Appendix A

Limited License Application Form

LL-2035

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

RECEIVED
JUL 31 2026
OWRD

License No.: LL-2035

Applicant Information

NAME Adam Ward, on behalf of Oregon State University			PHONE (HM)
PHONE (WK)	CELL		FAX
ADDRESS 116 Gilmore Hall, 124 SW 26th Street			
CITY Corvallis	STATE OR	ZIP 97331	E-MAIL * salini.sasiharan@oregonstate.edu

Agent Information

NAME GSI Water Solutions, Inc. ATTN: Rodrigo Prugue		PHONE 971-200-8513	FAX
ADDRESS 650 NE Holladay Street, Suite 900			CELL 305-606-1623
CITY Portland	STATE OR	ZIP 97232	E-MAIL * rprugue@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:** Well (CLAC 74247) a tributary of N/A
2. **AMOUNT OF WATER** to be diverted; 50 acre feet
   Maximum and instantaneous rate (cubic feet or gallons per minute): 400 gallons per minute
   Total volume annually (gallons or acre-feet): 50 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: Experimental study for recharge using vadose zone injection wells and infiltration basin
4. **IF THE INTENDED USE OF WATER IS FOR IRRIGATION, ONE OF THE FOLLOWING MUST APPLY:** (check one of the following)

   ☐ Irrigation if the sole purpose of the use is to provide water necessary **to establish a crop** for which no further irrigation will be required after the crop is established. ORS 537.143 (6)(a).

   ☐ Irrigation if the use of water under the limited license is for the **use of stored water** consistent with the purposes for which the stored water is authorized and the use of water is authorized by a contract between the user and a local, state or federal government. ORS 537.143 (9).
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:
6. **PROJECT SCHEDULE:** (List day, month, and year)
   Date water use will begin: 01/01/2027
   Date water use will be completed: 12/31/2030
   Months of the year water would be diverted and used: All year around as the experiment design demand

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

DocuSigned by:
Adam Ward
Applicant's Signature

Adam Ward
Print Name *and title if applicable*

BEE Dept Head

7/6/2026 | 17:45:05 PDT
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.

LL-2035

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

Superseded

License No.:_____

Applicant Information

NAME Dr. Salini Sasidharan			PHONE (HM)
PHONE (WK)	CELL		FAX
ADDRESS 203 Gilmore Hall, 124 SW 26th Street			
CITY Corvallis	STATE OR	ZIP 97331	E-MAIL * salini.sasiharan@oregonstate.edu

Agent Information

NAME GSI Water Solutions, Inc. ATTN: Rodrigo Prugue		PHONE 971-200-8513	FAX
ADDRESS 650 NE Holladay Street, Suite 900			CELL 305-606-1623
CITY Portland	STATE OR	ZIP 97232	E-MAIL * rprugue@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:** Groundwater a tributary of N/A
2. **AMOUNT OF WATER** to be diverted; 50 acre feet
   Maximum and instantaneous rate (cubic feet or gallons per minute): 400 gallons per minute
   Total volume annually (gallons or acre-feet): 50 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: Experimental study for recharge using vadose zone injection wells and infiltration basin
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   ☐ Irrigation if the sole purpose of the use is to provide water necessary **to establish a crop** for which no further irrigation will be required after the crop is established. ORS 537.143 (6)(a).

   ☐ Irrigation if the use of water under the limited license is for the **use of stored water** consistent with the purposes for which the stored water is authorized and the use of water is authorized by a contract between the user and a local, state or federal government. ORS 537.143 (9).
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:
6. **PROJECT SCHEDULE:** (List day, month, and year)
   Date water use will begin: 01/01/2027
   Date water use will be completed: 12/31/2030
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Superseded

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

DocuSigned by:
Adam Ward
Applicant's Signature

Adam Ward
Print Name *and title if applicable*

BEE Dept Head

7/6/2026 | 17:45:05 PDT
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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.

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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.

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This page to be completed by the local Watermaster.

WATER AVAILABILITY STATEMENT

Name of Applicant: Dr. Sanjini Sasidharan Limited License Number: LL-2035

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:

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

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

☒ Yes ☐ No

If yes, what are your observations for the stream?

Groundwater not regulated in this zone.
Supply generally meets demand.

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?

If new use causes injury to existing water rights the Limited License will be regulated in response.

5. Any other recommendations you would like to make?

Signature _____ WM District #: 16 Date: 4/16/2026

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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

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.

LL-2035

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LL-2035

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

NAME			PHONE
Dr. Salini Sasidharan			
MAILING ADDRESS			
Gilmore Hall, 124 SW 26th Street			
CITY	STATE	ZIP	EMAIL
Corvallis	OR	97211	salini.sasidharan@oregonstate.edu

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:
3S	1W	25	SWNE	500		☐ Diverted ☐ Conveyed ☒ Used	Artificial Groundwater Recharge/Research
						☐ 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:

Clackamas County, City of Aurora

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) rainwater collection system

Estimated quantity of water needed: 0.445 ☒ 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 Research

Briefly describe:

Will serve as an applied research, education, and outreach site to demonstrate the implementation, monitoring, and benefit of various AR systems.

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): _____

☒ 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:	
Nonconforming Use approval for educational/research facility in EFU.	ZDO 401 (EFU) and ZDO 1206 (NCU).	☒ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ Not Being Pursued
		☐ Obtained ☐ Denied	☐ Being Pursued ☐ 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.

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JUL 10 2026
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Name: Taylor Campi Title: Senior Planner

Signature: TCampi Digitally signed by: TCampi DN: CN = TCampi email = TCampi@clackamas.us Date: 2026.04.10 14:42:30 -07'00' Date: 4/10/26

Governmental Entity: Clackamas County Phone: 503 742 4512

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: _____

LL-2035

Appendix B

GeoSystems Analysis, Inc. Borehole Logs

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GeoSystems Analysis, Inc.
Innovations in Hydrology

May 31, 2024

Dr. Salini Sasidharan
Oregon State University
Department of Biological & Ecological Engineering
Gilmore Hall
124 SW 26th St.
Corvallis, OR 97331

RE: Supplement No.: OSU-1007-P-19-420 – NWREC Sonic Drilling and Well Installation Support Consulting Services Vadose Zone Monitor Well Geologic Logs

Dear Dr. Sasidharan,

Enclosed please find the geologic logs for the four vadose zone wells drilled and instrumented at the Oregon State University North Willamette Research and Extension Center in Wilsonville, Oregon. This document serves as GSA's deliverable for the project: Supplement No.: OSU-1007-P-19-420 – NWREC Sonic Drilling and Well Installation Support Consulting Services.

If you have any questions, please feel free to contact me.

Sincerely,

Jason Keller
Project Manager
GeoSystems Analysis, Inc.

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1412 13th St., Suite 400
Hood River, Oregon 97031
Phone: 541-399-3399
WWW.GEOSYSTEMSANALYSIS.COM

LL-2035

Geologic Logs – Vadose Zone Monitor Wells

GeoSystems *Analysis*, Inc

LL-2035

GeoSystems Analysis, Inc.
Innovative Solutions

Geologic Log Sheet

Client:	Oregon State University	**Logged By:**	J. Banuelos	**Date:**	4-15-24 - 4-17-24	**Core Barrel Diameter (inches):**	6.25"
GSA Project No.:	2334	**Drilling Company:**	Yellow Jacket Drilling	**Operator:**	Raymond Carroll	**Core Bit Diameter (inches):**	6"
Borehole No.	Vadose Zone Well 1	**Location:**	Wilsonville, OR			**Casing Shoe Diameter (inches):**	7"

Depth Interval (ft)		Sample Type (C=core, G=grab)	Moisture Content				Particle Size Distribution, Field				Grading	Sand Fraction			Plasticity				Color	USDA Group Name	USCS classification	Sonice Core Weight (Kg)	Sonic Core Length (cm)	Comments
From	To		Dry	Slightly Moist	Moist	Wet	% Gravel	% Sand	% Silt	% Clay	W= Well, P= Poor	Fine	Medium	Coarse	None	Low	Medium	High						
5	7.5	C			X		0	70	25	5	W	X			X				Brown	loamy sand	SM	14.00	37.00	1.5 " ribbon
7.5	10	C			X		0	65	30	5	W	X			X				Brown	sand	SM	20.90	53.00	1.5" ribbon
10	12	C			X		0	75	22	3	W	X			X				Brown	loamy sand	SM	24.20	59.00	1.5" ribbon
12	14	C			X		0	60	30	10	W	X				X			Brown	sand	SM	22.90	51.00	3" ribbon
14	16	C			X		0	60	30	10	W	X			X				Brown	loamy sand	SM	28.30	70.00	3" ribbon
16	18	C			X		0	85	14	1	W			X	X				Brown	loamy sand	SM	27.20	55.00	
18	20	C			X		0	85	14	1	W			X	X				Brown	sandy loam	SM	24.40	52.00	Layer in the middle - Fine grain layer similar to depths 12-14ft
20	22.5	C			X		0	85	14	1	W		X		X				Brown	sandy loam	SM	24.90	52.00	No ribbon
22.5	25	C		X			0	90	10	0	W	X			X				Brown	sandy loam	SM	26.80	59.00	No ribbon
25	27.5	C		X			0	85	14	1	W	X			X				Brown	loamy sand	SM	22.70	39.00	No ribbon
27.5	30	C					0	40	40	20	W	X					X		Brown	sandy loam	ML	28.50	51.00	5" ribbon - maleable
30	33	C			X		0	92	8	0	P			X	X				Dark brown	sandy loam	SM	26.60	57.00	No ribbon
33	35	C			X		0	92	8	0	P			X	X				Dark brown	sandy loam	SM	20.40	51.00	
35	37.5	C			X		0	92	8	0	P			X	X				Dark brown	loamy sand	SM	24.10	53.00	No ribbon- layer goes down to ~38ft
37.5	40	C			X		0	40	40	20	W	X							Light brown	loamy sand	ML	28.30	60.00	Goes from ~38-39ft; 39-40ft sand texture again (medium sand with 90% sand, 10%fines)
40	42.5	C			X		0	57	40	3	W	X			X				Light brown	sand	SM	20.80	43.00	light, talcy material
42.5	43	C			X		0	40	40	20	W	X					X		Light brown	sand	ML	22.18	50.00	4" ribbon, maleable and sticky
43	45	C			X		0	92	8	0	W		X		X				Dark brown	sand	SM	22.18	50.00	No ribbon
45	47.5	C			X		0	92	8	0	W		X		X				Dark brown	sand	SM	18.00	39.00	No ribbon
47.5	50	C			X		0	92	8	0	W		X		X				Dark brown	loamy sand	SM	22.80	47.00	No ribbon

LL-2035

GeoSystems Analysis, Inc.
Innovative Solutions

Geologic Log Sheet

Client:	Oregon State University	**Logged By:**	J. Banuelos	**Date:**	4-15-24 - 4-17-24	**Core Barrel Diameter (inches):**	6.25"
GSA Project No.:	2334	**Drilling Company:**	Yellow Jacket Drilling	**Operator:**	Raymond Carroll	**Core Bit Diameter (inches):**	6"
Borehole No.	Vadose Zone Well 2	**Location:**	Wilsonville, OR			**Casing Shoe Diameter (inches):**	7"

Depth Interval (ft)		Sample Type (C=core, G=grab)	Moisture Content				Particle Size Distribution, Field				Grading	Sand Fraction			Plasticity				Color	USDA Group Name	USCS classification	Sonice Core Weight (Kg)	Sonic Core Length (cm)	Comments
From	To		Dry	Slightly Moist	Moist	Wet	% Gravel	% Sand	% Silt	% Clay	W= Well, P= Poor	Fine	Medium	Coarse	None	Low	Medium	High						
2.5	5	C			X		0	65	28	7	W	X				X			Brown	loamy sand	SM	22.10	54.00	3" ribbon
5	7.5	C			X		0	72	23	5	W	X			X				Brown	sand	SM	22.90	55.00	2" ribbon
7.5	10	C			X		0	72	23	5	W	X			X				Brown	loamy sand	SM	20.00	50.00	2" ribbon
10	12.5	C			X		0	60	30	10	W	X				X			Brown	sand	SM	21.30	51.00	3.5" ribbon, very maleable and smooth
12.5	15	C			X		0	70	23	7	W	X			X				Brown	loamy sand	SM	23.80	50.00	2" ribbon- layer extends to ~16ft
15	17.5	C			X		5	87	8	0	W			X	X				Dark Brown	loamy sand	SM	33.30	75.00	~16-18.5 ft interval, no ribbon
17.5	20	C			X		0	72	23	5	W		X		X				Brown	sandy loam	SM	29.80	64.00	18.5-20ft interval, 2" ribbon
20	22.5	C			X		0	65	28	7	W	X				X			Brown	sandy loam	SM	29.30	62.00	3" ribbon,very maleable and smooth
22.5	25	C			X		0	80	17	3	W		X		X				Brown	sandy loam	SM	28.70	56.00	1" ribbon, dirty sand
25	27.5	C			X		0	78	20	2	W	X			X				Brown	loamy sand	SM	28.20	61.00	1" ribbon
27.5	30	C			X		0	63	30	7	W	X			X				Brown	sandy loam	SM	29.80	63.00	3.5" ribbon, maleable and smooth- silty sand
30	32.5	C		X			0	90	10	0	W		X		X				Dark Brown	sandy loam	SM	26.50	60.00	No ribbon
32.5	35	C			X		0	92	8	0	W		X		X				Dark Brown	sandy loam	SM	22.10	48.00	No ribbon
35	37.5	C			X		0	92	8	0	W		X		X				Dark Brown	loamy sand	SM	28.90	67.00	No ribbon, goes to ~38.5ft. Interval from 39.5-40 is the same as interval 35-37.5ft
37.5	40	C			X		0	73	25	2	W	X			X				Brown	loamy sand	SM	30.10	63.00	2" ribbon, describes interavl from ~38.5-39.5ft
40	42.5	C			X		0	83	15	2	W		X		X				Dark Brown	sand	SM	16.50	36.00	No ribbon
42.5	45	C			X		0	83	15	2	W		X		X				Dark Brown	sand	SM	22.20	52.00	No ribbon
45	47.5	C			X		0	90	10	0	W		X		X				Dark Brown	sand	SM	26.40	55.00	No ribbon
47.5	50	C				X	0	85	14	1	W		X		X				Dark Brown	sand	SM	22.60	45.00	No ribbon- bottom of the core saturated

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Innovative Solutions

Geologic Log Sheet

Client:	Oregon State University	**Logged By:**	J. Banuelos	**Date:**	4-15-24 - 4-17-24	**Core Barrel Diameter (inches):**	6.25"
GSA Project No.:	2334	**Drilling Company:**	Yellow Jacket Drilling	**Operator:**	Raymond Carroll	**Core Bit Diameter (inches):**	6"
Borehole No.	Vadose Zone Well 3	**Location:**	Wilsonville, OR			**Casing Shoe Diameter (inches):**	7"

Depth Interval (ft)		Sample Type (C=core, G=grab)	Moisture Content				Particle Size Distribution, Field				Grading	Sand Fraction			Plasticity				Color	USDA Group Name	USCS classification	Sonice Core Weight (Kg)	Sonic Core Length (cm)	Comments
From	To		Dry	Slightly Moist	Moist	Wet	% Gravel	% Sand	% Silt	% Clay	W= Well, P= Poor	Fine	Medium	Coarse	None	Low	Medium	High						
5	7.5	C			X		0	72	23	5	W	X			X				Brown	loamy sand	SM	16.50	45.00	2" ribbon
7.5	10	C			X		0	72	23	5	W	X			X				Brown	sand	SM	18.60	55.00	
10	12.5	C			X		0	75	22	3	W	X			X				Brown	loamy sand	SM	24.50	48.00	2" ribbon
12.5	15	C			X		0	75	22	3	W	X			X				Brown	sand	SM	23.50	50.00	2" ribbon
15	17.5	C		X			0	92	8	0	W			X	X				Brown	loamy sand	SM	21.10	44.00	Two intervals, the last 0.5ft is similar to 12.5-15ft interval
17.5	20	C			X		0	90	10	0	W	X			X				Brown	loamy sand	SM	19.90	47.00	No ribbon
20	22.5	C		X			0	90	10	0	W		X		X				Brown	sandy loam	SM	25.50	52.00	No ribbon
22.5	25	C		X			0	90	10	0	W	X			X				Brown	sandy loam	SM	24.50	53.00	No ribbon- goes to 26.5ft
25	27.5	C		X			0	65	30	5	W	X				X			Brown	sandy loam	SM	23.50	49.00	Two intervals- 26.5-27.5ft has higher silt/fines
27.5	30	C			X		0	90	10	0	W	X			X				Brown	loamy sand	SM	19.80	39.00	No ribbon
30	32.5	C			X		0	75	18	7	W		X		X				Brown	sandy loam	SM	22.30	46.00	Medium dirty sand- no ribbon
32.5	35	C			X		0	92	8	0	P		X		X				Brown	sandy loam	SM	21.70	42.00	No ribbon- coarse sand
35	37.5	C			X		0	90	10	0	W		X		X				Brown	sandy loam	SM	24.80	49.00	Slightly more fines- No ribbon
37.5	40	C			X		0	80	17	3	W		X		X				Brown	loamy sand	SM	20.50	45.00	More fines- 1.5" ribbon
40	42.5	C			X		0	95	5	0	W		X		X				Dark Brown	loamy sand	SW-SM	18.50	34.00	No ribbon
42.5	45	C			X		0	95	5	0	W	X			X				Dark Brown	sand	SW-SM	19.80	47.00	No ribbon
45	47.5	C			X		0	95	5	0	W	X			X				Dark Brown	sand	SW-SM	21.80	38.00	No ribbon
47.5	50	C				X	0	95	5	0	W	X			X				Dark Brown	sand	SW-SM	23.20	42.00	No ribbon

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GSA GeoSystems Analysis, Inc.
Innovative Solutions

Geologic Log Sheet

Client:	Oregon State University	**Logged By:**	J. Banuelos	**Date:**	4-15-24 - 4-17-24	**Core Barrel Diameter (inches):**	6.25"
GSA Project No.:	2334	**Drilling Company:**	Yellow Jacket Drilling	**Operator:**	Raymond Carroll	**Core Bit Diameter (inches):**	6"
Borehole No.	Vadose Zone Well 4	**Location:**	Wilsonville, OR			**Casing Shoe Diameter (inches):**	7"

Depth Interval (ft)		Sample Type (C=core, G=grab)	Moisture Content				Particle Size Distribution, Field				Grading	Sand Fraction			Plasticity				Color	USDA Group Name	USCS classification	Sonice Core Weight (Kg)	Sonic Core Length (cm)	Comments
From	To		Dry	Slightly Moist	Moist	Wet	% Gravel	% Sand	% Silt	% Clay	W= Well, P= Poor	Fine	Medium	Coarse	None	Low	Medium	High						
5	7.5	C			X		0	72	23	5	W	X			X				Brown	loamy sand	SM	12.60	30.00	1.5" ribbon
7.5	10	C			X		0	65	25	10	W	X			X				Brown	sand	SM	17.50	43.00	3" ribbon
10	12.5	C			X		0	77	20	3	W	X			X				Brown	loamy sand	SM	28.20	57.00	1" ribbon, goes to 13.5ft
12.5	15	C			X		0	92	8	0	P			X	X				Brown	sand	SM	29.30	64.00	Goes from 13.5-17ft, No ribbon
15	17.5	C			X		0	70	25	5	W	X			X				Brown	loamy sand	SM	25.20	54.00	17-17.5ft, 2.5" ribbon
17.5	20	C			X		0	70	25	5	W	X			X				Brown	loamy sand	SM	25.30	49.00	2.5" ribbon
20	22.5	C		X			0	90	10	0	W	X			X				Brown	sandy loam	SM	22.40	49.00	No ribbon, goes to 24 ft
22.5	25	C				X	0	77	20	3	W	X			X				Brown	sandy loam	SM	24.90	55.00	Goes from 24-26.25ft, 1.5" ribbon
25	27.5	C		X			0	77	20	3	W	X			X				Brown	sandy loam	SM	23.60	48.00	1.5" ribbon
27.5	30	C			X		0	70	23	7	W	X			X				Brown	loamy sand	SM	22.00	57.00	2.5" ribbon
30	32.5	C			X		0	92	8	0	W		X		X				Dark Brown	sandy loam	SM	26.50	51.00	No ribbon
32.5	35	C			X		0	95	5	0	P		X		X				Dark Brown	sandy loam	SP-SM	26.10	51.00	No ribbon
35	37.5	C			X		5	90	5	0	P		X		X				Dark Brown	sandy loam	SP-SM	27.10	48.00	No ribbon
37.5	40	C			X		0	92	8	0	P	X			X				Dark Brown	loamy sand	SM	24.10	48.00	No ribbon
40	42.5	C				X	0	60	35	5	W	X			X				Light Brown	loamy sand	SM	25.90	46.00	2.5" ribbon- silty, powdery material found at other boreholes. 40-41.5ft
42.5	45	C			X		0	92	8	0	P		X		X				Dark Brown	sand	SM	22.60	49.00	No ribbon- 41.25-45ft
45	47.5	C				X	0	80	15	5	W	X			X				Brown	sand	SM	29.70	50.00	1" ribbon, slightly sticky
47.5	50	C				X	0	92	8	0	P	X			X				Dark Brown	sand	SM	25.60	54.00	No ribbon

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Appendix C

Water Right Certificate

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STATE OF OREGON

COUNTY OF CLACKAMAS

CERTIFICATE OF WATER RIGHT

THIS CERTIFICATE ISSUED TO

OREGON STATE UNIVERSITY
NORTH WILLAMETTE RESEARCH AND
EXTENSION CENTER
15210 NE MILEY RD
AURORA, OR 97002

confirms the right to the use of water perfected under the terms of Permit G-3649. The amount of water used to which this right is entitled is limited to the amount used beneficially, and shall not exceed the amount specified, or its equivalent in the case of rotation, measured at the well(s). The specific limits and conditions of the use are listed below.

SOURCE OF WATER: TWO WELLS A TRIBUTARY OF WILLAMETTE RIVER

PURPOSE OR USE: IRRIGATION OF 100.8 ACRES

MAXIMUM RATE: 0.25 CUBIC FOOT PER SECOND

DATE OF PRIORITY: APRIL 12, 1967

The wells are located as follows:

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
3 S	1 W	WM	25	SW NE	WELL 4 - 480 FEET NORTH AND 2610 FEET WEST FROM E1/4 CORNER, SECTION 25
3 S	1 W	WM	25	NW SE	WELL 1 - 10.5 CHAINS SOUTH AND 22.75 CHAINS WEST FROM SE CORNER, DLC 43

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to ONE-EIGHTIETH of one cubic foot per second per acre, or its equivalent for each acre irrigated and shall be further limited to a diversion of not to exceed 2.5 acre-feet per acre for each acre irrigated during the irrigation season of each year, and shall conform to such reasonable rotation system as may be ordered by the proper state officers.

A description of the place of use is as follows:

Twp	Rng	Mer	Sec	Q-Q	Acres
3 S	1 W	WM	25	NE SW	38.7
3 S	1 W	WM	25	NE SE	32.0
3 S	1 W	WM	25	NW SE	30.1

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NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is an order in other than a contested case. This order is subject to judicial review under ORS 183.482. Any petition for judicial review must be filed within the 60-day time period specified by ORS 183.482. Pursuant to ORS 183.482, ORS 536.075 and OAR 137-003-0675, you may petition for judicial review and petition the Director for reconsideration of this order. A petition for reconsideration may be granted or denied by the Director, and if no action is taken within 60 days following the date the petition was filed, the petition shall be deemed denied.

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The quantity of water diverted at the new points of appropriation (Well 1 & Well 4) shall not exceed the quantity of water lawfully available at the original point of appropriation described as follows:

Twp	Rng	Mer	Sec	Q-Q	Measured Distances
3 S	1 W	WM	25	NW SE	740 FEET SOUTH AND 2110 FEET WEST FROM E1/4 CORNER, SECTION 25

Water shall be acquired from the same aquifer (water source) as the original point of appropriation.

The right to the use of the water for the purposes aforesaid is restricted to the lands or place of use herein described.

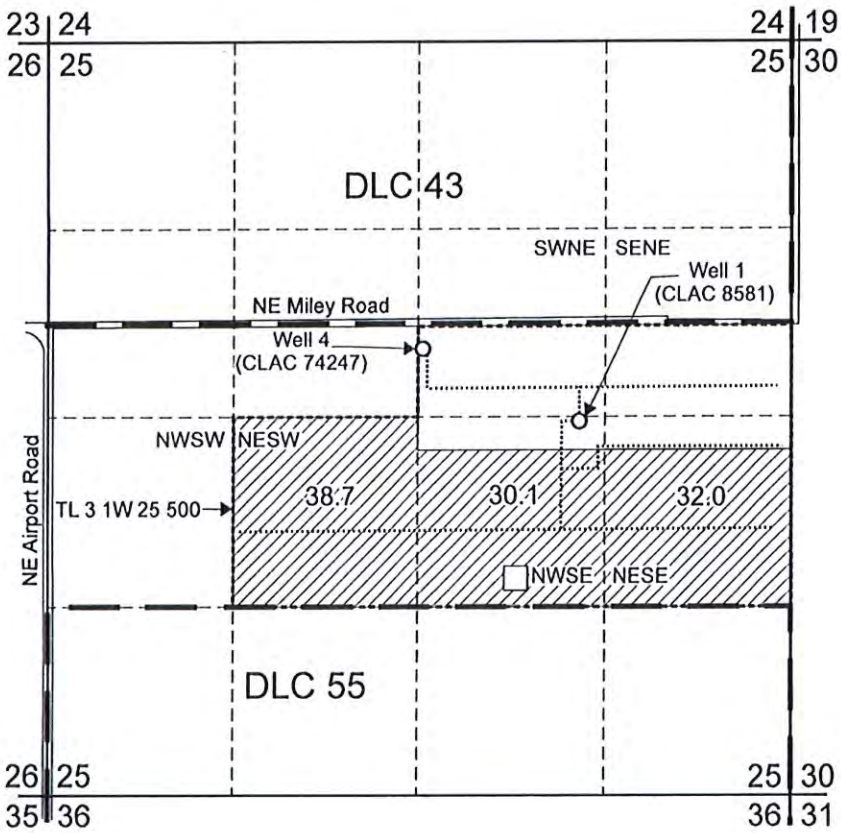
This certificate is issued to confirm a change in POINT OF APPROPRIATION approved by an order of the Water Resources Director entered August 4, 2017, at Special Order Volume 105, Page 549, approving Transfer Application T-12560, supercedes Certificate 38511, State record of Water Right Certificates.

Issued FEB 2 7 2026.

Katherine Ratcliffe
Water Right Services Division Administrator, for
Ivan Gall, Director
Oregon Water Resources Department

LL-2035

T.3S. R.1W. Section 25, W.M.



Well 1 (CLAC 8581) is located 10 ½ chains south and 22 3/4 chains west from the SE corner, DLC 43.

Well 4 (CLAC 74247) is located 480 feet north and 2,610 feet west from the E 1/4 corner, Section 25.

Area (100.8 Acres) irrigated under T-12560, formerly Certificate 38511, priority date: 4-12-1967.

--------- Tax lot boundary

— - DLC boundary

..... Irrigation mainline

CERTIFIED WATER RIGHT EXAMINER
85503
DOANN HAMILTON
MAY 10, 2012
STATE OF OREGON
EXPIRES: JUNE 30, 2026

N

Scale: 1" = 1,320'

0 1,320 Feet

This map was prepared for the purpose of identifying the location of a water right only and is not intended to provide legal dimensions or location of property ownership lines.

Claim of Beneficial Use Map
T-12560, formerly Certificate 38511

Pacific Hydro-Geology Inc.

11/2024

Oregon State University
North Willamette Research and Extension Center
T.3S. R.1W. Section 25, W.M.

OSUT-12560Cert38511COBUMap.cdr

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Attachment D

Underground Injection Control Application

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Oregon Water Initiative Managed Aquifer Recharge Innovation Field
North Willamette Research and Extension Center

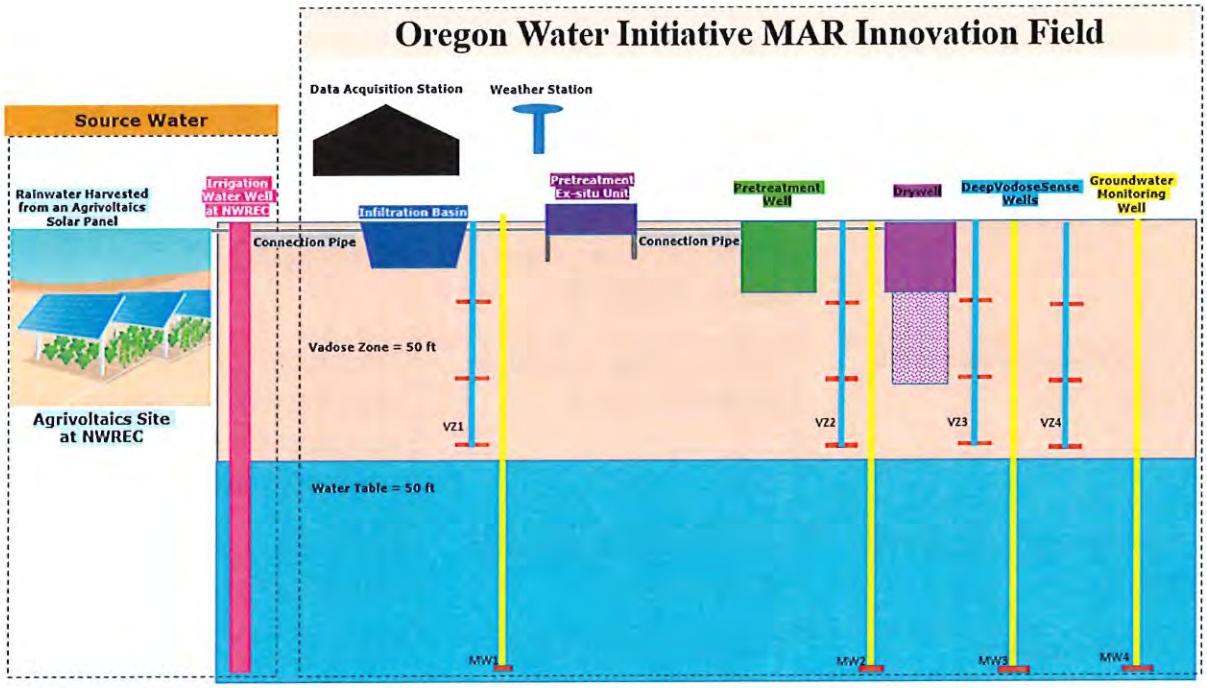
Water Quality and Water Quantity Monitoring Plan

Dr. Salini Sasidharan

Department of Biological and Ecological Engineering, Oregon State University

Salini.Sasidharan@oregonstate.edu

1. Conceptual Map for the Oregon Water Initiative Managed Aquifer Recharge Innovation Field



At the North Willamette Research & Extension Center (NWREC), the Managed Aquifer Recharge (MAR) Innovation Field is designed as an end-to-end controlled experiment research test bed that takes locally harvested water, pretreats it, and routes it through several recharge structures while continuously instrumenting the unsaturated (vadose) and saturated (groundwater) zones. A detailed explanation of each component is provided in Table 1.

Table 1: The components of the OWI MAR innovation Site.

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Component	Role in the system	Key point(s)
Source-water 1	Collect rainfall from the agrivoltaics array	Provides a controlled, local supply for recharge testing
Source-water 2	Irrigation well at NWREC	Provides a controlled, local supply for recharge testing
Source-water 3	Public Drinking water from the County distribution center	Perform a Preliminary test for accurately capturing flow characteristics
Primary coarse screen	Removes leaves & grit as water leaves the collector manifold	Simple inline strainer—keeps debris out of later units
Secondary pretreatment (purple, gravity-fed)	Passive settling/filtration box that polishes flow without pumps	Reduces fine sediment & turbidity before recharge
Pretreatment well (green)	A pretreatment shallow well	Conduct additional treatment for the source water
Infiltration basin (Purple)	Shallow surface basin for gravity infiltration	Baseline MAR method; tests surface spreading efficiency
Drywell (magenta)	Deeper bore-hole structure (40 ft) delivering water below surface soils	Evaluates rapid, point-source recharge potential
Deep VadoseSense Wells (VZ1–VZ4)	Sensor strings at multiple depths (~0–50 ft)	Track moisture front, temperature, redox potential, oxygen, and chemistry in unsaturated zone
Monitoring wells (MW1–MW4)	4″ PVC wells at the water table (100 ft)	Record head rise & sample groundwater quality changes
Weather station	Measures of rainfall, ET, wind, and solar radiation	Supplies boundary data for water-balance calculations
Data hub & telemetry	Logs all sensors and streams to the cloud dashboard	Enables real-time QA/QC and model calibration

2. Research Plan for Injection and Recharge for Drywell & Infiltration-Basin

Phase	Source water & permit status	Experimental goal	Injection / recharge set-up	Monitoring & data products
0 – Site preparation (ongoing)	n/a	• Install & calibrate flowmeters, pressure transducers, DeepVadoseSense lysimeters and sensors (VZ1-VZ4), and monitoring wells (MW1-MW4). • Commission data-logging & telemetry.	Drywell and basin constructed; manifold plumbed to pretreatment unit.	Baseline heads, moisture, T°, EC; background geochemistry, geophysics.
1 – Baseline hydraulic test *(Fall 2025)* (starts after UIC permit)	**Potable trucked water** (clean public supply) – no permit required	Establish site hydraulic parameters (hydraulic conductivity, specific yield) under controlled chemistry.	• Short falling-head & constant-head tests in drywell. • Small-volume slug test in basin.	• Time-drawdown curves in MW1-MW4. • Calculate K, Sy; derive initial HYDRUS/MODFLOW inputs. • Total volume of injection will be tracked using the flow meter and will be reported annually
2 – Seasonal rainwater recharge *(Oct – Jun)* (starts after UIC permit)	**Harvested roof / solar-gutter runoff** – treated via coarse screen + gravity pretreatment box	Evaluate natural source-water performance and water-quality evolution.	• Pulsed injections whenever ≥5 m^3 is stored (gravity feed). • Variable-flux tests: 0.2 – 1 L s^{-1}. • Compare drywell vs basin efficiency.	• Vadose-zone breakthrough (VZ-LY nests). VadoseSense Monitoring (moisture, content, matric potential, EC, Temperature, Redox Potential, Oxygen) • Water-level mounding in MW wells. • Pre- and post-recharge chemistry (nutrients, microbes). • Water balance + residence-time modelling. • Total volume of injection will be tracked using the flow meter and will be reported annually

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3 – Controlled irrigation-well recharge (starts after **AR** permit)	**Irrigation-well water** (continuous, reliable supply)	Run constant-flow and high-flux experiments to probe heterogeneity and scale effects.	• Step-rate tests (1, 5, 10 L s^{-1}) for 24–72 h. • Constant-flow test. • Alternate drywell & basin injections.	• Drawdown / recovery curves for transmissivity & Storativity validation. • Tracer tests (Br^-, dye) to map flow paths. • Reactive-transport calibration (MT3D, PHT3D). • Vadose-zone breakthrough (VZ-LY nests). VadoseSense Monitoring (moisture, content, matric potential, EC, Temperature, Redox Potential, Oxygen) • Water-level mounding in MW wells. • Pre- and post-recharge chemistry (nutrients, microbes). • Water balance + residence-time modelling. • Total volume of injection will be tracked using the flow meter and will be reported annually

3. Water Quality Monitoring Plan

- **Groundwater Monitoring Wells:** MW1, MW2, MW3, MW4
- **DeepVadoseSense:** VZ1, VZ2, VZ3, VZ4
- **Pretreatment Inflow and Outflow**
- **Drywell Inflow** (Assuming the same water is coming into the drywell from the pretreatment unit)

3.1. Monitoring Approach

- **Frequency:** Scheduled quarterly manual readings before and after recharge
- **Method:**
- **Source Water**

- Samples from source water (1-3 as applicable) will be collected before and after pre-treatment prior to any recharge activities under UIC permit.

- **Groundwater**
  - Pump water from monitoring wells to collect samples.
  - Conduct on-site measurements for water quality parameters at the on-site mobile lab.
  - Collect samples for transport to an off-site lab for analysis.

3.2. Water Quality Parameters Monitored

Category	Parameters
On-Site Measurements	
Routine Sampling	pH, Temperature, Dissolved Oxygen (DO), Oxidation-Reduction Potential (ORP), Conductivity, Turbidity, Alkalinity, Nitrate (using a probe *when possible*)
Off-Site Lab Analysis	
Routine Sampling	**Microbial:** E. coli counts
Additional Sampling	**Metagenomics:** Microbial community analysis (DNA/RNA) **Chemical Fingerprinting:** HRMS (High-Resolution Mass Spectrometry) **Nutrients:** Nitrate (NO_3^-), Nitrite (NO_2^-), Ammonium (NH_4^+) **Isotopes:** $\delta^{18}O$, δ^2H, δH_2O (water), δNO_3^- (nitrate) **Metals & Ions:** ICP-MS, ICP-OES, IC Analysis Note that the above parameters will only be analyzed as required to answer the research questions and within the funding availability.

3.3. Additional Considerations

- **Sampling Protocol:**
  - Record well depth and purge stagnant water before sampling.
  - Use appropriate preservation methods (e.g., cooling, chemical stabilization) for lab samples.
- **Data Management:**
  - Maintain a log of field readings and lab results.
  - Compare trends over time to assess recharge system performance.

3.4. Field preparation

- Ensure mobile lab equipment is calibrated before each use.

- Coordinate with on-site staff for access to MAR field.
- Coordinate with the off-site lab for sample handling and turnaround times.

Disclaimer

- The North Willamette Research & Extension Center MAR field is operated strictly as a **research experimental Class V underground-injection system** under *OAR 340-044-0011*. Because the purpose is to study subsurface heterogeneity and recharge dynamics, details such as injection schedules, water sources, monitoring frequency, and analytical scope may evolve as data, permit conditions, or operational needs change. All modifications will be made in accordance with Oregon DEQ requirements and will be documented in project reports.
- **OAR 340-044-0011 (5)(c)** – *"Fluid return injection systems that re-inject spent geothermal fluids into the source aquifer following extraction of heat energy or electric power generation, spent brines after extraction of salts, or non-contact heat-pump and air-conditioning return fluids. Irrigation return flows are not considered fluid return flows."* oregon.public.law
- **OAR 340-044-0011 (5)(e)** – *"Groundwater management injection systems that inject fluids to manage groundwater quality, groundwater levels, groundwater flow, or groundwater quantity. Injection systems may be used for aquifer recharge, aquifer storage and recovery, subsidence control, salt-water intrusion control, aquifer remediation, aquifer characterization, water-well maintenance, groundwater-table management, landslide stabilization or special experimental purposes. In general, fluids being injected have water quality equivalent to the background groundwater, or have only localized effects around the well bore when used in aquifer remediation or water-well maintenance, or are beneficial to the aquifer remediation."*

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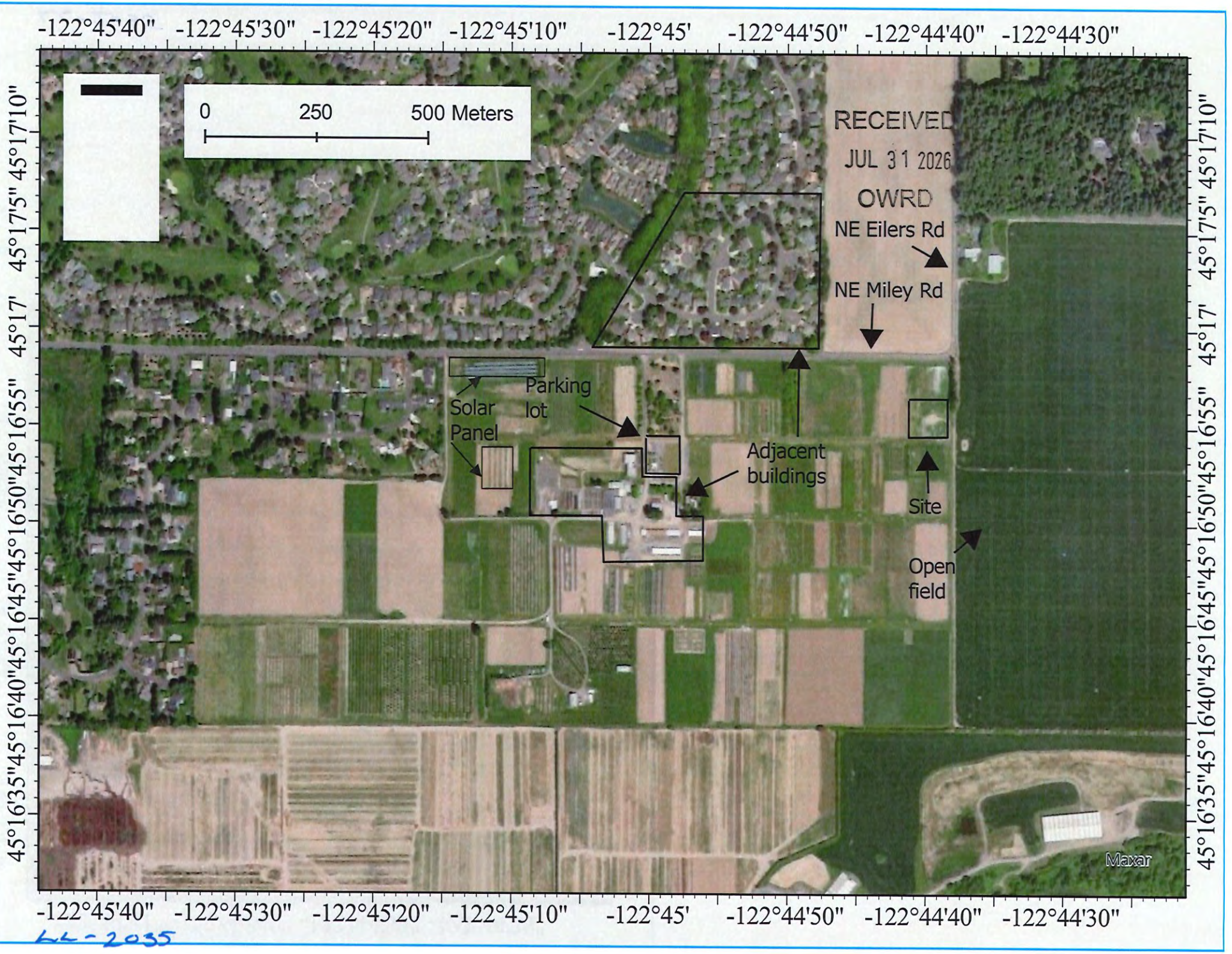
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-122°45'20"
-122°45'10"
-122°45'
-122°44'50"
-122°44'40"
-122°44'30"
45°17'10"
45°17'5"
45°17'
45°16'55"
45°16'50"
45°16'45"
45°16'40"
45°16'35"
0
250
500 Meters
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NE Eilers Rd
NE Miley Rd
Parking lot
Solar Panel
Adjacent buildings
Site
Open field
Maxar

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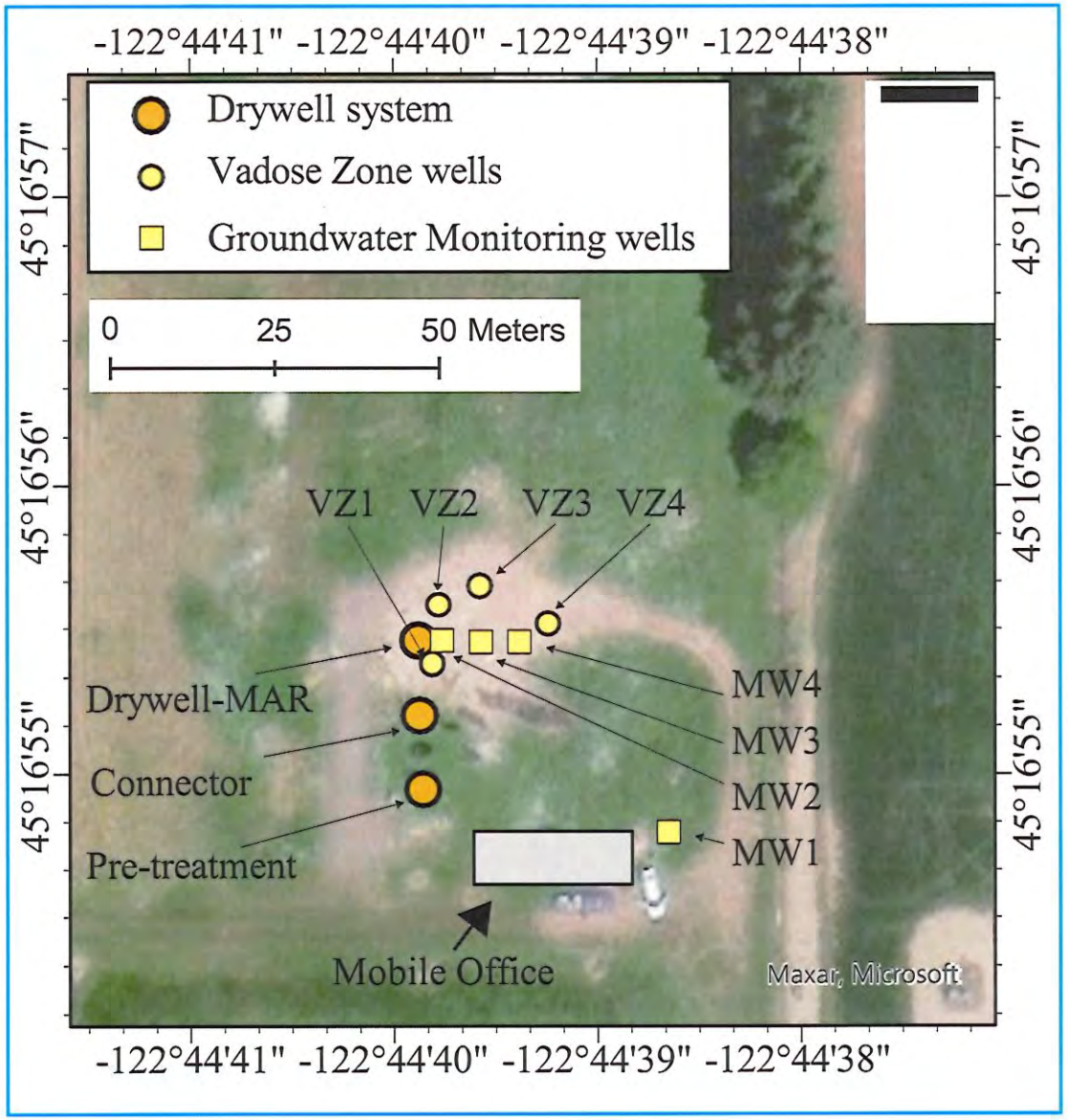

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Class V Underground Injection Control Authorization by Rule

Department of Environmental Quality, State of Oregon

700 NE Multnomah Street, Suite 600 Portland, OR 97232-4100

6/30/2025

Submittal RID: **77671** | Submitted Date: **6/30/2025**

Select the UIC Rule Authorized Application to Apply for

- ☑ UICs That Do Not Drain From Stormwater
- ☐ UICs That Drain Stormwater From Roof Only (If there is known soil or ground water contamination at the facility, do not select this option. Select 'UICs That Drain Stormwater From Any Surface')
- ☐ UICs That Drain Stormwater From Any Surface

UICs That Do Not Drain From Stormwater

Fee for Authorization by Rule

Number of Injection Points : **0** *$134= Total Amount Due: $**0**
(Please enter "0" for Remediation applications)

Owner Information

Organization: **Oregon State University**

Full Name: Salutation:

Company: **Oregon State University** Title: **Assistant Professor** Email: **Salini.Sasidharan@oregonstate.edu**

Phone: **541-737-6710** Mobile: **310-216-8836** Fax:

New

Consultant Information (optional)

Consultant Contact Name: Company:

Phone Number: Email Address:

UIC System Type

- ☑ Aquifer Storage and Recovery (5R21, 2-ASR) — Limited License or Permit #: **Pending** — ESCI Site ID and/or LUST #: **NA**
- ☐ Low Temp Geothermal (5A7, 2-Geo Heat Pump) — Water Right Permit or Certificate #: — Describe Fluid: **Stormwater from roof and solar panel and public drinking water for experimental test**
- ☐ Remediation (5X26, 2-Remediation) — ☐ Voluntary Cleanup Program
- ☐ Other

UIC Info

Individual UIC Information

ID	Fluid Type	Latitude	Longitude
Oregon Water Initiative Managed Aquifer Recharge Innovation Field	**Stormwater from roof and solar panel and public drinking water for experimental test**	**45.28**	**-122.74**

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☑ Site map is attached Status: **Under Construction** Depth (ft.): **40**

Are any of the following materials or activities exposed to precipitation in the area served by your injection systems, now or in the foreseeable future? (Please check either "Yes" or "No" in the appropriate box.) If you answer "Yes" to any of these questions, you do not qualify for the No-Exposure certification or rule authorization.

Signature of Responsible Official

I certify under penalty of law that the no exposure certification completed in this application is accurate to the best of my knowledge. I certify under penalty of law that there are no discharges of stormwater contaminated by exposure to industrial activities or materials from the industrial facility or site identified in this document (except as allowed under 40 CFR 122.26(g)(2)) and/or OAR 340-044 UIC rules.
I understand that I am obligated to submit a No Exposure Certification to DEQ once every five years. I understand that I must allow the DEQ permitting authority, where the discharge is, to perform inspections to confirm the condition of no exposure and to make such inspection reports publicly available upon request.
I hereby certify that the information contained in this registration is true and correct to the best of my knowledge and belief.

Signature: **Adam Ward** Submitted Date: **6/30/2025**

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Appendix E

Water Well Log

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Revised

Amended 2/26/2020

CLAC 74247

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL I.D. LABEL# L 128926
START CARD # 1038427
ORIGINAL LOG #

CLAC 74247

(1) LAND OWNER

Owner Well I.D. 5884
First Name _____ Last Name _____
Company Oregon State University
Address 644 SW 13th St.
City Corvallis State OR Zip 97333

(2) TYPE OF WORK

[X] New Well [ ] Deepening [ ] Conversion [ ] Alteration (complete 2a & 10) [ ] Abandonment (complete 5a)

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(2a) PRE-ALTERATION

	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
Casing:									

	Material	From	To	Amt	sacks/lbs
Seal:					

(3) DRILL METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger [ ] Cable Mud
[ ] Reverse Rotary [ ] Other _____

(4) PROPOSED USE

[ ] Domestic [X] Irrigation [ ] Community
[ ] Industrial/ Commericial [ ] Livestock [ ] Dewatering
[ ] Thermal [ ] Injection [ ] Other _____

(5) BORE HOLE CONSTRUCTION

Special Standard [ ] (Attach copy)
Depth of Completed Well 158 ft.

BORE HOLE

Dia	From	To
16	0	158

SEAL

Material	From	To	Amt	sacks/lbs
Cement	2	95	83	S
		Calculated	50	
Bentonite	0	2	2	S
		Calculated	2	

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E
[X] Other Poured dry
Backfill placed from 95 ft. to 98 ft. Material Fine sand
Filter pack from 0 ft. to 158 ft. Material Sand Size 10-20
Explosives used: [ ] Yes Type _____ Amount _____

(5a) ABANDONMENT USING UNHYDRATED BENTONITE

Proposed Amount _____ Pounds Actual Amount _____ Pounds

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
◉	○	12	X	1	102	250	◉	○	X	
◉	○	10	X	1.5	105	250	◉	○	X	
◉	○	10		137	147	250	◉	○	X	
○	○						○	○		
○	○						○	○		

Shoe [ ] Inside [ ] Outside [ ] Other Location of shoe(s) _____
Temp casing [ ] Yes Dia _____ From _____ To _____

(7) PERFORATIONS/SCREENS

Perforations Method _____
Screens Type V-wire Material Stainless steel

Perf/Screen	Casing/Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/pipe size
Screen		10	147	158	.02			
Screen		10	105	137	.02			

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

(◉) Pump ( ) Bailer ( ) Air ( ) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
600	29	117	4

Temperature 58 °F Lab analysis [ ] Yes By _____
Water quality concerns? [ ] Yes (describe below) TDS amount 260

From	To	Description	Amount	Units

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(9) LOCATION OF WELL (legal description)

CLAC 74247

County CLACKAMAS Twp 3 S N/S Range 1 W E/W WM
Sec 25 SW 1/4 of the NE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat _____ ° _____ ' _____ " or _____ DMS or DD
Long _____ ° _____ ' _____ " or _____ DMS or DD
(◉) Street address of well ( ) Nearest address
15210 NE Miley Rd. - Aurora, OR 97002

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Pre-Alteration				
Completed Well	6-25-18			36

Flowing Artesian? [ ] Dry Hole? [ ]

WATER BEARING ZONES Depth water was first found 36

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
06-25-2018	36	50				
06-25-2018	105	137	800			36
06-25-2018	151	155	300			36

(11) WELL LOG

Ground Elevation _____

Material	From	To
Loam	0	4
Brown silty sand wet	4	25
Sandy silt	25	35
Brown sandy gravel	35	50
Grey clay	50	56
Dark brown sandy - small gravel	56	65
Grey clay	65	73
Yellow clay	73	75
Brown dirty gravel & sand	75	85
Grey silty sand very fine	85	105
Grey sand	105	112
Grey sand 1" gravel	112	120
Grey sand to 1-1/2" gravel	120	128
Grey sand	128	137
Green clay conglomerate	137	139
Blue clay fine	139	151
Blue sand	151	155
Blue clay	155	158

Date Started 06-06-2018 Completed 06-25-2018

(unbonded) Water 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 water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 1411 Date 07-20-2018
Signed _____

(bonded) Water 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 water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1684 Date 07-20-2018
Signed _____
Contact Info (optional) jonesdrilling@hotmail.com

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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

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Oregon State University

Limited License Application for Artificial Groundwater Recharge

North Willamette Research and Extension Center (NWREC)

July 8, 2026

Oregon State University

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

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1 Introduction and Background

This report presents hydrogeologic data and site information in support of a Limited License application being submitted by GSI Water Solutions, Inc. (GSI) on behalf of the Oregon State University (OSU) for Artificial Recharge (AR) at their North Willamette Research and Extension Center (NWREC) Aurora Site for use at their Managed Aquifer Recharge Innovation Field (Site). The report is intended to generally characterize the hydrogeology in the vicinity of the Site, located approximately 1-mile south of the Willamette River (**Figure 1**). This report also proposes a plan to monitor water quality and hydraulic response to the AR project. The primary objectives of OSU's AR project are to:

1. Study the changes in physical, chemical, and biological subsurface properties during flow and transport from AR.
2. Perform chemical and biological fingerprinting to track water quality and quantity during AR or natural recharge.
3. Investigate heat transport during AR.
4. Develop models and approximations to correlate geophysical and soil physics properties for improved flow and transport prediction from AR activities.
5. Optimize novel designs for vadose zone infiltration systems.
6. Optimize pretreatment systems (filtration, modified sedimentation chamber, etc.) to enhance source water quality before infiltration.
7. Develop and optimize vadose zone and groundwater models for estimating recharge (temporal and spatial scale) from AR.
8. Examine system-level interactions between irrigation, soil health, vadose zone, and groundwater in agricultural-AR settings.
9. Explore incorporating AR in Agrivoltaics.

The Site also serves as an applied research, education, and outreach facility to demonstrate the implementation, monitoring, and benefit of various AR systems. **Table 1** summarizes the different site components and their purpose at the Site.

Table 1. Site Components

MAR Components	Purpose
Irrigation Water Well	Provide a controlled, local water supply for recharge testing.
Infiltration Basin	Evaluate surface spreading efficiency for AR testing at the Site.
Pretreatment Ex-Situ Unit	Passive filtration box to reduce fine sediment and turbidity.
Pretreatment Well	Shallow well used to conduct additional treatment to source water.
Drywell	Deeper borehole that allows for evaluation of rapid, point-source recharge potential.
Vadose Zone Wells (VZ1 – VZ4)	Monitoring wells used to track moisture, temperature, reduction potential, oxygen, and chemistry in the vadose zone.
Groundwater Monitoring Wells (MW1-MW4)	Monitoring wells are used to monitor water level and collect groundwater samples.

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This report contains project information required to apply for a new AR limited license application for OSU's proposed AR pilot testing program. The AR limited license application and information included herein follow Oregon Administrative Rules (OAR) 690-350-0020. The following index identifies where information required under OAR 690-350-0020 can be found in this document. The index was prepared to assist in reviewing OSU's AR limited license application.

OAR	Information Location in this Document
690-350-0120 (1) **Application Requirements**	Complete Document
690-350-0120 (1) **Applicant Information**	Application Form (Appendix A)
690-350-0120 (2) **Pre-Application Conference**	Occurred on 04/17/2025
690-350-0120 (3)(c) **Purpose of Recharge**	Section 3
690-350-0120 (3)(f) **Hydrogeologic Feasibility Report**	Entire report
690-350-0120 (3)(g) **Project Description Report**	Section 3
690-350-0120 (5)(a-e) **Permit Conditions**	Section 4
690-350-0120 (5)(A) **Monitoring Program**	Section 5

Appendix A presents a completed Oregon Water Resources Department (OWRD) AR limited license application for pilot testing at OSU's proposed AR project.

1.1 Pilot Testing Study Area

OSU's AR program involves diverting harvested rainwater from NWREC's agrivoltaics solar panels and/or pumping groundwater from the CLAC 74247 (Irrigation Well) at the Site into a drywell or an infiltration basin (**Figure 1**).

The purpose of the proposed AR project is to use the Site to study infiltration rates using a drywell and infiltration basin by recharging water into the shallow aquifer system. The proposed AR project will be overseen by Dr. Salini Sasidharan with OSU as part of her ongoing research and will guide future studies with the goal of using underground injection control systems for infiltration as part of AR projects. Findings from this research have important implications for drywell operation and groundwater management in Oregon and in other parts of the world with similar geological conditions.

OSU's primary source of water for the AR project is rainwater collected from solar panels. However, OSU may also use potable water to conduct controlled studies if rainwater systems are inoperable. The Irrigation Well at NWREC will also be used as an additional water supply source for larger infiltration volumes (above 50-1000 m^3, which are typical volumes for rain harvesting studies). The site is equipped with monitoring wells used to record responses to the aquifer at the Site. **Table 2** summarizes the Site's monitoring wells.

Table 2. NWREC Monitoring Well Network.

Well Name	OWRD Well ID	Well Depth (feet bgs)	Screened Interval (feet bgs)	Cased Depth (feet bgs)
MW1	CLAC 78641	99	78 – 98	78
MW2	CLAC 78642	99	78 – 98	78
MW3	CLAC 78643	99	78 – 98	78
MW4	CLAC 78644	99	58 – 98	58
VZ1	CLAC 78655	50	–	48
VZ2	CLAC 78656	50	–	48
VZ3	CLAC 78657	50	–	48
VZ4	CLAC 78658	50	–	48

Notes
- feet bgs = feet below ground surface

For this AR application, MW1 and CLAC 73435 (Downgradient Well) will be used to establish baseline water quality conditions, to observe responses to recharge activities, and to better understand how water migrates through the subsurface. Vadose zone wells are instrumented to enable continued monitoring of moisture content, electrical conductivity, temperature, oxidation-reduction potential, and oxygen. **Section 5** describes the water quality monitoring program in greater detail.

2 Hydrogeologic Characterization and Feasibility

The following sections describe the geology and hydrogeology of the Site and the impacts on project feasibility.

2.1 Geology and Shallow Soils

The Site is located in the central Willamette Basin, approximately 1-mile south of the Willamette River (**Figure 1**). The terrain is consistent with an alluvial floodplain, mostly flat to gently rolling and the area is primarily made up of the Missoula Flood deposits which overlie the Columbia River Basalt Group. Most of the vegetation in the surrounding areas has been replaced by agriculture and suburban development, but remnants of the original vegetation still exist, including oak savannas and riparian forest. The Site is private and closed off to the public and only accessible by employees or contractors for OSU.

The shallow soils within the Site were characterized by GeoSystems Analysis, Inc. (GSA) via the following methods:

- Drilling and geologic logging of four boreholes within the Site; and
- Collection of samples and laboratory testing of sample particle size distribution.

The boreholes were drilled to 50 feet below ground surface (feet bgs) in the northeast corner of NWREC (**Figure 1**). Sandy loam soils were present for nearly the entire extent of the boreholes. **Appendix B** includes complete descriptions of the boreholes.

2.2 Hydrogeology

The Site is located in a temperate region that receives approximately 47 inches of precipitation annually and lies within the Lower Willamette Sub-basin (HUC-8: 1709001; U.S. Geological Survey 2023).

Shallow groundwater occurs within the fine-grained sedimentary aquifer in the Willamette Valley known as the Willamette Silt Unit (WSU). The aquifer extends approximately 1,200 square miles and can be as thick as 130 feet. The target aquifer for AR at this site is the WSU, made up of interbedded silt with lenses of sand and gravel (O'Connor et al., 2001). The WSU experiences seasonal water-level fluctuations due to annual climate and water-use patterns regionally. Among the 136 alluvial wells identified within approximately 150 square miles of the Site, nearly all of which are located south of the Willamette River (Kumar and Sasidharan, 2023), the average seasonal water-level change is 11.6 feet between March and September (**Table 3**). Water-level elevation contours from these wells indicate greater hydraulic gradients in March compared to September (Kumar and Sasidharan, 2023).

Table 3. Seasonal Groundwater Level Statistics in the Alluvial Aquifer – Within 150 Square Miles of the Site

	Month[1] (feet amsl)		Water-Level Change (feet)
	March	September	
Minimum	77.0	64.0	13.0
Maximum	217.0	199.0	18.0
Average	130.2	118.6	11.6
Standard Deviation	40.6	28.5	12.1

Notes

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[1]Sample size in March and September was 136 and 48, respectively.
feet amsl = feet above mean sea level

3 Permits and Approvals

This section identifies permits and approvals necessary to conduct AR pilot testing and provides documentation that the permits and approvals have either been obtained, requested, or will be obtained before AR pilot testing.

3.1.1 Source Water Rights

OSU intends to use the Irrigation Well (CLAC 74247) at the Site for supplemental recharge water. Groundwater is appropriated under water right certificate 98953, held by OSU. The well appropriates water from a depth of approximately 100 to 160 feet bgs, with a maximum authorized rate of 0.25 cubic feet per second (cfs) (approximately 112 gallons per minute [gpm]), from March 1 through October 31. **Appendix C** includes a copy of the water right.

3.1.2 Underground Injection Control Registration

In general, AR operations and testing require registration and rule authorization under the Oregon Department of Environmental Quality (DEQ) Underground Injection Control (UIC) program. **Appendix D** contains a UIC application for the AR well.

3.1.3 Land Use Approval

All AR operations and testing require land use and development approval from the local government, or a determination from the local government that approval is not necessary. The completed Land Use Information Form for OSU's AR project is included in **Appendix A**.

3.1.4 Potential Impact to Groundwater Quality

Three domestic water supply wells were identified in the vicinity of the AR project (**Figure 1**). The closest domestic water supply well (CLAC 73435) is located approximately 130 feet to the east of the proposed AR infrastructure. The closest downgradient domestic water supply well (CLAC 73435) is located approximately 700 feet west of the Irrigation Well.

When using groundwater from the Irrigation Well, the system used for this AR permit will be a same-aquifer recharge system, where water from the deeper portion of the WSU will be pumped and then recharged into the top of the WSU. Based on the local soil and hydrogeologic characteristics, planned recharge system design, and operation procedures, it is GSI's opinion that the proposed AR project is hydrogeologically feasible. No negative impacts associated with the project, including impacts to alluvial groundwater quality are anticipated.

3.1.5 Impact on Nearby Groundwater Users

As part of the AR project, OSU will attempt to gain access to a well downgradient of the recharge well (CLAC 73435, Downgradient Well) as a monitoring point during the duration of the AR project. Prior to the start of recharge at the dry well, CLAC 73435 will be sampled to establish baseline water quality.

4 Project Description and System Design

The AR program involves pumping water from the Irrigation Well or harvested rainwater and diverting it into a drywell at the Site (**Figure 1**). The following sections describe the AR system design and proposed operation.

4.1 Supply Well

OSU proposes to use the Irrigation Well (CLAC 74247) and harvested rainwater as the water source for AR. A 16-inch diameter borehole was drilled to a depth of 158 feet bgs. The upper borehole consists of 12-inch diameter steel casing to a depth of 102 feet bgs. The lower borehole consists of a 10-inch diameter stainless steel screen assembly, with a 0.020-inch slot screen from 105 to 137 feet bgs and 147 to 158 feet bgs. **Appendix E** includes the water supply well report.

Rainwater is harvested from the agrivoltaics solar panels on the northwest side of the NWREC (**Figure 1**) property. The water will be conveyed using an existing water main that runs south towards the above ground storage tank and then east towards the drywell.

4.2 Diversion and Recharge

Rainwater from the agrivoltaic solar panels or water from the Irrigation Well (CLAC 74247) will be diverted into a pretreatment chamber. If the water meets applicable water quality parameters, it will then be diverted and gravity fed into either the drywell or infiltration basin for research testing.

4.2.1 Existing Infrastructure

The following sections describe existing infrastructure that has been installed at the Site for research purposes.

4.2.1.1 Monitoring Wells

Figure 1 shows the existing monitoring well network which consists of four vadose zone wells (VZ1, VZ2, VZ3, and VZ4) and four groundwater monitoring wells (MW1, MW2, MW3, and MW4). The vadose zone wells will be an important aspect of the research projects conducted at the Site but are not part of the water quality monitoring network. Rather, these shallow wells will be used to monitor the movement of water through the unsaturated zone.

A series of sensors have been installed in the vadose zone wells, which will monitor moisture content, electrical conductivity, temperature, oxygen reduction potential, and oxygen at various depths. **Table 4** summarizes the installation depth of the sensors. Given the anticipated recharge rate of 0.25 cfs (112 gpm), it is not anticipated that the mound of recharged water will extend beyond the property boundary.

Table 4. Vadose Zone Sensors and Installation Depth

Measurement Device	Depth (ft bgs)			
	VZ1	VZ2	VZ3	VZ4
Lysimeter	10.5	10.5	9	9
	20.5	20.5	26	26
	39	39	47	47
	15.5	15.5	14	14
	31	31	16.5	16.5

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Moisture Content Sensor	33	33	31	31
	45.5	45.5	42	42
Moisture Content Probe	30.5	30.5	-	-
Pressure Head Sensor	16	16	14.5	14.5
	31.5	31.5	17	17
	33.5	33.5	31.5	31.5
	46	46	42.5	42.5
Oxygen Sensor	24.5	24.5	21.5	21.5
Redox Potential Sensor	32	32	41	41
	44.5	44.5	-	-

4.2.1.2 Drywell

OSU proposes to use a drywell for AR. In the drywell system, water from the source well will pass through a pre-treatment chamber before being conveyed to the injection chamber in the drywell or the infiltration basin.

The drywell was constructed to a depth of 41 feet bgs with a diameter of 6 ft, and the screened interval is 14 to 41 feet bgs. For reference, the static water level observed at the Site is approximately 50 feet bgs. OSU proposes to inject approximately 322,851 gallons (50 acre-feet) of water into the drywell at a rate of 112 gpm per year.

4.2.1.3 Infiltration Basin

An infiltration basin is located at the site. The infiltration basin will be used to support targeted vadose zone experiments of flow, transport, and water quality. Water will be diverted to the basin to infiltrate through native soils, providing an additional level of attenuation prior to reaching groundwater.

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5 AR Monitoring Plan

The following sections summarize the key components of the AR monitoring plan.

5.1 Water Level Monitoring

Water levels will be monitored using all four monitoring wells and the four vadose zone wells (**Figure 1**). Monitoring wells will be instrumented with transducers to monitor the hydraulic response of the alluvial aquifer to infiltration. The transducers will be set up to record pressure, depth, and temperature readings on at least an hourly basis during the entire duration of AR activities. Water levels in the vadose zone wells and alluvial aquifer monitoring wells will be verified by manual measurements every few days to once a week (dependent on the frequency of visits to the site by OSU operators) throughout AR operations.

5.2 Flow Rate Monitoring

Flow rates and cumulative volumes will be measured using totalizing flow meters located on the discharge pipe from the Irrigation Well and the pipe connecting the agrivoltaics cells to the rest of the system. System flow rates and cumulative volumes will be manually recorded at regular intervals during active diversion and simultaneous recovery operations. Flow rates and volumes will be monitored to ensure flow rates do not exceed the maximum rate allowed under the AR Limited License and to evaluate system performance.

5.3 Water Quality Monitoring

Water quality sampling will occur at the Irrigation Well, Downgradient Well, and MW-1 and analyzed for a list of constituents considered most representative of the potential for AR degradation of alluvial aquifer groundwater quality. Given that source water is the same as the aquifer water, the primary purpose of water quality monitoring is to verify any impacts from activities to native groundwater. Water quality parameters (pH, temperature, electrical conductivity, turbidity and dissolved oxygen) will be measured in the field during the collection of all water samples.

Table 5 lists the proposed geochemical, microbial constituents, and field parameters for analysis. Sampling locations and frequency are described in the following sections. All data will be provided to OWRD to evaluate water quality changes in the shallow groundwater system that may result from AR during this phase of the project. The frequency of sample collection is covered below.

Table 5. Proposed Analyte List

Category	Analyte	Units
General Chemistry	Nitrate - N	mg/L
	Nitrite	mg/L
	Total Alkalinity as $CaCO_3$	mg/L
	Total Ammonium	mg/L
Microbial	E.Coli	
	Microbial community analysis	
Field Parameters	pH	
	Temperature	F
	Oxidation Reduction Potential	mV
	Turbidity	NTU
	Conductivity	uS
	Dissolved Oxygen	mg/L

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Notes
F = Fahrenheit
mV = millivolts
NTU = Nephelometric Turbidity Unit
mg/L = milligrams per liter
uS - microsemens

5.3.1 Recharge Source Water

Water quality samples from the Irrigation Well will be collected at the start and end of the first recharge activity. If the initial results indicate no significant variation in water quality, then no additional sampling will occur until the following water year. Recharge source water samples will be taken at end of the water main, once water reaches the pretreatment ex-situ unit. **Table 5** summarizes the water quality parameters to be collected during AR activities.

5.3.2 Background Water Quality

One sample will be collected from the Downgradient Well and MW-1 prior to the start of any AR activities. The results will be compared to samples collected during recharge events at the Downgradient Well and MW-1 to evaluate potential changes in water quality.

5.3.3 Shallow Alluvial Downgradient Groundwater

Once AR activities have started, OSU will collect groundwater samples at the Downgradient Well after approximately 5 – 25% of the recharge volume has been injected and again after 90 – 100% of the recharge volume has been injected. **Table 5** summarizes the water quality parameters analyzed during active operation of the AR system. Similar to the recharge source water sampling, if no degradation in groundwater quality is observed, then sampling at the Downgradient Well will cease until the following water year.

5.4 Reporting

OSU will provide a project operations summary report by February 15 each year. The report will include information related to the duration, rate, and volume of recharge, water level monitoring, and water quality monitoring.

6 References

O'Connor, Jim E., Andrei Sarna-Wojcicki, Karl C. Wozniak, Danial J. Polette, and Robert J. Fleck. "Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon." *USGS Professional Paper 1620* (2001). https://pubs.usgs.gov/pp/1620/.

U.S. Geological Survey, Lower Willamette Subbasin (HUC 17090012) — Watershed Boundary Dataset (WBD), U.S. Department of the Interior, last modified September 2023, https://www.usgs.gov/national-hydrography/watershed-boundary-dataset

Kumar, S. and S. Sasidharan. 2023. "Hydro-Geological Investigations in and around North Willamette Research and Extension Center (NWREC), Aurora Site." Draft unpublished article.

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