PACIFIC groundwater GROUP

WRIA 44/50
GROUNDWATER ELEVATION MONITORING REPORT
(2006 WATER YEAR)
EXEMPT WELL WATER USE PHASE 2

February 19, 2007

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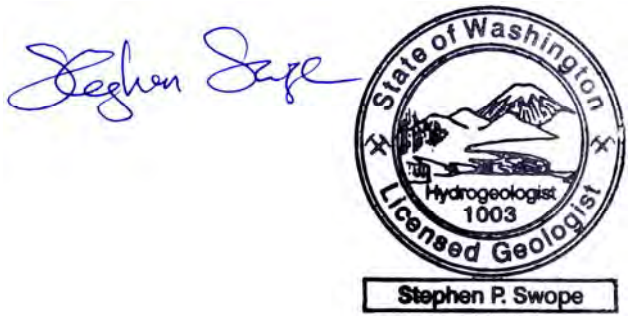
SIGNATURE

This report, and Pacific Groundwater Group's work contributing to this report, were reviewed by the undersigned and approved for release.



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1.0 SUMMARY OF FINDINGS

Groundwater elevations in Water Resource Inventory Area (WRIA) 44/50 fluctuated seasonally between a high spring elevation and low late summer to fall elevation in most monitored wells. Seasonal fluctuations ranged from over 11 feet to less than 1 foot. In general, shallow wells within the alluvial aquifer displayed the largest seasonal fluctuations, while deeper wells within the basalt aquifer displayed little to no seasonal fluctuations. Groundwater within the basalt aquifer is influenced by a more regional source and, therefore, groundwater elevations are less responsive to local recharge events.

Fluctuations in groundwater elevations are generally consistent from one year to the next with slight variations. However, a few monitored wells displayed substantial increases in peak groundwater elevations in the 2006 water year. Within the Lower Moses Coulee the peak groundwater elevation was 1 foot higher in the PID well and 2 to 3 feet higher in the Linville South well relative to the previous two years. In the Foster Creek area, the peak groundwater elevation in the Hammons well was also 2 to 3 feet higher relative to the previous two years. All three of these wells are completed in the alluvial aquifer.

Slightly higher groundwater elevations for the 2006 water year were also observed in many of the other monitored wells, including a few completed in the basalt aquifer. The Mayer well in Upper Moses Coulee and the Hemmer well in Foster Creek both monitor groundwater in the basalt aquifer. Groundwater elevations in both wells had been in decline since monitoring was first initiated but both wells recovered 1 to 1.5 feet during the 2006 water year.

The increase in peak groundwater elevations and recovery of declining trends observed for the 2006 water year are likely related to the higher precipitation in 2006. Precipitation records for the area indicate the total precipitation for the 2006 water year was about 1.5 times higher than the 2004 and 2005 water years.

Three new monitoring sites were added to the WRIA 44/50 long term monitoring program during the 2006 water year: the Chelan Hills, Chelan Springs, and the Badger Mountain areas. All three sites were identified in the Phase 1 Exempt Well Water Use Study as areas of concern in groundwater quantity. Four wells were instrumented with pressure transducers at the Chelan Hills and Chelan Springs area (2 at each site) and four wells were instrumented at the Badger Mountain area. However, one well in Chelan Hills has since been discontinued. Data analysis from the new sites indicates the new data loggers are malfunctioning. The new data loggers were apparently programmed with faulty software provided by the manufacturer and will need to be reprogrammed. The new data loggers will be reprogrammed no later than the spring of 2007.

2.0 INTRODUCTION

The subsequent sections provide an introductory discussion on the following: (1) the purpose of this study and this report; (2) background on the exempt well water use study; (3) a summary of the hydrogeology of the area; and (4) a description of the monitoring system and method of well selection.

2.1 PURPOSE OF STUDY AND REPORT

Many areas across Washington State are experiencing growth in the number of houses with exempt wells and septic tanks. This growth is unregulated and can result in declines in groundwater quantity and quality.

The purpose of this study is to monitor long-term trends in groundwater elevations in areas identified during the Phase 1 Exempt Well Water Use Study as potential for future groundwater level declines. These areas include Chelan Springs, Chelan Hills, Rimrock Meadows, and Badger Mountain. Existing monitoring sites in the Foster Creek and the Lower and Upper Moses Coulee were also added to the long-term

monitoring program. These sites were instrumented during previous studies and continued monitoring will provide useful information on long-term trends in groundwater elevations throughout WRIA 44/50. All long-term groundwater monitoring sites are shown in **Figure 1**.

The purpose of this report is to provide a summary of groundwater elevation trends observed at the monitoring sites up to the end of the 2006 water year (October 2006). Monitoring began as early as 2003 at some sites and as late as 2006 at other sites. Additional wells are also scheduled to be added to the monitoring program in 2007.

This work was performed, and this report prepared, using generally accepted hydrogeologic practices used at this time and in this vicinity, for exclusive application to the WRIA 44/50 Watershed Planning process and for the exclusive use of the Foster Creek Conservation District, the WRIA 44/50 Planning Unit, and their agents. This is in lieu of other warranties, express or implied.

2.2 EXEMPT WELL WATER USE BACKGROUND

To address the issue of exempt well water use, the Water Resource Inventory Area (WRIA) 44/50 Watershed Planning Unit (Douglas County Watershed Planning Association, 2004) proposed an Exempt Well Water Use Study.

Pacific Groundwater Group (PGG) performed an initial Phase 1 Exempt Well Water Use Study in four areas of Douglas County in 2005: Chelan Springs, Chelan Hills, Rimrock Meadows/Sagebrush Flats, and Badger Mountain. These areas were identified as high growth in exempt well water use. The phase 1 study involved the following elements:

- A water balance calculation comparing current and future groundwater use to recharge.
- A groundwater level survey to compare current groundwater levels to levels at the time of drilling.
- A nitrate loading calculation to assess affects on water quality at full build-out conditions.

The results of that study suggest the potential for groundwater level declines exists in all study areas except for Chelan Springs and that nitrate loading at full build-out conditions should have minimal impacts on groundwater in all areas except possibly Rimrock Meadows, an area that could experience relatively dense development (PGG, 2006a).

One component of the Phase 2 Exempt Well Water Use Study is monitoring long-term trends in groundwater elevations. Four sites were initially instrumented for long-term monitoring: Lower Moses Coulee, Upper Moses Coulee, Jameson/Grimes Lake Area, and Foster Creek (**Figure 1**). Surface water elevations are also monitored at the Jameson/Grimes Lake site. The first annual report on long-term groundwater elevations summarized monitoring up to October 2005 at these four sites (PGG, 2006b). Since then three additional sites (The Chelan Hills, Chelan Springs, and the Bader Mountain areas) were added to the monitoring program (**Figure 1**). As of December 2006, the monitoring program for the Phase 2 Exempt Well Use Study consists of six sites with a total of 22 monitored wells and 2 lake stations (**Table 1**). Well logs for each monitored well are provided in **Appendix B.**

Long term monitoring in the Upper Moses Coulee area will also provide observations in groundwater elevations for the Rimrock Meadows area, an area within the Upper Moses Coulee which may experience a substantial increase in the number of unregulated exempt water supply wells. An assessment of potential groundwater impacts in the Rimrock Meadows area at full build-out conditions was recently performed as part of the Phase 2 Exempt Well use study. The result of the Rimrock Meadows assessment was summarized in a technical memorandum and is attached in **Appendix A** of this document.

2.3 HYDROGEOLOGY

The hydrogeology of the study area is described in the WRIA 44/50 Final Phase 2 Basin Assessment April 2003 (PGG, 2003a) and in the WRIA 44/50 Foster Creek and Lower Moses Coulee Level 2 Hydrogeologic Assessment September 2003 (PGG, 2003b). The following summary is drawn predominantly from those reports.

WRIAs 44 and 50 are underlain predominantly by the Miocene basaltic rocks of the Columbia River Basalt Group. The basalt sequence is generally 2,000 to 3,000 feet thick in the area and is made up of numerous individual basalt flows ranging from a few tens of feet to about 300 feet thick; the average thickness is about 100 feet. Interbed deposits, often consisting of mudstones, siltstones, and sandstones, separate many of the individual basalt flows. The tops and bottoms of the flows are typically more permeable than flow interiors because of rubble zones, vesicles, and fractures. These zones form the principal aquifers within the basalt. Flow interiors are generally dense and less permeable. Openings caused by minor vertical cooling fractures provide some limited, primarily vertical, permeability in the central part of the flows.

In the Chelan Hills and Chelan Springs area, the Columbia River Basalt Group thins in the direction of the Cascades Mountains. In this area along the Columbia River valley, older, light-colored granitic rocks can be seen in outcrops underlying the Columbia River Basalt. Water saturated fractures in these older rocks provide some water supply to wells in this area.

The Ellensburg formation and other unconsolidated deposits, consisting of sand and gravel with varying amounts of clay and silt, overlie the basalts in many areas. These deposits are generally less than 50 feet thick on the plateau but may be as much as 300 feet thick on the banks of the Columbia River and in Moses Coulee. In these areas the unconsolidated deposits form a productive aquifer referred to as the alluvial aquifer.

All wells included in this analysis are completed in either the basalt aquifer or alluvial aquifer, except for the Corcoran and Nystrom wells in the Chelan Hills and Chelan Springs area, which are completed in the older fractured granitic rocks (**Table 1**).

2.4 MONITORING SYSTEM

Selection of monitored wells at each site includes the following criteria:

- Favorable location in study area.
- Permission granted by well owner.
- Well head accessibility (pitless adaptor versus top seal). Instrumenting wells with pitless adaptors is preferred, but modifications to instrument top seals is possible with owner's permission.
- Water levels in well recover to static conditions between pumping periods.

These criteria limit the number of potential wells available for monitoring at each site. For example, in the Chelan Hills and Chelan Springs area, the preferred number of wells (3 at each site) could not be achieved because the above criteria could not be met.

The monitoring system at each site uses Solinst LT Leveloggers transducers to measure and record both groundwater levels and barometric pressure at six different sites within WRIA 44/50 (**Figure 1**). The wells are all privately owned domestic, irrigation, or stock watering wells. Monitoring in Lower Moses Coulee and Foster Creek area began in 2003. Monitoring in Upper Moses Coulee and Jamison Lake began in 2004. Monitoring in the Chelan Springs, Chelan Hills, and Badger Mountain areas began in 2006.

Data are downloaded in the spring and fall each year with a laptop computer and imported into an MS Excel workbook so they can be stored, modified, and managed as needed. Water levels are corrected for barometric pressure because the transducers are not vented to the atmosphere.

3.0 RESULTS OF LONG-TERM GROUNDWATER ELEVATION MONITORING

The following subsections provide a brief summary of annual precipitation records during the monitoring period followed by results of the long-term groundwater elevation monitoring up to the end of the 2006 water year (October 1, 2006) at each site. Site maps and hydrographs are provided in **Figures 2-24**.

3.1 PRECIPITATION RECORDS

The Western Regional Climate Center (WRCC) operates a number of Remote Automated Weather Stations (RAW), providing daily values of total precipitation. The WRCC operates a RAW station at the town of Douglas, located in the central portion of WRIA 44/50, and at the town of Nespelem, just north of WRIA 44/50 (**Figure 1**).

The precipitation records indicate that the 2006 water year was a substantially wetter year than the 2004 or 2005 water years. The total annual precipitation reported at the Douglas RAW station for water years 2004, 2005 and 2006 were 5.88, 8.89 and 10.89 inches respectively. The total annual precipitation reported at the Nespelem RAW station for water years 2004, 2005 and 2006 were 10.44, 10.99 and 16.3 inches respectively.

3.2 LOWER MOSES COULEE

Lower Moses Coulee (**Figure 2**), from Rattle Snake Springs to the Columbia River, is approximately 20 miles long and 1 mile wide with steep basalt cliffs rising up to 1500 feet above the valley floor. The surface elevation of the valley floor ranges from 1100 feet (relative to mean sea level, msl) near McCartney Creek to 850 feet msl near the Columbia River.

3.2.1 Monitoring Network

Groundwater elevation monitoring in the Lower Moses Coulee commenced in late spring of 2003. Monitored wells include: Palisades Irrigation District (PID), King, Biram, Linville North, and Linville South (**Table 1**). Groundwater elevations were monitored in the King well from May 2003 to December 2003, after which monitoring in this well was terminated and therefore not included in this report. Monitoring continues in the remaining wells. None of the wells are currently used for water supply.

3.2.2 Seasonal Fluctuations

Groundwater elevations in all monitored wells display distinct seasonal fluctuations (**Figures 3-6**). In all wells, groundwater elevations increase during the wet winter months reaching their peaks in April after the spring snow melt and decrease during the dry summer months reaching their low in early October before the start of the wet winter months.

Seasonal fluctuations in groundwater elevations result from seasonal cycles in local groundwater recharge. Local recharge in the Lower Moses Coulee is derived from infiltrating precipitation and snow melt within the coulee itself and from infiltrating surface water sources, both of which contribute more recharge during the wet winter and spring months. Surface water sources include Douglas and McCarteney Creeks, which enter the coulee near its upper reaches and loose all their water to the highly permeable alluvial aquifer, except during exceptionally large runoff events when Douglas Creek has been known to flow all the way to the Columbia River.

In general the seasonal fluctuations in groundwater elevations are most pronounced in the shallow alluvial aquifer where recharge lag times are short. Driller's logs indicate that the Linville South and PID wells are completed within the alluvial aquifer. A driller's log is not available for the Biram monitored well; however, based on its depth and a driller's log for Biram's second well 50 feet away, the Biram well is likely completed within the alluvial aqui-

fer. Seasonal fluctuations observed in these wells range from over 11 feet in the Linville South well to about 6 feet in the PID and 5 feet in the Biram well. The larger seasonal fluctuations observed in the Linville South well may be related to heterogeneities within the aquifer, bedrock slope, and/or irrigation withdrawals.

Groundwater elevations in two alluvial aquifer wells (Linville South and PID) displayed a noticeably higher peak for the 2006 water year relative to the previous two years (**Figures 3 and 4**). Peak groundwater elevations were 2 to 3 feet higher in the Linville South well and about 1 foot higher in the PID well. The peak groundwater elevations in the Biram well increased to a much smaller degree (**Figure 5**).

The higher peak for the 2006 water year observed in the alluvial aquifer was not observed in the basalt aquifer. Driller's logs indicate the Linville North well is completed in the basalt aquifer and the seasonal fluctuations have been fairly consistent at 1 to 2 feet each water year (**Figure 6**). The seasonal fluctuations in the basalt aquifer are less pronounced because it is a deeper regional source and, therefore, less influenced by seasonal cycles in local recharge.

3.2.3 Summer Fluctuations

Groundwater elevations in the Linville North, Linville South, and Biram wells also display smaller, shorter time-scale fluctuations during the summer months in addition to the seasonal fluctuations described above. These smaller fluctuations are not observed in the PID well, which is located in the upper reaches of the coulee.

The smaller fluctuations observed during the summer months are likely in response to variable groundwater withdrawal during summer irrigation. The Palisades Irrigation District near Palisades in the upper reaches of the coulee uses surface water from Douglas Creek for irrigation and may explain the lack of summer fluctuations observed in that well.

3.2.4 Long Term Trends

Only three complete water years of monitoring has taken place in the Lower Moses Coulee (2004, 2005, and 2006); therefore, long term trends in groundwater elevations can not be accurately assessed. Groundwater elevations were lowest in the 2005 water year and highest in the 2006 water year, but generally the seasonal fluctuations have been consistent and do not display any long-term trends.

3.3 UPPER MOSES COULEE

Upper Moses Coulee from Jameson Lake to Lower Moses Coulee is approximately 20 miles long and follows McCarteney Creek (**Figure 7**). The surface elevation along the Upper Moses Coulee ranges from 1800 feet msl near Jameson Lake to 850 feet msl near the upper reaches of Lower Moses Coulee.

3.3.1 Monitoring Network

Groundwater elevation monitoring in the Upper Moses Coulee was initiated in the summer of 2004. Initial wells included Bechtol, Mayer, and The Nature Conservancy [TNC] (**Table 1)**. Monitoring of the Bechtol well was terminated in May 2005 and is therefore no longer presented. The data was included in the 2005 Water Year report. Data analysis of the TNC well indicates the transducer has either malfunctioned or is still above the water level and needs to be lowered. Data for the TNC well is therefore not presented.

A new monitoring well was added to the Upper Moses Coulee site in late 2006. The Johnson irrigation well, owned by Pete Muslin and operated by Rod and Russell Peterson, was added in September 2006. The Johnson well is completed in the alluvial aquifer. An aquifer pump test was performed on the Johnson well as part of the Flood Mitigation Assessment (PGG, 2006c). The results of the aquifer test indicated a highly transmissive aquifer (Transmissivity [T] = 1.6 million gallons per day per foot of drawdown gpd/ft). Monitoring of the Johnson well will

provide information on groundwater elevation trends in the alluvial aquifer between Jameson Lake and the Rimrock Meadows area.

Three additional wells are scheduled to be added to the Upper Moses Coulee long term groundwater monitoring program in 2007; the NAAC Rimrock Meadows deep irrigation well, the PK & T domestic well, and the Johncox domestic well (**Figure 7**).

The NAAC Rimrock Meadows irrigation well is a deep basalt aquifer well (738-ft deep). Monitoring of the NAAC deep well will provide information on long term groundwater trends in deeper portions of the basalt aquifer. The PK & T domestic well, owned by Pete Muslin, is completed in the upper most portions of the basalt aquifer near Camel Springs where McCartney Creek first gains water south of Jameson Lake. Monitoring in this location will provide information on groundwater trends and their influence on surface water flow in McCartney Creek.

The Johncox well, completed in the basalt aquifer in the Rimrock Meadows area, was part of the initial long term monitoring program for the Upper Moses Coulee, but obstructions in the well head led to instrumentation problems. Jim Johncox has granted permission for the well head to be modified to accommodate data instrumentation. Modification and instrumentation will take place in 2007.

Continued monitoring in the Upper Moses Coulee area will also provide observations in groundwater elevations for the Rimrock Meadows area, an area within the Upper Moses Coulee which may experience a substantial increase in the number of unregulated exempt water supply wells. An assessment of potential groundwater impacts in the Rimrock Meadows area at full build-out conditions was recently performed as part of the Phase 2 Exempt Well use study. The result of the Rimrock Meadows assessment was summarized in a technical memorandum and is attached in **Appendix A** of this document.

All new and future monitoring wells in the Upper Moses Coulee will be included in subsequent reports. Only data for the Mayer well is presented in this report.

3.3.2 Observations

Groundwater levels in the Mayer well showed a slow decline of about 0.6-ft throughout the 2005 water year, with no apparent seasonal fluctuation; groundwater levels have since recovered by about 0.5-ft during the wet season of 2006 (**Figure 8**). The declining levels during the 2005 water year may have been due to the low precipitation years of 2004 and 2005. The wetter 2006 water year may have brought some recovery back. The small instantaneous drops in groundwater levels in **Figure 8** are in response to pumping in the well.

3.4 JAMESON AND GRIMES LAKE

Jameson and Grimes Lake are contained behind a glacial moraine in the upper most reaches of Moses Coulee (**Figure 9**). Grimes Lake is about 2 miles upgradient of Jameson Lake and approximately 40 feet higher in elevation than Jameson Lake. Discharge to the lakes and the surrounding alluvial aquifer is derived mainly from precipitation, snow melt, runoff from storm events, and upward flow from the underlying basalt aquifer.

Throughout the first part of the 20th century, the lake level in Jameson Lake continued to rise, apparently as a result of agricultural practices in the surrounding watershed. The lake water elevation is now controlled by ditch and culvert structures at the south end of the lake. Details on the historical and current lake water quality can be found in *WRIA 44/50 Water Quality Assessment Jameson and Grimes Lakes* (Pacific Groundwater Group and Water Quality Engineering, 2004) and a more detailed discussion on the hydrogeology of the Jameson Lake area can be found in *WRIA 44/50 Jameson Lake and Moses Coulee Flood Mitigation Hydrogeologic Assessment* (PGG, 2006c).

3.4.1 Monitoring Network

Lake level monitoring in Grimes and Jameson Lake was initiated in May 2004. Lake levels are monitored at the northern end of Jameson Lake and along the southern portion of the western shoreline of Grimes Lake (**Figure 9**). The Grimes lake station was initially located at the southern end of the lake but was relocated to its current position in September 2006 because of freeze and thaw movement at its old location. The transducers are housed in 2" PVC pipes attached to a steel fence post within the lake.

Groundwater level monitoring of the shallow alluvial aquifer was initiated in March 2005 at the Matthiesen Resort (Matthiesen well) adjacent to Jameson Lake (**Figure 9**). Groundwater level monitoring of the deep alluvial aquifer was initiated in late August 2006 with the installation of a deep groundwater monitoring well (PGG-1) on the north end of Jameson Lake (**Figure 9**).

All four monitoring stations were professionally surveyed for their northing (y), easting (x), and elevation (z) positions in September 2006. Hydrographs for all four stations are shown in **Figures 10-13.** The Grimes Lake data was downloaded September 12, 2006; the last two weeks of the 2006 water year will be presented in subsequent reports.

3.4.2 Observations

The water level in Grimes Lake is about 40 ft higher than Jameson Lake throughout the year indicating a hydraulic gradient (slope) of 0.004 ft/ft between the two lakes. Water level elevations of both lakes display similar seasonal fluctuations of about 1.5 to 2.0 feet (**Figures 10 and 11**). Both lakes reach their peak levels by early May and declined to their lows by early October before the start of the wet winter months. Seasonal fluctuations during the 2005 and 2006 water years were fairly similar for both lakes; however, water levels in Jameson Lake were approximately 0.35 feet higher during the 2006 water year compared to the 2005 water year. Both lakes also display greater variability throughout the 2006 water year compared to the 2005 water year (small scale fluctuations of less than 0.5 feet). The slightly higher levels and greater variability are likely due to the wetter 2006 water year. Peak water levels in both lakes are likely dampened by the ditch and culvert control structures at the outlet of Jameson Lake.

Groundwater elevations in the Mattheisen water supply well (**Figure 12**) are closely tied to the Jameson Lake elevation indicating a strong hydraulic connection between the aquifer and the lake in this vicinity. Groundwater elevations in deep monitoring well PGG-1 have been fairly constant since monitoring was initiated in late August 2006 (**Figure 13**). The groundwater elevation in PGG-1 is about 8.5-ft higher than the Jameson Lake level indicating an upward groundwater gradient at the north end of the lake. The upward vertical gradient between PGG-1 and Jameson Lake is 0.05 ft/ft. Continued monitoring will indicate if there are any seasonal or long term trends.

3.5 FOSTER CREEK

Foster Creek drains approximately 660 square miles and lies north of Jameson and Grimes Lake (**Figure 14**).

3.5.1 Monitoring Network

Groundwater monitoring of six wells in the Foster Creek area was initiated in the summer of 2003 (**Table 1**). Three monitored wells, completed within the alluvial aquifer, are located within the valley of Foster Creek (Malone, Henton and Handford) and three monitored wells are located along the uplands above Foster Creek (Hammons, Hemmer, and Hunt); the Hunt and Hemmer wells are completed within the basalt aquifer and the Hammons well is completed within the alluvial aquifer. Upland elevations are approximately 1000 feet higher than the valley.

Hydrographs for all monitored wells are shown in **Figures 15** through **20**. The barometric pressure transducer malfunctioned from December 2004 to February 2005; data values jump sporadically on all hydrographs for this period. The

barometric pressure transducer was subsequently replaced in June of 2005. A data gap for May 2005 occurs on all hydrographs during the time the barometric transducer was removed from the site. The barometric pressure transducer again recorded a few anomalies (zero readings) during the months of December 2005 and January 2006, but appears to have resumed its functionality after January 2006. The functionality of the barometer will be investigated in during the spring 2007 download.

The following data gaps occur in the Hunt, Handford and Hammons wells:

- The transducer in the Hunt monitoring well malfunctioned and was subsequently replaced between April 2004 and June 2005.
- October 2005 to May 2006 data from the Handford well was inadvertently overwritten during the May 2006 download. The logger was removed to attempt data retrieval but was unsuccessful. The logger was subsequently replaced in late June 2006.
- Data from the Hammons well from June 2006 to October 2006 is unreliable because the recorded data was off by about 2-ft from the hand measured data and could therefore not be correlated to groundwater elevations.

3.5.2 Valley Observations

Groundwater elevations in monitored wells within the Foster Creek valley display variable amounts of seasonal fluctuations. Fluctuations range from about 1 foot in the Malone well to over 3 feet in the Henton well (**Figures 15, 16 and 17**). Groundwater elevations in the Henton and Hanford wells begin to rise in September reaching their peak in February or March and then gradually decline reaching their low in August. In comparison, the seasonal peaks and lows in the Malone well occur about two months later.

The 2006 peak groundwater elevation is slightly higher by about 0.5 feet in the Malone well compared to 2004 and 2005. The 2006 peak groundwater elevation in the Henton well is also higher by about 0.75 feet compared to 2005 but is similar to 2004; however, water level changes in the Henton well are harder to discern because of frequent pumping. Data for the 2006 peak groundwater elevation in the Handford is not available.

The seasonal fluctuations in the valley monitored wells result from cycles in local recharge derived from infiltrating precipitation, snow melt, and storm runoff. The higher 2006 peak groundwater elevations are likely due to the wetter 2006 water year.

3.5.3 Upland Observations

Trends in groundwater elevations along the upland wells are variable. Within the Hammons well, seasonal fluctuations of about 3 feet were observed during the 2004 and 2005 water years reaching its lowest observed level during the fall of 2005 (**Figure 18**). Water levels then increased over 6 feet during the spring 2006 season. Water levels also increased over 4 feet during the spring 2006 season in the Hunt well. Unlike the monitored wells in the Foster Creek valley, the groundwater elevations in the Hammons and Hunt wells increase rapidly in the early spring, likely in response to snow melt, and then gradually decline during the summer and fall before leveling off during the winter months. Rapid changes in groundwater elevations are common in uplands which are typically considered recharge areas for aquifer systems.

In contrast to the Hammons and Hunt well, groundwater elevations in the Hemmer well had been in decline at a rate of about 1 foot-per-year during the 2004 and 2005 water years but recovered about 1.5 feet during the spring 2006 season (**Figure 20**). This change in trend observed in the Hemmer well is similar to what was observed in the Mayer well in the Upper Moses Coulee (**Figure 8**).

3.6 CHELAN HILLS / CHELAN SPRINGS

Chelan Hills and Chelan Springs were incorporated into the long term groundwater monitoring program in 2006. The sites are located about 30 miles north of Wenatchee along the Columbia River near Chelan Falls (**Figure 1**). Chelan Springs is a 6,731 acre area in the McNeil Canyon area and Chelan Hills is a 7,637 acre area immediately south and adjacent to the Chelan Springs (**Figure 21**). Both sites occur along the eastern slopes of the Columbia River valley. Many springs emanate within the study area indicating a groundwater discharge area fed by more than water recharging directly within it; likely from upland recharge. Both areas have experienced relatively consistent growth since 1988.

3.6.1 Monitoring Network

Four domestic wells were instrumented with pressure transducers in the Chelan Hills and Chelan Springs area in 2006. In the Chelan Hills area, the Luce and Sandum wells were instrumented on May 9, 2006. In the Chelan Springs area, the Nystrom well was instrumented on May 9, 2006 and the Cocoran well was instrumented on November 8, 2006 (**Table 1**). All wells except the Luce well are completed in fractured granite. The Luce well is completed in the basalt aquifer. Data from the Corcoran well will not be reported until the 2007 water year report.

3.6.2 Observations

Data collected from the Sandum well indicates water levels fail to recover to static conditions between pumping periods. As a result, water levels measured in the Sandum well do not reflect ambient groundwater levels in the aquifer. Data collected from the Sandum well is therefore not reported and monitoring has been discontinued.

Data collected from the Luce and Nystrom wells are unreliable because of logger malfunction and therefore not presented. The new data loggers were apparently programmed with faulty software provided by the manufacturer and will need to be reprogrammed. Field mobilization to reprogram the data loggers (including the Corcoran well) will occur during the scheduled spring 2007 download.

3.7 BADGER MOUNTAIN

Badger Mountain was incorporated into the long term groundwater monitoring program in 2006. The site is located northeast of East Wenatchee, between East Wenatchee and Waterville (**Figure 1**). Badger Mountain is located on a local topographic high and therefore has no up-gradient recharge area. As such, it may be susceptible to groundwater declines if development of the area continues.

3.7.1 Monitoring Network

Four domestic wells were instrumented with pressure transducers at the Badger Mountain site on May 9, 2006: the Murray, Mouton, Robbins and Wilcox wells (**Figure 22** and **Table 1**). The Murray, Moulton, and Robins wells are currently used for domestic water supply. The Wilcox well is a domestic water supply well currently unused. All wells are completed within the basalt aquifer.

3.7.2 Observations

Data collected from all Badger Mountain wells are unreliable because of logger malfunction and therefore not presented. As with the Chelan Hills and Chelan Springs monitored wells, the new data loggers were apparently programmed with faulty software provided by the manufacturer and will also need reprogramming. Field mobilization to reprogram the data loggers will occur during the scheduled spring 2007 download.

4.0 REFERENCES

Douglas County Watershed Planning Associations, 2004. *Watershed Management Plan,*

Moses Coulee and Foster Creek Watershed, WRIA 44&50

Pacific Groundwater Group, 2003a. *WRIA 44/50 Final Phase 2 Basin Assessment April 2003.* Prepared for Foster Creek Conservation District.

Pacific Groundwater Group, 2003b. *WRIA 44/50 Foster Creek and Lower Moses Coulee Level 2 Hydrogeologic Assessment September 2003 Draft.* Prepared for Foster Creek Conservation District.

Pacific Groundwater Group and Water Quality Engineering, 2004. *WRIA 44/50 Water Quality Assessment Jameson and Grimes Lakes.* Prepared for Foster Creek Conservation District.

Pacific Groundwater Group, 2006a. *WRIA 44/50 Exempt Well Water Use Study.* Prepared for Foster Creek Conservation District

Pacific Groundwater Group, 2006b. *WRIA 44/50 Groundwater Elevation Monitoring Report Exempt Well Water Use Phase 2.* Prepared for Foster Creek Conservation District.

Pacific Groundwater Group, 2006c. *Jameson Lake and Moses Coulee Flood Mitigation Hydrogeologic Assessment Review Draft.* Prepared for Foster Creek Conservation District.

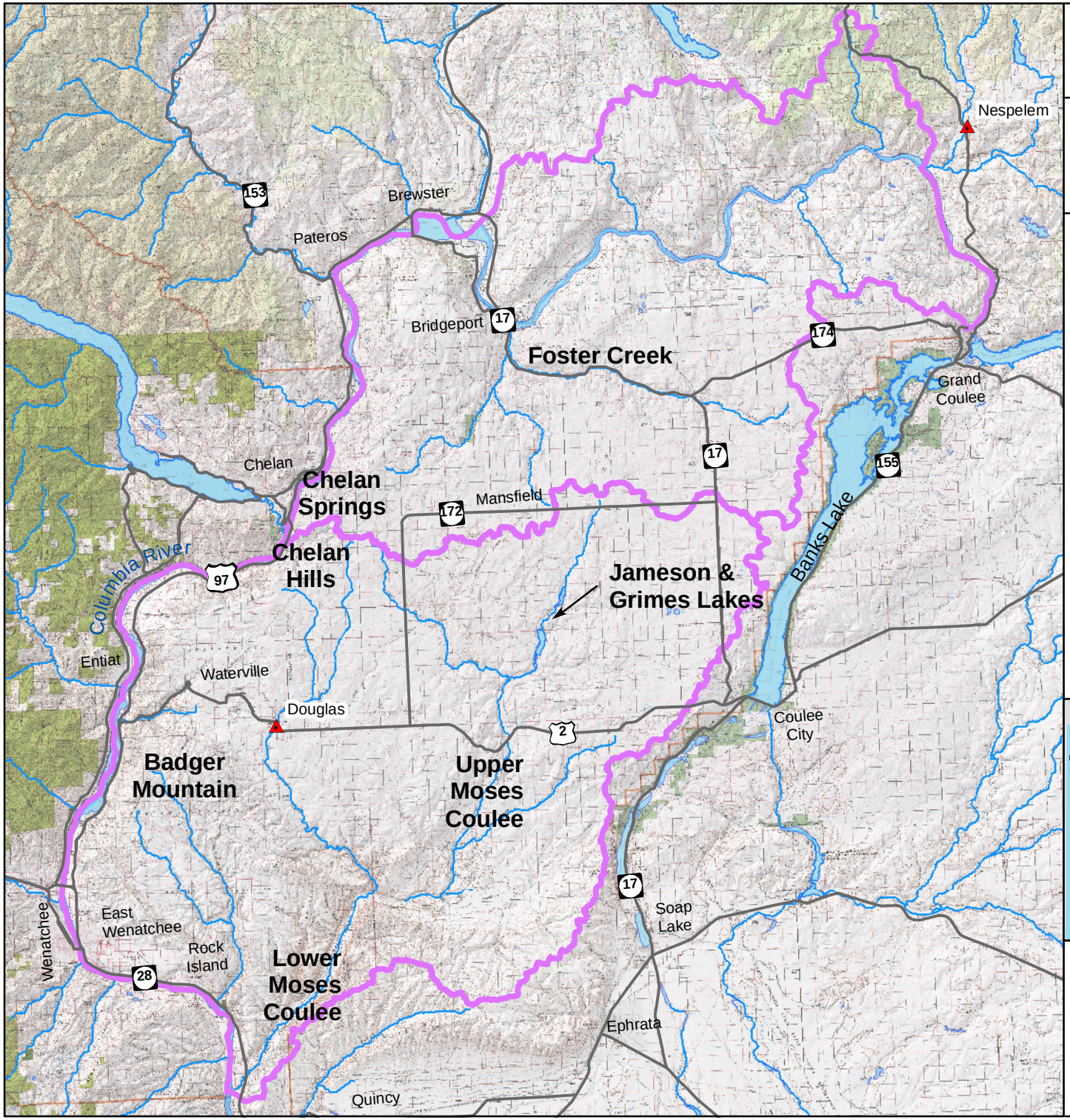
Pacific Groundwater Group, 2007. *WRIA 44/50 Rimrock Basin Assessment.* Technical Memorandum prepared for Foster Creek Conservation District.

TABLE 1: Groundwater and Surface Water Monitoring Sites (WRIA 44/50)

Site	Monitoring ID	Well Use	MP Elevation[1] (ft)	Aquifer	Well Depth (feet)	Start of Data Collection
Lower Moses Coulee	Biram	Unused	920.3	Alluvial	135	5/6/2003
Lower Moses Coulee	Linville N	Unused	906.5	Basalt	240	5/6/2003
Lower Moses Coulee	Linville S	Unused	849.0	Alluvial	251	6/25/2003
Lower Moses Coulee	PID	Unused	1029.4	Alluvial	160	5/7/2003
Lower Moses Coulee	King (discontinued 12/3/03)	Unused	981.7	Basalt	139	5/6/2003
Upper Moses Coulee	Mayer	Domestic	1569	Basalt	80	8/10/2004
Upper Moses Coulee	TNC	Unused	1888	Basalt	705	2/9/2005
Upper Moses Coulee	Johnson (aka Peterson)	Irrigation	1554	Alluvial	191	9/19/2006
Upper Moses Coulee	Bechtol (discontinued 5/31/05)	Livestock	2050	Unknown	>195	8/10/2004
Jameson Lake	Matthiesen	Domestic	1800.86	Alluvial	41	3/2/2005
Jameson Lake	PGG-1	Monitoring Well	1805.41	Alluvial	152	8/31/2006
Jameson Lake	Jameson Lake	NA	1797.71	NA	NA	4/28/2004
Jameson Lake	Grimes Lake	NA	1837.57	NA	NA	4/28/2004
Foster Creek	Hammons	Unused	2126	Alluvial	57	7/9/2003
Foster Creek	Handford	Unused	896	Alluvial	45	7/9/2003
Foster Creek	Hemmer	Livestock	2178	Basalt	200	7/9/2003
Foster Creek	Henton	Irrigation	971	Alluvial	90	7/9/2003
Foster Creek	Hunt	Old Domestic	2087	Basalt	290	8/5/2003
Foster Creek	Malone	Unused	1663	Alluvial	64	7/9/2003
Chelan Hills-Chelan Springs	Nystrom	Domestic	2247	Granite	205	5/9/2006
Chelan Hills-Chelan Springs	Corcoran	Domestic	1978	Granite	165	11/8/2006
Chelan Hills-Chelan Springs	Luce	Domestic	1913	Basalt	59	5/9/2006
Chelan Hills-Chelan Springs	Sandum (discontinued 10/20/06)	Domestic	967	Granite	485	5/9/2006
Badger Mountain	Wilcox	Unused	4053	Basalt	210	5/9/2006
Badger Mountain	Murray	Domestic	3659	Basalt	140	5/9/2006
Badger Mountain	Moulton	Domestic	3881	Basalt	299	5/10/2006
Badger Mountain	Robins	Domestic	4078	Basalt	125	5/11/2006

NA = Not Applicable
NM = Not Measured

[1] Measuring Point Elevations (execpt Jameson Lake Area) survyed with GPS hand held reciever (vertical accuracy estimated to be +/- 10-ft).
Jameson Lake Stations professionally surveys (vertical accuracy +/- 0.10-ft)
Grimes Lake Station Moved in Sept. 2006 (elevation in table is for new station site)
Datum: NAVD88

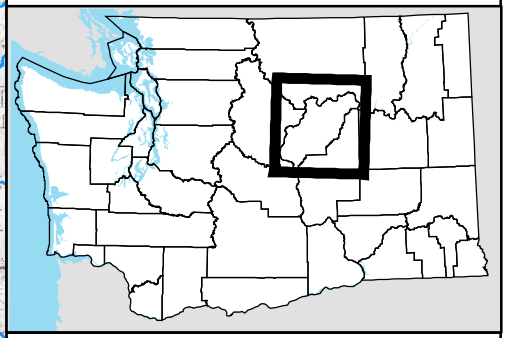


WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

FIGURE 1

Monitoring Sites

- Preciptation RAW Stations
- WRIAs 44 & 50 Boundaries
- Lakes
- State Routes
- County Line
- Rivers & Streams



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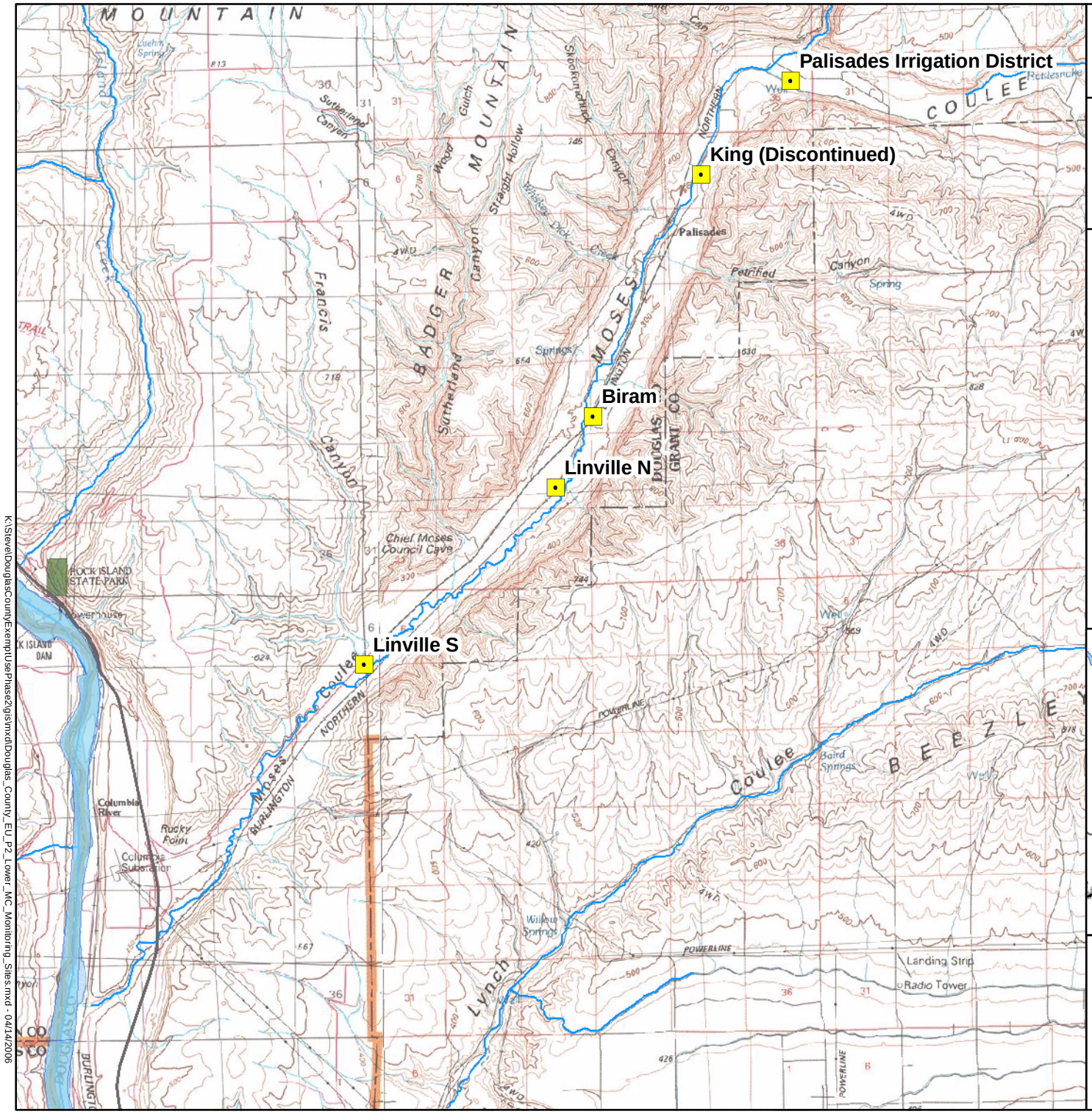
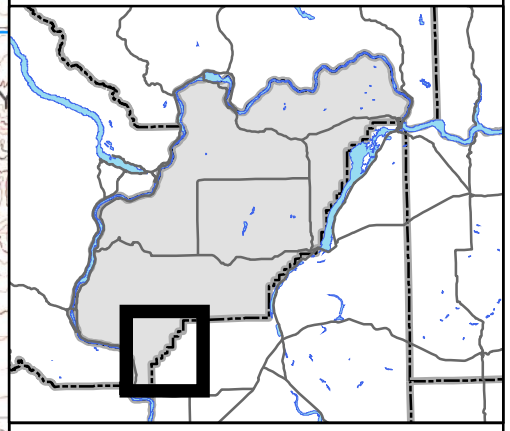


WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

FIGURE 2

Lower Moses Coulee Monitoring Sites

Groundwater Level Monitored Well



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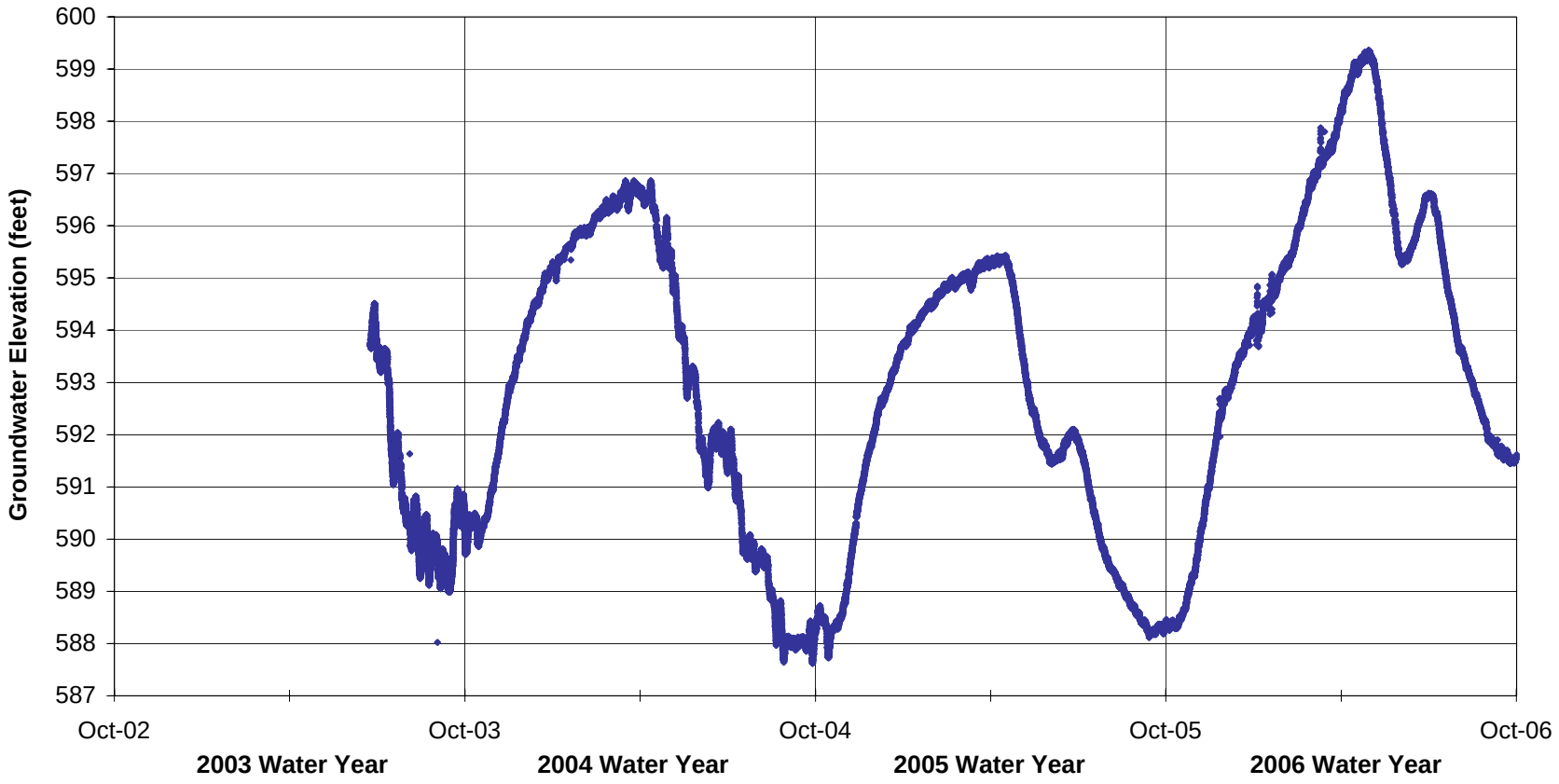

Figure 3
Linville South Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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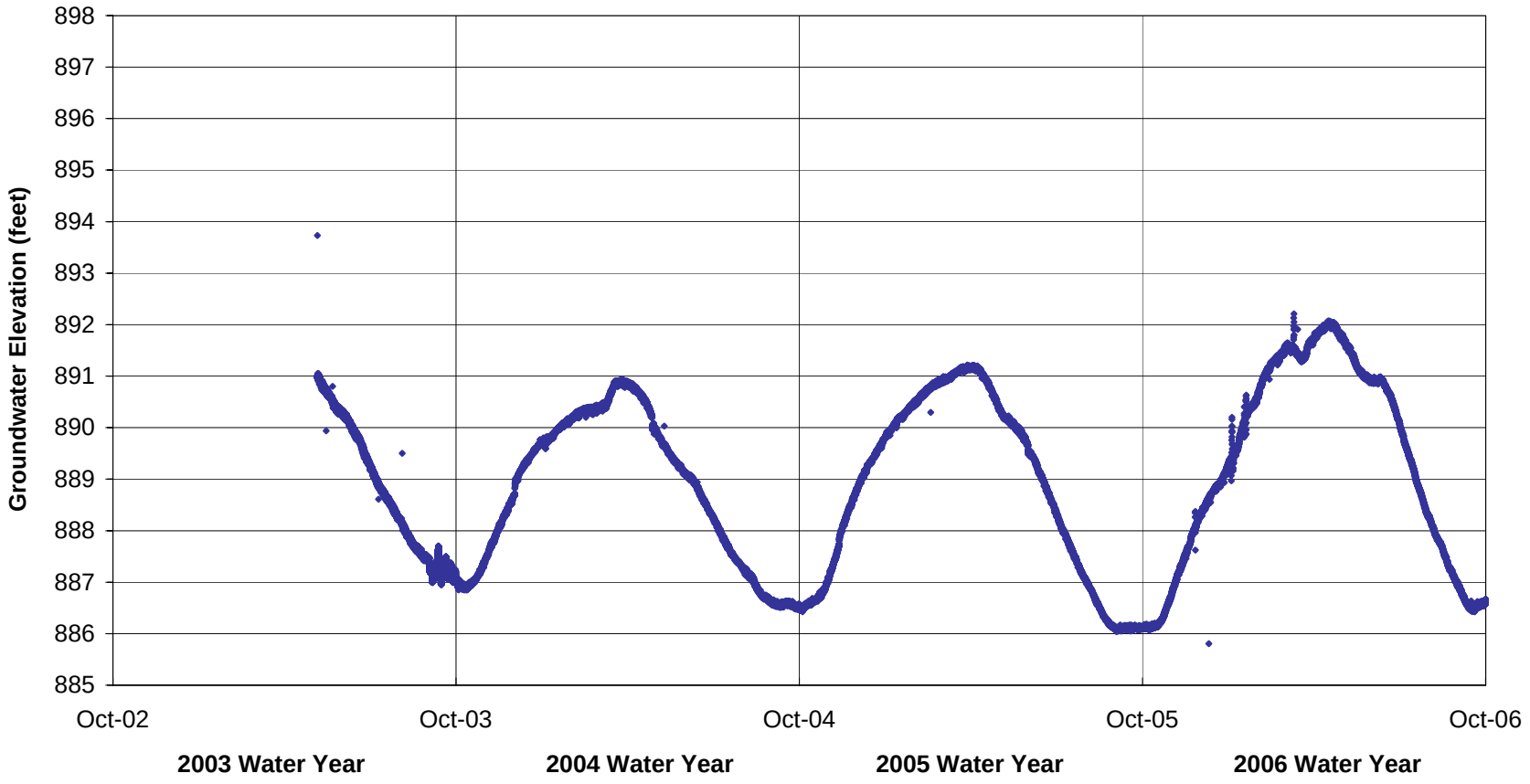

Figure 4
Palisades Irrigation District Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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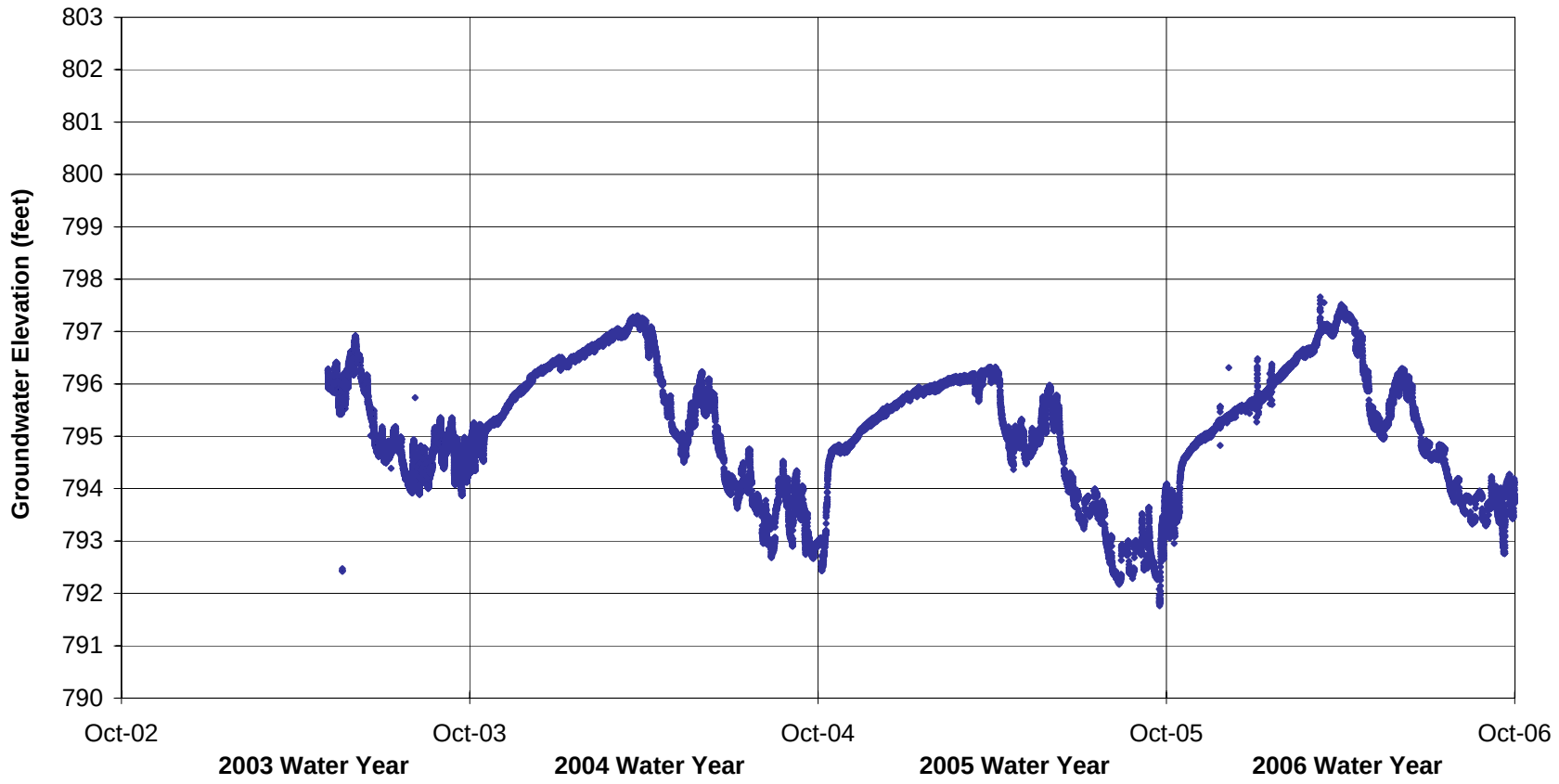

Figure 5
Biram Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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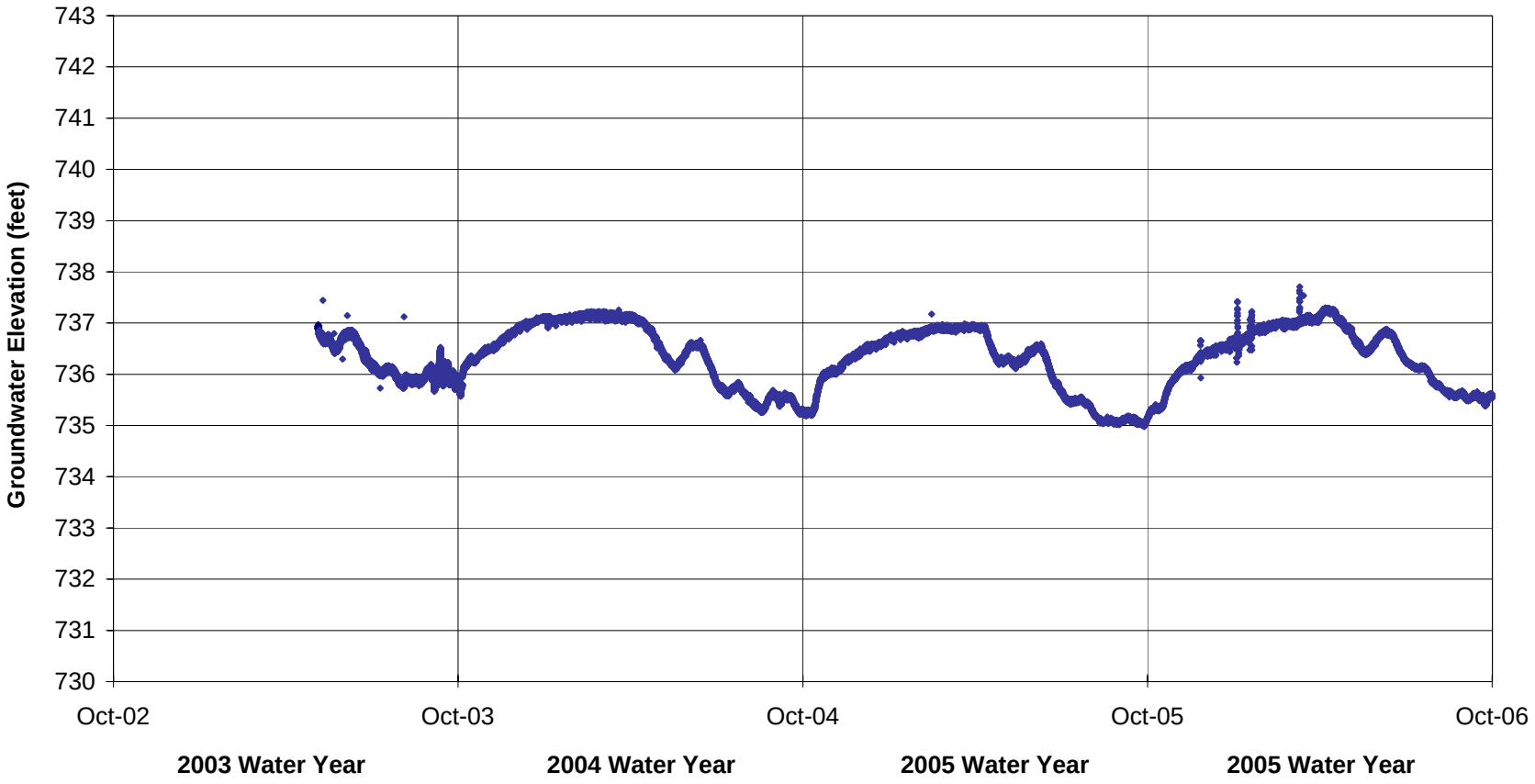

Figure 6
Linville North Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

FIGURE 7

Upper Moses Coulee Monitoring Sites

Bechtol (Discontinued)

TNC

Johnston (New)

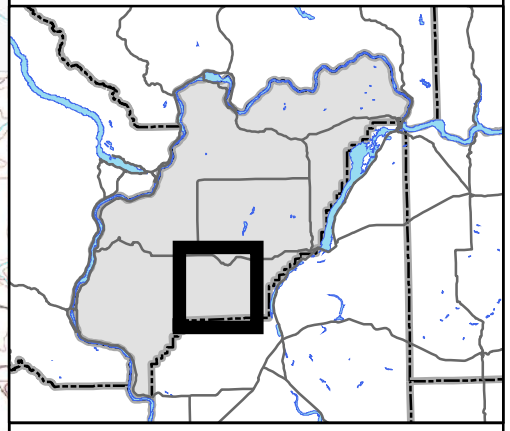
PK & T (Future)

NAAC-Deep (Future)

Johncox (Future)

Mayer

Groundwater Level Monitored Well



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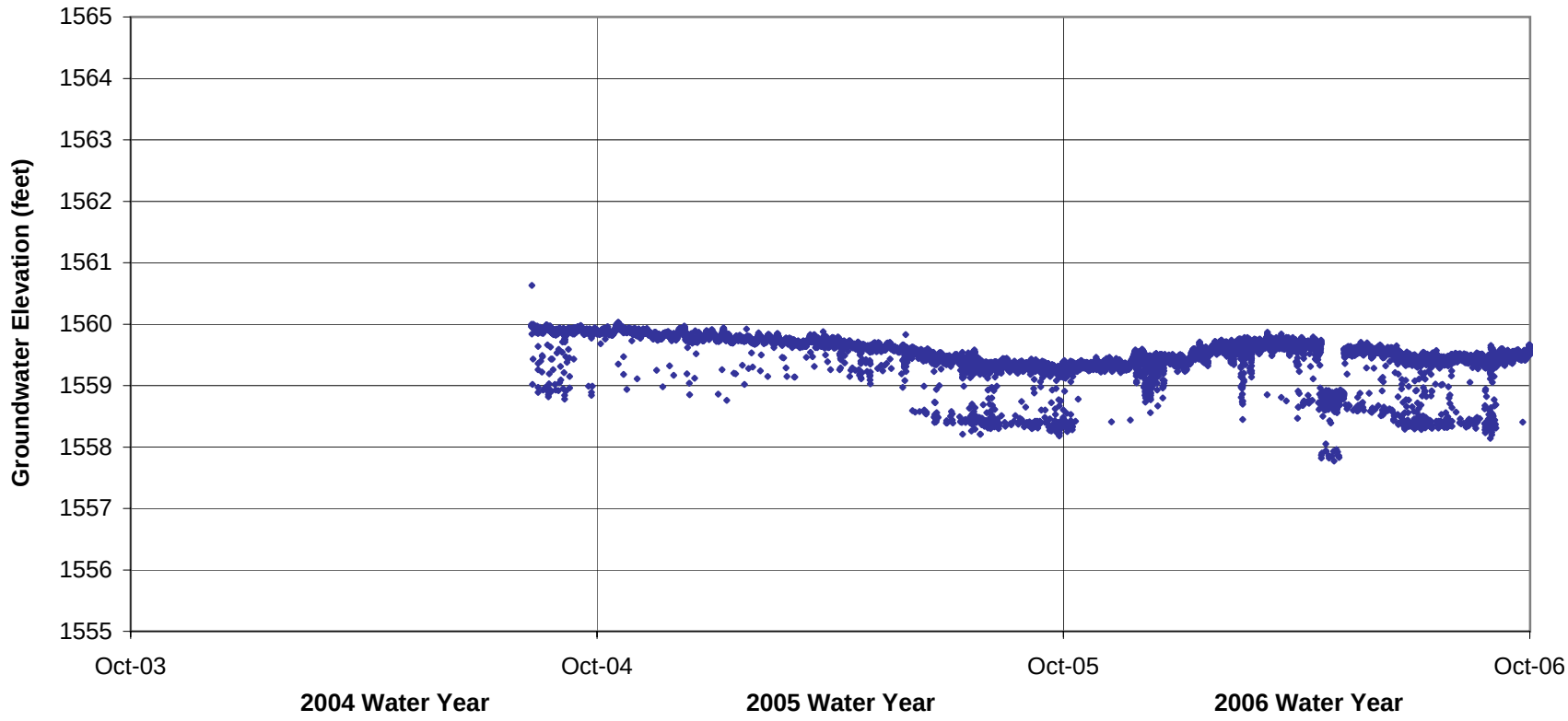

Figure 8
Mayer Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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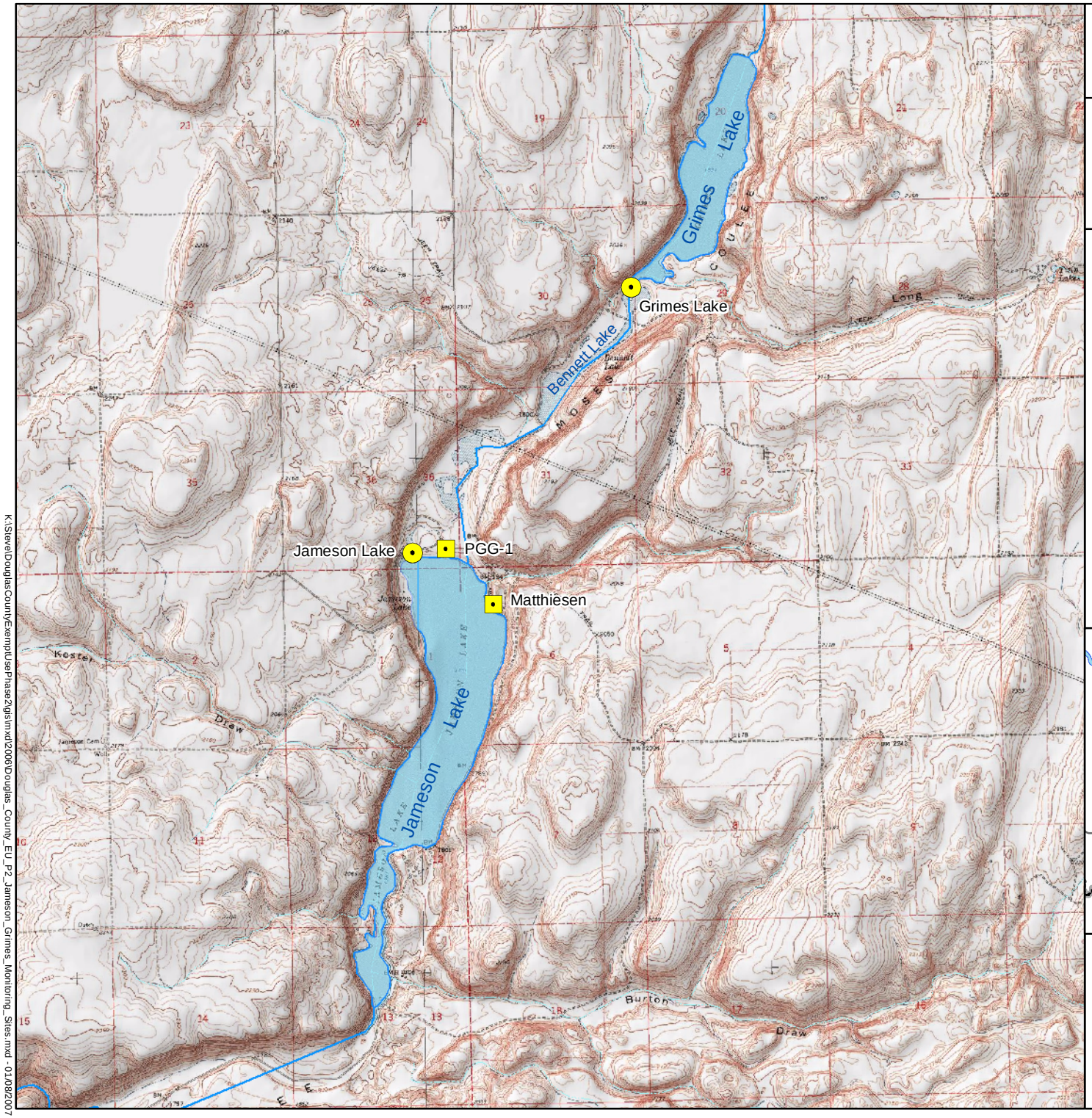


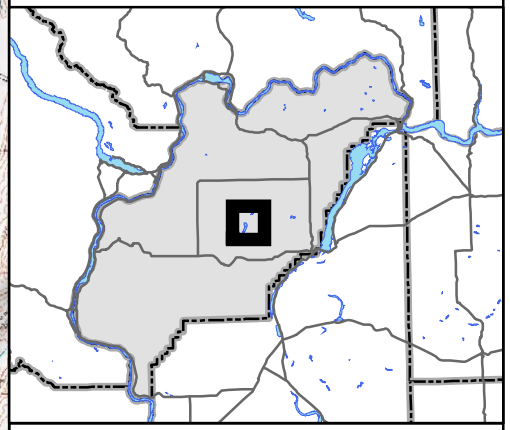
WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

FIGURE 9

Jameson & Grimes Lake Monitoring Sites

Surface Water Level Monitoring Station

Groundwater Level Monitored Well



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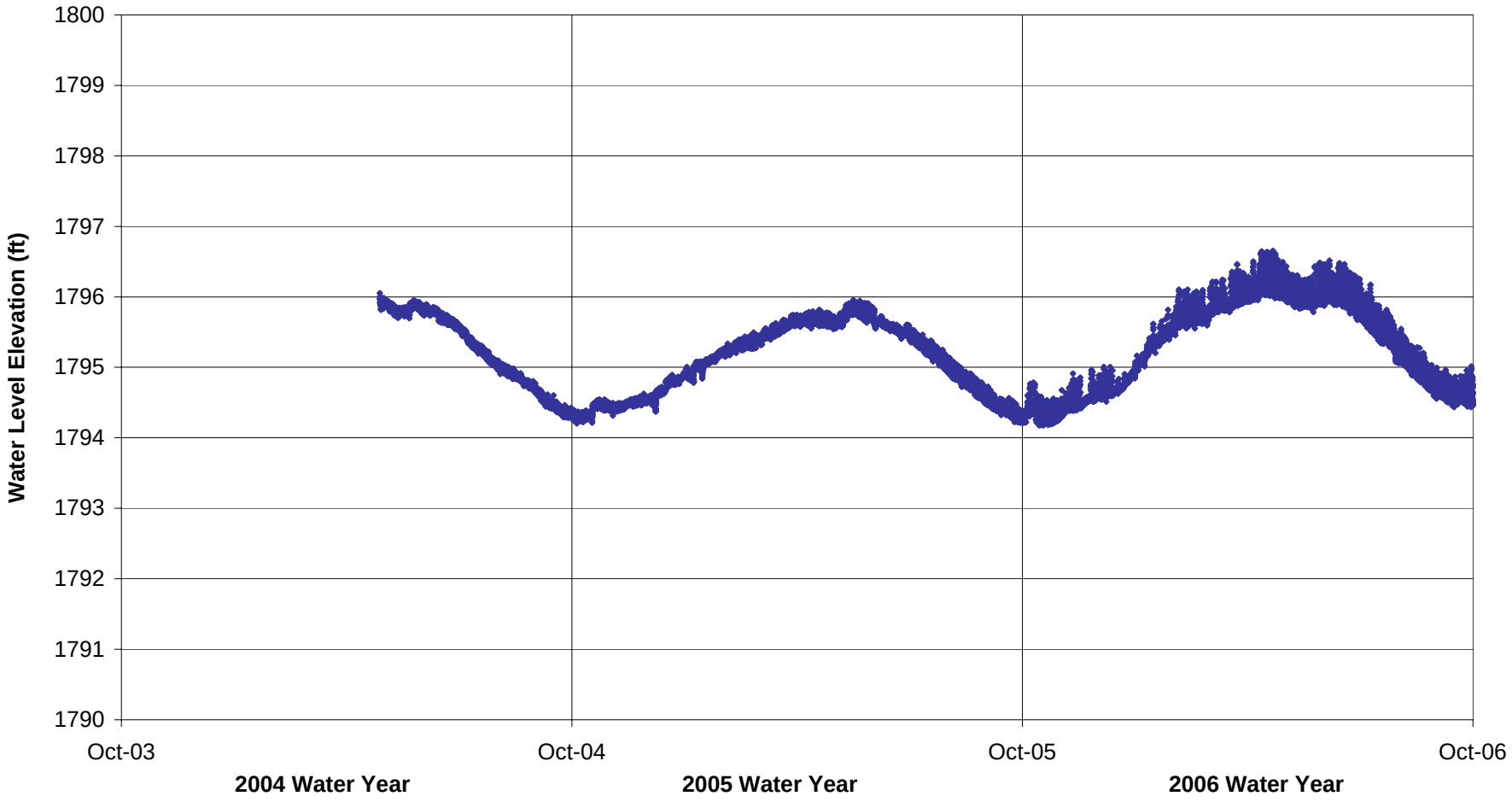

Figure 10
Jameson Lake Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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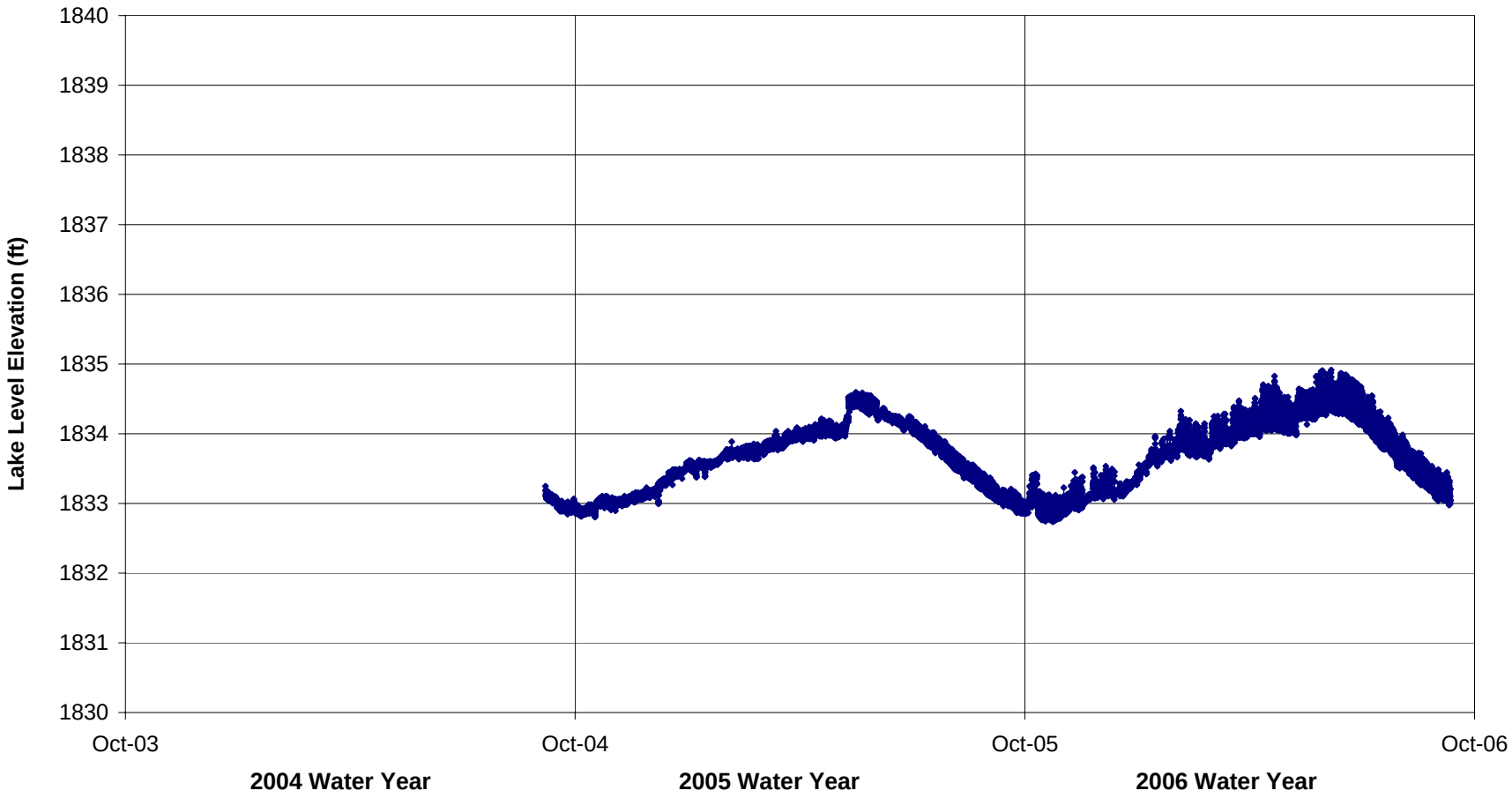

History of Grimes Station:

Originally 7.87' below Bench Mark (BM) = 1836.6
Spring 05 moved up 0.25 (7.62' below BM) = 1836.9
Spring 06 moved up anoth 0.47' (7.15' below BM) = 1837.4
Station Moved 9/12/06 to new location where less ice expected.

Figure 11
Grimes Lake Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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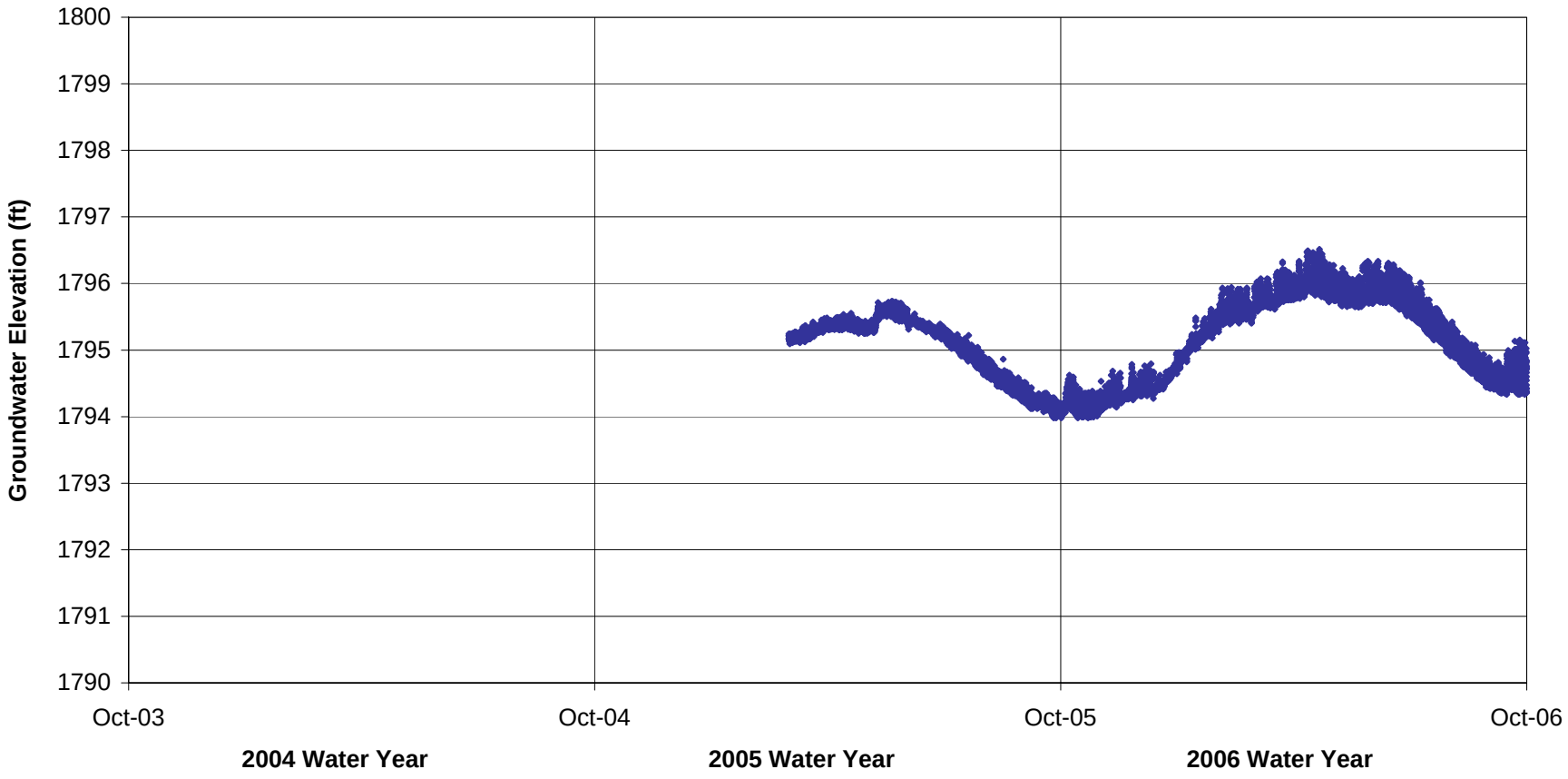

Figure 12
Mathiesen Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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Figure 13
PGG-1 Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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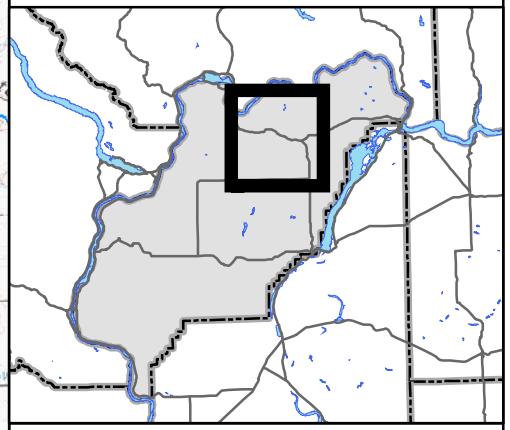
WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

FIGURE 14

Foster Creek Monitoring Sites

Groundwater Level Monitored Well



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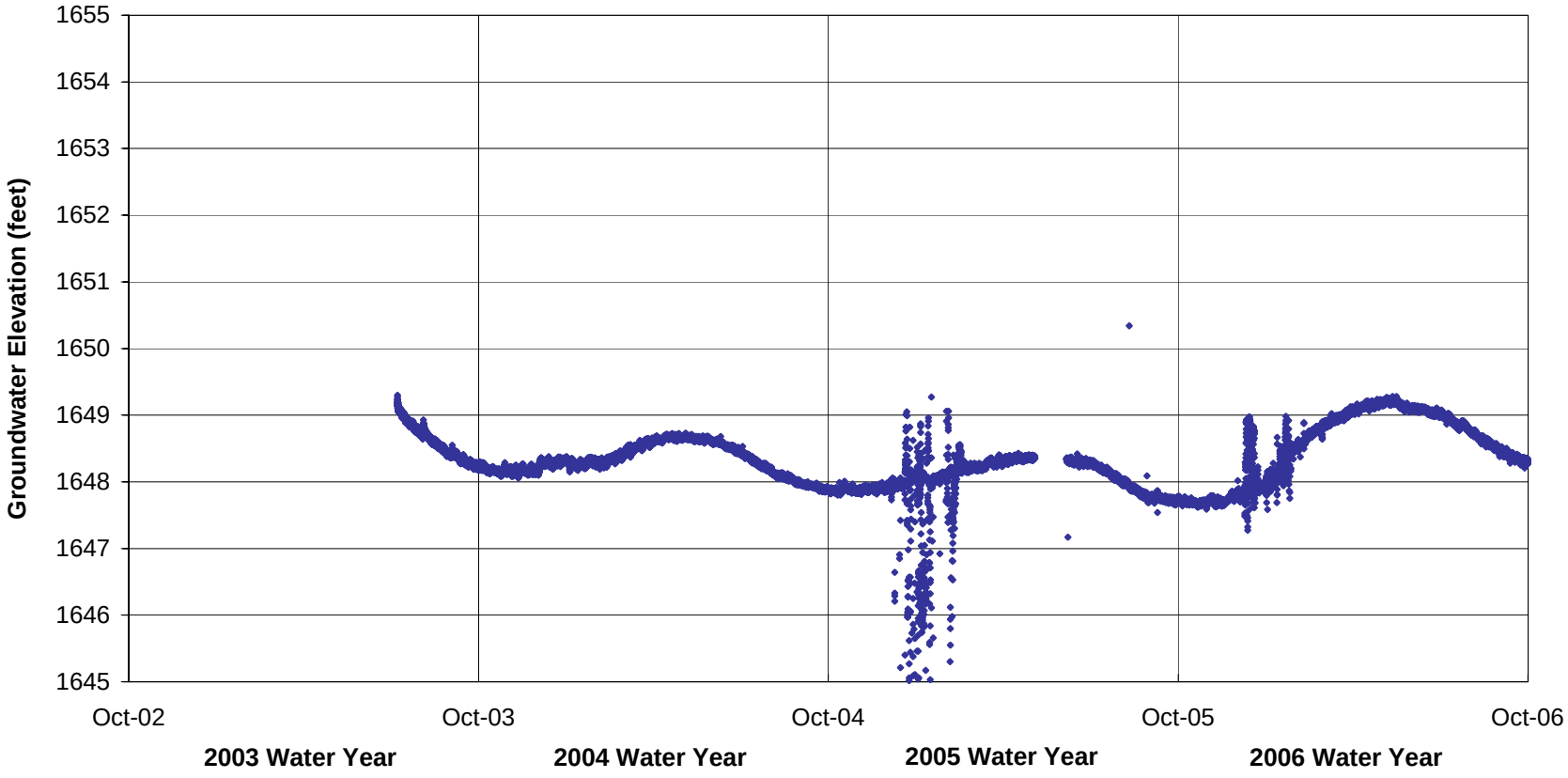

Jumps in data related to barometer malfunction.

Figure 15
Malone Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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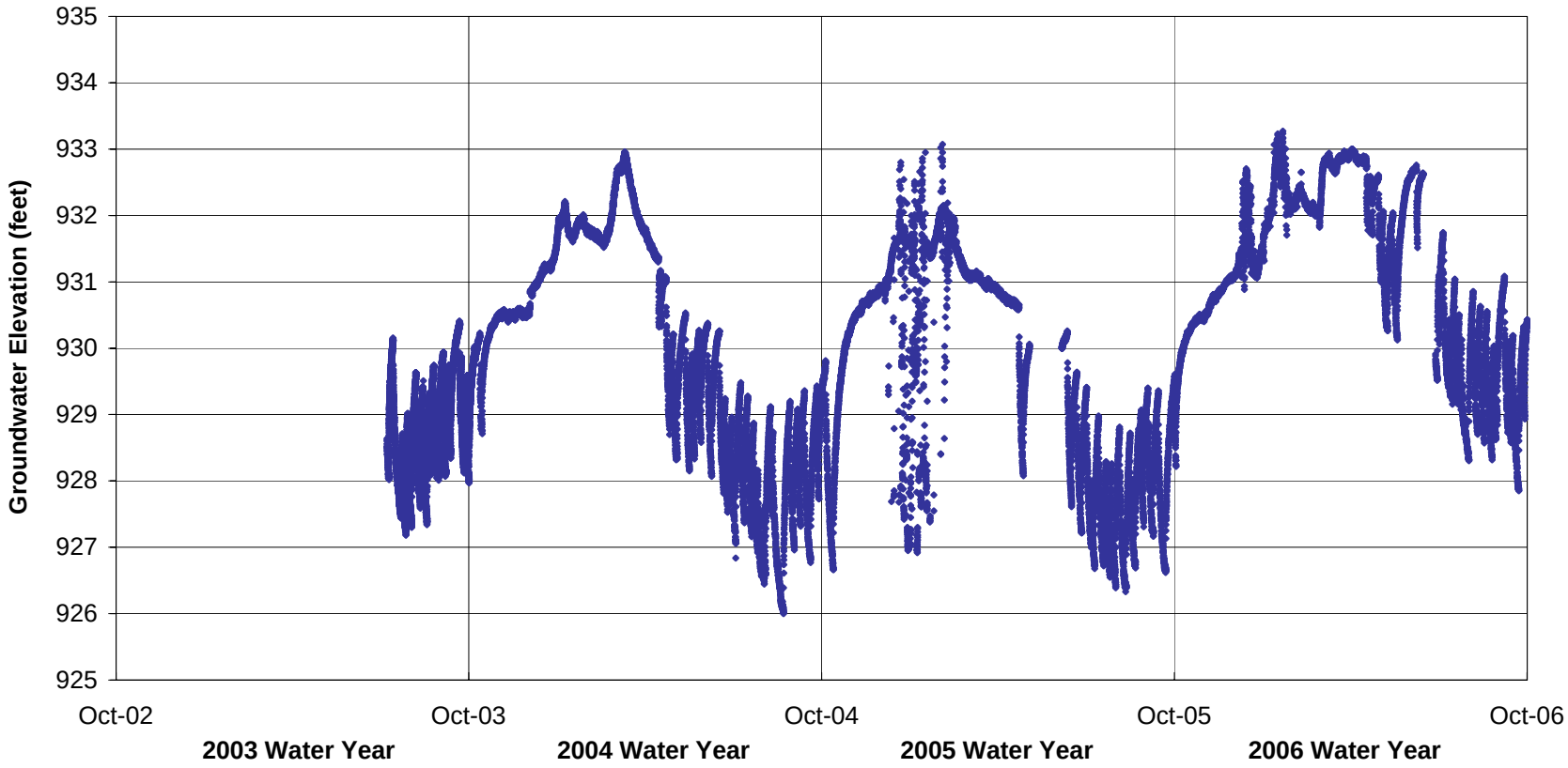

Jumps between 12/04 and 2/05 due to the barometer logger malfunctioning.
Small gap in data (5/4/05 to 6/10/05) while logger was replaced.
Possible logger malfunction 6/15/06 to 6/28/06 (data not included)

Summer fluctuations due to pumping of monitored well

Figure 16
Henton Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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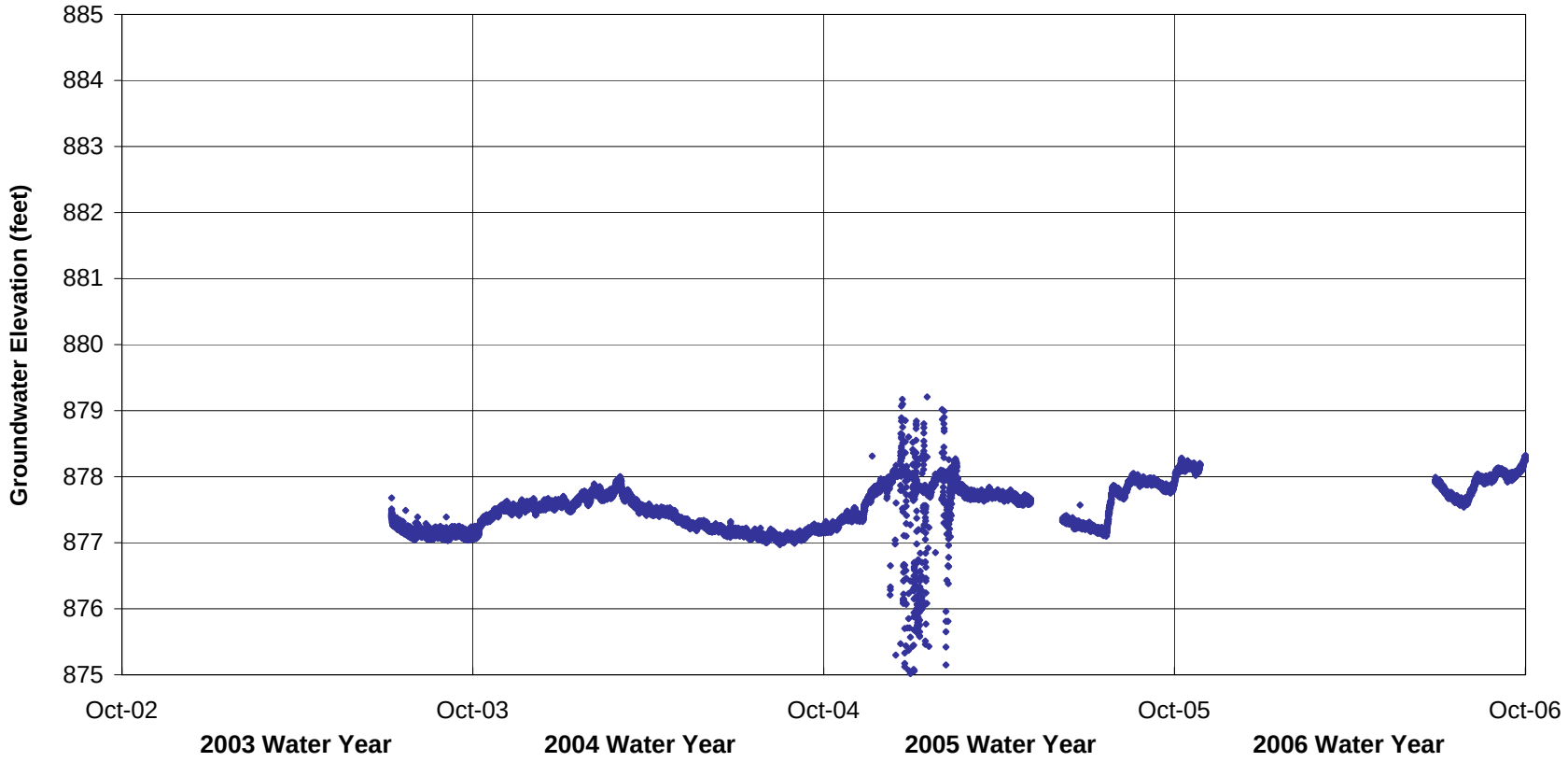

Jumps between 12/04 and 2/05 due to the barometer logger malfunctioning.
Small gap in data (5/4/05 to 6/10/05) while logger was replaced.
Data collected June 06 to Oct. 06 lost.

Figure 17
Handford Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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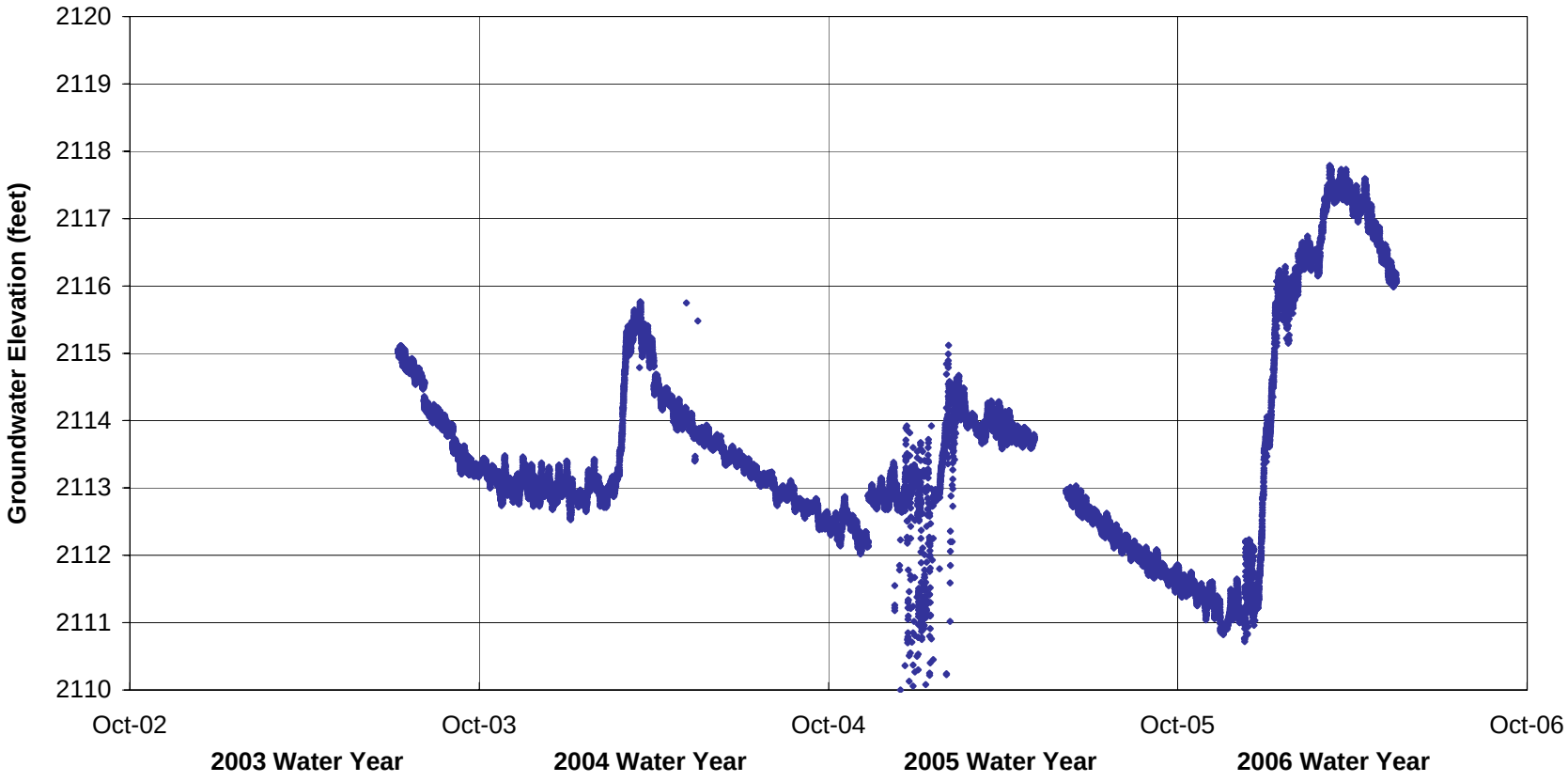

Jumps between 12/04 and 2/05 due to the barometer logger malfunctioning.
Small gap in data (5/4/05 to 6/10/05) while logger was replaced.
This well has no pump in it.
Data collected June 22, 2006 to October 1, 2006 unreliable.

Figure 18
Hammons Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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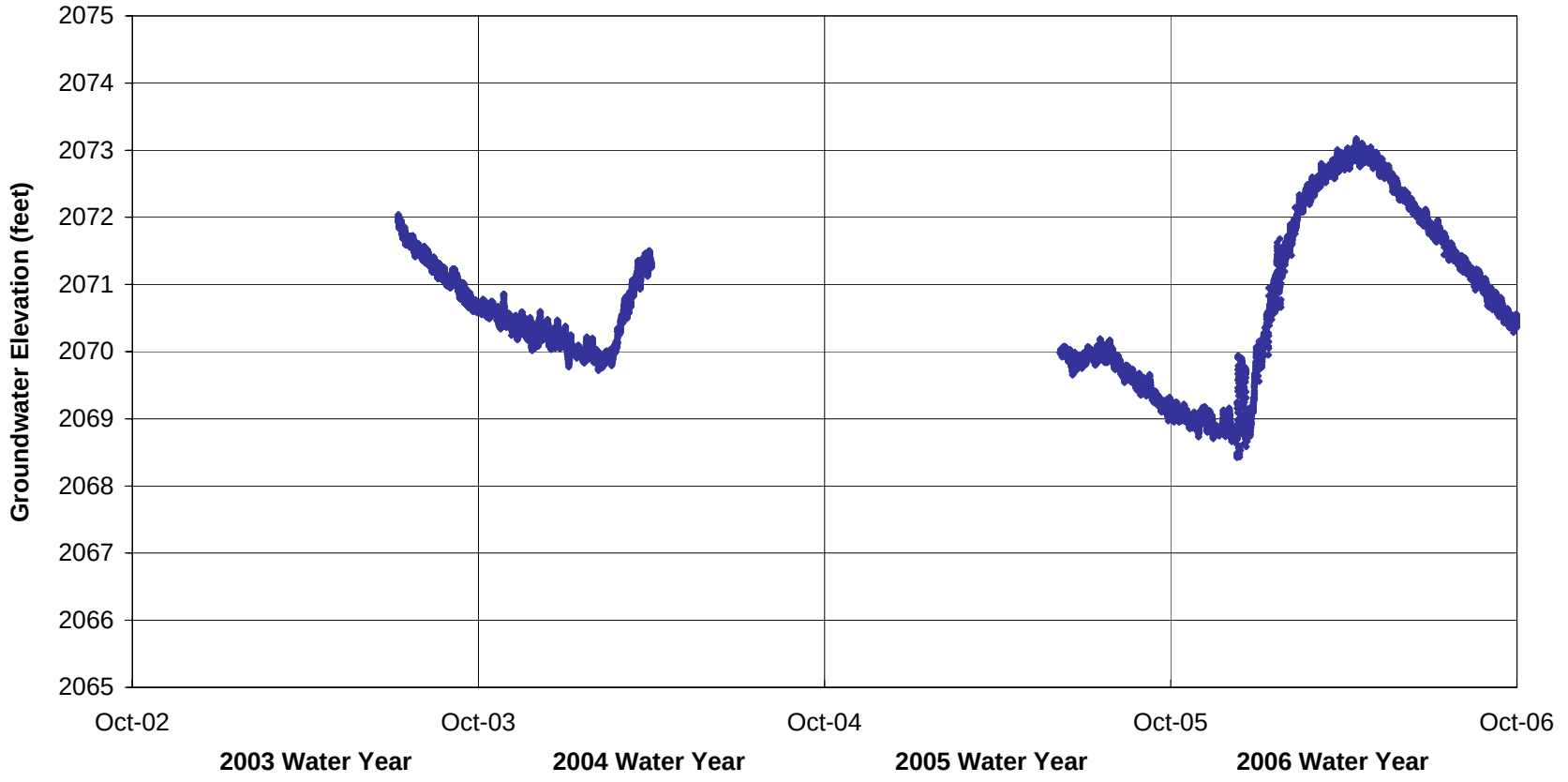

Data from April 2004 to June 2005 is unreliable because of logger malfunction and is therefore not displayed. The logger was replaced in June 2005.

Figure 19
Hunt Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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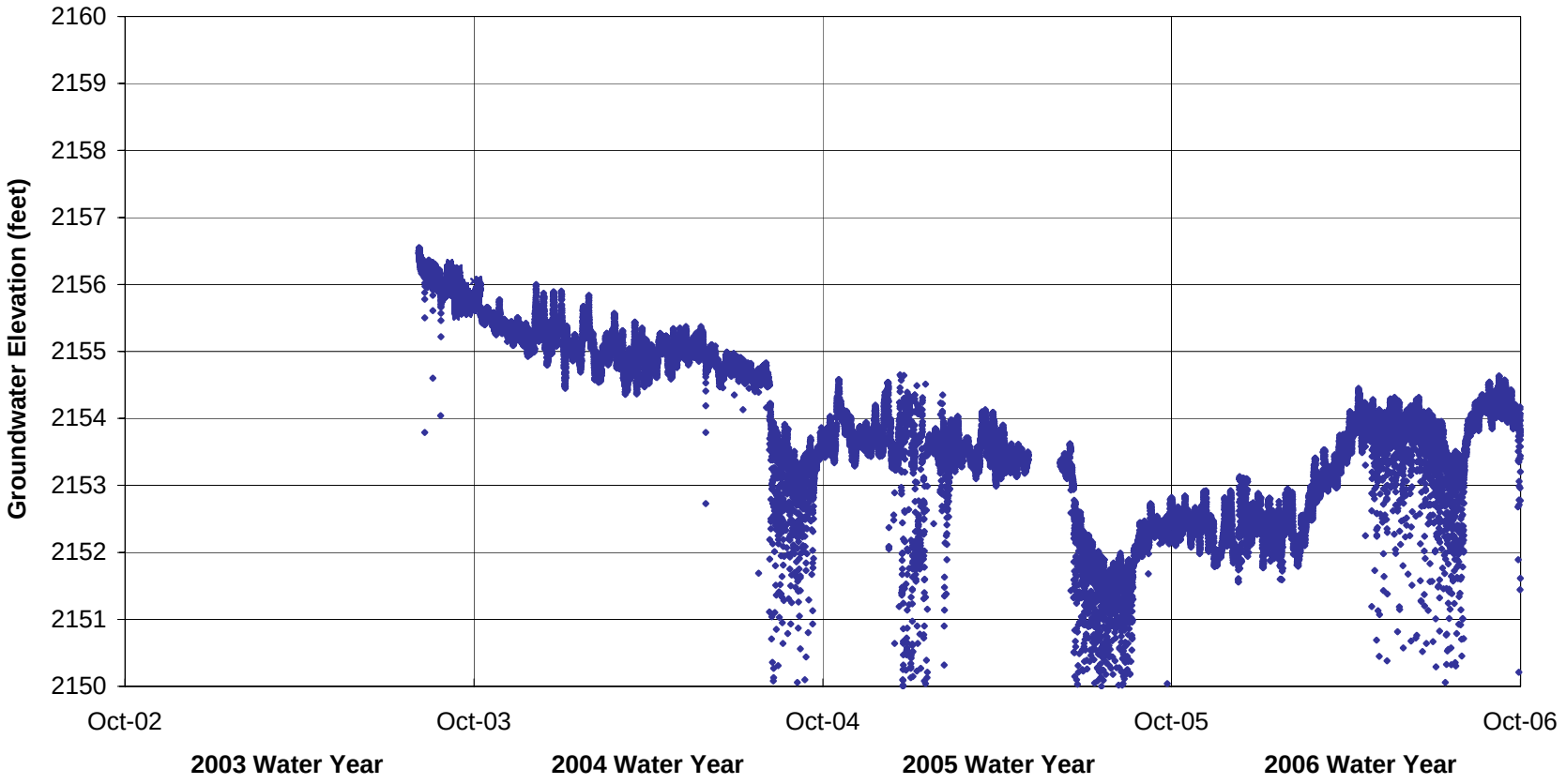

Jumps between 12/04 and 2/05 due to the barometer logger malfunctioning. Small gap in data (5/4/05 to 6/10/05) while logger was replaced.

Late summer declines due to pumping of monitored well.

Figure 20
Hemmer Well Hydrograph

WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

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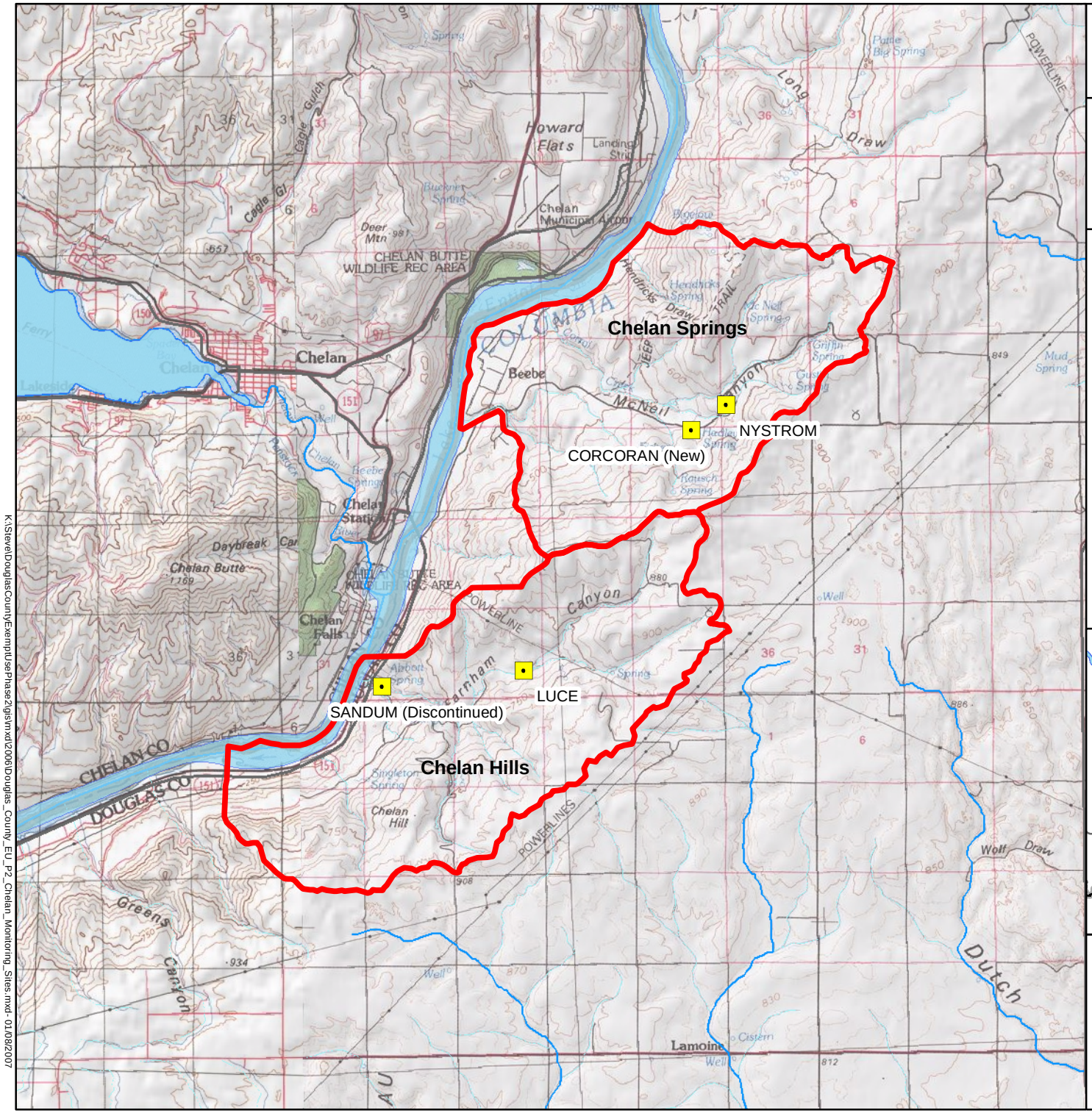
WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

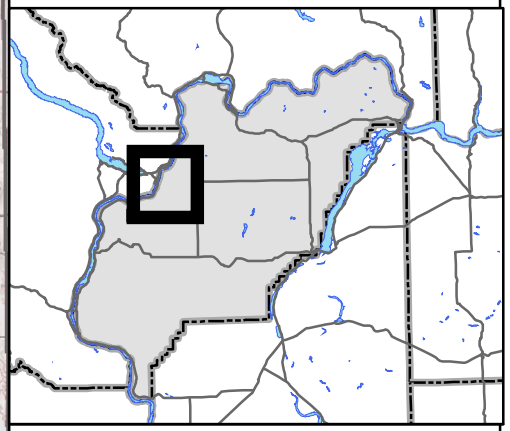
FIGURE 21

Chelan Hills and Chelan Springs Monitoring Sites



Groundwater Level Monitored Well

Project Boundaries



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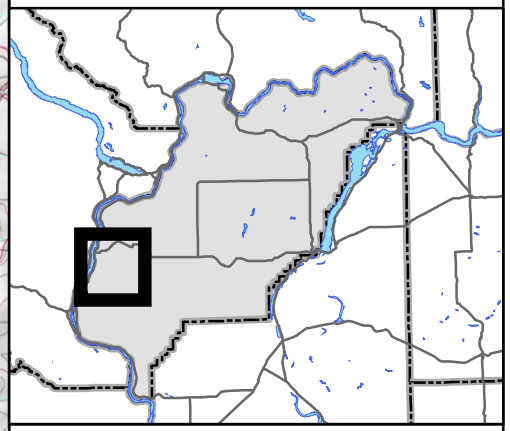
WRIA 44/50
Groundwater Elevation Monitoring
Exempt Well Water Use Phase 2

FIGURE 22

Badger Mountain Monitoring Sites

Groundwater Level Monitored Well



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APPENDIX A
WRIA 44/50 RIMROCK BASIN ASSESSMENT

Technical Memorandum

To:	Foster Creek Conservation District
From:	Steve Swope (Pacific Groundwater Group)
Re:	Rimrock Meadows Groundwater Assessment (Exempt Well Use Phase 2)
Date:	February 19, 2007

There is concern that increases in exempt well use in the Rimrock Meadows area of central Douglas County may lead to aquifer depletion and significant declines in groundwater elevations. Groundwater elevation declines in the Rimrock Meadows area could impact existing domestic wells, reduce discharge to springs in McCartney Creek, and eventually reduce groundwater elevations in the Lower Moses Coulee. To address these concerns, an assessment of aquifer response to pumpage at full build-out conditions was performed. This assessment uses a computer model to simulate pumpage effects at full build-out conditions assuming year-round residency. These conditions represent a worse-case scenario.

An aquifer test was also performed on an existing domestic well in the Rimrock Meadows area to evaluate aquifer properties and response to pumping.

The results of the model simulation indicate that, at full build-out conditions, groundwater elevations may decline by about 100 feet below present conditions. However, the results are very sensitive to the transmissivity of the aquifer, which is not well known and likely variable across the site. The assessment suggests existing wells would likely be impacted at full build-out conditions since most are less than 150 feet deep with less than 100-ft of available drawdown. Additional aquifer tests would improve estimates of aquifer transmissivity across the site. The tests are fairly inexpensive and easy to perform. Future development of the area could require or at least recommend that new homeowners grant access to perform one day pump tests as part of the monitoring program of the site.

Significant declines in groundwater elevations over time could eventually impact many of the existing domestic wells, reduce discharge to springs in McCartney Creek, and eventually reduce groundwater elevations in the Lower Moses Coulee. Options to mitigate impacts could include drilling of deeper private wells to increase available drawdown, switching to the use of a single community well, and conservation measures to minimize water use.

The following sections provide (1) a brief description of the site; (2) background on the exempt well water use concerns; (2) a summary of the methods and results of our assessment; and (3) recommendations for mitigation and monitoring.

SITE DESCRIPTION

Rimrock Meadows is a residential development located in central Douglas County, near McCarteney Creek (**Figure 1**). The area is arid with an annual precipitation of about nine inches per year and an estimated recharge of less than one inch per year. The site is underlain by thick Miocene basaltic rocks of the Columbia River Basalt Group (generally 2,000 to 3,000 feet thick). The sequence is made up of numerous individual basalt flows with an average thickness of about 100 feet. The zones between the basalt flows are generally more permeable than basalt flow interiors. These interflow zones form the principal aquifers within the basalt. All water supply wells in the Rimrock Meadows area draw water from the basalt aquifer.

Most of the current lots in the Rimrock Meadows area are used as summer recreational homes and do not have water supply wells. There are currently 37 water supply wells in the Rimrock Meadows area, many of which are not used. Only 3 are used year round (personal communication with Kevin Danby, Rimrock Meadows manager). The average rate of lot sales is currently about 35 per year and the average rate of new wells installed at the site is about 1 per year (personal communication with Kevin Danby, Rimrock Meadows manager).

EXEMPT WELL USE CONCERNS

Many areas across Washington State are experiencing growth in the number of houses with exempt wells and septic tanks. This growth is unregulated and can result in declines in groundwater quantity and quality. Pacific Groundwater Group (PGG) performed an initial Phase 1 Exempt Well Water Use Study in four areas of Douglas County[1]: Chelan Springs, Chelan Hills, Rimrock Meadows, and Badger Mountain. These areas were identified as high growth in exempt well water use. The results of that study suggest the greatest potential for groundwater level declines exists at Rimrock Meadows. A water balance analysis also showed that groundwater use in the Rimrock Meadows area at full build-out conditions could be as much as 400 percent of the estimated natural groundwater recharge to the immediate area.

Subsequent to the Phase 1 Exempt Well Water Use Study, a Phase 2 study was initiated. A major component of the Phase 2 study includes establishing a long-term groundwater level monitoring program in the areas identified in the Phase 1 study. Results to date of the long-term groundwater level monitoring are reported in the Groundwater Elevation Monitoring Report[2]. A second component of the Phase 2 study includes this current investigation of the Rimrock Meadows groundwater basin. This assessment uses a computer model to simulate groundwater impacts at full build-out conditions.

[1] Pacific Groundwater Group, 2006. WRIA 44/50 Exempt Well Water Use Study. Prepared for Foster Creek Conservation District.

[2] Pacific Groundwater Group, 2007. WRIA 44/50 Groundwater Elevation Monitoring Report (2006 Water Year) Exempt Well Water Use Phase 2. Prepared for Foster Creek Conservation District.

MODEL SIMULATION

A two-dimensional, steady-state, finite-difference, groundwater-flow model was constructed to simulate the long term aquifer drawdown under full build-out conditions in the Rimrock meadows area. The model simulates changes in groundwater levels relative to a baseline starting condition, not actual elevations.

The model domain was constructed to extend approximately 70 miles in all directions from the Rimrock Meadows area and is bounded by constant heads. The constant head boundaries are used to establish a starting condition of a flat water table arbitrarily set at 1500 feet. The constant head boundaries are located far enough from the project area to have minimal influence on the simulated drawdown. A constant cell spacing of 500 by 500 feet was used.

The aquifer was simulated as confined. A confined aquifer maintains a constant transmissivity value regardless of the change in groundwater level. The transmissivity was varied over a range of values to assess the sensitivity of the model. Recharge was not simulated because the simulation only models the changes to the system and recharge is assumed to be the same both before and after full build-out conditions. The only stress imposed on the aquifer was groundwater withdrawal.

Groundwater Withdrawal

Groundwater withdrawal under full build-out conditions was simulated using nine wells spaced uniformly throughout the Rimrock Meadows area. The difference between using nine wells spaced uniformly versus simulating each individual lot at full build-out conditions has minimal effect on the simulated drawdown in the basin and, using a smaller number of wells simplifies the model construction.

The private domestic groundwater use was estimated in the Phase 1 Exempt Well Water Use Study as 460 gallons per day per well. This value is based on the average water use per connection for the nearby Town of Waterville community system. The groundwater use is conservatively assumed to be entirely consumptive, although a certain percent of the water could be returned to the aquifer via septic and irrigation return flow. There are currently 37 private water supply wells in the Rimrock Meadows area (**Figure 1**). The full build-out conditions consists of 2,614 lots. At full build-out, and assuming all plots have wells installed, the total domestic groundwater use would be 1.2 million gallons per day (1,360 acre feet per year). This value was evenly distributed to the nine wells in the model simulation.

Many of the current lots are used as summer recreational homes and existing groundwater use for each lot is likely much less than the average water use per connection in Waterville. Of the currently installed 37 water supply wells in the Rimrock Meadows area only 3 are used year round (personal communication with Kevin Danby, Rimrock Meadows manager). However, the domestic water use in the area is currently unregulated, and many of the future lots could be developed into permanent residences. Economic growth

in the area of Wenatchee, the City of Ephrata and Quincy are likely to continue, making the affordable lots in the Rimrock Meadows area attractive as permanent residences. Therefore, a worse-case condition of year round use at full build-out was assumed for the simulation.

MODEL RESULTS

The results of the simulation indicate the predicted drawdown under full build-out conditions could be as little as 25-ft to over 2000-ft depending on the aquifer transmissivity. A graph of simulated drawdown versus transmissivity is shown in **Figure 2**. As the value of transmissivity decreases, the simulated drawdown increases substantially. Typical values of transmissivity for the basalt aquifer range from 200 to 5000 ft^2/day with an average of about 1000 ft^2/day, though individual values at specific locations can be much higher or lower. The typical values are based on estimates from numerous specific capacity data presented in U.S. Geological Survey (2000)[3] and typical values for basalt aquifers reported in Freeze and Cherry (1979)[4]. The results suggest the average drawdown under full build-out conditions at Rimrock Meadows would be about 100 feet.

The assessment indicates existing wells would likely be impacted under full build-out conditions since most are less than 150 feet deep and have less than 100 feet available drawdown. **Figures 3 and 4** show the number of existing wells versus well depth and available drawdown in the Rimrock Meadows area. The assessment also suggests discharge to nearby springs in McCartney Creek would also be impacted. Little Rattle Snake, Rattle Snake, and Mineral Springs are located less than 1 mile downgradient of the Rimrock Meadows area at an elevation of about 1450 feet. The average groundwater elevation in the Rimrock Meadows area is about 1525 feet (based on static water levels reported on driller's well logs and surface elevations provided by Gerald Cox). A 100 foot groundwater elevation decline could lower groundwater levels below the current discharge elevation of these spring systems. Significant declines in groundwater elevations over time could also eventually reduce groundwater elevations in the Lower Moses Coulee, which is a significant discharge point of upgradient groundwater sources in the surrounding area.

As previously noted, the results of the simulation are sensitive to the transmissivity of the basalt aquifer. The basalt aquifer is composed of numerous permeable interflow zones at depth with variable degrees of transmissivity and vertical hydraulic connection. The variability in aquifer transmissivity across the site is not well known. Aquifer pump tests are useful for quantifying aquifer transmissivity at a particular location and depth. Access to a private domestic well was granted to perform an aquifer pump test in the Rimrock Meadows area. The test methods and results are presented in the following section.

[3] U.S. Geological Survey, 2000. Hydrology of the Columbia Plateau Regional Aquifer System, Washington, Oregon, and Idaho. USGS Water Resource Investigation Report 96-4106.

[4] Freeze and Cherry, 1979. Groundwater. Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

AQUIFER PUMP TEST

Access to perform an aquifer pump test in a private domestic well in the Rimrock Meadows area was granted by Roy Downes. The location of the Downes well is shown in **Figure 1**. The 6-inch diameter well, constructed in 2005, is cased to a depth of 200 feet below ground surface (bgs) and perforated from 160 to 200 feet bgs. The well log indicates 30 feet of basalt followed by 15 feet of basalt with light brown silt (possibly an interflow zone) followed by another 150 feet of basalt before encountering 5 feet of green clay at the very bottom (well log attached). The static water level at time of drilling was 83 feet below ground surface (bgs). The static water level prior to the aquifer pump test was also about 83 feet bgs. The well is fitted with a submersible ½ horse-power Grundfos pump.

The test consisted of two phases:

- An initial phase pumping at the maximum pump rate of the well (8.8 gallon-per-minute) followed by recovery.
- A second phase pumping at a reduced rate of 2.7 gallons-per-minute for approximately one hour followed by about one hour of observed recovery.

Pumping rates were measured using a discharge hose, a graduated five-gallon bucket, and a stop watch. Discharge rates were measured periodically to confirm a constant rate. Water levels in the well were recorded every second using a pressure transducer.

The initial phase was used to select the optimal pump rate to conduct the test. The initial phase resulted in over 45-ft of drawdown, well below the pressure transducer, within 15 minutes of turning on the pump. Adjustments were made to the pumping rate with a check valve to establish a suitable lower rate to observe drawdown during the second phase. A rate of 2.7 gallons-per-minute was used for the second phase.

AQUIFER TEST RESULTS

Graphs of logarithmic elapsed time versus drawdown were used to compute the aquifer transmissivity (T). For the pumping phase the elapsed time (t) represents time since pumping began and for the recovery phase the elapsed time is calculated as t/t', where t' is the elapsed time since the pump shut off.

The following Cooper and Jacob (1946) equation was selected for the analysis:

$T = 264Q/\Delta s$

Where:

T= transmissivity, in gallons per day per foot (gpd/ft)

Q= pumping rate, in gallons per minute (gpm)

Δs=drawdown over one log cycle

The results of the pumping are shown in **Figure 5**. Drawdown data is plotted against elapsed time for both the pumping and recovery phase. The transmissivity was calculated to be 23 gpd/ft for the pumping phase and 14 gpd/ft for the recovery phase, with an average of 18.5 gpd/ft (2.5 ft^2/day). The transmissivity at the depth and location of the Downes well is extremely low and not likely to be representative of the site. A site-wide value of 2.5 ft^2/day would result in well over 2000 feet of drawdown in the model simulation at full build-out conditions (**Figure 2**). A review of driller's logs for existing private domestic wells in the Rimrock Meadow area indicate well yields range from less than 1 to 50 gpm, with an average of about 15 gpm, well above the yield of the Downes well, suggesting a lower than average value.

RECOMMENDATIONS

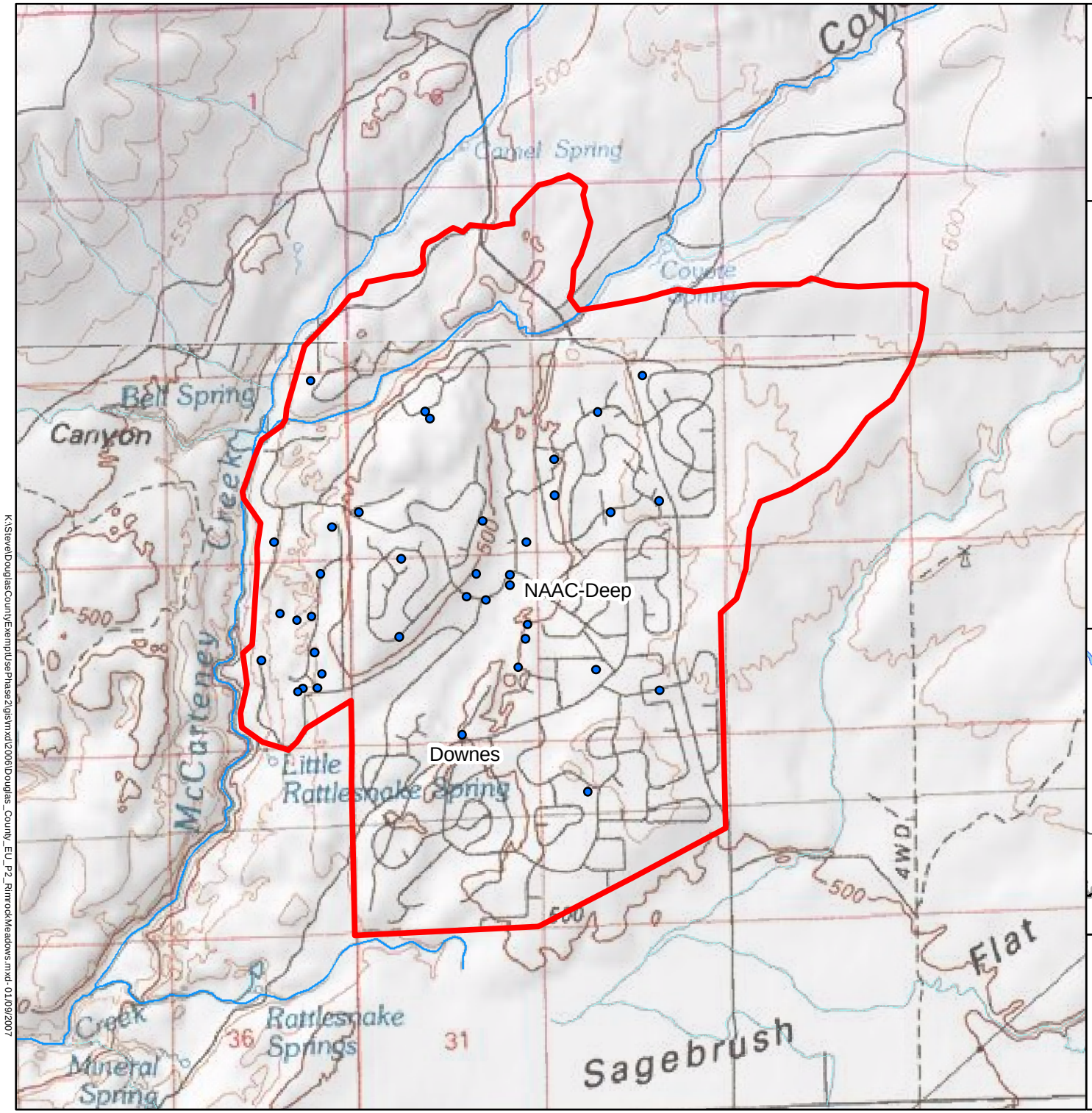
The results of the model simulation indicate that, at full build-out conditions, groundwater elevations may decline by about 100 feet below present conditions, which would likely impact existing wells, reduce discharge to nearby springs, and over time eventually lower groundwater elevations in the Lower Moses Coulee. However, the simulated declines in groundwater assumes a worse-case scenario of year round, 100% consumptive, groundwater use by every lot at full build-out conditions (2,614 lots). Currently most lots are used for summer recreation and only 3 out of the 37 existing water supply wells are used year round.

The results are also very sensitive to the transmissivity of the aquifer, which is not well known and likely variable across the site. Additional one-day aquifer tests of domestic wells across the site would be necessary to reduce this uncertainty. The tests are fairly inexpensive and easy to perform. Acquiring permission to perform tests from private owners has been difficult. Future development of the area could require or at least recommend that new homeowners grant access to perform one day aquifer tests as part of the monitoring program of the site. It would also be beneficial to require all wells be metered for water use and to install data loggers in additional wells for long-term groundwater level monitoring.

Options to mitigate future impacts from declines in groundwater levels could include the following:

- Drilling of deeper wells to increase the available drawdown.
- Switching to using a single community well such as the already existing club house irrigation well (NAAC-Deep). The driller's log of the NAAC-Deep well indicates a water bearing interflow zone at 700 feet depth with a yield of 1150 gpm (well log attached). This option would involve constructing a distribution system. Also, the water quality of this well is unknown.
- Conservation measures to reduce water use such as restricting lawns and other large consumptive activities.

Future groundwater monitoring of the site is also included in the long-term groundwater monitoring program. The NAAC-Deep well was recently instrumented with a pressure transducer and two more domestic wells in the Rimrock Meadows area are scheduled to be instrumented in 2007.



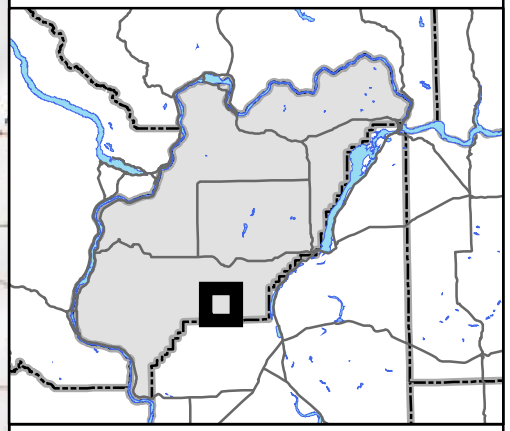
WRIA 44/50
Rimrock Basin Assessment
Exempt Well Water Use Phase 2

FIGURE 1

Site Map

Current Wells

Rimrock Meadows Area



0 4,000 Feet

0 1 Miles

1:48,000

PgG

K:\Steve\DouglasCountyExemptUsePhase2\gis\mxd\2006\Douglas_County_EU_P2_RimrockMeadows.mxd - 01/09/2007

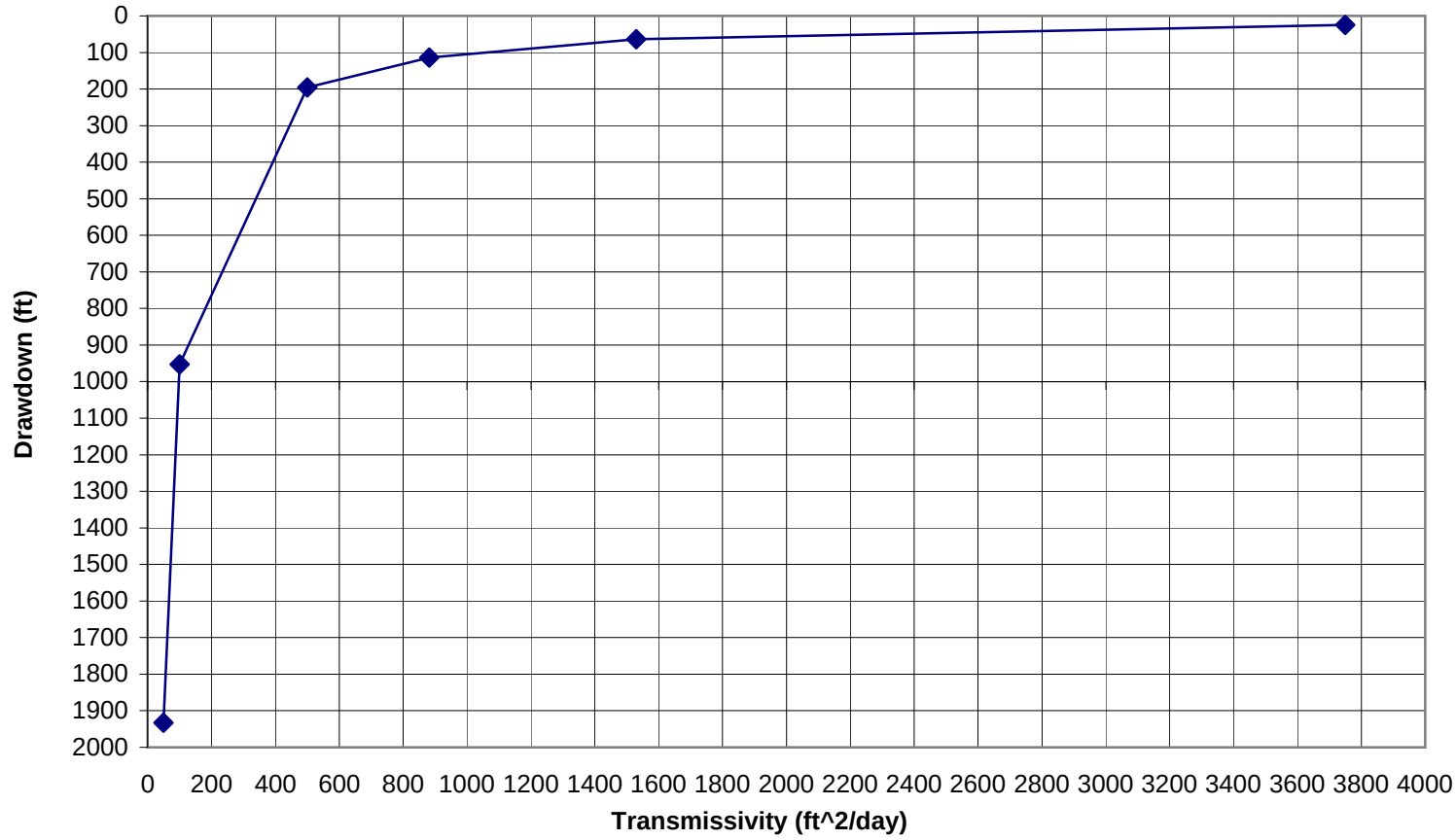


FIGURE 2. Simulated Drawdown vs Transmissivity under Full Built Out Conditions (Rimrock Meadows)

WRIA 44/50 Rimrock Basin Assessment
JS0604

PgG

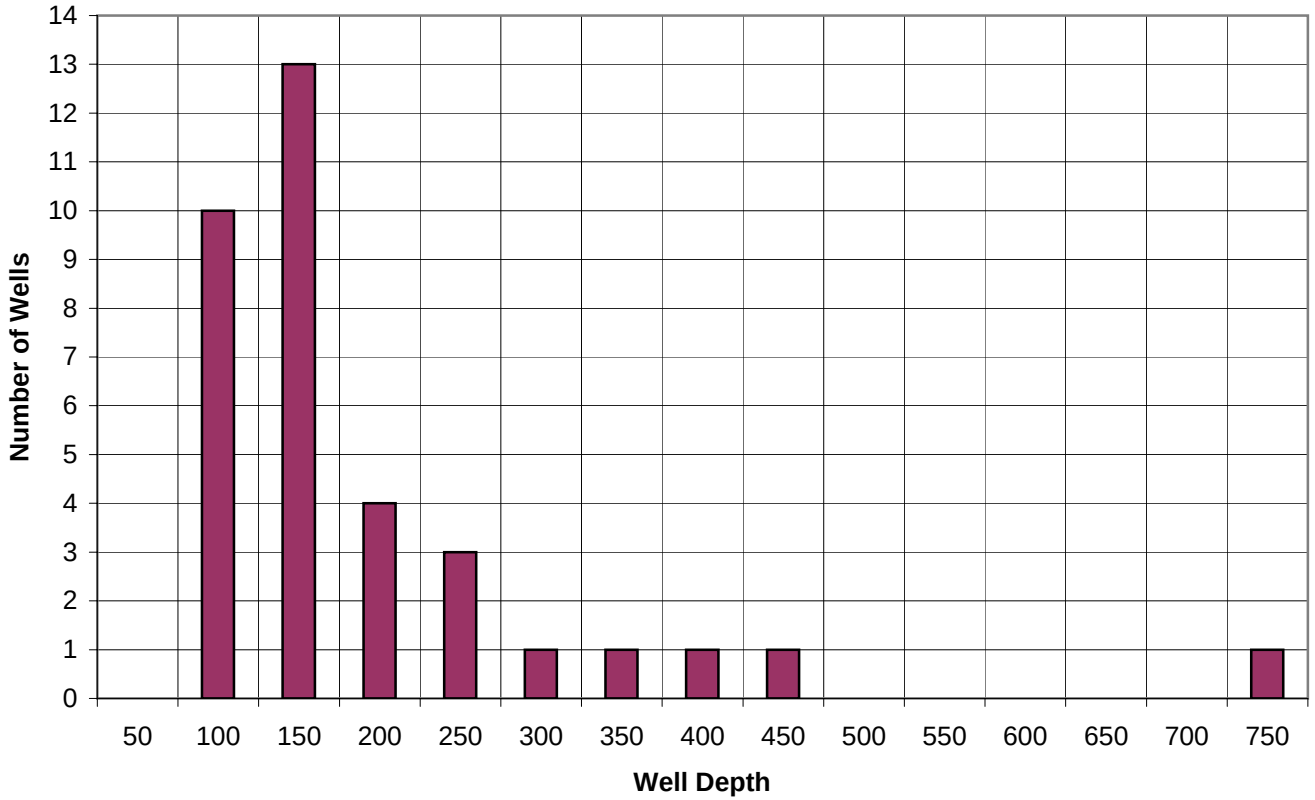
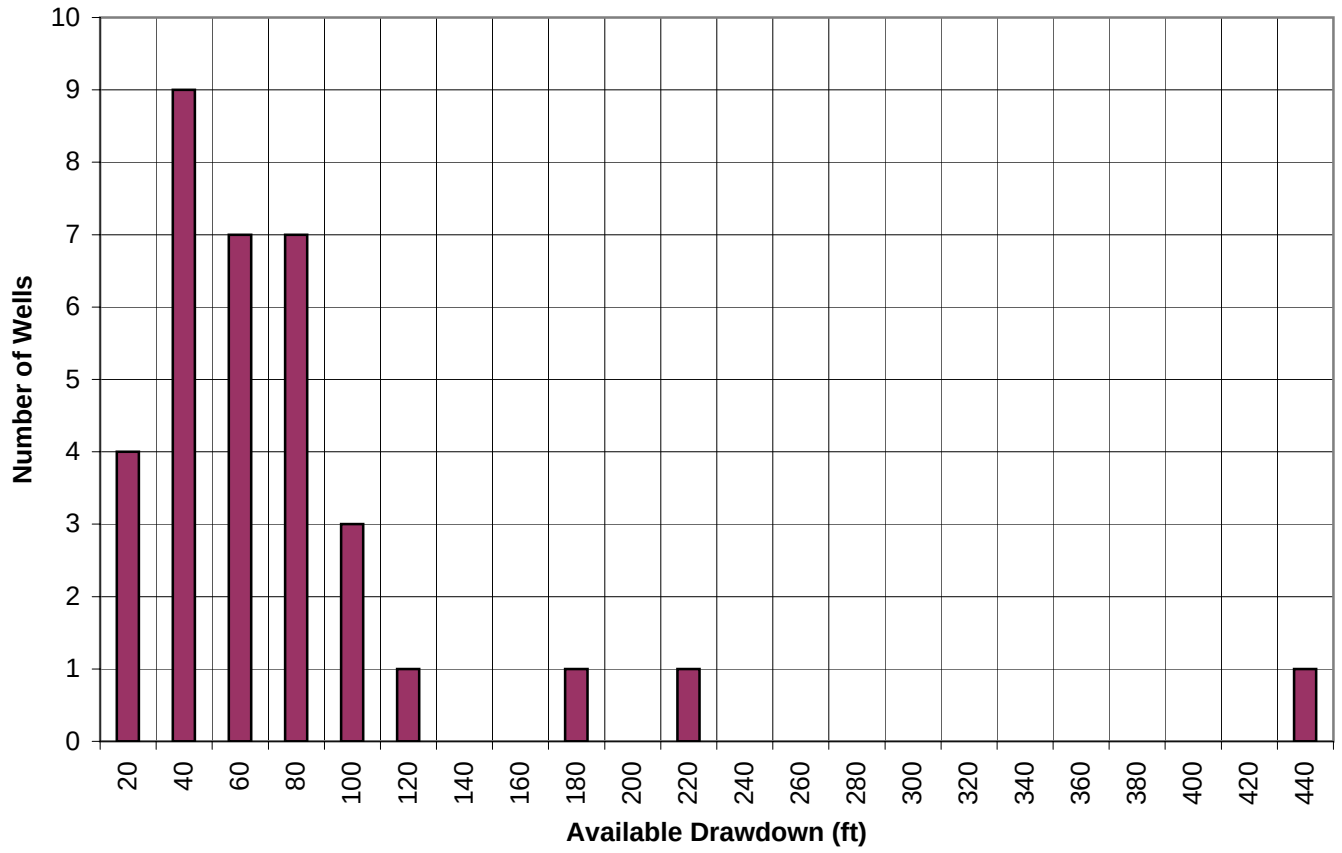


FIGURE 3. Distribution of Existing Well Depths (Rimrock Meadows)

WRIA 44/50 Rimrock Basin Assessment
JS0604

PgG



Available drawdown was estimated from driller's well logs as the difference between static water level and well depth.

FIGURE 4. Distribution of Available Drawdown in Current Wells (Rimrock Meadows)

WRIA 44/50 Rimrock Basin Assessment
JS0604

PgG

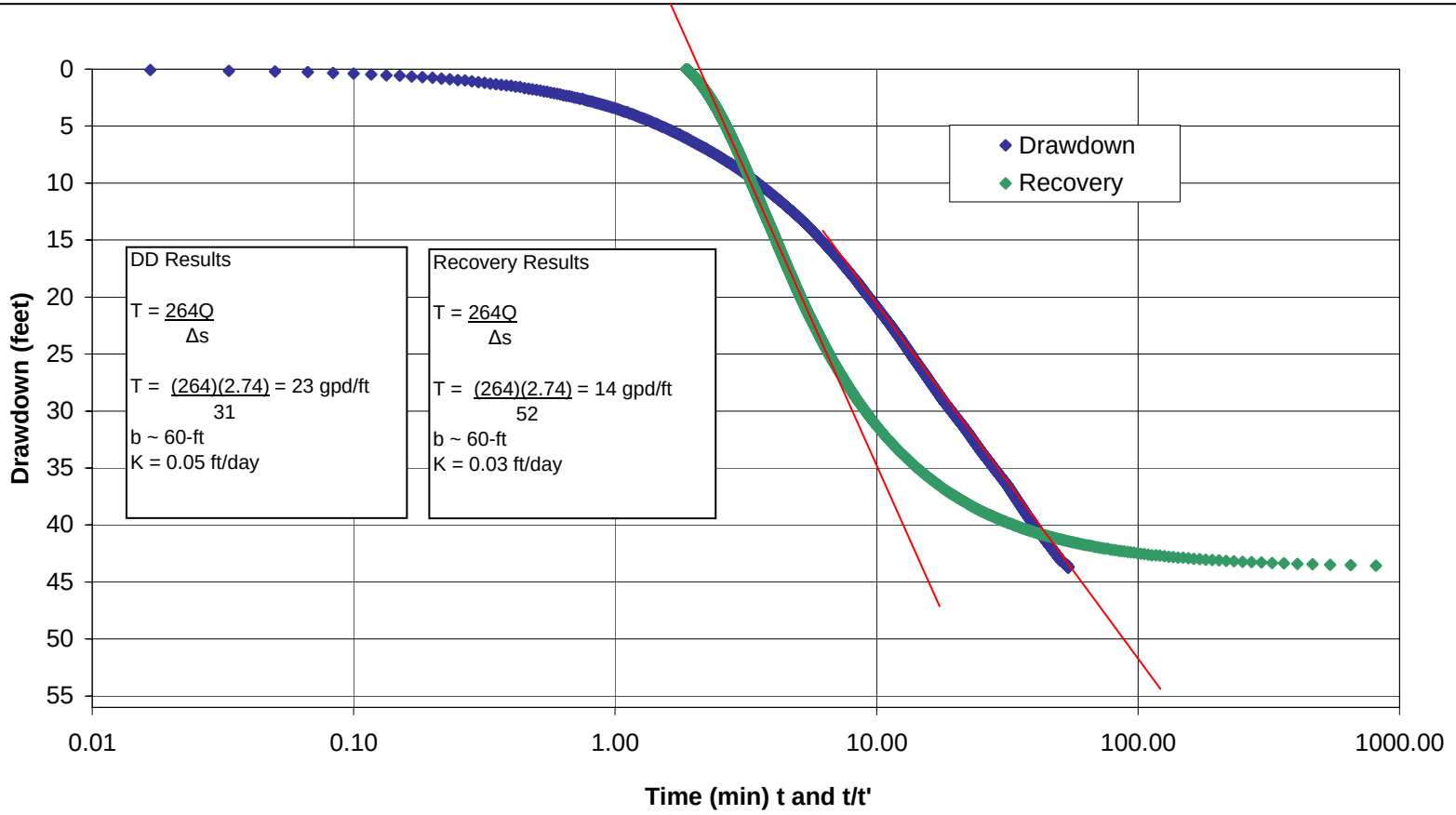


FIGURE 5. Downes Pump Test (Rimrock Meadows)

WRIA 44/50 Rimrock Basin Assessment
JS0604

PgG

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission *("x" in circle)*
(X) Construction
( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* _____

179919

CURRENT Notice of Intent No. W 166008

Unique Ecology Well ID Tag No. AHC 852

Water Right Permit No. _____

Property Owner Name Roy Downes

Well Street Address 3808 Tom Marks Rd

City Snohomish County: Douglas Meadows

Location NE 1/4 - 1/4 NE 1/4 Sec 26 Twn 25 R 5 E/W/M circle one

Lot 73 Blk 11 Rim Rock Meadows

Lat/Long: (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: (X) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
(X) New Well ( ) Reconditioned *Method:* ( ) Dug ( ) Bored ( ) Driven ( ) Deepened ( ) Cable (X) Rotary ( ) Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 200 ft.
Depth of completed well 200 ft.

CONSTRUCTION DETAILS
Casing ( ) Welded 6" Diam. from 0 ft. to 18 ft.
Installed: (X) Liner installed 4" Diam. from 6 ft. to 200 ft.
( ) Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: (X) Yes ( ) No
Type of perforator used Skil Saw
SIZE of perfs 1/8 in. by 4 in. and no. of perfs 100 from 160 ft. to 200 ft.

Screens: ( ) Yes (X) 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 (X) No ( ) Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: (X) Yes ( ) No To what depth? 18 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ( ) Yes (X) No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name Grunfos
Type: Submersible H.P. 1/2

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 83 ft. below top of well Date _____
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 (X) No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
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

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 60 gal./min. with stem set at 198 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ 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
Soil	0	1
Med Basalt	1	30
Med Basalt Lt Brn Silt	30	45
Med Basalt	45	185
DK Brn Basalt	185	195
Grn Clay	195	200

RECEIVED
SEP 15 2005
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 4-12-05 Completed Date 4-19-05

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.

(X) Driller ( ) Engineer ( ) Trainee Name (Print) Fred Emerson
Driller/Engineer/Trainee Signature Fred Emerson
Driller or Trainee License No. 2604

Drilling Company Four Star Drilling
Address P.O. Box 37
City, State, Zip Hartline Wa 99135
Contractor's Registration No. Four SD 110 D6 Date 4-21-05

If trainee, licensed driller's Signature and License no. _____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No G4-24488

(1) OWNER: Name NAAC of WASH. Address P.O. 1195

(2) LOCATION OF WELL: County Douglas NE¼ NE¼ ¼ Sec. 19 T. 23 N., R. 25 E.M.
Bearing and distance from section or subdivision corner 910'S & 757'W of Corner Sec 19 A

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

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

(5) DIMENSIONS: Diameter of well 16" inches.
Drilled 738 Depth of completed well 738 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16" Diam. from 0 ft. to 49' ft.
Threaded ☐ 12" Diam. from 0 ft. to 335 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used Milk Knife
SIZE of perforations ¼" in. by 4" in.
305 perforations from 305 ft. to 320 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? 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 GENERAL Electric
Type: Turbine K H.P. 150

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 305 ft. below top of well Date April 1969
Artesian pressure NO 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 Well Dug
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Layne
Yield: 1150 gal./min. with 60' ft. drawdown after 4 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
	Immediatly				

Date of test APRIL 1969
Bailer test NO gal./min. with ft. drawdown after hrs.
Artesian flow NO g.p.m. Date
Temperature of water NO Was a chemical analysis made? Yes ☒ No ☐

(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
TOP SOIL	0	7
GRAVEL	7	22
CLAY	22	48
MED HARD BASALT.	48	195
POUROUS ROCK WATER	195	205
TEST AT 250GAL		
HARD GRAY BASALT.	205	305
SOFT BROWN BASALT.	305	332
HARD GREY BASALT	332	431
BROKEN BROWN BASALT	431	500
HARD GREY BASALT	500	623
CHANGE to 8" HOLE		
POUROUS BLACK BASALT.	623	668
HARD GREY BASALT.	668	712
INTER FLOOD WATER.	712	738

RECEIVED
DEC 5 - 1977
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started ....., 19..... Completed ....., 19.....

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 Frank Zimmerman
(Person, firm, or corporation) (Type or print)

Address [illegible]

[Signed] [signature]
(Well Driller)

License No. 0548 Date 11/30 19 77

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

APPENDIX B
MONITORED WELL LOGS

LOWER MOSES COULEE
MONITORED WELL LOGS

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG No. Appl. 1921
Cert. #1568-A

Date Oct. 2, 1952

Record by K. V. Linville

Source Driller's Record

Location: State of WASHINGTON

County Douglas

Area

Map

SE ¼ SE ¼ sec. 1 T. 21 N., R. 22 E. W.

DIAGRAM OF SECTION

Drilling Co.

Address

Method of Drilling Date Aug. 15 1953

Owner K. V. Linville

Address Palisades, Washington

Land surface, datum ft. above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Soil	18	18
	Soil, gravel & rocks	88	100
	Black sand & gravel, trace of water,	1	101
	Hard formation, floater	4	105
	Rocks & boulders, blasted	15	120
	Hole & drove 8" casing to 120' (End of 8" casing at 120')		
	Perforated rocks and gravel and some sand, caved in 3 times, pored concrete and drilled out	150	270
	Hard formation	3	273
	Struck water, black sand & gravel	1½	274½

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses If material water-bearing, so state and record static level if reported Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc)

Turn up

Sheet of sheets

WELL LOG.—Continued No A/1921

Correlation	Material	Thickness (feet)	Depth (feet)
	K.V. Linville Depth forward	———	
	Balance of hole fine sand & gravel	19½	294
Pump	Test:		
	Dim: 294' x 7"		
	SWL: 257'		
	Dd: unknown		
	Yield: 180 g.p.m.		
	Casing: 8" dia. O.D. Standard, top to 120'		
	7" I.D. Standard, top to 294'		
	Perforations:		
	20' perforated, 3/8" wide 4" long, about 11 per ft. from 270' to 290'		

S F 7449-46 REMINGTON INC - 20 20 745-2 46

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No
Permit No

(1) OWNER: Name Jack Linville Address Palisades, Washington 98845

) LOCATION OF WELL: County ~~Grant~~ Douglas SE ¼ SE ¼ Sec. 1 T21 N., R 22E 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 ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 130 ft. Depth of completed well 630 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: " Diam. from ft. to ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to 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? 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.
Static level 200 ft. below top of well Date
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

Date of test
air ~~XXXXX~~ ted 200-300 gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water cold Was a chemical analysis made? Yes ☐ No ☒

(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
Hard basalt	500	540
Firm w/broken areas some water	540	585
Soft area basalt	585	630

RECEIVED
AUG 2 3 1979
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 7/10, 19 79 Completed 7/17/, 19 79

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 American Drilling & Development Inc.
(Person, firm, or corporation) (Type or print)

Address P.O. Box 14977 Spokane, Wash. 99214

[Signed] (Well Driller)

License No. 0688 Date 7/27/79, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
AND DEVELOPMENT

WELL LOG

No. Decla. #385
Cert. #321-D

Date 1929, 19

Record by R. L. Davis, Jr.

Source G. W. Decla. Claim

Location: State of WASHINGTON

County Douglas

Area

Map

SW ¼ NE ¼ sec. 36 T. 23 N., R. 23 E. W.

DIAGRAM OF SECTION

Drilling Co.

Address

Method of Drilling dug Date 1930 19

Owner Palisades Irrigation District

Address Palisades, Washington

Land surface, datum ft. above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Estimated from case history of neighboring wells		
	Soil	40	40
	Dry round stream bed rock	40	80
	Wet sand, stream " "	80	160
Pump	Test:		
	Dim: 160' x 4'		
	SWL: 160'		
	Dd: none		
	Yield: 800 g.p.m.		
	Casing: not given, cement curbed from top to bottom		

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up

Sheet of sheets

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. W 09053
Unique Well I.D. # AET969
Water Right Permit No.

(1) OWNER: Name KING, STEPHEN Address 5473 8TH ST. SE EAST WENATCHEE, WA 98802-

(2) LOCATION OF WELL: County DOUGLAS - NW 1/4 SE 1/4 Sec 2 T 22 N., R 23E WM
(2a) STREET ADDRESS OF WELL (or nearest address) PALISADES RD., PALISADES

K

(3) PROPOSED USE: DOMESTIC

(4) TYPE OF WORK: Owner's Number of well (If more than one)
NEW WELL Method: ROTARY

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 139 ft. Depth of completed well 138 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 6 " Dia. from +3 ft. to 138 ft.
WELDED " Dia. from ft. to ft.
" Dia. from ft. to ft.

Perforations: NO
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: NO
Manufacturer's Name
Type Model No.
Diam. slot size from ft. to ft.
Diam. slot size from ft. to ft.

Gravel packed: NO Size of gravel
Gravel placed from ft. to ft.

Surface seal: YES To what depth? 20 ft.
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft.
Method of sealing strata off SEAL METHOD 1

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

(8) WATER LEVELS: Land-surface elevation above mean sea level ... ft.
Static level 85 ft. below top of well Date 03/04/99
Artesian Pressure lbs. per square inch Date
Artesian water controlled by CAP

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

Recovery data

Time	Water Level	Time	Water Level	Time	Water Level

Date of test / /
Bailer test gal/min. ft. drawdown after hrs.
Air test 70+ gal/min. w/ stem set at 137 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? YES

(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 in formation.

MATERIAL	FROM	TO
BROWN CLAY	0	32
BROKEN BASALT	32	49
BROWN CLAY BROKEN BASALT	49	54
BROKEN BASALT	54	139

CENTRAL REGION OFFICE DEPT. OF ECOLOGY Received MAY 7 1999

Work started 03/03/99 Completed 03/04/99

WELL CONSTRUCTOR 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.

NAME TUMWATER DRILLING, INC.
(Person, firm, or corporation) (Type or print)

ADDRESS P.O.BOX 777

[SIGNED] License No. 1249

Contractor's
Registration No. TUMWADI 1330 C Date 03/04/99

Department of Ecology
Second Copy — Owner's Copy
Third Copy — Driller's Copy

WATER WELL REPORT
STATE OF WASHINGTON

Permit No 7768

(1) OWNER: Name Jack Seymour Address Palisades Wash

(2) LOCATION OF WELL: County Douglas SW ¼ SE ¼ Sec 28 T 22 N., R 23 W.M.
Bearing and distance from section or subdivision corner 1000' north and 250' E from South ¼ corner of Sec 28

(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 ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 12 inches.
Drilled ft. Depth of completed well 240 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 12" Diam. from 0 ft. to 209 ft.
Threaded ☐ " Diam. from ft. to ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to 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? 20 ft.
Material used in seal Bentonite
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 213 ft. below top of well Date
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

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 ☐

NOT A PRODUCTION WELL
LIMITED YIELD

(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
Over Burden	0	20
Gravel	20	112
Brown Clay	112	205
Black Basalt	205	208
Brown Clay	208	216
Black Basalt	216	220
Large Gravel Water Bearing	220	223
Black Basalt	223	240

RECEIVED
AUG 30 1976
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started 4 - 6, 19 76 Completed 5-14, 19 76

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 Jox Drilling Co (Person, firm, or corporation) (Type or print)
Address Moses Lake Wash
[Signed] (Well Driller)
License No. 648 Date June 3, 1976

(USE ADDITIONAL SHEETS IF NECESSARY)

S. F. No. 7356—OS—(Rev. 4-71)
ECY-070-28

9/7/76

UPPER MOSES COULEE
MONITORED WELL LOGS

22

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

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. UI 87563
UNIQUE WELL I.D. # ACL 330
Water Right Permit No. _____

(1) OWNER: Name Raymond Mayer Address 7781 Sagebrush Flats Rd Ephrata

LOCATION OF WELL: County [redacted] GRANT NE 1/4 NE 1/4 Sec 6 [redacted] N., R 25 E W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) Rd 24 N.W. 22

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

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

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 80 feet. Depth of completed well 80 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6" Diam. from +2 ft. to 28 ft.
Welded ☒ Liner installed ☐ Threaded ☐ _____" Diam. from _____ ft. to _____ ft.
_____" Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ 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? 28 ft.
Material used in seal Bentonite
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 _____
Static level 29 ft. below top of well Date 9-24-96
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

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 30 gal./min. with stem set at 75 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Top Soil	0	14
Brown Clay	14	18
Caliche	18	23
Sandy Clay	23	26
Brown Basalt	26	30
Black Basalt	30	57
Fractured Basalt & water	57	73
Black Basalt	73	80

Work Started 9-24 19 Completed 9-24 19 96

WELL CONSTRUCTOR 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.

NAME Mathews Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 9455 Stonecast Rd Mt. Vo.
(Signed) Mitch Mathews (WELL DRILLER) License No. 1267
Contractor's Registration No. Mathedc117BC Date 9-24 19 96

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

Appl# 8736
Perm# 9276

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES

WELL LOG

Record by: Driller
Source: Well Report

Location: State of WASHINGTON
County: Douglas
Area: —
Map: —
¼ ¼ sec 30 T. 24 N., R. 25 E. W.

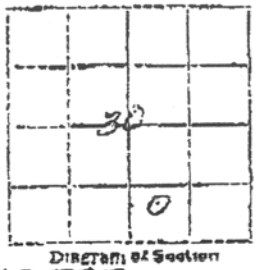


Diagram of Section

Drilling Co.: Frank L. Zimmerman
Address: 2004 South Colbert Mead Lake Wn.
Method of Drilling: Cable Date: 24 Nov., 1968
Owner: Glen Corning
Address: Box 845 Ephrata Wn.
Land surface, datum: 1910 ft. above ~~below~~ MSL
SWL: 315' Date: 24 Nov 1968, 19 Duns: 12" x 705'

Consolidation	Material	From (feet)	To (feet)
	Domestic & Irrigation		

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

	This is an old well reamed to 12"		
	0-575', casing here only data		
	at deepest portion of well		
	6" hole 575'-705'		
	Basalt, black, med. hard.	575'	690'
	Basalt, black porous water-bearing	690	705'
	Pump: Worthington Turbine 125 HP		
	Pump Test: 500 gpm - 175' DD (2 hrs) (24 Nov. 1968)		
	Recovery Time 30 sec		

Turn up

Sheet ___ of ___ sheets

WATER WELL REPORT

Original & 1st copy - Ecology, 2nd copy - owner, 3rd copy - driller

Construction/Decommission *("x" in circle)*
(X) Construction
( ) Decommission *ORIGINAL CONSTRUCTION Notice of Intent Number* _____

179919

CURRENT Notice of Intent No. W 166008

Unique Ecology Well ID Tag No. AHC 852

Water Right Permit No. _____

Property Owner Name Roy Downes

Well Street Address 3808 Tom Marks Rd

City Snohomish County: Douglas Meadows

Location NE 1/4 - 1/4 NE 1/4 Sec 26 Twn 25 R 5 E/W/M circle one

Lot 73 Blk 11 Rim Rock Meadows

Lat/Long: (s,t,r still REQUIRED) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

Tax Parcel No. _____

PROPOSED USE: (X) Domestic ( ) Industrial ( ) Municipal ( ) DeWater ( ) Irrigation ( ) Test Well ( ) Other _____

TYPE OF WORK: Owner's number of well (if more than one) _____
(X) New Well ( ) Reconditioned *Method:* ( ) Dug ( ) Bored ( ) Driven ( ) Deepened ( ) Cable (X) Rotary ( ) Jetted

DIMENSIONS: Diameter of well 6 inches, drilled 200 ft.
Depth of completed well 200 ft.

CONSTRUCTION DETAILS
Casing ( ) Welded 6" Diam. from 0 ft. to 18 ft.
Installed: (X) Liner installed 4" Diam. from 6 ft. to 200 ft.
( ) Threaded _____" Diam. from _____ ft. to _____ ft.

Perforations: (X) Yes ( ) No
Type of perforator used Skil Saw
SIZE of perfs 1/8 in. by 4 in. and no. of perfs 100 from 160 ft. to 200 ft.

Screens: ( ) Yes (X) 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 (X) No ( ) Size of gravel/sand _____
Materials placed from _____ ft. to _____ ft.

Surface Seal: (X) Yes ( ) No To what depth? 18 ft
Materials used in seal Bentonite
Did any strata contain unusable water? ( ) Yes (X) No
Type of water? _____ Depth of strata _____
Method of sealing strata off _____

PUMP: Manufacturer's Name Grunfos
Type: Submersible H.P. 1/2

WATER LEVELS: Land-surface elevation above mean sea level _____ ft.
Static level 83 ft. below top of well Date _____
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 (X) No If yes, by whom? _____
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
Yield: _____ gal./min. with _____ ft. drawdown after _____ hrs.
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

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 60 gal./min. with stem set at 198 ft. for 1 hrs.
Artesian flow _____ g.p.m. Date _____
Temperature of water _____ 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
Soil	0	1
Med Basalt	1	30
Med Basalt Lt Brn Silt	30	45
Med Basalt	45	185
DK Brn Basalt	185	195
Grn Clay	195	200

RECEIVED
SEP 15 2005
DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE

Start Date 4-12-05 Completed Date 4-19-05

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.

(X) Driller ( ) Engineer ( ) Trainee Name (Print) Fred Emerson
Driller/Engineer/Trainee Signature Fred Emerson
Driller or Trainee License No. 2604

Drilling Company Four Star Drilling
Address P.O. Box 37
City, State, Zip Hartline Wa 99135
Contractor's Registration No. Four SD 110 D6 Date 4-21-05

If trainee, licensed driller's Signature and License no. _____

Ecology is an Equal Opportunity Employer. ECY 050-1-20 (Rev 4/01)

STATE OF WASHINGTON
DEPARTMENT OF CONSERVATION AND DEVELOPMENT

WELL LOG No. Appli. 3138

Date Feb. 15, 1955.

Record by Edwin L. Johnson

Source Driller's Record

Location: State of WASHINGTON

County Douglas

Area

~~Mark~~ SE¼ of NW¼ &

NE.¼ SW.¼ sec 32 T. 24 N., R. 25E E. W.

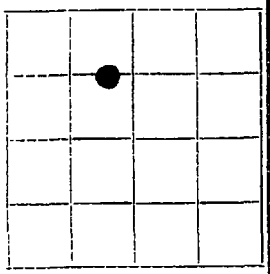


Diagram of Section

Drilling Co. Courtney Bach

Address Quincy, Washington

Method of Drilling Drilled Date ....., 19.....

Owner Edwin L. Johnson

Address Farmer, Washington

Land surface, datum ..... ft. above / below

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Gravel & clay	70	70
	Fine sand & silt	18	88
	Silt & clay	21	109
	Silt & clay	11	120
	Silt & clay	24	144
	Silt & clay	19	163
	Yellow clay & water gravel	5	168
	Water gravel	23	191
	Pump Test:		
	Dia: 191' X 10"		
	SWL: 37'		
	DD: 10'		
	Yield: 900 g.p.m.		
	Casing 10 in dia from	o to	191'

(Transcribe driller's terminology literally but paraphrase as necessary, in parentheses. If material water-bearing, so state and record static level if reported. Give depths in feet below land-surface datum unless otherwise indicated. Correlate with stratigraphic column, if feasible. Following log of materials, list all casings, perforations, screens, etc.)

Turn up

Sheet ..... of ..... sheets

WELL LOG.—Continued No. A/3138

CORRELATION	MATERIAL	THICKNESS (feet)	DEPTH (feet)
	Edwin L Johnson Depth forward	———	
	10" dia from	0 to 191'	
	10" dia from	0 to 191'	
	10" dia from	0 to 191'	
	~~Perforations: 8" by ½ from 163 to 189'~~		

S. F. No. 7[illegible]—12-54—3M. [illegible]08.

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No. .....
Permit No G4-24488

(1) OWNER: Name NAAC of WASH. Address P.O. 1195

(2) LOCATION OF WELL: County Douglas NE¼ NE¼ ¼ Sec. 19 T. 23 N., R. 25 E.M.
Bearing and distance from section or subdivision corner 910'S & 757'W of Corner Sec 19 A

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

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

(5) DIMENSIONS: Diameter of well 16" inches.
Drilled 738 Depth of completed well 738 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 16" Diam. from 0 ft. to 49' ft.
Threaded ☐ 12" Diam. from 0 ft. to 335 ft.
Welded ☒ " Diam. from ft. to ft.

Perforations: Yes ☒ No ☐
Type of perforator used Milk Knife
SIZE of perforations ¼" in. by 4" in.
305 perforations from 305 ft. to 320 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? 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 GENERAL Electric
Type: Turbine K H.P. 150

(8) WATER LEVELS: Land-surface elevation above mean sea level ft.
Static level 305 ft. below top of well Date April 1969
Artesian pressure NO 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 Well Dug
Was a pump test made? Yes ☒ No ☐ If yes, by whom? Layne
Yield: 1150 gal./min. with 60' ft. drawdown after 4 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
	Immediatly				

Date of test APRIL 1969
Bailer test NO gal./min. with ft. drawdown after hrs.
Artesian flow NO g.p.m. Date
Temperature of water NO Was a chemical analysis made? Yes ☒ No ☐

(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
TOP SOIL	0	7
GRAVEL	7	22
CLAY	22	48
MED HARD BASALT.	48	195
POUROUS ROCK WATER	195	205
TEST AT 250GAL		
HARD GRAY BASALT.	205	305
SOFT BROWN BASALT.	305	332
HARD GREY BASALT	332	431
BROKEN BROWN BASALT	431	500
HARD GREY BASALT	500	623
CHANGE to 8" HOLE		
POUROUS BLACK BASALT.	623	668
HARD GREY BASALT.	668	712
INTER FLOOD WATER.	712	738

RECEIVED
DEC 5 - 1977
DEPARTMENT OF ECOLOGY
CENTRAL REGIONAL OFFICE

Work started ....., 19..... Completed ....., 19.....

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 Frank Zimmerman
(Person, firm, or corporation) (Type or print)

Address [illegible]

[Signed] [signature]
(Well Driller)

License No. 0548 Date 11/30 19 77

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20

File Original with Department of Ecology
Second Copy - Owner's Copy 97450
Third Copy - Driller's Copy

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W 123727

UNIQUE WELL I D # AFL 121

Water Right Permit No. 98020

DEPT. OF ECOLOGY RECEIVED NOV 16 2000 CENTRAL REGION OFFICE

(1) OWNER: Name PKT Inc, Address 1430 olympic Ave Edmonds Wa,

(2) LOCATION OF WELL County Douglas SW 1/4 SE 1/4 Sec 6 T 23 N R 25E WM

(2a) STREET ADDRESS OF WELL. (or nearest address) Rim Rock Rd.

TAX PARCEL NO

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

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

(5) DIMENSIONS: Diameter of well 6 inches
Drilled 80 feet. Depth of completed well 80 ft

(6) CONSTRUCTION DETAILS
Casing Installed.
☒ Welded 6 " Diam from +2 ft to 60 ft
☐ Liner installed " Diam from ft to ft
☐ Threaded " Diam from ft to ft

Perforations. ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in by in
perforations 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
Material placed from ft to ft

Surface seal ☒ Yes ☐ No To what depth? 18 ft
Material used in seal Bentonite
Did any strata contain unusable water? ☒ Yes ☐ No
Type of water? Surface Depth of strata 4-26
Method of sealing strata off Casing

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land-surface elevation above mean sea level ft
Static level 65 ft below top of well Date 10/13/00
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
Yield gal./min with ft drawdown after hrs
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

Date of test
Bailer test gal./min with ft drawdown after hrs
Airtest 27 gal./min with -0- ft drawdown after 2 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(10) WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION
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

MATERIAL	FROM	TO
Top Soil	0	4
Brown Clay & water	4	16
Gravel & Clay Streaks	16	26
Sticky Clay	26	60
Brown Basalt & water	60	64
Black Basalt	64	80

RECEIVED NOV 16 2000 DEPARTMENT OF ECOLOGY EASTERN REGIONAL OFFICE

Work Started 10/11/00 Completed 10/12/00

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

Type or Print Name Mitch Mathews License No 1267
(Licensed Driller/Engineer)

Trainee Name License No
Drilling Company Mathews Drilling
(Signed) Mitch Mathews License No 1267
(Licensed Driller/Engineer)
Address 2317 Rd 10.2 NE Moses Lake Wa 98837
Contractor's Registration No MATHEDC117B6 Date 10/17/00

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs, contact the Water Resources Program at (360) 407-6600 The TDD number is (360) 407-6006

ECY 050-1-20 (11/98)

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

WATER WELL REPORT

STATE OF WASHINGTON

3885
Start Card No. _____

Water Right Permit No. A

(1) OWNER: Name Jim Johncox Address 12251 NE 70th Kirkland Wa.

(2) LOCATION OF WELL: County Douglas NE ¼ NE ¼ Sec 19 T 23 N., R 25 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Rim Rock Meadows

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

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

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 150 feet. Depth of completed well 150 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6 " Diam. from 0 ft. to 43 ft.
Welded ☒ Liner installed ☐ Threaded ☐
_____ " Diam. from _____ ft. to _____ ft.
_____ " Diam. from _____ ft. to _____ ft.

Perforations: Yes ☐ No ☒
Type of perforator used _____
SIZE of perforations _____ in. by _____ in.
_____ perforations from _____ ft. to _____ 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? 18' ft.
Material used in seal Bentonite
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 100' ft. below top of well Date _____
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: 20 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

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

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Gravel	0	30'
Dry Soil	30'	40'
Broken Rock	40'	43'
Med Basalt	43	80'
Clay & Rock	80	82'
Med Basalt	82	130
Hard Basalt	130	144
Porous Basalt & water	144	160

RECEIVED
AUG 17 1990
DEPARTMENT OF ECOLOGY
OFFICE

Work started 8-6-90, 19. Completed 8-8-, 1990

WELL CONSTRUCTOR 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.

NAME Four Star Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address Box 37 Hartline Wa.
(Signed) _____ License No. 124
Constructor's (WELL CONSTRUCTOR)
Date 8-2

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20 (10/87) -1329-

JAMESON LAKE AREA
MONITORED WELL LOGS

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

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 029000

Water Right Permit No.

(1) OWNER: Name Denny Smullen Address 23331 Woods Cr. Rd Snohomish WA

(2) LOCATION OF WELL: County Douglas Lot 4 ¼ NW ¼ Sec 5 T 25 N., R 26 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Jamison Lake Resort

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

(4) TYPE OF WORK: Owner's number of well (if more than one) 2
Abandoned ☐ New well ☒ Method: Dug ☐ Bored ☐ Deepened ☐ Cable ☐ Driven ☐ Reconditioned ☐ Rotary ☐ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 40 feet. Depth of completed well 41 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 6 " Diam. from +1 ft. to 39 ft. Welded ☒
" Diam. from ft. to ft. Liner installed ☐
" Diam. from ft. to ft. Threaded ☐
Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to 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? 18 ft.
Material used in seal Bentonite
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 1600 ft.
Static level 12 ft. below top of well Date 10/18/90
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: 30 gal./min. with ft. drawdown after hrs.
" EST AIR Lift " " "
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
Date of test
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 Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Overburden	0	3
Sand & Gravel, Dk Brown, Dry	3	12
Sand & Gravel, Moist	12	23
Gravel, Water bearing, w/ Broken Basalt,	23	41

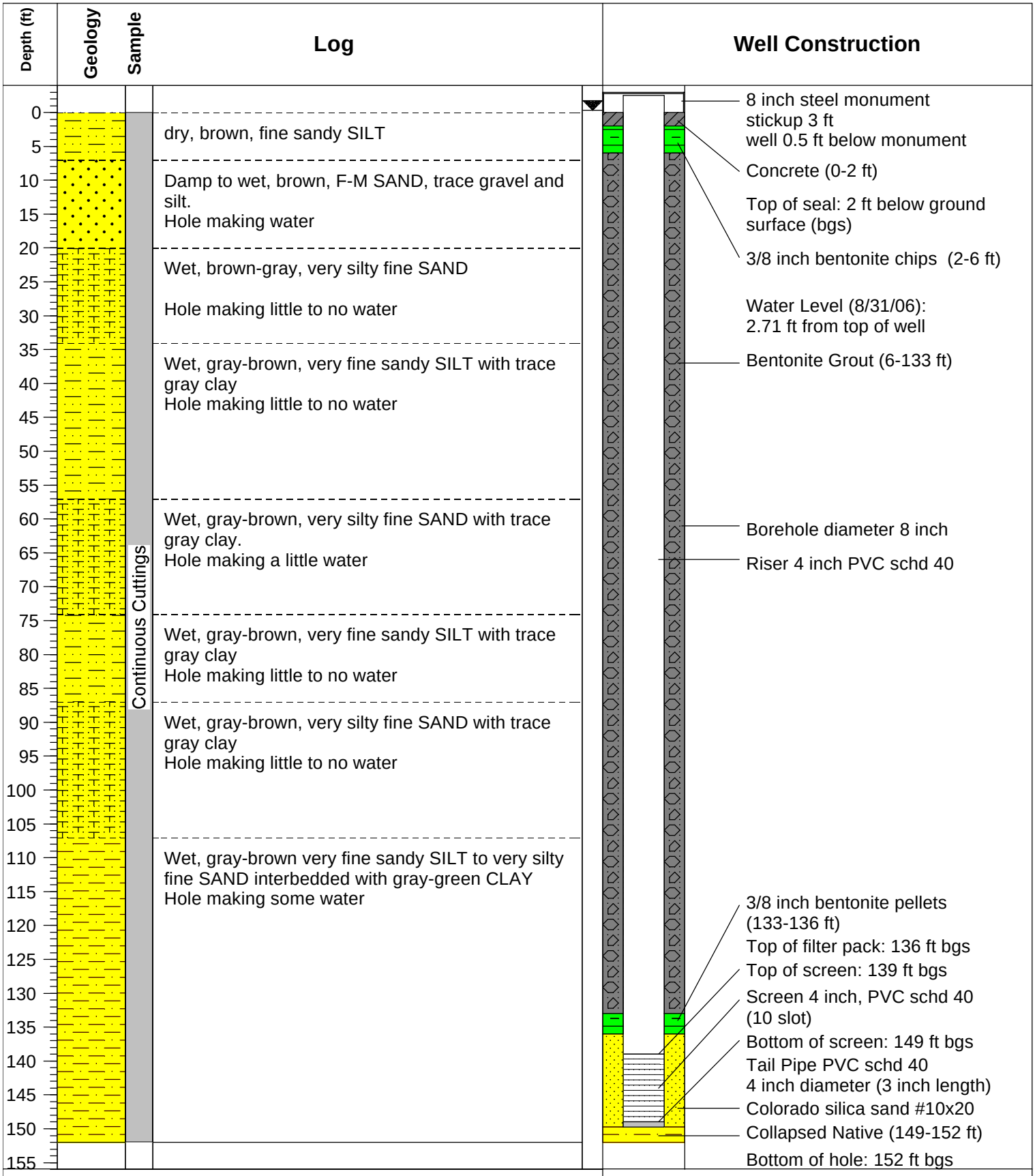
Work started 10/17 19 90 completed 10/18 19 90

WELL CONSTRUCTOR 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.

NAME Eagle Pump & Supply (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address 316 W 5th Colville WA. 99114
(Signed) Mike Loosen (WELL DRILLER) License No. 1451
Contractor's Registration No. PS194MF Date 10/19 19 90

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1-20 (10/87) -1329-



Project Name: Douglas County Recharge
Drilling Method: Air Rotary
Driller: Roy Sink
Firm: Environmental West Explorations
Consulting Firm: PGG
Logged by: Dawn Chapel
Location: Jameson Lake, Douglas County

Well Name: PGG-1
UWID: APK319
MP Elevation: 1805.4059
Datum: NAVD88
Installed: 7/18/2006

Figure
GEOLOGIC LOG AND AS-BUILT FOR MONITORING WELL PGG-1

Douglas County Recharge
JS0604, PGG-1.ldf, 9/2006

PgG

FOSTER CREEK
MONITORED WELL LOGS

1441

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

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 08/206

Water Right Permit No. N

(1) OWNER: Name Charles & Sharon Hammons Address Box 879 Br. Legport WA 98813

LOCATION OF WELL: County Douglas SW ¼ SW ¼ Sec 31 T 29 N. R 27 W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address)

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

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

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

(5) DIMENSIONS: Diameter of well 8+6 inches. Drilled 185 feet. Depth of completed well 120'6" ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from +3 ft. to 30 ft.
Welded ☒ Liner installed 4 " Diam. from -15 ft. to 120 ft.
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☐
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to 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? 18 ft.
Material used in seal Portland
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 7 ft below top of well Date 9-23-92
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

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 7 gal./min. with stem set at 145 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Top soil	0	5
clay bound sand	5	12
clay	12	14
hard pan, gravel/clay	14	30
basalt / soft	30	70
broken wet basalt	70	80
red hard basalt	80	145
broken basalt w/ clay	145	165
green clay with sandstringers	165	185
T		
Hole grouted w/ Portland cement		

SEP 22 1992

Work started 9-5 19 Completed 9-23 19 92

WELL CONSTRUCTOR 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.

NAME MVM Quality Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 760 Highland Rd 98813

(Signed) M Mullen Glenda (WELL DRILLER) License No. 1437/2021

Contractor's Registration No. MMQUD138NO Date 9-23 19 92

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 050-1 20 (10 87) 1329

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

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Lee Hartford Address Bridgeport, WA

(2) LOCATION OF WELL: County Douglas NE ¼ SE ¼ Sec 26 T 29 N., R 25 W.M.

ng 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 ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 8 inches.
Drilled 45 ft. Depth of completed well 45 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 8 " Diam. from +1 ft. to 45 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... 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? 18 ft.
Material used in seal cement
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 15 ft. below top of well Date 2-25-81
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
		are left	2at	60 gpm.	

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 ☒

(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
Top soil	0	2
Sand & gravel	2	45

MAY 27 1981

Work started 2-24, 19 81 Completed 2-25, 19 81

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 MM Quality Drilling
(Person, firm, or corporation) (Type or print)

Address 483 Bridgeport Wash

[Signed] Darrell B Connell
(Well Driller)

License No. 0358 Date 2-25, 1981

(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

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Lee Hemmer Address Star Route Mansfield, Wn.

(2) LOCATION OF WELL: County Douglas NE ¼ NW ¼ Sec. 19 T. 29 N., R. 28 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 ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☑ Jetted ☐

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 200 ft. Depth of completed well 200 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 1 ft. to 21 ft.
Threaded ☐ ..." Diam. from ... ft. to ... ft.
Welded ☐ ..." Diam. from ... ft. to ... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... 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? 20 ft.
Material used in seal Bentonite
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 34 ft. below top of well Date 5-8-78
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

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 ☒

(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
Soil & boulders	0	16
Basalt (black)	17	35
Basalt (brown & gray)	36	40
Basalt (black hard)	41	160
Basalt (broken 15 to 20 gpm)	161	170
Clay (green)	171	200

Work started 5-3 19 78 Completed 5-5 19 78

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 Henry Rath Well Drilling
(Person, firm, or corporation) (Type or print)

Address P.O. Box 1651 Yakima, Wn. 98907

[Signed] Henry Rath
(Well Driller)

License No. 0259 Date 5-8, 19 78

(USE ADDITIONAL SHEETS IF NECESSARY) OR

S. F. No. 7356—OS—(Rev. 4-71)
ECY-070-28

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

WATER WELL REPORT
STATE OF WASHINGTON

Application No. ✓
Permit No. ....

(1) OWNER: Name Terry Hunt Address .....

LOCATION OF WELL: County Douglas — ¼ NW ¼ Sec. 30 T. 27 N., R. 25 E.M.
ng 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 ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 8-10 inches.
Drilled 290 ft. Depth of completed well 290 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 8 " Diam. from 0 ft. to 24' ft.
Threaded ☐ ..." Diam. from ..... ft. to ..... ft.
Welded ☒ ..." Diam. from ..... ft. to ..... ft.

Perforations: Yes ☐ No ☒
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... 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? 18 ft.
Material used in seal Bentonite
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 60 ft. below top of well Date .....
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: 40 gal./min. with 0 ft. drawdown after 1 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

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

(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
Soil	0'	10'
Gravel & water	10'	40'
Red Basalt Rock	40'	130'
Brown Basalt & water	130'	150'
Red Basalt Rock	150'	290'
Hole - Cemented		

Work started 7-26 19 79 Completed 7-30 19 79

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 Four Star Drilling Co
(Person, firm, or corporation) (Type or print)
Address Box 885 Coulee City
[Signed] [illegible] Emerson
(Well Driller)
License No. 124 Date 10-26 19 79

(USE ADDITIONAL SHEETS IF NECESSARY)

✓ mc 12-79

ECY 050-1-20

7047

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

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 87187

Water Right Permit No. 1716 G

(1) OWNER: Name Ray Henton Address Bridgeport, Wa.

(2) LOCATION OF WELL: County Douglas SW¼ NE¼ Sec 35 T 29 N., R 25E W.M.

(2a) STREET ADDDRESS OF WELL (or nearest address) Highway 17 & Foster Creek Junction

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

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

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

(5) DIMENSIONS: Diameter of well 10 inches. Drilled 90 feet. Depth of completed well 90 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10" Diam. from 0 ft. to 60 ft.
Welded ☒ Liner installed ☐ 11" Diam. from 11 ft. to 11 ft.
Threaded ☐ 9" Diam. from 71 ft. to 83 ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

Screens: Yes ☒ No ☐
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 10T Slot size .100 from 61 ft. to 76 ft.
Diam. 10T Slot size .080 from 83 ft. to 90 ft.

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

Surface seal: Yes ☒ No ☐ To what depth? 25 ft.
Material used in seal Bentonite
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
Static level 140 ft. below top of well Date 7-24-92
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

Date of test
Bailer test 20 gal./min. with 0 ft. drawdown after 4 hrs.
Airtest gal./min. with stem set at ft. for hrs.
Artesian flow g.p.m. Date 7-24-92
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Top Soil	0	3
Sand & Gravel, Consolicated	3	24
Sand & Gravel & Clay	24	28
Bolders, Sand & Gravel	28	38
Sand & Gravel	38	46
Good Gravel with water	46	56
Gravel & Sand, (Tight)	56	62
Good Gravel	62	70
Sand	70	78
Good Gravel & Sand	78	90

JUL 8

Work started 7-6-92 Completed 7-24-, 1992

WELL CONSTRUCTOR 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.

NAME Windle Enterprises (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address P.O Box 279 Brewster, Wa. 98812
(Signed) Abe L Windle (WELL DRILLER) License No. 1421
Contractor's Registration No. WINDLE121AR Date 7-26-, 1992

(USE ADDITIONAL SHEETS IF NECESSARY)

ECY 060-1-20 (10/87) -1329-

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

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. ....

(1) OWNER: Name Foster Creek Land & Cattle Co. Address Mansfield, Wash 98830

(OCATION OF WELL: County Douglas 1/4 SW 1/4 Sec 1 T 28 N., R 26 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).... 2
New well ☑ Method: Dug ☐ Bored ☐
Deepened ☐ Cable ☐ Driven ☐
Reconditioned ☐ Rotary ☒ Jetted ☐

(5) DIMENSIONS: Diameter of well 10 inches.
Drilled 68 ft. Depth of completed well 64 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 10 " Diam. from +2 ft. to 64 ft.
Threaded ☐ ..... " Diam. from ..... ft. to ..... ft.
Welded ☒ ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes ☒ No ☐
Type of perforator used Torch
SIZE of perforations 1/8 in. by 4 in.
24 perforations from 64 ft. to 60 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? 18 ft.
Material used in seal Cement
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 12 ft. below top of well Date 2-3-81
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	lift	100+	

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 ☐

(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
Top soil	0	1
Sandy clay	1	18
Sandy clay wet	18	49
Sandy clay & gravel	49	53
Sand & gravel	53	64
Log @ Malone Property		

Work started 2-3-81, 19 ..... Completed 2-3, 1981

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 M.V.M. Quality Drilling
(Person, firm, or corporation) (Type or print)

Address P.O. Box 483 Bridgport, Wa. 98821

[Signed] .....
(Well Driller)

License No. 0658 Date 2-15, 1981

(USE ADDITIONAL SHEETS IF NECESSARY)

CHELAN HILLS AND CHELAN SPRINGS MONITORED WELL LOGS

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

97312

WATER WELL REPORT

STATE OF WASHINGTON

Notice of Intent W109842

UNIQUE WELL I D # AFE 409

Water Right Permit No

(1) **OWNER** Name Roy Luce Address 37845 M.L. Kay Rd Auburn WA 98001

(2) **LOCATION OF WELL** County Douglas 1/4 E ½ Sec 33 T 27 N R 23 WM

(2a) **STREET ADDRESS OF WELL** (or nearest address)

TAX PARCEL NO

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

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

(5) **DIMENSIONS** Diameter of well 8 inches
Drilled 61 feet Depth of completed well 59 ft

(6) **CONSTRUCTION DETAILS**
Casing Installed
☐ Welded 8 Diam from +2 ft to 59 ft
☐ Liner installed Diam from ft to ft
☐ Threaded Diam from ft to ft

Perforations ☐ Yes ☒ No
Type of perforator used
SIZE of perforations in by in
perforations 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
Material placed from ft to ft

Surface seal ☒ Yes ☐ No To what depth? 18 ft
Material used in seal Lenton, Fo
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 42.5 ft below top of well Date 10-29-99
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
Yield gal /min with ft drawdown after hrs
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
	12 gpm air lift estimate				

Date of test
Bailer test gal /min with ft drawdown after hrs
Airtest 12 gal /min with 4 psi ft drawdown after 1 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? ☐ Yes ☒ No

(10) **WELL LOG or DECOMMISSIONING PROCEDURE DESCRIPTION**
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

MATERIAL	FROM	TO
Sandy loam	0	2
gravel & boulders	2	15
red silt & angular gravel	15	40
damp clay & round gravel	40	46
silty sand	46	48
cinder basalt & angular gravel	48	59

RECEIVED
NOV 15 1999
DEPARTMENT OF ECOLOGY
CENTRAL REGION OFFICE

Work Started 10-28 99 Completed 10-29 99

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

Type or Print Name Marshall Miller License No 1437
(Licensed Driller/Engineer)

Trainee Name License No
Drilling Company MM Quality Drilling, LLC
(Signed) 1437 License No
(Licensed Driller/Engineer)
Address 22905 Riverview Rd, Chelan, WA 98816

Contractor's Registration No MVMQUDLO33MM Date

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer For special accommodation needs contact the Water Resources Program at (360) 407 6600 The TDD number is (360) 407 6006

ECY 050 1 20 (11/98)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

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

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No. 48235

UNIQUE WELL I.D. # ABX 913

Water Right Permit No.

(1) OWNER: Name Jason Sindum Address HCR 80 Box 486 Chelan WA 98831

(2) LOCATION OF WELL: County Douglas SW 1/4 SW 1/4 Sec 32 T 27 N. R 23 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) N

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

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

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

(5) DIMENSIONS: Diameter of well 6 inches. Drilled 485 feet. Depth of completed well 485 ft.

(6) CONSTRUCTION DETAILS:

Casing Installed: 6" Diam. from +2 ft. to 45 ft.
Welded ☒
Liner installed ☐ 4" Diam. from −6 ft. to 485 ft.
Threaded ☐ " Diam. from ft. to ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to 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? 18 ft.
Material used in seal Cement
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 150 ft. below top of well Date 7-19-95
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
	1080 gallons per day				

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 25 gal./min. with stem set at 484 ft. for 3 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☐

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Sandy loam	0	8
gravel in silt	8	24
silty sands / gravel	24	43
soft white gran. fe	43	150
orange soft granite (w)	150	155
med. hard black white gran.	155	305
green white soft granite (w)	305	340
black white med hard granite	340	405
black hard granite with intermittent soft loose zones	405	485

RECEIVED
JUL 24 1995
DEPARTMENT OF ECOLOGY

Work Started 7-14 19. Completed 7-19 19 95

WELL CONSTRUCTOR 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.

NAME MVM Quality Drilling (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)

Address 760 Kirkland Rd. 98813

(Signed) MV Mills (WELL DRILLER) License No. 1437

Contractor's Registration No. MVMAQUI38NO Date 7-21 19 95

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

The Department of Ecology does NOT Warranty the Data and/or the Information on this Well Report.

01

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

WATER WELL REPORT

STATE OF WASHINGTON

Application No. .....

Permit No. .....

(1) OWNER: Name Don Nystrom Address 500 McNiel Canyon Rd. Orondo Wa.

(2) LOCATION OF WELL: County Douglas — NE ¼ NE ¼ Sec. 13 T. 22 N., R. 23 W.M.

Bearing and distance from section or subdivision corner Lot 4 Div 3 Shelan Springs

(3) PROPOSED USE: Domestic [X] 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 [X] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 150 ft. Depth of completed well 205 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: ..." Diam. from .... ft. to .... ft.
Threaded [ ] ..." Diam. from .... ft. to .... ft.
Welded [ ] ..." Diam. from .... ft. to .... ft.

Perforations: Yes [ ] No [X]
Type of perforator used .....
SIZE of perforations ... in. by ... in.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

Screens: Yes [ ] No [X]
Manufacturer's Name .....
Type ... Model No. ...
Diam. ... Slot size ... from ... ft. to ... ft.
Diam. ... Slot size ... from ... ft. to ... ft.

Gravel packed: Yes [ ] No [X] Size of gravel: .....
Gravel placed from ... ft. to ... ft.

Surface seal: Yes [ ] No [ ] To what depth? ... 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.
Static level 150 ft. below top of well Date .....
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: 2 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

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 [ ]

(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
Decomposed Granite	55	205

RECEIVED
MAR 1 - [illegible]
DEPARTMENT OF ECOLOGY
SPOKANE REGIONAL OFFICE

Work started 3-15, 19 88 Completed 3-16, 19 88

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 Four Star Drilling (Person, firm, or corporation) (Type or print)

Address Box 37 Hartline Wa. 99135

[Signed] Dwight Emerson (Well Driller)

License No. 124 Date 3-16, 19 88

(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

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No. 50792
UNIQUE WELL I.D. # ABL957
Water Right Permit No.

OWNER: Name Tom Cochran Address P.O. Box 4 Chelan Falls WA 98817

(2) LOCATION OF WELL: County Douglas 1/4 NE 1/4 Sec 23 T. 27 N., R. 23 W.M.

(2a) STREET ADDRESS OF WELL (or nearest address) A

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

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

(5) DIMENSIONS: Diameter of well 8+6 inches. Drilled 165 feet. Depth of completed well 165 ft.

(6) CONSTRUCTION DETAILS:
Casing Installed: 8" Diam. from +2 ft. to 39 ft.
Welded ☐ Liner installed ☒ 6" Diam. from +2 ft. to 145 ft.
Threaded ☐ 6 minus at his request ft.

Perforations: Yes ☐ No ☒
Type of perforator used
SIZE of perforations in. by in.
perforations from ft. to 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? 18 ft.
Material used in seal Neat Cement
Did any strata contain unusable water? Yes ☒ No ☐
Type of water? Volume too small Depth of strata
Method of sealing strata off cased

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

(8) WATER LEVELS: Land-surface elevation above mean sea level
Static level 85 ft. below top of well Date 10-14
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

Date of test
Bailer test gal./min. with ft. drawdown after hrs.
Airtest 6 gal./min. with stem set at 164 ft. for 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? Yes ☐ No ☒

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
Top Soil	0	4
cobbles in silty ground	4	19
silt	19	28
basalt flakes in clay	28	39
basalt matrix	39	43
wet fine gravel in clay	43	46
cobbles and ground water	46	145
decomposed gran. rk	145	165

Work Started 10-12 19. Completed 10-14 19 94

WELL CONSTRUCTOR 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.

NAME MVM Quality Drilling (PERSON, FIRM OR CORPORATION) (TYPE OR PRINT)
Address 760 Highland Rd. 98813
(Signed) MV Mill (WELL DRILLER) License No. 1437
Contractor's Registration No. MVMQUD138NO Date 10-24 19 94

(USE ADDITIONAL SHEETS IF NECESSARY)

Ecology is an Equal Opportunity and Affirmative Action employer. For special accommodation needs, contact the Water Resources Program at (206) 407-6600. The TDD number is (206) 407-6006.

ECY 050-1-20 (9/93)

BADGER MOUNTAIN
MONITORED WELL LOGS

WATER WELL REPORT

STATE OF WASHINGTON

Start Card No W 170552
Unique Well I D # AKH866
Water Right Permit No

137784

(1) OWNER Name MOULTON, BRUCE H Address 628 LOWE ST WENATCHEE, WA 98801

(2) LOCATION OF WELL County DOUGLAS SE 1/4 SE 1/4 Sec 14 T 24 N , R 21E WM
(2a) STREET ADDRESS OF WELL (or nearest address) 114 PONDEROSA RD , EAST WENATCHEE

(3) PROPOSED USE DOMESTIC

(4) TYPE OF WORK Owner's Number of well (If more than one)
NEW WELL Method ROTARY

(5) DIMENSIONS Diameter of well 6 inches
Drilled 299 ft Depth of completed well 299 ft

(6) CONSTRUCTION DETAILS
Casing installed 6 " Dia from +1 5 ft to 18 5 ft
WELDED W/LINER 4 " Dia from 9 ft to 299 ft
" Dia from ft to ft

Perforations YES
Type of perforator used SKILL SAW
SIZE of perforations 125 in by 7 in
42 perforations from 139 ft to 159 ft
84 perforations from 259 ft to 299 ft
perforations from ft to ft

Screens NO
Manufacturer's Name
Type Model No
Diam slot size from ft to ft
Diam slot size from ft to ft

Gravel packed NO Size of gravel
Gravel placed from ft to ft

Surface seal YES To what depth? 18 ft
Material used in seal BENTONITE
Did any strata contain unusable water? NO
Type of water? Depth of strata ft
Method of sealing strata off SEAL METHOD 1

(7) PUMP Manufacturer's Name
Type H P

(8) WATER LEVELS Land surface elevation above mean sea level ft
Static level 24 ft below top of well Date 06/18/03
Artesian Pressure lbs per square inch Date
Artesian water controlled by

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

Recovery data
Time Water Level Time Water Level Time Water Level

Date of test / /
Bailer test gal/min ft drawdown after hrs
Air test 4 5 gal/min w/ stem set at 298 ft for 3 25 hrs
Artesian flow g p m Date
Temperature of water Was a chemical analysis made? NO

(10) WELL LOG

R

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 in formation

MATERIAL	FROM	TO
BROWN CLAY	0	2
BROWN CLAY BROKEN BASALT	2	11
HARD BASALT WITH	11	108
BROKEN LAYER(S)	11	108
BROKEN BASALT	108	118
BASALT	118	127
BROKEN BASALT WATER BEARING	127	131
BASALT	131	143
HARD BASALT	143	158
BROKEN BASALT WATER BEARING	158	161
HARD BASALT	161	258
FRACTURED BASALT WATER BEARING	258	266
HARD BASALT	266	289
BLACK CLAY	289	291
DARK BROWN CLAY	291	299

DEPT OF ECOLOGY Received AUG 01 2003 CENTRAL REGIONAL OFFICE

Work started 06/17/03 Completed 06/18/03

WELL CONSTRUCTOR 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

NAME TUMWATER DRILLING, INC
(Person, firm, or corporation) (Type or print)

ADDRESS ~~P O BOX 779~~

[SIGNED] License No 1249

Contractor's
Registration No TUMWADP 011 LZ Date 06/18/03

1955

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

WATER WELL REPORT

STATE OF WASHINGTON

Application No. 55141

Permit No. .....

(1) OWNER: Name Ron Robins Address RT 6 Box 52 55B Wenatchee Wa.

LOCATION OF WELL: County Grant Douglas NW ¼ NW ¼ Sec 13 T. 24 N., R. 21 W.M.

Bearing and distance from section or subdivision corner Lot 7 Badger Mtn Development D

(3) PROPOSED USE: Domestic [X] Industrial [ ] Municipal [ ]
Irrigation [ ] Test Well [ ] Other [ ]

(4) TYPE OF WORK: Owner's number of well (if more than one) .....
New well [X] Method: Dug [ ] Bored [ ]
Deepened [ ] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 125 ft. Depth of completed well 125 ft.

(6) CONSTRUCTION DETAILS:

Casing installed: 6 " Diam. from 0 ft. to 20 ft.
Threaded [ ] ..... " Diam. from ..... ft. to ..... ft.
Welded [ ] ..... " Diam. from ..... ft. to ..... ft.

Perforations: Yes [ ] No [X]
Type of perforator used .....
SIZE of perforations ..... in. by ..... in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

Screens: Yes [ ] No [X]
Manufacturer's Name .....
Type ..... Model No. .....
Diam. ..... Slot size ..... from ..... ft. to ..... ft.
Diam. ..... Slot size ..... from ..... ft. to ..... ft.

Gravel packed: Yes [ ] No [X] Size of gravel: .....
Gravel placed from ..... ft. to ..... ft.

Surface seal: Yes [X] No [ ] To what depth? 18' ft.
Material used in seal Bentonite
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 ..... ft. below top of well Date .....
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: 8 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

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 [ ]

(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
Soil	0	5'
Brown Broken Basalt rock	5'	125'
Water 100 to 125'		

Work started 6-1 1986 Completed 6-9- 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 Four Star Drilling (Person, firm, or corporation) (Type or print)

Address Box 37 Hartline Wa.

[Signed] Fred E Emerson (Well Driller)

License No. 124 Date 6-9- 1986

(USE ADDITIONAL SHEETS IF NECESSARY)

2/17/87

ECY 050-1-20 3

WELL LOG CHANGE FORM

Instructions: Record any change made to the well log record on this form. Append this form to the well log image. File with the original.

WCL Log ID (Required) N/A Well Log ID 145034

Regional Office: ☑CRO ☐ERO ☐NWRO ☐SWRO

Type of Well: ☑Water ☐ Resource

Notice of Intent: N/A Ecology Well ID Tag No. N/A

Property (Well) Owner's Name Ron Robins
Well Street Address _____
City _____ County Douglas Zip Code _____

Location: NW 1/4-1/4 NW 1/4 (Sec 12) Twn 24 R 21 (E) or W (Circle One)

Lat./Long: (Required) Lat. Deg. _____ Lat. Min/Sec _____
Long. Deg. _____ Long. Min/Sec _____
Horizontal Collection Method Code _____

Tax Parcel No _____

Type of Work: ☐ New Well ☐ Reconditioned ☐ Deepened
Well Log Received Date __/__/__
Well Diameter ___ (in inches) Well Depth _____ (in feet) Well Completed Date __/__/__

Driller's Ecology License No. _____
Trainee's Ecology License No. _____

Reason/Source of Change (Required)
CORRECTION TO SECTION ONLY
Well is in Section 12, not 13.

Signature of Well Log Tracker (Required) EB Date 1/20/05

WATER WELL REPORT

State of Washington Date Printed: **17-Jun-2005** Log No. **16405**

Construction/Decommission Original Construction Notice 175767

Construction

PROPOSED USE: **DOMESTIC**

TYPE OF WOR Owners's Well Number: (If more than one well) **1**

NEW WELL Method: **ROTARY**

DIMENSIONS Diameter of well: **6** inches

Drilled **140** ft. Depth of completed well **140** ft.

CONSTRUCTION DETAILS: Casing installed **WELDED**

Liner installed: PVC **6** " Dia from **+2** ft. to **18** ft.

" Dia from ft. to ft.

4 " Dia from **10** ft. to **140** ft. " Dia from ft. to ft.

Perforations: **Yes** Used In: **Liner**

Type of perforator used **SKILL SAW**

SIZE of perforations **6** in. b **1/8** in.

60 Perforation from **100** ft. to **140** ft.

Perforation from ft. to ft.

Perforation from ft. to ft.

Screens: **No** K-Pac Location

Manufacture's Name

Type: Model No

Diam. slot size from ft. to ft.

Diam. slot size from ft. to ft.

Gravel/Filter packed: **No** Size of Gravel

Material placed fro ft. to ft.

Surface seal: **Yes** To what depth **18** ft.

Seal method: Material used in seal **BENTONITE**

Did any strata contain unusable water **No**

Type of water Depth of strata

Method of sealing strata off

PUMP: Manufacture's name

Type: H.P. **0**

WATER LEVELS Land-surface elevation above mean sea level: **0** ft.

Static level **60** ft. below top of well Date **05/19/2005**

Artesian Pressure lbs per square inch Date

Artesian water controlled by

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

Was a pump test made **No** If yes, by whom

Yield gal/min with ft drawdown after

Yield gal/min with ft drawdown after

Yield gal/min with ft drawdown after

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

Time:	Water Leve	Time:	Water Leve	Time:	Water Leve

Date of test:

Bailer test gal/min ft drawdown after hrs.

Air test **20** gal/min w/ stem set at **140** ft. for **1** hours

Artesian flow gpm Date

Temperature of water Was a chemical analysis made **No**

CURRENT

Notice of Intent No.: **W190406**

Unique Ecology Well I.D. No **AKM235**

Water Right Permit Number:

OWNER: **MURRAY, EDWARD L.**

OWNER ADDR: **519 N. FRENCH RD ARLINGTON, WA 98223**

Well Street Address: **LOT 7 BADGER MTN. "D"**

City: **Wenatchee, WA 98802** County: **DOUGLAS**

Location: 1/4 **SW** 1/4 Sec **23** T **24** R **21E** EW

Lat/Long: (s, t, r still REQUIRED) Lat Deg Lat Min/Sec

Long Deg Long Min/Se

Tax Parcel No.: **45100000700**

L M, N P

CONSTRUCTION OR DECOMMISSION PROCEDURE

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

Material	From	To
BASALT COBBLE CLAY	0	2
BASALT MEDIUM	2	40
BASALT HARD	40	98
BROKEN BASALT	98	110
BASALT FRACTURED W/WATER	110	130
BASALT HARD	130	140

DEPT. OF ECOLOGY Received JUL 07 2005 CENTRAL REGION OFFICE

Notes:

Work starte **05/19/2005** Complete **05/20/2005**

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 are true to my best knowledge and belief.

☑ Driller ☐ Engineer ☐ Trainee

Name: **MARTY RUGO** License No.: **2038**

Signature: Marty Rugo

If trainee, Licensed driller is License No.:

Licensed Driller Signature

Drilling Company:

NAME: **FOGLE PUMP & SUPPLY, INC.** Shop: **REPUBLIC**

ADDRESS: **PO Box 456**

Republic, WA 99166

Phone: **5097752878** Toll Free: **8008453500**

E-Mail: **foglewest@rcabletv.com**

FAX: **5097750498** WEB Site: **www.foglepump.com**

Contractor's Registration No.: **FOGLEPS095L4** Date Log Created: **06/17/200**

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

WATER WELL REPORT
STATE OF WASHINGTON

Start Card No ~~W-088714C~~
UNIQUE WELL I.D. # ACK 059
Water Right Permit No. _____

(1) OWNER: Name WILLEY, GARY Address 9269 CRESENT BAR N.W. QUincy WA 98848

(2) LOCATION OF WELL: County DOUGLAS SE 1/4 NE 1/4 Sec 15 T 24 N.R 21E WM.

(2a) STREET ADDRESS OF WELL (or nearest address) 3 SW 17.5 BADGER MT, EAST WENATCHEE 4

(3) PROPOSED USE: [X] Domestic [ ] Industrial [ ] Municipal [ ] Irrigation [ ] Test Well [ ] Other [ ] DeWater

(4) TYPE OF WORK: Owner's number of well (if more than one) _____
Abandoned [ ] New well [ ] Method: Dug [ ] Bored [ ]
Deepened [X] Cable [ ] Driven [ ]
Reconditioned [ ] Rotary [X] Jetted [ ]

(5) DIMENSIONS: Diameter of well 6 inches.
Drilled 33 feet. Depth of completed well 210 ft.

(6) CONSTRUCTION DETAILS:
Casing installed: 4½" Diam. from 180 ft. to 210 ft.
Welded [ ] _____" Diam. from _____ ft. to _____ ft.
Liner installed [X] Threaded [ ] _____" Diam from _____ ft. to _____ ft.

Perforations: Yes [X] No [ ]
Type of perforator used 1/8 SKIL SAW
SIZE of perforations 1/8 in by 7 in.
42 perforations from 190 ft to 210 ft.
_____ perforations from _____ ft. to _____ ft.
_____ perforations from _____ ft to _____ ft.

Screens: Yes [ ] No [X]
Manufacturer's Name _____
Type _____ Model No. _____
Diam. ____ Slot size _____ from _____ ft. to _____ ft.
Diam. ____ Slot size _____ from _____ ft to _____ ft.

Gravel packed: Yes [ ] No [X] Size of gravel _____
Gravel placed from _____ ft to _____ ft

Surface seal: Yes [ ] No [ ] To what depth? _____ ft.
Material used in seal _____
Did any strata contain unusable water? Yes [ ] No [X]
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 116 ft below top of well Date 5-6-98
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 [X] 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)

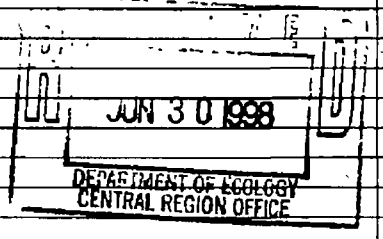
Time	Water Level	Time	Water Level	Time	Water Level

Date of test _____
Bailer test _____ gal./min. with _____ ft. drawdown after _____ hrs.
Airtest 15 gal./min. with stem set at 210 ft. for 1½ hrs.
Artesian flow _____ g.p.m. Date 5-6-98
Temperature of water _____ Was a chemical analysis made? Yes [ ] No [X]

(10) WELL LOG or ABANDONMENT PROCEDURE DESCRIPTION

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 information.

MATERIAL	FROM	TO
EXISTING 6" WELL - 0GPM	0	178
BASALT	178	182
BROKEN BASALT ½-1GPM	182	185
BASALT	185	189½
BLACK CLAY	189½	197
BROWN CLAY WBEC 201'-204	197	208
BROWN VERY FINE SAND	208	211



Work Started 5-6 19 Completed 5-7 1998

WELL CONSTRUCTOR 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.

NAME TUMWATER DRILLING INC. (PERSON, FIRM, OR CORPORATION) (TYPE OR PRINT)
Address LEAVENWORTH WA
(Signed) _____ (WELL DRILLER) License No 1349
Contractor's Registration No. TUMWAD2 1330C Date 5-26 1998

(USE ADDITIONAL SHEETS IF NECESSARY)

WELL LOG CHANGE FORM

Instructions: Record any change made to the well log record on this form
Then always append this form to the well log image File with the original

WCL Log ID (Required)_____ Well Log ID _____

Regional Office: ☐CRO ☐ERO ☐NWRO ☐SWRO

Type of Well: ☐ Water ☐ Resource
Notice of Intent Ecology Well ID Tag No. _
Property (Well) Owner's Name _____
Well Street Address _____
City _____ County _____ Zip Code _____
Location ____1/4-1/4 ____1/4 Sec ____ Twn ____ R ____ E or W (Circle One)
Lat /Long: (Required) Lat. Deg _____ Lat. Min/Sec _____
Long. Deg. _____ Long Min/Sec _____
Horizontal Collection Method Code _____
Tax Parcel No _____
Type of Work: ☐New Well ☐ Reconditioned ☐ Deepened ☐ Decommission
Well Log Received Date __/__/__
Well Diameter ___ (in inches) Well Depth _____ (in feet) Well Completed Date __/__/__
Driller's Ecology License No. _____
Trainee's Ecology License No _____

Reason/Source of Change (Required)
No Notice of Intent (NOI) sent in for this well log. Go to NOI# on this form for more information regarding this well.

Signature of Well Log Tracker (Required) Peg Plummer Date 1 1

ECY-WR-WLCF Rev. 10/02/02

P 206.329.0141 | **F** 206.329.6968

2377 Eastlake Avenue East | Seattle, WA 98102

P 206.842.3202 | **F** 206.842.5041

8150 West Port Madison NE | Bainbridge, WA 98110

P 360.570.8244 | **F** 360.570.0064

1627 Linwood Avenue SW | Tumwater, WA 98512

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