GSI Water Solutions, Inc.

LETTER OF TRANSMITTAL

To:	Andrew Wentworth, OWRD
Address:	725 Summer Street NE, Suite A, Salem, OR 97301
From:	Robyn Cook, GSI Water Solutions, Inc.
CC:	Jake Madison, Madison Ranches, Inc.
Date:	January 21, 2025

Enclosed is an application for artificial recharge (AR), which expands the current AR limited license held by Madison Ranches, Inc. (LL-1926). Also enclosed is a check in the amount of $1,150 for the application fee.

Please feel free to reach out with any questions.

Thank you,

Robyn Cook
Principal Hydrogeologist

Received
JAN 23 2025
OWRD

Limited License Application for Artificial Groundwater Recharge

Madison Ranches

Received
JAN 23 2025
OWRD

January 6, 2025

REGISTERED
OREGON
ROBYN CHRISTINA COOK
G2437
GEOLOGIST
Renews: 9-1-2025

Prepared for:
Oregon Water Resources Department

Prepared by:
GSI Water Solutions, Inc.
650 NE Holladay Street, Suite 900, Portland, OR 97232

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Application for Limited Water Use License

OREGON
WATER RESOURCES DEPARTMENT

Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem Oregon 97301-1271
(503) 986-0900
www.wrd.state.or.us

Application for Limited Water Use License

License No.:_____

Applicant Information

NAME			PHONE (HM)
Jake Madison, Madison Ranches, Inc.			
PHONE (WK) 541-376-8107	CELL		FAX
ADDRESS 29299 Madison Road			
CITY Echo	STATE OR	ZIP 97826	E-MAIL * Jake@MadisonRanches.com

Agent Information

NAME		PHONE	FAX
Robyn Cook, GSI Water Solutions, Inc.		503-239-8799	
ADDRESS 650 NE Holladay Stree, Suite 900			CELL
CITY Portland	STATE OR	ZIP 97232	E-MAIL * rcook@gsiws.com

I (We) make application for a Limited License to use the following described surface waters or groundwater – not otherwise exempt, or to use stored water for a use of a short-term or fixed-duration:

1. **SOURCE(S) OF WATER:** Butter Creek a tributary of_____
2. **AMOUNT OF WATER** to be diverted;
   Maximum and instantaneous rate (cubic feet or gallons per minute): 25 cfs (11,221 gpm)
   Total volume annually (gallons or acre-feet): _____. If water is to be used from more than one source, give the quantity from each:_____
3. **INTENDED USE(S) OF WATER:** (check all that apply)
   - ☐ Road construction or maintenance
   - ☐ General construction
   - ☐ Forestland and rangeland management; or
   - ☒ Other: Artificial groundwater recharge
4. **IF THE INTENDED USE OF WATER IS FOR IRRIGATION, ONE OF THE FOLLOWING MUST APPLY:** (check one of the following) ***N/A***
5. **DESCRIPTION OF PROPOSED PROJECT:** Include a description of the place of use as shown on the accompanying site map, the method of water diversion, the type of equipment to be used (including pump horsepower, if applicable), length and dimensions of supply ditches and pipelines:
   Water will be diverted from Butter Creek at rates up to 25 cfs during the periods when flow is less than 50 cfs or greater than 175 cfs, and will be conveyed to the place of use through the systems shown on the accompanying limited license application map. The specifics of the Butter Creek diversion are documented in Certificate 20259. The lengths and dimensions of the supply pipelines and locations where water will be used for artificial recharge are shown in the accompanying documentation.
6. **PROJECT SCHEDULE:** (List day, month, and year)
   Date water use will begin: Upon issuance of limited license
   Date water use will be completed: 5 years after issuance of limited license
   Months of the year water would be diverted and used: November through August

If for other than irrigation from stored water, how and where will water be discharged after use?

N/A - water will be recharged to the shallow aquifer system.

Applicant Signature

Jake Madison President
Print Name *and title if applicable*

11-22-24
Date

PLEASE READ CAREFULLY

NOTE: A completed water availability statement from the local watermaster, Land Use Information Form completed by the local Planning Department, fees and site map meeting the requirements of OAR 690-340-030 must accompany this request. The fee for this request is **$280** for the first point of diversion plus **$30** for each additional point of diversion. Please review the Department's fee schedule to view fees required to request a limited license for Aquifer Storage and Recovery testing purposes or for Artificial Groundwater Recharge testing purposes.

Failure to provide any of the required information will result in return of your application. The license, if granted, will not be issued or replaced by a new license for a period of more than five consecutive years. The license, if granted, will be subordinate to all other authorized uses that rely upon the same source, or water affected by the source, and may be revoked at any time it is determined the use causes injury to any other water right or minimum perennial streamflow.

If water source is well, well logs or adequate information for the Department to determine aquifer, well depth, well seal and open interval, etc. are required. The licensee shall indicate the intended aquifer. If for multiple wells, each map location shall be clearly tired to a well log.

If a limited license is approved, the licensee shall give notice to the Department (Watermaster) at least 15 days in advance of using the water under the Limited License and shall maintain a record of use. The record of use shall include, but need not be limited to, an estimate of the amount of water used, the period of use and the categories of beneficial use to which the water is applied. During the period of the Limited License, the record of use shall be available for review by the Department upon request.

Mapping Requirements (OAR 690-340-0030):

(1) A request for a limited license shall be submitted on a form provided by the Water Resources Department, and shall be accompanied by the following:

a. A site map of reproducible quality, drawn to a standard, even scale of not less than 2 inches = 1 mile, showing:

i. The locations of all proposed points of diversion referenced by coordinates or by bearing and distance to the nearest established or projected public land survey corner;

ii. The general course of the source for the proposed use, if applicable;

iii. Other topographical features such as roads, streams, railroads, etc., which may be helpful in locating the diversion points in the field.

New application to replace LL 1926 — 1/2/2025 RB

This page to be completed by the local Watermaster.

WATER AVAILABILITY STATEMENT

Name of Applicant: Madison Ranches Limited License Number: _____

1. To your knowledge, has the stream or basin that is the source for this application ever been regulated for prior rights?

☒ Yes ☐ No

If yes, please explain:

Annually - all permitted rights are regulated off.

2. Based on your observations, would there be water available in the quantity and at the times needed to supply the use proposed by this application?

☒ Yes ☐ No

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3. Do you observe this stream system during regular fieldwork?

☒ Yes ☐ No

If yes, what are your observations for the stream?

High seasonal flows in spring. Low-dry remainder of year.

4. If the source is a well and if WRD were to determine that there is the potential for substantial interference with nearby surface water sources, would there still be ground water and surface water available during the time requested and in the amount requested without injury to existing water rights?

☐ Yes ☐ No ☒ N/A

What would you recommend for conditions on a limited license that may be issued approving this application?

This application replaces current LL 1926. It includes additional lands that will need reviewed by OWRD groundwater section.

5. Any other recommendations you would like to make?

Signature _____ WM District #: 5 Date: 1/2/2025

Map 2N27;200 and MAP 3N28;6300
MAP 3N27; 5900, 5902, 5200, 5400, 5900

RECEIVED
DEC 02 2024
UMATILLA COUNTY
COMMUNITY DEVELOPMENT

Land Use Information Form

OREGON
WATER RESOURCES DEPARTMENT
Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
(503) 986-0900
www.oregon.gov/OWRD

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NOTE TO APPLICANTS

In order for your application to be processed by the Oregon Water Resources Department (OWRD), this Land Use Information Form must be completed by a local government planning official in the jurisdiction(s) where your water right will be diverted, conveyed, used, and developed. The planning official may choose to complete the form while you wait or return the "Receipt Acknowledging Request for Land Use Information" to you. Applications received by OWRD without the Land Use Information Form, or the signed receipt, will be returned to you. **IMPORTANT:** Please note that while OWRD can accept a signed receipt as part of intake for an application for a new permit to use or store water, a completed Land Use Information Form is required for OWRD's acceptance of all other applications. Please be aware that your application cannot be approved without land use approval.

This form is NOT required if:

1) Water is to be diverted, conveyed, and used on federal lands only; **OR**
2) The application is for a water right transfer, allocation of conserved water, exchange, permit amendment, or ground water registration modification, and **all** of the following apply:
   - **a.** The existing and proposed water use is located entirely within lands zoned for exclusive farm-use or within an irrigation district;
   - **b.** The application involves a change in place of use only;
   - **c.** The change does not involve the placement or modification of structures, including but not limited to water diversion, impoundment, distribution facilities, water wells and well houses; **and**
   - **d.** The application involves irrigation water uses only.

NOTE TO LOCAL GOVERNMENTS

The person presenting the attached Land Use Information Form is applying for a new water right or modifying an existing water right. The Oregon Water Resources Department (OWRD) requires applicants to obtain land use information to ensure the water right does not result in land uses that are incompatible with your comprehensive plan. Please complete the form and return it to the applicant for inclusion in their application. **NOTE:** For new water right applications only, if you are unable to complete this form while the applicant waits, you may complete the "Receipt Acknowledging Request for Land Use Information" and return it to the applicant.

You will receive notice via OWRD's weekly Public Notice once the applicant formally submits their request to OWRD. The notice will give more information about OWRD's water right process and provide additional comment opportunities. If you previously only completed the receipt for an application for a new permit to use or store water, you will have 30 days from the Public Notice date to complete the Land Use Information Form and return it to OWRD. Your attention to this request for information is greatly appreciated. If you have questions concerning this form, please contact OWRD's Customer Service Group at 503-986-0900 or WRD_DL_customerservice@water.oregon.gov.

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Land Use Information Form

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JAN 23 2025
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OREGON WATER RESOURCES DEPARTMENT

Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem, Oregon 97301-1266
(503) 986-0900
www.oregon.gov/OWRD

NAME			PHONE
Jake Madison, Madison Ranches, Inc.			541-376-8107
MAILING ADDRESS 29299 Madison Road			
CITY Echo	STATE OR	ZIP 97826	EMAIL Jake@MadisonRanches.com

A. Land and Location

Please include the following information for all tax lots where water will be diverted (taken from its source), conveyed (transported), and/or used or developed. Applicants for municipal use, or irrigation uses within irrigation districts, may substitute existing and proposed service-area boundaries for the tax-lot information requested below.

Township	Range	Section	¼ ¼	Tax Lot #	Plan Designation (e.g., Rural Residential/RR-5)	Water to be:	Proposed Land Use:
Please see attached Figure and Table						☐ Diverted ☐ Conveyed ☐ Used	Artificial Groundwater Recharge
						☐ Diverted ☐ Conveyed ☐ Used	
						☐ Diverted ☐ Conveyed ☐ Used	
						☐ Diverted ☐ Conveyed ☐ Used	

List all counties and cities where water is proposed to be diverted, conveyed, and/or used or developed:

Umatilla

NOTE: A separate Land Use Information Form must be completed and submitted for each county and city, as applicable.

B. Description of Proposed Use

Type of application to be filed with the Oregon Water Resources Department:

☐ Permit to Use or Store Water ☐ Water Right Transfer ☐ Permit Amendment or Ground Water Registration Modification
☒ Limited Water Use License ☐ Exchange of Water ☐ Allocation of Conserved Water

Source of water: ☐ Reservoir/Pond ☐ Ground Water ☒ Surface Water (name) Butter Creek

Estimated quantity of water needed: 25 ☒ cubic feet per second ☐ gallons per minute ☐ acre-feet

Intended use of water: ☐ Irrigation ☐ Commercial ☐ Industrial ☐ Domestic for _____ household(s)
☐ Municipal ☐ Quasi-Municipal ☐ Instream ☒ Other Artificial Recharge

Briefly describe:

An application for a limited water use license is being submitted to the Oregon Water Resources Department requesting to use water from Butter Creek for artificial groundwater recharge.

Note to applicant: For new water right applications only, if the Land Use Information Form cannot be completed while you wait, please have a local government representative sign the receipt on the bottom of page 4 and include it with the application filed with the Oregon Water Resources Department.

See Page 4 ➔

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For Local Government Use Only

The following section must be completed by a planning official from each county and city listed unless the project will be located entirely within the city limits. In that case, only the city planning agency must complete this form. This deals only with the local land use plan. Do not include approval for activities such as building or grading permits.

Please check the appropriate box below and provide the requested information

☒ Land uses to be served by the proposed water use(s), including proposed construction, are allowed outright or are not regulated by your comprehensive plan. Cite applicable ordinance section(s): UDC § 152.056 (A)

☐ Land uses to be served by the proposed water use(s), including proposed construction, involve discretionary land-use approvals as listed in the table below. (Please attach documentation of applicable land-use approvals which have already been obtained. Record of Action/land-use decision and accompanying findings are sufficient.) **If approvals have been obtained but all appeal periods have not ended, check "Being Pursued."**

Type of Land-Use Approval Needed (e.g., plan amendments, rezones, conditional-use permits, etc.)	Cite Most Significant, Applicable Plan Policies & Ordinance Section References	Land-Use Approval:
		☐ Obtained ☐ Being Pursued ☐ Denied ☐ Not Being Pursued
		☐ Obtained ☐ Being Pursued ☐ Denied ☐ Not Being Pursued
		☐ Obtained ☐ Being Pursued ☐ Denied ☐ Not Being Pursued
		☐ Obtained ☐ Being Pursued ☐ Denied ☐ Not Being Pursued

Local governments are invited to express special land use concerns or make recommendations to the Oregon Water Resources Department regarding this proposed use of water in the box below or on a separate sheet.

Name: Megan Davchevski Title: Planning Division Manager

Signature: Megan Davchevski Date: 12/3/2024

Governmental Entity: Umatilla County Phone: 541-278-6252

Receipt Acknowledging Request for Land Use Information

Note to Local Government Representative:
Please complete this form and return it to the applicant. **For new water right applications only**, if you are unable to complete this form while the applicant waits, you may complete this receipt and return it to the applicant. If you sign the receipt, you will have 30 days from the date of OWRD's Public Notice of the application to submit the completed Land Use Information Form to Oregon Water Resources Department. Please note while OWRD can accept a signed receipt as part of intake for an application for a new permit to use or store water, a completed Land Use Information Form is required for all other applications.

Applicant Name: _____

Staff Name: _____ Title: _____

Staff Signature: _____ Date: _____

Governmental Entity: _____ Phone: _____

Land Use Information Form

System information - Madison Ranches, Inc

Township	Range	Section	QQ	TLID	Taxlot	Water to be:
2N	27E	1	NWNW	2N27000000200	200	Diverted, Conveyed
2N	27E	1	NWNW/NENW	2N27000000200	200	Conveyed
2N	27E	1	NENW	2N27000000200	200	Conveyed, Used
2N	27E	1	NWNE/NENE	3N27000005900	5900	Conveyed, Used
2N	27E	1	NENW	3N27000005902	5902	Conveyed
3N	28E	19	NWSW	3N28000006300	6300	Used
3N	27E	24	NESE/SESE	3N27000005200	5200	Conveyed, Used
3N	27E	25	NENE	3N27000005200	5200	Conveyed
3N	27E	25	SENE	3N27000005400	5400	Diverted, Conveyed
3N	27E	36	NENE/SENE/NESE/SESE/SWSE/SESW	3N27000005900	5900	Conveyed, Used

Hydrologic Feasibility and Project Description Report

LOCATION DESCRIPTION

Butter Creek Diversion 1
Located 80 feet North and 100 feet West from the NW corner of the SW NW, Section 1, Township 2 North, Range 27 East (W.M.)

Butter Creek Diversion 2
Located 2,460 feet South and 900 feet West from the NE corner of Section 25, Township 3 North, Range 27 East (W.M.)

MW-3
Butter Creek
NORTH BASIN
UMAT 54823 (COLLECTOR WELL 3)
MADISON SAYLER RD
T03N R27E
T03N R28E
FLUME 4
BUTTER CREEK DIVERSION 2
CO 1356 RD
MW-1 (UMAT 56964)
LEXINGTON ECHO HWY
UMAT 57117 (BASALT WELL)
ASR WELL 1
SAYLOR RD
WINDMILL WELL (COLLECTOR WELL 1)
FLUME 3
MADISON RD
MADISON
T03N R27E
T02N R27E
ASR WELL 2
COLLECTOR WELL 2
FIELD 95
T03N R28E
T02N R28E
BUTTER CREEK DIVERSION 1
FLUME 2
BC FLUME 1
MW-2 (UMAT 56963)
WEST ANGUS AVE

LEGEND

- Diversion
- Well
- Flume
- AR Conveyance Line

System Type
- Existing
- Proposed

All Other Features
- New Basin
- Basin
- Field 95
- Tax Lot
- Major Road
- Watercourse

Date: January 30, 2025
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

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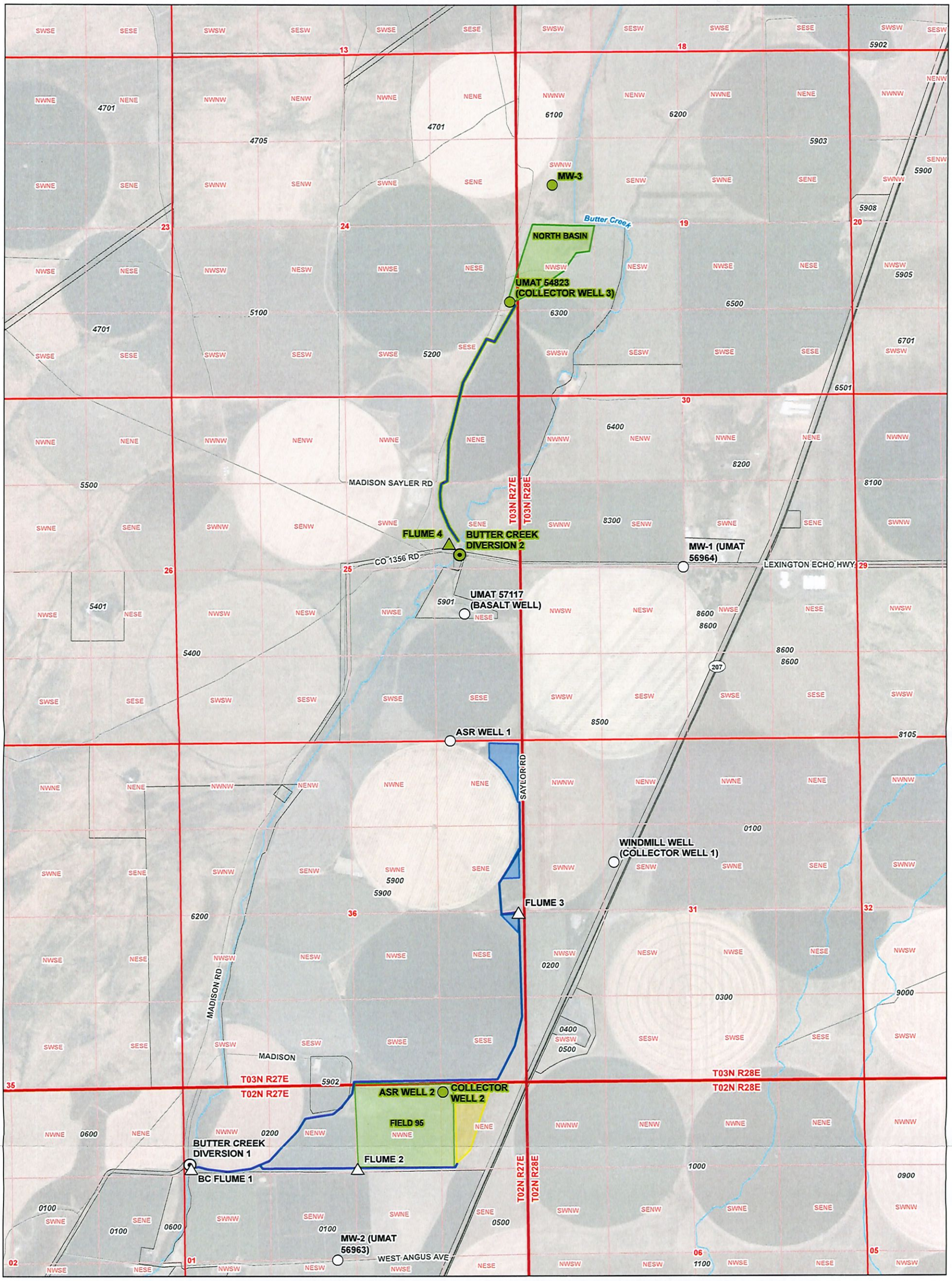
N

0 725 1,450 2,175
FEET

GSI Water Solutions, Inc.

FIGURE 1
AR-ASR Overview
Madison Ranches

Document Path: Y:\0136_MadisonMcCarty_ASR\Source_Figures\039_2025_ASR_Reporting\003_AR_Application\Figure1_AR-ASR_Overview_Land_Use_App.aprx, Figure1_AR-ASR_Overview_Land_Use_App, bramos



LEGEND

- Diversion
- Well
- Flume
- AR Conveyance Line

System Type

- Existing
- Proposed

All Other Features

- New Basin
- Basin
- Field 95
- Tax Lot
- Major Road
- Watercourse

Date: November 25, 2024
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

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FIGURE 1

AR-ASR Overview

Madison Ranches

N

0 725 1,450 2,175
FEET

GSI Water Solutions, Inc.

Document Path: Y:\0136_MadisonMcCarty_ASR\Source_Figures\039_2025_ASR_Reporting\003_AR_Application\Figure1_AR-ASR_Overview_Land_Use_App.aprx, Figure1_AR-ASR_Overview_Land_Use_App, bramos

1 Introduction

Madison Ranches (Madison) operates an artificial groundwater recharge (AR) program in Echo Junction, Oregon, most recently authorized for diversion and recharge testing by Limited License (LL) #1926 issued by the Oregon Water Resources Department in 2023. This application will supersede LL #1926 and includes proposed changes to the AR system. AR testing at Madison Ranches was initiated in 2002, and to date, a total of over 20,000 acre-feet of water have been diverted from Butter Creek and artificially recharged into Madison's AR basins, as authorized by the LLs listed below:

- LL #764 2002 to 2006
- LL #952 2006 to 2009
- LL #1193 2009 to 2012
- LL #1442 2013 to 2016
- LL #1628 2016 to 2021, and
- LL #1926 2023 to 2028.

Artificially recharged water has been recovered at Madison each year since 2012, authorized by the following limited licenses:

- LL 1424 in 2012
- LL 1452 in 2013
- LL 1510 in 2014
- LL 1553 in 2015
- LL 1615 in 2016
- LL 1684 in 2017
- LL-1717 in 2018
- LL-1772 in 2019,
- LL-1927 in 2023, and
- LL-1963 in 2024

This report contains project information required to modify and expand the existing operations for continued AR testing. Testing is proposed to continue under the same conditions set by the previous LLs, and given the successful history of this project, Madison has been approved to renew the LL every five years, the maximum LL duration, with the understanding that the LL may be modified if unforeseen conditions develop.

AR testing has been successful and, based on available data, has not resulted in any negative impacts to the shallow alluvial groundwater system underlying the recharge basin. The purpose of continued testing under an LL is to evaluate infiltration characteristics of the existing and proposed expanded recharge area and to continue evaluating the shallow aquifer water level response to AR. In many respects, this artificial recharge program is an enhancement of flood irrigation practices that have been ongoing in the area for more than 100 years, so no negative impacts are expected with this modification and expansion. Based on the historical data, it is our opinion that the expansion of the AR project will continue to result in improved shallow groundwater quality because the water quality of the Butter Creek recharge source is better than the underlying shallow groundwater quality.

This AR LL application modification proposes to expand the successful AR practices at Madison by increasing basin infiltration area and adding the infrastructure associated with a successful AR project. Proposed modifications to the Madison AR-ASR system are displayed in Figure 1, and Table 1 below details the changes.

Table 1. Proposed Modifications and Expansions to the Madison AR-ASR System

Modification/ Expansion	Existing Basin Area (acres)	Proposed Expansion (acres)	Proposed Total Basin Area (acres)	Comment
North Basin	-	19.4	19.4	New basin
Field 95	9.2	44.3	53.5	Increase in basin area
Butter Creek Diversion 2 and Flume 4	-	-	-	Includes new flume and new conveyance
MW-3	-	-	-	New downgradient shallow alluvial well
Collector Wells 2 and 3	-	-	-	New collector wells
ASR Well 2				New ASR well

Note: Collector Well 2 will be used for both irrigation and to recharge ASR 2; water recovered from Collector Well 3 will go directly to the existing irrigation system.

2 Project Description and System Design

The Madison AR program involves diverting winter/spring stream flows from Butter Creek to a series of recharge basins on Madison property (Figure 1). The current area of the operational recharge basins is approximately 16.44 acres. This AR LL application proposes an additional 63.69-acres of recharge basin areas. The proposed expansion of the AR system is expected to be completed in sequential phases. These phases are described in Table 2. The following sections describe the AR system design and proposed operation. Most project infrastructure is in place and was utilized for AR testing under LL #1926.

Table 2 Phased Expansion of AR

Phase No.	Description	Anticipated Timeline for System Integration
1	Drill MW-3 and collect baseline water quality samples	Winter 2024-2025
2	Begin recharge in the new Field 95 expansion	Winter 2024-2025
3	Drill Collector Well 2	Winter 2026-2027
4	Drill ASR Well 2	Winter 2026-2027
5	Construct North Basin and associated Butter Creek Diversion 2 and Flume 4	Winter 2026-2027
6	Drill Collector Well 3	Winter 2026-2027

2.1 Diversion and Recharge

The locations of the project diversion structure, conveyance, and recharge basins are shown on Figure 1. The Madison AR facility is currently approximately 16.44 acres in size. As with previous AR LLs, this LL requests diversion of up to 25 cfs from Butter Creek for AR recharge testing. Specifically, diversion of water from Butter Creek is limited to periods when there is adequate flow in Butter Creek to satisfy all existing water rights and is further limited to times when streamflows can satisfy all other existing water rights. Use is allowed when the rotations described in the Butter Creek Distribution Plan are not in effect. Madison is proposing a new period of use from November to August, as in some years Butter Creek flows at the applicable rate as early as November, and Madison would like to be able to capture water then if it is available.

There are three existing flumes located at the southern end of the Madison property that divert flow to the recharge areas: Flume 1, Flume 2, and Flume 3. This application proposes a new Flume 4. A 42-inch Palmer-Bowlus automatically operated diversion structure and flume are installed at the Butter Creek Diversion. Flume 1 (manufactured by Plasti-Fab) can measure flow between approximately 0.48 cubic feet per second (cfs) and 58 cfs. Two 30-inch flumes (Flumes 2 and 3) are installed at the entrance to the existing Field 95 recharge basins (Flume 2) and at the southern-most basin of the existing basis located downstream from Field 95 (Flume 3). Specifications for the flume and diversion structures are included in Appendix A. Flumes 1-3 were installed and utilized for testing under Madison's previous AR LLs.

This application proposes AR testing on an additional 44.3 acres of land located to the south (expanding Field 95) as well as 19.4 acres to the north (adding the North Basin) for a total of 63.4 acres. Each recharge basin will be surrounded by a 1- to 2-foot-high earthen berm to maintain water inside the recharge area. The existing Field 95 basin contains a series of cells separated by 20-foot-wide, 1-foot-high berms. Cell sizes range from 0.5 to 3.3 acres. The cells have been designed to allow water from the diversion structure to fill

the first up-gradient cell. Once filled, the water flows over the berm into the next cell, continuing this process sequentially. The berms are generally covered with grass. To maintain the water level in the last cell below the top of the berm, the flow entering the recharge basin is manually adjusted. The expanded basin adjacent to the current recharge area will be constructed in a similar manner.

2.2 Recovery

There is one existing collector well (Collector Well 1), and two proposed new collector wells (Collector Well 2 and Collector Well 3). The purpose of these wells is to collect shallow groundwater from the alluvial aquifer in the vicinity of the recharge basins. Alluvial groundwater flows generally downgradient and parallel to Butter Creek. The wells will also capture recharge water from the AR basins. These collector wells are intended to be used for recovery under this LL.

Collector Well 1 (also referred to as the Windmill Well) is a horizontal well that is approximately 0.5 miles long and up to 25 feet deep. A 100-hp end suction centrifugal pump and 60-hp booster pump, capable of producing 2,500 gallons per minute (gpm), are located within a vertical pump chamber on the east end of the collector well.

In most years, there is sufficient groundwater in the alluvium during the months of April through June to allow pumping from Collector Well 1. Madison has water right certificates (75107, 83692, 83693, and T-11414) to withdraw up to 2.06 cfs (925 gpm) of native groundwater from Collector Well 1 for irrigation purposes. This collector well is also used to pump groundwater from the alluvial aquifer for injection into the deep basalt aquifer as part of Madison's ASR project under ASR LL #020, issued by OWRD in 2024 (ASR testing has been conducted since 2006 under LL #014 and #007).

The proposed Collector Well 2 will be constructed as an approximately 25 to 40 -foot deep well, which will act as a collection point to drain tiles that will be installed under the Field 95 recharge basin. Water recovered from this well will be used to recharge the new ASR 2 well, and also to convey water to the irrigation system (under an AR Recovery license).

The proposed Collector Well 3 (UMAT 52823) is a shallow (20 foot deep) well that is an authorized point of appropriation for irrigation and supplemental irrigation under certificates 75260 and 76784. AR water recovered from this well will be conveyed to the existing irrigation system.

Water levels and flow rates are continuously monitored at Collector Well 1, and data are logged hourly by Madison's telemetry system. Artificial recharge flow rates and volumes are monitored at flume-type monitoring stations located at the Butter Creek diversion (Flume 1) and at the entrance to the recharge basins (Flume 2 and Flume 3) and at the proposed new recharge basin (Flume 4). Recharge rates and volumes are recorded at the flumes using ultrasonic flow meters and data loggers which are also connected to Madison's telemetry system, allowing for real-time monitoring and data archiving. The proposed system will be monitored in the same manner, as shown in the attached revised monitoring plan.

3 Hydrologic and Hydrogeologic Characterization

This section describes the hydrologic and hydrogeologic conditions in the Madison property and surrounding area.

3.1 Butter Creek

Butter Creek flows north-northeasterly toward the Umatilla River, through the Madison property. The Butter Creek drainage basin is a sub-basin of the Umatilla River basin and has its headwaters in the uplands of the Blue Mountains. In the lower portion of the sub-basin, near the Madison property, the topography is characterized by gentle northward sloping plains, dissected in several locations by geologic structures within the underlying Columbia River Basalt Group (Hogenson, 1964).

Butter Creek is the principal drainage in this area and is typically an intermittent stream. Flow in the creek is derived from snowmelt in the Blue Mountains, precipitation, and irrigation return flow. Creek discharge is greatest during the winter and spring months and generally approaches zero during late summer. Butter Creek provides some recharge to the shallow alluvial aquifer during the rainy season and receives groundwater discharge during late spring and summer months.

3.1.1 Streamflow Data

Butter Creek gauging station #14032000 is located approximately 15 miles upstream from the Madison property. Streamflow data from this gauging station was accessed from OWRD's online database. Figure 2 shows streamflow data from this gauging station over a 27-year period from October 1994 through October 2024. Maximum streamflow during this period was 1,430 cfs recorded on December 31, 1996, and the minimum streamflow of 0 cfs was recorded on August 9-11, 2014 and August 21-23, 2015.

3.1.2 Water Quality

Water quality data collected from Butter Creek were presented in the first AR feasibility report (GSI, 2002), and are included in Appendix B.[1] The data set includes cations and anions, total dissolved solids (TDS), chemical oxygen demand (COD), pH, and temperature, and provides an indication of water quality in the creek during the time of year when diversion for the recharge project would occur. Nitrate concentrations were as high as 6.3 mg/L but were typically less than 3 mg/L. The available data presented in Appendix B indicate that the concentrations of dissolved constituents increase in the summer as expected when flows are lowest. To supplement the historical water quality data, 10 years of alluvial groundwater quality data from the Windmill Well are summarized in Table 3, indicating no degradation of alluvial aquifer water quality resulting from AR activities.

3.2 Geology

The subsurface stratigraphy of the Butter Creek Sub-basin generally consists of Holocene and Pleistocene-aged unconsolidated alluvial sediments and Pliocene-aged semi-consolidated alluvial sediments (fanglomerate or the Alkali Canyon Formation) overlying Miocene-aged basalt flows of the Columbia River Basalt Group (CRBG). The recharge basins overlie approximately 30 feet of Holocene-aged unconsolidated

[1] Historical data comes the NATIONAL WATER QUALITY MONITORING COUNCIL which summarizes USGS and EPA data for "Butter Creek at Madison Bridge off Hwy 207 (Site ID OREGONDEQ-12730-ORDEQ)", Data Profile "Sample Results (physical/chemical metadata)". Available at: https://www.waterqualitydata.us/#advanced=true. Downloaded October 16, 2024.

alluvial sand and gravel deposits that were deposited by historic Butter Creek. The alluvial deposits are underlain by the CRBG. Each unit is described regionally in greater detail below.

3.2.1 Holocene and Pleistocene Sediments

The Holocene deposits consist of locally derived unconsolidated alluvial materials and are located in the flood plains of streams. These materials generally consist of sand, gravel, with some silt and can be up to 50 feet thick (Robinson, 1971).

The Pleistocene sediments are the most widespread surface unit in this area, locally underlying the Holocene deposits in the Butter Creek flood plain. These deposits are associated with the Missoula floods and are generally described as poorly sorted, consisting of sand, gravel and some silt (Robinson, 1971). Maximum thickness of this unit is approximately 200 feet (Robinson, 1971).

3.2.2 Pliocene Fanglomerate (Alkali Canyon Formation)

The Pliocene-aged fanglomerate is a weakly to moderately cemented, poorly sorted, rudely stratified alluvial fan deposit that consists of sand, silt, and basaltic gravel (Hogenson, 1964; Robinson, 1971). In some locations, the gravel is strongly cemented with calcium carbonate (Hogenson, 1964). This unit attains a maximum thickness of 250 feet, but is generally much less (Robinson, 1971).

3.2.3 Miocene Basalt

The basaltic lava flows of the CRBG underlie all surface units in the Butter Creek Subbasin. These flows are dense and hard near the base, grading to vesicular and scoriaceous near the top of individual flows (Robinson, 1971). Between some interior flows, up to 100 feet of clay and/or tuffaceous sand layers may be present. The maximum thickness of the CRBG can be up to several thousand feet.

3.3 Hydrogeology

Madison Farms is located in a semiarid region that receives approximately 9 inches of precipitation annually and lies within the Butter Creek Critical Groundwater Area (BCCGA). Groundwater pumping from the deep basalt aquifers has been significantly reduced in the BCCGA since its designation in order to mitigate the effects of regional groundwater decline in the basalt aquifer. This section focuses on the characteristics of the shallow aquifer and includes a brief discussion on the basalt aquifer as it relates to the AR project.

3.3.1 Shallow Aquifer

Shallow groundwater occurs within the fanglomerate (Alkali Canyon Formation) and younger alluvial sediments. In some locations, there is perched groundwater of limited extent near Butter Creek. Perched groundwater generally lies within 30 feet of the ground surface and is recharged by Butter Creek and irrigation water (Norton and Bartholomew, 1984). Locally, soil thickness over the top of these deposits ranges from 3 to 12 feet. The static water level near the recharge area is generally 12 feet or more below the ground surface.

Unconfined groundwater also occurs in the lower portion of the alluvial sediments, and is found throughout this area at depths greater than approximately 110 feet. Depth to the top of the alluvial sediments locally ranges from 3 to 12 feet from the ground surface. Recharge is primarily from Butter Creek. Water from this aquifer is pumped from wells greater than 100 feet deep.

Groundwater level in the shallow aquifer generally fluctuates up to 20 feet per year, resulting from natural recharge from Butter Creek, infiltration from up-basin flood irrigation, and groundwater pumping for

irrigation. Shallow groundwater in the vicinity of the Madison recharge project generally flows parallel to Butter Creek in a north-northeasterly direction with a gradient of approximately 0.006 ft/ft. The average linear groundwater flow velocity is on the order of 26 feet/year (GSI, 2002).

Two domestic water supply wells were identified in the vicinity of the AR project (GSI, 2002). The closest domestic water supply well (UMAT 1170) is located 1,950 feet to the southwest, generally upgradient of the project. No domestic water supply wells have been negatively impacted by artificial recharge activities to date.

No structures with basements are located nearby that could be affected by the elevated groundwater levels within the alluvial aquifer as a result of artificial recharge activities.

3.3.2 Basalt Aquifer

Historical pumping from the deep Columbia River Basalt Group (CRBG) aquifers has significantly reduced groundwater levels in the basalt aquifer. The shallow aquifer, which relates to the AR project, has not been affected by declining water levels in the basalt aquifer.

The proposed AR project will use a portion of the recovered AR water for ASR injection via Madison's ASR well completed in the CRBG aquifer.

3.4 Shallow Soils

Two soil types are present in the current recharge basins and planned additional recharge area. These soils are described in the Umatilla County Soil Survey Report as: (1) 72A-Powder silt loam and (2) 92A-Stanfield silt loam.

Powder silt loam is described as a deep, well-drained soil that typically forms in silty alluvium. Permeability of this soil ranges from 0.6 – 2.0 in/hr (Table 4), with runoff slow and erosion slight. The soil survey report recommends that irrigation water applied by flood or sprinkler methods to minimize erosion.

Stanfield silt loam is described as a moderately deep, moderately well drained soil that typically forms in silty alluvium. Permeability of this soil also ranges from 0.6 – 2.0 in/hr (Table 4). Runoff is slow, with hazard of water erosion slight. Irrigation water can be applied by flood or sprinkler methods.

Table 4. Physical Properties of the Soil in the Vicinity of the Madison Artificial Recharge Basin

Soil Name	Depth (inches)	Clay (%)	Moist Bulk Density (g/cc)	Permeability (in/hr)	Available Water Capacity (in/in)
Powder (72A)	0-15	10-18	1.25-1.35	0.6-2.0	0.18-0.25
	15-27	10-18	1.30-1.40	0.6-2.0	0.18-0.25
	27-60	10-18	1.40-1.60	0.6-2.0	0.18-0.25
Stanfield (92A)	0-6	10-15	1.25-1.35	0.6-2.0	0.23-0.29
	6-30	10-15	1.30-1.50	0.6-2.0	0.22-0.28

Notes

Number in parentheses is the soil map symbol from the Umatilla County Soil Survey Report (Johnson and Makinson, 1988).

Madison estimates that the time period required to fill the existing AR recharge basins is 1 to 2 weeks, and that the sustainable rate for maintaining a constant water level in the basins is approximately 12 to 15 cfs (GSI, 2009). The corresponding infiltration rate is 1.3 to 1.7 in/hr over a basin size of 9 acres. This infiltration rate appears to be consistent with the permeability values listed in the soil survey table above, and a similar infiltration rate is expected for the new recharge basins. Due to limitations in the current system, the total allowed recharge rate of 25 cfs has not been attainable. Expanding the system to include the new recharge basins will allow the project to be built out to the full rate.

3.5 Groundwater Quality

As previously stated, alluvial groundwater quality degradation has not been observed since AR testing was initiated utilizing water from Butter Creek. This LL application proposes to continue to use water from Butter Creek for AR. Based on observations from historical AR testing, degradation issues are not anticipated in the alluvial groundwater system underlying the existing and proposed Madison AR basins.

Based on historical observations, the Madison AR program has generally improved the alluvial aquifer water quality, specifically with regard to lower TDS and nitrate concentrations in the recharge water (Table 3). As is the case with all recharge basins, periodic maintenance that includes disking and removal of fines will continue to be necessary in order to maintain infiltration capacity. No reductions in soil permeability or impacts to shallow groundwater quality have been observed during the AR testing completed to date.

3.6 Hydrogeologic Feasibility Assessment

Based on the local soil and hydrogeologic characteristics, water chemistry data, and the planned recharge system design, operation procedures, and information obtained from previous AR LL testing at the site, it is our professional opinion that the proposed AR project is hydrogeologically feasible. No negative impacts associated with the project, including impacts to alluvial groundwater quality, have been observed or are anticipated in the future.

4 AR Monitoring Plan

The following sections summarize the key components of Madison's AR monitoring plan. GSI submitted the Monitoring Plan for the Madison AR and ASR system on February 19, 2024. The approved Monitoring Plan, with track changes displaying the additions and modifications that are proposed as part of this recharge expansion is attached to this document (Appendix C).

4.1 Water Level Monitoring

Madison Ranches monitors the flow rates and volumes of water used each season. Madison has installed a telemetry system which allows continuous tracking of artificial recharge flow rates and volumes at the following locations: the Butter Creek diversion 1 and at the entrances to the recharge basins. The telemetry system produces a daily report which will display 24 hours of recharge rates, minimum/maximum/average rates for the 24 hour period, cumulative AR storage volume, and net AR storage available for recovery. These reports can be provided to OWRD, if requested. The proposed system will be incorporated into the existing telemetry system, as described in the attached revised monitoring plan.

4.1.1 Collector Wells and Observation Wells

Water level at the Madison collector wells will be continuously monitored with pressure transducers in each well maintained by Madison, and logged on an hourly basis through the telemetry system. The two alluvial monitoring wells installed in the vicinity of the recharge basins (MW-1 and MW-2; Figure 1; well logs included in Appendix D) are equipped with pressure transducers, installed in 2015 by OWRD and maintained by OWRD. OWRD collects manual depth-to-water measurements at the two existing observation wells and at the collector well access port during routine monitoring in the area.

This AR LL application proposes to add a new monitoring well (MW-3) to be installed north of the North Basin as the designated downgradient monitoring well (the Windmill well will serve as the upgradient monitoring location for the north basin). The new monitoring well will be a shallow alluvial well that is approximately 25 feet deep, similar in construction to the existing MW-1. MW-3 will be equipped with a pressure transducer and monitored along with the existing wells (OWRD has indicated that they may be able to instrument this well and incorporate it into the existing monitoring network).

4.2 Water Quality Monitoring

Water quality data will be collected from Butter Creek, Collector Well 1, and the three observation wells. As additional collector wells are brought online, they will be incorporated into the water quality monitoring plan. Nitrate concentrations will be continuously measured by a nitrate meter (Hach OptiQuant UV Nitrate Analyzer) as water is conveyed from Collector Well 1 to ASR Well 1 during the injection phase of the ASR project (typically January to June). Additionally, general water quality parameters (general chemistry, metals, etc.) from the existing and new collector wells will be evaluated annually as described in the Monitoring Plan from 2024 (Appendix C). These data will continue to be provided to OWRD to evaluate water quality changes in the shallow groundwater system that may result from artificial groundwater recharge.

Water quality sampling events associated with the AR program, conducted to comply with conditions of the the ASR program, will occur as follows:

- prior to ASR recharge at Collector Well 1
- at the beginning of ASR recharge (two weekly nitrate samples of the Collector Well 1)
- monthly (nitrate samples of Collector Well 1 to verify nitrate meter readings), and

- in the middle of the ASR recharge cycle (from Butter Creek, Windmill Well, and alluvial monitoring wells).

4.3 Reporting

Madison proposes to provide an AR and ASR Annual Report each year by April 15th, which will include a project operations summary which will include information related to the period of recharge, rate of recharge, volume of recharge, water level monitoring, and water quality monitoring.

5 References

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Robinson, J.H. 1971. Hydrology of basalt aquifers in the Hermiston-Ordinance area, Umatilla and Morrow Counties, Oregon: USGS Hydrogeologic Investigations Atlas HA-387.

Table

Table 3. Madison Ranches Windmill Well (Collector Well 1) Water Quality Data Summary

Analyte	Lowest Regulatory Standard	Limited License Action Level	Units	Regulatory Criteria	MDL[1]	Source Water Minimum and Maximum Concentration (2006 to 2023)			
						Number of Samples	Number of Detections	Minimum	Maximum Detection
Analytes from Table B1									
Fecal Coliform / E.coli			CFU/100 mL		1	9	0	Absent	3.1
Total Coliform	<1/100 ML	None	CFU/100 mL	MML	1	9	7	Absent	770.1
Chloroform (Trichloromethane)	None	None	mg/L	URC	0.0005	16	0	ND	NA
Bromodichloromethane	None	None	mg/L	None	0.0005	16	0	ND	NA
Dibromochloromethane	None	None	mg/L	None	0.0005	16	0	ND	NA
Bromoform (Tribromomethane)	None	None	mg/L	URC	0.0005	16	0	ND	NA
Total Trihalomethanes	0.08	0.08	mg/L	MCL, MML	0.0005	16	0	ND	NA
Monochloroacetic Acid	None	None	mg/L	None	0.002	16	0	ND	NA
Dichloroacetic Acid	None	None	mg/L	None	0.001	16	0	ND	NA
Trichloroacetic Acid	None	None	mg/L	None	0.001	16	0	ND	NA
Monobromoacetic Acid	None	None	mg/L	None	0.001	16	0	ND	NA
Dibromoacetic Acid	None	None	mg/L	None	0.001	16	0	ND	NA
Total Haloacetic Acids	0.06	0.06	mg/L	MCL	0.001	16	0	ND	NA
Temperature	None	None	Celsius	None	NA	14	14	7.4	20.2
Conductivity	None	None	µS/cm	None	NA	13	13	510	811
Dissolved Oxygen	None	None	mg/L	None	NA	9	9	0.8	12.7
pH	6 - 8.5	6 - 8.5	Units	SMCL	NA	17	17	6.32	7.6
Turbidity	1	0.5	NTU	MCL, MML	NA	7	7	0.2	0.95
ORP	None	None	mV	None	NA	13	13	-385	331
Bicarbonate	None	None	mg/L	None	2	18	18	188	320
Calcium	None	None	mg/L	None	0.1	19	19	38.7	67.4
Carbonate	None	None	mg/L	None	2-10	17	0	ND	NA
Chloride	250	250	mg/L	SMCL	0.1-1	19	19	7.39	32.7
Hardness (as CaCO3)	250	None	mg/L	URC	1-4	18	18	119	260
Magnesium	None	None	mg/L	None	0.05-0.1	19	19	13.8	22.3
Nitrate as N	10	9.5	mg/L	MML	0.003-0.5	14	14	3.52	8.99
Nitrite as N	1	0.5	mg/L	MCL	0.0004-0.5	14	2	ND	0.155
Total Nitrate-Nitrite	10	9.5	mg/L	MML	0.003-0.5	16	16	3.52	8.99
Potassium	None	None	mg/L	None	0.1	19	19	3.86	6.63
Silica (as SiO2)	None	None	mg/L	None	0.1-0.2	18	18	21.6	54
Silicon	None	None	mg/L	None	0.1-0.2	11	11	19.3	23
Sodium	20	None	mg/L	URC (advisory)	0.05-0.1	19	19	35.8	65.9
Sulfate	250	250	mg/L	URC, SMCL	1-5	19	19	26.9	87.2
Total Alkalinity	250	250	mg/L	SMCL	1-2	18	18	188	277
Total Dissolved Solids	500	500	mg/L	SMCL	0.7-10	18	18	305	525
Total Organic Carbon	None	None	mg/L	None	0.1-0.5	18	18	1.45	4.5
Total Suspended Solids	None	None	mg/L	None	1-10	18	4	ND	3.26
Aluminum	0.05	0.05	mg/L	SMCL	0.007-0.05	15	9	ND	0.0849
Antimony	0.006	0.003	mg/L	MCL	0.001	16	0	ND	NA
Arsenic	0.05	0.025	mg/L	MCL, MML	0.0009-0.002	17	15	ND	0.00269
Barium	1	0.5	mg/L	MCL, MML	0.001-0.05	17	17	0.0634	0.109
Beryllium	0.004	0.002	mg/L	MCL	0.0005-0.003	16	0	ND	NA
Cadmium	0.005	0.0025	mg/L	MCL, MML	0.0002-0.001	16	0	ND	NA
Chromium	0.05	0.025	mg/L	MCL, MML	0.001-0.005	16	10	ND	0.0071
Copper	1.3	0.65	mg/L	MCL, MML	0.001-0.005	15	15	0.00154	0.0079
Iron (Total)	None	None	mg/L	None	0.01-0.05	17	9	ND	0.559
Iron (Dissolved)	0.3	0.3	mg/L	SMCL	0.01-0.05	14	4	ND	0.535
Lead	0.015	0.0075	mg/L	Action Level	0.0005-0.001	16	0	ND	NA
Manganese (Total)	None	None	mg/L	None	0.001-0.01	16	1	ND	0.0466
Manganese (Dissolved)	0.05	0.05	mg/L	SMCL	0.001-0.01	15	1	ND	0.00181
Mercury	0.002	0.001	mg/L	MCL, MML	0.0001-0.0004	16	0	ND	NA
Nickel	0.1	0.05	mg/L	MCL	0.001-0.009	16	2	ND	0.005
Selenium	0.01	0.005	mg/L	MCL, MML	0.0006-0.005	17	6	ND	0.00274
Silver	0.05	0.025	mg/L	MML, SMCL	0.0005-0.009	16	0	ND	NA
Thallium	0.002	0.001	mg/L	MCL	0.0006-0.001	16	0	ND	NA
Zinc	5	5	mg/L	SMCL	0.001-0.01	17	10	ND	0.00521
Odor	3	3	TON	SMCL	1	12	2	ND	6
Color	15	15	ACU	SMCL	3-5	11	8	ND	10
Methylene Blue Active Substance	0.5	0.5	mg/L	SMCL	0.05	14	0	ND	NA
Corrosivity (Langelier Saturation Index)	Non-Corrosive	Non-Corrosive	mg/L	SMCL	NA	12	12	-0.659	9.05
Cyanide (as free cyanide)	0.2	0.1	mg/l	MCL	0.0025-0.025	11	0	ND	NA
Fluoride	2	1	mg/L	MCL, MML, SMCL	0.1-0.5	14	13	ND	0.609
Combined Radium 226/228	5	2.5	pCi/L	MCL, MML	NA	12	11	ND	1.609

Analyte	Lowest Regulatory Standard	Limited License Action Level	Units	Regulatory Criteria	MDL[1]	Source Water Minimum and Maximum Concentration (2006 to 2023)			
						Number of Samples	Number of Detections	Minimum	Maximum Detection
Uranium	0.03	0.015	mg/L	MCL	0.001	14	14	0.004	0.00944
Gross Alpha	15	7.5	pCi/L	MCL, MML	NA	14	14	2.11	7.89
Gross Beta	50	25	pCi/L	MML	NA	14	13	ND	8.6
Analytes from Table B2									
2,4,5-TP (Silvex)	0.01	0.005	mg/L	MCL, MML	0.0004-0.0004	12	0	ND	NA
2,4-D	0.07	0.035	mg/L	MCL, MML	0.0001-0.0002	12	0	ND	NA
Alachlor	0.002	0.001	mg/L	MCL	0.00005-0.0004	12	0	ND	NA
Atrazine	0.003	0.0015	mg/L	MCL	0.00005-0.0002	12	0	ND	NA
Benzo[a]pyrene	0.0002	0.0001	mg/L	MCL	0.00002-0.00004	12	0	ND	NA
gamma-BHC (Lindane)	0.0002	0.0001	mg/L	MCL, MML	0.00001-0.00004	12	0	ND	NA
Carbofuran	0.04	0.02	mg/L	MCL	0.0005-0.002	12	0	ND	NA
Chlordane	0.002	0.001	mg/L	MCL	0.00005-0.0004	12	0	ND	NA
Dalapon	0.2	0.1	mg/L	MCL	0.0001-0.002	12	0	ND	NA
bis(2-ethylhexyl)phthalate	0.4	0.2	mg/L	MCL	0.0006-0.001	12	1	ND	0.000683
bis-2(ethylhexyl)adipate	0.006	0.003	mg/L	MCL	0.0002-0.001	10	0	ND	NA
1,2-Dibromo-3-chloropropane(DBCP)	0.0002	0.0001	mg/L	MCL	0.00001-0.00004	12	0	ND	NA
Dinoseb	0.007	0.0035	mg/L	MCL	0.0001-0.0004	12	0	ND	NA
Diquat	0.02	0.01	mg/L	MCL	0.0004-0.0008	12	0	ND	NA
1,2-Dibromoethane (EDB)	0.00005	0.000025	mg/L	MCL	0.00001-0.00002	12	0	ND	NA
Endothall	0.1	0.05	mg/L	MCL	0.005-0.01	12	0	ND	NA
Endrin	0.0002	0.0001	mg/L	MCL, MML	0.00002	12	0	ND	NA
Glyphosate	0.7	0.35	mg/L	MCL	0.006-0.01	12	0	ND	NA
Heptachlor	0.0004	0.0002	mg/L	MCL	0.00001-0.00008	12	0	ND	NA
Heptachlor Epoxide	0.0002	0.0001	mg/L	MCL	0.00001-0.00004	12	0	ND	NA
Hexachlorobenzene	0.001	0.0005	mg/L	MCL	0.00005-0.0002	12	0	ND	NA
Hexachlorocyclopentadiene	0.05	0.025	mg/L	MCL	0.00005-0.0002	12	0	ND	NA
Methoxychlor	0.04	0.02	mg/L	MCL, MML	0.00005-0.0002	12	0	ND	NA
Polychlorinated Biphenyls (PCBs)	0.0005	0.00025	mg/L	MCL	0.00008-0.0002	12	0	ND	NA
Pentachlorophenol	0.001	0.0005	mg/L	MCL	0.00008-0.001	12	0	ND	NA
Picloram	0.5	0.25	mg/L	MCL	0.0001-0.0002	12	0	ND	NA
Simazine	0.004	0.002	mg/L	MCL	0.00005-0.0001	12	0	ND	NA
Toxaphene	0.003	0.0015	mg/L	MCL, MML	0.0005-0.002	12	0	ND	NA
Vydate (Oxamyl)	0.2	0.1	mg/L	MCL	0.0005-0.004	12	0	ND	NA
1,1,1-Trichloroethane	0.2	0.1	mg/L	MCL, MML	0.0005	12	0	ND	NA
1,1,2-Trichloroethane	0.005	0.0025	mg/L	MCL	0.0005	12	0	ND	NA
1,1-Dichloroethene	0.007	0.0035	mg/L	MCL, MML	0.0005	12	0	ND	NA
1,2,4-Trichlorobenzene	0.07	0.035	mg/L	MCL	0.0005	12	0	ND	NA
1,2-Dichlorobenzene	0.6	0.3	mg/L	MCL	0.0005	12	0	ND	NA
1,2-Dichloroethane	0.005	0.0025	mg/L	MCL, MML	0.0005	12	0	ND	NA
1,2-Dichloropropane	0.005	0.0025	mg/L	MCL	0.0005	12	0	ND	NA
1,4-Dichlorobenzene	0.075	0.0375	mg/L	MCL, MML	0.0005	12	0	ND	NA
Benzene	0.005	0.0025	mg/L	MCL, MML	0.0005	12	0	ND	NA
Carbon Tetrachloride	0.005	0.0025	mg/L	MCL, MML	0.0005	12	0	ND	NA
Chlorobenzene	0.1	0.05	mg/L	MCL	0.0005	12	0	ND	NA
cis-1,2-dichloroethene	0.07	0.035	mg/L	MCL	0.0005	12	0	ND	NA
Ethylbenzene	0.7	0.35	mg/L	MCL	0.0005	12	0	ND	NA
Dichloromethane (methylene chloride)	0.005	0.0025	mg/L	MCL	0.0005	12	0	ND	NA
Styrene	0.1	0.05	mg/L	MCL	0.0005	12	0	ND	NA
Tetrachloroethene	0.005	0.0025	mg/L	MCL	0.0005	12	0	ND	NA
Toluene	1	0.5	mg/L	MCL	0.0005	12	0	ND	NA
trans-1,2-Dichloroethene	0.1	0.05	mg/L	MCL	0.0005	12	0	ND	NA
Trichloroethene	0.005	0.0025	mg/L	MCL, MML	0.0005	12	0	ND	NA
Vinyl chloride	0.002	0.001	mg/L	MCL, MML	0.0003-0.0005	12	0	ND	NA
Total Xylene	10	5	mg/L	MCL	0.0005-0.0015	12	0	ND	NA
Bromoxynil			mg/L		0.0002	8	0	ND	NA
MCPA			mg/L		0.0002	9	0	ND	NA
Pronamide/Kerb			mg/L		0.0002	9	0	ND	NA
Terbacil/Sinbar			mg/L		0.0002	10	0	ND	NA

Notes

[1] Detection limits vary. See the individual sample reports for specific detection limits.

ND = Analyte not detected above reporting limit.

– = not analyzed

Analyte	Lowest Regulatory Standard	Limited License Action Level	Units	Regulatory Criteria	MDL[1]	Source Water Minimum and Maximum Concentration (2006 to 2023)			
						Number of Samples	Number of Detections	Minimum	Maximum Detection

< = not detected at or above the laboratory reporting limit
ASR = aquifer storage and recovery
DET = detected
MCL = maximum contaminant level
MDL = method detection limit
mg/L = milligrams per liter
MML = maximum measurable level
NA = not applicable
SMCL = secondary maximum contaminant level
U = Analyte not detected above method reporting limit
URC = State unregulated contaminant

Figures

LOCATION DESCRIPTION

Butter Creek Diversion 1
Located 80 feet North and 100 feet West from the NW corner of the SW NW, Section 1, Township 2 North, Range 27 East (W.M.)

Butter Creek Diversion 2
Located 2,460 feet South and 900 feet West from the NE corner of Section 25, Township 3 North, Range 27 East (W.M.)

LEGEND

- Diversion
- Well
- Flume
- AR Conveyance Line

System Type

- Existing
- Proposed

All Other Features

- New Basin
- Basin
- Field 95
- Major Road
- Watercourse

Date: January 30, 2025
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

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JAN 30 2025
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FIGURE 1

AR-ASR Overview

Madison Ranches

N

0 725 1,450 2,175
FEET

GSI Water Solutions, Inc.

Document Path: Y:\0136_MadisonMcCarty_ASR\Source_Figures\039_2025_ASR_Reporting\003_AR_Application\Figure1_AR-ASR_Overview.aprx, Figure1_AR-ASR_Overview, bramos

LEGEND

- Diversion
- Well
- Flume
- AR Conveyance Line

System Type

- Existing
- Proposed

All Other Features

- New Basin
- Basin
- Field 95
- Major Road
- Watercourse

Date: December 2, 2024
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

N

0 725 1,450 2,175
FEET

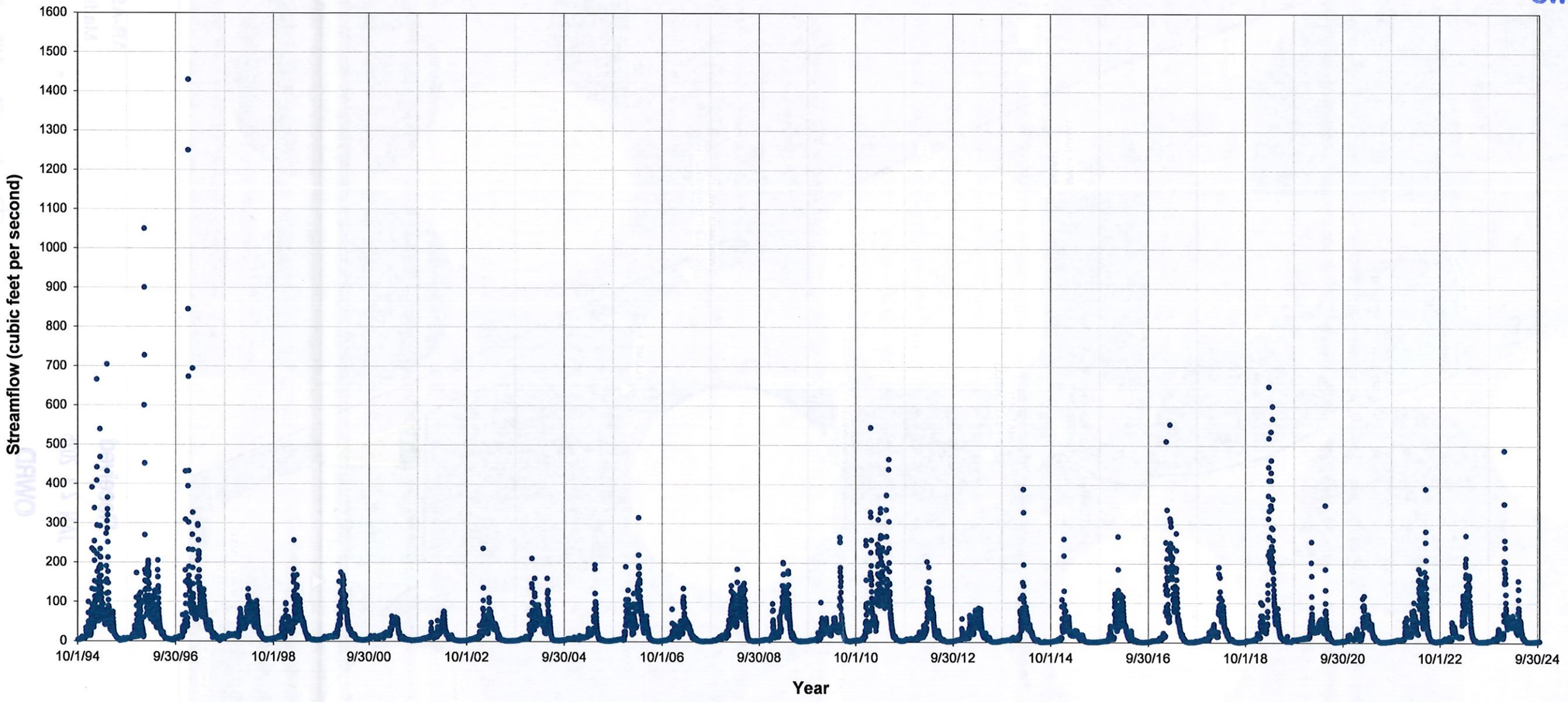
GSI Water Solutions, Inc.

FIGURE 1

AR-ASR Overview

Madison Ranches

Document Path: Y:\0136_MadisonMcCarty_ASR\Source_Figures\039_2025_ASR_Reporting\003_AR_Application\Figure1_AR-ASR_Overview.aprx, Figure1_AR-ASR_Overview, bramos



NOTES
Mean daily streamflow measured at OWRD/NWS gauging station #14032000 near Pine City.

FIGURE 2
Butter Creek Streamflow
October 1994 - October 2024

GSI Water Solutions, Inc.

P:\136 - MadisonMcCarty ASR\039-2024_2025 AR-ASR_Support\02 - Modify AR Recharge LL\02 Figures\[Figure 2 Streamflow 2024.xlsx]Figure_Format

APPENDIX A

Flume and Diversion Specifications

Plasti-Fab®

Flumes 1, 2 and 3

9665 S.W. TUALATIN-SHERWOOD ROAD
PO BOX 100 ❖ TUALATIN OR 97062
PHONE: (503) 692-5460 FAX: (503) 692-1145

E-MAIL: sales@plasti-fab.com
WEB: http://www.plasti-fab.com

QUOTATION

Quote #: PQ-A-0206-047
Date: June 10, 2002
Method: **Fax: 541-376-8618**

Attention: Kent Madison
Madison Farms
Hermiston, OR

Phone: 541-376-8107

RE; Butler Creek

QUAN.	DESCRIPTION	PRICE
1 only	42" Palmer-Bowlus flume with approach, staff gage, s/s ultrasonic bracket and FRP caulking collars for 42" dia. corrugated metal pipe.	$ 4,670.00
1 only	30" Palmer-Bowlus flume with approach, staff gage, s/s ultrasonic bracket and FRP caulking collars for 30" dia. corrugated metal pipe.	$ 3,550.00
	Plus Estimated Freight.	$ Included Above
Notes:	1. Information on the Palmer-Bowlus flumes and flow ranges for the two sizes shown are attached. 2. The caulking collar can be sized so that it is larger that the OD of the corrugated pipe. This allows the flume to be leveled independently of any slope in the line. Grout or other form of caulk is used to seal between the collar and flume. 3. Please let me know if you have any questions. You can also contact our area representative, Mr. Jim Fitz with Whitney Equipment Co. in Vancouver, WA. His phone number is 360-694-9175.	

Freight	At cost
Drawings	1-2 wks
Shipping ARA	6-8 wks

SHIP TERMS: FOB our Factory
PAYMENT TERMS: NET 30
TAXES ARE NOT INCLUDED

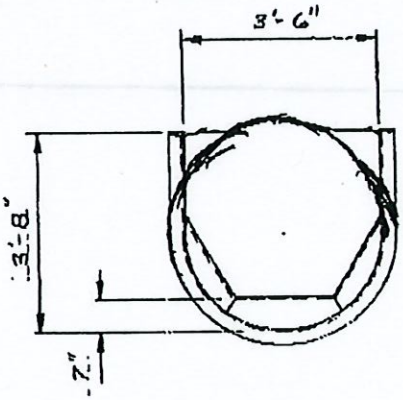
Quoted By: Alan Belyea

(Our representative in your area)
cc: Whitney Equipment Co.

M 3530-C

" FLANGE
L AROUND

NOTES:
1. ¼" MINIMUM WALL THICKNESS TO CONSIST OF ORTHOPHTHALIC POLYESTER RESIN w/30% MIN. GLASS CONTENT, EXCLUSIVE OF RESIN RICH SURFACES.
2. INSIDE SURFACE TO BE SMOOTH WHITE GELCOAT.
3. TEMPORARY WOOD STIFFENERS ACROSS TOP OF FLUME NOT SHOWN.
4. 2" x 2" ANGLE CLIPS ON SIDES (FOR ANCHORING IN CONCRETE) ARE NOT SHOWN.

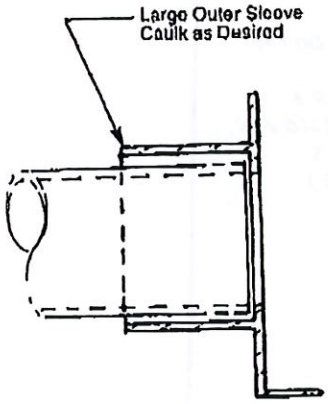


CUSTOMER:

P.O. NO.
PLASTI-FAB JOB NO.
REP.

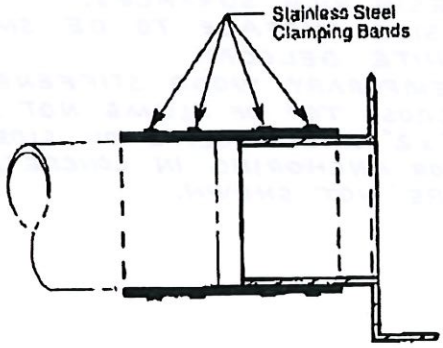
REVISIONS	Plasti-Fab INC LOGSDEN, OREGON
	42" PALMER-BOWLUS w/INTEGRAL APPROACH
DR. BY	CHK'D
DATE	
SCALE: ½" = 1'-0"	

M3530-C

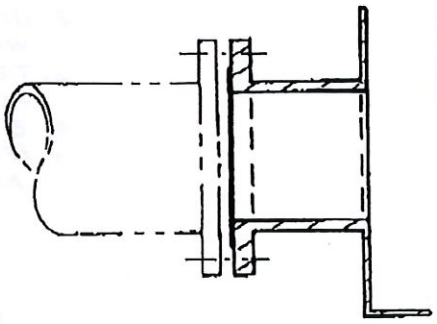


Available for:

CAULKING COLLARS
Collars made 1" to 2" larger than pipe O.D. to allow for some adjustment in leveling flume.



NEOPRENE BOOTS
Boot with stainless steel bands slips over pipe stub, and is sized to match O.D. of connecting pipe.



BOLTED FLANGE
PVC, FRP or Van Stone flanges are available. Other special connections can be supplied when desired.

Plasti-Fab® INC.
P.O. Box 100
Tualatin, Oregon 97062
503/692-5460
FAX 503-692-1145

Plasti-Fab®, INC.

9665 S.W. TUALATIN-SHERWOOD ROAD
PO BOX 100 ❖ TUALATIN OR 97062
PHONE: (503) 692-5460 FAX: (503) 692-1145

E-MAIL: sales@plasti-fab.com
WEB: http://www.plasti-fab.com

INSTALLATION INSTRUCTIONS
PLASTI-FAB FLUMES

1. The flume should be installed level end-to-end and side-to-side.

2. Flume must be cribbed/shored up inside, especially with flumes having a 12" throat or larger, in order to keep the sidewalls plumb and maintain the dimensional integrity of the flume. The throat is the most critical portion of the flume to protect.

3. The top cross ties should be left on the flume until it has been installed. If the flume is set in concrete the cross ties can be removed if desired.

4. Secure the 2" x 2" angle clips on flume to rebar with tie-wire, shove a rod through the clips or at least loop No. 8 wire through the clips to key the flume into the concrete. (Concrete does not bond well to fiberglass).

   The 2" x 2" angle clips are not made to prevent shifting. Additional cross beams and/or bracing, temporarily anchored into the channel wall or adjacent bench, is suggested to prevent possible floating during installation.

   NOTE: Flume **must** remain level both directions.

5. Provide adequate bottom support for flume and approach to prevent settling or shifting.

6. **Alternatives for setting flume:** Plasti-Fab flumes are designed to be free standing, and require no additional external support in order to maintain their dimensional integrity during operation.

   A. The flume can be grouted into a roughed-in concrete channel, either new or existing. Grouting is a preferred form of installation because it lessens the chance of wall deflection.

   B. If the flume is being placed in concrete do not pour the concrete so fast as to bulge the sides and floor of the flume. Excessive use of a vibrator can also cause distortion.

   NOTE: When setting flumes we would recommend that concrete be poured in successive lifts of not more than 6"- 10" per lift.

Q:\O&M\FLUMEINS.98 August 28, 1998

Plasti-Fab®, INC.

9665 S.W. TUALATIN-SHERWOOD ROAD
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PHONE: (503) 692-5460 FAX: (503) 692-1145

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   NOTE: When setting flumes we would recommend that concrete be poured in successive lifts of not more than 6"- 10" per lift.

PLASTI-FAB, INC.

30 inch Palmer-Bowlus Flume Free Flow Discharge

Head (feet)	MGD	CFS	GPM
0.11			
0.12			
0.13	0.14349	0.22201	99.644
0.14	0.16401	0.25380	113.91
0.15	0.18494	0.28614	128.43
0.16	0.20620	0.31904	143.20
0.17	0.22783	0.35251	158.22
0.18	0.24983	0.38654	173.49
0.19	0.27220	0.42116	189.03
0.20	0.29495	0.45636	204.83
0.21	0.31809	0.49216	220.90
0.22	0.34162	0.52857	237.24
0.23	0.36555	0.56558	253.85
0.24	0.38987	0.60322	270.75
0.25	0.41461	0.64149	287.92
0.26	0.43975	0.68040	305.38
0.27	0.46532	0.71995	323.14
0.28	0.49131	0.76016	341.18
0.29	0.51772	0.80103	359.53
0.30	0.54457	0.84258	378.17
0.31	0.57186	0.88480	397.13
0.32	0.59959	0.92771	416.38
0.33	0.62778	0.97132	435.96
0.34	0.65642	1.0156	455.85
0.35	0.68552	1.0607	476.05
0.36	0.71508	1.1061	496.59
0.37	0.74512	1.1529	517.45
0.38	0.77564	1.2001	538.64
0.39	0.80664	1.2481	560.16
0.40	0.83812	1.2968	582.03
0.41	0.87010	1.3463	604.24
0.42	0.90258	1.3965	626.79
0.43	0.93557	1.4475	649.70
0.44	0.96906	1.4994	672.96
0.45	1.0031	1.5520	696.57
0.46	1.0376	1.6054	720.55
0.47	1.0727	1.6596	744.90
0.48	1.1082	1.7147	769.61
0.49	1.1444	1.7706	794.69
0.50	1.1810	1.8273	820.15

Head (feet)	MGD	CFS	GPM
0.51	1.2182	1.8849	845.99
0.52	1.2560	1.9433	872.22
0.53	1.2943	2.0026	898.83
0.54	1.3332	2.0628	925.83
0.55	1.3726	2.1238	953.23
0.56	1.4127	2.1857	981.02
0.57	1.4533	2.2485	1,009.2
0.58	1.4945	2.3123	1,037.8
0.59	1.5362	2.3769	1,066.8
0.60	1.5786	2.4424	1,096.2
0.61	1.6216	2.5089	1,126.1
0.62	1.6651	2.5763	1,156.3
0.63	1.7093	2.6447	1,187.0
0.64	1.7541	2.7140	1,218.1
0.65	1.7995	2.7842	1,249.7
0.66	1.8455	2.8555	1,281.6
0.67	1.8922	2.9277	1,314.0
0.68	1.9395	3.0008	1,346.9
0.69	1.9874	3.0750	1,380.1
0.70	2.0360	3.1501	1,413.9
0.71	2.0852	3.2263	1,448.1
0.72	2.1351	3.3034	1,482.7
0.73	2.1856	3.3816	1,517.8
0.74	2.2368	3.4608	1,553.3
0.75	2.2886	3.5410	1,589.3
0.76	2.3411	3.6222	1,625.8
0.77	2.3943	3.7045	1,662.7
0.78	2.4482	3.7879	1,700.1
0.79	2.5027	3.8722	1,738.0
0.80	2.5579	3.9577	1,776.3
0.81	2.6138	4.0442	1,815.2
0.82	2.6704	4.1318	1,854.5
0.83	2.7277	4.2204	1,894.2
0.84	2.7857	4.3101	1,934.5
0.85	2.8444	4.4010	1,975.3
0.86	2.9038	4.4929	2,016.5
0.87	2.9639	4.5859	2,058.3
0.88	3.0247	4.6800	2,100.5
0.89	3.0863	4.7752	2,143.3
0.90	3.1485	4.8715	2,186.5

1) Pipes/channels larger than flume may cause over discharge up to 3% (as noted in chart for upper flow ranges).

2) Flow ranges are based on meter capability, freeboard allowances and flow studies. Points beyond these may perform satisfactorily.

PLASTI-FAB, INC.

30 inch Palmer-Bowlus Flume Free Flow Discharge

Head (feet)	MGD	CFS	GPM
0.91	3.2115	4.9690	2,230.2
0.92	3.2752	5.0675	2,274.5
0.93	3.3396	5.1672	2,319.2
0.94	3.4048	5.2680	2,364.4
0.95	3.4707	5.3700	2,410.2
0.96	3.5373	5.4730	2,456.5
0.97	3.6047	5.5772	2,503.2
0.98	3.6728	5.6826	2,550.5
0.99	3.7416	5.7891	2,598.3
1.00	3.8112	5.8968	2,646.6
1.01	3.8815	6.0055	2,695.5
1.02	3.9525	6.1155	2,744.8
1.03	4.0244	6.2266	2,794.7
1.04	4.0969	6.3389	2,845.1
1.05	4.1702	6.4523	2,896.0
1.06	4.2443	6.5668	2,947.4
1.07	4.3191	6.6826	2,999.3
1.08	4.3946	6.7995	3,051.8
1.09	4.4709	6.9175	3,104.8
1.10	4.5480	7.0367	3,158.3
1.11	4.6258	7.1571	3,212.3
1.12	4.7043	7.2786	3,266.9
1.13	4.7836	7.4013	3,322.0
1.14	4.8637	7.5252	3,377.5
1.15	4.9445	7.6502	3,433.7
1.16	5.0260	7.7764	3,490.3
1.17	5.1083	7.9037	3,547.4
1.18	5.1914	8.0322	3,605.1
1.19	5.2751	8.1618	3,663.3
1.20	5.3597	8.2926	3,722.0
1.21	5.4449	8.4246	3,781.2
1.22	5.5310	8.5577	3,840.9
1.23	5.6177	8.6919	3,901.2
1.24	5.7052	8.8272	3,961.9
1.25	5.7934	8.9637	4,023.2
1.26	5.8823	9.1013	4,085.0
1.27	5.9720	9.2401	4,147.2
1.28	6.0624	9.3799	4,210.0
1.29	6.1535	9.5209	4,273.3
1.30	6.2454	9.6630	4,337.1

Head (feet)	MGD	CFS	GPM
1.31	6.3379	9.8062	4,401.3
1.32	6.4312	9.9505	4,466.1
1.33	6.5251	10.096	4,531.3
1.34	6.6198	10.242	4,597.1
1.35	6.7152	10.390	4,663.3
1.36	6.8112	10.538	4,730.0
1.37	6.9079	10.688	4,797.2
1.38	7.0054	10.839	4,864.8
1.39	7.1035	10.991	4,933.0
1.40	7.2022	11.143	5,001.5
1.41	7.3016	11.297	5,070.6
1.42	7.4017	11.452	5,140.1
1.43	7.5025	11.608	5,210.0
1.44	7.6039	11.765	5,280.5
1.45	7.7059	11.923	5,351.3
1.46	7.8085	12.082	5,422.6
1.47	7.9118	12.241	5,494.3
1.48	8.0157	12.402	5,566.5
1.49	8.1202	12.564	5,639.1
1.50	8.2254	12.727	5,712.1
1.51	8.3311	12.890	5,785.5
1.52	8.4374	13.055	5,859.3
1.53	8.5443	13.220	5,933.5
1.54	8.6517	13.386	6,008.1
1.55	8.7597	13.553	6,083.2
1.56	8.8683	13.721	6,158.6
1.57	8.9774	13.890	6,234.3
1.58	9.0871	14.060	6,310.5
1.59	9.1973	14.230	6,387.0
1.60	9.3080	14.402	6,463.9
1.61	9.4192	14.574	6,541.1
1.62	9.5309	14.747	6,618.7
1.63	9.6431	14.920	6,696.6
1.64	9.7558	15.095	6,774.9
1.65	9.8690	15.270	6,853.5
1.66	9.9826	15.445	6,932.4
1.67	10.097	15.622	7,011.6
1.68	10.211	15.799	7,091.1
1.69	10.326	15.977	7,171.0
1.70	10.442	16.155	7,251.1

1) Pipes/channels larger than flume may cause over discharge up to 3% (as noted in chart for upper flow ranges).

2) Flow ranges are based on meter capability, freeboard allowances and flow studies. Points beyond these may perform satisfactorily.

PLASTI-FAB, INC.

30 inch Palmer-Bowlus Flume Free Flow Discharge

Head (feet)	MGD	CFS	GPM
1.71	10.557	16.335	7,331.5
1.72	10.674	16.514	7,412.2
1.73	10.790	16.695	7,493.1
1.74	10.907	16.875	7,574.4
1.75	11.024	17.057	7,655.9
*For points listed below please see footnote 1.			
1.76	11.142	17.239	7,737.6
1.77	11.260	17.422	7,819.6
1.78	11.379	17.605	7,901.8
1.79	11.497	17.789	7,984.2
1.80	11.616	17.973	8,066.9
1.81	11.736	18.158	8,149.8
1.82	11.855	18.343	8,232.9
1.83	11.975	18.529	8,316.2
1.84	12.096	18.715	8,399.7
1.85	12.216	18.901	8,483.4
1.86	12.337	19.088	8,567.3
1.87	12.458	19.275	8,651.3
1.88	12.579	19.463	8,735.5
1.89	12.701	19.651	8,819.9
1.90	12.822	19.839	8,904.5
1.91	12.944	20.028	8,989.2
1.92	13.067	20.217	9,074.0
1.93	13.189	20.406	9,159.0
1.94	13.312	20.596	9,244.1
1.95	13.434	20.786	9,329.4
1.96	13.557	20.976	9,414.8
1.97	13.680	21.167	9,500.3
1.98	13.804	21.358	9,585.9
1.99	13.927	21.549	9,671.7
2.00	14.051	21.740	9,757.6
2.01	14.175	21.932	9,843.6
2.02	14.299	22.123	9,929.7
2.03	14.423	22.315	10,016
2.04	14.547	22.508	10,102
2.05	14.672	22.700	10,189
2.06	14.796	22.893	10,275
2.07	14.921	23.086	10,362
2.08	15.046	23.279	10,448
2.09	15.171	23.473	10,535
2.10	15.296	23.666	10,622

Head (feet)	MGD	CFS	GPM
2.11	15.421	23.860	10,709
2.12	15.547	24.055	10,796
2.13	15.673	24.249	10,884
2.14	15.798	24.444	10,971
2.15	15.924	24.639	11,059
2.16	16.051	24.834	11,146
2.17	16.177	25.030	11,234
2.18	16.304	25.226	11,322
2.19	16.431	25.422	11,410

1) Pipes/channels larger than flume may cause over discharge up to 3% (as noted in chart for upper flow ranges).

2) Flow ranges are based on meter capability, freeboard allowances and flow studies. Points beyond these may perform satisfactorily.

PLASTI-FAB, INC.

42 inch Palmer-Bowlus Flume Free Flow Discharge

Head (feet)	MGD	CFS	GPM
0.15			
0.16			
0.17			
0.18	0.28731	0.44453	199.52
0.19	0.31498	0.48735	218.74
0.20	0.34342	0.53135	238.46
0.21	0.37261	0.57651	258.75
0.22	0.40254	0.62282	279.54
0.23	0.43321	0.67026	300.84
0.24	0.46462	0.71887	322.65
0.25	0.49675	0.76859	344.97
0.26	0.52961	0.81943	367.79
0.27	0.56319	0.87138	391.10
0.28	0.59748	0.92444	414.92
0.29	0.63247	0.97858	439.22
0.30	0.66817	1.0338	464.01
0.31	0.70457	1.0901	489.28
0.32	0.74166	1.1475	515.04
0.33	0.77944	1.2060	541.28
0.34	0.81791	1.2655	567.99
0.35	0.85705	1.3261	595.18
0.36	0.89688	1.3877	622.83
0.37	0.93738	1.4503	650.95
0.38	0.97854	1.5140	679.54
0.39	1.0204	1.5788	708.60
0.40	1.0629	1.6445	738.11
0.41	1.1060	1.7113	768.08
0.42	1.1499	1.7791	798.51
0.43	1.1943	1.8479	829.40
0.44	1.2395	1.9177	860.74
0.45	1.2852	1.9886	892.53
0.46	1.3317	2.0604	924.77
0.47	1.3787	2.1332	957.46
0.48	1.4265	2.2071	990.60
0.49	1.4748	2.2819	1,024.2
0.50	1.5238	2.3577	1,058.2
0.51	1.5735	2.4345	1,092.7
0.52	1.6238	2.5123	1,127.6
0.53	1.6747	2.5911	1,163.0
0.54	1.7263	2.6709	1,198.8

Head (feet)	MGD	CFS	GPM
0.55	1.7785	2.7517	1,235.0
0.56	1.8313	2.8334	1,271.7
0.57	1.8848	2.9162	1,308.9
0.58	1.9389	2.9999	1,346.4
0.59	1.9936	3.0846	1,384.5
0.60	2.0490	3.1703	1,422.9
0.61	2.1050	3.2569	1,461.8
0.62	2.1617	3.3446	1,501.2
0.63	2.2190	3.4332	1,540.9
0.64	2.2769	3.5229	1,581.2
0.65	2.3355	3.6135	1,621.8
0.66	2.3947	3.7051	1,663.0
0.67	2.4545	3.7977	1,704.5
0.68	2.5150	3.8913	1,746.5
0.69	2.5761	3.9858	1,789.0
0.70	2.6379	4.0814	1,831.9
0.71	2.7003	4.1780	1,875.2
0.72	2.7634	4.2756	1,919.0
0.73	2.8271	4.3741	1,963.3
0.74	2.8914	4.4737	2,007.9
0.75	2.9565	4.5743	2,053.1
0.76	3.0221	4.6759	2,098.7
0.77	3.0885	4.7786	2,144.8
0.78	3.1555	4.8822	2,191.3
0.79	3.2231	4.9869	2,238.3
0.80	3.2914	5.0926	2,285.7
0.81	3.3604	5.1993	2,333.6
0.82	3.4300	5.3071	2,382.0
0.83	3.5004	5.4159	2,430.8
0.84	3.5714	5.5257	2,480.1
0.85	3.6430	5.6366	2,529.9
0.86	3.7154	5.7486	2,580.1
0.87	3.7884	5.8616	2,630.9
0.88	3.8622	5.9757	2,682.1
0.89	3.9366	6.0908	2,733.7
0.90	4.0117	6.2070	2,785.9
0.91	4.0875	6.3243	2,838.6
0.92	4.1640	6.4427	2,891.7
0.93	4.2413	6.5622	2,945.3
0.94	4.3192	6.6828	2,999.4

1) Pipes/channels larger than flume may cause over discharge up to 3% (as noted in chart for upper flow ranges).

2) Flow ranges are based on meter capability, freeboard allowances and flow studies. Points beyond these may perform satisfactorily.

PLASTI-FAB, INC.

42 inch Palmer-Bowlus Flume Free Flow Discharge

Head (feet)	MGD	CFS	GPM
0.95	4.3978	6.8045	3,054.1
0.96	4.4772	6.9273	3,109.2
0.97	4.5573	7.0512	3,164.8
0.98	4.6381	7.1762	3,220.9
0.99	4.7196	7.3023	3,277.5
1.00	4.8019	7.4296	3,334.6
1.01	4.8849	7.5580	3,392.3
1.02	4.9686	7.6876	3,450.4
1.03	5.0531	7.8183	3,509.1
1.04	5.1384	7.9502	3,568.3
1.05	5.2243	8.0832	3,628.0
1.06	5.3111	8.2175	3,688.3
1.07	5.3986	8.3529	3,749.0
1.08	5.4869	8.4894	3,810.3
1.09	5.5759	8.6272	3,872.2
1.10	5.6657	8.7662	3,934.5
1.11	5.7563	8.9063	3,997.4
1.12	5.8477	9.0477	4,060.9
1.13	5.9398	9.1903	4,124.9
1.14	6.0328	9.3341	4,189.4
1.15	6.1265	9.4791	4,254.5
1.16	6.2211	9.6254	4,320.2
1.17	6.3164	9.7730	4,386.4
1.18	6.4126	9.9217	4,453.2
1.19	6.5095	10.072	4,520.5
1.20	6.6073	10.223	4,588.4
1.21	6.7059	10.376	4,656.9
1.22	6.8054	10.529	4,725.9
1.23	6.9056	10.685	4,795.6
1.24	7.0067	10.841	4,865.8
1.25	7.1086	10.999	4,936.5
1.26	7.2114	11.158	5,007.9
1.27	7.3150	11.318	5,079.8
1.28	7.4194	11.480	5,152.4
1.29	7.5247	11.642	5,225.5
1.30	7.6309	11.807	5,299.2
1.31	7.7379	11.972	5,373.5
1.32	7.8458	12.139	5,448.5
1.33	7.9545	12.307	5,524.0
1.34	8.0641	12.477	5,600.1

Head (feet)	MGD	CFS	GPM
1.35	8.1746	12.648	5,676.8
1.36	8.2860	12.820	5,754.1
1.37	8.3982	12.994	5,832.1
1.38	8.5113	13.169	5,910.6
1.39	8.6253	13.345	5,989.8
1.40	8.7402	13.523	6,069.6
1.41	8.8560	13.702	6,150.0
1.42	8.9727	13.883	6,231.0
1.43	9.0902	14.065	6,312.7
1.44	9.2087	14.248	6,394.9
1.45	9.3280	14.433	6,477.8
1.46	9.4483	14.619	6,561.3
1.47	9.5695	14.806	6,645.5
1.48	9.6915	14.995	6,730.2
1.49	9.8145	15.185	6,815.6
1.50	9.9384	15.377	6,901.7
1.51	10.063	15.570	6,988.3
1.52	10.189	15.765	7,075.6
1.53	10.316	15.960	7,163.6
1.54	10.443	16.158	7,252.1
1.55	10.572	16.357	7,341.3
1.56	10.701	16.557	7,431.2
1.57	10.831	16.758	7,521.6
1.58	10.962	16.961	7,612.7
1.59	11.094	17.166	7,704.5
1.60	11.228	17.372	7,796.9
1.61	11.361	17.579	7,889.9
1.62	11.496	17.787	7,983.6
1.63	11.632	17.998	8,077.8
1.64	11.769	18.209	8,172.8
1.65	11.906	18.422	8,268.3
1.66	12.045	18.636	8,364.5
1.67	12.184	18.852	8,461.4
1.68	12.325	19.069	8,558.9
1.69	12.466	19.288	8,657.0
1.70	12.608	19.508	8,755.7
1.71	12.751	19.729	8,855.1
1.72	12.896	19.952	8,955.1
1.73	13.040	20.176	9,055.7
1.74	13.186	20.402	9,156.9

1) Pipes/channels larger than flume may cause over discharge up to 3% (as noted in chart for upper flow ranges).

2) Flow ranges are based on meter capability, free board allowances and flow studies. Points beyond these may perform satisfactorily.

PLASTI-FAB, INC.

42 inch Palmer-Bowlus Flume Free Flow Discharge

Head (feet)	MGD	CFS	GPM
1.75	13.333	20.629	9,258.8
1.76	13.480	20.857	9,361.3
1.77	13.629	21.087	9,464.4
1.78	13.778	21.318	9,568.2
1.79	13.928	21.551	9,672.5
1.80	14.080	21.784	9,777.5
1.81	14.232	22.020	9,883.1
1.82	14.385	22.256	9,989.3
1.83	14.538	22.494	10,096
1.84	14.693	22.733	10,203
1.85	14.849	22.974	10,312
1.86	15.005	23.216	10,420
1.87	15.162	23.459	10,529
1.88	15.320	23.704	10,639
1.89	15.479	23.950	10,749
1.90	15.639	24.197	10,860
1.91	15.800	24.446	10,972
1.92	15.961	24.695	11,084
1.93	16.123	24.947	11,197
1.94	16.286	25.199	11,310
1.95	16.450	25.452	11,424
1.96	16.615	25.707	11,538
1.97	16.781	25.963	11,653
1.98	16.947	26.221	11,769
1.99	17.114	26.479	11,885
2.00	17.282	26.739	12,001
2.01	17.450	27.000	12,118
2.02	17.620	27.262	12,236
2.03	17.790	27.525	12,354
2.04	17.961	27.790	12,473
2.05	18.133	28.055	12,592
2.06	18.305	28.322	12,712
2.07	18.478	28.590	12,832
2.08	18.652	28.859	12,953
2.09	18.826	29.129	13,074
2.10	19.002	29.400	13,196
2.11	19.178	29.672	13,318
2.12	19.354	29.945	13,440
2.13	19.532	30.220	13,564
2.14	19.709	30.495	13,687
2.15	19.888	30.771	13,811

Head (feet)	MGD	CFS	GPM
2.16	20.067	31.049	13,936
2.17	20.247	31.327	14,061
2.18	20.428	31.606	14,186
2.19	20.609	31.887	14,312
2.20	20.791	32.168	14,438
2.21	20.973	32.450	14,565
2.22	21.156	32.733	14,692
2.23	21.339	33.017	14,819
2.24	21.523	33.302	14,947
2.25	21.708	33.587	15,075
2.26	21.893	33.874	15,204
2.27	22.079	34.161	15,333
2.28	22.265	34.449	15,462
2.29	22.452	34.738	15,592
2.30	22.639	35.028	15,722
2.31	22.827	35.319	15,852
2.32	23.015	35.610	15,983
2.33	23.204	35.902	16,114
2.34	23.393	36.195	16,245
2.35	23.583	36.488	16,377
2.36	23.773	36.782	16,509
2.37	23.964	37.077	16,641
2.38	24.155	37.373	16,774
2.39	24.346	37.669	16,907
2.40	24.538	37.966	17,040
2.41	24.730	38.263	17,174
2.42	24.923	38.561	17,308
2.43	25.116	38.860	17,442
2.44	25.309	39.159	17,576
2.45	25.503	39.459	17,711
*For points listed below please see footnote 1.			
2.46	25.697	39.760	17,845
2.47	25.892	40.061	17,980
2.48	26.087	40.362	18,116
2.49	26.282	40.664	18,251
2.50	26.477	40.966	18,387
2.51	26.673	41.269	18,523
2.52	26.869	41.573	18,659
2.53	27.066	41.877	18,796
2.54	27.263	42.181	18,932
2.55	27.460	42.486	19,069

1) Pipes/channels larger than flume may cause over discharge up to 8% (as noted in chart for upper flow ranges).

2) Flow ranges are based on motor capability, freeboard allowances and flow studies. Points beyond these may perform satisfactorily.

PLASTI-FAB, INC.

42 inch Palmer-Bowlus Flume Free Flow Discharge

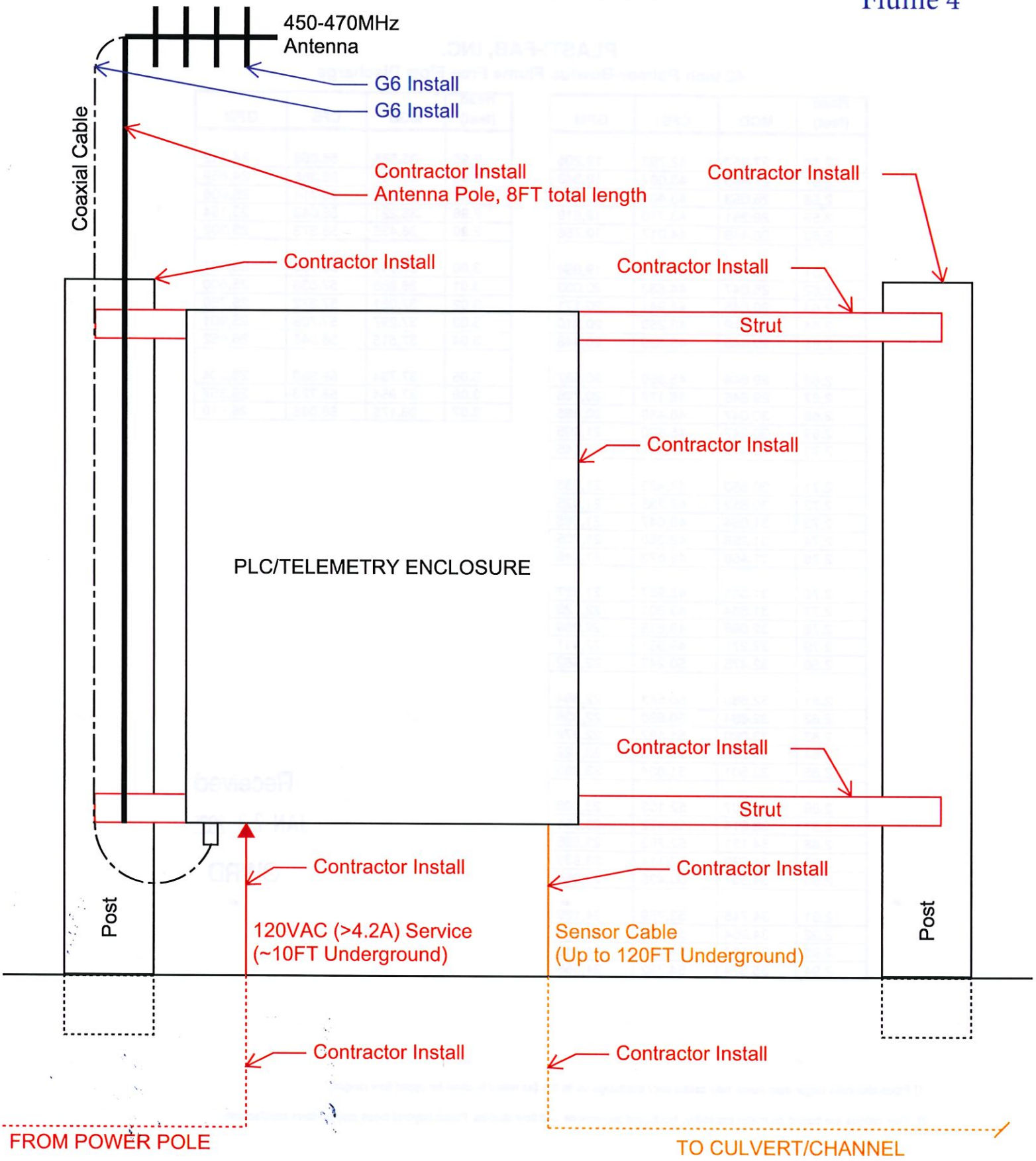
Head (feet)	MGD	CFS	GPM
2.56	27.657	42.793	19,206
2.57	27.855	43.097	19,343
2.58	28.053	43.404	19,481
2.59	28.251	43.710	19,619
2.60	28.449	44.017	19,756
2.61	28.648	44.325	19,894
2.62	28.847	44.633	20,033
2.63	29.046	44.941	20,171
2.64	29.246	45.250	20,310
2.65	29.446	45.559	20,448
2.66	29.646	45.869	20,587
2.67	29.846	46.179	20,726
2.68	30.047	46.489	20,866
2.69	30.247	46.800	21,005
2.70	30.449	47.111	21,145
2.71	30.650	47.423	21,285
2.72	30.852	47.735	21,425
2.73	31.054	48.047	21,565
2.74	31.256	48.360	21,705
2.75	31.458	48.673	21,846
2.76	31.661	48.987	21,987
2.77	31.864	49.301	22,128
2.78	32.068	49.616	22,269
2.79	32.271	49.931	22,411
2.80	32.475	50.247	22,552
2.81	32.680	50.563	22,694
2.82	32.884	50.880	22,836
2.83	33.090	51.197	22,979
2.84	33.295	51.515	23,122
2.85	33.501	51.834	23,265
2.86	33.707	52.153	23,408
2.87	33.914	52.472	23,551
2.88	34.121	52.793	23,695
2.89	34.329	53.114	23,839
2.90	34.537	53.436	23,984
2.91	34.745	53.759	24,129
2.92	34.954	54.082	24,274
2.93	35.164	54.407	24,419
2.94	35.374	54.732	24,565
2.95	35.585	55.058	24,712
2.96	35.797	55.385	24,859
2.97	36.009	55.714	25,006
2.98	36.221	56.043	25,154
2.99	36.435	56.373	25,302
3.00	36.649	56.705	25,451
3.01	36.865	57.038	25,600
3.02	37.081	57.372	25,750
3.03	37.297	57.708	25,901
3.04	37.515	58.045	26,052
3.05	37.734	58.383	26,204
3.06	37.954	58.723	26,357
3.07	38.175	59.065	26,510

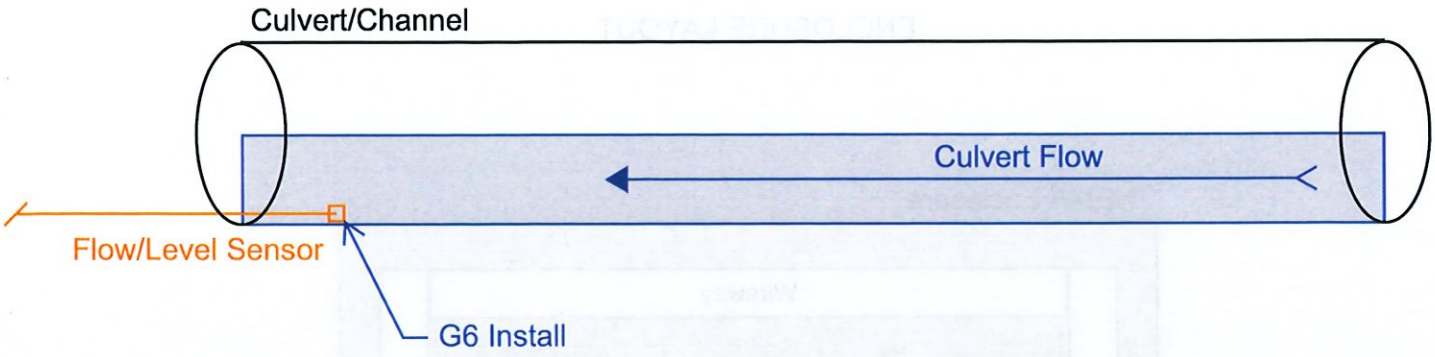
1) Pipes/channels larger than flume may cause over discharge up to 3% (as noted in chart for upper flow ranges).

2) Flow ranges are based on meter capability, freeboard allowances and flow studies. Points beyond these may perform satisfactorily.

SINGLE ENCLOSURE INSTALL

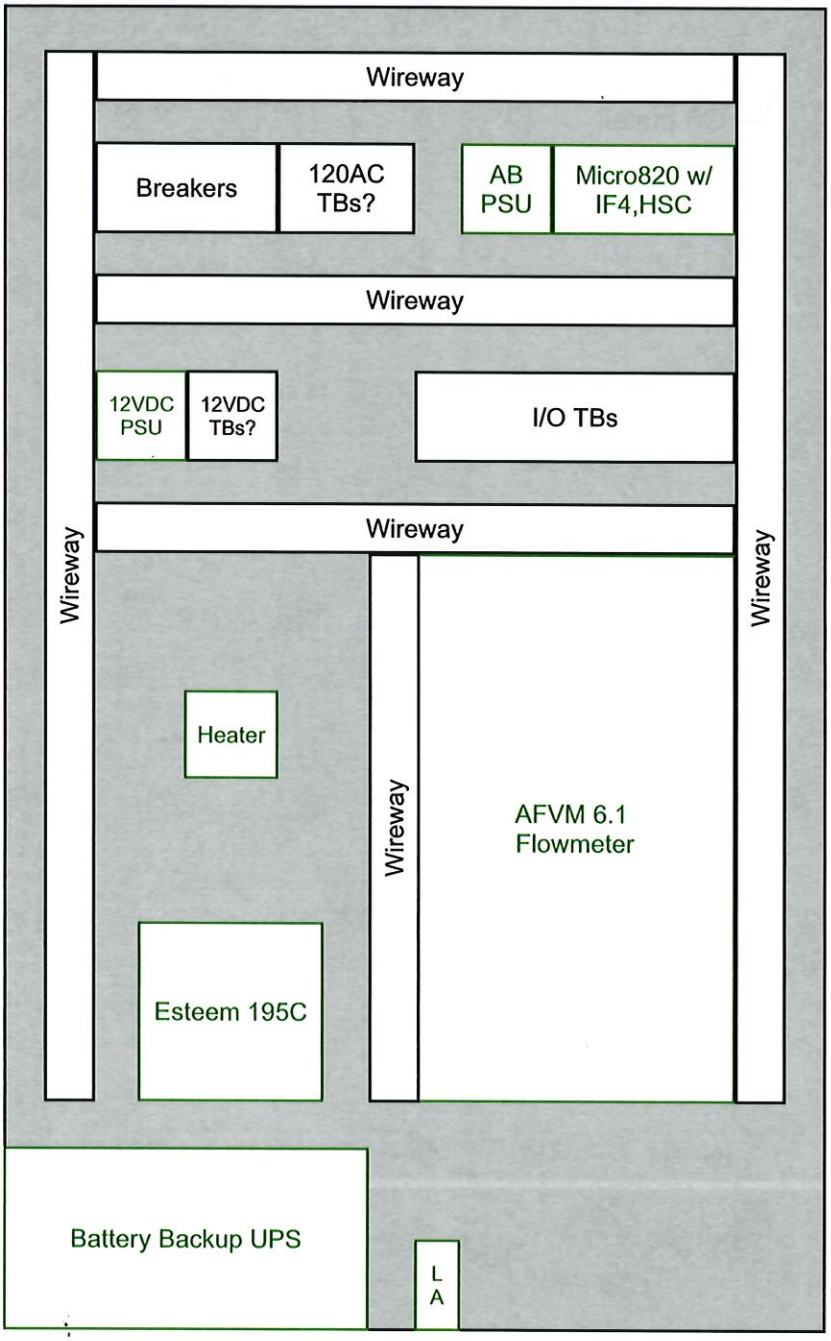
Flume 4





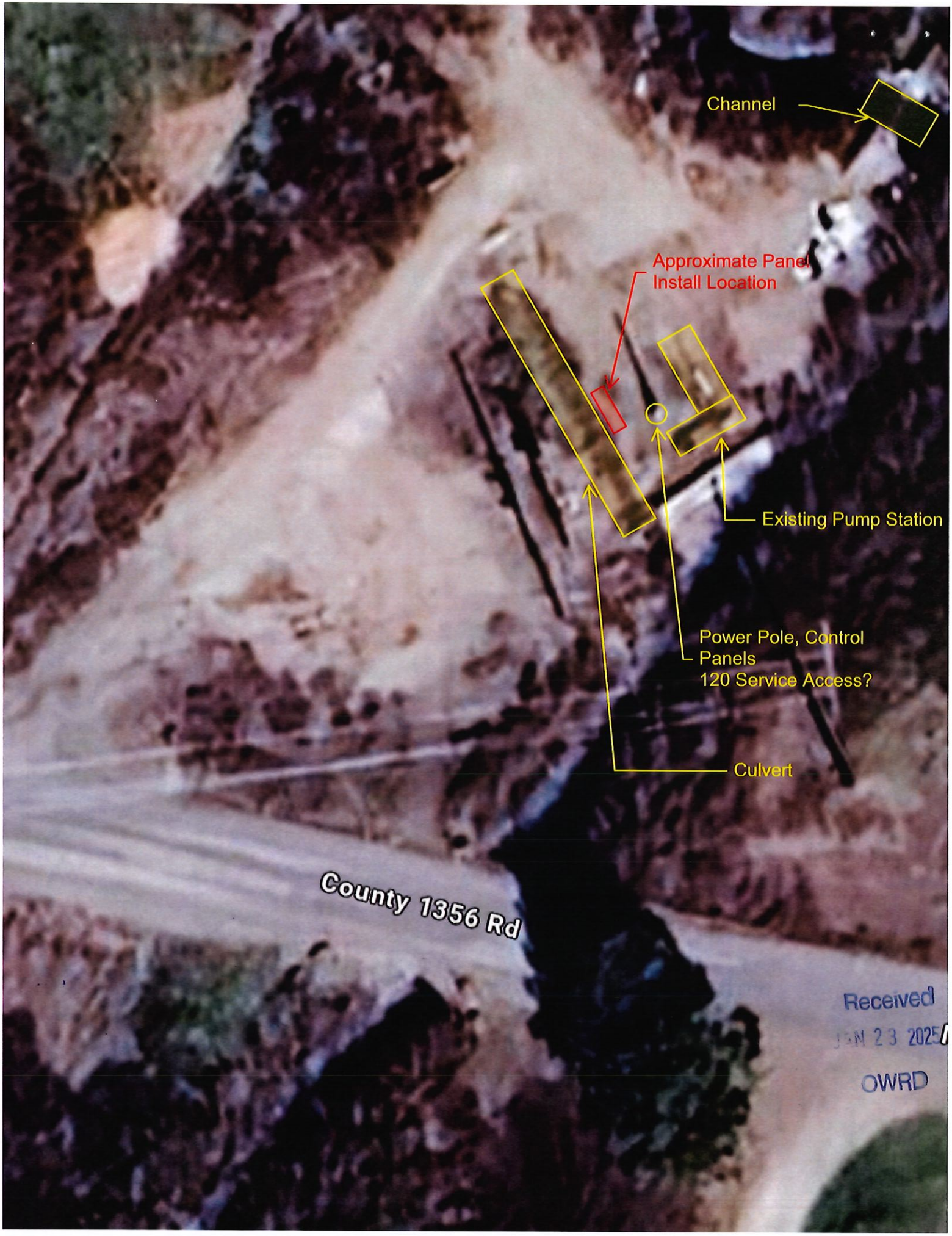
ENCLOSURE LAYOUT

NEMA Enclosure



Notes:
*Esteem Radio - 12VDC @1.54A (4W TX)
*Flowmeter - 120VAC @10VA Max OR 9-30VDC @10W Max
*Heater: 200W required 120AC
*PLC Power: 120VAC @0.7A

Required inbound power: 4.213A @120VAC



APPENDIX B

Butter Creek Historical Water Quality Data

Location	Sample Date & Time	Result	Units	Parameter	Suffix_1	Suffix_2	QA_QC_Type	Class	Data_Quality
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	132	mg/L	Alkalinity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	270	mg/L	Alkalinity	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	<0.010	mg/L	Aluminum	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	0.04	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	0.04	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	0.05	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	0.03	mg/L	Ammonia	Dissolved		Field Duplicate	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	0.04	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	0.04	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	0.06	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	0.31	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	0.02	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	<0.02	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	0.04	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	0.08	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	0.08	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	<0.02	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	0.02	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	0.02	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	0.03	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	0.03	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	0.05	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	0.05	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	0.02	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	0.03	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	0.07	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.05	mg/L	Ammonia	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	3	mg/L	Biochemical Oxygen Demand	5 Day	Un-Diluted	Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	3.9	mg/L	Biochemical Oxygen Demand	5 Day	Un-Diluted	Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.0411	mg/L	Boron	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	53.2	mg/L	Calcium	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	6	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	5	mg/L	Carbon	Total	Organic	Field Duplicate	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	5	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	12	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	6	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	7	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/15/1997 10:43	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	3	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	6	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	6	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	6	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	5	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	5	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	3	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	5	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	5	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	8	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	4	mg/L	Carbon	Total	Organic	Sample	Organic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	25	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	10	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	11	mg/L	Chemical Oxygen Demand			Field Duplicate	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	12	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	16	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	10	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	15	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	14	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/15/1997 10:43	6	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	7	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	6	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	7	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	22	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	14	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	12	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	10	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	15	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	10	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	12	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	21	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	24	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	11	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	9	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	24	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	10	mg/L	Chemical Oxygen Demand			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	13	mg/L	Chloride	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	134	CU	Color			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	20	CU	Color			Sample	Physical	A+

Location	Sample Date & Time	Result	Units	Parameter	Suffix_1	Suffix_2	QA_QC_Type	Class	Data_Quality
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	194	umhos/cm	Conductivity	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	587	umhos/cm	Conductivity	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	645	umhos/cm	Conductivity	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	333	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/15/1997 10:43	597 Est	umhos/cm	Conductivity			Sample	Physical	B
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	632	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	662	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	335	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	425	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	448	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	529	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	436	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	379	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	375	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	259	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	229	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	396	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	559	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	396	umhos/cm	Conductivity			Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	209	mg/L	Hardness	Dissolved	Calculated	Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.0054	mg/L	Iron	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	0.7	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	0.5	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	0.6	mg/L	Kjeldahl Nitrogen	Total		Field Duplicate	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	0.6	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	0.6	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	0.8	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	1	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	1.2	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	0.3	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	0.3	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	0.4	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	1.7	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	0.8	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	0.5	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	0.4	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	0.5	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	0.5	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	0.5	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	1	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	1	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	0.5	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	0.4	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	1.1	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.6	mg/L	Kjeldahl Nitrogen	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	<0.0010	mg/L	Lanthanum	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.0105	mg/L	Lithium	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	18.5	mg/L	Magnesium	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.0205	mg/L	Manganese	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	0.98	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	1.3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	1	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	1	mg/L as N	Nitrate/nitrite	Dissolved		Field Duplicate	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	1.3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	0.94	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	1.1	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	6.3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	3.7	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	3.8	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	4.1	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	1.3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	3.3	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	2.4	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	1.6	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	1.7	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	0.75	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	0.53	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	2.4	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	3.6	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	2	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	4.8	mg/L as N	Nitrate/nitrite	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.105	mg/L as P	Orthophosphate	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	8.3	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	7.9	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	7.3	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	8.5	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	8.1	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	7.1	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/15/1997 10:43	7	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	7.8	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	7.9	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	7.1	SU	pH	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	7.4	SU	pH	Field		Sample	Inorganic	A+

Location	Sample Date & Time	Result	Units	Parameter	Suffix_1	Suffix_2	QA_QC_Type	Class	Data_Quality
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	7.2	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	8.3	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/15/1997 10:43	7.7 Est	SU	pH			Sample	Inorganic	B
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	7.6	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	7.6	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	8.1	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	8.2	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	8.3	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	8.3	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	8.2	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	8.3	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	8.1	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	8	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	8.1	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	8.1	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	7.5	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	8	SU	pH			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	0.22	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	0.05	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	0.13	mg/L as P	Phosphate	Total		Field Duplicate	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	0.13	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	0.09	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	0.13	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	0.19	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	0.2	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10:00	0.12	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	0.12	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	0.2	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	0.54	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	0.35	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	0.16	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	0.13	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	0.15	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	0.14	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	0.16	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	0.39	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	0.32	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	0.13	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	0.12	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	0.3	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	0.14	mg/L as P	Phosphate	Total		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	5.59	mg/L	Potassium	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	64.1	mg/L	Sodium	Dissolved		Sample	Metals	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	410	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	440	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	240	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	280	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	270	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	340	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	290	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	250	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	68	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	190	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	195	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	260	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	370	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	260	mg/L	Solids	Total	Dissolved	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16:15	5	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19:12	12	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8:55	36	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9:35	33	mg/L	Solids	Total	Suspended	Field Duplicate	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10:08	2	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9:27	8	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10:01	47	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	17	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9:18	2	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10:59	18	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9:35	180	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9:52	32 Est	mg/L	Solids	Total	Suspended	Sample	Physical	B
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9:50	22	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9:35	6	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10:00	20	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9:00	41	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9:07	34	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9:10	280	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9:20	206	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9:05	11	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9:35	6	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9:05	65	mg/L	Solids	Total	Suspended	Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14:55	VOID	mg/L	Solids	Total	Suspended	Sample	Physical	C

Location	Sample Date & Time	Result	Units	Parameter	Suffix_1	Suffix_2	QA_QC_Type	Class	Data_Quality
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16.15	170	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19.12	240	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8.55	230	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9.35	270	mg/L	Solids	Total		Field Duplicate	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10.08	250	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9.27	280	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10.01	300	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	490	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9.18	410	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10.59	450	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9.35	460	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9.52	350	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9.50	320 Est	mg/L	Solids	Total		Sample	Physical	B
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9.35	370	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10.00	300	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9.00	290	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9.07	100	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9.10	480	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9.20	390	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9.05	280	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9.35	390	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9.05	340	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14.55	460	mg/L	Solids	Total		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14.55	38	mg/L	Sulfate	Dissolved		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16.15	17.3	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19.12	13.5	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9.35	12	°C	Temperature	Field		Field Duplicate	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8.55	11	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10.08	15.3	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9.27	14.5	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10.01	16.3	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	17.6	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/15/1997 10.43	11.2	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10.00	8.2	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9.18	11.9	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10.59	10	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9.35	4.7	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9.52	8.7	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9.50	5.9	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9.35	7.4	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10.00	8.3	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9.00	5.7	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9.07	7.7	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9.10	7.2	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9.20	10.4	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9.05	8.3	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9.35	9.6	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9.05	7.9	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14.55	16.5	°C	Temperature	Field		Sample	Physical	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9.27	NOT	NTU	Turbidity	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10.01	NOT	NTU	Turbidity	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/27/1998 14.55	2.7	NTU	Turbidity	Field		Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	8/12/1996 16.15	20	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/9/1997 19.12	9	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 8.55	14	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/23/1997 9.35	12	NTU	Turbidity			Field Duplicate	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/7/1997 10.08	4	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	5/21/1997 9.27	3	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/4/1997 10.01	19	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	6/18/1997 14:11	6	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/22/1997 10.00	4	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	12/29/1997 9.18	3	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/5/1998 10.59	6	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/20/1998 9.35	143	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	1/27/1998 9.52	33	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/10/1998 9.50	15	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/17/1998 9.35	7	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	2/24/1998 10.00	12	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/3/1998 9.00	27	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/10/1998 9.07	27	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/17/1998 9.10	98	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/23/1998 9.20	97	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	3/31/1998 9.05	15	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/6/1998 9.35	4	NTU	Turbidity			Sample	Inorganic	A+
Butter Creek @ Madison Bridge Off Hwy. 207	4/14/1998 9.05	41	NTU	Turbidity			Sample	Inorganic	A+

APPENDIX C

Approved Water Quality Monitoring Program (with Proposed Updates)

Madison Ranches, Inc.

Madison Ranches Artificial Recharge and Aquifer Storage and Recovery – Monitoring Plan

February 19, 2024

Revised November 20, 2024

MADISON RANCHES INC

Prepared by:
GSI Water Solutions, Inc.
650 NE Holladay Street, Suite 900, Portland, OR 97232

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Abbreviations and Acronyms

AR	artificial groundwater recharge
ASR	aquifer storage and recovery
cfs	cubic feet per second
CRBG	Columbia River Basalt Group
DEQ	Department of Environmental Quality
gpm	gallons per minute
LL	limited license
Madison	Madison Ranches, Inc.
mg/l	milligrams per liter
OHA-DWS	Oregon Health Authority Drinking Water Services
OWRD	Oregon Water Resources Department
SAY	sustainable aquifer yield
SOC	Synthetic organic compound
VOC	Volatile organic compound

Introduction

Madison Ranches, Inc. (Madison) is a 17,000-acre agricultural farm in eastern Oregon. After extreme water level declines were observed in the Columbia River basalt aquifer, the Oregon Water Resources Department (OWRD) curtailed groundwater use by designating the Butter Creek Critical Groundwater Area in 1990. Madison's supply from the Columbia River Basalt Group (CRBG) was limited by the sustainable aquifer yield (SAY) determined by OWRD. Madison now employs two managed aquifer recharge technologies to meet irrigation supply needs—aquifer storage and recovery (ASR) in the CRBG aquifer and artificial groundwater recharge (AR) in the shallow alluvial aquifer. Madison's ASR and AR operations have been authorized under limited water use licenses (LL) including the most recent:

1. AR Recharge LL-1926 authorized use of water diverted from Butter Creek for artificial groundwater recharge. A new AR Recharge LL ~~basis~~ being submitted concurrently with this Monitoring Plan Update ~~been submitted in October 2024~~.
2. Annual AR Recovery limited licenses, which authorize the use of the recharged water under AR limited licenses (currently LL-1926) for irrigation.
3. ASR LL-020 authorizes use of alluvial groundwater for ASR testing in the CRBG aquifer. The source water diversion rate is authorized by a combination of existing Madison water right certificates, totaling 925 gallons per minute (gpm), and the limited license authorizing use of artificially recharged water. ASR LL-020 was renewed for 5 years in March 2018. A renewal application was submitted to Oregon Water Resources Department (OWRD) in September 2022 and is currently under review.

This Monitoring Plan (Plan) is being submitted to OWRD to provide a succinct plan that incorporates monitoring activities associated with all aspects of the Madison Ranches AR and ASR programs, including proposed modifications and expansions detailed Table 1~~.~~

Table 1. Proposed Modifications and Expansions to the Madison AR-ASR System

Modification/ Expansion	Existing Basin Area (acres)	Proposed Expansion (acres)	Proposed Total Basin Area (acres)	Comment
North Basin	-	19.4	19.4	New basin
Field 95	9.2	44.3	53.5	Increase in basin area
Butter Creek Diversion 2 and Flume 4	-	-	-	Includes new flume and new conveyance
MW-3	-	-	-	New downgradient shallow alluvial well
Collector Wells 2 and 3	-	-	-	New collector wells
ASR Well 2				New ASR well

The proposed expansion of the AR-ASR system is expected to be completed in sequential phases. These phases are described in Table 2.

Table 2 Phased Expansion of AR-ASR

Phase No.	Description	Anticipated Timeline for System Integration
1	Drill MW-3 and collect baseline water quality samples	Winter 2024-2025
2	Begin recharge in the new Field 95 expansion	Winter 2024-2025
3	Drill Collector Well 2	Winter 2026-2027
4	Drill ASR Well 2	Winter 2026-2027
5	Construct North Basin and associated Butter Creek Diversion 2 and Flume 4	Winter 2026-2027
6	Drill Collector Well 3	Winter 2026-2027

Definitions of Water Types and Project Wells

The following definitions are used throughout the Plan to indicate which part of the AR and/or ASR system is being referenced:

- **AR Source Water.** Surface water from Butter Creek, which infiltrates to the shallow alluvial aquifer.
- **AR Recovery Water.** Water pumped from the Windmill well for either ASR injection or irrigation.
- **ASR Source Water.** Water pumped from the Windmill well for ASR injection.
- **ASR Recovery Water.** Water pumped from the ASR Well for irrigation.

The following wells are part of the AR/ASR Monitoring System (see Figure 1):

Table 3 AR-and ASR Well Details

Well Name	Well ID	Role in AR/ASR System
Windmill Well (Collector Well 1)	UMAT 57869	AR Collector Well
		AR Recovery Water
		Irrigation Water/ASR Source Water
		Upgradient AR Shallow Monitoring Well for the North Basin
ASR Well 1 (Deep Well)	UMAT 1166	ASR Well
		ASR Recovery Water
ASR Well 2	Not yet drilled	ASR Well
~~Domestic~~ Basalt Well	UMAT 57117	ASR Observation Well
MW-1	UMAT 56964	Downgradient AR Shallow Monitoring Well for the Field 95 Expansion and Existing recharge basins
MW-2 ~~(Upgradient)~~	UMAT 56963	Upgradient AR Shallow Monitoring Well for the Field 95 Expansion and Existing recharge basins
~~MW-1 (Downgradient)~~	~~UMAT 56964~~	~~AR Shallow Monitoring Well~~

MW-3	Not yet drilled	Downgradient AR Shallow Monitoring Well for the North Basin
Collector Well 2	Not yet drilled	AR Collector Well
Collector Well 3	UMAT 54823	~~Upgradient AR Shallow Monitoring Well for the North Basin~~Recovery Well for the North Basin

Overall Project Description

The Madison AR project involves diverting winter/spring stream flows from Butter Creek to a series of recharge basins on the Madison property through surface canals. Water infiltrates through the basins (approximately 18 acres) and recharges the shallow alluvial aquifer. Drain tiles installed beneath several fields deliver water to ~~a~~ Ccollector Wwell 1 (Windmill Well). AR water is recovered from the Windmill Well and either sent to the ASR well, or to Madison's irrigation system, depending on irrigation needs. Water that is delivered to the ASR well flows past a continuous nitrate meter, and is chlorinated prior to being injected in the deep basalt well (ASR Well 1). Figure 1 shows diversion, conveyance, and recharge elements of the Madison AR project, and Figure 2 provides a schematic of the system.

Authorizations

Madison has diverted water from Butter Creek for shallow AR groundwater recharge each year since 2002, authorized under the following limited licenses:

- LL-764 from 2002 to 2006
- LL-952 from 2006 to 2009
- LL-1193 from 2009 to 2012
- LL-1442 from 2013 to 2016
- LL-1628 from 2016 to 2021
- LL-1926 from 2023 to 2028

LL-1926 authorized diversion of water from Butter Creek for AR testing at Madison's recharge basins at rates up to 25 cubic feet per second (cfs) during periods when there is adequate flow in Butter Creek to satisfy all existing water rights, and is further limited to times when the Butter Creek Distribution Plan is not in effect.

Artificially recharged water has been recovered each year since 2012, authorized by the following AR recovery limited licenses:

- LL-1424 in 2012
- LL-1452 in 2013
- LL-1510 in 2014
- LL-1553 in 2015
- LL-1615 in 2016
- LL-1684 in 2017
- LL-1717 in 2018
- LL-1772 in 2019
- LL-1927 in 2023
- LL-1963 in 2024

LL-192763 authorized recovery of up to 85 percent of the volume of water recharged in 201924; any portion of the recoverable volume remaining at the end of the recovery period is relinquished and does not carry over to the next year.

ASR pilot testing was initiated at Madison Farms in March 2006 and has been authorized by the following limited licenses:

- LL-007 from 2003 to 2008
- LL-014 from 2008 to 2012
- LL-020 from 2013 to 20235

The source water for the ASR Program comes from Madison's collector Collector wellWell 1, with diversion authorized under:

- Certificate 75107 for 1.25 cfs or 561 gpm
- Certificate 83692 for 0.33 cfs or 148 gpm
- Certificate 83693 for 0.2 cfs or 90 gpm
- Transfer T-11414 for 0.28 cfs or 126 gpm
- Madison's AR recovery limited license (LL-192763 in 20234) for diversion rates in excess of 925 gpm (the total of the four water rights listed above)

ASR LL-020 authorizes recovery of up to 98 percent of the running storage volume and allows maximum injection and recovery rates of 6,000 gpm and a maximum storage volume of 1.65 billion gallons (5,049 acre-feet).

AR and ASR Monitoring

The following sections describe the proposed monitoring to be completed under the AR and ASR limited licenses for Madison.

Flow Rate and Volume Monitoring

The AR and ASR limited licenses require monitoring the flow rates and volumes of water used each season. Surface water diverted from Butter Creek is recorded at the diversion flume and at the entrance to each recharge basin using ultrasonic flow meters, which are connected to Madison's telemetry system, allowing for real-time monitoring and data archiving. The ASR program injection and pumping is recorded using totalizing flowmeters. The following locations (as shown on Figure 1) and types of data collection are included in the monitoring network:

- Butter Creek diversion (flume; rate, which is used to calculate volume); monitored at each of the two Butter Creek diversions (Flume 1; Flume 4)
- At the entrances to the northern recharge basins located in Township 3 North, Range 28 East, Section 36 (AR Recharge) (fFlume 2; rate, which is used to calculate volume)
- At the entrance to the southern recharge basin (Field 95 Recharge) (Fflume 3; rate, which is used to calculate volume)
- At the entrance to the northern recharge basin (Flume 4; rate, which is used to calculate volume)
- Windmill Well (totalizing flowmeter; rate and volume)
- ASR Well 1 (totalizing flowmeter; rate and volume)

The telemetry system records the above data and produces a report daily, which is provided to OWRD.

Water Level Monitoring

Water level data will be collected at the Windmill Well, ASR Well 1, and at ~~three~~ four observation wells (~~UMAT 57177, UMAT 56963 and UMAT 56964~~Basalt Well, MW-1, MW-2, and MW-3) to assess the hydraulic response of the basalt aquifer to pilot testing at the ASR ~~well~~Well 1, and to monitor the response of the alluvial aquifer to AR activities. Currently, OWRD provides field staff and instruments to monitor the observation wells. Dedicated pressure transducers and loggers will collect continuous water level data from the Windmill Well and ASR Well 1. Water level data will be provided to OWRD as part of the combined AR/ASR annual reports. Electronic water level data will also be provided to OWRD on an annual basis.

The following table provides details regarding the water level monitoring program.

Well Name	OWRD Well Log	Well Tag L-	Well Type/Use	Latitude	Longitude	Frequency of Measurement*	Monitoring Season	Method
ASR Well 1	UMAT 1166, 5430, 55174	65435	ASR/ Irrigation	45.7049	-119.3771	30-minute	Year-round	Transducer
~~Observation~~ Basalt Well	UMAT 57117	106775	Domestic/ Observation (ASR)	45.7099	-119.3759	Daily	Year-round	Transducer
Collector Well 1/ Windmill Well	UMAT 57869	NA	AR/ Irrigation	45.6995	-119.3671	30-minute	Year-round	Transducer
~~UMAT 56963~~MW-2	UMAT 56963	108663	Shallow AR obs well (upgradient)	45.6828	-119.3838	Hourly	Year-round	Transducer
~~UMAT 56964~~MW-1	UMAT 56964	108662	Shallow AR obs well (down-gradient)	45.7118	-119.3626	Hourly	Year-round	Transducer
MW-3	NA (not yet drilled)	NA (not yet drilled)	Shallow AR obs well (down-gradient)	N/A	N/A	Hourly	Year-round	Transducer

Notes

*Frequency reflects transducer settings; each well is measured manually on a quarterly basis with a calibrated E-tape. OWRD collects manual measurements at all wells except UMAT 1166.

ASR = aquifer storage and recovery

AR = artificial recharge

NA = not applicable

obs = observation

OWRD = Oregon Water Resources Department

Water Quality Monitoring

Water quality data will be collected to assess receiving water (native groundwater/ASR stored water), source water, and recovery water during AR and ASR pilot testing. Water quality data will be collected from Butter Creek, the Windmill Well, the ASR Well 1, and ~~two~~ three observation wells (UMAT 56963, ~~and~~ UMAT 56964, and MW-3). The existing sampling locations are shown on Figures 1 and 2. Table 1 shows the timing and location of water quality samples and a monitoring schedule is included in Attachment A.

Prior to injection, ASR source water is chlorinated to prevent potential borehole clogging issues associated with microorganisms (to date, the well has not been impacted by microbial issues).

Samples collected during AR/ASR pilot testing will be tested for field parameters (pH, conductivity, temperature, and oxygen-reducing potential). In addition to field parameters, the following analytes, or classes of analytes (refer to Appendix A), will be analyzed by an accredited analytical laboratory:

- Nitrate
- Geochemical
- Disinfection by-products (DBPs)
- Metals
- Bacteriological
- Radionuclides
- Miscellaneous chemistry parameters (color, odor, etc.)
- Regulated synthetic organic compounds (SOCs)
- Regulated volatile organic compounds (VOCs)
- Site-specific pesticides

A complete list of the water quality testing parameters and associated method detection limits, as well as the sampling frequency of these analytes, is included in Attachment A. Water quality sampling events associated with the ASR/AR program occur as follows:

1. ~~prior~~ Prior to ASR recharge (within a month of initiating ASR recharge) at the ASR Well 1 and Windmill Well~~s~~,
2. A~~a~~t the beginning of ASR recharge (two weekly nitrate samples of ASR source water/Windmill Well),
3. ~~monthly~~ Monthly (nitrate samples of ASR source water/Windmill Well), and
4. I~~i~~n the middle of the ASR recharge cycle (from Butter Creek, Windmill Well, and ~~both~~ all three alluvial monitoring wells).

Expanded System Water Quality Monitoring

North Basin: Prior to recharging water to the North Basin, baseline water quality samples will be collected and analyzed from UMAT 54823 (Collector Well 3) and MW-3. One sample will be collected in January, and one sample will be collected in April, to evaluate seasonal trends in the receiving aquifer. The samples will be analyzed for nitrate and coliform. Currently, the alluvial monitoring wells are only sampled for coliform (as requested by OWRD and DEQ in 2016); nitrate is added as an analyte to evaluate background concentrations prior to recharging surface water.

Expansion of Field 95: With the added acreage at the Field 95 basin, OHA requested Microparticulate Analysis (MPA) sampling be conducted prior to recharging recovered water to the new ASR well (ASR 2).

These samples will be collected from the water line that will ultimately recharge ASR 2, to evaluate the potential for connection with surface water. MPA sampling will occur when Collector Well 2 has been constructed and water has been applied to the expanded Field 95 basin. Results of the MPA sampling will be submitted to OHA.

GSI developed a Quality Assurance and Quality Control (QA/QC) plan for Madison and McCarty Ranch prior to initiating ASR pilot testing (GSI, 2002). A slightly modified version of this document will continue to be used during AR/ASR pilot testing, and is included in Attachment B.

Nitrate Monitoring

In addition to the sampling events listed in the section above, ASR source water is monitored continuously just prior to injection into the ASR ~~well~~Well 1 by a HACH "NITRATAX™ clear sc UV Nitrate Sensor". The meter is located in a shed at the ASR ~~well~~Well 1, where the ASR pump controls are housed (Figure 2). The nitrate concentrations are transmitted through Madison's SCADA system, and are included on the daily graphs transmitted daily to OWRD and other parties. The meter will be professionally serviced twice a year (prior to ASR recharge and within a month of beginning ASR recharge). The meter will be field-calibrated on a monthly basis, unless laboratory samples show that the meter needs more frequent calibration (see below).

Laboratory samples will be used to verify the nitrate meter readings using the following schedule:

- The first week of ASR recharge
- The second week of ASR recharge
- Monthly to verify nitrate meter readings for the first two months of ASR recharge
    - If the laboratory samples verify the meter readings (i.e. the meter reading is within minus 0.33 or plus 1.01 mg/L of the laboratory sample), the nitrate meter can be field-calibrated on a monthly basis
    - If the laboratory samples are outside of the meter readings (i.e., the reading is outside of -0.33 to +1.01 mg/L of the laboratory sample), the meter will be field-calibrated on a weekly basis

If the meter reads 7mg/L or higher over a 24-hour average of 10-minute readings (midnight to midnight), weekly laboratory samples will be submitted (with rush status; less than one-week turn around) until nitrate meter readings drop below 7 mg/L.

If the meter reads 9.5 mg/L or higher over a 24-hour average of 10-minute readings (midnight to midnight), injection will stop until analytical samples and the continuous nitrate meter show concentrations below 9.25 mg/L, and the Department of Environmental Quality (DEQ) and the Oregon Health Authority Drinking Water Services (OHA-DWS) concur.

When ASR 2 is brought online, the same nitrate monitoring schedule will be followed for the new well.

Reporting, Compliance, and Communication

Madison will submit a combined AR/ASR Annual Report each year by April 15th. This report will include the information required by the three limited licenses (AR recharge, AR recovery, and ASR) for each AR/ASR cycle, including period of recharge, rate of recharge, volume of recharge, water level monitoring and water quality monitoring.

Madison will adhere to this Plan, notwithstanding factors that are out of reasonable control (i.e., broken instruments, SCADA malfunctions, etc.). In the event that one of the required monitoring parameters cannot

be collected, Madison will communicate with OWRD to notify the appropriate staff of the issue, and to provide a solution and timeline for rectifying the problem.

References and Sources Consulted

GSI. 2002. Water Sampling QA/QC Control Plan, Madison and McCarty ASR Testing Program. Groundwater Solutions, Inc. September 2002.

GSI. 2012. Madison Farms Aquifer Storage and Recovery (ASR) Limited License Application Supplemental Information and Testing Plan. October 8, 2012.

GSI. 2013. Response to OWRD, DEQ, and OHA-DWP Comments on Madison Farms Aquifer Storage and Recovery (ASR) Limited License Application. January 25, 2013.

GSI. 2016. Madison Ranches Artificial Groundwater Recharge Hydrologic Feasibility Report and Project Description Report. January 29, 2016.

GSI. 2016. Madison Ranches Limited License Application for Artificial Recharge – Addendum to revise water quality monitoring plan. March 29, 2016.

GSI. 2018. Madison Ranches request for a 5-year renewal of ASR Limited License #20: Addendum to revise water quality monitoring plan. March 8, 2018.

Tables

Table 1. Madison Ranches AR/ASR Water Quality Sampling Schedule (Expanded System)

Water Quality Monitoring Schedule Item #	Event	AR/ASR Event Timing																				
		Prior to ASR Recharge (1 to 4 weeks before recharge)	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Week 19	Week 20
1a	ASR 1 and ASR 2 testing for nitrate	X																				
1b	Coliform sampling at Collector Wells 1 and 2	X																				
2a	Professional Service & Calibration - Nitrate Meter (Both ASR Wells)	X					X															
2b*^	Nitrate lab samples to verify meter readings (Both ASR Wells)		X	X																		
2c*	Monthly nitrate lab samples for meter calibration verification (Both ASR Wells)						X				X				X				X			X
2cii	Monthly meter calibration - field (Both ASR Wells)						X				X				X				X			X
2ciii	*Weekly meter calibration (if needed)*							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	Middle of Recharge Sampling (8 Samples: 3 collector wells, 3 monitoring wells, and 2 Butter Creek locations)						X															
Action				compare Week 1 lab result to Week 1 meter reading	compare Week 2 lab result to Week 2 meter reading			compare Week 5 lab result to Week 5 meter reading														

Notes:
Deep Well: ASR Well (ASR Recovered Water)
Collector Well: Windmill Well (AR Recovered Water/ASR Source Water)
Field parameters are collected with each sample
* Nitrate verification samples to be submitted with rush status (less than one-week turnaround)
^ If the meter reads 7 mg/L or higher (for a 24-hour average of 10 mintute readings), collect weekly laboratory samples until the nitrate meter readings drop below 7 mg/L.

Figures

LEGEND

- Diversion
- Well
- Flume
- AR Conveyance Line

System Type

- Existing
- Proposed

All Other Features

- New Basin
- Basin
- Field 95
- Major Road
- Watercourse

Date: November 19, 2024
Data Sources: BLM, ESRI, ODOT, USGS, Imagery (2022)

Received
JAN 23 2025
OWRD

FIGURE 1

AR-ASR Overview

Madison Ranches

N

0 725 1,450 2,175
FEET

GSI Water Solutions, Inc.

Document Path: Y:\0136_MadisonMcCarty_ASR\Source_Figures\039_2025_ASR_Reporting\003_AR_Application\Figure1_AR-ASR_Overview.aprx, Figure1_AR-ASR_Overview, bramos

FIGURE 2
Madison Ranches AR/ASR System Schematic
Madison Ranches

1.

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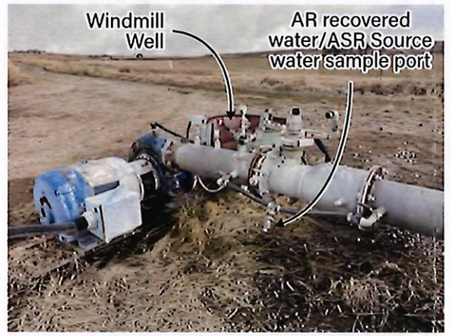

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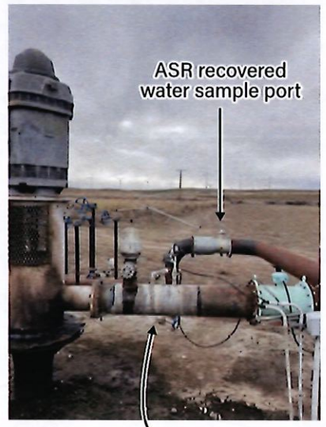
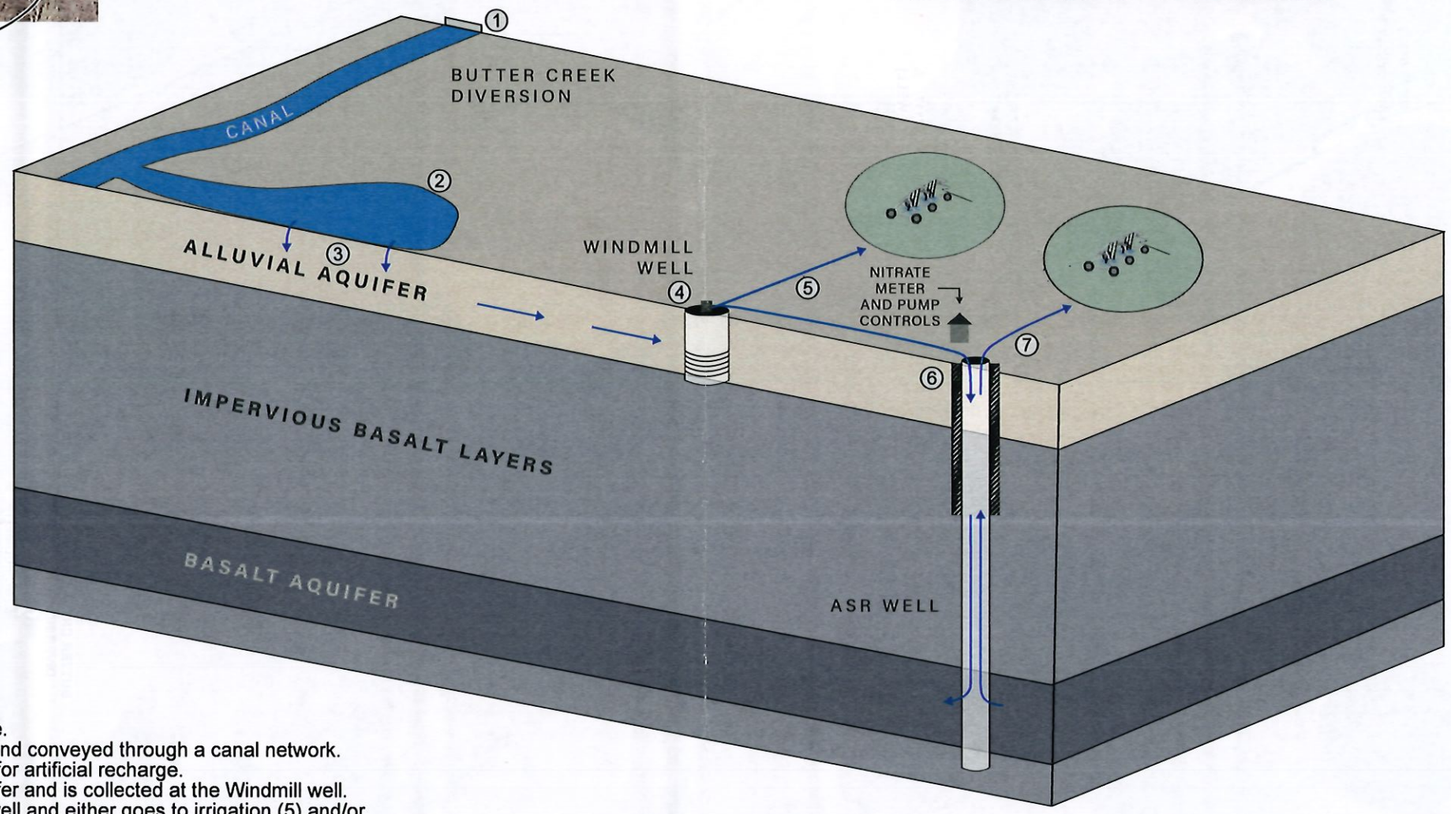




NOTES

* Well diagram conceptual, not to scale.
1. Water is diverted from Butter Creek and conveyed through a canal network.
2. Water is applied to infiltration basins for artificial recharge.
3. Water infiltrates into the shallow aquifer and is collected at the Windmill well.
4. Water is pumped from the Windmill well and either goes to irrigation (5) and/or the ASR well (6), depending on irrigation needs.
7. Water is recovered from the ASR well and used for irrigation.

GSI Water Solutions, Inc.

Y:\0136_MadisonMcCarty_ASR\Source_Figures\037_2023_ASR_Reporting

APPENDIX A

Water Quality Monitoring Schedule

Madison ASR/AR Combined Water Quality Monitoring Schedule

Definitions:
Deep Well – ASR Well (UMAT 1166): ASR Recovered Water
Windmill Well – Collector Well (UMAT 57869): AR Recovered Water and ASR Source Water
ASR 2 – New ASR well to be constructed
Collector Well 2 – New well to be constructed to recovery AR water at Field 95
Collector Well 3 – UMAT 54823 (North Basin recovery well)

1. Prior to recharge (Within a month of beginning ASR Recharge) (ASR Requirement) – **1 event, ~~2~~ 4 samples:**
   Field parameters are required.
   a. Deep well and ASR 2:
      Nitrate
      i. If nitrate is detected above 5mg/L in the receiving water sample (groundwater), a confirmation sample will be collected and analyzed for a limited list of geochemical parameters to verify the nitrate result and to look for any indication that reactions other than mixing are occurring in the aquifer.
      ii. If the nitrate result is verified, OWRD will be notified, and an approach will be proposed to investigate the change in water quality.
   b. Windmill Well and Collector Well 2
      Total/Fecal Coliform (See attached coliform procedure for positive results)

2. Nitrate monitoring during recharge (ASR and AR requirements) – **at least ~~3~~ 6 sample events/~~3~~ 6 lab samples:**
   Field parameters are required.
   a. Calibrate the meter (Professional service) prior to ASR recharge (ideally one week prior to recharge; within a month of recharge at most) and mid-way (5 weeks) into ASR recharge.
   b. **Lab samples to verify meter readings – At least 2 events:**
      Nitrate only (rush status for laboratory; less than one-week turn around)
      i. First week of Recharge: Source water at ~~the~~ each meter
      ii. Second week of Recharge: Source water at ~~the~~ each meter
         1. If the meter reads 7 mg/L or higher (for a 24-hour average of 10-minute readings; average is calculated based on readings from midnight to midnight each day ASR recharge occurs), collect weekly laboratory samples until nitrate meter readings drop below 7 mg/L.
         2. If the meter reading (observed at the time the raw water sample was collected) is outside of the lab result minus 0.33 or plus 1.01 mg/L for 2 weeks in a row, correct the meter.
         3. If the meter reading (observed at the time the raw water sample was collected) is outside the range above, and the lab result is greater than 8.5 mg/L, stop injection until the meter is corrected.
   c. **Monthly lab samples to verify nitrate meter calibration (field calibrate every month)**
      i. First **two months** of ASR recharge to verify nitrate meter readings at each ASR well. **Week 1 sample (2.b.i)** and a sample collected at **Week 5** will be compared to the nitrate meter reading at the time of the raw water sample.

ii. If laboratory samples verify meter readings (i.e., the meter reading is within minus 0.33 or plus 1.01 mg/L of the laboratory sample), continue monthly field calibration.

iii. If laboratory samples show drift in nitrate meter (i.e., the meter reading is outside of the lab result minus 0.33 or plus 1.01 mg/L), switch to weekly field calibration.

d. If ~~the~~ a meter reads 9.5 mg/L or higher over a 24-hour average of 10-minute readings (midnight to midnight), injection will stop at that ASR well until analytical samples and the continuous nitrate meter show concentrations below 9.25 mg/L, and the Department of Environmental Quality (DEQ) and the Oregon Health Authority Drinking Water Services (OHA-DWS) concur.

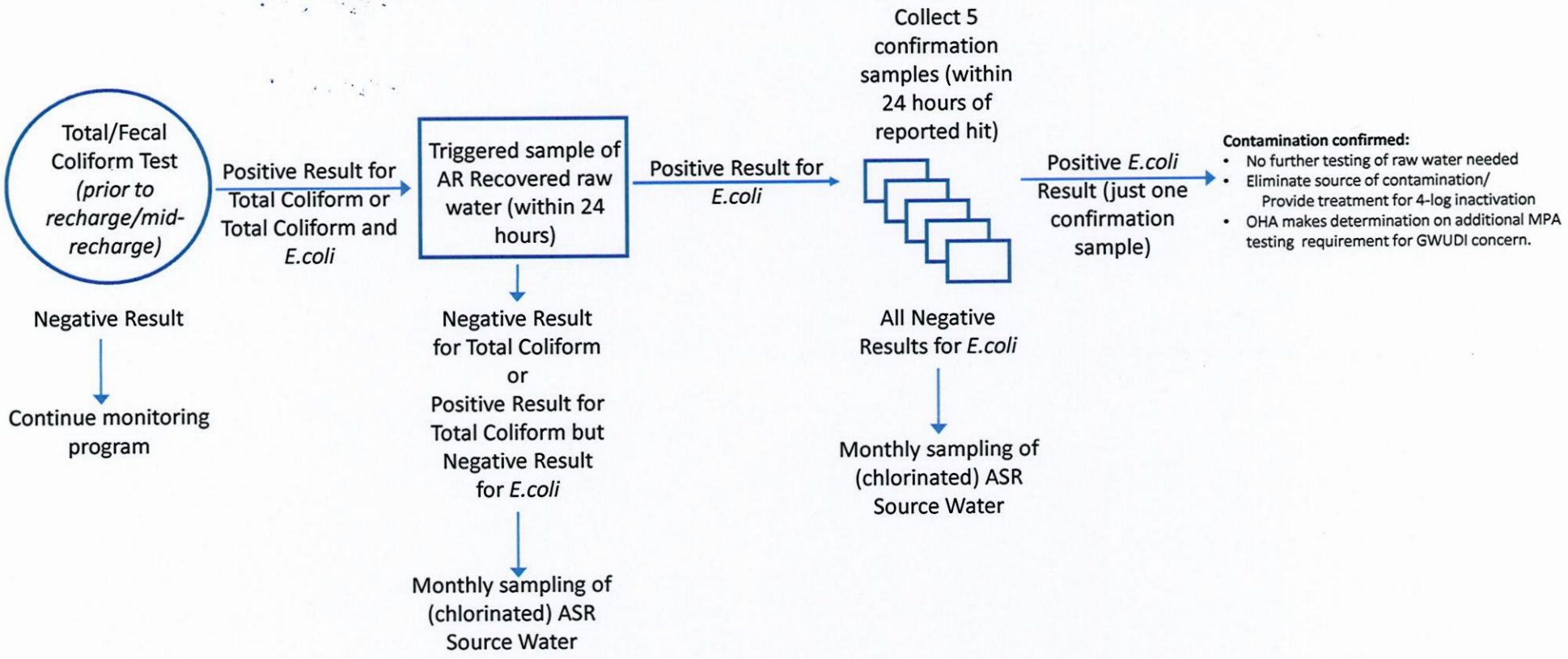
3. Middle of Recharge (5 weeks after start-up, or end of recharge if less than 5 weeks; ASR and AR requirements) – **1 event, ~~4~~ 8 samples:**
Field parameters are required for every sample.
   a. Windmill well (ASR and AR Requirement)
   Nitrate/Nitrite, Total/Fecal Coliforms, long list (B1 or B2)(See attachment for positive coliform results)
      i. Table B1 most years: 2023, 2025, 2026, 2028, 2029...
      ii. Table B2 every three years: 2024, 2027, 2030 ...
   b. Collector Well 2 (ASR and AR Requirement)
   Nitrate/Nitrite, Total/Fecal Coliforms, long list (B1 or B2)(See attachment for positive coliform results)
      i. Table B1 most years: 2023, 2025, 2026, 2028, 2029...
      ii. Table B2 every three years: 2024, 2027, 2030 ...
   c. Collector Well 3 (AR Requirement)
   Nitrate/Nitrite, Total/Fecal Coliforms,
   ~~b.~~d. Monitoring well UMAT 56963 (upgradient) (AR Requirement)
   Total/Fecal Coliforms
   e. Monitoring well UMAT 56964 (downgradient) (AR Requirement)
   Total/Fecal Coliforms
   ~~c.~~f. MW-3 (downgradient) (AR Requirement)
   Total/Fecal Coliforms
   g. Butter Creek diversion 1 (AR Requirement)
   Total/Fecal Coliforms
   ~~d.~~h. Butter Creek diversion 2 (AR Requirement)
   Total/Fecal Coliforms

Current (2024) laboratories to utilize (Oregon certified laboratory shall be used, if the laboratories listed below are not available):
Nitrate and total/fecal coliform: Kuo
All others: Anatek

Coliform Sampling Requirements

1. For coliform sampling (AR Recoverd Water/ASR Source Water prior to ASR recharge and mid-way through ASR recharge): a positive hit requires a raw water sample (collected prior to chlorination).
    a. If the raw water sample is positive for E. Coli, collect 5 confirmation samples (at the same time), within 24 hours of the positive result.
        i. If E.Coli is present in one or more of the confirmation sample, the well and surounding area shold be inspected for temporary fecal contaminant sources that could be removed and/or addressed (such as a rat nest in the wellhouse or a determination that the wellhead casing is not water-tight and is then repaired). If a fecal contaminant source or contaminant source pathway is removed, bacteria sampling would continue in the same manner as if total coliform had been confirmed. If the presence of E.coli is confirmed in the source water and there is no temporary fecal contaminant source present that can be addressed, to meet drinking water standards, OHA would require disinfection of the source water to meet 4-log inactivation of viruses and that a review be conducted to determine if additional monitoring for groundwater under the direct influence of surface water should also occur, and/or the need for increased treatment to occur prior to ASR injection.
        ii. If all five samples are negative for E. Coli, collect monthly coliform samples (of chlorinated ASR Source Water).
    b. If the raw water sample is negative for total coliform, or positive for total coliform but negative for E.Coli, collect monthly coliform samples (of chlorinated ASR Source Water).

Coliform sampling procedure for ASR – Madison Ranches, Inc.



Appendix A - Madison AR/ASR Combined Water Quality Monitoring Schedule

Item No.	Sample Type[1]	Timeline	Location(s)	Required for ASR and/or AR	If detection occurs
Prior to Recharge					
1	Nitrate	Within a month of beginning ASR Recharge	Deep Well	ASR	(1) If nitrate is detected above 5mg/L, a confirmation sample will be collected and analyzed for a limited list of geochemical parameters to verity the nitrate result and to look for any indication that reactions other than mixing are occurring in the aquifer. (2) If the nitrate result is verified, OWRD will be notified, and an approach will be proposed to investigate the change in water quality.
2	Total/Fecal Coliform	Within a month of beginning ASR Recharge	Windmill Well	ASR	See attached coliform procedure for positive results
3	Calibrate the nitrate meter (Professional service)	prior to ASR recharge (ideally one week prior to recharge; within a month of recharge at most)	Nitrate meter (at ASR wells)	AR and ASR	NA
During Recharge					
4	Professional service calibrate the nitrate meter	mid-way (5 weeks) into ASR recharge	Nitrate meter (at ASR wells)	AR and ASR	NA
5	Field calibrate the nitrate meter	Monthly	Nitrate meter (at ASR wells)	AR and ASR	NA
6	Nitrate lab sample[2]	First week of ASR recharge Second week of ASR recharge	Source water at the nitrate meter	AR and ASR	(1) If the meter reads 7 mg/L or higher (for a 24-hour average of 10-minute readings; average is calculated based on readings from midnight to midnight each day ASR recharge occurs), collect weekly laboratory samples until nitrate meter readings drop below 7 mg/L. (2) If the meter reading (observed at the time the raw water sample was collected) is outside of the lab result minus 0.33 or plus 1.01 mg/L for 2 weeks in a row, correct the meter. (3) If the meter reading (observed at the time the raw water sample was collected) is outside the range above, and the lab result is greater than 8.5 mg/L, stop injection until the meter is corrected.
	Nitrate lab sample[3]	Week 1 sample Week 5 sample	Source water at the nitrate meter	AR and ASR	(1) If laboratory samples verify meter readings (i.e., the meter reading is within minus 0.33 or plus 1.01 mg/L of the laboratory sample), continue monthly field calibration. (2) If laboratory samples show drift in nitrate meter (i.e., the meter reading is outside of the lab result minus 0.33 or plus 1.01 mg/L), switch to weekly field calibration.
7	Continuous nitrate monitoring	Daily	Nitrate meter	AR and ASR	If the meter reads 9.5 mg/L or higher over a 24-hour average of 10-minute readings (midnight to midnight), injection will stop until analytical samples and the continuous nitrate meter show concentrations below 9.25 mg/L, and the Department of Environmental Quality (DEQ) and the Oregon Health Authority Drinking Water Services (OHA-DWS) concur.
8	Nitrate/Nitrite, Total/Fecal Coliforms, long list (B1 or B2)[4]	Middle of ASR recharge	Windmill Well	AR and ASR	See attachment for positive coliform results
9	Total/Fecal Coliforms	Middle of ASR recharge	MW-2 MW-1 Butter Creek diversion 1	AR	

Definitions

Deep Well – ASR Well (UMAT 1166): ASR Recovered Water

Windmill Well – Collector Well (UMAT 57869): AR Recovered Water and ASR Source Water

MW-1 – UMAT 56964

MW-2 – UMAT 56963

Notes

[1]Field Parameters also collected at the time of every sampling event

[2]Nitrate Lab sample collected to verify nitrate meter reading
Rush status for laboratory- less than 1-week turnaround

[3]Nitrate lab sample to verify nitrate meter calibration

[4] Table B1 most years (i.e. 2023, 2025, 2026, 2028, 2029...)
Table B2 every three years (i.e. 2024, 2027, 2030 ...)

ASR = aquifer storage and recovery

AR = artificial recharge

NA = not applicable

OWRD = Oregon Water Resources Department

Appendix A - Madison AR/ASR Combined Water Quality Monitoring Schedule - Expanded System

Item No.	Sample Type[1]	Timeline	Location(s)	Required for ASR and/or AR	If detection occurs
Prior to Recharge					
1	Nitrate	Within a month of beginning ASR Recharge	Deep Well and ASR 2	ASR	(1) If nitrate is detected above 5mg/L, a confirmation sample will be collected and analyzed for a limited list of geochemical parameters to verity the nitrate result and to look for any indication that reactions other than mixing are occurring in the aquifer. (2) If the nitrate result is verified, OWRD will be notified, and an approach will be proposed to investigate the change in water quality.
2	Total/Fecal Coliform	Within a month of beginning ASR Recharge	Windmill Well and Collector Well 2	ASR	See attached coliform procedure for positive results
3	Calibrate the nitrate meter (Professional service)	prior to ASR recharge (ideally one week prior to recharge; within a month of recharge at most)	Nitrate meter (at ASR wells)	AR and ASR	NA
During Recharge					
4	Professional service calibrate the nitrate meter	mid-way (5 weeks) into ASR recharge	Nitrate meter (at ASR wells)	AR and ASR	NA
5	Field calibrate the nitrate meter	Monthly	Nitrate meter (at ASR wells)	AR and ASR	NA
6	Nitrate lab sample[2]	First week of ASR recharge Second week of ASR recharge	Source water at each nitrate meter	AR and ASR	(1) If a meter reads 7 mg/L or higher (for a 24-hour average of 10-minute readings; average is calculated based on readings from midnight to midnight each day ASR recharge occurs), collect weekly laboratory samples until nitrate meter readings drop below 7 mg/L. (2) If a meter reading (observed at the time the raw water sample was collected) is outside of the lab result minus 0.33 or plus 1.01 mg/L for 2 weeks in a row, correct the meter. (3) If a meter reading (observed at the time the raw water sample was collected) is outside the range above, and the lab result is greater than 8.5 mg/L, stop injection until the meter is corrected.
	Nitrate lab sample[3]	Week 1 sample Week 5 sample	Source water at each nitrate meter	AR and ASR	(1) If laboratory samples verify meter readings (i.e., the meter reading is within minus 0.33 or plus 1.01 mg/L of the laboratory sample), continue monthly field calibration. (2) If laboratory samples show drift in nitrate meter (i.e., the meter reading is outside of the lab result minus 0.33 or plus 1.01 mg/L), switch to weekly field calibration.
7	Continuous nitrate monitoring	Daily	Nitrate meter	AR and ASR	If a meter reads 9.5 mg/L or higher over a 24-hour average of 10-minute readings (midnight to midnight), injection will stop at that ASR well until analytical samples and the continuous nitrate meter show concentrations below 9.25 mg/L, and the Department of Environmental Quality (DEQ) and the Oregon Health Authority Drinking Water Services (OHA-DWS) concur.
8	Nitrate/Nitrite, Total/Fecal Coliforms, long list (B1 or B2)[4]	Middle of ASR recharge	Collector Well 2 Windmill Well	AR and ASR	See attachment for positive coliform results
9	Nitrate/Nitrite and Total/Fecal Coliforms	Middle of ASR recharge	Collector Well 3	AR	(Irrigation water only)
10	Total/Fecal Coliforms	Middle of ASR recharge	MW-1 MW-2 MW-3 Butter Creek diversion 1 Butter Creek diversion 2	AR	

Definitions

Deep Well – ASR Well (UMAT 1166): ASR Recovered Water
Windmill Well – Collector Well 1 (UMAT 57869): AR Recovered Water and ASR Source Water
MW-1 – UMAT 56964
MW-2 – UMAT 56963
ASR 2 – New ASR well to be constructed
Collector Well 2 – New well to be constructed to recover AR water at Field 95
Collector Well 3 – UMAT 54823 (North Basin recovery well)
MW-3 – North Basin downgradient well, to be constructed

Notes

[1]Field Parameters also collected at the time of every sampling event

[2]Nitrate Lab sample collected to verify nitrate meter reading
Rush status for laboratory- less than 1-week turnaround

[3]Nitrate lab sample to verify nitrate meter calibration

[4]Table B1 most years (i.e. 2023, 2025, 2026, 2028, 2029...)
Table B2 every three years (i.e. 2024, 2027, 2030 ...)

ASR = aquifer storage and recovery

AR = artificial recharge

NA = not applicable

OWRD = Oregon Water Resources Department

Table B1. Analyte List for Yearly Sampling ASR
Source Water Quality Monitoring - Collector Wells (2022, 2023, 2025, 2026, ...)
Madison Ranches

	Analyte	Units	MDL
Field Parameters	Temperature	Celsius	NA
	Conductivity	mS/cm	NA
	pH	Units	NA
	Chlorine	mg/L	NA
	ORP	mV	NA
Bacteriological	Fecal Coliform/E.Coli		
	Total Coliform	CFU/100 ml	
Disinfection By-Products	Chloroform (Trichloromethane)	mg/L	0.0005
	Bromodichloromethane	mg/L	0.0005
	Dibromochloromethane	mg/L	0.0005
	Bromoform (Tribromomethane)	mg/L	0.0005
	Total Trihalomethanes	mg/L	--
	Monochloroacetic Acid	mg/L	0.002
	Dichloroacetic Acid	mg/L	0.001
	Trichloroacetic Acid	mg/L	0.001
	Monobromoacetic Acid	mg/L	0.001
	Dibromoacetic Acid	mg/L	0.001
	Total Haloacetic Acids	mg/L	
Geochemical	Bicarbonate	mg/L	2
	Calcium	mg/L	0.1
	Carbonate	mg/L	2
	Chloride	mg/L	1
	Hardness (as CaCO3)	mg/L	4
	Magnesium	mg/L	0.05
	Nitrate as N	mg/L	0.5
	Nitrite as N	mg/L	0.01
	Total Nitrate-Nitrite	mg/L	--
	Potassium	mg/L	0.1
	Silica	mg/L	0.2
	Sodium	mg/L	0.05
	Sulfate	mg/L	5
	Total Alkalinity	mg/L	2
	Total Dissolved Solids	mg/L	0.7
	Total Organic Carbon	mg/L	0.5
	Total Suspended Solids	mg/L	2
Metals	Aluminum	mg/L	0.05
	Antimony	mg/L	0.001
	Arsenic	mg/L	0.002
	Barium	mg/L	0.05
	Beryllium	mg/L	0.0005
	Cadmium	mg/L	0.001
	Chromium	mg/L	0.002
	Copper	mg/L	0.005
	Iron (Total)	mg/L	0.05
	Iron (Dissolved)	mg/L	0.05

	Analyte	Units	MDL
Metals	Lead	mg/L	0.001
	Manganese (Total)	mg/L	0.002
	Manganese (Dissolved)	mg/L	0.002
	Mercury	mg/L	0.0004
	Nickel	mg/L	0.004
	Selenium	mg/L	0.002
	Silver	mg/L	0.005
	Thallium	mg/L	0.0006
	Zinc	mg/L	0.01
Miscellaneous	Odor	TON	1 ton
	Color	ACU	5 color units
	Methylene Blue Active Substance	mg/L	0.05
	Corrosivity (Langelier Saturation Index)	mg/L	--
	Cyanide (as free cyanide)	mg/l	
	Fluoride	mg/L	0.5
Radionuclides	Combined Radium 226/228	pCi/L	
	Uranium	mg/L	
	Gross Alpha	pCi/L	1.79
	Gross Beta	pCi/L	2.83

Notes:
MDL = Method Detection Limit
NA = Not Applicable
Samples are unfiltered unless noted (i.e., dissolved)

Table B2. Expanded Analyte List for 3-Year Sampling
ASR Source Water Quality Monitoring - Collector Wells (2024, 2027, 2030...)
Madison Ranches

	Analyte	Units	MDL
Field Parameters	Temperature	Celsius	NA
	Conductivity	mS/cm	NA
	pH	Units	NA
	Chlorine	mg/L	NA
	ORP	mV	NA
Bacteriological	Fecal Coliform/E.Coli		
	Total Coliform	CFU/100 ml	
Disinfection By-Products	Chloroform (Trichloromethane)	mg/L	0.0005
	Bromodichloromethane	mg/L	0.0005
	Dibromochloromethane	mg/L	0.0005
	Bromoform (Tribromomethane)	mg/L	0.0005
	Total Trihalomethanes	mg/L	--
	Monochloroacetic Acid	mg/L	0.002
	Dichloroacetic Acid	mg/L	0.001
	Trichloroacetic Acid	mg/L	0.001
	Monobromoacetic Acid	mg/L	0.001
	Dibromoacetic Acid	mg/L	0.001
	Total Haloacetic Acids	mg/L	
Geochemical	Bicarbonate	mg/L	2
	Calcium	mg/L	0.1
	Carbonate	mg/L	2
	Chloride	mg/L	1
	Hardness (as CaCO3)	mg/L	4
	Magnesium	mg/L	0.05
	Nitrate as N	mg/L	0.5
	Nitrite as N	mg/L	0.01
	Total Nitrate-Nitrite	mg/L	--
	Potassium	mg/L	0.1
	Silica	mg/L	0.2
	Sodium	mg/L	0.05
	Sulfate	mg/L	5
	Total Alkalinity	mg/L	2
	Total Dissolved Solids	mg/L	0.7
	Total Organic Carbon	mg/L	0.5
	Total Suspended Solids	mg/L	2
Metals	Aluminum	mg/L	0.05
	Antimony	mg/L	0.001
	Arsenic	mg/L	0.002
	Barium	mg/L	0.05
	Beryllium	mg/L	0.0005
	Cadmium	mg/L	0.001
	Chromium	mg/L	0.002
	Copper	mg/L	0.005
	Iron (Total)	mg/L	0.05
	Iron (Dissolved)	mg/L	0.05

	Analyte	Units	MDL
Metals	Lead	mg/L	0.001
	Manganese (Total)	mg/L	0.002
	Manganese (Dissolved)	mg/L	0.002
	Mercury	mg/L	0.0004
	Nickel	mg/L	0.004
	Selenium	mg/L	0.002
	Silver	mg/L	0.005
	Thallium	mg/L	0.0006
	Zinc	mg/L	0.01
Miscellaneous	Odor	TON	1 ton
	Color	ACU	5 color units
	Methylene Blue Active Substance	mg/L	0.05
	Corrosivity (Langelier Saturation Index)	mg/L	--
	Cyanide (as free cyanide)	mg/l	
	Fluoride	mg/L	0.5
Radionuclides	Combined Radium 226/228	pCi/L	
	Uranium	mg/L	
	Gross Alpha	pCi/L	1.79
	Gross Beta	pCi/L	2.83
Regulated Synthetic Organic Compounds	2,4,5-TP (Silvex)	mg/L	0.0004
	2,4-D	mg/L	0.0002
	Alachlor (Lasso)	mg/L	0.0004
	Atrazine	mg/L	0.0002
	Benzo(a)Pyrene	mg/L	0.00004
	BHC-gamma (Lindane)	mg/L	0.00002
	Carbofuran	mg/L	0.001
	Chlordane	mg/L	0.0004
	Dalapon	mg/L	0.002
	Di(2-ethylhexyl)adipate *(adipates)*	mg/L	0.001
	Di(2-ethylhexyl)phthalate *(phthalates)*	mg/L	0.001
	Dibromochloropropane (DBCP)	mg/L	0.00002
	Dinoseb	mg/L	0.0004
	Diquat	mg/L	0.0004
	Ethylene Dibromide (EDB)	mg/L	0.00001
	Endothall	mg/L	0.01
	Endrin	mg/L	0.00002
	Glyphosate	mg/L	0.01
	Heptachlor	mg/L	0.00004
	Heptachlor Epoxide	mg/L	0.00002
	Hexachlorobenzene (HCB)	mg/L	0.0001
	Hexachlorocyclopentadiene	mg/L	0.0002
	Methoxychlor	mg/L	0.0002
	Polychlorinated Biphenyls (PCBs)	mg/L	0.0002
	Pentachlorophenol	mg/L	0.00008
	Picloram	mg/L	0.0002
	Simazine	mg/L	0.0001
	Toxaphene	mg/L	0.001
	Vydate (Oxamyl)	mg/L	0.002

	Analyte	Units	MDL
Regulated Volatile Organic Compounds	1,1,1-Trichloroethane	mg/L	0.0005
	1,1,2-Trichloroethane	mg/L	0.0005
	1,1-Dichloroethylene	mg/L	0.0005
	1,2,4-Trichlorobenzene	mg/L	0.0005
	1,2-Dichlorobenzene (o)	mg/L	0.0005
	1,2-Dichloroethane (EDC)	mg/L	0.0005
	1,2-Dichloropropane	mg/L	0.0005
	1,4-Dichlorobenzene (p)	mg/L	0.0005
	Benzene	mg/L	0.0005
	Carbon Tetrachloride	mg/L	0.0005
	Chlorobenzene	mg/L	0.0005
	cis-1,2-Dichloroethylene	mg/L	0.0005
	Ethylbenzene	mg/L	0.0005
	Dichloromethane (methylene chloride)	mg/L	0.0005
	Styrene	mg/L	0.0005
	Tetrachloroethylene	mg/L	0.0005
	Toluene	mg/L	0.0005
	trans-1,2-Dichloroethylene	mg/L	0.0005
	Trichloroethylene	mg/L	0.0005
	Vinyl chloride	mg/L	0.0005
	Total Xylenes	mg/L	0.0005
Selected Additional Site-Specific Pesticides	Kerb	mg/L	
	Sinbar	mg/L	
	Bromoxynil	mg/L	
	MCPA	mg/L	

Notes:
MDL = Method Detection Limit
NA = Not Applicable
Samples are unfiltered unless noted (i.e., dissolved)

APPENDIX B

Quality Assurance and Quality Control Plan

Madison Farms Artificial Recharge and Aquifer Storage and Recovery – Quality Assurance and Quality Control Plan

Introduction

This quality assurance and quality control (QA/QC) plan describes water sampling QA/QC procedures that will be performed during sample collection for Madison Farm's ASR program. The purpose of the QA/QC plan is to obtain water quality data that are valid representations of the water quality at each sampling location. IRZ staff will collect the water quality data with guidance from GSI Water Solutions, Inc. (GSI) staff. GSI will review field and laboratory data for completeness and compliance with this plan.

Field QA/QC

QA/QC procedures that will be used in the field during the AR/ASR program include field equipment calibration, field record keeping, and chain-of custody documentation. No duplicate samples will be collected in the field. If lab testing results indicate that a parameter has an unexpectedly high concentration approaching the MCL or MML, injection or pumping will be stopped and the location will be resampled as soon as possible. Each element of the Field QA/QC is described below.

Field Equipment Calibration

Field meters require calibration to ensure accurate and precise measurement of field parameters. The field meters will be calibrated prior to each sampling event and subsequently operated in a manner consistent with the manufacture's recommendations.

Field Record Keeping

The sampling technician will record field observations and measurements on a Water Sampling Field Form during sampling. IRZ will provide field sampling forms. The following information will be recorded on the form for each sampling point:

- Time of day and date
- Name of person performing the sampling
- Location of sampling point
- Field parameter values (pH, temperature, and conductivity) collected during sampling
- Appearance of sample
- Thermal and chemical preservation (if any)

*If groundwater samples are collected from wells, the following additional information will be recorded on the form (as available):

- Depth to groundwater
- Field parameter values collected during purging intervals
- Purging time and volume of water purged

Sample Labels

A sample label will be secured to each water sample container. The following information will be included on the sample labels:

- Project location
- Sample number (e.g., well ID# and date)
- Name of person collecting the sample
- Date and time of sample collection
- Type of preservative (if any)

Chain-of-Custody

A chain-of-custody form will be used to track possession of each sample and document the requested analyses. The following procedure will be used regarding chain-of-custody records.

1. After collecting the samples, the sampling technician will complete the chain-of-custody form.
2. The chain-of-custody record will accompany the samples from the field to the laboratory.
3. Each individual having samples in his/her custody must ensure that the samples are not tampered with and that the chain-of-custody record is completed upon sample transfer.
4. A copy of the completed forms will be retained in the project files.

Laboratory Quality Assurance Program

Samples collected during the AR/ASR pilot testing program will be analyzed by an analytical laboratory certified by the Oregon Environmental Laboratory Accreditation Program (OREALAP).

The analytical laboratory will use trip blanks, method blanks, spikes, duplicates, surrogates, and control samples in each analytical batch containing the Madison Farms samples being analyzed or at a frequency of at least one in every 20 samples, depending upon the analysis being performed. The results from these procedures will accompany the sample test results. A copy of the analytical laboratory's quality assurance manual is available upon request.

APPENDIX D

Well Logs

UMAT 56963

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

01-06-2012

WELL LABEL # L 108663

START CARD # 1015655

(1) LAND OWNER

Owner Well I.D. MW-2

First Name KENT Last Name MADISON

Company

Address 29299 MADISON RD

City ECHO State OR Zip 97822

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion ☐ Alteration (repair/recondition) ☐ Abandonment

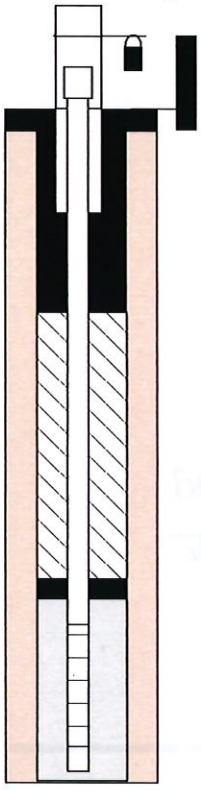
(3) DRILL METHOD

☐ Rotary Air ☒ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☐ Other

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 25 ft. Special Standard ☐



MONUMENT/VAULT Above Ground From 0 To 1

BORE HOLE Diameter 10 From 0 To 25.5

CASING Dia. 2 From 0 To 25 Gauge SCH40 Wld ☐ Thrd ☒ Material ◯ Steel ◉ Plastic

LINER Dia. From To Gauge Wld ☐ Thrd ☐ Material ◯ Steel ◯ Plastic

SEAL From 1 To 8 Material Bentonite Chips Amount 6.00 S Grout weight

SCREEN Casing/Liner Casing Material PVC Diameter 2 From 10 To 25 Slot Size .010

FILTER From 8 To 25 Material SCCS Size of pack 10/20

(5) WELL TESTS

◯ Pump ◯ Bailer ◯ Air ◯ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 56 °F Lab analysis ☐ Yes By

Supervising Geologist/Engineer

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Umatilla Twp 3.00 N N/S Range 28.00 E E/W WM

Sec 30 NE 1/4 of the SW 1/4 Tax Lot 330

Tax Map Number Lot

Lat ° ' " or DMS or DD

Long ° ' " or DMS or DD

◉ Street address of well ◯ Nearest address

28800 MADISON RD, ECHO OR

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well				

WATER BEARING ZONES Flowing Artesian? ☐ Dry Hole? ☐ Depth water was first found

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

Ground Elevation

Material	From	To
SAND	0	13
SAND AND GRAVEL	13	25

Received JAN 23 2025 OWRD

Date Started 12-28-2012 Completed 12-28-2012

(unbonded) Monitor Well Constructor Certification

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

License Number 10357 Date 01-06-2012

Electronically Submitted

Signed TERRENCE JACQUES (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10357 Date 01-06-2012

Electronically Submitted

Signed TERRENCE JACQUES (E-filed)

Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Map of well

Major Drilling Env. Project No. 339 990

Oregon Water Resources Department (OWRD) requires completion of a Geotechnical Hole Report if any of the following apply:

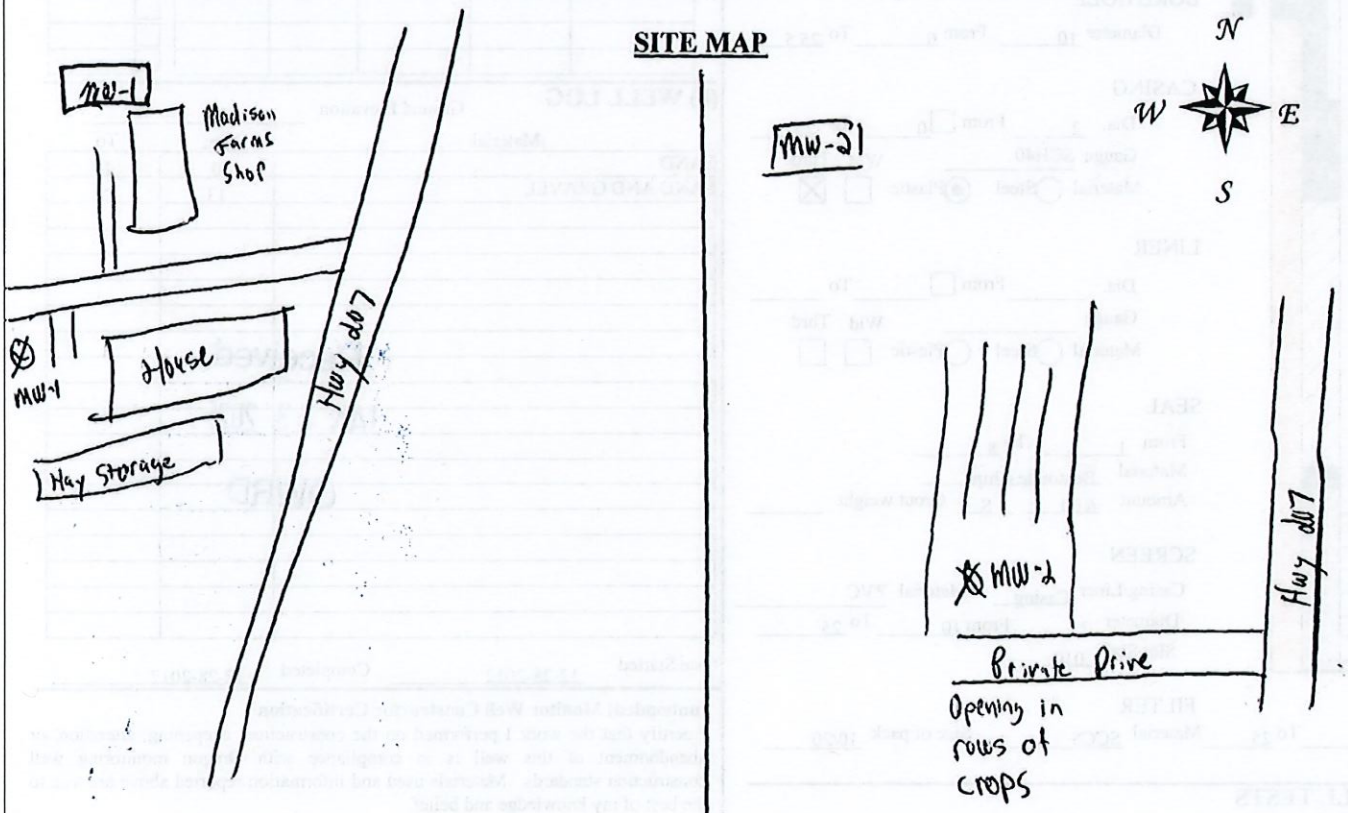
- Geotechnical hole is greater than 18 feet deep;
- Within 50 feet of a water supply or monitoring well;
- Used to make a determination of water quality;
- Constructed in an area of known or reasonably suspected contamination.

In order to comply with OWRD requirements, please provide a Site Map:

Map shall include an approximate scale of north arrow. Upon completion of well activities, a site map with each well location identified must be filed with each Geotechnical Hole Report (OR 690-240-035).

Thank You for your information and assistance on compliance with Oregon Administrative Rules.

SITE MAP



Received
JAN 23 2025
OWRD

Site Address: _____
Client: _____
Major Drilling Project No.: _____

Scale: 1 Inch = 50 feet

UMAT 56964

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

01-06-2012

WELL LABEL # L 108662

START CARD # 1015656

(1) LAND OWNER

Owner Well I.D. MW-1

First Name KENT Last Name MADISON

Company

Address 29299 MADISON RD

City ECHO State OR Zip 97822

(2) TYPE OF WORK

☒ New ☐ Deepening ☐ Conversion
☐ Alteration (repair/recondition) ☐ Abandonment

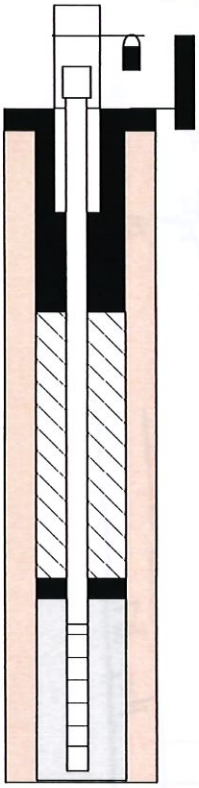
(3) DRILL METHOD

☐ Rotary Air ☒ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 25 ft. Special Standard ☐



MONUMENT/VAULT Above Ground
From 0 To 1

BORE HOLE
Diameter 10 From 0 To 25.5

CASING
Dia. 2 From 0 To 25
Gauge SCH40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER
Dia. From To
Gauge Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL
From 1 To 8
Material Bentonite Chips
Amount 6.00 S Grout weight

SCREEN
Casing/Liner Casing Material PVC
Diameter 2 From 10 To 25
Slot Size .010

FILTER
From 8 To 25 Material SCCS Size of pack 10/20

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)

Temperature 56 °F Lab analysis ☐ Yes By

Supervising Geologist/Engineer

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Umatilla Twp 3.00 N N/S Range 28.00 E E/W WM
Sec 30 NE 1/4 of the SW 1/4 Tax Lot 330
Tax Map Number Lot
Lat ° ' " or DMS or DD
Long ° ' " or DMS or DD
◉ Street address of well ○ Nearest address

28800 MADISON RD, ECHO OR

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well			

WATER BEARING ZONES Flowing Artesian? ☐ Dry Hole? ☐
Depth water was first found

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation

Material	From	To
SAND	0	13
SAND AND GRAVEL	13	25

Received
JAN 23 2025
OWRD

Date Started 12-28-2012 Completed 12-28-2012

(unbonded) Monitor Well Constructor Certification

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

License Number 10357 Date 01-06-2012
Electronically Submitted
Signed TERRENCE JACQUES (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10357 Date 01-06-2012
Electronically Submitted
Signed TERRENCE JACQUES (E-filed)
Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.95

Map of well

Major Drilling Env. Project No. 339 990

Oregon Water Resources Department (OWRD) requires completion of a Geotechnical Hole Report if any of the following apply:

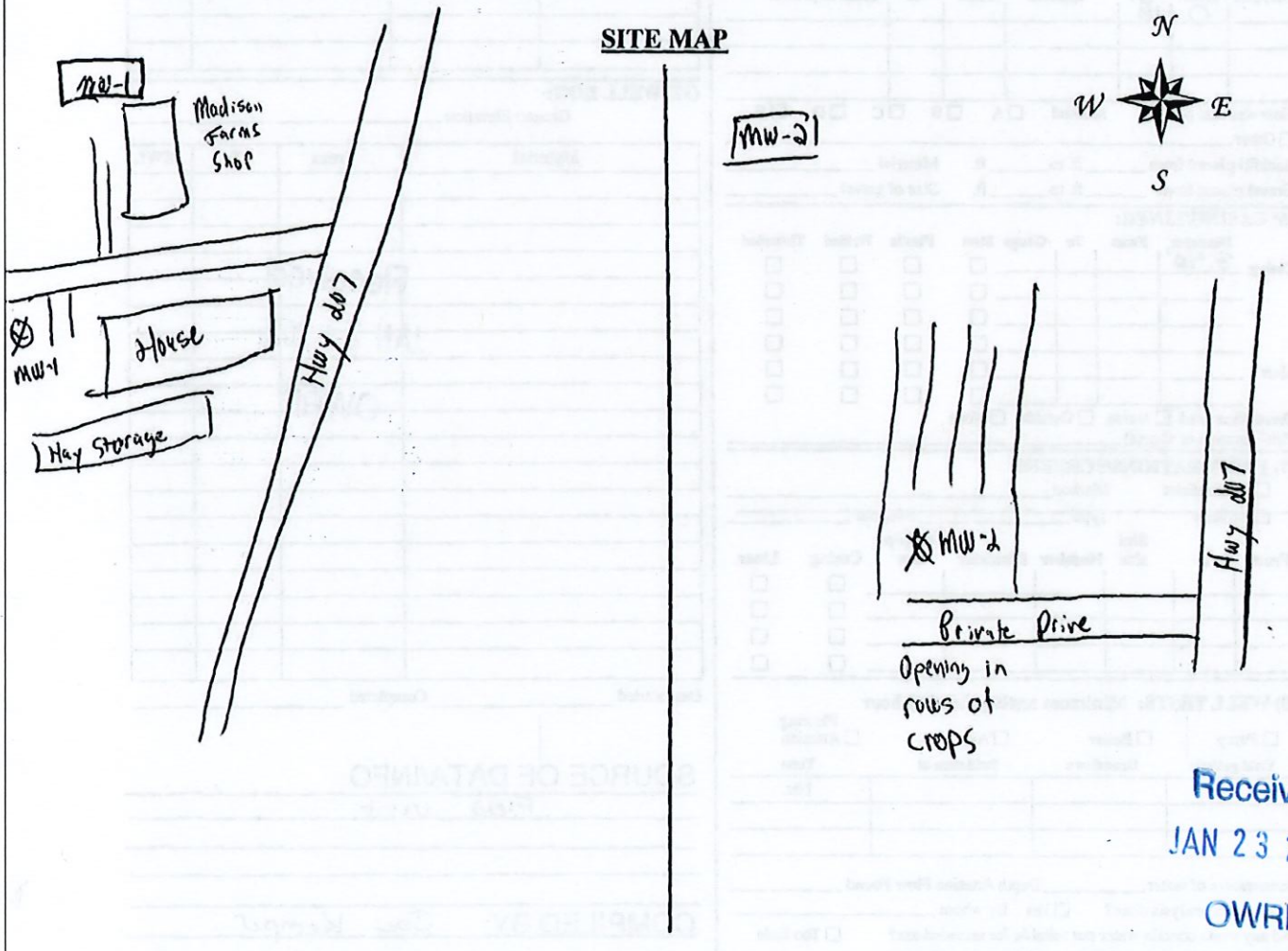
- Geotechnical hole is greater than 18 feet deep;
- Within 50 feet of a water supply or monitoring well;
- Used to make a determination of water quality;
- Constructed in an area of known or reasonably suspected contamination.

In order to comply with OWRD requirements, please provide a Site Map:

Map shall include an approximate scale of north arrow. Upon completion of well activities, a site map with each well location identified must be filed with each Geotechnical Hole Report (OR 690-240-035).

Thank You for your information and assistance on compliance with Oregon Administrative Rules.

SITE MAP



Received
JAN 23 2025
OWRD

Site Address: _____
Client: _____
Major Drilling Project No.: _____

Scale: 1 Inch = 50 feet

UMAT 57869

WELL I.D. # L 103830

(1) LAND OWNER Well Number
Name Madison Ranches
Address 29299 Madison Rd.
City Echo State OR Zip 97826

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

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

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

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☐ No Depth of Completed Well 18 ft.
Explosives used ☐ Yes ☐ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
	0	18				

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

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	3.40				☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

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

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

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

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump Yield gal/min	☐ Bailer Drawdown	☐ Air Drill stem at	☐ Flowing Artesian Time
			1 hr.

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

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude 45.6995 Longitude -119.3671
Township 3 N N or S Range 28 E E or W. WM.
Section 31 SE 1/4 NW 1/4
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address)

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

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

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL

Received
JAN 23 2025
OWRD

Date started Completed

SOURCE OF DATA/INFO
Field visit

COMPILED BY: Joe Kemper

DATE: 8-29-2017

WELL INFORMATION REPORT

11/16/2000

RECEIVED
AUG 15 1960
STATE ENGINEER
SALEM, OREGON

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

OBSERVATION WELL

UMAT 1166

WATER WELL REPORT

STATE OF OREGON G1845

State Well No. 3N/27-25R

State Permit No. 6-1688

(1) OWNER:

Name George N. Wallace B. O. LAKE

Address 3434 N.E. Sandy Blvd.
Portland, Oregon

(2) LOCATION OF WELL:

County Umatilla Owner's number, if any—

SE ¼ SE ¼ Section 25 T. 3 N R. 27 W.M.

Bearing and distance from section or subdivision corner

10 ft N and 10 ft E from SW corner of SE ¼ SE ¼ Sec. 25

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☐

Irrigation ☒ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐

Cable ☒ Jetted ☐

Dug ☐ Bored ☐

(6) CASING INSTALLED:

Threaded ☒ Welded ☐

12 " Diam. from 0 ft. to 184 ft. Gage .....

..... " Diam. from ..... ft. to ..... ft. Gage .....

..... " Diam. from ..... ft. to ..... ft. Gage .....

(7) PERFORATIONS:

Perforated? ☐ Yes ☒ No

Type of perforator used

SIZE of perforations ..... in. by ..... in.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

..... perforations from ..... ft. to ..... ft.

(8) SCREENS:

Well screen installed ☐ Yes ☒ No

Manufacturer's Name .....

Type ..... Model No. .....

Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

..... Slot size ..... Set from ..... ft. to ..... ft.

(9) CONSTRUCTION:

Was well gravel packed? ☐ Yes ☒ No Size of gravel: .....

Gravel placed from ..... ft. to ..... ft.

Was a surface seal provided? ☐ Yes ☐ No To what depth? ..... ft.

Material used in seal—

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? Depth of strata

Method of sealing strata off

(10) WATER LEVELS:

Static level 240 ft. below land surface Date 7-17-60

Artesian pressure ..... lbs. per square inch Date

Log Accepted by:

[Signed] ..... (Owner) Date Aug 12, 1960

(11) WELL TESTS:

Drawdown is amount water level is lowered below static level

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

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

" " " "

" " " "

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

Artesian flow ..... g.p.m. Date .....

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

(12) WELL LOG:

Diameter of well 12 inches.

Depth drilled 591 ft. Depth of completed well 591 ft.

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

MATERIAL	FROM	TO
Soil	0	14
Gravel	14	24
Boulders	24	28
Cement gravel	28	52
Red clay	52	80
White clay	80	100
Green clay	100	173
Black rock	173	183
Gray rock	183	218
Blue clay	218	222
Green rock	222	275
Black rock	275	303
Gray rock	303	335
Black rock	335	354
Gray rock	354	361
Black sand	361	364
Gray rock	364	502
Black rock	502	534
Red rock	534	539
Black rock	539	551
Gray rock	551	561
Black rock	561	588
Gray rock	588	591

Received JAN 23 2025 OWRD

Work started May 3 1960. Completed July 17 1960

(13) PUMP:

Manufacturer's Name Western Turbine

Type: ..... H.P. .....

Well Driller's Statement:

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

NAME Ben Dreyer Drilling Contractor
(Person, firm, or corporation) (Type or print)

Address Rt. 2 Box 73BB - Pendleton, Oregon

Driller's well number .....

[Signed] Ben Dreyer (Well Driller)

License No. 12 Date August 7, 1960

(USE ADDITIONAL SHEETS IF NECESSARY)

STATE ENGINEER
Salem, Oregon

State Well No. 3N/27-25 R 1)

County Umatilla

Application No. G-1845

Water Level Record

OWNER: George Wallace OWNER'S NO.

Description of measuring point:

Date	Water Level Feet (~~above~~) (below) Land Surface	Remarks	Date	Water Level Feet (above) (below) Land Surface	Remarks
		Pumped installed 1/25/61			
1-26-61	240.00	Reported 7-60			
5-25-61	259.00	WSB			
11-7-61	269.00	RD&WSB WET TAPE - 80'			
	? SW 130's				
	191-195'				

REMARKS:

State Printing 89314

UMAT 55174

Amended **UMAT 55174** 2nd Version

D UMAT 55174

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

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

(WELL I.D.)# L 65435

(START CARD) # 162347

(1) OWNER: Well Number

Name KENT MADISON

Address 29221 MADISON RD

City ECHO State OR Zip 97826

(2) TYPE OF WORK

☐ New Well ☐ Deepening ☒ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☒ Other ASR

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 693 ft.

Explosives used ☐ Yes ☐ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
12"	625	693	120 lbs pressure cement	249	40'	6 yrds

How well seal placed: Method ☐A ☐B ☐C ☐D ☐E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

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

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☐ Screens Type Material

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

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

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

Temperature of water Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

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

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Umatilla Latitude Longitude

Township 3N N or S Range 27E E or W WM.

Section 27 SE 1/4 SE 1/4

Tax Lot 5900 Lot Block Subdivision

Street Address of Well (or nearest address) 200 YDS OFF SAYLOR ROAD ECHO OR

(10) STATIC WATER LEVEL:

492 ft. below land surface. Date 6-15-04

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:

Ground Elevation

Material	From	To	SWL
Grey BASALT	625	662	
Vesicular BASALT	662	684	
Black BASALT	684	693	
Reamed 8" TO 12"	625	693	

RECEIVED DEC 06 2004 WATER RESOURCES DEPT SALEM, OREGON

RECEIVED JUN 23 2004 WATER RESOURCES DEPT SALEM, OREGON

RECEIVED JUL 22 2004 WATER RESOURCES DEPT SALEM, OREGON

Date started 4-20-04 Completed 6-10-04

(unbonded) Water Well Constructor Certification:

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

WWC Number 1735

Signed Date 6-15-04

(bonded) Water Well Constructor Certification:

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

WWC Number 544

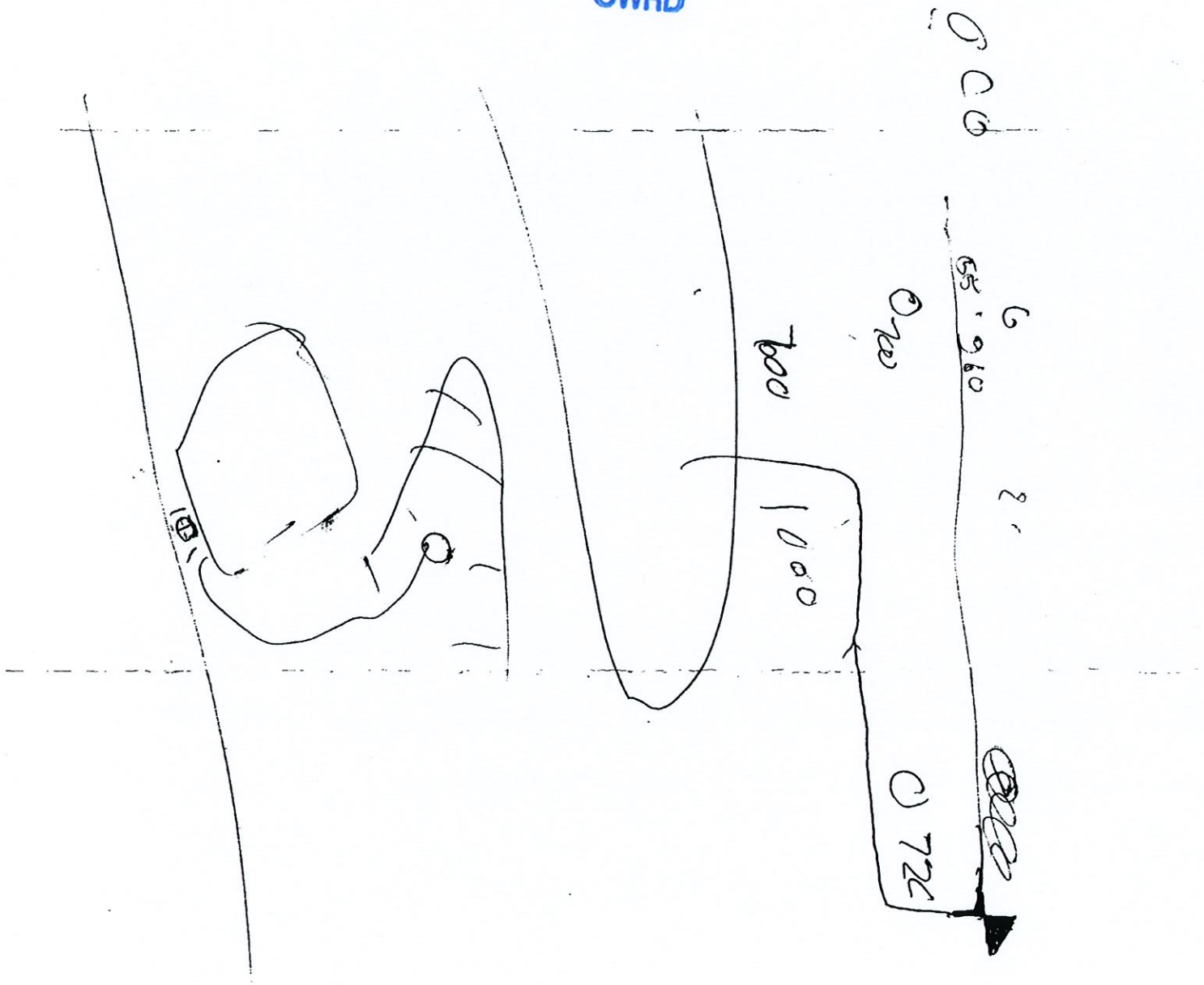
Signed Larry Rund Date 6-15-04

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

Received JAN 23 2025 OWRD

UMAT 55174

Received
JAN 23 2025
OWRD



UMAT 57117

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

WELL I.D. # L 106775
START CARD # 208454

(1) LAND OWNER Well Number
Name Kent Madison
Address 29299 Madison Rd.
City Echo State OR Zip 97826

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

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

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

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 640 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
12"	0	20	Cement	0	181	20 sacks
10"	20	181				
8"	181	640				

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

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	8"	+1	181	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☒ Outside ☐ None
Final location of shoe(s) 181

Received
JAN 23 2025
OWRD

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

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

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

Yield gal/min	Drawdown	Drill stem at	Time
60		640	1 hr.

Temperature of water 62° Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude Longitude
Township 3N N or S Range 27E E or W. WM.
Section 25 NE 1/4 SE 1/4
Tax Lot 3900 Lot Block Subdivision
Street Address of Well (or nearest address) 28868 Madison Rd. Echo, OR 97826

(10) STATIC WATER LEVEL:
482 ft. below land surface. Date 11-13-12
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES:
Depth at which water was first found 530

From	To	Estimated Flow Rate	SWL
512	620	60	482

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Silty soil	0	12	
Clay with gravel	12	40	
Brown clay	40	58	
Gravel with some clay	58	65	
Green clay	65	90	
Clay with gravel	90	103	
Brown clay	103	130	
Sandy clay	130	156	
Green clay	156	175	
Gray basalt hard	175	231	
Gray & brown basalt	231	254	
Gray basalt	254	295	
Red & gray basalt	295	304	
Gray basalt	304	503	
Black basalt	503	512	
Black basalt with white soapstone	512	620	WB
Gray basalt	620	640	

Date started 10-25-12 Completed 11-13-12

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

RECEIVED
DEC 17 2012
SALEM, OR

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 6218
Signed Patrick Wallace Date 12-11-12

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

UMAT 54823

Received
JAN 23 2025
OWRD

WELL I.D. # L _____

(1) LAND OWNER Well Number _____
Name R.G. Saylor # / John Madison
Address RT 1 ~~Box 72~~
City Echo State OR Zip

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

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

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

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☐ No Depth of Completed Well 20 ft.
Explosives used ☐ Yes ☐ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds

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

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	4"	0	20		☐	☐	☐	☐
		Concrete			☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

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

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

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

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

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

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

(9) LOCATION OF WELL by legal description:
County Umatilla Latitude Longitude
Township 3 (N) ~~S~~ Range 27 (E) ~~W~~ WM.
Section 24 SE 1/4 SE 1/4
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address)

(10) STATIC WATER LEVEL:
12 ft. below land surface. Date 4/2/75
Artesian pressure lb. per square inch Date

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

From	To	Estimated Flow Rate	SWL

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Alluvial material	0	20	12

Date started Completed

SOURCE OF DATA/INFO
Water Right File - G-4080
Permit - G-3834

COMPILED BY: Marc Nonor
5/19/2003

WELL INFORMATION REPORT

11/12/2020