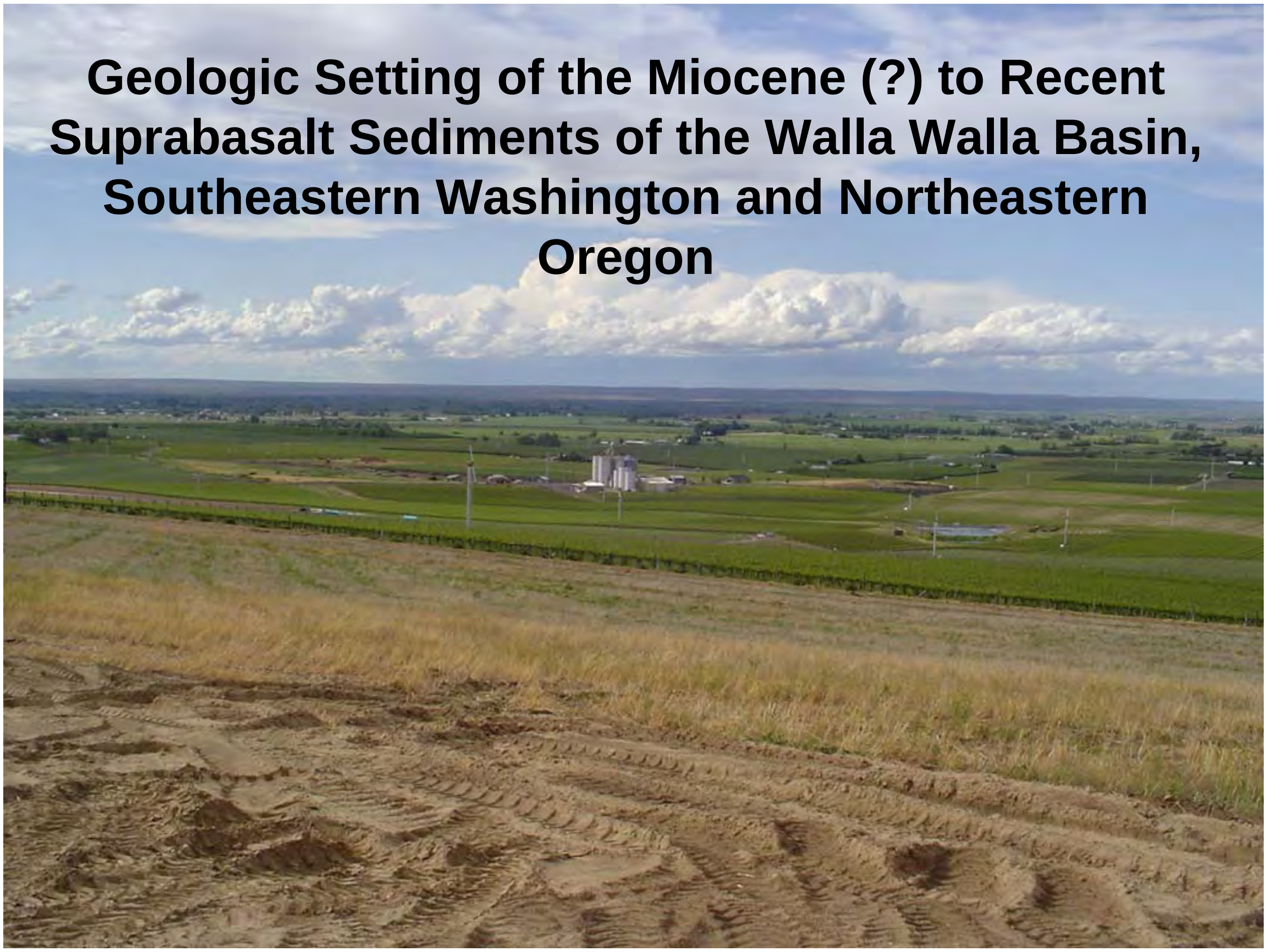
Geologic Setting of the Miocene (?) to Recent Suprabasalt Sediments of the Walla Walla Basin, Southeastern Washington and Northeastern Oregon



Prepared for the

Walla Walla Basin Watershed Council

and the

Washington Department of Ecology

by

GSI Water Solutions, Inc.

1020 North Center Parkway, Suite F, Kennewick,
Washington 99336

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Summary

The Walla Walla Basin contains a thick (up to 800 feet) sequence of clastic sediments overlying basalt. These strata, referred to herein as the suprabasalt sediments, host an alluvial aquifer system which supplies water to hundreds of domestic and irrigation wells. In addition, this alluvial aquifer system displays a high degree of hydrologic continuity with salmonid-bearing surface waters. This project was done in order to better understand the physical geologic framework of the suprabasalt sediments which host the alluvial aquifer system in the Walla Walla Basin.

The subsurface distribution of five suprabasalt sediment stratigraphic units, and the top of the underlying Columbia River basalt surface, in the Walla Walla Basin are mapped and described in this report. This report also includes a discussion of the: (1) methodologies used to identify, describe, and interpret the extent of these units, (2) basic physical characteristics of each mapped unit, and (3) distribution and occurrence of each mapped unit. This report is based predominantly on available and existing information, most notably geologic maps and reports and driller's logs. Where possible this existing information was supplemented by geologic logging of drill cuttings made available to the project team before and during work on this project, field reconnaissance of the few outcrops of strata we interpreted to be analogous to subsurface strata, and experience and information the team had gathered during previous work in the Walla Walla Basin.

Suprabasalt sediments found within the Walla Walla Basin consist of continental clastic strata deposited during the Quaternary, before, during, and after Pleistocene Cataclysmic Flooding, and continental clastic strata deposited in the Mio-Pliocene during the waning stages of, and following the end of, Columbia River basalt volcanism. The Quaternary deposits, as mapped for the project, are subdivided into two units, the Quaternary fine unit (silt and fine sand) and the Quaternary coarse unit (uncemented basalt lithic sand and gravel). Of these two units, the fine unit is more widespread and generally consists of Touchet Beds, loess, and fine grained alluvial flood plain deposits. Without good surface geologic mapping, these materials generally are indistinguishable in the subsurface.

The Mio-Pliocene strata (which generally correspond to what R.C. Newcomb originally referred to as the old clay and gravel, of Pleistocene age) are subdivided into three units:

(1) Mio-Pliocene upper coarse unit, (2) Mio-Pliocene fine unit, and (3) Mio-Pliocene basal coarse unit. The upper coarse unit consists predominantly of indurated, weathered, basalt lithic sand and gravel that commonly is red to brown in color. Silt, both as intercalated beds and as matrix, can be locally abundant. The fine unit consists predominantly of weakly indurated siltstone and claystone with minor intercalated sand and gravel. Previously unrecognized felsic-micaceous quartz sand interbedded with micaceous siltstone and claystone forms the basalt coarse unit. The basal unit directly overlies basalt at several locations in the Basin.

The basalt surface that underlies these sediments forms the bottom of the alluvial aquifer system. Mapping this surface for this report reveals a number of discontinuities that seem to project upward into the overlying suprabasalt sediments. Many of these features are interpreted to be faults and folds. In addition to these folds and faults, the basalt surface underlying the basin is found to not be defined by the same basalt unit at all locations. At a minimum we identified three different basalt units, including one previously unrecognized Saddle Mountains Basalt unit, forming the uppermost basalt unit at different locations in the Basin.

The work presented herein provides a consistent, basin-wide physical geologic model of the suprabasalt sediments. It also provides a basis for further subdivision of these strata on a local scale within this consistent basin-wide context. Future work that could build on the insights presented in this report includes development of three-dimensional grid models for use in numerical aquifer modeling, characterization of the hydrologic properties of the different parts of the alluvial system, and better understanding the relationships between surface waters and the different components of the alluvial aquifer system.

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Section 1: INTRODUCTION

Groundwater hosted by valley-filling and basin-filling alluvial sediments is a common target for water supply wells throughout the semi-arid to arid intermontane western United States. These groundwater systems frequently display some degree of hydrologic continuity with surface water found in streams and wetlands. Because these surface waters commonly host threatened and/or endangered species, conflicts between surface water users and managers, groundwater users and managers, and habitat managers can occur. Managing, and better yet avoiding, such conflict between diverse water users and managers in any area relies, in part, on a good understanding of groundwater conditions, of which the geologic framework is a critical basic component. The Walla Walla Basin of southwestern Washington and northeastern Oregon is no stranger to these potential conflicts.

Recognizing the importance of a good understanding of geologic and hydrogeologic conditions to support water management decisions in the Walla Walla Basin (the Basin), the Washington Department of Ecology (Ecology) recently embarked on a series of water management initiatives in the Basin. These initiatives, generally referred to as the Walla Walla WMI (or WMI), are being designed and implemented via a series of partnerships and joint projects with a diverse group of water users, managers, and planners in the Basin. One of these entities, the Walla Walla Basin Watershed Council (WWBWC), has been engaged in both planning and on-the-ground monitoring and test projects focused on improving watershed conditions for the past several years. For the WMI, the WWBWC is building on this work and taking a central role in organizing and collecting basic water resource data for the Basin. One of the joint projects involving the WWBWC focuses on developing a groundwater monitoring network for the Basin. This network, using both purpose built monitoring wells and existing groundwater supply wells, primarily is being used to track water level in the shallow, or more appropriately, the suprabasalt alluvial sediment aquifer system. This aquifer system is found in a sequence of continental clastic sediments overlying basalt bedrock.

The goal of this report is to map and describe the basic, subsurface physical geologic framework of the alluvial aquifer system. This work supports the WWBWC-WMI monitoring effort by providing a consistent, basin-wide, physical framework within which to place monitoring data. This report is based on our knowledge of Neogene sediments in the region, available subsurface and surface data for the Basin, and evaluation of a limited amount of new data compiled from reconnaissance and recently completed well drilling projects. Contents of this report include:

- A summary of the data and information sources used.
- A discussion of the methodology used to evaluate existing and new data and information and construct subsurface geologic maps.
- A review of the basic geologic setting of the suprabasalt alluvial sediment system, the underlying Columbia River basalt, and structural (fold and fault) geology.
- Maps and descriptions of the subsurface alluvial geology of the Basin.

The work described herein provides a basic physical framework for evaluating and monitoring the suprabasalt sediments and the alluvial aquifer system within the Basin.

This report is based on information found in previously written reports, existing geologic maps, our interpretation of subsurface geology based on evaluation of several hundred well logs (both geologist's and driller's), our field reconnaissance, and our logging of drill cuttings acquired from a small number of wells drilled in the Basin that we had access to.

The project team for this report was lead by Dr. Kevin Lindsey L.Hg. and Mr. Terry Tolan, R.G. of GSI Water Solutions, Inc. (GSI), formerly Groundwater Solutions, Inc. They were assisted by Mr. Jon Travis of GSI. Mr. Troy Baker of the WWBWC provided GIS support for the production of the maps included with this report. GSI worked under contract to WWBWC. The WWBWC was funded by Ecology to have this work done under the WMI.

Section 2: GEOGRAPHIC SETTING

The Walla Walla Basin is a topographic depression in southeastern Washington and northeastern Oregon (Figure 1). It has a roughly triangular shape, being bound on the east by the Blue Mountains, the south and southwest by the Horse Heaven Hills, and the north and northwest by the Palouse Slope (Figure 2). The western end of the Basin is bound by Nine Mile Hill.

Major population centers in the Basin are grouped around the cities of Walla Walla, Washington, College Place, Washington, and Milton-Freewater, Oregon in the eastern end of the Basin (Figure 2; Plate 1). Population generally thins to the west across the Basin. The primary small towns in the central to western Basin include Umapine, Oregon and Touchet and Lowden, Washington (all unincorporated). Aside from these urban areas, primary land use in the Basin is agricultural. Irrigated orchards and other irrigated crops, vineyards, grain and grass growing, pea growing, and grazing is common in the eastern Basin. In the western basin similar activity, with the exception of vineyards and orchards is done. Dryland grain farming predominates on the highlands bordering the northern and southern edges of the Basin. Mixed grazing and woodlands are found on the slopes of the Blue Mountains overlooking the eastern Basin.

The Basin is drained by the Walla Walla River and its two primary tributaries, Mill Creek and the Touchet River. Each of these streams originates in the Blue Mountains.

- The Walla Walla River and Mill Creek enter the Basin on its eastern edge, flowing out of the mountains and onto the Basin floor at Milton-Freewater and Walla Walla, respectively.
- The Touchet River flows around the northern perimeter of the Basin before its confluence with the Walla Walla River in the western Basin near Touchet, Washington.
- The Walla Walla River leaves the Basin via a water gap in Nine Mile Hill (the Divide Anticline), before flowing a few miles across the southeastern corner of the Pasco Basin and into the Columbia River just north of Wallula Gap.

A number of smaller perennial to intermittent streams, including spring feed creeks, enter the Walla Walla Basin from the north, south, and east. These include two different Dry Creeks (one in Washington and one in Oregon), Pine Creek, Russell Creek, and Cottonwood Creek.

Section 3: DATA SOURCES AND METHODS

As stated in the introduction, the primary objective of this report is to describe and map the subsurface occurrence and distribution of the major lithostratigraphic units comprising the suprabasalt sediment system that hosts the alluvial aquifer system. This work is based on a variety of data and information sources. This section describes: (1) the types of data and information sources used to evaluate and interpret the suprabasalt sediment sequence within the Walla Walla Basin and (2) methods used in evaluating and interpreting these data and information.

3.1 Data Sources

Aspects of the Basin's geology and hydrogeology are discussed in previously published papers and maps. These publications include both regional studies and work specific to the Basin. As appropriate within this report, these publications are cited and their content and conclusions relevant to suprabasalt sediment geology are discussed. However, because most of the work presented in this report focuses on new interpretations of the subsurface geologic framework of the suprabasalt sediment system, use of primary information and data sources and reevaluation of previously prepared reports and maps was integral to this project.

The primary published information sources used in preparing this report were maps and reports describing basic surface and subsurface geology (Newcomb, 1965; Swanson and others, 1981; Schuster, 1994; Kennedy/Jenks, 2003, 2004a, 2004b). These were used to provide: (1) surface controls on establishing unit occurrence and (2) primary data (usually borehole geologic logs) for interpreting subsurface geology. However, given the nature of the work that went into preparing this report, most of the interpretations presented herein are the results of our reinterpretations of primary, or raw, data and information.

The single largest raw information source used for this project is driller's logs. Driller's logs are written records, typically on a Water Well Report form, filed by well driller's with state agencies. These driller's logs typically describe geologic materials encountered during drilling, water level(s), pumping test results, groundwater temperature, and well construction details. Driller's logs are on-file electronically with the Washington Department of Ecology (Ecology) for Washington and Oregon Water Resources Department (OWRD) for Oregon. Other primary, or raw, data and information sources we used for this report, and which supplemented the driller's logs, include:

- Drill cuttings geologic logs we prepared for a small number of wells and boreholes for which we were able to acquire drill cuttings.
- Outcrop evaluation focusing on field visits to outcrops of suprabasalt sediments analogous to strata thought to occur in the subsurface.
- Dr. Lindsey's post-doctoral research files, which included field notes compiled when conducting work on the Ringold Formation and equivalent units.

3.2 Data Interpretation Methodology

Data interpretation efforts for this project focused on two basic phases. For the first of these, different data sources were evaluated to define and identify suprabasalt sediment units present at any given location. This effort included determining unit identification criteria, and then refinement of those criteria as more was learned during the course of this project. The second of the data interpretation phases focused on interpreting unit distribution across the Basin. This portion of the project essentially involved mapping unit subsurface occurrence and distribution. Methodology employed in each of these phases is described below.

3.2.1 Unit Identification

Stratigraphic control is needed to establish the presence and absence of specific map units with a high degree of certainty. This control typically is provided by detailed data. The control is then used to establish a network of “known points” which provide control data that constrain the stratigraphic interpretation of adjacent locations where available data is less detailed. Stratigraphic control for this project was established using both surface and subsurface data. This section describes the basic methodology by which subsurface and surface stratigraphic control was established and how this control was used to extend interpretations through the subsurface.

3.2.1.1 Surface Control

Given that the suprabasalt sediment units can crop out at the Earth’s surface, existing geologic maps provide a primary source of information for defining stratigraphic control. The main geologic maps used for this project were the Walla Walla 1:100,000 map (Schuster, 1994), the Pendleton 1:250,000 map (Swanson and others, 1981), and the surface geology map produced by Newcomb (1965). These maps were supplemented by our own field reconnaissance and outcrop examination. Using these maps, and our own field work, we determined the presence or absence of suprabasalt sediments and observed basic physical characteristics. This portion of the effort also was used to help establish the shape of the top of basalt surface underlying the suprabasalt sediments by identifying basalt outcrops.

3.2.1.2 Drill Cuttings Geologic Logs

Building on surface controls, information used to provide subsurface control was compiled from: (1) geologic logs of relatively deep (> 200 feet) wells having detailed descriptions of drill cuttings collected during drilling and (2) geologic logs of drill cuttings collected from independently drilled wells before, and during, the project. Before, and during, the project we gained access to drill cuttings collected from 20 wells drilled in the Basin. Ten of these were relatively shallow monitoring wells and 10 were deep water supply wells, several of which penetrate into the basalt. Drill cuttings from an additional 10 water wells were collected, but not logged, as they were judged to be unsuitable for geologic logging. Drill cuttings from the water wells were collected by the well drillers then supplied to us through the OWRD, WWBWC, or in rare cases directly from the driller. Monitoring well cuttings where collected by members of the project team during earlier work on three shallow aquifer recharge test projects, the Hall-Wentland project, Locher Pit project, and the Hudson Bay project. Drill cuttings were geologically logged to identify, to the extent possible given the physical condition of the cuttings, suprabasalt sediment physical properties. The geologic logging process consisted of two main parts: (1) determining the cuttings suitability for geologic logging and (2) geologic logging of suitable cuttings.

Cuttings suitability for geologic logging was established through visual examination. This examination was primarily to determine if: (1) the sand and gravel size fraction (if present) was abundant enough and large enough to be used to confidently identify natural conditions and drilling effects and (2) the mud size fraction was representative of natural geologic conditions encountered during well drilling, or drilling generated fines. Drill cuttings from water wells primarily drilled using cable tool methods, commonly (but not always) were found to be unsuitable for geologic logging because the cuttings consist primarily a mix of sand and granule-sized grit and smaller material in a muddy slurry of fine ground up particles. Geologic logging notes for the drill cuttings samples we were able to log are included in this report in Appendix A.

Drill cuttings samples that were determined to be useful for geologic logging were examined and logged using visual methods. Using the unaided eye, hand lens, and binocular microscope, cuttings samples were examined to identify natural physical properties. Physical properties we attempted to identify included the following:

- Dry color of the sand and mud fraction using the Munsell Color Charts.
- Sand fraction petrology and mineralogy.
- Sand fraction size range.
- Gravel fraction clast petrology, including rock type, size and roundness, and evidence of weathering.
- Presence/absence of cemented matrix material, and if present composition of cementing agents.
- Presence/absence of calcium carbonate.
- Abundance of mud fraction in sample, and if intact fragments present, color and physical structures, if any.
- Relative abundance if the sample of the mud, sand, and gravel fraction with an attempt to differentiate natural sizes from the effects of drilling.

3.2.1.3 Drillers' Logs

Due to the very limited number of quality subsurface control points, the primary source of information used to interpret subsurface suprabasalt sediment conditions for this report was is driller's logs. Although drillers are required to provide these to Ecology in Washington and OWRD in Oregon, the completeness and relative quality of driller's logs vary greatly. The project area for this report covers all or portions of 16 townships (Plate 1). Several thousand drillers' logs were acquired from Ecology and OWRD for this area. However, given the wide variation in quality, not all of these logs were used for this project.

Due to the variation in quality of drillers' logs, a set of selection criteria were developed to identify those logs with data judged to be most useful for interpreting subsurface conditions for the project. The process and selection criteria for identifying drillers' logs to use for the project are summarized below:

1. Drillers' logs were reviewed on a Township by Township basis to eliminate those that (a) did not provide well location information to the quarter-quarter section and/or street address for the well, (b) contained no, or very generalized, geologic information, and/or (c) did not fully penetrate the suprabasalt sediment section. Of the several thousand driller's logs obtained from WADOE and OWRD approximately 950 were selected for further use with these criteria.
2. As stated earlier, the quality of geologic descriptions/information on the logs varied greatly. For example, descriptions might simply state: "Dirt from 0 ft to100 ft. From this type of description, one can derive only the thickness of undifferentiated suprabasalt sediments and not the nature or thicknesses of units penetrated. These logs were used only to map the top of basalt. Drillers' logs with more detailed descriptions (e.g., rock/sediment type, color changes, textural changes, drilling rate changes, water-producing zones – all important interpretative clues) were sorted by section number for use in interpreting subsurface geologic conditions. Stratigraphic unit identification and

unit contact depths we interpreted from drillers' logs are based on a combination of criteria including the following:

   a. Mapped surface geology at the well location.
   b. Correlations with the nearest stratigraphic control points.
   c. Knowledge of the overall areal distribution and thickness of stratigraphic units and the likelihood of their presence at the well site.
   d. The team's knowledge of and experience in suprabasalt sediment geology.

3. The approximately 950 drillers' logs that passed the screening criteria described above were each assigned a unique identification number based upon the county in which they are located. Log identification numbers for wells in Walla Walla County begin with a WW. The Walla Walla County logs were numbered sequentially, starting from 0001. Umatilla County well logs were numbered using the UMAT code number assigned by OWRD with UMAT being replaced by U. Several other unique prefixes were used for monitoring wells drilled for shallow aquifer recharge test projects. These are HW for the Hall-Wentland Project and L for the Locher Road project.
4. For this project most wells were located using information taken off the driller's logs. This location information included:
   a. At a minimum the quarter-quarter section.
   b. Also, we used nearest street address, a location map, or directions, when provided, to perform a check on the section location and if possible, better refine the well location.
   c. If direct knowledge of a well location was available, through a team members personal information and/or surveyed coordinates, we used this information instead of the drillers location or street address
5. Each driller's log selected for interpretation was plotted on a 7.5 minute topographic map using TOPO© to get its UTM NAD83 Oregon Mercator coordinates. These coordinates were then plotted on a 10 meter digital elevation model (DEM) to get the DEM surface elevation at the location the driller's log was assigned.

For this project it was assumed for each driller's log used to make subsurface interpretations, that the location identified on the driller's log is correct. However, when contour maps for stratigraphic unit tops were generated, location errors could manifest themselves as anomalous highs and/or lows (a bulls-eye pattern within the contours). When this happened, the location(s) of the well(s) responsible for producing such anomalies was reexamined in an attempt to determine if it was correctly or incorrectly located. In addition, if anomalous unit distributions were suggested after maps were initially compiled, mapped surface geology and the geology of the nearest subsurface stratigraphic control point was rechecked against our geologic interpretation of the problem driller's log(s) to try to validate interpreted subsurface stratigraphy. If our earlier geologic interpretation of the driller's log could not be reconciled with outcrop and subsurface control point geology, a location error was assumed and the log was removed from the database. The final results of the stratigraphic interpretation for each numbered well used to generate our interpretations of unit distribution are summarized in Appendix B. Appendix B includes top of basalt elevation and structure-contour top and isopach (thickness) data for mapped suprabasalt sediment units. Where units are absent, isopach data was set to zero. In addition, well construction, test pumping, and water level data as reported on well logs was compiled for each geologically interpreted well. Plate 1 shows the distribution of geologically interpreted wells used in this project.

Using the methodology described above, we defined five suprabasalt sediment lithostratigraphic units for mapping for this project. These units are listed below and discussed in detail in Section 5.0 of this report. The mapped units are:

- Quaternary fine unit
- Quaternary coarse unit
- Mio-Pliocene upper coarse unit
- Mio-Pliocene fine unit
- Mio-Pliocene basal coarse unit

3.3 Methodology for Creating Subsurface Maps

This section describes the methodology used in creating the three types of maps included with this report, structure contour, isopach, and facies maps. Structure contour maps are contour maps of a specific geologic surface. For this report the structure-contour maps produced were for the tops of units. Isopach maps are contour maps showing the thickness of a defined geologic unit. Facies maps come in several forms. For this project we constructed facies maps showing the relative abundance of coarse (sand and gravel) or fine (silt and clay) strata interpreted to comprise a given mapped unit.

The structure contour maps produced for this project were built as GIS compatible shapefiles. These shapefiles include folds and faults we interpret to influence subsurface suprabasalt sediment geology. These maps provide a relatively detailed interpretation of mapped unit distribution in the subsurface beneath the Basin. The isopach and facies maps where produced to identify basic trends and not provide detailed coverage. As will be described below, shapefiles were not produced for the isopach and facies maps.

3.3.1 Structure Contour Maps

The first layer mapped was the Quaternary fine unit (see Section 5 of this report for descriptions of mapped units). The top of this unit corresponds to the land surface (as represented in the project area by the DEM). The extent of the unit was mapped as follows:

1. GIS generated 1:50,000 scale maps where printed on paper for the unit. These maps showed locations of wells used to interpret unit presence and extent.
2. An outcrop polygon for the unit was then constructed using geologic maps and subsurface interpretations shown in Appendix B. The outcrop map was drawn on the Mylar overlay registered to the 1:50,000 map. The registration marks on the mylar map georeferenced it to the GIS coverage used for the project.
3. The registered Mylar overlays were scanned and TIFF files produced from the scanned image. The TIFF files were converted into a GIS layer which was checked for scanning errors. Errors (if found) were corrected, and the TIFF file edited. The edited TIFF file then was converted to a GIS shape file showing the interpreted extent of the unit.
4. Finally, within the interpreted extent for the Quaternary fine unit, the top of the unit was set to match the DEM since this unit is interpreted to be at the Earth’s surface, not buried.

For the other units, Quaternary coarse, Mio-Pliocene upper coarse, Mio-Pliocene fine, and Mio-Pliocene basal coarse (see Section 5 of this report for descriptions of mapped units), structure contour maps were produced as follows:

1. GIS generated 1:50,000 scale maps for each unit were printed on paper. These maps showed the location of all wells used to interpret unit extent and the interpreted elevation of the top of the unit at each well (if the unit present).
2. For each unit two sets of Mylar overlays were registered to the 1:50,000 maps. These Mylar overlays were used as follows:
    a. On one set unit extent was drawn. The extent, or unit boundary, was interpreted from outcrop extent, interpreted well data, and topography.
    b. On the second set of Mylar overlays structure contours for the top of each unit were drawn. Structure contours were interpreted from outcrop extent, interpreted well data, the DEM, and the structure contour maps of any overlying unit(s). Structure contours where only drawn where a unit was interpreted to be present.
3. The surface maps were superimposed to check against each other to make sure underlying layers did not extend above an overlying layer. Where this was found to occur, edits were made to correct the problem. These edits consisted of shifting line positions to correct relative positions.
4. The Mylar maps were then scanned and TIFF files produced, one for the extent of the unit and one for the contours. The images were georeferenced and converted into GIS coverage. The coverage was edited for final production of GIS shape files.

A top of basalt map also was prepared for this report. The top of basalt map was drawn, edited, and modified for this project using the following steps:

1. GIS generated 1:50,000 scale maps were printed on paper. These maps showed the locations of wells for which we were able to interpret the top of basalt elevation and the top-of-basalt data. On these maps generalized basalt outcrop polygons interpreted from existing maps and well logs and top of basalt structure contours were drawn.
2. Two mylar overlays, one for top of basalt and one for basalt outcrops, were registered to the 1:50,000 maps. Top-of-basalt structure contours were hand drawn on the Mylar overlays. Structure contours were interpreted from well data, outcrop polygons, and the DEM. Where basalt is shown to crop out on geologic maps, top-of-basalt was set to match the DEM.
3. The Mylar maps were then scanned and TIFF files produced. The images were georeferenced and converted into GIS coverage. This coverage was cleaned up to produce the final GIS shape files.

3.3.2 Isopach maps

Isopach (thickness) maps were prepared for several suprabasalt sediment units. The purpose of these maps were to evaluate general thickness trends. The isopach maps prepared for this report were constructed using a Kriging grid algorithm in Surfer®. Each isopach grid was calculated from the raw thickness data compiled for geologically interpreted well logs used in the project. These isopach grids are limited by the fact that they are calculated independent of the elevations of the upper and lower bounding surfaces defining each unit. Therefore, thicknesses calculated using this methodology can be, at least locally, more or less than the difference (thickness) that would be calculated by subtracting bounding surface grids using gridmath. This can generate isopach maps that are not completely representative of actual unit thickness. Therefore, they are only used in this report to evaluate general thickness trends.

3.3.3 Facies Maps

Facies maps portray the distribution of sediment types (or facies) within a geologic unit and they can provide a visual representation of heterogeneity within a unit. Such maps can be constructed in several ways. One is to determine the distribution of sediment types defined on the basis of depositional interpretations (e.g. river channel sand versus overbank silt/clay) and map that distribution. Such a map illustrates areas where the unit consists predominantly of a certain type of deposit versus another. Another way to construct facies maps is to determine the relative percentage of a unit that consists of specific lithologies such as, clay, silt, sand, and gravel. This type of facies map was complied for several of the units mapped for this project.

Facies maps are prepared for two of the three Mio-Pliocene units (upper coarse and fine). Facies changes in these units are manifest as spatial changes in the relative proportion of coarse lithologies (sand and gravel) versus fine lithologies (silt/clay or mud) comprising a unit as interpreted from well logs. Facies changes in the Quaternary units were not mapped because these units consist predominantly of a single lithology and show little variation that is discernible from well logs across the project area.

For this project we identified two basic lithologies for each unit, coarse (gravel and sand) and fine (silt, clay, and/or mud), and calculated the relative percentage of each comprising the unit in wells which fully penetrate the unit. An example of this is as follows:

- In a given well the log indicates a unit is fully penetrated and the total thickness of the unit is 145 feet.
- Of this 145 foot thickness, 93 feet is reported on the log to be gravelly, 31 feet sandy, and 21 feet silty/clayey.
- These lithogic thicknesses are converted to their percentage of total unit thickness, resulting in 85% gravel plus sand (coarse) and 15% silt/clay(fine) for the unit at that point.

The resulting coarse/fine percentages are then contoured by first building a grid of the percent data using a Kriging algorithm in Surfer®. This grid was than contoured at 10 percent intervals and the contours were plotted on a map of the project area. The facies distributions shown on these maps are clipped so that percent data is only shown for those areas the unit is inferred to occur in. Percent facies data is compiled in Appendix C. These maps provide an illustration of overall lithologic variability within a unit. However, these maps are limited in that they do not portray the stratigraphic position of specific lithologies within a unit.

Section 4: GEOLOGIC SETTING

The Walla Walla Basin is a structural basin bounded by basalt cored structural uplifts. These uplifts include the Blue Mountains on the east, the Horse Heaven Hills on the south, the Palouse Slope on the north, and the Divide Anticline on the west. The same Columbia River basalt units found on these highlands (Swanson and others, 1981; Schuster, 1994) occur beneath the Basin where they are covered by Miocene (?) to Recent sedimentary strata which can by many of hundreds of feet thick. These sedimentary strata, the suprabasalt sediments, record a history of basin subsidence and uplift of the surrounding highlands, river and flood plain deposition, and soil formation and wind deposition (Newcomb, 1965; Fecht and others, 1987; Lindsey, 1996; Lindsey and Tolan, 2004). The suprabasalt sediments overlie an irregular basalt surface which is the product of basin subsidence, highland uplift along faults and folds bounding the Basin, and emplacement of Columbia River basalt flows, some of which only partially covered the Basin.

The next section describes the suprabasalt sediment units within the Basin. Following sections review basic Columbia River basalt geology and structural geology of the Basin. For the remainder of this report the sedimentary strata found within the Basin overlying basalt are referred to as the suprabasalt sediments. The aquifer system found within some, or all, of the suprabasalt sequence is referred to herein as the alluvial aquifer system.

4.1 Suprabasalt Sediments

Studying the suprabasalt sediments filling the Walla Walla Basin is hampered by the lack of formal descriptions for the majority of these strata, especially those hosting the bulk of the alluvial aquifer system. Without these formal descriptions there is no systematic guide to use in identifying and mapping most of the suprabasalt sediment strata filling the Basin. The only exceptions to this are the two primary surface units, Touchet Beds and Palouse Formation, which while widespread rarely host groundwater. Regardless of the general lack of formal unit descriptions and given the purpose of this project - map the subsurface suprabasalt sediment geologic framework of the alluvial aquifer system - it is desirable to identify and map, to the extent possible given available information, the primary suprabasalt sediment lithostratigraphic units hosting the alluvial aquifer system.

Given the lack of a formal context for describing the suprabasalt sediment sequence filling the Basin, this section reviews the historical context by which these sediments have been mapped and described in the past. Working within this historical context, this review sets the basis for identifying the units we map for this project, including the criteria used to recognize them, relationships between the units we mapped, and the traditional, or historical, view of the alluvial sediments within the Basin.

4.1.1 Oldest Sediments: Old Gravel and Clay

Newcomb (1965) described a thick (500 to 800 feet) sequence of gravel and clay-dominated strata filling most of the Basin, and lying directly atop Columbia River basalt. On driller’s logs the clay portion of the section generally is referred to as blue, green, and gray clay. Newcomb generally described the old gravel as a gravel-dominated sequence consisting predominantly of well rounded, undecomposed, basaltic gravel with a well consolidated sand and silt matrix (Newcomb, 1965). Newcomb generally has the gravel dominated sequence being thickest and most widespread in the eastern portion of the Basin, grading westward into more clay-rich strata. In addition, Newcomb generally has the old clay directly overlying basalt across most of the Basin, therefore the old gravel only is found directly atop basalt around the edge of the Basin. Although Newcomb does not directly indicate this, the basic stratigraphic relationship he suggests generally has been interpreted by subsequent investigators to be old gravel overlying old clay.

Because the old clay has not been found in outcrop its physical characteristics are not well understood. The few drill cuttings samples we have seen which we interpret as being from strata Newcomb described as old clay, suggests these strata may range from massive to well stratified, weakly indurated claystone and siltstone. In addition, our observations (Appendix A), and driller's logs for many recently drilled wells, suggest these claystones and siltstones commonly contain interstratified sand and gravel intervals. In the eastern part of the Basin we have found that some of these sandy intervals consist predominantly of quartz, feldspar, and white mica interstratified within the lower part of this mudstone-claystone dominated sequence and directly overlying basalt. Figure 3 shows geologically logged drill cuttings displaying this felsic petrology. Felsic, micaceous quartz sand also is found directly overlying basalt in a road cut on the northern edge of the Basin on Sudbury Road (Figure 4). Sand from this outcrop (Lindsey and Tolan, 2004), and the geologically drill cuttings noted above, is similar to the Mio-Pliocene Ringold Formation (as described by Lindsey, 1996) which is exposed to the west, in the Pasco Basin.

Small outcrops of indurated gravel with, and without, interfingering fines and a sandy to silty matrix are found in many areas around the edge of the Basin and mapped as Quaternary to Miocene gravel and conglomerate (Schuster, 1994). Based on our examination of these outcrops we find these strata contain a high proportion of basalt clasts with weathering rinds, they commonly are stained a red-brown to yellow-brown color (although this is not diagnostic), and they are indurated enough to hold up steep faces and banks in outcrop. These strata also tend to be fairly tightly packed forming a largely clast-supported material. On driller's logs, strata we interpret to be equivalent to Newcomb's old gravel commonly are described as cemented, brown, and/or muddy (clay and gravel). These outcrops rarely are extensive enough to display much bedding, but what can be seen suggests generally west directed imbrication, and bedforms suggestive of gravelly cut-and-fill structures (channels?) and cross-bedding.

Newcomb (1965) originally placed a Pleistocene age (less than 2 million years old) on the old gravel and clay and suggested its stratigraphic correlation to the Ringold Formation found in the Pasco Basin (west of the Walla Walla Basin). The Ringold Formation is a sequence of continental clastic sediments (Fecht and others, 1987; USDOE, 1988; Smith and others, 1989; Lindsey, 1996) directly overlying many of the same Columbia River basalt units found underlying the old gravel and clay of the Walla Walla Basin (Schuster, 1994). The Ringold Formation, as summarized by Fecht and others (1987), Smith and others (1989), and Lindsey (1996), is Miocene to late Pliocene in age, making it approximately 10.5 to 3 million years old. Given that the old gravel and clay of the Walla Walla Basin: (1) overlies the same basic Columbia River basalt rocks as the Ringold Formation does, (2) is found in the same basic regional geologic context as the Ringold Formation, and (3) contains, at least locally, similar lithologies we infer that the old gravel and clay of the Walla Walla Basin generally is age equivalent to the Ringold Formation, giving these strata a Mio-Pliocene age of approximately 10.5 to 3 million years old.

4.1.2 Loess and Terrace Deposits of the Quaternary

Newcomb (1965) describes several fine grained, silt and clay rich units, overlying the old clay and gravel across much of the Basin. More recent geologic maps of the Basin (Schuster, 1994) combine several of these into a smaller number of units. In general stratigraphic order, Newcomb's fine units, and their current map designations are as follows:

- Loess - Pleistocene loess (also called the Palouse Formation) consists of eolian (wind-deposited), massive to poorly stratified silt and very fine sand deposits that display evidence of pedogenic (soil forming) modification (Busacca and MacDonald, 1994). Newcomb (1965) generally described this unit as massive, well compacted clayey silt (or loess) containing irregular, thin caliche layers. Pedogenic calcium carbonate may also be found in these loess deposits. Palouse Formation loess can range from less than 1 foot to several tens of feet-thick in the area (Newcomb, 1965). These loess deposits are thought to range from greater than 50,000 years old to less than 10,000 years old, making loess older than, age-equivalent to, and younger than the Touchet Beds. In roadcuts around the Basin, loess generally appears to consist of multiple, superimposed paleosols, and includes poorly to well developed calcrete. From our examination of outcrops of these materials, we generally see massive to poorly developed thickly bedded silt and clayey silt displaying a variety of pedogenic (soil) structures, including blocky peds, root and burrow casts, and a variable caliche (calcium carbonate) over print. Schuster (1994) maps these strata simply as Quaternary loess.
- Deposits of the upper valley terraces – These strata generally are described by Newcomb (1965) as reworked loess (Palouse Formation) forming terraces generally around the higher portions of the edge of the Basin. In places, these deposits contain variable amounts of basalt rubble. Newcomb indicates upper valley terrace deposits are younger than the Palouse Formation. On Schuster's map (Schuster, 1994) these strata are shown as Quaternary loess, and less frequently as Quaternary alluvium.

4.1.3 Youngest Sediments: Touchet Beds, Loess, and Recent Alluvium

Following the basic sediment stratigraphy described by Newcomb (1965) the youngest sediments found in the Basin include Touchet Beds, young loess, and gravelly alluvial deposits related to the modern (or Recent) streams.

The Touchet Beds mapped by Newcomb (1965) and described by subsequent investigators (Baker and others, 1991; Kiver and others, 1989; Waitt, 1980; Waitt and others, 1994) consist of well stratified, normally graded sand and silt deposited by Pleistocene Cataclysmic Flood waters that repeatedly inundated the Basin between approximately 1,000,000 and 12,000 years ago. Sand and silt deposited in the Walla Walla Basin by these flood waters consist of well stratified, normally graded, interbedded felsic silt and felsic to basaltic fine to medium sand. Finer grained layers tend to be brown to tan colored, coarser layers brown to gray-brown colored. Individual beds (or layers) range from a few inches to less than 3 feet-thick. These strata do not commonly display significant cementing, although some pedogenic calcium carbonate (caliche or hardpan) can be present. A range of soft-sediment deformation features and cross-cutting clastic dikes are commonly found in this unit (Fecht and others, 1999). Newcomb describes these strata as overlying the Palouse Formation and the upper terrace deposits. Touchet Beds are found on the hills surrounding the Basin and they comprise the small hills found across the Basin floor. On Schuster's map (Schuster, 1994) the Touchet beds are mapped as Quaternary flood sediments.

Wind deposited, gray colored, sandy silt and fine sand referred to by Newcomb (1965) as young loess, is described by Newcomb as mantling the surface of much of the Basin and surrounding hills. Newcomb generally characterized this material as reworked Palouse Formation and

Touchet Beds less than 10 feet thick. Schuster (1994) does not map this unit. Based on field reconnaissance, we infer that young loess generally corresponds to the many of the modern surface soils as shown on soil survey maps. Soils in the Walla Walla Basin range from silt loams, to gravelly and cobbly loams, to bedrock land. The basic characteristics are discussed here.

- Bedrock areas generally are restricted to the periphery of the Basin where stream erosion has stripped away the thin sediment cover overlying shallow basalt bedrock that has been uplifted to near the Earth's surface. Bedrock soils are found in gullies, ravines, and stream valleys incised into these upland areas and across the upland surfaces themselves.
- Gravelly to cobbly soils, usually part of the Yakima series, generally are found in elongate tracts associated with major streams, including most notably Mill Creek, the Little Walla Walla system, and the main channel of the Walla Walla River. This soil generally is the result of Recent (<10,000 years old) stream deposition and essentially delineates the position of geologically young stream meander belts and braidplains associated with the modern (<10,000 year old) drainage.
- A number of silt loam and related soils cover all of the upland areas and much of the Walla Walla valley floor. These soils include numerous subtypes in the Athena, Catherine, Hermiston, Onyx, Walla Walla, and Yakima series. On the valley floor these soils are generally a few feet thick and superimposed on fines a few feet to tens of feet (<25) thick. In upland areas these soils my be superimposed on multiple older soils.

Gravel and sand, with and without intercalated fines, deposited in and by the modern streams crossing the Basin is mapped by both Newcomb (1965) and Schuster (1994) as Quaternary young alluvium and Quaternary alluvium, respectively. Generally, the cleaner gravel and sand alluvial deposits are found in the southern and eastern Basin where the Walla Walla River, and Mill Creek, respectively leave the highlands. In the central and western Basin the alluvial deposits generally are silty, and in many areas may consist predominantly of reworked Touchet Beds and loess (of various ages). These reworked deposits can consist of discontinuous deposits of clay, silt, and fine sand are found on portions of the valley floor across the Basin. These areas are related to the main stem of the within the Walla Walla River and its tributaries. These fine grained deposits are inferred to be locally derived loess and flood deposits which are eroded off upland areas and deposited into the drainages that cross cut the area. As such, these strata form what are essentially flood plain areas along the modern stream courses. Except where good outcrops occur, displaying bedding features and lithology, these strata are generally indistinguishable from the parent materials. The variable thickness is inferred to be the result of both stream erosion removing previously deposited material and localized deposition in areas where flood plain conditions predominated in the geologic past.

4.2 Columbia River Basalt Group (CRBG)

Although not the primary focus of this project, a brief introduction to the CRBG is provided here because it does host the single largest aquifer system in the region, the nature of its relationship with the suparabasalt sediments and alluvial aquifer system is important to future work in the Basin. An understanding of the CRBG is central to understanding the geologic setting of the Basin, including the folds and faults that play a role in suprabasalt sediment distribution and properties.

4.2.1 Regional

Collectively the CRBG consists of a thick sequence of more than 300 continental tholeiitic flood basalt flows that cover an area of more than 200,000 km^2 in Washington, Oregon, and western Idaho (Camp and others, 2003). The total estimated CRBG volume is greater than 234,000 km^3 (Camp and others, 2003) with the maximum thickness of over 3.2 km occurring in the Pasco Basin area based on geophysical and deep hydrocarbon exploration well data (Reidel and others, 1989a, 1989b). The CRBG underlies the entire Walla Walla Basin and is estimated to range from 1 to greater than 1.5 km-thick beneath the this area.

CRBG flows were erupted during a period from about 17 to 6 Ma from long (10 to >50 km), north-northwest-trending linear fissure systems located in eastern Washington, northeastern Oregon, and western Idaho. Although CRBG eruptive activity spanned an 11 million year period, most (>96 volume %) of the CRBG flows were emplaced over a 2.5 million year period from 17 to 14.5 Ma (Swanson and others, 1979; Tolan and others, 1989). When erupted, CRBG basalt flows generally flowed from east to west across a generally flat to gently rolling topography, with each successive basalt flow commonly burying much of the preexisting topography. Prior to 14.5 Ma this topographic surface was generally covered by poorly integrated stream drainages and interconnected lakes. Following 14.5 Ma stream drainages were generally well established with discreet river channels and canyons forming.

The CRBG has been divided into a host of regionally mappable units (Figure 5) based on variations in physical, chemical, and paleomagnetic properties - in regard to stratigraphic position - that exist between flows and packets of flows (Swanson and others, 1981; Beeson and others, 1985; Reidel and others, 1989b). The CRBG underlying the Basin is divided into three formations. These formations are, from youngest to oldest, the Saddle Mountains Basalt, Wanapum Basalt, and Grande Ronde Basalt (Swanson and others, 1981). These formations are further subdivided into members defined, as are the formations, on the basis of a combination of unique physical, geochemical, and paleomagnetic characteristics. These members can be, and often are, further subdivided into flow units (e.g., Beeson and others, 1985).

4.2.2 CRBG Physical Characteristics

CRBG units consist predominantly of flood basalt flows. These types of basalt flows have similar physical features throughout their mapped extent, all displaying a typical three-tier subdivision. These physical characteristics, summarized in the following paragraphs, are common to the vast majority of the 300+ basalt flows that comprise the CRBG. Examination of vertical exposures through CRBG flows reveal that they all exhibit the same basic three-part internal arrangement of features. These features, termed intraflow structures, (Figure 6) originated during the emplacement and cooling of the lava flow. Intraflow structures, referred to as the flow top (Figure 7), flow interior (Figure 8), and flow bottom (Figure 7), are summarized below:

- Flow tops commonly consist of glassy to very fine-grained basalt that is riddled with numerous spherical and elongate voids (vesicles), giving this portion of the flow the appearance of a sponge. CRBG flow tops can display a wide range of variation in both their physical character and thickness (USDOE, 1988). The physical character of a flow tops fall between two basic end-members: 1) simple vesicular flow top and 2) flow top breccia. Simple vesicular flow tops consist of glassy to fine-grained basalt that displays a rapid increase in the density of vesicles near the top of the flow (USDOE, 1988; McMillan and others, 1989). Vesicles may be isolated or interconnected, resulting respectively in lower and higher permeability and porosity (USDOE, 1988). Flow top breccia consists of angular, scoriaceous to vesicular fragments of basaltic rubble that lie above a zone of non-fragmented, vesicular basalt. Flow top breccias can be very thick, laterally extensive over the entire aerial extent of a given flow, and in some cases comprise half the entire thickness of the flow (USDOE, 1988).

- CRBG flow interiors typically consist of dense, non-vesicular, glassy to crystalline basalt that contains numerous contraction joints (cooling joints) that formed when the lava shrank as it solidified. CRBG cooling joints often form regular patterns or styles, with the two most common being termed: 1) entablature/colonnade and 2) columnar-blocky jointing. A columnar-blocky jointed basalt flow typically consists of vertically oriented, relatively well-formed to poorly formed, polygonal columns that can range from 1 to >10ft (0.5 to >3 m) in diameter. The vertical columns are often cut by horizontal to sub-horizontal joints. Entablature/colonnade jointed basalt flows display a more complex pattern. The majority of such flows display a pattern of numerous, rather irregular jointed small columns to apparently random oriented joints, called the entablature. This entablature generally overlies a thinner zone displaying well-developed columnar jointing and referred to as the colonnade. The transition zone between the two is very narrow, commonly less than an inch in width. Studies on the nature and characteristics of cooling joints within the CRBG (USDOE, 1988; Lindbergh, 1989) have found that undisturbed joints are narrow, averaging 0.009 inches (0.23 mm) wide, and that there is no difference in joint widths between entablature and columnar-blocky jointing despite the extreme difference in their appearance. These studies also found that joints are typically 77% to +99% filled with secondary minerals (clay, silica, zeolite) and open spaces (voids) that do occur are not well connected.
- Flow bottom physical characteristics are largely dependant on the paleoenvironmental conditions the molten lava encountered as it flowed across the Earth's surface. If the lava flow encountered relatively dry ground conditions, the flow bottom typically consists of a narrow (<3 foot thick) zone of sparsely vesicular, glassy to very fine-grained basalt. This type of flow bottom structure is very common within the CRBG. However, if advancing flows encountered lakes, rivers, and areas of water-saturated, unconsolidated sediments more complex flow bottom structures formed (Swanson and others, 1979; USDOE, 1988). One of the most common flow bottom structures is the pillow lava complex which forms when lava flows into standing water (lake). Flow bottom structures can be either highly localized to wide-spread.

The combination of a flow top of one flow and the flow bottom of the overlying flow is commonly referred to as the interflow zone (Figure 7). Individual interflow zones are laterally extensive, commonly extending as far as the flows which they separate.

4.2.3 CRBG Stratigraphy

Regional-scale and reconnaissance geologic mapping of the CRBG units exposed in the uplands around the Basin has been done by Kienle (1980), Swanson and others (1981), and Schuster (1994). Only limited detailed outcrop-scale mapping conducted for structural geology/tectonics studies of specific faults is available for the project area (e.g., Kienle, 1980; Farooqui and Thoms, 1980; Mann and Meyer, 1993). Systematic subsurface mapping of CRBG units is even less widespread than surface mapping.

Previous work that provides some information on the CRBG subsurface stratigraphy in the vicinity of the Basin includes:

- Newcomb (1965, Plate 2) prepared a basin-scale, structure-contour map of the top of the CRBG (“top of basalt” map) based on available water well logs.
- Bush and others (1973) geochemically analyzed drilling cuttings from a deep test-observation well constructed jointly by the Washington State Department of Ecology and the U.S. Geological Survey west of Locher Road (NE1/4 section 18, T6N, R35E). The well encountered the top of the CRBG at approximately 710 feet below ground surface and penetrated approximately 598 feet of CRBG. Based on the geochemistry they obtained, Bush and others (1973) concluded that the well penetrated approximately 120 feet of Saddle Mountains Basalt (Umatilla Member and unidentified younger flows), 478 feet of Wanapum Basalt (Priest Rapids and Frenchman Springs Members), and did not penetrate the top of the Grande Ronde Basalt.
- Kienle (1980, Figure 6) constructed a north-south geologic cross-section from north of Mill Creek to south of Cottonwood Creek. This cross-section used Newcomb’s (1965) water well driller’s logs and top of CRBG map for baseline control and projected CRBG unit thicknesses from his mapping of the adjacent upland areas. Kienle (1980) identified the Wanapum Basalt (Frenchman Springs and Eckler Mountain Member – undifferentiated) as the youngest CRBG formation beneath eastern portion of the Basin. He also depicted the Wanapum Basalt increasing slightly in thickness from north (approximately 320 feet-thick) to south (approximately 370 feet-thick).
- CH2M HILL (1997, 1999), as part of their aquifer storage and recovery project for the City of Walla Walla, prepared a subsurface geologic assessment of the Mill Creek area. Based on their analysis of existing geologic mapping, water well drillers logs, and downhole video logs they concluded that the Wanapum Basalt to be greater than 800 feet-thick beneath this area.

One will note that there is a marked disagreement in the interpreted thickness of the Wanapum Basalt beneath the Mill Creek area between Kienle (1980, Figure 6) and CH2M HILL (1999, Figure 3-5). This probably is due to the fact that neither study had sufficient subsurface stratigraphic control to definitively establish CRBG unit identifications and thicknesses beneath this area. Developing definitive subsurface stratigraphic control for the CRBG is done by logging and systematically analyzing collected drill-cuttings. Such logging allows identification of unit thickness and type and thickness of intraflow structures within individual flows. An additional benefit of establishing these subsurface stratigraphic “control points” is that they can be used to help interpret driller’s logs for other existing wells in the immediate vicinity of the stratigraphic control points.

Systematically collected CRBG drill-cuttings from wells within the Basin are relatively rare. The team has previously logged and systematically analyzed CRBG drill-cuttings collected from several new water wells that have been drilled in the southern portion of the Basin in Oregon. With regards to this project, relevant stratigraphic findings from these wells include:

- Geochemical analyses of drill-cuttings from these stratigraphic control point wells confirm Bush and others’s (1973) interpretation that members of the Saddle Mountains Basalt are present in the Basin. The Saddle Mountains Basalt section in stratigraphic control point wells ranges from 180 feet to greater than 550 feet in thickness and can consist of from 1 to more than 5 individual flow units.
- The Frenchman Springs Member and Eckler Mountain Member of the Wanapum Basalt are confirmed to be present in the Basin. Frenchman Springs units identified to date include the basalt of Sentinel Gap, basalt of Silver Falls, and the basalt of Ginkgo.

Eckler Mountain units identified to date include the basalt of Dodge and basalt of Lookingglass. The Wanapum Basalt in much of the Basin exceeds 600 feet in thickness.

- Comparing the CRBG stratigraphy seen in control wells to available geologic maps indicates the pinch-out and thinning of the Saddle Mountains and Wanapum Basalts sections from within the Basin (stratigraphic control point wells) to the adjacent upland areas supports Kienle's (1980) interpretation that the Basin existed and was continuing to subside during Wanapum and Saddle Mountains time (15.5 to 6 Ma). This suggests that CRBG unit stratigraphy changes significantly from the Basin's center to its uplands. The locations of where CRBG units may pinch-out are unknown, but are inferred to likely coincide with the locations of the major Basin-defining structures (faults and folds).

Based on our work, and previous mapping, CRBG units known in occur in the Basin include, from the top down:

- A new informal unit, the Walla Walla member of the Saddle Mountains Basalt. This member is subdivided into two informal subunits, the basalt of Birch Creek and the basalt of Spofford.
- Ice Harbor Member, Saddle Mountains Basalt.
- Buford Member, Saddle Mountains Basalt.
- Umatilla Member, Saddle Mountains Basalt.
- Frenchman Springs Member, Wanapum Basalt. This member is further subdivided into the Basalt of Sentinel Gap, Basalt of Sand Hollow, Basalt of Silver Falls, and Basalt of Ginkgo.
- Eckler Mountain Member, Wanapum Basalt, which is further subdivided into the Basalt of Lookinglass and the Basalt of Dodge.
- Sentinel Bluffs Member, Grande Ronde Basalt.
- Winter Water Member, Grande Ronde Basalt
- Ortley Member, Grande Ronde Basalt
- Additional, yet to be identified members of the Grande Ronde Basalt.

4.3 Structural Geology

The Walla Walla Basin is a triangular-shaped structural basin that is bounded on the south (Horse Heaven Hills - Wallula Fault zone) and east (Hite Fault system – Blue Mountains) by major regional fault systems and to the north by the Palouse Slope which dips to the southwest into the Basin (Newcomb, 1965; Kienle, 1980; Swanson and others, 1981; USDOE, 1988) (Figure 9). The western end of the Basin is defined by the Divide Anticline (Newcomb, 1965) which separates this Basin from the Pasco Basin (Figure 2). The CRBG units that crop out around the edge of the Basin on the Horse Heaven Hills and Blue Mountains are down dropped across these bounding faults and form the "bedrock basement" beneath the Basin's sedimentary fill. Many of the faults, and associated folds, found on the southern and eastern edge of the Basin are inferred to extend beneath the Basin (Newcomb, 1965; Kienle, 1980; Swanson and others, 1981).

Geologic evidence indicates that the Basin began to form by at least Miocene time (approximately 16 million years ago) and has continued to develop to the present day (Kienle, 1980; USDOE, 1988). There is both geologic and seismic data indicating that the Walla Walla Basin is tectonically active (Kienle, 1980; WPPSS, 1981; USDOE, 1988; Mann and Meyer, 1993). Several locations in, and around, the Basin have been found where faults are thought to displace Quaternary-age sedimentary deposits (Shannon and Wilson, Inc. 1973; Kienle, 1980; WPPSS, 1981; USDOE, 1988; Mann and Meyer, 1993). Seismic activity, including small magnitude events apparently related to both the Wallula Fault zone and Hite Fault System (just east of the project area), indicate these structures are still active (USDOE, 1988; Mann and Meyer, 1993). In fact the largest, instrumentally recorded, earthquake to occur within the Columbia Plateau region was the M_s 6.1 July 1936 Milton-Freewater Earthquake (WCC, 1980; USDOE, 1988). The estimated location of the epicenter for this earthquake is placed at 46^o 12.3' North, 118^o 14.0' West which is approximately 7 miles northwest of the City of Walla Walla in the Spring Valley area (WWC, 1980).

Previous studies of the Hite and Wallula Fault systems (Kienle, 1980; WPPSS, 1981; USDOE, 1988; Mann and Meyer, 1993) have found that both fault systems display evidence of extensive strike-slip movement. For the Hite Fault system this movement is sinistral (left-lateral) oblique-slip, while the Wallula Fault system movement is dextral (right-lateral) oblique-slip. The interaction between these regional-scale structures is thought to have created the conditions that allowed the Walla Walla structural basin (a “pull-apart basin”) to form (Kienle, 1980; WPPSS, 1981; USDOE, 1988). This process of basin formation would also result in the development of numerous subsidiary faults and folds. Given the local tectonic regime within the Basin, localized areas of transtension (horst and graben structures) and transpression (anticlines and synclines) are expected to have been created along, and between, subsidiary faults. Evidence for the specific structures that influence suprabasalt sediment unit distribution and the basalt surface is discussed later in this report.

Section 5: SUBSURFACE OCCURRENCE AND DISTRIBUTION OF SUPRABASALT SEDIMENTS AND TOP OF BASALT IN THE WALLA WALLA BASIN

Building on the suprabasalt sediment geology, basalt geology, and structural geology described in the previous section, regional work (Fecht and others, 1987; Smith and others, 1989; Lindsey, 1996), existing geologic maps (Newcomb, 1965; Swanson and others, 1981; Schuster, 1994), recent work in the Basin (Kennedy/Jenks, 2003, 2004a; Lindsey and Tolan, 2004), and work our team did for this project, five suprabasalt sediment units are described and mapped for this report. In addition, the top of basalt also is mapped. The five suprabasalt sediment units mapped for this project are:

- Quaternary fine unit (Figures 9 and 10).
- Quaternary coarse unit (Figure 11).
- Mio-Pliocene upper coarse unit (Figure 12).
- Mio-Pliocene fine unit.
- Mio-Pliocene lower coarse unit.

Surface soils are not mapped for this project because they generally are to thin to adequately represent at the map scale we used. Figure 13 illustrates the stratigraphic relationships between the 5 mapped units and top of basalt. The following sections describe the basic physical characteristics of each suprabasalt sediment unit and top of basalt, criteria we use to identify each unit and differentiate them from each other, and unit distribution and occurrence.

5.1 Quaternary Fine Unit

As discussed in Section 4, Newcomb (1965) and several subsequent investigators (Fecht and others, 1987; Busacca and MacDonald, 1994; Waitt and others, 1994) described a variety of Quaternary aged fine (clay/silt/fine sand dominated) units in the area of the Walla Walla Basin. Above elevations of approximately 1150 to 1200 feet above sea level (msl) these strata consist predominantly of loess (Figure 10), commonly referred to as the Palouse Formation. Isolated hills found on the valley floor and much of the upland area north of the Walla Walla River consist predominantly of Pleistocene Cataclysmic Flood deposited silt and sand referred to as the Touchet Beds (Figure 9). Reworked flood deposits and loess form local accumulations of fine strata across the valley floor near major streams. For this project these three main fine-grained Quaternary units found in the Walla Walla Basin, Touchet Beds, the Palouse Formation, and floodplain deposits, are grouped into a single fine-grained unit, the Quaternary fine unit. This is done because the predominant data source for interpreting subsurface conditions, driller's logs, do not contain descriptive information of sufficient detail to differentiate these units.

Lithologic descriptors on driller's logs used to identify this composite unit include terms such as soil, dirt, mud, clay, and clay and sand. Where these are described as the uppermost materials present, and where a review of available geologic and topographic maps and our own reconnaissance suggest the presence of loess, flood deposits, and/or flood plains, these deposits are designated the Quaternary fine unit. Where it is present, the Quaternary fine unit is the uppermost suprabasalt sediment unit found in the Basin. For this reason, the top of this unit corresponds to the topography of the Earth's surface. The thickness of this unit varies greatly, depending on local topography, depth of stream incision, and original depositional patterns.

Plate 2 illustrates the occurrence and distribution of the Quaternary fine unit, which, with a few notable exceptions, covers most of the Basin. Basic distribution trends for this unit are as follows:

- North of the Walla Walla River, Mill Creek, and upper Dry Creek (near Dixie, WA) the unit is widespread, mantling most of the hills in the area and ranging from a few feet to over 80 feet thick. This unit only is absent where streams have incised through it and into underlying strata, including basalt bedrock.
- Along the modern Walla Walla River channel, lower Touchet River channel, Mill Creek channel, and several tributary streams (including Cottonwood Creek, Yellowhawk Creek, and Russell Creek, to name several) the unit is absent.
- On the valley floor immediately north of Milton-Freewater, Oregon the unit is absent across several square miles. From there to the north and west the unit gradually thickens. South of the Walla Walla River and west of Umapine, Oregon the unit may be up to 100 feet thick in many of the Touchet Bed cored hills scattered across this area.
- Around the southern and eastern edge of the Basin, on the slopes of the Horse Heaven Hills and Blue Mountains, this unit generally is absent from canyon floors, canyon walls, and many upland areas. Where present on the uplands east of Walla Walla and Milton-Freewater, it ranges from a few feet to locally as much as 100 feet thick. On the Horse Heaven Hills similar thickness variations are seen.

Variation in unit thickness and its local absence, especially along modern stream courses, likely reflects both depositional factors and post-deposition erosion. For example, the wide distribution of the Quaternary fine unit around the northern edge of the Basin primarily reflects widespread deposition followed by localized deep erosion along relatively, ephemeral stream courses. Conversely, the fact that the unit is thin to absent along major stream courses (notably the Touchet River, Walla Walla River, and Mill Creek) likely reflects, at least in large part, the erosive effects of these major streams incising into and removing Pleistocene Cataclysmic Flood deposits and eolian deposited fines.

5.2 Quaternary Coarse Unit

Uncemented and nonindurated sandy to gravelly strata is found in the shallow subsurface beneath much of the Basin (Figure 12). Based on previously described outcrops of such uncemented strata found elsewhere in the Basin (Newcomb, 1965), drill cuttings logged for this project, and field reconnaissance done for this project these gravely deposits are basaltic, moderately to well bedded, have a silty to sandy matrix, and contain thin, local silt interbeds. These uncemented and nonindurated basaltic gravels generally are equivalent to Newcomb's (1965) younger alluvial sand and gravel. For this report these deposits are defined as the Quaternary coarse unit. This sequence of uncemented gravel is interpreted to record stream deposition in the Walla Walla Basin by streams draining off the adjacent Blue Mountains. These streams are inferred to include the ancestral courses of the modern stream drainage.

The age of these coarse strata is not well constrained. In some parts of the Basin these strata are found underlying loess and Touchet Beds (Quaternary fines, or Pleistocene Cataclysmic Flood deposits). In many of the modern stream channels (e.g., Walla Walla River, Mill Creek, Reser Creek, Russell Creek, Cottonwood Creek, etc.) that are incised into and through Quaternary fines these gravelly sediments are interpreted to be actively deposited and reworked by these streams and they may be contemporaneous with or younger than the Quaternary fine unit. Based on these stratigraphic relationships the Quaternary coarse unit predates, is contemporaneous with, and post-dates Pleistocene Cataclysmic Flood deposits. Given this, the Quaternary coarse unit probably ranges in age from a few years old to as old as 1 million years or more.

Criteria used to identify this unit includes driller's log descriptions indicating gray to black gravel, basalt gravel, basalt rubble, and dark sand and gravel. These descriptions may also include reference to these types of materials overlying cemented, muddy, and/or hard brown colored gravels. In the few cases where we had samples we could geologically log, the color(s), presence of unweathered to slightly weathered clasts, and the absence of cement was used to identify unit presence.

The Quaternary coarse unit as defined for this report has a variable distribution across the Basin. The distribution and elevation of the top of the unit are shown on Plate 3. Generally, the unit lies at, or near the Earth's surface in, and around, modern stream channels throughout much of the eastern part of the Basin. In the eastern Basin the unit generally extends into the Blue Mountains, occurring as sand and gravel deposits partially filling stream cut canyons. Throughout the eastern part of the Basin the top of the unit generally slopes down to the west. In the central to western Basin this trend changes, and more east-west oriented highs and lows are present. Some additional observations about unit distribution and occurrence are as follows:

- The planar nature of the top of the unit (Plate 3) is most pronounced at, and north, of Milton-Freewater and east of Walla Walla. These surfaces seem to merge in the southeastern portion of T6N, R35E, from which a well developed low continues to the west, essentially down the modern course of the Walla Walla River.
- Throughout the eastern half of the Basin, beneath the valley floor, there are a number of locations where this unit is absent (Plate 3, Figure 14). Many of these locations generally have southeast to northwest and east to west trends.
- In the western Basin (generally south of Touchet and Lowden, Washington), there are several pronounced, generally east-west oriented highs and lows coupled with areas of thickening and thinning, especially near where the unit pinches out at the base of the Horse Heaven Hills.
- Beneath the northern part of the Basin the unit is found in an isolated linear tract, essentially along the course of modern Dry Creek. The unit is not exposed in this area however, as it is completely covered by the Quaternary fine unit.

As with the Quaternary fine unit, both depositional and erosional mechanisms can explain Quaternary coarse unit distribution. The planar nature of the surface in the Milton-Freewater area and the area beneath and east of Walla Walla, both probably reflect deposition in shallow, braided channel complexes on an active (or recently active) braidplain. To the west, the elongate low (down which the modern Walla Walla River essentiall flows) reflects gravel deposition down the topographically low axis of the Basin as it has existed in the recent geologic past (last 1 to 2 million years). The elongate areas where the unit is absent potentially reflect areas of non-deposition because of the absence of channels and/or post-depositional erosion. The linear tract generally underlying the modern course of Mud Creek around the northern edge of the Basin is interpreted to reflect the presence of an ancestral Mill Creek drainage, possible pre-dating the advent of Pleistocene Cataclysmic flooding.

The highs and lows apparent in the top of this unit along the base of the Horse Heaven Hills are interpreted to have a different origin. These features are tentatively inferred to be related to the deformation and uplift of these hills. During that uplift, the surface of the unit has been deformed, in some areas uplifted, in other areas, down-dropped.

5.3 Mio-Pliocene Strata

The primary basin-filling suprabasalt sediment strata are a sequence of indurated sand, gravel, siltstone, and claystone generally equivalent to Newcomb's old gravel and clay. Based on lithologic and stratigraphic relationships these indurated suprabasalt sediments are inferred to have a Miocene to late Pliocene age (10+ to ~3 million years old). The lithologic and stratigraphic trends suggestive of this age include the following:

- These indurated strata overlie many of the same CRBG units in the Walla Walla Basin as the Mio-Pliocene continental clastic Ringold Formation (Lindsey, 1996) does in the Pasco Basin.
- These indurated strata underlie the Quaternary-aged Palouse Formation and Touchet Beds.
- Weathered clasts such as are seen in other Mio-Pliocene strata (Lindsey, 1996), but not in younger cataclysmic flood deposits, are common in these indurated strata.
- These strata, at least locally contain coarse, micaceous, felsic sand similar to that seen in the Mio-Pliocene Ringold Formation of the Pasco Basin (Fecht and others, 1987; Smith and others, 1989; Lindsey, 1996), but not similar to Pleistocene aged cataclysmic flood deposits or locally derived alluvial deposits we observe in the Walla Walla Basin.

Absolute ages via direct dating of specific strata and/or materials, and biostratigraphic correlations useful in dating these strata are lacking for the Mio-Pliocene strata of the Walla Walla Basin. Under these circumstances, it is not possible to determine a more refined age for these strata. The Mio-Pliocene age inferred here for these strata should be considered tentative. These strata, as noted earlier, are subdivided into three mappable units – Mio-Pliocene upper coarse unit, Mio-Pliocene fine unit, and Mio-Pliocene basalt coarse unit (Figure 13) – for this report, which are described in the following sections.

5.3.1 Mio-Pliocene Upper Coarse Unit

The Mio-Pliocene upper coarse unit consists of a sequence of variably cemented sandy gravel, with a muddy to sandy, silcic to calcic matrix. This unit underlies much of the Walla Walla Basin. Field reconnaissance reveals thin, localized, discontinuous caliche at the top of these strata at some locations. Based on physical characteristics displayed by analogous strata in rare outcrops, field reconnaissance, and a small number of borehole log descriptions (Appendix A) these indurated gravel and sand predominantly are basaltic in composition and typically have a slightly too well developed red, red brown, and yellow brown color (Figure 15). The Mio-Pliocene upper coarse unit is differentiated from the younger Quaternary gravels by the presence of weathered basalt gravel clasts, clay matrix, red-brown colors, and cementation which are absent in the younger gravels.

As shown on Plate 4, the Mio-Pliocene upper coarse unit generally is continuous beneath the entire Basin, being absent only in a few, relatively small areas. Although widespread in the subsurface, the unit only crops out in a few locations around the southeastern and eastern edge of the Basin. At these locations a few feet to several tens of feet of indurated, basalt-lithic gravel and sand are exposed. It is notable that at several locations around the edge of the Basin, the indurated gravel which we assign to this unit is noted on driller's logs for wells located on the canyon floor in the lower reaches of the Walla Walla River (at Milton-Freewater), Russell Creek (east of Walla Walla), and Mill Creek (northeast of Walla Walla). Other notable trends relative to the top of the unit include the following:

- In the eastern half of the Basin the top of the unit generally dips to the west, although a number of crudely east-west oriented linear highs and lows are developed on it. These features are most well developed south of the modern course of Mill Creek. Along the base of the Horse Heaven Hills several of these features appear to line up with, and extend northwest into the Basin, from the mouths of the Pine Creek and Dry Creek canyons.
- North of Mill Creek, to the edge of the unit along the course of Dry Creek, these linear features are less frequent and more poorly developed.
- Beneath the western half of the Basin, east-west oriented highs and lows become more pronounced and generally longer. In addition, several well developed highs and lows are developed adjacent to the base of the Horse Heaven Hills in T6N, R33E.

Isopach data for this unit (see Appendix B) reveals that it varies greatly in thickness, ranging from just a few feet thick to over 500 feet thick. The thickest accumulations of the unit tend to be along the southern edge of the Basin adjacent to the base of the Horse Heaven Hills where it generally ranges from 200 to more than 500 feet thick, and along the eastern edge of the Basin. Coarse-fine facies variation in the unit, illustrated on a coarse percent facies map (Figure 16), show coarse tracts extending outward (westward) from the general areas where the Walla Walla River and Mill Creek leave the highlands and enter the valley floor.

A combination of depositional and erosional factors likely generated many of the features described above. Based on the few outcrops of this unit available to examine in the basin, we interpret this unit to reflect predominantly braided stream deposition on a series of coalescing gravel braid plains lain down by the ancestral Walla Walla River, Mill Creek, and larger tributaries. These streams delivered large volumes of coarse detritus onto the basin floor as it subsided and the bounding uplands were uplifted. Generally, these streams merged into a single, main Walla Walla River ancestral stream that generally flowed to the west, much like, but south of the modern stream. In addition, we suspect faulting also played a role in at least some of these features, including: (1) the highs and lows extending into the Basin from the mouths of the Dry and Pine Creek canyons (in Oregon), (2) the areas of the highs and lows adjacent to the Horse Heaven Hills in T6N, R33E, and (3) the rapid north to south thinning of the unit seen just north of Milton-Freewater. Plate 4 shows the inferred locations of several major folds and faults that may influence the distribution and occurrence of this unit.

5.3.2 Mio-Pliocene Fine Unit

The Mio-Pliocene upper coarse unit generally is underlain by fine deposits variously described as silt, clay, sandy clay, and sandy mud having blue, green, gray, brown, and yellow colors. For this report these fine strata are designated the Mio-Pliocene fine unit. The surface map of the top of this unit (Plate 5) reveals a complex surface displaying a number of highs and lows. Many, although not all, of these features generally are east-west oriented. In addition, many of these features generally appear to be in the same general areas as those noted for the overlying Mio-Pliocene upper coarse unit, including the trends extending northwest from the mouth of the Dry Creek and Pine Creek canyons and the edge of the Horse Heaven Hills in T6N, R33E. This unit is thickest (Figure 17) generally in the northeastern, north, central, and western Basin where it can range between 300 and 500 feet thick. These areas generally are located north and west of areas of thickest accumulation of the overlying Mio-Pliocene upper coarse unit. The facies map (Figure 18) generally suggests the unit coarsens towards the south.

Depositional, erosional, and structural factors similar to those that are interpreted to affect the tops and thicknesses of overlying units, also are interpreted to have a role in controlling Mio-Pliocene fine unit distribution. In addition, the irregular nature of the top of the unit may reflect both lateral and vertical variation in the depositional-erosional system in which the upper part of this unit and the lower part of the overlying unit formed. This variation could have generated interfingering of fine strata (fine unit) with coarser strata (upper coarse unit) with the contact between the two units being deeper where interbedded coarse material predominates and shallower where interbedded fine material predominates. Given these conditions, the contact between this unit and the overlying Mio-Pliocene upper coarse unit probably is not a single, continuous, uninterrupted surface. Instead, the contact may reflect the lower boundary of a transition zone separating underlying fine dominated strata from overlying coarse dominated strata. Although it is portrayed as a single surface delineating the mapped transition between fine and coarse strata, it is in fact a composite of less widespread, localized, overlapping surfaces.

Bedding and stratigraphic relationships within the strata comprising the unit are unknown because of a lack of outcrops and intact drill-cuttings samples. Based on apparent lateral and vertical gradations between it and the Mio-Pliocene upper coarse unit, we infer the Mio-Pliocene fine unit to largely be a floodplain or overbank series of deposits, having been lain down peripheral to streams (including the ancestral Walla Walla River) as they flowed through the Basin. Given such a depositional system, the presence of at least localized coarse sand and gravel intervals in the unit should be expected.

5.3.3 Mio-Pliocene Basal Coarse Unit

Geologically logged drill-cuttings from several recently drilled water supply wells (Appendix A) in the southwestern Basin, just north of Milton-Freewater reveal the presence of arkosic-micaceous sand and silt in the basal portion of the Mio-Pliocene section (Figure 3) and directly overlying basalt. These strata form an interval several tens of feet to over 100 feet thick. On the northern edge of the Basin, along Sudbury Road north of Lowden (in Sec 31, T8N, R35E), arkosic-micaceous sand (Figure 4) is observed in outcrop directly overlying the Frenchman Springs Member, Wanapum Basalt. In outcrop and cuttings samples these sands have an appearance similar to Ringold Formation materials of the Pasco Basin described by Goodwin (1993) and Lindsey (1996). A small number of water well logs interpreted for this report show an interbedded sequence of mudstone, cemented gravel (conglomerate) and sand underlying the thick mud sequence of the Mio-Pliocene fine unit and overlying basalt in portions of the Basin. Although no mineralogic information is provided on these logs, the close proximity of several of these wells to those for which we have geologically logged drill cuttings samples, suggests the presence of these arkosic-micaceous sands. Taken together, we interpret these strata to belong to a distinctive unit we designate the Mio-Pliocene basal coarse unit.

Based on the data collected for this report we do not map the Mio-Pliocene basalt coarse unit as a single continuous unit. Instead, we interpret its presence in 5 main areas (Plate 6), 3 of which are in the eastern portion of the Basin. These bodies may indeed form a single body, or several more widespread bodies, but given the generally poor or simplified geologic descriptions on many driller’s logs we could not identify such lateral continuity.

This unit, with its distinctive arkosic mineralogy, is very different petrographically from other strata comprising the Mio-Pliocene sequence in the Basin. Because of this distinctive mineralogy, this unit is inferred to have been deposited by the ancestral Salmon-Clearwater River, which entered the Basin from the north.

5.4 Top of Basalt and Structural Geology

The CRBG underlies the entire suprabasalt sediment sequence, forming the basal boundary for this stratigraphic package. In addition, a number of folds and faults which effect the top of basalt also appear to have some effect on suprabasalt sediment unit distribution. The following two sections describe the top of basalt surface and structures in the Basin as they may pertain to suprabasalt sediment unit distribution and occurrence.

5.4.1 Top of Basalt

The top of basalt surface portrays Basin as a structural depression in which the suprabasalt sediments previously described were deposited. The top of basalt surface is elevated on the highlands bordering the Basin, and dips into the Basin (Plate 7). In the central part of the Basin the top of basalt surface lies at, or below, sea level (Plate 7). In addition, the top of basalt surface shows a number of smaller features which generally are manifest as abrupt changes in the elevation and/or strike of the top of basalt surface. Some of these features are as follows:

- Along the Horse Heaven Hills, abrupt changes in elevation and shifts in strike direction on the basalt surface are present extending northwest from the mouths of the Dry Creek and Pine Creek canyons and just north of Milton-Freewater.
- Several north-south oriented displacements in top of basalt are found on the northern edge of the Basin north of the Touchet River, east of Lowden, and northwest of Walla Walla.
- Generally east-west oriented displacements in the top of basalt are found on the eastern edge of the Basin, especially along Cottonwood Creek, Russell Creek, and Mill Creek.
- In the central part of the Basin, the axis of the basalt low extending from the northeast to southwest, through Walla Walla both changes orientation, turning generally east-west in the south-central Basin, and appears to be segmented.

Several of these patterns, most notably those along the base of the Horse Heaven Hills, appear to be repeated or extend upward into overlying suprabasalt sediment units. Many of the abrupt changes seen in the top of the overlying Mio-Pliocene units generally overlie the features described above that occur in the top of basalt.

In addition to the displacements in the top of basalt surface described above, we have found that the identity of the uppermost CRBG unit present changes from location to location across the Basin. For this project we had geologically logged drill-cuttings from several wells geochemically analyzed to confirm the identity of the uppermost CRBG unit (see Appendix D). This new data and data from previous work, coupled with existing CRBG geologic mapping around the margins of the Basin, reveals that the uppermost CRBG unit present varies from location to location beneath the suprabasalt sediments. Generally the uppermost CRBG unit present in the Basin varies as follows:

- Basin’s margins and immediately adjacent uplands – typically the uppermost CRBG unit present belongs to the Frenchman Springs Member of the Wanapum Basalt. Flows of the Frenchman Springs Member range from 15.5 to 15.3 million years old.

- Western-half of the Basin – typically the uppermost CRBG unit present is a basalt of Martindale flow, Ice Harbor Member, Saddle Mountains Basalt. These Ice Harbor Member flows were erupted from linear fissure system that, in part, transects the western margin of the Basin. The Martindale flows have been radiometrically age dated at approximately 8.5 million years old and represent some of the youngest CRBG eruptive activity.
- Eastern-half of the Basin – A basalt flow (up to 2 flows) that is younger than the 8.5 million year old Ice Harbor Member of the Saddle Mountains Basalt. These youngest flows are separated from the underlying Martindale flow (Ice Harbor Member of the Saddle Mountains Basalt) by a thick (50 to >300 foot-thick) sedimentary interbed. Geochemical analyses of drill-cuttings from wells that penetrate these youngest flows within the Basin show that their composition is different from the youngest formal CRBG unit (Lower Monumental Member) and therefore do not belong to this unit. We have informally assigned these youngest CRBG flows within the Basin to a new member, the Walla Walla member of the Saddle Mountains Basalt.

As discussed in Section 4.3, the Basin was created by tectonic deformation related to several major regional structures. Many mapped faults and folds along the eastern and southern margins of the Basin do appear to trend into the Basin and “disappear” beneath its suprabasalt sediment fill. The abrupt elevations changes mapped in the top of basalt beneath the Basin (Plate 7) along the projections of these mapped surface faults and folds likely do represent the “buried” projection of these features. However where we have abrupt elevations changes mapped in the top of basalt beneath the Basin (Plate 7) that do not correspond to projections of mapped faults and folds, we can not automatically assume that these features represent a ‘buried” fault or fold. This is due to the fact that there are several other “non-deformational” processes that might have potentially produced some of the features. These processes include:

1. Constructional topography produced at CRBG flow margins (flow pinch-outs).
2. Mio-Pliocene stream erosion of the basalt surface prior to burial.

To determine whether these features were the result of deformational or “non-deformational” processes would require geologic mapping of the top of basalt beneath the Basin. This would require more subsurface stratigraphic control than currently exists for the Basin. The remainder of this section discusses top of basalt features that can be identified as likely being structural features.

5.4.2 Structural Geology

As noted above, a number of folds and faults have been mapped on Basin margin highlands (Newcomb, 1965; Kienle, 1980; Swanson and others, 1981; Schuster, 1994). Many of these structures correspond to projections of the features described in previous sections. These are summarized in the following discussion.

In the northeastern portion of the Basin, basically the area around and east of Walla Walla, earlier work by the project team (Kennedy/Jenks, 2004a) summarized the faults (previously described by Kienle, 1980, and our own work) present in the area. Generally, these faults have two distinct trends, north-south and northwest-southeast. The northwest-southeast trending faults (shown on Plate 7) include:

- Cottonwood Creek fault
- Promontory Point fault – part of the Wallula Fault system (Kienle, 1980)

- Reser fault
- Prospect Point fault – part of the Wallula Fault system (Kienle, 1980)
- Mill Creek
- College Place fault – part of the Wallula Fault system (Kienle, 1980)

The generally north-south oriented faults (shown on Plate 7) include:

- Pikes Peak fault
- Buroker faults – part of the Wallula Fault system (Kienle, 1980)

Many of these faults appear to be at least partial barriers to groundwater flow (Newcomb, 1965)

In addition to influencing many of the faults known to exist in the eastern Basin, elements of the Wallula Fault system (Plate 7) define the southern edge of the Basin. The Wallula Fault system is interpreted to account for many of the offsets and displacements we map in the top of basalt along the base of the Horse Heaven Hills in T6N, R34E. Elements of this fault system also are interpreted to account for the offsets we map extending northwest from the mouth of the Pine Creek canyon and Dry Creek canyon. In addition, the offsets we map in the area just north of Milton Freewater may be part of the Wallula fault system.

The structure of the northern and western basin, generally the area north of the Walla Walla River and west of Walla Walla, is characterized by the southwest dipping Palouse Slope monocline merging into the Basin (Kienle, 1980). However, our work suggests this picture may be too simplified. The generally north-south features interpreted to be offsetting basalt along the northern edge of the Basin could be faults. The westernmost one, near the mouth of the Touchet River, may be associated with the Divide anticline, the structure defining the western end of the Basin. The thrust fault exposed on the northern edge of the Basin in Sec. 31, T8N, R35E (Figure 19) further suggests the potential for a more complex structural setting than previously described or suspected.

Section 6: SUMMARY AND CONCLUSIONS

Based on the data collected and evaluated for this report, including driller's logs, drill cuttings geologist's logs, field reconnaissance, and existing geologic reports and maps, the suprabasalt sediments found within the Walla Walla Basin are subdivided into five mappable units. These units are defined on the basis of petrographic information and stratigraphic position. They can be mapped in the subsurface across much of the Basin. The five suprabasalt sediment units mapped for the project are:

- Quaternary fine unit – This unit consists predominantly of surface deposits of silt and fine sand deposited by Pleistocene Cataclysmic Floods (Touchet Beds), eolian processes (Palouse Formation - loess), and floods on modern flood plains (alluvial fines). These materials rarely host usable quantities of groundwater, instead they comprise a significant portion of the vadose zone.
- Quaternary coarse unit – This coarse unit consists predominantly of unconsolidated and uncemented basalt lithic sand and gravel. This unit commonly hosts the upper few feet to tens of feet of the alluvial aquifer system.
- Mio-Pliocene upper coarse unit – This unit consists of variably cemented, weakly to well indurated, sandy to silty, basalt-lithic pebble-cobble conglomerate. These strata typically display red-brown colors. This unit probably comprises the majority of the productive portion of alluvial aquifer system.
- Mio-Pliocene fine unit – This unit consists predominantly of blue, gray, and green, weakly indurated siltstone and claystone. Intercalated sandy and gravelly strata are at least locally present, although these coarser strata may be more widespread than currently interpreted. A number of wells appear to produce usable quantities of water from strata assigned to this unit.
- Mio-Pliocene basal coarse unit – This unit consists of felsic, micaceous sand interbedded in weakly indurated claystone and siltstone. This previously undescribed stratigraphic interval is found deep in the Mio-Pliocene sequence and directly overlies basalt. At least locally, we infer that this unit should produce usable quantities of groundwater.

The two Quaternary units should be considered to be generally time correlative, although the coarse unit is more commonly found underlying the fine unit where both units occur. The degree of inter fingering between these two units is not well understood. The three Mio-Pliocene units generally form a stratigraphic sequence with the upper coarse unit overlying the fine unit, and the fine unit overlying the basal coarse unit. However, there is interpreted to be a significant degree of inter fingering between these units, with the contacts as mapped for this project generally being gradational.

The suprabasalt sediment units, and the top of basalt that defines the base of the suprabasalt sediment sequence, were mapped in order to better understand the physical framework of the alluvial aquifer system. GIS shapefiles were created to portray the subsurface distribution and geometry of the tops of each unit. Facies variation within the three Mio-Pliocene units was evaluated from coarse-fine changes interpreted from driller's logs and geologic logs. Thickness data for all five units also was compiled and general trends evaluated. Some basic observations with respect to unit distribution, thickness, and facies trends are as follows:

- The Quaternary fine unit is widespread across much of the Basin. It varies from less than 1 foot thick to approximately 100 feet thick, generally thickening to the west and north in the Basin. Where absent, the unit likely was removed by post-depositional erosion by modern streams.
- The Quaternary coarse unit is less widespread than the Quaternary fine unit. Areas where it is absent are interpreted to reflect non-deposition. The unit ranges from less than a foot thick to approximately 80 feet thick.
- The Mio-Pliocene upper coarse unit varies from less than 1 foot thick to over 300 feet thick and displays, at least locally, numerous fine intervals consisting of both siltstone-claystone strata and muddy gravel. This unit essentially underlies the entire Basin.
- The Mio-Pliocene fine unit also underlies much of the Basin, forming an interval a few feet thick to locally over 500 feet thick. Facies interpretations for the unit suggest it generally coarsens to the southeast and east, and fines to the west. However, if coarse intercalated strata are more common than currently understood, this trend may differ than we infer here.
- The micaceous-felsic Mio-Pliocene basalt coarse unit, as currently mapped, is laterally discontinuous and ranges from less than 1 foot thick to approximately 80 feet thick. This unit may be more widespread than currently interpreted.

The top of basalt structure contour map, while showing the basal bounding surface of the suprabasalt sediments and the alluvial aquifer system, also provides clues to the locations of folds and faults. Many of these folds and faults appear to influence suprabasalt sediment unit distribution, potentially accounting for many of the thickness changes and surface offsets mapped in these units near known and inferred folds and faults. The impacts of these structures on alluvial aquifer hydrogeology are unknown.

In the process of compiling the top of basalt map, analysis of geochemical data from drill cuttings, revealed that the uppermost basalt unit encountered beneath the suprabasalt sediment sequence varies from place-to-place across the Basin. This variation generally is as follows:

- Beneath the eastern Basin a previously unidentified basalt unit, informally designated the Walla Walla member of the Saddle Mountains Basalt, is the uppermost basalt unit.
- To the west, the uppermost basalt unit beneath the suprabasalt sediments is the older Ice Harbor Member of the Saddle Mountains Basalt.
- On highlands surrounding the Basin, where the suprabasalt sediments generally thin or are absent, the much older Frenchman Springs Member of the Wanapum Basalt is the uppermost basalt unit.

Given these observations, basalt flow pinch outs beneath the suprabasalt sediment sequence provide potential hydrologic connections between portions of the uppermost basalt aquifer system and the alluvial aquifer system. Interconnections also may be provided by at least some of the faults mapped during this project. The variations in the uppermost basalt unit revealed by this work also has implications for basalt aquifer system investigators and projects as it suggests that the uppermost water-bearing zones in the basalt system are not the same everywhere beneath the Basin.

Based on the work done for this report, and our interpretations of the suprabasalt sediment system physical framework presented herein, we have the following recommendations for future hydrogeologic characterization work in the Walla Walla Basin:

1. Using the shapefiles constructed for each mapped unit and unit top data, generate grid models of each surface mapped for this project. From these surface grid models, generate thickness (isopach) grid models more representative of unit thickness than can be produced from the thickness data alone (as was done for this report).
2. Continue to collect drill cuttings samples as opportunity allows. Also geologically log these samples and update the spreadsheet data sets attached to this report (Appendices B and C).
3. This report provides physical geologic framework information for the strata (suprabasalt sediments) hosting the alluvial aquifer system. It does not provide hydrologic data for these units, in part because such information is relatively rare. Therefore, we recommend that aquifer hydrologic data (water level, aquifer hydraulic properties, water quality) be collected from privately owned wells to which access can be gained and from purpose built characterization wells.
4. Continue, and expand on, the current groundwater level monitoring efforts, installing transducers/data loggers in new and existing wells as opportunities can be found. For wells in which this is done, collect information relative to well construction so that the data collected can be better understood.
5. Refine the top of basalt map as cuttings from new wells become available. These cuttings should be geologically logged and geochemically analyzed to better constrain the top of basalt, including identifying folds and faults that may influence conditions within the alluvial aquifer system.
6. Drill 3 to 6 characterization borings that fully penetrate the entire suprabasalt sediment sequence, and attempt to collect continuous core samples from these boreholes. Data from these samples will provide much needed subsurface geologic control to be used to both constrain the physical stratigraphy of the alluvial aquifer system, and its physical properties.
7. Designate a geologic/hydrogeologic lead (person or agency/entity) that coordinates and compiles the various hydrogeologic data collection efforts in the alluvial aquifer system, provides consistent interpretations of data and information as it becomes available (including resolving incompatible interpretations by others), and supports water resource management efforts with a well thought out, and technically sound, conceptual and numerical model of the alluvial aquifer system.

Finally, although the project described herein focused on the suprabasalt sediments, data and information collected and interpreted for this report suggests there is a significant lack of information about the Columbia River basalts (and the basalt aquifer system) underlying and surrounding the Basin. Therefore, we strongly recommend that an effort begin to be made to collect basalt geology and aquifer information upon which to build a technically sound conceptual model of basalt aquifer conditions in the future.

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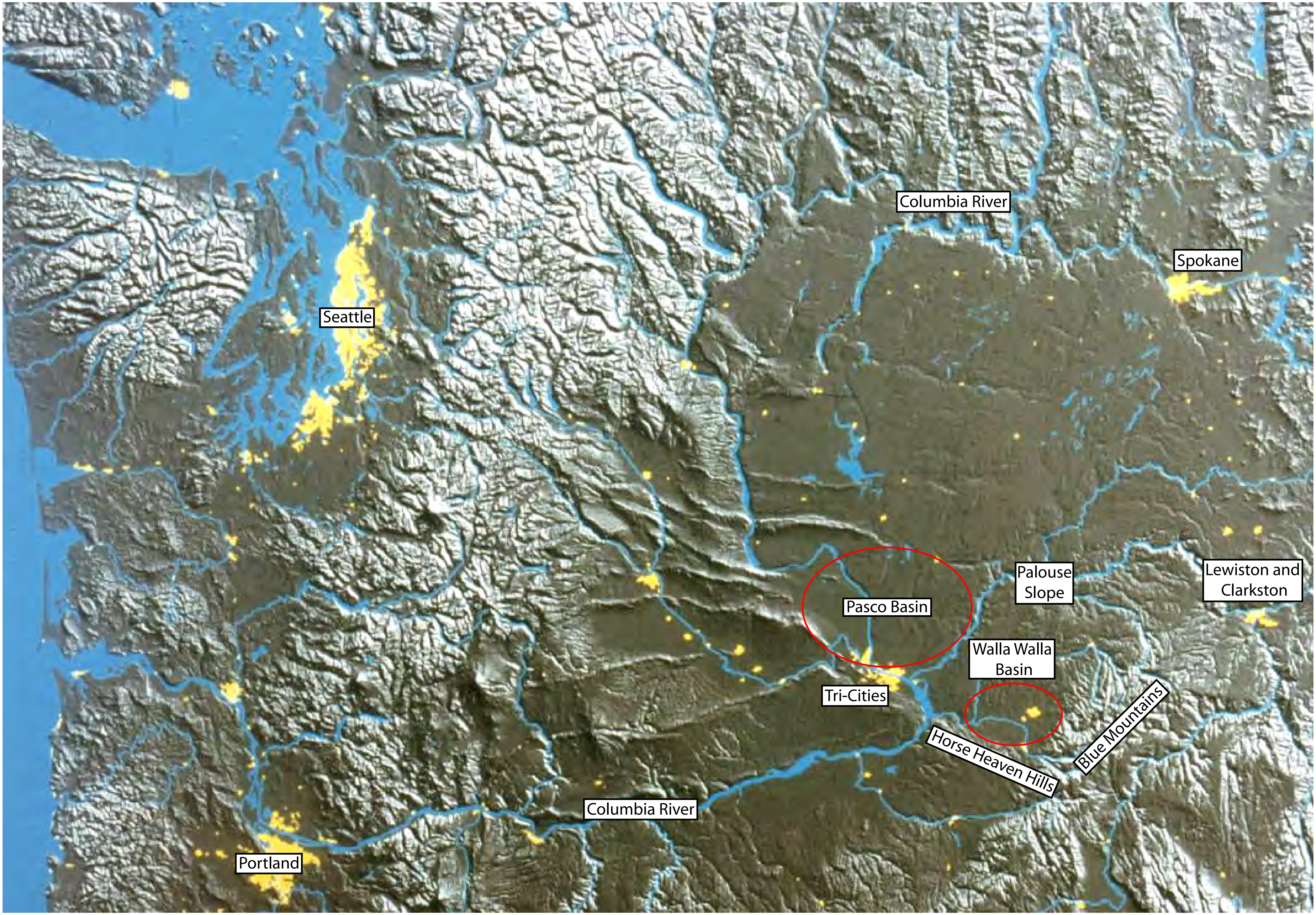

Figure 1. Location of the Walla Walla Basin, southeastern Washington and northeastern Oregon. Map also shows the Blue Mountains and Horse Heaven Hills, two of the major features bounding the basin.

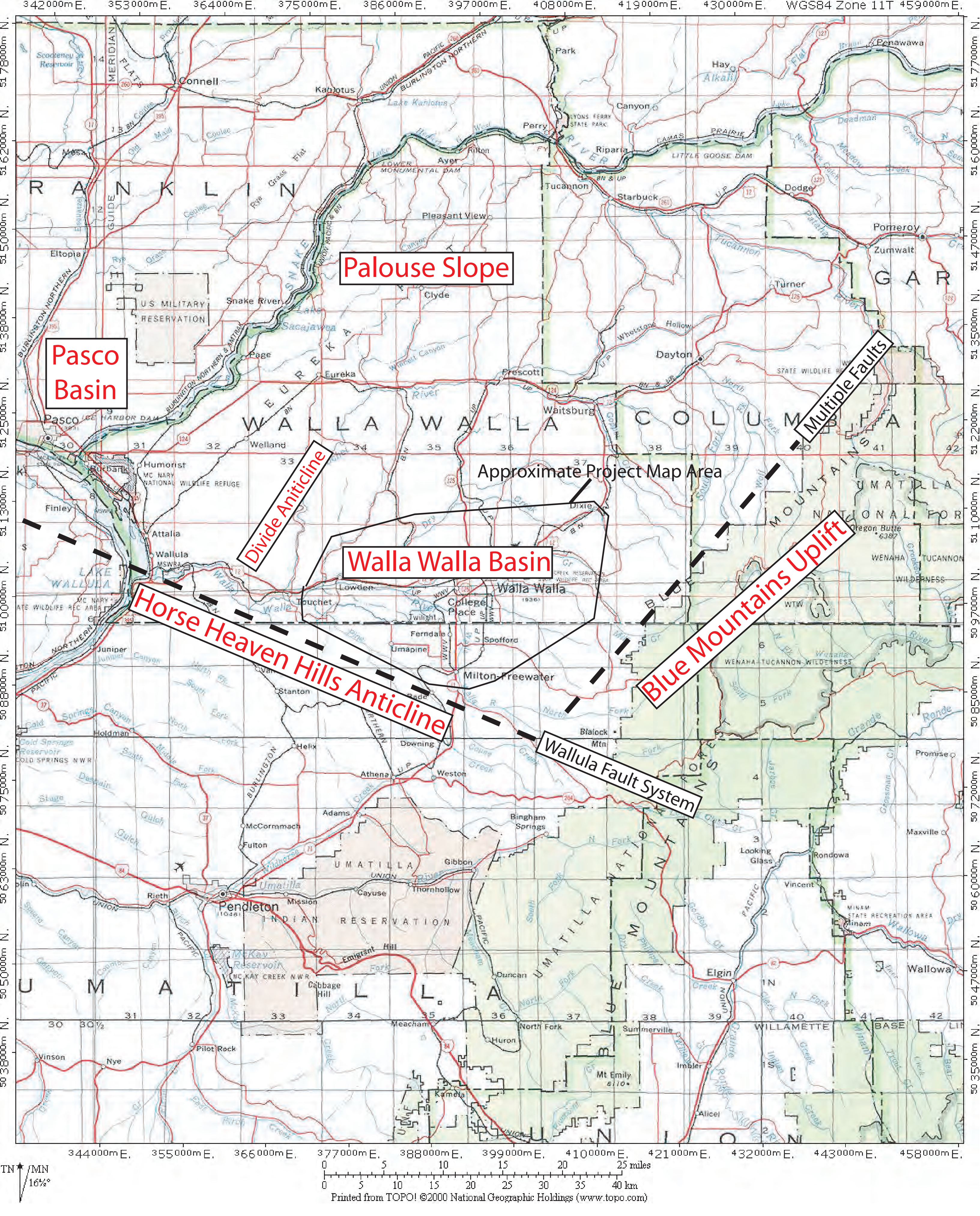

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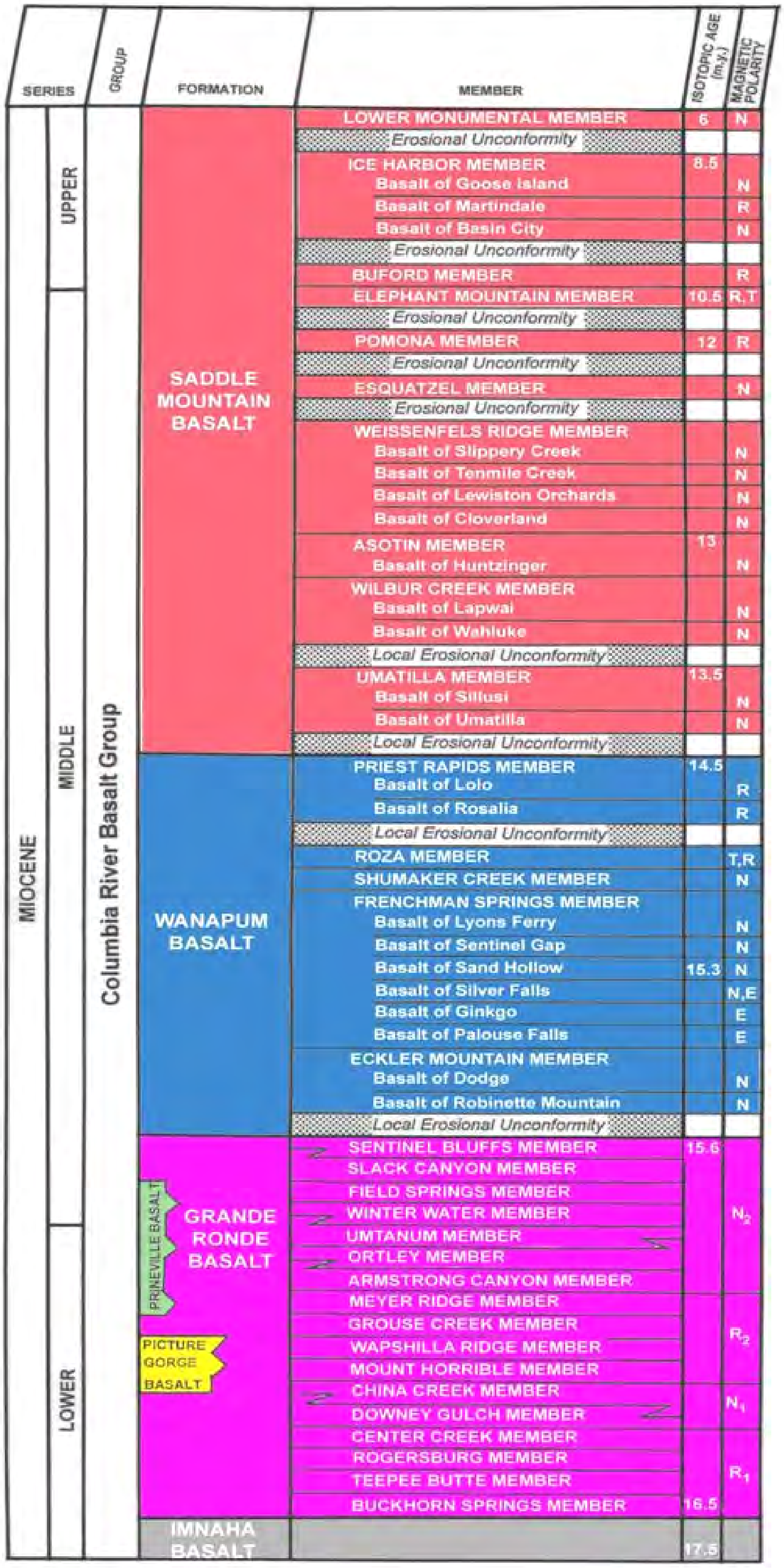
Figure 2. General structural geologic setting of the Walla Walla Basin.

Figure 3. Photograph of interval deep in well UMAT 54524 showing the presence of felsic micaceous sediment in the Mio-Pliocene (old clay and gravel) interval. Note position of top of basalt (TOB) to right, at depth of 434 feet.

Figure 4. Outcrop of felsic-micaceous quartz sand (where the shovel is) underlying Quaternary fine sediment. The older sediment dips approximately 45 degrees to the left (north). This outcrop is on Sudbury Road on the northern edge of the Walla Walla Basin.



SERIES		GROUP	FORMATION	MEMBER	ISOTOPIC AGE (m.y.)	MAGNETIC POLARITY
MIOCENE	UPPER	Columbia River Basalt Group	SADDLE MOUNTAIN BASALT	LOWER MONUMENTAL MEMBER	6	N
				Erosional Unconformity		
				ICE HARBOR MEMBER	8.5	
				Basalt of Goose Island		N
				Basalt of Martindale		R
				Basalt of Basin City		N
				Erosional Unconformity		
				BUFORD MEMBER		R
	MIDDLE			ELEPHANT MOUNTAIN MEMBER	10.5	R,T
				Erosional Unconformity		
				POMONA MEMBER	12	R
				Erosional Unconformity		
				ESQUATZEL MEMBER		N
				Erosional Unconformity		
				WEISSENFELS RIDGE MEMBER		
				Basalt of Slippery Creek		N
				Basalt of Tenmile Creek		N
				Basalt of Lewiston Orchards		N
				Basalt of Cloverland		N
				ASOTIN MEMBER	13	
				Basalt of Huntzinger		N
				WILBUR CREEK MEMBER		
				Basalt of Lapwai		N
				Basalt of Wahluke		N
				Local Erosional Unconformity		
				UMATILLA MEMBER	13.5	
				Basalt of Sillusi		N
				Basalt of Umatilla		N
				Local Erosional Unconformity		
			WANAPUM BASALT	PRIEST RAPIDS MEMBER	14.5	
				Basalt of Lolo		R
				Basalt of Rosalia		R
				Local Erosional Unconformity		
				ROZA MEMBER		T,R
				SHUMAKER CREEK MEMBER		N
				FRENCHMAN SPRINGS MEMBER		
				Basalt of Lyons Ferry		N
				Basalt of Sentinel Gap		N
				Basalt of Sand Hollow	15.3	N
				Basalt of Silver Falls		N,E
				Basalt of Ginkgo		E
				Basalt of Palouse Falls		E
				ECKLER MOUNTAIN MEMBER		
				Basalt of Dodge		N
				Basalt of Robinette Mountain		N
				Local Erosional Unconformity		
			GRANDE RONDE BASALT	SENTINEL BLUFFS MEMBER	15.6	N_2
				SLACK CANYON MEMBER		
			PRINEVILLE BASALT	FIELD SPRINGS MEMBER		
				WINTER WATER MEMBER		
	LOWER			UMTANUM MEMBER		
				ORTLEY MEMBER		
				ARMSTRONG CANYON MEMBER		
				MEYER RIDGE MEMBER		R_2
				GROUSE CREEK MEMBER		
			PICTURE GORGE BASALT	WAPSHILLA RIDGE MEMBER		
				MOUNT HORRIBLE MEMBER		
				CHINA CREEK MEMBER		N_1
				DOWNEY GULCH MEMBER		
				CENTER CREEK MEMBER		R_1
				ROGERSBURG MEMBER		
				TEEPEE BUTTE MEMBER		
				BUCKHORN SPRINGS MEMBER	16.5	
			IMNAHA BASALT		17.5	

Figure 5. Columbia River Basalt Group stratigraphy.

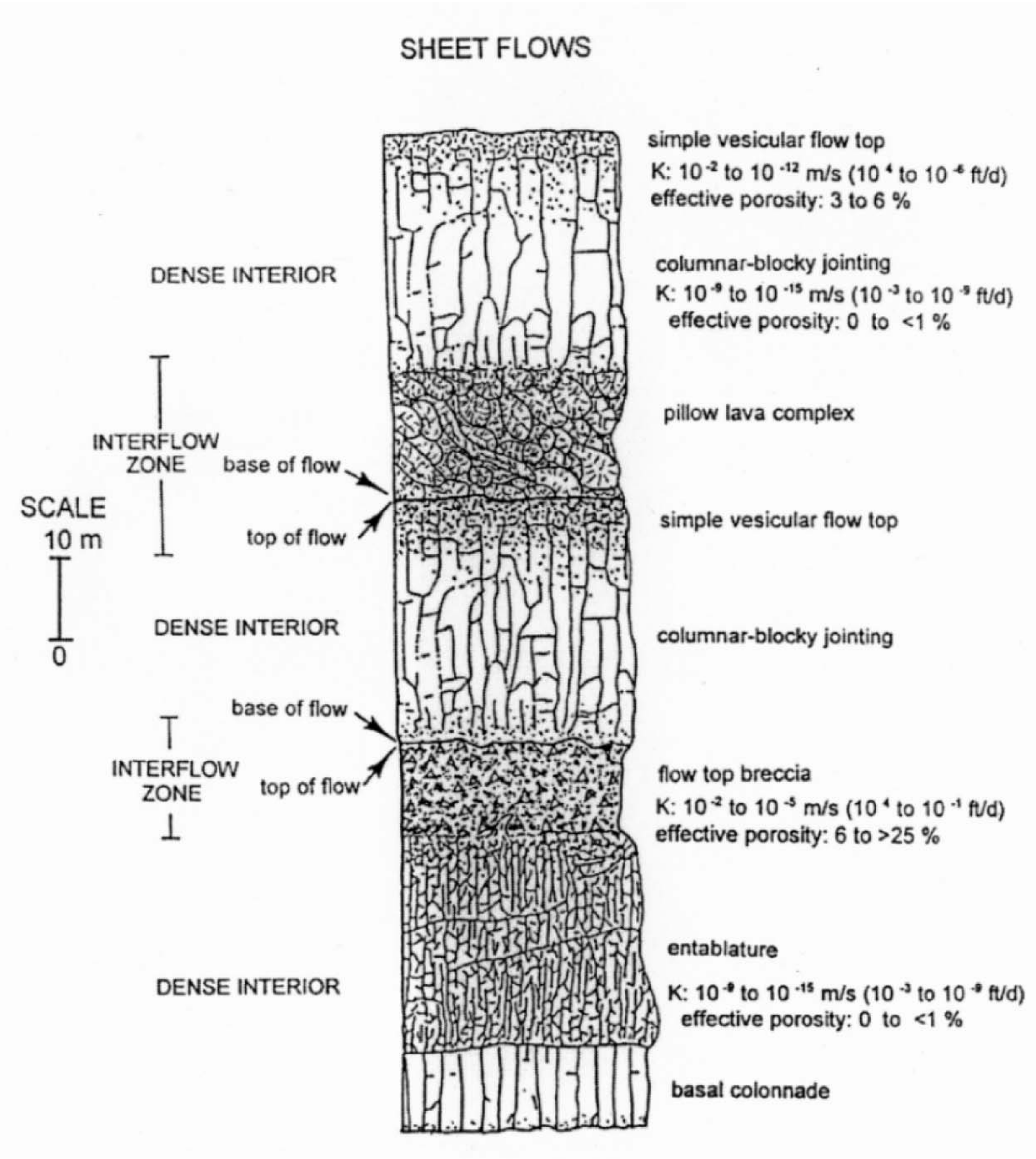


Figure 6. Diagram illustrating the basic arrangement of interflow structures within typical Columbia River basalt units.

Figure 7. Outcrop of a typical CRBG flow contact. Hammer lies near bottom of a simple flow top. The contact between these two flows lies at the base of the blocky jointed rock above the hammer. The base of the overlying flow is typical of most CRBG contacts. Outcrop is in Wallula Gap, just west of the Walla Walla Basin.

Figure 8. Photograph of a typical flow interior sequence within the CRBG. This photograph shows a entablature overlying a blocky columnar jointed interval. This flow is several tens of feet thick. Outcrop is located in Sentinel Gap, many miles west of the Walla Walla Basin.

Figure 9. Photograph of the interstratified sand and silt typical of the Touchet Beds. This is one of the two main sediment types that comprise the Quaternary fine unit.

Figure 10. Photograph of thick loess deposit (Palouse Formation) typical of the thick fine grained deposits on the northern edge of the Walla Walla Basin and upland areas of the Basin to the east and south. Loess is the other main sediment type comprising the Quaternary fine unit.

Figure 11. Photograph of gray colored excavated gravel of the Quaternary coarse unit. This trench was dug at the WWBWC/Hudson Bay SAR Site.

Figure 12. Photograph of indurated, partially cemented basalt gravel of the Mio-Pliocene upper coarse unit near Milton-Freewater, Oregon. Note the presence of the overhanging ledge indicative of partial cementing.

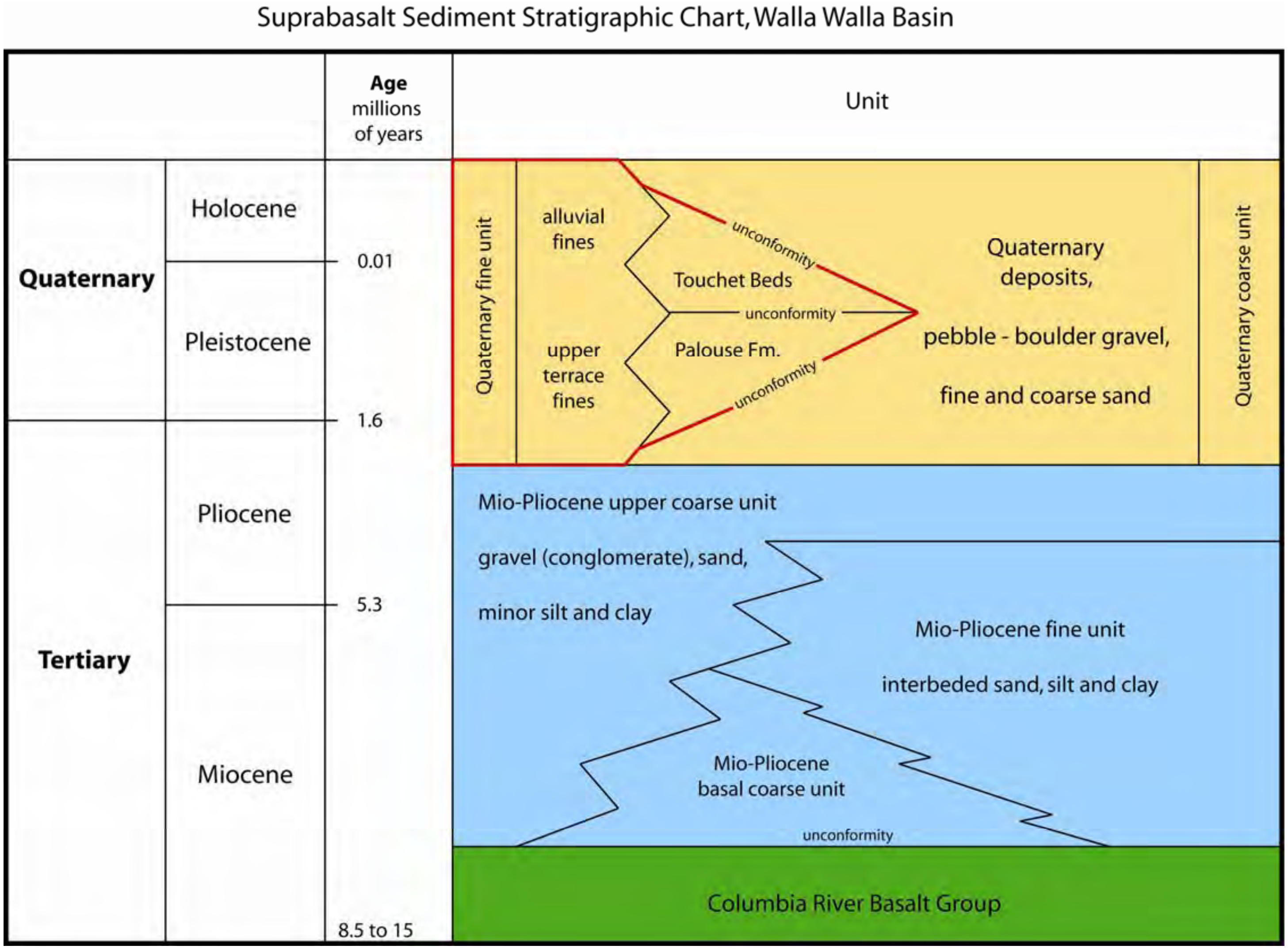


Figure 13. Suprabasalt sediment stratigraphy in the Walla Walla Basin as used in this report.

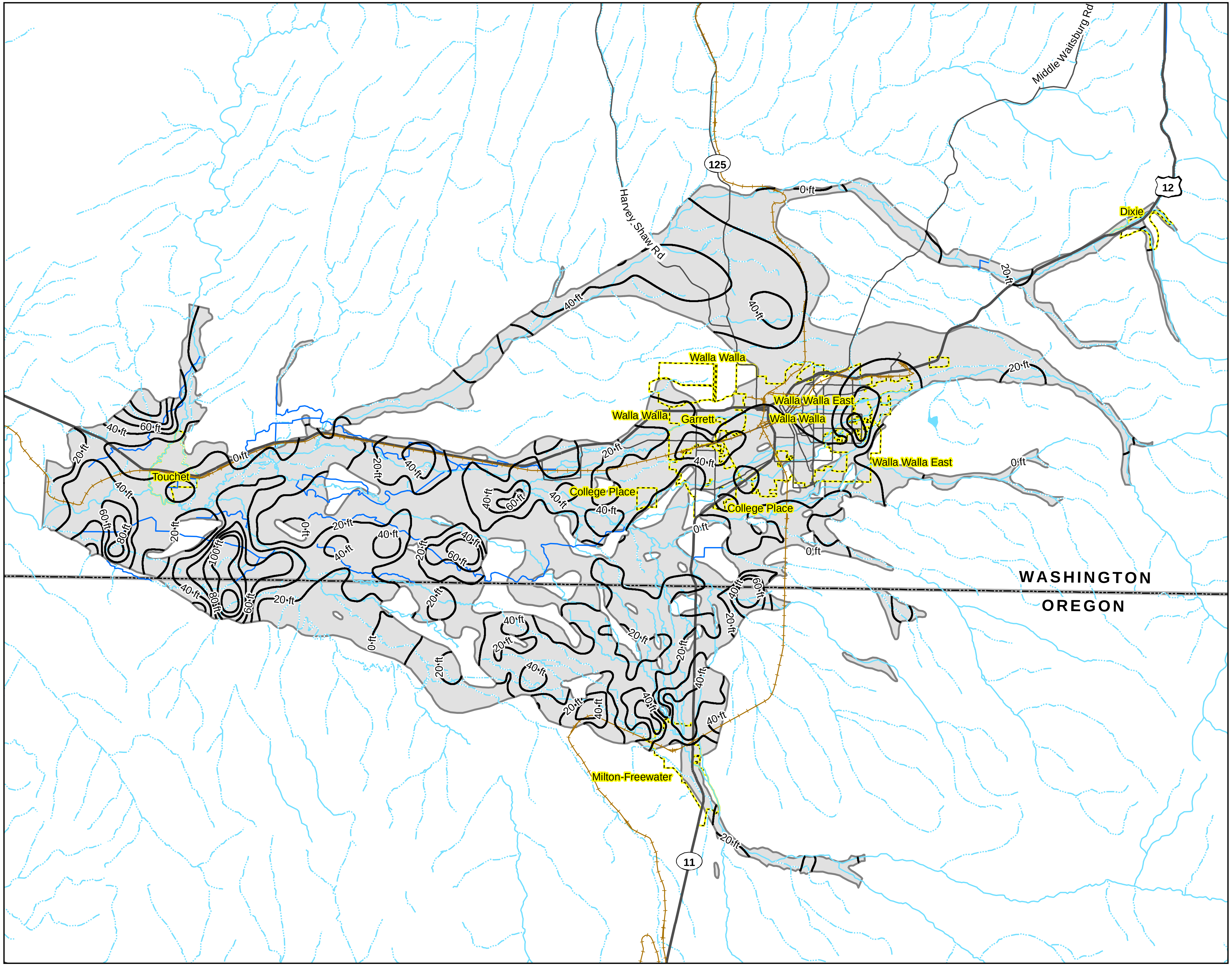
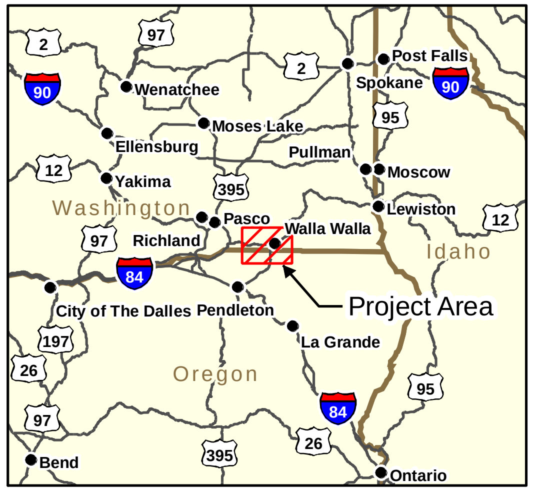


FIGURE 14

Isopach Map of the Quaternary Coarse Unit

Walla Walla Basin Watershed Council



LEGEND

∼	Qc Iso Thickness Contours (20 foot Intervals)
▨	Qc Iso Boundary
⬚	Cities
∧	Highways
∧	Major Roads
┼	Railroads
∼	Perennial Stream
∼	Intermittent Stream
∼	Intermittent Canal
●	Waterbodies

N

Scale

1:158,400

0 1.25 2.5 3.75 5

Miles

MAP NOTES:
Projection: Universal Transverse Mercator
Zone 11 North
Datum: North American Datum of 1983
Date: June 20, 2007

GSI Water Solutions, Inc.

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Figure 15. Photograph of the red-brown colored basaltic, lithic, indurated gravel typical of the Mio-Pliocene upper coarse unit. Outcrop is located in gravel pit near the Washington-Oregon border in the central part of the Basin.

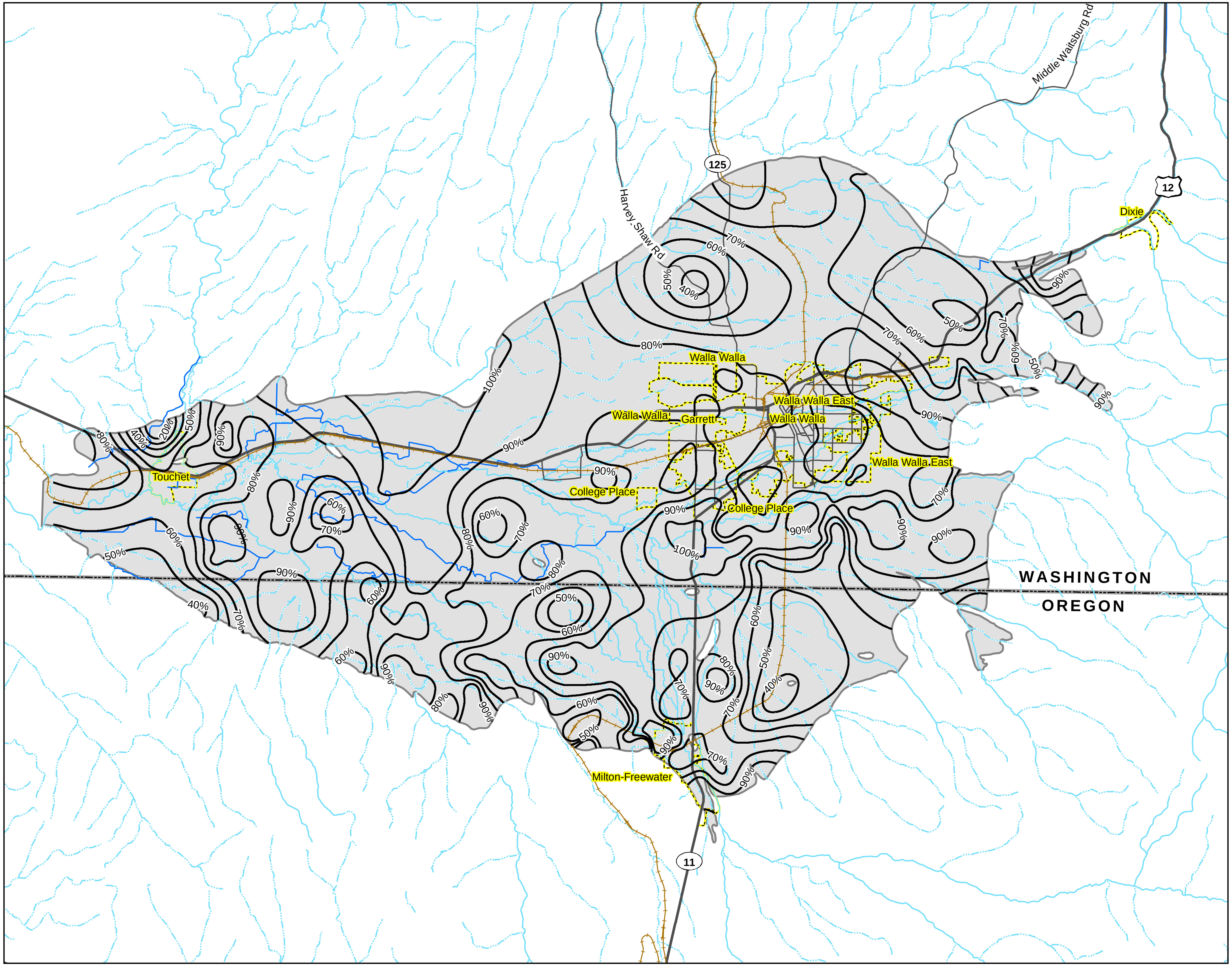
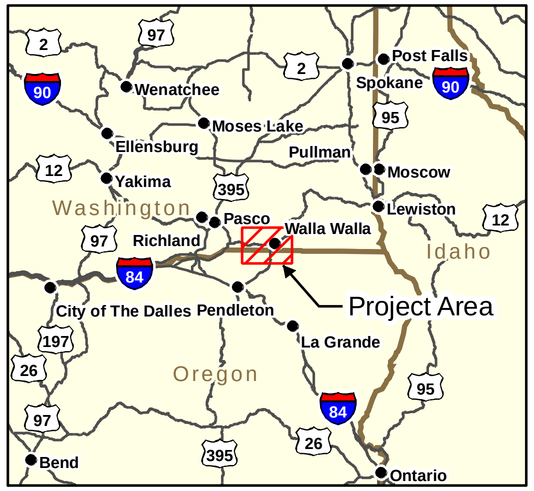


FIGURE 16

Percent Gravel Facies in the Mio-Pliocene Upper Coarse Unit

Walla Walla Basin Watershed Council



LEGEND

- MPc % Gravel Contours (10% Intervals)
- MPc Iso Boundary
- Cities
- Highways
- Major Roads
- Railroads
- Perennial Stream
- Intermittent Stream
- Intermittent Canal
- Waterbodies

N

Scale
1:158,400

0 1.25 2.5 3.75 5
Miles

MAP NOTES:
Projection: Universal Transverse Mercator
Zone 11 North
Datum: North American Datum of 1983
Date: June 11, 2007

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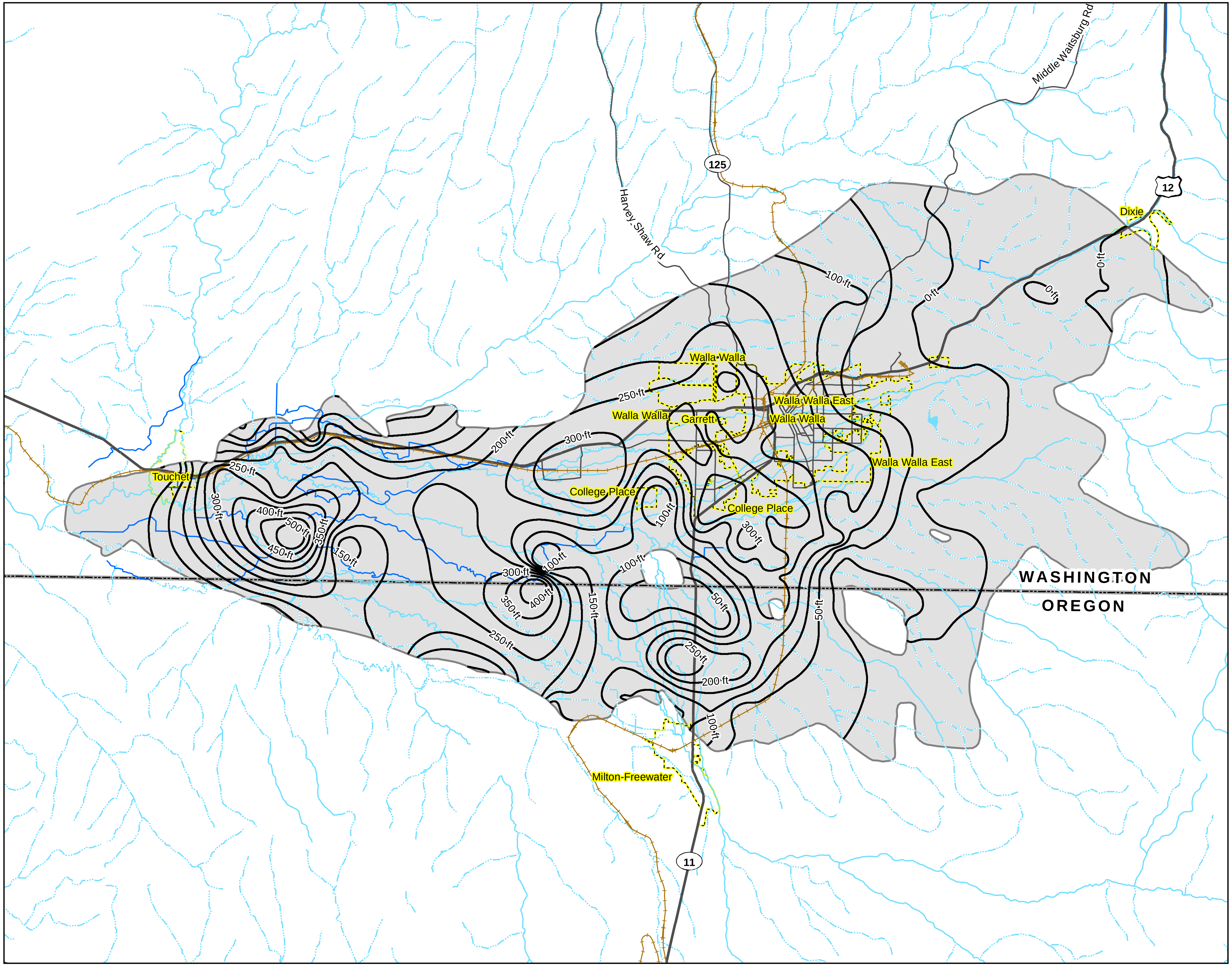
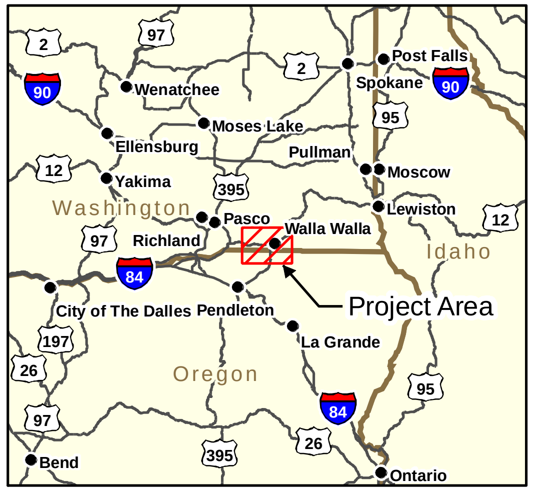


FIGURE 17

Isopach Map of the Mio-Pliocene Fine Unit

Walla Walla Basin Watershed Council



LEGEND

- MPf Iso Thickness Contours (50 foot Intervals)
- MPf Iso Boundary
- Cities
- Highways
- Major Roads
- Railroads
- Perennial Stream
- Intermittent Stream
- Intermittent Canal
- Waterbodies

N

Scale

1:158,400

0 1.25 2.5 3.75 5

Miles

MAP NOTES:
Projection: Universal Transverse Mercator
Zone 11 North
Datum: North American Datum of 1983
Date: June 20, 2007

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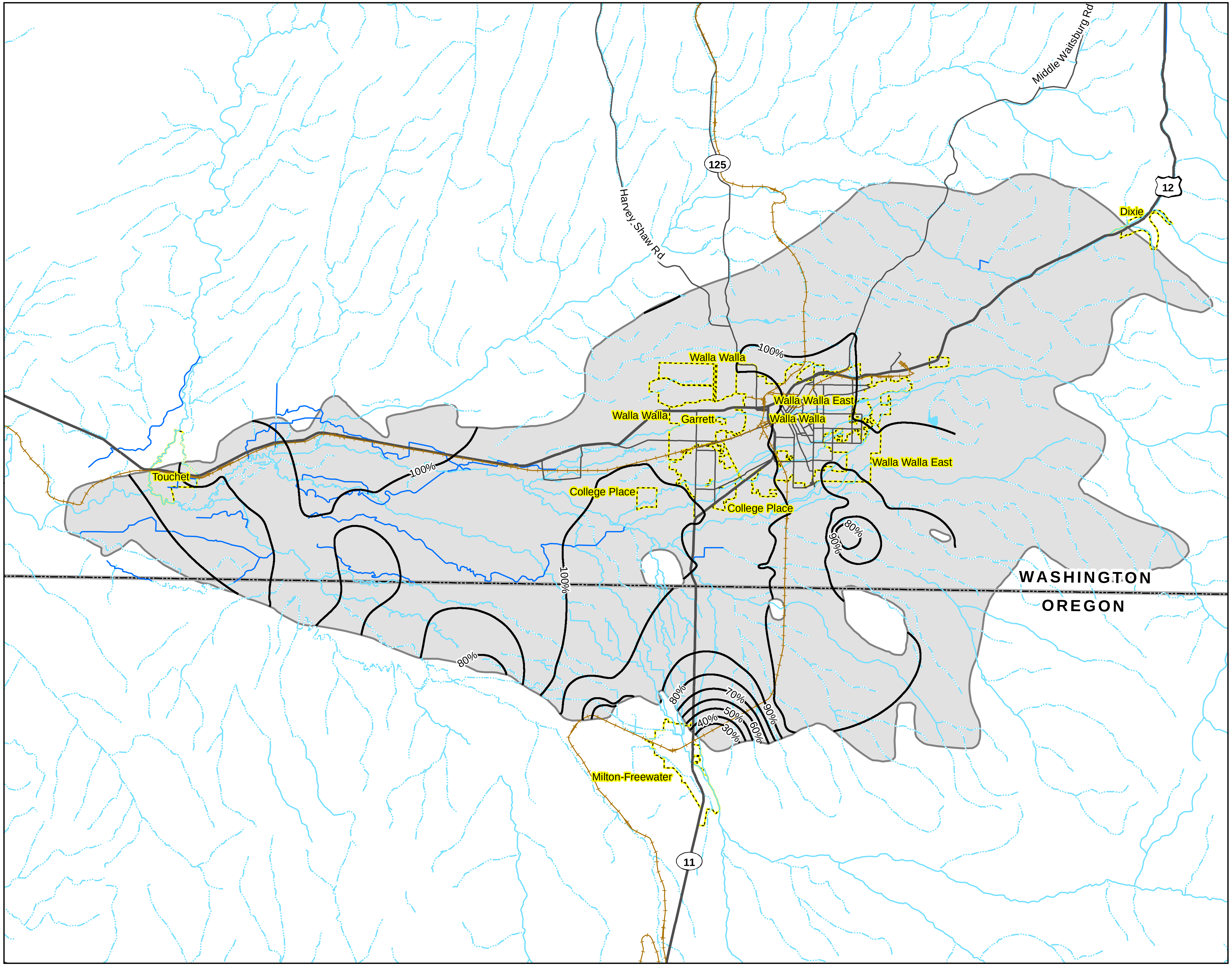
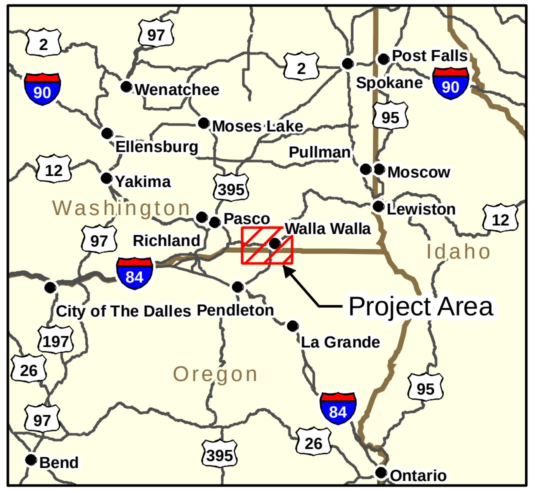


FIGURE 18
Percent Fine (Clay and Silt) Facies in the Mio-Pliocene Fine Unit

Walla Walla Basin Watershed Council



LEGEND

- MPf % Mud Contours (10% Intervals)
- MPf Iso Boundary
- Cities
- Highways
- Major Roads
- Railroads
- Perennial Stream
- Intermittent Stream
- Intermittent Canal
- Waterbodies

N

Scale
1:158,400

0 1.25 2.5 3.75 5
Miles

MAP NOTES:
Projection: Universal Transverse Mercator
Zone 11 North
Datum: North American Datum of 1983
Date: June 11, 2007

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Water Solutions, Inc.

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Figure 19. Photograph of the Sudbury Road thrust fault. The top of the shovel handle lies just below the trace of the fault, and rests against a basalt pebble gravel with a felsic-micaceous quartz sand matrix. The upper block above the shovel is basalt thrust over these sediments which in turn overlie basalt.

Appendix A

Geologic Logging Notes and Logs for Wells from which Drill Cuttings were Obtained and Geologically Logged

Drill cuttings geologic logging notes and/or geologist logs included in this appendix are for the following wells:

- WW1042
- WW0144
- WW0386
- WW0387
- U54524
- U54845
- U55248
- U55253
- U55437
- U55891

All notes and comments are those of the geologists and our best interpretations based on the available drill cuttings. These could be subject to change if new information becomes available.

LL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. WW0142 WADOE No.______ S/T/R 25/7N/35E

Date Completed______ Drill Method______ Use______

DEM elevation 839 Map elevation______ Survey elevation______

Total Depth (ft bgs) 653

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
SOIL		10	Qs	839	10						
G		63	Qc	829	63						
G	cmt	20	MPc	766	143			143			100
G	cmt, mica	17	↓								
G	cmt, lithic	106									
Mud	z/cl, gray	49	MPf	623	174	143		31	82		18
MS	felsic fN	20	↓								
cl/Z	dusgy	52									
G	bsltic	5									
sM		8									
MS	lithic	25									
M	sgy	15									
S	bsltic M18S, dark	74	MPbc	449	160	59		101	37		63
sM		11	↓								
S	qtz, no mica felsic, lithic, brn	21									
M	dk sgy	54									
Bslt			Bslt	289							

First water/SWL/date____/____/____

Temp.______

Well Test (rate/dd)____/____

Specific capacity______

Water Bearing Zones

Casing/liner______

Seals______

Screens______

Perfs______

Open______

Page 1 of 1

Well ID: Green Tank Well (WA State)
Location: T________R________Section________
Date Drilled: ________
Driller: ________
Date: 2/14/2007

Groundwater Solutions, Inc.
1020 North Center Parkway, Suite F
Kennewick, Washington 99336

Logged By: Terry Tolan, RG

Unit ID	Chem. Sample	Depth	Sediment	Glass	Fine-Gr.	Med.-Gr.	Crs.-Gr.	Scoria	Ab. Vesicles	Few Vesicles	Dense	Dikty.	Microphyric	Phyric	Weathered	Oxidized	Sec. Minerals	Slicks	Comments
		556			☒						☒	/	/						DI, v. small chip v. small sample
→	☒	625		☒	☒			/	☒		/		/		/		/		FB (Glass)/FT sample for chem from Glass,
		630			☒				☒	/					☒		/		FT
		640			☒				☒						☒		/		deeply wx FT
		645			☒				/	/	/				/		/		DI? mix of chips
		653			☒						☒						/	☒	DI + fault gauge?
—		lost Sample																	

Please print, sign and return to the Department of Ecology

Water Well Report

Original – Ecology, 1st copy – owner, 2nd copy – driller

Construction/Decommission

☑ Construction
☐ Decommission *ORIGINAL INSTALLATION Notice of Intent Number* ____

Current Notice of Intent No. W 05733

Unique Ecology Well ID Tag No. AAM 472

Water Right Permit No. #944 transfer of decommissioned well

Property Owner Name Green Tank Irrigation District #11

Well Street Address in front of 467 NE Myra Rd

City College Place **County** Walla Walla

Location NW 1/4-1/4 SE 1/4 Sec 25 Twn 7N R 35 EWM ☑ or WWM ☐ circle one

Lat/Long (s, t, r still REQUIRED) Lat Deg 46 Lat Min/Sec 03/22 N

Long Deg 118 Long Min/Sec 22/27 W

Tax Parcel No. 35-07-25-52-2308

PROPOSED USE: ☐ Domestic ☐ Industrial ☑ Municipal ☐ DeWater ☐ Irrigation ☐ Test Well ☐ Other ____

TYPE OF WORK: Owner's number of well (if more than one) New well #1

☑ New well ☐ Reconditioned ☐ Deepened *Method:* ☐ Dug ☐ Bored ☐ Driven ☑ Cable ☐ Rotary ☐ Jetted

DIMENSIONS: Diameter of well 8 inches, drilled 653 ft.

Depth of completed well 653 ft.

CONSTRUCTION DETAILS

Casing Installed: ☑ Welded 10 " Diam. from +0.5 ft. to 240 ft.
☐ Liner installed 8 " Diam. from +2.5 ft. to 540 ft.
☐ Threaded ____ " Diam. from ____ ft. to ____ ft.

Perforations: ☐ Yes ☑ No

Type of perforator used ____

SIZE of perfs ____ in. by ____ in. and no. of perfs ____ from ____ ft. to ____ ft.

Screens: ☐ Yes ☑ No ☐ K-Pac Location ____

Manufacturer's Name ____

Type ____ Model No. ____

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Diam. ____ Slot size ____ from ____ ft. to ____ ft.

Gravel/Filter packed: ☐ Yes ☑ No ☐ Size of gravel/sand ____

Materials placed from ____ ft. to ____ ft.

Surface Seal: ☑ Yes ☐ No To what depth? 75 ft.

Material used in seal Bentonite "Hole Plug"

Did any strata contain unusable water? ☐ Yes ☑ No

Type of water? ____ Depth of strata ____

Method of sealing strata off ____

PUMP: Manufacturer's Name ____

Type: ____ H.P. ____

WATER LEVELS: Land-surface elevation above mean sea level 840 ft.

Static level 184' 5" ft. below top of well Date 12/22/04

Artesian pressure ____ lbs. per square inch Date ____

Artesian water is controlled by ____ (cap, valve, etc.)

WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☑ Yes ☐ No If yes, by whom? driller

Yield: 300 gal./min. with 1.25 ft. drawdown after 3 hrs.
Yield: 400 gal./min. with 1.5 ft. drawdown after 4 hrs.
Yield: 540 gal./min. with 3.0 ft. drawdown after 5 hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level
0	187' 5"	10	184' 5"		
2	185' 6"	15	184' 5"		
5	184' 6"	60	184' 5"		

Date of test 12/22/04

Bailer test ____ gal./min. with ____ ft. drawdown after ____ hrs.

Airtest ____ gal./min. with stem set at ____ ft. for ____ hrs.

Artesian flow ____ g.p.m. Date ____

Temperature of water 66 (F) Was a chemical analysis made? ☐ Yes ☑ No

CONSTRUCTION OR DECOMMISSION PROCEDURE

Formation: Describe by color, character, size of material and structure, and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of information indicate all water encountered. (USE ADDITIONAL SHEETS IF NECESSARY.)

MATERIAL	FROM	TO
Topsoil	0	10
Gravel w/ Surface Water	10	73
Cemented Gravel	73	93
Brown Clay	93	98
Cemented Gravel	98	166
Brown Clay w/ Gravel	166	179
Cemented Gravel	179	216
Brown Clay w/ Gravel	216	227
Blue Clay	227	330
Black Sand	330	375
Dark Blue Clay	375	390
Blue Clay w/ Sand	390	421
Blue/green Sandstone w/ Shale	421	464
Brown Clay	464	489
Brown Clay w/ Gravel	489	497
Gray Clay	497	534
Blue Clay	534	539
Hard Gray Basalt	539	590
Broken Black Basalt (water bearing)	590	642
Black Basalt	642	653

Start Date 2/24/04 Completed Date 12/30/04

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Driller/Engineer/Trainee Name (Print) Thomas R. Ruther Jr

Driller/Engineer/Trainee Signature ____

Driller or trainee License No. 0429

If TRAINEE,
Driller's Licensed No. ____
Driller's Signature ____

Drilling Company T.R. Ruther Well Drilling

Address 1714 Circle Drive

City, State, Zip Walla Walla, WA 99362

Contractor's Registration No. TRRUTWD990CW Date 12/30/04

Ecology is an Equal Opportunity Employer.

ECY 050-1-20 (Rev 2/03)

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. WW 0143 WADOE No.________ S/T/R 10/~~3~~9N/35E

Date Completed________ Drill Method________ Use________

DEM elevation 687 Map elevation________ Survey elevation________

Total Depth (ft bgs) 560

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
G	bsltic	18	Qc	687	18						
G	s,z Matrix	22	MPc	669	222	180		142	36		64
M	z/cl	10									
sMG		30									
G		10									
mG		60									
cl/z	Mica	20									
mG		20									
gM		30									
G		20									
M	c/z	160	MPf	447	160	160			100		
S	mica	30	MPbc	287	160	30		130	19		81
G	cmt, bslt	70									
mS	qtz	20									
gsM		40									
bslt		bslt	bslt	127							

First water/SWL/date____/____/____

Temp.________

Well Test (rate/dd)____/____

Specific capacity________

Water Bearing Zones

Casing/liner________

Seals________

Screens________

Perfs________

Open________

Log of Borehole: MC-3a

WW0143

Also known as: Duthie Well

Project: Hall Wentland SAR **Well ID:**

6

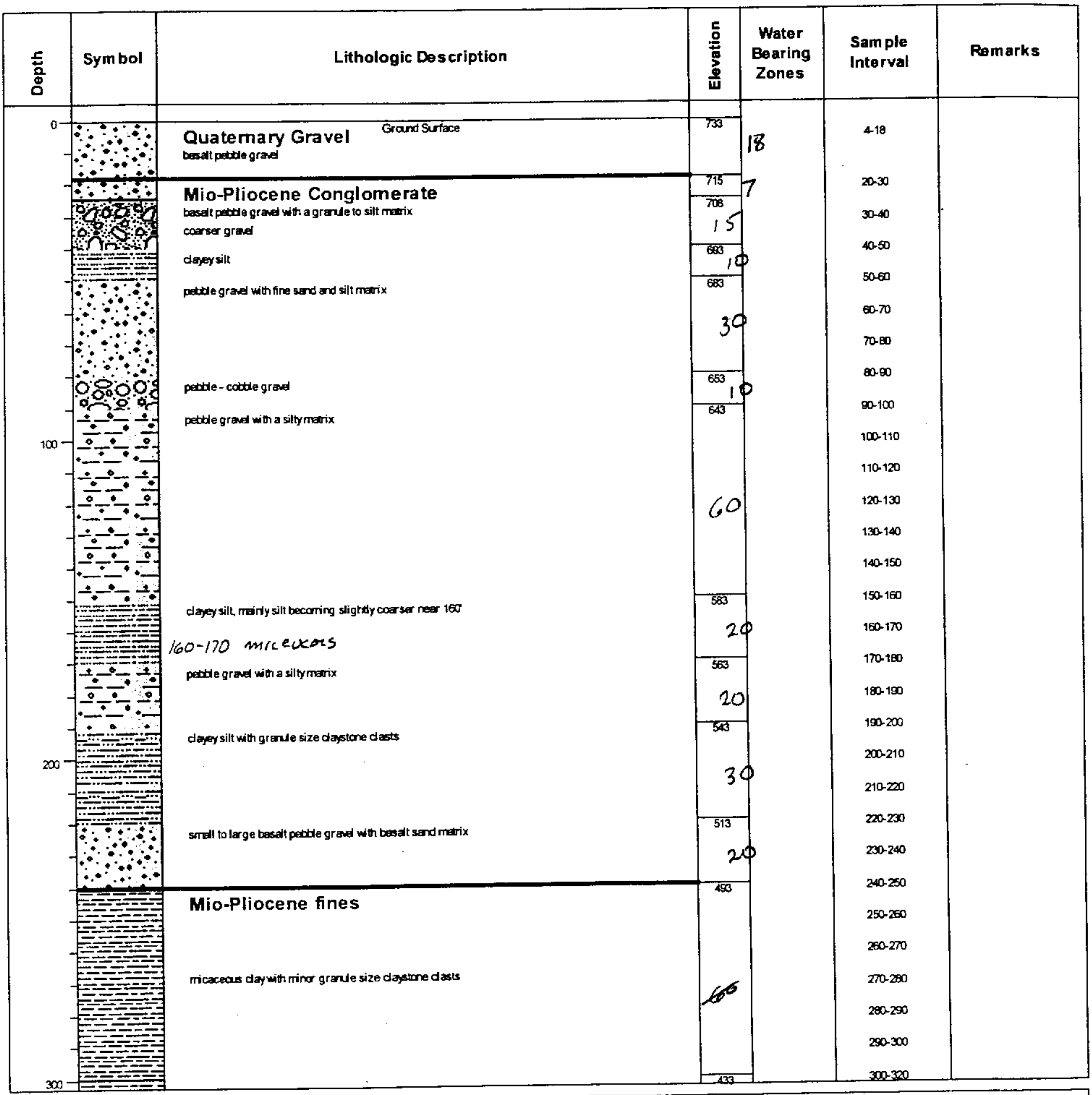
Location: SW 1/4, SE 1/4, sec. 10, T~~7~~N, R35E

Geologist: Kevin Lindsey

Kennedy/Jenks Consultants

Engineers & Scientists

Kennedy/Jenks Consultants
1020 N. Center Parkway, Suite F
Kennewick, Washington 99336
509-734-9763
FAX 509-734-9764
www.kennedyjenks.com



Drilled By:
Drill Method:
Drill Date:

Total Depth: 600 ft.

Page: 1 of 2

Figure 12. Interpreted geologic log for well MC-3a (Duthie well)

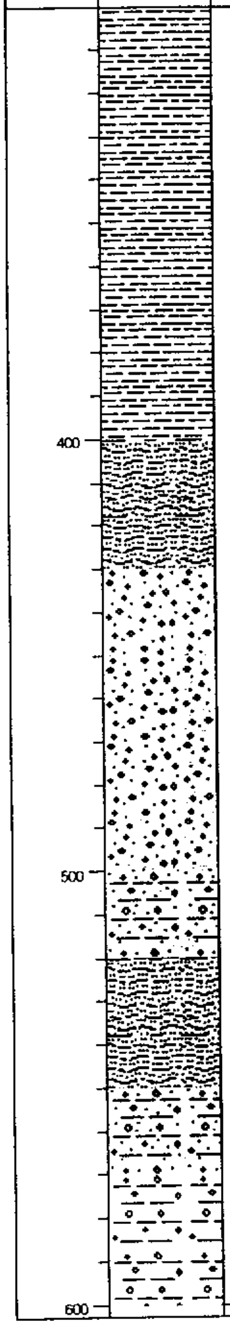
Log of Borehole: MC-3a
Also known as: Duthie Well

Project: Hall Wentland SAR **Well ID:**

Location: SW 1/4, SE 1/4, sec. 10, T7N, R35E

Geologist: Kevin Lindsey

Kennedy/Jenks Consultants
Engineers & Scientists
Kennedy/Jenks Consultants
1020 N. Center Parkway, Suite F
Kennewick, Washington 99336
509-734-9763
FAX 509-734-9764
www.kennedyjenks.com



Depth	Lithologic Description	Elevation	Water Bearing Zones	Sample Interval	Remarks
	micaceous clay with minor granule size claystone clasts				
				320-340	
		160		340-360	
				360-380	
				380-400	
400	fine silt - fine sandstone	333			
	micaceous + qts bearing	30		420	
	fine sandstone cemented matrix with basalt pebbles	303 20		440	
	basalt pebble gravel coarsening downward with a sandy matrix	283		460	
		50		480	
500	silty fine sand with small claystone clasts	233 20		500	
	silty fine sand } bears qts, minor/tr mica	213 30		520 540	
	silty fine sand with claystone and caliche clasts	183 20		560	
	basalt, claystone and caliche clasts with a micaceous clay matrix	163 40		580	
600		133		600	

Drilled By:
Drill Method: hole reported by drilla to TD e TOB
Drill Date:

Total Depth: 600 ft.

Page: 2 of 2

Figure 12. (continued)

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. WW 0386 WADOE No.________ S/T/R 7/37-17

Date Completed________ Drill Method________ Use________

DEM elevation 1427 Map elevation________ Survey elevation________

Total Depth (ft bgs) 314

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
dirt		7	Qs	1427	7						
MG	brn	~~15~~ 16	Qc	1420	30						
CB		14									
MGC	brn rd	160	MPc	1390	179	~~50~~			50		50
MGC	grn.	19	↓								
bslt			bslt	1211							

First water/SWL/date____/____/____

Temp.________

Well Test (rate/dd)____/____

Specific capacity________

Water Bearing Zones

Casing/liner________

Seals________

Screens________

Perfs________

Open________

7/37-17E

File Original and First Copy with Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

Ref No. 8

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No.

(1) OWNER: Name Bill Kibler Address Rt. 4 Mill Creek, Walla Walla

(2) LOCATION OF WELL: County Walla Walla SW ¼ NW ¼ Sec. 17 T. 7 N., R. 37 E.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)
New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Mud Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 12¼ to 221 ft 8" to inches.
Drilled 8 to Depth of completed well 374 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from +18 ft. to 221 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ 6" Diam. from 211 ft. to 374 ft.

Perforations: Yes ☒ No ☐
Type of perforator used Saw
SIZE of perforations 1/8 in. by 6" in.
200 perforations from 374' ft. to 314 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 221 ft.
Material used in seal
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
2 Static level ft. below top of well Date 5/1
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time Water Level | Time Water Level | Time Water Level

Air tested 70-80 Gallons
Per Min. Air test.

1 Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

9/17/86

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO	
Dirt	0	7	95
Brown Clay & Gravel	7	23	Qac
Cobbles & Gravel	23	37	
Brownish Red Clay & Cobbles With Some Boulders	37	197	MPc
Greenish Blue Clay, Cobbles & Gravel	197	[redacted]2	
[redacted]			
" " "	221	243	
Basalt Med. Black	243	283	
" Soft "	283	286	
Porous Black Basalt Water Bearing	286	314	
		TWP	

SEP 17 1986

Work started April 24 1986 Completed May 1 1986

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Lenah-Witt Well Drilling (Person, firm, or corporation) (Type or print)
Address 2202 6th Ave. Clarkston Wa
[Signed] Nathaniel (Well Driller)
License No. 0276 Date June 15, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

Ref No. 8

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No

(1) OWNER: Name Bud Kehler Address Rt. 4 Mill Creek, Walla Walla

(2) LOCATION OF WELL: County Walla Walla SW ¼ NW ¼ Sec. 17 T. 7 N., R. 37 E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Bored ☐ Cable ☐ Driven ☐ Mud Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 12¼ to 221 ft 8" to inches.

Drilled Depth of completed well 374' ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from +18 ft. to 221 ft.

Threaded ☐ " Diam. from ft. to ft.

Welded ☒ 6" Diam. from 211 ft. to 314 ft.

Perforations: Yes ☒ No ☐

Type of perforator used Saw

SIZE of perforations 1/8 in. by 6" in.

400 perforations from 374' ft. to 314 ft.

perforations from ft. to ft.

perforations from ft. to ft.

Screens: Yes ☐ No ☒

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel:

Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 221 ft.

Material used in seal

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? Depth of strata

Method of sealing strata off

(7) PUMP: Manufacturer's Name

Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.

2 Static level ft. below top of well Date 5/1

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom?

Yield gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time	Water Level	Time	Water Level	Time	Water Level

Air tested 70-80 Gallons
Per Min., Air test.

Date of test

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? Yes ☐ No ☒

9/17/86 PK

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Dirt	0	7
Brown Clay & Gravel	7	23
Cobbles & Gravel	23	37
Brownish Red Clay & Cobbles With Some Boulders	37	197
Greenish Blue Clay, Cobbles & Gravel	197	[redacted]2
Black Hard Basalt	216	221
" " "	221	243
Basalt Med. Black	243	283
" Soft "	283	286
Porous Black Basalt Water Bearing	286	314
		TWD

SEP 17 1986

Work started April 24 1986 Completed May 1 1986

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Leach-Nutt Well Drilling (Person, firm, or corporation) (Type or print)

Address 2202 6th Ave. Clarkston

[Signed] Nathaniel D. Steel (Well Driller)

License No. 0276 Date June 15, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. WW 0387 WADOE No.________ S/T/R 17/7/37

Date Completed________ Drill Method________ Use________

DEM elevation 1450 Map elevation________ Survey elevation________

Total Depth (ft bgs) 227

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
dirt		8	Qs	1450	8						
CG		4	Qc	1442	62						
CBG		24	|								
"		34	↓								
cl	rd brn	6	MPc	1380	102				50		50
MG	brn	4	MPc								
MGCB	brn	92	MPc								
bslt			bslt	1278							

First water/SWL/date____/____/____

Temp.________

Well Test (rate/dd)____/____

Specific capacity________

Water Bearing Zones

Casing/liner________

Seals________

Screens________

Perfs________

Open________

7|37-176

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

Ref NO. 10

WATER WELL REPORT

STATE OF WASHINGTON

Application No

Permit No.

(1) OWNER: Name K Secker Address Rt 4, Mill Creek Walla Walla W

(2) LOCATION OF WELL: County Walla Walla — SW ¼ NE ¼ Sec. 17 T. 7 N., R. 37E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Deepened ☐ Reconditioned ☐

Method: Dug ☐ Cable ☐ Mud Rotary ☒ Bored ☐ Driven ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 12¼ To 177 inches.

Drilled 8" To Depth of completed well 227 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from +18 ft. to 177 ft.

Threaded ☐ " Diam. from ft. to ft.

Welded ☒ 6" Diam. from 167 ft. to 227 ft.

Perforations: Yes ☒ No ☐

Type of perforator used Saw

SIZE of perforations 1/8 in. by 6" in.

200 perforations from 187 ft. to 227 ft.

perforations from ft. to ft.

perforations from ft. to ft.

Screens: Yes ☐ No ☒

Manufacturer's Name

Type Model No.

Diam. Slot size from ft. to ft.

Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel

Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 177 ft.

Material used in seal Benite Clay

Did any strata contain unusable water? Yes ☐ No ☒

Type of water? Depth of strata

Method of sealing strata off

(7) PUMP: Manufacturer's Name

Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.

Static level 48' ft. below top of well Date 5/15

Artesian pressure lbs. per square inch Date

Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? Yes ☐ No ☐ If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time | Water Level | Time | Water Level | Time | Water Level

Air tested 250 To 300 Gallons Per. Min. Air.

Date of test

Bailer test gal./min. with ft. drawdown after hrs.

Artesian flow g.p.m. Date

Temperature of water Was a chemical analysis made? Yes ☐ No ☒

9/17/86

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO	
Brown dirt	0	8	95
Cobbles & Gravel	8	12	
Boulders Cobbles & Gravel	12	36	Qac
Same formation	36	70'	
Redish Brown Clay	70	76	
Brown Clay & Gravel	76	80'	MPe
Brown Clay & Boulders	80	136'	
" " Cobbles	136	172	
[redacted]	[redacted]	[redacted]	
Brown Basalt	207	227	
Porous Water Bearing		Two.	

SEP 17 1986

Work started May 8, 19 86 Completed May 15, 19 86

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Leach-White Well Drilling (Person, firm, or corporation) (Type or print)

Address 2202 6th Ave Clarkston

[Signed] Nathaniel L. Leach (Well Driller)

License No. 0276 Date June 15, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

File Original and First Copy with
Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

Ref No. 10

WATER WELL REPORT

STATE OF WASHINGTON

Application No.
Permit No.

(1) OWNER: Name Klecker Address Rt 4, Mill Creek Walla Walla

(2) LOCATION OF WELL: County Walla Walla — SW ¼ NE ¼ Sec. 17 T. 7 N., R. 37E W.M.

Bearing and distance from section or subdivision corner

(3) PROPOSED USE: Domestic ☒ Industrial ☐ Municipal ☐ Irrigation ☐ Test Well ☐ Other ☐

(4) TYPE OF WORK: Owner's number of well (if more than one)

New well ☒ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Mud Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 12¼ To 177 inches.
Drilled 8" to Depth of completed well 227 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8" Diam. from +18 ft. to 177' ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ 6" Diam. from 167 ft. to 227 ft.

Perforations: Yes ☒ No ☐
Type of perforator used Saw
SIZE of perforations 1/8 in. by 6" in.
200 perforations from 187 ft. to 227 ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☐ No ☒
Manufacturer's Name
Type Model No.
Diam. Slot size from ft. to ft.
Diam. Slot size from ft. to ft.

Gravel packed: Yes ☐ No ☒ Size of gravel
Gravel placed from ft. to ft.

Surface seal: Yes ☒ No ☐ To what depth? 177 ft.
Material used in seal Benite Clay
Did any strata contain unusable water? Yes ☐ No ☒
Type of water? Depth of strata
Method of sealing strata off

(7) PUMP: Manufacturer's Name
Type: H.P.

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 48' ft. below top of well Date 5/15
Artesian pressure lbs. per square inch Date
Artesian water is controlled by (Cap, valve, etc.)

(9) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? Yes ☐ No ☐ If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.

Recovery data (time taken as zero when pump turned off) (water level measured from well top to water level)

Time Water Level | Time Water Level | Time Water Level

Air tested 250 To 300 Gallons Per. Min. Air.

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

9/17/86

(10) WELL LOG:

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Brown Dirt	0	8
Cobbled Gravel	8	12
Boulders Cobbles & Gravel	12	36
Same formation	36	70'
Redish Brown Clay	70	76
Brown Clay & Gravel	76	80'
Brown Clay & Boulders	80	136'
" " Cobbles	136	172
Black Basalt	172	207
Brown Basalt	207	227
Porous Water Bearing		TWO.

SEP 17 1986

Work started May 8 1986 Completed May 15 1986

WELL DRILLER'S STATEMENT:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Leach-Witt Well Drilling
(Person, firm, or corporation) (Type or print)

Address 2202 6th Ave Clarkston

[Signed] Nathaniel L. Leach
(Well Driller)

License No. 0276 Date June 15, 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. U 54524 WADOE No.______ S/T/R 26/6/35

Date Completed 8 Drill Method______ Use______

DEM elevation 892 Map elevation______ Survey elevation______

Total Depth (ft bgs) 427

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
soil		12	Qf	892	12						
G	cl	15	Qc	880	15						
G	oxidized	35	MPc	865	274	51		223	19		81
G		17	↓								
MG	brn	93									
G	cmt, brn	104									
cl	brn	5									
G	cmt	20									
M	rdbrn	15	MPf	591	84	84			100		
Mudstn	st/cl mica	69	↓								
S	felsic	10	MPbc	507	42	27		15	64		36
G	bslt	5	↓								
M	dk mica	27									
bslt			bslt	465							

First water/SWL/date____/____/____

Temp.______

Well Test (rate/dd)____/____

Specific capacity______

Water Bearing Zones

Casing/liner______

Seals______

Screens______

Perfs______

Open______

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MAY 30 2002

WATER RESOURCES DEPT.
SALEM, OREGON

Page 1

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

WELL I.D. # L 55001
START CARD # 116997

(1) LAND OWNER Well Number 1
Name Davis Orchards
Address 53285 Appleton Rd
City Milton Freewater State OR Zip 97862

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 438 ft.
Explosives used ☐ Yes ☒ No Type ______ Amount ______

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
24"	0	18	Bentonite	0	18	66SK.
20"	18	400				
16	400	438	Cement	438	230	90 SKS.

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☒ Other SueSaco To Poured Backside
Backfill placed from ______ ft. to ______ ft. Material ______
Gravel placed from ______ ft. to ______ ft. Size of gravel ______

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	20"	0	199.6	.325	☒	☐	☒	☐
	16"	+2	438		☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☐ Outside ☐ None
Final location of shoe(s) (199.6 20") (16" 438')

(7) PERFORATIONS/SCREENS:
☐ Perforations Method ______
☐ Screens Type ______ Material ______

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
		None				☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☒ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
30	0	79	1 hr.
30	0	301	
20	0	431	

Temperature of water 60° Depth Artesian Flow Found ______
Was a water analysis done? ☐ Yes By whom ______
Did any strata contain water not suitable for intended use? ☒ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ______
Depth of strata: ______

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude ______ Longitude ______
Township 6 [✓ N] or S Range 35 [✓ E] or W. WM.
Section 26 NE 1/4 SE 1/4
Tax Lot 1400 Lot ______ Block ______ Subdivision ______
Street Address of Well (or nearest address) Hwy 339

(10) STATIC WATER LEVEL:
123.6 ft. below land surface. Date May, 4
Artesian pressure ______ lb. per square inch Date ______

(11) WATER BEARING ZONES:
Depth at which water was first found 62'

From	To	Estimated Flow Rate	SWL
62'	79	30 G.p.m.	33
280	301	30 G.p.m.	140
427	431	20 G.p.m.	123

(12) WELL LOG:
Ground Elevation ______

Material	From	To	SWL
Top Soil	0	12	
Cobbles + Br Clay.	12	62	
Gravel Multi Color	62	79	33
Cobbles Br Clay	79	172	
Tight Cement Gravel Br Clay	172	276	
Br Clay	276	281	
Cement Gravel	281	301	140
Redish Br Clay	301	316	
Yellow Clay	316	321	
Tan Clay	321	341	
Sticky yellow Clay + Gray	341	351	
Sticky Blue Clay	351	366	
Blue Clay Seams of Br Clay	366	376	
Blue Clay 1/4" Rocks	376	385	
Blue Clay + Seams of Br Clay	385	391	
Blue Clay w/ 2" to 3" Rocks	391	395	
Blue Clay + Seams of Br Clay	395	397	
Blue Shale	397	400	

Date started March 1, 2002 Completed May 21, 2002

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1669
Signed Jody Hagard Date ______

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1669
Signed Jody Haga Date ______

UMAT 54524

Page 2

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 55001
START CARD # 116997

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number
Name Davis Orchard
Address 53285 AppleTon Rd.
City Milton Freewater State OR Zip 97862

(2) TYPE OF WORK
☐ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☐ No Depth of Completed Well ____ ft.
Explosives used ☐ Yes ☐ No Type ____ Amount ____

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other
Backfill placed from ____ ft. to ____ ft. Material ____
Gravel placed from ____ ft. to ____ ft. Size of gravel ____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☐ Outside ☐ None
Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☐ Screens Type ____ Material ____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
			1 hr.

Temperature of water ____ Depth Artesian Flow Found ____
Was a water analysis done? ☐ Yes By whom ____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude ____ Longitude ____
Township 6 [✓ N] or S Range 35 [✓ E] or W. WM.
Section 26 NE 1/4 SE 1/4
Tax Lot 1400 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) Hwy 339

(10) STATIC WATER LEVEL:
____ ft. below land surface. Date ____
Artesian pressure ____ lb. per square inch Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found ____

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground Elevation ____

Material	From	To	SWL
Blue + Brown Clay	400	405	
Blue Gray Clay	405	4246	
Black Clay.	424.6	427	
Broken Rocks	427	430	1236
Soft Basalt	430	431	
Hard Black Basalt	431	438	

Conti
from
Page 1

Date started ____ Completed ____

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1669
Signed ____ Date May 21, 2

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1669
Signed ____ Date May 24,

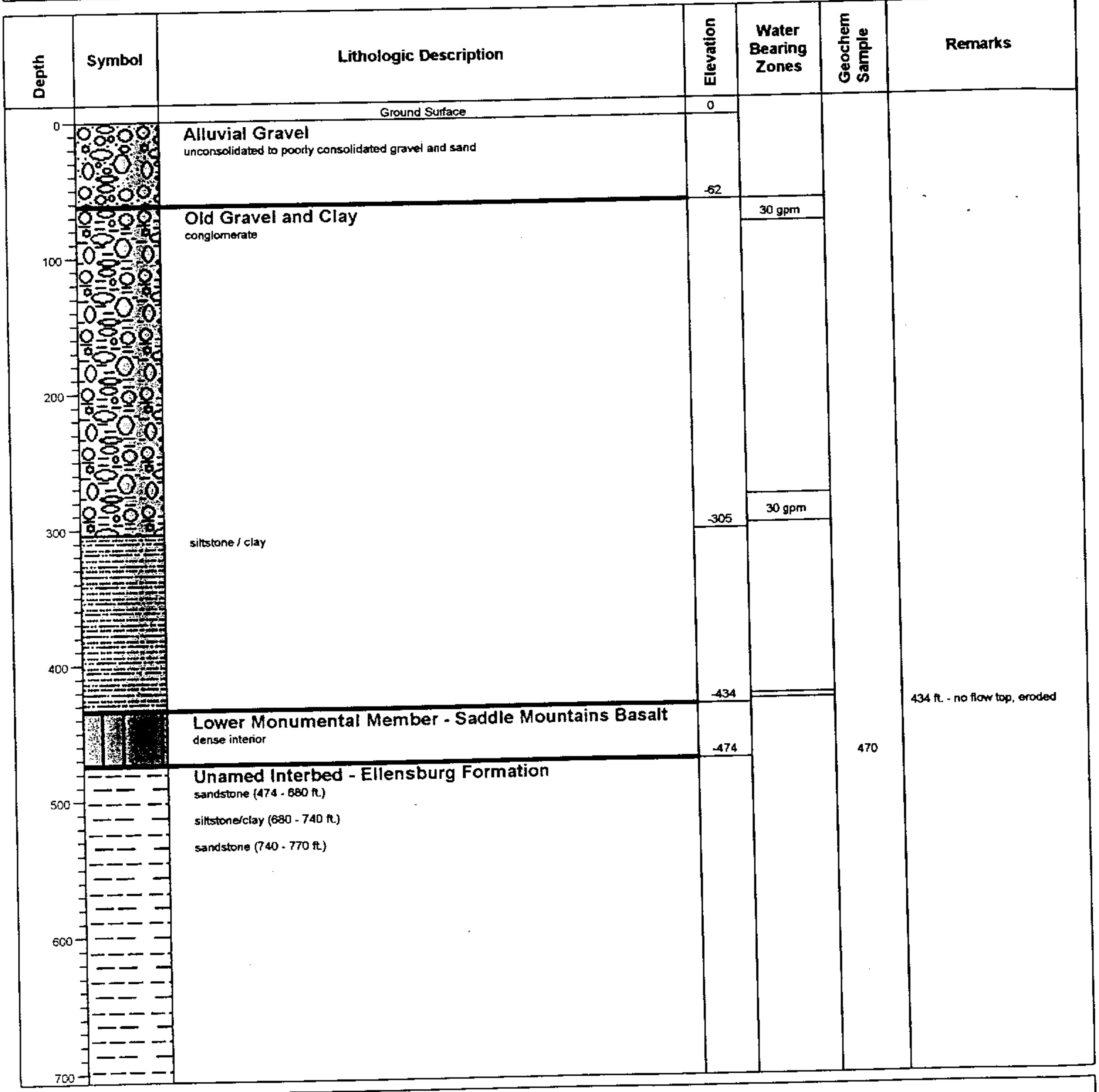
Log of Borehole: Davis Orchards Well
Also known as:

Project: USGS **Well ID: UMAT 54524/54779**

Location: sec. 26, T6N R35E

Geologist: Terry L. Tolan R.G.

Kennedy/Jenks Consultants
Engineers & Scientists
Kennedy/Jenks Consultants
1020 N. Center Parkway, Suite F
Kennewick, Washington 99336
509-734-9763
FAX 509-734-9764
www.kennedyjenks.com



Lithologic Description	Elevation	Water Bearing Zones	Geochem Sample	Remarks
Ground Surface	0			
Alluvial Gravel unconsolidated to poorly consolidated gravel and sand	-62	30 gpm		
Old Gravel and Clay conglomerate siltstone / clay	-305	30 gpm		
	-434			434 ft. - no flow top, eroded
Lower Monumental Member - Saddle Mountains Basalt dense interior	-474		470	
Unamed Interbed - Ellensburg Formation sandstone (474 - 680 ft.) siltstone/clay (680 - 740 ft.) sandstone (740 - 770 ft.)				

Drilled By: Jody Carpenter
Drill Method: Cable
Drill Date: 5-12-2002

Total Depth: 995 ft.

Log of Borehole: Davis Orchards Well
Also known as:

Project: USGS

Well ID: UMAT 54524/54779

Location: sec. 26, T6N R35E

Geologist: Terry L. Tolan R.G.

Kennedy/Jenks Consultants
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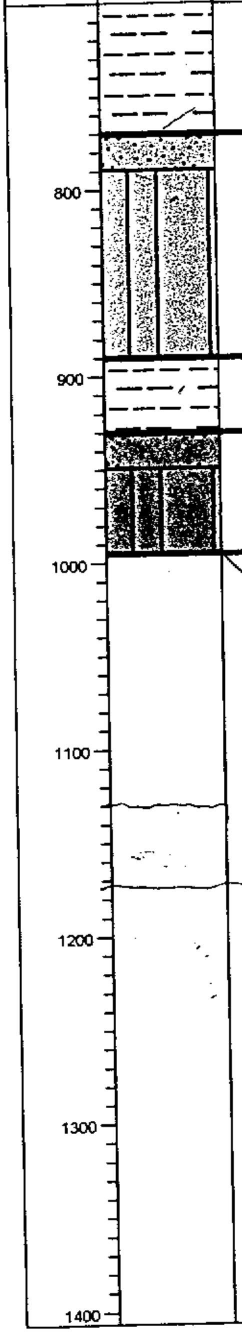
1020 N. Center Parkway, Suite F
Kennewick, Washington 99336
509-734-9763
FAX 509-734-9764
www.kennedyjenks.com



Lithologic Description	Elevation	Water Bearing Zones	Geochem Sample	Remarks
	-770			
Ice Harbor Member - Saddle Mountains Basalt Basalt of Martindale normal flow top dense interior - colonnade	-790 -890		790	
Levey Interbed - Ellensburg Formation siltstone / claystone	-930			
Umatilla Member - Saddle Mountains Basalt normal flow top dense interior	-950 -995			
TD 995 ft.				

Drilled By: Jody Carpenter
Drill Method: Cable
Drill Date: 5-12-2002

Total Depth: 995 ft.

Page: 2 of 2

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. U 54845 WADOE No.______ S/T/R 21/5/36

Date Completed______ Drill Method______ Use______

DEM elevation 1329 Map elevation______ Survey elevation______

Total Depth (ft bgs) 104

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
soil		3	Qf	1329	7						
cl	brn	4									
G	cobs	28	Qc	1322	28						
bslt			bslt	1294							

First water/SWL/date____/____/____

Temp.______

Well Test (rate/dd)____/____

Specific capacity______

Water Bearing Zones

Casing/liner______

Seals______

Screens______

Perfs______

Open______

UMAT 54845

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 56524
START CARD # W133852

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number 1
Name Mark Sexton
Address 55141 Walla Walla River Rd
City Milton Freewater State OR Zip 97862

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 104 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE			SEAL			
Diameter	From	To	Material	From	To	[✓ Sacks] or pounds
10"	0	41	neat cement	0	41	Sacks
6"	41'	104'				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+2'	41	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☒ Outside ☐ None
Final location of shoe(s) 41

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
35		100'	1 hr.

Temperature of water 51° Depth Artesian Flow Found
Was a water analysis done? no ☐ Yes By whom
Did any strata contain water not suitable for intended use? yes ☒ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata: 25'-35

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude Longitude
Township 5 [✓ N] or S Range 36 [✓ E] or W. WM.
Section 21 SW 1/4 NE 1/4
Tax Lot 800 Lot Block Subdivision
Street Address of Well (or nearest address) 55141 Walla Walla River Road, Milton Freewater OR 97862

(10) STATIC WATER LEVEL:
35 ft. below land surface. Date 6-17-03
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES:
Depth at which water was first found 25'

From	To	Estimated Flow Rate	SWL
25	35	5 gpm	
91	95	35 gpm	35'

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Topsoil	0	3	
clay - Brown	3	7	
cobbles - Lg -	7	35	
Baselt - Black. Hard	35	67	
" Brown soft	67	84	
" Black Hard	84	91	
" Black Fractured - water	91	95	35'
" Black - med Hard	95	104	35'

RECEIVED
JUN 25 2003
WATER RESOURCES DEPT
SALEM, OREGON

Date started 6-13-03 Completed 6-17-03

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number
Signed Date

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1659
Signed Mike Harding Date 6-23-03

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER

Page 1 of 1

Well ID: UMAT 54845 Sexton
Location: T 5N R 36E Section 21
Date Drilled: 6/13 → 6/17/2003
Driller: Mike Harding
Date: 2/14/2007

Groundwater Solutions, Inc.
1020 North Center Parkway, Suite F
Kennewick, Washington 99336

Logged By: Terry Tolan, RG

Unit ID	Chem. Sample	Depth	Sediment	Glass	Fine-Gr.	Med.-Gr.	Crs.-Gr.	Scoria	Ab. Vesicles	Few Vesicles	Dense	Dikty.	Microphyric	Phyric	Weathered	Oxidized	Sec. Minerals	Slicks	Comments
																			Driller Report TOB @ 35'
	X	45			X						X						/		DIE, brn-glo on joints
Cement		55																	Cement chips
—		65			X				/		X						/		PB/FT, ; Brn on joints cement coating cuttings
		75			X				X							/	/		FT, brn ox on some chips
		85			X						X						/		DIE, hydration rinds
	X	95			X						X						/		DIE " "
																			Last sample @ 95' well TD 104'

L DATA SHEET, SUPRABASALT SEDIMENTS

Well No. U 55248 WADOE No.______ S/T/R 36/6N/35E

Date Completed______ Drill Method______ Use______

DEM elevation 942 Map elevation______ Survey elevation______

Total Depth (ft bgs) 500

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
MSG	gry-olv brn	61	Qc	942							
MG	cmts ltg brn	29	MPc	881	129	15		114	12		88
G	brn, yllw brn	100	↓								
MS	"	20	MPs	752	60	50		10	83		17
Z	sandy brn, gry, yllw	40	↓								
MG		20	MPbc	692	50	10		40	20		80
G	gry brn	50	↓								
bslt			bslt	642							

First water/SWL/date____/____/____

Temp.______

Well Test (rate/dd)____/____

Specific capacity______

Water Bearing Zones

Casing/liner______

Seals______

Screens______

Perfs______

Open______

Page 1 of ____

Well ID: UMAT 55248 (Roloff)
Location: T 6N R 35E Section 36
Date Drilled: 7/18 → 8/25/04
Driller: Larry Byrd
Date: 2/14/07

Groundwater Solutions, Inc.
1020 North Center Parkway, Suite F
Kennewick, Washington 99336

Logged By: T. Tolan, RG

Unit ID	Chem. Sample	Depth	Sediment	Glass	Fine-Gr.	Med.-Gr.	Crs.-Gr.	Scoria	Ab. Vesicles	Few Vesicles	Dense	Dikty.	Microphyric	Phyric	Weathered	Oxidized	Sec. Minerals	Slicks	Comments Log only Ter samples
old gvl		300	X																most frags of basalt pebble/cobbles - Mult. Ter liths
old gvl		320	X																same as above - if TOB here, can't separate out basalt from clastics.
Ter	X	340			X				X				/	/	/		/		F.T., ylw clay/blue coats in ves. spar. microphyric, ~~phyric~~ spar. phyric w/small phenos
		350			X				/	X		/	/	/	X		/		F.T., " " in ves.
		360			X				/	X	→ /	/	/	/	X		/		F.T. " " " " ↳DI
		370			X				/	/	/		/		/		/		F.T.? few lg chunks of ves/nonves. all microphyric.
		380			X				X	/		/	/		X		/		FT
		390		/	X				X	/			/				X		FT?, some hyaloclastic-type materials FB?
		400		/	X				X	/			/				/		FT? " " " FB? "
		410			X				/	X	/		X				/		FT, small ves., fresh.
//// ↑		420			X					X	/		/				/	X	FT→DI, shatter breccia Fault
↑		430			X					X	→ /		/		X		/	X	FT→DI " " Fault
		440			X					/	→ X		/		/		/	/	DI Some shatter breccia brn clay in breccia Fault
Fault		450			X					/	→ X		/	/	/		/	/	DI " " " Fault
↓	X	460			X					/	→ X		/	/	/		/	/	DI " " " Fault
↓		470			X					/	→ X		/	/	/		/	/	DI Shatter breccia
↓ /////		480				X				/	X	/	/		X		/	/	DI coarser grained, deeply wx. shatter breccia
		490			X				X →	/			/		/		/		FT, spar. microphyric
	X	500			X					/	→ X		X	/	/		/		DI, spar microphyric, v. spar phyric w/small laths

UMAT 55248

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

(WELL I.D.) # L 71112
(START CARD) # 166222

(1) OWNER:
Well Number ______
Name WALT ROLOFF
Address 53515 LOCUST ROAD
City MILTON FREEWATER State OREGON Zip 97862

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other ______

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other ______

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 500 ft.
Explosives used ☐ Yes ☒ No Type ______ Amount ______

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
14"	0	18'	BENTONITE	18'	0	28 SACKS
12"	18'	338'	PORT. CEMENT	338'	300'	27 SACKS
10"	338'	500'				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other ______
Backfill placed from ______ ft. to ______ ft. Material ______
Gravel placed from ______ ft. to ______ ft. Size of gravel ______

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	10"	+2	338'	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) TUBEX SHOE @ 338'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method ______
☐ Screens Type ______ Material ______

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
		N/A				☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
500+		500'	1 hr.

Temperature of water 61° Depth Artesian Flow Found ______
Was a water analysis done? ☐ Yes By whom ______
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ______
Depth of strata: ______

(9) LOCATION OF WELL by legal description:
County UMATILLA Latitude ______ Longitude ______
Township 6N [✓ N] or S Range 35E [✓ E] or W WM.
Section 36 NW 1/4 SW 1/4
Tax Lot 800 Lot ______ Block ______ Subdivision ______
Street Address of Well (or nearest address) ON ELIZABETH ST. BEHIND SAW SHOP ON 395

(10) STATIC WATER LEVEL:
311 ft. below land surface. Date 8-25-04
Artesian pressure ______ lb. per square inch. Date ______

(11) WATER BEARING ZONES:
Depth at which water was first found 120'

From	To	Estimated Flow Rate	SWL
120	140	60 gpm	274
370'	500'	500+ gpm	311'

(12) WELL LOG:
Ground Elevation ______

Material	From	To	SWL
SOIL & GRAVEL	0'	51'	
GRAVEL & CLAY	51'	308'	274'
BLACK BASALT	308'	370'	
BLACK SCORIA w/GREEN CLAY	370'	500'	311'

RECEIVED
SEP 15 2004
WATER RESOURCES DEPT
SALEM, OREGON

Date started 7-18-04 Completed 8-28-04

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1731
Signed ______ Date 8-28-04

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 544
Signed Tony Bird Date 8-25-04

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. U 55253 WADOE No.______ S/T/R 35/6/35

Date Completed______ Drill Method______ Use______

DEM elevation 932 Map elevation______ Survey elevation______

Total Depth (ft bgs) 420

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
soil		19	Qs	932	19						
G	bsltic cmt	176	MPc	913	199			199			100
S	micaceous	23	↓								
sM	mica	32	MPs	714	32	16		16	50		50
S	mudstn	20	MPbc	682	70			20			100
G	bslt	50	"								
bslt			bslt	612							

First water/SWL/date____/____/____

Temp.______

Well Test (rate/dd)____/____

Specific capacity______

Water Bearing Zones

Casing/liner______

Seals______

Screens______

Perfs______

Open______

Page 1 of 1

Well ID: UMAT 55253
Location: T 6N R 35E Section 35
Date Drilled: 8/30 → 9/10/2004
Driller: Larry Bard
Date: 2/14/2007

Groundwater Solutions, Inc.
1020 North Center Parkway, Suite F
Kennewick, Washington 99336

Logged By: Terry Tolan, RG

Unit ID	Chem. Sample	Depth	Sediment	Glass	Fine-Gr.	Med.-Gr.	Crs.-Gr.	Scoria	Ab. Vesicles	Few Vesicles	Dense	Dikty.	Microphyric	Phyric	Weathered	Oxidized	Sec. Minerals	Slicks	TOB on sample basis ~ 320' Comments TOB ~ 270' bgs by Driller
gvl		280	X																Appear to be mostly gvl – basalt comp.
gvl		290	X																mix of wx basalt gvl chips + sed
clay		306·	X																grey clay / tan fine mica sand stone
		320			X				X				X				/		TOB ?, FT, ylw clay in ves.
Tih?		340			X→	⋰					X	X	X				/		DIC, brn clay on joints
Tih?	X	350			X→	/					X	/	X	⋰			/		DIC, " " " " v. spar phyric, small clear phenos
Tih?		360				X					X	/	X	⋰			/		DIC, " " " " " " " " "
Tih?		370				/→	X				X	/	X	⋰			/		DIC " " " " " " " " "
Tih?		380				/→	X				X	⋰	X	/			/		DIC " " " " " " " " "
Tih		390			/	←X				/	X		X	/			/		FB, brn clay on joints.
Tu		400			X						X		⋰				/		Eroded top? Opal, v. fine grn. DIE
Tu	X	410			X					/	X		⋰				/		DIE, ylw on joints
Tu		420			X					/	X		⋰				/		

UMAT 55253

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

(WELL I.D.)# L 71150

(START CARD) # 166237

(1) OWNER:
Well Number

Name WALT ROLOFF

Address 53515 LOCUST ROAD

City MILTON FREEWATER State OREGON Zip 97862

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger

☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 420 ft.

Explosives used ☐ Yes ☒ No Type Amount

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
14"	0	18	BENTONITE	18'	0	20 SACKS
12"	18	338	NEAT CEMENT	338'	320'	27 SACKS
10"	338	420				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	10"	42'	338'	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) TUBEX SHOE @ 338'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method

☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
		N/A				☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
500+		420'	1 hr.

Temperature of water 68° Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:
County UMATILLA Latitude Longitude

Township 6 [✓ N] or S Range 35 [✓ E] or W WM.

Section 35 SE 1/4 NW 1/4

Tax Lot 4602 Lot Block Subdivision

Street Address of Well (or nearest address) FIVE BLOCKS WEST OF HWY 11 ON NORTH SIDE OF COBB ROAD

(10) STATIC WATER LEVEL:
214' ft. below land surface. Date 9-13-04

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 250'

From	To	Estimated Flow Rate	SWL
250'	270'	100 gpm	236'
367'	420'	500+ gpm	214

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
SOIL & GRAVEL	0	42	
BROWN CLAY & GRAVEL	42	170	
TAN CLAY & GRAVEL	170	218	
SAND & CLAY	218	250	
GRAVEL	250	270	236'
BLACK BASALT	270	280	
GREY CLAY	280	310	
VESICULAR BASALT	310	316	
BLACK BASALT	316	367	
BLACK W/ GREEN CLAY	367	420	214'

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SEP 17 2004

WATER RESOURCES DEPT
SALEM, OREGON

Date started 8-30-04 Completed 9-10-04

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

Signed WWC Number 1731

Date 9-13-04

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 544

Signed Larry Bird Date 9-13-04

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. U 55437 WADOE No._____ S/T/R 20/6N/34E

Date Completed_____ Drill Method_____ Use_____

DEM elevation 538 Map elevation_____ Survey elevation_____

Total Depth (ft bgs) 341

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G
silty Loam	brn	26	Qf	538	26						
MSG	brn/blk	20	Qc	512	20						
sG	brn, Fe, stz	30	MPc		263	13		250	5		95
MG	brn	15									
M		5									
S	brn	14									
G	brn	21									
sS		35									
G	brn	25									
S+G	felsic sd	118									
M		24	MPf	229	>32						
mG		5									
M	brn	>3									

First water/SWL/date____/____/____

Temp._____

Well Test (rate/dd)____/____

Specific capacity_____

Water Bearing Zones

Casing/liner_____

Seals_____

Screens_____

Perfs_____

Open_____

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WATER RESOURCES DEPT
SALEM, OREGON

UMAT 55437

Umat 55437

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

(WELL I.D.)# L L72454
(START CARD) # 168779

(1) OWNER:
Well Number A
Name White Brothers Co. Inc.
Address PO Box 683
City Walla Walla State WA Zip 99362

(2) TYPE OF WORK
☑ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☑ Other Reverse Circulation Rotary

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☑ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Well 330 ft.
Explosives used ☐ Yes ☑ No Type Amount

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
20	0	341	Cement	0	88	~475 sacks

How was seal placed: Method ☐ A ☐ B ☑ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from 88 ft. to 341 ft. Size of gravel 3/8 pea

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12	+2	330	.375	☑	☐	☑	☐
	w/plate	bottom			☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☑ Perforations Method Factory mill cut
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
150	310	.19x2.5	5400			☑	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
1280	21		1 hr.
1280	23		3 hours
1280	26		10 hours

Temperature of water 59 F Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude Longitude
Township 6 N Range 34 E WM.
Section 20 NW 1/4 NW 1/4
Tax Lot 601 Lot Block Subdivision
Street Address of Well (or nearest address) 85201 White Reservoir Rd,
Milton-Freewater, OR 97862

(10) STATIC WATER LEVEL:
68 ft. below land surface. Date 4/7/05
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found indeterminate: flooded hole

From	To	Estimated Flow Rate	SWL
102	309	see (8)	see
			(10)
???`	80	not measured	NM

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Loam, brown, silty	0	26	
Sand, brn & blk, med-crse & grvl, 1"-, w/clay	26	51	
Gravel, 3"- & sand, coarse, multi-colored	51	65	
Gravel, brn, 3"- w/some cobbles	65	80	
Gravel, brn & blk, 2"- & sand, brn & blk,	80		
medium-coarse w/clay, brown		102	
Sand, brn & blk, coarse w/gravel, 1.5"-	102	111	
Sand, brn & blk, coarse, w/gravel, 1.5"- &	111		
occasional clay lenses		154	
Sand, brn & blk, coarse, w/gravel, 1.5"-	154	286	
Gravel, brn & blk, 1.5"- w/sand brn & blk,	286		
coarse-fine - some cementation		309	
same as previous w/clay, tan, soft	309	312	
Clay, tan, soft w/gravel, 1.5"- & sand, med	~~312~~	~~328~~	
Clay, brown, med	328	333	
Gravel, 1.5"- & sand, medium -	333		
multi-colored w/clay, tan, soft		338	
Clay, brown, soft	338	341	

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JUN 1 4 2005
WATER RESOURCES DEPT
SALEM, OREGON

Date started 3/4/05 Completed 5/13/05

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

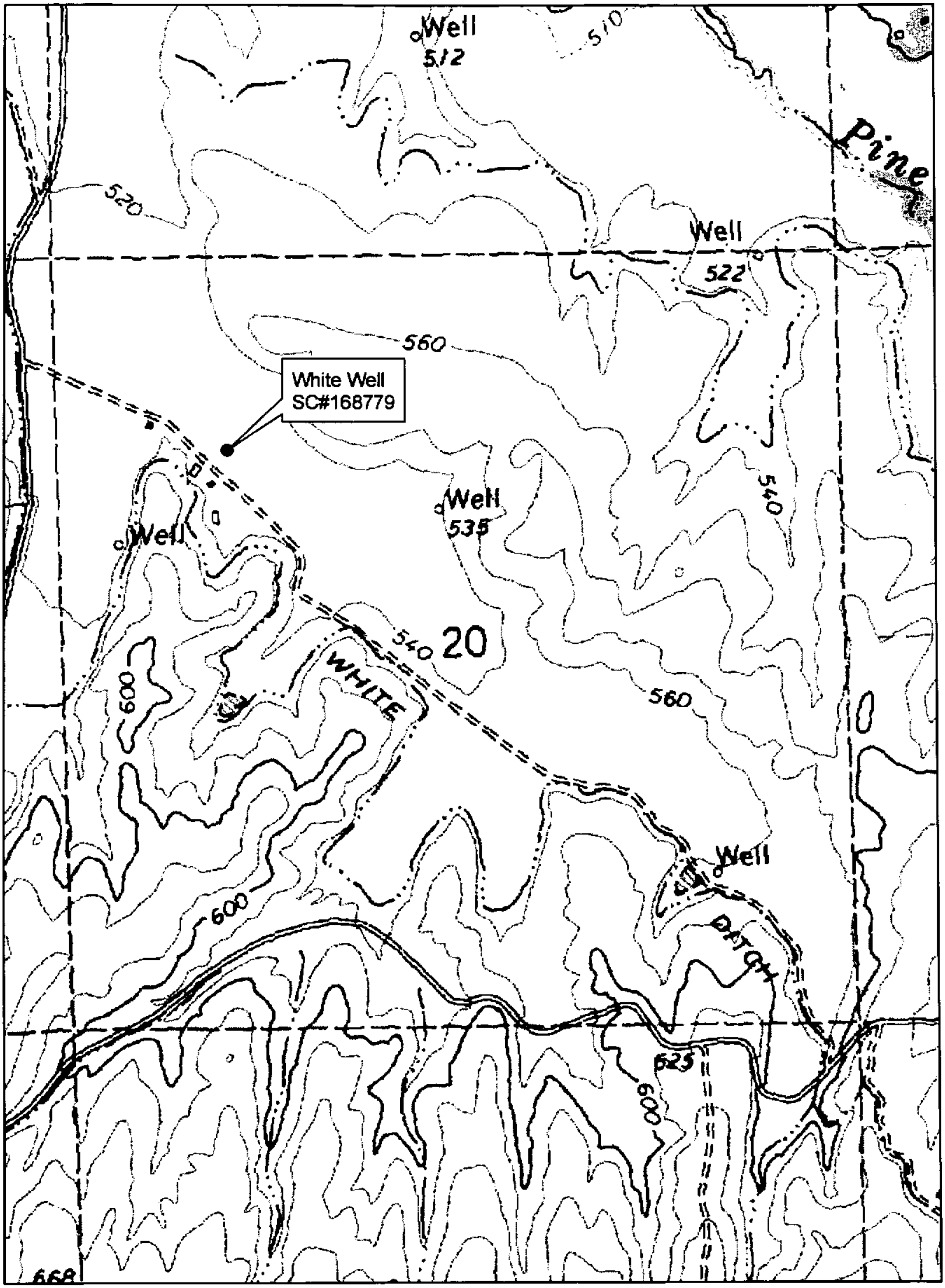
WWC Number 1797
Signed Date 6/10/05

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 649
Signed Date 6/10/05

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER



WHITE BROS. SC # 168779
6N 34E SEC.20

FOR WATER RESOURCES DEPARTMENT USE ONLY

Date Postmarked: [illegible]

Date Hand-Delivered: [illegible]

Date [illegible]

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JAN 18 2005
JAN 18 2005
WATER RESOURCES DEPT
SALEM, OREGON

START CARD

NOTICE OF BEGINNING OF WELL CONSTRUCTION
(as required by ORS 537.762)

This form must be completed and the original mailed or delivered to the Water Resources Department, 725 Summer Street NE Suite A, Salem OR 97301-1271 for all new construction, conversion, alteration, deepening and abandonments. This original must be mailed or delivered before work is commenced. A $125 fee shall accompany the original for all new well construction, conversion, and deepenings (make checks payable to the Water Resources Department). In addition, the constructor shall provide a legible copy of this notice to the region office within which the well is being constructed, converted, altered, deepened, or abandoned using one of the following methods: (a) by regular mail no later than three (3) calendar days (72 hours) prior to commencement of work; (b) by hand delivery, during regular office hours before work is commenced; or (c) by FAX before work is commenced. If method (c) is used, a legible copy of the start card shall also be mailed or delivered to the region office no later than the day work is commenced. The Water Resources Commission has authority to impose civil penalties for failure to submit the required $125 fee with the start card, for failure to submit the $125 fee in a timely manner, and for failure to timely submit start cards.

Owner's name and mailing address: White Brothers Co. Inc.
PO Box 683
Walla Walla, WA 99362

Home Phone: ( )

Work Phone: ( )

Type of work: **Fee Required:** ☒ **New Construction** ☐ **Conversion** ☐ **Deepening** **Orig. Start Card No.** ____

No Fee Required: ☐ **Alteration (Repair/Recondition)** ☐ **Abandonment** **Orig. Start Card No.** ____

Proposed Commencement Date: Approx. 1/20/05

Existing or Proposed Well Depth: 250 Diameter: 12 Original Well I.D. Label Number: ____

Use: ☐ Domestic ☐ Community (Public System) ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Monitoring ☐ Other ____

Proposed Well Location:

County Umatilla Township 6N (North or South) Range 34E (East or West) Section 20 Tax Lot 601

1/4 NW 1/4 NW Or Latitude 45°59'14.632"N Longitude 118°35'46.344W

Street Address of well, if not assigned, nearest address:
~~[illegible]~~ 85201, White Reservoir Road, Milton-Freewater, OR 97862

We have read the back of this form and the information provided is accurate to the best of our knowledge.

Carl W. [illegible] — Owner/Agent Name
Stephen [illegible] Schneider — Bonded Water Supply/Monitor Well Constructor Name
649 — License No.

12/28/04 — Date Signed
Schneider Drilling Co. — Company
12/20/04 — Date Signed

OWNER PLEASE NOTE: This is not a water right application. The owner is responsible for obtaining a water right through the Water Resources Department, if required. The Oregon Health Division requires plans to be submitted and approved prior to construction if the well is to be used as a public system.

ADDITIONAL IMPORTANT INFORMATION ON BACK.

****

THIS COPY, WITH ACCOMPANYING FEE, TO WATER RESOURCES DEPARTMENT IN SALEM

WELL DATA SHEET, SUPRABASALT SEDIMENTS

Well No. UMAT 55891 WADOE No.________ S/T/R________

Date Completed________ Drill Method________ Use________

DEM elevation________ Map elevation________ Survey elevation________

Total Depth (ft bgs)________

see attached interpreted geo log.

Lithology	Modifier	Lithology Thickness	Unit name	Unit top	Unit thickness	Facies thickness			Facies percent		
						M	S	G	M	S	G

First water/SWL/date_____/_____/_____

Temp.________

Well Test (rate/dd)_____/_____

Specific capacity________

Water Bearing Zones

Casing/liner________

Seals________

Screens________

Perfs________

Open________

Log of Borehole: Casper Well No.1
Also known as:

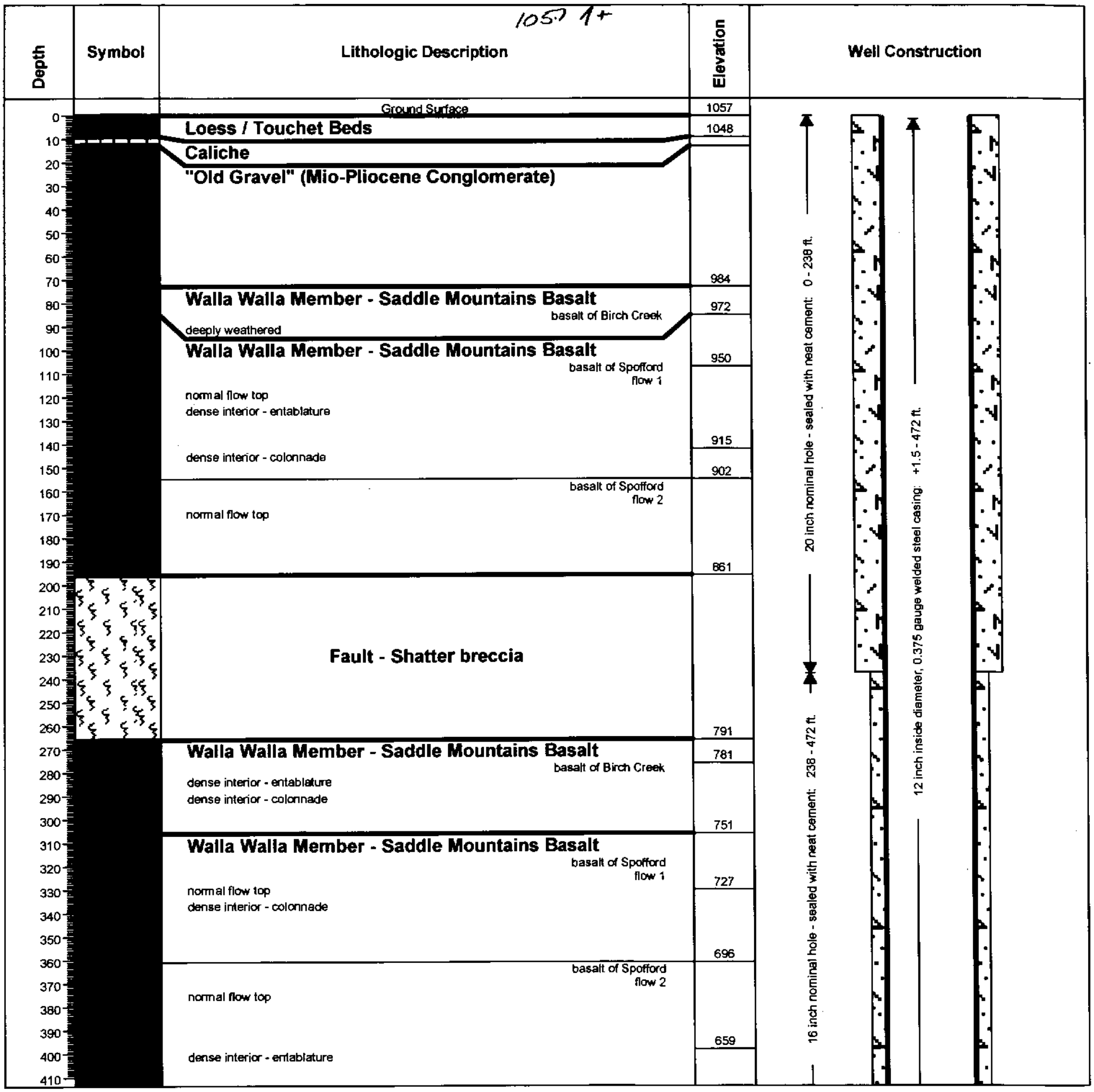
Project: Casper **Well ID: UMAT 55891**

Location: SE1/4, SE1/4, section 10, T6N, R36E

Geologist: Terry L. Tolan, R.G. 5094111 N 398251 E

Groundwater Solutions Inc.
1020 N. Center Parkway, Suite F
Kennewick, Washington 99336
509-735-7135
FAX 509-735-7067
www.groundwatersolutions.com

1057 ft



Drilled By: Schneider Drilling **Total Depth: 800 ft.**
Drill Method: Mud and Air Rotary
Drill Date: 8/8/2006 through 10/12/2006 **Page: 1 of 2**

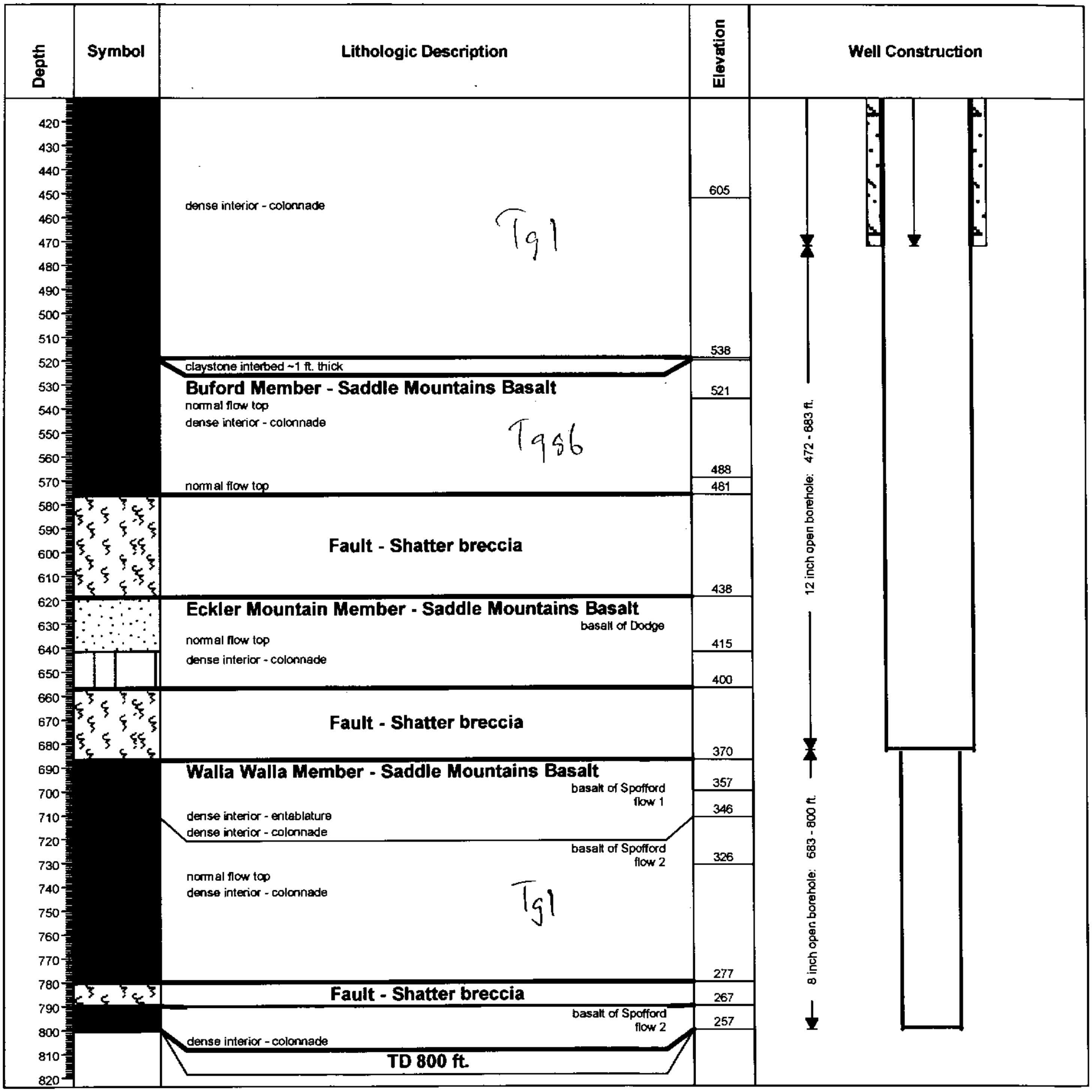
Log of Borehole: Casper Well No.1
Also known as:

Project: Casper **Well ID: UMAT 55891**

Location: SE1/4, SE1/4, section 10, T6N, R36E

Geologist: Terry L. Tolan, R.G.

Groundwater Solutions Inc.
1020 N. Center Parkway, Suite F
Kennewick, Washington 99336
509-735-7135
FAX 509-735-7067
www.groundwatersolutions.com



Drilled By: Schneider Drilling **Total Depth: 800 ft.**

Drill Method: Mud and Air Rotary

Drill Date: 8/8/2006 through 10/12/2006 **Page: 2 of 2**

Appendix B

Tabulation of Structure Contour Data, Isopach Data, and Well Construction Information

Explanation of Abbreviations used in column headings

Well ID	unique identification number assigned to well log
T/R-sec	Township, Range, and Section well located in
Mo/yr drilled	Month and year well reported to have been completed in
UTM northing	north grid coordinate for well, NAD 83 datum
UTM easting	east grid coordinate for well, NAD 83 datum
ft amsl	feet above mean sea level
ft	feet
surf elev	surface elevation based on 10 m DEM
Qf top	structure contour elevation for top of Quaternary fine unit
Qf iso	thickness of Quaternary fine unit
Qc top	structure contour elevation for top of Quaternary coarse unit
Qc iso	thickness of Quaternary coarse unit
MPc top	structure contour elevation for the top of the Mio-Pliocene upper coarse unit
MPc iso	thickness of Mio-Pliocene upper coarse unit
MPf top	structure contour elevation for the top of the Mio-Pliocene fine unit
MPf iso	thickness of Mio-Pliocene fine unit
MPbc top	structure contour elevation for the top of the Mio-Pliocene basal coarse unit
MPbc iso	thickness of Mio-Pliocene basal coarse unit
DTB	depth to top of basalt
ft bgs	feet below ground surface
TOB	elevation of top of basalt
TD	total depth of well
Use	reported use of well I – irrigation M – municipal D – domestic S – stock water
Seal	depth seal(s) reported
Casing	depth casing reported
Open	depth open interval(s) reported
Min open int dia	reported average diameter of open interval(s)
DTW 1st	depth water was reported first encountered during drilling
DTW	depth to water reported following completion of well
WT elev	water table elevation, based on DTW

Pump test type	P – pumping, A – airlift, B- bailer
Rate (gpm)	reported pump test rate, gallons per minute
DD	drawdown reported during test
SC	specific capacity of well calculated from pumping and drawdown data
gpm/ft-DD	gallons per minute/foot of drawdown
Temp (F)	water temperature, degrees Fahrenheit
Bslt	basalt

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U3885	5/35-01	Sep-68	5088819	392620	991	991	0	991	10	981	0	981	175	806	0	185	806		660	331	I	0-60	0-562	442-542	
U3899	5/35-01	Sep-68	5088616	393356	1020	1020	12	1008	16	992	175	817	85	732	59	347	673		660	360	I	0-60	0-5621	442-502	10
U3909	5/35-01		5088434	392122	994	994	3	991	0	991	157	834	0	834	0	160	834		840	154	I		0-212	212-512	12
U6509	5/35-01	Feb-45	5088521	392293	997	997	0	997	20	977	72	905	0	905	0	92	905		528	469	I,M	0-109	0-109	109-528	16
U3918	5/35-02	Oct-83	5088482	390599	961	961	6	955	24	931	40	891	0	891	0	70	891		252	709	D	0-185	0-95	95-252	6
U3922	5/35-02	Mar-75	5088829	390578	948	948	0	948	48	900	22	878	0	878	0	70	878		300	648	D	0-20	0-58	58-300	8
U3930	5/35-02	Jun-46	5088109	391899	1004	1004	0	1004	0	1004	43	961	0	961	0	43	961		550	454	M		0-20	20-550	16
U3937	5/35-02		5088916	390621	948	948	0	948	55	893	40	853	0	853	0	95	853		344	604	I		0-61	61-344	8
U3940	5/35-03	Jan-76	5088523	390496	958	958	2	956	10	946	120	826	0	826	0	132	826		295	663	D	0-22	0-97	97-295	6
U3941	5/35-03	Nov-69	5088903	390339	942	942	34	908	0	908	>84								118	824	D	0-34	0-46.5	46.5-118	
U51581	5/35-03	May-98	5088559	390407	955	955	2	953	83	870	55	815	0	815	0	140	815		371	584	D	0-258	0-258	258-371	6
U5530	5/35-03	Jan-91	5088409	388826	981	981	18	963	0	963	90	873	0	873	0	108	873		1102	-121	I	0-502	0-502	502-1102	10
U3950	5/35-04	Mar-79	5087995	387514	909	909	10	899	0	899	0	899	0	899	0	10	899		160	749	D	0-18	0-18	18-160	6
U3951	5/35-04	Mar-70	5088554	387906	951	951	20	931	0	931	140	791	82	709	11	253	698		260	691	I	0-23	0-54	54-260	12
U50516	5/35-04	May-97	5088922	387626	879	879	55	824	0	824	71	753	59	694	89	274	605		274	605	I	0-705	0-706	706-1107	10
U3956	5/35-05	Aug-82	5089103	385805	823	823	8	815	0	815	0	815	0	815	0	8	815		360	463			0-250	50-360	
U3955	5/35-06	Aug-82	5088872	385882	873	873	8	865	0	865	0	865	0	865	0	8	865		300	573	D,1	0-19	0-19	19-300	6
U3962	5/35-12	Oct-45	5086912	392743	1060	1060	0	1060	28	1032	42	990	0	990	0	70	990		902	158			0-99		
U3965	5/35-12	Aug-51	5086033	392947	1125	1125	0	1125	0	1125	41	1084	0	1084	0	41	1084		918	207	I,M				12
U50069	5/35-12	Feb-96	5087239	393539	1165	1165	11	1154	10	1144	105	1039	0	1039	0	126	1039		706	459	I	0-630	0-630	400-620; 620-706	6
U5408	5/35-12	Feb-90	5086864	392966	1063	1063	0	1063	26	1037	8	1029	0	1029	0	34	1029		305	758	D	0-39	0-305	265-305	6
U3969	5/35-13	Sep-74	5085156	392622	1312	1312	20	1292	0	1292	0	1292	0	1292	0	30	1282		681	631	D	0-35	0-35	35-681	8
U54322	5/35-13	Aug-01	5085637	393419	1115	1115	0	1115	23	1092	27		0		0	50	1065		80	1035	I	0-19	0-51	35-38	8
U50535	5/36-05	Jun-97	5089090	396355	1033	1033	14	1019	0	1019	67	952	28	924	0	109	924		1300	-267	I	0-265	0-265	265-1300	12
U55766	5/36-05	Jun-06	5087881	396550	1135	1135	8	1127	0	1127	0	1127	0	1127	0	8	1127		902	233	D/I	0-105	0-105	105-902	8
U55735	5/36-07	Apr-06	5085805	393732	1115	1115	0	1115	35	1080	0	1080	0	1080	0	35	1080		244	871	I	0-90	0-90	90-244	8
U3990	5/36-08	Feb-64	5087408	395309	1132	1132	8	1124	0	1124	4	1120	0	1120	0	12	1120		530	602	D	0-24	0-24	24-530	8
U54426	5/36-18	Nov-06	5085523	393749	1122	1122	4	1118	53	1065	0	1065	0	1065	0	57	1065		55	1067	D	0-20	0-53	25-48;53-55	6
U4018	5/36-19	Oct-87	5082763	393750	1358	1358	12	1346	0	1346	0	1346	0	1346	0	12	1346		125	1233	D	0-19	0-19	19-125	6
U4020	5/36-19	Jan-64	5083302	393711	1312	1312	9	1303	13	1290	0	1290	0	1290	0	22	1290		89	1223	D	0-18	0-27	27-89	6
U6177	5/36-19	Apr-83	5083948	393694	1257	1257	3	1254	0	1254	0	1254	0	1254	0	3	1254		452	805	D	0-19	0-19	19-452	6
U4029	5/36-21	Sep-79	5083511	397369	1306	1306	0	1306	10	1296	0	1296	0	1296	0	10	1296		410	896	D	0-28	0-28	28-410	8
U4030	5/36-21	Sep-77	5083402	397732	1322	1322	3	1319	29	1290	0	1290	0	1290	0	32	1290		240	1082	D	0-37	0-37	37-240	6
U54845	5/36-21	Jun-03	5083530	397886	1329	1329	7	1322	28	1294	0	1294	0	1294	0	35	1294		104	1225	D	0-41	0-41	41-104	
U54869	5/36-21	Jun-03	5083659	396665	1273	1273	5	1268	31	1237	0	1237	0	1237	0	36	1237		104	1169	D	0-45	0-45	45-104	6
U4034	5/36-22	Nov-84	5083659	399302	1516	1516	4	1512	17	1495	0	1495	0	1495	0	21	1495		100	1416	D	0-36	0-36	36-100	6
U4037	5/36-22	Sep-78	5083601	399176	1447	1447	3	1444	44	1400	0	1400	0	1400	0	47	1400		76	1371	D	0-23	0-56	56-76	6
WW0420	6/33-01	Apr-77	5098387	372996	440	440	19	421	67	354	>95								181	259	I	0-22	0-130	25-181	10
WW0421	6/33-01	Nov-64	5098060	374379	482	482	23	459	10	449	219	230	448	-218	0	700	-218		1025	-543	I	0-131	0-950	950-1025	6
WW0422	6/33-01	Jan-63	5098621	374575	515	515	66	449	30	419	>98					700	-185		194	321		0-173	0-173	40-173	10
WW0423	6/33-02	Jan-64	5097707	372531	538	538	60	478	0	478	175	303	>59			700	-162		294	244	I		0-228	228-294	8
WW0424	6/33-03	May-91	5099306	370893	440	440	19	421	63	358	5	353	>265			700	-260		352	88	D	0-23	0-89	89-352	8
WW0425	6/33-03	Nov-69	5097733	371549	456	456	48	408	0	408	>122					700	-244		170	286	I	0-40	0-148	148-170	12
WW0426	6/33-04	Feb-96	5097999	369748	541	541	45	496	10	486	>195					700	-159		250	291	I	0-18	0-240	155-235; 240-250	12
WW0427	6/33-06	May-69	5097915	365555	423	423	80	343	4	339	>196					700	-277		280	143	I		0-228	152-223; 228-280	12
WW0428	6/33-06	Jul-60	5099466	365920	479	479	0	479	42	437	113	324	0	324	0	155	324		400	79			0-202	202-400	10
WW0429	6/33-07	Mar-62	5097473	365633	417	417	8	409	54	355	0	355	0	355	0	62	355		300	117			0-276	276-300	12
WW0430	6/33-07	Feb-91	5097714	366566	466	466	7	459	51	408	>127								185	281	D/I/S	0-53	0-170	127-162; 170-185	12
WW0431	6/33-08	Apr-64	5097000	368152	502	502	36	466	79	387	83	304	2	302	0	62	440		226	276	I		0-200	160-226	12
WW0432	6/33-08	May-80	5097514	367772	486	486	27	459	22	437	>171								220	266	D/I	0-20	0-201	120-195; 200-220	12
WW0433	6/33-08	Jan-63	5096550	367450	571	571	4	567	8	559	124	435	60	375	0	196	375		325	246		0-42	0-306	306-325	13
WW0434	6/33-08	Apr-71	5097720	368303	499	499	32	467	112	355	50	305	>70						264	235	I		0-193		12
WW0435	6/33-08	Apr-99	5096886	368171	499	499	32	467	133	334	95	239	0		0	260	239		303	196	I	0-20	0-290	290-303	8
WW0436	6/33-09	May-83	5097480	369351	535	535	39	496	34	462	>110								183	352	D/I	0-39	0-176	176-183	6

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U3885	5/35-01		302	689		925	8	123.33	66						X	
U3899	5/35-01		302	718		925	25	37.00	66						X	
U3909	5/35-01		67	927	P	1200	47	25.53							X	
U6509	5/35-01		49	948	P	1550	32	48.44							X	
U3918	5/35-02		150	811	A	25			60						X	
U3922	5/35-02		81	868	A	37	50	0.74	65			X			X	
U3930	5/35-02			1004												
U3937	5/35-02		61	887												
U3940	5/35-03	160	143	815	B	15	4	3.75	51			X				
U3941	5/35-03		35	907	B	12	77	0.16	54			X				
U51581	5/35-03	85	200	755	A	35			58						X	
U5530	5/35-03		313	668	P	1500			71						X	
U3950	5/35-04	150	12	897	A	10	148	0.07	63						X	
U3951	5/35-04		65	886	P	100	190	0.53	53			X	X	X		
U50516	5/35-04	121	191	688	A	1200			61						X	
U3956	5/35-05			823											X	
U3955	5/35-06		34	839	A	20			68						X	
U3962	5/35-12	230	105	955												
U3965	5/35-12	205	90	1035												
U50069	5/35-12	385	356	809	A	150			68						X	
U5408	5/35-12		220	843	A	25			56						X	
U3969	5/35-13	640	280	1032	A	100	110	0.91							X	
U54322	5/35-13	21	21	1094	A	2			60			X			X	
U50535	5/36-05	380	380	653					76						X	
U55766	5/36-05	633	524	611	A	250			73						X	
U55735	5/36-07	15	120	995	A	250			52						X	
U3990	5/36-08		247	885	B	1200			70						X	
U54426	5/36-18	14	10	1112	A	25			59		X					
U4018	5/36-19	91	35	1323	A	40			56						X	
U4020	5/36-19		68	1244	B	5	3	1.67							X	
U6177	5/36-19		274	983	A	30			56						X	
U4029	5/36-21	115	95	1211	A	150	185	0.81	60						X	
U4030	5/36-21	28	51	1271	P	31	12	2.58	58						X	
U54845	5/36-21	25	35	1294	A	35			51							
U54869	5/36-21		41	1232	A	60			52						X	
U4034	5/36-22	87	64	1452	A	50									X	
U4037	5/36-22	57	4	1443	P	80	27	2.96	58						X	
WW0420	6/33-01		6	434	P	400	145	2.76	59		X	X				
WW0421	6/33-01		21	461	P	600	100	6.00							X	
WW0422	6/33-01		39	476	P	225	111	2.03				X				
WW0423	6/33-02				P	300	102	2.94				X	X			
WW0424	6/33-03		28	412	P	25	56	0.45	58				X			
WW0425	6/33-03		14	442	P	600	140	4.29				X				
WW0426	6/33-04		94	447					56			X				
WW0427	6/33-06		80	343	P	400	83	4.82				X				
WW0428	6/33-06		90	389	P	84	110	0.76							X	
WW0429	6/33-07		20	397	P	550	114	4.82	64						X	
WW0430	6/33-07		75	391					56			X				
WW0431	6/33-08		40	462	P	480	75	6.40				X	X			
WW0432	6/33-08		60	426	P	650	110	5.91	58				X			
WW0433	6/33-08		75	496	P	322	225	1.43	62						X	
WW0434	6/33-08		60	439	P	600	130	4.62				X	X			
WW0435	6/33-08		27	472	P	490	11	44.55	65						X	
WW0436	6/33-09		34	501	B	50	55	0.91	59			X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0437	6/33-09	Feb-05	5097191	368916	518	518	29	489	36	453	>170								235	283	I	0-18	0-230	140-220	12
WW0438	6/33-09	Mar-05	5096374	369746	502	502	46	456	0	456	>135								181	321	D	0-40	0-179	119-179	6
WW0441	6/33-10	Dec-85	5097468	370974	545	545	28	517	0	517	>172								200	345	D	0-20	0-199	183-193	6
WW0442	6/33-10	Oct-04	5096600	370103	522	522	33	489	19	470	>127								179	343	D	0-33	0-179	130-179	6
WW0443	6/33-10	Aug-05	5097458	370143	548	548	37	511	64	447	>86								187	361	D	0-37	0-187	153-187	6
WW0444	6/33-11	May-66	5096190	372305	558	558	38	520	100	420	152	268	>19						309	249	I		0-222	202-278	12
WW0445	6/33-11	Jan-64	5096899	372960	587	587	36	551	185	366	>93								314	273	I		0-240	210-235; 240-314	12
WW0446	6/33-11	Sep-57	5096958	372500	581	581	40	541	75	466	>180								295	286			0-141	141-295	10
WW0447	6/33-12	Jun-70	5096296	373528	568	568	45	523	62	461	>206								313	255	I		0-240	200-230; 240-313	12
WW0448	6/33-12	Jan-64	5096810	373615	591	591	36	555	66	489	>209								311	280	I		0-240	200-238; 240-311	12
WW0449	6/33-12	Mar-79	5097081	374185	459	459	14	445	22	423	>164								200	259	I	0-22	0-195	30-200	10
WW0450	6/33-12	Jun-78	5097081	374684	469	469	14	455	7	448	69	379	>104						200	269	I	0-30	0-30	30-200	10
U4064	6/33-13	Jun-95	5094478	374164	522	522	142	380	17	363	>71								230	292	I		0-230	150-230	10
U54343	6/33-13	Jul-01	5094400	373006	545	545	8	537	170	367	>142								320	225	I	0-49	0-280	105-280	10
WW0451	6/33-14	Nov-60	5095939	372647	548	548	101	447	104	343	70	273	>20						295	253			0-225	225-295	12
WW0452	6/33-15	Nov-91	5095962	370997	522	522	38	484	62	422	>154								254	268	I	0-38	0-253	137-233	10
WW0453	6/33-16	Jun-69	5096041	369603	502	502	54	448	14	434	112	322	>165						345	157	D/I		0-345	158-180; 310-325	10
U4073	6/33-23	Jan-58	5094284	372074	571	571	68	503	11	492	53	439	0	439	0	132	439		781	-210	I		0-340	100-781	12
WW0011	6/34-01P	Jun-64	5097621	383455	614	614	10	604	7	597	129	468	>32						178	436	I		0-112	40-100; 112-178	12
WW0010	6/34-01Q	Jun-74	5097568	383693	620	620	15	605	25	580	137	443	244	199	0	421	199		706	-86	I	0-20	0-400.5	400-706	10
WW0014	6/34-02N	Mar-62	5097443	381102	577	577	36	541	12	529	>106								154	423	D,1		0-133	133-154	12
WW0013	6/34-02P	Apr-88	5097823	381967	564	564	19	545	0	545	>101								120	444	D	0-19	0-75	75-120	6
WW0016	6/34-03M	Apr-92	5098170	380324	535	535	7	528	24	504	>109								140	395	D	0-20	0-132	52-132	6
WW0019	6/34-04B	7/62	5099030	379119	518	518	20	498	0	498	105	393	235	158	0	360	158		617	-99			0-505	310-373 505-617	8
WW0020	6/34-04C	Jun-63	5099075	378502	512	512	12	500	22	478	>126								160	352	I		0-144	25-140; 144-160	12
WW0021	6/34-04R	Sep-96	5097495	379578	643	643	95	548	24	524	>126								245	398	D	0-65	0-245	165-245	
WW0022	6/34-05J	Mar-83	5098213	377318	554	554	27	527	0	527	268	259	335	-76	0	630	-76		1200	-646	I	0-144	0-640	640-1200	10
WW0023	6/34-06D	Oct-47	5098935	375183	541	541	47	494	18	476	78	398	222	176	176	541	0		582	-41	I		0-154	154-582	10
WW0024	6/34-06N	Dec-47	5097741	375137	531	531	16	515	0	515	151	364	>54						221	310			0-221	144-221	6
WW0025	6/34-07A	Jan-64	5097129	376097	502	502	15	487	0	487	155	332	>24						194	308			0-130	0-120; 130- 194	12
WW0026	6/34-07B	Nov-68	5097260	375774	525	525	45	480	0	480	140	340	600	-260		785	-260		865	-340					8
WW0027	6/34-07N	Dec-51	5096202	375166	561	561	32	529	102	427	105	322	>9						248	313					12
WW0029	6/34-08A	Nov-83	5096944	377721	568	568	6	562	56	506	243	263	107	156		412	156		412	156	I	0-75	0-975	975-1200	12
WW0028	6/34-08F	Jan-51	5096804	377121	525	525	23	502	45	457	117	340	>433						618	-93	I		0-485	485-618	10
WW0030	6/34-09	Jan-92	5096885	378529	574	574	23	551	18	533	84	449	>189						360	214	I	0-20	0-235	50-360	12
WW0031	6/34-09	Jun-59	5095840	379160	581	581	32	549	7	542	>186								225	356	I		0-225	150-225	12
WW0032	6/34-10	Feb-75	5096671	380854	620	620	89	531	0	531	>170								252	368	I	0-65	0-195	100-252	12
WW0033	6/34-10	May-53	5096863	379674	597	597	22	575	89	486	>64								175	422	I		0-113	113-175	12
WW0034	6/34-10	Dec-52	5096173	380173	597	597	40	557	5	552	>155								200	397	I		0-100	68-200	12
WW0035	6/34-11	Apr-83	5096884	382795	587	587	15	572	81	491	114	377	>1						210	377	I		0-210	91-209	12
WW0036	6/34-11	Jun-58	5096082	382422	636	636	92	544	23	521	>125								240	396	I		0-146	146-200	12
WW0037	6/34-11	Feb-54	5096812	382316	581	581	15	566	75	491	>100								190	391	I		0-190	50-190	12
WW0038	6/34-11	Oct-61	5097047	381957	577	577	62	515	32	483	118	365	>9						230	347	I		0-172	172-230	10
WW0039	6/34-11	May-86	5096526	381323	640	640	57	583	60	523	>168								285	355	I	0-30	0-190	190-285	8
WW0041	6/34-12B	Feb-50	5096958	384029	602	602	8	594	0	594	>154								160	442	I				12
WW0042	6/34-12E	Mar-58	5096572	383202	607	607	26	581	108	473	>102								210	397	I		0-137	137-210	12
WW0043	6/34-12E1	Nov-87	5096833	383484	597	597	13	584	18	566	141	425	>61						233	364	D,1		0-208	70-125; 185-233	10

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0437	6/33-09		68	450	P	500	52	9.62	58			X				
WW0438	6/33-09		38	464	P	60	14	4.29	59			X				
WW0441	6/33-10		75	470	B	20	3	6.67	54			X				
WW0442	6/33-10		62	460	P	30	12	2.50	59			X				
WW0443	6/33-10		62	486	P	48	38	1.26	58			X				
WW0444	6/33-11		75	483	P	700	35	20.00				X				
WW0445	6/33-11		90	497	P	60	50	1.20			X	X				
WW0446	6/33-11		90	491	P	450	54	8.33				X				
WW0447	6/33-12		100	468	P	600	65	9.23				X				
WW0448	6/33-12		95	496	P	740	57	12.98				X				
WW0449	6/33-12		18	441	P	370	170	2.18	59		X	X				
WW0450	6/33-12		16	453	P	325	70	4.64	58			X	X			
U4064	6/33-13				P	465	20	23.25	58		X	X				
U54343	6/33-13		92	453	P	300	73	4.11	57		X	X				
WW0451	6/33-14		60	488	P	600	15	40.00				X				
WW0452	6/33-15		66	456	P	470	69	6.81	58			X				
WW0453	6/33-16		21	481	P	500	54	9.26				X	X			
U4073	6/33-23		85	486	P	330	108	3.06				X			X	
WW0011	6/34-01P		25	589	P	560	82	6.83				X	X			
WW0010	6/34-01Q		75	545									X		X	
WW0014	6/34-02N		25	552	P	220	123	1.79	54			X				
WW0013	6/34-02P		26	538	B	40	50	0.80	57			X				
WW0016	6/34-03M		10	525	A	80	132	0.61	57			X				
WW0019	6/34-04B		75	443	P	440	79	5.57	63				X		X	
WW0020	6/34-04C		21	491	P	350	135	2.59			X	X				
WW0021	6/34-04R		105	538	P	60	35	1.71	58			X				
WW0022	6/34-05J		230	324	P	1550	70	22.14	78						X	
WW0023	6/34-06D		150	391								X	X	X	X	
WW0024	6/34-06N		20	511	P	177	150	1.18				X	X			
WW0025	6/34-07A		14	488	P	500	71	7.04				X	X			
WW0026	6/34-07B			525												
WW0027	6/34-07N		82	479												
WW0029	6/34-08A		242	326	P	1125	123	9.15	104						X	
WW0028	6/34-08F		42	483	P	450	197	2.28				X	X			
WW0030	6/34-09		23	551	P	350	49	7.14	54			X	X			
WW0031	6/34-09		23	558	P	400	140	2.86				X				
WW0032	6/34-10		48	572	P	270	64	4.22	57			X				
WW0033	6/34-10		10	587	P	600	120	5.00				X				
WW0034	6/34-10		16	581	P	500	100	5.00				X				
WW0035	6/34-11		29	558	P	400	200	2.00	59		X	X				
WW0036	6/34-11		90	546	P	490	60	8.17				X				
WW0037	6/34-11		5	576	P	400	160	2.50				X				
WW0038	6/34-11		59	518	P	285	146	1.95				X	X			
WW0039	6/34-11		95	545	B	35	0	350.00	53			X				MICA @ 133
WW0041	6/34-12B			602												
WW0042	6/34-12E		26	581	P	450	134	3.36			X	X				
WW0043	6/34-12E1			597	P	172	80	2.15	53			X	X			

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U4080	6/34-13	Apr-69	5094196	383572	646	646	32	614	0	614	>234								266	380	I	22	0-212	22-24; 36-40; 56-60; 80-90; 100-190	10
WW0001	6/34-13	Feb-59	5095328	383178	669	669	87	582	23	559	110	449	>21						290	379			0-290	205-225; 258-290	12
WW0002	6/34-13	Feb-46	5095645	384243	686	686	97	589	0	589	>213								310	376					10
U4087	6/34-14	Sep-76	5094307	380922	600	600	29	571	0	571	>76								105	495	D	29	0-92	92-105	6
U4090	6/34-14	Nov-49	5094468	382105	607	607	18	589	27	562	162	400	>13						220	387	I		0-84	84-220	12
U54199	6/34-14	May-06	5095032	381055	574	574	10	564	5	559	>185								200	374	I	80	0-200	120-200	14
U55227	6/34-14	Aug-06	5095104	380986	584	584	27	557	58	499	<90								175	409	D	36	0-175	90-175	6
WW0004	6/34-14	Apr-50	5095328	382614	643	643	35	608	17	591	>170								222	421			0-62	62-222	12
U4093	6/34-15	Feb-85	5094319	380519	584	584	20	564	0	564	>210								230	354	I	20	0-227	100-226; 227-230	10
U4094	6/34-15	Jul-74	5094366	379684	577	577	29	548	0	548	232	316	>40						301	276	I	22	0-143	22-135; 143-301	12
U4095	6/34-15	Mar-61	5094534	379734	568	568	37	531	82	449	>107								226	342	I	37	0-122	122-226	12
U4096	6/34-15	Jan-51	5094951	380499	581	581	32	549	0	549	>193								225	356	I		0-70	0-68; 70-225	8
WW0005	6/34-15	Mar-50	5095339	380898	607	607	15	592	5	587	220	367	>10						250	357			0-57	57-250	12
U51190	6/34-16	Nov-77	5095025	379198	535	535	20	515	24	491	166	325	>96						306	229	I	20	0-220	20-306	12
U53239	6/34-16	Feb-99	5095310	378493	528	528	30	498	65	433	>140								235	293	D	32	0-325	138-208; 235	8
U6179	6/34-16	May-77	5094823	379216	551	551	42	509	6	503	195	308	>57						300	251	I	20	0-220	20-300	12
WW0006	6/34-16	Dec-52	5095454	378897	545	545	38	507	35	472	157	315	>11						241	304			0-122	122-241	10
U4628	6/34-17	Jan-51	5094790	376790	509	509	22	487	8	479	>70								100	409					10
WW0007	6/34-17	Feb-53	5095637	377896	518	518	37	481	10	471	207	264	>55						303	215					
WW0008	6/34-17	Apr-69	5095407	376914	499	499	20	479	18	461	184	277	>86						308	191		20	0-159	40-154 159-308	12
WW0009	6/34-18	Jan-54	5095748	375320	561	561	8	553	62	491	>130								200	361					12
U4101	6/34-19	Nov-79	5093077	374701	577	577	60	517	0	517	55	462	0	462	0	115	462		705	-128	I	0-120	0-125	125-705	12
U4102	6/34-19	Mar-57	5094163	374757	541	541	35	506	5	501	42	459	70	389	12	164	377		218	323	I		0-213	165-213	12
U55437	6/34-20	May-06	5093844	376259	538	538	26	512	20	492	263	229	>32						341	197	I	88	0-330	150-310	12
U4107	6/34-21	Jun-80	5092718	377996	584	584	32	552	0	552	>210								242	342	I	32	0-292	80-60;100-160	10
U4627	6/34-21	Oct-53	5092842	378335	561	561	28	533	4	529	>199								231	330					12
U52004	6/34-21	Jul-88	5093732	377831	541	541	82	459	0	459	>23								106	435	I	105	0-105	105	12
U6181	6/34-21	Sep-80	5093839	379273	548	548	19	529	2	527	174	353	>108						303	245	I	20	0-280	20-280; 280-303	12
U5378	6/34-22	Mar-80	5094210	380871	600	600	26	574	0	574	255	319	>34						315	285	I	26	0-303	57-288; 303-315	12
U4113	6/34-23	Aug-77	5093435	380989	597	597	28	569	0	569	>257								365	232	I	28	0-370	28-294: 365	12
U4115	6/34-23	Jun-74	5093531	381983	620	620	19	601	0	601	>182								200	420	I	19	0-169	25-168; 169-200	12
U4117	6/34-23	Mar-72	5092976	381961	620	620	32	588	0	588	>121								151	469	I	20	0-79	20-64; 79-151	10
U52037	6/34-23	Oct-98	5094040	381679	620	620	20	600	43	557	292	265	>30						385	235	I	130	0-330	321-385	12
U5357	6/34-23	Feb-79	5093816	381026	577	577	37	540	7	533	290	243	>45						380	197	I	37	0-380	96-296; 380	12
U4124	6/34-24	Jun-86	5093324	382581	636	636	7	629	24	605	>29								58	578	D	18	0-35	35-58	6
U4125	6/34-24	May-80	5093182	383146	653	653	13	640	0	640	375	265	>27						402	251	I	20	0-400	20-400	10
U4126	6/34-24	Dec-71	5093149	383397	659	659	18	641	0	641	285	356	>15						318	341	I	23	0-123	50-318	12
U4132	6/34-24	Sep-58	5093637	383669	663	663	14	649	26	623	>177								217	446	I	0	0-80	80-217	10
U4462	6/34-24	Oct-87	5093096	382577	633	633	18	615	17	598	>111								146	487	D,I	27	0-110	70-146	8
U4141	6/34-25	Oct-81	5092480	383874	666	666	8	658	48	610	>74								130	536	D	19	0-112	92-110; 112-130	6
U4144	6/34-25	Dec-65	5092401	383077	650	650	16	634	0	634	>49								65	585	I	22	0-60	45-65	10

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U4080	6/34-13		34	612	P	150	120	1.25	54			X				
WW0001	6/34-13		60	609	P	300	204	1.47	57			X	X			
WW0002	6/34-13		60	626	P	500	67	7.46				X				no casing or seal details
U4087	6/34-14	45	37	563	B	50	20	2.50	58			X				
U4090	6/34-14		26	581	P	290	140	2.07				X	X			
U54199	6/34-14	10	24	550	A	300			71			X				
U55227	6/34-14	30	21	563	P	120	3	40.00	56		X	X				
WW0004	6/34-14		27	616	P	315	160	1.97				X				
U4093	6/34-15	55	50	534	A	200						X				
U4094	6/34-15	29	22	555	P	350	18	19.44	56	X		X	X			
U4095	6/34-15		23	545	P	600	67	8.96				X				
U4096	6/34-15		25	556	P	300	50	6.00		X	X	X	X			
WW0005	6/34-15	20	11	596	P	410	99	4.14				X	X			
U51190	6/34-16	32	18	517	P	425	202	2.10	60		X	X	X			
U53239	6/34-16	45	26	502	P	65	44	1.48	52			X				
U6179	6/34-16	42	39	512	P	215	124	1.73	60	X	X	X	X			
WW0006	6/34-16	73	19	526	P	200	120	1.67				X	X			
U4628	6/34-17		6	503												not much detail
WW0007	6/34-17	17		518												
WW0008	6/34-17		7	492	P	386	75	5.15	58			X	X			
WW0009	6/34-18		30	531												
U4101	6/34-19	165	150	427	P	600	150	4.00							X	
U4102	6/34-19		58	483	P	550	42	13.10	58						X	
U55437	6/34-20		68	470	P	1280	26	49.23	59			X	X			
U4107	6/34-21	55	53	531	P	185	250	0.74	59			X				
U4627	6/34-21	35	23	538												
U52004	6/34-21	100	83	458	A	30			70			X				
U6181	6/34-21	19	19	529	P	550	201	2.74	60		X	X	X			
U5378	6/34-22	54		600	P	300	205	1.46	59			X	X			
U4113	6/34-23	39	49	548	P	650	200	3.25	59			X	X			
U4115	6/34-23	17	10	610	P	500	7	71.43	56			X				
U4117	6/34-23	35	19	601	P	100	120	0.83	56	X		X				
U52037	6/34-23	20	18	602	A	500			60			X	X			
U5357	6/34-23	21	20	557	P	270	280	0.96	60			X	X			
U4124	6/34-24	45	19	617	A	150			58			X				
U4125	6/34-24	37	23	630	P	170	175	0.97	59			X	X			
U4126	6/34-24		25	634	P	230	172	1.34				X	X			
U4132	6/34-24	14	15	648	P	400	140	2.86				X				
U4462	6/34-24		29	604	P	185	120	1.54	54			X				
U4141	6/34-25	90	43	623	A	35			51			X				
U4144	6/34-25		18	632	P	500	7	71.43	52			X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U4146	6/34-25	Nov-66	5091161	383241	676	676	14	662	0	662	>106								118	558	D	20	0-58	20-44; 58-118	8
U4152	6/34-25	Mar-59	5092393	383297	653	653	17	636	0	636	>203								220	433	I		0-73	40-44; 45-47; 48-50; 51-55; 56-65; 73-220	10
U55269	6/34-25	Oct-06	5091119	384022	696	696	14	682	0	682	201	481	55	426		270	426		427	269	D	0-18 190-288	0-288	240-260; 288-427	8
U6324	6/34-25	Jan-95	5091999	383121	653	653	3	650	0	650	112	538	>135						250	403	D	25	0-199	199-250	6
U4157	6/34-26	Dec-88	5091897	382500	646	646	0	646	46	600	>60								105	541	I		0-96	38-42; 60-70	8
U4166	6/34-27	Jul-77	5091919	379613	636	636	37	599	0	599	140	459	319	140		496	140		1105	-469	I	34	0-1012	560-630; 1012-1105	8
U53567	6/34-27	Sep-99	5091274	380738	633	633	10	623	0	623	290	333	0	333		300	333		660	-27	I	316	0-316 500 610	316-660	8
U53529	6/34-28	Aug-99	5091820	378862	620	620	45	575	0	575	109	466	0	466		154	466		510	110	I	0-60 158-198	0-501	198-238; 238-501	12
U54639	6/34-29	Sep-06	5092598	377488	597	597	32	565	0	565	655	-90	155	-245		842	-245		1001	-404	I	0-258 840-878	0-879	879-1001	12
U4170	6/34-33	May-80	5090894	378188	863	863	0	863	15	848	0	848	0	848	0	15	848		380	483	D	0-38	0-380	360-380	6
U4174	6/34-35	Mar-81	5089736	381418	702	702	4	698	0	698	0	698	0	698		4	698		187	515	D	0-19	0-19	19-187	6
U4177	6/34-35	May-56	5090565	381342	702	702	20	682	0	682	40	642	0	642		60	642		476	226		0-90	0-90	90-476	10
U4178	6/34-35	Mar-48	5090780	380821	653	653	11	642	0	642	27	615	0	615		38	615		702	-49	I		0-60	60-702	14
U4179	6/34-35	Feb-56	5090015	382202	719	719	60	659	7	652	92	560	0	560		159	560		227	492	I		0-192	192-227	12
U4181	6/34-36	Dec-88	5090840	383256	676	676	9	667	25	642	134	508	>52						180	496	I	0-20	0-139	139-180	10
U4184	6/34-36	Aug-57	5089707	382778	728	728	57	671	0	671	63	608	5	603		125	603		300	428	I		0-255	255-300	10
U4185	6/34-36	Aug-53	5089339	383554	761	761	47	714	0	714	13	701	0	701		60	701		402	359	I		0-354	354-402	8
U6184	6/34-36	Feb-65	5089328	383929	781	781	47	734	0	734	12	722	0	722		59	722		198	583	D	0-85	0-135	135-198	6
WW0044	6/35-01A	Oct-68	5098503	393869	817	817	22	795	61	734	>69								152	665	D,I,S	0-38	0-140	140-152	6
WW0045	6/35-01B	Jan-53	5098768	393602	801	801	21	780	0	780	>79								100	701			0-67	67-100	8
WW0046	6/35-01E	Dec-62	5098049	392808	780	780	34	746	0	746	>114								148	632			0-118	118-148	6
WW0047	6/35-01F	Apr-66	5098100	392999	792	792	40	752	29	723	>140								209	583	I		0-82	82-209	8
WW0054	6/35-01G	Jul-47	5098206	393424	802	802	40	762	18	744	58	686	370	316	0	486	316		650	152	D		0-540	540-650	6
WW0048	6/35-01J	Jul-54	5097943	393897	838	838	7	831	16	815	>84								107	731			0-63	63-107	8
WW0049	6/35-01L	Apr-57	5097701	393117	777	777	16	761	0	761	>94								110	667	D,I	0-18	0-67	67-110	8
WW0052	6/35-01M	Oct-47	5097826	392831	791	791	20	771	0	771	200	571	320	251	0	540	251		540	251			0-540	540-703	6
WW0051	6/35-01P	Dec-68	5097405	393291	777	777	18	759	0	759	166	593	223	370	135	542	235		542	235	I	0-30	0-551	551-719	12
WW0050	6/35-01R	Nov-62	5097489	394101	807	807	27	780	0	780	>138								165	642			0-139	139-165	6
WW0055	6/35-01R	Jun-63	5097723	393723	792	792	30	762	0	762	190	572	206	366	0	426	366		638	154	I		0-532	532-630	8
WW0056	6/35-02D	Aug-70	5098681	391126	738	738	60	678	0	678	>108								168	570	D	0-62	0-160+	160-168	6
WW0067	6/35-02D	May-50	5098798	390966	729	729	11	718	16	702	0	702	0	702	0	27	702		107	622	D		0-107	42-64	6
WW0057	6/35-02D1	Sep-70	5098870	391101	730	730	9	721	18	703	>198								225	505	D,I	0-20	0-110	110-225	8
WW0058	6/35-02D2	Oct-68	5098814	391308	740	740	50	690	0	690	>137								187	553	D	0-50	0-132	132-187	6
WW0059	6/35-02J	Aug-68	5097691	392156	780	780	38	742	7	735	>130								175	605	D	0-40	0-159	159-168	6
WW0060	6/35-02J1	Nov-06	5097672	392292	790	790	30	760	0	760	>118								148	642	D	0-25	0-148	90-148	6
WW0061	6/35-02J2	Jun-61	5097963	392432	765	765	50	715	0	715	>148								198	567					6
WW0062	6/35-02M		5098002	391163	719	719	12	707	0	707	188	519	326	193		526	193		526	193	I		0-540	540-814	10
WW0063	6/35-02N1	Jun-06	5097438	391056	740	740	12	728	12	716	>106								130	610	D	0-30	0-130	80-130	6
WW0064	6/35-02Q	Sep-76	5097334	391721	740	740	21	719	13	706	>126								160	580	D	0-35	0-140	140-147	6
WW0065	6/35-02R	Jan-63	5097583	392100	770	770	16	754	18	736	>160								194	576		0-34	0-146.5	146.5-195	8
WW0071	6/35-03B	Apr-53	5098521	390331	710	710	4	706	24	682	114	568	>62						204	506	D,I		0-204	98-107; 111-142	8
WW0068	6/35-03P1	Jul-47	5097315	389756	680	680	5	675	0	675	115	560	>30						150	530					10
WW0070	6/35-03Q	Aug-95	5097630	390364	700	700	63	637	0	637	>182								245	455	D	0-60	0-158	156-245	10
WW0072	6/35-04B	Apr-99	5098632	388733	677	677	12	665	10	655	>170								192	485		0-22	0-192	103-192	10
WW0073	6/35-04C	Apr-90	5098633	388331	656	656	11	645	16	629	>144								190	466		0-21	0-190	102-190	6

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U4146	6/34-25	46	24	652	B	18	65	0.28				X				
U4152	6/34-25	31	18	635	P	80	160	0.50				X				
U55269	6/34-25	193	42	654	A	35			63				X		X	
U6324	6/34-25	195	97	556	A	30			52				X			
U4157	6/34-26	38	16	630	A	200			56							
U4166	6/34-27	60	30	606	P	590	160	3.69	72						X	
U53567	6/34-27		60	573	A	1000			65						X	
U53529	6/34-28	104	52	568	A	2700									X	
U54639	6/34-29	195	51	546	A	250	150	1.67	57						X	
U4170	6/34-33	370	272	591	A	30	75	0.40	55						X	
U4174	6/34-35	174	41	661	A	20			56						X	
U4177	6/34-35	186	0	702	P	950	95	10.00							X	
U4178	6/34-35		0	653	A	165									X	
U4179	6/34-35		25	694	A	1123									X	
U4181	6/34-36	55	3	673	A	80			58			X	X			
U4184	6/34-36	192	0	728											X	
U4185	6/34-36		29	732	P	1500	7	230.77							X	
U6184	6/34-36		65	716	B	30	3	10.00	57						X	
WW0044	6/35-01A		31	786	P	80	32	2.50				X				
WW0045	6/35-01B		17	784	P	45	4	11.25				X				
WW0046	6/35-01E		.	#VALUE!								X				
WW0047	6/35-01F		40	752	B	70	20	3.50				X				
WW0054	6/35-01G			802	P	242	6	40.33							X	
WW0048	6/35-01J		25	813	P	185	73	2.53				X				
WW0049	6/35-01L		18	759	P	219	82	2.67				X				
WW0052	6/35-01M		0	791	P	375	35	10.71							X	Open at TOB boundary.
WW0051	6/35-01P		52	725	P	700	125	5.60							X	
WW0050	6/35-01R		22	785	P	62	123	0.50				X				
WW0055	6/35-01R		59	733	P	785	53	14.81	68						X	
WW0056	6/35-02D		56	682	P	35	110	0.32				X				
WW0067	6/35-02D		8	721	P	85	57	1.49							X	
WW0057	6/35-02D1		17	713	P	300	138	2.17				X				
WW0058	6/35-02D2		67	673	P	60	63	0.95				X				
WW0059	6/35-02J		151	629		50	100	0.50				X				
WW0060	6/35-02J1		45	745	B	30	7	4.29				X				
WW0061	6/35-02J2			765												open to all aquifers?
WW0062	6/35-02M		22	697											X	
WW0063	6/35-02N1		14	726	P	60	60	1.00				X				
WW0064	6/35-02Q		17	723	B	31	53	0.58				X				
WW0065	6/35-02R		46	724	P	180	135	1.33				X				
WW0071	6/35-03B		3	707	P	213	127	1.68				X				
WW0068	6/35-03P1			680												
WW0070	6/35-03Q		66	634	B	200	180	1.11	56			X				
WW0072	6/35-04B		12	665	P	220	120	1.83	50			X				
WW0073	6/35-04C		8	648	B	50	10	5.00	50			X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0074	6/35-04D	Apr-90	5098824	387998	646	646	10	636	33	603	>147								190	456		0-22	0-190	72-170	10
WW0075	6/35-04H	Aug-99	5098069	389232	675	675	9	666	58	608	>35								102	573		0-18	0-97	97-102	6
WW0076	6/35-04L	Apr-47	5098003	388374	645	645	3	642	80	562	97	465	>160						340	305			0-44	55-340	10
WW0077	6/35-04M	Aug-62	5097732	388027	658	658	5	653	42	611	>158								205	453			0-157	157-205	12
WW0078	6/35-04N	Jul-61	5097353	387955	662	662	13	649	10	639	>181								204	458			0-180	35-204	12
WW0079	6/35-04R1	Mar-73	5097286	389246	679	679	13	666	>71	#VALUE!									84	595			0-78		6
WW0080	6/35-05C	Jan-03	5098625	386714	622	622	10	612	40	572	46	526	>24						120	502			0-100	100-120	6
WW0081	6/35-05G	Dec-99	5097915	387216	680	680	76	604	0	604	194	410	>40						310	370			0-160	160-310	12
WW0082	6/35-05H	Aug-90	5098178	387661	640	640	8	632	22	610	>160								190	450			0-190	155-180	6
WW0083	6/35-06A1	Sep-74	5098710	385923	612	612	4	608	11	597	>122								137	475			0-132	63-122; 132-137	8
WW0084	6/35-06D	May-67	5098742	384518	662	662	38	624	88	536	>141								267	395			0-143	143-267	6
WW0085	6/35-06M	Apr-70	5097995	384662	664	664	32	632	8	624	111	513	>32						183	481			0-105	42-103; 103-183	12
WW0086	6/35-07A	Jan-72	5097122	386008	697	697	43	654	6	648	>234								283	414			0-238	36-236; 238-283	10
WW0087	6/35-07B	Apr-56	5097314	385333	669	669	18	651	13	638	>158								189	480			0-86	11-86; 86-189	12
WW0088	6/35-07G	Jun-73	5096906	385396	676	676	79	597	0	597	>63								142	534			0-136	136-142	6
WW0089	6/35-07L	Apr-98	5096116	385213	643	643	17	626	0	626	>193								210	433			0-38	38-210	12
WW0126	6/35-07R	Apr-50	5095852	385984	662	662	0	662	33	629	>137								170	492			0-44	44-170	12
WW0090	6/35-07R1	Jun-56	5095716	385976	662	662	2	660	20	640	>198								220	442			0-150	45-145; 150-220	12
WW0091	6/35-08L		5096287	386535	691	691	62	629	21	608	>38								121	570			0-117	117-121	6
WW0093	6/35-08M1	Jan-03	5096237	386301	667	667	4	663	10	653	>221								235	432			0-140.5	18-55; 70-140; 140-235	12
WW0094	6/35-08N	Jun-59	5096018	386101	660	660	24	636	41	595	0	595	0	595	0	65	595		300	360			0-164	40-153; 153-164	10
WW0096	6/35-09D	Jul-01	5097247	387812	669	669	7	662	41	621	>52								100	569		0-18	0-100	80-100	6
WW0097	6/35-09E	Jun-64	5096645	387774	672	672	0	672	0	672	>136								136	536	I		0-130	20-130	12
WW0098	6/35-09F	Jan-98	5096568	388413	682	682	7	675	0	675	>175								182	500		0-35	0-182	83-182	8
WW0099	6/35-09G	Jan-56	5096882	388566	679	679	14	665	30	635	>146								110	569			0-45	45-110	10
WW0100	6/35-09J1	Nov-75	5096419	388962	694	694	7	687	0	687	>73								80	614		0-26	0-72		6
WW0102	6/35-09K	Jun-95	5096288	388571	690	690	4	686	28	658	>127								155	535	D	0-23	0-150	60-146	8
WW0101	6/35-09R	Jul-46	5095705	389180	720	720	14	706	30	676	>160								190	530			0-100	35-55; 100-190	8
WW0143	6/35-10	Apr-06	5097114	389774	687	687	0	687	18	669	222	447	160	287	160	560	127		560	127					
WW0103	6/35-10B	Jun-46	5096862	390437	698	698	5	693	3	690	>136								143	555			0-140		6
WW0104	6/35-10C	Oct-60	5097201	389722	684	684	3	681	20	661	>84								110	574			0-95		8
WW0112	6/35-10C	Aug-02	5097145	390171	690	690	4	686	26	660	>110								140	550	D	0-25	0-141	70-115; 125-135	8
WW0105	6/35-10H	Mar-48	5096737	390619	705	705	5	700	15	685	>144								165	540	I		0-78	125-133	12
WW0106	6/35-10H1	Mar-48	5096408	390665	720	720	9	711	0	711	153	558	>43						205	515			0-91	12-23; 66-80	8
WW0107	6/35-10J	Dec-62	5096283	390687	722	722	10	712	0	712	>49								56	666				40-56	10
WW0108	6/35-10J2	Mar-01	5096286	390521	721	721	8	713	5	708	>89								102	619		0-32	0-102	76-100	6
WW0109	6/35-10N	Mar-58	5095803	389593	720	720	5	715	20	695	>30								55	665			0-44		10
WW0110	6/35-10Q	Sep-02	5095889	390395	725	725	13	712	9	703	>90								117	608		0-18	0-117	72-117	6
WW0111	6/35-10Q1	Jan-62	5095724	390330	729	729	0	729	11	718	>34								45	684			0-30	30-45	10
WW0113	6/35-11B1	Jun-77	5097090	392021	731	731	25	706	0	706	>180								205	526	I	0-25	0-123	45-205	12
WW0114	6/35-11E	Jul-59	5096707	391239	710	710	18	692	4	688	>62								84	626	D			0-84	8
WW0015	6/35-11E1	Apr-80	5096449	391081	721	721	19	702	0	702	>61								80	641	D	0-18	0-80	60-80	6
WW0116	6/35-11G	May-74	5096742	391727	723	723	12	711	26	685	>45								83	640	D,I	0-39	0-39	39-83	6
WW0119	6/35-11Q	Jun-53	5095629	391909	791	791	59	732	14	718	125	593	>18						216	575			0-152	152-216	10
WW0118	6/35-11R	Jun-89	5095920	392174	751	751	20	731	0	731	>91								101	650	D	22	0-99	99-101	6
WW0121	6/35-12A	May-95	5096935	394048	810	810	18	792	18	774	>179								215	595	D	24	0-210	60-215	8
WW0122	6/35-12L	May-68	5096245	393113	769	769	20	749	0	749	175	574	320	254	0	515	254		1250	-481	I	536	0-600	500-1250	12
WW0123	6/35-12N	Jan-06	5095587	392885	763	763	20	743	30	713	170	543	315	228	0	535	228		590	173			0-535	535-590	6
WW0124	6/35-12R	Aug-61	5095931	393700	828	828	87	741	0	741	147	594	283	311	0	517	311		517	311			0-596	596-635	12

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0074	6/35-04D		11	636	P	150	150	1.00	58			X				
WW0075	6/35-04H		18	657	A	18						X				
WW0076	6/35-04L	60		645	P	75	95	0.79				X	X			
WW0077	6/35-04M	19	17	641		200	140	1.43				X				
WW0078	6/35-04N	179	15	647	P	275	130	2.12	54			X				
WW0079	6/35-04R1		10	669	B	27	20	1.35			X					
WW0080	6/35-05C		4	618	A	40						X	X			
WW0081	6/35-05G	112	80	600	P	370	170	2.18	58			X	X			
WW0082	6/35-05H	123	11	629	P	50	10	5.00	52			X				
WW0083	6/35-06A1		8	605					52			X				
WW0084	6/35-06D	87	56	606	P	45	47	0.96	56			X				
WW0085	6/35-06M	32	25	639		410	100	4.10	59			X	X			
WW0086	6/35-07A	43	36	661	P	450	130	3.46	58	X	X	X				
WW0087	6/35-07B	18	19	651	P	290	123	2.36	58	X	X	X				
WW0088	6/35-07G	119	80	596	B	60	10	6.00	55			X				
WW0089	6/35-07L			643								X				
WW0126	6/35-07R	138	14	648	P	300	110	2.73				X				
WW0090	6/35-07R1	45	18	644	P	370	152	2.43	43			X				
WW0091	6/35-08L	104	80	611	A	40						X				
WW0093	6/35-08M1	28	13	654					54			X				
WW0094	6/35-08N	53	32	628	P	450	60	7.50			X				X	
WW0096	6/35-09D		18	651	A	60			53			X				
WW0097	6/35-09E		20	652		245	80	3.06				X				
WW0098	6/35-09F	148	27	655	P	120	50	2.40	56			X				
WW0099	6/35-09G		16	663	P	240	65	3.69				X				
WW0100	6/35-09J1	65	14	680	B	60	35	1.71	55							
WW0102	6/35-09K		21	669	P	70	36	1.94	58			X				
WW0101	6/35-09R	14	20	700	P	75	40	1.88			X	X				
WW0143	6/35-10			687												
WW0103	6/35-10B	5		698	P	150	150	1.00								
WW0104	6/35-10C	3	6	678	P	100	39	2.56								
WW0112	6/35-10C		18	672	P	50	112	0.45	54			X				
WW0105	6/35-10H		10	695	P	251	50	5.02				X				
WW0106	6/35-10H1	58	10	710	P	85	135	0.63				X				
WW0107	6/35-10J	40	6	716	P	100	3	33.33	59			X				
WW0108	6/35-10J2	71	9	713	P	100	20	5.00	52			X				
WW0109	6/35-10N	9	4	716	P	60	14	4.29								
WW0110	6/35-10Q	114	18	707	A	35			60			X				
WW0111	6/35-10Q1	39	11	718	P	225	31	7.26				X				
WW0113	6/35-11B1		29	702	P	240	160	1.50				X				
WW0114	6/35-11E		6	704	P	40	10	4.00		X	X	X				
WW0015	6/35-11E1		13	708	B	30	3	10.00				X				
WW0116	6/35-11G			723								X				
WW0119	6/35-11Q		60	731	P	450	135	3.33				X				
WW0118	6/35-11R		40	711	B	50	0					X				
WW0121	6/35-12A		12	798	P	100	178	0.56				X				
WW0122	6/35-12L		59	710	?	450	250	1.80							X	
WW0123	6/35-12N			763	P	1000									X	
WW0124	6/35-12R		36	792	P	600	57	10.53							X	

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U4187	6/35-13	Oct-87	5094228	393540	810	810	9	801	0	801	>141								150	660	D			104-150	6
U4195	6/35-13	Jun-73	5094615	392233	801	801	34	767	0	767	>162								196	605	D,I			160-190	8
U4202	6/35-13	Jan-65	5094855	392522	808	808	44	764	36	728	0	728	0	728	0	80	728		145	663	I	0-32	0-119	60-118	10
U4204	6/35-13		5094604	392758	823	823	37	786	0	786	>85								120	703				103-120	8
U50011	6/35-13	1995	5094271	392352	823	823	44	779	0	779	>146								190	633	D	0-22	0-179	179-190	6
U51035	6/35-13	1998	5094412	393272	814	814	13	801	25	776	>120								145	669	D	0-25	0-133.5	133-145	6
U4217	6/35-14	1985	5094188	391156	784	784	0	784	32	752	>68								100	684				79-100	
U4219	6/35-14	1983	5094091	391764	794	794	9	785	0	785	>114								123	671	D,I	0-19	0-91	91-123	8
U4224	6/35-14	1975	5094548	391220	781	781	18	763	33	730	>74								125	656	D	0-45	0-114	114-125	6
U5625	6/35-14	Jan-92	5094298	390681	781	781	5	776	36	740	>109								150	631	I	0-20	0-147	23-34; 54-137	8
WW0127	6/35-14F1	Jun-50	5095124	391483	759	759	7	752	28	724	>125								160	599			0-25		8
U4215	6/35-14K	Jun-87	5094697	391550	778	778	8	770	24	746	>114								146	632	D	0-20	0-99	99-146	8
HW-1	6/35-15	Dec-05	5095033	390630	751	751	0	751	9	742	>42								51	700	MN	0-8	0-51		2
HW-2	6/35-15	Dec-05	5094642	390649	771	771	1	770	9	761	>40								51	720	MN	0-8	0-51		2
HW-3	6/35-15	Dec-05	5095071	390470	750	750	1	749	13	736	>36								51	699	MN	0-8	0-51		2
U52581	6/35-15		5094944	390496	752	752	5	747	19	728	>91								115	637				65-115	
U53413	6/35-15		5094265	389943	771	771	0	771	0	771	0	771	0	771	0	0	771		0	771					
U54912	6/35-15	Sep-03	5094308	389594	761	761	0	761	30	731	>73								103	658	D	0-20	0-103	63-103	5
U54970	6/35-15	Oct-03	5094641	389936	758	758	0	758	47	711	201	510	>37						285	473	D,I	0-40	0-285	120-220; 240-275	10
U6342	6/35-15		5094589	389713	755	755	0	755	35	720	>67								102	653				60-102	
WW0128	6/35-15G	May-46	5095161	390190	766	766	3	763	16	747	>144								163	603					8
WW0129	6/35-15G1	Mar-68	5095255	390205	771	771	27	744	8	736	>46								81	690			0-80	80-81	10
U5413	6/35-15L	May-90	5094631	390376	768	768	9	759	36	723	>40								85	683	D	0-19	0-59	59-85	6
U4244	6/35-15N	Sep-88	5094257	389115	758	758	7	751	47	704	>36								90	668	D	0-20	0-79	79-90	8
WW0130	6/35-15P	Aug-99	5095140	389864	746	746	16	730	8	722	>201								225	521			0-225	30-164; 205-225	8
U5339	6/35-15R	Oct-89	5094217	390424	784	784	3	781	29	752	>53								85	699	D	0-19	0-59	59-85	6
U4256	6/35-16	Jan-68	5094548	388529	774	774	14	760	4	756	>262								280	494	I	0-22	0-106	46-86; 103-280	10
U4258	6/35-16	1967	5094094	388829	801	801	46	755	0	755	>104								150	651	I	0-40	0-132	60-130; 132-150	8
WW0131	6/35-16A1	Sep-02	5095247	389046	725	725	13	712	25	687	>42								80	645	D	0-18	0-80	60-80	6
WW0132	6/35-16B	Apr-48	5095394	388755	712	712	0	712	58	654	>16								74	638					8
WW0133	6/35-16D	Nov-61	5095412	387741	761	761	35	726	0	726	>85								120	641			0-120		12
WW0134	6/35-16F	Nov-55	5095164	388236	760	760	47	713	15	698	>178								240	520			0-240		12
WW0135	6/35-16G	Jul-66	5095167	388665	723	723	16	707	0	707	>157								173	550	I	0-25	0-63		8
U4261	6/35-16P	Mar-58	5094163	388017	741	741	4	737	30	707	>37								71	670	D,I		0-48	48-71	8
U4273	6/35-17	1960	5094250	386796	722	722	4	719	0	719	>196								200	522	I		0-37.5	37-200	8
U4275	6/35-17	1959	5094432	386339	712	712	25	687	15	672	>217								257	455	I		0-62	40-61; 62-257	12
U4279	6/35-17	1954	5094644	387266	732	732	9	723	0	723	355	368	>92						456	276	I		0-387	20-383; 387-456	10
U53471	6/35-17	1999	5094623	386282	696	696	8	688	18	670	>123								149	547	D	0-25	0-109	102-149	5
WW0136	6/35-17A	Oct-82	5095602	387429	706	706	59	647	0	647	>251								310	396	D,I		0-310	70-86; 88-121; 123-145; 181-197	10
WW0137	6/35-17B	Mar-98	5095554	386826	679	679	7	672	25	647	>130								162	517	I		0-158	98-158; 158-162	8
WW0138	6/35-17C	Mar-62	5095628	386632	675	675	2	673	0	673	>10								322	353			0-210	16-63; 82-161;161-322	10
L1	6/35-18	Dec-05	5095216	385973	676	676	0	676	0	676	>60								60	616	MN	0-8	0-60		2
L2	6/35-18	Dec-05	5095699	385699	663	663	2	661	10	651	>39								51	612	MN	0-8	0-51		2
L3	6/35-18	Jan-07	5095438	385754	673	673	0	673	12	661	>56								68	605	MN	0-7	0-68		2
U4282	6/35-18	1972	5094479	384162	663	663	21	642	0	642	>82								103	560	D,I	0-21	0-90	60-85; 90-103	8
WW1092	6/35-18	Feb-73	5095477	385966	673	673	0	673	0	673	260	413	490	-77	0	750	-77		1308	-635	O	0-90; ??			

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U4187	6/35-13	14	17	793					57							
U4195	6/35-13	39	29	772	P	190	120	1.58	53			X				
U4202	6/35-13		28	780	P	290	62	4.68				X				
U4204	6/35-13		40	783							X				X	
U50011	6/35-13	181		823					48			X				
U51035	6/35-13	14	6	809	P	75	35	2.14	53			X				
U4217	6/35-14	92	24	760					56			X				
U4219	6/35-14	23	8	787					57			X				
U4224	6/35-14	24	34	747	P	40	14	2.86	58			X				
U5625	6/35-14	25	24	757	B	60	23	2.61	55		X	X				
WW0127	6/35-14F1			759												
U4215	6/35-14K		10	768	A	40			56			X				
HW-1	6/35-15			751								X				
HW-2	6/35-15			771								X				
HW-3	6/35-15			750								X				
U52581	6/35-15	24	30	722	B	35	5	7.00	52			X				
U53413	6/35-15			771												
U54912	6/35-15	75	46	715	B	24	3	8.00	59			X				
U54970	6/35-15	60	28	730	P	260	70	3.71	57			X	X			
U6342	6/35-15		30	725	B	25	4	6.25	54			X				
WW0128	6/35-15G	42		766	P	208	12	17.33	52							
WW0129	6/35-15G1	46	39	732		300	20	15.00				X				
U5413	6/35-15L	42	37	731	A	60			58			X				
U4244	6/35-15N		37	721	A	500			56			X				
WW0130	6/35-15P	42	24	722	P	150	96	1.56	54			X				
U5339	6/35-15R	24	22	762	A	30			56			X				
U4256	6/35-16		21	753	P	400	18	22.86	56			X				
U4258	6/35-16	62	62	739								X				
WW0131	6/35-16A1		15	710	A	50						X				
WW0132	6/35-16B		4	709	P	60	18	3.33								
WW0133	6/35-16D		8	753	P	133	90	1.48		X		X				
WW0134	6/35-16F	47	32	728	P	295	150	1.97								
WW0135	6/35-16G	16	7	716	P	60	20	3.00	52							
U4261	6/35-16P		9	732	P	400	63	6.35				X				
U4273	6/35-17		42	680	P	150	30	5.00	51			X				
U4275	6/35-17		40	672	P	250	150	1.67				X				
U4279	6/35-17			732								X	X			
U53471	6/35-17	55	43	653	B	25	3	8.33	50			X				
WW0136	6/35-17A		96	610	P	120	84	1.43				X				
WW0137	6/35-17B	32	28	651	A	250						X				
WW0138	6/35-17C	55	30	645	P	325	160	2.03	56							
L1	6/35-18			676								X				
L2	6/35-18			663							X	X				
L3	6/35-18			673								X				
U4282	6/35-18	46	38	625	P	150	40	3.75	54			X				
WW1092	6/35-18			673												

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0139	6/35-18B	Nov-56	5095405	385183	656	656	20	636	11	625	>195								226	430			0-204	70-204	12
WW0140	6/35-18D	May-98	5095578	384655	652	652	11	641	0	641	>233								244	408	D		0-244	145-243	6
WW0141	6/35-18D1	Feb-98	5095620	384688	649	649	25	624	0	624	>195								220	429	D		0-220	130-170; 180-220	6
U4287	6/35-18J	Jun-59	5094740	385307	715	715	64	651	4	647	>182								250	465	I		0-80	80-250	10
U4289	6/35-19	1984	5092676	385556	719	719	46	673	0	673	91	582	>48						185	534	I	0-20	0-169	100-140; 169-185	10
U4293	6/35-19	1977	5093336	384780	698	698	3	695	57	638	>97								157	541	D,I	0-42	0-157	73-157	8
U4304	6/35-19	1957	5092954	384957	699	699	12	687	0	687	>88								200	499				0-200	10
U4305	6/35-19	1958	5093193	385161	702	702	18	684	62	622	>120								200	502	I		0-81	30-80/81-200	8
U4317	6/35-20	1988	5092639	386691	748	748	20	728	21	707	>64								105	643	D	0-20	0-105	59-65; 65-105	5
U54166	6/35-20	Jun-80	5093864	386844	738	738	38	700	0	700	>82								120	618	D	0-42	0-95	95-120	6
U6188	6/35-20	Aug-82	5092814	386042	725	725	27	698	27	671	>47								101	624	D	0-27	0-88	61-88; 88-101	6
U6192	6/35-20	1978	5094060	387119	732	732	16	716	52	664	215	449	>119						402	330		0-20	0-320	40-402	10
U6194	6/35-20	1955	5093950	386260	735	735	67	668	0	668	>208								285	450	I		0-110	110-275	12
U6196	6/35-20	1976	5093313	386953	741	741	46	695	19	676	>60								125	616	D	0-46	0-119	119-125	6
U4319	6/35-21	1987	5093441	388313	764	764	6	758	16	742	>103								125	639	D,I	0-18	0-59	18-59	8
U4327	6/35-21	1968	5093064	387491	758	758	6	752	0	752	>104								110	648	D	0-18	0-59	33-36; 59-110	8
U4329	6/35-21	Oct-67	5092840	387660	768	768	17	751	0	751	168	583	>25						210	558	D,I	0-23	0-60	40-210	10
U4332	6/35-21	1965	5093877	388919	794	794	22	772	43	729	>98								163	631	I	0-20	0-84	54-80; 84-163	8
U4345	6/35-21	Sep-63	5092559	388140	787	787	9	778	5	773	354	419	>27						395	392					
U4347	6/35-21	1951	5092758	387611	778	778	20	758	0	758	>169								189	589	I		0-46	46-189	10
U4348	6/35-21	1943	5093491	387912	758	758	3	755	15	740	>153								171	587	I			0-171?	8
U50130	6/35-21	Apr-96	5093050	387692	761	761	2	759	0	759	>133								135	626	D	0-40	0-135	110-120	8
U51045	6/35-21	Feb-98	5093536	388254	761	761	0	761	75	686	>200								275	486	I	0-18	0-268	65-258	8
U5841	6/35-21	1995	5093468	387998	758	758	3	755	65	690	>147								215	543	D	0-18	0-215	75-188; 198-215	8
U6208	6/35-21	1978	5092870	388905	787	787	7	780	63	717	>80								150	637	D,I	0-20	0-140	40-140; 140-150	10
U4367	6/35-22	1974	5092981	389402	820	820	12	808	0	808	330	478	>34						376	444	D,I	0-21	0-137	30-127; 137-376	8
U4369	6/35-22	1969	5093284	388924	781	781	27	754	9	745	>82								118	663	D,I	0-36	0-88	36-118	6
U4370	6/35-22	Oct-68	5092828	389913	840	840	47	793	0	793	>265								312	528	I	0-22	0-101	101-312	8
U4379	6/35-22	Mar-59	5092618	390106	833	833	30	803	0	803	>170								200	633	I		0-73	12-70; 73-200	10
U4381	6/35-22		5093252	390088	814	814	7	807	31	776	240	536	>22						300	514	I	0-20	0-80	80-300	8
U51921	6/35-22	1998	5092610	389493	804	804	48	756	12	744	>98								158	646	D	0-48	0-158	99-158	6
U53775	6/35-22	May-00	5083257	398616	1362	1362	0	1362	20	1342	0	1342	0	1342	0	20	1342		125	1237	D	0-33	0-33	33-125	
U5882	6/35-22N	Jul-93	5092687	389109	797	797	20	777	2	775	>81								103	694	D	0-20	0-103	103	6
U4403	6/35-23	May-81	5092700	391173	833	833	40	793	0	793	>140								180	653	D	0-20	0-100	100-180	6
U4404	6/35-23	May-81	5092668	390764	837	837	35	802	15	787	>250								300	537	D	0-20	0-260	190-300	6
U4406	6/35-23	1979	5093740	391935	759	759	4	755	36	719	>80								120	639	D	0-20	0-75	75-120	6
U4410	6/35-23	May-77	5092607	392437	843	843	16	827	0	827	>137								153	690	D,I	0-20	0-126	62-118; 126-153	8
U4412	6/35-23	1975	5092615	391715	840	840	9	831	36	795	>87								132	708	D	0-18	0-125	125-132	8
U4416	6/35-23	Jun-73	5092299	391258	850	850	8	842	25	817	>237								270	580	D	0-38	0-139	139-270	6
U6211	6/35-23	Apr-81	5092932	390617	823	823	25	798	25	773	>105								155	668	D,I	0-30	0-119	119-155	6
U4461	6/35-24	May-87	5093166	392946	846	846	65	781	0	781	>95								160	686	I	0-18	0-160	90-95; 135-140	6
U4462	6/35-24	1987	5093000	392313	833	833	18	815	17	798	>111								146	687	D,I	0-27	0-110	27-146	8
U4464	6/35-24	1985	5092725	392194	840	840	5	835	7	828	>100								112	728	I	0-18	0-95	18-112	5
U4469	6/35-24	1982	5092559	392675	846	846	5	841	18	823	>82								105	741	D	0-19	0-78	19-105	6
U4471	6/35-24	Sep-82	5093606	393619	814	814	34	780	0	780	0	780	0	780	0	34	780		305	509	I	0-39	0-300	65-140; 140-285	10
U4479	6/35-24	1977	5093446	393217	827	827	28	799	52	747	>25								105	722	D	0-28	0-100	28-105	6

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0139	6/35-18B		32	624	P	350	150	2.33				X				
WW0140	6/35-18D		56	596	P	60	100	0.60	60			X				
WW0141	6/35-18D1	137	47	602	P	40	76	0.53	58			X				
U4287	6/35-18J		64	651								X				
U4289	6/35-19	46	13	706	P	670	99	6.77	54			X				
U4293	6/35-19	28	30	668	P	300	83	3.61				X				
U4304	6/35-19		18	681	P	50	100	0.50	52	X		X				
U4305	6/35-19		50	652	P	128	95	1.35	55		X	X				
U4317	6/35-20	80	38	710					56			X				
U54166	6/35-20	95	23	715	A	15			63			X				
U6188	6/35-20	101	32	693	A	50			56			X				
U6192	6/35-20	16	13	719	P	180	300	0.60	52		X	X				
U6194	6/35-20		68	667								X				
U6196	6/35-20	68	42	699					58			X				
U4319	6/35-21	51	46	718					58		X	X				
U4327	6/35-21		31	727	P	300	70	4.29	54			X				
U4329	6/35-21		54	714	P	120	140	0.86	52			X	X			
U4332	6/35-21		33	762	P	260	25	10.61	54		X	X				
U4345	6/35-21			787												
U4347	6/35-21		22	756	P	125	10	12.50				X				
U4348	6/35-21	40	44	714							X	X				
U50130	6/35-21	35	35	726	A	300			56			X				
U51045	6/35-21	60	35	726	P	167	185	0.90	46		X	X				
U5841	6/35-21	42	36	722	P	190	164	1.16	53			X				
U6208	6/35-21	50	59	728	P	145	142	1.02	52		X	X				
U4367	6/35-22	21	26	794	P	130	105	1.24	59			X	X			
U4369	6/35-22	47	54	727	B	75	25	3.00	53			X				
U4370	6/35-22		94	747	P	30	127	0.24				X				
U4379	6/35-22		22	812	P	115	124	0.93	54	X		X				
U4381	6/35-22		10	804								X	X			
U51921	6/35-22	52	69	735	B	24	6	4.00	51			X				
U53775	6/35-22	20	20	1342	A	60			50						X	
U5882	6/35-22N	20	10	787	A	30			57			X				
U4403	6/35-23	41	42	791	A	30			54			X				
U4404	6/35-23	75	65	772	A	30			58			X				
U4406	6/35-23	75	20	739	P?	17	80	0.21	56			X				
U4410	6/35-23	20	12	831	B	112	10	11.20	57			X				
U4412	6/35-23	12	30	810	A	30	40	0.75	64			X				
U4416	6/35-23	37	5	845	P	30	113	0.27	52			X				
U6211	6/35-23		40	783	A	80	21	3.81	56			X				
U4461	6/35-24		8	838	A	100			54			X				
U4462	6/35-24	65	29	804	P	185	120	1.54	54		X	X				
U4464	6/35-24	5	16	824	B	100	25	4.00	57			X				
U4469	6/35-24	15	10	836					56		X	X				
U4471	6/35-24	63	54	760	P	220	170	1.29	58						X	
U4479	6/35-24	28	27	800	B	60	20	3.00			X	X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U4506	6/35-24	Jun-53	5093820	392452	840	840	49	791	26	765	>145								220	620	I				
U5915	6/35-24	Apr-93	5093862	393691	820	820	30	790	11	779	>79								120	700	D,I	0-20	0-99	99-120	8
U4538	6/35-25	1979	5091401	393377	883	883	0	883	100	783	90	693	>20						210	673	I	0-18	0-185	18-210	8
U4590	6/35-25	1934	5092187	392952	859	859	0	859	27	832	0	832	>375						402	457	I			54-402?	8
U4599	6/35-25	1926	5091173	393535	889	889	6	883	0	883	>26								32	857				0-32	
U4610	6/35-25	pre-1917	5091993	393360	860	860	20	840	0	840	>155								175	685				0-175?	8
U5958	6/35-25	Dec-93	5091147	392517	899	899	0	899	24	875	>179								203	696	D,I	0-32	0-203	80-190	8
U4642	6/35-26	1981	5090804	392068	912	912	7	905	27	878	>71								105	807	D	0-19	0-53	53-105	6
U4643	6/35-26	1977	5091724	390743	860	860	0	860	35	825	>67								102	758	I	0-20	0-60	40-102	8
U4644	6/35-26	1977	5090973	391142	892	892	0	892	24	868	>81								105	787	I	0-30	0-53	33-105	8
U4648	6/35-26	1974	5091068	391406	892	892	0	892	12	880	>103								115	777	D,I	0-32	0-62	62-115	8
U4653	6/35-26	Nov-68	5090995	390822	886	886	0	886	20	866	>130								150	736	I	0-28	0-72	72-150	10
U4690	6/35-26	1925	5091823	391037	860	860	8	852	24	828	>68								100	760	I		0-52	52-100	8
U4691	6/35-26		5092036	391258	860	860	10	850	0	850	>100								110	750	I		0-44	44-110	8
U54063	6/35-26	Dec-06	5091994	391363	860	860	10	850	66	784	>104								180	680	D	0-18	0-180	140-180	4
U54134	6/35-26	Apr-61	5092073	391889	856	856	9	847	14	833	169	664	373	291	0	565	291		630	226	D,I	0-40	0-569	569-630	10
U54524	6/35-26	May-02	5090984	391121	892	892	12	880	15	865	274	591	84	507	42	427	465		427	465	I				
U54963	6/35-26	Sep-03	5091412	391487	879	879	0	879	17	862	>126								143	736	I	0-43	0-100	100-143	8
U6281	6/35-26	Oct-94	5091303	390567	869	869	0	869	16	853	>94								110	759	D	0-20	0-80	80-110	8
U6441	6/35-26	Jan-81	5091700	391470	869	869	0	869	15	854	>85								100	769	D	0-20	0-100	60-100	6
U4707	6/35-27	Jun-88	5091751	389532	840	840	0	840	42	798	>78								120	720	D	0-20	0-120	90-120	4
U4712	6/35-27	Feb-82	5091391	389895	856	856	0	856	12	844	>138								150	706	D,I	0-40	0-54	54-150	8
U4714	6/35-27	Feb-81	5091807	389115	823	823	11	812	31	781	>113								155	668	D,I	0-20	0-56	56-155	6
U4715	6/35-27	Feb-81	5092308	389390	820	820	12	808	18	790	>125								155	665	D,I	0-19	0-54	34-155	8
U4718	6/35-27	Mar-77	5090844	390450	886	886	0	886	41	845	>159								200	686	D,I	0-20	0-68	48-200	8
U4730	6/35-27	May-43	5090652	389937	883	883	0	883	50	833	330	503	>100						480	403	I		0-60	60-480	8
U4731	6/35-27	Jun-41	5091816	390494	853	853	0	853	30	823	>191								221	632	I		0-43	43-221	8
U53996	6/35-27	Nov-00	5091482	390293	860	860	0	860	65	795	>60								125	735	D	0-30	0-125	60-125	6
U5657	6/35-27	Mar-92	5091777	389891	846	846	4	842	11	831	>289								304	542	I	0-18	0-304	60-304	8
U6443	6/35-27	Jan-81	5091156	390101	869	869	0	869	30	839	>140								170	699	D,I	0-30	0-160	60-170	8
U4759	6/35-28	Jan-81	5091432	387929	804	804	0	804	46	758	>79								125	679	I	0-20	0-125	20-70; 73-125	8
U4762	6/35-28	Jul-78	5090991	387307	797	797	14	783	0	783	>301								315	482	D,I	0-18	0-78	78-315	8
U4763	6/35-28	Apr-78	5091375	388644	830	830	5	825	0	825	>118								123	707	I	0-20	0-106	40-98; 106-123	8
U4764	6/35-28	Oct-77	5091504	388490	840	840	12	828	43	785	>51								105	735	I	0-20	0-70	44-68; 70-105	8
U4774	6/35-28	Apr-71	5091736	388836	827	827	14	813	23	790	>67								104	723	D,I	0-18	0-365	18-30; 36-104	8
U4775	6/35-28	Feb-71	5090682	388831	846	846	12	834	24	810	88	722	>195						340	506	I	0-18	0-58	58-340	
U5268	6/35-28	Apr-89	5092305	388252	801	801	9	792	34	758	>77								120	681	I	0-20	0-120	80-120	6
U5464	6/35-28	Oct-90	5090670	387891	823	823	9	814	0	814	>295								304	519	I	0-60	0-260	70-304	8
U5496	6/35-28	Mar-91	5091324	388355	820	820	9	811	0	811	387	424	>29						425	395	I	0-22	0-425	145-155; 211-425	8
U4797	6/35-29	Jun-88	5091897	386286	745	745	0	745	10	735	>330								340	405	I	0-25	0-300	300-340	10
U4799	6/35-29	Feb-78	5091010	385770	741	741	11	730	83	647	>67								161	580	D	0-25	0-100	100-161	6
U4801	6/35-29	Sep-76	5091811	386219	741	741	0	741	31	710	>79								110	631	I	0-21	0-96	96-110	6
U4806	6/35-29	Mar-54	5091872	386069	738	738	0	738	26	712	>83								109	629	I		0-35	35-109	8
U4808	6/35-29	Jan-55	5092250	385932	732	732	11	721	46	675	>288								345	387	I		0-57	23-345	13
U6405	6/35-29	Aug-98	5092200	386943	761	761	10	751	54	697	>59								123	638	D	0-25	0-123	63-123	5
U6445	6/35-29	Apr-81	5091878	386704	758	758	0	758	27	731	>116								143	615	I	0-21	0-140	40-140	10
U4819	6/35-30	Jun-85	5091573	384688	702	702	6	696	11	685	>83								100	602	D	0-19	0-100	80-100	4
U4824	6/35-30	Oct-77	5091552	384096	682	682	0	682	77	605	>28								105	577	D	0-22	0-69	69-105	6
U4828	6/35-30	May-71	5091946	384250	686	686	3	683	14	669	>90								107	579	D,I	0-18	0-52	52-107	6
U4839	6/35-30	Mar-55	5091980	384090	679	679	0	679	36	643	>101								137	542	D,I		0-43	43-137	8
U4840	6/35-30	May-05	5092340	384727	699	699	5	694	30	664	>205								240	459	I		0-61	30-54; 61-240	8
U5	6/35-30	Aug-87	5092431	384184	679	679	4	675	6	669	>111								121	558	D	0-23	0-421	81-121	4
U53932	6/35-30	Aug-00	5092434	384297	682	682	0	682	25	657	>101								126	556	D	0-18	0-126	63-126	5
U5743	6/35-30	Aug-92	5092262	385353	722	722	12	710	25	685	>148								185	537	D	0-20	0-185	65-185	4

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U4506	6/35-24			840												
U5915	6/35-24	50	31	789	A	40			58			X				
U4538	6/35-25	65	27	856					52		X	X				
U4590	6/35-25			859								X				
U4599	6/35-25		6	883						X		X				
U4610	6/35-25			860	P	300	18	16.67		X		X				
U5958	6/35-25	71	42	857	P	214	21	10.19	54			X				
U4642	6/35-26	65	34	878	A	30			52			X				
U4643	6/35-26	38	28	832	B	60	8	7.50	54			X				
U4644	6/35-26	45	33	859	P	200	31	6.45				X				
U4648	6/35-26	61	49	843	B	75	22	3.41	46			X				
U4653	6/35-26		54	832	P	170	86	1.98				X				
U4690	6/35-26			860	P	400	15	26.67				X				
U4691	6/35-26		20	840	P	400	25	16.00				X				
U54063	6/35-26	35	33	827	A	20			53			X				
U54134	6/35-26	38		856											X	
U54524	6/35-26			892												
U54963	6/35-26	59	36	843	A	450	50	9.00	54			X				
U6281	6/35-26	55	40	829	A	300	20	15.00	53			X				
U6441	6/35-26	65	36	833	A	60			52			X				
U4707	6/35-27	70	16	824	A	30	104	0.29	58			X				
U4712	6/35-27	49	34	822					55			X				
U4714	6/35-27	44	32	791					54			X				
U4715	6/35-27	45	20	800	P	300	120	2.50				X				
U4718	6/35-27	80	50	836	P	30	130	0.23				X				
U4730	6/35-27		30	853	P	400	5	80.00				X	X			
U4731	6/35-27		15	838	P	450	20	22.50				X				
U53996	6/35-27	40	34	826					56		X	X				
U5657	6/35-27	55	34	812					56			X				
U6443	6/35-27	60	36	833					56			X				
U4759	6/35-28		14	790	P	100	55	1.82	59		X	X				
U4762	6/35-28	180	93	704	P	150	190	0.79	58			X				
U4763	6/35-28	35	23	807	P	500	70	7.14	58			X				
U4764	6/35-28	24	12	828	P	120	71	1.69	58		X	X				
U4774	6/35-28	34	23	804	P	122	70	1.74	54		X	X				
U4775	6/35-28		68	778	P		130	0.00	58			X				
U5268	6/35-28	98	26	775					56			X				
U5464	6/35-28	42	22	801	P	214	198	1.08	48							
U5496	6/35-28	40	58	762					56			X	X			
U4797	6/35-29	70	67	678								X				
U4799	6/35-29	90	62	679	P	6	42	0.14	59			X				
U4801	6/35-29	43	31	710	B	75	20	3.75	59			X				
U4806	6/35-29		20	718	P	125	50	2.50				X				
U4808	6/35-29			732							X	X				
U6405	6/35-29	25	55	706	B	20	10	2.00	57		X	X				
U6445	6/35-29	47	43	715					52			X				
U4819	6/35-30	60	39	663					56			X				
U4824	6/35-30	31	26	656	B	50	12	4.17	56		X	X				
U4828	6/35-30		32	654	B	75	20	3.75	50			X				
U4839	6/35-30		40	639								X				
U4840	6/35-30	35	14	685	P	160	89	1.80			X	X				
U5	6/35-30	40	39	640					57			X				
U53932	6/35-30	75	47	635	B	21	2	10.50	52			X				
U5743	6/35-30	55	52	670	A	60			58			X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U6447	6/35-30	Jun-82	5091868	384645	699	699	0	699	24	675	>96								120	579	I	0-50	0-80	60-120	10
U6449	6/35-30	Sep-86	5092264	384669	696	696	2	694	33	661	>67								102	594	D,I	0-20	0-100	39-100	4
U4848	6/35-31	Jun-61	5090741	385053	758	758	15	743	30	713	>60								105	653	D		0-40	10-30; 40-105	10
U4853	6/35-32	Sep-88	5089179	386705	856	856	12	844	0	844	0	844	0	844	0	12	844		225	631	D				5
U4856	6/35-32	Sep-81	5090808	385804	745	745	16	729	17	712	>87								120	625	I		0-105	80-120	10
U4859	6/35-32	Nov-70	5090014	387218	814	814	6	808	13	795	>119								138	676	I	0-20	0-122	42-111; 122-138	10
U4864	6/35-32	Dec-54	5090401	385847	804	804	32	772	0	772	193	579	278	301	0	503	301		715	89	I	0-100	0-635	100-635	8
U50577	6/35-32	Mar-97	5089813	386919	820	820	12	808	23	785	378	407	123	284	0	536	284		860	-40	I	0-400	0-568	380-400; 568-860	10
U4873	6/35-33	3/82	5089485	388687	869	869	3	866	31	835	>171								205	664	D	0-20	0-119	99-205	6
U4879	6/35-33	3/80	5089564	387808	837	837	2	835	8	827	265	562	>25						300	537	I	0-18	0-73	73-300	10
U4880	6/35-33	12/79	5090838	387274	801	801	18	783	47	736	>65								130	671	I	0-20	0-70	70-130	8
U4881	6/35-33	10/79	5090059	387290	814	814	3	811	38	773	>95								136	678	I	0-30	0-133	58-136	10
U4882	6/35-33	8/79	5090563	388261	837	837	0	837	35	802	>150								185	652	I	0-20	0-59	59-185	10
U4888	6/35-33	12/71	5090521	387464	810	810	6	804	2	802	>97								105	705	D,I	0-26	0-78	30-74; 78-104	8
U4897	6/35-33	4/53	5089817	388613	860	860	3	857	29	828	>118								150	710	I		0-78	78-150	10
U4898	6/35-33	-/16	5089814	387633	823	823	3	820	0	820	>87								90	733	I		0-60	60-90	10
U4903	6/35-33	-/26	5090458	388037	827	827	10	817	>65	#VALUE!									75	752	I		0-30	30-75	8
U4906	6/35-33	-/22	5090042	387383	817	817	3	814	0	814	>47								50	767	I		0-50	20-50	6
U4907	6/35-33	<-/20	5090524	387650	817	817	10	807	>30	#VALUE!									40	777	I		0-10	10-40	
U4912	6/35-33	1916	5089740	387630	827	827	0	827	3	824	>137								140	687	I		0-75	72-140	8
U4917	6/35-33	1910	5090036	388041	833	833	0	833	95	738	>21								116	717	I		0-116	116	8
U50016	6/35-33	11/95	5089448	387436	837	837	29	808	56	752	>156								241	596	D	0-36	0-241	190-241	5
U6217	6/35-33	8/94	5090203	387418	814	814	0	814	16	798	>186								192	622	I	0-29	0-182	120-192	8
U4871	6/35-33H	Jul-84	5090156	388819	860	860	1	859	17	842	>112								130	730	D	0-19	0-125	105-130	
U4885	6/35-33M	Sep-78	5089870	387531	820	820	4	816	54	762	>70								128	692	I	0-18	0-54	54-128	
U4785	6/35-34	1908	5086581	390461	930	930	2	928	0	928	>98								100	830	I		0-53	53-100	
U4876	6/35-34	1908	5090294	390087	896	896	2	894	42	852	>56								100	796	D,I		0-60	60-100	12
U4924	6/35-34	Mar-88	5089955	389402	886	886	0	886	18	868	72	796	95	701	0	185	701		240	646	D	0-30	0-237	197-240	4
U4929	6/35-34	Mar-82	5089405	390380	925	925	0	925	38	887	>214								252	673	I	0-20	0-233	233-252	8
U4936	6/35-34	May-78	5089813	390394	915	915	0	915	120	795	>42								162	753	I	0-24	0-162	112-162	10
U4938	6/35-34	Jul-77	5089448	390447	928	928	0	928	41	887	>101								142	786	D	0-46	0-46	46-142	6
U4939	6/35-34	Jan-77	5089290	389846	912	912	0	912	70	842	>50								120	792	D	0-37	0-75	75-120	6
U4954	6/35-34	Nov-68	5089100	389586	912	912	0	912	20	892	157	735	109	626	0	286	626		302	610	I	0-20	0-287	40-90; 230-280	8
U4970	6/35-34	Jan-60	5089631	390217	915	915	0	915	22	893	141	752	>27						190	725	I		0-44	30-43; 44-190	8
U4971	6/35-34	Jun-59	5089304	389383	899	899	0	899	20	879	>92								112	787	I		0-40	25-35; 40-112	6
U4975	6/35-34	Jul-56	5089250	389346	899	899	0	899	26	873	>84								110	789	D		0-85	85-110	8
U5021	6/35-34	<1900	5089353	389104	889	889	0	889	2	888	>91								93	796	I		0-41	41-93	8
U5025	6/35-34		509022	389001	869	869	0	869	3	866	>42								45	824	D,I		0-15	15-45	
U50478	6/35-34	Feb-97	5089769	388859	869	869	0	869	27	842	216	626	164	462	0	407	462		475	394	I	0-270	0-389	389-475	8
U53462	6/35-34	Jun-99	5090556	390467	896	896	0	896	71	825	>122								193	703	D	0-20	0-193	93-193	5
U53769	6/35-34	Feb-00	5090149	389509	883	883	2	881	66	815	>182								250	633	D	0-22	0-250	83-250	5
U5512	6/35-34	7/90	5090602	389109	856	856	0	856	34	822	>146								180	676	I	0-20	0-180	60-180	6
U5670	6/35-34	May-92	5089213	389498	906	906	0	906	26	880	161	719	33	686	0	220	686		440	466	I	0-20	0-239	239-440	8
U6053	6/35-34	Jul-94	5089702	389149	883	883	0	883	9	874	260	614	79	535	0	348	535		363	520	I	0-33	0-350	350-363	8
U6283	6/35-34	Aug-94	5090366	389170	863	863	0	863	2	861	253	608	41	567	92	388	475		1003	-140		0-470			10
U6355	6/35-34	Aug-95	5089552	389188	886	886	0	886	37	849	206	643	127	516	0	370	516		455	431	I	0-287	0-430	430-455	8
U5027	6/35-35	Dec-87	5090284	390670	909	909	18	891	6	885	0	885	0	885	0	24	885		285	624	D,I	0-39	0-39	39-285	8
U5039	6/35-35	Jan-83	5089339	391054	948	948	0	948	98	850	>92								190	758	D	0-19	0-190	150-190	8
U5042	6/35-35	May-82	5090150	391264	925	925	0	925	81	844	145	699	>14						240	685	D	0-20	0-240	55-240	6
U5043	6/35-35	Apr-82	5090617	390701	899	899	0	899	34	865	>119								153	746	D,I	0-19	0-153	93-113; 133-153	8
U5044	6/35-35	Apr-82	5090516	391167	912	912	0	912	17	895	>85								102	810	D	0-18	0-102	62-102	6
U5048	6/35-35	Jan-82	5089052	390773	945	945	0	945	61	884	>209								270	675	D,I	0-30	0-270	155-270	6

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U6447	6/35-30	60	18	681	P	100	1	100.00	56			X				
U6449	6/35-30		54	642	A	40			54			X				
U4848	6/35-31		30	728	B	15	50	0.30	51	X	X	X				
U4853	6/35-32			856												BASALT WELL?
U4856	6/35-32	16	16	729												
U4859	6/35-32	30	19	795	P	400	5	80.00	53			X				
U4864	6/35-32	80	182	622	P	500	28	17.86				X			X	
U50577	6/35-32			820								X			X	
U4873	6/35-33	110	67	802	P	40	185	0.22	58			X				
U4879	6/35-33	125	70	767	P	200	205	0.98	58			X				
U4880	6/35-33	65	16	785	B	50	30	1.67	51			X				
U4881	6/35-33	60	32	782	P	215	3	86.00	52			X				
U4882	6/35-33	173	60	777	P	140	90	1.56	60			X				
U4888	6/35-33	24	24	786	P	100	95	1.05	56			X				
U4897	6/35-33		52	808	P	70	43	1.63				X				
U4898	6/35-33		35	788	P	300	30	10.00				X				
U4903	6/35-33			827							X					
U4906	6/35-33		6	811								X				
U4907	6/35-33		20	797	P	250	10	25.00			X					
U4912	6/35-33			827								X				
U4917	6/35-33		32	801								X				
U50016	6/35-33	41	100	737	P	60	68	0.88	57			X				
U6217	6/35-33	68	50	764					54			X				
U4871	6/35-33H	100	31	829	A	10						X				
U4885	6/35-33M	60	41	779	P	400	28	14.29	57		X	X				
U4785	6/35-34		20	910								X				
U4876	6/35-34		42	854								X				
U4924	6/35-34	50	111	775	A		45	0.00	51			X			X	
U4929	6/35-34	148	110	815					56			X				
U4936	6/35-34	45	15	900	P	125	60	2.08	56		X	X				
U4938	6/35-34	35	36	892	P	51	43	1.19	58			X				
U4939	6/35-34	80	47	865	P	5	63	0.08	56			X				
U4954	6/35-34		41	871	B	50	60	0.83				X				
U4970	6/35-34		40	875	P	20	110	0.18				X				
U4971	6/35-34	40	35	864	B	45	8	5.63				X				
U4975	6/35-34	10	19	880	B	25	31	0.81	65			X				
U5021	6/35-34		20	869	P	300	9	33.33				X				
U5025	6/35-34		30	839	P	100	12	8.33				X				
U50478	6/35-34			869									X		X	
U53462	6/35-34	41	33	863	B	6	45	0.13	54			X				
U53769	6/35-34		49	834	P	20	67	0.30	58			X				
U5512	6/35-34		42	814					57			X				
U5670	6/35-34			906											X	
U6053	6/35-34			883											X	
U6283	6/35-34			863												
U6355	6/35-34			886											X	
U5027	6/35-35			909											X	
U5039	6/35-35	103	86	862	P	75	93	0.81	52		X	X				
U5042	6/35-35	80	70	855	B	50	10	5.00	59		X	X				
U5043	6/35-35	46	34	865					57			X				
U5044	6/35-35	75	60	852					56			X				
U5048	6/35-35			945								X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
U5049	6/35-35	Dec-81	5089754	391267	942	942	0	942	12	930	>140								152	790	D	0-19	0-150	110-150	6
U5050	6/35-35	Feb-82	5090262	391462	922	922	0	922	80	842	>195								275	647	I	0-19	0-194	72-275	8
U5052	6/35-35	Feb-81	5090596	391538	912	912	0	912	30	882	>247								277	635	D,I	0-19	0-39	39-277	8
U5053	6/35-35	Mar-79	5090634	390658	899	899	0	899	80	819	>20								100	799	D	0-18	0-100	80-100	6
U5057	6/35-35	Jul-77	5090603	391290	909	909	0	909	30	879	>132								162	747	D,I	0-30	0-50	0-162	8
U5058	6/35-35	Jun-77	5089215	391305	958	958	0	958	26	932	119	813		813		145	813		300	658	I	0-35	0-39	39-300	8
U5059	6/35-35	May-77	5090238	391553	925	925	0	925	27	898	>98								125	800		0-25	0-53	53-125	6
U5316	6/35-35	Aug-89	5090267	391114	919	919	0	919	36	883	>149								183	736	D	0-20	0-183	143-183	4
U54464	6/35-35	Feb-02	5089953	390599	919	919	0	919	37	882	202	680	44	636		283	636		1005	-86	I	0-540	0-540	540-1005	12
U5477	6/35-35	Dec-90	5089853	391780	942	942	0	942	95	847	>77								172	770	D	0-30	0-172	162-172	5
U55253	6/35-35	Sep-04	5090002	391364	932	932	19	913	0	913	199	714	32	682	70	320	612		420	512	I	0-338	0-338	338-420	
U6466	6/35-35	Aug-79	5089220	390632	938	938	3	935	27	908	>300								330	608	I	0-19	0-306	260-330	6
U6468	6/35-35	Jan-66	5089665	391380	945	945	0	945	18	927	99	828	>35						152	793	D	0-24	0-87	87-152	6
U50473	6/35-36	Mar-97	5089917	393112	942	942	0	942	18	924	>87								105	837	I	0-22	0-105	53-105	6
U5121	6/35-36	Nov-87	5090171	392546	935	935	0	935	40	895	>80								120	815	D	0-19	0-59	59-120	6
U5126	6/35-36	Aug-85	5090459	392225	922	922	0	922	60	862	>41								101	821	D	0-20	0-68	70-101	6
U5128	6/35-36	May-85	5090584	392233	919	919	0	919	55	864	>47								102	817	I	0-30	0-58	58-102	8
U5132	6/35-36	Mar-79	5089084	392436	981	981	0	981	80	901	>180								260	721	I	0-19	0-238	238-260	8
U5148	6/35-36	Jul-61	5089284	392878	974	974	0	974	20	954	>115								135	839	D	0-20	0-57	57-135	6
U5358	6/35-36	Feb-90	5089380	392755	965	965	0	965	38	927	>65								103	862	D	0-19	0-103	63-103	4
U53647	6/35-36	Nov-99	5090723	393449	906	906	5	901	60	841	>55								120	786	D,I	0-18	0-119	80-110	8
U53762	6/35-36	Mar-00	5089308	393482	974	974	5	969	68	901	>60								133	841	D	0-19	0-133	70-133	5
U54050	6/35-36	Dec-00	5089340	392296	965	965	2	963	44	919	>155								201	764	D	0-22	0-201	91-201	4
U54145	6/35-36	Mar-01	5089638	392276	955	955	0	955	51	904	>71								122	833	D	0-18	0-122	62-122	6
U55248	6/35-36	Aug-04	5089978	392440	942	942	0	942	61	881	129	752	60	692	50	300	642		500	442	I		0-338	338-500	
U5965	6/35-36	Dec-93	5090303	392152	928	928	0	928	23	905	>82								105	823	I	0-25	0-79	79-105	6
WW0472	6/36-02	Sep-61	5098559	401976	1162	1162	0	1162	0	1162	72	1090	0	1090	0	72	1090		150	1012			0-108	85-150	8
WW0144	6/36-03A	Jun-51	5098369	400595	1056	1056	6	1050	0	1050	24	1026	245	781	0	275	781		275	781			0-286.5	286.5-290	18
WW0145	6/36-04A	Jun-47	5098367	398690	1011	1011	54	957	0	957	122	835	0	835	0	176	835		295	716			0-140		8
WW0146	6/36-04A1	Apr-67	5098740	398805	968	968	22	946	6	940	133	807	>45						206	762	D/I	0-45	0-142	30-206	8
WW0147	6/36-04A2	Aug-92	5098518	398812	992	992	46	946	0	946	188	758	150	608	0	384	608		485	507	D	0-40	10-207	207-485	5
WW0148	6/36-04D	Mar-76	5098675	397502	925	925	9	916	5	911	>131								145	780	D	0-19	0-119	119-145	6
WW0149	6/36-04E	Dec-94	5097940	397593	925	925	37	888	12	876	194	682	202	480	0	445	480		687	238	D	0-45	0-618	618-687	5
WW0150	6/36-04E1	Sep-67	5098248	397706	962	962	47	915	32	883	203	680	>28						310	652	D/I	0-30	0-115	115-290	8
WW0151	6/36-04E2	Feb-60	5098251	397527	964	964	15	949	0	949	342	607	239	368	0	596	368		1012	-48			0-706	706-1012	10
WW0152	6/36-04H	Jan-91	5098370	398858	1004	1004	58	946	35	911	165	746	168	578	0	426	578		578	426	D	0-45	0-428	428-579	8
WW0153	6/36-04K	Jul-94	5097738	398295	978	978	10	968	0	968	222	746	120	626	0	352	626		525	453	D	0-405	0-409	409-525	6
WW0154	6/36-04L	Dec-77	5097757	398056	975	975	7	968	5	963	228	735	>20						260	715	D	0-23	0-225	163-260	5
WW0155	6/36-04L1	Sep-69	5097800	397845	970	970	28	942	11	931	>136								175	795	D	0-30	0-100	100-175	6
WW0156	6/36-04L2	Feb-49	5097589	398156	988	988	0	988	23	965	204	761	202	559	0	429	559		732	256			0-432	432-732	8
WW0157	6/36-04M	Jun-50	5097915	397787	960	960	50	910	25	885	>33								108	852			0-88	61-108	6
WW0158	6/36-04M1	Sep-69	5097981	397518	940	940	6	934	31	903	>172								204	736	D	16	0-95.5	63-209	6
WW0159	6/36-04N	Oct-78	5097347	397653	952	952	5	947	0	947	248	699	194	505	0	447	505		825	127	I	0-253	0-557	557-825	8
WW0160	6/36-04P1	Jan-71	5097444	398062	968	968	11	957	74	883	>105								190	778	D,I	0-160	0-160	40-190	6
WW0161	6/36-04P2	Sep-50	5097181	397824	964	964	8	956	30	926	232	694	277	417	0	547	417		838	126			0-553	215-838	8
WW0162	6/36-04Q	Apr-83	5097160	398426	998	998	2	996	16	980	122	858	232	626	0	372	626		525	473	D,I	0-25	0-380	380-525	8
WW0163	6/36-04Q1	Jul-99	5097516	398600	1020	1020	18	1002	0	1002	217	785	129	656	0	364	656		450	570	D	0-20	0-408	408-450	6
WW0164	6/36-05F	Jul-59	5098120	396602	902	902	32	870	8	862	210	652	288	364	0	538	364		855	47			0-585	585-855	10
WW0165	6/36-05M	Dec-47	5097636	395590	857	857	20	837	70	767	145	622	220	402	72	527	330		616	241					
WW0166	6/36-06G	Sep-93	5098176	395209	849	849	12	837	15	822	>120								147	702	D	0-22	0-147	94-147	5
WW0167	6/36-06J	Aug-75	5097727	395391	872	872	36	836	0	836	>206								242	630	D,I	0-30	0-122	122-242	8
WW0168	6/36-06J1	Jun-91	5097821	395659	860	860	22	838	0	838	>217								239	621	I	0-32	0-228	38-239	8
WW0169	6/36-06J2	Oct-94	5097780	395788	870	870	9	861	13	848	>161								183	687	D	0-24	0-183	115-183	4
WW0170	6/36-06K	Nov-78	5097929	395009	828	828	32	796	0	796	>98								130	698	D	0-24	0-100	100-130	6
WW0171	6/36-06N	Apr-60	5097637	394304	818	818	0	818	35	783	102	681	291	390	0	428	390		620	198			0-536	536-620	10
WW0172	6/36-06N1	Dec-96	5097338	394310	820	820	42	778	51	727	>97								190	630	D	0-45	0-190	120-190	5
WW0173	6/36-06P	Jul-62	5097219	394644	835	835	5	830	69	761	>152								225	610			0-210	20-225	8
WW0174	6/36-06R	Dec-80	5097528	395610	872	872	18	854	0	854	200	654	303	351	0	521	351		815	57	I	0-18	0-522	522-815	10

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
U5049	6/35-35	114	50	892	P	40	25	1.60	54			X				
U5050	6/35-35			922							X	X				
U5052	6/35-35	50	34	878	P	80	26	3.08	56			X				
U5053	6/35-35	80	45	854					58		X	X				
U5057	6/35-35	46	36	873	P	180	72	2.50	58		X	X				
U5058	6/35-35			958								X			X	
U5059	6/35-35	45	34	891	P	20	1	20.00				X				
U5316	6/35-35	60	43	876					56			X				
U54464	6/35-35			919											X	
U5477	6/35-35	35	30	912	B	30	30	1.00	58							
U55253	6/35-35			932											X	
U6466	6/35-35			938								X				
U6468	6/35-35		73	872	B	15	24	0.63				X	X			
U50473	6/35-36		38	904	P	125	11	11.36	54			X				
U5121	6/35-36	35	50	885					58			X				
U5126	6/35-36	55	34	888					58			X				
U5128	6/35-36	78	36	883					58		X	X				
U5132	6/35-36	67	120	861								X				
U5148	6/35-36		30	944	B	45	2	22.50				X				
U5358	6/35-36	80	35	930					56			X				
U53647	6/35-36	46	34	872	P	50	2	25.00	49			X				
U53762	6/35-36	45	19	955	B	30	6	5.00	52		X	X				
U54050	6/35-36	75	78	887	A	20			55			X				
U54145	6/35-36		47	908					53			X				
U55248	6/35-36	120	311	631	A	500			61						X	
U5965	6/35-36		34	894					57			X				
WW0472	6/36-02		6	1156											X	
WW0144	6/36-03A		49	1007	P	1500	54	27.78							X	
WW0145	6/36-04A		59	952	P	40	140	0.29								
WW0146	6/36-04A1		22	946	P	45	125	0.36				X	X			
WW0147	6/36-04A2		325	667	A	10	485	0.02				X	X		X	
WW0148	6/36-04D		33	892	P	22	4	5.50				X				
WW0149	6/36-04E		305	620	P	40	50	0.80							X	
WW0150	6/36-04E1		64	898	?	50	166	0.30				X	X			
WW0151	6/36-04E2		150	814	P	560	11	50.91							X	
WW0152	6/36-04H		194	810	P	40	23	1.74							X	
WW0153	6/36-04K		202	776	P	40	36	1.11							X	
WW0154	6/36-04L		25	950	B	20	30	0.67				X	X			
WW0155	6/36-04L1		42	928	B	40	100	0.40				X				
WW0156	6/36-04L2		26	962	P	500	66	7.58							X	Open at TOB boundary.
WW0157	6/36-04M		52	908	P	30	60	0.50			X	X				Open 3 feet above MPc boundary.
WW0158	6/36-04M1		28	912	B	45	120	0.38				X				
WW0159	6/36-04N		287	665	P	503	3	167.67							X	
WW0160	6/36-04P1		13	955	B	20	117	0.17				X				
WW0161	6/36-04P2		174	790	P	350	174	2.01				X	X		X	
WW0162	6/36-04Q		140	858	P	120	50	2.40							X	
WW0163	6/36-04Q1		179	841	A	40	450	0.09							X	
WW0164	6/36-05F			902	P	383	4	95.75								
WW0165	6/36-05M			857												
WW0166	6/36-06G		15	834	P	35	30	1.17				X				
WW0167	6/36-06J		42	830	P	125	78	1.60				X				
WW0168	6/36-06J1		20	840	P	220	65	3.38				X				
WW0169	6/36-06J2		16	854	B	20	0	200.00				X				
WW0170	6/36-06K		24	804	B	37	17	2.18				X				
WW0171	6/36-06N		11	807	P	786	117	6.72							X	
WW0172	6/36-06N1		33	787	P	40	25	1.60				X				
WW0173	6/36-06P		10	825	P	100	110	0.91			X	X				
WW0174	6/36-06R		187	685	P	200	115	1.74							X	Open at TOB boundary.

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0176	6/36-07D	Jul-68	5097155	394535	835	835	23	812	12	800	139	661	330	331	0	504	331		556	279		0-50	0-516	516-556	10
WW0177	6/36-07E	Aug-68	5096723	394375	830	830	21	809	37	772	123	649	296	353	0	477	353		605	225	I	0-40	0-537	537-605	8
WW0178	6/36-07K	Sep-75	5096138	395245	860	860	17	843	3	840	195	645	236	409	0	451	409		551	309	D,I	0-22	0-515	515-551	6
WW0179	6/36-07M	May-60	5096380	394462	830	830	21	809	4	805	203	602	269	333	0	497	333		980	-150			0-748.5	748-980	12
WW0180	6/36-08D	Jul-48	5097022	395960	885	885	15	870	27	843	193	650	185	465	0	420	465		505	380					
WW1082	6/36-08M	Aug-54	5096188	395854	889	889	18	871	0	871	84	787	380	407	0	482	407		641	248			0-495	495-641	12
WW0183	6/36-08N	Sep-99	5095746	395933	886	886	22	864	29	835	87	748	196	552	61	395	491		660	226	D	0-54	0-540	540-660	8
WW0184	6/36-09B	Mar-48	5097093	398588	1003	1003	6	997	26	971	156	815	170	645	0	358	645		617	386			0-350?	0-617	8
WW0185	6/36-09B2	Apr-83	5096886	398281	990	990	2	988	16	972	207	765	147	618	0	372	618		525	465	D,I	0-25	0-380	380-525	8
WW0186	6/36-09D	May-02	5096957	397609	950	950	15	935	0	935	>220								235	715	D	0-20	0-231	231-235	6
WW0187	6/36-09H	Apr-75	5096656	398700	1010	1010	19	991	8	983	137	846	0	846	0	164	846		800	210	I	0-205	0-205	205-800	16
WW0188	6/36-09P		5095660	398157	1005	1005	22	983	0	983	202	781	0	781	0	224	781			1005	I				
U55891	6/36-10	Oct-06	5094111	398251	1057	1057	9	1048	0	1048	64	984	0	984	0	73	984		800	257	I	0-472	0-472	472-800	12
WW0189	6/36-10E		5096525	399409	1059	1059	3	1056	35	1021	92	929	36	893	56	222	837		800	259	I		0-22	222-800	10
WW0473	6/36-12	Apr-53	5096678	403449	1327	1327	80	1247	0	1247	165	1082	7	1075	0	252	1075		795	532			0-263	263-795	10
WW0474	6/36-13	Nov-56	5094078	401926	1247	1247	12	1235	17	1218	0	1218	0	1218	0	17	1230		325	922	D	0-27	0-27	27-325	
WW0475	6/36-13	Jul-42	5095369	403103	1334	1334	9	1325	0	1325	>56								65	1269			0-64	64-65	10
U55981	6/36-16	Oct-06	5094111	398251	1057	1057	9	1048	0	1048	64	984	0	984	0	73	984		800	257	i	0-472	0-472	472-800	
U54161	6/36-17	Jun-77	5094596	395854	902	902	24	878	11	867	149	718	279	439	0	463	439		794	108	I	0-22	0-568	458-794	8
WW0477	6/36-17	May-97	5095145	395825	904	904	48	856	0	856	>114								162	742	D	0-18	0-162	122-162	4
WW0190	6/36-18D	Apr-66	5095399	394236	865	865	83	782	0	782	134	648	>21						238	627	D,I		0-100	100-238	12
WW1091	6/36-18F	Sep-91	5095050	394689	854	854	46	808	127	681	>30								203	651	D	0-30	0-179	179-203	6
U5172	6/36-19	Dec-62	5093278	394297	837	837	28	809	28	781	>109								165	672	I	0-28	0-73	40-70; 73-165	10
U5185	6/36-23	Oct-87	5093649	401241	1217	1217	0	1217	23	1194	0	1194	0	1194	0	23	1194		265	952	D	0-36	0-101	101-265	5
U55130	6/36-23	Apr-04	5092914	401338	1286	1286	20	1266	0	1266	0	1266	0	1266	0	20	1266		619	667	D	0-60	0-60	60-619	8
U5187	6/36-24	Sep-77	5092949	402919	1463	1463	3	1460	0	1460	0	1460	0	1460	0	3	1460		165	1298	I	0-45	0-47	47-165	8
U54702	6/36-26	Nov-02	5091987	401225	1381	1381	0	1381	0	1381	>126								126	1255	D	0-100	0-100	100-126	6
U6452	6/36-26	Jun-54	5091784	400364	1263	1263	6	1257	18	1239	>116								140	1123	I	0-30	0-30	30-140	10
U5193	6/36-27	Dec-64	5092206	400099	1257	1257	13	1244	0	1244	0	1244		1244		13	1244		760	497	D	0-50	0-106	106-760	12
U6455	6/36-29	Mar-63	5091459	396045	942	942	14	928	0	928	78	850	74	776	0	166	776		250	692	D	0-20	0-250	200-205; 243-250	4
U5200	6/36-30	May-78	5091179	393879	899	899	2	897	48	849	115	734	>35						200	699	I	0-19	O-84	84-200	8
U5211	6/36-30	Jul-67	5091739	394361	879	879	28	851	0	851	123	728	257	471	0	408	471		583	296	I	0-66	0-501	501-583	10
U5227	6/36-31	Nov-80	5089565	394828	971	971	32	939	0	939	204	735	47	688	43	326	645		717	254	I	0-36	0-470	470-717	15
U5238	6/36-31		5089869	394553	955	955	20	935	0	935	180	755	0	755	0	200	755		2000	-1045	I		0-537	537-2000	6
U5241	6/36-32	Oct-69	5090267	395835	961	961	23	938	0	938	153	785	27	758	0	203	758		947	14	I	0-226	0-806	595-795	10
WW0478	6/37-03	Aug-94	5107578	409972	1765	1765	0	1765	0	1765	0	1765	0	1765	0	0	1765		325	1440	D	0-19	0-325	285-325	6
WW0479	6/37-03	Oct-70	5107548	409445	1787	1787	4	1783	0	1783	0	1783	0	1783	0	4	1783		202	1585	D/I	0-18	0-41	41-202	8
WW0480	6/37-04	Oct-94	5106870	408663	1583	1583	101	1482	0	1482	59	1423	0	1423	0	160	1423		460	1123	D	0-20	0-218	218-460	8
WW0482	6/37-05	Jun-48	5107864	407161	1376	1376	20	1356	0	1356	67	1289	0	1289	0	87	1289		814	562			0-102	102-814	14
WW0483	6/37-05	Jan-45	5107562	406341	1334	1334	15	1319	0	1319	55	1264	0	1264	0	70	1264		612	722			0-125	125-612	12
WW0484	6/37-06	May-52	5108292	404770	1237	1237	6	1231	0	1231	152	1079	0	1079	0	158	1079		300	937			0-156	156-300	8
WW0485	6/37-07	Feb-00	5106215	404238	1309	1309	61	1248	0	1248	32	1216	0	1216	0	93	1216		322	987	I	0-165	0-165	165-322	8
WW0486	6/37-07	Sep-91	5106165	404612	1354	1354	8	1346	0	1346	8	1338	0	1338	0	16	1338		65	1289	D	0-28	0-60	50-65	5
WW0487	6/37-07	Aug-97	5106126	405063	1393	1393	15	1378	0	1378	5	1373	0	1373	0	20	1373		105	1288	D	0-20	0-105	105	6
WW0488	6/37-08	Aug-68	5105856	405657	1394	1394	29	1365	0	1365	53	1312	0	1312	0	82	1312		177	1217	D/I	0-40	0-105	105-177	8
WW0489	6/37-08	Mar-67	5106116	405672	1362	1362	27	1335	0	1335	30	1305	0	1305	0	57	1305		238	1124	D/I	0-106	0-106	106-238	12
U5245	6/37-18	Aug-86	5094372	404315	1516	1516	21	1495	0	1495	14	1481	0	1481	0	35	1481		203	1313	D	0-20	0-40	40-203	6
WW0455	7/33-11	Dec-76	5106284	372090	541	541	23	518	14	504	0	504	0	504	0	37	504		130	411	D	0-37	0-55	55-130	6
WW0456	7/33-14	Jul-05	5104760	371690	541	541	25	516	7	509	0	509	0	509	0	32	509		324	217	D	0-49	0-49	49-324	8
WW0457	7/33-21	Mar-76	5102968	369588	531	531	0	531	133	398	0	398	0	398	0	133	398		351	180		0-28	0-328	80-240	12
WW0458	7/33-24	Feb-69	5103565	374846	574	574	25	549	0	549	86	463	0	463	0	111	463		723	-149	D/I		0-200	200-723	12
WW0459	7/33-24	Aug-86	5103147	374805	561	561	85	476	0	476	10	466	0	466	0	95	466		400	161	D	0-60	0-400	340-380	6
WW0192	7/33-24H	Feb-69	5103569	374895	545	545	25	520	0	520	86	434	0	434	0	111	434		723	-178			0-200	200-723	
WW0193	7/33-24K	Aug-86	5103114	374552	538	538	85	453	0	453	10	443	0	443	0	95	443		400	138		0-60	0-400	340-380	
WW0194	7/33-24R	May-82	5102717	374864	528	528	0	528	0	528	50	478	45	433	0	95	433		205	323		0-20	0-98	98-205	
WW0461	7/33-25	Sep-51	5101134	373920	459	459	17	442	0	442	>83								100	359			0-73	73-100	10
WW0462	7/33-25	May-71	5101536	373646	535	535	77	458	0	458	237	221	0	221	0	314	221		1090	-555			0-667	667-1090	6

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0176	6/36-07D		144	691	P	708	8	88.50							X	
WW0177	6/36-07E		123	707		400	30	13.33							X	
WW0178	6/36-07K		109	751	P	200	141	1.42							X	
WW0179	6/36-07M		7	823	P	575	147	3.91							X	
WW0180	6/36-08D			885												
WW1082	6/36-08M		108	781	P	750	50	15.00							X	
WW0183	6/36-08N		231	655											X	
WW0184	6/36-09B		35	968	P		200	0.00			X	X	X		X	
WW0185	6/36-09B2		140	850	P	120	50	2.40							X	
WW0186	6/36-09D			950	A	30	220	0.14				X				
WW0187	6/36-09H		195	815	P	1100	24	45.83							X	Open at TOB boundary.
WW0188	6/36-09P			1005												
U55891	6/36-10			1057											X	
WW0189	6/36-10E			1059												
WW0473	6/36-12		111	1216	P										X	FAULT REPORTED ON LOG
WW0474	6/36-13		230	1017	P	25	25	1.00	62						X	
WW0475	6/36-13		0	1334												200 GPM ARTESIAN
U55981	6/36-16														X	
U54161	6/36-17		228	674	P	636	117	5.44	56						X	
WW0477	6/36-17		64	840	A	30						X				
WW0190	6/36-18D	105	50	815		265	150	1.77				X				
WW1091	6/36-18F		67	787	A	20			59							
U5172	6/36-19			837							X	X				
U5185	6/36-23	12	63	1154	A	30			60						X	
U55130	6/36-23	560	414	872	A	50			61						X	
U5187	6/36-24	85	75	1388	P	300	41	7.32	57						X	
U54702	6/36-26	30	18	1363	A	75			45			X				
U6452	6/36-26	65	37	1226	P	200	10	20.00	53			X				
U5193	6/36-27		275	982	P	350	30	11.67	61						X	
U6455	6/36-29		156	786	B	12	6	2.00	56						X	
U5200	6/36-30	85	28	871	A	150	147	1.02	54			X	X			
U5211	6/36-30		143	736	P	1023	5	204.60	66						X	BASALT WELL
U5227	6/36-31			971											X	
U5238	6/36-31			955												
U5241	6/36-32		247	714	P	2400	6	400.00	77						X	
WW0478	6/37-03		253	1512	A	15									X	
WW0479	6/37-03														X	
WW0480	6/37-04		250	1333	A	30			55						X	
WW0482	6/37-05		75	1301	P	636	75	8.48							X	
WW0483	6/37-05				P	265	140	1.89							X	
WW0484	6/37-06		13	1224	P	220	19	11.58				X			X	
WW0485	6/37-07		48	1261	P	250	21	11.90	58						X	
WW0486	6/37-07		3	1351	A	50			58						X	
WW0487	6/37-07		0	1393	A	60									X	
WW0488	6/37-08		19	1375	P	37	100	0.37	56						X	
WW0489	6/37-08		84	1278	P	300	141	2.13	54						X	
U5245	6/37-18		50	1466	A	60			56						X	
WW0455	7/33-11		40	501					50						X	
WW0456	7/33-14		131	410	A	60			58						X	
WW0457	7/33-21		75	456	P	1067	12	88.92	60		X				X	
WW0458	7/33-24		83	491	P	900	3	300.00	66						X	
WW0459	7/33-24		120	441	A	150									X	
WW0192	7/33-24H			545	P	900	3	300.00							X	
WW0193	7/33-24K		120	418	A	100-150	NR								X	
WW0194	7/33-24R		60	468	A	40	NR				X				X	
WW0461	7/33-25		70	389	P	103	70	1.47				X				
WW0462	7/33-25		97	438	P	700	223	3.14							X	

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0196	7/33-25P	Sep-51	5101018	373983	459	459	17	442	0	442	73	369	>10						100	359			0-73	14-100	
WW0197	7/33-25P2	Feb-52	5101095	374202	463	463	15	448	0	448	>45								60	403			0-40	10-60	
WW0198	7/33-25P3	Jul-52	5101245	374058	469	469	12	457	0	457	53	404	>10						75	394			0-55	55-75	
WW0463	7/33-26	Apr-85	5101746	372953	554	554	60	494	0	494	15	479	15	464	160	250	304		1100	-546	I	0-25	0-295	295-1100	10
WW0464	7/33-26	Sep-65	5101429	372239	587	587	93	494	0	494	74	420	76	344	85	328	259		863	-276	I		0-334	334-863	10
WW0465	7/33-26	Jan-66	5101095	372902	486	486	42	444	0	444	38	406	145	261	108	333	153		850	-364	I	0-18	0-333	333-850	12
WW0466	7/33-27	Oct-97	5102474	370857	502	502	0	502	26	476	0	476	0	476	0	26	476		375	127	D	0-20	0-160	160-375	6
WW0467	7/33-27	Mar-88	5101672	371515	466	466	34	432	0	432	142	290	0	290	0	176	290		190	276	D	0-28	0-190	140-190	5
WW0468	7/33-27	Jan-75	5101497	371043	453	453	20	433	25	408	23	385	0	385	0	68	385		82	371	D	0-20	0-68	68-82	6
WW0469	7/33-27	Jun-93	5100220	370820	446	446	23	423	18	405	0	405	0	405	0	41	405		210	236	D	0-18	0-210	150-210	4
WW0470	7/33-27	Jun-03	5102342	371681	469	469	27	442	36	406	28	378	0	378	0	91	378		205	264	D	0-98	0-205	185-205	4
WW0471	7/33-27	Sep-04	5101999	370183	499	499	48	451	111	340	0	340	0	340	0	159	340		195	304	D	0-18	0-159	159-195	6
WW0490	7/33-28	Nov-73	5101747	370036	479	479	22	457	32	425	81	344	0	344	0	135	344		170	309	D	0-22	0-138	138-170	6
WW0491	7/33-30	Jul-69	5101170	366796	571	571	80	491	15	476	85	391	0	391	0	180	391		920	-349	I	0-102	0-102	102-920	6
WW0492	7/33-30	Feb-75	5101508	366471	558	558	0	558	15	543	0	543	0	543	0	15	543		905	-347	I	0-408	0-408	408-905	14
WW0493	7/33-31	Feb-74	5100090	366205	564	564	50	514	0	514	0	514	0	514	0	50	514		873	-309	I	0-81	0-81	81-873	14
WW0494	7/33-32	Feb-95	5100821	368082	459	459	28	431	12	419	10	409	0	409	0	50	409		140	319		0-55	0-140	140	4
WW0495	7/33-32	Jun-99	5099971	367196	436	436	65	371	71	300	0	300	0	300	0	136	300		190	246	D	0-20	0-140	140-190	6
WW0496	7/33-33	Aug-98	5100112	368713	433	433	12	421	10	411	45	366	0	366	0	67	366		267	166	I	0-18	0-148	148-267	8
WW0497	7/33-34	Jul-78	5100053	370757	446	446	18	428	0	428	>272								290	156	D	0-18	0-290	135-290	5
WW0498	7/33-34	Oct-69	5099656	370266	436	436	18	418	28	390	>56								100	336	D/I	0-20	0-94	94-100	6
WW0499	7/33-34	Oct-69	5100066	370377	440	440	18	422	0	422	>42								60	380	D/I		0-40	40-60	6
WW0501	7/33-34	Feb-62	5100754	371265	499	499	58	441	0	441	74	367	163	204	0	295	204		417	82		0-20	0-140	140-417	10
WW0502	7/33-35	Sep-77	5099603	372549	443	443	20	423	28	395	>63								111	332	D/I	0-23	0-64	64-111	6
WW0503	7/33-35	Mar-55	5100587	373020	463	463	17	446	0	446	>46								63	400			0-46	46-63	10
WW0504	7/33-35	Sep-69	5099892	372728	446	446	19	427	35	392	50	342	345	-3	0	449	-3		1017	-571		0-80	0-449	449-1017	12
WW0505	7/33-35	Jun-65	5100609	372743	489	489	42	447	38	409	0	409	145	264	142	367	122		380	109	I				6
WW0506	7/33-35	Jan-59	5100153	373011	446	446	21	425	21	404	>24								57	389			0-46	16-57	12
WW0507	7/33-36	Feb-52	5100722	373842	456	456	17	439	0	439	>48								65	391			0-54	14-65	10
WW0199	7/33-36C	Feb-52	5100826	373795	459	459	17	442	0	442	>48								65	394			0-65	14-54	
WW0200	7/33-36G	Nov-75	5100309	374386	449	449	18	431	42	389	>22								82	367		0-28	0-80	40-80	
WW0510	7/34-13	Feb-54	5105076	384532	622	622	38	584	23	561	>20								81	541			0-61	61-81	10
WW0511	7/34-13	Apr-89	5104343	383893	607	607	50	557	25	532	0	532	25	507	0	100	507		497	110	D	0-40	0-120	120-497	8
WW0201	7/34-20R	Dec-53	5102452	377755	509	509	26	483	>4										40	469			0-40	20-40	
WW0203	7/34-21N	Oct-53	5102757	378265	558	558	29	529	>4										33	525			0-29	29-33	
WW0206	7/34-24M	Jun-90	5102793	383136	643	643	34	609	19	590	0	590	0	590	0	53	590		272	371			0-272	232-272	
WW0207	7/34-24Q	Jun-75	5102436	383904	614	614	40	574	0	574	147	427	121	306	0	308	306		566	48		0-22	0-566		
WW0208	7/34-25C	May-93	5102025	383555	679	679	12	667	0	667	83	584	>105						200	479		0-30	0-97	97-200	
WW0209	7/34-25P	Jun-97	5100786	383542	600	600	29	571	16	555	55	500	>22						122	478		0-19	0-97		
WW0210	7/34-26R	Mar-58	5100784	382544	604	604	29	575	0	575	77	498	143	355	0	249	355		460	144			0-185	145-185; 185-460	
WW0211	7/34-27A	Mar-77	5102242	381276	600	600	76	524	0	524	72	452	0	452	0	148	452		515	85		0-165	0-305	280-300; 305-515	10
WW0215	7/34-27R	Feb-77	5100722	381203	538	538	7	531	60	471	>26								93	445		0-23	0-73	73-93	
WW0216	7/34-28A	Aug-50	5102252	379676	535	535	30	505	>6										36	499			?	8-36	
WW0217	7/34-28B1	May-61	5101963	379177	528	528	20	508	0	508	54	454	0	454	0	74	454		572	-44			1-75	75-572	8
WW0218	7/34-28B2	-/55	5102321	378907	525	525	35	490	25	465	24	441	>4						88	437			?	28-70	10
WW0219	7/34-28C	Oct-51	5101960	378775	525	525	32	493	>4										36	489			0-36	30-36	
WW0220	7/34-28E	Dec-54	5101902	378395	515	515	45	470	2	468	61	407	34	373	0	142	373		240	275			10-88	44-88; 88-240	10
WW0221	7/34-28L	Mar-99	5101222	378685	505	505	19	486	0	486	29	457	97	360	0	145	360		157	348		0-18	0-157	77-157	
WW0222	7/34-28M	Jun-79	5101242	378241	499	499	14	485	32	453	38	415	>1						85	414		0-20	0-85	?	
WW0223	7/34-28P	Oct-53	5100844	378612	499	499	5	494	20	474	>20								45	454			?	?	
WW0224	7/34-28R	May-97	5100915	379666	518	518	9	509	35	474	11	463	>50						105	413		0-19	0-105	22-105	
WW0225	7/34-29E	Feb-53	5101864	376479	489	489	18	471	>2										20	469			0-20	10-20	
WW0226	7/34-29F	Dec-98	5101700	377056	492	492	22	470	0	470	30	440	137	303	0	189	303		193	299		0-18	0-192	133-193	4
WW0227	7/34-29J	May-98	5101605	377743	499	499	15	484	50	434	>46								111	388		0-18	0-111	51-111	
WW0228	7/34-29K	Jun-80	5101138	377479	482	482	20	462	2	460	34	426	>9						65	417		0-20	0-60	40-60; 60-65	
WW0229	7/34-29M	Nov-75	5101452	376715	486	486	8	478	38	440	166	274	0	274	0	212	274		204	282		0-20	0-204	?-204	

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0196	7/33-25P		70	389	P	103	70	1.47		X		X				
WW0197	7/33-25P2		60	403	P	110	43	2.56		X		X				
WW0198	7/33-25P3		65	404	P	102	50	2.04				X				
WW0463	7/33-26		153	401	P	900	22	40.91	76						X	
WW0464	7/33-26		104	483	P	450	136	3.31							X	
WW0465	7/33-26		45	441	P	400	210	1.90							X	
WW0466	7/33-27		87	415	A	10									X	
WW0467	7/33-27		72	394					56			X			X	
WW0468	7/33-27		12	441											X	
WW0469	7/33-27				A	20									X	
WW0470	7/33-27		66	403	P	35	129	0.27	64						X	
WW0471	7/33-27		120	379	A	30			57						X	
WW0490	7/33-28		58	421	B	25	100	0.25	60						X	
WW0491	7/33-30		168	403	A	500			73			X			X	
WW0492	7/33-30		264	294	A	1600			78						X	
WW0493	7/33-31		110	454											X	
WW0494	7/33-32		73	386	A	14									X	
WW0495	7/33-32		90	346	A	40									X	
WW0496	7/33-33		58	375	A	150									X	
WW0497	7/33-34		43	403	B	37	17	2.18				X				
WW0498	7/33-34		20	416	B	30	8	3.75				X				
WW0499	7/33-34		19	421	B	45	7	6.43				X				
WW0501	7/33-34		58	441	P	220	105	2.10					X		X	
WW0502	7/33-35		14	429	P	110	80	1.38	58			X				
WW0503	7/33-35		13	450								X				
WW0504	7/33-35		29	417	P	750	140	5.36	87				X		X	
WW0505	7/33-35		17	472	P	280	60	4.67								
WW0506	7/33-35		12	434	P	85	30	2.83				X				
WW0507	7/33-36		50	406	P	110	44	2.50				X				
WW0199	7/33-36C		50	409	P	110	44	2.50		X		X				
WW0200	7/33-36G		18	431		25	6	4.17			X	X				
WW0510	7/34-13		8	614	P	450	37	12.16				X				
WW0511	7/34-13								62						X	
WW0201	7/34-20R		8	501	P	150	27	5.56		X	X					
WW0203	7/34-21N		17	541	P	400	10	40.00			X					
WW0206	7/34-24M		150	493	P	100	48	2.08							X	
WW0207	7/34-24Q		80	534	P	495	195	2.54								
WW0208	7/34-25C		11	668	P	22	6	3.67	54		X	X				
WW0209	7/34-25P		27	573	A	75										
WW0210	7/34-26R		22	582	P	455	146	3.12					X		X	
WW0211	7/34-27A			600											X	
WW0215	7/34-27R		14	524	P	45	3	15.00	51			X				
WW0216	7/34-28A		10	525	P	225	12	18.75		X	X					
WW0217	7/34-28B1		94	434	P	500	25	20.00							X	
WW0218	7/34-28B2		34	491	P	164	16	10.25		X	X	X				
WW0219	7/34-28C		12	513	P	235	16	14.69		X	X					
WW0220	7/34-28E		34	481	P	250	22	11.36			X	X			X	
WW0221	7/34-28L		25	480	A								X		X	
WW0222	7/34-28M		14	485	B	8	57	0.14	52							
WW0223	7/34-28P		2	497	P	100	12	8.33								
WW0224	7/34-28R		5	513	P	5	60	0.08	53		X	X				
WW0225	7/34-29E		6	483	P	200	14	14.29		X	X					
WW0226	7/34-29F		110	382	A	9							X		X	
WW0227	7/34-29J		10	489	P	20	31	0.65	50		X	X				
WW0228	7/34-29K		17	465	B	15	22	0.68	55		X	X				
WW0229	7/34-29M		80	406	B	20	40	0.50								

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0230	7/34-29P	Oct-69	5100784	377228	472	472	5	467	55	412	0	412	241	171	0	301	171		632	-160		0-56	0-632	517-632	
WW0231	7/34-30A	Dec-60	5102006	376178	482	482	18	464	19	445	110	335	0	335	0	147	335		601	-119			0-147	147-601	8
WW0232	7/34-30N1	Sep-98	5100996	375079	466	466	21	445	0	445	46	399	>113						180	286		0-20	0-180	?	
WW0233	7/34-30N2	May-78	5101145	375233	479	479	12	467	0	467	60	407	204	203	0	276	203		285	194		0-285		50-80; 150-160; 280-284	
WW0234	7/34-31C	Dec-03	5100556	375628	459	459	16	443	22	421	34	387	>168						240	219		0-18	0-240	220-240	
WW0235	7/34-31D2	Jul-80	5100624	374935	453	453	12	441	48	393	49	344	>10						117	336		0-20	0-117	35-105	
WW0236	7/34-31D3	Dec-00	5100556	375075	449	449	17	432	20	412	35	377	>169						241	208		0-18	0-241	200-240	
WW0237	7/34-31E1	Nov-90	5100190	375182	463	463	15	448	29	419	21	398	>35						100	363		0-18	0-100	18-28; 48-65; 80-100	
WW0238	7/34-31E2	May-68	5100032	374929	472	472	24	448	2	446	69	377	>12						107	365		0-20	0-86	38-58	8
WW0239	7/34-31M	Oct-96	5099917	374954	476	476	8	468	55	413	102	311	>5						170	306		0-70	0-164	110-145	
WW0240	7/34-31Q	Jan-00	5099371	375897	476	476	19	457	30	427	33	394	>18						100	376			0-100	?	
WW0241	7/34-31R	May-58	5099380	376277	486	486	46	440	19	421	>27								89	397		0-20	0-89	?	
WW0242	7/34-32C	Jul-99	5100507	376973	479	479	19	460	21	439	>64								104	375		0-19	0-104	44-104	
WW0243	7/34-32D	Feb-98	5100689	376825	472	472	15	457	45	412	118	294	>102						280	192		0-22	0-280	191-201	
WW0244	7/34-32G	Sep-92	5100127	377470	492	492	22	470	>34										56	436		0-20	0-56	28-35	
WW0245	7/34-32L	Dec-59	5099562	377242	492	492	13	479	>3										16	476					
WW0247	7/34-33E	Mar-59	5100181	378399	502	502	12	490	16	474	>87								115	387				0-62; 63-115	
WW0248	7/34-33G	Jun-60	5100271	379024	499	499	18	481	9	472	>72								99	400				0-54; 54-119	
WW0249	7/34-33J	Mar-57	5099861	379662	518	518	10	508	>58										68	450				10-48	
WW0512	7/34-34	Sep-99	5099545	381142	531	531	13	518	43	475	>44								100	431	D	0-18	0-100	80-100	4
WW0513	7/34-34	Jul-65	5100072	379726	512	512	12	500	32	468	>110								154	358	I		0-52	52-154	12
WW0514	7/34-34	Jun-01	5099621	380292	522	522	4	518	7	511	>97								108	414	D	0-25	0-108	67-100	4
WW0515	7/34-34	Dec-69	5099822	379748	518	518	12	506	43	463	>113								168	350	D	0-26	0-110	110-168	6
WW0250	7/34-35P	May-59	5099148	381704	545	545	13	532	7	525	100	425	277	148	0	397	148		397	148			0-530	15-427; 530-753	8
WW0251	7/34-36B	Jun-68	5100484	383716	594	594	26	568	0	568	71	497	>53						150	444		0-14	0-93	14-92; 93-150	
WW0252	7/34-36C	Sep-67	5100250	383462	571	571	3	568	26	542	78	464	>7						114	457		0-20	0-68	68-114	6
WW0516	7/35-02	Sep-70	5107831	392532	872	872	14	858	51	807	45	762	149	613	0	259	613		294	578	D/I		0-181	181-294	8
WW0517	7/35-07	Jun-93	5106679	385943	736	736	40	696	45	651	>15								100	636	D	0-20	0-100	100	6
WW0518	7/35-12	Feb-73	5106214	393695	877	877	0	877	26	851	138	713	201	512	0	336	541		356	521	D	0-38	0-356	210-230; 332-352	6
WW0519	7/35-13	May-57	5103995	394178	891	891	43	848	0	848	160	688	344	344	0	547	344		1618	-727	I		0-561	561-1618	8
WW0520	7/35-14	Dec-67	5104553	391762	843	843	29	814	0	814	187	627	196	431	120	532	311		1227	-384	I				10
WW0522	7/35-18	Jun-68	5105345	384945	630	630	45	585	0	585	21	564	26	538	0	92	538		1006	-376	I	0-114	0-144	144-1006	8
WW0523	7/35-19	Feb-06	5102797	384663	678	678	89	589	0	589	>51								140	538	D	0-58	0-130	110-140	4
WW0525	7/35-22	Apr-91	5102342	390831	792	792	9	783	38	745	>143								190	602	I	0-20	0-71	71-190	10
WW0526	7/35-23	Jul-77	5103569	391179	832	832	79	753	6	747	>125								204	628	D	0-20	0-204	75-180	6
WW0527	7/35-23	Jun-70	5102770	392122	826	826	15	811	22	789	157	632	>15						209	617	D/I		0-109	109-209	6
WW0528	7/35-23		5102546	392527	808	808	20	788	30	758	170	588	315	273	0	535	273		618	190	M		0-535	535-618	6
WW0529	7/35-23	Oct-06	5102287	391216	768	768	9	759	26	733	>65								100	668	D	0-18	0-96	96-100	6
WW0530	7/35-24	Aug-99	5102602	393697	844	844	3	841	0	841	130	711	>47						180	664	D	0-20	0-178	100-120	6
WW0531	7/35-24	Aug-54	5102627	392876	818	818	15	803	0	803	135	668	238	430	110	498	320		572	246			0-507	507-572	8
WW0142	7/35-25	Dec-04	5101238	393685	839	839	10	829	63	766	143	623	174	449	160	550	289		653	186	I	0-75	0-540	540-653	
WW0533	7/35-25	Apr-58	5100685	393632	826	826	12	814	60	754	>139								211	615		0-18	0-201	201-211	
WW0534	7/35-25	Sep-57	5100536	394119	839	839	6	833	27	806	115	691	>74						222	617			0-46	46-222	8
WW0535	7/35-25	May-58	5101080	393121	814	814	10	804	65	739	145	594	320	274	0	540	274		752	62					
WW0536	7/35-25	Jul-63	5101312	393501	831	831	5	826	0	826	>207								212	619			0-148	148-212	10
WW0537	7/35-25	May-46	5101685	393937	858	858	10	848	38	810	172	638	318	320	0	538	320		772	86	M/I		0-415	415-772	10
WW0538	7/35-25	Jul-62	5101815	392699	804	804	20	784	10	774	>116								146	658					8
WW0539	7/35-25	Jun-68	5101608	393348	829	829	12	817	21	796	174	622	168	454	177	542	287		780	49	M/D/I		0-544	544-780	10
WW0540	7/35-26	Sep-00	5100583	392002	776	776	6	770	47	723	>49								102	674	I	0-18	0-102	62-102	4
WW0541	7/35-26	Mar-66	5101383	392561	798	798	4	794	66	728	109	619	343	276	0	522	276		650	148	M	0-30	0-520	520-650	12
WW0542	7/35-26	Aug-53	5101932	392521	797	797	0	797	15	782	>90								105	692			0-87	22-105	8

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0230	7/34-29P			472	P	1000	6	166.67							X	
WW0231	7/34-30A		62	420	P	560	50	11.20							X	
WW0232	7/34-30N1		77	389	A	15										
WW0233	7/34-30N2		32	447	B	50	25	2.00	50			X	X		X	
WW0234	7/34-31C		76	383	A	60							X			
WW0235	7/34-31D2		15	438	P	75	50	1.50	48		X	X				
WW0236	7/34-31D3		73	376					60				X			
WW0237	7/34-31E1		7	456	P	40	58	0.69	55		X	X	X			
WW0238	7/34-31E2			472								X				
WW0239	7/34-31M		53	423	P	30	12	2.50	57			X				
WW0240	7/34-31Q		8	468	P	160	40	4.00								
WW0241	7/34-31R		35	451	A	20										
WW0242	7/34-32C		16	463	B	18	59	0.31	50			X				
WW0243	7/34-32D		70	402	P	30	67	0.45	59				X			gravel course bottom
WW0244	7/34-32G		9	483	A	25					X					
WW0245	7/34-32L		5	487	P	100	6	16.67	45							dug
WW0247	7/34-33E		53	449	P	525	16	32.81		X	X	X				
WW0248	7/34-33G		7	492	P	500	13	38.46		X	X	X				
WW0249	7/34-33J		2	516	P	200	13	15.38			X					
WW0512	7/34-34		9	522	A	50						X				
WW0513	7/34-34		9	503	P	340	44	7.73	56			X				
WW0514	7/34-34		4	518	P	20	60	0.33	54			X				
WW0515	7/34-34		17	501	B	40	60	0.67	54			X				
WW0250	7/34-35P			545	P	620	241	2.57	58		X	X	X		X	
WW0251	7/34-36B			594	P	50			57			X	X			
WW0252	7/34-36C			571	P	55	23	2.39				X	X			
WW0516	7/35-02		41	831	P	200	175	1.14					X		X	
WW0517	7/35-07		20	716	A	47						X				
WW0518	7/35-12		38	839	P	30	162	0.19	63				X		X	
WW0519	7/35-13		410	481	P	793	90	8.81							X	
WW0520	7/35-14		150	693											X	
WW0522	7/35-18		68	562	P	528	170	3.11							X	
WW0523	7/35-19		73	605	A	60						X				
WW0525	7/35-22		9	783	B	60	26	2.31	54			X				
WW0526	7/35-23		70	762	B	40	10	4.00	62		X	X				
WW0527	7/35-23		37	789	P	268	51	5.25				X	X			
WW0528	7/35-23														X	
WW0529	7/35-23		21	747	A	75						X				
WW0530	7/35-24		34	810	A	25						X				
WW0531	7/35-24		75	743	P	225	26	8.65							X	
WW0142	7/35-25		184	655	P	540	3	180.00	66					X	X	
WW0533	7/35-25		53	773	B	30	45	0.67				X				
WW0534	7/35-25		19	820	P	75	66	1.14				X	X			
WW0535	7/35-25															
WW0536	7/35-25											X				
WW0537	7/35-25		29	829	P	495	5	99.00					X		X	
WW0538	7/35-25		32	772	P	45	8	5.63								
WW0539	7/35-25		126	703											X	
WW0540	7/35-26		25	751	A	80						X				
WW0541	7/35-26		34	764	P	750	16	46.88					X		X	
WW0542	7/35-26		18	779	P	85	44	1.93				X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0543	7/35-26	Aug-95	5101443	391637	767	767	0	767	21	746	>202								223	544	I	0-21	0-223	108-203	6
WW0544	7/35-27	Feb-00	5100680	390507	731	731	30	701	9	692	>73								112	619	D	0-18	0-94	94-112	6
WW0545	7/35-27	Jul-98	5101097	389971	713	713	18	695	8	687	>114								140	573	D	0-18	0-140	120-140	4
WW0546	7/35-27	Sep-53	5100946	390528	738	738	16	722	16	706	>103								138	600			0-138	79-138	6
WW0547	7/35-27	Aug-02	5101208	390484	736	736	16	720	16	704	>128								160	576	D	0-18	0-155	26-136; 155-160	6
WW0548	7/35-27	Aug-78	5100750	390552	732	732	11	721	24	697	136	561	>21						192	540	I	0-20	0-170	90-165; 170-192	8
WW0549	7/35-27	May-01	5101387	390770	735	735	13	722	8	714	>101								122	613	I	0-18	0-116	67-122	6
WW0551	7/35-28	Oct-68	5100820	389057	686	686	8	678	24	654	>138								170	516	I		0-151	8-130; 151-170	12
WW0553	7/35-29	Sep-70	5100980	386834	640	640	11	629	19	610	>117								147	493	D/S/I	0-10	0-90	10-147	10
WW0554	7/35-29	Apr-74	5101207	386332	653	653	22	631	26	605	>117								165	488		0-20	0-165	30-160	10
WW0555	7/35-29	Aug-44	5100687	387155	660	660	30	630	4	626	>131								165	495			0-58	58-165	10
WW0253	7/35-31N	Aug-95	5099232	384750	584	584	24	560	14	546	>79								117	467	I	0-18	0-115	115-117	8
WW0254	7/35-31P	Feb-75	5099177	385064	588	588	12	576	73	503	>45								130	458	D	0-19	0-87	87-130	6
WW0255	7/35-31P1	Dec-72	5099055	385197	589	589	7	582	>68										75	514	D,I	0-18	0-64	64-75	8
WW0556	7/35-32	Aug-61	5099738	386767	620	620	15	605	13	592	121	471	368	103	0	517	103		755	-135			0-524	524-755	12
WW0557	7/35-32	Aug-87	5099335	387081	628	628	51	577	57	520	>72								180	448		0-61	0-165	115-125	4
WW0558	7/35-32	Jul-75	5099991	387169	638	638	6	632	0	632	151	481	>14						171	467		0-18	0-170	60-150	8
WW0559	7/35-33	Sep-46	5100369	388199	669	669	18	651	44	607	143	464	>345						550	119			0-108	108-550	10
WW0560	7/35-33	Jan-56	5100143	388963	691	691	3	688	21	667	>143								167	524			0-57	0-167	12
WW0561	7/35-33	Nov-52	5100435	389023	684	684	12	672	3	669	121	548	>29						165	519			0-41	41-165	10
WW0562	7/35-33	Jul-53	5099906	388545	694	694	18	676	8	668	>105								131	563			0-109	109-131	10
WW0563	7/35-33	Dec-60	5099829	388930	676	676	0	676	28	648	122	526	401	125	0	551	125		760	-84			0-644	644-760	12
WW0564	7/35-33	Apr-45	5099453	388390	671	671	20	651	30	621	115	506	370	136	0	535	136		619	52			0-540	540-619	6
WW0565	7/35-33	Jul-87	5099592	388468	667	667	19	648	0	648	166	482	217	265	187	589	78		1003	-336		0-23	0-802	802-1003	8
WW0566	7/35-33	Mar-67	5098987	388588	706	706	85	621	0	621	>55								130	576		0-70	0-130	130	8
WW0567	7/35-34	Feb-04	5100269	390718	738	738	12	726	40	686	158	528	192	336	93	495	243		585	153		0-240	0-503	503-585	10
WW0568	7/35-34	Dec-51	5099726	389810	707	707	8	699	22	677	>173								203	504			0-148	49-203	10
WW0569	7/35-34	Apr-53	5100063	390115	721	721	7	714	26	688	>170								203	518			0-203	50-203	10
WW0570	7/35-34	Apr-50	5100293	389962	731	731	0	731	34	697	>169								203	528			0-46	33-203	8
WW0256	7/35-35H		5100027	392452	790	790	17	773	0	773	>83								100	690	D		0-100	75-100	10
WW0257	7/35-35K	Nov-65	5099477	391911	797	797	60	737	0	737	198	539	203	336	125	586	211		757	40	I	0-60	0-600	600-757	8
WW0258	7/35-35R	Aug-63	5099216	392205	772	772	20	752	11	741	>139								170	602			0-117	117-170	8
WW0259	7/35-35R1	Sep-59	5098988	392515	812	812	38	774	0	774	>115								115	697			0-113	113-115	6
WW0261	7/35-36J1	Oct-61	5099310	394024	850	850	5	845	8	837	>207								220	630			0-132	64-220	10
WW0571	7/36-02	Aug-55	5107325	402347	1273	1273	36	1237	0	1237	134	1103	0	1103	0	170	1103		810	463			0-164	164-810	12
WW0572	7/36-03	Nov-64	5107112	399718	1095	1095	26	1069	0	1069	159	910	107	803	0	292	803		1004	91		0-18	0-302	302-1004	12
WW0573	7/36-08	Dec-67	5106414	396292	978	978	12	966	53	913	>195								260	718		0-20	0-160	160-260	8
WW0574	7/36-09	May-49	5106365	397612	1040	1040	22	1018	0	1018	>140								162	878			0-53	53-162	10
WW0575	7/36-10	Mar-70	5105946	399285	1101	1101	25	1076	0	1076	223	853	56	797	0	304	797		916	185		0-310	0-310	310-916	12
WW0576	7/36-10	Apr-51	5106595	399481	1117	1117	41	1076	8	1068	>199								248	869		0-30	0-155	155-248	8
WW0262	7/36-11C	Jan-47	5106735	401548	1186	1186	13	1173	0	1173	157	1016	0	1016	0	170	1016		170	1016			0-170	170-807	16
WW0263	7/36-12K	Jun-75	5105861	403219	1270	1270	14	1256	0	1256	>247								261	1009	D	0-24	0-250	250-261	6
WW0264	7/36-13D	Sep-62	5104912	402451	1249	1249	29	1220	5	1215	193	1022	0	1022	0	227	1022		922	327	D,I		0-233	233-922	12
WW0265	7/36-13F	May-42	5104562	402955	1277	1277	0	1277	32	1245	96	1149	0	1149	0	128	1149		810	467	D,I		0-145.5	145-810	16
WW0266	7/36-13G	Jul-67	5104367	403223	1260	1260	0	1260	21	1239	87	1152	0	1152	0	108	1152		500	760	D,I	0-110	0-110	110-500	6
WW0267	7/36-13H	Jul-76	5104545	403687	1309	1309	6	1303	0	1303	44	1259	0	1259	0	50	1259		160	1149	D	0-18	0-50	50-160	6
WW0268	7/36-13J	Dec-01	5104115	403756	1289	1289	3	1286	21	1265	26	1239	0	1239	0	50	1239		422	867	D	0-18	0-400	382-422	6
WW0269	7/36-13K	Jul-01	5104301	403320	1264	1264	4	1260	60	1200	40	1160	0	1160	0	104	1160		465	799	D	0-18	0-465	405-465	6
WW0270	7/36-13L	Feb-03	5104115	403002	1248	1248	0	1248	18	1230	285	945	0	945	0	303	945		313	935	D	0-32	0-313	97-313	4
WW0271	7/36-13P	Jan-63	5103962	403087	1249	1249	0	1249	16	1233	155	1078	0	1078	0	171	1078		278	971	D	0-45	0-278	183-278	6
WW0578	7/36-16	Feb-88	5103884	398142	1054	1054	43	1011	0	1011	>213								256	798		0-43	0-256	186-256	6
WW0579	7/36-18	Jan-56	5104144	394377	920	920	38	882	0	882	154	728	213	515	0	405	515		1004	-84			0-525	525-1004	16
WW0580	7/36-18	Dec-70	5103942	395031	941	941	37	904	0	904	180	724	>55						272	669			0-260	105-173; 205-220	12
WW0582	7/36-19	Dec-42	5102159	395768	920	920	0	920	43	877	147	730	215	515	155	560	360		1590	-670			0-1590	MANY	6
WW0583	7/36-20	Apr-62	5102872	397282	991	991	5	986	0	986	165	821	156	665	0	326	665		1202	-211			0-400	400-1202	16
WW0584	7/36-20	Nov-47	5102448	396002	928	928	0	928	20	908	207	701	175	526	0	402	526		700	228			0-508	508-700	12

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0543	7/35-26		32	735	P	130	61	2.13				X				
WW0544	7/35-27		18	713	A	36						X				
WW0545	7/35-27		54	659	A	40						X				
WW0546	7/35-27		9	729	P	75	69	1.09				X				
WW0547	7/35-27		15	721	A	150						X				
WW0548	7/35-27		7	725	P	140	158	0.89	52			X	X			
WW0549	7/35-27		12	723	A	250						X				
WW0551	7/35-28		12	674	P	215	112	1.92	59			X				
WW0553	7/35-29		13	627	P	250	127	1.97				X				
WW0554	7/35-29		15	638	P	180	120	1.50				X				
WW0555	7/35-29		27	633	P	170	90	1.89				X				
WW0253	7/35-31N		14	571	A	125						X				
WW0254	7/35-31P	34	8	581	B	35	10	3.50	55			X				
WW0255	7/35-31P1		16	573	B	50	7	7.14	51			X				
WW0556	7/35-32		35	585	P	77	310	0.25							X	
WW0557	7/35-32		39	589	P	58	20	2.90	54			X				
WW0558	7/35-32		8	630	P	150	150	1.00	52			X				
WW0559	7/35-33		20	649								X	X			
WW0560	7/35-33		25	666	P	165	154	1.07				X				
WW0561	7/35-33		21	663	P	235	115	2.04				X	X			
WW0562	7/35-33		22	672	P	204	120	1.70				X				
WW0563	7/35-33		47	629	P	1050	88	11.93							X	
WW0564	7/35-33		25	646	P	500	1	500.00							X	
WW0565	7/35-33		134	533	P	1100	164	6.71	70						X	
WW0566	7/35-33		103	603	P	30	1	30.00				X				
WW0567	7/35-34				A	600			58						X	
WW0568	7/35-34		6	701	P	234	113	2.07				X				
WW0569	7/35-34		6	715	P	211	163	1.29				X				
WW0570	7/35-34		3	728	P	200	67	2.99				X				
WW0256	7/35-35H			790												
WW0257	7/35-35K		126	671		1000	4	250.00							X	
WW0258	7/35-35R		20	752		270	95	2.84				X				
WW0259	7/35-35R1			812	P	220	115	1.91				X				
WW0261	7/35-36J1		16	834	P	210	155	1.35				X				
WW0571	7/36-02		65	1208	P	1160	83	13.98				X			X	
WW0572	7/36-03		79	1016	P	1080	117	9.23							X	
WW0573	7/36-08		15	963	P	395	140	2.82				X				
WW0574	7/36-09		55	985	P	36	22	1.64				X				
WW0575	7/36-10		71	1030	P	1500	80	18.75							X	
WW0576	7/36-10		95	1022	B	40	10	4.00				X				
WW0262	7/36-11C		20	1166	P	1500	33	45.45							X	Open at TOB boundary.
WW0263	7/36-12K		141	1129	B	5	50	0.10				X				
WW0264	7/36-13D		151	1098	P	1100	16	68.75							X	Open at TOB boundary.
WW0265	7/36-13F		90	1187	P	1900	22	86.36							X	
WW0266	7/36-13G		173	1087		148	23	6.43							X	Open at TOB boundary.
WW0267	7/36-13H		118	1191	B										X	Open at TOB boundary.
WW0268	7/36-13J		183	1106	A	60	420	0.14							X	
WW0269	7/36-13K		158	1106	A	60	460	0.13							X	
WW0270	7/36-13L		13	1235	P	50	170	0.29				X			X	
WW0271	7/36-13P		82	1167	P	35	170	0.21							X	Open at TOB boundary.
WW0578	7/36-16		53	1001	B	60	13	4.62	53			X				
WW0579	7/36-18		74	846											X	
WW0580	7/36-18		87	854								X				
WW0582	7/36-19		94	826	P	1134	22	51.55							X	
WW0583	7/36-20		65	926	P	708	47	15.06	72						X	
WW0584	7/36-20		85	843	P	99	55	1.80							X	

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)
WW0585	7/36-21	Dec-29	5102859	398043	1024	1024	10	1014	18	996	>103								131	893			0-66	66-131	10
WW0586	7/36-21	Oct-59	5102655	398535	1040	1040	0	1040	17	1023	>86								103	937		0-18	0-84	84-103	6
WW0272	7/36-22C	Oct-93	5103397	399716	1102	1102	0	1102	22	1080	>27								50	1052	D	0-38	0-50	50	2
WW0273	7/36-22D	Sep-47	5103568	399199	1076	1076	0	1076	27	1049	>198								225	851			0-58	58-225	8
WW0274	7/36-22D1	Jul-46	5103259	399183	1072	1072	0	1072	67	1005	>43								110	962			0-70	40-110	6
WW0275	7/36-22D2	May-92	5103331	399406	1084	1084	0	1084	43	1041	142	899	0	899	0	185	899		303	781	D	0-20	0-303	103-303	4
WW0276	7/36-22H	Feb-79	5102922	400506	1121	1121	0	1121	42	1079	>153								195	926	D	0-20	0-195	95-195	5
WW0277	7/36-22N	Sep-53	5102162	399143	1057	1057	0	1057	79	978	215	763	103	660	0	397	660		789	268	M		0-400	400-789	20
WW0278	7/36-22N1	May-81	5102360	399336	1069	1069	0	1069	61	1008	>19								80	989	I		0-79	59-80	6
WW0279	7/36-22P	Oct-02	5102059	399819	1080	1080	1	1079	7	1072	>112								120	960	D	0-18	0-120	100-120	4
WW0280	7/36-23C2	Oct-02	5103206	401123	1153	1153	0	1153	25	1128	>172								197	956	D	0-18	0-194	154-197	4
WW0281	7/36-23D	Jul-90	5103412	400790	1147	1147	2	1145	35	1110	75	1035	0	1035	0	112	1035		125	1022	D	0-20	0-125	105-125	4
WW0282	7/36-23D1	Jun-61	5103256	401059	1153	1153	3	1150	14	1136	>93								110	1043	D,I	0-24	0-71	71-110	6
WW0283	7/36-23E	Jun-60	5103096	400834	1140	1140	0	1140	31	1109	>101								132	1008	D,I		0-84	84-132	6
WW0284	7/36-25E	Aug-45	5101209	402701	1308	1308	100	1208	0	1208	32	1176	0	1176	0	132	1176		494	814	I				
WW0286	7/36-27A	Jun-01	5101730	400367	1095	1095	37	1058	61	997	>149								247	848	D	0-38	0-247	90-247	5
WW0287	7/36-27E	Jul-98	5101256	399405	1057	1057	15	1042	89	953	>86								190	867		0-18	0-190	170-190	4
WW0288	7/36-27F1	Jun-75	5101623	399557	1066	1066	0	1066	52	1014	>93								145	921	D	0-20	0-99	99-145	6
WW0289	7/36-27G	May-48	5101477	400184	1080	1080	10	1070	4	1066	216	850	110	740	0	340	740		450	630			0-357	357-450	8
WW0290	7/36-27H	Oct-01	5101312	400333	1116	1116	68	1048	0	1048	>202								270	846	D	0-48	0-270	85-270	6
WW0291	7/36-27J1	May-93	5100828	400358	1127	1127	41	1086	0	1086	>151								190	937	D	0-96	0-190	124-190	6
WW0292	7/36-27L	Oct-75	5100791	399622	1041	1041	22	1019	6	1013	>187								215	826	D,I	0-22	0-120	70-215	8
WW0293	7/36-27N	Mar-06	5100397	399467	1040	1040	0	1040	10	1030	>72								82	958			0-82	82	6
WW0294	7/36-27P	Aug-99	5100650	399585	1038	1038	18	1020	22	998	>160								200	838	D	0-20	0-98	98-200	6
WW0295	7/36-27P1	Feb-61	5100458	399728	1074	1074	30	1044	15	1029	>45								90	984			0-74	74-90	6
WW0296	7/36-28A	Oct-46	5101636	398766	1038	1038	12	1026	49	977	>50								100	938					6
WW0297	7/36-28B	Apr-49	5101671	398604	1030	1030	7	1023	19	1004	>40								65	965	D,I				6
WW0298	7/36-28E	Aug-68	5101531	397544	980	980	0	980	17	963	209	754	145	609	0	371	609		1305	-325	M		0-408	408-1305	8
WW0299	7/36-28E2	Sep-03	5101221	397625	983	983	1	982	46	936	>81								128	855	D	0-50	0-128	78-128	4
WW0300	7/36-28G	Aug-48	5101541	398580	1028	1028	10	1018	20	998	>79								109	919	D,I	0-20	0-54	54-109	6
WW0301	7/36-28H	Sep-46	5101344	399048	1046	1046	10	1036	13	1023	>82								105	941			0-105	67-?	6
WW0302	7/36-28H1	Aug-47	5101206	398802	1029	1029	16	1013	65	948	>121								202	827			0-82	82-202	8
WW0303	7/36-28H2	May-49	5101479	398747	1029	1029	15	1014	17	997	>46								78	951			0-42	42-78	6
WW0304	7/36-28K	May-52	5100926	398662	1021	1021	10	1011	23	988	>107								140	881			0-105	105-140	8
WW0305	7/36-28L	Aug-77	5100978	398153	996	996	5	991	0	991	193	798	>67						265	731	D	0-25	0-265	60-265	6
WW0306	7/36-28M	May-81	5100870	397788	981	981	19	962	0	962	>188								207	774	D,I	0-18	0-142	142-207	6
WW0307	7/36-28M1	Jun-46	5100976	397616	979	979	0	979	23	956	>19								42	937			0-42		8
WW0308	7/36-28P	Apr-70	5100655	397969	982	982	76	906	0	906	>114								190	792	D,I	0-38	0-80	80-190	6
WW0309	7/36-28R	Jun-86	5100564	398867	1022	1022	28	994	56	938	>75								159	863	D,I	0-28	0-159	115-159	5
WW0310	7/36-28R1	May-63	5100599	398754	1018	1018	23	995	0	995	>66								89	929			0-74	74-89	6
WW0312	7/36-29J	Mar-46	5101013	397372	969	969	9	960	16	944	>23								48	921			0-48	48+?	6
WW0313	7/36-29P	Mar-68	5100444	396332	918	918	0	918	23	895	>242								265	653	D,I	0-25	0-160.5	160.5-265	8
WW0314	7/36-29P1	Jul-60	5100423	396587	928	928	0	928	32	896	>70								102	826					6
WW0315	7/36-30J		5100978	395593	908	908	4	904	0	904	246	658	178	480	0	428	480		550	358	D,I		0-540	540-550	8
WW0317	7/36-31H	Nov-68	5099779	395795	890	890	2	888	79	809	>14								95	795	I		0-80	70-95	8
WW0318	7/36-31J1	Oct-46	5099530	395758	887	887	12	875	70	805	163	642	187	455		432	455		1715	-828			0-537	537-1715	12
WW0319	7/36-31K	Apr-01	5099319	395364	877	877	17	860	35	825	>167								219	658	I	0-24	0-210	210-219	10
WW0321	7/36-31L	Nov-62	5099472	394699	850	850	29	821	0	821	177	644	296	348	0	502	348		809	41			0-535	635-809	8
WW0322	7/36-31N	Jan-02	5098875	394336	839	839	10	829	35	794	>83								128	711	D,I	0-45	0-128	90-128	4
WW0323	7/36-31N1	May-47	5099010	394393	840	840	0	840	33	807	>157								190	650			0-190	107-190	8
WW0324	7/36-31N2		5098856	394190	828	828	20	808	30	778	170	608	>299						519	309			0-519	519+?	6
WW0325	7/36-31Q	Nov-68	5099128	395410	890	890	31	859	36	823	>186								253	637	D,I	0-60	0-141	141-253	6
WW0326	7/36-31R	May-47	5098995	395586	887	887	0	887	32	855	>15								47	840					
WW0327	7/36-32C	Apr-49	5100175	396501	921	921	32	889	0	889	>179								211	710			0-70	70-211	8
WW0328	7/36-32E	Oct-99	5099733	395973	894	894	32	862	17	845	>172								221	673	D	0-37	0-221	121-221	5
WW0329	7/36-32E1	Aug-45	5099919	396182	905	905	0	905	20	885	>65								85	820					10
WW0330	7/36-32F	Apr-50	5099662	396618	912	912	35	877	0	877	>99								134	778			0-77.5	77.5-134	6
WW0331	7/36-32K1	Feb-44	5099189	396989	935	935	30	905	0	905	>39								69	866			0-65	65-69	6
WW0332	7/36-32N	Sep-96	5098971	396031	900	900	29	871	49	822	>120								198	702	D	0-35	0-198	114-198	5

Well ID	T/R-sec	DTW 1st water	DTW (ft bgs)	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0585	7/36-21		20	1004	P	100	20	5.00				X				
WW0586	7/36-21		36	1004	B	20	31	0.65	57			X				
WW0272	7/36-22C		41	1061								X				
WW0273	7/36-22D		47	1029	P	25	99	0.25				X				
WW0274	7/36-22D1		24	1048	P	30					X	X				
WW0275	7/36-22D2		54	1030	A	15	383	0.04				X			X	
WW0276	7/36-22H		30	1091	B	28	8	3.50				X				
WW0277	7/36-22N		0	1057	P	400	100.5	3.98							X	Open at TOB boundary.
WW0278	7/36-22N1		42	1027	P	100	38	2.63				X				
WW0279	7/36-22P		33	1047	A	30	120	0.25				X				
WW0280	7/36-23C2		58	1095	A	15	190	0.08				X				
WW0281	7/36-23D			1147	A	15	125	0.12				X			X	Open 5 feet above TOB boundary.
WW0282	7/36-23D1		24	1129	B	25	31	0.81				X				
WW0283	7/36-23E		35	1105	B	40	26	1.54				X				
WW0284	7/36-25E		147	1161												no additional data listed
WW0286	7/36-27A		43	1052	P	60	7	8.57			X	X				
WW0287	7/36-27E		43	1014	A	18	185	0.10				X				
WW0288	7/36-27F1		27	1039	B	35	4	8.75				X				
WW0289	7/36-27G		0	1080	P	224	85	2.64								Open 3 feet below TOB boundary.
WW0290	7/36-27H		78	1038	P	15	167	0.09				X				
WW0291	7/36-27J1		98	1029	B	20	7	2.86				X				
WW0292	7/36-27L		49	992	P	60	150	0.40				X				
WW0293	7/36-27N		30	1011	P	75	0	750.00				X				
WW0294	7/36-27P		50	988	A	50	200	0.25				X				
WW0295	7/36-27P1		40	1034	P	400	20	20.00				X				
WW0296	7/36-28A			1038						X	X	X				
WW0297	7/36-28B		9	1021	B	25	25	1.00			X	X				
WW0298	7/36-28E		185	795		150	88	1.70								abandoned well
WW0299	7/36-28E2		20	963	P	42	40	1.05				X				
WW0300	7/36-28G			1028		30	30	1.00				X				
WW0301	7/36-28H		12	1034	P	13						X				
WW0302	7/36-28H1		9	1020	P	30	77	0.39				X				
WW0303	7/36-28H2		7	1022	P	65	10	6.50				X				
WW0304	7/36-28K		4	1017	P	120	12	10.00				X				
WW0305	7/36-28L		40	956	B	20	20	1.00				X	X			
WW0306	7/36-28M		26	955	P	30	97	0.31				X				
WW0307	7/36-28M1		6	973	P	50	10	5.00			X	X				
WW0308	7/36-28P		42	940	B	50	22	2.27				X				
WW0309	7/36-28R		18	1004	B	30	29	1.03				X				
WW0310	7/36-28R1		23	995	B	40	65	0.62				X				
WW0312	7/36-29J		6	963	P	100						X				
WW0313	7/36-29P		51	867	P	415 265	180 64					X				
WW0314	7/36-29P1		50	878	P	30	15	2.00		X	X	X				
WW0315	7/36-30J			908											X	
WW0317	7/36-31H		22	868	B	75	0				X	X				
WW0318	7/36-31J1		75	812	P	1135	58	19.57							X	
WW0319	7/36-31K		13	864	P	412	135	3.05			X	X				
WW0321	7/36-31L		3	847		600	51	11.76							X	Driller depths do not match his statements.
WW0322	7/36-31N		29	810	P	60	30	2.00				X				
WW0323	7/36-31N1		17	823	P	64	28	2.29				X				
WW0324	7/36-31N2		25	803	P	500	25	20.00				X	X			USGS site states completed in CRBG
WW0325	7/36-31Q		160	730		160	59	2.71				X				
WW0326	7/36-31R			887						X	X	X				
WW0327	7/36-32C		30	891	P	110	110	1.00				X				
WW0328	7/36-32E		51	843	B	25	11	2.27				X				
WW0329	7/36-32E1		30	875	P						X	X				
WW0330	7/36-32F		45	867	P	25	57	0.44				X				
WW0331	7/36-32K1		40	895	P	50	0	500.00				X				
WW0332	7/36-32N		34	866	P	30	36	0.83				X				

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)	DTW 1st water	DTW (ft bgs)
WW0333	7/36-32N1	Mar-00	5098793	395979	898	898	33	865	12	853	>186								231	667	D	0-36	0-231	116-231	5		43
WW0334	7/36-32P	Sep-68	5098994	396606	909	909	26	883	36	847	>163								225	684	D,I,S		0-147	147-225	6		51
WW0335	7/36-32P1	Oct-62	5099128	396413	910	910	27	883	0	883	>104								131	779			0-91	91-131	6		39
WW0336	7/36-32Q	Jun-64	5098925	396866	930	930	0	930	14	916	>76								90	840	I		0-84	69-83	8		22
WW0337	7/36-32Q1		5098873	397038	931	931	30	901	11	890	>103								144	787			0-128	128-144	6		32
WW0338	7/36-32R	Nov-62	5098877	397456	940	940	14	926	9	917	>188								211	729					8		35
WW0340	7/36-33A	Nov-41	5100044	398788	1002	1002	25	977	0	977	335	642	110	532	0	470	532		762	240			0-546	546-762	6		66
WW0341	7/36-33A1	Apr-57	5100167	398948	1009	1009	25	984	25	959	>60								110	899					8		13
WW0342	7/36-33C	Oct-54	5100030	397996	982	982	23	959	42	917	>85								150	832			0-150	134-150	8		34
WW0343	7/36-33D	Apr-67	5100154	397722	974	974	25	949	0	949	>105								130	844		0-30	0-124	40-120	6		34
WW0344	7/36-33F	May-59	5099969	398087	982	982	16	966	43	923	>31								98	884			0-82	82-98	6		17
WW0345	7/36-33F1	Jun-88	5099608	397886	965	965	5	960	30	930	212	718	225	493	0	472	493		943	22	I	0-40	0-890	890-943	8		130
WW0346	7/36-33G1	Jul-78	5099663	398543	982	982	19	963	17	946	191	755	>31						258	724	D	0-20	0-258	109-258	5		14
WW0347	7/36-33H	Dec-72	5099816	398774	990	990	17	973	17	956	>141								175	815			0-168	43-175	6		34
WW0348	7/36-33H1	Jul-94	5099681	399070	1000	1000	27	973	0	973	>175								202	798	D	0-30	0-202	102-202	5		35
WW0349	7/36-33J	Mar-54	5099261	398851	980	980	10	970	0	970	>90								100	880			0-36	36-100	6		13
WW0350	7/36-33J1	Oct-78	5099540	398742	994	994	10	984	3	981	202	779	185	594	0	400	594		600	394	I	0-22	0-512	512-600	6		128
WW0351	7/36-33K	Nov-02	5099370	398479	974	974	8	966	0	966	>148								156	818	D	0-27	0-156	118-156	4		19
WW0353	7/36-33K3	Oct-06	5099368	398647	988	988	17	971	30	941	>133								180	808	D	0-18	0-177	137-180	4		25
WW0354	7/36-33L1	Aug-01	5099356	398050	959	959	27	932	35	897	>98								160	799	D	0-18	0-152	112-152	4		42
WW0355	7/36-33L2	Mar-63	5099513	398047	962	962	26	936	0	936	>132								158	804		0-40	0-116	116-158	6		18
WW0356	7/36-33M	Sep-49	5099269	397701	950	950	0	950	37	913	>84								121	829			0-51	51-121	8		
WW0357	7/36-33N	Oct-68	5099084	397742	950	950	9	941	18	923	>228								255	695	D,I	0-40	0-147	40-145	10		23
WW0358	7/36-33N1	Jan-74	5098940	397582	945	945	20	925	0	925	>214								234	711	D	0-30	0-235	198-234	6		20
WW0359	7/36-33P	May-54	5098810	398208	949	949	12	937	6	931	>82								100	849			0-41	41-100	12		9
WW0360	7/36-33P1	Jun-48	5099035	398061	955	955	12	943	0	943	273	670	>290						575	380			0-434	105-575	8		30
WW0361	7/36-33Q	May-63	5099118	398610	961	961	18	943	20	923	>76								114	847		0-25	0-97	97-114	6		12
WW0362	7/36-33Q1	Feb-61	5098803	398621	958	958	14	944	14	930	>39								67	891	D,I	0-30	0-30	30-67	6		10
WW0363	7/36-33R	Jul-69	5098879	398970	971	971	16	955	0	955	>61								77	894	D	0-40	0-85	85-86	6		18
WW0364	7/36-34C	Apr-49	5100317	399688	1077	1077	44	1033	5	1028	>54								103	974			0-70	70-103	6		40
WW0365	7/36-34D	Nov-83	5100193	399295	1019	1019	7	1012	0	1012	>178								185	834	D	0-31	0-178	158-185	6		
WW0366	7/36-34E1	Jun-93	5099780	399321	1017	1017	18	999	0	999	212	787	201	586	0	431	586		565	452	D	0-40	0-550	470-565	6		210
WW0367	7/36-34F	Jun-88	5099715	399662	1018	1018	22	996	34	962	>144								200	818	D	0-20	0-196	136-200	4		34
WW0368	7/36-34F1	Mar-52	5099842	399837	1020	1020	24	996	37	959	>159								220	800			0-156	156-220	8		16
WW0370	7/36-34L	Aug-77	5099492	399653	1009	1009	5	1004	0	1004	193	811	>67						265	744	D	0-25	0-265	60-265	6		40
WW0371	7/36-34M1	Dec-03	5099450	399234	991	991	16	975	31	944	>173								220	771	D	0-18	0-220	200-220	4		38
WW0372	7/36-34N1	Feb-95	5099028	399151	978	978	16	962	67	895	115	780	197	583	0	395	583		605	373	D	0-35	0-500	500-605	6		142
WW0373	7/36-34P	Aug-03	5099003	399694	1005	1005	28	977	7	970	>179								214	791	D	0-30	0-214	100-214	5		22
WW0374	7/36-35L	Feb-97	5099455	401290	1150	1150	7	1143	22	1121	>74								103	1047	D	0-18	0-103	83-103	4		
WW0375	7/36-35Q	Mar-54	5099044	401853	1172	1172	7	1165	0	1165	218	947	0	947	0	225	947		936	236			0-255	255-936	16		72
WW0376	7/36-36E	May-75	5099635	402579	1168	1168	10	1158	0	1158	>130								140	1028	D,I	0-21	0-100	100-140	6		7
WW0377	7/36-36F	Mar-93	5099786	403042	1223	1223	18	1205	7	1198	22	1176	0	1176	0	47	1176		265	958	D	0-47	0-91	91-265	6		91
WW0378	7/36-36J	Jul-43	5099452	403558	1224	1224	0	1224	30	1194	151	1043	0	1043	0	181	1043		245	979			0-135	135-245	8		17
WW0379	7/36-36J1	Oct-46	5099099	403883	1253	1253	65	1188	0	1188	99	1089	0	1089	0	164	1089		454	799			0-273	273-454	12		75
WW0599	7/37-01	Aug-01	5108033	412349	1814	1814	15	1799	0	1799	0	1799	0	1799	0	15	1799		185	1629	D	0-20	0-20	20-185	6		0
WW0600	7/37-04	Nov-94	5106887	407499	1453	1453	21	1432	17	1415	0	1415	0	1415	0	38	1415		530	923	D	0-57	0-57	57-530	8		285
WW0601	7/37-05	Oct-77	5107986	406663	1296	1296	7	1289	13	1276	122	1154	0	1154	0	142	1154		445	851	D	0-25	0-160	160-445	10		135
WW0602	7/37-05	Nov-64	5107954	406292	1286	1286	12	1274	41	1233	0	1233	0	1233	0	53	1233		795	491	I	0-80	0-80	80-795	16		157
WW0604	7/37-12	Jul-06	5105986	412667	1854	1854	3	1851	11	1840	0	1840	0	1840	0	14	1840		85	1769	D	0-25	0-25	25-85	6		0
WW0606	7/37-13	Jul-67	5104111	412733	2119	2119	16	2103	0	2103	0	2103	0	2103	0	16	2103		375	1744	D	0-21	0-21	21-375	6		270
WW0607	7/37-14	Jan-78	5104326	411371	1955	1955	29	1926	0	1926	0	1926	0	1926	0	29	1926		77	1878	D	0-29	0-70	70-77	8		30
WW0381	7/37-16L	Apr-97	5104020	407787	1516	1516	5	1511	17	1494	0	1494	0	1494	0	22	1494		175	1341	D	0-126	0-126	126-175	6		17
WW0382	7/37-16M	Mar-03	5104228	407351	1499	1499	8	1491	19	1472	0	1472	0	1472	0	27	1472		425	1074	D	0-47	0-425	380-425	4		316
WW0383	7/37-16N		5103920	407244	1457	1457	0	1457	37	1420	0	1420	0	1420	0	37	1420		155	1302	D,I	0-20	0-41	41-155			15
WW0384	7/37-16P	Sep-87	5103702	407961	1499	1499	4	1495	11	1484	15	1469	0	1469	0	30	1469		256	1243	D,I	0-20	0-34	34-256	8		20
WW0385	7/37-17A	Apr-83	5104815	406964	1519	1519	9	1510	19	1491	0	1491	0	1491	0	28	1491		177	1342	D	0-19	0-35	35.5-177	6		21
WW0386	7/37-17E	May-86	5104507	405794	1427	1427	7	1420	30	1390	179	1211	0	1211	0	216	1211		314	1113	D	0-221	0-314	274-314			
WW0387	7/37-17G	May-86	5104386	406579	1450	1450	8	1442	62	1380	102	1278	0	1278	0	172	1278		227	1223	D	0-177	0-227	187-227			48
WW0388	7/37-17H	Jun-87	5104389	407110	1483	1483	0	1483	46	1437	0	1437	0	1437	0	46	1437		242	1241	M	0-52	0-52	52-242	10		12
WW0389	7/37-17J	May-86	5104279	407195	1486	1486	8	1478	35	1443	112	1331	0	1331	0	155	1331		225	1261	D	0-160	0-225	185-225	6		47

Well ID	T/R-sec	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0333	7/36-32N1	855	P	60	30	2.00				X				
WW0334	7/36-32P	858	P	80	14	5.71				X				
WW0335	7/36-32P1	871	P	30	15	2.00				X				
WW0336	7/36-32Q	908	B	50	20	2.50				X				
WW0337	7/36-32Q1	899	P	25	72	0.35				X				
WW0338	7/36-32R	905		145	205	0.71				X				Well produces at 205, 164, 110, 82 feet.
WW0340	7/36-33A	936	P	100	14	7.14							X	
WW0341	7/36-33A1	996	P	30	4	7.50			X	X				difficult to decipher
WW0342	7/36-33C	948	P	35	20	1.75				X				difficult to decipher
WW0343	7/36-33D	940	B	20	1	20.00				X				
WW0344	7/36-33F	965	P	20	23	0.87				X				
WW0345	7/36-33F1	835	P	550	1	550.00							X	
WW0346	7/36-33G1	969	P	40	170	0.24				X	X			
WW0347	7/36-33H	956		15						X				
WW0348	7/36-33H1	965	P	20	105	0.19				X				
WW0349	7/36-33J	967	P	68.4	7	9.77				X				
WW0350	7/36-33J1	866	P	207	62	3.34							X	
WW0351	7/36-33K	955	P	42	60	0.70				X				
WW0353	7/36-33K3	963	A	25	175	0.14				X				
WW0354	7/36-33L1	917	A	50	150	0.33				X				
WW0355	7/36-33L2	944	P	80	85	0.94				X				Polluted water at 110 feet.
WW0356	7/36-33M	950	P	100						X				
WW0357	7/36-33N	927		146	162	0.90				X				
WW0358	7/36-33N1	925	P	30	45	0.67				X				
WW0359	7/36-33P	940	P	170	80	2.13				X				
WW0360	7/36-33P1	925	P	150	140	1.07				X	X			
WW0361	7/36-33Q	949	B	40	58	0.69				X				
WW0362	7/36-33Q1	948	B	30	12	2.50				X				
WW0363	7/36-33R	953	B	40	40	1.00				X				
WW0364	7/36-34C	1037	P	35	54	0.65				X				
WW0365	7/36-34D	1019	B	35	5	7.00				X				difficult to decipher
WW0366	7/36-34E1	807	P	60	10	6.00							X	
WW0367	7/36-34F	984	A	60	200	0.30				X				
WW0368	7/36-34F1	1004	P	30	25	1.20				X				difficult to decipher
WW0370	7/36-34L	969	B	20	20	1.00				X	X			
WW0371	7/36-34M1	953	A	30	218	0.14				X				
WW0372	7/36-34N1	836	P	15	156	0.10							X	dditional deepening of well, depths do not ma
WW0373	7/36-34P	983	P	20	83	0.24				X				
WW0374	7/36-35L	1150	A	35	95	0.37				X				
WW0375	7/36-35Q	1100	P	2032	11	184.73							X	
WW0376	7/36-36E	1161	B	40	7	5.71				X				
WW0377	7/36-36F	1132	P	32	24	1.33							X	
WW0378	7/36-36J	1207	P	200	25	8.00				X			X	
WW0379	7/36-36J1	1178	P	1130	14	80.71							X	difficult to decipher
WW0599	7/37-01	1814	A	50			60						X	
WW0600	7/37-04	1168	A	150			63						X	
WW0601	7/37-05	1161	P	60	230	0.26	60						X	
WW0602	7/37-05	1129	P	1100	38	28.95	58						X	
WW0604	7/37-12	1854	A	25									X	
WW0606	7/37-13	1849	B	18	45	0.40							X	
WW0607	7/37-14	1925	B	25	14	1.79	60						X	
WW0381	7/37-16L	1499	A	75	150	0.50							X	unusable water at 22 feet (Qac/TOB)
WW0382	7/37-16M	1183	A	50	420	0.12							X	
WW0383	7/37-16N	1442	B	30	10	3.00							X	
WW0384	7/37-16P	1479	B	50	10	5.00							X	Open 4 feet below TOB boundary.
WW0385	7/37-17A	1498	A	30									X	Open 3.5 feet below TOB boundary.
WW0386	7/37-17E	1427	A	80									X	
WW0387	7/37-17G	1402	A	300									X	
WW0388	7/37-17H	1471											X	Open at TOB boundary.
WW0389	7/37-17J	1439	A	700									X	

Well ID	T/R-sec	mo/yr drilled	UTM northing	UTM easting	surf elev (ft amsl)	Qf top (ft amsl)	Qf iso (ft)	Qc top (ft amsl)	Qc iso (ft)	MPc top (ft amsl)	MPc iso (ft)	MPf top (ft amsl)	MPf iso (ft)	MPbc top (ft amsl)	MPbc iso (ft)	DTB (ft bgs)	TOB (ft amsl)	bslt unit	TD (ft bgs)	TD (ft amsl)	Use	Seal (ft bgs)	Casing (ft bgs)	Open (ft bgs)	min open int dia (in)	DTW 1st water	DTW (ft bgs)
WW0390	7/37-17P	Jul-66	5103734	406238	1411	1411	0	1411	29	1382	0	1382	0	1382	0	29	1382		250	1161	I				6		300
WW0391	7/37-18E	Feb-86	5104531	404207	1345	1345	0	1345	36	1309	107	1202	0	1202	0	143	1202		343	1002	D	0-149	0-343	299-343	6		205
WW0392	7/37-18F	Jun-75	5104559	404532	1352	1352	2	1350	6	1344	115	1229	31	1198	0	154	1198		1169	183	M		0-1102	1102-1169	16		228
WW0393	7/37-18F1	Feb-86	5104421	404671	1358	1358	0	1358	8	1350	152	1198	0	1198	0	160	1198		397	961	D	0-174	0-397	357-397	6		163
WW0394	7/37-18F2	Jul-88	5104575	404912	1371	1371	38	1333	17	1316	100	1216	0	1216	0	155	1216		285	1086	D	0-164	0-160	160-285	6		87
WW0395	7/37-18H	Apr-86	5104486	405377	1407	1407	18	1389	0	1389	211	1178	0	1178	0	229	1178		274	1133	D	0-234	0-274	224-274	6		43
WW0396	7/37-18K	Jun-73	5103948	405054	1345	1345	1	1344	15	1329	11	1318	0	1318	0	27	1318		220	1125	D,I	0-18	0-30	30-220	6		45
WW0397	7/37-18R1	Jun-49	5103686	405457	1378	1378	12	1366	5	1361	0	1361	0	1361	0	17	1361		181	1197		0-100	0-102	102-770	12		180
WW0398	7/37-22H	Feb-87	5102645	410060	1667	1667	12	1655	18	1637	16	1621	0	1621	0	46	1621		273	1394		0-50	0-50	50-273	10		0
WW0399	7/37-22J	May-86	5102513	410156	1670	1670	16	1654	19	1635	0	1635	0	1635	0	35	1635		153	1517	D	0-54	0-153	113-153	6		0
WW0400	7/37-22R	Oct-03	5102146	410356	1650	1650	7	1643	17	1626	0	1626	0	1626	0	24	1626		150	1500	D	0-25	0-25	25-150	8		0
WW0401	7/37-23N	May-86	5101925	410619	1637	1637	17	1620	15	1605	0	1605	0	1605	0	32	1605		103	1534	D	0-41	0-103	83-103	6		28
WW0402	7/37-23N1	May-86	5101975	410571	1627	1627	17	1610	5	1605	0	1605	0	1605	0	22	1605		113	1514	D		0-113	93-113	6		8
WW0403	7/37-26F	Oct-96	5101101	410889	1657	1657	8	1649	42	1607	0	1607	0	1607	0	50	1607		255	1402	D	0-57	0-57	57-255	8		45
WW0404	7/37-26F1	Nov-99	5101285	410957	1709	1709	3	1706	8	1698	0	1698	0	1698	0	11	1698		105	1604	D	0-24	0-24	24-105	6		18
WW0406	7/37-26M	May-86	5100788	410743	1673	1673	0	1673	30	1643	0	1643	0	1643	0	30	1643		76	1597	D	0-41	0-76	51-76	6		6
WW0407	7/37-29P	May-94	5100438	406182	1453	1453	24	1429	0	1429	0	1429	0	1429	0	24	1429		347	1106	D	0-36	0-54	54-347	6		72
WW0408	7/37-29R	Aug-94	5100562	406911	1558	1558	17	1541	38	1503	0	1503	0	1503	0	55	1503		152	1406	D	0-18	0-62	62-152	8		
WW0411	7/37-31M	Jun-97	5099242	404113	1270	1270	68	1202	0	1202	92	1110	0	1110	0	160	1110		349	921	I	0-295	0-295	295-349	6		56
WW0412	7/37-32N		5098793	405783	1398	1398	68	1330	0	1330	0	1330	0	1330	0	68	1330		395	1003	D,I	0-81	0-81	81-395	8		45
WW0413	7/37-33P	Nov-71	5098786	407660	1604	1604	9	1595	62	1533	0	1533	0	1533	0	71	1533		178	1426	D,I	0-76	0-76	76-178	6		0
WW0587	8/35-13	Jun-96	5114394	393125	879	879	15	864	0	864	0	864	0	864	0	15	864		493	386		0-18	0-493	453-493	4		244
WW0590	8/35-35	Dec-67	5109077	391505	768	768	20	748	43	705	67	638	89	549	0	219	549		540	228		0-222	0-222	222-540	8		112
WW0592	8/36-20	Dec-97	5111815	396508	899	899	30	869	0	869	95	774	0	774	0	125	774		125	774		0-30	0-125	65-125	5		32
WW0593	8/36-21	Apr-89	5112129	398550	965	965	12	953	0	953	70	883	40	843	0	122	843		340	625	D/I	0-19	0-130	130-340	6		16
WW0594	8/36-21	Mar-54	5111685	397804	942	942	24	918	0	918	34	884	72	812	0	130	812		339	603	I						
WW0595	8/36-26	Mar-04	5111057	402031	1148	1148	86	1062	0	1062	0	1062	0	1062	0	86	1062		305	843	D	0-104	0-104	104-305	8		137
WW0596	8/36-30	Apr-97	5111588	394521	843	843	20	823	0	823	15	808	51	757	0	86	757		370	473	D	0-131	0-131	131-370	8		212
WW0597	8/36-36	Apr-77	5109036	403412	1240	1240	3	1237	14	1223	0	1223	0	1223	0	17	1223		189	1051	D	0-22	0-22	22-189	6		76
WW0598	8/36-36	Sep-57	5109089	403103	1155	1155	10	1145	0	1145	11	1134	0	1134	0	21	1134		143	1012			0-22	22-143			10
WW0608	8/37-04	Feb-06	5117264	408052	1476	1476	25	1451	0	1451	0	1451	0	1451	0	25	1451		260	1216	D	0-27	0-27	27-160	6		44
WW0609	8/37-09	May-98	5116083	407491	1375	1375	18	1357	0	1357	0	1357	0	1357	0	18	1357		100	1275	D	0-18	0-100	18-100	4		
WW0610	8/37-09	Apr-98	5115930	407945	1421	1421	26	1395	0	1395	0	1395	0	1395	0	26	1395		225	1196	D	0-34	0-225		4		141
WW0613	8/37-19	Jul-96	5112857	404271	1280	1280	17	1263	0	1263	0	1263	0	1263	0	17	1263		285	995	D	0-23	0-285	265-285	4		51
WW0615	8/37-25	May-02	5110117	412808	1824	1824	28	1796	2	1794	0	1794	0	1794	0	30	1794		577	1247	D	0-35	0-35	35-577	6		297
WW0616	8/37-26	May-69	5110350	410975	1565	1565	15	1550	10	1540	0	1540	0	1540	0	25	1540		512	1053	M	0-18	0-42	42-512	8		300
WW0617	8/37-26	Nov-79	5110639	411256	1637	1637	18	1619	0	1619	0	1619	0	1619	0	18	1619		417	1220	D	0-24	0-24	24-417	10		307
WW0619	8/37-31	Apr-90	5108642	404634	1224	1224	8	1216	14	1202	63	1139	0	1139	0	85	1139		450	774	D	0-117	0-117	117-450	6		
WW0621	8/37-34	Apr-84	5109535	409528	1496	1496	8	1488	11	1477	0	1477	0	1477	0	19	1477		257	1239	I	0-30	0-30	30-257	10		4
WW0622	8/37-35	Mar-05	5109714	411742	1604	1604	12	1592	50	1542	0	1542	0	1542	0	62	1542		560	1044	D	0-65	0-560	520-560	6		380
WW0623	8/37-35	Feb-67	5109387	411797	1624	1624	21	1603	16	1587	0	1587	0	1587	0	37	1587		515	1109	I	0-304	0-304	304-515	8		319

Well ID	T/R-sec	WT elev (ft amsl)	pump test type	rate (gpm)	DD (ft)	SC (gpm/ft-DD)	Temp (F)	Qf	Qc	Mpc	Mpf	Mpbc	Bslt	Comments
WW0390	7/37-17P	1111												
WW0391	7/37-18E	1140	A	100									X	
WW0392	7/37-18F	1124	P	3400	134	25.37							X	
WW0393	7/37-18F1	1195	A	60									X	
WW0394	7/37-18F2	1284	P	36	37	0.97							X	
WW0395	7/37-18H	1364	A	40						X			X	Open 4 feet above TOB boundary.
WW0396	7/37-18K	1300	P	65	93	0.70							X	
WW0397	7/37-18R1	1198	P	300									X	difficult to decipher
WW0398	7/37-22H	1667		250									X	Open 4 feet below TOB boundary.
WW0399	7/37-22J	1670		120									X	
WW0400	7/37-22R	1650	A	300	140	2.14							X	Open at TOB boundary.
WW0401	7/37-23N	1609	A	50									X	difficult to decipher
WW0402	7/37-23N1	1619		15									X	
WW0403	7/37-26F	1612	A	150	255	0.59							X	Open 7 feet below TOB boundary.
WW0404	7/37-26F1	1691		45									X	Open 5 feet below TOB boundary.
WW0406	7/37-26M	1667	A	35									X	
WW0407	7/37-29P	1381	A	120	235	0.51							X	difficult to decipher
WW0408	7/37-29R	1558	P	12	152	0.08							X	Open 5 feet below TOB boundary.
WW0411	7/37-31M	1214	P	75	0	750.00							X	
WW0412	7/37-32N	1353	B	90	56	1.61							X	
WW0413	7/37-33P	1604	B	45	8	5.63							X	Open 5 feet below TOB boundary.
WW0587	8/35-13	635	A	30									X	
WW0590	8/35-35	656	P	284	9	31.56	63						X	
WW0592	8/36-20	867	P	24	33	0.73	53			X				
WW0593	8/36-21	949	A	400			56						X	
WW0594	8/36-21												X	
WW0595	8/36-26	1011	A	45			58						X	
WW0596	8/36-30	631	P	50	103	0.49	58						X	
WW0597	8/36-36	1164	P	20	1	20.00	56						X	
WW0598	8/36-36	1145	P	80	123	0.65	59						X	
WW0608	8/37-04	1432	A	15									X	
WW0609	8/37-09		A	12									X	
WW0610	8/37-09	1280	A	40									X	
WW0613	8/37-19	1229	A	10									X	
WW0615	8/37-25	1527	A	35									X	
WW0616	8/37-26	1265	A	300									X	
WW0617	8/37-26	1330	P	51	100	0.51	56						X	
WW0619	8/37-31		A	100			57						X	
WW0621	8/37-34	1492	P	830	50	16.60							X	
WW0622	8/37-35	1224	A	60									X	
WW0623	8/37-35	1305											X	

Appendix C

Percent Facies Data for the Three Mio-Pliocene Units

Explanation of abbreviations used in tabulation

Well ID	unique identification number assigned to well log
Northing	north grid coordinate for well, UTM NAD 83 datum
Easting	east grid coordinate for well, UTM NAD 83 datum
MPc	Mio-Pliocene upper coarse unit
MPf	Mio-Pliocene fine unit
MPbc	Mio-Pliocene basal coarse unit
% mud	calculated percent muddy facies
% gravel	calculated percent sandy and gravelly facies

			MPc		MPf		MPbc	
Well ID	northing	easting	%Mud	%Gravel	%Mud	%Gravel	%Mud	%Gravel
U3899	5088616	393356	26	74	0	100	36	64
U3909	5088434	392122	12	88				
U3918	5088482	390599	0	100				
U3922	5088829	390578	0	100				
U3930	5088109	391899	49	51				
U3937	5088916	390621	0	100				
U3940	5088523	390496	49	51				
U3951	5088554	387906	9	91	50	50	46	54
U3962	5086912	392743	0	100				
U3965	5086033	392947	0	100				
U3990	5087408	395309	0	100				
U4073	5094284	372074	62	38				
U4090	5094468	382105	25	75				
U4094	5094366	379684	4	95				
U4102	5094163	374757	0	100	100	0	84	16
U4125	5093182	383146	9	91				
U4166	5091919	379613	4	96	99	1		
U4177	5090565	381342	0	100				
U4178	5090780	380821	0	100				
U4179	5090015	382202	40	60				
U4181	5090840	383256	0	100				
U4184	5089707	382778	5	95				
U4185	5089339	383554	0	100				
U4279	5094644	387266	51	49				
U4289	5092676	385556	30	70				
U4329	5092840	387660	19	81				
U4345	5092559	388140	22	78				
U4367	5092981	389402	9	91				
U4381	5093252	390088	13	87				
U4538	5091401	393377	3	97				
U4730	5090652	389937	2	98				
U4864	5090401	385847	49	51	100	0		
U4924	5089955	389402	50	50	51	49		
U4954	5089100	389586	6	94	94	6		
U4970	5089631	390217	17	83				
U50069	5087239	393539	35	65				
U5042	5090150	391264	41	59				
U50478	5089769	388859	50	50	59	41		
U50516	5088922	387626	71	29	100	0	49	51
U50535	5089090	396355	33	67	100	0		
U50577	5089813	386919	37	63	100	0		
U5058	5089215	391305	0	100				

			MPc		MPf		MPbc	
Well ID	northing	easting	%Mud	%Gravel	%Mud	%Gravel	%Mud	%Gravel
U51190	5095025	379198	50	50				
U51581	5088559	390407	58	42				
U5200	5091179	393879	4	96				
U52037	5094040	381679	0	100				
U5211	5091739	394361	33	67	89	11		
U5227	5089565	394828	48	52	57	43	60	40
U5241	5090267	395835	71	29	100	0		
U5245	5094372	404315	50	50				
U53529	5091820	378493	50	50				
U53567	5091274	380738	9	91				
U5357	5093816	381026	34	66				
U5378	5094210	380871	27	73				
U5408	5086864	392966	0	100				
U54134	5092073	391889	36	64	90	10		
U54161	5094596	395854	53	47	100	0		
U54322	5085637	393419	0	100				
U54464	5089953	390599	12	88	100	0		
U54639	5092598	377488	34	66	84	16		
U5496	5091324	388355	11	89				
U54970	5094641	389936	24	76				
U55269	5091119	384022	44	56	69	31	0	100
U5530	5088409	388826	50	50				
U55437	5093844	376259	4	96				
U5670	5089213	389498	0	10	100	0		
U6053	5089702	389149	0	100	100	0		
U6179	5094823	379216	46	54				
U6181	5093839	379273	27	73				
U6192	5094060	387119	74	26				
U6283	5090366	389170	50	50	98	2	77	23
U6324	5091999	383121	50	50				
U6445	5091878	386704	0	100	100	0		
U6468	5089665	391380	37	63				
U6509	5088521	392293	36	64				
WW0001	5095328	383178	22	78				
WW0005	5095339	380898	0	100				
WW0006	5095454	378897	40	60				
WW0007	5095637	377896	29	71				
WW0010	5097568	383693	55	45	100	0		
WW0011	5097621	383455	38	62				
WW0019	5099030	379119	0	100	100	0		
WW0022	5098213	377318	53	47	100	0		
WW0023	5098935	375183	0	100	99	1	82	18

			MPc		MPf		MPbc	
Well ID	northing	easting	%Mud	%Gravel	%Mud	%Gravel	%Mud	%Gravel
WW0024	5097741	375137	0	100				
WW0025	5097129	376097	23	67				
WW0026	5097260	375774	22	78	99	1		
WW0028	5096804	377121	0	100	100	0		
WW0029	5096944	377721	23	77	80	20	50	50
WW0030	5096885	378529	26	74				
WW0035	5096884	382795	9	91				
WW0038	5097047	381957	0	100				
WW0043	5096833	383484	30	70				
WW0051	5097405	393291	5	95	98	2	82	18
WW0052	5097826	392831	0	100	100	0		
WW0054	5098206	393424	0	100	100	0		
WW0055	5097723	393723	50	50	100	0		
WW0062	5098002	391163	0	100	100	0		
WW0071	5098521	390331	37	63				
WW0081	5097915	387216	27	73				
WW0085	5097995	384662	39	61				
WW0094	5096018	386101	5	95				
WW0106	5096408	390665	7	93				
WW0122	5096245	393113	0	100	100	0		
WW0123	5095587	392885	12	88				
WW0124	5095931	393700	12	88	100	0	63	37
WW0144	5098369	400595	0	100	100	0		
WW0145	5098367	398690	11	89				
WW0146	5098740	398805	25	75				
WW0150	5098248	397706	14	86				
WW0151	5098251	397527	0	100	100	0		
WW0152	5098370	398858	0	100	100	0		
WW0153	5097738	398295	64	36	100	0		
WW0154	5097757	398056	22	78				
WW0156	5097589	398156	48	52	100	0		
WW0159	5097347	397653	21	79	100	0		
WW0161	5097181	397824	0	100	100	0		
WW0162	5097160	398426	52	48	89	11		
WW0163	5097516	398600	38	62	67	33		
WW0164	5098120	396602	6	94	100	0		
WW0165	5097636	395590	33	67	100	0	68	32
WW0171	5097637	394304	23	77	100	0		
WW0174	5097528	395610	8	92	100	0		
WW0176	5097155	394535	4	96	97	3		
WW0177	5096723	394375	2	98	100	0		
WW0178	5096138	395245	44	56	100	0		

			MPc		MPf		MPbc	
Well ID	northing	easting	%Mud	%Gravel	%Mud	%Gravel	%Mud	%Gravel
WW0179	5096380	394462	20	80	100	0		
WW0180	5097022	395960	11	89	100	0		
WW0183	5095746	395933	43	57	100	0	88	12
WW0184	5097093	398588	45	55	70	30		
WW0185	5096886	398281	60	40	100	0		
WW0188	5095660	398157	44	56	100	0		
WW0189	5096525	399409	14	86	86	14	36	64
WW0190	5095399	394236	5	95				
WW0210	5100784	382544	0	100	100	0		
WW0257	5099477	391911	42	58	100	0	75	25
WW0262	5106735	401548	49	51				
WW0264	5104912	402451	38	62				
WW0265	5104562	402955	34	66				
WW0266	5104367	403223	8	92				
WW0267	5104545	403687	25	75				
WW0268	5104115	403756	0	100				
WW0269	5104301	403320	67	33				
WW0271	5103962	403087	46	54				
WW0275	5103331	399406	0	100				
WW0277	5102162	399143	47	53	100	0		
WW0281	5103412	400790	0	100				
WW0284	5101209	402701	0	100				
WW0289	5101477	400184	22	78	100	0		
WW0298	5101531	397544	28	72	100	0		
WW0305	5100978	398153	35	65				
WW0315	5100978	395593	22	78	100	0		
WW0318	5099530	395758	34	66	100	0		
WW0321	5099472	394699	43	57	96	4		
WW0324	5098856	394190	16	84				
WW0340	5100044	398788	33	67	100	0		
WW0345	5099608	397886	33	67	100	0		
WW0350	5099540	398742	22	78	97	3		
WW0360	5099035	398061	20	80				
WW0366	5099780	399321	7	93	100	0		
WW0370	5099492	399653	35	65				
WW0375	5099044	401853	34	66				
WW0377	5099786	403042	50	50				
WW0378	5099452	403558	0	100				
WW0379	5099099	403883	20	80				
WW0384	5103702	407961	40	60				
WW0389	5104279	407195	55	45				
WW0391	5104531	404207	50	50				

			MPc		MPf		MPbc	
Well ID	northing	easting	%Mud	%Gravel	%Mud	%Gravel	%Mud	%Gravel
WW0392	5104559	404532	17	83				
WW0393	5104421	404671	34	66				
WW0398	5102645	410060	0	100				
WW0421	5098060	374379	22	78	100	0		
WW0423	5097707	372531	0	100				
WW0424	5099306	370893	40	60				
WW0426	5097999	369748	40	60				
WW0427	5097915	365555	40	60				
WW0439	5096902	371538	34	66				
WW0444	5096190	372305	9	91				
WW0450	5097081	374684	16	84				
WW0451	5095939	372647	14	86				
WW0453	5096041	369603	57	43				
WW0458	5103565	374846	0	100				
WW0462	5101536	373646	36	64				
WW0463	5101746	372953	0	100	100	0	69	31
WW0464	5101429	372239	31	69	99	1	70	30
WW0465	5101095	372902	0	100	97	3	54	46
WW0467	5101672	371515			100	0		
WW0468	5101497	371043			100	0		
WW0470	5102342	371681			100	0		
WW0472	5098559	401976	33	67				
WW0473	5096678	403449	0	100	100	0		
WW0480	5106870	408663	40	60				
WW0482	5107864	407161	0	100				
WW0483	5107562	406341	36	64				
WW0484	5108292	404770	35	65				
WW0485	5106215	404238	55	45				
WW0486	5106165	404612	50	50				
WW0487	5106126	405063	0	100				
WW0488	5105856	405657	36	64				
WW0489	5106116	405672	50	50				
WW0490	5101747	370036	100	0				
WW0491	5101170	366796	0	100				
WW0494	5100821	368082			100	0		
WW0496	5100112	368713	16	84				
WW0501	5100754	371265	24	76	100	0		
WW0504	5099892	372728	42	58	100	0		
WW0505	5100609	372743			90	10	68	32
WW0511	5104343	383893			100	0		
WW0516	5107831	392532	69	31	100	0		
WW0519	5103995	394178	0	100	100	0		

			MPc		MPf		MPbc	
Well ID	northing	easting	%Mud	%Gravel	%Mud	%Gravel	%Mud	%Gravel
WW0520	5104553	391762	8	92	99	1	87	13
WW0522	5105345	384945	0	100	100	0		
WW0528	5102546	392527	15	85	100	0		
WW0530	5102602	393697	18	82				
WW0531	5102627	392876	33	67	89	11	72	28
WW0534	5100536	394119	7	93				
WW0535	5101080	393121	25	75	100	0		
WW0537	5101685	393937	21	79	98	2		
WW0539	5101608	393348	8	92	96	4	76	24
WW0541	5101383	392561	30	70	89	11		
WW0556	5099738	386767	12	88	98	2		
WW0558	5099991	387169	9	91				
WW0559	5100369	388199	20	80				
WW0561	5100435	389023	31	69				
WW0563	5099829	388930	0	100	100	0		
WW0564	5099453	388390	16	84	100	0		
WW0565	5099592	388468	0	100	100	0	75	25
WW0567	5100269	390718	19	81	100	0	73	27
WW0572	5107112	399718	38	62	91	9		
WW0575	5105946	399285	19	81	100	0		
WW0579	5104144	394377	21	79	100	0		
WW0582	5102159	395768	19	81	100	0	55	45
WW0583	5102872	397282	31	69	100	0		
WW0584	5102448	396002	10	90	100	0		
WW0592	5111815	396508	21	79				
WW0593	5112129	398550	30	70	100	0		
WW0594	5111685	397804	6	94	100	0		
WW0596	5111588	394521	0	100	100	0		
WW0601	5107986	406663	11	89				

Appendix D

Geochemical Composition of the Columbia River Basalt Units Identified Beneath the Walla Walla Basin

	Saddle Mtns. Basalt Walla Walla member basalt of Birch Creek (4)			Saddle Mtns. Basalt Walla Walla member basalt of Spofford upper flow (3)			Saddle Mtns. Basalt Walla Walla member basalt of Spofford lower flow (3)			Saddle Mtns. Basalt Ice Harbor Member Basalt of Martindale (4)			Saddle Mtns. Basalt Buford Member (3)		
wt.%	Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma	
SiO_2	54.23	0.98		55.24	0.52		54.59	0.51		48.36	0.46		52.84	0.20	
TiO_2	2.41	0.04		2.00	0.15		2.16	0.06		3.55	0.16		2.02	0.03	
Al_2O_3	13.26	0.23		13.62	0.12		13.25	0.07		12.73	0.17		13.78	0.09	
FeO	14.17	0.71		12.90	0.25		13.97	0.26		16.20	0.27		13.99	0.21	
MnO	0.23	0.01		0.20	0.01		0.22	0.01		0.24	0.02		0.19	0.01	
MgO	3.30	0.09		3.69	0.10		3.53	0.13		5.09	0.45		4.55	0.10	
CaO	7.14	0.31		7.14	0.29		7.10	0.11		9.57	0.20		8.09	0.11	
Na_2O	3.10	0.14		2.98	0.05		2.95	0.04		2.50	0.03		3.03	0.05	
K_2O	1.59	0.18		1.59	0.21		1.80	0.09		0.95	0.12		1.12	0.05	
P_2O_5	0.57	0.01		0.36	0.03		0.40	0.01		0.81	0.04		0.40	0.01	
ppm															
Cr	27	18		11	10		19	11.00		122	31		41	13	
Ba	796	117		658	16		674	30		689	112		548	23	
Sr	329	1		319	10		322	5		249	7		344	9	
Y	42	2		34	1		36	1		54	3		31	2	
Zr	196	5		176	3		181	3		289	21		147	2	
V	332	6		375	46		398	31		373	7		400	4	
Co	35	4		34	2		35	3		41	3		36	2	
Hf	4.8	0.4		4.3	0.3		4.7	0.2		6.0	0.6		3.8	0.5	
Sc	32.4	0.8		31.0	1.8		31.8	1.3		39.4	1.6		35.8	1.1	
Th	4.5	0.2		4.6	0.4		4.8	0.6		3.1	0.7		2.9	0.3	
La	28.8	1		24.4	1.1		26.4	0.6		41.0	3.3		21.6	1.4	
Ce	57	8		49	5		54	2		78	7		47	1	
Nd	28	4		25	1		26	4		39	2		23	1	
Sm	7.1	0.3		5.5	0.2		6.0	0.3		10.5	0.5		5.3	0.3	
Eu	2.5	0.3		1.9	0.1		2.2	0.2		3.0	0.1		2.1	0.1	
Cu	20	6		13	2		19	10		34	5		39	2	
Ni	7	4		6	1		8	4		31	5		16	1	
Zn	119	17		91	2		93	3		153	9		86	5	

	Saddle Mtns. Basalt Umatilla Member (2)			Wanapum Basalt Frenchman Springs Member Basalt of Sentinel Gap high TiO_2 unit (11)			Wanapum Basalt Frenchman Springs Member Basalt of Sentinel Gap low TiO_2 unit (8)			Wanapum Basalt Frenchman Springs Member Basalt of Sand Hollow (15)			Wanapum Basalt Frenchman Springs Member Basalt of Silver Falls high TiO_2/low P_2O_5 (2)		
wt.%	Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma	
SiO_2	54.4	nc		51.92	0.70		51.91	0.74		51.24	0.61		51.68	nc	
TiO_2	2.89	nc		3.10	0.03		2.85	0.08		2.88	0.08		3.18	nc	
Al_2O_3	13.44	nc		13.40	0.21		12.89	0.2		13.22	0.25		13.17	nc	
FeO	13.42	nc		14.72	0.68		15.58	1.03		14.97	0.53		15.05	nc	
MnO	0.17	nc		0.22	0.03		0.22	0.01		0.20	0.01		0.24	nc	
MgO	2.46	nc		3.69	0.16		3.73	0.18		4.02	0.15		3.61	nc	
CaO	6.10	nc		8.04	0.27		7.77	0.18		8.21	0.19		8.14	nc	
Na_2O	3.46	nc		2.87	0.16		2.84	0.12		2.70	0.18		2.89	nc	
K_2O	2.14	nc		1.30	0.24		1.34	0.23		1.09	0.26		1.43	nc	
P_2O_5	0.87	nc		0.61	0.01		0.69	0.04		0.56	0.02		0.61	nc	
ppm															
Cr	12	nc		24	12		20	10		46	10		19	nc	
Ba	3163	nc		630	223		694	153		598	109		629	nc	
Sr	280	nc		323	9		302	18		318	14		315	nc	
Y	44	nc		43	5		45	4		40	3		43	nc	
Zr	458	nc		197	10		192	12		174	6		200	nc	
V	213	nc		439	20		380	27		411	11		452	nc	
Co	28	nc		35	2		35	4		40	3		34	nc	
Hf	9.5	nc		4.5	0.6		4.9	0.9		4.5	0.6		4.1	nc	
Sc	26.5	nc		35.2	1.5		34.1	1.1		36.7	2.3		36.7	nc	
Th	5.1	nc		4.1	0.8		4.3	0.7		3.8	0.8		4.1	nc	
La	43.9	nc		27.2	2.3		28.2	1.9		24.8	2.3		27.1	nc	
Ce	82	nc		51	8		56	7		52	5		51	nc	
Nd	43	nc		29	3		32	4		29	4		28	nc	
Sm	8.7	nc		7.4	1.0		7.5	0.6		7.0	0.7		7.3	nc	
Eu	3.6	nc		2.2	0.3		2.5	0.2		2.2	0.2		2.1	nc	
Cu	8	nc		26	4		26	7		30	7		26	nc	
Ni	6	nc		13	3		13	2		18	3		13	nc	
Zn	130	nc		137	7		131	9		122	7		139	nc	

	Wanapum Basalt Frenchman Springs Member Basalt of Silver Falls low TiO_2/high P_2O_5 (3)			Wanapum Basalt Eckler Mountain Member Basalt of Lookingglass (2)			Wanapum Basalt Eckler Mountain Member Basalt of Dodge (1)			Grande Ronde Basalt Sentinel Bluffs Member (18)			Grande Ronde Basalt Winter Water Member (4)	
wt.%	Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma		Mean	1 Sigma
SiO_2	51.94	0.78		54.58	nc		52.00	nc		53.75	0.55		54.38	0.60
TiO_2	2.92	0.05		2.66	nc		1.56	nc		1.84	0.06		2.15	0.08
Al_2O_3	13.21	0.30		12.61	nc		14.71	nc		13.90	0.25		13.78	0.14
FeO	14.92	1.32		14.71	nc		11.69	nc		12.95	0.41		13.79	0.53
MnO	0.25	0.02		0.23	nc		0.19	nc		0.21	0.02		0.21	0.01
MgO	3.73	0.13		2.76	nc		5.82	nc		4.79	0.17		3.98	0.30
CaO	7.88	0.22		6.59	nc		10.34	nc		8.50	0.26		7.66	0.37
Na_2O	2.85	0.10		3.04	nc		2.73	nc		2.77	0.14		2.94	0.06
K_2O	1.60	0.20		2.02	nc		0.66	nc		1.02	0.21		1.01	0.51
P_2O_5	0.69	0.01		0.77	nc		0.29	nc		0.31	0.10		0.37	0.05
ppm														
Cr	15	4		870	nc		160	nc		40	15		27	9
Ba	758	111		5	nc		337	nc		460	56		603	53
Sr	330	8		323	nc		385	nc		310	7		330	3
Y	47	2		52	nc		27	nc		32	3		33	3
Zr	216	2		215	nc		112	nc		144	8		159	2
V	389	6		159	nc		344	nc		316	20		337	31
Co	34	1		28	nc		32	nc		35	3		37	3
Hf	4.4	0.3		5.4	nc		2.6	nc		3.9	0.6		4.7	0.3
Sc	33.8	0.9		32.6	nc		37.2	nc		34.2	1.7		34.3	0.9
Th	4.4	0.2		5.8	nc		1.2	nc		3.1	0.6		3.5	0.5
La	30.4	2.3		33.7	nc		15.5	nc		18.2	1.6		21.2	1.0
Ce	52	6		66	nc		35	nc		39	6		43	6
Nd	32	5		42	nc		16	nc		22	6		23	6
Sm	7.7	0.6		9.4	nc		4.2	nc		5.0	0.4		5.7	0.4
Eu	2.2	0.1		2.9	nc		1.7	nc		1.5	0.1		1.7	0.1
Cu	23	3		15	nc		49	nc		28	4		21	3
Ni	12	3		2	nc		21	nc		13	2		10	1
Zn	148	3		137	nc		73	nc		98	6		115	6