WATER RESOURCES DEPARTMENT

MEM	10							16	March	,2	200_2012
TO: FROM SUBJ	M: ECT:	GW:	GERALD (R) (R) (R) (R)	H. Gro	NOIN	— nce Eva	luation				
X	_YES _NO	The so	ource of	approp	riation i	s within	or abov	ve a Sce	nic Wat	terway	
<u>×</u>	_YES	Use th	e Scenie	e Water	way cor	ndition (Conditi	on 7J)			
×	Per OF interfe the Detthat the	rence wated into	with surface references 835, the with surface references with surface referenc	Ground ace water able to ewill n	er that c ributed d Water er that c find the	Section ontribut section ontribut at thereby reding cha	is unal tes to a se is a produce the	ole to ca scenic w reponde surface	Waterwa	ground y; there of evide flows	water
Calcula calcular informin	ite the per ted, per c ng Water	riteria in Rights th	of consum 390.835, at the De	aptive use do not fit partment	by mont Il in the to is unable	h and fill able but c to make	heck the a Prepon	"unable" derance (option a	bove, thu ce finding	5
Water	way by		owing a	mounts		ed as a p			e consu		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

		TOD	LIC IIV	EREST	XE VIEVV	TOR G	ROUND	WATER	AFI	LICAI	IONS		
TO:		Water	Rights S	ection				Dat	e	16 M	larch 20	12	
FROM	1:	Groun	d Water/	Hydrology	Section _			din					
SUBJ	ECT.	Annli	ration	C-1751	,	Revie	ewer's Name	review of			V.A.		
SUDO	ECI.	Appin		G-1/31		3	upersedes	ieview oi		-	Date of Re	view(s)	
oar of welfare to determine the pres	590-310-1 e, safety a rmine wh sumption NERAL Applica	30 (1) and healtheather the criteria.	The Depart has described presump This revi RMATIC Ek(s) 3.3	ribed in ORS tion is estab ew is based ON: A	presume to 5 537.525. Ilished. OA upon avai pplicant's I	hat a prop Departmen R 690-310 Iable infor Name: Cr	osed ground t staff review -140 allows mation and rystal Clea well(s) in the	dwater use we ground was the propose lagency polar Energy, lene Goose and Map. Lea	ter apd use icies i	nsure the populications be modifiin place atCounty:	under O ied or cor t the time	ion of th AR 690- nditioned e of evalu	310-140 to meet uation. Basin,
	_1 nom	as Cree	K			sub b	asın Qu	ad Map La	kevie	ew NE	Carlot or		
A2.	Propose	ed use:	Heating	& Power (Generation		Sea	asonality: 1	ear l	Round (36	65 days)	3	
A3.	Well an	d aquife	er data (att	ach and nu	mber logs	for existin	g wells; ma	rk proposed	l well	s as such	under lo	gid):	
Wel	Log	id	Applicant's Proposed				ed	Location	170		n, metes		
1			Well #		quifer*	Rate(cf		/R-S QQ-Q)		2250' 1	N, 1200' E	fr NW co	r S 36
1	LAKE		Well 1		f Breccia	3.34		0E-sec 03 B					
2	Not dr		Well2		Basalt	-3.34		0E-sec 04 A			, 80' W		
3	Not dr		Well 3		Basalt	-3.34	39S/2	0E-sec 03 C	CA	4545' S,	1065' E	fr NW c	or S 03
4	Not dr		Well 4		Basalt	-3.34	39\$/2	OE-sec 10 B	DA	1390' S.	, 2020' E	fr SW c	or S 03
* Alluvi	um, CRB,	Bedrock	drung.							Carell			11.3
Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)		forations Screens (ft)	Well Yield (gpm)	Draw Down (ft)	Test Type
1	4950	120	109	03/19/81	685	0-140	+1-140	None		None	900	7	P
2	4840	?	?	?	500	?	?	?		50-500	?	?	?
3	4860	?	?	?	500	?	?	?	15	50-500	?	?	?
4	4920	?	?	?	500	?	?	?	15	50-500	?	?	?
Use data	from app	lication f	or proposed	wells.	ar ar					(terner			15023
A4.	Comme	ents:											
	adjacer	t to Ha		Creek for				well LAKE					

The proposed annual groundwater use is 2420 acre-feet. That converts to 1500 gpm of continuous pumping for 365 days. How the re-injection will be distributed among the three proposed injection wells was not specified.

The proposed aquifer at the production well is identified as volcanic deposits. Walker (1963) mapped the site as tuff (Ttf). Brown and others (1980) mapped the site as tuffs (Tmt). Both describe the unit as being of rhyolitic and dacitic composition, tuffaceous sedimentary rocks, and aerially restricted rhyodacitic and andesitic flows.

The proposed aquifer identified on the application for the proposed injection wells is igneous rock basalt.

Proposed Well 2 (inection) is located on or near the boundary between the tuff of the uplands mapped by Walker (1963) as Ttf and by Brown and others (1980) as Tmt and the valley sediments mapped by Walker (1963) as Qal and by Brown and others (1980) as Qal/Qs which is undifferentiated alluvium and sediments that includes lacustrine and fluviatile gravel, sand, and silt, and can include undifferentiated evaporate deposits.

rovisions of the Goose & Sumn nagement of ground water hydraulica of all basin rules contain such provisio mments:	Basin rules relative to the development, classificated lly connected to surface water are, or are not, activated by this arens.)
是一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个	e Subbasin) may or may not apply. The groundwater system is
confined. The proposed production	well is less than 100 feet from Hammersley Creek (the proposed injects). Technically, the creek is a tributary to Thomas Creek. However,
	Hammersley Canyon which ultimately discharges to Thomas Creek.
properly anditional parmit to loss	ate the injection wells the same or less distance from the Hammerski
uth as the production well should	satisfy the provision of the Goose & Summer Lakes Basin rule OAL
20 2(12 (Studie Lane Subbasiu).	
ÉMIL	
me of administrative area:	,, tap(s) an aquifer limited by an administrative rest
mments: Currently, no administr	ative area.
	nagement of ground water hydraulica of all basin rules contain such provision mments: AR 690-513-0030 2dE (Goose Lake confined. The proposed production emore than 1,000 feet from the cree pears to run dry from the mouth of properly conditioned permit to locate the agent water production well should 30 2dE (Goose Lake Subbasin).

B. GROUND WATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

a.		
	is over appropriated, is not over appropriated, or ⊠ cannot be determined to period of the proposed use. * This finding is limited to the ground water proposed uses the determination as prescribed in OAR 690-310-130;	
b.	will not or will likely be available in the amounts requested without injury to is limited to the ground water portion of the injury determination as prescri	
c.	will not or will likely to be available within the capacity of the ground water in	resource; or
d.	will, if properly conditioned, avoid injury to existing ground water rights or to the i. The permit should contain condition #(s)	ne ground water resource: cial conditions
	iii. The permit should contain special condition(s) as indicated in item 3 belo	w;
a.	Condition to allow ground water production from no deeper than	ft. below land surface;
b.	Condition to allow ground water production from no shallower than	ft. below land surface;
c.	Condition to allow ground water production only from the water reservoir between approximately ft. and ft. below I	ground
	water reservoir between approximately ft. and ft. below I	and surface;
	Describe injury -as related to water availability- that is likely to occur without w	
	senior water rights, not within the capacity of the resource, etc):	
Gro		
Rei	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all	uvium, basin fill sediments, an
Rep diff bas	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of values.	uvium, basin fill sediments, an y) sediment unit (predominant arying thickness overlies a hig
Reg diff bas trai	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and sedimentary sources)	uvium, basin fill sediments, an y) sediment unit (predominant arying thickness overlies a hig ments). Groundwater occurs i
Rep diff bas trai	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of values.	uvium, basin fill sediments, and sediment unit (predominant arying thickness overlies a high ments). Groundwater occurs
Rei diff bas trai bot Gro	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected.	uvium, basin fill sediments, and sediments and sediment unit (predominant arying thickness overlies a high ments). Groundwater occurs within each unit. Additionall
Rej diff bas trai bot Gro	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: corts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected to	uvium, basin fill sediments, and sediment unit (predominant arying thickness overlies a higments). Groundwater occurs within each unit. Additionally from upland recharge areas
Reg diff bas trai bot Gro Mo low	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected. organ (1988) notes for the Goose Lake subbasin that ground water flow is generally cland discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded, discontinuous, units the sediment water move through complexly interbedded.	uvium, basin fill sediments, and streams. Larging uplated recharge areas within each unit. Additionally from upland recharge areas meadows, and streams. Larging revel, silvents and streams.
Reg diff bas tran bot Gro Mo low qua and	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: oorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected. organ (1988) notes for the Goose Lake subbasin that ground water flow is generally land discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, unit clay deposits. Morgan characterizes the upper portion of ground water as	uvium, basin fill sediments, and sediment unit (predominant arying thickness overlies a higments). Groundwater occurs is within each unit. Additionall of the form upland recharge areas areadows, and streams. Large areas areadows, and streams. Large areas areas.
Reg diff bas tran bot Gro Mo low qua and con hyd	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: ourts for the Goose and Summer Lakes Basin indicate ground water occurs in all Greent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected and water in the sediment unit and the basalt unit is hydraulically connected. ound water in the sediment unit and the basalt unit is hydraulically connected. ound discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, unit clay deposits. Morgan characterizes the upper portion of ground water as ditions increasing with depth. This appears related to anisotropic hydraulic draulic conductivity much greater than vertical hydraulic conductivity. For one	uvium, basin fill sediments, an y) sediment unit (predominant) arying thickness overlies a higments). Groundwater occurs is within each unit. Additionally of from upland recharge areas of meadows, and streams. Large neonsolidated sand, gravel, sil unconfined with confined-like conductivities with horizonts site noted, the estimated ratio
Reg diffi bass tran bot Gro Mo low qua and con hyd	senior water rights, not within the capacity of the resource, etc): ound water availability remarks: outs for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected. organ (1988) notes for the Goose Lake subbasin that ground water flow is generally land discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, unit clay deposits. Morgan characterizes the upper portion of ground water as ditions increasing with depth. This appears related to anisotropic hydraulic	uvium, basin fill sediments, an y) sediment unit (predominant arying thickness overlies a higments). Groundwater occurs is within each unit. Additionally from upland recharge areas meadows, and streams. Large neonsolidated sand, gravel, sil unconfined with confined-like conductivities with horizonts site noted, the estimated ratio
Reg diff bas tran bot Gro Mo low qua and con hyd	cound water availability remarks: Doorts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and sedient the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected. Togan (1988) notes for the Goose Lake subbasin that ground water flow is generally land discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, util clay deposits. Morgan characterizes the upper portion of ground water as ditions increasing with depth. This appears related to anisotropic hydraulic laulic conductivity much greater than vertical hydraulic conductivity. For one used from 2:1 to 179:1. There is no indication of shallower ground water being the by a confining layer.	uvium, basin fill sediments, and sediment unit (predominant arying thickness overlies a higments). Groundwater occurs is within each unit. Additionally from upland recharge areas meadows, and streams. Largaconsolidated sand, gravel, sill unconfined with confined-lill conductivities with horizont site noted, the estimated ratio separated from deeper ground
Regularity bot Ground G	senior water rights, not within the capacity of the resource, etc): bound water availability remarks: corts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected. Tegan (1988) notes for the Goose Lake subbasin that ground water flow is generally land discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, unit clay deposits. Morgan characterizes the upper portion of ground water as additions increasing with depth. This appears related to anisotropic hydraulic laulic conductivity much greater than vertical hydraulic conductivity. For one used from 2:1 to 179:1. There is no indication of shallower ground water being the base of the Hammersley Canyon mouth. The ose lake valley about 0.7 miles southwest of the Hammersley Canyon mouth.	uvium, basin fill sediments, ar y) sediment unit (predominant arying thickness overlies a higments). Groundwater occurs within each unit. Additionall y from upland recharge areas meadows, and streams. Larnconsolidated sand, gravel, si unconfined with confined-lil conductivities with horizont site noted, the estimated rati separated from deeper ground tell LAKE 2424). It is located 800 foot deep well is complete
Rep diffi	senior water rights, not within the capacity of the resource, etc): bund water availability remarks: corts for the Goose and Summer Lakes Basin indicate ground water occurs in all ferent basalt units. Generally in the valleys, a low transmissivity (low permeability in-fill from volcanic and sedimentary sources with occasional basalt flows) of vansmissivity (high permeability) basalt unit (predominantly volcanic flows and seding the sediment unit and the basalt unit. Groundwater is vertically connected bound water in the sediment unit and the basalt unit is hydraulically connected. Tegan (1988) notes for the Goose Lake subbasin that ground water flow is generally land discharge areas. However, local subsystems discharge to lakes, reservoirs, antities of ground water move through complexly interbedded, discontinuous, unit clay deposits. Morgan characterizes the upper portion of ground water as additions increasing with depth. This appears related to anisotropic hydraulic largulic conductivity much greater than vertical hydraulic conductivity. For one used from 2:1 to 179:1. There is no indication of shallower ground water being the by a confining layer.	uvium, basin fill sediments, and sediment unit (predominant arying thickness overlies a high ments). Groundwater occurs within each unit. Additionally from upland recharge areas meadows, and streams. Larkneonsolidated sand, gravel, si unconfined with confined-lic conductivities with horizont site noted, the estimated rati separated from deeper groundwater level data

below land surface, then there was a gradual decline in the annual water level from about 40 to 50 feet below land surface from 1970 to 1990, then the annual water level water level rose to about 20 feet below land surface and has fluctuated between 15 to 20 from 1990 to 2010. The cause of the rise is undetermined at this time.

The proposed aquifer at the production well is identified as volcanic deposits. It is located above Goose Lake valley in Hammersley Canyon in the uplands on the east border of Goose Lake valley. Walker (1963) mapped the site as tuff (Ttf). Brown and others (1980) mapped the site as tuffs (Tmt). Both describe the unit as being of rhyolitic and dacitic composition, tuffaceous sedimentary rocks, and aerially restricted rhyodacitic and andesitic flows.

The proposed aquifer identified on the application for the proposed injection wells is igneous rock basalt. These wells are located on eastern edge of Goose Lake valley where the east uplands begin.

Proposed Well 2 (inection) is located on or near the boundary between the tuff of the uplands mapped by Walker (1963) as Ttf and by Brown and others (1980) as Tmt and the valley sediments mapped by Walker (1963) as Qal and by Brown and others (1980) as Qal/Qs which is undifferentiated alluvium and sediments that includes lacustrine and fluviatile gravel, sand, and silt, and can include undifferentiated evaporate deposits.

Proposed Well 3 (injection) and Well 4 (injection) are located on or near the boundary between the tuff, tuff breccia of the uplands mapped by Walker (1963) as Taf and by Brown and others (1980) as Tmst which is tuffaceous sedimentary rocks, claystones, hornblende andesite flows, and basalt flows and the valley sediments mapped by Walker (1963) as Qal and by Brown and others (1980) as Qal/Qs which is undifferentiated alluvium and sediments that includes lacustrine and fluviatile gravel, sand, and silt, and can include undifferentiated evaporate deposits.

If a permit is issued, the following conditions need to be included: 7B, 7F, 7L, 7N (modified), 7T, and special conditions (see below):

7N, the measurement condition modified (change part "A" from three to "one or more feet", merge "B" and "C" to read "Annual water-level measurements reveal a water-level decline of 5 or more feet:", and change part "D" from 25 to "10 or more feet", and add a part "E" to read "OWRD groundwater section staff approved static ground water level measurements at well LAKE 2424 (state observation well 381) is below 30 feet below land surface", and insert the following to the last paragraph after "no action is necessary because...": insert "...the use is not contributing to the decline or contributing to the groundwater level being below 30 feet below land surface at well LAKE 2424 (state observation well 381) or because..."). Note: this is condition modification is needed to reduce the possibility of injury to surface water rights at the mouth of Hammersley Creek and to reduce the possibility of violating OAR 690-513-0030 2dE (Goose Lake Subbasin).

7T, the measuring tube condition modified (add "For existing wells with a pump installed, installation of the measuring tube shall occur when the pump is removed or replaced and/or when the well is deepened or reconstructed or altered.").

The "large" water use condition (require a flow meter at each well; each flow meter shall be located within 50 feet of the wellhead. Adjacent to every flow meter shall be a clearly visible monument with a sign noting the flow meter. Lastly, require for every flow meter the reading, recording (monthly at minimum), and annual reporting of the flow meter data, all flow meters).

Well construction condition ("All wells shall be constructed to extract or inject groundwater from and to the same or adjoining water-bearing zone within the basalt unit (this includes tuff breccia) below the basin sediments. To meet this criterion, each well shall have at minimum continuous casing and continuous seal from land surface, through the sediment to the productive portion of the basalt unit.").

Injection well location condition ("The location of all injection wells shall be at a distance from a point near the mouth of Hammersley Canyon that is equal to or less than the distance of the production well from the same point near the mouth of Hammersley Canyon. Otherwise, the use is invalid and subject to regulation, including possible immediate cancellation of the permit. The point location is 400 feet east of the west quarter of section 3 in township 39 south, range 20 east."). Note: this is condition is needed to ensure no net groundwater level drawdown at Hammersley Creek which will prevent injury to surface water rights at the mouth of Hammersley Creek and to prevent violation of OAR 690-513-0030 2dE (Goose Lake Subbasin).

Special condition for no net groundwater use: "This permit is valid if and only if 100 percent of the groundwater extracted from the production well(s) is injected in the authorized injection well(s) which can be confirmed by flow meter data. Otherwise, the use is invalid and subject to regulation, including possible immediate cancellation of the permit."

Continues on next page

Wel	Unconfin		finement:	40 (1): Evaluation of aquifer confinent	09-04 Vel
Aquifer of Proposed Aquifer 1 Basalt/Tuff Breccia 2 Basalt/Tuff Breccia 3 Basalt/Tuff Breccia 4 Basalt/Tuff Breccia Basis for aquifer confinement evaluation: The system is identified as generally unconfined with discontinuous low permeability layer			finement:	40 (1): Evaluation of aquifer confinent	09-04 Vel
Wel Aquifer or Proposed Aquifer Confined 1		Confined		Aquifer or Propose	Vel l
Wel Aquifer or Proposed Aquifer Confined 1		Confined		Aquifer or Propose	Vel l
Aquifer of Proposed Aquifer 1 Basalt/Tuff Breccia 2 Basalt/Tuff Breccia 3 Basalt/Tuff Breccia 4 Basalt/Tuff Breccia Basis for aquifer confinement evaluation: The system is identified as generally unconfined with discontinuous low permeability layer			posed Aquifer	Space National Control of the Contro	1
2 Basalt/Tuff Breccia 3 Basalt/Tuff Breccia 4 Basalt/Tuff Breccia Basis for aquifer confinement evaluation: The system is identified as generally unconfined with discontinuous low permeability layer				Resalt/Tuff Breccia	
3 Basalt/Tuff Breccia 4 Basalt/Tuff Breccia Basis for aquifer confinement evaluation: The system is identified as generally unconfined with discontinuous low permeability layer				Dasaiti Tuli Di eccia	1
4 Basalt/Tuff Breccia Basis for aquifer confinement evaluation: The system is identified as generally unconfined with discontinuous low permeability layer				Basalt/Tuff Breccia	_
Basis for aquifer confinement evaluation: The system is identified as generally unconfined with discontinuous low permeability layer					3
The system is identified as generally unconfined with discontinuous low permeability layer				Basalt/Tuff Breccia	4
The system is identified as generally unconfined with discontinuous low permeability layer (discontinuous, limited) confinement.			n.	aquifer confinement evaluation:	is for
ooth the sediment unit and the basalt unit. Groundwater is vertically connected within each Ground water in the sediment unit and the basalt unit is hydraulically connected.					
	landkana	flow is genevally from	ke subbasin that ground wa	(1988) notes for the Goose Lake so	rgan
Morgan (1988) notes for the Goose Lake subbasin that ground water flow is generally from up	upiand recharge	r now is generally from		The state of the s	
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows	ws, and stream	lakes, reservoirs, meado			
Morgan (1988) notes for the Goose Lake subbasin that ground water flow is generally from up- lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated	ws, and streams ted sand, gravel	lakes, reservoirs, meado continuous, unconsolida	igh complexly interbedded,	es of ground water move through o	ntiti
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with continuous and the continuous of the continuo	ws, and stream ted sand, gravel confined-like c	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with	igh complexly interbedded, the upper portion of ground	es of ground water move through cosits. Morgan characterizes the u	ntitie dep
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with coincreasing with depth. This appears related to anisotropic hydraulic conductivities with	ws, and streams ted sand, gravel confined-like c ith horizontal	lakes, reservoirs, meado scontinuous, unconsolida vater as unconfined with Iraulic conductivities w	igh complexly interbedded, the upper portion of ground rs related to anisotropic l	es of ground water move through cosits. Morgan characterizes the ung with depth. This appears re	ntitio dep reasi
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with concreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimate	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of cosits. Morgan characterizes the using with depth. This appears re- sivity much greater than vertical hy	ntitie dep reasin ducti
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with coincreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimates 179:1. There is no indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indicated the conductivity in the conductivity is not indicated to an indication of shallower ground water being separated from deeper than the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated the conductivity indicated	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with coincreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimates 179:1. There is no indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indicated the conductivity in the conductivity is not indicated to an indication of shallower ground water being separated from deeper than the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated the conductivity indicated	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with coincreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimates 179:1. There is no indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indicated the conductivity in the conductivity is not indicated to an indication of shallower ground water being separated from deeper than the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated the conductivity indicated	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with coincreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimates 179:1. There is no indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indication of shallower ground water being separated from deeper than the conductivity is not indicated the conductivity in the conductivity is not indicated to an indication of shallower ground water being separated from deeper than the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated to an indicated the conductivity is not indicated the conductivity indicated	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with concreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimated in the conductivity. There is no indication of shallower ground water being separated from deeper than the conductivity.	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1
lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows quantities of ground water move through complexly interbedded, discontinuous, unconsolidated clay deposits. Morgan characterizes the upper portion of ground water as unconfined with concreasing with depth. This appears related to anisotropic hydraulic conductivities with conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimated in the conductivity. There is no indication of shallower ground water being separated from deeper than the conductivity.	ws, and streams ted sand, gravel confined-like c ith horizontal nated ratios ran	lakes, reservoirs, meado continuous, unconsolida vater as unconfined with draulic conductivities we one site noted, the estin	igh complexly interbedded, the upper portion of ground rs related to anisotropic l al hydraulic conductivity.	es of ground water move through of soits. Morgan characterizes the unit with depth. This appears relivity much greater than vertical hy 79:1. There is no indication of s	ntition depression duction 1

C2. 690-09-040 (2) (3): Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected? YES NO ASSUMED	Potential for Subst. Interfer. Assumed? YES NO
1	1	Hammersley Creek	4841	4810	1570		
2	1	Hammersley Creek	4735	4810	1350		
3	1	Hammersley Creek	4735	4810	2010		
4	1	Hammersley Creek	4735	4810	4375		

3	1	Hammersley Creek	4735	4810	2010					
4	1	Hammersley Creek	4735	4810	4375					
Basis fo	or aqu	ifer hydraulic connection evaluat	tion:					A LAND		
-100 /17				merch.					-955.7	100
Hamm	ersley	Creek is a tributary to Thomas (Creek.	la comp					9	
T) ·			100			*		9 1 2		
		inds a hydraulic connection betw Canyon. The creek in Ham								
		Groundwater from the uplane								
		r rights are located. In the v								
		unit (basin-fill) and becomes ar								
creek b	ed ele	vation in the valley.			A. T. O. C. S. S. C. P. S. C.					
					C (1	2		20 41		0 4
		uth point location of 400 feet easmine each well distance from the								
2.0		radient of all the propose injection		ns point it	ocation is t	iown-grae	urem	of the pro	poseu j	<u>Jiouuction</u>
***************************************	u up ¿	ration of all the propose injecti	on wens.	A STATE OF						
The gr	oundw	ater elevation at the production	well is bas	ed upon t	he static w	ater leve	l no	ted on the	water v	vell report
		that well and the land surface								
		0 scale). The groundwater eleva								
		2 2424 (state observation well 3		land sur	face elevat	ion at we	ell L	AKE 2424	derived	I from the
0363	Lakevi	ew NW topographic map (1:24,0	ou scale).							
A poter	ntial fo	or substantial interference is not	assumed gi	iven the di	istances for	r each we	ll is	greater th	an 0.25	mile (1320
feet) fr	om Ha	mmersley Creek at the mouth of	f Hammersl	ey Canyor	1.		1/27	Ing Pride	F-1-F-3 T	P) Littleanin
				200			SEE ST			100
			Name of the last o							100
		TOTAL STREET		69.33				125	1 P. 1	
								HTE CL		
C / LDS									44.00	
				-200						
	-				-		-			
		The second secon								
					Mr.			C F1-7 A		
		5 - 232 24		- 76				W. S. L.		
										- 14 70
						172.00				
	-					1	_			
-		1989					81	THE REAL PROPERTY.	THE PIE	
Water	Availa	bility Basin the well(s) are locate	ed within:	THOM	AS CR > C	GOOSE L	- A	T MOUTI	I	

C3a. 690-09-040 (4): Evaluation of stream impacts for each well that has been determined or assumed to be hydraulically connected and less than 1 mile from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% natural flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < 1/4 mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	1			N.A.	N.A.		8.24			
2	1			N.A.	N.A.		8.24			
3	1			N.A.	N.A.		8.24			
4	1			N.A.	N.A.		8.24		Service 1	

C3b. 690-09-040 (4): Evaluation of stream impacts by total appropriation for all wells determined or assumed to be hydraulically connected and less than 1 mile from a surface water source. Complete only if Q is distributed among wells. Otherwise same evaluation and limitations apply as in C3a above.

SW #		Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
	4		And the same of th						

Comments:

The proposed production well (LAKE 2326) site and all the injection well sites are less than 1-mile from Hammersley Creek.

The natural flow rate is for Thomas Creek to which Hammersley Creek is tributary.

No Analysis. The application proposes and this review is based upon no net use of groundwater (net use = 0.0 gpm) where 100 percent of the groundwater extracted is injected back to the same source. So no calculation was conducted. If less than 100 percent of the groundwater extracted is injected to the same source and/or if any injection well is located at a distance from a point near the mouth of Hammersley Canyon that is greater than the distance of the production well from the same point near the mouth of Hammersley Canyon (the location of the point at the canyon mouth is 400 feet east of the west quarter of section 3 in township 39 south, range 20 east) this review is invalid and the permit should not be issued.

Note: the injection wells location previously noted is important (critical) to ensure no net groundwater level drawdown

t Hammersley Ci										
iolation of OAR	690-513-0030	2dE (Goose	Lake	Subbasin),	and to	prevent	triggering	a potential	for s	ubstant
iterference.								111-101 17		
	- Million - Francis							4	1-1	illi gad
									_	
				£ 7.30						Section 1
THE REAL PROPERTY.										
The state of the s		Market 19							OLL, I	
13 79 7				-10 (0.55)					-	
	Children Harris Land	M-2-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		The State of the S					-	
KIELS WIVE										

C4a. 690-09-040 (5): Estimated impacts on hydraulically connected surface water sources greater than one mile as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Di	istributed	Wells				100	19552				The same	971	
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-10		%	%	%	%	%	%	%	%	%	%	%	%
Well Q	as CFS	14 (11)	100										
	ence CFS						Jan III			50		5-1-4-	
Distrib	uted Well	S											
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q	as CFS					Maria						300.00	
Interfere	ence CFS										A THE	(CA.)	
-	Harrings	%	%	%	%	%	%	%	%	%	%	%	%
Well Q	as CFS									T Proper	Mark Light		
Interfere	nce CFS		-		11								XAL T
		%	%	%	%	%	%	%	%	%	%	%	9/
Well Q	as CFS		-17	1,10		15							
Interfere	nce CFS												115675
(A) = Tot	tal Interf.	LUL.					16.	Hami			37.	1111111	
$(B) = 80^{\circ}$	% Nat. Q		MILE			att of	1500					SALE.	
(C) = 1 %	% Nat. Q		TOUT										977.11
(D) = (A)) > (C)					7 25	ck Syn					- T. Jan	
(E) = (A)	/ B) x 100					7000	17.79.5			1141-15	77,0,04		1

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

Basis for impact evaluation:
The proposed production well (LAKE 2326) site and all the injection well sites are less than 1-mile from Hammersley Creek.

Application	G- 17512	continued

Date 16 March 2012

- C4b. 690-09-040 (5) (b) The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.
- C5. If properly conditioned, the surface water source(s) can be adequately protected from interference, and/or ground water use under this permit can be regulated if it is found to substantially interfere with surface water:

i. The permit should contain condition #(s)

ii. Mr The permit should contain special condition(s) as indicated in "Remarks" below;

C6. SW / GW Remarks and Conditions

The application proposes and this review is based upon no net use of groundwater (net use = 0.0 gpm) where 100 percent of the groundwater extracted is injected back to the same source. If less than 100 percent of the groundwater extracted is injected to the same source and/or if any injection well is located at a distance from a point near the mouth of Hammersley Canyon that is greater than the distance of the production well from the same point near the mouth of Hammersley Canyon (the location of the point at the canyon mouth is 400 feet east of the west quarter of section 3 in township 39 south, range 20 east) this review is invalid and the permit should not be issued.

Note: the injection wells' location noted in the condition below is important (critical) to ensure no net groundwater level drawdown at Hammersley Creek which will prevent injury to surface water rights at the mouth of Hammersley Creek, to prevent violation of OAR 690-513-0030 2dE (Goose Lake Subbasin), and to prevent triggering a potential for substantial interference. If the location condition is not met, this review is invalid and the permit should not be issued. If the permit is issued and the condition is not met, the use needs to be considered invalid and subject to regulation, including possible immediate cancellation of the permit.

If a permit is issued, the following conditions need to be included: 7B, 7F, 7L, 7N (modified), 7T, and special conditions (see below):

7N, the measurement condition modified (change part "A" from three to "one or more feet", merge "B" and "C" to read "Annual water-level measurements reveal a water-level decline of 5 or more feet:", and change part "D" from 25 to "10 or more feet", and add a part "E" to read "OWRD groundwater section staff approved static ground water level measurements at well LAKE 2424 (state observation well 381) is below 30 feet below land surface", and insert the following to the last paragraph after "no action is necessary because...": insert "...the use is not contributing to the decline or contributing to the groundwater level being below 30 feet below land surface at well LAKE 2424 (state observation well 381) or because..."). Note: this is condition modification is needed to reduce the possibility of injury to surface water rights at the mouth of Hammersley Creek and to reduce the possibility of violating OAR 690-513-0030 2db (Goose Lake Subbasin).

7T, the measuring tube condition modified (add "For existing wells with a pump installed, installation of the measuring tube shall occur when the pump is removed or replaced and/or when the well is deepened or reconstructed or altered.").

The "large" water use condition (require a flow meter at each well; each flow meter shall be located within 50 feet of the wellhead. Adjacent to every flow meter shall be a clearly visible monument with a sign noting the flow meter. Lastly, require for every flow meter the reading, recording (monthly at minimum), and annual reporting of the flow meter data, all flow meters).

Well construction condition ("All wells shall be constructed to extract or inject groundwater from and to the same or adjoining water-bearing zone within the basalt unit (this includes tuff breccia) below the basin sediments. To meet this criterion, each well shall have at minimum continuous casing and continuous seal from land surface, through the sediment to the productive portion of the basalt unit.").

Injection well location condition ("The location of all injection wells shall be at a distance from a point near the mouth of Hammersley Canyon that is equal to or less than the distance of the production well from the same point near the mouth of Hammersley Canyon. Otherwise, the use is invalid and subject to regulation, including possible immediate cancellation of the permit. The point location is 400 feet east of the west quarter of section 3 in township 39 south, range 20 east."). Note: the injection wells location just noted is important (critical) to ensure no net groundwater level drawdown at Hammersley Creek which will prevent injury to surface water rights at the mouth of Hammersley Creek, to prevent violation of OAR 690-513-0030 2dE (Goose Lake Subbasin), and to prevent triggering a potential for substantial interference.

Continues on next page

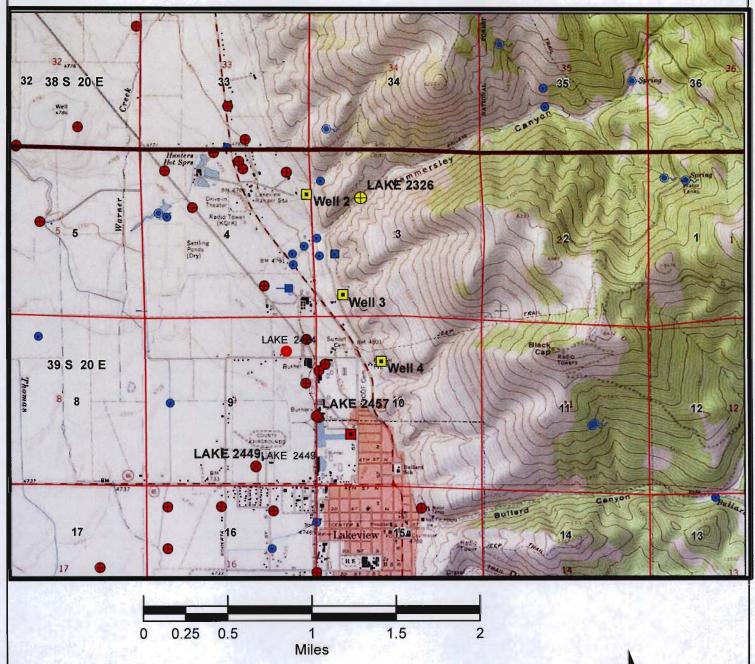
Special condition for no net groundwater use: "This permit is valid if and only if 100 percent of the groundwater extracted from the production well(s) is injected in the authorized injection well(s) which can be confirmed by flow meter data. Otherwise, the use is invalid and subject to regulation, including possible immediate cancellation of the permit." Special condition for low temperature geothermal wells used for heating: "All water produced under this permit shall be injected into the authorized well(s). Prior to receiving a certificate of water right, the permit holder shall submit documentation affirming that any applicable additional requirements of the Department's Division 230 rules have been Special Condition for groundwater production: "Groundwater production shall occur from the predominant basalt unit (this includes tuff breccia) below the predominant basin fill unit by casing and sealing through the basin fill unit into the basalt unit." Reports for the Goose and Summer Lakes Basin indicate ground water occurs in alluvium, basin fill sediments, and different basalt units. Generally in the valleys, a low transmissivity (low permeability) sediment unit (predominantly basin-fill from volcanic and sedimentary sources with occasional basalt flows) of varying thickness overlies a high transmissivity (high permeability) basalt unit (predominantly volcanic flows and sediments). Groundwater occurs in both the sediment unit and the basalt unit. Groundwater is vertically connected within each unit. Additionally, Ground water in the sediment unit and the basalt unit is hydraulically connected. Morgan (1988) notes for the Goose Lake subbasin that ground water flow is generally from upland recharge areas to lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows, and streams. Large quantities of ground water move through complexly interbedded, discontinuous, unconsolidated sand, gravel, silt, and clay deposits. Morgan characterizes the upper portion of ground water as unconfined with confined-like conditions increasing with depth. This appears related to anisotropic hydraulic conductivities with horizontal hydraulic conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimated ratios ranged from 2:1 to 179:1. There is no indication of shallower ground water being separated from deeper ground water by a confining layer. The nearest state observation well with long term data is state observation well 381 (well LAKE 2424). It is located in Goose lake valley about 0.7 miles southwest of the Hammersley Canyon mouth. The 800 foot deep well is completed in the predominantly basin fill sediments that overlie the predominantly basalt unit. The ground water level data is from 1965 through 2010. Interestingly, the annual peak water level from 1965 to 1970 was between 35 to 40 feet below land surface, then there was a gradual decline in the annual water level from about 40 to 50 feet below land surface from 1970 to 1990, then the annual water level water level rose to about 20 feet below land surface and has fluctuated between 15 to 20 from 1990 to 2010. The cause of the rise is undetermined at this time.

References Used:
Brown, D.E., Peterson, N.V., and McLean, G.D., 1980, Preliminary geology and geothermal resource potential of the Lakeview area, Oregon: DOGAMI Open-File Report O-80-09, 57 p., 1:62,500 maps.
Gonthier, J.B. 1985, A description of aquifer units in eastern Oregon: USGS Water Resources Investigations Report 84 4095, 39 p., 4 plates.
Morgan, D.S., 1988, Geohydrology and numerical model analysis of ground-water flow in the Goose Lake Basin, Oregonand California: USGS Water Resources Investigations Report 87-4058, 92 p.
Oregon Water Resources Department, 1989, Goose and Summer Lakes Basin report: OWRD Basin Report, 112 p.
Peterson, N.V. and McIntyre, J.R., 1970, The reconnaissance geology and mineral resources of eastern Klamath Count and western Lake County, Oregon: DOGAMI Bulletin 66, 70 p.
Phillips, K.N. and VanDenburgh, A.S., 1971, Hydrology and geochemistry of Abert, Summer, and Goose Lakes, and othe closed-basin lakes in south-central Oregon: USGS Professional Paper 502-B, 86p.
Walker, G.W., 1963, Reconnaissance geologic map of the eastern half of the Klamath Falls (AMS) quadrangle, Lake and Klamath Counties, Oregon: USGS Mineral Investigations Field Studies Map MF-260.
Walker, G.W. and Reppening, C.A., 1965, Reconnaissance geologic map of the Adel quadrangle, Lake, Harney, and Malheur Counties, Oregon: USGS Miscellaneous Geologic Investigations Map I-446.
Waring, G.A., 1908, Geology and water resources of a portion of south-central Oregon: USGS Water Supply Paper 220
Goose and Summer Lakes Basin Program rules (OAR 690-513).
State Obesrvation Well SOW 381 (well LAKE 2424).
Water well reports for well LAKE 2326 (proposed production well).
USGS Lakeview NW quadrangle map (1:24,000)

D. WELL CONSTRUCTION, OAR 690-200

D1.	Well #:	Well 1	Logid:	LAKE 2326	
	Well #:	Well 2	Logid:	not drilled yet	MARIENE BASE
	Well #:	Well 3	Logid:	not drilled yet	
	Well #:	Well 4	Logid:	not drilled yet not drilled yet not drilled yet	(1) A(1)
D2.	THE WELL	does not meet current well co	netruation etandards based a		
102.		ew of the well log;	istruction standards based t	ipon:	
		inspection by			VIII
	c repo	rt of CWRE	THE CONTRACTOR OF THE CONTRACT	The state of the s	
	d. dothe	r: (specify)	- A 12 23 25 25 25 25 25 25 25 25 25 25 25 25 25		
D2	THE WELL				
D3.		construction deficiency: titutes a health threat under Div	ision 200 miles		
		mingles water from more than o			
		nits the loss of artesian head;	ne ground water reservoir,		
		nits the de-watering of one or me	ore ground water reservoirs:		
		r: (specify)			
	of the state of th	(-13)			
D4.	THE WELL	construction deficiency is des	cribed as follows:		
	No.		71.124.5.222.233.20		THE RESERVE
	Committee of the	SWARD IN THE	14 14 15 6 1 1 1 5 1 a		
D5.	THE WELL	Well #: Well 1	Fig. With the property of the second		
				e standards in effect at the time of	
		original construct	ion or most recent modification	on.	
		h 🖂 1 danklana:6:4	met standards at the time of c		
		b. don't know if it	met standards at the time of c	onstruction.	
D6. [Route to the	Enforcement Section.			
			34 Landson 318		
					at the traction
	- C 8450 3 T				
		A STATE OF STREET		1 2014 92	
					The Part of the Pa
	Park and				700
THIS	SECTION T	O BE COMPLETED BY E	NFORCEMENT PERSON	NNEL	
	The Carte of				
D7.	Well construc	ction deficiency has been correc	ted by the following actions: _		
	-			The state of the s	
	-				
	-				100
	ALC: NO.		SEASON NO.		
			SPACES TO THE REAL PROPERTY.		, 200
	(Enf	forcement Section Signature)			
D0 1	Doute to W.	ater Rights Section (attach we	I reconstruction loss to this	naga)	
D8. [Koute to Wa	ater Rights Section (attach we	i reconstruction logs to this	page).	

Water Right Application G-17512 Crystal Clear Energy, LLC

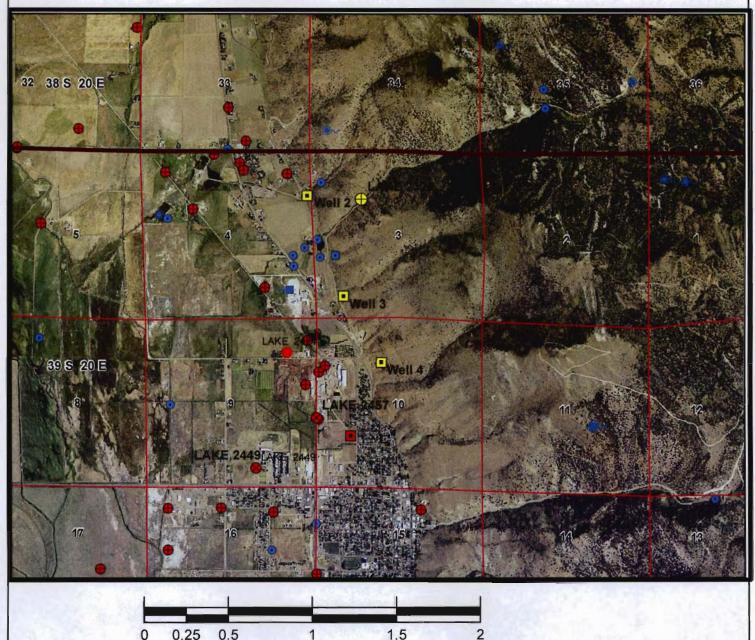


Yellow = Proposed Well(s) Red = Other Wells

Blue and Other = surface water rights



Water Right Application G-17512 Crystal Clear Energy, LLC



0 0.25 0.5 1 1.5 Miles

Yellow = Proposed Well(s) Red = Other Wells

Blue and Other = surface water rights



WATER WELL REPORT STATE OF OREGON

Deepening
Reconditioning

Domestic

Irrigation

in. by perforations from

Well screen installed? Yes

Slot Size Set from

Yes D No If yes, by whom?

gal./min. with

gal/min. with

g.p.m.

Drawdown is amount wat

gal/min. with drill stem at

Depth artesian flow en

Special standards: Ye

..... Type HP

depth of strata

perforations from

perforations from ...

Manufacturer's Name

Diam. Slot Size Set from

Diameter of well bore to bottom of seal 20in. Diameter of well bore below seal in. Number of sacks of cement used in well seal 7/25 = How was cement grout placed? METHOD D GROUT Pump

Did any strata contain unusable water? DYes X No

(4) PROPOSED I

Perforated? | Yes

If abandonment, describe material and procedure in Item 12.

12. "Diam. from + 1 ft. to - 140 ft. Gauge

(1) OWNER:

New Well

Rotary Air Rotary Mud

City PORTLAND

(3) TYPE OF WELL:

Driven

(5) CASING INSTALLED:

LINER INSTALLED:

(6) PERFORATIONS:

Type of perforator used Size of perforations

(7) SCREENS:

(8) WELL TESTS:

(9) CONSTRUCTION:

Was pump installed?

Method of sealing strata off

Gravel placed from

Type of Water?

Was a drive shoe used? ☐ Yes XNo

Was well gravel packed? Yes YNo

Well seal-Material used ... NEZ Well sealed from land surface to ... /40

Air test Bailer test

sian flow

Dug

NARTHWEST 123 FLANDERS

(2) TYPE OF WORK (check):

RECEIVED

(10) LOCATION OF WELL.

MAY 111981 State Well No.

WATER RESOURCES DEPOPErmit No. SALEM, OREGON

	(10) DOCATION OF WELL.			
THERMAL	County LAKE Driller's well			
57,	SE " NW " Section 3 T. 395	R. 20	Ē.	W.M.
State OR	Tax Lot # Lot Blk		bdivision	
	Address at well location: /631 ft. 6 4/3	5065	at 1	N.W
	CORNER OF SEC. 3.		0	
aditioning	(11) WATER LEVEL: Completed w	ell.		
edure in Item 12.		·		
ROPOSED USE (check):	Depth at which water was first found 12Q			ft.
		2300000		3-19-81
☐ Industrial ☐ Municipal ☐ ☐ Test Well ☐ Other ☐	Artesian pressure lbs. pe	r square 1	nch. Date	
Withdrawal B, Reinjection	(12) WELL LOG: Diameter of well below	casing	13 "	
Steel M Plastic	Depth drilled 685 ft. Depth of	completed	well 68	5 ft.
Thresded □ Welded ₩ O ft. Gauge	Formation: Describe color, texture, grain size and stru- thickness and nature of each stratum and aquifer pene- for each change of formation. Report each change in y and indicate principal water-bearing strata.	trated, wi	th at least	one entry
	MATERIAL	From	To	SWL
	BROWN Soil TBLDRS	0	8	CIC III
ft. Gauge	BROWN LITHIC TUFF		-	-
erforated? Yes No	TUFF BRECCIA	8	30	- 500
		30	40	
in.	WHITE TUFF	40	50	-
tions from ft. to ft.	BASAUT	50	60	
tions from ft. to ft.	ANDESITE	60	80	
tions from ft. to ft.	BROWN THEF BRECCIA		90	
	GREEN LITHIC TUFE	90	110	
talled? Yes No	ANDESITE	110	150	
	GREEN LITHIC BRECCIA	120		
Model No.	GRN-RED BRN LITHIE "	185		
. Set from ft. to ft.	GREEN TOFF BRECCIA	330		
. Set from ft. to ft.	BASALT	280	345	
own is amount water level is lowered tatic level	GREEN THEF	345	360	110
1 1	GRN- GRAY LITH'S TUFF BREECIG	-	600	-
yes, by whom? HG (FNTER	BASALT	600	615	
h / ft. drawdown after 4 hrs.	TUFF BRECCIA		640	
	SINTER		670	
with drill stem at ft. hrs.	ANDESTE	670	685	
with ft. drawdown after hrs.	THE SERVICE STREET SERVICES		ATT 12	
	TOTAL TOTAL POPULATION AND THE			Treasure
oth artesian flow encountered ft.	Work started 2- // 198) Complete	ed 3-	19	1981
cial standards: Yes D No X	Date well drilling machine moved off of well 3			1981
CEMENT	Drilling Machine Operator's Certification:			
ft.	This well was constructed under my direct s	unervisi	on Mate	rials used
d in	and information reported above are true to my h			
in.	(Simod) 11) 4 Williams			., 198/
7705 - 189 sacks	(Drilling Machine Operator)	. 1	120	
THOD D	Drilling Machine Operator's License No	(a.4		
	Water Well Contractor's Certification:	H 2000		
	This well was drilled under my jurisdiction	and th	is report	is true to
	the best of my knowledge and belief.			
Plugs Size: location ft.		الم عالمة		
Yes X No	Address ? D. Box 1310 LAILEVIEW	00	(Type or	30
h of strata	Address Livi. A.		J(.G	M
	[Signed] W. Williams			
Size of gravel:	(Water Well Contract Contractor's License No. 665 Date	tor)		180
ft.	Contractor's License No & & S Date		••••••	, 19.0.1

NOTICE TO WATER WELL CONTRACTOR The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT. SALEM, OREGON 97310 within 30 days from the date of well con

SP*12658-690

Water Ground

(503)378-8455 - 158 12th St. NE, Salem, OR 97310

Oregon Water Resources Departmen

Oregon Water Resources Department Hydrograph for State Well LAKE 2424, State Observation Well #381

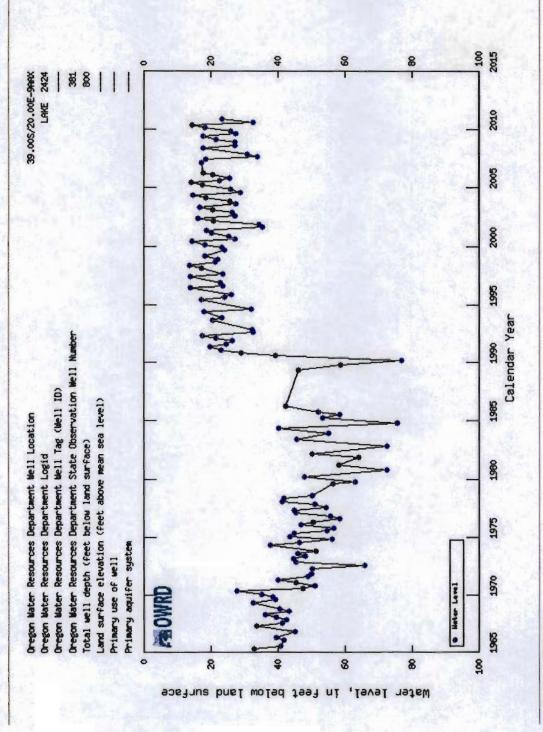


Table showing water-level data for State Well LAKE 2424, State Observation Well #381

												The second second
Theis Equation:	$s = [O/(4^*T^*p)][W(u)]$ $u = (r^*r^*S)/(4^*T^*t)$ $W(u) = (-\ln u) - (0.5772157) + (u'1^*1t) - (u^*u'2^*2t) + (u^*u^*t)$	J)] 72157)+(u/1*1!))-(n,n/2,zi)+(n,n,	*u/3*3!)-(u*u*u*u/4*4!)+	4*4!)+							
	s = drawdown (L) T = transmissivity (L*L/T) S = storage coefficient (dimensionless) pi = 3.141592654	L*L/T) ent (dimension	ess)		r = radial distance (L) t = time (T) u = dimensionless W(u) = well function	ance (L) nless unction						
Transmissivity	Transmissivity	Storage	Pumping Rate	Pumping Rate	Time	Distance	id	5	W(u)	Drawdown	Comments	Net
(gpd/ft)	(ft2/day)	S	(gal/min)	(ft3/sec)	(days)	(feet)				(feet)		(feet)
								Note: W(u)	Note: W(u) calculation valid when u < 7.1	alid when u	<7.1	
Note	Note: yellow grid areas are where values are calculate	are where valu	es are calculate	p				7.0000	1.1545E-04		W(u) calculation test	
nario 1: Injec	Scenario 1: Injection evenly distributed among all 3 proposed injection wells	ited among all	3 proposed inje	sction wells								
(E 2326 to Su	LAKE 2326 to Surface Water Right at Hammersley Canyon mouth	t Hammersley	Canyon mouth									
72.944.05	9,751.20	0.00124	1,500.00	3.34	30.00	1,570.00	3.14	0.0026	5.3754	12.6668	Continuous Pumping at Full Rate	1.7464
72,944.05	9,751.20	0.00124	1,500.00	3.34	365.00	1,570.00	3.14	0.0002	7.8717	18.5492	Continuous Pumping at Full Rate	2.6982
2 to Surface	Well 2 to Surface Water Right at Hammersley Canyon mouth	imersley Cany	on mouth									
72.944.05	9,751.20	0.00124	-500.00	4.11	30.00	1,350.00	3.14	0.0019	5.6767	4.4589	Continuous Pumping at Full Rate	
72,944.05	9,751.20	0.00124	-500.00	1.11	245.00	1,350.00	3.14	0.0002	7.7751	-6.1071	Continuous Pumping at Full Rate	
3 to Surface	Well 3 to Surface Water Right at Hammersley Canyon mouth	nmersley Cany	ron mouth									
72 944 05	9,751.20	0.00124	-500.00	-1,41	30.00	2,010.00	3.14	0.0043	4.8830	-3.8355	Continuous Pumping at Full Rate	
72,944.05	9,751.20	0.00124	-500.00	1.1	245.00	2,010.00	3.14	0.0005	6.9793	-5.4821	Continuous Pumping at Full Rate	
4 to Surface	Well 4 to Surface Water Right at Hammersley Canyon mouth	nmersley Cany	on mouth									
72,944.05	9,751.20	0,00124	-500.00	21,11	30.00	4,375.00	3.14	0.0202	3.3433	-2.6261	Continuous Pumping at Full Rate	
72,944.05	9,751,20	0.00124	-500.00	41.11	245.00	4,375.00	3.14	0.0025	5.4257	4.2618	Continuous Pumping at Full Rate	

rawdown Calcu	Drawdown Calculations Using Theis Equation	s Equation										
Theis Equation:	$\begin{split} s &= [O/(4^*T^*p)][W(u)]\\ u &= (r^*r^*S)/(4^*T^*p)\\ W(u) &= (-1n \ u) + (0.5772157) + (u/^*1!) + (u^*u/2^*2!) + (u^*u'u/3^*3!) - (u^*u'u'u'4^*4!) + \dots \end{split}$	(u)] 772157)+(u/1*1!	i)-(u*u/2*2!)+(u*u	/n,n,n,n)-(is,s/n,	/4*4!)+							
	s = drawdown (L) T = transmissivity (L*L/T) S = storage coefficient (dimensionless) pi = 3.141592654	(L・レ丌) :ient (dimension	iless)		r = radial distance (L) t = time (T) u = dimensionless W(u) = well function	tance (L)						
Transmissivity	Transmissivity	Storage	Pumping Rate	Pumping Rate.	Time	Distance	id	ם	W(u)	Drawdown	Comments	Net
(gpd/ft)	(ft2/day)	S	(gal/min)	(ft3/sec)	(days)	(feet)				(feet)		(feet)
								Note: W(u)	calculation	Note: W(u) calculation valid when u < 7.1	< 7.1	
Note	Note: yellow grid areas are where values are calculate	are where valu	ues are calculate	pe				7.0000	1.1545E-04		W(u) calculation test	
cenario 2: Inje	Scenario 2: Inject 100% at one injection well only	ction well only					-					
AKE 2326 to Su	LAKE 2326 to Surface Water Right at Hammersley Canyon mouth	at Hammersley	Canyon mouth									
72 944 05	9,751.20	0.00124	1.500.00	3.34	30.00	1,570.00	3.14	0.0026	5.3754	12.6668	Continuous Pumping at Full Rate	
72,944.05	9,757.20	0.00124	1,500.00	3.34	365.00	1,570.00	3.14	0.0002	7.8717	18.5492	Continuous Pumping at Full Rate	
Vell 2 to Surface	Well 2 to Surface Water Right at Hammersley Canyon mouth [ass	mmersley Can	you mouth (assi	uming 100% re-injection occurs at this well)	njection oc	curs at this w	ell)					
72 944 05	9.757.20	0.00124	-1.500.00	-3.34	30.00	1.350.00	3.14	0.0019	5.6767	-13.3767	Continuous Pumping at Full Rate	-0.7099
72,944.05	9,751.20	0,00124	-1,500.00	-3.34	245.00	1,350.00	3.14	0.0002	7,7751	-18.3214	Continuous Pumping at Full Rate	0.2278
Vell 3 to Surface	Well 3 to Surface Water Right at Hammersley Canyon mouth (ass	mmersley Can	you mouth (assi	uming 100% re-injection occurs at this well	njection oc	curs at this w	ell)					
72 944.05	9,751.20	0.00124	-1.500.00	-3.34	30.00	2,010.00	3.14	0.0043	4.8830	-11,5064	Continuous Pumping at Full Rate	1.1604
72,944.05	9,751.20	0.00124	-1,500.00	.3.34	245.00	2,010.00	3.14	0.0005	6.9793	-16.4462	Continuous Pumping at Full Rate	2.1030
Vell 4 to Surface	Well 4 to Surface Water Right at Hammersley Canyon mouth (assuming 100% re-injection occurs at this well)	mmersley Can	yon mouth (assi	uming 100% re-ii	njection oc	curs at this w	ell)					
72 944 05	9,751.20	0.00124	-1,500.00	.3.34	30.00	4.375.00	3.14	0.0202	3.3433	-7.8782	Continuous Pumping at Full Rate	4.7886
72 944 05	e.751.20	0.00124	-1,500.00	.3.34	245.00	4,375.00	3.14	0.0025	5.4257	-12.7853	Continuous Pumping at Full Rate	5.7639