Results of the First Season of Shallow Aquifer Recharge Testing at the Locher Road Site, Walla Walla County, Washington

Prepared for:
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And
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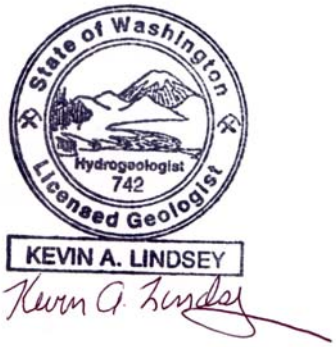

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1.0 Introduction

The Locher Road shallow aquifer recharge project (the Project) is one of several test projects in the Walla Walla Basin (the Basin) currently underway to evaluate shallow aquifer recharge (SAR) methods and effects. Water resource stakeholders in the Basin are exploring SAR, in conjunction with other activities, to assist in addressing water supply, stream flow, water table level, and habitat issues. Data collected from the Locher Road site (the Site) will be used to address these issues in the immediate area of the Site and contribute to basin wide planning and water resource management efforts.

It is anticipated that SAR activities at the Site will continue for several years, or recharge seasons. This report summarizes basic Site physical conditions, describes infrastructure used for the project, discusses the results of the first SAR test season, and presents recommendations for future SAR test activities at the Site. As testing progresses over the next several years, future project reports will build on the data and recommendations presented in this report.

The data and information described in this report was collected by GSI Water Solutions, Inc. (GSI) (formerly Groundwater Solutions, Inc.) under contract to Gardena Farms Irrigation District #13 (GFID). Specifically this report describes:

1. The geographic setting of the Site.

2. Regulatory conditions under which the project was executed during the 2006/2007 recharge season.

3. Characterization, monitoring, and testing methods used during the completion of the work described in this report.

4. Site layout as it was used during the 2006/2007 recharge season.

5. The general geologic and hydrogeologic setting of the project area.

6. Monitoring locations.

7. Volume and timing of water delivered to the Site during the 2006/2007 recharge season.

8. Site specific geology and surface water, source water, vadose zone, alluvial aquifer, and water quality conditions before, during, and after the 2006/2007 recharge season.

9. Conclusions and recommendations.

This report continues work previously completed by GSI scientists then working as employees of Kennedy/Jenks Consultants (Kennedy/Jenks, 2006) under subcontract to HDR, Inc. The previous work, and the work described herein, was completed using funding supplied by the Washington Department of Ecology (Ecology).

For the work described herein, the project team included the following people:

- Stuart Durfee – GFID Manager, project manager for this Project, and Site operator.
- Kevin Lindsey, Ph.D., L.Hg. – GSI project manager and hydrogeologist.
- John Fazio, P.E. – Fazio Engineering, project engineer, working under subcontract to GSI.
- Jon Travis – GSI, technical support.
- Terry Tolan, L. Hg. – GSI, technical review, hydrogeologist.

The work conducted for this project could not have been done without the cooperation of the Site landowner, Mrs. Patricia Case, the efforts of GFID staff, and the endorsement of the GFID Board of Directors. We thank these people for their support.

2.0 Geographic Setting

The Site is in, and adjacent to, a previously excavated gravel pit. The pit is located adjacent to the intersection of Locher and Stateline Roads, in the NE ¼, NE ¼, Section 18, T6N, R35E, approximately 4.5 miles west-southwest of College Place, Washington (Figure 1). The gravel pit is owned by Mrs. Patricia Case. The actual test site is located in the northern portion of the gravel pit (Figure 2). The gravel pit is approximately 800 feet long (north-south) and 300 feet wide (east-west) and ranges from approximately 15 to 20 feet deep.

Land uses in the area surrounding the gravel pit and Site consist primarily of irrigated farming, rural residential homes, and irrigated pasture. Irrigated fields are located immediately to the north, west, and south of the gravel pit and Site. Housing density in the immediate Site vicinity is highest east of Locher Road where homes are on parcels ranging a few acres to a few ten's of acres in size. Several homes are located on Locher Road immediately east of the Site. To the west and north of the Site, the nearest homes are at least 0.5 miles away from the Site. Each home in the Site area is served by at least one water supply well for domestic potable, and in some cases irrigation uses.

Gardena Farms Canal (the Canal), operated by GFID, bounds the north edge of the Site (Figure 2) and is how water for SAR testing is delivered to the Site. Gardena Farms Canal water is diverted from the Walla Walla River at GFID's diversion structure at Beet Road. The total distance in the Canal, from the Walla Walla River to the Site, is approximately 3.6 miles. The natural surface water body closest to the Site is Mud Creek. Mud Creek flows into Washington east of the Site, crossing under Stateline Road before flowing north and then west of the Site (Figure 1).

3.0 Regulatory Setting

The SAR testing described in this report was conducted under a Short Term Water Use Authorization issued by Ecology to GFID on 12 December 2006. This authorization allowed GFID to use water from the Walla Walla River, delivered via the Canal, for shallow aquifer recharge testing. The authorization listed several provisions, including period of use, maximum instantaneous diversion rate, minimum and maximum Walla Walla River flow conditions, and monitoring and sampling requirements under which SAR testing could be conducted.

4.0 Characterization, Monitoring, and Test Methods

Characterization, monitoring, and testing activities for this project were carried out generally as described in revision 3 of the project monitoring and test plan (Kennedy/Jenks, 2005). This section briefly summarizes methods used to collect characterization, monitoring, and test data. For more detailed information the reader is referred to revision 3 of the test and monitoring plan.

4.1 Geologic Conditions

Site geology was characterized by reviewing existing information and conducting site-specific field investigations. Existing information used to evaluate Site geologic conditions included previously published/prepared reports (Newcomb, 1965; Bush and others, 1973; Kennedy/Jenks, 2003, 2004), existing geologic maps (Schuster, 1994), and Water Well Reports (driller's logs) for wells in the general Site area. These materials were reviewed to evaluate general area geology and any site-specific information they contained. Site specific investigation focused on examining outcrops exposed in the gravel pit at the Site and geologic logging of drill cuttings collected during the drilling of three monitoring wells at, and near, the Site. These geologic evaluations, which identified basic physical geology as it might relate to Site hydrogeology, focused on: (1) identifying matrix and framework grain petrology, (2) cement types, and (3) stratification. Physical properties identified from outcrops and drill cuttings relied primarily on visual examination and geologic logging techniques typically used for continental clastic sediments.

4.2 Water Level and Flow Measurements

Water levels were measured using two basic methods, a manual method and an automated method. The manual method used an electronic water level sounder (e-tape). E-tape measurements in monitoring wells were collected each time the well was visited using standard procedures for such instruments. In each well, the e-tape measurement, as read off the marked tape, was done in reference to a fixed, permanent notch, or reference point, on the PVC well casing. Automated water level measurements were collected using digital transducers (Solinst Levellogger®) programmed to collect data hourly. The transducers were suspended in each well on a wire cable, and pulled to the surface periodically for data retrieval to a lap top computer. The transducers used for the Project are unvented, self-contained units so their data was corrected for barometric effects using a barometer installed at the near-by Hall-Wentland SAR site (Figure 1).

Water level data was collected from the three monitoring wells before, during, and following SAR testing.

The volume of water delivered to the Site was measured in a concrete and steel ramp flume constructed at the turn-out from Gardena Farms Canal. A staff gauge for manual readings and a digital transducer for electronic readings were installed in the flume. A conversion chart for the staff gauge (see Appendix A) was prepared that allowed the direct conversion of staff gauge readings, in feet, to flow, in cubic feet per second (cfs). Direct staff gauge readings were recorded in field notebooks by GSI and GFID staff during each Site visit. Digital transducer data was colleted hourly and subsequently converted to flow estimates by comparing the water depth measured by the transducer to the direct observation readings, converted to flow, off the staff gauge.

Late in testing a staff gauge and digital transducer was installed in the SAR test basins (described in Section 6.1) to better measure basin responses to testing, including how basin water level fluctuated as delivery rates were varied, and how fast the basins drained once water delivery was stopped.

4.3 Water Quality Sampling

Both surface water and groundwater quality were analyzed for the project. Surface water quality data was collected to: (1) evaluate the water quality of source water being used at the Site for SAR testing, (2) track changes, if any, in water quality in the nearest surface water body (e.g., Mud Creek) before, during, and after SAR testing, and (3) provide a baseline for assessing possible SAR impacts on groundwater. Source water was collected from Gardena Farms Canal at the diversion to the Site. Surface water was collected from two locations on Mud Creek, one at State Line Road and one at Locher Road.

Groundwater quality was evaluated to assess changes, if any, to groundwater as a result of SAR testing. Groundwater was collected from two monitoring wells, L-1 and L-2 prior to January 2007 and three wells after L-3 was completed in early January 2007.

Three categories of water quality parameters were collected for the 2006/2007 recharge season:

- Field parameters – pH, temperature, turbidity, and electrical conductance.
- Basic parameters – nitrate-N, hardness, total dissolved solids, chloride, soluble reactive phosphorous, chemical oxygen demand, and presence/absence of coliform and e-coli bacteria.
- Synthetic organic compounds (SOCs) – see Appendix B for list.

Surface water (Mud Creek) and source water (Gardena Farms Canal) sampling was done by simply dipping a clean sample bottle supplied by the analytical laboratory into the water and letting it fill. If debris was present in the water, the sampler attempted to clear the water surface prior to sampling. These bottles were than capped and placed in a cooler for preservation and shipment to the laboratory for analysis. Field parameters were collected at the same time the sample for the laboratory was collected.

Groundwater samples were collected after purging 3 to 5 well bore volumes from the monitoring well being sampled, as described in the test and monitoring plan. A low volume purge pump was used to purge the well and collect samples. Water quality samples were pumped directly into clean, laboratory bottles. Samples bottles were capped and placed in a cooler for shipment to the laboratory. Field parameters were collected periodically throughout the well purge, including when sample for submittal to the laboratory was collected.

Sampler's field notes, laboratory results, and supporting information are reproduced in this report in Appendix C.

4.4 Test Operations

The Site, including turnouts, control gates, and water distribution was operated by GFID personnel. GFID staff adjusted flow diverted to the Site as needed to prevent overtopping of the recharge basins and to meet the conditions and provisions of the Short Term Water Use Authorization. GFID staff recorded the time and date of specific actions in field notes, and provided those notes to GSI for use in the preparation of this report. Staff gauge readings also were periodically taken by GFID staff and GSI staff and recorded in project field notes.

Given the test nature of this project, the site was operated to gain both experience and information on operations and to collect information and data to use in evaluating the possible effects of SAR on shallow alluvial aquifer groundwater. The primary actions associated with this centered on turning the delivery of water to the Site off and on and changing the rate water was delivered to the Site (GFID staff primarily responsible) and collecting and evaluating monitoring data (GSI staff primarily responsible).

Below, in sequential order, is a chronological list of basic project actions conducted for the first test season, beginning in July 2006. All activities conducted prior to July 2006 are described in a 30 June 2006 memorandum (K.Lindsey, Kennedy/Jenks, to Matt Rajnus, Walla Walla County) which is reproduced here in Appendix D.

- 11 October 2006 – Field and basic water quality parameters collected for wells L-1 and L-2.
- 12 December 2006 – Ecology issues temporary authorization to use water for SAR testing.
- 09 January 2007 – Monitoring well L-3 drilled.
- 15 January 2007 – Field, basic, and SOC water quality samples collected from wells L-1, L-2, and L-3, and field and basic water quality parameters collected from Mud Creek at Locher Road and Stateline Road. The Canal was not sampled at this time because it was dry.
- 14 March 2007 – Canal operation resumes for spring with opening of head gate on the Walla Walla River near Beet Road.
- Mid- to late-March 2007 – Diversion flow monitoring equipment installation completed.

- 29 March 2007 – Filled upper basin in approximately 7 hours at average flow rate of 0.45 cfs. Test shut down because the upper basin filled to capacity.

- 02 April 2007 – Connecting ditch built between upper and lower basin.

- 03 April 2007 – Test restarted at 0745 hours, ran until 1837 hours on 10 April 2007. Instantaneous flow rates ranged from 0.12 to 1.37 cfs, averaging approximately 0.8 cfs from 06 to 10 April. Test shut down because of flow conditions in the Walla Walla River.

- 12 April 2007 – Field and basic water quality sampling in all three wells, the Canal, and Mud Creek. Also ran test from 0730 to 1830 hours at approximate rate of 0.8 cfs.

- 16 April 2007 – Restart test at 1615 hours and run at approximately 0.8 cfs until 18 April 2007.

- 18 April 2007 – Slowed withdrawal rate to between 0.57 and 0.74 cfs, continued in this rate until 20 April 2007.

- 20 April 2007 – Increased flow rate to 0.94 cfs until testing for season ends at 1200 hours on 20 April 2007.

- 23 April 2007 – Field, basic, and SOC sampling conducted at all monitoring wells, and the Canal. Field and basic parameter sampling conducted on Mud Creek.

5.0 Walla Walla Basin Suprabasalt Sediment Geologic and Alluvial Aquifer Hydrogeologic Setting

Recent work by GSI (GSI, in prep) and previous work by members of the team (Kennedy/Jenks, 2004, 2005; Lindsey and Tolan, 2004) has revised the basic suprabasalt sediment geologic picture of the Walla Walla Basin as originally described by Newcomb (1965). This section summarizes this revised suprabasalt sediment geology in the general Site area. Because the target of this SAR test project is the shallow aquifer, typically found within a few tens of feet of the Earth's surface and hosted by suprabasalt sediments, this discussion focuses primarily on the upper 200 feet of the suprabasalt sedimentary strata underlying the Site area.

5.1 Structural Geologic Setting

The Walla Walla Basin (the Basin) is a structural basin bounded on the south and southwest by the Horse Heaven Hills anticline, the east by the Blue Mountains, and the north by the Palouse Slope (Figure 3). The same basalt units found on these highlands (Swanson and others, 1981; Schuster, 1994) occur beneath the Basin where they are covered by Miocene (?) to Recent sedimentary sequence which can be many of hundreds of feet thick. These sedimentary strata, the suprabasalt sediments, record a history of Basin formation (subsidence) and uplift of the surrounding highlands, river and

flood plain deposition, and soil formation and wind deposition (Newcomb, 1965; Fecht and others, 1987; Lindsey, 1996; Lindsey and Tolan, 2004). Subsidence and uplift lead to the accumulation of a heterogeneous basin-fill sedimentary sequence displaying evidence of braided gravelly river deposition, floodplain deposition and soil formation, and deposition of fines in lakes. The suprabasalt sediments overlie an irregular basalt surface which is the product of both basin subsidence and highland uplift along faults and folds bounding the Basin and emplacement of basalt flow lobes which only partially covered the Basin. The Site is located in the east-central portion of the Walla Walla Basin (Figures 1 and 3).

5.2 Suprabasalt Sediment Geology

This section summarizes the basic subsurface suprabasalt sediment geology of the Walla Walla Basin as it is currently being mapped by GSI (GSI, in prep) for the WWBWC and the Ecology WMI program. For more detailed information about these sediments the reader is referred to that report, which should be completed in July 2007. From the surface downwards, mapped suprabasalt sediment units in the Site area discussed in the following sections include two Quaternary units, fine and coarse, and three Mio-Pliocene units, upper coarse, fine, and basal coarse (Figure 4). The suprabasalt sediment sequence is overlain by thin, to thick soils which display characteristics reflective of the materials they are developed on.

5.2.1 Surface soils

Wind deposited, gray colored, sandy silt and fine sand is described by Newcomb (1965) as mantling the surface of much of the Basin and surrounding hills. Newcomb generally characterized this material as reworked Palouse Formation and Touchet Beds less than 10 feet thick. Based on field reconnaissance, we infer that young loess generally corresponds to the many of the modern surface soils as shown on soil survey maps. Soils in the Walla Walla Basin range from silt loams, to gravelly and cobbly loams, to bedrock land. The basic characteristics are discussed here.

- Bedrock areas generally are restricted to the periphery of the Basin where stream erosion has stripped away thin sediments overlying shallow basalt bedrock that has been uplifted to near the Earth's surface. Bedrock soils can be found in gullies, ravines, and stream valleys incised into these upland areas as well across the upland surfaces themselves.

- Gravelly to cobbly soils, usually part of the Yakima series, generally are found in elongate tracts associated with major streams, including most notably Mill Creek and the Walla Walla River. This soil generally is the result of Recent (<10,000 years old) stream deposition and essentially delineates the position of geologically young stream meander belts and braidplains associated with the modern (<10,000 year old) drainage. Infiltration capacity of these soils generally will be high.

- A number of silt loam and related soils cover all of the upland areas and much of the Walla Walla valley floor. These soils include numerous subtypes in the Athena, Catherine, Hermiston, Onyx, Walla Walla, and Yakima series. On the valley floor these soils are generally a few feet thick and superimposed on fines a

few feet to tens of feet (<25) thick. In upland areas these soils may be superimposed on multiple older soils. Infiltration capacity of these loamy soils varies from low to moderate depending on local conditions.

5.2.2 Quaternary fine unit

The Quaternary fine unit consists of several main subdivisions which, while easily differentiated on the Earth's surface, are difficult to differentiate in the subsurface. The two primary subdivisions of the Quaternary fine unit are the Touchet Beds and the Palouse Formation. Other fine strata comprising the unit are fine-grained flood plane deposits (fine alluvium) and fine strata comprising Newcomb's upper valley terrace deposits (Newcomb, 1965). The basic characteristics of these strata are summarized in the following paragraphs.

The Touchet Beds mapped by Newcomb (1965) and described by subsequent investigators (Baker and Bunker, 1985; Baker and others, 1987, 1991; Kiver and others, 1989; Waitt, 1980, 1985) consist of well stratified, normally graded sand and silt (Figure 5) deposited by Pleistocene Cataclysmic Flood waters as the Basin was repeatedly inundated by these flood waters. Cataclysmic Floods (e.g., Missoula or Bretz Floods) periodically inundated the Walla Walla valley between approximately 1,000,000 and 12,000 years ago (Baker and others, 1991; Waitt and others, 1994). Sand and silt deposited in the Walla Walla Basin by these flood waters consist of well stratified, normally graded, interbedded felsic silt and felsic to basaltic fine to medium sand (Figure 5). Finer grained layers tend to be brown to tan colored, coarser layers brown to gray-brown colored. Individual beds (or layers) range from a few inches to less than 3 feet-thick. These strata do not commonly display significant cementing, although some pedogenic calcium carbonate (caliche or hardpan) may be observed in the upper parts of these deposits where they are exposed at the Earth's surface. A range of soft-sediment deformation features and cross-cutting clastic dikes are commonly found in this unit (Fecht and others, 1999). Newcomb describes these strata as overlying the Palouse Formation and the upper terrace deposits. Touchet Beds are found on the hills surrounding the Basin and they comprise the small hills found across the Basin floor. On Schuster's map (Schuster, 1994) the Touchet beds are mapped as Quaternary flood sediments.

In the central and western Basin fine-grained alluvial deposits, which probably consist predominantly of reworked Touchet Beds and loess (of various ages) are widespread. These deposits consist of discontinuous deposits of clay, silt, and fine sand found on portions of the valley floor across the Basin. These strata are interpreted to be locally derived deposits which are eroded off upland areas and deposited into the drainages that cross cut the area. As such, these strata form what are essentially flood plain areas along the modern stream courses.

The Palouse Formation consists of eolian (wind-deposited), massive to poorly stratified silt and very fine sand deposits that display evidence of pedogenic (soil forming) modification (Figure 6) (Busacca and MacDonald, 1994). Newcomb (1965) generally described this unit as massive, well compacted clayey silt (or loess) containing irregular, thin caliche layers. Pedogenic calcium carbonate may also be found in these loess deposits. Palouse Formation loess can range from less than 1 foot to several tens of feet-thick in the area (Newcomb, 1965). These loess deposits are thought to range from greater than 50,000 years old to less than 10,000 year old, making loess older than,

age-equivalent to, and younger than the Touchet Beds. In outcrops found along a number of the county roads, loess appears to consist of up multiple, superimposed paleosols, and includes poorly to well developed calcrete (Figure 6). Schuster (1994) maps these strata simply as Quaternary loess.

The upper valley terraces are described by Newcomb (1965) as reworked loess (Palouse Formation) forming terraces generally around the higher portions of the edge of the Basin. In places, these deposits contain variable amounts of basalt rubble. Newcomb indicates upper valley terrace deposits are younger than the Palouse Formation. On Schuster's map (Schuster, 1994) these strata are shown as Quaternary loess, and less frequently as Quaternary alluvium.

5.2.3 Quaternary coarse unit

Uncemented and nonindurated sandy to gravelly strata is found in the shallow subsurface beneath much of the Basin (Figure 7). Based on previously described outcrops of such uncemented strata found elsewhere in the Basin (Newcomb, 1965) drill cuttings geologic logging (GSI, in prep), and field reconnaissance these gravely deposits are basaltic, moderately to well bedded, have a silty to sandy matrix, are generally uncemented, and contain thin, local silt interbeds. These uncemented and nonindurated gravels are generally equivalent to Newcomb's (1965) younger alluvial sand and gravel and for this report referred to as the Quaternary coarse unit. This sequence of uncemented gravel is interpreted to record stream deposition in the Walla Walla Basin by streams draining off the adjacent Blue Mountains. These streams are inferred to include the ancestral courses of the modern stream drainage.

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

5.2.4 Mio-Pliocene units

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

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

GSI (GSI, in prep), building on recent geologic investigations (Lindsey and Tolan, 2004; Kennedy/Jenks, 2004) subdivides these strata into three units, Mio-Pliocene upper coarse, Mio-Pliocene fine, and Mio-Plocene basal coarse unit. The basic characteristics of these units are as follows:

- The Mio-Pliocene upper coarse unit consists of a sequence of variably cemented sandy gravel, with a muddy to sandy, silcic to calcic matrix. The unit underlies much of the Walla Walla Basin. Field reconnaissance (GSI, in prep) reveals thin, localized, discontinuous caliche at the top of these strata at some locations. Based on physical characteristics displayed by analogous strata in rare outcrops, field reconnaissance, and a small number of borehole log descriptions (GSI, in prep) these indurated gravels and sands predominantly are basaltic in composition and typically have a slightly to well developed red, red brown, and yellow brown color (Figure 8). The Mio-Pliocene upper coarse unit is differentiated from the younger Quaternary gravels by the presence of weathered basalt gravel clasts, clay matrix, and cementation which are absent in the younger gravels.

- The Mio-Pliocene upper coarse unit generally is underlain by fine deposits variously described as silt, clay, sandy clay, and sandy mud having blue, green, gray, brown, and yellow colors. These strata are referred to as the Mio-Pliocene fine unit and it generally is correlative to Newcomb's old clay. The contact between the fine unit and upper coarse unit appears to be irregular and is interpreted by GSI (in prep) to be gradational, with coarse strata dominant in some areas and fine strata dominant in others. Given these conditions, the contact between this unit and the overlying Mio-Pliocene upper coarse unit probably is not a single, continuous, uninterrupted surface.

- GSI (in prep) describes a discontinuous sequence of arkosic-micaceous sand and silt deep in the Mio-Pliocene section and directly overlying basalt. These strata form an interval several tens of feet to over 100 feet thick. In outcrop and cuttings samples, GSI (in prep) describes these sands having an appearance similar to Ringold Formation materials of the Pasco Basin. This unit, with it's distinctive arkosic mineralogy, is very different petrographically from other strata comprising the Mio-Pliocene sequence in the basin. These strata are interpreted

by GSI (in prep) to belong to a distinctive, previously undescribed unit designated the Mio-Pliocene basal coarse unit.

As noted earlier, the CRBG underlies the entire project area, and Basin. Given the focus of this Project on the shallow portions of the alluvial aquifer system, these rocks will not be described further in this report.

5.3 Alluvial Aquifer Hydrogeology

The uppermost aquifer underlying area of the Site is hosted predominantly by the Mio-Pliocene upper coarse unit. At least locally, especially near the Walla Walla River the upper part of this aquifer system also is hosted by the lower portions of the Quaternary coarse unit.

Regionally, the alluvial aquifer system generally is considered to be unconfined (Newcomb, 1965; Barker and Mac Nish, 1975), although at least locally water level data reported on Water Well Reports (driller's logs) suggest local semi-confined conditions do occur. Given local heterogeneities formed as a result of variable cement, induration, and fine interbeds likely to be found within the Mio-Pliocene upper coarse unit, some variation in hydrologic properties for the unit should be expected. Unfortunately, information describing the range of hydrologic properties likely occurring within the unit was not found for this project. General hydrologic property estimates found for strata equivalent to this unit include:

- Effective porosity, approximately 5 percent (Newcomb, 1965).
- Hydraulic conductivity, 13 to 328 feet/day (Barker and Mac Nish, 1976).
- Transmissivity, 10,000 to 60,000 feet2/day (Barker and MacNish, 1976).

Other than these generalizations, information about this aquifer system generally is lacking. This will change over the next few years though as monitoring data and information recently collected, and currently being collected, by WWBWC and Ecology staff becomes available. This information, when coupled with the results of SAR tests, like those described herein, will provide far more information describing the physical conditions within the shallow alluvial aquifer system across the Walla Walla Basin.

6.0 Test Site

The physical layout of the Site, including geologic and hydrogeologic conditions and how the Site was constructed and used during the first season of testing, is described in this section.

6.1 Site Facilities

Water for SAR testing is delivered to the Site from the Walla Walla River via the Gardena Farms Canal. A head gate structure built into the side of the Canal (Figure 9) controls the flow of water onto the Site. Water flows from the gate and through a buried

pipe into a concrete and steel ramp flume structure (Figure 10) constructed specifically for measuring the amount of water diverted onto the Site. Water quantity delivered to the Site was measured by reading a staff gauge and converting the depth of water read off the staff gauge to quantity in cfs using a conversion chart (Appendix A) calibrated to the flume dimensions. A digital transducer also was installed in the flume to collect periodic water level measurements for later flow calculations.

The flume empties into an unlined ditch that carries water to the edge of, and into, the gravel pit (Figure 11). Water is conveyed into the gravel pit and the first of two infiltration basins (upper basin) via an unlined ditch excavated into the sloping wall of the gravel pit (Figure 11). The upper basin was generally configured as follows:

- It is roughly circular in shape with sloping slides and a generally flat floor (Figure 12).
- This basin was excavated using a blade equipped bulldozer pushing material off the gravel pit floor at the basin location to build up the basin sides. The material underlying the basin was reported by GFID staff as very hard and/or compacted and difficult to excavate.
- The radius of the basin floor is approximately 20.5 feet.
- Its radius at its maximum fill depth of approximately 5.21 feet was approximately 31.6 feet.
- Based on these general dimensions, the upper basin has a total approximate volume of 11,360 cubic feet or 85,000 gallons.

From the upper basin, water was directed via a shallow unlined ditch (Figure 13) to the second, or lower, infiltration basin (Figure 14) located several hundred feet from the upper basin. For this ditch, referred to as the connecter ditch:

- The upper end was excavated using a blade equipped bulldozer, and excavation was reported as difficult due to hard and/or compacted conditions.
- The lower end of the ditch was dug using a toothed bucket excavator and digging was reported to be easier than in the upper end.
- The connecting trench ranges from 1 to 3 feet wide and 1 to 4 feet deep.

The lower basin was generally constructed and configured as follows:

- It has a roughly rectangular shape with sloping sides and a generally flat floor (Figure 14).
- The lower basin was dug using a toothed bucket excavator and the basin floor was ripped using the bucket during construction.
- The basin floor is approximately 39 feet long by 35 feet wide.

- At the highest measured level in the basin of 4.12 feet, its maximum length and width was approximately 56 feet by 47 feet.

- Based on these dimensions the lower basin had an approximate volume of 8,300 cubic feet or 62,100 gallons.

- There is no overflow ditch to direct excess water from the lower basin back to Gardena Farms Canal.

6.2 Monitoring Locations

Surface water and groundwater monitoring points were established for the project at various locations at and near the Site (Figures 1 and 2). Three groundwater monitoring wells were drilled at and near the Site for water quality and water level monitoring. In addition, water level data was provided by Ecology from their well. Surface water quality samples also were collected from Gardena Farms Canal and surface water quality and stream stage data was collected from three points on Mud Creek. Specific information about these, and other monitoring points is as follows:

- Three groundwater monitoring wells, L-1, L-2, and L-3, were drilled and constructed to sample the shallow portion of the alluvial aquifer system. Wells L-1, L-2, and L-3 are 60 feet, 51 feet, and 68 feet deep, respectively. As-built diagrams for these wells are attached in Appendix E.

- Each well has a Solinst Levellogger® installed in it measuring water level and temperature. Water quality samples were periodically collected from these wells. These wells are monitored to evaluate up gradient (L-1) and down gradient (L-2 and L-3) conditions before, during, and after testing.

- Water level data from a well owned by Ecology (referred to in the remainder of this report as the WWGRVL well), also was made available for this project by Ecology staff.

- Water quality samples were collected from Gardena Farms Canal at the turn out to the Site. These samples were collected to evaluate source water quality.

- Mud Creek was monitored at three locations, where it passes under Stateline Road, Locher Road, and Frog Hollow Road (Figures 1 and 2). Water quality samples were collected from two of these locations (Stateline Road and Locher Road) to evaluate possible impacts of the test on water quality in this stream. Stream discharge data for the Stateline location was to be supplied by WWBWC, but unfortunately it was not available in time to be included in this report. Stream stage was measured at Locher and Frog Hollow to track general changes in water level in the creek before, during, and after testing.

- Late in testing staff gauges and digital transducers were installed in both basins to better record test results.

No private, pre-existing wells were monitored before, during, and after this seasons test because none could be found in the Site area that we could confidently determine was only open to the shallow portion of the alluvial aquifer system.

6.3 Water Volume Delivered

Gardena Farms Canal operation relevant to the SAR testing described in this report, began in the spring of 2007 on 13 March. Due to GFID staff concerns about turbidity associated with Canal start-up (priming), the start of Site operations were delayed until 29 March 2007. Water was delivered to the Site in three separate events. Water levels measured in the flume, flows calculated from those levels, and water volume delivered to the Site is summarized in Table 1.

Water quantities delivered in each of the three test events are as follows:

- On 29 March 2007 the site was operated for a few hours as a basic shake down of operational issues and an initial test of the infiltration capacity of the upper basin. Estimated water delivered during this event was approximately 0.27 acre-feet.

- Between 03 April and 11 April 2007 approximately 9.01 acre-feet was delivered during a sustained recharge test delivering water to both basins. Delivery rates varied between approximately 0.12 cfs and 1.37 cfs, and averaged 0.53 cfs.

- Between 16 April and 20 April 2007, the third test event was conducted. During this period approximately 5.74 acre-feet of water was delivered to the Site, delivery rates varied between 0.57 and 0.94 cfs, and averaged approximately 0.79 cfs. At the end of this event the rate at which water drained from each basin was measured in an effort to characterize infiltration capacity of the Site.

Total water volume delivered to the Site during the combined 15 days of testing (total of 17,332 minutes), as measured at the flume, was approximately 14.77 acre-feet, for a daily delivery of approximately 1 acre-foot. The average delivery rate for this period was 0.67 cfs, and the time weighted average delivery rate was 0.62 cfs.

7.0 Site Geology, Vadose Zone, Shallow Alluvial Aquifer, and Mud Creek

This section describes natural physical conditions at, and in the immediate vicinity of, the Site. The first part of this discussion presents basic Site-specific geologic and vadose zone conditions, In addition, in this section we discuss water table and water quality conditions in the shallow alluvial aquifer and stream stage and water quality conditions in Mud Creek before, during, and after the recently completed SAR tests.

7.1 Site Geology

Site geologic conditions are based on data collected from three monitoring wells drilled at the Site and review of general area information and data.

The Quaternary fine unit in the immediate project area consists predominantly of Touchet Beds forming the low hills within approximately 1 to 2 miles to the north, west, and east of the Site. The unit is essentially absent from the Site and only forms thin, rocky soils in the fields adjacent to the Site. The Quaternary coarse unit, consisting predominantly of uncemented, sandy to silty, pebble-cobble gravel, occurs near the Site forming a unit a few feet to tens of feet thick. These unit, which is found to the north, west, and south of the Site is absent from the Site proper, probably as a result of gravel pit excavation.

The uppermost unit found at the Site, including the strata exposed in the gravel pit, is interpreted to be the Mio-Pliocene upper coarse unit. The strata exposed in the gravel pit at the Site consist of weakly to moderately indurated, weakly cemented, pebble to cobble conglomerate with a sand to silty sand matrix. The sand and gravel fraction consist almost entirely of weakly to strongly weathered, rounded to subrounded basalt lithic detritus. Weathering rinds on gravel clasts are very common. The degree of weathering typically seen in the strata cropping out in the gravel pit generally is accompanied by strongly developed brown to red brown colors. While no interbedded muddy strata are exposed in this unit in the gravel pit, regional work (GSI, in prep) suggests local, intercalated siltstone and mudstone could occur. Based on the geologic log for the WWGRVL well, this unit extends to a depth of approximately 250 to 260 feet at the Site (Bush and others, 1973).

The deepest suprabasalt sediment unit at and near the Site is the Mio-Pliocene fine unit. This unit extends from the base of the Mio-Pliocene upper coarse unit to the top of basalt at approximately 710 feet below ground surface (bgs) (Bush and others, 1973). This unit, also referred to as the old clay by Newcomb (1965), typically is described in the general area by water well drillers as blue or gray clay. However, recent work (Lindsey and Tolan, 2004; GSI, in prep) indicates that this clay sequence typically is a weakly indurated mudstone that can locally contain significant, intercalated sand and conglomerate intervals, some of which are arkosic.

7.2 Vadose Zone

Based on water level data collected from wells L-1, L-2, and L-3 and the WWGRVL well (Figure 15) and the previous discussion, the vadose zone at the Site is hosted by the Mio-Pliocene upper coarse unit. Beneath the gravel pit, which is excavated into the Mio-Pliocene upper coarse unit, vadose zone strata are interpreted to consist predominantly of sandy to silty-sandy, indurated, variably cemented, pebble-cobble conglomerate. Outcrops exposed in the gravel pit show these strata are crudely to moderately stratified. The vadose zone at the Site varies in thickness as water level in the shallow alluvial aquifer system fluctuates. Beneath the gravel pit floor the vadose zone ranges from approximately 10 feet to 20 feet thick. Around the gravel pit, it ranges from approximately 25 to 40 feet thick.

Infiltration rates through the vadose zone beneath the two basins were estimated by measuring the rate at which they drained. This was done using data collected during the

third SAR event done between 16 and 20 April 2007. For this test both basins were filled to a measured depth, then the time it took to drain each after water delivery was turned off was measured. The hydrographs for both basins showing this final fill and drain event are reproduced on Figure 16. The results of these tests for both basins are listed on Table 2, and generally found to be (1) 0.058 gpm/ft^2 or 5.63 cfs/acre in the lower basin and (2) 0.008 gpm/ft^2 or 0.81 cfs/acre in the upper basin. This data also provides insight into the speed of water movement through the vadose zone at the Site.

The lower basin began to fill at approximately 2140 hours on 16 April 2007. By 0200 hours on 17 April water level in the WWGRVL well started to rise at a rate higher than the preceding several days. This indicates water was able to move from the base of the basin, 10 to 20 feet through the vadose zone to the alluvial aquifer water table, and generate a pressure wave that could be seen in the WWGRVL well within approximately 6 hours. Given earlier operations at the Site, we surmise the vadose zone was at, or near, saturation during testing, although we have no direct evidence of that in the data collected to-date.

Based on GFID observations made during Site excavation work and the methods used to dig the two basins, the difference in infiltration rates between the two basins are interpreted to reflect a combination of substrate permeability and basin construction methods.

7.3 Shallow Alluvial Aquifer

Shallow alluvial aquifer water table and water quality conditions as observed before, during, and after testing are discussed in this section.

7.3.1 Shallow alluvial aquifer water level

In the Site area regional studies cited earlier in this report generally describe water movement in the upper part of the alluvial aquifer to be to the north-northwest. Water levels measured in Wells L-1, L-2, and L-3 and the WWGVRL well (Figure 15) confirm this basic trend. Alluvial aquifer water table elevation before SAR testing started in late March 2007 were highest in Well L-1, at approximately 643.75 feet above mean sea level (amsl), decreasing to the north through the WWGRVL well and well L-3 to well L-2, at approximately 641.5 feet amsl (Figure 15). These basic elevation trends remained relatively constant following resumption of Gardena Farms Canal operation on 13 March 2007 for wells L-1, L-3, and L-2. The WWGRVL well, on the otherhand, showed the highest water levels of all alluvial aquifer wells at the Site following the resumption of Gardena Farms Canal operation. Based on the water level data collected prior to the start of SAR testing and the beginning of Gardena Farms Canal operation, the alluvial aquifer water table has an estimated gradient of 0.0013 feet/feet (6.9 feet/mile) to the north-northwest. At the time this report was written, site specific aquifer property data such as hydraulic conductivity, porosity, and permeability, was not available.

Between the time Gardena Farms Canal operation began on 13 March 2007 and the majority of SAR testing began on 03 April 2007, the alluvial aquifer water table rose approximately 1.7 to 2.3 feet in Wells L-1, L-2, and L-3 (Table 3; Figure 15). Water level rose approximately 3 feet in the WWGRVL well during the same pre-test period (Table 3; Figure 15). Wells L-1, L-2, and L-3 do not display a noticeable change in water level trends corresponding to the initial shakedown event on 29 March 2007. At that time,

water level in each well continued to rise at approximately the same rate as it did during the preceding period following the resumption of Gardena Farms Canal operation. The WWGRVL well does show an increase in the water level rise rate on 29 March 2007.

The primary sequence of testing began on 03 April 2007. All wells show increasing rates of water level rise beginning on that day. This phase of the test continued until late on 10 April when it ended to allow the lower basin to drain. Apparent rises in the wells, based on well hydrographs during this period range from approximately 1.2 feet (Well L-2) to 2.6 feet (WWGRVL well) (Table 3; Figure 15). Following the end of this test event on 10 April, water levels declined in all 4 wells (Table 3; Figure 15). This decline ranged from approximately 0.1 feet (Well L-2) to 1.4 feet (WWGRVL well).

Beginning on 16 April 2007, the day the final test event started, in wells L-1 and L-3 and the WWGRVL well, and early on 17 April in well L-2, water levels rose. These water level increases ranged from approximately 0.5 feet (well L-2) to 1.7 feet (WWGRVL well). Water level in all of these wells began falling following the end of this event at 1200 hours on 20 April. As in earlier parts of the test, Well L-2 responded last following the end of testing.

Water level changes observed in the shallow alluvial aquifer in all 4 wells during and after the 04-10 April and 16-20 April 2007 test events are interpreted to be the direct result of SAR testing. In addition, while wells L-1, L-2, and L-3 do not show an apparent response to the 29 March shakedown event, the WWGRVL well located less than 200 feet from, and down gradient of, the upper basin did. The lack of response in the three monitoring wells is interpreted to reflect their distance from the upper basin and delivery ditch and the small volume of water used in the shakedown test.

Throughout testing well L-2 responded slowest, and the WWGRVL well responded quickest, to the starting and stopping of recharge test events in the basins. Table 3 lists the different times these two wells responded to test start up and shut down.

7.3.2 Source water, surface water, and shallow aquifer water quality

Water quality monitoring during and following testing served a two-fold purpose: (1) tracking source water conditions to identify potential water quality problems with the water being used to conduct the test and (2) tracking the effect of recharge on the shallow aquifer water quality for both test evaluation and to identify potential undesirable impacts. Pre-test water quality data was collected from the 3 monitoring wells and Mud Creek. Gardena Farms Canal was not sampled prior to the start of testing because it did not contain water during the pre-test monitoring event in January 2007.

Water quality for basic and field parameters prior to testing is summarized as follows:

- Nitrate-N, hardness, TDS, and chloride generally are highest (4.2 to 6.5 mg/l) in well L-1, the well up gradient of the Site (Table 4) (Appendix C).

- For these same parameters, they generally are the lowest (0.4 to 2.8 mg/l) in well L-3, the well closest to the Canal and down gradient of the Site (Table 4) (Appendix C). It is interesting to note that land uses between L-3 and the Site are primarily devoted to Gardena Farms Canal and its associated right of way, while those between L-2 and the Site are primarily irrigated pasture and crop land.

- Surface water quality at both Mud Creek monitoring locations generally show lower concentrations than groundwater for all parameters (Table 4) (Appendix C).

During and following testing field and basic water quality parameter concentrations were as follows:

- pH in groundwater shows little variation, being between 6.7 and 7.3. In surface water (including Gardena Farms Canal) pH is very similar, but was less than groundwater before testing and higher after testing started.

- Electrical conductance, hardness, and TDS are highest in L-1 and lowest in Gardena Farms Canal throughout the pre-test, test, and post-test period.

- Although not completely constant, nitrate-N also generally was highest in L-1 and lowest in Gardena Farms Canal. In Mud Creek, L-2, and L-3 it varies between approximately 0.2 and 3.6 mg/l with wells generally being higher.

- Chloride and SRP are more variable than nitrate-N, but generally show the lowest concentrations in surface water and highest in groundwater.

Generally, these basic and field parameter data are interpreted to show that leakage from Gardena Farms Canal and infiltration from the test site generally lead to reduction in electrical conductance, TDS, hardness, nitrate-N, chloride, and SRP in groundwater quality. The highest concentrations in all of these are usually in L-1, the up gradient well. Surface waters generally show the lowest concentrations for all parameters, and based on the data collected to-date, surface water interpreted to not have been influenced by test site operation.

Samples for SOC analysis were collected during the 15 January 2007 and 04 April 2007 sampling events. Analysis results are provided in Table 5 and for the January sampling event summarized as follows:

- Source water could not be sampled in January because Gardena Farms Canal was not operating.

- Except for two constituents, SOC's were not detected in all three monitoring wells.

- The only constituents detected during the January event were bromacil (0.74 ug/l and di-n-butyl phthalate (0.95 ug/l), both in L-1 the up gradient well.

    - Bromacil is a broad spectrum herbicide commonly used on non-cropland.

    - Di-n-butyl phthalate is a manufactured chemical commonly used in plastic, paint, glue, and other household products.

More SOC's were detected in the April sampling event, although they are rare and in low concentrations (Table 5). The SOC's detected are as follows:

- Bromacil (at 0.95 ug/l) was again detected, but only in well L-2, down gradient of the Site.

- Di-n-butyl phthalate was also again detected, this time in all three wells, but at concentrations less than or equal to 0.7 ug/l. It was not detected in source water.

- Malathion, a general use pesticide, was detected in all three wells, L-1, L-2, and L-3 at 0.4, 0.5, and 0.3 ug/l, respectively, but not in source water.

- Dacthal, a phthalate pre-emergent herbicide for grasses and broadleaf weeds in vegetable crops was detected in source water (at 0.21 ug/l), but not in groundwater.

The SOC data is interpreted to indicate a very small number of these compounds are found in local groundwater and Gardena Farms Canal. However, inconsistent occurrence, both temporally and spatially, and low concentrations suggest the detections represent background conditions and that Site operation has an extremely low potential to contribute to the presence of these compounds in groundwater as a result of testing.

7.4 Mud Creek Stage

Stream level stage in Mud Creek was measured at Locher Road and Frog Hollow Road, beginning on 03 March 2007. Stage was measured to gauge relative changes in flow before, during, and after testing. These stations were not rated, preventing the measurement of flow. We originally planned to incorporate WWBWC flow data for Mud Creek collected from their State Line Road gauge. Unfortunately that data was not available for use at the time this report was written.

At Locher Road water level (stream stage) in Mud Creek has fluctuated approximately 0.15 feet before, during, and after testing (Figure 17). In the week prior to the start of testing on 29 March 2007, stream stage at Locher Road rose approximately 0.05 feet. This rising trend continued throughout the period of record until approximately 21 April 2007. Between 21 April and the end of our data record on 4 May, stream stage fluctuated up and down approximately 0.05 feet.

Mud Creek stage at Frog Hollow shows more fluctuation than was observed at Locher Road. In late March 2007, preceding the start of testing, stream stage at Frog Hollow rose approximately 0.15 feet (Figure 17). This rise continued until approximately 05 April, at which time total rise was approximately 0.25 feet. Following this, stage generally stabilized for a period of about 10 days. From 15 April through the end of the current data record stage began to fluctuate, falling and rising approximately 0.25 feet.

The reasons for these stage fluctuations are not readily apparent. The general rises in stream stage seen throughout the data record we have collected to-date could be related to one or more of several basic causes. These could include, but are not limited to:

- Increased base flow to the stream resulting from rising groundwater levels related to leakage from Gardena Farms Canal, or other irrigation ditches operating in the Basin.

- Growth of aquatic vegetation in the stream displacing water and causing higher stage measurements.

- The presence of more water in the stream as spring rains feed it.

From the data collected to-date, groundwater level changes resulting from SAR testing are not interpreted to be directly related to the stage changes seen in Mud Creek downstream of the Site.

8.0 Conclusions and Recommendations

8.1 Conclusions

During the first test season at the Locher Road SAR site, which ran intermittently between 29 March 2007 and 20 April 2007, approximately 15 acre-feet of water was diverted from Gardena Farms Canal onto the Site for shallow aquifer recharge. Average diversion rates during this period were approximately 0.63 cfs and 1 acre-foot/day. As constructed and used for this test event, water is diverted from Gardena Farms Canal via turnout and delivered to the Site through a concrete and steel ramp flume structure where diverted water volume is measured. From the flume, water enters the Locher Road gravel pit flowing into two excavated infiltration basins, the upper basin and the lower basin. These two basins are connected via a shallow trench.

Both the vadose zone and shallow alluvial aquifer at the Site are interpreted to be hosted by the variable indurated, basalt-lithic conglomerate of the Mio-Pliocene upper coarse unit. Beneath the Site infiltration basins the vadose zone is interpreted to be approximately 10 to 20 feet thick and the alluvial aquifer is over 200 feet thick. Based on the data collected during testing:

- Vadose zone infiltration rate at the Site ranges from a low of 0.008 gpm/square-foot to 0.058 gpm/square-foot, or up to 5.63 cfs/acre.

- Alluvial aquifer flow direction and gradient at the Site is approximately 6.9 feet/mile to the north-northwest.

- Water level changes caused by testing, in the form of a pressure wave, propagate through the aquifer in the immediate vicinity of the Site at a speed of approximately 2000 to 2200 feet/day. Absolute water velocity was not calculated because of a lack of aquifer pumping test property data for the Site.

The shallow alluvial aquifer did respond to SAR test activities, rising approximately 2.3 feet during the test. Based on the data collected to-date, the water table underlying the site generally responded to test start up and shut down within a few hours. However, from the data we collected during this test, we do not know how far away from the Site these water table responses extend. During testing, water table levels do not appear to have stabilized. During each test event, water level in the aquifer surrounding the Site was still rising as each event was shut down.

Mud Creek flow stage down gradient of the Site does not appear to have been affected by testing. Although stage did rise in the creek at Frog Hollow Road, no direct

relationship with testing could be identified and there are alternative explanations for the stage changes observed.

Testing appears to have had essentially no negative impact on groundwater quality in the Site area. If testing had any impact, for the parameters measured, groundwater quality improved slightly during testing as the source water generally had lower basic and field constituent concentrations than groundwater, and groundwater concentrations appear to have slightly decreased during testing. A few SOC's were detected intermittently before and during testing. However, the timing and distribution of these detections suggest they were not caused by test activity and that the measured concentrations represent background concentrations related to off site activities.

8.2 Recommendations

Based on the results of the first test season described in this report, we have several recommendations for changes to Site operation and testing for the 2007/2008 and 2008/2009 recharge seasons. These include:

1. Increase the size of the lower recharge basin, or build additional basins in the immediate vicinity of the lower basin.

2. Install up to 5 new shallow aquifer monitoring wells at and near the Site. One of these should be up gradient of the Site, adjacent to or south of State Line Road, in Oregon. New down gradient monitoring well locations would generally be along Mud Creek, possibly as far west as the Frog Hollow road crossing over Mud Creek. These wells would be used predominantly for water level data and field water quality parameter collection.

3. Install and test one 8-inch by approximately 300-foot deep aquifer test well. This work should include step-draw down and 72-hour constant discharge test. If budget permits, this well should be drilled using sonic or other drilling technology that allows collection of relatively intact core samples.

4. Discontinue water quality on Mud Creek at State Line Road, replacing this with water quality sampling on Mud Creek at Frog Hollow Road.

5. Following the end of the 2007/2008 recharge season, prepare an interim report outlining basic work activities and results for that season. Following the end of the 2008/2009 recharge season prepare a final report which focuses on summarizing all data collected since the beginning of the project, analyzes test performance, and provides recommendations for future operations.

6. In future applications for temporary water diversion for the Site, request the ability to use irrigation water already available to the Gardena Farms Canal, but not currently in use by irrigators.

Other than these, site operation should begin as soon as possible following the receipt of a temporary water use permit and the ability of Gardena Farms Canal to deliver water to the Site.

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Tables

time	total time (min)	rate (cfs)	rate (cfm)	vol (ft3)	acre-ft	cumulative acre-ft
3/29/07 1545	7	1.69	101.4	709.8	0.016	0.016
3/29/07 1552	8	0.68	40.8	326.4	0.007	0.023
3/29/07 1600	400	0.45	27	10800	0.248	0.271
4/03/07 0745	27	0.27	16.2	437.4	0.010	0.281
4/03/07 0812	93	0.23	13.8	1283.4	0.029	0.311
4/03/07 0945	825	0.12	7.2	5940	0.136	0.447
4/03/07 2330	495	0.12	7.2	3564	0.082	0.529
4/04/07 0745	1673	0.064	3.84	6424.32	0.147	0.677
4/05/07 1138	42	1.37	82.2	3452.4	0.079	0.756
4/05/07 1220	269	1.29	77.4	20820.6	0.478	1.234
4/05/07 1649	121	0.27	16.2	1960.2	0.045	1.279
4/05/07 1850	1400	0.46	27.6	38640	0.887	2.166
4/06/07 1800	5797	0.8	48	278256	6.388	8.554
4/11/07 0730	660	0.8	48	31680	0.727	9.281
4/16/07 1615	1535	0.8	48	73680	1.691	10.972
4/17/071740	860	0.57	34.2	29412	0.675	11.648
4/18/07 0800	1680	0.68	40.8	68544	1.574	13.221
4/19/07 1200	1210	0.74	44.4	53724	1.233	14.455
4/20/07 0810	166	1	60	9960	0.229	14.683
4/20/07 1056	64	0.936	56.16	3594.24	0.083	14.766
totals	17332			643209	14.766	
averages		0.667	40.02			
time weight av		0.619	37.11			

Table 1. Timing of SAR test events, flow rate per event, and total water volume delivered to Site.

Basin	Volume (ft^3)	Volume (gal)	Fill depth (ft)	Wetted area when full (ft^2)	Drain time (min)	Drain rate (gpm)	Infiltration rate			
							(gpm/ft^2)	(gpm/acre)	(ft^3/min/acre)	(cfs/acre)
Lower	8,300	62,000	4.17	2,600	590	105	0.058	2500	337	5.6
Upper	11,300	85,000	5.12	3,100	3,230	26.3	0.008	360	48.7	0.81

Table 2. Approximate size, volume, and infiltration rates for the two test basins. Infiltration rate estimates based on observed drain rates for the basins following the end of testing on 20 April.

Well L-1			Well L-2			Well L-3			WWGRVL well		
Date	Level (ft)	Level change (ft)	Date	Level (ft)	Level change (ft)	Date	Level (ft)	Level change (ft)	Date	Level (ft)	Level change (ft)
3/15	643.78	-	3/15	641.36	-	3/14	641.72	-	3/15	643.57	-
4/3	645.68	+1.90	4/3	643.14	+1.78	4/3	644.04	+2.32	4/3	646.71	+3.14
4/11	647.92	+2.24	4/12	644.41	+1.27	4/11	645.89	+1.81	4/10	649.26	+2.55
4/17	646.69	-1.23	4/17	644.3	-0.11	4/16	645.06	-0.78	4/16	647.88	-1.38
4/20	647.99	+1.30	4/21	644.85	+0.55	4/21	646.00	+0.94	4/20	649.55	+1.67
5/4	646.49	-1.50	5/4	644.30	-0.55	5/4	644.73	-1.27	-	-	-

Table 3. Water level changes observed in monitoring wells L-1, L-2, and L-3 and the WWGRVL well during and following SAR testing.

MDL -->								0.21		0.11	21.1		0.297		0.043		8.0		
Sample ID	**Date**	**Lab No.**	**pH**	**Temp. C**	**Electrical Conductivity (mS/cm)**	**Turbidity (NTU)**		**NO_3-N (mg/L)**	**Hardness (mg/L)**	**TDS (mg/L)**		**chloride (mg/L)**		**Soluble Reactive Phosphorous (mg/L)**		**COD (mg/L)**	**Total Coliform (per 100ml)**	**E-Coli (per 100ml)**
L-1	10/12/2006	85232						6.23	205.00	262.0		7.800		0.100	<	8.0		A
L-1	1/15/2007	86451	6.77	12.8	432	0.15		6.50	202.00	238.0		1.200		0.120	<	8.0	A	
L-1	4/4/2007	87538	7.24	13.8	401	0.89		5.68	217.00	253.0		5.000	<	0.043	<	8.0	A	A
L-1	4/12/2007	87725	7.25	13.5	393	1.92		5.19	213.00	248.0		6.500		0.090	<	8.0	A	A
L-1	4/23/2007	87918	7.17	13.9	428	0.42		4.20	624.00	247.0		7.500		0.130	<	8.0	A	A
L-2	10/12/2006	85233						3.27	132.00	184.0		6.400		0.140	<	8.0		A
L-2	1/15/2007	86452	7.05	11.9	281	0.67		3.63	117.00	154.0		0.800		0.130	<	4.0	A	
L-2	4/4/2007	87539	7.19	13.0	284	0.39		4.12	145.00	190.0		5.500	<	0.043	<	8.0	A	A
L-2	4/12/2007	87726	7.17	13.0	284	0.65		3.62	148.00	148.0		0.297		0.080	<	8.0	A	A
L-2	4/23/2007	87919	7.17	13.2	288	0.64		1.34	134.00	180.0		4.500		0.140	<	8.0	A	A
L-3	10/12/2006																	
L-3	1/15/2007	86453	6.88	10.1	202	25.00		2.86	83.40	118.0	<	0.297		0.130	<	8.0	A	
L-3	4/4/2007	87540	7.47	9.6	104	2.51		0.81	54.50	92.5		48.500	<	0.043	<	8.0	A	A
L-3	4/12/2007	87727	7.36	9.4	126	2.57		0.90	61.80	92.5	<	0.297		0.070	<	8.0	P	A
L-3	4/23/2007	87920	7.35	9.8	135	1.97		0.47	54.70	86.7	<	0.297		0.100	<	8.0	A	A
Mud Ck - L	10/12/2006																	
Mud Ck - L	1/15/2007	86454	6.21	1.8	262	1.39		2.18	112.00	144.0		2.000		0.060	<	8.0	A	
Mud Ck - L	4/4/2007	87542	8.05	11.2	242	3.48		1.30	132.00	158.0		10.000	<	0.043	<	8.0	P	P
Mud Ck - L	4/12/2007	87729	7.70	9.6	173	1.49		0.40	95.00	118.0	<	0.297		0.100		8.0	P	P
Mud Ck - L	4/23/2007	87922	8.01	15.3	181	1.26	<	0.21	83.10	117.0	<	0.297		0.060	<	8.0	P	P
Mud Ck - SL	10/12/2006																	
Mud Ck - SL	1/15/2007	86455	6.13	2.8	268	3.56		2.17	113.00	146.0		0.800		0.050		9.0	A	
Mud Ck - SL	4/4/2007	87541	8.28	12.6	248	1.81		1.39	130.00	165.0		11.000	<	0.043	<	8.0	P	P
Mud Ck - SL	4/12/2007	87728	7.89	10.9	175	1.89		0.52	95.50	123.0		0.700		0.040		9.0	P	P
Mud Ck - SL	4/23/2007	87921	8.16	16.5	180	1.89		0.47	82.40	113.0		5.000		0.080		10.0	P	P
diversion	10/12/2006																	
diversion	1/15/2007																	
diversion	4/4/2007	87543	8.02	9.4	95	6.28		0.38	45.20	95.0		40.000	<	0.043	<	8.0	A	A
diversion	4/12/2007	87730	7.77	8.0	90	4.27		0.12	44.10	65.0		2.200		0.080		12.0	P	P
diversion	4/23/2007	87923	8.17	12.7	94	6.39		4.21	31.40	73.3		39.000	<	0.043	<	8	P	P

Table 4. Field and basic water quality monitoring results for monitoring wells, surface water, and source water at the Locher Road SAR Site during the 2006/2007 recharge season.

Date	1/15/2007	1/15/2007	1/15/2007
Well ID	L-1	L-2	L-3
Chemical			
Carbamates in Drinking water			
Carbofuran	ND	ND	ND
Oxymal	ND	ND	ND
3-Hydroxycabofuran	ND	ND	ND
Aldicarb	ND	ND	ND
Aldicarb sulfone	ND	ND	ND
Aldicarb sulfoxide	ND	ND	ND
Carbaryl	ND	ND	ND
Methomyl	ND	ND	ND
Propoxur (Baygon)	ND	ND	ND
Methiocarb	ND	ND	ND
Synthetic Organic Compounds			
Endrin	ND	ND	ND
Lindane (BHC-Gamma)	ND	ND	ND
Methoxychlor	ND	ND	ND
Alachlor	ND	ND	ND
Atrazine	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND
Chlordane Technical	ND	ND	ND
Di(ethylhexyl)-Adipate	ND	ND	ND
Di(ethylhexyl)-phthalate	ND	ND	ND
Heptachlor	ND	ND	ND
Heptachlor Epoxide A&B	ND	ND	ND
Hexachlorobenzene	ND	ND	ND
Hexachlorocyclo-Pentadiene	ND	ND	ND
Simazine	ND	ND	ND
Aldrin	ND	ND	ND
Butachlor	ND	ND	ND
Dieldrin	ND	ND	ND
Metolachlor	ND	ND	ND
Metribuzin	ND	ND	ND
Propachlor	ND	ND	ND
Bromacil	**0.74**	ND	ND
Prometon	ND	ND	ND
Terbacil	ND	ND	ND
Diazinon	ND	ND	ND
EPTC	ND	ND	ND
4,4-DDD	ND	ND	ND
4,4-DDE	ND	ND	ND
4,4-DDT	ND	ND	ND
Cyanazine	ND	ND	ND
Malathion	ND	ND	ND
Trifluralin	ND	ND	ND

Table 5. SOC results for the Locher Road SAR Site for the 2006/2007 recharge season.

Date	1/15/2007	1/15/2007	1/15/2007
Well ID	L-1	L-2	L-3
Chemical			
Napthalene	ND	ND	ND
Fluorene	ND	ND	ND
Acenaphthylene	ND	ND	ND
Acenaphthene	ND	ND	ND
Anthracene	ND	ND	ND
Benz(A)anthracene	ND	ND	ND
Benzo(B)fluoranthene	ND	ND	ND
Benzo(G,H,I)peryene	ND	ND	ND
Benzo(K)fluoranthene	ND	ND	ND
Chrysene	ND	ND	ND
Dibenzo(A,H)anthracene	ND	ND	ND
Fluoranthene	ND	ND	ND
Indeno(1,2,3-CD)pyrene	ND	ND	ND
Phenanthrene	ND	ND	ND
Pyrene	ND	ND	ND
Benzyl Butyl Phthalate	ND	ND	ND
Di-N-Butyl Phthalate	**0.95**	ND	ND
Diethyl Phthalate	ND	ND	ND
Dimethyl Phthalate	ND	ND	ND
Toxaphene	ND	ND	ND
Aroclor 1221	ND	ND	ND
Aroclor 1232	ND	ND	ND
Aroclor 1242	ND	ND	ND
Aroclor 1248	ND	ND	ND
Aroclor 1254	ND	ND	ND
Aroclor 1260	ND	ND	ND
Aroclor 1016	ND	ND	ND
Herbicides in Drinking Water			
2,4-D	ND	ND	ND
2,4,5-TP (Silvex)	ND	ND	ND
Pentachlorophenol	ND	ND	ND
Dalapon	ND	ND	ND
Dinoseb	ND	ND	ND
Picloram	ND	ND	ND
Dicamba	ND	ND	ND
2,4 DB	ND	ND	ND
2,4,5 T	ND	ND	ND
Bentazon	ND	ND	ND
Dichlorprop	ND	ND	ND
Actiflorfin	ND	ND	ND
Dacthal (DCPA)	ND	ND	ND
3,5-Dichlorobenzoic Acid	ND	ND	ND

Table 5. SOC results (continued).

Date	4/4/2007	4/4/2007	4/4/2007	4/4/2007
Well ID	Diversion	L-1	L-2	L-3
Chemical				
Carbamates in Drinking water				
Carbofuran	ND	ND	ND	ND
Oxymal	ND	ND	ND	ND
3-Hydroxycabofuran	ND	ND	ND	ND
Aldicarb	ND	ND	ND	ND
Aldicarb sulfone	ND	ND	ND	ND
Aldicarb sulfoxide	ND	ND	ND	ND
Carbaryl	ND	ND	ND	ND
Methomyl	ND	ND	ND	ND
Propoxur (Baygon)	ND	ND	ND	ND
Methiocarb	ND	ND	ND	ND
Synthetic Organic Compounds				
Endrin	ND	ND	ND	ND
Lindane (BHC-Gamma)	ND	ND	ND	ND
Methoxychlor	ND	ND	ND	ND
Alachlor	ND	ND	ND	ND
Atrazine	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND
Chlordane Technical	ND	ND	ND	ND
Di(ethylhexyl)-Adipate	ND	ND	ND	ND
Di(ethylhexyl)-phthalate	ND	ND	ND	ND
Heptachlor	ND	ND	ND	ND
Heptachlor Epoxide A&B	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND
Hexachlorocyclo-Pentadiene	ND	ND	ND	ND
Simazine	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND
Butachlor	ND	ND	ND	ND
Dieldrin	ND	ND	ND	ND
Metolachlor	ND	ND	ND	ND
Metribuzin	ND	ND	ND	ND
Propachlor	ND	ND	ND	ND
Bromacil	ND	**0.2**	ND	ND
Prometon	ND	ND	ND	ND
Terbacil	ND	ND	ND	ND
Diazinon	ND	ND	ND	ND
EPTC	ND	ND	ND	ND
4,4-DDD	ND	ND	ND	ND
4,4-DDE	ND	ND	ND	ND
4,4-DDT	ND	ND	ND	ND
Cyanazine	ND	ND	ND	ND
Malathion	ND	**0.4**	**0.5**	**0.3**
Trifluralin	ND	ND	ND	ND

Table 5. SOC results (continued).

Date	4/4/2007	4/4/2007	4/4/2007	4/4/2007
Well ID	Diversion	L-1	L-2	L-3
Chemical				
Napthalene	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND
Acenaphthene	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND
Benz(A)anthracene	ND	ND	ND	ND
Benzo(B)fluoranthene	ND	ND	ND	ND
Benzo(G,H,I)peryene	ND	ND	ND	ND
Benzo(K)fluoranthene	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND
Dibenzo(A,H)anthracene	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND
Indeno(1,2,3-CD)pyrene	ND	ND	ND	ND
Phenanthrene				
Pyrene	ND	ND	ND	ND
Benzyl Butyl Phthalate	ND	ND	ND	ND
Di-N-Butyl Phthalate	ND	**0.7**	**0.7**	**0.5**
Diethyl Phthalate	ND	ND	ND	ND
Dimethyl Phthalate	ND	ND	ND	ND
Toxaphene	ND	ND	ND	ND
Aroclor 1221	ND	ND	ND	ND
Aroclor 1232	ND	ND	ND	ND
Aroclor 1242	ND	ND	ND	ND
Aroclor 1248	ND	ND	ND	ND
Aroclor 1254	ND	ND	ND	ND
Aroclor 1260	ND	ND	ND	ND
Aroclor 1016	ND	ND	ND	ND
Herbicides in Drinking Water				
2,4-D				
2,4,5-TP (Silvex)	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND
Dalapon	ND	ND	ND	ND
Dinoseb	ND	ND	ND	ND
Picloram	ND	ND	ND	ND
Dicamba	ND	ND	ND	ND
2,4 DB	ND	ND	ND	ND
2,4,5 T	ND	ND	ND	ND
Bentazon	ND	ND	ND	ND
Dichlorprop	ND	ND	ND	ND
Actiflorfin	ND	ND	ND	ND
Dacthal (DCPA)	**0.21**	ND	ND	ND
3,5-Dichlorobenzoic Acid	ND	ND	ND	ND

Table 5. SOC results (continued).

Figures

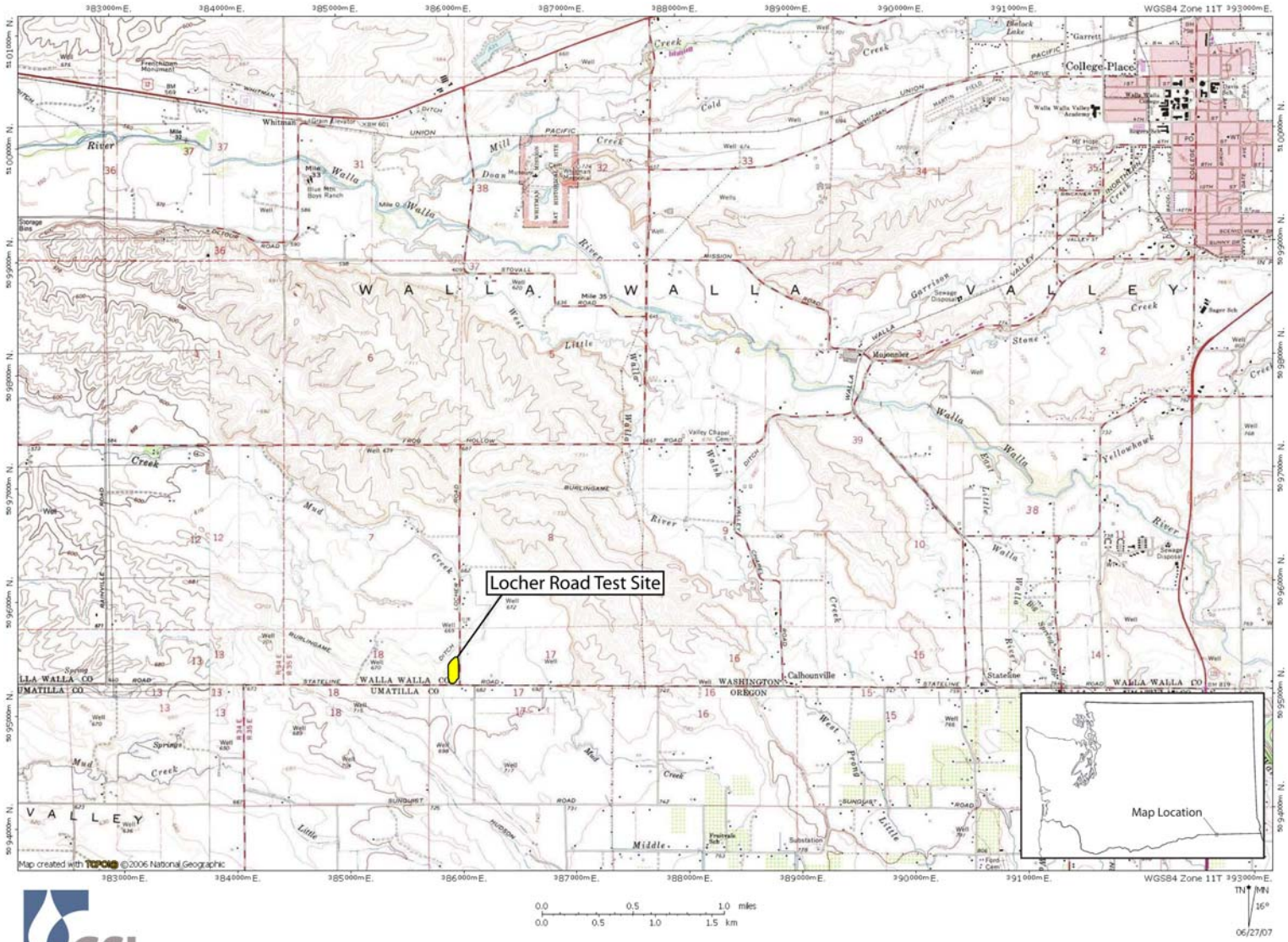

Figure 1. Area location map.

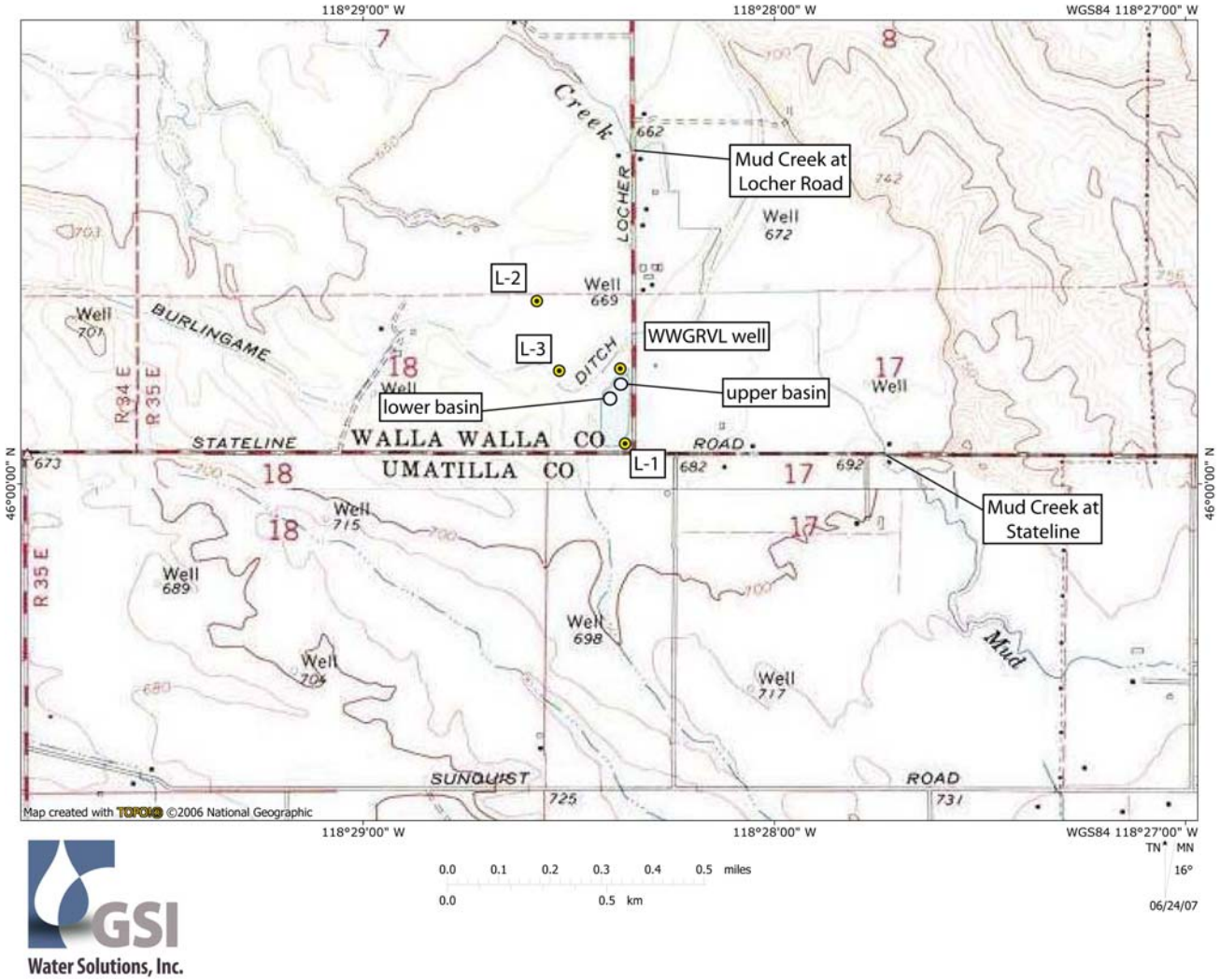

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Figure 2. Site location and layout.

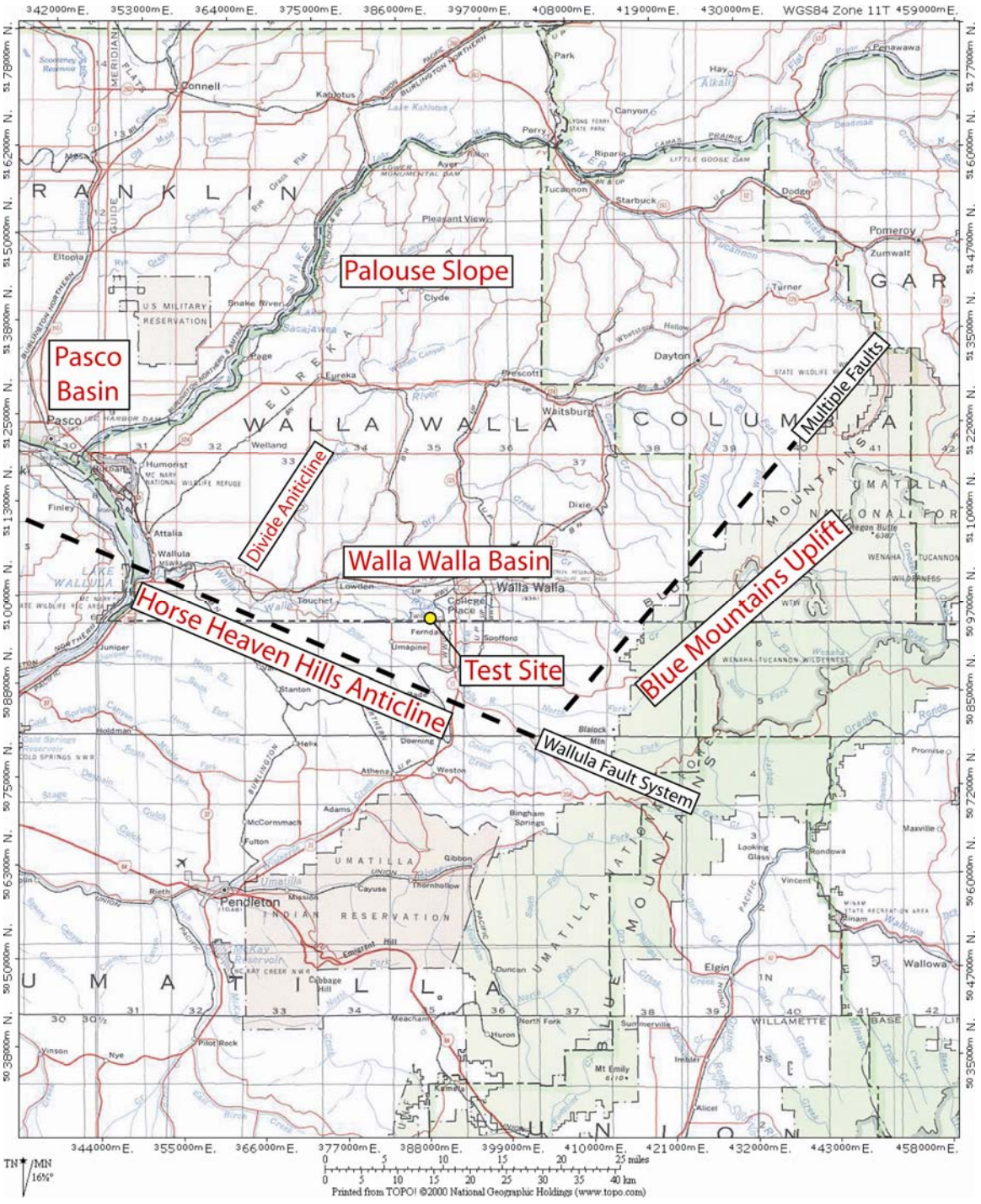


Figure 3. Structural geologic setting of the Walla Walla Basin.

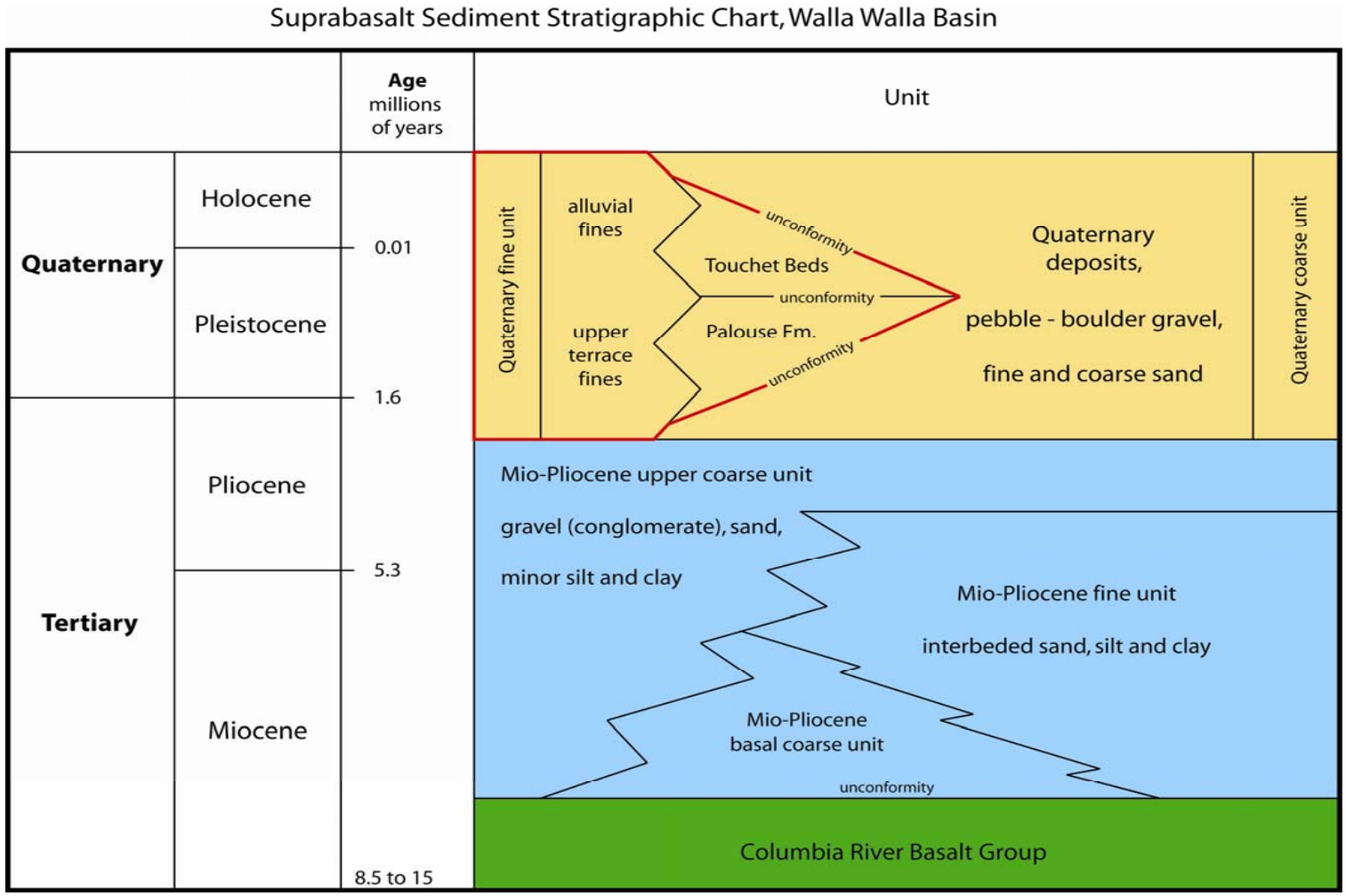


Figure 4. Suprabasalt sediment stratigraphy of the Walla Walla Basin.

Figure 5. Outcrop of Touchet Beds (Quaternary fine unit) showing the well bedded nature of these strata. Outcrop is located a few miles west of the Locher Road SAR Site.

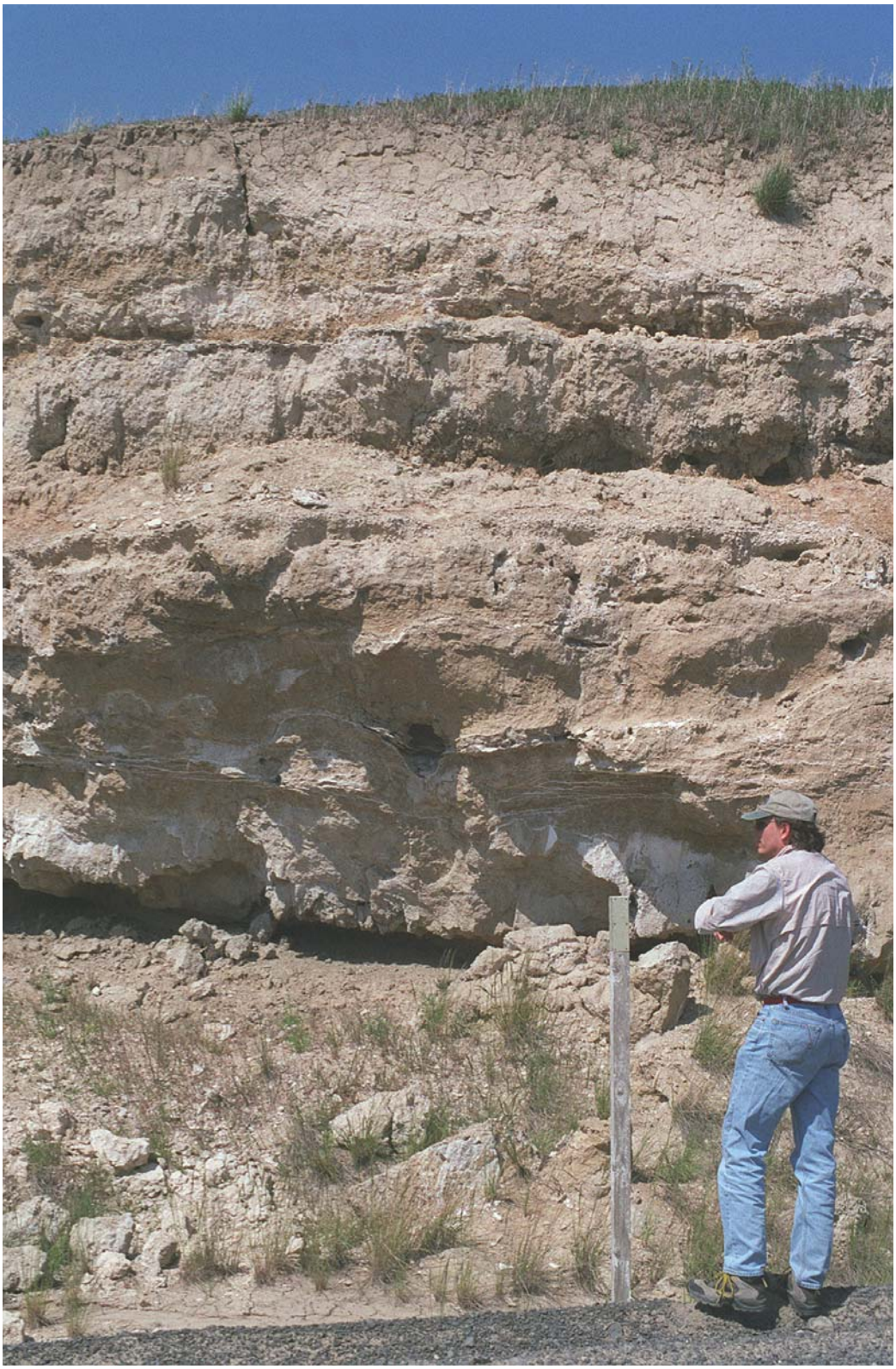


Figure 6. Photograph of loess (Palouse Formation, Quaternary fine unit) with overprint of pedogenic calcium carbonate.

Figure 7. Photograph of uncemented, non-indurated gravel of the Quaternary coarse unit. Trench excavated during the construction of the WWBWC-Hudson Bay SAR Site.

Figure 8. Outcrop of the Mio-Pliocene upper coarse unit showing the red-brown colors typically associated with this unit. Outcrop is in the Locher Road SAR Site gravel pit.

Figure 9. Head gate on the Gardena Farm Canal for the Locher Road SAR Site. View is looking to west-southwest, down stream on the Ditch. Site is just out of picture to the left.

Figure 10. View looking to north up the ramp flume Gardena Farm Canal and the head gate (Figure 9) are located just beyond the flume, near the guard rail in top of photo. Transducer installed in a tube located in the blue pipe to left of flume.

Figure 11. Ditch leading into upper basin. Ramp flume is visible just above head of ditch in background.

Figure 12. Upper basin as it was filling approximately mid-test.

Figure 13. View to southwest looking across the upper basin and down the connecter ditch leading to the lower basin, seen in the distance. Photograph was taken the first day the lower basin was used, 03 April 2007.

Figure 14. The lower basin late in the test. Tube in middle of basin contains digital transducer and an attached staff gauge. Upper basin is at base of slope in upper part of photo.

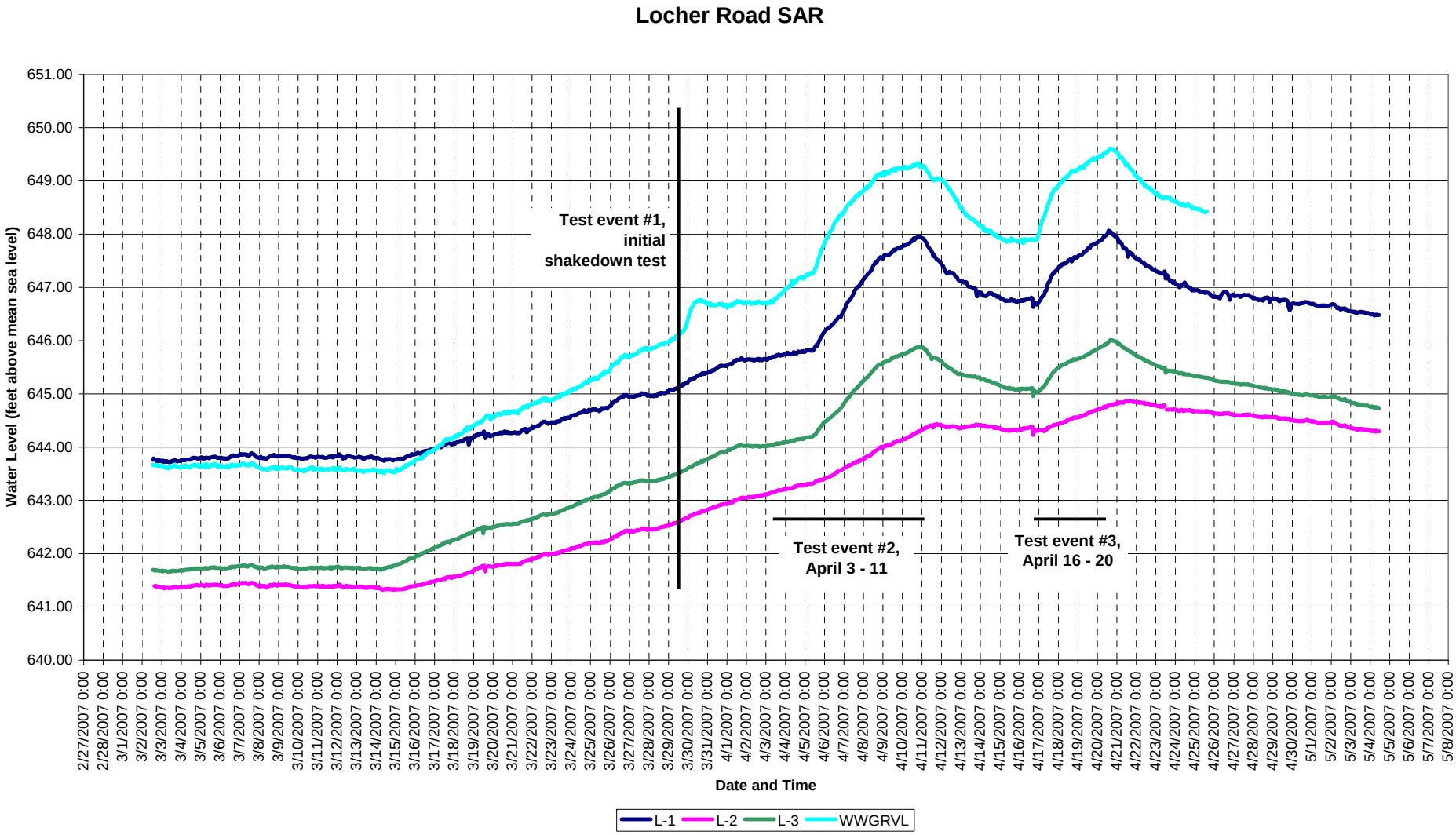


Figure 15. Hydrographs for monitoring wells L-1, L-2, and L-3 and the WWGRVL well.

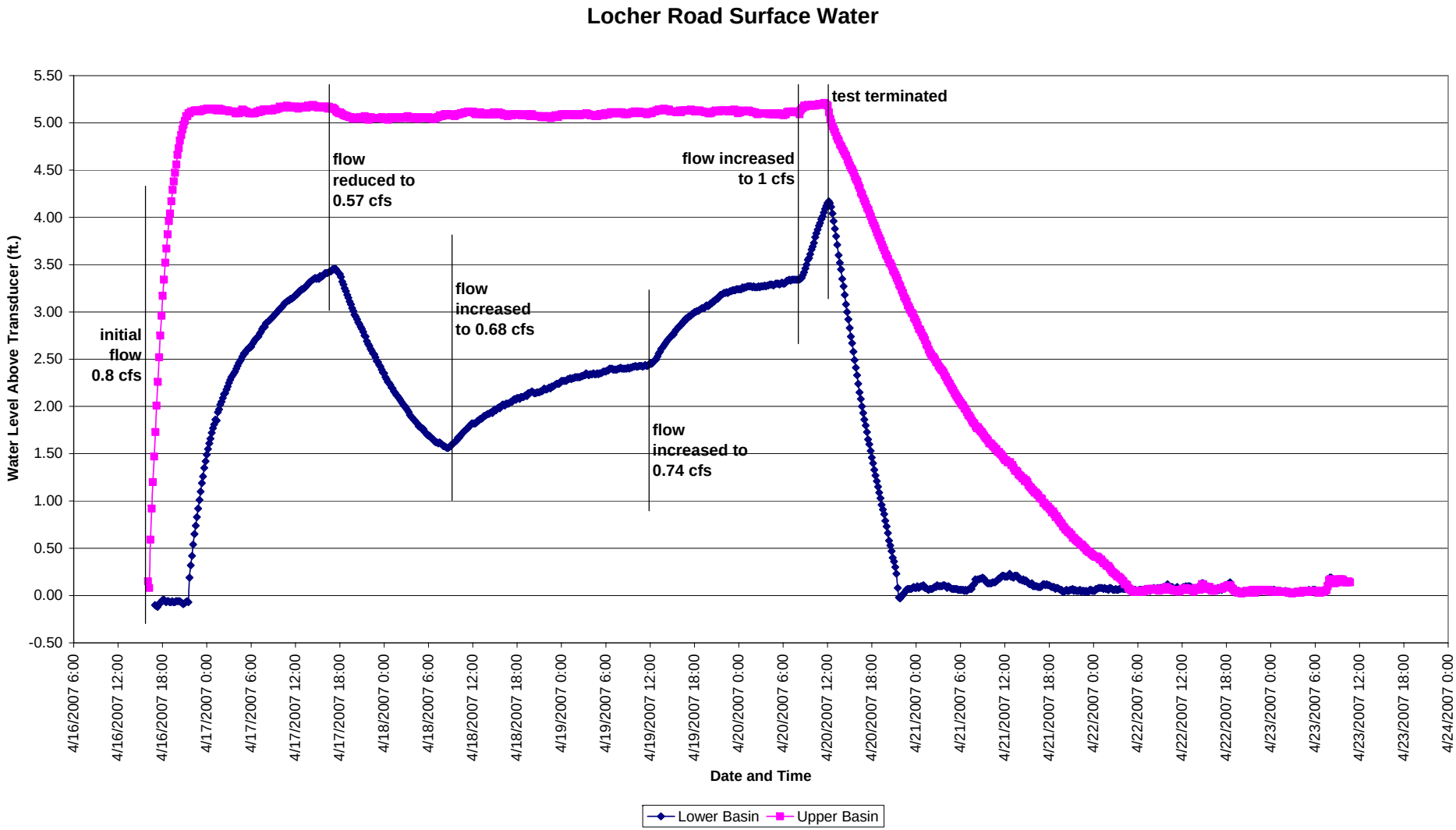


Figure 16. Hydrographs for the to recharge basins showing water level changes as they were filled and drained between 16 April and 20 April.

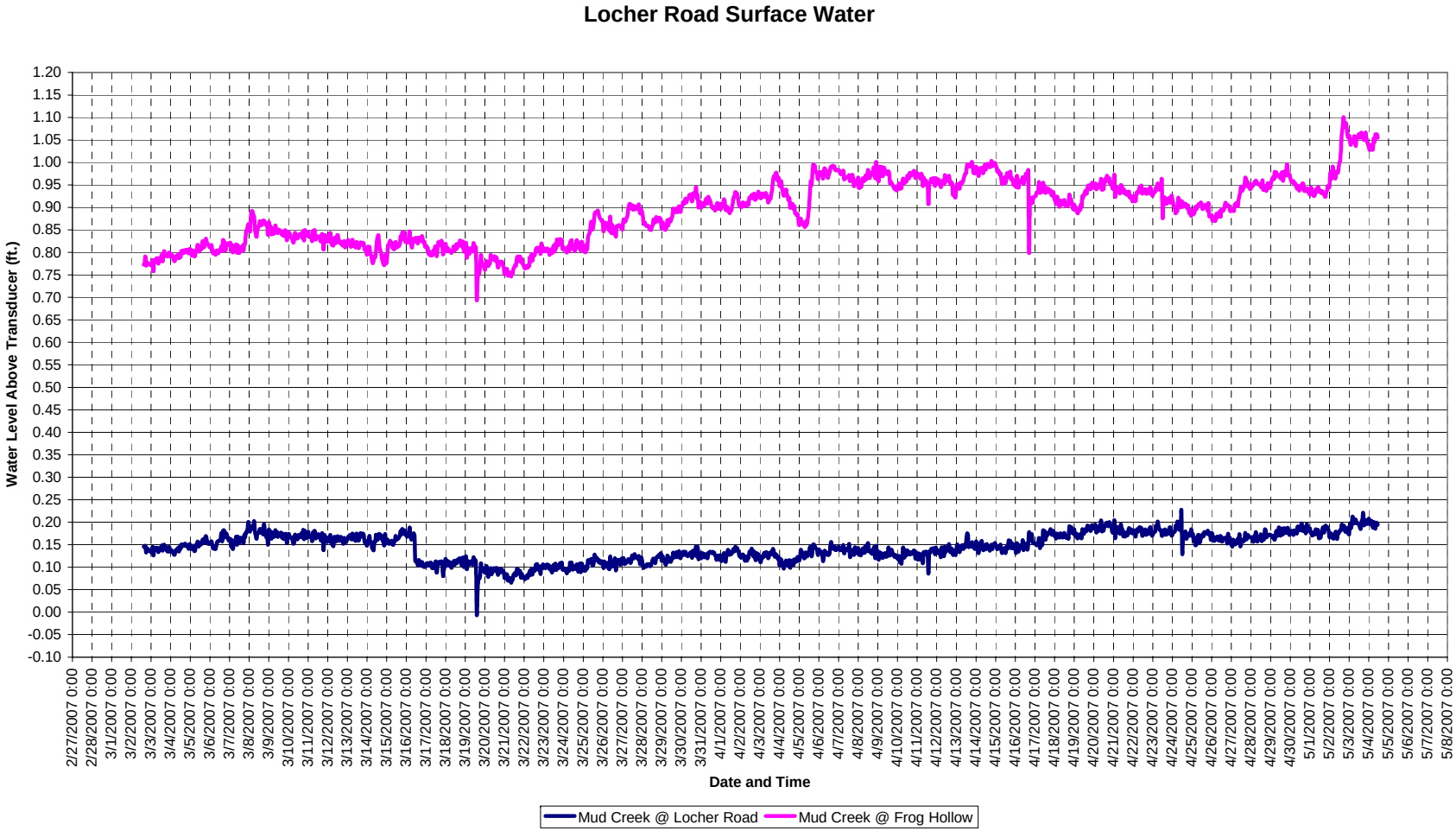


Figure 17. Hydrographs showing changes in stream stage for Mud Creek at Locher Road and at Frog Hollow Road.

Appendices

APPENDIX A
Ramp Flume and Staff Gauge Information

Rating Curves Specific to Locher Road Flumes

2 Foot Diameter Flume

Equation: CFS = K1(H+K2)^u

K1 7.226

K2 0

u 1.697

Head feet	Flow CFS	Head feet	Flow CFS
0.01	0.003	0.46	1.935
0.02	0.009	0.47	2.007
0.03	0.019	0.48	2.080
0.04	0.031	0.49	2.154
0.05	0.045	0.5	2.229
0.06	0.061	0.51	2.305
0.07	0.079	0.52	2.382
0.08	0.099	0.53	2.460
0.09	0.121	0.54	2.540
0.1	0.145	0.55	2.620
0.11	0.171	0.56	2.701
0.12	0.198	0.57	2.784
0.13	0.227	0.58	2.867
0.14	0.257	0.59	2.951
0.15	0.289	0.6	3.037
0.16	0.322	0.61	3.123
0.17	0.357	0.62	3.211
0.18	0.394	0.63	3.299
0.19	0.431	0.64	3.388
0.2	0.471	0.65	3.479
0.21	0.511	0.66	3.570
0.22	0.553	0.67	3.662
0.23	0.597	0.68	3.755
0.24	0.641	0.69	3.850
0.25	0.687	0.7	3.945
0.26	0.735	0.71	4.041
0.27	0.783	0.72	4.138
0.28	0.833	0.73	4.236
0.29	0.884	0.74	4.335
0.3	0.937	0.75	4.435
0.31	0.990	0.76	4.536
0.32	1.045	0.77	4.637
0.33	1.101	0.78	4.740
0.34	1.158	0.79	4.844
0.35	1.217	0.8	4.948
0.36	1.276	0.81	5.054
0.37	1.337	0.82	5.160
0.38	1.399	0.83	5.267
0.39	1.462	0.84	5.375
0.4	1.526	0.85	5.484
0.41	1.591	0.86	5.594
0.42	1.658	0.87	5.705
0.43	1.725	0.88	5.817
0.44	1.794	0.89	5.929
0.45	1.864	0.9	6.043

3 Foot Rectangular Flume

Equation: CFS = K1(H+K2)^u

K1 10.18

K2 0

u 1.576

Head feet	Flow CFS	Head feet	Flow CFS
0.01	0.007	0.46	2.994
0.02	0.021	0.47	3.097
0.03	0.041	0.48	3.202
0.04	0.064	0.49	3.307
0.05	0.091	0.5	3.414
0.06	0.121	0.51	3.523
0.07	0.154	0.52	3.632
0.08	0.190	0.53	3.743
0.09	0.229	0.54	3.855
0.1	0.270	0.55	3.968
0.11	0.314	0.56	4.082
0.12	0.360	0.57	4.198
0.13	0.409	0.58	4.314
0.14	0.459	0.59	4.432
0.15	0.512	0.6	4.551
0.16	0.567	0.61	4.671
0.17	0.624	0.62	4.792
0.18	0.682	0.63	4.915
0.19	0.743	0.64	5.038
0.2	0.806	0.65	5.163
0.21	0.870	0.66	5.289
0.22	0.936	0.67	5.416
0.23	1.004	0.68	5.543
0.24	1.074	0.69	5.672
0.25	1.145	0.7	5.803
0.26	1.218	0.71	5.934
0.27	1.293	0.72	6.066
0.28	1.369	0.73	6.199
0.29	1.447	0.74	6.334
0.3	1.526	0.75	6.469
0.31	1.607	0.76	6.606
0.32	1.690	0.77	6.743
0.33	1.774	0.78	6.882
0.34	1.859	0.79	7.021
0.35	1.946	0.8	7.162
0.36	2.035	0.81	7.303
0.37	2.124	0.82	7.446
0.38	2.216	0.83	7.590
0.39	2.308	0.84	7.734
0.4	2.402	0.85	7.880
0.41	2.497	0.86	8.026
0.42	2.594	0.87	8.174
0.43	2.692	0.88	8.322
0.44	2.791	0.89	8.472
0.45	2.892	0.9	8.623

FAZIO ENGINEERING
P.O. Box 246
Milton-Freewater, OR 97862
(541) 938-6084

December 31, 2004

Kevin Lindsey
Kennedy/Jenks Consultants
1020 North Center Parkway, Suite F
Kennewick, WA 99336

Re: Locher Road Draft Design

Kevin,

This letter includes a brief description of the proposed water diversion layout, flow monitoring equipment and general infiltration site preparation.

The general plan is to control and measure the amount of water flowing from the Burlingame Ditch to infiltration sites located on the bottom of an existing rock pit. For planning purposes, the target infiltration rate for this site was selected to be 8 inches per hour. According to the county soil survey the permeability of the lower portions of the Yakima soil series is greater than 20 inches per hour. Assuming a maximum flow of 8 cfs and 8 inches per hour infiltration the total surface area required is about 43,000 square feet. Actual allowable flows into the infiltration area will be determined through operation and may change over time

Assumptions

The primary assumptions are:
1. Anticipated flows into the infiltration site for 2005-2006 will be up to 8 cubic feet per second (cfs) and maximum capacity could reach 20 cfs in future years. The water diversion and measurement components proposed assume the lower flow value of 8 cfs.
2. Gardena Farms Irrigation District and/or their subcontractors will purchase the necessary materials and perform all construction activities.
3. Fazio Engineering or others will perform construction staking and provide field support during construction.

Main Construction Activities
Figure 1 shows the general site layout showing the relative placement of each component. Figure 2 shows typical cross-sections of the head gate and flume. A utility locate will be done before construction activities begin.

1. Diversion head gate at ditch
A new 24-inch head gate will be installed off the Burlingame Ditch similar to existing head gates installed by the Irrigation District. A concrete head wall will be constructed

and tied to an existing wall previously used for placing boards in the main ditch. There is a metal push up structure that will also be retrofitted so that boards can be used again to back up water in the Burlingame Ditch.

2. Conveyance pipe under an existing access drive
Approximately 80 feet of pipe will be installed from the head gate to an existing ditch. The pipe material chosen is 24" ADS N12 brand drainpipe with belled ends and 20-foot sections. Based on existing grade, the pipe's invert will be about 4 feet below ground surface. The grade of the pipe is important for flow measurement and will be approximately 1-inch drop in 80 feet.

3. Flume and stilling well for flow measurement
Please refer to documents prepared by Trimmer Engineering for flume and stilling well construction guidelines. Two flume options are suggested. It is proposed that the internal pipe flume be installed with a four-foot wide concrete apron. The apron will aid in erosion control and provide the base for installing a 3-foot flume in the future if flow capacity is increased.

4. Recondition existing conveyance ditch to infiltration areas
Approximately 135 feet of an existing ditch needs to be cleaned and deepened. On average the ditch will be 2 feet deeper. Although the final ditch grade is not critical, it needs to be flat or sloping away from the flume towards the rock pit. Suggested construction equipment is an excavator or dozer to create a relatively wide (4-6 feet) ditch bottom with gradual side slopes.

Near the ditch outfall into the infiltration site there is small PVC irrigation line that will have to be rerouted either over or under the new reconditioned ditch. It is not known if other pipes exist.

5. Surface preparation of infiltration area(s)
Surface preparation of the infiltration areas will simply involve removing any vegetation and remaining topsoil, approximately 2-4 inches. It is preferred that the infiltration basins be excavated below grade as much as possible. The basins will be approximately level with 2-foot perimeter berms or edges. The infiltration sites are irregular in shape following existing excavations. The area of the first infiltration site is approximately 15,000 square feet and the second site is 28,000 square feet. A small ditch will be constructed between each infiltration basin.

Please call if you any questions or require additional information. I would be happy to discuss these proposed construction activities in person or on-site.

Regards,

John A. Fazio P.E.

cc: Stuart Durfee, Gardena Farms Irrigation District

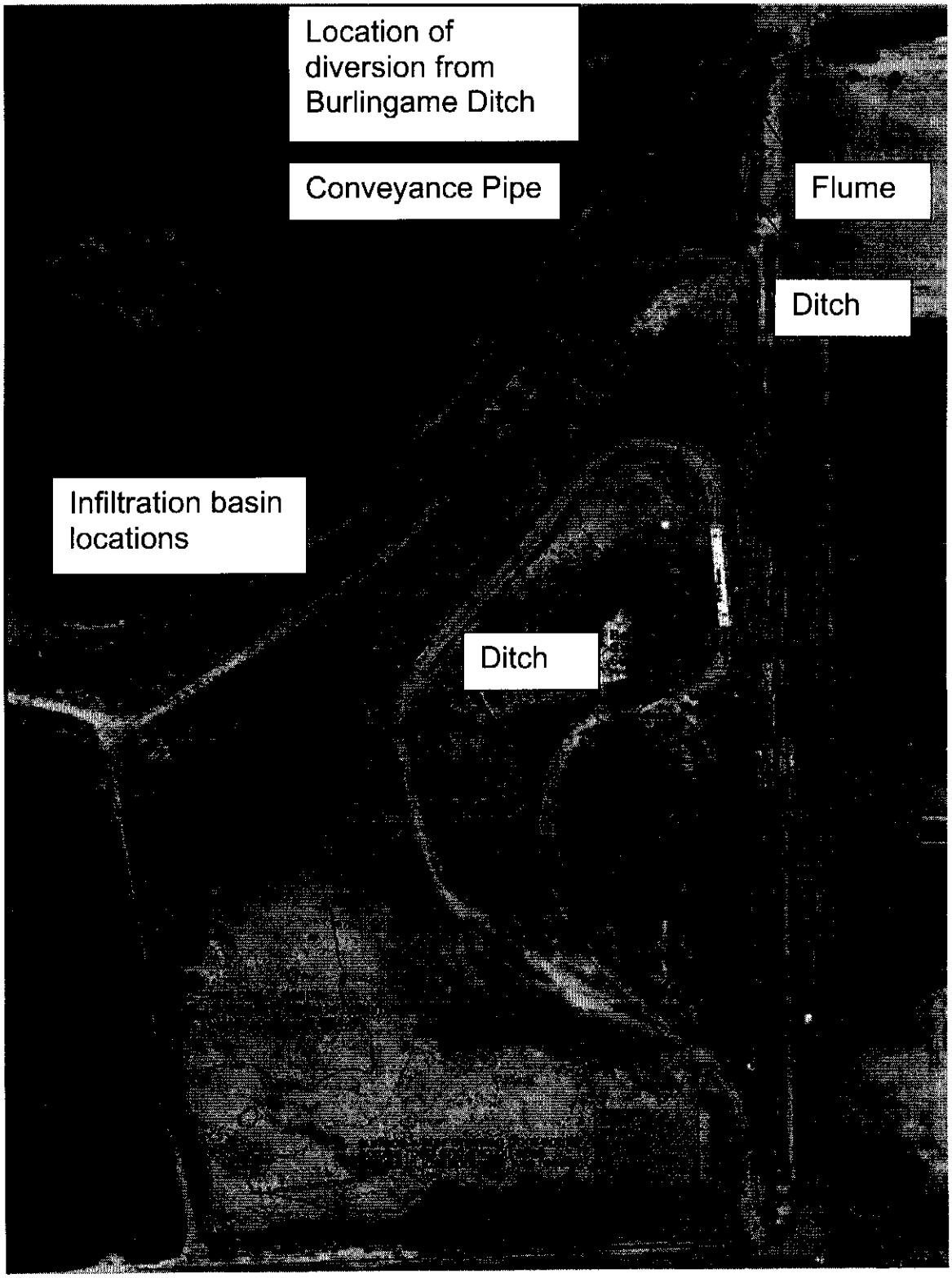
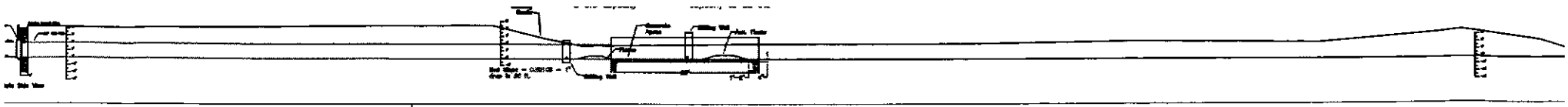
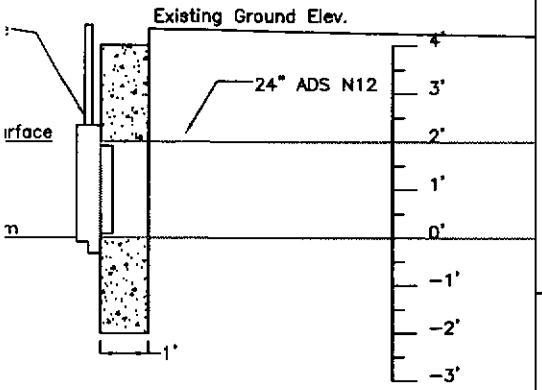


Figure 1. Site Layout.
Figure 1 is not to scale and contains information from a larger image created by Fountainhead Irrigation.

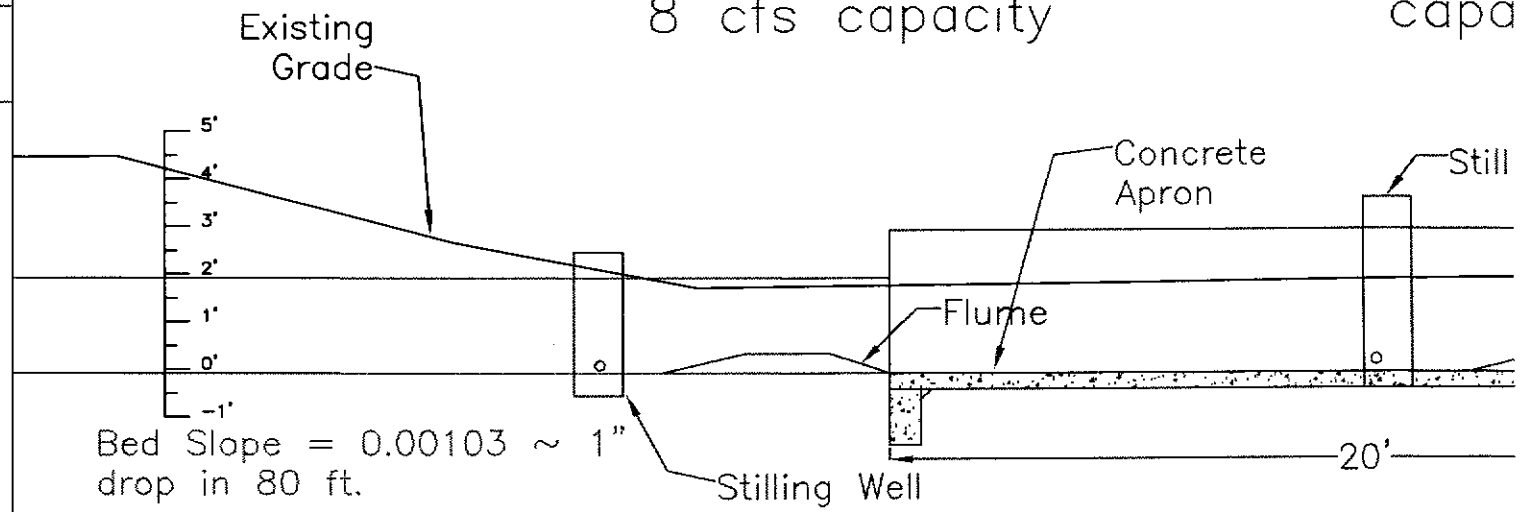




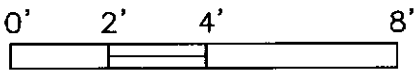
ate Side View

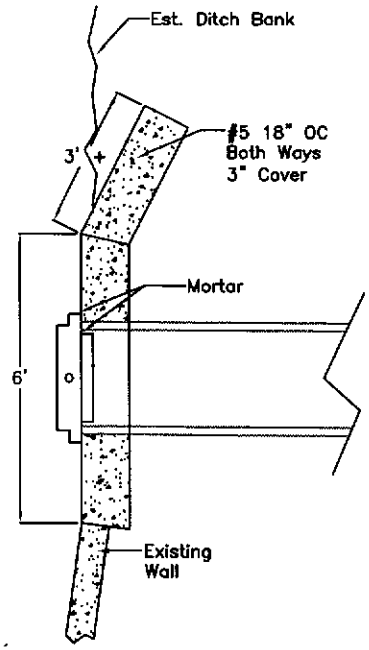
Replogle Flume
8 cfs capacity

Auxil
capa



Bed Slope = 0.00103 ~ 1"
drop in 80 ft.





Cost Estimate 12/31/2004
Locher Road Infiltration Site

Item Description	Qty.	Unit Cost	Total Cost	Who
Construct Concrete Head Wall	16	$ 50	$ 800	ID
Concrete for Head Gate and Apron	3	$ 90	$ 270	ID
Rebar and other steel	1	$ 100	$ 100	ID
24" galv. toggle gate, spigot back	1	$ 280	$ 280	Dunning
24" ADS N12 Pipe	80	$ 16	$ 1,280	Dunning
Pipe Trenching & Backfill	8	$ 100	$ 800	ID
Ditch Cleaning & Excavation	4	$ 125	$ 500	ID
Staff Gauge	1	$ 75	$ 75	ID
Internal Flume construction	1	$ 1,000	$ 1,000	ID
Stilling Well and Installation	1	$ 500	$ 500	ID
Trutrack Water Level Recorders, WT-HR 500	2	$ 250	$ 500	
Trutrack cable, DLC3	1	$ 45	$ 45	
Shipping	1	$ 50	$ 50	
Mounting Level Recorder	2	$ 50	$ 100	ID
Repair existing metal pushup structure	5	$ 65	$ 325	ID
Infiltration Site Grading	8	$ 125	$ 1,000	ID
Equipment Hauling	1	$ 300	$ 300	ID
		Total Cost	$ 7,925	

Engineering Calculations and Plans for Locher Road Flow Measurement

December 21, 2004

Trimmer Engineering Inc.

3924 NW Walnut Place ■ Corvallis, OR 97330 ■ (541)754-2819 ■ FAX:(541)754-0301

TRIMMER
ENGINEERING, Inc.
Civil Engineering ■ Water Resources ■ Irrigation ■ Conservation ■ Water Rights ■ Flow Measurement

December 21, 2004

John Fazio
Fazio Engineering
P.O. Box 246
Milton-Freewater, OR 97862

Re: Engineering for Locher Rd. Flow Measurement.

This letter is a cover for a series of design calculations for a Replogle Flume to be built in a pipeline to be constructed off Locker Road to measure water going into a groundwater recharge project. Additionally, an auxiliary Replogle flume design is included that can constructed when the need to measure more than 8 cfs becomes necessary.

The design of the outlet serving the recharge project incorporates a 24" dia. HDPE drainage pipe. The flow measurement structure is a Replogle flume built into a short section of the pipe that will be attached at the discharge end. A 12" dia. PVC or equivalent stilling well will be connected to the main pipe with a flexible PE pipe to measure the static water level in the pipe and provide a shelter for stage recording equipment.

This pipe will discharge onto a concrete apron to reduce scour. This apron will also serve as the foundation for an auxiliary Replogle flume that can be constructed when the rate of water delivery for the recharge project exceeds the 8 cfs design capacity of the first Replogle Flume. The auxiliary Replogle flume is a rectangular flume that is 3 ft. wide and with concrete side walls.

List of sheets

- Drawing
- Figures
- Plans for Replogle flume (LocherRD) including design summary; dimensions; rating table and equation. (3 pages)
- Plans for auxiliary Replogle flume (Locher Aux) including design summary; dimensions; rating table and equation. (3 pages)
- LocherRd.dwg (file sent separately)

Specifications:

24" pipeline placed on 0.00103 bed slope.
Flume dimensions as shown. It is suggested to use 0.125" thick aluminum for sill inside pipe. Use same material for converging ramp. Install in 8' section of HDPE pipe for easy

3924 NW Walnut Place ■ Corvallis, OR 97330 ■ (541)754-2819 ■ FAX:(541)754-0301

installation in field. The contractor may wish to make the sill plate ready to be attached to concrete. Use grout to for the expansion ramp and attach to apron.
Apron can be 3 to 5" thick 2500 psi concrete slab. Edges of apron should be 18" deep and min. 8" thick for scour and frost upheaval protection. Use two #5 rebar along all edges.
5" thick by 36" high concrete or concrete block wall when building auxiliary flume.

If you have any questions, please call.

Sincerely,

Walter L. Trimmer, P.E, Ph.D.
President
Enc.

3924 NW Walnut Place ■ Corvallis, OR 97330 ■ (541)754-2819 ■ FAX:(541)754-0301

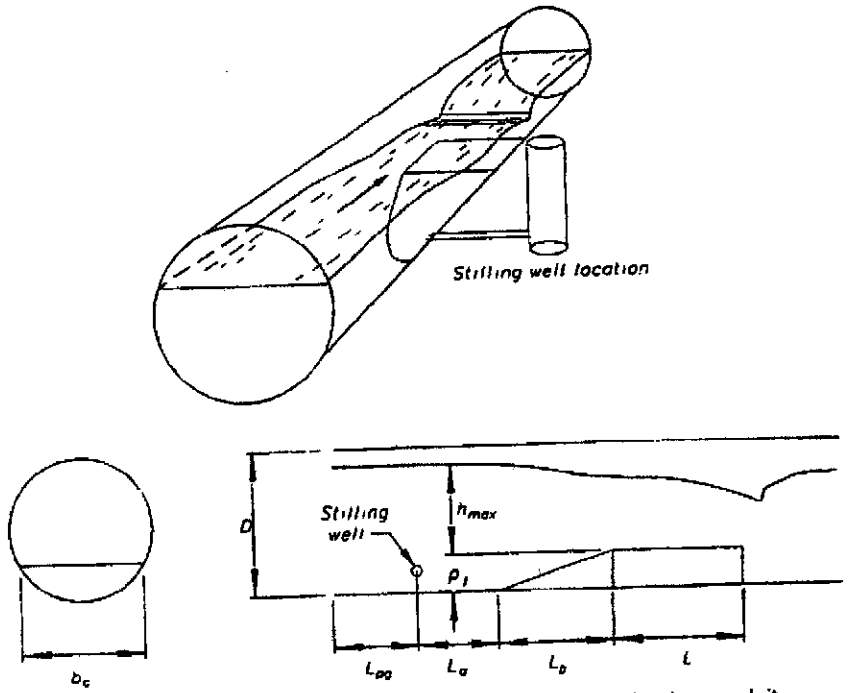


Figure 1.—Long-throated flume in a partially filled circular conduit.

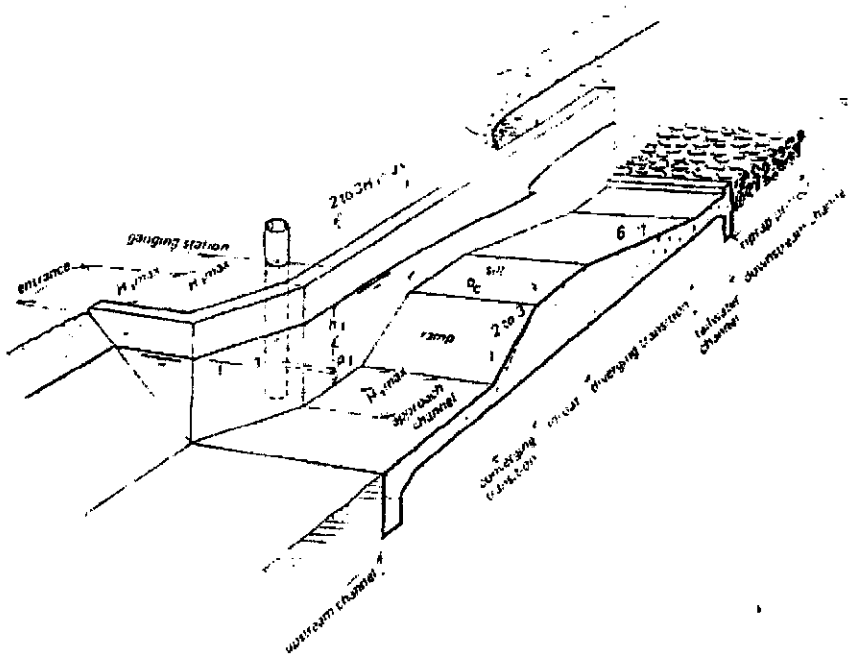


Figure 2. Flow-measuring structure for earthen channel with rectangular control section.

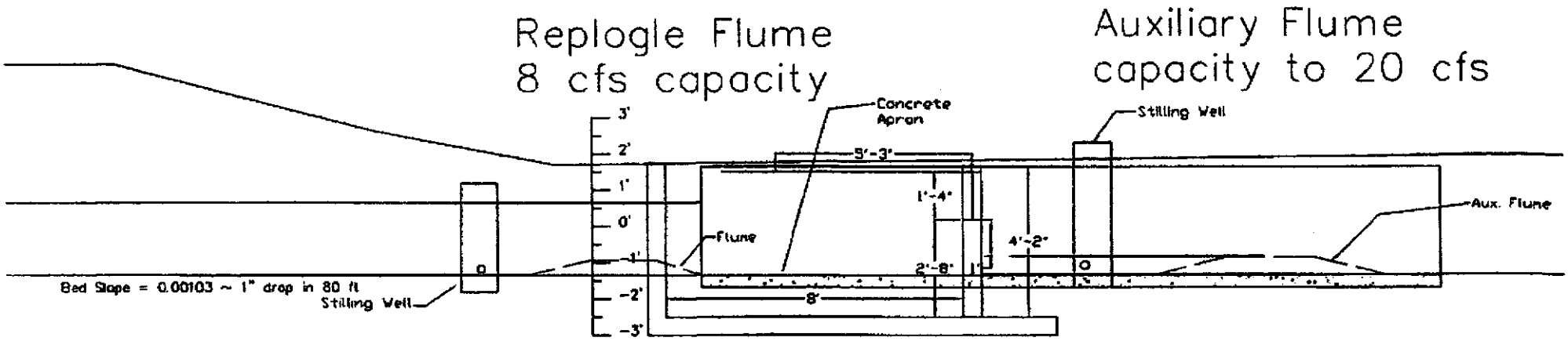

Replogle Flume
8 cfs capacity
Auxiliary Flume
capacity to 20 cfs
Concrete Apron
Stilling Well
Aux. Flume
Flume
3'
2'
1'
0'
-1'
-2'
-3'
5'-3"
1'-4"
4'-2"
2'-8"
1"
8"
Bed Slope = 0.00103 ~ 1" drop in 80 ft
Stilling Well

Fig. 3

LocherRd - Revision 5

C:\Program Files\WinFlume\LocherRd.Flm

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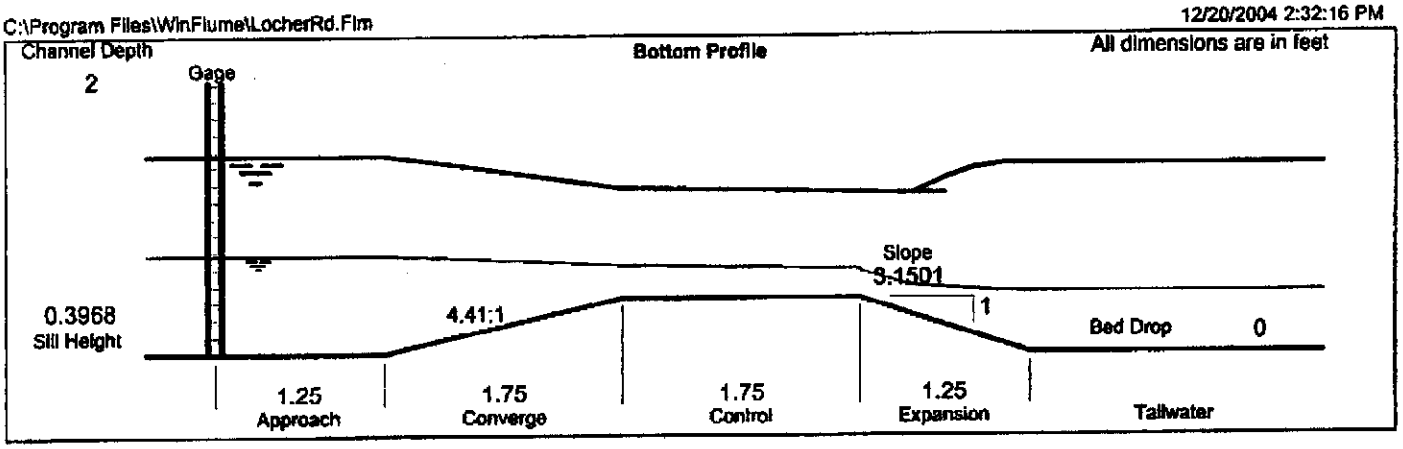

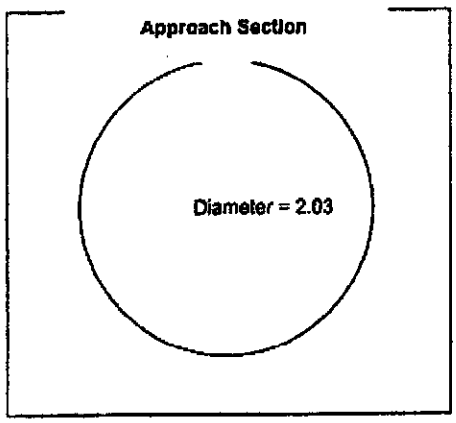

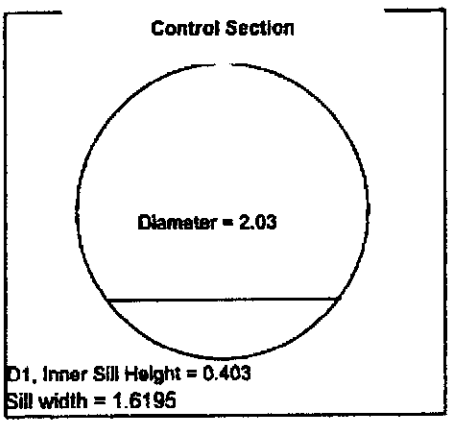

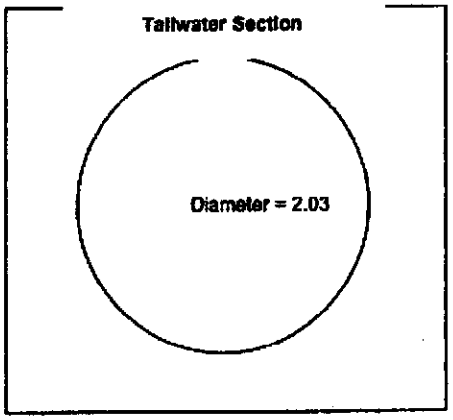

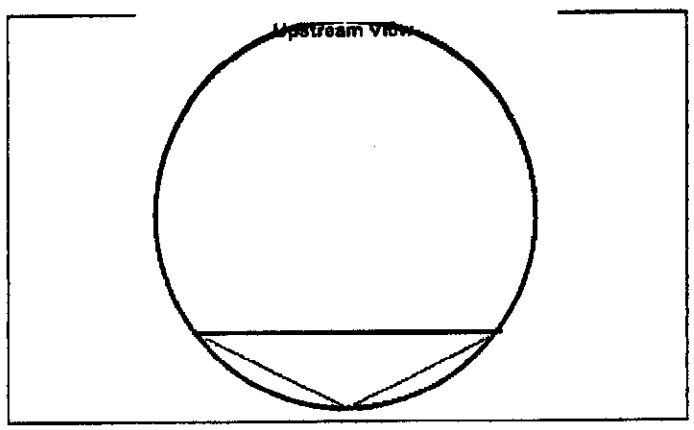

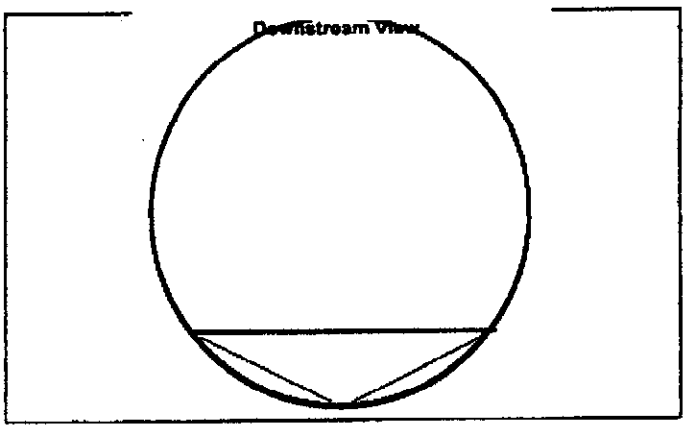

6/11

User: Walt Trimmer WinFlume32 - Version 1.05.0022
C:\Program Files\WinFlume\LocherRd.Flm - Revision 5
LocherRd
Printed: 12/20/2004 2:32:30 PM

FLUME DATA REPORT

GENERAL DATA ON FLUME

Type of structure: Stationary Crest
Type of lining: Metal - smooth [custom]
Roughness height of flume: 0.000197 ft

BOTTOM PROFILE DATA

Length per section: Approach section, La = 1.250 ft
Converging transition, Lb = 1.750 ft
Control section, L = 1.750 ft
Diverging transition, Ld = 1.250 ft

Vertical dimensions: Upstream channel depth = 2.000 ft
Height of sill, p1 = 0.397 ft
Bed drop = 0.000 ft
Diverging transition slope = 3.150:1

-- APPROACH SECTION DATA --

Section shape = CIRCLE
Diameter = 2.030 ft

-- CONTROL SECTION DATA --

Section shape = SILL IN CIRCLE
Sill width = 1.620 ft
Pipe diameter = 2.030 ft Internal sill height = 0.403 ft

-- TAILWATER SECTION DATA --

Section shape = CIRCLE
Diameter = 2.030 ft

7/11

User: Walt Trimmer WinFlume32 - Version 1.05.0022
C:\Program Files\WinFlume\LocherRd.Flm - Revision 5
LocherRd
Rating Equation Report, Printed: 12/20/2004 2:33:05 PM
Page 1

Head at Gage, h1 feet	Discharge cu. ft/s	Equation Discharge cu. ft/s	Equation Error cu. ft/s	Equation Error %	Hydraulic Errors
0.205	0.500	0.491	-0.009	-1.79	
0.312	1.000	1.001	+0.001	+0.14	
0.398	1.500	1.511	+0.011	+0.74	
0.472	2.000	2.017	+0.017	+0.85	
0.538	2.500	2.520	+0.020	+0.80	
0.598	3.000	3.020	+0.020	+0.67	
0.654	3.500	3.518	+0.018	+0.52	
0.707	4.000	4.015	+0.015	+0.37	
0.758	4.500	4.510	+0.010	+0.22	
0.805	5.000	5.004	+0.004	+0.09	
0.851	5.500	5.498	-0.002	-0.03	
0.896	6.000	5.992	-0.008	-0.13	
0.938	6.500	6.485	-0.015	-0.23	
0.980	7.000	6.979	-0.021	-0.30	
1.020	7.500	7.472	-0.028	-0.37	
1.059	8.000	7.965	-0.035	-0.44	6
1.097	8.500	8.457	-0.043	-0.50	6,12
1.134	9.000	8.949	-0.051	-0.56	*6,12,21

Equation: $Q = K1 * (h1 + K2) ^ u$
Parameters: K1 = 7.226
K2 = 0.000 (forced to zero by user)
u = 1.697
Coefficient of determination: 0.99993486

Error Summary

6 - Upstream energy head / control section length exceeds 0.7.
12 - Gage is too close to converging section and/or throat.
21 - FATAL: Submergence ratio exceeds modular limit. Critical flow will not oc

8/11

Locher Auxiliary - Revision 3

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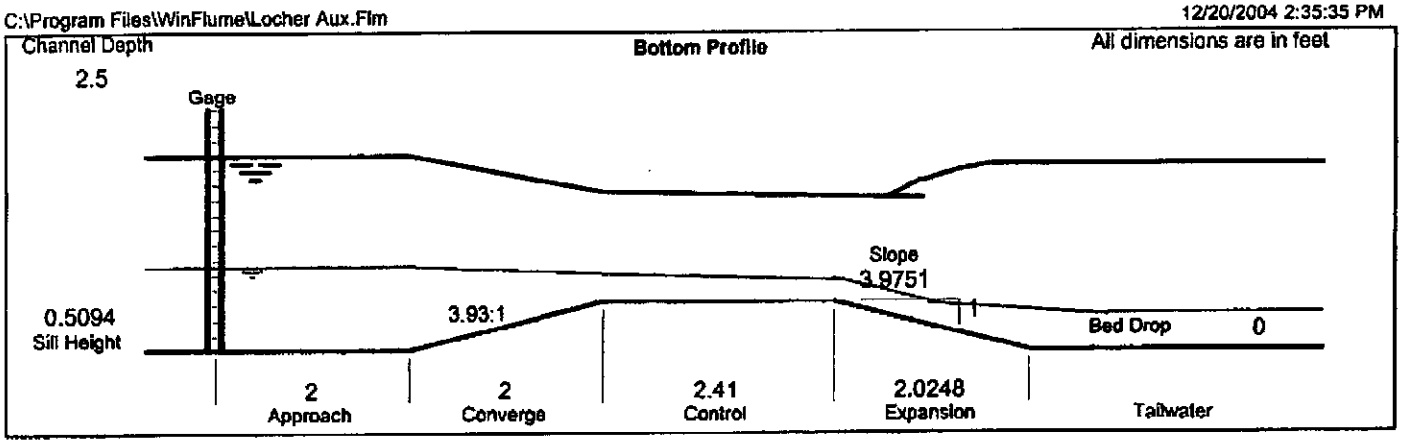
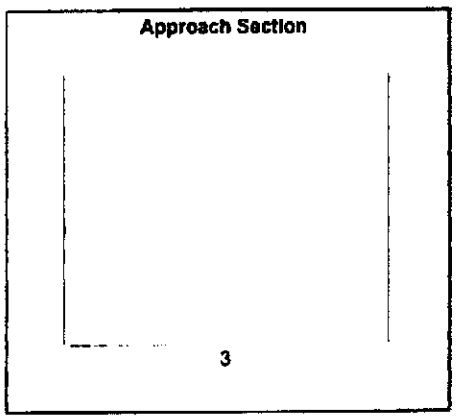
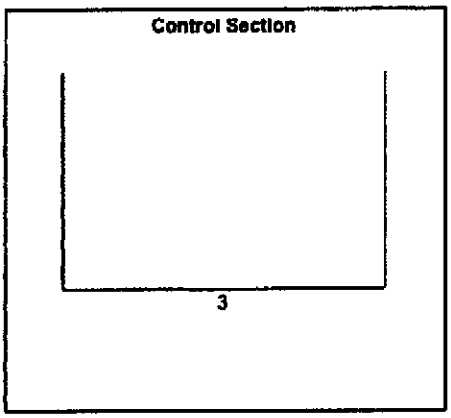
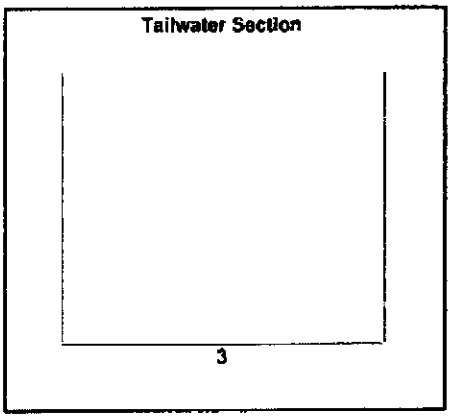
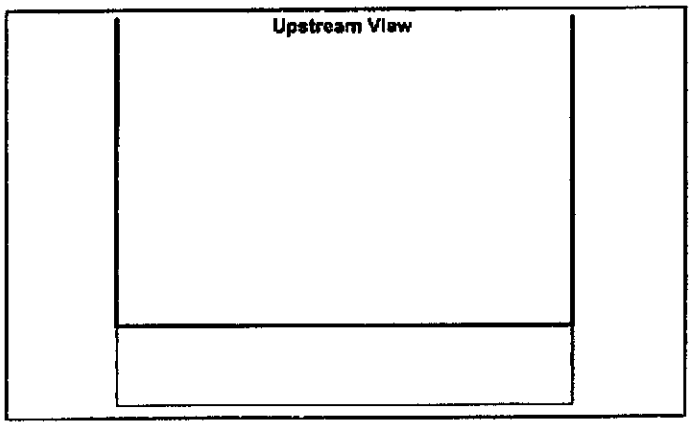
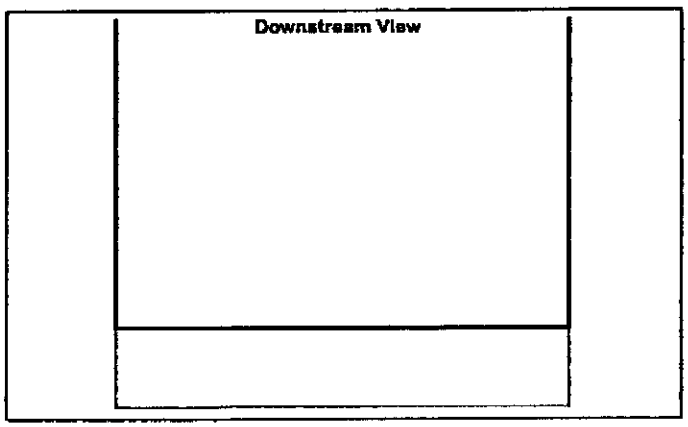












9/11

User: Walt Trimmer WinFlume32 - Version 1.05.0022
C:\Program Files\WinFlume\Locher Aux.Flm - Revision 3
Locher Auxiliary
Printed: 12/20/2004 2:35:26 PM

FLUME DATA REPORT

GENERAL DATA ON FLUME

Type of structure: Stationary Crest
Type of lining: Concrete - smooth [custom]
Roughness height of flume: 0.000492 ft

BOTTOM PROFILE DATA

Length per section: Approach section, La = 2.000 ft
Converging transition, Lb = 2.000 ft
Control section, L = 2.410 ft
Diverging transition, Ld = 2.025 ft

Vertical dimensions: Upstream channel depth = 2.500 ft
Height of sill, p1 = 0.509 ft
Bed drop = 0.000 ft
Diverging transition slope = 3.975:1

-- APPROACH SECTION DATA --

Section shape = RECTANGULAR
Bottom width = 3.000 ft

-- CONTROL SECTION DATA --

Section shape = RECTANGULAR
Bottom width = 3.000 ft

-- TAILWATER SECTION DATA --

Section shape = RECTANGULAR
Bottom width = 3.000 ft

10/1

User: Walt Trimmer WinFlume32 - Version 1.05.0022
C:\Program Files\WinFlume\Locher Aux.Flm - Revision 3
Locher Auxiliary
Rating Equation Report, Printed: 12/20/2004 2:35:58 PM

Head at Gage, h1 feet	Discharge cu. ft/s	Equation Discharge cu. ft/s	Equation Error cu. ft/s	Equation Error %	Hydraulic Errors
0.147	0.500	0.493	-0.007	-1.33	5
0.229	1.000	1.000	0.000	-0.02	
0.297	1.500	1.506	+0.006	+0.39	
0.357	2.000	2.011	+0.011	+0.56	
0.412	2.500	2.515	+0.015	+0.61	
0.462	3.000	3.017	+0.017	+0.58	
0.510	3.500	3.518	+0.018	+0.52	
0.554	4.000	4.018	+0.018	+0.45	
0.597	4.500	4.515	+0.015	+0.34	
0.638	5.000	5.012	+0.012	+0.23	
0.677	5.500	5.507	+0.007	+0.12	
0.715	6.000	6.000	0.000	0.00	
0.752	6.500	6.492	-0.008	-0.12	
0.787	7.000	6.983	-0.017	-0.24	
0.822	7.500	7.474	-0.026	-0.34	
0.856	8.000	7.963	-0.037	-0.46	
0.888	8.500	8.451	-0.049	-0.57	
0.921	9.000	8.938	-0.062	-0.69	

Equation: $Q = K1 * (h1 + K2) ^ u$
Parameters: K1 = 10.18
K2 = 0.000 (forced to zero by user)
u = 1.576
Coefficient of determination: 0.99995577

Error Summary

5 - Upstream energy head / control section length is less than 0.07.

11/11

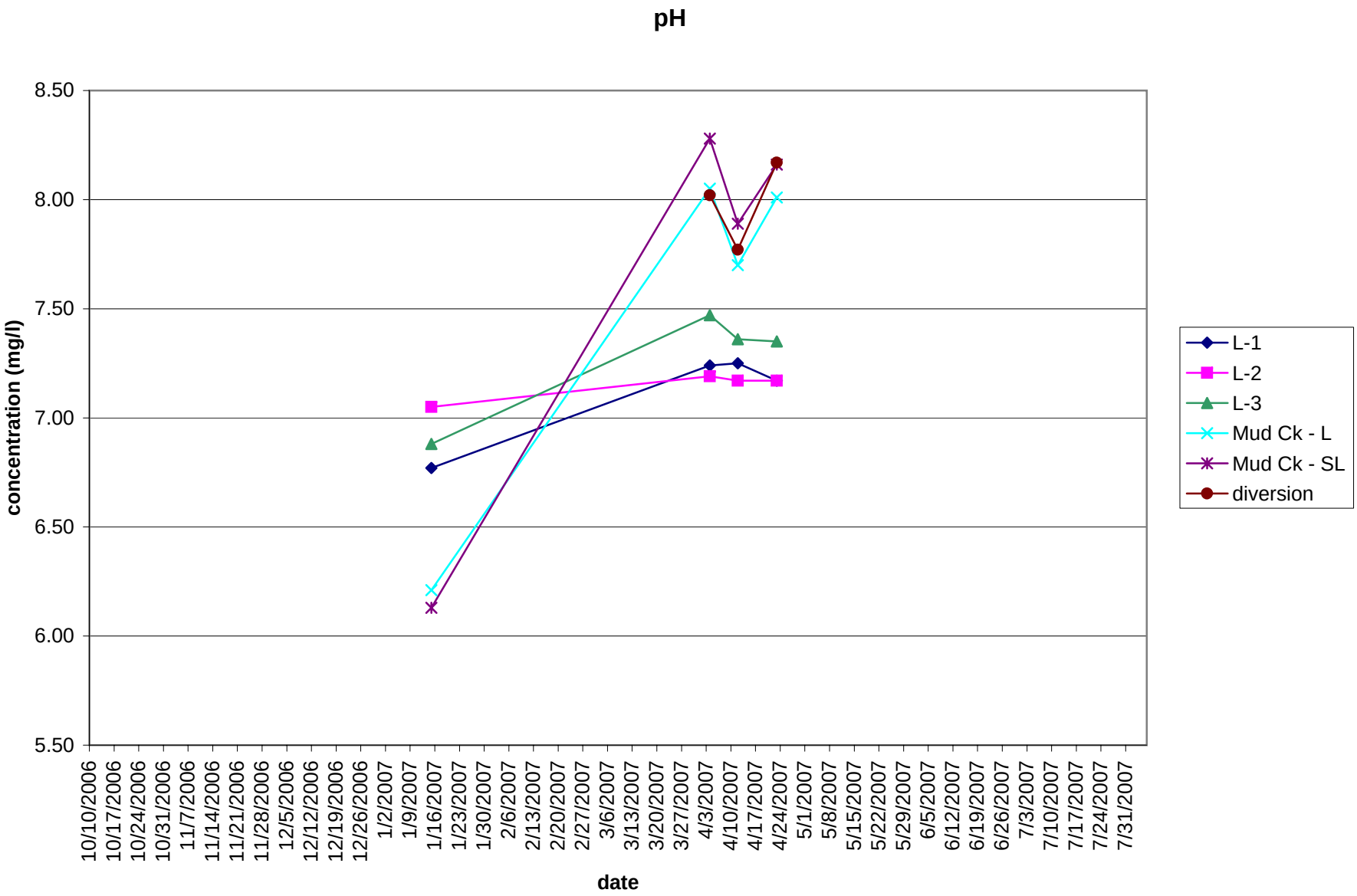
APPENDIX B
Synthetic Organic Compounds Analyzed for the Locher Road SAR Site

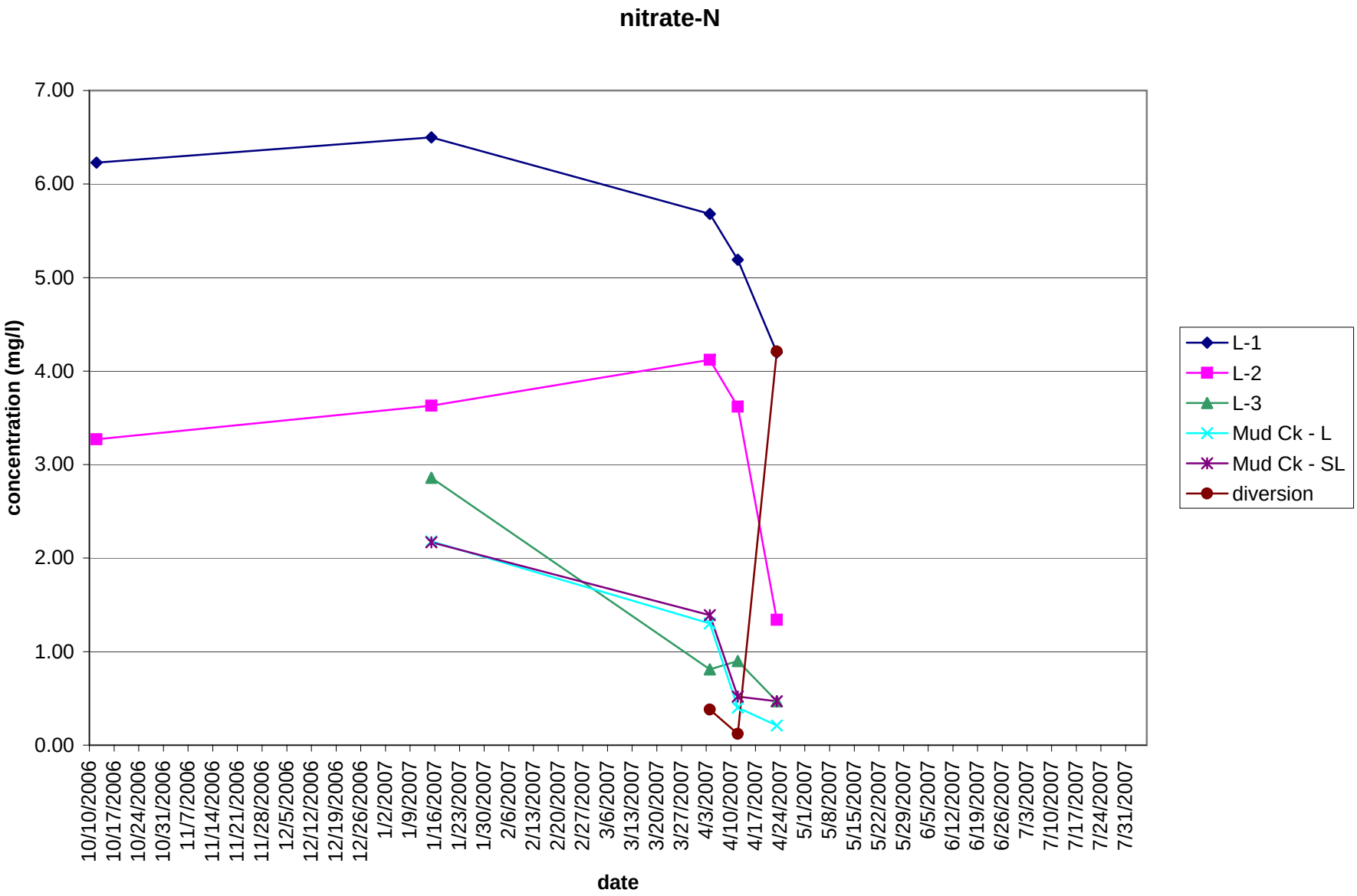
DOH#	Compounds	Units	SRL	Trigger	MCL
	Carbamates in Drinking water				
146	Carbofuran	ug/L	1.8	1.8	40.0
148	Oxymal	ug/L	4.0	4.0	200.0
141	3-Hydroxycarbofuran	ug/L	2.0	2.0	
142	Aldicarb	ug/L	1.0	1.0	
143	Aldicarb Sulfone	ug/L	1.6	1.6	
144	Aldicarb Sulfoxide	ug/L	1.0	1.0	
145	Carbaryl	ug/L	2.0	2.0	
147	Methomyl	ug/L	1.0	4.0	
326	Propoxur(Baygon)	ug/L	1.0		
327	Methiocarb	ug/L	4.0		
	Synthetic Organic Compounds				
33	Endrin	ug/L	0.02	0.02	2.0
34	Lindane (BHC-Gamma)	ug/L	0.04	0.04	0.2
35	Methoxychlor	ug/L	0.20	0.20	40.0
117	Alachlor	ug/L	0.40	0.40	2.0
119	Atrazine	ug/L	0.20	0.20	3.0
120	Benzo(a)pyrene	ug/L	0.04	0.04	0.2
122	Chlordane Technical	ug/L	0.40	0.40	2.0
124	Di(ethylhexyl)-Adipate	ug/L	1.30	1.30	400.0
125	Di(ethylhexyl)-phthalate	ug/L	1.30	1.30	6.0
126	Heptachlor	ug/L	0.08	0.08	0.4
127	Heptachlor epoxide (A & B)	ug/L	0.04	0.04	0.2
128	Hexachlorobenzene	ug/L	0.20	0.20	1.0
129	Hexachlorocyclo-Pentadiene	ug/L	0.20	0.20	50.0
133	Simazine	ug/L	0.15	0.15	4.0
118	Aldrin	ug/L	0.20	0.20	
121	Butachlor	ug/L	0.40	0.40	
123	Dieldrin	ug/L	0.20	0.20	
130	Metolachlor	ug/L	1.00	1.00	
131	Metribuzin	ug/L	0.20	0.20	
132	Propachlor	ug/L	0.20	0.20	
179	Bromacil	ug/L	0.20	0.20	
183	Prometon	ug/L	0.20	0.20	
190	Terbacil	ug/L	0.20	0.20	
202	Diazinon	ug/L	0.20	0.20	
208	EPTC	ug/L	0.30	0.30	
232	4,4-DDD	ug/L	0.20	0.20	
233	4,4-DDE	ug/L	0.20	0.20	
234	4,4_DDT	ug/L	0.20	0.20	
236	Cyanazine	ug/L	0.20	0.20	
239	Malathion	ug/L	0.20	0.20	
240	Parathion	ug/L	0.20	0.20	
243	Trifluralin	ug/L	0.20	0.20	
96	Napthalene	ug/L	0.10	0.10	
154	Fluorene	ug/L	0.20	0.20	
244	Acenaphthylene	ug/L	0.20	0.20	
245	Acenaphthene	ug/L	0.20	0.20	
246	Anthracene	ug/L	0.20	0.20	
247	Benz(a)anthracene	ug/L	0.10	0.10	

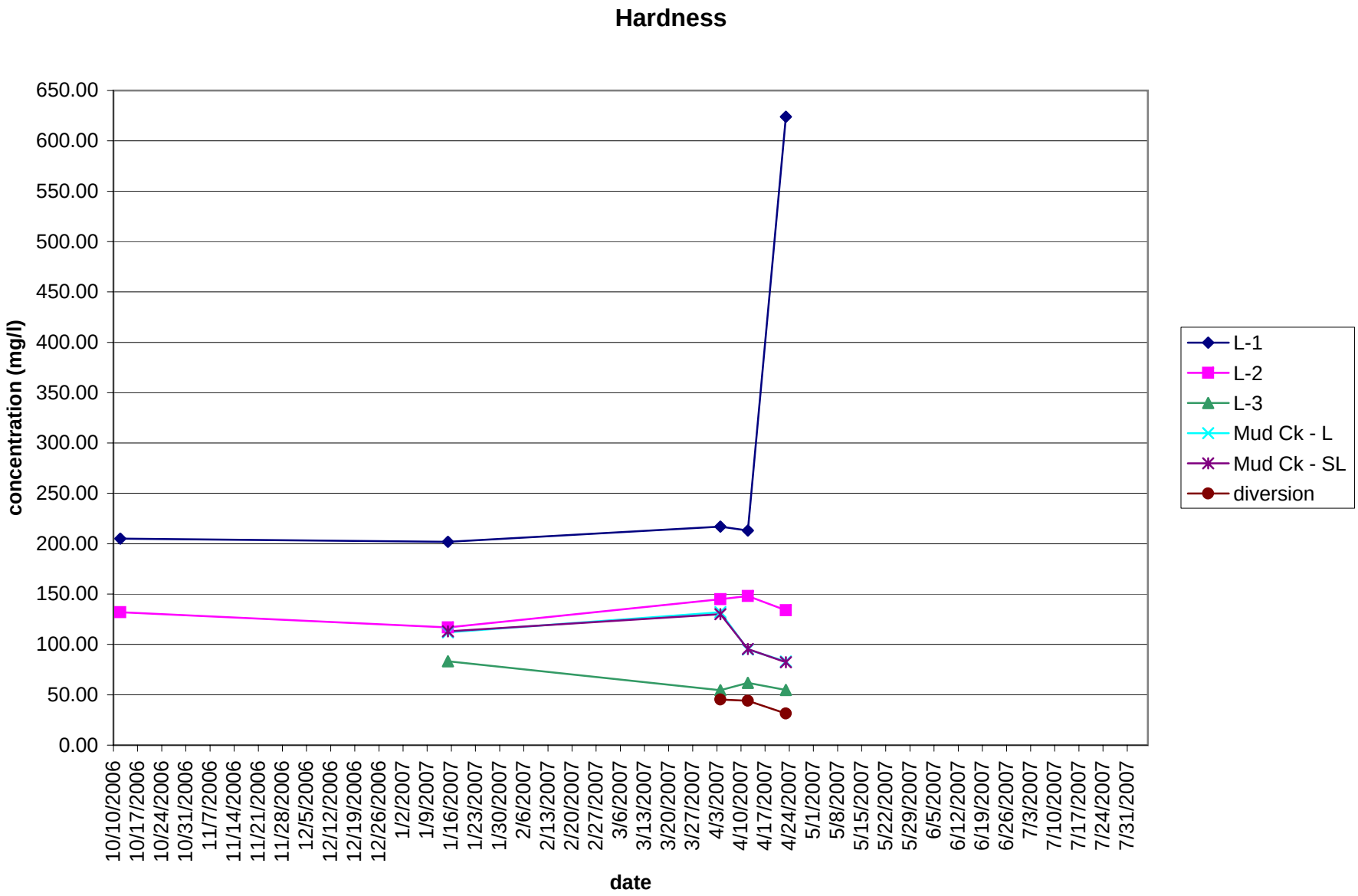
248	Benzo(b)fluoranthene	ug/L	0.20	0.20	
249	Benzo(g,h,i)perylene	ug/L	0.20	0.20	
250	Benzo(k)fluoranthene	ug/L	0.20	0.20	
251	Chrysene	ug/L	0.20	0.20	
252	Dibenzo(A,H)anthracene	ug/L	0.20	0.20	
253	Fluoranthene	ug/L	0.20	0.20	
255	Indeno(1,2,3-CD)Pyrene	ug/L	0.20	0.20	
256	Phenanthrene	ug/L	0.20	0.20	
257	Pyrene	ug/L	0.20	0.20	
258	Benzyl Butyl Phthalate	ug/L	0.60	0.60	
259	Di-N-Butyl Phthalate	ug/L	0.60	0.60	
260	Diethyl Phthalate	ug/L	0.60	0.60	
261	Dimethyl Phthalate	ug/L	0.60	0.60	
36	Toxaphene	ug/L	2.0	2.0	3.0
173	Aroclor 1221	ug/L	20.0	20.0	
174	Aroclor 1232	ug/L	0.5	0.5	
175	Aroclor 1242	ug/L	0.5	0.3	
176	Aroclor 1248	ug/L	0.1	0.1	
177	Aroclor 1254	ug/L	0.1	0.1	
178	Aroclor 1260	ug/L	0.2	0.2	
180	Aroclor 1016	ug/L	0.1	0.1	
	Herbicides in Drinking Water				
37	2,4-D	ug/L	0.2	0.2	70.0
38	2,4,5-TP (Silvex)	ug/L	0.4	0.4	50.0
134	Pentachlorophenol	ug/L	0.1	0.1	1.0
137	Dalapon	ug/L	2.0	2.0	200.0
139	Dinoseb	ug/L	0.4	0.4	7.0
140	Picloram	ug/L	0.2	0.2	500.0
138	Dicamba	ug/L	0.2	0.2	
135	2,4 DB	ug/L	1.0	1.0	
136	2,4,5 T	ug/L	0.4	0.4	
220	Bentazon	ug/L	0.5	0.5	
221	Dichloroprop	ug/L	0.5	0.5	
223	Actiflorfin	ug/L	2.0	2.0	
225	Dacthal (DCPA)	ug/L	0.1	0.1	
226	3,5-Dichlorobenzoic Acid	ug/L	0.5	0.5	

APPENDIX C

Sampler's Notes and Laboratory Results for Water Quality Sampling


pH
8.50
8.00
7.50
7.00
6.50
6.00
5.50
concentration (mg/l)
10/10/2006
10/17/2006
10/24/2006
10/31/2006
11/7/2006
11/14/2006
11/21/2006
11/28/2006
12/5/2006
12/12/2006
12/19/2006
12/26/2006
1/2/2007
1/9/2007
1/16/2007
1/23/2007
1/30/2007
2/6/2007
2/13/2007
2/20/2007
2/27/2007
3/6/2007
3/13/2007
3/20/2007
3/27/2007
4/3/2007
4/10/2007
4/17/2007
4/24/2007
5/1/2007
5/8/2007
5/15/2007
5/22/2007
5/29/2007
6/5/2007
6/12/2007
6/19/2007
6/26/2007
7/3/2007
7/10/2007
7/17/2007
7/24/2007
7/31/2007
date
L-1
L-2
L-3
Mud Ck - L
Mud Ck - SL
diversion


nitrate-N
concentration (mg/l)
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/10/2006
10/17/2006
10/24/2006
10/31/2006
11/7/2006
11/14/2006
11/21/2006
11/28/2006
12/5/2006
12/12/2006
12/19/2006
12/26/2006
1/2/2007
1/9/2007
1/16/2007
1/23/2007
1/30/2007
2/6/2007
2/13/2007
2/20/2007
2/27/2007
3/6/2007
3/13/2007
3/20/2007
3/27/2007
4/3/2007
4/10/2007
4/17/2007
4/24/2007
5/1/2007
5/8/2007
5/15/2007
5/22/2007
5/29/2007
6/5/2007
6/12/2007
6/19/2007
6/26/2007
7/3/2007
7/10/2007
7/17/2007
7/24/2007
7/31/2007
date
L-1
L-2
L-3
Mud Ck - L
Mud Ck - SL
diversion


Hardness
concentration (mg/l)
650.00
600.00
550.00
500.00
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
10/10/2006
10/17/2006
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4/24/2007
5/1/2007
5/8/2007
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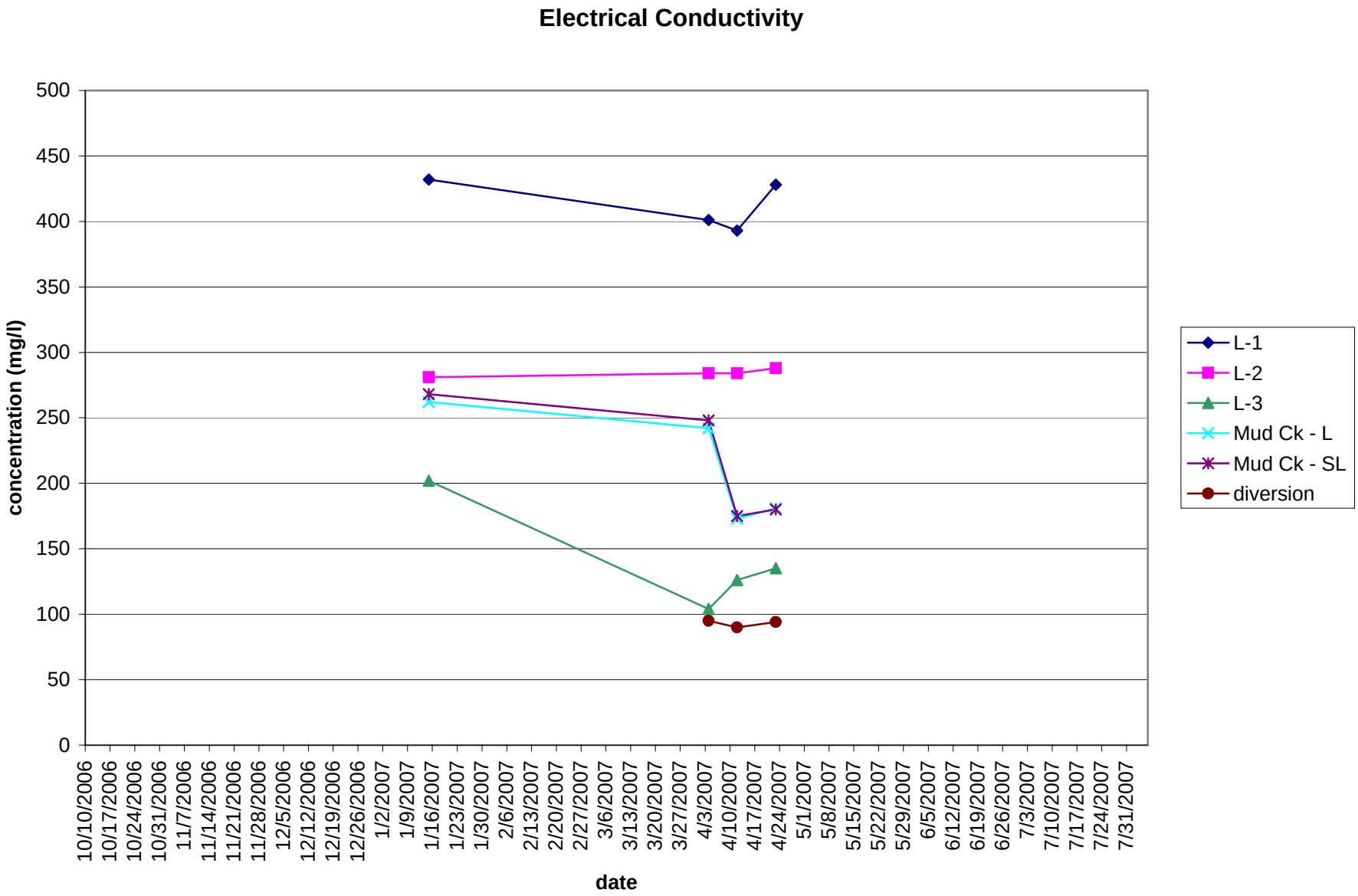
5/22/2007
5/29/2007
6/5/2007
6/12/2007
6/19/2007
6/26/2007
7/3/2007
7/10/2007
7/17/2007
7/24/2007
7/31/2007
date
L-1
L-2
L-3
Mud Ck - L
Mud Ck - SL
diversion


Electrical Conductivity
concentration (mg/l)
500
450
400
350
300
250
200
150
100
50
0
10/10/2006
10/17/2006
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10/31/2006
11/7/2006
11/14/2006
11/21/2006
11/28/2006
12/5/2006
12/12/2006
12/19/2006
12/26/2006
1/2/2007
1/9/2007
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3/6/2007
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3/27/2007
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4/17/2007
4/24/2007
5/1/2007
5/8/2007
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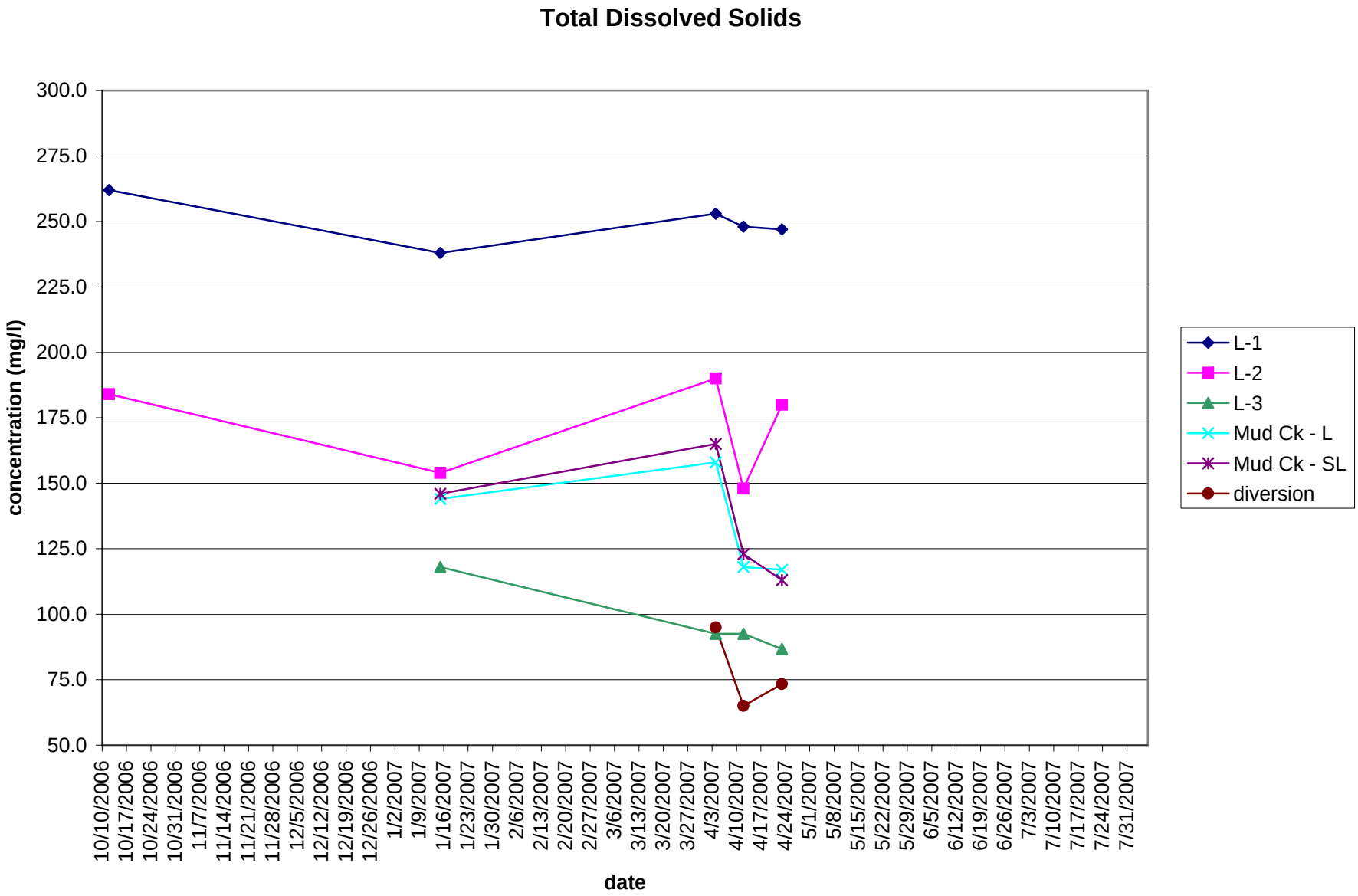
5/22/2007
5/29/2007
6/5/2007
6/12/2007
6/19/2007
6/26/2007
7/3/2007
7/10/2007
7/17/2007
7/24/2007
7/31/2007
date
L-1
L-2
L-3
Mud Ck - L
Mud Ck - SL
diversion


Total Dissolved Solids
concentration (mg/l)
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250.0
225.0
200.0
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150.0
125.0
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75.0
50.0
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11/7/2006
11/14/2006
11/21/2006
11/28/2006
12/5/2006
12/12/2006
12/19/2006
12/26/2006
1/2/2007
1/9/2007
1/16/2007
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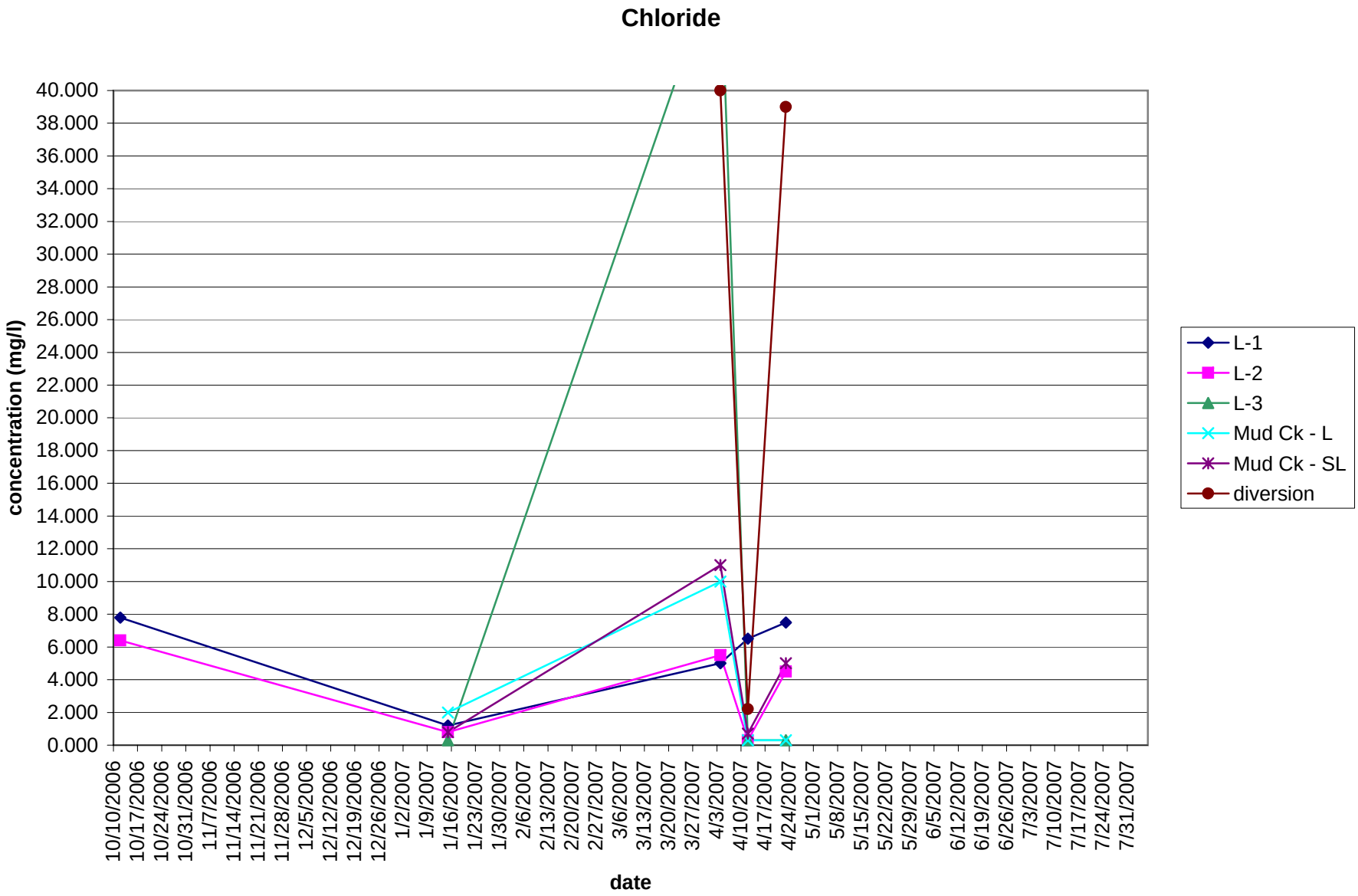
5/1/2007
5/8/2007
5/15/2007
5/22/2007
5/29/2007
6/5/2007
6/12/2007
6/19/2007
6/26/2007
7/3/2007
7/10/2007
7/17/2007
7/24/2007
7/31/2007
date
L-1
L-2
L-3
Mud Ck - L
Mud Ck - SL
diversion


Chloride
concentration (mg/l)
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20.000
18.000
16.000
14.000
12.000
10.000
8.000
6.000
4.000
2.000
0.000
10/10/2006
10/17/2006
10/24/2006
10/31/2006
11/7/2006
11/14/2006
11/21/2006
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12/5/2006
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2/27/2007
3/6/2007
3/13/2007
3/20/2007
3/27/2007
4/3/2007
4/10/2007
4/17/2007
4/24/2007
5/1/2007
5/8/2007
5/15/2007
5/22/2007
5/29/2007
6/5/2007
6/12/2007
6/19/2007
6/26/2007
7/3/2007
7/10/2007
7/17/2007
7/24/2007
7/31/2007
date
L-1
L-2
L-3
Mud Ck - L
Mud Ck - SL
diversion

Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**	
Contractor:	Kuo Testing Labs, Inc.	**Task #:**	
KTL Personnel:	Laura Hofbauer	**Page**	**OF**
		Date:	**01/15/07**

SITE	TIME	pH	CONDUCTIVITY	TEMPERATURE	TURBIDITY
Mud Creek -Locher	12:40	6.21	0262	01.8	1.39
Mud Creek -Stateline	01:28	6.13	0263	2.3	3.56

Kuo Testing Labs, Inc.

337 South 1st Avenue, Othello, WA 99344
(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 1/15/2007
DATE RECEIVED: 1/16/2007
DATE REPORTED: 2/16/2007

SYSTEM CUSTOMER

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Project Name:Locher Rd SAR

SEND REPORT TO

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Attn:

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULT	MDL	UNITS	ANALYSIS
86455	Stateline Mud Creek	Nitrate as Nitrogen	2.17	0.21	mg/L	Hatch
86455	Stateline Mud Creek	Total Dissolved Solids	146	21.1	mg/L	Hatch
86455	Stateline Mud Creek	Hardness	113	0.11	mg/L	Hatch
86455	Stateline Mud Creek	Chloride	0.80	0.297	mg/L	Hatch
86455	Stateline Mud Creek	Orthophosphate as P	0.05	0.0433	mg/L	Hatch
86455	Stateline Mud Creek	COD	9	8	mg/L	Hatch
86455	Stateline Mud Creek	Fecal Coliforms	ND		cfu/100mL	Micro Analytical

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
Please check out our new Web Site at http://www.kuotesting.com
***TNTC= Too Numerous To Count*

Dr. Eugene Kuo, Quality Assurance Manager

02-16-07
Date

Kuo Testing Labs, Inc.

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1/15/2007	1/16/2007	2/16/2007

SYSTEM CUSTOMER

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Project Name:

SEND REPORT TO

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Attn:

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSIS
86454	Locher Mud Creek	Nitrate as Nitrogen	2.18	0.21	mg/L	Hatch
86454	Locher Mud Creek	Total Dissolved Solids	144	21.1	mg/L	Hatch
86454	Locher Mud Creek	Hardness	112	0.11	mg/L	Hatch
86454	Locher Mud Creek	Chloride	2.0	0.297	mg/L	Hatch
86454	Locher Mud Creek	Orthophosphate as P	0.06	0.0433	mg/L	Hatch
86454	Locher Mud Creek	COD	4	8	mg/L	Hatch
86454	Locher Mud Creek	Fecal Coliforms	ND		cfu/100mL	Micro Artalytical

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
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1/15/2007	1/16/2007	2/16/2007

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Project Name:

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Touchet WA 99360
Attn:

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
86456	Duplicate	Nitrate as Nitrogen	3.59	0.21	mg/L	Hatch
86456	Duplicate	Total Dissolved Solids	160	21.1	mg/L	Hatch
86456	Duplicate	Hardness	118	0.11	mg/L	Hatch
86456	Duplicate	Chloride	1.0	0.297	mg/L	Hatch
86456	Duplicate	Orthophosphate as P	0.10	0.0433	mg/L	Hatch
86456	Duplicate	COD	4	8	mg/L	Hatch
86456	Duplicate	Fecal Coliforms	ND		cfu/100mL	Micro Analytical

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mg/L:Indicates milligrams per litre
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1/15/2007	1/16/2007	2/16/2007

SYSTEM / CUSTOMER

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Project Name:

SEND REPORT TO:

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Attn:

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSIS
86457	Blind A&B	Nitrate as Nitrogen	1.97	0.21	mg/L	Hatch
86457	Blind A&B	Hardness	108	0.11	mg/L	Hatch

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
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Dr. Eugene Kuo, Quality Assurance Manager

02-16-07
Date

Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR monitoring	**Project#:**
Contractor:	Kuo Testing Labs, Inc.	**Task #:**
KTL Personnel:	Laura Hofbauer	**Page OF**
		Date:01/15/07
Weather:	clear - very cold	

TIME:	DESCRIPTION OF WORK
11:13	on site hr. 2
11:58	on site hr. 3
12:37	on site Mud Creek - Locher Rd - ice on surface, but water is flowing
12:45	on site hr. 1

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: **Locher Road SAR Project**	No.:	WELL NO: **LR - 1**
FIELD SAMPLER: **Laura Hofbauer**		DATE: **01/15/07**
FIELD ANALYST: **Laura Hofbauer**		
SAMPLING METHOD: **Battery Operated Whale Water Mini Purge Pump**		
FIELD INSTRUMENTS USED: **Orion pH Meter model 210A** **Hach Conductivity Meter** **Solinst Water Level Meter Model 101** **HF Scientific ORT-15 CE Turbidi Meter**		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	63.6	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	37.35	Bore Hole Diameter D_3 (in.)	6"	L_1 25.65 *0.16 = 4.10 CV in Gallons	
3) Final Depth To Water	37.35	Filter Pack Length L_2 (feet)	12	CV 4.10 /2 = 2.05 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	12.3
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	25.65			Number of Bore Volumes Purged	

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
12:50			began	purge			
12:54	3	5.83	12.6	0441	5.61		
12:58	6	6.29	13.0	0435	0.59		
01:02	9	6.51	13.1	0433	0.26		
01:06	12	6.68	12.8	0432	0.19		
01:10	15	6.77	12.8	0432	0.15		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

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DATE REPORTED: 2/16/2007

SYSTEM / CUSTOMER

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539 White Rd
Touchet WA 99360
Project Name: Locher Rd SAR

SEND REPORT TO:
Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Attn:

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	PQL	UNITS	ANALYSIS
86451	LR-1	Nitrate as Nitrogen	6.50	0.21	mg/L	Hatch
86451	LR-1	Total Dissolved Solids	238	21.1	mg/L	Hatch
86451	LR-1	Hardness	202	0 11	mg/L	Hatch
86451	LR-1	Chloride	1.20	0.297	mg/L	Hatch
86451	LR-1	Orthophosphate as P	0.12	0.0433	mg/L	Hatch
86451	LR-1	COD	7	8	mg/L	Hatch
86451	LR-1	Fecal Coliforms	ND		cfu/100mL	Micro Analytical
86451	LR-1	SOC/Synthetic Organic Compounds	Report		mg/L	Edge Analytical

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Please check out our new Web Site at http://www.kuotesting.com
***TNTC= Too Numerous To Count*

Dr. Eugene Kuo, Quality Assurance Manager

02-16-07
Date

EDGE ANALYTICAL
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Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

HERBICIDES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86451
County:
Sampled By:
Sampler Phone:

Field ID: 86451
Lab Number: 04601279
Date Collected: 1/15/2007
Date Extracted: 515_070129
Date Analyzed: 2/5/2007
Report Date: 2/13/2007
Analyst: CO
Supervisor:

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
138	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	ND	ug/L	0.1	0.1		
225	DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
A blank MCL or SAL value indicates a level is not currently established.
***- If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
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J - Estimated value.

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86451
County:
Sampled By:
Sampler Phone:

Field ID: 86451
Lab Number: 04601279
Date Collected: 1/15/2007
Date Extracted: 525_070123
Date Analyzed: 1/26/2007
Report Date: 1/30/2007
Analyst: CO
Supervisor:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
118	ALDRIN	ND	ug/L	0.2	0.2		
121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	0.74	ug/L	0.2	0.2		Field dup - 0.70 ug/L
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable in Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
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J - Estimated value.

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"the lab that can insist"

Reference Number: 07-00579
Lab Number: 04801279
Report Date: 1/30/2007

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	ND	ug/L	0.2	0.2		
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	0.95	ug/L	0.6	0.6		Field dup - 0.89 ug/L
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

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J - Estimated value.

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Microbiology | 360.671.0688 • 360.671.1577fax

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86451
County:
Sampled By:
Sampler Phone:

Reference Number: 07-00579

Project: 86451,86452,86453

Field ID: 86451
Lab Number: 04601279
Date Collected: 1/15/2007
Date Extracted: 508_070123
Date Analyzed: 1/29/2007
Report Date: 1/30/2007
Analyst: CO
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

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J - Estimated value.

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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86451
County:
Sampled By:
Sampler Phone:

Field ID: 86451
Lab Number: 04601279
Date Collected: 1/15/2007
Date Extracted: 531_070205
Date Analyzed: 2/7/2007
Report Date: 2/15/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

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J - Estimated value.

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 2
FIELD SAMPLER: Laura Hofbauer		DATE: 01/15/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	53.0	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	23.75	Bore Hole Diameter D_3 (in.)	6"	L_1 29.25 0.16 = 4.68 CV in Gallons	
3) Final Depth To Water	23.75	Filter Pack Length L_2 (feet)	12	CV 4.68 /2 = 2.34 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	14.04
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	29.25			Number of Bore Volumes Purged	

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
11:30			began	purge			
11:32	3	7.00	12.0	0282	3.79		
11:34	6	7.04	12.3	0280	2.42		
11:36	9	7.03	12.4	0280	2.39		
11:38	12	7.04	12.3	0280	0.98		
11:40	15	7.05	11.9	0281	0.67		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

337 South 1st Avenue, Othello, WA 99344
(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 1/15/2007
DATE RECEIVED: 1/16/2007
DATE REPORTED: 2/16/2007

SYSTEM / CUSTOMER

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Project Name: Locher Rd SAR

SEND REPORT TO:
Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Attn:

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
86452	LR-2	Nitrate as Nitrogen	3.63	0.21	mg/L	Hatch
86452	LR-2	Total Dissolved Solids	154	21.1	mg/L	Hatch
86452	LR-2	Hardness	117	0.11	mg/L	Hatch
86452	LR-2	Chloride	0.80	0.297	mg/L	Hatch
86452	LR-2	Orthophosphate as P	0.13	0.0433	mg/L	Hatch
86452	LR-2	COD	4	8	mg/L	Hatch
86452	LR-2	Fecal Coliforms	ND		cfu/100mL	Micro Analytical
86452	LR-2	SOC/Synthetic Organic Compounds	Report		mg/L	Edge Analytical

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
Please check out our new Web Site at http://www.kuotesting.com
***TNTC= Too Numerous To Count*

Dr. Eugene Kuo, Quality Assurance Manager

02-16-07
Date

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HERBICIDES IN DRINKING WATER

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337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86452
County:
Sampled By:
Sampler Phone:

Field ID: 86452
Lab Number: 04601280
Date Collected: 1/15/2007
Date Extracted: 515_070129
Date Analyzed: 2/5/2007
Report Date: 2/13/2007
Analyst: CO
Supervisor:

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
128	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	ND	ug/L	0.1	0.1		
225	DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc.
337 S 1st
Othello, WA 99344

Reference Number: 07-00579
Project: 86451,86452,86453

System Name:
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DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86452
County:
Sampled By:
Sampler Phone:

Field ID: 86452
Lab Number: 04601280
Date Collected: 1/15/2007
Date Extracted: 525_070123
Date Analyzed: 1/26/2007
Report Date: 1/30/2007
Analyst: CO
Supervisor:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
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124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
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121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	ND	ug/L	0.2	0.2		
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable in Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	ND	ug/L	0.2	0.2		
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
A blank MCL or SAL value indicates a level is not currently established.
***- If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
****- Method Detection Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater than zero.
J - Estimated value.

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Bellingham WA – Microbiology | 805 Orchard Dr Suite 4 · 98225 | 360.671.0688 • 360.671.1577fax

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86452
County:
Sampled By:
Sampler Phone:

Field ID: 86452
Lab Number: 04601280
Date Collected: 1/15/2007
Date Extracted: 508_070123
Date Analyzed: 1/29/2007
Report Date: 1/30/2007
Analyst: CO
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86452
County:
Sampled By:
Sampler Phone:

Field ID: 86452
Lab Number: 04601280
Date Collected: 1/15/2007
Date Extracted: 531_070205
Date Analyzed: 2/7/2007
Report Date: 2/15/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
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Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 3
FIELD SAMPLER: Laura Hofbauer		DATE: 01/15/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	67.0	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	28.80	Bore Hole Diameter D_3 (in.)	6"	L_1 38.2 *0.16 = 6.11 CV in Gallons	
3) Final Depth To Water	29.35	Filter Pack Length L_2 (feet)	12	CV 6.11 /2 = 3.06 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	18.3
				Actual Volume Purged (gals)	~~15~~ 18
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	38.2			Number of Bore Volumes Purged	

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
12:06			began	purge			Very dirty
12.08	3	6.47	09.5	0182	157		
12:10	6	6.59	09.6	0193	64.6		
12:12	9	6.56	09.8	0200	49.4		
12:14	12	6.71	10.0	0201	40.2		
12:16	15	6.75	10.1	0201	28.0		
			End purge	Collected	sample		
12:18	18	6.88	10.1	0202	25.0		

Forms by Gina Clark

Kuo Testing Labs, Inc.

337 South 1st Avenue, Othello, WA 99344
(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED	DATE RECEIVED	DATE REPORTED
1/15/2007	1/16/2007	2/16/2007

SYSTEM / CUSTOMER

Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Project Name:Locher Rd SAR

SEND REPORT TO:
Gardena Farms Irr. Dist., No 13
539 White Rd
Touchet WA 99360
Attn:

SAMPLE NO	CWS OWNER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYST'S
86453	LR-3	Nitrate as Nitrogen	2.86	0.21	mg/L	Hatch
86453	LR-3	Total Dissolved Solids	118	21.1	mg/L	Hatch
86453	LR-3	Hardness	83.4	0.11	mg/L	Hatch
86453	LR-3	Chloride	ND	0.297	mg/L	Hatch
86453	LR-3	Orthophosphate as P	0.13	0.0433	mg/L	Hatch
86453	LR-3	COD	ND	8	mg/L	Hatch
86453	LR-3	Fecal Coliforms	ND		cfu/100mL	Micro Analytical
86453	LR-3	SOC/Synthetic Organic Compounds	Report		mg/L	Edge Analytical

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
Please check out our new Web Site at http://www.kuotesting.com
***TNTC= Too Numerous To Count*

Dr. Eugene Kuo, Quality Assurance Manager

02-16-07
Date

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HERBICIDES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86453
County:
Sampled By:
Sampler Phone:

Reference Number: 07-00579
Project: 86451,86452,86453
Field ID: 86453
Lab Number: 04601281
Date Collected: 1/15/2007
Date Extracted: 515_070129
Date Analyzed: 2/5/2007
Report Date: 2/13/2007
Analyst: CO
Supervisor: CO

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
138	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	ND	ug/L	0.1	0.1		
225	DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
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****- Method Detection Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater than zero.
J - Estimated value.

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Bellingham WA (Microbiology) | 805 Orchard Dr Suite 4 - 98225 | 360.671.0688 • 360.671.1577fax

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86453
County:
Sampled By:
Sampler Phone:

Project: 86451,86452,86453
Field ID: 86453
Lab Number: 04601281
Date Collected: 1/15/2007
Date Extracted: 525_070123
Date Analyzed: 1/26/2007
Report Date: 1/30/2007
Analyst: CO
Supervisor: WJL

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
118	ALDRIN	ND	ug/L	0.2	0.2		
121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	ND	ug/L	0.2	0.2		
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable in Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

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J - Estimated value.

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	ND	ug/L	0.2	0.2		
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-00579

Project: 86451,86452,86453

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86453
County:
Sampled By:
Sampler Phone:

Field ID: 86453
Lab Number: 04601281
Date Collected: 1/15/2007
Date Extracted: 508_070123
Date Analyzed: 1/29/2007
Report Date: 1/30/2007
Analyst: CO
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 86453
County:
Sampled By:
Sampler Phone:

Reference Number: 07-00579

Project: 86451,86452,86453

Field ID: 86453
Lab Number: 04601281
Date Collected: 1/15/2007
Date Extracted: 531_070205
Date Analyzed: 2/7/2007
Report Date: 2/15/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
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Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**
Contractor:	Kuo Testing Labs, Inc.	**Task #:**
KTL Personnel:	Laura Hofbauer	**Page OF**
		Date:04/4/07
Weather:		

TIME:	DESCRIPTION OF WORK
12:16	on site L-2
12:50	on site L-3
01:30	on site. Burlingame Ditch
01:40	on site - Mud Creek - Locher Rd
01:54	on site L-1
02:23	on site - Mud Creek - Stateline Rd

Kuo Testing Labs, Inc.

337 South 1st Avenue, Othello, WA 99344
(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 4/4/2007
DATE RECEIVED: 4/5/2007
DATE REPORTED: 5/22/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name: Locher Road SAR Monitoring

SEND REPORT TO:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87544	Duplicate	Nitrate as Nitrogen	4.06	0.015	mg/L	Reed
87544	Duplicate	Total Dissolved Solids	178	21.1	mg/L	Reed
87544	Duplicate	Hardness	148	0.11	mg/L	Reed
87544	Duplicate	Chloride	6.0	0.297	mg/L	Reed
87544	Duplicate	Orthophosphate as P	ND	0.043	mg/L	Reed
87544	Duplicate	COD	<8	8	mg/L	Morris
87544	Duplicate	Total Coliform and E. Coli	Absent/Absent			Reed

mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
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'Upon Visual Observation

Dr. Eugene Kuo, Quality Assurance Manager

05-28-07
Date

Kuo Testing Labs, Inc.

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(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 4/4/2007
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Kennewick WA 99336
Project Name: Locher Road SAR Monitoring

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87545	Field Blank	Nitrate as Nitrogen	ND	0.015	mg/L	Reed
87545	Field Blank	Total Dissolved Solids	125	21.1	mg/L	Reed
87545	Field Blank	Hardness	0.08	0.11	mg/L	Reed
87545	Field Blank	Chloride	2.0	0.297	mg/L	Reed
87545	Field Blank	Orthophosphate as P	ND	0.043	mg/L	Reed
87545	Field Blank	COD	<8	8	mg/L	Morris
87545	Field Blank	Total Coliform and E. Coli	Absent/Absent			Reed

mg/L:Indicates milligrams per litre
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MDL: Method Detection Limit
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Dr. Eugene Kuo, Quality Assurance Manager

05-28-07
Date

Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**	
Contractor:	Kuo Testing Labs, Inc.	**Task #:**	
KTL Personnel:	Laura Hofbauer	**Page**	**OF**
		Date:	04/04/07

SITE	TIME	pH	CONDUCTIVITY	TEMPERATURE	TURBIDITY
Canal	01:42	8.02	0095	9.4	6.28
Mud Creek -Locher	01:51	8.05	0242	11.2	3.48
Mud Creek -Tabeling	02:31	8.28	0243	12.6	1.81

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DATE COLLECTED: 4/4/2007
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SYSTEM / CUSTOMER:
GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name: Locher Road SAR Monitoring

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87541	Mud Creek- StateLine	Nitrate as Nitrogen	1.39	0.015	mg/L	Reed
87541	Mud Creek- StateLine	Total Dissolved Solids	165	21.1	mg/L	Reed
87541	Mud Creek- StateLine	Hardness	130	0.11	mg/L	Reed
87541	Mud Creek- StateLine	Chloride	11.0	0.297	mg/L	Reed
87541	Mud Creek- StateLine	Orthophosphate as P	ND	0.043	mg/L	Reed
87541	Mud Creek- StateLine	COD	<8	8	mg/L	Morris
87541	Mud Creek- StateLine	Total Coliform and E. Coli	Present/Present			Reed

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
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SYSTEM / CUSTOMER:
GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name: Locher Road SAR Monitoring

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87542	Mud Creek- Locher Rd.	Nitrate as Nitrogen	1.30	0.015	mg/L	Reed
87542	Mud Creek- Locher Rd.	Total Dissolved Solids	158	21.1	mg/L	Reed
87542	Mud Creek- Locher Rd.	Hardness	132	0.11	mg/L	Reed
87542	Mud Creek- Locher Rd.	Chloride	10.0	0.297	mg/L	Reed
87542	Mud Creek- Locher Rd.	Orthophosphate as P	ND	0.043	mg/L	Reed
87542	Mud Creek- Locher Rd.	COD	<8	8	mg/L	Morris
87542	Mud Creek- Locher Rd.	Total Coliform and E. Coli	Present/Present			Reed

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
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Project Name: Locher Road SAR Monitoring

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1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87543	Burlingame Ditch	Nitrate as Nitrogen	0.38	0.015	mg/L	Reed
87543	Burlingame Ditch	Total Dissolved Solids	95.0	21.1	mg/L	Reed
87543	Burlingame Ditch	Hardness	45.2	0.11	mg/L	Reed
87543	Burlingame Ditch	Chloride	40.0	0.297	mg/L	Reed
87543	Burlingame Ditch	Orthophosphate as P	ND	0.043	mg/L	Reed
87543	Burlingame Ditch	COD	<8	8	mg/L	Morris
87543	Burlingame Ditch	Total Coliform and E. Coli	Absent/Absent			Reed
87543	Burlingame Ditch	SOC/Synthetic Organic Compounds	Attached Report		mg/L	Edge Analytical

mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
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05-28-07
Date

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Microbiology | 360.671.0688 • 360.671.1577fax

HERBICIDES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87543
County:
Sampled By:
Sampler Phone:

Field ID: 87543
Lab Number: 04609384
Date Collected: 4/4/2007
Date Extracted: 515_070411
Date Analyzed: 4/30/2007
Report Date: 5/4/2007
Analyst: HY/CC
Supervisor:

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
138	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	0.21	ug/L	0.1	0.1		verified by GC/MS
225	DCPA (ACID METABOLITES)	-	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
A blank MCL or SAL value indicates a level is not currently established.
***- If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
****- Method Detection Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater than zero.
J - Estimated value.

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Microbiology | 360.671.0688 • 360.671.1577fax

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87543
County:
Sampled By:
Sampler Phone:

Field ID: 87543
Lab Number: 04609384
Date Collected: 4/4/2007
Date Extracted: 525_070409
Date Analyzed: 4/11/2007
Report Date: 4/19/2007
Analyst: CO
Supervisor:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
118	ALDRIN	ND	ug/L	0.2	0.2		
121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	ND	ug/L	0.2	0.2		
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable in Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

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J - Estimated value.

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	ND	ug/L	0.2	0.2		
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

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J - Estimated value.

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87543
County:
Sampled By:
Sampler Phone:

Field ID: 87543
Lab Number: 04609384
Date Collected: 4/4/2007
Date Extracted: 508_070409
Date Analyzed: 4/11/2007
Report Date: 4/13/2007
Analyst: MM/C
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87543
County:
Sampled By:
Sampler Phone:

Field ID: 87543
Lab Number: 04609384
Date Collected: 4/4/2007
Date Extracted: 531_070418
Date Analyzed: 4/18/2007
Report Date: 4/26/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

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Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 1
FIELD SAMPLER: Laura Hofbauer		DATE: 04/ /07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	62.90	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	35.07	Bore Hole Diameter D_3 (in.)	6"	L_1 27.83*0.16 = 4.45 CV in Gallons	
3) Final Depth To Water	35.10	Filter Pack Length L_2 (feet)	12	CV 4.45 /2 = 2.23 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	13.4
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	27.83			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
02:00			began	purge			
02:02	3	7.18	13.8	0405	24.3		
02:04	6	7.21	13.7	0404	5.06		
02:06	9	7.23	13.7	0402	2.39		
02:08	12	7.25	13.7	0402	1.40		
02:10	15	7.24	13.8	0401	0.89		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

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(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 4/4/2007
DATE RECEIVED: 4/5/2007
DATE REPORTED: 5/22/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name: Locher Road SAR Monitoring

SEND REPORT TO:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87538	LR-1	Nitrate as Nitrogen	5.68	0.015	mg/L	Reed
87538	LR-1	Total Dissolved Solids	253	21.1	mg/L	Reed
87538	LR-1	Hardness	217	0.11	mg/L	Reed
87538	LR-1	Chloride	5.0	0.297	mg/L	Reed
87538	LR-1	Orthophosphate as P	ND	0.043	mg/L	Reed
87538	LR-1	COD	<8	8	mg/L	Morris
87538	LR-1	Total Coliform and E. Coli	Absent/Absent			Reed
87538	LR-1	SOC/Synthetic Organic Compounds	Attached Report		mg/L	Edge Analytical

mg/L: Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
Please check out our new Web Site at http://www.kuotesting.com
'Upon Visual Observation

Dr. Eugene Kuo, Quality Assurance Manager

05-28-07
Date

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Corporate Office | 800.755.9295 • 360.757.1400 • 360.757.1402fax
Bellingham WA | 805 Orchard Dr Suite 4 - 98225
Microbiology | 360.671.0688 • 360.671.1577fax

HERBICIDES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87538
County:
Sampled By:
Sampler Phone:

Field ID: 87538
Lab Number: 04609381
Date Collected: 4/4/2007
Date Extracted: 515_070411
Date Analyzed: 4/30/2007
Report Date: 5/4/2007
Analyst: HY/CC
Supervisor:

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
138	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	ND	ug/L	0.1	0.1		
225	DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
A blank MCL or SAL value indicates a level is not currently established.
***- If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
****- Method Detection Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater than zero.
J - Estimated value.

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87538
County:
Sampled By:
Sampler Phone:

Field ID: 87538
Lab Number: 04609381
Date Collected: 4/4/2007
Date Extracted: 525_070409
Date Analyzed: 4/11/2007
Report Date: 4/26/2007
Analyst: CO
Supervisor:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
118	ALDRIN	ND	ug/L	0.2	0.2		
121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	0.2	ug/L	0.2	0.2		Field dup - 0.2 ug/L
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable in Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
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J - Estimated value.

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	0.4	ug/L	0.2	0.2		Field dup - 0.3 ug/L
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	0.7	ug/L	0.6	0.6		Field dup - 0.7 ug/L
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

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J - Estimated value.

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Microbiology | 360.671.0688 • 360.671.1577fax

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87538
County:
Sampled By:
Sampler Phone:

Field ID: 87538
Lab Number: 04609381
Date Collected: 4/4/2007
Date Extracted: 508_070409
Date Analyzed: 4/11/2007
Report Date: 4/13/2007
Analyst: MM/C(
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

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J - Estimated value.

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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87538
County:
Sampled By:
Sampler Phone:

Field ID: 87538
Lab Number: 04609381
Date Collected: 4/4/2007
Date Extracted: 531_070418
Date Analyzed: 4/18/2007
Report Date: 4/26/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

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J - Estimated value.

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	**No.:**	**WELL NO:** LR - 2
FIELD SAMPLER: Laura Hofbauer		**DATE:** 04/ /07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		**CONDITION of WELL:** satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	52.97	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	22.02	Bore Hole Diameter D_3 (in.)	6"	L_1 30.95 *0.16 = 4.95 CV in Gallons	
3) Final Depth To Water	22.03	Filter Pack Length L_2 (feet)	12	CV 4.95 /2 = 2.48 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	14.9
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	30.95			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
12:25			began	purge			
12:27	3	7.07	13.1	0284	2.48		
12:29	6	7.12	13.0	0284	1.37		
12:31	9	7.15	13.0	0284	0.94		
12:33	12	7.17	13.0	0284	0.76		
12:35	15	7.19	13.0	0284	0.39		
			End purge	Collected	sample		
				duplicate			

Forms by Gina Clark

Kuo Testing Labs, Inc.

337 South 1st Avenue, Othello, WA 99344
(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 4/4/2007
DATE RECEIVED: 4/5/2007
DATE REPORTED: 5/22/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name: Locher Road SAR Monitioring

SEND REPORT TO:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87539	LR-2	Nitrate as Nitrogen	4.12	0.015	mg/L	Reed
87539	LR-2	Total Dissolved Solids	190	21.1	mg/L	Reed
87539	LR-2	Hardness	145	0.11	mg/L	Reed
87539	LR-2	Chloride	5.50	0.297	mg/L	Reed
87539	LR-2	Orthophosphate as P	ND	0.043	mg/L	Reed
87539	LR-2	COD	<8	8	mg/L	Morris
87539	LR-2	Total Coliform and E. Coli	Absent/Absent			Reed
87539	LR-2	SOC/Synthetic Organic Compounds	Attached Report		mg/L	Edge Analytical

mg/L: Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
Please check out our new Web Site at http://www.kuotesting.com
'Upon Visual Observation

Dr. Eugene Kuo, Quality Assurance Manager

05-28-07
Date

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HERBICIDES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
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Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87539
County:
Sampled By:
Sampler Phone:

Field ID: 87539
Lab Number: 04609382
Date Collected: 4/4/2007
Date Extracted: 515_070411
Date Analyzed: 4/30/2007
Report Date: 5/4/2007
Analyst: HY/CC
Supervisor:

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
138	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	ND	ug/L	0.1	0.1		
225	DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

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337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
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DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87539
County:
Sampled By:
Sampler Phone:

Field ID: 87539
Lab Number: 04609382
Date Collected: 4/4/2007
Date Extracted: 525_070409
Date Analyzed: 4/11/2007
Report Date: 4/19/2007
Analyst: CO
Supervisor:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
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132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	ND	ug/L	0.2	0.2		
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable In Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
A blank MCL or SAL value indicates a level is not currently established.
***- If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
****- Method Detection Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater than zero.
J - Estimated value.

EDGE ANALYTICAL

Reference Number: 07-04107
Lab Number: 04609382
Report Date: 4/19/2007

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	0.5	ug/L	0.2	0.2		
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	0.7	ug/L	0.6	0.6		
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
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J - Estimated value.

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Microbiology | 360.671.0688 • 360.671.1577fax

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87539
County:
Sampled By:
Sampler Phone:

Field ID: 87539
Lab Number: 04609382
Date Collected: 4/4/2007
Date Extracted: 508_070409
Date Analyzed: 4/11/2007
Report Date: 4/13/2007
Analyst: MM/CC
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87539
County:
Sampled By:
Sampler Phone:

Reference Number: 07-04107

Project: 87538,87539,87540,87543

Field ID: 87539
Lab Number: 04609382
Date Collected: 4/4/2007
Date Extracted: 531_070418
Date Analyzed: 4/18/2007
Report Date: 4/26/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

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J - Estimated value.

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	**No.:**	**WELL NO:** LR - 3
FIELD SAMPLER: Laura Hofbauer		**DATE:** 04/ /07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		**CONDITION of WELL:** satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	66.58	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	26.20	Bore Hole Diameter D_3 (in.)	6"	L_1 40.38 *0.16 = 6.46 CV in Gallons	
3) Final Depth To Water	26.20	Filter Pack Length L_2 (feet)	12	CV 6.46 /2 = 3.23 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	19.38
				Actual Volume Purged (gals)	~~15~~ 20
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	40.38			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
01:01			began	purge			
01:04	3 4	7.50	9.3	0115	25.9		
01:06	8 8	7.48	9.2	0115	8.81		
01:09	8 12	7.48	9.2	0115	5.24		
01:11	12 16	7.49	9.2	0115	3.46		
01:14	16 20	7.47	9.6	0104	2.51		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

337 South 1st Avenue, Othello, WA 99344
(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 4/4/2007
DATE RECEIVED: 4/5/2007
DATE REPORTED: 5/22/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name: Locher Road SAR Monitoring

SEND REPORT TO:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87540	LR-3	Nitrate as Nitrogen	0.81	0.015	mg/L	Reed
87540	LR-3	Total Dissolved Solids	92.5	21.1	mg/L	Reed
87540	LR-3	Hardness	54.3	0.11	mg/L	Reed
87540	LR-3	Chloride	48.5	0.297	mg/L	Reed
87540	LR-3	Orthophosphate as P	ND	0.043	mg/L	Reed
87540	LR-3	COD	<8	8	mg/L	Morris
87540	LR-3	Total Coliform and E. Coli	Absent/Absent			Reed
87540	LR-3	SOC/Synthetic Organic Compounds	Attached Report		mg/L	Edge Analytical

mg/L:Indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
Please check out our new Web Site at http://www.kuotesting.com
'Upon Visual Observation

Dr. Eugene Kuo, Quality Assurance Manager

05-25-07
Date

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HERBICIDES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87540
County:
Sampled By:
Sampler Phone:

Reference Number: 07-04107

Project: 87538,87539,87540,87543

Field ID: 87540
Lab Number: 04609383
Date Collected: 4/4/2007
Date Extracted: 515_070411
Date Analyzed: 4/30/2007
Report Date: 5/4/2007
Analyst: HY/CC
Supervisor:

EPA Method 515.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
37	2,4 - D	ND	ug/L	0.2	0.2	70	
38	2,4,5 - TP (SILVEX)	ND	ug/L	0.4	0.4	50	
134	PENTACHLOROPHENOL	ND	ug/L	0.08	0.08	1	
137	DALAPON	ND	ug/L	2	2	200	
139	DINOSEB	ND	ug/L	0.4	0.4	7	
140	PICLORAM	ND	ug/L	0.2	0.2	500	
	EPA Unregulated						
138	DICAMBA	ND	ug/L	0.2	0.2		
	State Unregulated						
222	TOTAL DCPA	ND	ug/L	0.1	0.1		
225	DCPA (ACID METABOLITES)	ND	ug/L	0.1	0.1		
135	2,4 DB	ND	ug/L	1.0	1.0		
136	2,4,5 T	ND	ug/L	0.4	0.4		
220	BENTAZON	ND	ug/L	0.5	0.5		
221	DICHLORPROP	ND	ug/L	0.5	0.5		
223	ACIFLUORFEN	ND	ug/L	2.0	2.0		
224	CHLORAMBEN	ND	ug/L	0.2	0.2		
226	3,5 - DICHLOROBENZOIC ACID	ND	ug/L	0.5	0.5		

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J - Estimated value.

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87540
County:
Sampled By:
Sampler Phone:

Field ID: 87540
Lab Number: 04609383
Date Collected: 4/4/2007
Date Extracted: 525_070409
Date Analyzed: 4/11/2007
Report Date: 4/19/2007
Analyst: CO
Supervisor:

EPA Method 525.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
33	ENDRIN	ND	ug/L	0.02	0.02	2	
34	LINDANE (BHC - GAMMA)	ND	ug/L	0.04	0.04	0.2	
35	METHOXYCHLOR	ND	ug/L	0.2	0.2	40	
117	ALACHLOR	ND	ug/L	0.4	0.4	2	
119	ATRAZINE	ND	ug/L	0.2	0.2	3	
120	BENZO(A)PYRENE	ND	ug/L	0.04	0.04	0.2	
122	CHLORDANE, TECHNICAL	ND	ug/L	0.4	0.4	2	
124	DI(ETHYLHEXYL)-ADIPATE	ND	ug/L	1.3	1.3	400	
125	DI(ETHYLHEXYL)-PHTHALATE	ND	ug/L	1.3	1.3	6	
126	HEPTACHLOR	ND	ug/L	0.08	0.08	0.4	
127	HEPTACHLOR EPOXIDE	ND	ug/L	0.04	0.04	0.2	
128	HEXACHLOROBENZENE	ND	ug/L	0.2	0.2	1	
129	HEXACHLOROCYCLO-PENTADIENE	ND	ug/L	0.2	0.2	50	
133	SIMAZINE	ND	ug/L	0.15	0.15	4	
134	PENTACHLOROPHENOL	ND	ug/L	0.4	0.08	1	screening only / compliance by 515.1
	EPA Unregulated						
118	ALDRIN	ND	ug/L	0.2	0.2		
121	BUTACHLOR	ND	ug/L	0.4	0.4		
123	DIELDRIN	ND	ug/L	0.2	0.2		
130	METOLACHLOR	ND	ug/L	1.0	1.0		
131	METRIBUZIN	ND	ug/L	0.2	0.2		
132	PROPACHLOR	ND	ug/L	0.2	0.2		
	State Unregulated - Other						
179	BROMACIL	ND	ug/L	0.2	0.2		
190	TERBACIL	ND	ug/L	0.2	0.2		
202	DIAZINON	ND	ug/L	0.2	0.2		Unstable in Acidified Sample Matrix
208	EPTC	ND	ug/L	0.3	0.3		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
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J - Estimated value.

SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
232	4,4-DDD	ND	ug/L	0.2	0.2		
233	4,4-DDE	ND	ug/L	0.2	0.2		
234	4,4-DDT	ND	ug/L	0.2	0.2		
236	CYANAZINE	ND	ug/L	0.2	0.2		Qualitative Analysis Only
239	MALATHION	0.3	ug/L	0.2	0.2		
240	PARATHION	ND	ug/L	0.2	0.2		
243	TRIFLURALIN	ND	ug/L	0.2	0.2		
	- PAHs						
96	NAPTHALENE	ND	ug/L	0.1	0.1		
254	FLUORENE	ND	ug/L	0.2	0.2		
244	ACENAPHTHYLENE	ND	ug/L	0.2	0.2		
245	ACENAPHTHENE	ND	ug/L	0.2	0.2		
246	ANTHRACENE	ND	ug/L	0.2	0.2		
247	BENZ(A)ANTHRACENE	ND	ug/L	0.1	0.1		
248	BENZO(B)FLUORANTHENE	ND	ug/L	0.2	0.2		
249	BENZO(G,H,I)PERYLENE	ND	ug/L	0.2	0.2		
250	BENZO(K)FLUORANTHENE	ND	ug/L	0.2	0.2		
251	CHRYSENE	ND	ug/L	0.2	0.2		
252	DIBENZO(A,H)ANTHRACENE	ND	ug/L	0.2	0.2		
253	FLUORANTHENE	ND	ug/L	0.2	0.2		
255	INDENO(1,2,3-CD)PYRENE	ND	ug/L	0.2	0.2		
256	PHENANTHRENE	ND	ug/L	0.2	0.2		
257	PYRENE	ND	ug/L	0.2	0.2		
	- Phthalates						
258	BENZYL BUTYL PHTHALATE	ND	ug/L	0.6	0.6		
259	DI-N-BUTYL PHTHALATE	0.5KK	ug/L	0.6	0.6		
260	DIETHYL PHTHALATE	ND	ug/L	0.6	0.6		
261	DIMETHYL PHTHALATE	ND	ug/L	0.6	0.6		

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.

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SYNTHETIC ORGANIC COMPOUNDS (SOC) REPORT

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

Reference Number: 07-04107

Project: 87538,87539,87540,87543

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87540
County:
Sampled By:
Sampler Phone:

Field ID: 87540
Lab Number: 04609383
Date Collected: 4/4/2007
Date Extracted: 508_070409
Date Analyzed: 4/11/2007
Report Date: 4/13/2007
Analyst: MM/CC
Supervisor:

EPA Method 508.1 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	PCBs/Toxaphene						
153	PCBS (Total Aroclors)	ND	ug/L	0.2	0.2	0.5	
173	AROCLOR 1221	ND	ug/L	20	20		
174	AROCLOR 1232	ND	ug/L	0.5	0.5		
175	AROCLOR 1242	ND	ug/L	0.5	0.3		
176	AROCLOR 1248	ND	ug/L	0.1	0.1		
177	AROCLOR 1254	ND	ug/L	0.1	0.1		
178	AROCLOR 1260	ND	ug/L	0.2	0.2		
180	AROCLOR 1016	ND	ug/L	0.1	0.1		
36	TOXAPHENE	ND	ug/L	2	2	3	

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
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CARBAMATES IN DRINKING WATER

Client Name: KUO Testing Labs Inc
337 S 1st
Othello, WA 99344

System Name:
System ID Number:
DOH Source Number:
Multiple Sources:
Sample Type:
Sample Purpose: Investigative or Other
Sample Location: 87540
County:
Sampled By:
Sampler Phone:

Reference Number: 07-04107

Project: 87538,87539,87540,87543
Field ID: 87540
Lab Number: 04609383
Date Collected: 4/4/2007
Date Extracted: 531_070418
Date Analyzed: 4/18/2007
Report Date: 4/26/2007
Analyst: CO
Supervisor:

EPA Method 531.2 For State Drinking Water Compliance

DOH#	COMPOUNDS	RESULTS	Units	SRL	Trigger	MCL	COMMENT
	EPA Regulated						
148	OXYMAL	ND	ug/L	4.0	4.0	200	
146	CARBOFURAN	ND	ug/L	1.8	1.8	40	
	EPA Unregulated						
144	ALDICARB SULFOXIDE	ND	ug/L	1.0	1.0		
143	ALDICARB SULFONE	ND	ug/L	1.6	1.6		
147	METHOMYL	ND	ug/L	1.0	1.0		
141	3-HYDROXYCARBOFURAN	ND	ug/L	2.0	2.0		
142	ALDICARB	ND	ug/L	1.0	1.0		
145	CARBARYL	ND	ug/L	2.0	2.0		
	State Unregulated - Other						
326	PROPOXUR (BAYGON)	ND	ug/L	1.0			
327	METHIOCARB	ND	ug/L	4.0			

*- An amount of "ND" indicates that the compound was not detected above the Lab's Method Detection Limit - MDL.
**- Maximum Contaminant Level, maximum permissible level of a contaminant in water established by EPA, NPDWR. State Advisory Level (SAL) for Unregulated compounds.
A blank MCL or SAL value indicates a level is not currently established.
***- If a compound is detected > or = to the State Reporting Level, SRL, specified increased monitoring frequencies may occur per DOH.
****- Method Detection Limit is the lab's minimum concentration a compound can be measured and reported with 99% confidence that the compound concentration is greater than zero.
J - Estimated value.

Kuo Testing Labs, Inc.

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DATE COLLECTED: 4/11/2007
DATE RECEIVED: 4/12/2007
DATE REPORTED: 4/26/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87725	LR-1	Nitrate as Nitrogen	5.19	0.21	mg/L	Reed
87725	LR-1	Total Dissolved Solids	248	21.1	mg/L	Reed
87725	LR-1	Hardness	213	0.11	mg/L	Reed
87725	LR-1	Chloride	6.50	0.297	mg/L	Reed
87725	LR-1	Orthophosphate as P	0.09	0.043	mg/L	Reed
87725	LR-1	COD	<8	8	mg/L	Reed
87725	LR-1	Total Coliform and E. Coli	Absent/Absent			Reed

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
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MDL: Method Detection Limit
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Dr. Eugene Kuo, Quality Assurance Manager

04-27-07
Date

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 1
FIELD SAMPLER: Laura Hofbauer		DATE: 04/11/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	62.89	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	33.11	Bore Hole Diameter D_3 (in.)	6"	L_1 29.78 *0.16 = 4.76 CV in Gallons	
3) Final Depth To Water	33.15	Filter Pack Length L_2 (feet)	12	CV 4.76 /2 = 2.38 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	14.29
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	29.78			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
11:04			began	purge			
11:06	3	7.08	13.7	0385	86.1		
11:08	6	7.17	13.6	0392	11.8		
11:10	9	7.20	13.6	0392	3.98		
11:12	12	7.25	13.6	0392	2.31		
11:14	15	7.25	13.5	0393	1.92		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

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DATE COLLECTED: 4/11/2007
DATE RECEIVED: 4/12/2007
DATE REPORTED: 4/26/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87726	LR-2	Nitrate as Nitrogen	3.62	0.21	mg/L	Reed
87726	LR-2	Total Dissolved Solids	188	21.1	mg/L	Reed
87726	LR-2	Hardness	148	0.11	mg/L	Reed
87726	LR-2	Chloride	5.20	0.297	mg/L	Reed
87726	LR-2	Orthophosphate as P	<8	0.043	mg/L	Reed
87726	LR-2	COD	6.0	8	mg/L	Reed
87726	LR-2	Total Coliform and E. Coli	Absent/Absent			Reed

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ND: None Detected
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Dr. Eugene Kuo, Quality Assurance Manager

04-27-07
Date

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: **Locher Road SAR Project**	No.:	WELL NO: **LR - 2**
FIELD SAMPLER: **Laura Hofbauer**		DATE: **04/11/07**
FIELD ANALYST: **Laura Hofbauer**		
SAMPLING METHOD: **Battery Operated Whale Water Mini Purge Pump**		
FIELD INSTRUMENTS USED: **Orion pH Meter model 210A** **Hach Conductivity Meter** **Solinst Water Level Meter Model 101** **HF Scientific ORT-15 CE Turbidi Meter**		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	52.80	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	20.91	Bore Hole Diameter D_3 (in.)	6"	L_1 31.89 *0.16 = 5.10 CV in Gallons	
3) Final Depth To Water	20.90	Filter Pack Length L_2 (feet)	12	CV 5.10 /2 = 2.55 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	15.3
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	31.89			Number of Bore Volumes Purged	5

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
9:43			began	purge			
9:45	3	7.01	13.1	0284	3.86		
9:47	6	7.09	13.0	0283	1.37		
9:49	9	7.16	13.1	0284	0.86		
9:51	12	7.17	13.0	0284	0.73		
9:53	15	7.17	13.0	0284	0.65		
			End purge	Collected	sample		

Forms by Gina Clark

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DATE COLLECTED: 4/11/2007
DATE RECEIVED: 4/12/2007
DATE REPORTED: 4/26/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87727	LR-3	Nitrate as Nitrogen	0.90	0.21	mg/L	Reed
87727	LR-3	Total Dissolved Solids	92.5	21.1	mg/L	Reed
87727	LR-3	Hardness	61.8	0.11	mg/L	Reed
87727	LR-3	Chloride	ND	0.297	mg/L	Reed
87727	LR-3	Orthophosphate as P	0.07	0.043	mg/L	Reed
87727	LR-3	COD	<8	8	mg/L	Reed
87727	LR-3	Total Coliform and E. Coli	Present/Absent			Reed

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Dr. Eugene Kuo, Quality Assurance Manager

04-27-07
Date

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 3
FIELD SAMPLER: Laura Hofbauer		DATE: 04/11/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	66.68	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	24.50	Bore Hole Diameter D_3 (in.)	6"	L_1 42.18 *0.16 = 6.75 CV in Gallons	
3) Final Depth To Water	24.51	Filter Pack Length L_2 (feet)	12	CV 6.75 /2 = 3.38 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	20.2
				Actual Volume Purged (gals)	15 20
4) Length of Water in Column L_1 *Value on Line1 – Value on Line 2 (feet)*	42.18			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
10:08			began	purge			
10:11	4	7.38	9.8	0126	22.1		
10:14	8	7.38	9.5	0126	7.63		
10:16	12	7.37	9.5	0126	4.37		
10:19	16	7.37	9.4	0126	3.09		
10:22	20	7.36	9.4	0126	2.57		
			End purge	Collected	sample		
			duplicate				

Forms by Gina Clark

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DATE COLLECTED: 4/11/2007
DATE RECEIVED: 4/12/2007
DATE REPORTED: 5/4/2007
SEND REPORT TO:

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87729	Locher Rd.	Nitrate as Nitrogen	0.40	0.21	mg/L	Reed
87729	Locher Rd.	Total Dissolved Solids	118	21.1	mg/L	Reed
87729	Locher Rd.	Hardness	95.0	0.11	mg/L	Reed
87729	Locher Rd.	Chloride	ND	0.297	mg/L	Reed
87729	Locher Rd.	Orthophosphate as P	0.10	0.043	mg/L	Reed
87729	Locher Rd.	COD	8.0	8	mg/L	Reed
87729	Locher Rd.	Total Coliform and E. Coli	Present/Present			Reed

mg/L indicates milligrams per litre
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MDL: Method Detection Limit
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Dr. Eugene Kuo, Quality Assurance Manager

05-04-07
Date

Kuo Testing Labs, Inc.

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DATE COLLECTED: 4/11/2007
DATE RECEIVED: 4/12/2007
DATE REPORTED: 4/26/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87728	Stateline	Nitrate as Nitrogen	0.52	0.21	mg/L	Reed
87728	Stateline	Total Dissolved Solids	123	21.1	mg/L	Reed
87728	Stateline	Hardness	95.5	0.11	mg/L	Reed
87728	Stateline	Chloride	0.70	0.297	mg/L	Reed
87728	Stateline	Orthophosphate as P	0.04	0.043	mg/L	Reed
87728	Stateline	COD	9.0	8	mg/L	Reed
87728	Stateline	Total Coliform and E. Coli	Present/Present			Reed

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
ND: None Detected
mg/L:Indicates milligrams per litre
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Dr. Eugene Kuo, Quality Assurance Manager

04-27-07
Date

Kuo Testing Labs, Inc.

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DATE COLLECTED: 4/11/2007

DATE RECEIVED: SEND REPORT TO: 4/12/2007

DATE REPORTED: 4/26/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO	CUSTOMER SAMPLE NO	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87730	Canal	Nitrate as Nitrogen	0.12	0.21	mg/L	Reed
87730	Canal	Total Dissolved Solids	65.0	21.1	mg/L	Reed
87730	Canal	Hardness	44.1	0.11	mg/L	Reed
87730	Canal	Chloride	2.20	0.297	mg/L	Reed
87730	Canal	Orthophosphate as P	0.08	0.043	mg/L	Reed
87730	Canal	COD	12	8	mg/L	Reed
87730	Canal	Total Coliform and E. Coli	Present/Present			Reed

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
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mg/L:Indicates milligrams per litre
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Dr. Eugene Kuo, Quality Assurance Manager

04-27-07
Date

Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**	
Contractor:	Kuo Testing Labs, Inc.	**Task #:**	
KTL Personnel:	Laura Hofbauer	**Page**	**OF**
		Date:	**04/11/07**

SITE	TIME	pH	CONDUCTIVITY	TEMPERATURE	TURBIDITY
Stateline	11:28	7.89	0175	10.9	1.89
Locher Rd	10:55	7.70	0173	9.6	1.49
Canal	10:41	7.77	0090	8.0	4.27

Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**
Contractor:	Kuo Testing Labs, Inc.	**Task #:**
KTL Personnel:	Laura Hofbauer	**Page OF**
		Date:04/11/07
Weather:	beautiful!	

TIME:	DESCRIPTION OF WORK
9:33	on site LR-2
10:00	on site LR-2
10:35	on site - Canal
10:51	on site - MW-1 Well - Locher Rd
10:58	on site. LR-1
11:22	on site - Mud Creek - Stateline

Kuo Testing Labs, Inc.

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DATE COLLECTED: 4/11/2007
DATE RECEIVED: 4/12/2007
DATE REPORTED: 4/26/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

SEND REPORT TO:
Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87731	Duplicate	Nitrate as Nitrogen	0.50	0.21	mg/L	Reed
87731	Duplicate	Total Dissolved Solids	90.0	21.1	mg/L	Reed
87731	Duplicate	Hardness	62.7	0.11	mg/L	Reed
87731	Duplicate	Chloride	0.20	0.297	mg/L	Reed
87731	Duplicate	Orthophosphate as P	0.05	0.043	mg/L	Reed
87731	Duplicate	COD	<8	8	mg/L	Reed
87731	Duplicate	Total Coliform and E. Coli	Absent/Absent			Reed

<(0.001): indicates the analyte was not detected at or above the concentration indicated.
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Dr. Eugene Kuo, Quality Assurance Manager

04-27-07
Date

Kuo Testing Labs, Inc. Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**	
Contractor:	Kuo Testing Labs, Inc.	**Task #:**	
KTL Personnel:	Laura Hofbauer	**Page**	**OF**
		Date:	04/23/07
Weather:	Overcast		

TIME:	DESCRIPTION OF WORK
12:42	on site LR-2
01:06	on site LR-3
01:42	on site Locher Rd. Mud Creek - met w/ Kevin
01:49	on site - Burlingame Ditch
01:58	on site - LR-1
02:21	on site - Gadelina Rd. Mud Creek

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 1
FIELD SAMPLER: Laura Hofbauer		DATE: 04/23/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	62.74	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	33.55	Bore Hole Diameter D_3 (in.)	6"	L_1 29.19 *0.16 = 4.67 CV in Gallons	
3) Final Depth To Water	33.58	Filter Pack Length L_2 (feet)	12	CV 4.67 /2 = 2.34 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	14.0
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1 – Value on Line 2 (feet)*	29.19			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
2:03			began	purge			
2:05	3	7.17	14.6	0434	21.9		
2:08	6	7.16	14.1	0430	2.42		
2:10	9	7.17	14.0	0428	0.98		
2:12	12	7.19	13.9	0428	0.73		
2:14	15	7.17	13.9	0429	0.42		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

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DATE COLLECTED: 4/23/2007
DATE RECEIVED: SEND REPORT TO: 4/24/2007
DATE REPORTED: 5/14/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87918	LR-1	Nitrate as Nitrogen	4.20	0.21	mg/L	Reed
87918	LR-1	Total Dissolved Solids	247	21.1	mg/L	Reed
87918	LR-1	Hardness	624	0.11	mg/L	Reed
87918	LR-1	Chloride	7.5	0.297	mg/L	Reed
87918	LR-1	Orthophosphate as P	0.13	0.043	mg/L	Reed
87918	LR-1	COD	<8	8	mg/L	Reed
87918	LR-1	Total Coliform and E. Coli	Absent/Absent			Reed

mg/L indicates milligrams per litre
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Dr. Eugene Kuo, Quality Assurance Manager

05-14-07
Date

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 2
FIELD SAMPLER: Laura Hofbauer		DATE: 04/23/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	52.83	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	20.47	Bore Hole Diameter D_3 (in.)	6"	L_1 32.36 *0.16 = 5.18 CV in Gallons	
3) Final Depth To Water	20.47	Filter Pack Length L_2 (feet)	12	CV 5.18 /2 = 2.59 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	15.5
				Actual Volume Purged (gals)	15
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	32.36			Number of Bore Volumes Purged	5

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
12:47			began	purge			
12:50	3	7.13	14.1	0289	19.0		
12:58	6	7.17	13.3	0288	4.19		
12:54	9	7.18	13.2	0287	3.13		
12:56	12	7.17	13.2	0288	1.26		
12:58	15	7.17	13.2	0288	0.64		
			End purge	Collected	sample		

Forms by Gina Clark

Kuo Testing Labs, Inc.

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(509) 488-0112 Phone (509) 488-0118 Fax (800) 328-0112 Toll Free
Web Site: http://www.kuotesting.com e-mail: kuotest@atnet.net

DATE COLLECTED: 4/23/2007
DATE RECEIVED: SEND REPORT TO: 4/24/2007
DATE REPORTED: 5/14/2007

SYSTEM / CUSTOMER

GSI , Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Project Name:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87919	LR-2	Nitrate as Nitrogen	1.34	0.21	mg/L	Reed
87919	LR-2	Total Dissolved Solids	180	21.1	mg/L	Reed
87919	LR-2	Hardness	134	0.11	mg/L	Reed
87919	LR-2	Chloride	4.50	0.297	mg/L	Reed
87919	LR-2	Orthophosphate as P	0.14	0.043	mg/L	Reed
87919	LR-2	COD	<8	8	mg/L	Reed
87919	LR-2	Total Coliform and E. Coli	Absent/Absent			Reed

mg/L: indicates milligrams per litre
* PQL=Practical Quantitation Limit is the lowest level that can be achieved within specified limits of precision and accuracy during routine laboratory operating conditions
MDL: Method Detection Limit
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Upon Visual Observation

Dr. Eugene Kuo, Quality Assurance Manager

05-14-07
Date

Kuo Testing Labs, Inc.

Groundwater Sampling Field Data Sheet

PROJECT NAME: Locher Road SAR Project	No.:	WELL NO: LR - 3
FIELD SAMPLER: Laura Hofbauer		DATE: 04/23/07
FIELD ANALYST: Laura Hofbauer		
SAMPLING METHOD: Battery Operated Whale Water Mini Purge Pump		
FIELD INSTRUMENTS USED: Orion pH Meter model 210A Hach Conductivity Meter Solinst Water Level Meter Model 101 HF Scientific ORT-15 CE Turbidi Meter		CONDITION of WELL: satisfactory

Water Level Data		Well Construction Data		Well Purging Data	
1) Total Well Depth (feet)	66.62	Outside Casing Diameter D_2 (in.)	2"	Calculate Casing Volume	
2) Initial Depth to Water WT** (feet)	24.80	Bore Hole Diameter D_3 (in.)	6"	L_1 41.82 *0.16 = 6.69 CV in Gallons	
3) Final Depth To Water	24.81	Filter Pack Length L_2 (feet)	12	CV 6.69 /2 = 3.35 BV in Gallons	
		Porosity of Filter Pack N (%)	25	Total Purge Volume (gals) CV*(3)= TPV(gals)	20.1
				Actual Volume Purged (gals)	~~15~~ 20
4) Length of Water in Column L_1 *Value on Line1– Value on Line 2 (feet)*	41.82			Number of Bore Volumes Purged	6

* The surveyed point on the inside (usually PVC) casing

** The depth to the water table before removing any water from the well

WELL PURGING MEASUREMENTS

Time	Cumulative Gallons Purged	pH	Temperature °C	Conductivity µs/cm 2mS 20mS	Turbidity NTU	Purge Rate GPM	Comments
01:15			began	purge			
01:18	4	7.49	10.3	0135	30.0		
01:20	8	7.44	9.8	0135	6.93		
01:23	12	7.41	9.8	0135	3.41		
01:26	16	7.38	9.7	0135	2.56		
01:29	20	7.35	9.8	0135	1.97		
			End purge	Collected	sample		

Forms by Gina Clark

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Project Name:

SEND REPORT TO:

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87920	LR-3	Nitrate as Nitrogen	0.47	0.21	mg/L	Reed
87920	LR-3	Total Dissolved Solids	86.7	21.1	mg/L	Reed
87920	LR-3	Hardness	54.7	0.11	mg/L	Reed
87920	LR-3	Chloride	ND	0.297	mg/L	Reed
87920	LR-3	Orthophosphate as P	0.10	0.043	mg/L	Reed
87920	LR-3	COD	<8	8	mg/L	Reed
87920	LR-3	Total Coliform and E. Coli	Absent/Absent			Reed

mg/L: indicates milligrams per litre
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MDL: Method Detection Limit
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Dr. Eugene Kuo, Quality Assurance Manager

05-14-07
Date

Kuo Testing Labs, Inc.

Daily Field Report

Project:	Locher Road SAR Monitoring	**Project#:**	
Contractor:	Kuo Testing Labs, Inc.	**Task #:**	
KTL Personnel:	Laura Hofbauer	**Page**	OF
		Date:	04/23/07

SITE	TIME	pH	CONDUCTIVITY	TEMPERATURE	TURBIDITY
Stateline	02:25	8.16	0180	16.5	1.89
Locher Rd	01:47	8.01	0181	15.3	1.26
Canal	01:54	8.17	0094	12.7	6.39

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GSI , Inc.
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Kennewick WA 99336
Project Name:

SEND REPORT TO.

Ground Water Solutions, Inc.
1020 N. Center Pkwy, Ste F
Kennewick WA 99336
Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87921	Stateline	Nitrate as Nitrogen	0.47	0.21	mg/L	Reed
87921	Stateline	Total Dissolved Solids	113	21.1	mg/L	Reed
87921	Stateline	Hardness	82.4	0.11	mg/L	Reed
87921	Stateline	Chloride	5.0	0.297	mg/L	Reed
87921	Stateline	Orthophosphate as P	0.08	0.043	mg/L	Reed
87921	Stateline	COD	10	8	mg/L	Reed
87921	Stateline	Total Coliform and E. Coli	Present/Present			Reed

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SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87922	Locher Rd	Nitrate as Nitrogen	0.05	0.21	mg/L	Reed
87922	Locher Rd	Total Dissolved Solids	117	21.1	mg/L	Reed
87922	Locher Rd	Hardness	83.1	0.11	mg/L	Reed
87922	Locher Rd	Chloride	ND	0.297	mg/L	Reed
87922	Locher Rd	Orthophosphate as P	0.06	0.043	mg/L	Reed
87922	Locher Rd	COD	<8	8	mg/L	Reed
87922	Locher Rd	Total Coliform and E. Coli	Present/Present			Reed

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Project Name:

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Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87923	Canal	Nitrate as Nitrogen	4.21	0.21	mg/L	Reed
87923	Canal	Total Dissolved Solids	73.3	21.1	mg/L	Reed
87923	Canal	Hardness	31.4	0.11	mg/L	Reed
87923	Canal	Chloride	39.0	0.297	mg/L	Reed
87923	Canal	Orthophosphate as P	<0.043	0.043	mg/L	Reed
87923	Canal	COD	<8	8	mg/L	Reed
87923	Canal	Total Coliform and E. Coli	Present/Present			Reed

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Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87924	Duplicate	Nitrate as Nitrogen	ND	0.21	mg/L	Reed
87924	Duplicate	Total Dissolved Solids	190	21.1	mg/L	Reed
87924	Duplicate	Hardness	125	0.11	mg/L	Reed
87924	Duplicate	Chloride	5.50	0.297	mg/L	Reed
87924	Duplicate	Orthophosphate as P	0.10	0.043	mg/L	Reed
87924	Duplicate	COD	<8	8	mg/L	Reed
87924	Duplicate	Total Coliform and E. Coli	Absent/Absent			Reed

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Attn: Jon, Kevin

SAMPLE NO.	CUSTOMER SAMPLE NO.	ANALYSIS	RESULTS	MDL	UNITS	ANALYSTS
87925	Field Blank	Nitrate as Nitrogen	0.32	0.21	mg/L	Reed
87925	Field Blank	Total Dissolved Solids	153	21.1	mg/L	Reed
87925	Field Blank	Hardness	ND	0.11	mg/L	Reed
87925	Field Blank	Chloride	ND	0.297	mg/L	Reed
87925	Field Blank	Orthophosphate as P	ND	0.043	mg/L	Reed
87925	Field Blank	COD	<8	8	mg/L	Reed

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Upon Visual Observation

r. Eugene Kuo, Quality Assurance Manager

05-14-07
Date

APPENDIX D
30 June 2006 Memorandum

30 June 2006

Memorandum

To: Matt Rajnus

Cc: Allan Evans

From: Kevin Lindsey

Subject: Technical Memorandum, Locher Road SAR Site Project Activities
K/J 0492001*00

The purpose of this memo is to describe for you the results of Kennedy/Jenks Consultants work activities at the Locher Road shallow aquifer recharge (SAR) test site. These activities originally were scoped to include a full hydrogeologic characterization effort, background groundwater and source water quality monitoring, preparation of a test and monitoring plan, design and construction of water conveyance structures, and testing. This work was to be documented and presented in a project report.

However, the SAR project was revised in mid-2005, and as a result of this revision, Kennedy/Jenks Consultants main project activities at the Locher Road SAR test site were revised to include only the following:

- Preparation of a monitoring and test plan.
- Work with Gardena Farms Irrigation District (GFID) to plan water conveyance structures for the Site.
- Drill and construct 2 of the planned monitoring wells.

Site hydrogeologic characterization, background water quality sampling, and testing was rescheduled to be conducted by GFID under grant funding from Department of Ecology direct to GFID. This work currently is scheduled to be done in 2006 and 2007 under the direct supervision of GFID.

The results of Kennedy/Jenks Consultants revised work efforts are as follows:

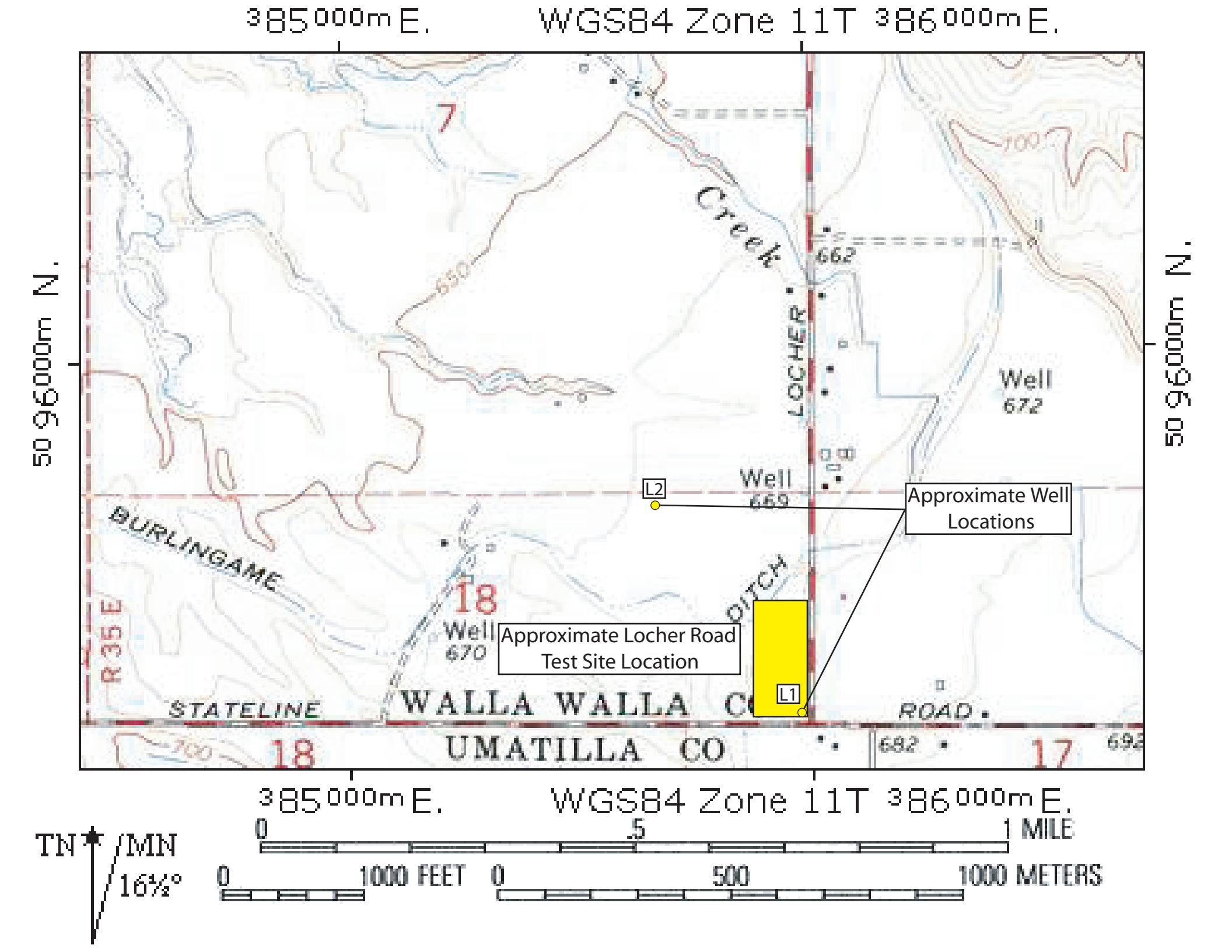
- The final monitoring and test plan was produced and delivered to HDR and the Department of Ecology in late 2004, prior to project re-scoping.
- Initial planning done with GFID prior to re-scoping did not result in final plans. Following re-scoping GFID conducted final planning and construction efforts under HDR. Any as-built diagrams produced for this will be generated by GFID and/or HDR.
- Monitoring wells L-1 and L-2 were installed in December 2005. Both of these wells are located in the NE1/4, Section 18, T6N, R35E (as shown on attached map). Well geologic

logs and as-built diagrams for these two wells are included with this memorandum. Basic hydrogeologic conditions interpreted from these two wells include the following:

- The suprabasalt sediments underlying the Site down to depths of 60 feet or more are interpreted to consist entirely of Mio-Pliocene conglomerate. Based on our geologic interpretations of water well logs for other wells in the Locher Road area, these strata may extend to a depth of approximately 200 feet.
- When the wells were drilled in late 2005, the water table was at a depth of approximately 37 feet in L-1 and 24 feet in L-2. The aquifer in these two wells is interpreted to be unconfined because: (1) an overlying confining layer was not observed and (2) water level at the time of drilling was essentially the same as water level following well construction.
- The locations of the two wells relative to the Locher Road Site are shown on the attached map.

Kennedy/Jenks Consultants staff did not equip these wells with pressure transducers and data loggers, nor were they sampled for water quality. When the SAR project work scope was revised in late 2005, this work was deferred to the GFID effort currently scheduled for 2006/2007, as noted above.

Enclosure(s) (3)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WGS84 Zone 11T
386000m E.
5096000m N.
7
Creek
LOCHER
662
650
Well
672
Well
669
L2
Approximate Well Locations
BURLINGAME
18
Well
670
Approximate Locher Road Test Site Location
DITCH
R 35 E
L1
STATELINE
WALLA WALLA CO
ROAD
UMATILLA CO
682
18
17
692
700
TN
MN
16½°
0
.5
1 MILE
0
1000 FEET
0
500
1000 METERS

Log of Borehole: L-1

Project: Walla Walla SAR

Location: Locher Road

Geologist: Kevin Lindsey

Well ID:

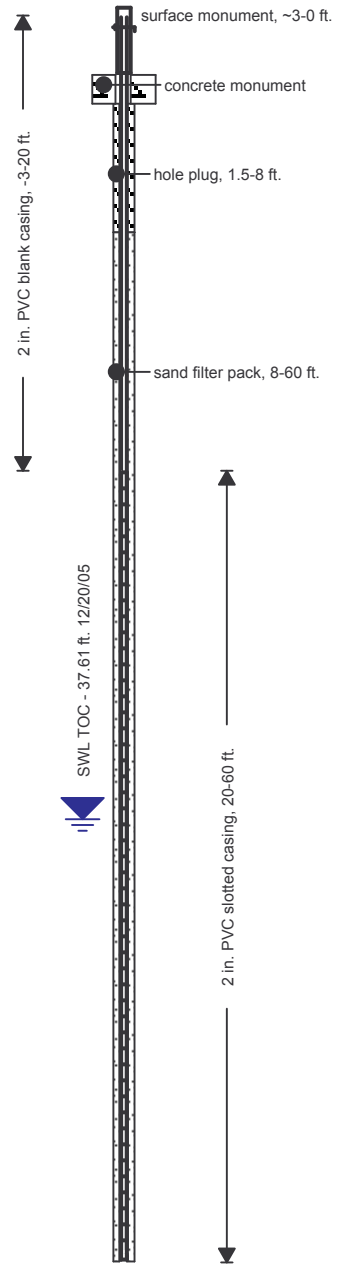
Nominal Hole Diameter: 2 in.

Kennedy/Jenks Consultants

Engineers & Scientists

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

Depth	Lithologic Description	Elevation	Sample Location
	Ground Surface	0	
	road material < 6in. silty sand with small basalt pebbles	-5	4-5
7	basalt gravel with very little sandy silt matrix larger gravel.	-7	7-8
	amount of matrix increasing slowly with depth	-15	15-16
17		-19	19-20
	basalt pebble size decreasing. matrix still increasing with depth	-23	23-24
		-25	25-26
27	28-29 ft. sample contains some larger gravel	-28	28-29
	gravel getting smaller	-32	32-33
		-35	35-36
37	gravel increasing in size. same amount of sandy silt matrix	-39	39-40
	samples becoming wet and cohesive	-42	42-43
	similar material to TD	-44	44-45
47			
		-53	53-54
57		-57	57-58
	TD 60 ft.	-60	



Drilled By: Environmental West Exploration, Inc.

Drill Method: Air Rotary

Drill Date: 12/19/2005

Total Depth: 60 ft.

Log of Borehole: L-2

Project: Walla Walla SAR

Location: Locher Road

Geologist: Kevin Lindsey

Well ID:

Nominal Hole Diameter: 2 in.

Kennedy/Jenks Consultants

Engineers & Scientists

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FAX 509-734-9764
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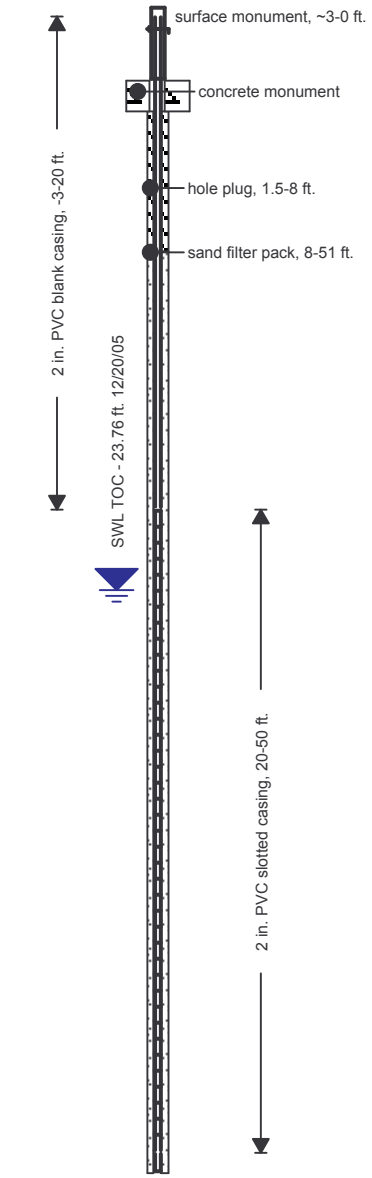
Depth	Symbol	Lithologic Description	Elevation	Sample Location
		Ground Surface	0	
		topsoil to 2 ft. sandy silt with very few small pebbles	-2	2-3
7		basalt gravel with very little sandy silt matrix	-7	7-8
		much more sandy silt matrix	-12	12-13
17		less matrix in 17-18 ft. sample	-17	17-18
		sandy silt matrix increasing in same basalt gravel same material to TD	-23	23-24
27			-27	27-28
			-33	33-34
37			-37	37-38
			-44	44-45
47			-48	48-49
		TD 51 ft.	-51	



Drilled By: Environmental Wese Exploration, Inc.

Drill Method: Air Rotary

Drill Date: 12/19/2005

Total Depth: 51 ft.

APPENDIX E
Monitoring Well As-Built Diagrams

USKH

May 30, 2007

Jon Travis
GSI Water Solutions
1020 North Center Parkway
Kennewick, WA 99336

RE: Monitoring Well Data, Locher Road site at Stateline

Site Bench Mark, Magnetic nail w/ brass washer set in flume headwall, near the Northeast corner of the site. Elevation 670.95'.

Monitoring Well L-1
N 250137.09', E 2155532.44'
Lat 46°00'04.02" Long -118°28'22.09"
Top of Concrete 678.50'. Top of Monitoring Well Pipe 680.74'.

Monitoring Well L-2
N 251662.01', E 2154378.89'
Lat 46°00'19.36" Long -118°28'37.87"
Top of Concrete 663.84'. Top of Monitoring Well Pipe 666.05'.

Monitoring Well L-3
N 250883.04', E 2154744.85'
Lat 46°00'11.58" Long -118°28'32.97"
Top of Concrete 671.20'. Top of Monitoring Well Pipe 670.16'.

Co-ordinate pairs are Washington State Plane, South Zone, NAD '83.
Elevation are NAVD '88.

ADDRESS
5 North Colville Street
Walla Walla, Washington 99362
Phone (509) 522-4843
Fax (509) 522-1902

http://www.uskh.com

OFFICE LOCATIONS
Anchorage, Alaska
Fairbanks, Alaska
Juneau, Alaska
Wasilla, Alaska
Lewiston, Idaho
Ferndale, Washington
Spokane, Washington
Walla Walla, Washington

5-30-07

Log of Borehole: L-1

Project: Walla Walla SAR

Location: Locher Road

Geologist: Kevin Lindsey

Well ID:

Nominal Hole Diameter: 2 in.

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Depth	Symbol	Lithologic Description	Elevation	Sample Location	Construction Details
-3					surface monument, ~3-0 ft.
		Ground Surface	0		concrete monument
		road material < 6in. silty sand with small basalt pebbles	-5	4-5	hole plug, 1.5-8 ft.
7		basalt gravel with very little sandy silt matrix larger gravel.	-7	7-8	
		amount of matrix increasing slowly with depth	-15	15-16	sand filter pack, 8-60 ft.
17			-19	19-20	
		basalt pebble size decreasing. matrix still increasing with depth	-23	23-24	
			-25	25-26	
27		28-29 ft. sample contains some larger gravel	-28	28-29	
		gravel getting smaller	-32	32-33	
			-35	35-36	
37		gravel increasing in size. same amount of sandy silt matrix	-39	39-40	
		samples becoming wet and cohesive	-42	42-43	
		similar material to TD	-44	44-45	
47					
			-53	53-54	
57			-57	57-58	
		TD 60 ft.	-60		

2 in. PVC blank casing, -3-20 ft.

SWL TOC - 37.61 ft. 12/20/05

2 in. PVC slotted casing, 20-60 ft.

Drilled By: Environmental West Exploration, Inc.

Drill Method: Air Rotary

Drill Date: 12/19/2005

Total Depth: 60 ft.

Log of Borehole: L-2

Project: Walla Walla SAR

Location: Locher Road

Geologist: Kevin Lindsey

Well ID:

Nominal Hole Diameter: 2 in.

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509-734-9763
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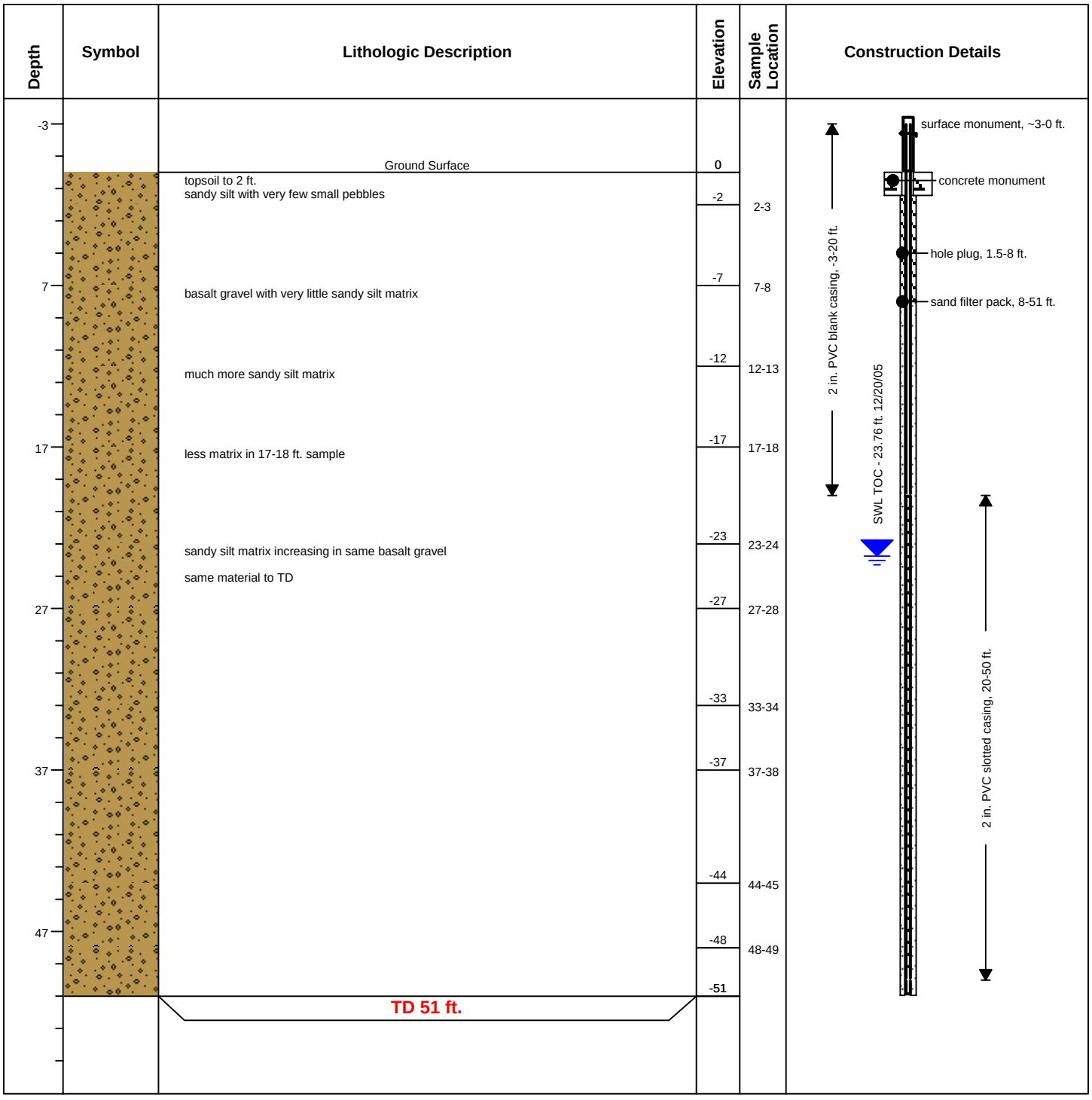

Drilled By: Environmental Wese Exploration, Inc.

Drill Method: Air Rotary

Drill Date: 12/19/2005

Total Depth: 51 ft.

Log of Borehole: L-3

Also known as:

Project: Walla Walla SAR **Well ID: L-3**

Location: Locher Road

Geologist: Kevin Lindsey

Groundwater Solutions Inc.
1020 N. Center Parkway, Suite F
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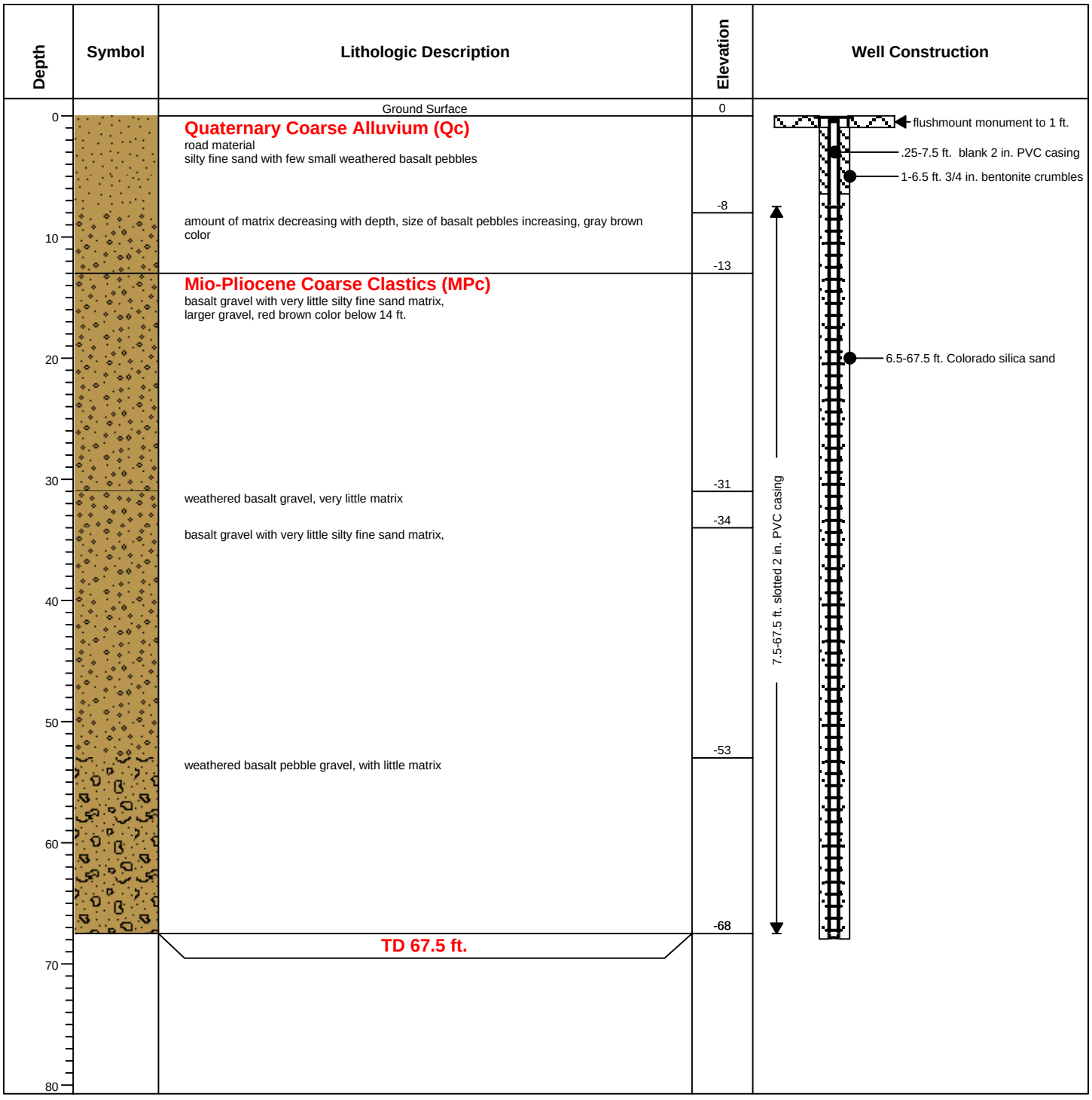

Drilled By: Environmental West Exploration, Inc. **Total Depth: 67.5 ft.**

Drill Method: Reverse Air Rotary, Tubex

Drill Date: 1/9/2007 **Page: 1 of 1**