to appropriate calibration chart for standard value for a given temperature. Usually located on the bottle and/or U-53G instruction manual. There may be a need to interpolate between temperature readings to obtain the correct standard value.

12.4 Percentage of Drift = (Calibration Standard – Drift Measurement) / Calibration Standard

13.0 Waste Management and Pollution Prevention

Recycle used containers when possible both in the field and in accordance with Manchester Environmental Laboratory's Waste Management and Pollution Prevention Programs when at the Manchester Lab Facility. Disposal of calibration solution should only occur in an appropriate manner, i.e. not on the ground or in a body of water. All waste solutions should be saved and disposed of once you have returned from the field.

14.0 References

14.1 Horiba U-50 series, Multi Water Quality Checker, Instruction Manual, April 2009.
14.2 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), current version.
14.3 Standard Methods for the Examination of Water and Wastewater, Joint Editorial Board, American Public Health Association, American Water Works Association and Water Environment Federation, latest edition.
14.4 Code of Federal Regulations, Title 40 (40 CFR), Part 136.3, Table IB.
14.5 Pollution Prevention Plan of the Manchester Environmental Laboratory,@ USEPA Region 10,current version.
14.6 Manchester Environmental Laboratory Dangerous Waste Disposal Manual,@ USEPA Region 10, current version.

12 Appendix 2 – SOP for Shipping Container Preparation

U.S. Environmental Protection Agency, Region 10
Office of Environmental Assessment
Maja Tritt, CLP PO, 205.553.6265
Bethany Plewe, RSCC, 206.553.1603
Jennifer Crawford, RSCC, 206.553.6261

R10 Manchester Environmental Laboratory (MEL)
Lab Support Work Flow

1. Submit 2 copies of QAPP to RSCC and QA reviewer 3-4 weeks prior to sampling. Contact those above for assistance in preparing the QAPP. If modifications are required to the CLP SOW (ex: low detection limits) submit QAPP 4 weeks prior to sampling (electronic version is acceptable).
2. Use assigned Regional sample numbers and project code on all sample labels and TR/COCs.
3. RSCC supplies copies of FORMS II Lite software and custody seals.
4. Contact RSCC with shipping information via email (preferred) or **on the day that you ship**. Include the following information:
   Project code
   Airbill number
   Date shipped, date to arrive at lab
   Laboratory shipped to
   Number of samples including matrices (not number of bottles)
   Analysis needed on samples, note samples for QC
   Note when case is complete
5. MEL is closed after 4:30 pm on weekdays and closed on weekends.
6. Electronic, validated analytical data are expected to be sent to EPA and contractor PMs within 8 weeks or turnaround time described by MEL, after lab receipt of samples
7. For all superfund, CLP or non-CLP work, submit TR/COCs (.xml format) to the ESDS website immediately after shipping is completed.
   http://epasmoweb.fedcsc.com/scstr/
   Username: R10ESDS
   Password: uploadR10
   **include analytical costs or email them to Elizabeth Holman (holman.elizabeth@epa.gov)
8. Submit the Regional copy of ALL TR/COCs for every project to the RSCC when the last samples are shipped.
9. REMINDER: Submit TR/COCs to lab, RSCC, and ESDS

USEPA REGION 10
SAMPLE CONTAINER REQUIREMENTS FOR MEL

SHIPPING SAMPLES

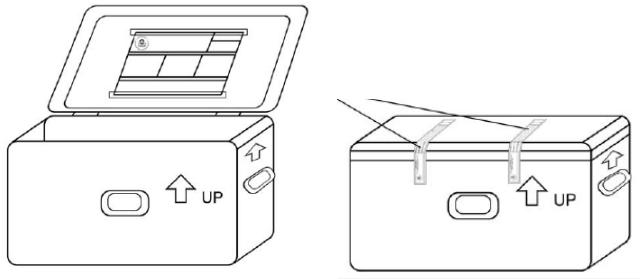
Conduct an inventory of the contents of the shipping cooler/container against the corresponding TR/COC record. Wrap each glass bottle with plastic bubble wrap. Use suitable non-combustible packing materials (ex. air filled plastic bags) for the coolers. Vermiculite and kitty litter packing materials are not allowed.

Cover samples with double-bagged ice (bottom, sides and top). Do not pour loose ice directly into the sample cooler unless each of the sample containers is sealed in a plastic bag.

Include a 40-ml vial filled with water and labeled "**temperature blank"** with each cooler shipped. Do not assign a sample number for the temp blank.

Place signed TR/COCs and return cooler label in a ziplock plastic bag and tape it to the lid of each cooler.

Include necessary paperwork = signed TR/COCs, sample labels, return cooler label.



USEPA REGION 10
BOTTLE CODE REQUIREMENTS FOR MEL

In order for the Region 10 Manchester Laboratory to remain NELAC certified, they have to be able to track every bottle that is received. Region 10 uses container codes in order to track every bottle. One sample number can consist of several containers from one location for a variety of analyses. 2 digit alphanumeric codes are assigned to each bottle for each sample number. The first digit in the code refers to the preservative used in the sample, and the second digit refers to the bottle count associated with the preservative and sample number.

Preservative Codes
A - HCl
B - HNO_3

C - NaOH
D - H_2SO_4
E - $Na_2S_2O_3$
F - ascorbic acid, then HCl
G - $Na_2S_2O_3$ + EDTA
H - EDTA
N - No chemical preservation
P - Bottles per-preserved at lab
T - To be preserved at the lab

Example 1: If you are collecting a soil sample with EPA number 08184000 from location to be analyzed for SVOCs and total metals, you'll have 3 containers (2-8oz jars for SVOC and QC, 1-4oz jar for total metals and QC). No chemical preservation is necessary, so for sample #08184000, you'll have 3 container codes associated with it = N1, N2, N3 each respectively indicated on each container.

Example 2: If you are collecting a water sample with EPA number 08184001 from a location to be analyzed for SVOCs and total metals, you'll have 7 containers (6-1L amber glass for SVOC and QC, and 1-1L HDPE bottle for total metals and QC). No chemical preservation is necessary for the SVOCs, but HNO3 preservation is required for total metals in water. The container codes for the 7 bottles associated with #08184001 are N1, N2, N3, N4, N5, N6, B1

13 Appendix 3 –Job Hazard Assessment for Sampling Team

OFFICE/UNIT/PROGRAM: OEA	**DATE COMPLETED: 1-26-2010**
JOB/TASK: SET UP LOGISTICS FOR WELL SAMPLING STUDY	**PROJECT LOCATION: YAKIMA VALLEY, WA**
SUPERVISOR(S): CURT BLACK	**ANALYSIS PERFORMED BY: CATHE BELL / CURT BLACK**
DATE(S) TASK TO BE PERFORMED: FEB 22 – MAR 7, 2010	**TYPE OF TASK:** ☒One time ☒ Routine task

TO COMPLETE THE FOLLOWING CHART, DESCRIBE THE ASPECT OF THE WORK YOU PERFORM WHICH YOU JUDGE MOST HAZARDOUS. IDENT ACCOMPLISH THAT WORK, THE HAZARDS ASSOCIATED WITH EACH STEP, AND MEANS OF CONTROLLING OR LIMITTING THOSE

ACTIVITY SEQUENCE	ENVIRONMENTAL, SAFETY, OR HEALTH HAZARD	HAZARD CONTRO
1. Prepare and load materials for sampling activity.	Lifting, twisting, low back strain. Forgetting materials.	Careful lifting techniques, secure grip, packing
2. Drive to sampling area.	Motor vehicle crash, snow, ice, lost of traction, weather, pass conditions, driving in unfamiliar areas and conditions.	Select rested, experienced driver. Slow down winter driving guidance (appendix x). Comply Order Forbidding texting while driving.
3. Check into post in Yakima area.	Material transfer, storage. Unsuitable residence.	Careful lifting technique, park close, assure go clothing including protective foot gear.
4. Review plans for day's activities.	Failure to be thoroughly prepared.	Engage in logistics meetings and group comm from day before considering controls to preven
5. See JHA: Household tap water sampling.	See JHA: Household tap water sampling.	See JHA: Household tap water sampling.
6. Pool and pack samples for delivery to lab/FedEx..	Weight, bending, twisting, lifting, dropping: both the samplers and receivers are at risk.	Careful lifting techniques. Secure grip. Carefu level or higher. Do not pack boxes too heavily
7. Drive to west side of mountains.	MVA, adverse weather conditions, visibility, see #2.	Refer to map prior to leaving. Be attentive and conditions. See 2.
8. Drop samples, supplies.	Weight, lifting, carrying.	Park close. Stretch on exiting vehicle. Carefu grip.

HAZARDS –NOTE ALL POTENTIAL HAZARDS ASSOCIATED WITH THE WORK ACTIVITY.

Physical

Radiation	☐ ionizing	☐ microwave	☒ light
	☐ heat	☒ cold	☒ noise
	☐ explosion	☐ fire	
Vehicles	☒ traffic	☐ heavy equip	☐ forklift
	☐ helicopter	☐ small aircraft	☐ boat
Boat Ops	☐ sediment sampling	☐ rapid water	☐ open water
	☐ diving	☐ electrofish	☐ weather
Industrial	☐ comp gas	☐ electricity	☐ conf space
	☐ equip	☐ moving parts	
Overhead	☐ obstruction	☐ falling objs	
Elevation	☐ roof	☐ scaffold	☐ ladder
	☒ stairs	☐ catwalk	
Slips/trips	☒ terrain	☒ debris	☒ slippery
	☐ trench	☒ pits/holes	
Other physical hazards:		☐	

Biological

	☒ fatigue	☒ violence	☐ ill
Agriculture	☐ CAFO	☐ fish	☐ fa
Animals	☒ dogs	☐ feral animals	☒ s
Insects	☒ spiders	☐ mosquitoes	☐ w
	☐ bees		
Pathogens	☒ bloodborne	☒ sewage	☐ m
Other Biological:		☒ TB/MARSA	

Chemical

Containers	☐ ammonia	☐ chlorine	☐ o
VOCs	☐ solvents	☐ fuel	☐ o
Wastes	☐ sewer	☐ landfill	☐ s
	☐ metals	☐ PCBs	☐ p
Particulates	☐ fibers	☐ diesel	☐ a
Sampling	☒ acids	☐ bases	
Other Chem:		☒ packaged samples	

Comments:

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED (CIRCLE ALL THAT APPLY)

PE

Feet:	x	safety shoes	safety-toe		shank
		rubber boots	waders		
Gloves:		leather	cotton		cut-resistant
		chem resist	x disposable	x	warmth
Body:	x	safety vest	pfd		harness
		tyvek	sarnex-tyvek		coveralls
Eyes:	x	safety glasses	sunglasses		goggles
Head:		hard hat	hearing prot		respirator

Other PPE:

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

Other Safety Equipment and Procedures

	dosimetery	x	Communication	
x	first aid kit		fire extinguish	x
x	chains/studs		eye wash	

Other Equipment/Procedures:

Emergency Contact:

REMINDERS:

- have clear agency identifications at all times
- wear seatbelts, drive at the speed limit
- know your emergency numbers and evacuation routes
- violence is unacceptable: pull back and get help
- sanitize after contact with dirty water (alcohol gel or wipes)
- know your limitations / take breaks when needed
- stay hydrated – bring water supplies with you
- be able to stay dry (carry extra socks, etc.)
- wear sunscreen (SPF 15 or higher) and / or hats wher
- remember biological hazards (repellant)

CERTIFICATION OF HAZARD ASSESSMENT

EPA FIELD SAMPLING MANAGER: CURT BLACK

DATE:1/26/2010

SAFETY/HEALTH REPRESENTATIVE: CATHE BELL

DAT

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED TASKS AND FULLY UNDERSTAND THE TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED.			
DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

OFFICE/UNIT/PROGRAM: OEA	**DATE COMPLETED:1-26-2010**
JOB/TASK: HOUSEHOLD TAPWATER SAMPLING-YAKIMA NITRATE STUDY	**PROJECT LOCATION: YAKIMA VALLEY, WA**
SUPERVISOR(S): CURT BLACK	**ANALYSIS PERFORMED BY: CATHE BELL/CURT BLACK**
DATE(S) TASK TO BE PERFORMED: FEB 22-MAR 7, 2010	**TYPE OF TASK:** ☒ One time ☐ Routine task

TO COMPLETE THE FOLLOWING CHART, DESCRIBE THE ASPECT OF THE WORK YOU PERFORM WHICH YOU JUDGE MOST HAZARDOUS. IDENTIFY THE STEPS TAKEN TO ACCOMPLISH THAT WORK, THE HAZARDS ASSOCIATED WITH EACH STEP, AND MEANS OF CONTROLLING OR LIMITTING THOSE HAZARDS.		
ACTIVITY SEQUENCE	**ENVIRONMENTAL, SAFETY, OR HEALTH HAZARD**	**HAZARD CONTROLS**
Drive to sampling site. Park.	Driving hazards, navigating unfamiliar areas,	Plan your trip, review the days stops, assign a navigator, park so as to depart without backing
Exit vehicle, contact homeowner/tenant, unload sampling gear.	Mistaken for evil-doer or Immigration, greeted with prejudice, injury during lifting, yard may be cluttered, slippery walk or steps in poor repair	Always work in teams, don't look sneaky, wear bright colors, have someone on team in EPA logo wear, smile, know your talking points, introduce yourself, withdraw if necessary, use proper lifting techniques, keep loads small and manageable
Bring sampling gear to house.	Keep outside dirt outside, cluttered house, indoor air quality, bio-hazards in sink area, dogs, nervous home owner	WATCH YOUR STEP, TRANSFER TO INSIDE SHOES FROM OUTSIDE BOOTS, WATCH FOR TRIPPING HAZARDS, USE GOOD LIFTING TECHNIQUES, KEEP LOADS MANAGABLE
Go to well, survey position with GPS, note pipe diameter, condition of sanitary seal, other observations.	Moving in unfamiliar yard, more potential for dog interactions, neighbors, decreased situational awareness while focused on GPS or in well house, black-widow spiders in well house	Ask home owner about dogs, have a light, watch your step, watch your surroundings, don't' penetrate into well house more than necessary for observations of well condition
Enter house. Arrange sampling gear.	Homeowner upset over mud inside home, difficult working conditions,	Keep outside dirt outside – switch shoes at the door, CREATE AN ORGANIZED WORK AREA, SPREAD BLANKET'/BEACH-TOWEL OUT, SET UP TABLE, SET UP RECORDING FORMS, WATCH FOR PETS AND EXTABLISH RAPPORT WITH HOMEOWNER
Prepare for sampling: disassemble kitchen spigot, clean spigot, plumb spigot into multiparameter cell.	Sink may need to be emptied for flow-through cell, knives or sharps in sink, water may be outgassing H2S or contain coliform bacteria or pathogenic organisims.	ISOLATE YOURSELF FROM THE CONTENTS OF THE SINK, OR MOVE THE CONTENTS WITH CARE , SANITIZE WORKING AREA INCUDLING HANDS BEFORE GLOVES ON, THEN GLOVES. REMAIN VIGILANT FOR H2S, MINIMIZE SPLASHING WATER, REMOVE AEREATOR CAREFULLY TO AVOID DAMAGE
Collect samples.	Splash contact with pathogens, if TKN sample is needed, acid handling for preservation,	Work neatly, avoid splashing and producing aerosols, before opening acid, put on eye protection, have neutralization solution ready.
Stop sampling. Reconnect water delivery.	Sharp corroded plumbing, splash hazard	Carefully replace aerator on faucet – if it breaks, place the aerator in a Ziploc bag with the address of the home and purchase a replacement – follow up with repair
Pack samples and sampling equipment.	Injury from lifting ice chests full of equipment,	Clean and dry equipment, pack the acid container if used in a protective container

Exit house, carrying samples and equipment to vehicle.	same tripping hazards as during entry, lifting injuries from heavy loads, same dogs as during entry	Watch your step, lift properly and organize in multiple smaller loads. Demobe and leave the home cleaner than when you arrived – put **everything** back as it was. Double check nothing is left behind but a happy homeowner. Exit interview with educational materials left behind as appropriate.
Load car.	Injury from lifting and twisting during packing of vehicle	Lift correctly, keep loads manageable, get help with packing
Drive to next site.	Risks of driving, dark, icy roads, unfamiliar roads, manure trucks, feed trucks, milk trucks, cattle trucks, Vacuum Trucks,	Plan your trip, review the next stop, assign a navigator, watch for trucks, carry chains, use the most experienced driver, take the time to be safe.

HAZARDS –NOTE ALL POTENTIAL HAZARDS ASSOCIATED WITH THE WORK YOU HAVE PLANNED .	

Physical

Radiation	☐ ionizing	☐ microwave	☐ light
	☐ heat	☒ cold	☐ noise
	☐ explosion	☐ fire	
Vehicles	☒ traffic	☒ heavy equip	☐ forklift
	☐ helicopter	☐ small aircraft	☐ boat
Boat Ops	☐ sediment sampling	☐ rapid water	☐ open water
	☐ diving	☐ electrofish	☐ weather
Industrial	☐ comp gas	☐ electricity	☐ conf space
	☐ equip	☐ moving parts	
Overhead	☐ obstruction	☐ falling objs	
Elevation	☐ roof	☐ scaffold	☐ ladder
	☐ stairs	☐ catwalk	
Slips/trips	☒ terrain	☒ debris	☒ slippery
	☐ trench	☒ pits/holes	
Other physical hazards:		☒ DOGS	

Biological

	☐ fatigue	☒ violence	☒ illness/injury
Agriculture	☐ CAFO	☐ fish	☒ farm animals
Animals	☒ dogs	☒ feral animals	☒ snakes
Insects	☒ spiders	☐ mosquitoes	☐ wasp/hornet
	☒ bees		
Pathogens	☒ bloodborne	☒ sewage	☐ med/lab
Other Biological:		☒ TB, MARSA	

Chemical

Containers	☐ ammonia	☐ chlorine	☐ other
VOCs	☐ solvents	☐ fuel	☐ oils
Wastes	☒ sewer	☐ landfill	☐ smoke/dust/fume
	☐ metals	☐ PCBs	☐ paints/surfacing
Particulates	☐ fibers	☐ diesel	☐ asbestos
Sampling	☒ acids	☐ bases	
Other Chem:		☐	

Comments:

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED (CIRCLE ALL THAT APPLY)

PPE

Feet:		safety shoes	safety-toe	shank
	x	rubber boots	waders	
Gloves:		leather	cotton	cut-resistant
		chem resist	x disposable	
Body:	x	safety vest	pfd	harness
		tyvek	sarnex-tyvek	coveralls
Eyes:	x	safety glasses	sunglasses	goggles
Head:		hard hat	hearing prot	respirator

Other PPE:

OTHER SAFETY EQUIPMENT/CONSIDERATIONS

Other Safety Equipment and Procedures

	dosimetery		Communication		decon
x	first aid kit	x	fire extinguish	x	flares
x	chains/studs		eye wash	x	Hand sanitizer

Other Equipment/Procedures:

Emergency Contact:

REMINDERS

- have clear agency identifications at all times
- wear seatbelts
- drive at the speed limit
- know your emergency numbers and evacuation routes
- violence is unacceptable: pull back and get help
- sanitize after contact with dirty water (alcohol gel or wipes)
- know your limitations / take breaks when needed
- stay hydrated – bring water supplies with you
- be able to stay dry (carry extra socks, etc.)
- wear sunscreen (SPF 15 or higher) and / or hats when needed
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DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

14 Appendix 4 - GPS SOP and Instructions

Garmin GPSmap 60CSx

Equipment Check List

- GPS unit
- Owner's Manual
- AA batteries

MapSource software – install on your computer.
PC-download cable – USB mini-B plug to A-type plug
Learn button and screen functions

Appropriate area maps have been uploaded into the units
We've loaded Metroguide 7 for Washington, Oregon, and Idaho into the units.

Main Menu (Press "MENU" button twice)

- Setup
  - System
    - GPS – Normal
    - WAAS – Enabled
    - Battery Type – Alkaline or NiMH
    - External Power Lost – Stay On
  - Time
    - Time Format – 12 or 24 Hour
    - Time Zone – ENTR correct time zone
    - Daylight Saving Time – Auto
  - Units
    - Position Format – hddd.ddddd°
    - Map Datum – NAD83
    - Distance/Speed – Statute
    - Elevation – Feet

Operation

1. After turning the unit on, wait until it has completed "Acquiring" and/or "Locating" Satellites and that you have "3D" coverage.
2. Note your Location accuracy estimate. Under good conditions it should indicate better than +/- 30 ft. If the accuracy is acceptable for the intended purpose, record your position. If not, wait for the accuracy to improve, or move to a different location. Satellites constantly move into and out of view, so it may not be a long wait.
3. Recording your position.
   a. Press the "MARK" button.
   b. Record the waypoint number in field notes;
   c. To record an average of multiple satellite fixes, after noting the waypoint number, scroll the cursor to "Avg" and press the "ENTR" button. The number of satellite fixes is indicated on the bottom of the screen as "Measurement Count." Once you've reached approximately 60 fixes (abouyt 1 minute) , press the "ENTR" button to "save" your averaged position, then highlight "OK" and press the "ENTR" button again. Note: 60 measurements are usually adequate.
   d. Press the "QUIT" button to exit the waypoint screen.

4. Pressing the “PAGE” button allows you to switch between various screen modes.
5. Pressing the “MENU” button once shows specific menu options for the current page/screen.
6. Pressing the “MENU” button twice from any screen takes you to the Main Menu options.

Accessing Previously Logged Waypoints

1. Press the “FIND” button.
2. Highlight “Waypoints” on the screen, and press the “ENTR” button.
3. Highlight the waypoint of interest and then press the “ENTR” button. This displays the location and options to delete, show on map, or navigate.

15 Appendix 5 – Chain of Custody Forms, Labels and Custody Seals